·CTU·
CONTEST UNIVERSITY

Dayton Contest University
May 19, 2016
Crowne Plaza Hotel
Dayton, Ohio

DX ENGINEERING

8:30 am to midnight ET, Monday-Friday
1230 to 0400 UTC March-October

8:30 am to 5 pm ET, Weekends
1230 to 2100 UTC March-October

International/Tech: 330-572-3200
8:30 am to 7 pm ET, Monday-Friday
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DX Engineering can supply you with what you need to stay competitive, including advice from serious Amateur Operators, access to great gear and the fastest shipping in the industry.

EAntenna

Contesters have been clamoring for rugged, high performance antennas that won't break the bank. EAntenna's Yagi and dipole antenna designs deliver on all three fronts. These HF and VHF antennas can be found in some of Europe's most competitive stations, and now you can get them for your installation. See them now at DXEngineering.com. The VK0EK Heard Island team relied on EA Antenna's high performance antennas to help ensure the DXpedition's success.

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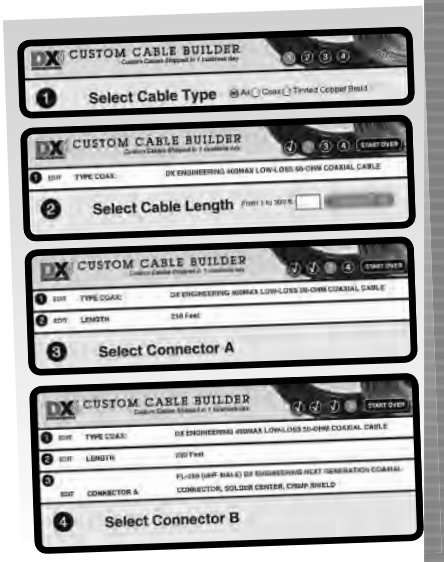

ARRL Contest University Textbooks

If you missed any earlier Contest University events, you can still get the slides. These paperback books are similar to the one you're holding right now, and serve as standalone guides to becoming a better contester. Read up, and discover even more helpful tips and pointers on mode-specific contesting, rules and ethics, propagation, and station setup.

PRO-STACK Broadband Antenna Phasing Systems

DX Engineering's PRO-STACK phasing systems allow you to combine multiple Yagi, log periodic, beam or quarter-wave verticals for enhanced performance. The PRO-STACK allows multiple selections of any or all antennas including in and out of phase combinations. There are 2- and 3-antenna systems, available with SO-239, Type N or 7-16 DIN connectors.

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The **World Wide Radio Operators Foundation** was created in 2009 by a group of experienced radio operators who saw a need for an independent organization devoted to the skill and art of radio operating. Until now, many of the elements of modern radio contest operating such as log-checking software, log submission robots, etc., have been developed and supported by volunteers. Who will organize and fund the enhancement of these tools into the future? The **World Wide Radio Operators Foundation** was created to help fill that need.

WWROF is dedicated to improving the skills of amateur radio operators around the world, utilizing education, competition, advancement of technology and scientific research, promoting international friendship and goodwill, and preparing them to better serve society in times of communication need.

WWROF Programs

- Webinar series on contesting and operating topics
- Stewards of the Cabrillo log file standard
- Log submission and processing infrastructure
- Contest award management including certificate and plaque distribution
- Support of Contest University and WRTC
- Other projects that support contesting

WWROF Contester's Code of Ethics

- I will learn and obey the rules of any contest I enter, including the rules of my entry category.
- I will obey the rules for amateur radio in my country.
- I will not modify my log after the contest by using additional data sources to correct callsign/exchange errors.
- I will accept the judging and scoring decisions of the contest sponsor as final.
- I will adhere to the DX Code of Conduct in my operating style.
- I will yield my frequency to any emergency communications activity.
- I will operate my transmitter with sufficient signal quality to minimize interference to others.

Leadership

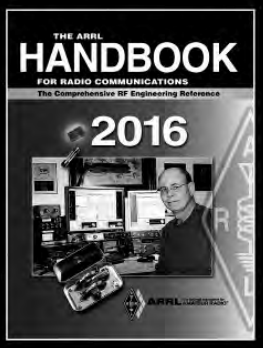
John Dorr, K1AR, Chair
Tim Duffy, K3LR, Vice-Chair
Ralph Bowen, N5RZ, Treasurer
Tom Lee, K8AZ, Secretary
Doug Grant, K1DG, Founding Director
Mark Beckwith, N5OT, Founding Director
Bob Cox, K3EST, Founding Director
John Sluymer, VE3EJ, Director
Tine Brajnik, S50A, Director
Randy Thompson, K5ZD, Director

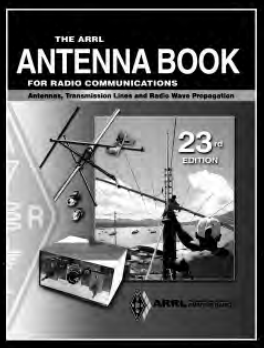
Donate

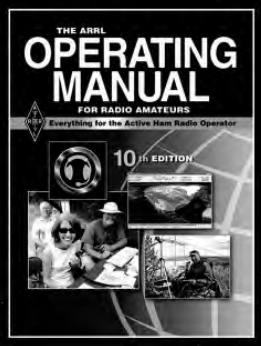
Can you imagine contesting without electronic logs? Sophisticated log checking software? Certificates for winners? The World Wide Radio Operators Foundation is completely dependent on contributions for our funding. We welcome donations of any amount to help us fund our projects.

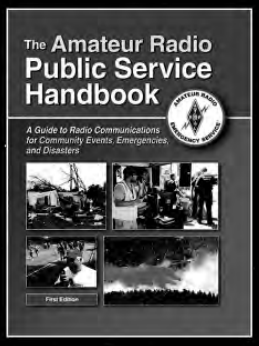
WWROF is recognized by the Internal Revenue Service as a tax-exempt public charity under section 501(c)(3) of the Internal Revenue Code.

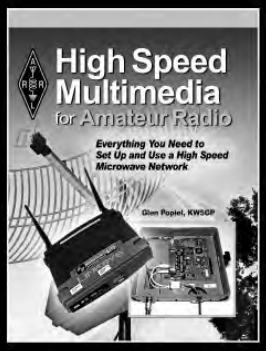
Learn more. Visit wwrof.org





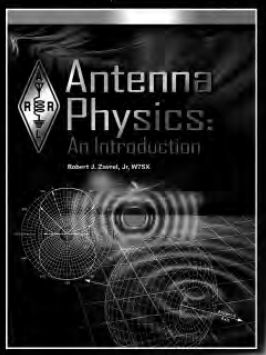


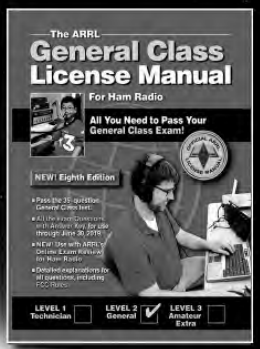




Stay in the Know!

ARRL Publications and Journals
www.arrl.org/shop





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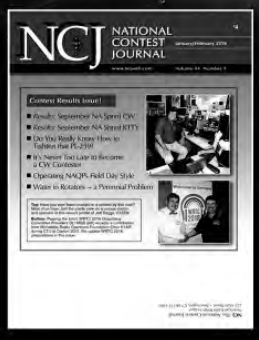

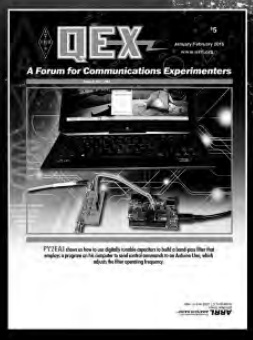

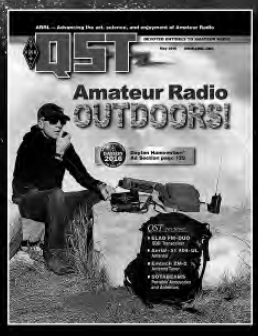

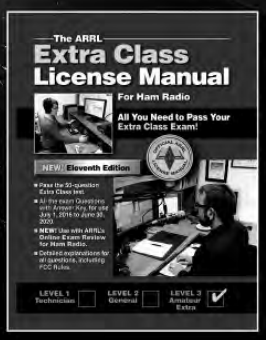

QST 6/2016

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First Edition

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Welcome

On behalf of the CTU Board of Directors K1DG, N9JA and K1AR, K8MNJ and the 11 Professors of Dayton Contest University 2016 we are pleased you are here and we extend a warm welcome to you!

There have been more than 39 in nine years. Ten have been held here in Dayton, two in South America (Brazil), seventeen in Europe (England, Germany, Finland and Italy), one in Australia, one in Russia, and one in Puerto Rico.

Over 20 presentations are available here at Dayton Contest University 2016. They are the work product of many hours of hard effort by your Professors and the CTU staff (special thanks to K8MNJ, N9RV and K1SO).

Icom America has led the way by sponsoring this event from the start in 2007. Contest University would not be possible without the support of Ray Novak, N9JA and Icom, DX Engineering, CQ Magazine, and The ARRL, all have contributed their help and guidance in making this CTU the best ever. Please support these vendors who have given back to our RadioSport hobby.

Contest University is a platform for sharing ideas and learning new ways to enjoy Amateur Radio Contesting. We hope you will enjoy and share what you learn here today.

Finally, while we have tried to make everything as perfect as possible for you here at CTU, this is a work in process for all of us. I ask for your patience as we work out any problems. Your on going support for CTU is critical as we move forward to more Contest University's in the future.

Always – Share, Learn, Enjoy and Encourage!

Very 73!

Tim Duffy K3LR
CTU Chairman

2016 Dayton Contest University "CTU" – COURSE OUTLINE – 7:00 AM to 5:00 PM

7:00 ALL SALON A & B – Student Registration and Contest Buffet Breakfast – ALL – 60 minutes
8:00 ALL SALON A & B – Welcome to CTU 2016 – K3LR – ALL – 10 minutes
8:10 ALL SALON A & B – Fair Play – How to Earn and Keep Respect – K4RO – ALL 40 minutes

9:00 CONTEST TOPIC SESSION #1 – attend ONE of 4 sessions – 60 minutes
SALON A – Adapting Your Contest Strategies to the Rapidly Declining Solar Cycle 24 – W3LPL
SALON B –The Advantages of Waterfall Displays for Contesting and DXing – N6TV
SALON C/D – Small Station Bang for the Buck – NØAX
HARDING – Techniques to Optimize 6 Meter Contest Performance – W5ZN
10:00 ALL – *CONTEST SNACK* – 15 minutes

10:15 CONTEST TOPIC SESSION #2 – attend ONE of 4 sessions – 60 minutes
SALON A – Improving Your 160 and 80 Meter Antennas for the Declining Solar Cycle – W3LPL
SALON B – Coax Connectors, A Deep Look At What Can Go Wrong– W8WWV
SALON C/D – Improving Single Operator 2 Radio (SO2R) Techniques – N2NT
HARDING– Getting Started with RTTY Contesting – WØYK

11:20 CONTEST TOPIC SESSION #3 – attend ONE of 4 sessions – 55 minutes
SALON A – Improving Your 40 Through 10 Meter Antennas for the Declining Solar Cycle – W3LPL
SALON B – Improving Your Contest Scores Through Log Analysis – NV9L
SALON C/D – How to Record an Entire Contest and Learn From Your Mistakes – N6TV
HARDING – Advanced RTTY Contesting – WØYK

12:15 ALL SALON A & B – *CONTEST LUNCH* – ALL – 35 minutes
12:50 ALL SALON A & B – 2016 Eye Ball Sprint Contest **"LIVE"** – K1DG – ALL – 10 minutes
1:00–1:35 ALL SALON A & B – How Contesting Contributes to Ham Radio – K3LR

***1:45 CONTEST TOPIC SESSION by REQUEST to RERUN** – 50 minutes
*SALON A – As determined by *vote 1
SALON B – As determined by *vote 2
*SALON C/D – As determined by *vote 3
*HARDING – As determined by *vote 4

2:40 CONTEST OPEN DISCUSSION Q&A GROUPs Attend ONE of 4 sessions – 30 minutes
SALON A – Antennas and Propagation – W3LPL
SALON B – Contest Shack Design – K1DG
SALON C/D – Waterfalls, Recordings and Reverse Beacon Network – N6TV
HARDING – Basic Tower Design and Climbing Safety – W3YQ

3:15 CONTEST OPEN DISCUSSION Q&A GROUPs Attend ONE of 4 sessions – 30 minutes
SALON A – Small Stations With Big Ideas – NØAX
SALON B – Multi Operator Hints and Kinks – W3LPL
SALON C/D – Let's Talk About Improving Your Contest Scores – NV9L
HARDING – RTTY Contesting – WØYK

3:45 ALL – *CONTEST SNACK* – 15 minutes

4:00 ALL SALON A & B – 2016 Contest Radio Performance – NCØB – ALL – 50 minutes
4:50 ALL SALON A & B – 2016 CTU Survey, K1DG Eye Ball Winner – K3LR – ALL – 10 minutes

*** 1:45 PM CONTEST SESSION by REQUEST vote to RERUN**
CTU students will vote for 4 topics/classes that they missed and would like to have presented again – the top 4 WANTED by vote – will RERUN in this time slot

Contest University Professor Bios

Andy Blank, N2NT

Andy has been a Ham since 1972, and enjoys CW and DX contesting both single op and multi multi. Andy lives in New Jersey with his wife Bonnie, and one son Bryan who is engaged to be married. Andy's station sits on 2 acres in Central NJ, with one main tower, and a lot of wires. His main radios are an IC7800, and K3, with ACOM and Alpha Amps. Andy works in the large ship Marine Communications industry as Service Manager for the Northeast region. Andy is veteran of 6 WRTC's, one as organizer. Andy also maintains a station in Saint Kitts (V47NT/V47T) for DX contesting, along with his home station in NJ. Andy has operated from many famous stations including W2PV and K3LLR, where he still operates from at least once a year. VHF is a new contesting endeavor for him.

Frank Donovan, W3LPL

Frank's contesting career began as a twelve year old at the Providence Radio Assn. 1959 ARRL Field Day, W1OP/1, on a hilltop two miles from his home in Providence, Rhode Island. Soon afterwards he began to slowly build his own small contest station on 1/10th acre in a densely populated urban neighborhood.

17 year old K1LPL finished first place USA in the 1964 ARRL CW DX Contest low power category. In 1968 he was the leader of the W1OP/1 Field Day that finished in first place in the Field Day 4A category. Immediately after college, 2nd Lieutenant Frank Donovan's first military assignment was in the Washington DC area where he worked for PVRC member W3GN and with his multi-multi mentor W4BVV.

Frank finished first place USA single operator in four CQ WW CW and four ARRL CW DX contests from 1973 to 1978. His first multi-multi experience was with the world high scoring 1974 PJ9JT CQ WW CW team. W3LPL multi-multi teams started with a small entry in the 1978 CQ WW Phone DX Contest. Less than four years later, two incredible long nights of 10 meter JA runs unexpectedly produced the team's first USA multi-multi win in the 1982 ARRL Phone DX Contest.

W3LPL multi-multi teams have completed nearly one million QSOs and achieved 45 first place USA finishes out of more than 150 entries in the CQ WW and ARRL DX contests. Frank is a member of the prestigious CQ Contest Hall of Fame and is a regular presenter at Contest University. Frank retired five years ago as a Chief Engineer at General Dynamics Corporation after a 45 year career in electronics and systems engineering.

Tim Duffy, K3LR

Tim has been an active contest operator for over 43 years. He has hosted over 130 different operators as part of the K3LR Multi-Multi DX contest efforts since. Tim served on the ARRL Contest Advisory Committee as a member and multi-year Chairman. K3LR has been an active member of the CQ Contest Committee for 26 years. Tim was the Atlantic Division Technical Achievement award winner in 1998. He was moderator of the Dayton Contest Forum for 10 years and has been moderator of the Hamvention Antenna forum for 33 years. He is a founding member and past President of the North Coast Contesters. K3LR serves as founder and chairman of Contest University (10 years) and the Dayton Contest Dinner (24 years), chairman of the Top Band Dinner (5 years) – as well as coordinator of the Contest Super Suite (31 years) in Dayton. He is founder and moderator of the popular RFI Reflector (RFI@contesting.com). He has been a guest on Ham Nation many times. Tim was a member of Team USA at WRTC – four times. Tim serves on the board of directors of the World Wide Radio Operators Foundation (WWROF) as Vice Chairman. He is President of The Radio Club of

America (RCA). Tim is President of the Mercer County Amateur Radio Club - W3LIF (15 years). K3LR was elected to the CQ Contesting Hall of Fame in 2006. He was honored with the prestigious Barry Goldwater Amateur Radio service award by RCA in 2010. Tim was elected ARRL Section Manager for Western Pennsylvania in 2015 and was the 2015 Amateur of the Year as awarded by the Dayton Amateur Radio Association which runs the Dayton Hamvention®. Tim is the Chief Operating Officer and General Manager at DX Engineering

Joel Harrison, W5ZN

Joel was first licensed as WN5IGF in 1972. His first contest was the old ARRL CD Party in 1973. His interests later turned to VHF contesting, finally breaking into the top 10 in the ARRL June VHF contest in 1993. In June 1996 he won first place in the single op category setting a new world record under the callsign WB5IGF. In 1998 he returned to the June contest as W5ZN, once again winning first place and breaking his previous 1996 record. In 2001 he won first place single op in the ARRL UHF Contest and in 2011 the W5ZN team won first place in the Limited Multiop category of the ARRL June VHF Contest. W5ZN was a team member of the record setting WA8WZG contest team in 1999 and 2000 and the K1WHS team that finished first in the Multiop category of the 2010 ARRL September VHF contest outing multi-year winner W2SZ. W5ZN is also active in HF contests. In the 2006 ARRL DX Contest he set a new 80 meter CW record for the W5 call area that held until 2009. In 2011 he reclaimed that record that still holds today. He is a member of the N2CEI Multi-op team for the ARRL 160 Meter Contest and in 2016 was a team member of the W2GD CQWW 160 CW Contest Team finishing with the top claimed NA score. In 2015 he challenged a group of “Rookies” in his local club to learn CW and the prize was their operating in the 2015 ARRL Rookie Roundup – CW contest from his station as a Multi-op team that finished with the most Q’s. Joel holds 10 band DXCC and 11 band VUCC, is an A-1 Operator and served as ARRL President from 2006 until 2010 when he retired from ARRL elected service after 27 years. In 2014 he was awarded the ARRL Medal of Honor for outstanding service to amateur radio.

Valerie Hotzfeld, NV9L

Valerie was first licensed in 2006 not knowing anyone in amateur radio. So it took her until April 2011 before she discovered DXing. Later that year she met some contesters at a DX convention in Chicago. They talked her into entering the California QSO Party. So with her modest station of a used HF radio and used tribander, she entered and won her very first contest!!! Operator skill? Probably not. It might have been because she was the only entry in her category; Out of State, YL, LP. But that was all she needed to get bit by the contesting bug. A few contests later, she stumbled onto WB9Z’s frequency; a World class contester with a World class station. Some flirting took place on the air, and 6 months later they began dating and contesting together. Valerie has 1 World contest win along with 1 top USA win, both as a member of multi-single teams. As an accountant & financial analyst, Valerie loves to dissect and analyze every contest looking for ways to improve her scores. Valerie is also a host on the show Ham Nation where she focuses on DXing and Contesting.

Tim Jellison, W3YQ/KL7WV

Tim was licensed in 1973 at 13 years of age. He achieved 5BDXCC then went on to confirm 100+ countries on 160. He no longer chases DX, but is a regular participant in CW DX contests, these days primarily as an operator at the K8AZ multi-op station.

Professionally, he took a job managing a satellite communication facility following his graduation from Penn State in 1981, then changed career paths in 1999 and accepted a position running a cellular network throughout the state of Alaska. He left corporate life in 2012 and is now semi retired.

Tim has been a technician and a technical manager all of his adult life. He's been involved in all aspects of electronics, radio, towers, and antennas. He holds a valid FCC Radiotelephone License and is Comtrain certified as an Authorized Climber/Rescuer.

Ed Muns, WØYK

Ed, WØYK, entered CW and SSB DX contests initially in the early 1970s as a way to work new band/mode-countries for DXCC. His interest rapidly evolved from DXing to contesting with his early learning at the KØRF multi-multi. Today, CW and RTTY contesting dominate Ed's operating time. His local contest club, the Northern California Contest Club (NCCC), mounted an effort for the club competition gavel first offered in the 2004 ARRL RTTY Round-Up where Ed reluctantly (kicking and screaming) learned how to setup RTTY and ultimately won the Pacific Division SOHP plaque. He ironically enjoyed that induction into RTTY so much that he now includes all the major RTTY contests in his contesting schedule. With his P49X call sign, Ed holds the world SOHP record in ARRL RTTY Round-Up, having broken the record eight times, and the world SOHP record in CQ WPX RTTY, having broken that record seven times and set a world SOHP record in the 2010 CQ WW RTTY. Ed is the contest manager for the NCJ NA RTTY Sprint and the contest director for the two CQ RTTY contests, CQ WW RTTY and CQ WPX RTTY. He and Don, AA5AU, sponsor the Ten-Meter RTTY Contest which they initiated in December 2011 with nearly 700 logs submitted. He was inducted into the CQ Contest Hall of Fame in May 2014. This is his ninth year at CTU delivering the two RTTY presentations and Q&A.

Greg Ordy, W8WWV

Greg was first licensed as WB9CTH in 1969 at the age of 15. Active through high school and college, amateur radio went on the back burner while he obtained a BS and MS in Computer Engineering from Case Western Reserve in Cleveland, Ohio. He has worked in the field of digital simulation software and several small businesses ever since. The itch for amateur radio soon returned, and over the last 20 years he has been refining his HF station. His main interests include phased arrays, antennas for the lower HF bands, antenna measurements, and antenna modeling. He has contributed to the National Contest Journal, given several papers at the Dayton Antenna forum, helped with the ARRL Antenna book and the Low Band DXing book. Greg is also a professor at a local college. His web is site filled with lots of helpful "stuff":

http://www.seed-solutions.com/gregordy/Amateur%20Radio/W8WWV%20Experimentation.htm

Kirk Pickering, K4RO

Kirk was fascinated with antennas, electricity, and magnetism as a young child. At the tender age of 9, a complete stranger gave him a Heathkit GR-81 regenerative receiver. The first two stations heard were WWV and the "Voice of the Andes" HCJB. Short Wave Listening set the hook, and by age 14 Kirk was licensed as WB3FAX.

After earning a civil engineering degree, computers became Kirk's chosen field. His work time is spent managing UNIX-type computer systems. Also a lifelong musician, he particularly enjoys learning and sharing traditional acoustic string band music, commonly referred to as "Old Time."

After dabbling in a few contests in the late 1980's, in 1994 Kirk got his first taste of a dedicated contest operating session. Since that time he has made over 300 thousand QSOs in contests, mostly CW. Kirk has posted four victories as a single operator in CW Sweepstakes and has been a part of several multi-operator teams from both sides of the pileups.

In 2007, National Contest Journal editor KØAD tasked Kirk with writing a column for beginning contesters. The resulting "Contesting 101" column started a relationship with NCJ which continues to this day. After 4 years as a columnist plus another 3 years as NCJ Editor, he continues on with NCJ as the web site manager. The contesting community has inspired Kirk to develop into a better radio operator and a better person.

Rob Sherwood, NCØB

Ham radio began for me in 1961 in Cincinnati, Ohio, as both a novice and general-class operator. After graduating college in 1969 with a degree in physics, I moved to Denver and worked for KOA radio as an engineer until 1987. While at KOA, I maintained their 50 KW AM and FM transmitters, microwave links and studio equipment.

1974 saw the beginning of Sherwood Engineering, offering roofing filters and upgrade kits for the Drake R-4C. In 1976 I started measuring receiver performance on dozens of radios, since reviews in QST did not correlate with actual on-air observations at crunch time in CW contests. In 1977 “ham radio magazine” published the first of several of my articles on receiver problems and cures, vertical antenna ground systems and mobile antenna efficiency. Those articles are available on my web site as PDF files. Receiver test data is now web based with over 100 transceivers included at **www.nc0b.com/table.html**.

In the 80s I was invited to be a forum speaker at the Dayton Hamvention on several occasions, discussing both receiver and antenna performance issues. In 2004 I returned to the Dayton Contest Forum, giving a talk on the status of receivers both old and new, with special emphasis on the Orion and the Icom 7800. In 2007 the Drake Forum had me present a talk on the pros and cons of the new batch of DSP transceivers. In 2009 I made a presentation at the Dayton Hamvention Antenna Forum on ground systems for vertical antennas.

April 2016 will include a presentation at the Visalia DX Convention, and a ninth appearance at Contest University run by K3LR on Thursday before Dayton.

Other speaking invitations at ham events have included WØDXCC, W9DXCC, W4DXCC, YCCC, New Orleans, Austin, Huntsville and Albuquerque hamfests. Locally around Colorado I have discussed receiver performance at the Boulder Amateur Radio, Northern Colorado Amateur Radio, Colorado QRP & 285 TechConnect Radio Clubs.

Nine years ago, my XYL encouraged me to build my dream contest station on 10 acres east of Ft. Collins, Colorado. This has made it possible to evaluate top transceivers in major contests in a real-world environment to augment my laboratory data. This rural setting has allowed me to focus my interest on effective antennas. Six towers support nine mono-band Yagis and several wire antennas from 160 – 2 meters.

Ward Silver, NØAX

Ward has been an active contester since before his Novice days began in 1972. He credits contesting and later DXing with propelling him to major in ham radio at the Missouri University of Science and Technology as WØEEE with a minor in electrical engineering and, miraculously, a career. After twenty years of developing industrial and medical products, Ward is now the Lead Editor of the ARRL Handbook, the ARRL Antenna Book and all three ARRL License Manuals. He has been known to amuse his fellow amateurs by “hamifying” popular songs and performing them publicly with the *Spurious Emissions (Out of the) Band*.

He helped create the World Radiosport Team Championships (WRTC) in 1990 and is currently Secretary of the WRTC Sanctioning Committee. In 2013 he was elected President of the Yasme Foundation which supports amateur radio activities around the world. A 2015 inductee into the CQ

Contest Hall of Fame, his list of contest operating spans four continents and includes a variety of good scores from home and multioperator stations such as HC8N, PJ4Q, KH6RS/NH6T, K3LR, K9CT, W7RM, KL7RA, W5ZN, and W1AW. He considers himself fortunate to have a few top finish plaques on the wall of the radio room but the best part is participating in record –setting team efforts with friends from coast-to-coast.

Robert Wilson, N6TV

“TV Bob” is an active CW contester and Win-Test supporter. Licensed for 44 years, Bob competed at the World Radiosport Team Championship (WRTC) in San Francisco (1996), Slovenia (2000), and Moscow (2010). He finished in first place in the 2013 ARRL November CW Sweepstakes CW, and the September 2014 CW NA Sprint.

Bob was an early adopter of the Perseus SDR and CW Skimmer, and has recently been experimenting with audio and software interfaces to the latest generation of HF transceivers. He voluntarily supports Win-Test users, and also helps update the documentation. He was a member of the K2KW’s original “Team Vertical” group (6Y4A, 4M7X), and has been part of the multi-op teams at HC8N, K3LR, and W7RN (K5RC). Bob recently retired after 36 years as a software engineer at IBM.

2016 Contesting Related Events

May 18th – Wednesday night

7 PM Contest Super Suite at the Crowne Plaza opens the first of 4 nights in the Harding, Harrison and McKinley Ballrooms. Sponsored by MRRC, NCC, FRC.
8 PM to 10 PM CTU 2016 Registration
10:30 PM Pizza Party sponsored by Contest University 2016 http://contestsupersuite.com.

May 19th – Thursday all day

7 AM CTU Registration opens. Must sign up in advance – http://www.contestuniversity.com.
8 AM – 5 PM Dayton Contest University 2016 at the Crowne Plaza – 2nd floor.

May 19th – Thursday night

7 PM Contest Super Suite at the Crowne Plaza hosted by the Mad River Radio Club (MRRC), Frankford Radio Club (FRC) and the North Coast Contesters (NCC).
10:30 PM QSL Wings and Pizza Party in the Harding, Harrison and McKinley Ballrooms sponsored by K8CC, K3WW, K3LR, and Society of Midwest Contesters (SMC). http://www.contestsupersuite.com

May 20th – Friday

2:30 PM– 4:45 PM Antenna Forum at HARA Arena Room 1 Moderator: Tim Duffy, K3LR.

"Bent Elements for Impedance Matching and Performance Enhancement Within Yagi Antennas for HF" – Justin Johnson, GØKSC

"The Antenna Book – Its Purpose and Structure in the Internet Age" – Ward Silver, NØAX

"Innovative Wideband Techniques in Antennas – A New OWA Concept" – Dr. Jim Breakall, WA3FET

"Low Band Antennas at W3LPL: Fifty Years of Continuous Improvement" – Frank Donovan, W3LPL

May 20th – Friday night

7 PM Contest Super Suite at the Crowne Plaza hosted by The Mad River Radio Club (MRRC), Frankford Radio Club (FRC) and North Coast Contesters (NCC). WRTC 2018 German Beer Fundraising.
7:30 PM 27th Annual top Band Dinner at the Crowne Plaza – Presidential Ballroom. Speaker is Larry "Tree" Tyree, N6TR . Tickets in advance from http://topbanddinner.com.
10:00 PM **"Spurious Emission Band"** Live in its **NEW** location the Presidential Ballroom.
11 PM Pizza Party sponsored by the Potomac Valley Radio Club (PVRC).
http://contestsupersuite.com

May 21st – Saturday

12:30 PM – 2:30 PM Contest Forum at HARA Arena Room 1 Moderator: Doug Grant, K1DG.

“Progress on WRTC2018 Preparations” – Chris Janssen, DL1MGB

“Building a 21st-Century Multi-Single: ED8X” – Paul Young, K1XM and Charlotte Richardson, KQ1F

“Design and Construction of an HF/VHF/UHF Contest Station” – Fred and Anita Kemmerer, AB1OC/AB1QB

“An All-SDR Contest Station” – Craig Thompson, K9CT

May 21st – Saturday evening

6:30 PM 24th Annual Dayton Contest Dinner hosted by North Coast Contesters at the Crowne Plaza Presidential Ballroom. Dinner speaker is John Crovelli, W2GD. Space is limited. Details and tickets in advance are available at http:// www.contestdinner.com.

7 PM Contest Super Suite at the Crowne Plaza hosted by The Mad River Radio Club (MRRC), Frankford Radio Club (FRC) and North Coast Contesters (NCC).

11 PM Pizza Party sponsored by the Yankee Clipper Contest Club (YCCC). Harding, Harrison, and McKinley Ballrooms. http://www.contestsupersuite.com

World Wide Radio Operators Foundation

Contester's Code of Ethics

- I will learn and obey the rules of any contest I enter, including the rules of my entry category
- I will obey the rules for amateur radio in my country.
- I will not modify my log after the contest by using additional data sources to correct callsign/exchange errors.
- I will accept the judging and scoring decisions of the contest sponsor as final.
- I will adhere to the DX Code of Conduct in my operating style.
- I will yield my frequency to any emergency communications activity.
- I will operate my transmitter with sufficient signal quality to minimize interference to others.

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Fair Play – How to Earn and Keep Respect, K4RO

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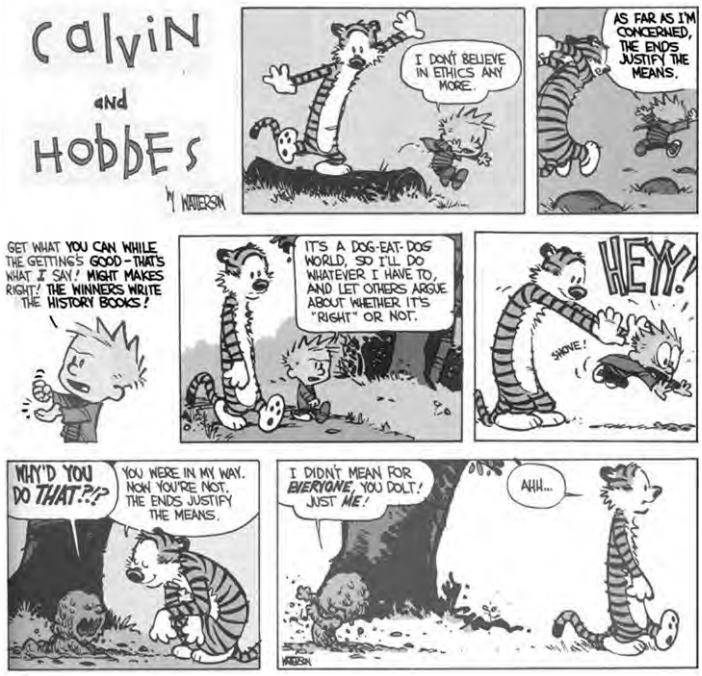

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Purpose of this Session

- Discussion of what ethical behavior is in radio contesting
- Understand the impact of unethical behavior, and some of the motivations behind it
- Encourage participants to take ownership of their own behavior and encourage others to do the same

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Who are We?

- K4RO check 76. Formerly WB3FAX
- QSYed to W4 in 1980
- First contest entry 1994 – Late to the game
- Enthralled with the magic of radio
- Hopelessly hooked on contesting game
- Grateful to the contesting community

- Audience contesting experience?

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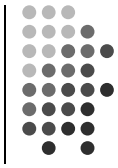
Acknowledgments



- This presentation draws on material developed by Ken Adams, K5KA (SK), Randy Thompson, K5ZD, Doug Grant K1DG, Larry Tyree N6TR, Dave McCarty K5GN and Ward Silver N0AX.
- Grateful to be standing on the shoulders of giants

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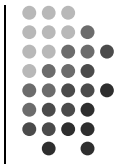
Why do we play games?



- What is a game?
  - A contest with rules to determine a winner
  - An amusement, pastime, entertainment
- Games provide players with
  - A means of exploring one's own capabilities
  - An opportunity to look at, understand, and experience things
  - Lessons about themselves and possibly the world.

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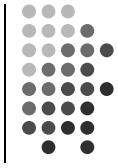
An unusual game



- Entrants keep their own score
- Complex rules govern scoring
- Individuals and “team” entries permitted
- Some events include off-times
- Winners of the top-level event often invest $50k or more and travel to favorable locations
- An on-line network helps participants increase their scores
- Spectators don’t find it particularly interesting

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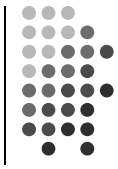
Is this Radio Contesting?



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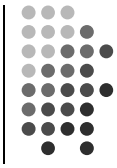

YES! It's a Strange Game!

Like many games, contesting is a game clearly intended for the participants, and not really meant to entertain others.

The rules (written and unwritten) have evolved over time, but the basic nature of the game itself remains the same.

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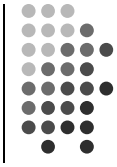
Why do we do games?



- FUN and EXCITEMENT!!!
- Self Improvement
- Personal Satisfaction
- Financial Rewards

Internal

- Peer Recognition

External

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Why do we do radio contests?

- FUN and EXCITEMENT!!
- Self Improvement
- Personal Satisfaction
- ~~Financial Rewards~~

Internal

- Peer Recognition

External

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Ethics in Contesting

- Unobservable rules require participants to choose right or wrong on their own.
- Ethics are in play particularly when no one is looking. We are free to choose.
- The freedom to choose right or wrong carries both responsibility and scrutiny.

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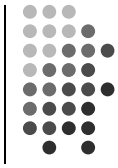
What do we mean … Ethics?



- Ethics denote the theory of right and wrong actions
- Ethics in practice is knowing the difference between right and wrong and choosing to do what is right.
- N0AX refers to our “Good Arrow.” We know which way it points. Our ethics begin here.
- We also know where it doesn’t point (narcissism, psychopathy, Machiavellianism.)

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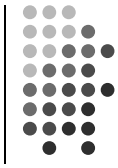
Ethics and Respect



- Ethical behavior requires ***respect***…
- Respect for ***others***
- Respect for ***the game***
- Respect for ***yourself***
- Our fellow competitors want the same respect that we want for ourselves (Golden Rule principle)

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Ethics and Respect

- Ethical behavior requires ***respect***…

- Respect for ***others***
- Respect for ***the game***
- Respect for ***yourself***

- To ***get*** respect, you have to ***give*** respect

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Why do ethics matter?

Without ethics and respect –
we have NOTHING
(N0AX 2015)

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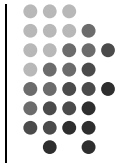
Motivations for Cheating



- Desire to be a “hero” on the field of competition (ancient, unconscious)
- Achieve immortality via community legend, fame, and lasting peer recognition
- Seeking current community “stardom”
- Prove superiority over others (sibling rivalry)
- A means to prove self-worth
- *Powerful forces*, worthy of study and caution

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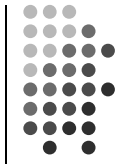
Rationalizations for Cheating



- *Everybody is doing it (#1 Reason)*
- Nobody was hurt (*Except those cheated*)
- Nobody was watching (*Not any longer*)
- Large investments in QTH & station
- Overcome unfair disadvantages
- Rules don’t specifically disallow a practice
- Rules apply to others, not us

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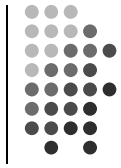
"All the guys at the top are cheating"



- No, they are not
  - There are a few bad apples – this is true in any sport
  - They usually don't last long
- This belief is the primary reason for cheating - in virtually every sport studied! It's mostly an illusion!
- This mindset is a contagious malady – don't let it get a foothold

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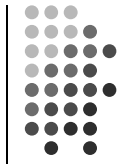
"I'm not a big gun…it doesn't matter if I cut corners a bit"



- **Yes it does!**
- Bad habits early on become seriously bad habits later
- Your reputation is established early
- Dealing with temptation is hard…"It's easy to just give in! And it keeps getting easier."
- Start off right, and it will pay big rewards later

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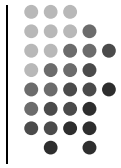
What is this peer recognition?



- We are recognized by our achievements and how we went about achieving those results
- Our recognition is influenced by what other people say about us
- We all need peer recognition (external) more than we may realize
- The classical “hero” myth lives in our psyche. We rightfully cheer those who win fairly.

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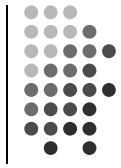
Negative Peer Recognition Examples



- That station was too loud in the NAQP
- That guy uses a pair of 8877s and has remote receivers in Europe
- Joe uses spots but enters as unassisted
- Dim padded his log with bogus QSOs
- Larry operated with a broad signal to push away nearby stations and keep his channel clear.

While most of these examples can not be proven – they are often based upon something not being quite right about a log entry.

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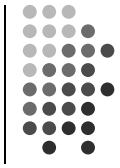
How do we know what to do?



- Written Rules
  - Specified by the contest sponsor in writing
  - Black and white
  - May, can, should, must…
- Unwritten Rules
  - Expectations about behavior
  - Interpreted norms
  - Gray areas – Ethical behavior required

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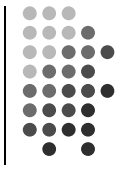
Some written rules are very clear
(some people break these anyway)



- **"A. Single Operator categories**: For all single operator categories, only one person (the operator) can contribute to the final score during the official contest period."
- "Total output power per band must not exceed 1500 watts or the output power regulations of the country in which the entrant is operating, whichever is less."

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Excessive Power

- Do not exceed power limits for your category
- Just because the knobs go to 11…
- Applies to ALL power categories

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Essence of Unwritten Rules

- Just because it's not specifically prohibited by written rules doesn't mean you should do it!
- Keep the contest on the radio and within the contest period – no log washing or padding!
- Don't give or take unfair advantage of others
- Learn and follow the spirit of the rules

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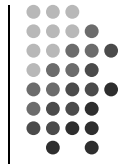
Examples of Unwritten "Rules"



- **Do not** make pre-arranged schedules
- **Do** identify frequently
- **Do not** ask friends to work you … only
- **Do** encourage club members to work everyone
- **Do not** work friends with multiple calls
- **Do** work and spot stations equally

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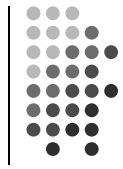
Examples of Unwritten "Rules"



- **Do not** telephone or text message multipliers
- **Do** make an effort to help casual callers enjoy the contest and make a contact
- **Do not** let others "help" your single-op effort
- **Do not** plop down 100 Hertz away from your competitor to intentionally disrupt their run

See the ARRL's *"HF Contesting - Good Practices, Interpretations & Suggestions*"

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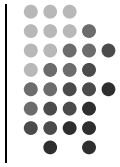
No “Log Washing”



- Using QRZ.com, spot history, 3830 reports, LoTW, club databases
- Using utilities to analyze and correct the log
- Replaying the contest to change the log
- Asking others who they worked or if a call sign is correct
- “Fixing” off times or band changes
- It’s **over** when the 2359 rolls over to 0000

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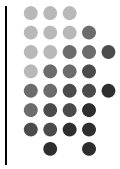
Technology - A Game Changer



- With more technology comes more ways to cheat… and more ways to detect cheating..
- Remote operations - Specify transmitter QTH unambiguously. Adhere to RX distance rules.
- Crowd sourcing – CQWW 2014 CW – egregious cheating found through community effort. World high TO7A DQed – previous years also DQed!
- Few places left to hide with SDR, RBN, etc.
- Ethics becomes more important than ever as technology marches onward

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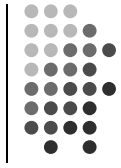
Honor Code



- You are responsible for your own reputation
  - Follow the rules!
  - Don't participate with people who cheat – you will be known by the company you keep
- Lead by example
  - You never know who is listening or watching
  - Don't do anything you would not want to be made public
- Be vocal
  - Confront cheating when you see it
  - Every incident is an opportunity to teach proper behavior

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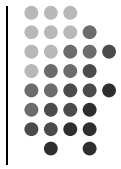
Peer Pressure



- Social pressure by members of one's peer group to take a certain action, adopt certain values, or otherwise conform in order to be accepted.

- Good
  - Encourage others to follow the rules
  - People respect those who are true to their beliefs
- Bad
  - Letting others influence you into not doing the right thing
  - "everyone else is doing it."

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Applying Positive Peer Pressure

- Be aware of your motives
  - Is it personal?
  - If necessary, enlist others to help deliver the message
- Give the benefit of the doubt
  - They may not realize what they are doing is against the rules
  - Take the opportunity to encourage taking the right path
- Choose the right time and place
  - Can they listen without feeling attacked?
- Don't be angry, accusatory, or judgmental
  - Treat the issue as a mistake, not a crime
  - Focus on actions, not character
- Be there
  - People cheat because they see others get away with it
  - Not confronting the problem hurts everyone

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Communication Success is Defined by the Receiver

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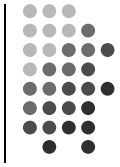
Scenario 1



- We discover a local contester uses cluster spotting and enters an unassisted category. What do we do?
  - They never win anything so assume it doesn't matter
  - Avoid speaking to them ever again
  - Publicly call them a cheater at the next club meeting
  - Send a letter to the contest sponsor
  - Call them up and ask if they are aware of the rules about using spotting information

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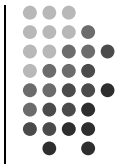
Scenario 2



- We are invited to a multi-op and upon arrival, we discover they are running 2.5 kW. What do we do?
  - We are there, loud is good, operate anyway
  - Turn the power down to 1500 W when we're operating
  - Loudly encourage the other ops to follow our example
  - Quietly ask the owner if he always runs excess power
  - Leave (hard to do if thousands of miles from home)
  - Send a note to the contest sponsor and FCC

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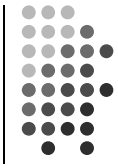
Scenario 3



- A local contester has key clicks that wipe out large chunks of the band. What do you do?
  - Sharpen up YOUR keying and give him a dose of his own medicine!
  - Send “KLIX” on his frequency anonymously
  - Call him, tell him he has key clicks, and sign your call
  - Contact him after the contest, explain the problem, and ask to help fix the problem
  - Notify the contest sponsor and his rig’s manufacturer

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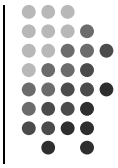
The Contest Code of Ethics www.wwrof.org



1. I will learn and obey the rules of any contest I enter, including the rules of my entry category.
2. I will obey the rules for amateur radio in my country.
3. I will not modify my log after the contest by using additional data sources to correct call sign/exchange errors.
4. I will accept the judging and scoring decisions of the contest sponsor as final.
5. I will adhere to the DX Code of Conduct in my operating style (see dx-code.org).
6. I will yield my frequency to any emergency communications activity.
7. I will operate my transmitter with sufficient signal quality to minimize interference to others.

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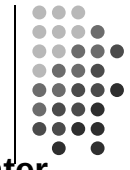
ICOM

Contest Code of Ethics, expanded



1. I will learn and obey the rules of any contest I enter, including the rules of my entry category.

No spotting if not permitted, no second op or skimmer for single ops, off-times per rules, correct output power

2. I will obey the rules for amateur radio in my country.

Power, frequencies, licensing – wherever you transmit. Remote operations must be especially vigilant!

3. I will not modify my log after the contest by using additional data sources to correct call sign/exchange errors.

When it's over, it's over

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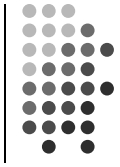
ICOM

Contest Code of Ethics, expanded



4. I will accept the judging and scoring decisions of the contest sponsor as final.

No whining, no lawsuits, no threats or defamation of any sort. No operation is that important.

5. I will adhere to the DX Code of Conduct in my operating style (see dx-code.org).

Listen, listen, listen; only call when you can hear the station; never trust the cluster (copy the call!)…

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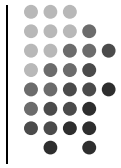
Contest Code of Ethics, expanded



6. I will yield my frequency to any emergency communications activity.

Contesting is a game. Emergencies are real life.

7. I will operate my transmitter with sufficient signal quality to minimize interference to others.

Mic gain set properly; amp not overdriven; no splatter!

Note that CQWW rules have added language specifically emphasizing this rule of conduct. Expect increased scrutiny as SDR archives reveal the worst offenders!

www.wwrof.org

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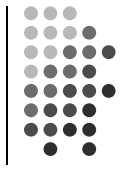
The RIGHT Way – It's Not Hard



- Play Fair!
  - Obey the rules, respect your fellow competitors
- Try to do better next time
  - Improve your skills, station, and strategies
- Make your enjoyment of contesting be about the journey, not the destination. Set goals, and enjoy achieving them ethically.

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Who is the final judge ?

- The person in the mirror

- Your peers

  "Yeah, I know that guy. He cheats."

  - *Anonymous Contester*

- We learned it in grade school – just follow the Golden Rule.

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Adapting Your Contest Strategies to the Rapidly Declining Solar Cycle 24

- Two more years of declining solar activity
- Then at least three years of solar minimum

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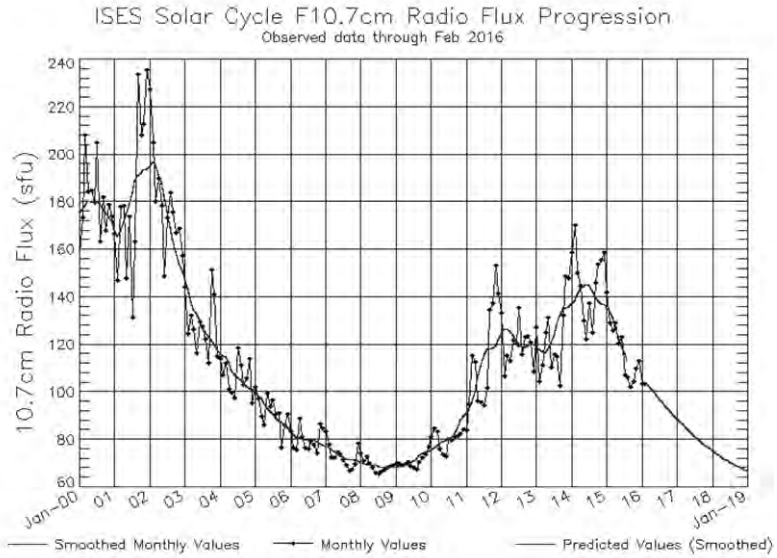
Dayton 2016

Two More Years of Declining Solar Activity Then Three+ Years of Solar Minimum



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What About Solar Cycle 25 ??

Precursors of a *possibly* weak Solar Cycle 25

- Unusually weak solar polar magnetic field strengths
  - field strengths should reach their peak between 2018 and 2020
    - www.solen.info/solar/polarfields/polarfields.jpg
- Unusually large numbers of spotless days
  - possibly starting later this year or next year
- Unusually quiet geomagnetic field from 2018 to 2020+
  - reported by the A-index
- Unusually late appearance of new Solar Cycle 25 sunspots
  - new Solar Cycle 25 sun spots should appear by 2020
- Unusually long solar minimum
  - solar flux in the low 70s persisting after 2020

Accurate Cycle 25 forecasting is not possible until about three years *after* solar minimum

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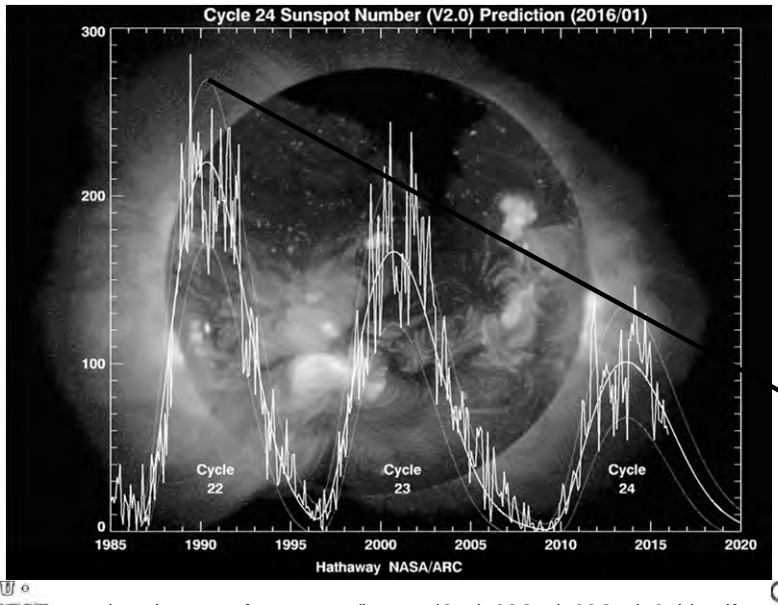
Declining Solar Activity Since Cycle 22

Suggests a Weak Solar Cycle 25



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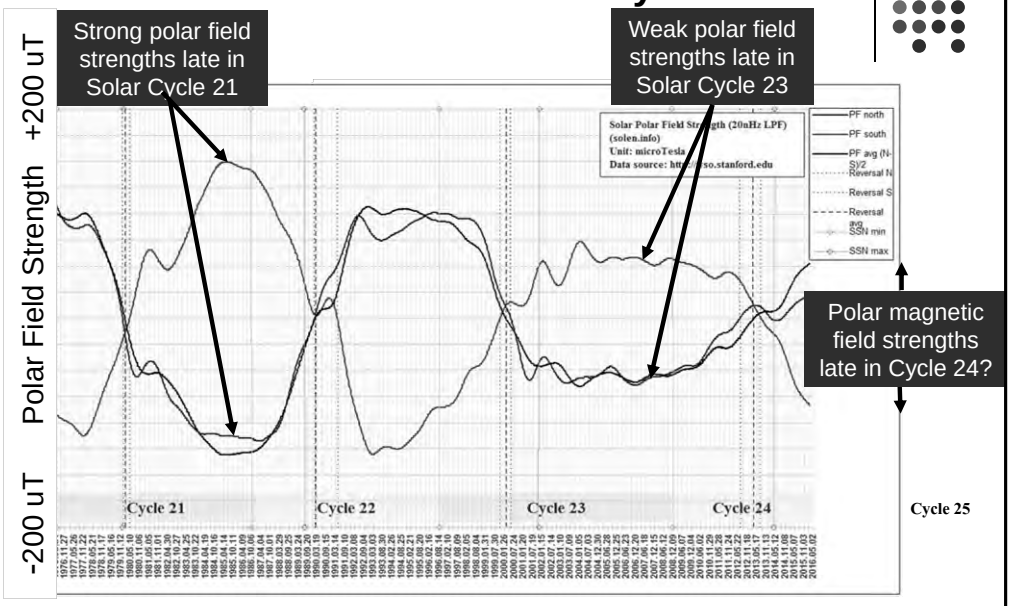
solarscience.msfc.nasa.gov/images/Cycle22Cycle23Cycle24big.gif

ICOM

The Sun's Polar Magnetic Field Strength
A Reliable Precursor of Solar Cycle 25

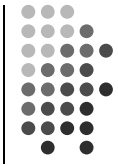


www.solen.info/solar/polarfields/polar.html

160 Meter Propagation
During the Two Year Decline to Solar Minimum

- Improving DX propagation
  - stronger signals
  - more reliable openings especially to Europe and Japan
  - lower geomagnetic activity
    - especially as we approach solar minimum in ~2020
    - declining daytime D layer absorption before sunset and after sunrise
  - declining nighttime E layer absorption
- More crowded band conditions
  - especially when there is no strong 40 meter propagation to Europe
- Longer and more regular worldwide openings
  - reliable openings to Europe, Mid-East & north Africa 2130-0830Z
  - more frequent openings to JA at our sunrise ~1200-1230Z

80 Meter Propagation
During the Two Year Decline to Solar Minimum



- Improving DX propagation
  - stronger signals
  - more reliable openings especially to Europe and Japan
  - lower geomagnetic activity
    - especially as we approach solar minimum in ~2020
    - declining daytime D layer absorption before sunset and after sunrise
  - declining nighttime E layer absorption
- More crowded band conditions
  - especially when there is no strong 40 meter propagation to Europe
- Longer and more regular worldwide openings
  - continuous openings to Europe, Mid-East & north Africa 2100-0830Z
  - regular openings to JA starting before sunrise ~1130-1300Z

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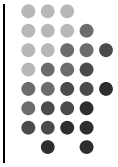
40 Meter Propagation
During the Two Year Decline to Solar Minimum



- Nearly 24 hour DX propagation during CQWW CW
- Europe, Mid-East, north Africa propagation
  - activity QSYs to 40 meters earlier in the afternoon ~1930Z
  - don't miss the strong mid-afternoon European openings!
    - beginning at about 1930Z to 2030Z (earlier in New England)
    - propagation may fail several hours after our sunset at about 0100Z
  - strong openings often resume at European sunrise: ~0600-0900Z
- Japan, Far East and Central Asia propagation
  - brief direct path opening starting before JA sunset: 0800-0900Z
  - weak skew path opening at ~ 240 degrees azimuth ~0900-1130Z
  - the strongest opening from the east coast: ~1130-1300Z
    - direct path strong signals for an hour or more
  - strong long path signals at 150 degrees azimuth: 2130-2215Z
- VK/ZL and south Asia long path propagation 2100-2300Z
- south and central Asia long path propagation ~1200-1300Z

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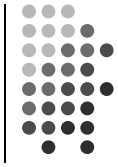
20 Meter Propagation
During the Two Year Decline to Solar Minimum



- Usually closes well before midnight ~0300Z
  - usually stays closed all night
- Europe, Mid-East, north Africa propagation
  - from before our sunrise until mid afternoon ~1000-1900Z
    - the opening may be delayed to until sunrise or later
  - shorter openings than we've enjoyed in recent years
- Japan, Far East and central Asia propagation
  - afternoon short path opening from 2130Z to about 0000Z
  - morning short path opening from about 1300Z to about 1500Z
  - significantly shorter openings than we've enjoyed in recent years
- Long path to VK/ZL and south Asia starting in mid-afternoon
  - starting about 1900Z until our sunset
- Long path to south Asia begins about an hour after our sunrise
  - starting about 1300Z until about 1500Z

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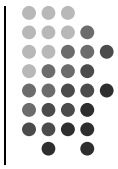
15 Meter Propagation
During the Two Year Decline to Solar Minimum



- Usually closes a few hours after our sunset ~0200Z
  - always stays closed all night
- Europe, Mid-East, north Africa propagation
  - from about our sunrise until mid-afternoon 1200Z to about 1800Z
  - much shorter openings than we've enjoyed in recent years
- Japan, Far East and central Asia propagation
  - afternoon short path opening from 2130 to about 0000Z
  - morning long path opening from about 1300Z to about 1400Z
  - polar opening to central Asia from about 1400 to about1600Z
  - much shorter openings than we've enjoyed in recent years

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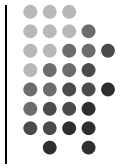
10 Meter Propagation
During the Two Year Decline to Solar Minimum



- Usually starts to open about an hour after our sunrise ~1300Z
- Usually closes a few hours after our sunset ~0000Z
  - always stays closed all night
- Europe, Mid-East, north Africa propagation
  - short path propagation becomes less frequent and much shorter
  - weak signal skew paths (110-150 degrees) typically ~1400-1700Z
- Japan and Far East propagation
  - short path propagation is extremely unusual
  - morning long path starting at about 1300Z to about 1400Z
  - evening skew paths (200-270 degrees) from ~2130Z to 2230Z

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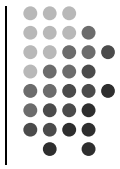
DX Contest Strategies
for the Two Year Decline to Solar Minimum



- Improve your low band antennas this summer!
- Start the contest on 40 meters
  - the strong European opening could end after just a few hours
- Capitalize on improving 160 and 80M propagation 0200-0830Z
  - mainly when 40 meters is not strongly open to Europe
- Look for a strong European opening on 40 meters 0600-0900Z
- 160, 80 and 40 meter openings to VK, ZL, JA 0900-1230Z
- Look for the start of the 20M European opening 1000-1200Z
- Look for the start of the 15M European opening 1200-1400Z
- Check 10 meters frequently for propagation 1300-2200Z
- Start of the strong 40M meter European opening at ~2000Z
- Look for short 15 and 20 meter JA openings 2130-2300Z

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The Advantages of Waterfall Displays for Contesting and DXing

Presented by N6TV
n6tv@arrl.net

Presentation Overview

- Legacy “Panadapters”
- Waterfall scope in CW Skimmer
- Latest radios with waterfall displays
- Waterfall display advantages & disadvantages
- How to use waterfall displays while contesting or DXing
- Q & A

Legacy Panadapters

- Kenwood SM-230 Station Monitor (25, 100, or 250 KHz):

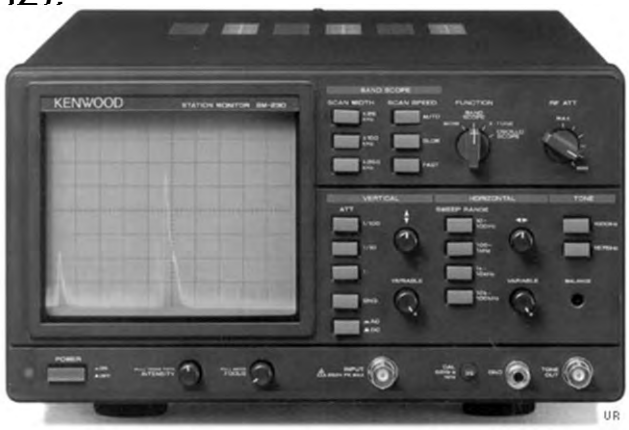
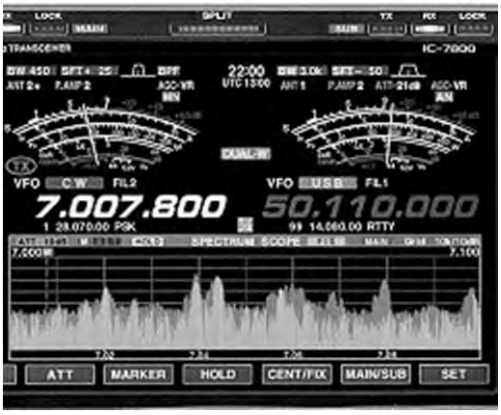


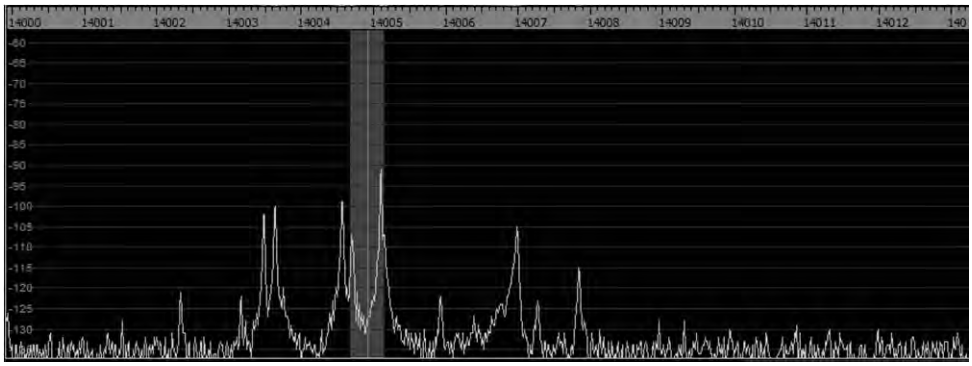
Photo courtesy http://www.universal-radio.com/

Legacy Panadapters

- "Band Scopes" in Icom IC-781, IC-756ProIII, IC-7800 (before V3.0), IC-7700 (before V2.0)

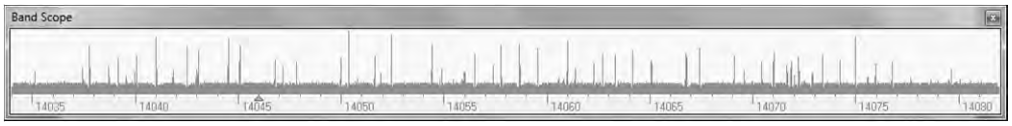


Spectrum Displays Hide Weak Signals



CW Skimmer's Band Scope

- From the CW Skimmer menu, select View → Band Scope

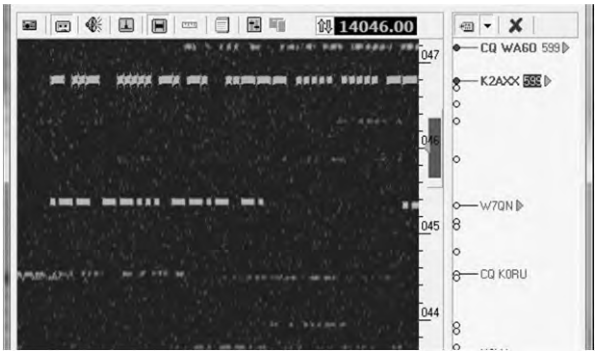


- Much better resolution, but display is very jumpy
- No "peak signal" memory
- Not useful on SSB

Legacy Panadapter Limitations

- Big signals dominate the display
- Weak signals very difficult to spot
- Signal peaks disappear, no history
- Difficult to find “clear spots” on a crowded band
- Limited zoom in or out
- Display jumpy, distracting
  - Signal averaging helps, but it also hides things

CW Skimmer Waterfall Limitations



- You only see 10 - 15 kHz of the band at most
- Scale is fixed, cannot “zoom” in or out, or tune smoothly
- Narrow 500 Hz CW filter – *not* usable on phone

Better Waterfall Displays

- The Elecraft P3 Panadapter

- Major improvement over legacy designs

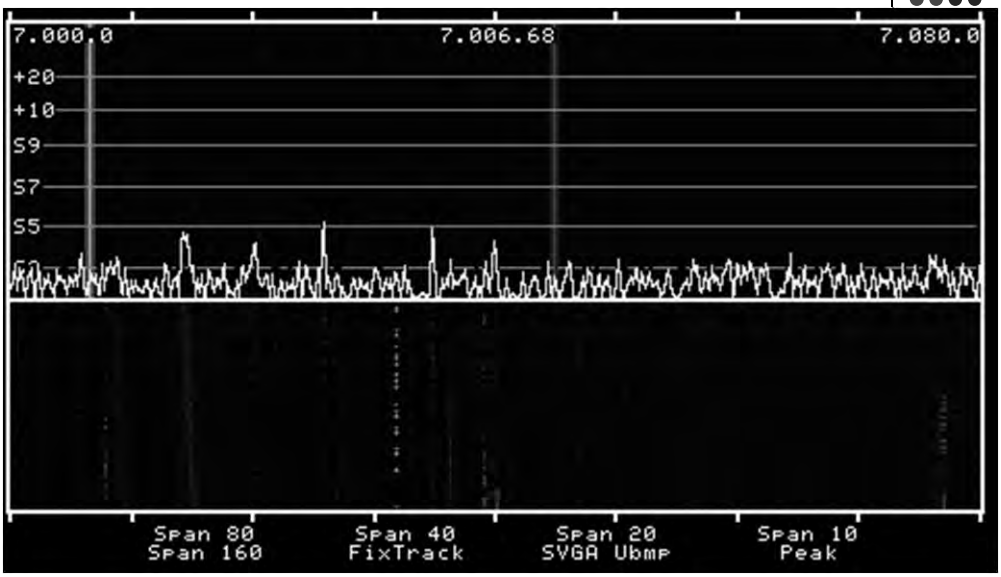
Photo courtesy http://www.elecraft.com

Elecraft P3 + P3SVGA Option

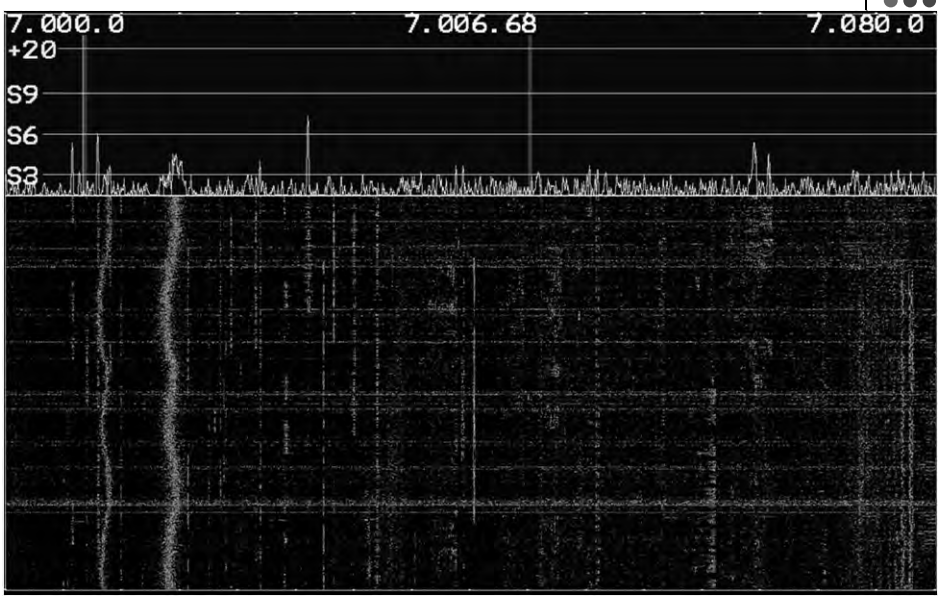
- P3 resolution only 480 x 272 pixels
- P3SVGA: internal SVGA Large Screen Adapter
  - 1024 x 768
  - 1280 x 1024
  - 1440 x 900
  - 1920 x 1080
- Displays far more signals

Photo courtesy http://www.elecraft.com

P3 Built-in Display at 480 x 272



P3SVGA at 1440 x 900



Old Icom IC-7800 firmware

(no waterfall)

Photo courtesy http://www.icomamerica.com

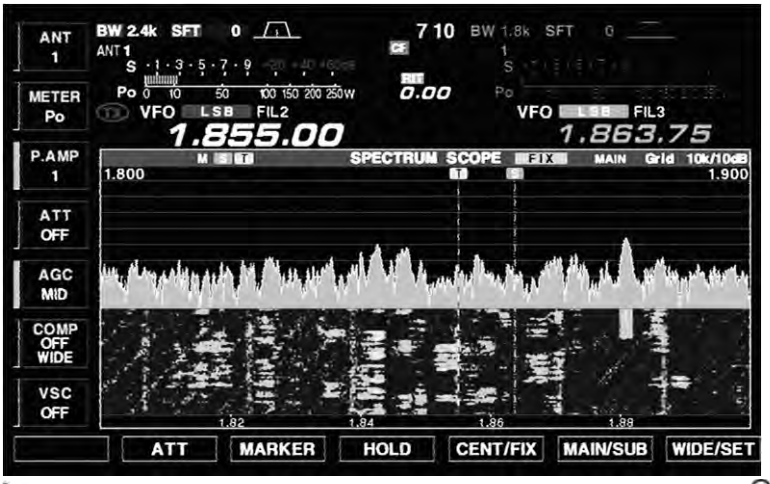
Icom IC-7800 with V3.0 firmware

Photo courtesy http://www.icomamerica.com

IC-7800 V3.0 Screen Shot

IC-7700 V2.0 Also Supports Waterfall Feature

- 800 x 480 (with or without external monitor)



IC-7850 significantly improves waterfall (800x600)

IC-7850 / 7851 – *Huge* Improvement

- Fast, 800 x 600, MAIN only, or MAIN + SUB
- "Click to tune" with USB mouse

New IC-7300 has fast waterfall too!

- With touch screen

Kenwood TS-990S

Photo courtesy http://www.kenwoodusa.com

FlexRadio FLEX-5000™, FLEX-6700™

Photos courtesy http://www.flexradio.com

FlexRadio Systems® SmartSDR

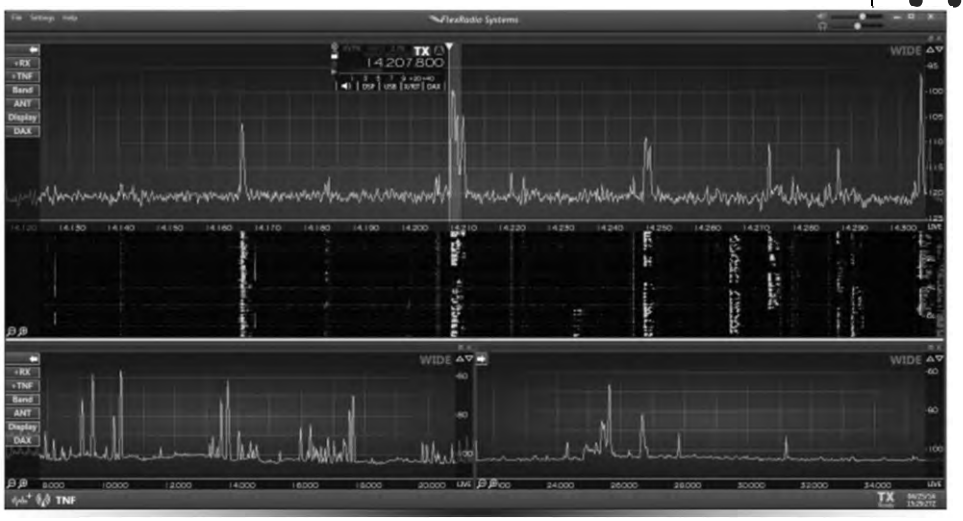
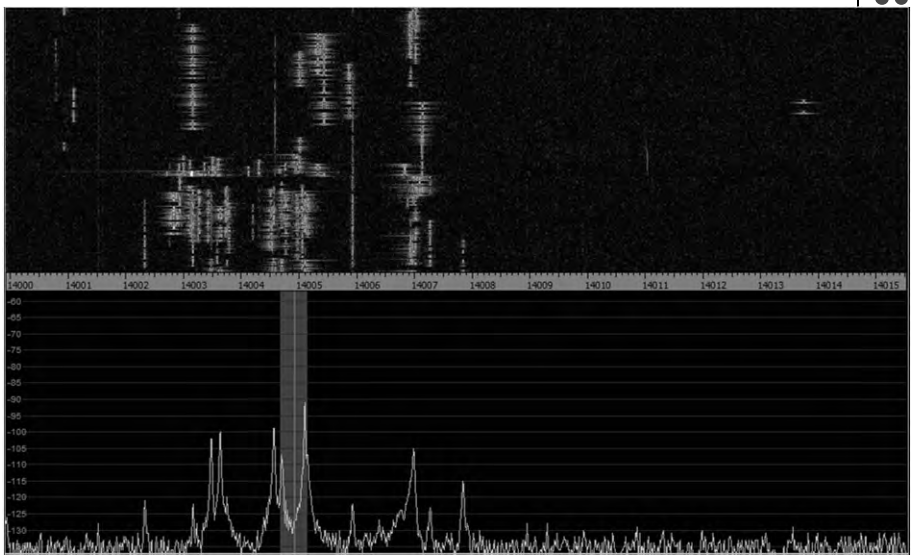
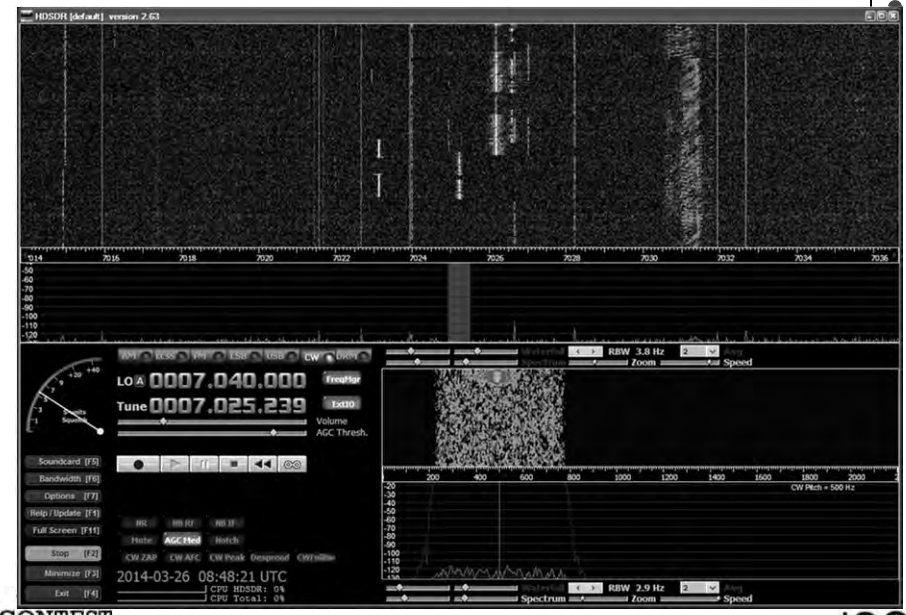


Image courtesy K3UK

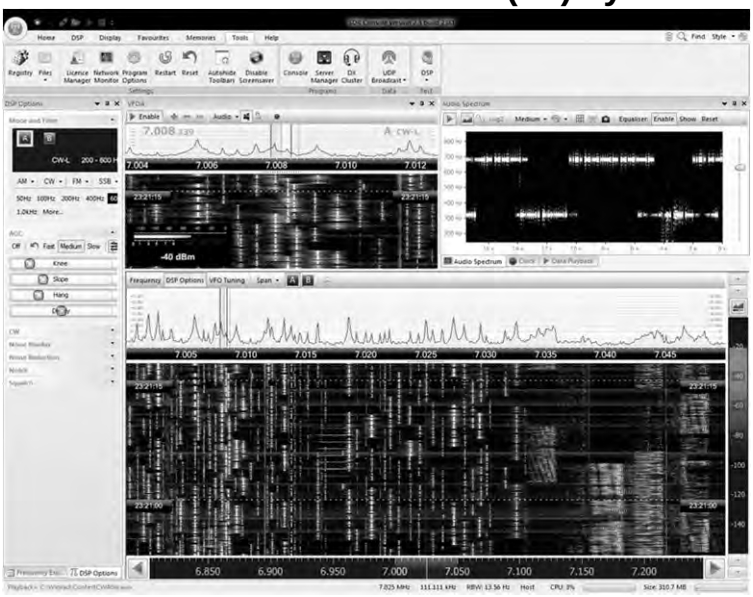
Winrad Software



HDSDR Software

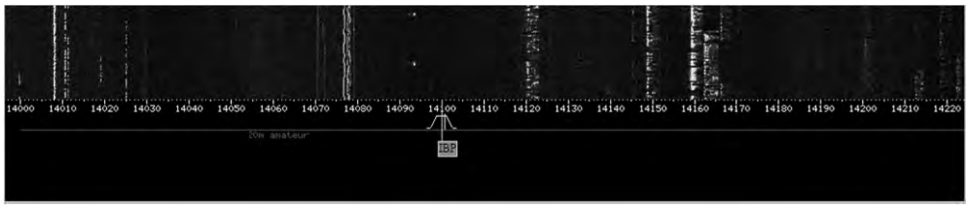


SDR-Radio.com SDRConsole (V2) by HB9DRV



WebSDR: Waterfalls on the Web

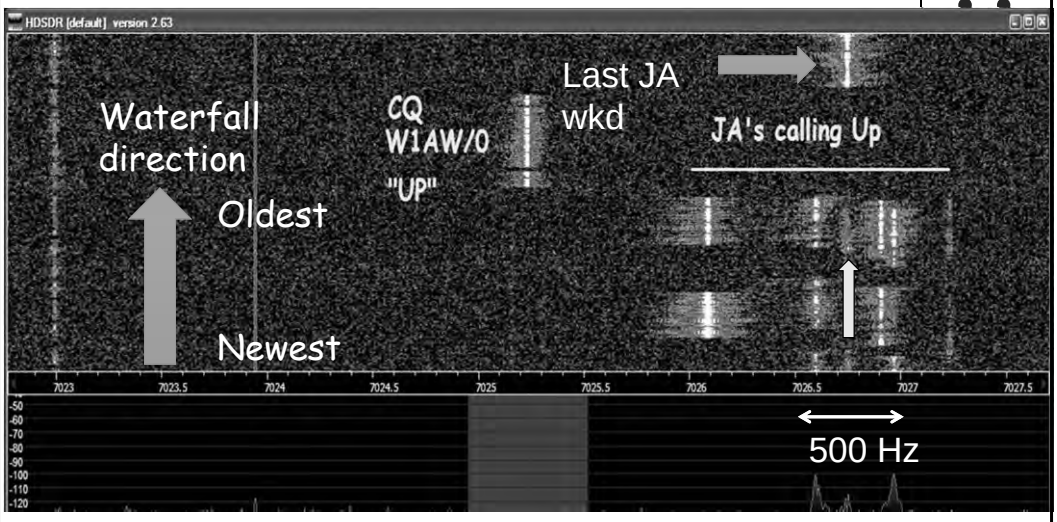
- http://websdr.ewi.utwente.nl:8901/



Waterfall Display Advantages

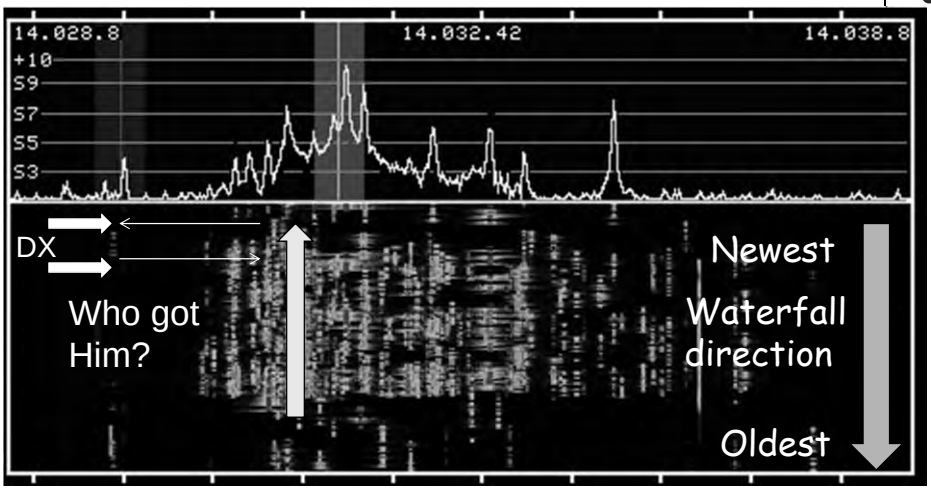
- "Click to Tune" – direct access using a mouse
  - IC-7300, IC-7800 V3.0, IC-7851, Flex/SmartSDR, HDSDR, SDRConsole (but *not* Elecraft P3)
- Weak signals easy to spot (faint traces)
- Many zoom levels: 5, 10, 30, 60, …, 800 KHz+
  - Watch the whole band at once, or a small slice
- Find clear frequencies *fast*
- Find who the DX just worked, *fast*
- Spot the gaps in a crowded CW pileup

Listening "Up"? Not a problem



Who will W1AW/0 answer next?

E30FB CW Pileup on P3 display

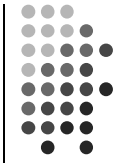


Where will he listen next?

Advantage: Waterfall

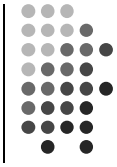
- Find “good spots to call” in a CW pileup
- Find clear spots to call CQ
- QRM? You can *see* where to move your VFO to minimize it
- During S&P, find the “next” signal fast (who needs careful tuning?)
- Position VFO B or 2nd receiver without having to *listen* to it
  - S&P while CQing, “SO2V” (single-op, two VFOs)
- Monitor overall band activity
- Keep an eye on the local competition

Waterfall Display *Disadvantages*



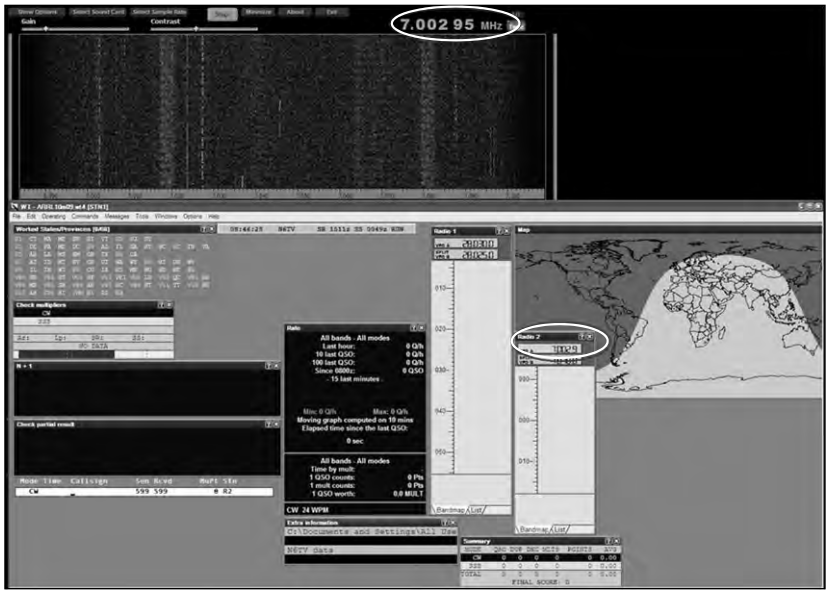
- Radios don't automatically tune from signal-to-signal like CW Skimmer (yet)
- Clicking on a signal with the mouse not as precise as tuning with VFO, must still fine tune, contest software loses focus
- Some find it visually distracting
- Cumbersome to adjust scope width and band edges
- **But, if you're *not* using a waterfall display in a contest, you're really operating "blind"**
- A waterfall display is really the "killer app"

Recommendations While Contesting

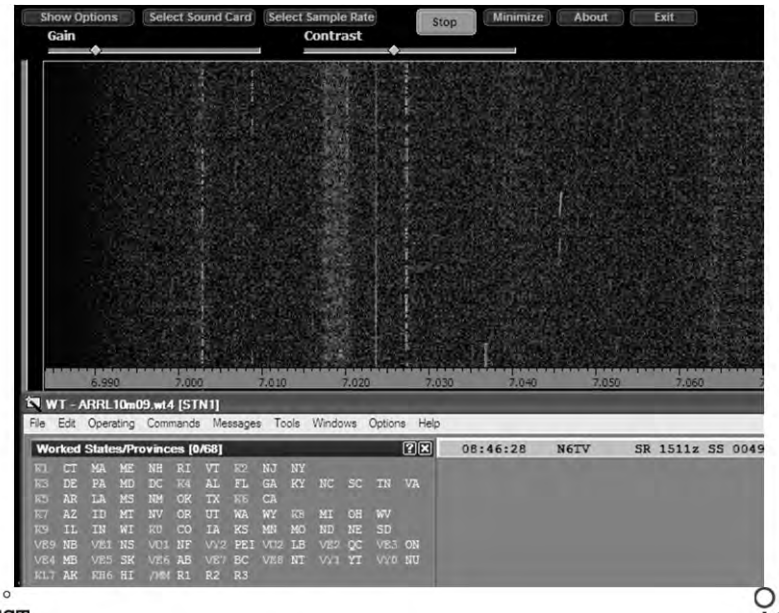


- Always enable the waterfall
- Use **Fixed** Mode (never "Center" mode)
  - You want the VFO cursor to move, not the scope
- Use narrow 5 - 20 kHz span for CQ, running
- Use wider 40 -100 kHz span for S&P, tuning
- Logging software can and should automate this:
  - In Win-Test, type **SPAN20** [Enter] to set a 20 kHz scope span, limited to band edges
  - See http://bit.ly/wtscripts - Win-Test Scripts P3scripts.zip, IcomScripts.zip, includes source code

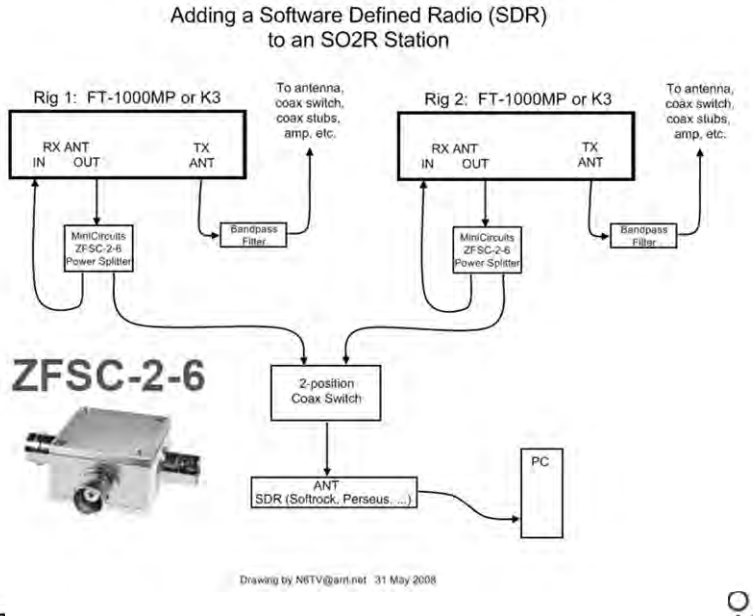
Winrad on Top, Win-Test on Bottom



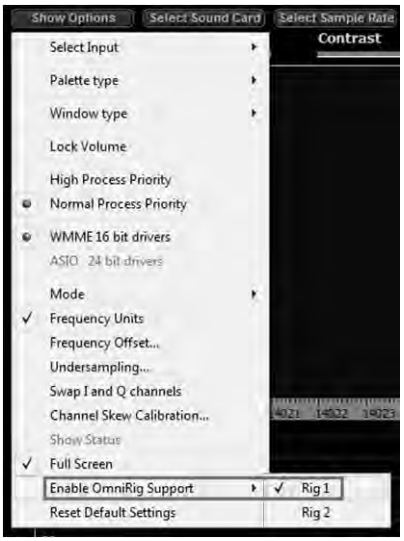
Winrad & Win-Test (zoomed)



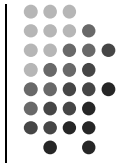
Click-To-Tune with a “Legacy” Transceiver + SDR



Use Omnirig support in Winrad or HDSDR to synch freq. with any transceiver

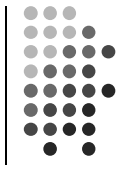


Try Winrad Waterfall Demo



- Perseus SDR used to make a wideband recording (122 KHz for 10 minutes = 300 MB)
- Demo will play back that recording and others
- To try the demo yourself, follow instructions at
  - http://www.kkn.net/~n6tv

Questions?



- http://www.winrad.org - Winrad software
- http://http://www.hdsdr.de/ - HDSDR software
- http://sdr-radio.com/Software - SDRConsole
- http://www.kkn.net/~n6tv - Winrad demo file
- http://www.qrz.com/db/n6tv - Links to this and other presentations

CTU Presents

Small Station Bang for the Buck

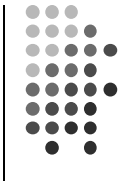
"Band Fare for the Common Ham"

Ward Silver, NØAX

Overview

- Priorities
- Building On Success
- Bang for the Buck
- Refine & Enhance
- Q&A – Anytime!

Who the Heck is NØAX?



- And why do you care?

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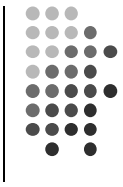
Goals of the Session



- Define the problem
- Discuss making an overall strategy
- Find “Score dB’s”
- Encourage you to improve
- Laff

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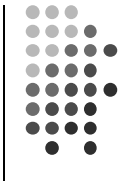
Assumptions about you



- Familiar with contesting
- Modest station – one radio, no amp
- Modest budget
- Willing to progress step-by-step
- Taken and given some lumps
- Want to give some more lumps
- What's the best way to get better?

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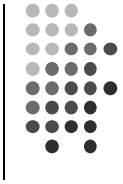
How To Use This Presentation



- Not a how-to cookbook
- Follow in the text
- Take short notes
- Jot down ideas as we go
- Every operator and station is different
- We ***all*** started low and slow

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Priorities

- Operator First
- Technique Second
- Antennas Third
- Radios Fourth
- Gadgets Last

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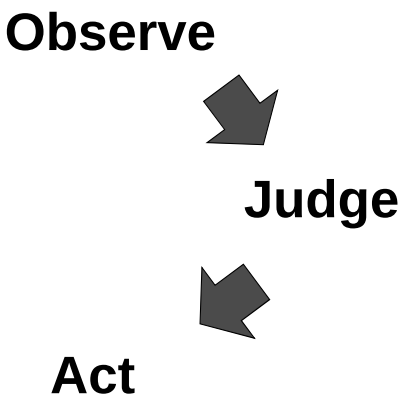
Cycle of Life



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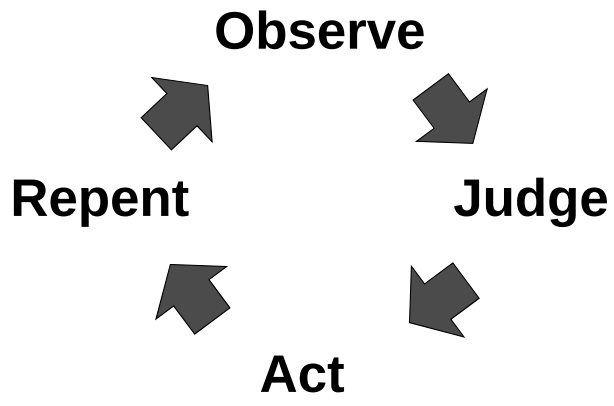
Cycle of Life



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Layers

- Contest success is incremental
- Peel the onion
  - Be heard, then hear, then be heard, then hear…
- Operator improvement is continuous
- Study and analyze and plan
- Address the obvious deficiencies first
- Choose wisely, grasshopper…

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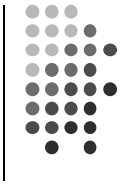
The Operator - Ergonomics



- Incredibly important
- Fun or Slog? – Choose!
- Maintain concentration, remove distractions
- Labels and logical, consistent layout
- Preserve and enhance accuracy

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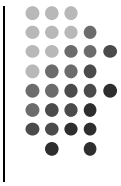
The Operator – A Human!



- Head and Eyes
- Back & Arms
- Your Butt
- Fitness (Before and During)
- Stay Alert & Engaged

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Knowledge

- Know Your Stuff
- Study Propagation
- Learn Your Software
- Recognize Calls
- Study Your Old Logs
- Study the Logs of Winning Stations

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Technique

- Number one source of score dB's
- Practice makes the master
- Listen to the Masters – Up Close
  - Start working with multi-op teams
  - Or start one!
  - Ask them questions!
- Trade recordings or listen live

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Technique – Gimme's

- Run more and whenever you can
  - Find propagation that allows your station to run
  - You don't have to be on the band edge!
  - Think signal-to-noise on both ends
- Type – send – speak – copy accurately
- Breathe, be consistent, find a rhythm
- The second radio – make it play

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Technique – Accuracy

- Go for World Class Accuracy (<1% error)
- Study that LCR/UBN Report
  - What do you consistently miss?
  - What do others consistently miss from you?
- Pull Out Full Calls
- Be Wary of Databases, Spots, Skimmers
- Learn Not to Guess and When to Move On

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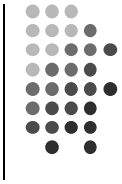
Technique – Managing Time



- Running is key
- Rate meter – QSOs per mult
- Distractions
  - Packet and Dxing
  - Too much information
- Operating time planning
- Go get that next contact!
  - No magazines, no TV, no email, no browsing

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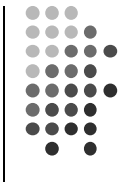
Technique – Managing Score



- Watch for & move mults (Sunday!)
- Avoid penalties at all costs
- Expeditions – work ‘em all!
- Make skeds – during the contest
  - Know the propagation
- Quick reviews of the situation now and then
- Review and adjust your plan

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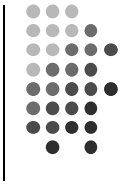
The Second Radio & Antenna



- Keep it simple
- Temporary is OK - be consistent
- Integrate into your station
- Target low-rate periods
- Don’t diminish your primary rig & antenna
- Consider automation

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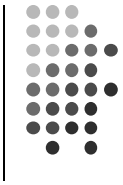
The Second Radio – Using It



- In-band Tuning
- The Quick QSY
- Running and Tuning at the Same Time
  - Learn to listen to two audio streams at one time
  - Practice shifting your focus
- Great for spot-chasing while slow-running
- Operate for a net gain

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CQing

- Call high in the band for best SNR
- Respond consistently & efficiently
- Work the fast stations first
- Pull out a full call whenever you can
- Listen for “DX sound” and odd first letters
- Manage your RF Gain & Attenuation
- Learn to rely on your ears for filtering

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Antenna Selection

- Improve for the next level
- Simplify switching and aiming
  - Contesting is not DX-ing
- A small fixed Yagi to EU, Carib, PacRim, or ?
- Simple low-band receive antennas
  - Reduce noise = reduce fatigue
- Still the biggest bang for the buck

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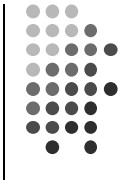
Radios



- Clean receiver – most important
  - Linearity
  - Gain management
  - Filtering
  - Low Distortion audio
- Clean transmit – code, phone, digital
- Learn to use them!

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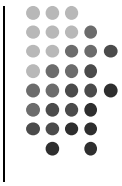
Gadgets



- The fewer boxes to manage, the better
- Carefully evaluate the need
- Are there alternatives?
- Is the extra complexity worth it?
- Integrate into the station
- Learn to use it!

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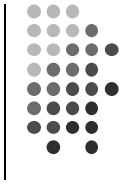
Software



- Turn off unused features & windows
- Upgrade and test ***before*** Friday
- Arrange windows to match your layout
- Learn how to
  - Edit a previous QSO while not suspending a run
  - Switch focus between radios
- Put the monitor where you can see it easily

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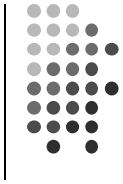
Resources



- Other contesters & your contest club
- **3830scores.com** soapbox
- K8ND's SO2R Web page - **www.k8nd.com/Radio/SO2R/K8ND_SO2R.htm**
- W4RNL Antenna Design – **cebik.com**
- Towertalk, Top Band reflectors
- *National Contest Journal* & **ncjweb.com**
- ARRL *Contest Update* newsletter

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Priorities

- Operator First
- Technique Second
- Antennas Third
- Radios Fourth
- Gadgets Last

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Thanks!

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CTU Presents

Techniques to Optimize 6 Meter Contest Performance

Joel Harrison, W5ZN

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Techniques to Optimize 6 Meter Contest Performance

- **Antenna Techniques**
- **Station Techniques**
- **Propagation Techniques**
- **Operating Techniques**

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Antenna Techniques

- **What Kind of an Antenna?**
  - **Yagi**
    - **Horizontal polarization**
  - ~~**Vertical**~~
  - ~~**Dipole / Inverted Vee**~~
- **How Many Elements?**
  - **More is better up to a point.**
  - **7 is good**
- **How High Should it Be?**
  - **30 Ft ?**
  - **Let's look at some plots**

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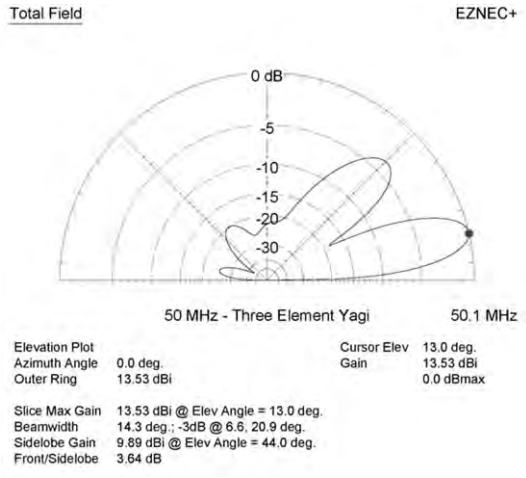
Antenna Techniques



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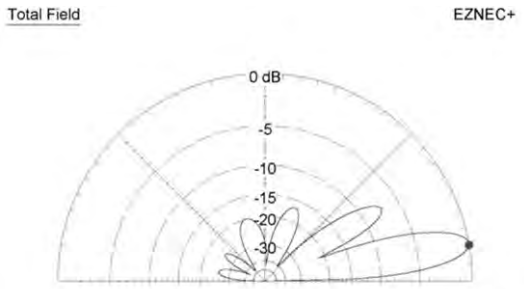
Antenna Techniques



Elevation Plot		Cursor Elev	10.0 deg.
Azimuth Angle	0.0 deg.	Gain	17.98 dBi
Outer Ring	17.98 dBi		0.0 dBmax
Slice Max Gain	17.98 dBi @ Elev Angle = 10.0 deg.		
Beamwidth	11.1 deg.; -3dB @ 5.1, 16.2 deg.		
Sidelobe Gain	10.86 dBi @ Elev Angle = 32.0 deg.		
Front/Sidelobe	7.12 dB		

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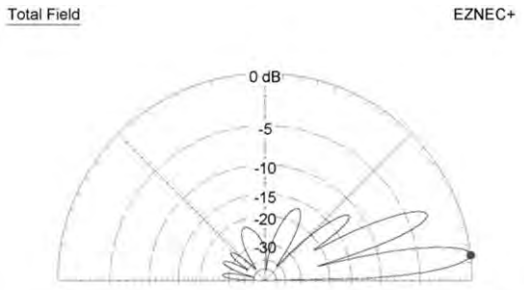
Antenna Techniques



Elevation Plot		Cursor Elev	7.0 deg.
Azimuth Angle	0.0 deg.	Gain	18.42 dBi
Outer Ring	18.42 dBi		0.0 dBmax
Slice Max Gain	18.42 dBi @ Elev Angle = 7.0 deg.		
Beamwidth	7.4 deg.; -3dB @ 3.6, 11.0 deg.		
Sidelobe Gain	15.52 dBi @ Elev Angle = 22.0 deg.		
Front/Sidelobe	2.9 dB		

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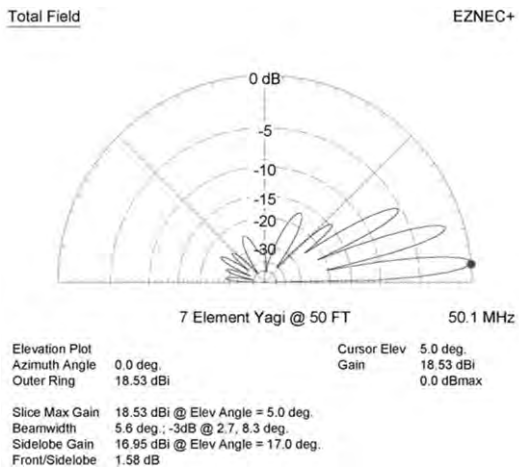
Antenna Techniques



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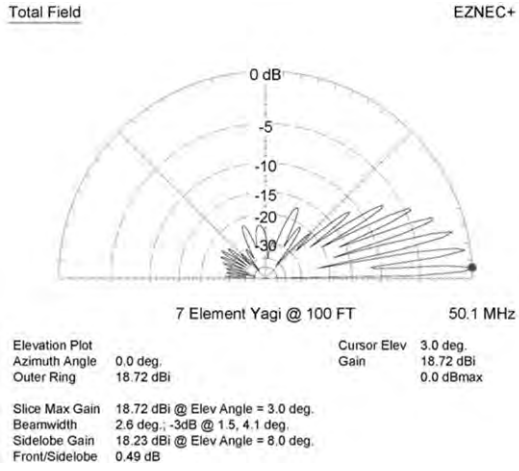
Antenna Techniques



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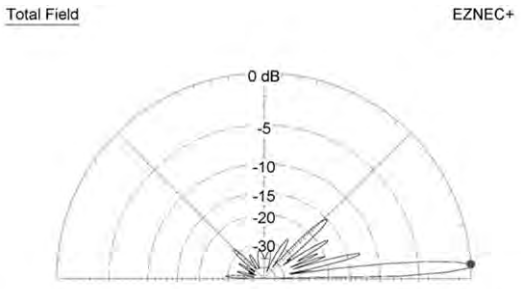
Antenna Techniques



Elevation Plot		Cursor Elev	4.0 deg.
Azimuth Angle	0.0 deg.	Gain	22.84 dBi
Outer Ring	22.84 dBi		0.0 dBmax
Slice Max Gain	22.84 dBi @ Elev Angle = 4.0 deg.		
Beamwidth	3.8 deg.; -3dB @ 1.8, 5.6 deg.		
Sidelobe Gain	10.1 dBi @ Elev Angle = 14.0 deg.		
Front/Sidelobe	12.74 dB		

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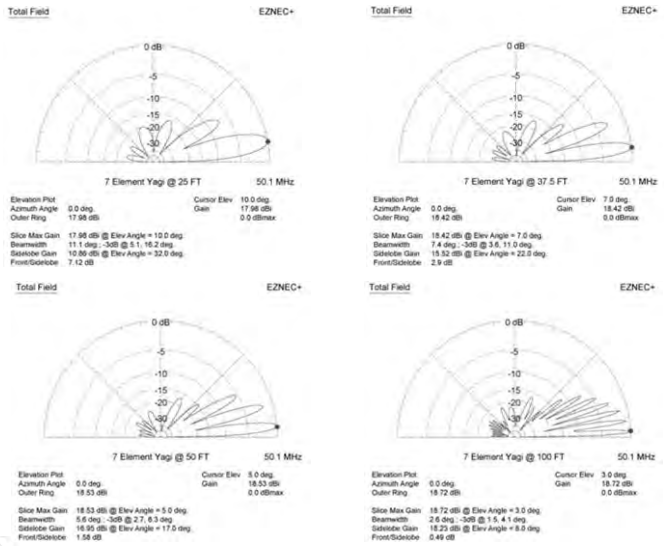
Antenna Techniques



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Antenna Techniques

- **What is the best height for my antenna?**
  - You will always have dead zones and nulls regardless of height
  - Get your antennas as high as you reasonable can
- **How Many Antennas do I need?**
  - **Really depends on where you live**

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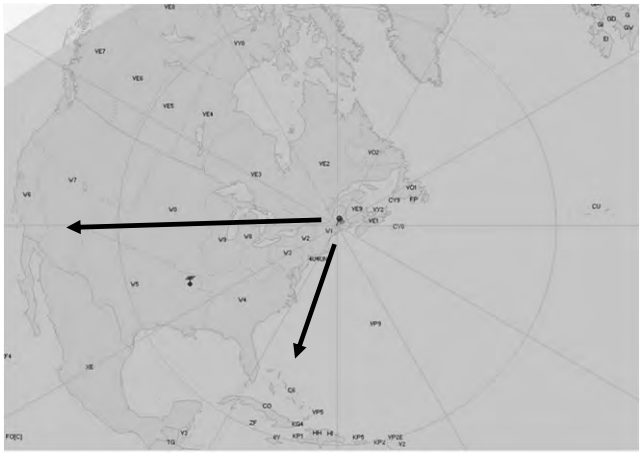
Antenna Techniques

QTH in Maine / Northeast USA



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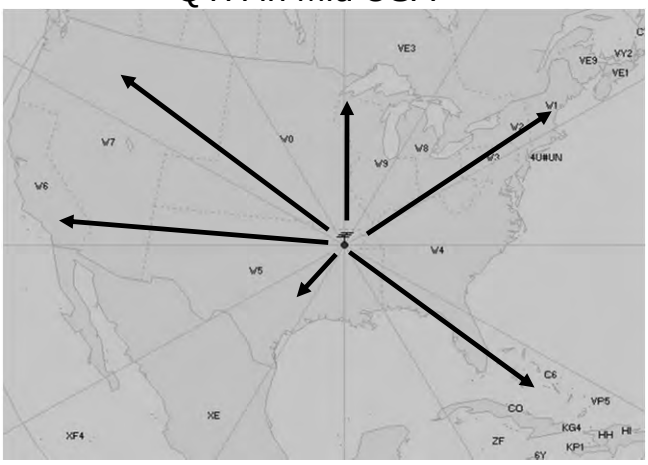
Antenna Techniques

QTH in Mid USA



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Antenna Techniques

How can you quickly change antenna direction??

Antenna, or a stack of smaller antennas in a fixed direction allow fast direction change without waiting for a rotor to turn.

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Station Techniques

- Radio
- Preamp
- Interconnecting cables
- Noise

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Station Techniques

- Radio
  - All new radios include 6 meters
  - Good dynamic range, roofing filters essential
- Preamp
- Interconnecting cables
- Noise

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Station Techniques

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Station Techniques

- **Radio**
  - **All new radios include 6 meters**
  - **Good dynamic range, roofing filters essential**
- **Preamp**
  - **Will improve weak sigs when band is dead but can cause problems in presence of strong stations**
- **Interconnecting cables**
  - **Ensure solid connections**
  - **Avoid cheap phono connectors & cable**
- **Noise**

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Station Techniques

Noise! The Grim Reaper of noise is *not* your friend!!

- Sky Noise
- Atmospheric Noise
- Line Noise
- Other man-made noise

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Station Techniques

- **Internet Routers can be a significant noise source at 50 MHz that will populate the band, especially the DX Window**
  - Multiple carriers of relatively constant amplitude but with modulation (Birdies)
    - 50.044, 50.058, 50.105, 50.120, 50.148, 50.166
  - Broadband trash
- ***Get your own station "clean" first!***

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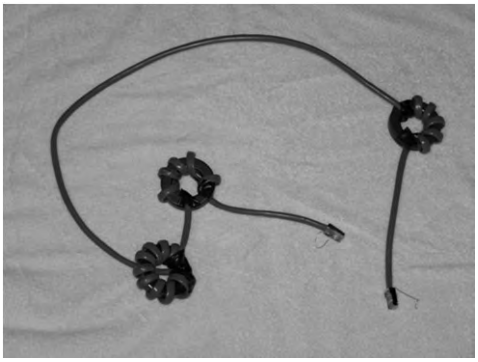
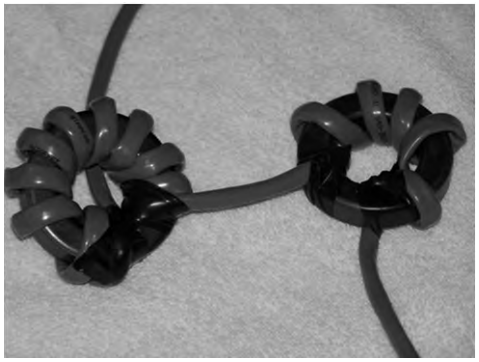
Station Techniques

Internet Router noise can be significantly reduced or eliminated.





Also utilize shielded CAT5 cable and connectors

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Station Techniques

- **Some Actual Results**
  - All “birdies” are gone
  - Noise floor dropped 8 dBm !!!
- **More technical info:**
  - A Ham’s Guide to RFI, Ferrites, Baluns and Audio Interfacing - Jim Brown, K9YC
    - http://audiosystemsgroup.com

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Station Techniques

Noise – Recap

- **Clean up your own station**
- **Address line noise issues**
- **Use Bandpass Filters**

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Propagation Techniques

- **Sporadic E – “Es”**
- **Meteor Scatter – “MS”**

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Propagation Techniques

- **Sporadic ionization of the E-Layer**
  - Peaks May–July, Possibly generated by lightning
- **50 & 144 MHz, possibly 222 MHz**
  - Single-hop optimum range 900-1300 miles, maximum range 1350-1500 miles
  - Double-hop optimum range 2000-2600 miles, maximum range 2750-3100 miles
- **Peak time during daylight hours & early evening**

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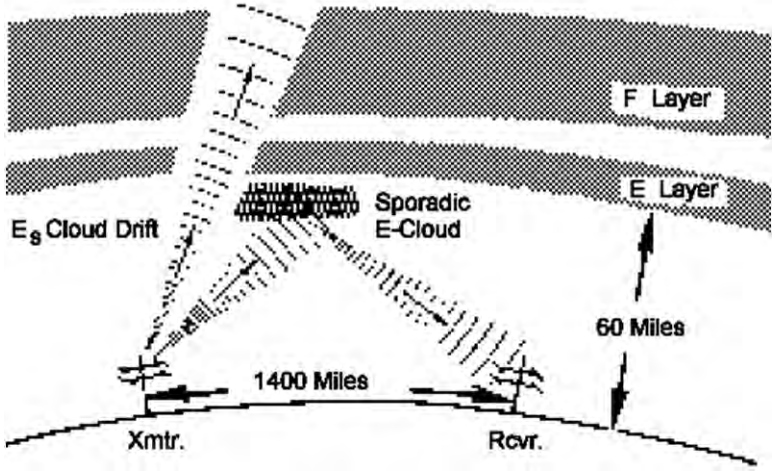
Propagation Techniques



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Propagation Techniques

- **Meteor scatter is the reflection of radio waves from the ionized trails from meteors burning up in the upper atmosphere.**
- **Meteors burn up in the upper atmosphere at a height of around 65 miles.**
- **This may be used to make QSOs up to about 1400 miles**

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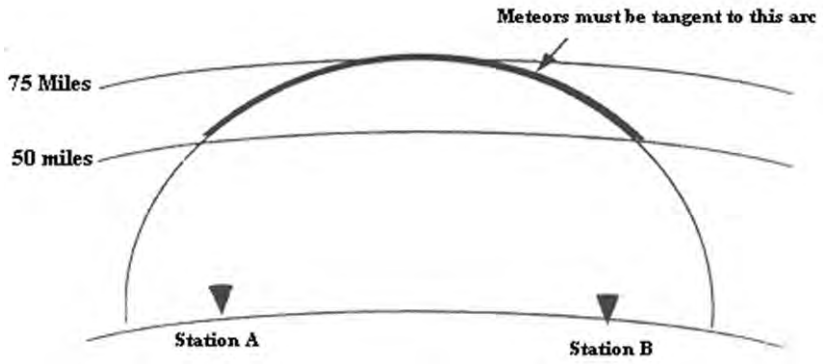
Propagation Techniques

Reflection will occur when the trail is oriented as shown



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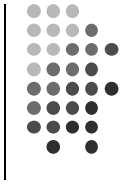
Propagation Techniques



- **Excellent for 50 MHz**
- **Very Predictable Paths**
  - Best times between midnight & approx 9 AM
  - Peak during “showers” – Anytime with high speed procedures like ***WSJT***

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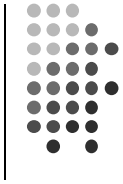
Operating Techniques



K1JT Digital Modes

- **Weak Signal Communication by K1JT (WSJT) offers specific digital protocols optimized for EME and meteor scatter at VHF/UHF**
- **Free open-source programs. Normal usage requires only a standard SSB transceiver and a personal computer with soundcard.**
- **Can Provide Outstanding access to new grid multipliers from moderate stations**

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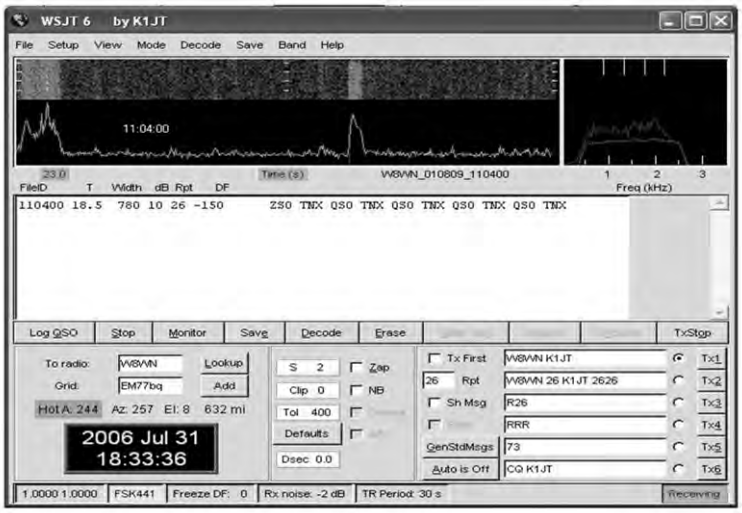
Operating Techniques



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Operating Techniques

- **FSK441 Mode**
  - **Calling frequencies 50.260**
  - **Single Antenna & 100 W is outstanding**
  - **Antenna is pointed toward station worked**
  - **Run 30 second sequences**
    - **Normally eastern most station runs 1st 30 second period (0-30) and western station runs 2nd 30 second period (31-00).**

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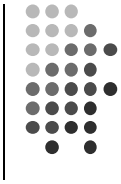
Operating Techniques



- **FSK441 Mode (cont)**
  - **Once calls are received stations start sending report**
  - **Stations will be on after 0500z**
  - **Listen on 50.260 in "Monitor" mode for stations calling CQ**
    - **You may hear "CQ W5ZN EM45 U5" or "D10"**
      - **U5 means the CQ station is listening Up 5 KHz**
      - **Call there. When CQ station hears you he will begin transmitting Up 5 KHz.**

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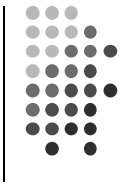
Operating Techniques



- **Download Free Software at:**

  http://physics.princeton.edu/pulsar/K1JT/wsjt.html

  Download User's Guide at:

  http://physics.princeton.edu/pulsar/K1JT/WSJT_User_600.pdf

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Operating Techniques

- **How to monitor for an unpredictable band opening:**
  - Radio with Panadapter
  - CW Skimmer
  - ON4KST Region 2 - 50 MHz Chat
  - DX Sherlock
    - Based on Cluster spots & shows paths
  - DX Cluster

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Operating Techniques

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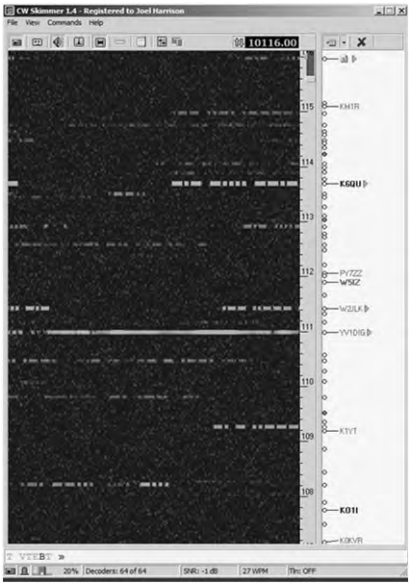
Operating Techniques

CW Skimmer allows you to see CW stations on the band



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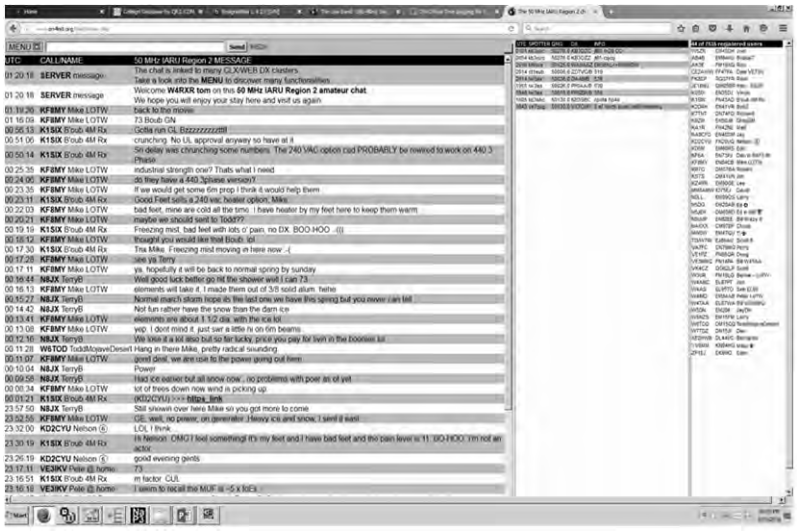
Operating Techniques



http://www.on4kst.org/chat/index.php

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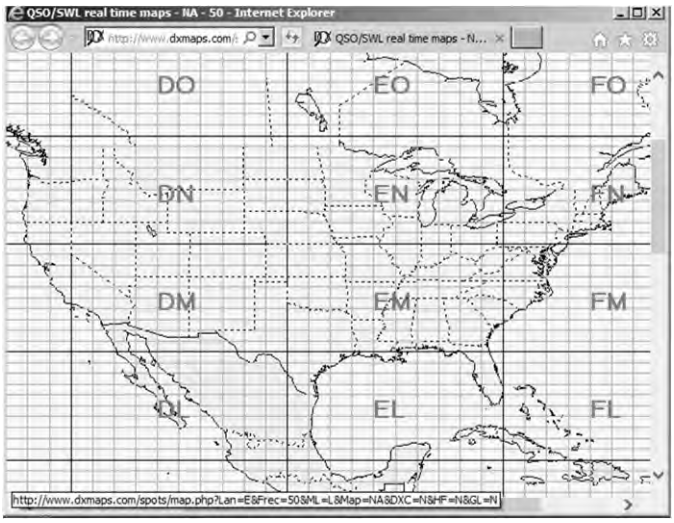
Operating Techniques

DX Sherlock will display open paths between stations



http://www.dxmaps.com/spots/map.php?Map=NA

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Operating Techniques

- **READ THE RULES!!!!!!!!!!!!**
  - Different contests have different rules. Some allow assistance for single op and some don't. Do NOT assume they are all the same!
- **The band will not be open continuously or with any certainty**
  - Monitor & Listen!
  - Monitor & Listen some more!!

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Important Techniques

- **The Same Principles for HF Apply to VHF**
  - Tower & Electrical Safety
  - Station Ergonomics
  - Physical Fitness
  - **ETHICS !!!**
    - A system of moral values and motivation based on right and wrong
      - "The rules are black and white, we make them gray!"
        K5ZD, CTU Dayton 2009

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Where to Learn the Techniques

- VHF Conferences & Microwave Update
  - Central States VHF Society (CSVHFS)
  - Northeast Weak Signal Society (NEWS)
  - Southeast VHF Society (SEVHFS)
  - Western States Weak Signal Society (WSWSS)
  - Microwave Update Conference
  - Not "traditional" hamfests
  - Publish proceedings (compilation of technical papers)

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Improving Your 160 and 80 Meter Antennas for the Declining Solar Cycle

- Vertical polarization on 160 meters
- Horizontal polarization on 80 meters
- Small receiving antennas
- High performance receiving antennas

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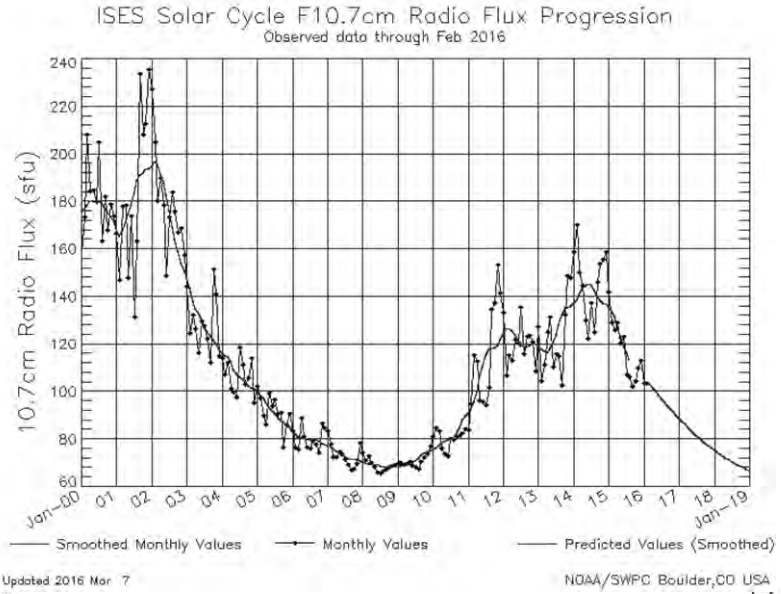
Dayton 2016

Two More Years of Declining Solar Flux

Followed by Three+ Years of Solar Minimum



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What About Solar Cycle 25 ??

Precursors of a *possibly* weak Solar Cycle 25

- Unusually weak solar polar magnetic field strengths
  - field strengths should reach their peak between 2018 and 2020
    - www.solen.info/solar/polarfields/polarfields.jpg
- Unusually large numbers of spotless days
  - possibly starting later this year or next year
- Unusually quiet geomagnetic field from 2018 to 2020+
  - reported by the A-index
- Unusually late appearance of new Solar Cycle 25 sunspots
  - new Solar Cycle 25 sun spots should appear by 2020
- Unusually long solar minimum
  - solar flux in the low 70s persisting after 2020

Accurate Cycle 25 forecasting is not possible until about three years *after* solar minimum

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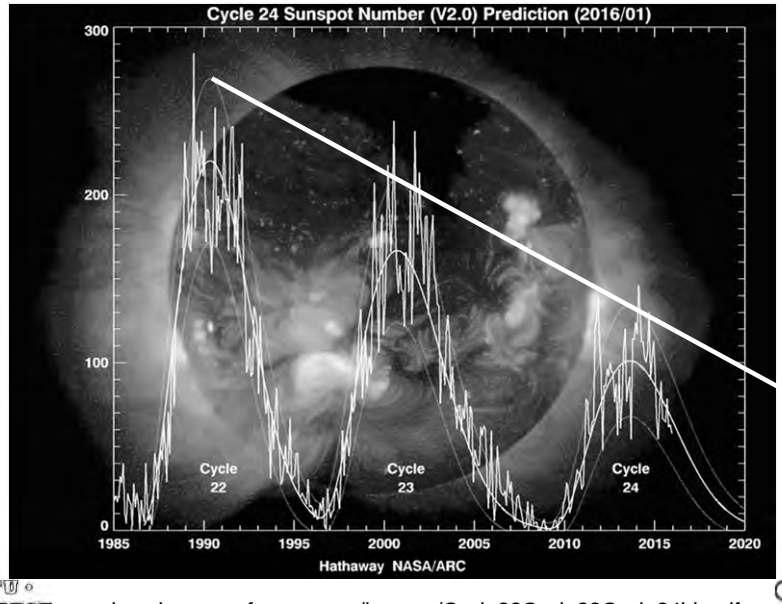
3

Declining Solar Activity Since Cycle 22

Suggests a Weak Solar Cycle 25



Cycle 25?

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solarscience.msfc.nasa.gov/images/Cycle22Cycle23Cycle24big.gif

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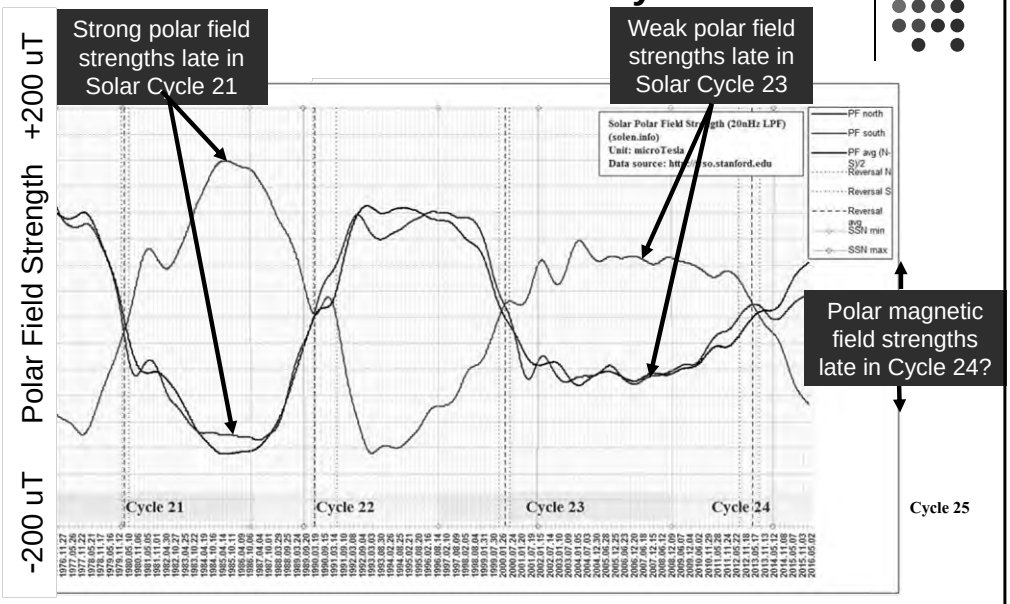
The Sun's Polar Magnetic Field Strength
A Reliable Precursor of Solar Cycle 25



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www.solen.info/solar/polarfields/polar.html

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Vertical Polarization for 160 Meters
almost always provides better DX performance than any horizontally polarized antenna

- Vertical, inverted-L, T, and umbrella transmitting antennas *almost always* outperform horizontally polarized antennas at distances beyond 1500 miles
- Nearby tall towers and antennas can significantly degrade the performance of vertical antennas
  - antenna pattern degradation
  - losses
- Efficient radial systems are essential to achieving the full performance potential of vertical transmitting antennas

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Horizontal Polarization for 80 Meters
easily provides 6 dB of "free" ground gain

- Horizontal dipole or inverted-V dipole 50-70 feet high
  - superb Sweepstakes and Field Day antenna
  - a good DX antenna for distances up to about 5000 miles
- Horizontal dipole or inverted-V dipole at 70 feet or higher
  - outperforms a single 65 foot vertical installed over all but the most conductive soils such as a salt marsh
- Use a vertically polarized antenna if you cannot install a dipole or inverted-V dipole at least 70 feet high
  - 65 foot vertical, inverted-L, T or umbrella with at least 30-60 radials
  - or a corner fed delta loop or inverted-U
- **Four-square vertical array**
  - with at least sixty 70 foot shallow buried radials per vertical
  - very competitive with high horizontally polarized arrays

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High Performance Transmitting Antennas for 160 Meter DX

- A 125 foot vertical: the gold standard 160 meter antenna
  - well spaced from all nearby tall towers and antennas
    - at least 140 feet from towers over 80 feet tall supporting large HF Yagis
    - optimum performance with spacing much greater than 140 feet
  - Install at least 30-60 shallow buried 125 foot radials
    - or at least two (preferably four or more) elevated 125 foot radials
      - but only if 30-60 shallow buried 125 foot radials are not possible
    - or a K2AV folded counterpoise (a counterpoise for small lots)
- Inverted-L, T and umbrella antennas are good alternatives
  - 50 feet or higher (as short as 35 feet with reduced performance)
  - supported by a tower, mast or trees
- Vertically polarized corner fed delta loop

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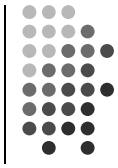
High Performance Transmitting Antennas for 80 Meter DX



- Horizontal dipole at least 70 feet high
  - higher is better
- 65 foot vertical
  - install at least 30-60 shallow buried 65 foot radials
    - or at least two (but preferably four or more) elevated 65 foot radials
      - only if buried radials are impossible
  - at least 70 feet from towers over 40 feet tall supporting a Yagi antenna
    - optimum performance with much more than 70 foot spacing
- Inverted-L, T and umbrella verticals are good alternatives
  - as little as 25 feet tall supported by a tower or trees
  - install at least 30-60 shallow buried 65 foot radials
    - or elevated radials
    - or a reduced size counterpoise
- Or a vertically polarized corner fed delta loop

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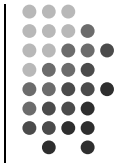
4-Square Vertical Array

an excellent high performance alternative to a very high 80 meter horizontal antenna



- A four square vertical array is very competitive with high horizontally polarized Yagis and quads
  - its also an excellent receiving antenna
- install at least 70 feet from all other towers
  - much more than 70 feet will significantly improve its performance
- at least 30-60 shallow buried 70 foot radials under each vertical

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Comtek 4-Square Controller

www.dxengineering.com/search/brand/comtek

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Why Receiving Antennas?

- Much better performance than most transmitting antennas
  - much lower cost
  - greatly reduced footprint
  - greatly reduced height (7 to 25 feet)
  - good directivity on as little as 650 to 2500 square feet
  - excellent directivity on less than an ¼ acre
  - superb directivity on less than 3/4 acre
  - greatly reduced mutual coupling between individual verticals
  - greatly reduced need for high efficiency matching and radial systems
- A large array performs equivalent to a 5 element Yagi!
- Combining two antennas with a variable phase controller
  - steerable nulls
  - optimizes the front-to-back ratio of phased arrays of Beverages and verticals
- Diversity reception with dual phase locked receivers

All receiving antennas dimension are for 160 meters - simply scale them to 80 meters

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Receiving Directivity Factor (RDF)

- A proven measure of receiving antenna performance
  - forward gain at the desired azimuth and elevation angle compared to average gain over the entire hemisphere
- 4 dB: very small diameter “magnetic” loop
- 5 dB: single vertical antenna (short vertical or a 1/4 wavelength vertical)
- 4 - 6 dB: 250 - 400 foot Beverage
- 4 - 6 dB: 225 foot Beverage on Ground (BOG)
- 6 - 9 dB: small loop arrays (flag, pennant, EWE, K9AY, Shared Apex Loop Array)
- 9 dB: two element or triangle array of short verticals (80-120 foot spacing)
- 10 dB: 500 - 600 foot Beverage
- 11 dB: two or three close spaced 500 - 600 foot Beverages staggered 65 feet
- **12 dB: 4-square array of short verticals only 80 feet on a side (3/16 acre)**
- 13.5 dB: four short verticals switchable in two directions (1/2 acre)
- 13.5 dB: steerable 8-circle array of short verticals (3/4 acre)
- 14 dB broadside/end-fire 800 foot Beverages (8 acres)

Re-radiation from nearby antennas, towers and power lines can degrade your actual RDF **especially high RDF arrays**

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Popular Receiving Antennas

- Small loops 4-12 dB RDF 80 to165 degree beamwidth
  - eight foot diameter “magnetic” loop
  - fixed unidirectional terminated loop (e.g., flag, pennant, EWE, K9AY)
  - electrically steerable compact array of loops (e.g., K9AY, Shared Apex Loop Array)
  - mechanically rotatable unidirectional terminated loop (e.g., rotatable flag)
- Beverages 4-14 dB RDF 35 to 90+ degree beamwidth
  - Beverage on ground (BOG)
  - single wire Beverage
  - two wire bi-directional Beverage or BOG
  - arrays of two or three close spaced staggered Beverages or BOGs
- Arrays of short verticals 9-14 dB RDF 50 to 135 degree beamwidth
  - active high impedance 20 foot verticals
    - requires a high input impedance amplifier at the base of each vertical
  - passive low impedance 25 foot verticals – **simple to troubleshoot and very reliable**
    - requires eight 70 foot or sixteen 35 foot radials at the base of each vertical
      - stabilizes feed point impedance in all weather and decouples the coax shield
    - four 25 foot umbrella wires
      - reduces the required height to 25 feet and increases the array bandwidth

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Small Diameter Loop Antenna

The "Magnetic" Loop

- Excellent for nulling a single nearby RFI source
  - but a poor low angle DX receiving antenna
  - RFI must be vertically polarized and received at a low angle via ground wave
- Excellent for very accurately locating RFI sources
- Bi-directional figure-8 pattern 150 degree 3 dB beamwidth
  - omni-directional for skywave propagated signals
- Very deep nulls (2 degrees wide) off both ends of the loop
  - mechanically rotate the loop until the single local RFI source is nulled
  - no useful nulls for skywave propagated signals
- Small loop antennas produce very low signal levels
  - requires a high gain, low noise preamplifier
- Decouple stray pickup from all attached cables
  - install chokes on the coaxial feed line shield and the DC power cable
  - bury cables about 12 inches deep for optimum null depth
- Avoid re-radiated signals from nearby antennas and power lines
  - locate the antenna as far as possible from other antennas and power lines

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The "Magnetic" Loop is a Specialized Antenna

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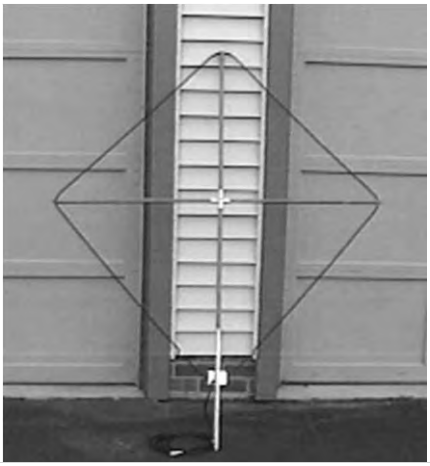
Small Diameter Loop Antenna

inexpensive and very easy to build and use
8 foot diameter (4 foot diameter on 80 meters)
Very deep, narrow beam width nulls for local RFI suppression
bidirectional 150 degree 3 dB beam width
4 dB RDF



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www.seedsolutions.com/gregordy/Amateur%20Radio/Experimentation/160loop.htm

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Electrically Steerable Loop Arrays

- Two K9AY loops
  - switchable in four directions
  - footprint is only 25x25 feet and 25 feet tall
  - 120 degree 3 dB beam width
  - 7 dB RDF
- Shared Apex Loop Array
  - switchable in eight directions
  - footprint is only 50x50 feet and 25 feet tall
  - 75 degree 3 dB beam width
  - 8 dB RDF
- Loops produce very low signal levels
  - a high gain, low noise figure preamplifier must be used
  - requires very careful attention to eliminating all unwanted signal coupling
    - decouple the coaxial feed line shield, control cable and DC power cable
    - bury cables about 12 inches deep for best unwanted signal rejection
- Avoid re-radiated signals from nearby antennas, towers and power lines
  - locate the antenna as far as possible from antennas, towers and power lines

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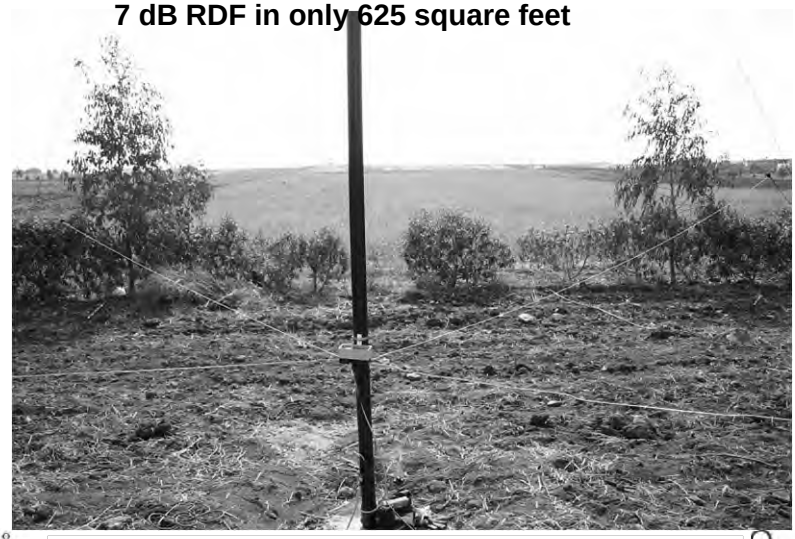
Two K9AY Loops

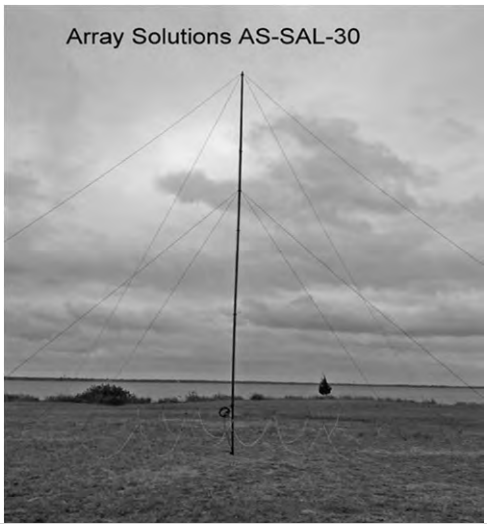
very small 25x25 foot square x 25 feet high footprint
switchable in four directions
120 degree 3 dB beam width
7 dB RDF in only 625 square feet



CTU CONTEST UNIVERSITY www.arraysolutions.com/Products/lowbandrcv.htm ICOM

Shared Apex Loop Array

50x50 foot square x 25 feet high footprint
switchable in eight directions
75 degree 3 dB beam width
8 dB RDF in only 2500 square feet



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www.arraysolutions.com/Products/sal_array.htm

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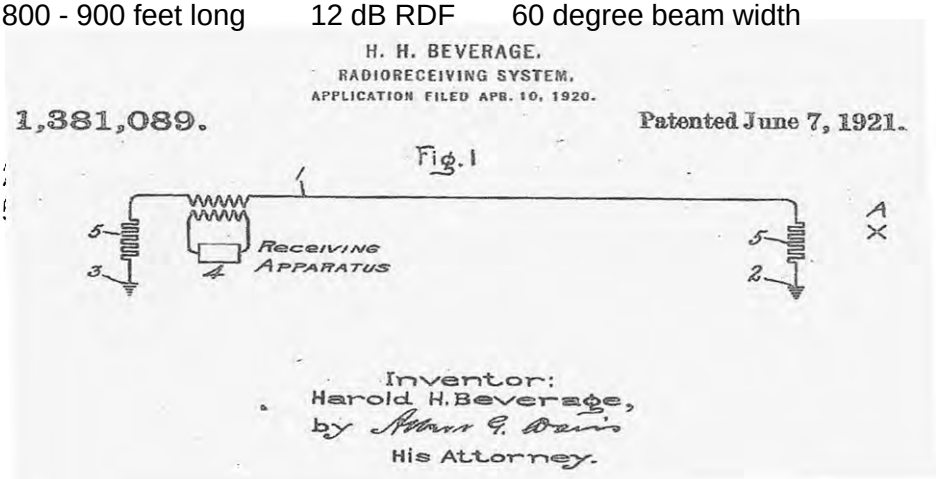
Single Wire Beverage

The simplest and most reliable high performance receiving antenna

250 - 400 feet long	4 - 6 dB RDF	100 degree beam width
500 - 700 feet long	10 -11 dB RDF	70 degree beam width
800 - 900 feet long	12 dB RDF	60 degree beam width


H. H. BEVERAGE.
RADIORECEIVING SYSTEM.
APPLICATION FILED APR. 10, 1920.

1,381,089. Patented June 7, 1921.

Fig. 1

Inventor:
Harold H. Beverage,
by Albert G. Davis
His Attorney.

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http://www.w8ji.com/beverages.htm

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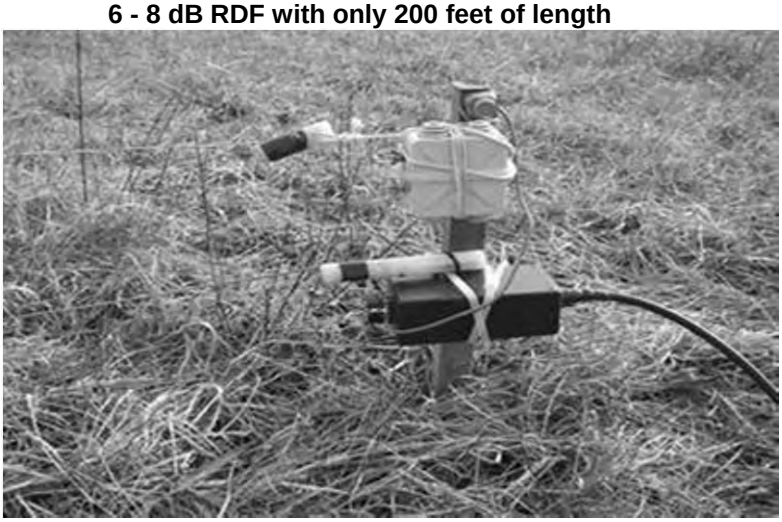
Beverage on (or near) Ground

a good choice when stealth is important
only 200-250 feet long for 160 meters
longer lengths degrade performance
70 - 100 degree 3 dB beam width
6 - 8 dB RDF with only 200 feet of length



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http://n4dj.com/Beverage.html

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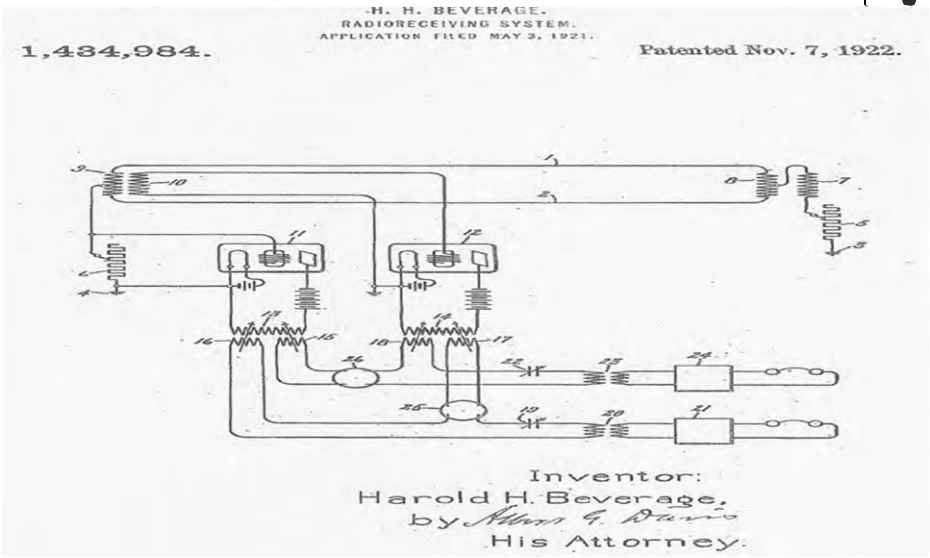
Two Wire Bidirectional Beverage

Switchable in two directions with one feed line
deep steerable rear null if both feed lines feed a variable phase combiner


H. H. BEVERAGE.
RADIORECEIVING SYSTEM.
APPLICATION FILED MAY 3, 1921.

1,434,984. Patented Nov. 7, 1922.

Inventor:
Harold H. Beverage,
by Albert G. Davis
His Attorney.

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www.w0btu.com/Beverage_antennas.html

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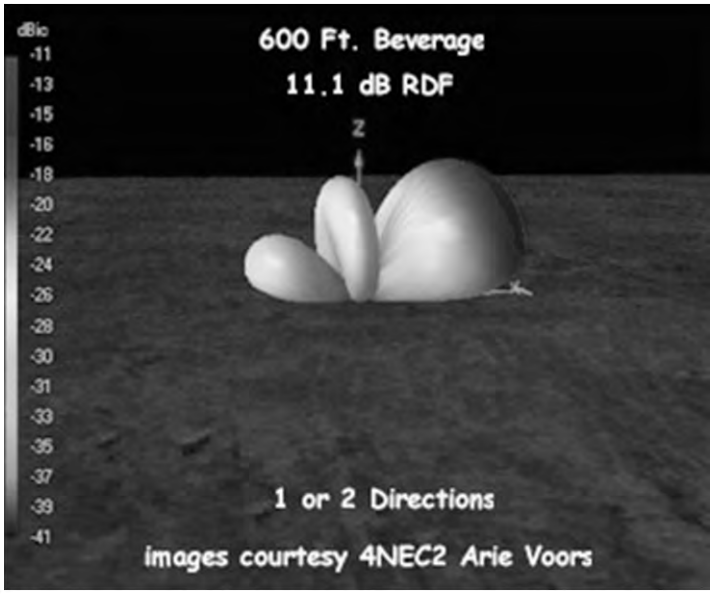
Radiation Pattern of a 600 Foot Beverage



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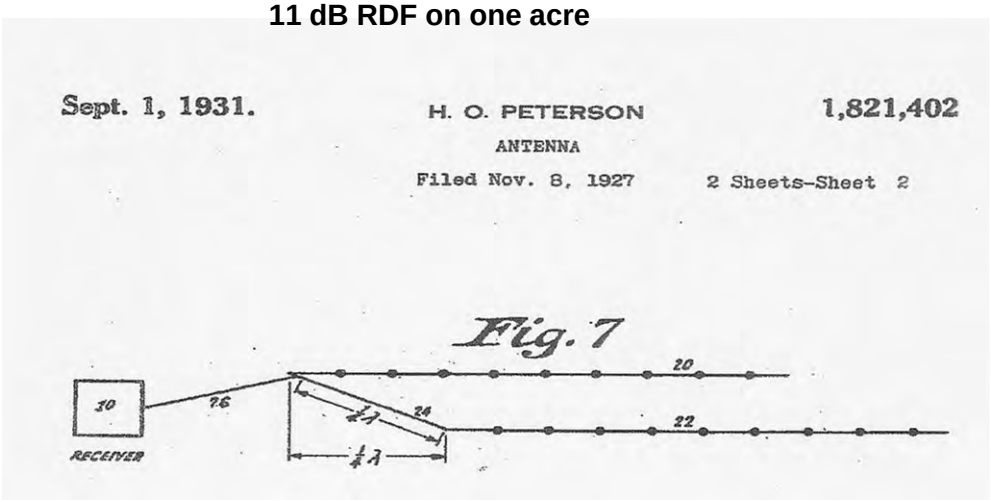
Close Spaced Staggered Beverage Arrays

two or three close spaced, staggered Beverages or BOGs
enhanced front-to-back ratio compared to a single Beverage or BOG
the deep rear null can be steered by a variable phase combiner
11 dB RDF with two or three close spaced 500-600 foot Beverages

11 dB RDF on one acre


Sept. 1, 1931. H. O. PETERSON 1,821,402

ANTENNA

Filed Nov. 8, 1927 2 Sheets-Sheet 2

Fig. 7

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http://ncjweb.com/features/sepoct11feat.pdf

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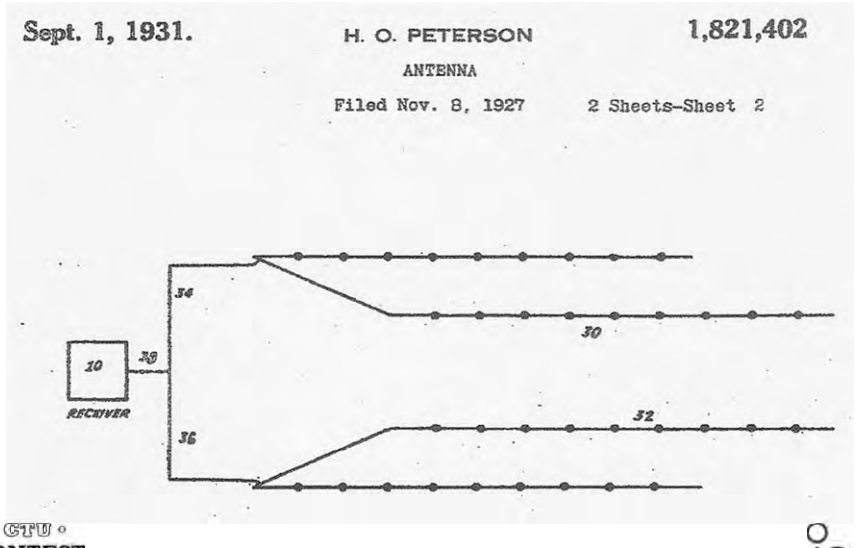
Broadside Pair of Staggered Beverages

800-900 foot Beverages, 330 foot broad side spacing

45 degree 3 dB beamwidth

14 dB RDF on 8 acres



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Phased High Impedance Verticals

Two or More 20 Foot Verticals

- No radials
- No umbrella wires
- Dual band operation with compromise 65 foot element spacing
- 80 foot element spacing for improved 160 meter performance
  - closer spacing is possible by using a variable phase combiner
- High input impedance amplifier at the feed point of <u>each</u> vertical
  - stray capacitance to nearby trees and other objects, at the feed point of each vertical and at the input to each amplifier must be as low as possible
- Switchable in multiple directions
- Verticals must not be installed within ten feet of nearby objects
  - Avoid nearby trees or any conductive or partially conductive structure
- Avoid re-radiated signals from nearby antennas and power lines
  - locate the antenna as far as possible from antennas, towers and power lines

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www.hizantennas.com

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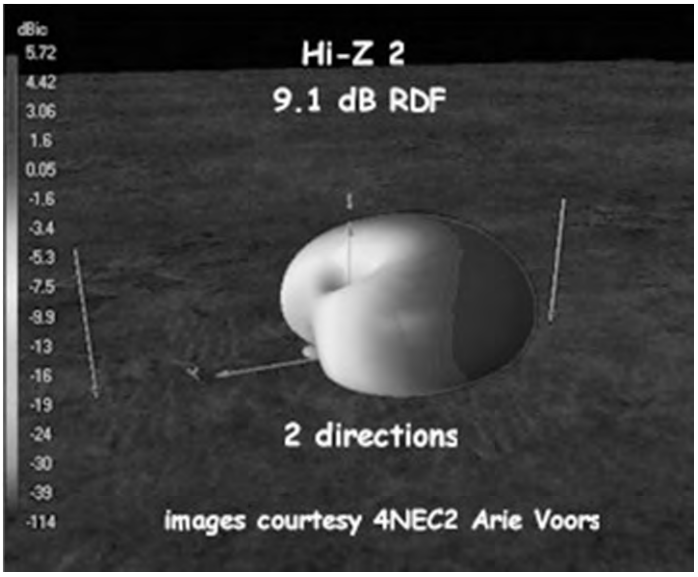
Radiation Pattern of a Two Element Array of 20 Foot Verticals



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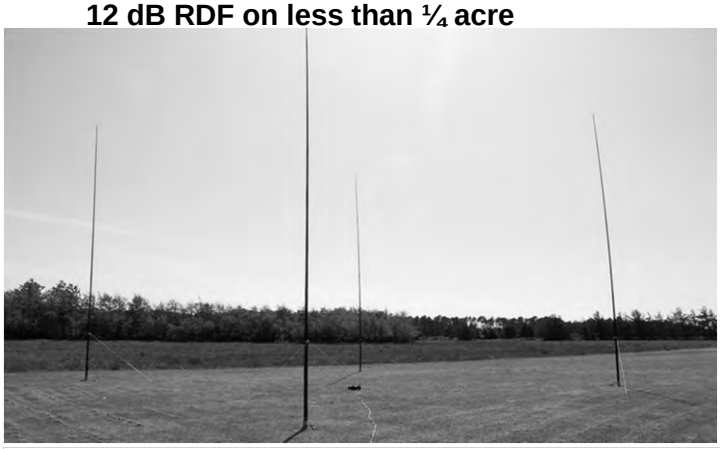
Electrically Steerable 4-Square Vertical Array

four <u>high impedance</u> 20 foot verticals
no radials and no umbrella wires
80x80 foot square x 20 foot high footprint
high input impedance amplifier at the base of <u>each</u> vertical
switchable in four directions
100 degree 3 dB beam width
12 dB RDF on less than ¼ acre



www.dxengineering.com/parts/hiz-4-lv2-80

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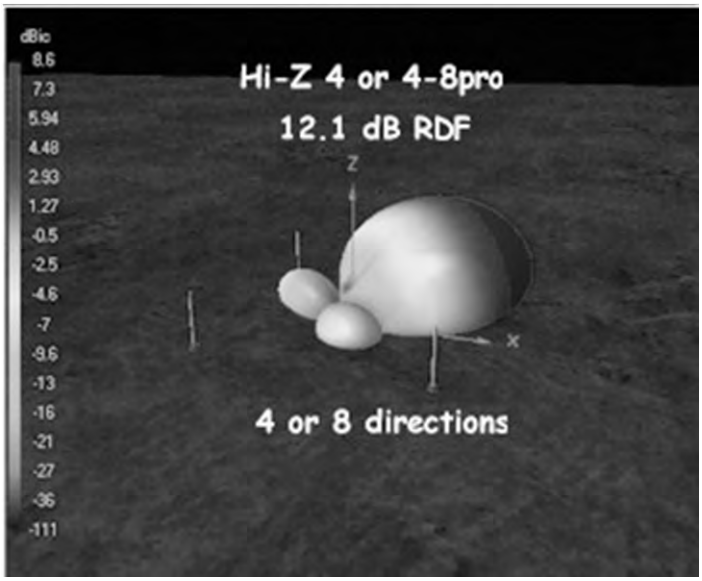
Radiation Pattern of a 4-Square Array of 20 Foot Verticals



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Electrically Steerable 8-Circle Vertical Array

eight high impedance 20 foot verticals
no radials and no umbrella wires
requires a high input impedance amplifier at the base of each vertical
200 foot diameter array with 106 degree phasing
switchable in eight directions
50 degree 3 dB beam width, the performance of a 5 element Yagi
13.5 dB RDF on ¾ acre

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www.hizantennas.com/8_element_arrays.htm

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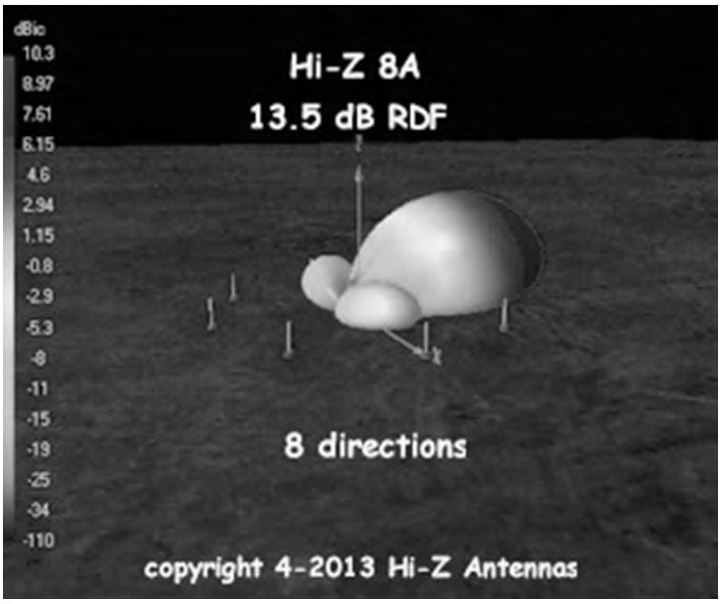
Radiation Pattern of a 200 Foot Diameter 8-Circle Array



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Eight phased verticals with 106 degree phasing

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Phased Low Impedance Verticals
Two or More 25 Foot Umbrella Verticals

- Short radials are required at the base of each vertical
  - eight 70 foot radials, sixteen 35 foot radials or chicken wire
  - randomly laid on the ground or shallow buried, symmetry is not important
- Four 25 foot umbrella wires attached to the top of each vertical
  - reduces antenna height and improves array bandwidth
  - if necessary, use 35 foot verticals with no umbrella wires
- As little a 65 foot element spacing
  - its difficult to achieve stable, repeatable performance with smaller spacing
- Amplifiers not needed at the base of each vertical – higher reliability
- Switchable in multiple directions
- Very easy and low cost to homebrew your own antenna
  - large diameter arrays are very tolerant of moderate amplitude and phase errors
- Low impedance verticals are tolerant of nearby trees and buildings
- Avoid re-radiated signals from nearby towers, antennas and power lines
  - locate the antenna as far as possible from other antennas and power lines

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Excellent Performance and High Reliability

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Electrically Steerable 4-Square Vertical Array

four low impedance 25 foot umbrella verticals
four 25 foot umbrella wires attached to the top of each vertical
eight 70 foot or sixteen 35 foot radials per vertical
65x65 foot square footprint plus additional space for radials
switchable in four directions
easy and inexpensive to build
100 degree 3 dB beamwidth
12 dB RDF on ¼ acre

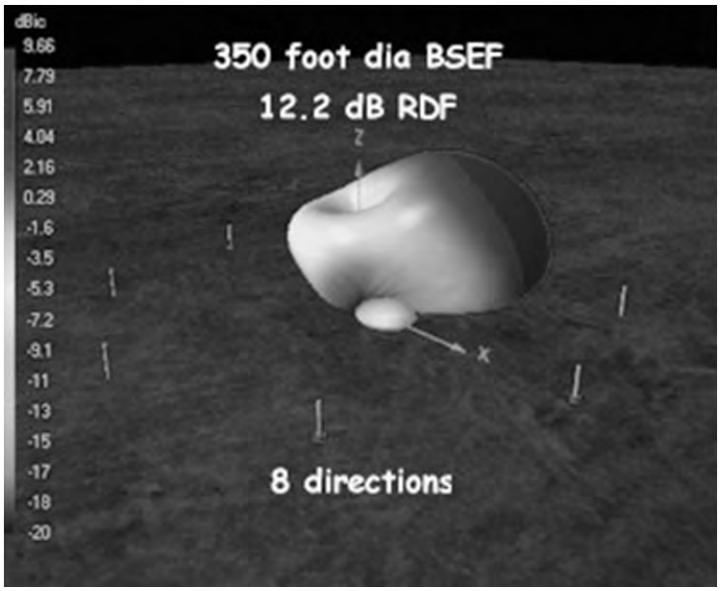
www.iv3prk.it/user/image/site2-rxant.prk_4-square_1.pdf

Electrically Steerable 8-Circle Vertical Array

eight low impedance 25 foot umbrella verticals
four 25 foot umbrella wires per vertical
eight 70 foot or sixteen 35 foot radials per vertical
350 foot diameter with 1/4 wavelength spacing plus space for radials
or only 200 foot diameter with a 106 degree Hi-Z phasing controller
switchable in eight directions
Very easy and inexpensive to build
50 degree 3 dB beam width, the performance of a 5 element Yagi
13.5 dB RDF on one acre

construction details: http://www.w5zn.org

Radiation Pattern of a 350 Foot Diameter 8-Circle Array



Four phased elements with 115 degree phasing

Receive Antenna Variable Phasing Controller DX Engineering NCC-1

Combines the inputs from two antennas

- creates a directional pattern with deep steerable nulls
- optimizes the performance of phased Beverages and phased verticals
- very well engineered and exceptionally easy to use

www.dxengineering.com/parts/dxe-ncc-1

Phase Synchronous Diversity Reception

two widely spaced antennas (500 to1000+ feet) feeding
two identical high performance phase locked receivers

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Elecraft K3S transceiver with KRX3 sub-receiver

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CTU Presents

Coax Connectors, a Deep Look at What Can Go Wrong

by

Greg Ordy, W8WWV

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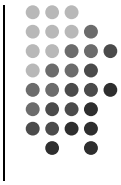
Topics to Cover



1. Let's Step Outside for a Moment.
2. What is **PIM?** (Passive Intermodulation)
3. Examples From the Field.
4. Techniques to Find the Problem.
5. Techniques to Avoid/Fix the Problem.
6. Acknowledgements.
7. References, Further Information.

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Let's Step Outside for a Moment

- It seems like the opportunities for something to go wrong around the old ham station are endless…
- In this session the focus will be on problems with normally passive and linear devices, usually located outside, and usually taken for granted.
- The session title names the *coax connector*, but the problems and solutions can be generalized to most any metal to metal connection.
- Another title might be: *How to Avoid Accidental Diodes.*
- RF + Diodes = Crud (and we want to avoid crud)

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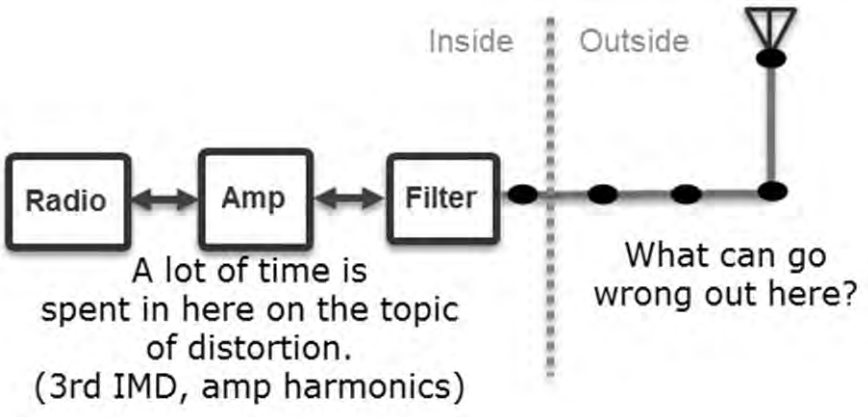
Let's Step Outside for a Moment (2)

- Simple station block diagram:



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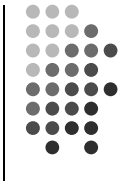
Let's Step Outside for a Moment (3)



- Of course a lot can go wrong outside!
  - Towers can collapse, antennas can fall, etc.
- Beyond those obvious problems, **distortion**, the creation of spurious signals that interfere with desired signals, can be generated by innocent looking passive devices, like coax connectors.
- One manifestation of the distortion is called **PIM** – *passive intermodulation distortion*.

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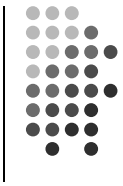
What is PIM?



- "**PIM** is a form of intermodulation distortion that occurs in components normally thought of as linear, such as cables, connectors, antennas, and towers. When subject to high RF power, these devices can generate spurious signals. PIM shows up as a set of unwanted signals created by the mixing of two or more strong RF signals in a non-linear device, such as in a loose or corroded connector, or in nearby rust. Other names for PIM include the *diode effect* and the *rusty bolt effect*." (*Nicholas Cannon, Anritsu*)

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What is PIM? (2)

- PIM is a hot topic at the cellular/mobile service level.
- They have multiple transmitters/receivers/antennas jammed onto a single tower, and, the many added challenges inherent in GHz operation (usually due to short wavelengths).
- The problem can occur at HF, however.
- The contest station with multiple transmitters/receivers/antennas and even nearby commercial broadcast stations has a similar *RF rich* environment and lots of connectors and connections.
- The causes, culprits, and solutions are largely the same. (meaning we can learn from them!)

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What is PIM? (3)

- PIM gets more discussion than simple harmonic generation because in the odd order cases you can generate spurious signals in the operating band – so they are right up in your grill.
  - You are forced to deal with your own pollution.
- But, there are many amateur bands with harmonic relationships and the opportunities to be negatively impacted by spurious signals goes far beyond PIM if PIM implies two signals.
- It's all the same underlying problem – diodes where you don't want diodes. Passive becomes active. Linear becomes non-linear.

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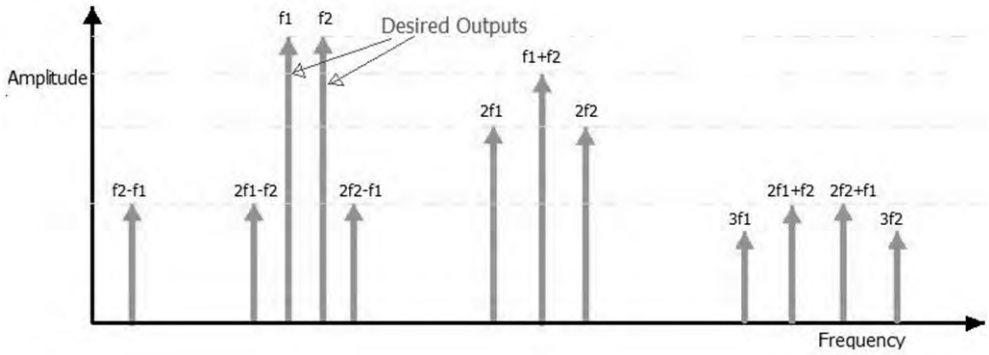
What is PIM? (4)



- Fundamental, second order, third order products.
- Talk about crud!

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What is PIM? (5)

- Common causes of PIM (thanks to Ian Poole):
  - (how to make a diode without really trying….)
- Dirty, oxidized, rusty, loose, corroded connections.
- Irregular contact areas.
- Use of ferromagnetic metals: e.g. iron, nickel, steel.
- Deterioration due to moisture entry (salt spray).
- Deterioration due to spark discharges creating craters/voids that then accumulate dirt/oxidation.
- Metal flakes/shavings/whiskers crossing over RF conductors.

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What is PIM? (6)

- Joints where dissimilar metals meet.
- Coaxial connectors: joints with dissimilar metal in contact and exposure to the atmosphere and weather.
- Coaxial cable (the outer braid is nothing but an endless number of overlapping mechanical connections). A foil layer can help.
- The proverbial rusty fence, metal roof, loose and dirty gutter, or broken insulator (and on and on).
- Obviously Mother Nature invented diodes long before we noticed or needed them!
- Point Contact Diode discovery: Ferdinand Braun, 1874. He is better known for his invention of the CRT oscilloscope, 1897. He shared the 1909 Nobel Prize with Marconi for his "*Contributions to Wireless Telegraphy*".

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What is PIM? (7)

- Does a non-linear diode-like junction cause trouble if it falls over by itself in the woods?
- Not really – we also need to deliver energy into it (the signals), and conduct the undesired IMD products away from it and eventually to a receiver.
- Connectors and transmission lines are perfect for this since they carry radio RF as part of their job.
- Anything else that can act like an antenna can also contribute to energy flowing in or out.
  - And if a resonant conductor, then even more so.
  - With a direct or parasitic connection.

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Examples From the Field

- Check updated presentation.

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Techniques to Find the Problem

- It can be hard to find PIM problems.
- It is probably easier, therefore, to work a little harder to prevent them rather than have one show up and then try to find it.
- In other words, be *proactive* and not *reactive.*

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Techniques to Find the Problem (2)

- Inspection/Cleaning of Connections
- Spectrum Analyzer
- TDR Time Domain Reflectometer
- Listen to identify AM station ID
- Consult list of nearby AM stations (FCC)
- Antenna Orientation, Resonant Lengths
- Chokes can break up common mode antennas.
- Portable receiver with Directional Antenna.
- Check Harmonic frequencies.
- Everything gets worse with time.

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Techniques to Avoid/Fix the Problem

- From the Electro Rent Europe (they rent commercial PIM test equipment (cellular/mobile)) web site:
- **Q**: What are the most common causes of PIM?
- **A**: From testing over 2000 feeder lines, 75% of problems are found in poor quality, poorly assembled, dirty connectors. Other contributors are poor component plating, ferromagnetic materials, low contact pressure (connectors not torque correctly). [this is at UHF]

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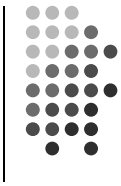
Techniques to Avoid/Fix the Problem (2)



- Periodic inspection, especially if a problem is suspected.
  - Return everything to shiny, bright, tight, dry, and taped.
- NCJ Article on PL-259's
- Solid friction fit.
- Clean with brass brush, remove flux/dirt, leave no residue (steel wool)
- Remove rust.
- Various Tape strategies.
- Chokes can deny common mode antenna energy.
- Bond metal around moving joints (ring rotators).

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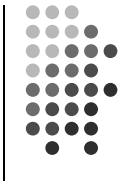
Many Thanks go to…..



- This presentation could not have been prepared without the help and input of many, including:

- Check updated presentation…..

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References and Further Information

- How to reach me: ordy@seed-solutions.com
- The ARRL RFI Book
- http://www.radio-electronics.com/info/rf-technology-design/passive-intermodulation-pim/basics-tutorial.php
- https://en.wikipedia.org/wiki/Intermodulation
- http://users.tpg.com.au/ldbutler/Intermodulation.htm
- http://ac0c.com/attachments/ac0c_Intro_to_Roofing_Filters__cadxa_6_oct_2011.pdf

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References and Further Information (2)

- http://anritsu.typepad.com/thepimsource/2013/01/getting-to-the-root-cause-of-pim.html
- http://www.electrorent-europe.com/pim-test/faqs.aspx
- http://www.anritsu.com/en-us/test-measurement/solutions/en-us/Troubleshooting-passive-intermodulation
- http://www.rfwireless-world.com/Terminology/what-is-PIM-Passive-Intermodulation-Distortion-and-its-mitigation-techniques.html

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CTU Presents

Improving Single Operator 2 Radio (SO2R) Techniques

Presented by
Andy Blank N2NT
andyn2nt@gmail.com

Scope of presentation

- Explore the evolution of SO2R and present different setups
- Everyone's setup will be different, no one way to do it.
- Emphasize spatial awareness and 2 keyboard use.
- Improve your ergonomics, and present ways to practice.
- Show new ideas such as dual pileups and diversity reception
- Ideas on how to improve your Rate
- Our purpose is not to show you how to setup hardware and software, but how to maximize your setup to it's full potential.

What is SO2R

- Single Op/2 Radios. One operator uses 2 radios at the same time to increase band presence.
- There are many ways to accomplish this.
- Use 2 radios and 1 computer.
- Use 2 radios and 2 computers.
- Use a single radio with 2 receivers.
- Use a single radio with 2 receivers and transmitters.
- Flex Radio with built in SO2R (beta testing now)

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Evolution
Caveman SO2R

earliest known Cabrillo Log

Found by archaelogists

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Some History by DL1IAO

Historical tidbits

- First documented in 1952 by W4KFC
- 1970´s: Some US contesters use 2 radios connected to one keyer (not allowed nowadays).
- 1993: DK3GI wins German XMAS Sprint with 100W and 2 radios-

CQ WW CW 1999: LY6M (LY1DS) sets new SOAB HP EU record

Today:

Many US-contesters do it - but only a few Europeans!

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Brief History of SO2R

- Before computer logging, some contesters used hardware solutions for quicker band changing.
- I used a device called the “Ultimate Sprinter”.
- This was basically a telephone switchboard, changing headphones, amp keying lines and CW key lines from one radio to another.

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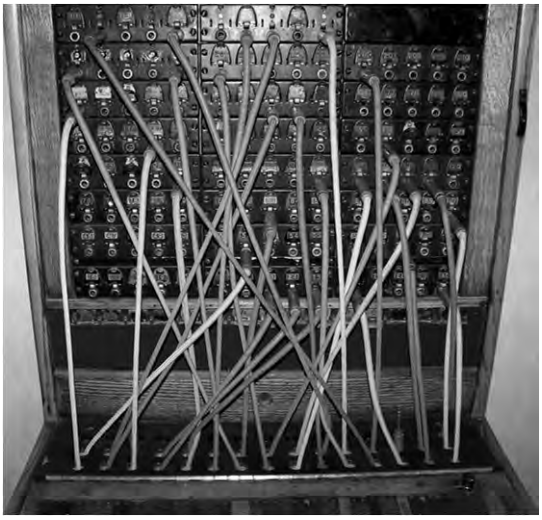
Closest approximation of Ultimate Sprinter. Unfortunately I never took a picture of it. Much like an old telephone switchboard, it had push button switches to change bands, operating 4 to 5 different radios.



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Earliest known SO2R box also found by Archaelogists

I Still use the box today!

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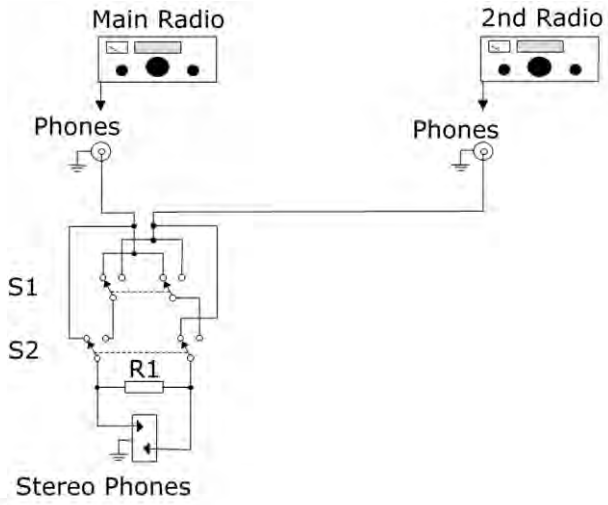
Simple Audio Switch



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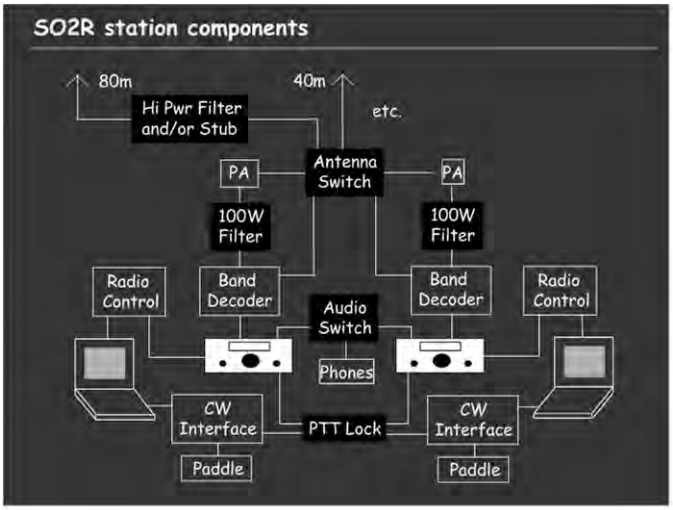
Typical simple SO2R setup
Filters are key to hearing on 2 bands at once.



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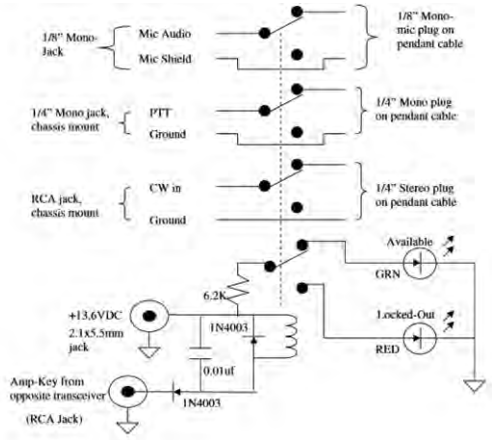
If you have no SO2R box AD5X Simple lockout



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Why is SO2R important?

- A wise ham once said “RATE is KING”
- There is no wasted time while Cqing, increasing RATE
- You are present on 2 bands at once, increasing RATE
- New techniques such as dual pileups increase your RATE
- Did I mention it will increase RATE?

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How can I increase my rate?

- Practice, Practice, Practice.

- Use software such as MorseRunner by VE3NEA to simulate pileups.
- N1MM+ has the capability to log using MorseRunner
- Get on the air and operate, especially mini contests such as CWT, and Sprints.
- Practice Cqing and tuning at the same time.
- Practice Cqing and Cqing at the same time.

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Spatial Awareness is important

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All major Contest Logging programs interface with SO2R boxes

- N1MM +
- Win-Test
- Writelog
- The purpose of this presentation is not to recommend logging software. The user must decide which is better for them.
- SO2R setup is available in each suite and should be set up according to the individual needs

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Commercial Solutions
Top Ten Devices
LPT control

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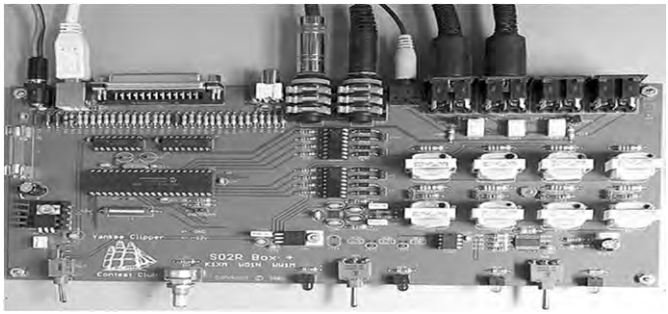
Microham Micro2R
Very powerful
Setup can be challenging

http://www.microham.com/

YCCC SO2R by K1XM
Kit only
OTRSP



4O3A Interface Genius
LAN based SO2R
Very Powerful and highly configurable

http://4o3a.com/

- Using communication through LAN, the interface genius will allow full audio and keying control of each radio using 2 PCs.
- Allows for more powerful configurations.
- If you use 2 computers, no trouble with lockouts, other boxes need external solutions.

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ERGONOMICS for Maximum EFFICIENCY

- Keep you hands on the keyboard as much as possible. Use macros and redefine keys.
- Use footswitches to emulate keys
- Keep radios close enough that you don't have to reach for controls
- Monitor(s) should be at eye level to minimize neck movement.
- Try to keep spatial awareness with radios and monitors

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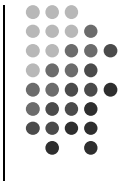
Use macros and scripts for frequently used features such as RIT



- For WinTest users, Bob N6TV has written many LUA scripts to emulate functions; Available here: http://www.kkn.net/~n6tv/wtscripts/
- RIT, DVK, ESM, K3 control, P3 control, SwapFocus, and many others
- eg. I use F8 and F9 for RIT control
- N1MM+ is also highly configurable.

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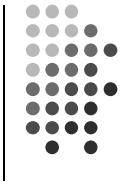
Advantages of 2 computers or keyboards



- Classic SO2R uses one computer and an interface to change RX/TX focus
- 2 Computer or 2 keyboard SO2R will allow better Spatial Awareness
- Dual pileups can be “queued” easier
- No chance of entering calls in the wrong window

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2 computers add redundancy

- If something fails on one computer you can continue logging.
- No chance of losing log
- Hardware lockout is required to prevent 2 signals at once. (except with interface genius)

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N1MM + and WinTest now have dual keyboard capability
For those who prefer one computer:

- N2IC has added 2 keyboard support to N1MM+
- SM5AJV has written an LUA script for WinTest 2 keyboard support.
- When you type on the second keyboard, it automatically enters the information in the proper window.

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Use Macros to shorten keystrokes

- X-keys for keyboard key substitutes
- Macros for key simulations
- Redefine your keyboard keys to make frequent keystrokes easier.
- OTRSP scripts help define your goals
- Footswitches can save keystrokes

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X Keys makes wonderful programmable keys. Connect via USB, program keys or macros easily.

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ESM mode /Enter Sends Message

- First introduced by N6TR in Trlog, ESM is a very intuitive way to use your logging software.
- Most loggers have this feature.
- It is highly configurable, and you can use macros to your advantage.
- Less thinking of which keys to hit, the computer knows.
- At N2NT I have used Xkeys footswitches to emulate the Enter key.
- Frees up your hands to do other things.
- Introduces unintended consequences, I had severe leg cramps the first 48 hour contest with it.

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Dual footswitch for ESM Frees up hands for other things

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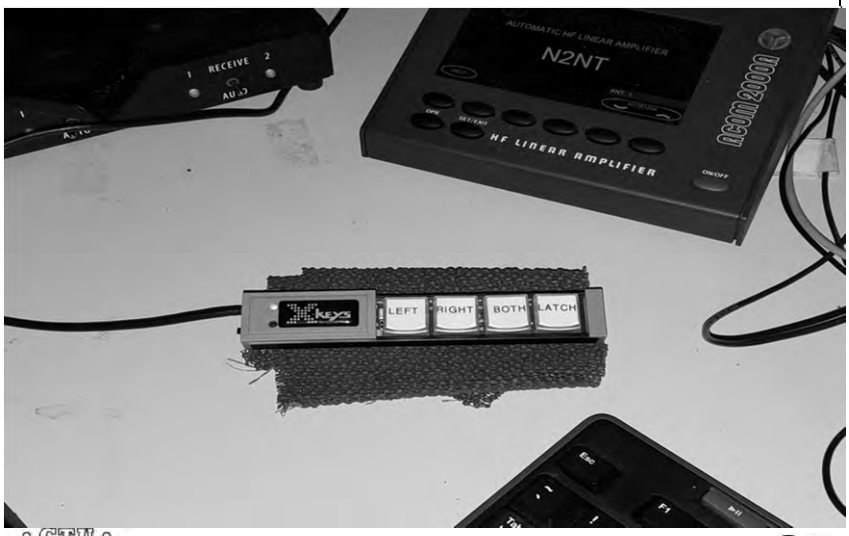
X keys Headphone switch
Uses macros to activate OTRSP Protocol



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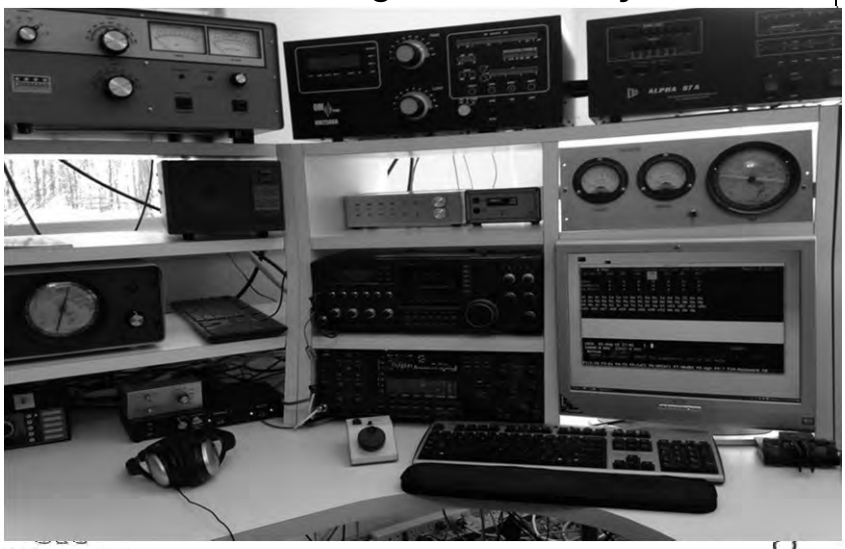
N9RV SO2R with Trlog and 1 computer
Radios stacked for easy access.
Note Remote tuning knob near keyboard



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Typical SO2R station layout using 2 discreet stations
UR0MC/UW2M

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N2NT SO2R
Monitors move depending on Operator preference
Advil placed in middle for easy access

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V47T SO2R 2 laptops 2 keyboards Cheetos in the middle for easy access

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Don AA5AU has written an excellent Primer on RTTY SO2R. RTTY is a natural fit for SO2R because you can have the computer decode callsigns without paying attention to the other radio.
You can point and click when ready, thus maximizing your rate.
Check out http://www.rttycontesting.com/lagniappe/so2r/ for more information,

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N6MJ at ZF1A setup 2015
The most QSOs Single Op ever in CQWW CW

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What do you do between CQ's?

- If you want to compete, you must make use of idle time.
- Standard SO2R/Listen on another band while you CQ.
- Use the second VFO to tune SAME BAND in between CQ's. SO2V will support this in N1MM+.
- SO2R is better if you have another antenna you can listen on the same band while you are Cqing.
- If you are using a skimmer or cluster, you can use the band map to line up QSOs in between your run. Don't just work multipliers, use it for regular QSOs. Your rate will increase easily.
- You must practice to avoid losing your run frequency. Learn the keystrokes for returning to your CQ frequency quickly.
- Use the bandmap to give a mental picture of the band.
- Enter frequency of everyone you hear into the bandmap, if you are single op Unassisted.

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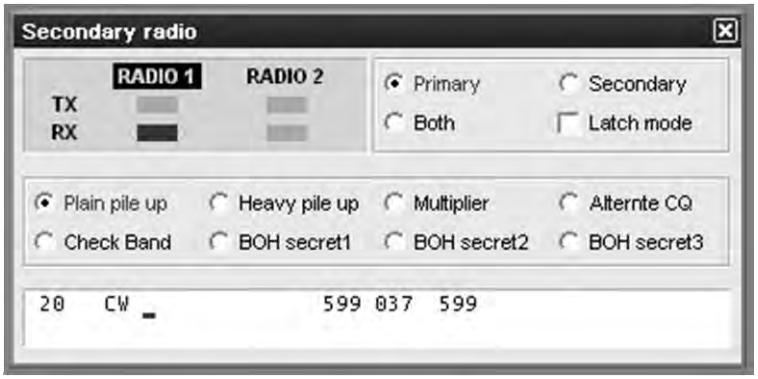
WinTest uses a secondary window for 2nd radio entry
Scenarios increase flexibility



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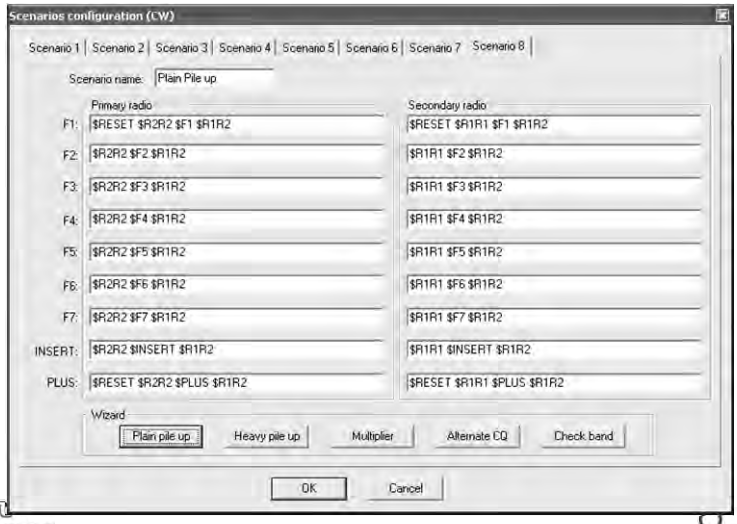
Using scenarios, you can configure your SO2R box to adapt to different operating conditions



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Typical SO2R setup in N1MM+
Support for SO2V also available

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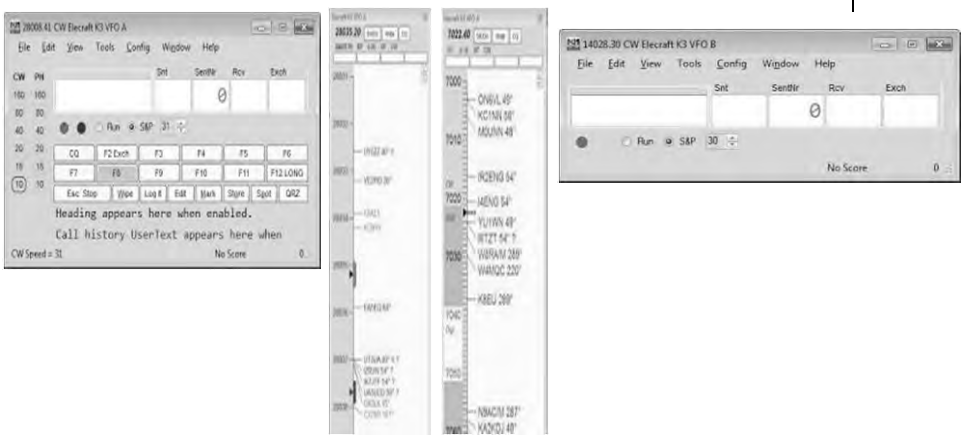
Typical SO2R setup with N1MM+



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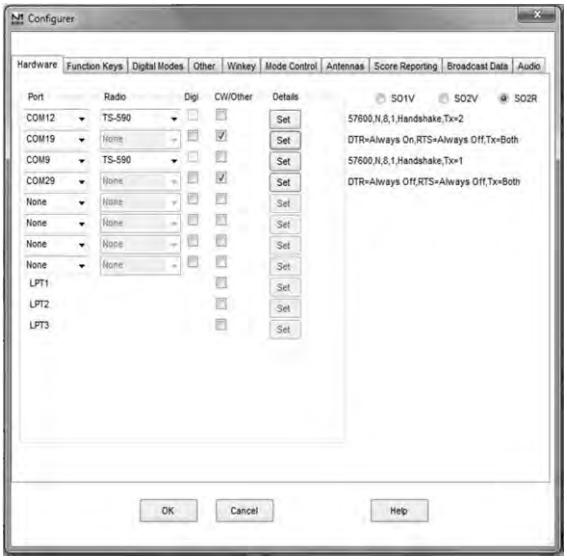
N1MM+ SO2R configuration for YCCC box



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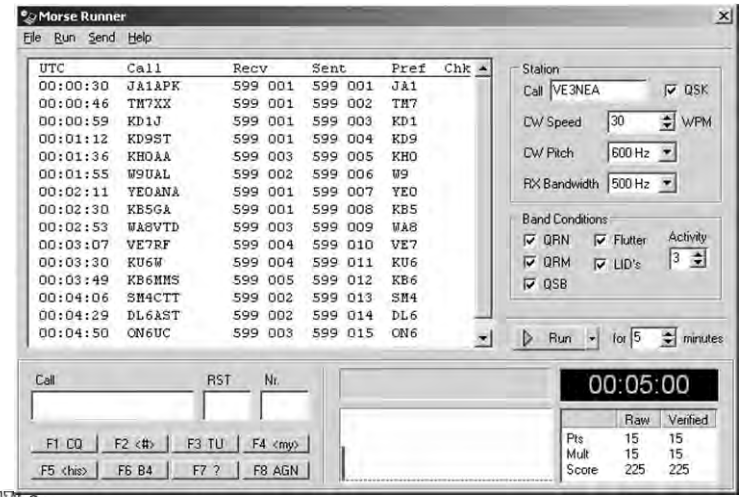
Morse Runner by VE3NEA is a fabulous CW training tool. Amazingly realistic.



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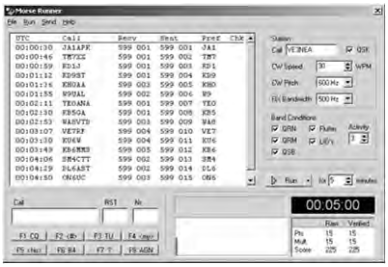
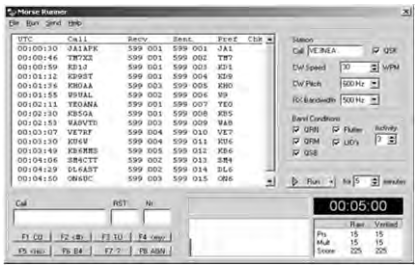
Morse Runner on Steroids. Dual Pileup practice





Laptop 1

Headphone Switch L/R/Both

Laptop 2

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Rates with 1 and 2 pileups

2014 CQWW CW

- 280 TO7A UT5UGR Dual
  258 P40C KU1CW Single
  257 V47T N2NT Dual
  249 KL7RA NN1N Single
  247 VE2IM VE3DZ Single
  238 UP0L UN9LW Single
  236 OH0V OH6LI Dual
  229 A71BX K5GN Single
  228 P40W(LP) W2GD Single
  227 VY2TT K6LA Single

2015 CQWW CW

- 371 ZF2MJ (N6MJ) Dual (mutant Lid)
  301 V47T (N2NT) Dual (Lid
  272 CR6K (CT1ILT) Dual
  267 CR3OO (CT1BOH) Dual
  264 SW9AA (LZ3FN) Dual (80/40!)
  247 KP2M (KT3Y) Single
  247 VE2IM (VE3DZ) Single
  237 OH0X (OH6KZP) Single
  236 TI5W (M0DXR) Single
  234 *VP2VVV (K9VV) Single
  228 LP1H (LU5DX) Single
  227 OH0Z (OH6EI) Single
  226 NN1N Single (Lid)
  224 *P40W (W2GD) Single (LP with a band change!)
  224 UP0L (UN9LW) Single
  222 OH0V (OH6LI) Dual (and a band change!)
  220 UW2M (UR0MC) Dual (80/40)
  219 KQ2M Single
  219 YW4D (YV1DIG) Single (includes a 3-band jump with VE2IM)
  217 K0DQ (@K8PO) Single (Lid)

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Rates with 1 and 2 pileups

2014 CQWW CW

- 280 TO7A UT5UGR Dual
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  219 KQ2M Single
  219 YW4D (YV1DIG) Single (includes a 3-band jump with VE2IM)
  217 K0DQ (@K8PO) Single

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Dual CQ Technique

- Practice with Morse Runner to see how long to CQ.
- Short CQ's are better. Send faster. Keep the pileups small.
- It is better to be spotted LESS for smaller pileups (when you are DX).
- Try to limit "Auto CQ"s or Blind CQ's. Sometimes they are launched on top of other established Cqers and cause interference.
- If you don't answer anyone and just keep Cqing, you sound like a lid. Unfair to the ops calling you.

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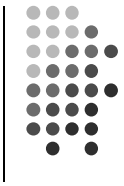
If you have 2 bands open, use the dual pileup technique. If you are good at it, it can increase your rate by 20-50%



- Keep your headphones in stereo mode.
- Timing is everything. If you get confused, go back to one pileup.
- Works great even if the rate is slow.
- Easier in CQWW, copying zones is less intense.
- USA is easier to run, well behaved.
- If you are calling a dual CQer, don't give up. There might be a long delay before he gets to you

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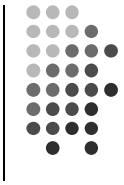
NO3M 3 Receiver technique http://no3m.net/



- SO2R-3RX
- Three Receiver Operating Technique

1. An effective technique for lowband contesting is to utilize three independent receivers when operating SO2R, otherwise referred to as SO2R-3RX. The implementation I have successfully used is specific to the Elecraft K3 and Microham MK2R/MK2R+, other equipment has not been tested but may work equally as well. When the K3 is in diversity mode, in this case only the "run" radio, the main and sub receivers in the radio are phase locked, tracking not only frequency, including RIT, but also filter bandwidth/shift. This permits the use of receive antennas aimed in different directions

   while running, increasing the effective azimuthal coverage.

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Diversity and spatial separation

- Using the MK2R/MK2R+, “RADIO1-A” and “RADIO2-A” audio streams are routed to the “LEFT EAR” channel, while “RADIO1-B” and “RADIO2-B” audio to the “RIGHT EAR” channel. With the “run” radio (ie. RADIO1) in diversity mode, the main and sub receiver’s audio within that radio are streamed only to the left and right earpieces respectively, typically with no cross-over between earpieces (in rare cases certain phase relationships can cause the audio to “center” momentarily) . The second (ie. S&P) radio’s main receiver audio, another K3 with sub-RX OFF, is routed to both earpieces, resulting in audio that is spatially centered in the headphones with the K3’s AFX setting turned ON and in BIN (binaural) mode. However, the use of the K3’s AFX also depends on the headphones used. I have a favorite pair of old Lafayette headphones that require AFX be turned off using the above audio routing. Some Heil headsets have a phase selection switch, which can be toggled to produce the desired effect regardless of the AFX setting, which may lend themselves to use with other radios in the S&P position.

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Minimize interstation interference

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CTU 2016 Presents

Getting Started in RTTY Contesting

Ed Muns, W0YK

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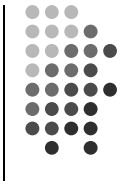
RTTY Contesting



- Introduction
- Part 1: Operating
- Part 2: Setting Up
  - RTTY Decoder/Encoder
  - PC-radio interface
- 2nd CTU RTTY session: "*Advanced RTTY Contesting*"

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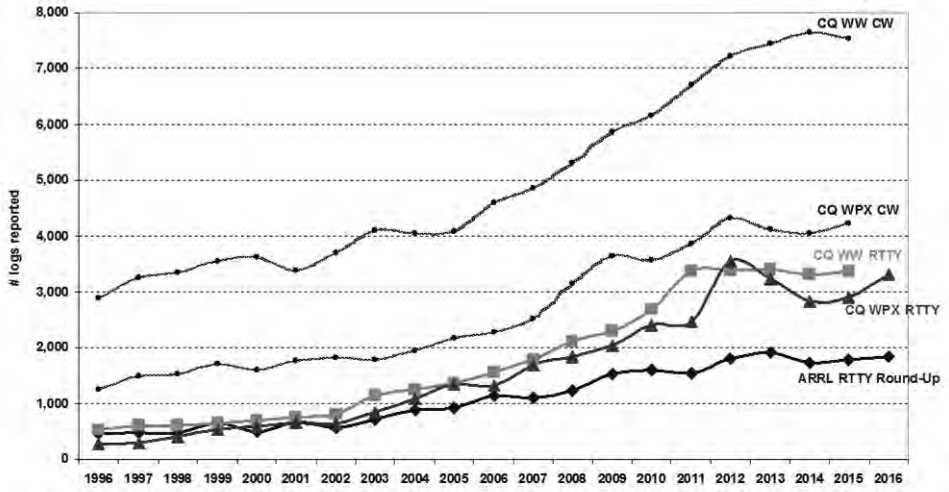
Three Largest RTTY Contests



Lots of RTTY Contests

> two/month

- **Biggies (7)**
  - CQ WW RTTY (last weekend in September)
  - CQ WPX RTTY (2nd weekend in February)
  - ARRL RTTY Roundup (1st weekend in January)
  - BARTG (3rd weekend Jan, 3rd weekend March)
    - 75 Baud (April & September)
  - WAE RTTY (2nd weekend in November)
- **NCJ contests (4)**
  - NAQP RTTY (3rd Sat. in February, 2nd Sat. in July)
  - Sprint RTTY (2nd Sat. in March & October)
- **Other popular RTTY contests (20)**
  - Ten-Meter RTTY (1st Sat. in December)
  - JARTS, Makrothen, SARTG (2)
  - 15 others

What is RTTY?

compared to CW

CW	RTTY
• ***One*** RF carrier	• ***Two*** RF carriers 170 Hz apart *(Space & Mark; Shift)*
• Local audio ***pitch***	• Local audio ***tones***

• On ***or*** off
  • key up is data 0
  • key down is data 1
	• One on ***and*** other off
	  • Space is data 0
	  • Mark is data 1

• ***Morse*** code
  • typically 25-40 wpm
	• ***Baudot*** code
	  • constant 60 wpm *(or 45.45 Baud)*

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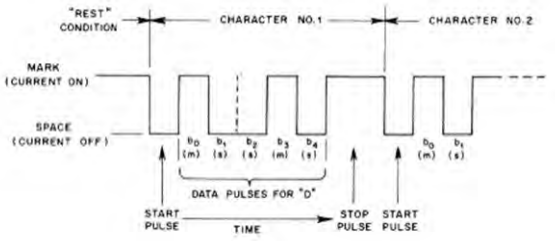
What is RTTY?

45.45 Baud = 60 WPM



- Asynchronous character stream
  - 1 bit Start pulse (Space)
  - 5 bits of data (character code)
  - 1, 1.5 or 2 bits Stop pulse (Mark)

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What is RTTY?

code history

- Bacon's cipher (1605)
- Gauss & Weber (1833)
- Baudot code (1870)
  - Manual bit entry
  - 5-bit ITA1 code
  - Two 32-bit character sets
    - letters
    - figures
- Murray code (1901)
  - Teletype character entry
  - Western Union variation
- **5-bit ITA2 code (1930)**
  - **USTTY variation**
- ASCII (1963)
  - 7-bit ITA5 code

Code	Control Characters		
11111	LTRS		
11011	FIGS		
00000	Null		
00100	Space		
01000	LF		
00010	CR		
	Letters	Figures ITA2	Figures USTTY
00011	A	-	-
11001	B	?	?
01110	C	:	:
01001	D	ENQ	$
00001	E	3	3
01101	F		!
11010	G		&
10100	H		#
00110	I	8	8
01011	J	BELL	'
01111	K	(	(
10010	L	)	)
11100	M	.	.
01100	N	,	,
11000	O	9	9
10110	P	0	0
10111	Q	1	1
01010	R	4	4
00101	S	'	BELL
10000	T	5	5
00111	U	7	7
11110	V	;	;
10011	W	2	2
11101	X	/	/
10101	Y	6	6
10001	Z	"	"

What is RTTY?

Figures Shift

- 5-bit code→32 chars.
- 2 sets:
  - Letters set & Figures set
  - 6 common control chars.
    - LTRS (unshifted)
    - FIGS (shifted)
    - Null, Space, LF, CR
- LTRS or FIGS toggle set

Code	Control Characters		
11111	LTRS		
11011	FIGS		
00000	Null		
00100	Space		
01000	LF		
00010	CR		
	Letters	Figures ITA2	Figures USTTY
00011	A	-	-
11001	B	?	?
01110	C	:	:
01001	D	ENQ	$
00001	E	3	3
01101	F		!
11010	G		&
10100	H		#
00110	I	8	8
01011	J	BELL	'
01111	K	(	(
10010	L	)	)
11100	M	.	.
01100	N	,	,
11000	O	9	9
10110	P	0	0
10111	Q	1	1
01010	R	4	4
00101	S	'	BELL
10000	T	5	5
00111	U	7	7
11110	V	;	;
10011	W	2	2
11101	X	/	/
10101	Y	6	6
10001	Z	"	"

What is RTTY?

Figures Shift

- The *LTRS* and *FIGS* characters do not print
  - The code for the characters “Q” and “1” is the same; which one prints depends on if you are in Letters or Figures set
  - Note that the *LTRS*, *FIGS* and *Space* characters appear in both sets
- Example: “***KI7GUO DE K4GMH***” gets sent as:
  - *LTRS* ***K I*** *FIGS* ***7*** *LTRS* ***G U O*** *Space* ***D E*** *Space* ***K*** *FIGS* ***4*** *LTRS* ***G M H***
- Why do we care to understand this?
  - If a burst of static garbles the *LTRS* or *FIGS* character, then what prints after that is from the wrong set until the next *LTRS* or *FIGS* character appears

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What is RTTY?

UnShift on Space

- UnShift On Space (USOS or UOS)
  - Increases noise immunity for alpha text
  - Space character forces a shift to the Letters set
- Contest exchanges are alpha and numeric
  - Should UOS be on or off?
  - Should Space or Hyphen delimit exchange elements?
    - 599 JOHN NY or 599-JOHN-NY
- *Recommendation:*
  - *Turn on both RX & TX UOS and use Space delimiters*
  - *(more detail in Advanced RTTY Contesting)*

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What is RTTY?

audio tones

- Space and Mark audio tones
  - Default: 2295 and 2125 Hz (“high tones”)
  - Less fatiguing: 1085 and 915 Hz (“low tones”)
- Analogous to CW pitch
  - Operator choice
  - Each operator can use different tone pairs
  - Transmission is always two carriers 170Hz apart
- Must be same in radio and decoder/encoder

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What is RTTY?

AFSK vs. FSK

Two methods of transmission:

- AFSK (Audio Frequency Shift Keying)
  - keyed audio tones into SSB transmitter via:
    - Mic input, or
    - Auxiliary audio input. e.g., Line In
- FSK (Frequency Shift Keying)
  - keys the transmitter just like CW

Note: Receiving is the same in either case.

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What is RTTY?

dial frequency

spots are often wrong

- RTTY RF is independent of local audio tones and whether LSB or USB is used:
  - The higher RF frequency is the Mark *(14090.000 kHz)*
  - The lower RF frequency is the Space *(14089.830 kHz)*
  - The difference between the two is the shift *(170 Hz)*
- FSK displays Mark *(14090.000 kHz)*
- AFSK displays suppressed carrier which varies with local audio tones and sideband used!
  - For Mark tone of 2125 Hz (Space tone of 2295 Hz):
    - LSB *(14092.125 kHz)*
    - USB – Mark & Space tones reversed *(14087.005 kHz)*

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What is RTTY?

AFSK vs. FSK

AFSK

- Indirect *(tones → Mic input)*
- Any SSB radio *(esp. legacy)*
- SSB (wide) filtering
- Dial = sup. car. frequency
- VOX
- Audio cable *(same as PSK31)*
- Must use high tones
- *NET (automatic TX tone control)*
- *Less bandwidth (depends on radio)*
- *Easier hook-up; NET*

FSK

- Direct *(like CW keying)*
- "Modern" radios
- RTTY (narrow) filtering
- Dial = Mark frequency
- PTT
- COM FSK keying cable
- Can use low tones
- *No audio level adjust*
- *No disabling speech proc.*
- *No erroneous sound keying*
- *Less pitfalls*

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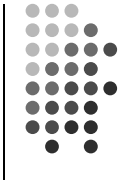
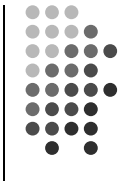
What is RTTY?

summary



- Uses 5-bit Baudot (actually, USTTY) code with two sets of 32 characters: Letters and Figures
- Space & Mark frequencies separated by 170 Hz “Shift”
- Local Space & Mark tones analogous to pitch in CW
- Constant 45.45 Baud (60 wpm) asynchronous character stream with 5 data bits and 2-3 sync bits
- Figures Shift & Letters UnShift
  - Use optional UnShift-On-Space (UOS), plus space delimiter
- AFSK vs. FSK transmission (receiving is the same)
  - Radio dial frequency differences
  - 100% duty cycle!

The Cynics Say …



- “RTTY is a pain to set up and get working.”
  … stay tuned, it’s really not that difficult!

- “The RTTY decoder/encoder does everything.”
  however, this attribute …
  - frees the operator to improve other skills
  - enables more contest participants
  - provides mode diversity for contest junkies

RTTY Considerations

Much like CW and SSB, except:

- Non-human decoding implications
  - *serial number repeat, universal "fist" or "voice"*
- Distractions are tempting
  - *watch TV, do email, read, etc.*
- RTTY established practice
  - *'CQ' at end of CQ message*
- Whisper-level headphone volume; low tones
  - *just to detect presence & timing*
- Key-down transmission … 100% duty cycle

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RTTY Sub-Bands

- 10 meters: 28080-28100, during contests 28080-28200
  - JA: 21070-21150
- 15 meters: 21080-21100, during contests 21080-21150
  - JA: 21070-21150
- 20 meters: 14080-14100, during contests 14080-14150
  - JA: 14070-14150
- 40 meters: 7025-7050 & 7080-7100, during contests 7025-7100
  - JA: 7030-7100
- 80 meters: 3580-3600, during contests 3560-3600
  - JA: 3520-3575 and 3599-3612
- 160 meters: No RTTY contesting

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RTTY Sub-Bands

don't QRM!

- Avoid PSK-31 operations near:
  - 28120, 21070, 14070, 7070 and 3580
- Avoid the NCDXF beacons:
  - 21150 and 14100

- More details:
  www.aa5au.com/rtty/rtty-sub-bands

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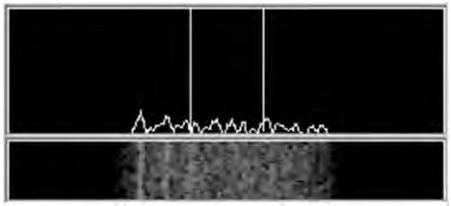
Receiving

- Set RX audio level
  - noise 5% of full-scale
- Use narrow filtering
  - CW filters ~ 500 Hz



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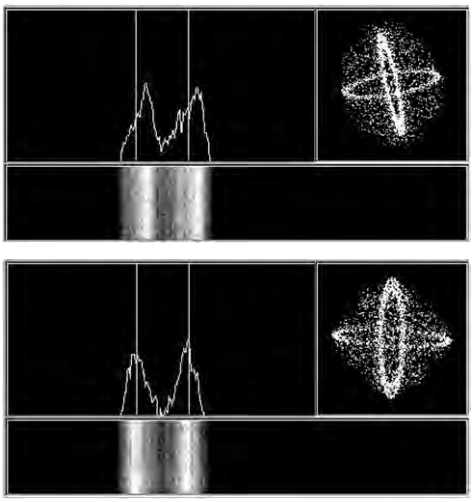
Receiving

- Set RX audio level
  - noise 5% of full-scale
- Use narrow filtering
  - CW filters ~ 500 Hz
- Learn to tune by ear
  - practice with eyes closed
  - get within 10-20 Hz
- Use “low tones” (if FSK)
  - less fatigue



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Basic RTTY Contest QSO

- ***WPX K5AM K5AM CQ***
- ***ZC4LI ZC4LI***
- ***ZC4LI 599 1349 1349***
- ***[K5AM] TU 599 985 985***
- ***[ZC4LI] TU K5AM CQ***

K5AM: running station
ZC4LI: S&P station

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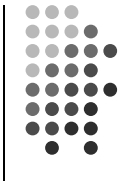
Disciplined QSO Flow



- Standard keystroke (or mouse) sequences for:
  - Normal contact in Run mode
  - Normal contact in S&P mode
  - Repeats/Fills (in either mode)
  - QSO phase skip & tail-enders (in Run mode)
- Each sequence is executed the same way hundreds (thousands) of times during the contest
- Avoid deviations and special sequences

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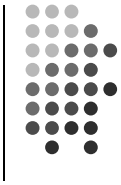
The 4 Phases of a QSO



- Normal Run mode flow:
  1. Enter or F1 (CQ)
     - repeat
     - AGN?
  2. pile-up
  3. Insert or ‘ (grab call sign, send exchange)
     - Send fill(s)
  4. receive exchange
  - ➢ check pre-fill, click their exchange
     - AGN? or NR? or QTH? or NAME?
  1. Enter or + (log contact, send TU/CQ)
     - optionally send F7 (QRV message)
- Normal S&P mode flow:
  1. CQ
  2. Enter or F4 (mycall)
     - repeat
  3. receive exchange
  - ➢ check pre-fill, click their exchange
     - AGN? or NR? or QTH? or NAME?
  4. Enter or F5 (send exchange)
     - send fill(s)
  1. find next CQ

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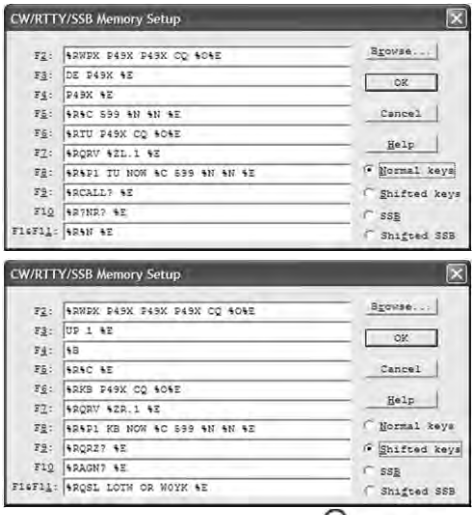
RTTY Messages

- Short, as with CW/SSB
- No extraneous info
- 599 (not 5NN) once
- Serial number twice
- Space (not hyphen)
- Omit ‘DE’
- RTTY chars (%R, %E)

www.rttycontesting.com/tutorials/messages



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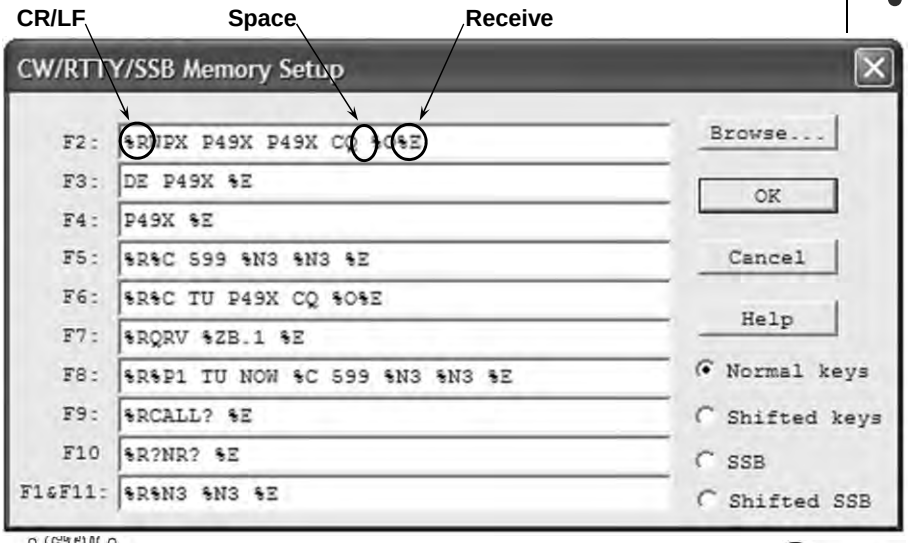
RTTY Messages

formatting



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Super Check Partial

- SCP (Super Check Partial) enables computer to pick out call signs in receive window
  - Call signs
  - New mults and double mults
  - Dupes

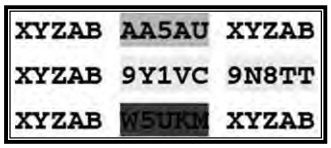
N1MM Logger

- Use main SCP from CW/SSB/RTTY contests
  - RTTY SCP is a subset

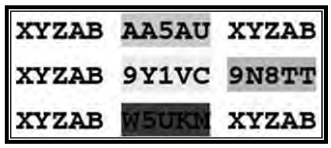
Super Check Partial

logger differences

N1MM Logger



WriteLog

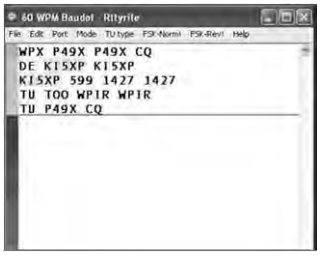


Win-Test

Tips

"All I receive is gibberish!"

- "Upside-down"
  - Reverse Mark & Space in software
  - LSB vs. USB
- Figures vs. letters
  - TOO=599, WPIR=2084
  - Shift-click to convert, or
  - Look at top two rows
- Mic/Line In, level, muting, tones, flutter



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Tips

"They never answer me!"

- "Upside-down"
  - FSK polarity switch in radio
  - AFSK mode, LSB vs. USB
- MMTTY AFC & NET
  - AFC & NET are on by default!
    (and every time you choose a profile!)
  - Change defaults in USERPARA.INI
- Radio mode, tones, FSK interface, AFSK: Mic & SC level & speech processor

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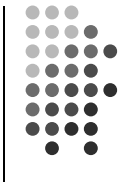
More Tips



- Transmit when others stand-by
- Add his call at end of exchange in pile-ups
- Recommend RIT, but if you use AFC/NET …
  - AFC only for running, not S&P
  - AFC/NET for S&P (NET only avail. with AFSK)
- Mode-independent skills
  - Bandmap usage
  - ~~QSO B4~~
  - Roving mult: “Squat & Shoot” *(Cajun-speak!)*

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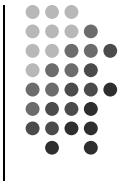
and … More Tips



- 100% duty cycle … *caution!*
- Practice
  - During RTTY contests (~ two per month)
  - NCCC Thursday night practices (weekly)
- Multi-Ops
- SO2V & SO2R

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Interim Summary

- Predominantly casual RTTY contest participants
- RTTY sub-bands; 10-80 only; avoid PSK & beacons
- 500 Hz receive filtering
- Common problems
  - "Upside-down" or reversed Space/Mark (and, LSB vs. USB)
  - Figures vs. Letters
  - Audio:
    - RX audio output level and TX (AFSK only) audio input level
    - Unmuted soundcard inputs and outputs
    - Space and Mark tone consistency between decoder and radio
  - Off-frequency tuning (e.g., MMTTY AFC & NET); propagation flutter
- Messages ("macros")
  - Short, ~~5NN~~, unique exchange twice, Space delimiter

The Cynics Say …

- "RTTY is a pain to set up and get working."
  … stay tuned, it's really not that difficult!

- "The RTTY decoder/encoder does everything."
  however, this attribute …
  - frees the operator to improve other skills
  - enables more contest participants
  - provides mode diversity for contest junkies

How Do I Set it Up?

overview

- ***Acquire*** hardware and/or software to convert between the RTTY signal and text:
  - RTTY ***receive*** decoder
  - RTTY ***transmit*** encoder
  - PC-radio interface
- ***Configure*** decoder/encoder
- ***Integrate*** decoder/encoder with logger

The rest of the station setup is the same as for CW and SSB

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How Do I Set it Up?

RTTY decoder/encoder

- RTTY ***receive*** decoder converts printed characters from the two RF freqs.
  - CW and SSB receive audio is converted to typed characters by our ears/brain/hands

    (CW decoders are also available, similar to RTTY decoders, but seldom used)
- RTTY ***transmit*** encoder converts typed characters (or messages) into the two RF freqs.
  - Transmitted CW is converted from text by our brain/hand with the aid of a key and/or keyer
  - Transmitted SSB is converted from text by our brain/mouth via a microphone

    (*CW software keyers and SSB DVKs are also used, similar to RTTY encoders)*

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How Do I Set it Up?

decoder/encoder terminology

- The RTTY ***transmit encoder*** and ***receive decoder*** is sometimes referred to as a MODEM or a TNC:
  - MODEM = MOdulator DEModulator
  - TNC = Terminal Node Controller
- MODEMs can be:
  - a hardware box, or
  - a software application driving a PC soundcard

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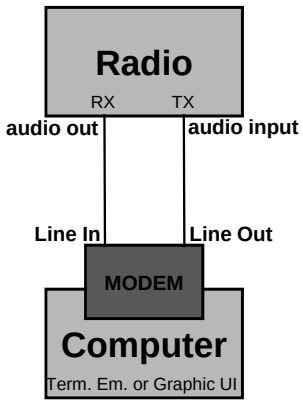
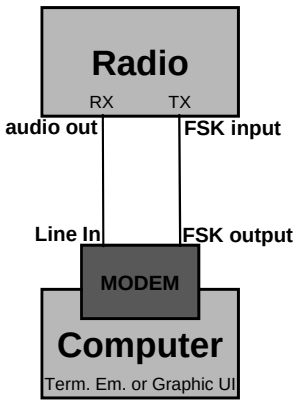
How Do I Set It Up?

hardware *MODEM*

AFSK



FSK



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How Do I Set It Up?

hardware *MODEM*

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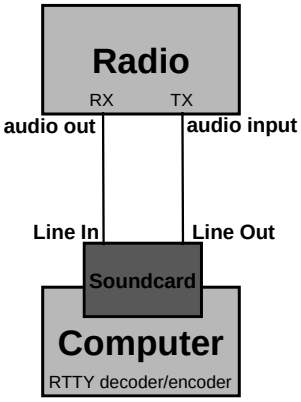
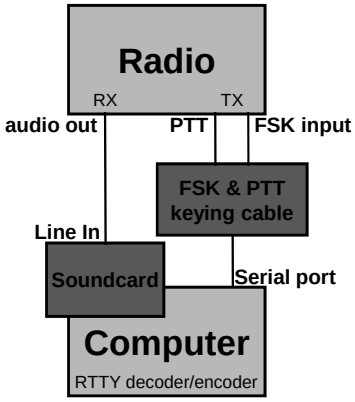
How Do I Set It Up?

software application & *soundcard*

AFSK



FSK



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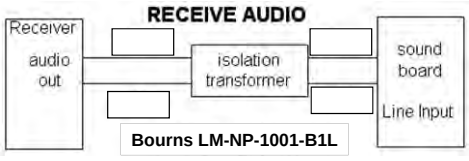
How Do I Set It Up?

ground loops

- Eliminate ground loops between radio and PC
- Otherwise insert 1:1 audio isolation transformer on:
  - RX output
  - TX Mic input *(AFSK only)*
- Alternatives:
  - Bourns LM-NP-1001-B1L transformer → homebrew cable
  - Ground loop isolators
  - W2IHY iBox
  - Commercial RTTY interfaces
  - K3 (uses Bourns LM-NP-1001-B1L on LINE IN & OUT)

How Do I Set It Up?

homebrew audio isolation



Bourns LM-NP-1001-B1L

-90 dBc 3rd order IMD

How Do I Set It Up?

ground loop isolators

Radio Shack $19.49 or eBay $6.99
-64 dBc 3rd order IMD

eBay $3.35

eBay $5.50

eBay $7.45

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How Do I Set It Up?

W2IHY iBox audio isolation

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How Do I Set It Up?

commercial interface audio isolation

Rascal

How Do I Set It Up?

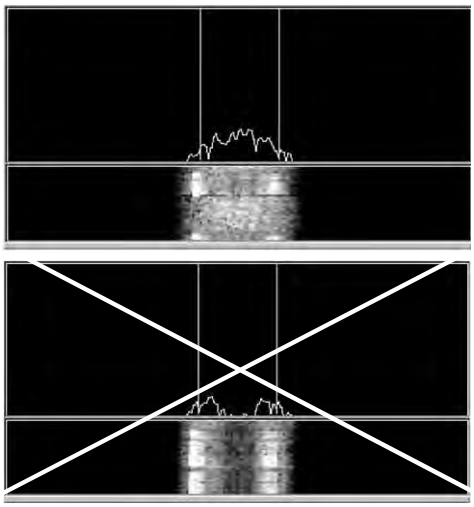
radio audio isolation

K3 audio isolation **IN – LINE – OUT**

How Do I Set It Up?

radio IF filtering

- PC Audio isolation
  - Transformer
  - Commercial interface
  - Some radios (K3)
- Narrow IF filters (Roofing & DSP)
  - 500 Hz - normal
  - 250 Hz - strong QRM only
  - Tone filters – don't use!
    - Icom Twin Peak Filter
    - K3 Dual-Tone Filter



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How Do I Set It Up

AF filtering

- PC Audio isolation
  - Transformer
  - Commercial interface
  - Some radios (K3)
- Narrow IF filters (Roofing & DSP)
  - 400 Hz - normal
  - 250-300 Hz – strong QRM
  - Tone filters – don't use
    - Icom Twin Peak Filter
    - K3 Dual-Tone Filter
- Audio filtering
  - JPS NIR-10/12
  - Timewave DSP-599zx
  - Modern DSP rigs

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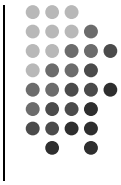
How Do I Set It Up?

soundcard levels



- Adjust levels in Windows Volume Control
  *(or, in MMTTY **Options/Soundcard** …)*
  - Use isolation transformer, if needed
  - Mute other inputs and outputs
- RX audio goes to LINE IN (or, MIC w/pad)
  - ***Options/Soundcard input level***
- TX AFSK audio (mic) comes from LINE OUT
  - ***Options/Soundcard output level***
  - Turn off radio compression (speech proc.)
  - Avoid over-drive

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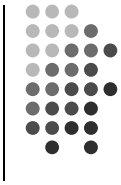
How Do I Set It Up?

PTT vs. VOX



- FSK uses PTT
  - Serial port controls FSK and PTT signals
- AFSK uses VOX

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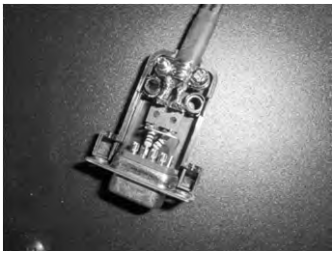
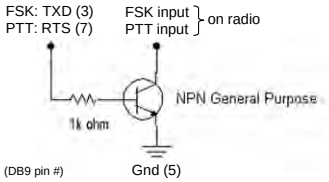
How Do I Set It Up?

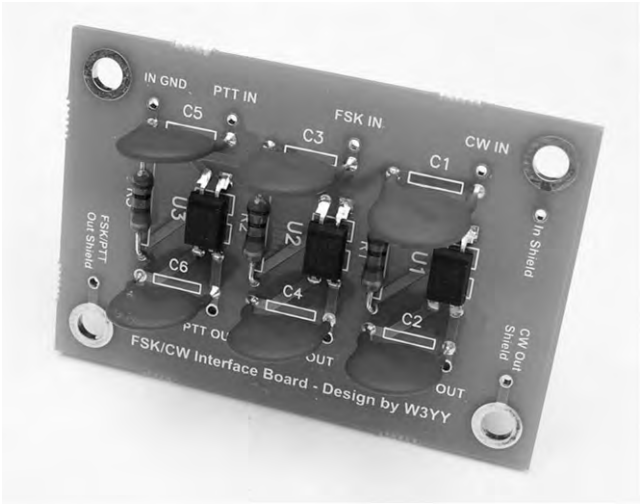
homebrew *FSK & PTT keying cable*





How Do I Set It Up?

W3YY *FSK & PTT keying cable*



How Do I Set It Up?

commercial interfaces

RASCAL

RIGblasters

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How Do I Set It Up?

commercial interfaces

Vendor	Model	Price	PC In'fc	PTT	Soundcard	Level ctrl	FSK	CW	WinKey	Voice	Radio in'fc
generic (with K3)	(2) 3.5mm M-M audio cables	$ 10	-			√					
Buxcomm	Rascal-IIB or -IIIA	$ 69	-								
Buxcomm	Rascal GLX	$ 79	Serial	√							
Tigertronics	SL-1+	$ 80	-	auto							
Tigertronics	USB	$ 110	USB	auto	√	√					
MFJ	1273B	$ 60	Serial	√							
MFJ	1275	$ 110	Serial	√							
MFJ	1279	$ 140	Serial	√	√						
Mountain Radio	RIGblaster Nomic	$ 60	Serial/USB	√							
Mountain Radio	RIGblaster Plug & Play	$ 120	USB	√				√			some
Mountain Radio	RIGblaster Plus II	$ 160	USB	√			√ or CW	√ or FSK			some
Mountain Radio	RIGblaster Advantage	$ 200	USB	√	√	√	√ or CW	√ or FSK			√
Mountain Radio	RIGblaster Pro	$ 300	Serial/USB	√			√	√			√
Navigator	Navigator	$ 417	USB	√	√	√	√	√	√		√

See May-June 2012 NCJ, "RTTY Contesting" column

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How Do I Set It Up?

RigExpert Interfaces

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How Do I Set It Up?

microHAM interfaces

One Radio

SO2R

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How Do I Set It Up?

RigExpert & microHAM interfaces

Vendor	Model	Price	PC In'fc	PTT	Soundcard	Level ctrl	FSK	CW	WinKey	Voice	Radio in'fc	SO2R
RigExpert	Tiny	$ 120	USB	√	√			√		√	√	
RigExpert	Standard	$ 265	USB	√	√	√	√	√	√	√	√	
RigExpert	TI-5	$ 365	USB	√	√	√	√	√	√	√	√	
microHAM	USB Interface II	$ 179	USB	√				√			√	
microHAM	USB Interface III	$ 225	USB	√	√	√		√			√	
microHAM	Digi KEYER II	$ 369	USB	√	√	√	√	√	√		√	
microHAM	microKEYER II	$ 479	USB	√	√	√	√	√	√	√	√	
microHAM	micro2R	$ 369	USB	√		√	√	√	√	√	√	√
microHAM	MK2R	$ 899	USB	√		√	√	√	√	√	√	√
microHAM	MK2R+	$ 999	USB	√	√	√	√	√	√	√	√	√

See May-June 2012 NCJ, "RTTY Contesting" column

How Do I Set It Up?

summary - receive

1. Use appropriate receiver IF and AF filtering.
2. Receiver Audio Out (via isolation) to …
   - MODEM Audio In, or
   - MMTTY via Soundcard Line In (or Mic In with pad):
     - Enable soundcard Line In (or Mic) input, disable/mute other inputs
3. Set level so band noise is 5% of full-scale

How Do I Set It Up?

summary - FSK

1. Connect the radio FSK and PTT inputs to:
   - the MODEM FSK and PTT outputs and connect the MODEM Serial port to the PC

     OR, if MMTTY
   - the RTTY interface FSK and PTT outputs and connect the interface Serial or USB port to the PC
2. If no PC Serial port, then use a USB-Serial adapter.
   - Beware that some won't key FSK properly. Edgeport USB-Serial adapters are known good.

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How Do I Set It Up?

summary - AFSK

1. Turn off speech processor in radio; enable VOX
2. Connect radio's Line In (Mic In with pad) via isolation to:
   - MODEM Audio Out
     - Set radio Mic level to just reach peak power output

   or …
   - Soundcard Line Out
     - Enable soundcard WAV output, disable/mute other outputs
     - Increase WAV level and/or radio Mic level to just reach peak power output
3. Do not overdrive!

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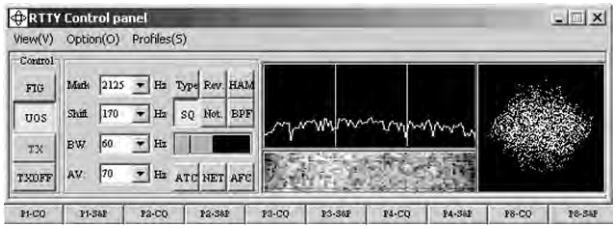
Decoders

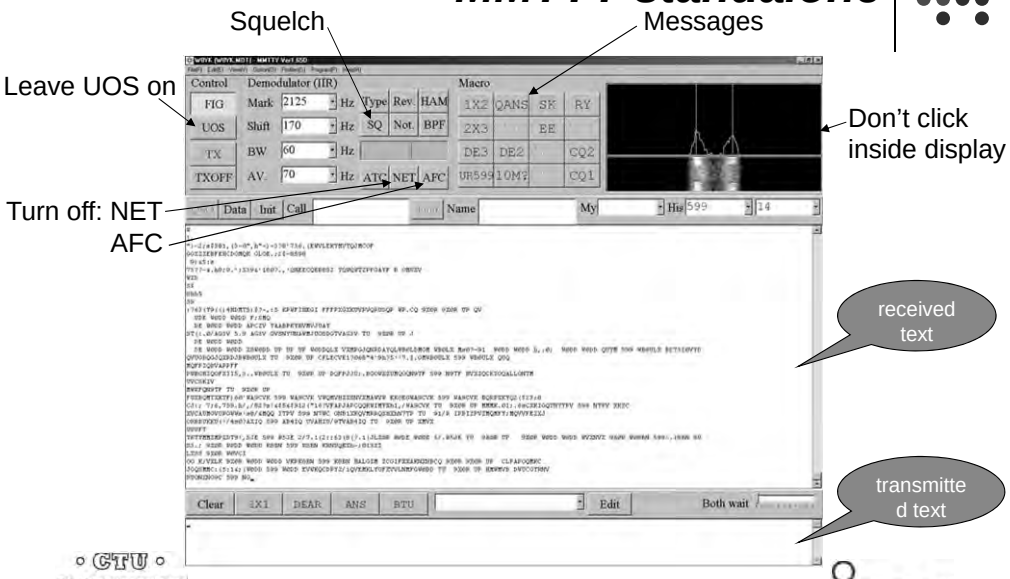
MMTTY



- Dominant soundcard MODEM in use today
- Exceeds performance of most other MODEMs
- Freeware since introduction in 2000
- Written by Mako, JE3HHT

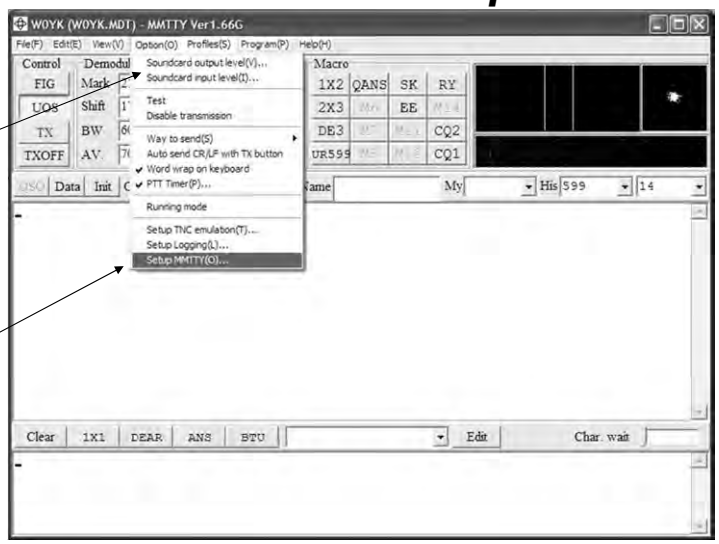
How Do I Set It Up?

MMTTY standalone



How Do I Set It Up?

MMTTY Option menu

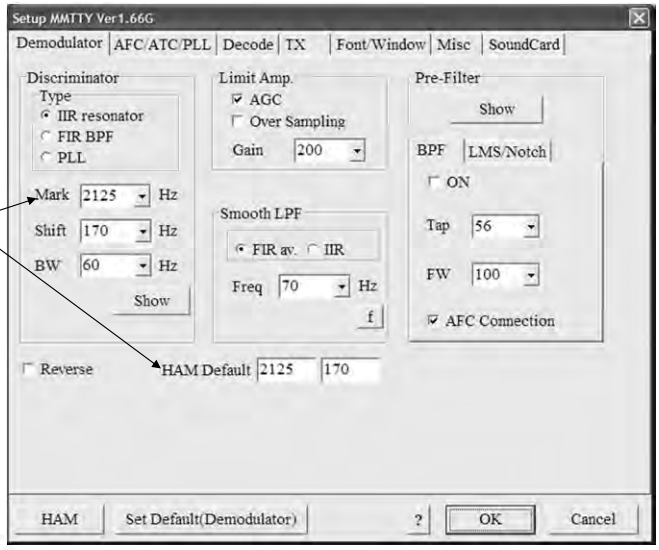


Soundcard levels

MMTTY setup

How Do I Set It Up?

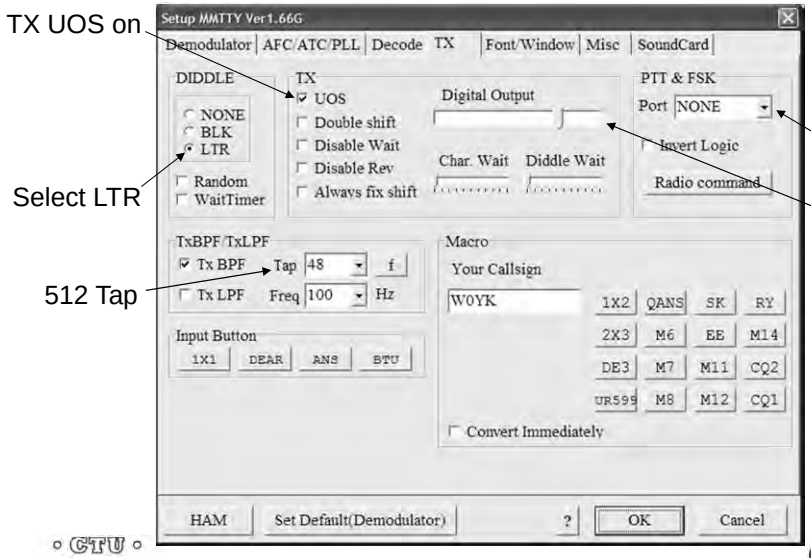
MMTTY Option/Setup/Demodulator



Set tones

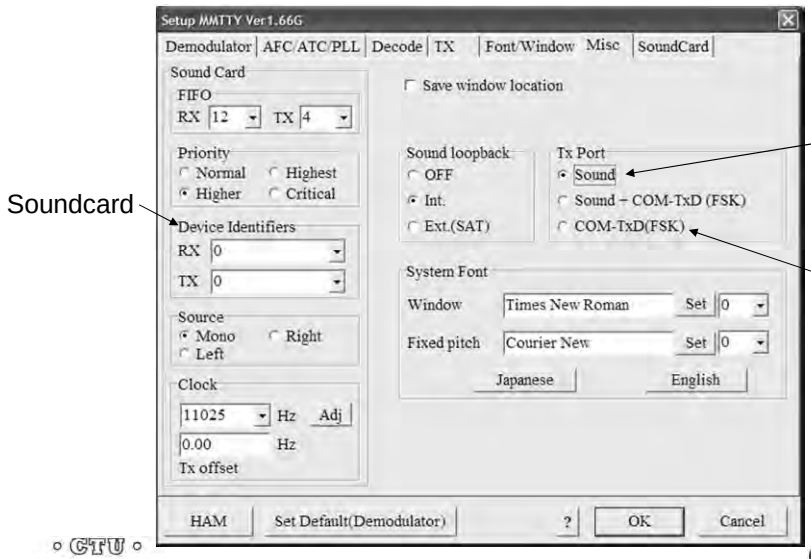
How Do I Set It Up?

MMTTY Option/Setup/TX



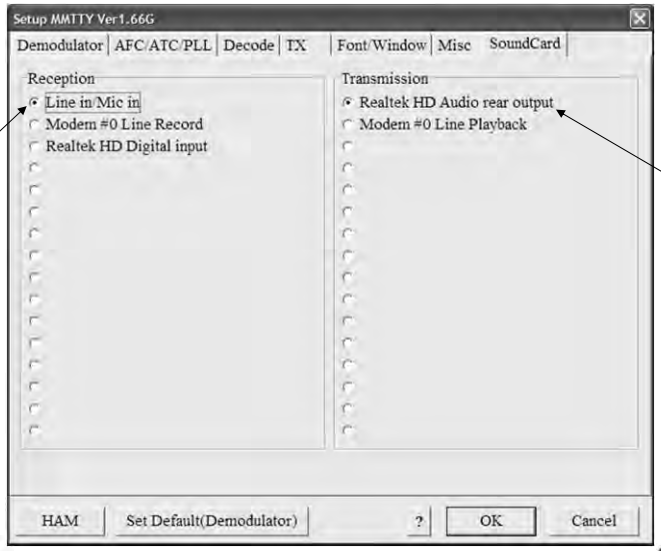
How Do I Set It Up?

MMTTY Option/Setup/Misc



How Do I Set It Up?

MMTTY Option/Setup/SoundCard



Select receive Soundcard

Select transmit Soundcard (AFSK only)

How Do I Set It Up?

MMTTY userpara.ini

- ***userpara.ini*** file (in MMTTY program directory) stores parameter defaults
- There is a section for each profile, e.g.,
  - [Define0]
  - Name=Standard RTTY
- In each section (profile) make sure:
  - NET and AFC are off [NET=0, AFC=0]
  - UOS and TXUOS are on [UOS=1, TXUOS=1]
  - Other parameters are set so that they do not have to be changed every time you load MMTTY or that profile

RTTY Radios

FSK & AFSK bandwidth

FSK

- Use radio FSK filter
  - DSP TX filter (K3)
  - Crystal TX filter (K3)
  - Lobby other mfrs
- Otherwise, use AFSK
  - With TX filtering
  - Properly adjusted

AFSK

- Use radio AFSK filter
  - DSP TX filter (K3)
  - Crystal TX filter (K3)
  - Lobby other mfrs
- Use MODEM TX filter
  - MMTTY 512-tap
  - 2Tone default

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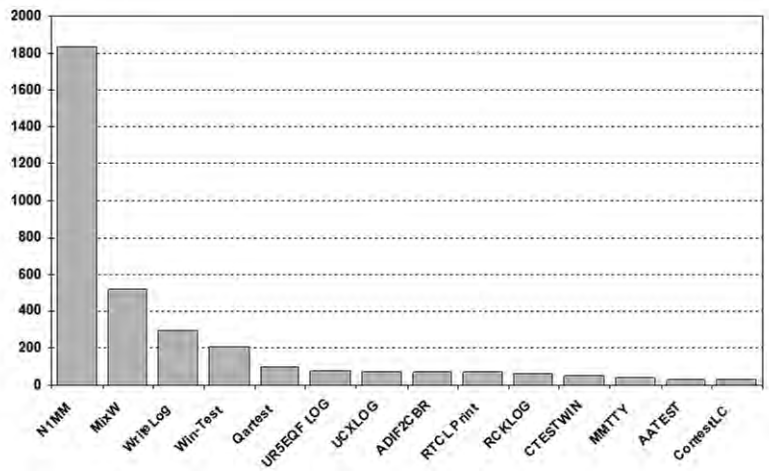
2012 CQ WPX RTTY

3550 submitted logs



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RTTY Contest Loggers

- WriteLog *(1994)*
  - created for RTTY *(CW & SSB came later)*
  - *www.rttycontesting.com/tutorials*
- N1MM Logger+ *(2000; dedicated RTTY software designer)*
  - Free
  - *www.rttycontesting.com/tutorials*
- Win-Test *(2003; RTTY is low priority)*

All three integrate MMTTY and have similar functionality for basic RTTY contesting.

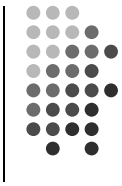
A Blizzard of Details!

this is fun??

Start Simple, then Enhance

- MMTTY *(free)*
  - get RX working *(std audio cable from radio to PC)*
  - get TX working; use either:
    - AFSK *(2nd std audio cable from radio to PC)*
    - FSK *(keying cable or commercial interface)*
- Integrate MMTTY with logging software
- Enhance later
  - Audio isolation *(highly recommended)*
  - Commercial interface
  - Advanced setup: SO2V, SO2R, multiple decoders, ...

Resources



- www.rttycontesting.com premier website
  - Tutorials and resources (beginner to expert)
  - WriteLog, N1MM Logger+ and MMTTY
- rtty@contesting.com Email reflector
  - RTTY contester networking
  - Q&A
- Software web sites
  - mmhamsoft.amateur-radio.ca/ (MMTTY)
  - n1mm.hamdocs.com/tiki-index.php (N1MM Logger+)
  - www.writelog.com (WriteLog)
  - www.wintest.com (Win-Test)
- Software Email reflectors
  - mmtty@yahoogroups.com (MMTTY)
  - N1MMLoggerplus@yahoogroups.com (N1MM Logger+)
  - N1MMLogger-Digital@yahoogroups.com (N1MM Logger+ RTTY & PSK)
  - writelog@contesting.com (WriteLog)
  - support@win-test.com (Win-Test)

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Improving your 40 through 10 Meter Antennas for the Declining Solar Cycle

- Horizontally polarized antennas
- Single Yagi stations
- Single tower stations
- Stacked Yagis
- Care and feeding of coaxial cables

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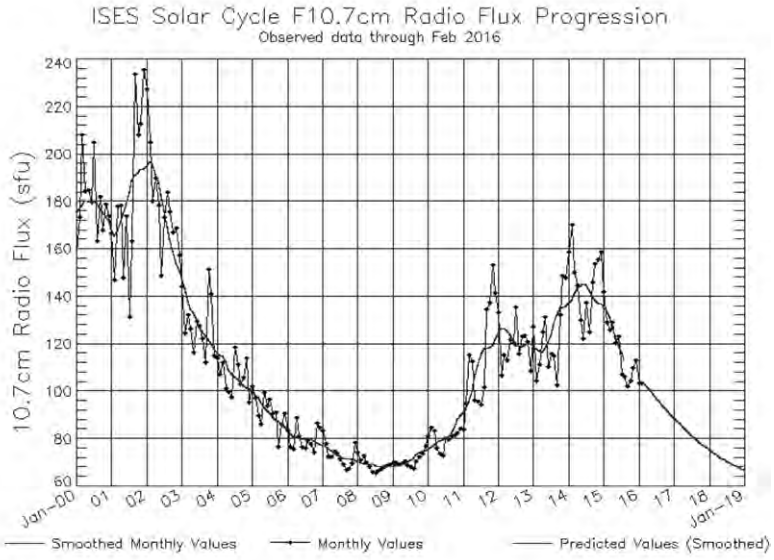
Dayton 2016

Two More Years of Declining Solar Activity Then Three+ Years of Solar Minimum



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What About Solar Cycle 25 ??

Precursors of a *possibly* weak Solar Cycle 25

- Unusually weak solar polar magnetic field strengths
  - field strengths should reach their peak between 2018 and 2020
    - www.solen.info/solar/polarfields/polarfields.jpg
- Unusually large numbers of spotless days
  - possibly starting later this year or next year
- Unusually quiet geomagnetic field from 2018 to 2020+
  - reported by the A-index
- Unusually late appearance of new Solar Cycle 25 sunspots
  - new Solar Cycle 25 sun spots should appear by 2020
- Unusually long solar minimum
  - solar flux in the low 70s persisting after 2020

Accurate Cycle 25 forecasting is not possible until about three years *after* solar minimum

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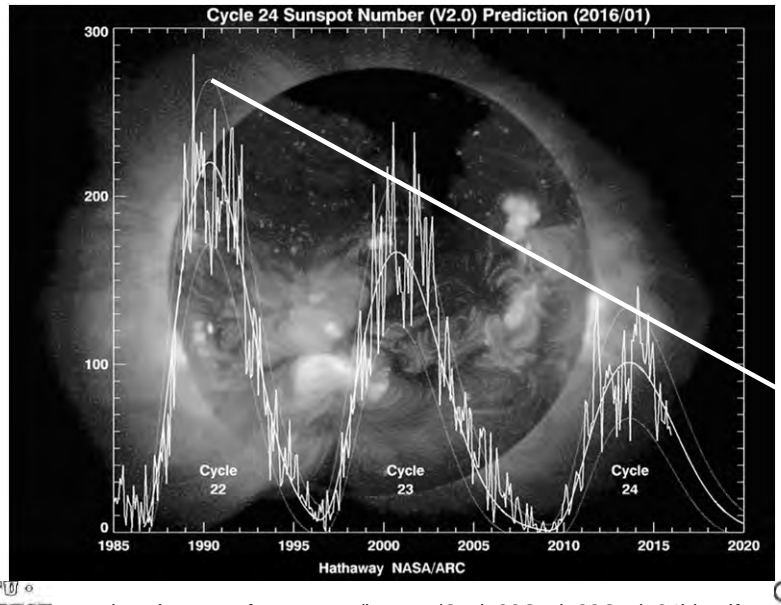
3

Declining Solar Activity Since Cycle 22

Suggests a Weak Solar Cycle 25



Cycle 25?

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solarscience.msfc.nasa.gov/images/Cycle22Cycle23Cycle24big.gif

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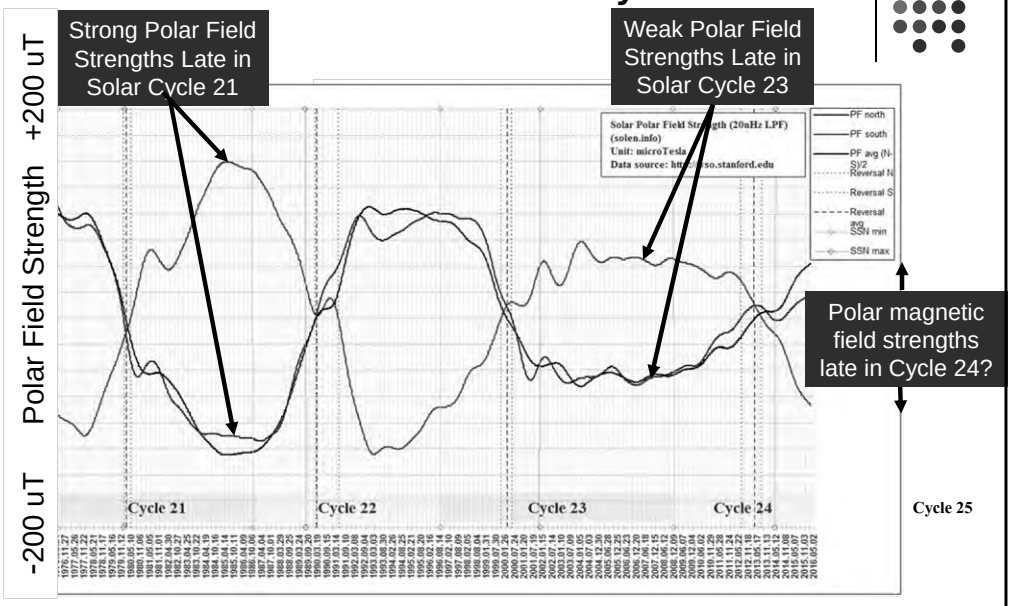
The Sun's Polar Magnetic Field Strength

A Reliable Precursor of Solar Cycle 25



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www.solen.info/solar/polarfields/polar.html

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6 dB of "Free" Ground Gain

- A horizontally polarized dipole, Yagi or quad easily provides 6 dB of useful ground gain
  - but only if you install it an appropriate height
  - vertical antennas can achieve equivalent ground gain only over highly conductive soil such as a salt marsh
- Stacked HF Yagis achieve higher gain mainly by suppressing undesired high angle radiation and redistributing the power into the main low angle beam
  - stacked Yagis must be installed at appropriate heights to achieve the expected results

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High Performance Antennas for 40 Meters

- High horizontal dipole at least 70 feet high for DX contests
  - otherwise use a four-square vertical array with 30-60 radials
  - 40-50 foot high dipole is excellent for Sweepstakes and Field Day
- Higher gain: 2 element Yagi at 70-100 feet high
  - significant improvement over a simple horizontal dipole for DX
  - a Cushcraft XM-240 at 70-100+ feet high is very cost effective
- Highest gain: full size 3 element Yagi at 100-140+ feet high
  - but don't underestimate the high cost and complexity of the effort !
- High performance receiving antennas
  - 200 foot Beverages
  - 4-square and 8-circle arrays of 14 foot verticals

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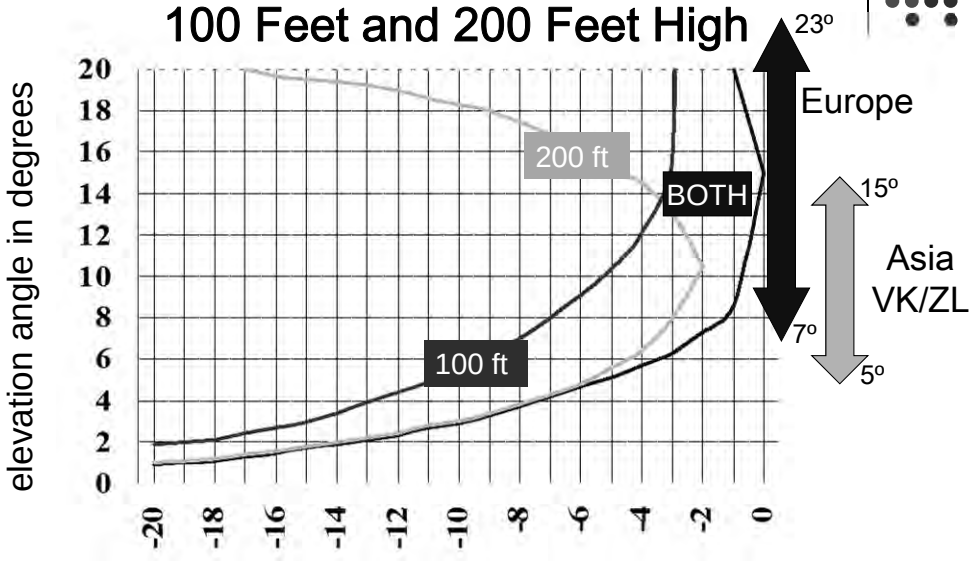
Stacked 3 Element 40 Meter Yagis
48 Foot Booms
100 Feet and 200 Feet High



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4-Square Vertical Array for 40 Meters

- A 4-square vertical array is good alternative to a Yagi if you cannot install it at least 70 feet high
  - install a 4-square at least 40 feet from all towers
    - more spacing will significantly improve its performance
  - at least 30 to 60 slightly buried 35 foot radials under each vertical
- A 4-square is an excellent receiving antenna

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The Comtek 4-Square Controller

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www.dxengineering.com/search/brand/comtek

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High Performance Antennas for 20 Meters

- A horizontal Yagi or quad is always the best choice
  - if you can install your antenna at 35 feet high or higher
  - otherwise use a four-square vertical array with 30-60 radials
- Moderate gain: small tri-band Yagi, hex-beam or quad
  - a small Yagi at 50 to 70 feet high will produce good DX results
  - a small Yagi at 35 to 50 feet high for Sweepstakes and Field Day
- High gain: full size tri-band Yagi, small monoband Yagi or quad at 70 to 100 feet high for excellent DX results
- Highest gain: two stacked monoband Yagis on a 100-140 foot tower (170 to 200 feet high for three stacked Yagis)
  - stack switching (a "stackmatch") provides high payoff at low cost

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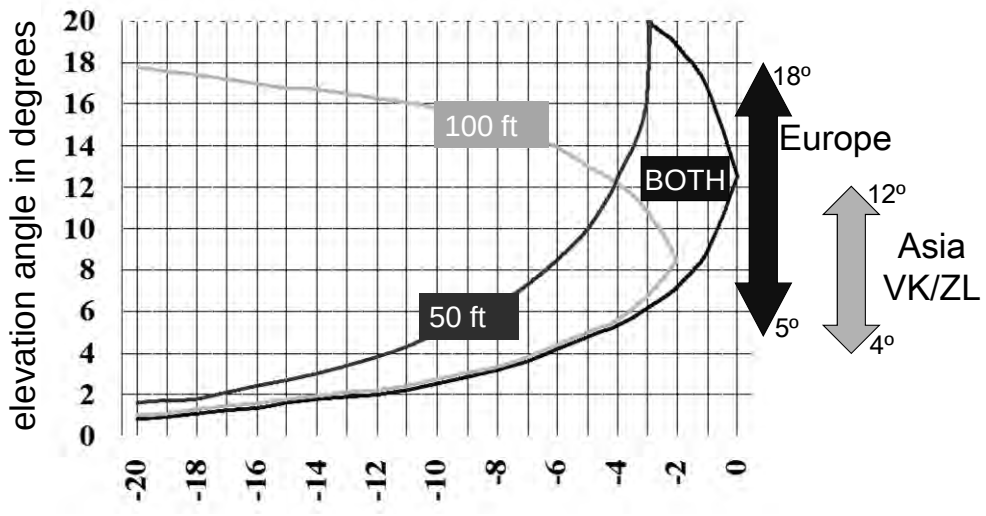
Stacked 5 Element 20 Meter Yagis
48 Foot Booms
50 and 100 Feet High



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The Array Solutions Stack Match

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www.arraysolutions.com/Products/stackmatch.htm

ICOM

High Performance Antennas for 15 Meters

- Horizontal polarization is always the best choice
  - if you can install your antenna 35 feet high or higher
  - otherwise use a four-square vertical array with 30 to 60 radials
- Moderate gain: small tri-bander Yagi, hex-beam or quad
  - a small Yagi at 40 to 50 feet high will produce good DX results
  - a small Yagi at 30 to 50 feet high for Sweepstakes and Field Day
- High gain: a full size tri-band Yagi, small monoband Yagi or quad at 70 to 90 feet high for excellent DX results
- Highest gain: two stacked monoband Yagis on an 80-90 foot tower (120-140 feet high for three stacked Yagis)
  - stack switching (a “stackmatch”) provides high payoff at low cost

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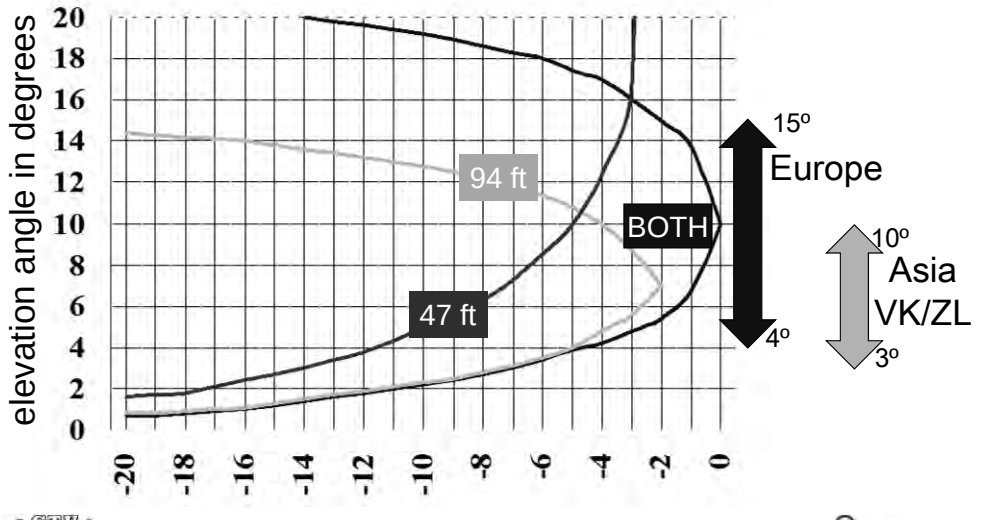
Stacked 6 Element 15 Meter Yagis
48 Foot Booms
47 and 94 Feet High



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High Performance Antennas for 10 Meters

- Horizontal polarization is always your best choice
  - if you can install your antenna only 25 feet high or higher
  - otherwise use a four-square vertical array with 30 to 60 radials
- Moderate gain: small tri-band Yagi, hex-beam or quad
  - a small Yagi 25 to 50 feet high will produce good DX results
  - a small Yagi at 25 to 50 feet high for Sweepstakes and Field Day
- High gain: a full size tri-band Yagi, small monoband Yagi or quad, at 50 to 70 feet high for excellent DX results
- Highest gain: two stacked monoband Yagis on a 60-70 foot tower (90 to 100 feet high for three stacked Yagis)
  - stack switching (a “stackmatch”) provides high payoff at low cost

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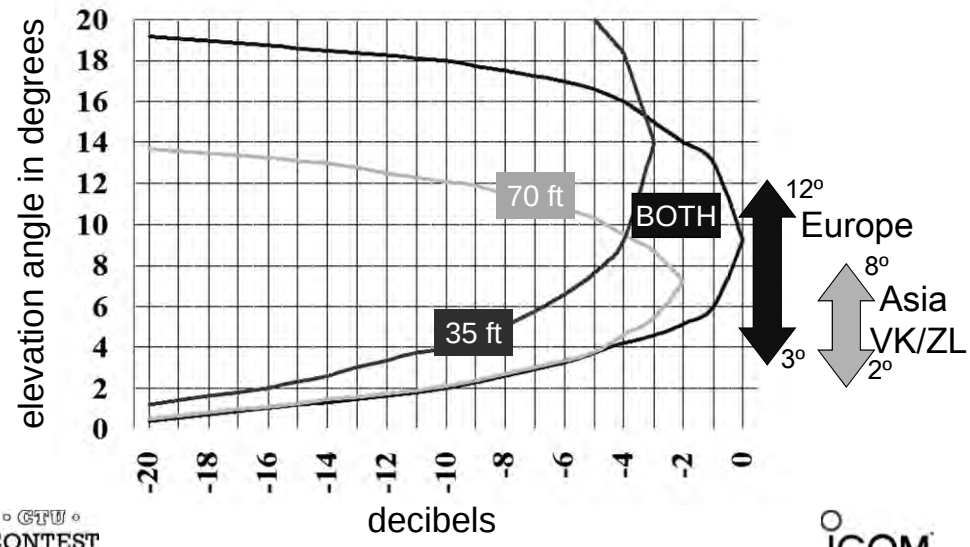
ICOM

Stacked 6 Element 10 Meter Yagis
36 Foot Booms
35 and 70 Feet High



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Competitive One Tower Antenna Systems

- 50-60 foot tower and a small rotator (e.g., HyGain Ham-IV)
  - small tri-band Yagi, Hex-beam or quad
  - 40 and 80 meter dipoles and a 160 meter inverted-L
- 70-80 foot tower and a medium rotator (e.g. HyGain T2X)
  - Cushcraft XM-240 two element 40 meter Yagi
  - large tri-band Yagi such as the DX Engineering Skyhawk
  - 80 meter dipole and a 160 meter inverted-L
- 100-140+ foot tower and a large rotator (e.g., M2 Orion)
  - Cushcraft XM-240 two element 40 meter Yagi
  - monoband Yagis such as the Hy-Gain LJ series on ring rotators
  - 80 meter dipole and a 160 meter inverted-L

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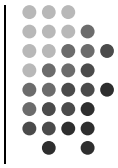
Achieving and Maintaining Low Loss Coaxial Cables



- Select appropriate low loss coaxial cables for each antenna
- Protect your investment
  - water entry and condensation are persistent, serious threats to the competitive performance of your station
- Hard-line (e.g., Heliax or 75 ohm CATV) coaxial cables are your best choice for cable runs longer than 100 feet
  - RG-213 and all other flexible jacket coaxial cables are very susceptible to physical jacket damage and water entry
    - a pin hole in the jacket can quickly cause a high loss cable
    - carefully protect your coax cables from physical damage and water entry
- Assure long term performance
  - test and inspect your cables and connectors at least annually

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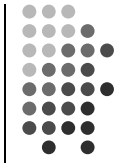
Coaxial Cable Monetary Considerations



- The selection, installation and maintenance of coaxial cables and connectors should be among your most important investments when building and improving your competitive station
  - is the proper grade of coaxial cable worth your additional cost?
  - is attention to the many details of installation worth your extra effort?
  - is annual inspection to preserve your investment worth your effort?
- Yes
  - if you want trouble-free low loss coax cables for 25 years or longer
- No
  - if you don't mind the high cost and disappointment of catastrophic failure when you least expect it or are least able to repair it

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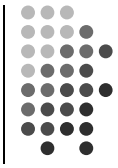
Coaxial Cable Environmental Considerations



- Constant exposure to wind, ice, water, condensation, heat, cold, ultra-violet radiation and lightning strikes
- Flexible jackets of RG-213 and LMR-400 flexible coaxial cables are easily damaged during feedline installation, antenna installation, tower maintenance, wind, ice, UV and lightning
  - never use 9913 air dielectric coax or similar “water hose”
  - never use foam dielectric flexible coaxial cable outdoors
    - except Davis RF Bury-Flex
- Heliax and jacketed CATV hardline are highly resistant to environmental damage and provide 25 years of service
  - If no installation errors are made
  - if you perform annual inspections to detect problems early

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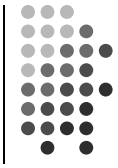
UHF Coaxial Cable Connectors



- N and UHF connectors are the most commonly used
  - both have insignificant loss at 50 MHz and below
- High quality silver plated PL-259 connectors provide much more center pin mating force than N connectors
  - eliminates cross-station interference and N connector failures from:
    - unreliable center pin mating force and common pin alignment failures
    - installation errors (e.g., incorrect pin depth, misalignment and pullback)
- Avoid using adapters as much as possible
  - but if necessary use only name-brand silver plated adapters
  - never use nickel plated or “astro-plated” connectors and adapters
  - never use cheap import “no name” adapters and connectors
- Wrench tighten your all of your PL-259 connectors (1/4 turn)

Avoid saving a few dollars on cheap unbranded connectors and adapters

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Amphenol 83-1SP
PL-259 Connector

Shell is labeled exactly:
Amphenol 83-1SP

Silver Plated
Center Pin

Silver Plated
Body

www.dxengineering.com/parts/aml-83-1sp

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This is not a good place to save money

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Coaxial Cables
83-1SP Connector Installation

www.k3lr.com/engineering/pl259/

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An unconventional but superb method

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Connector Waterproofing

Cover your connectors with two 50% overlapped layers of Scotch 130C stretched to 50% of its original width, **sticky side facing out**

Cover the Scotch 130C with two 50% overlapped layers of Scotch 33+ or Scotch 88

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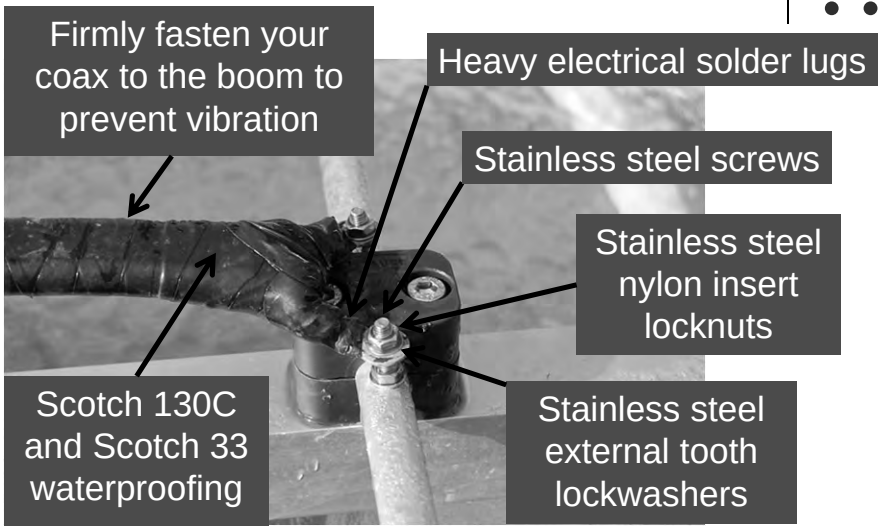
Antenna Feedpoint
Waterproof and Shakeproof Connections



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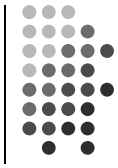
Coaxial Cables Can Make or Break Your Competitive Performance



- How well you select, install, waterproof, inspect and maintain your coaxial cables and connectors can make or break the competitive performance of your contest station
- Cross-station interference in multi-operator and SO2R stations is often caused by
  - failure to properly tighten your PL-259 coaxial connectors
    - wrench tighten ¼ turn
  - inappropriate or failing outdoor coaxial cables or connectors
    - never use type-N connectors below 50 MHz
  - nickel plated, cheap low quality imported connectors and adapters
  - poor connector installation workmanship
  - failure to perform annual inspections and regular maintenance

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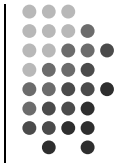
Low Loss Coaxial Cables for Single Operator Stations



- Cable loss, proper installation, water proofing and annual inspections are the most important concerns for single operator stations
  - Andrew LDF4-50A 50 ohm Heliax and connectors are commonly available at hamfests and eBay for ~ $1.00/foot
    - Less than 1 dB of loss on 10 meters for lengths up to 300 feet
  - If you must use flexible coaxial cable on your tower, Davis RF Bury-Flex is an acceptable alternative for single operator stations only, at about the same price.
    - never use any other type of foam dielectric flexible coaxial cable
  - Non-flooded coax such as RG-213 and LMR-400 has short service life in the harsh environment on a tower
    - especially on the rotating cable loop above a rotator
    - never direct bury RG-213 or LMR-400 or lay it on wet ground

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Low Loss Coaxial Cables for Multi-Op and SO2R Stations

- Andrew LDF4-50A ½ inch Heliax and 3/4 inch CATV cable are ideal choices for lengths up to:
  - 300 feet on 10 meters
  - 400 feet on 20 meters
  - 600 feet on 40 meters
- Eliminate the most common cross-station RFI sources:
  - Heliax avoids RFI caused by dissimilar metals corrosion in aluminum foil and tinned braid shields of Davis RF Bury-Flex cable
  - Avoid signal coupling between single braid shielded RG-213 coaxial cables by not bundled them or running them together in conduits
  - Use the smallest possible number of connectors and adapters
    - use only brand name silver plated UHF connectors and adapters
    - never use nickel plated or cheap no-name connectors and adapters

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Low Loss Coaxial Cables for Multi-tower Stations

- Multi-tower stations often use coax cables longer than 300 ft
- Andrew LDF5-50A 7/8 inch Heliax is an ideal choice for lengths up to:
  - 500 feet on 10 meters
  - 600 feet on 15 meters
  - 700 feet on 20 meters
  - 1000 feet on 40 meters
- Be cautious of the wind load and weight (including ice load) of multiple large diameter coaxial cables fastened to light duty towers such as Rohn 25 and 45

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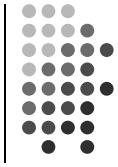
Coaxial Cable Installation on your Tower



- Wind, ice, water, condensation, heat, cold, ultra-violet radiation and lightning strikes are important concerns
  - If any of these conditions are unusually severe in your environment, implement additional protective measures
- Heliax and CATV hardline must be firmly fastened to the tower at least every five feet to protect them from wind and ice damage
- Flexible coaxial cables (e.g. RG-213) should be firmly attached to the tower at least every two or three feet to protect them from wind and ice damage
- Use electrical tape to protect plastic tie-wraps from ultra-violet radiation

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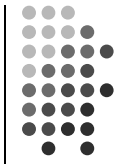
Coaxial Cable Interface to the Top of your Tower



- Coaxial cables must be bonded (“grounded”) to the top of your tower
  - prevents the coaxial cable jacket from developing pinholes caused by cable-to-tower arcing during lightning strikes
- Connectors must be carefully placed and waterproofed
  - so that water cannot not flow down the outside of your coaxial cables then directly into your connectors

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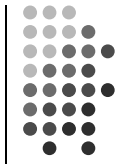
Coaxial Cable Interface to the Bottom of your Tower



- Tower mounted coaxial cables must be bonded ("grounded") to your tower base
  - prevents the coaxial cable jacket from developing pinholes caused by cable-to-tower arcing during lightning strikes
- An effective ground system must be connected to your tower base to strip lightning currents from your cables before they flow down the cable shields into your station
  - A *minimum* of three 8-foot galvanized steel ground rods
  - spaced at eight feet from each other and from the tower base
- Connectors must be carefully placed and waterproofed
  - so that water cannot not flow down the outside of the coaxial cables then directly into your connectors

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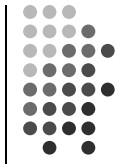
Buried Coaxial Cables



- Direct Burial
  - use only coaxial cable that is rated for direct burial
    - Andrew Heliax, jacketed CATV cable or Davis RF Bury-Flex
  - PVC jacketed coaxial cable should never be direct buried or laid on wet ground
- Conduit
  - use oversized conduit with plenty of room for cable pulling
  - use sweeps, not sharp right angle connectors
  - use appropriate methods to drain moisture from the conduit
  - prevent water and vermin entry into conduit entrances
  - use only Heliax cables in multi-op and SO2R stations
    - bundled single shielded coax can cause cross-station RFI

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Antenna Rotation Coax

- Your antenna rotation coaxial cable is exposed to the most extreme environmental conditions in your station
- Carefully prevent the coax from rubbing or pulling against the tower or any other objects that could damage it when rotating the antenna or when blown by strong wind
  - rotators with more than 360 degrees of rotation make this extremely difficult to achieve
- Use only new, name brand, high quality RG-213
  - 95% shielded, stranded center conductor, solid dielectric, black UV-resistant jacket
- Replace your coaxial cable when needed
  - whenever you discover abrasion, damage or degradation during your annual inspections
  - replace at least once every ten years

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Single Point Ground
at the Cable Entry into your Station

- Your station cable entry interface should establish a single point ground as close as possible to the outside wall of your building
  - a minimum of three 8-foot ground rods near your cable entry
  - spaced at least eight feet from each other in undisturbed soil
- Your single point ground strips lightning currents off of the coaxial cable shields before they enter your station
- Lightning protectors should be installed at your station single point ground
  - never install lightning protectors at your tower base

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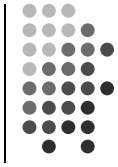
Coaxial Cables Inside your Station



- RG-213 is much more practical than Heliax cable
  - RG-223 and RG-400 are excellent choices for small diameter coax
- Eliminating cable, connector and adapter related cross-station interference in SO2R and multi-operator stations
  - never bundle single shielded coaxial cables such as RG-213
    - avoids cross-cable signal coupling between single shield coaxial cables
    - use double shielded coax if you must bundle your coaxial cables
  - use only PL-259 connectors and never N connectors for much better connector reliability and higher center pin contact pressure
    - use only high quality Amphenol 83-1SP silver plated PL-259s
    - use K3LR's excellent PL-259 installation technique
  - avoid nickel plated and cheap low quality imported adapters
    - high quality silver plated adapters are available from DX Engineering

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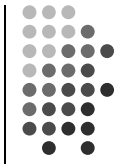
Annual Coaxial Cable Inspections



- Inspect all indoor and outdoor coaxial cables, connectors and waterproofing for evidence of damage, cuts, cracks, moisture intrusion and improper installation
  - antenna feed point connection (wear and water intrusion)
  - antenna rotation coaxial cable (chaffing and wear)
  - tower top connectors and bonding to tower
  - tower base connectors and bonding to tower
  - all coaxial cable connectors and adapters in your station
  - all SO-239 chassis connectors on your station equipment
- If in doubt, remove the connector for detailed inspection
- Verify that all indoor and outdoor PL-259 connectors are wrench tighted ¼ turn

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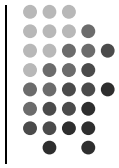
Coaxial Cable
Measurements Inside Your Shack



- Make a record of the following measurements at the ham shack end of every coaxial cable:
  - VSWR across the entire band(s)
  - center conductor to shield resistance
    - typically either a fraction of one ohm or many megohms
  - TDR and/or VNA plots
    - serious station builders should own (and use!) a TDR and a VNA
- Well before your next competitive contest, verify that all measurements are unchanged and not erratic
  - any change (better or worse) requires detailed investigation
- Use a digital wattmeter in your station to allow you to quickly detect and diagnose abnormal operation

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CTU Presents

Improving Your Contest Scores Through Log Analysis

Contesting Resources

Before

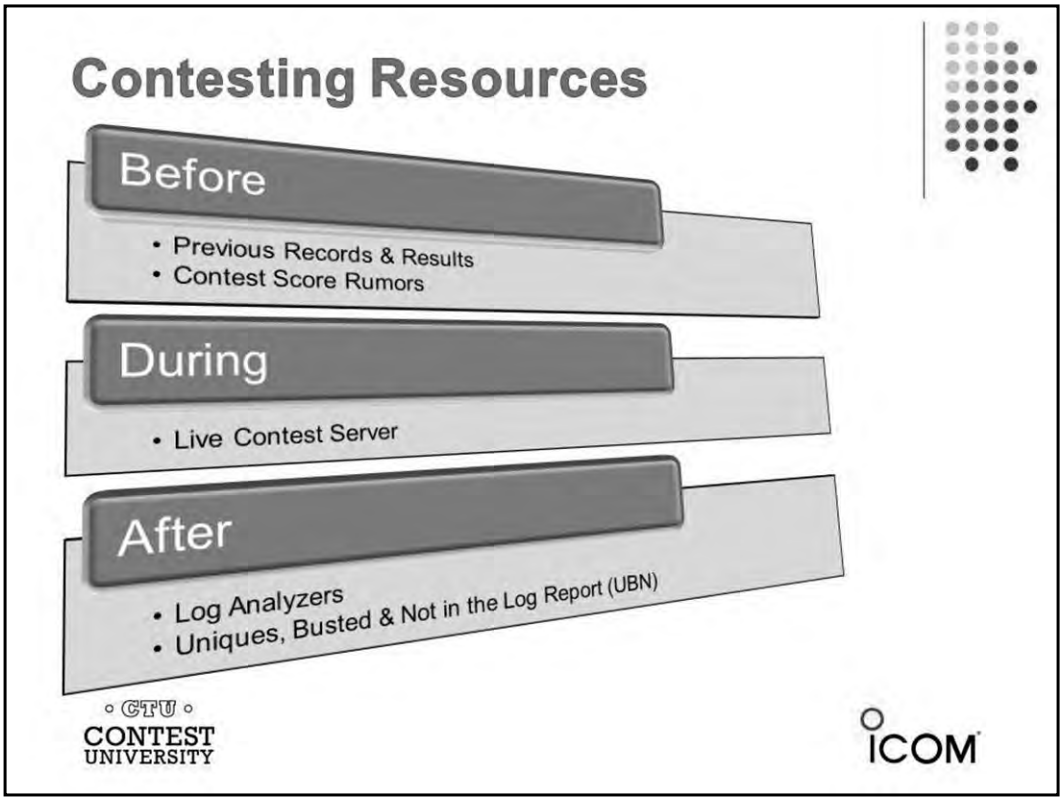
- Previous Records & Results
- Contest Score Rumors

During

- Live Contest Server

After

- Log Analyzers
- Uniques, Busted & Not in the Log Report (UBN)


Contesting Resources
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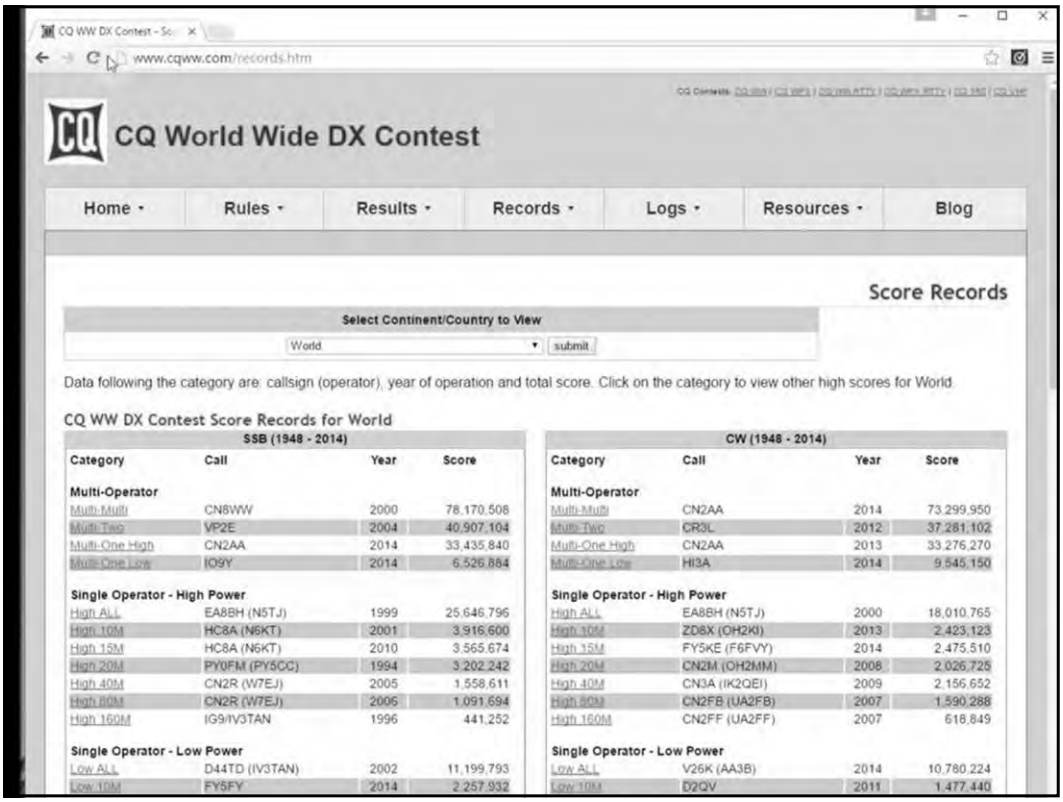


www.cqww.com/records.htm

CQ World Wide DX Contest

Home | Rules | Results | Records | Logs | Resources | Blog

Score Records

Select Continent/Country to View

World | submit

Data following the category are: callsign (operator), year of operation and total score. Click on the category to view other high scores for World.

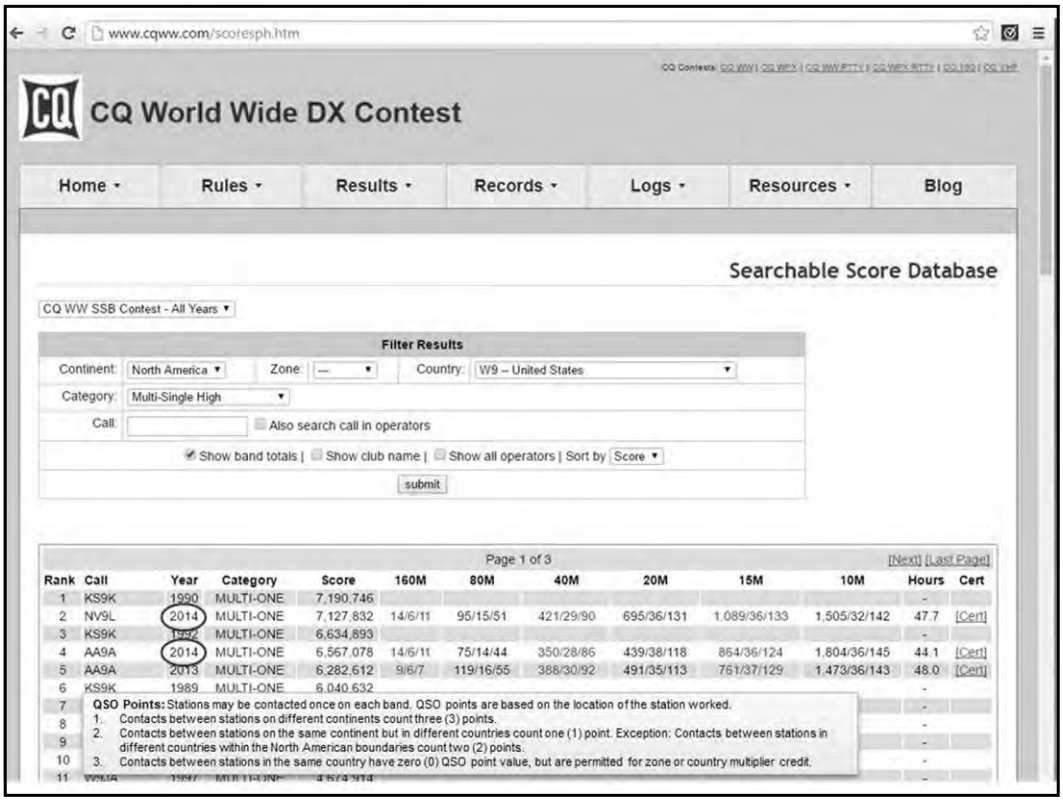
CQ WW DX Contest Score Records for World

SSB (1948 - 2014)

Category	Call	Year	Score
Multi-Operator			
Multi-Multi	CN8WW	2000	78,170,508
Multi-Two	VP2E	2004	40,907,104
Multi-One High	CN2AA	2014	33,435,840
Multi-One Low	IO9Y	2014	6,526,884
Single Operator - High Power			
High ALL	EA8BH (N5TJ)	1999	25,646,796
High 10M	HC8A (N6KT)	2001	3,916,600
High 15M	HC8A (N6KT)	2010	3,565,674
High 20M	PY0FM (PY5CC)	1994	3,202,242
High 40M	CN2R (W7EJ)	2005	1,558,611
High 80M	CN2R (W7EJ)	2006	1,091,694
High 160M	IG9/IV3TAN	1996	441,252
Single Operator - Low Power			
Low ALL	D44TD (IV3TAN)	2002	11,199,793
Low 10M	FY5FY	2014	2,257,932

CW (1948 - 2014)

Category	Call	Year	Score
Multi-Operator			
Multi-Multi	CN2AA	2014	73,299,950
Multi-Two	CR3L	2012	37,281,102
Multi-One High	CN2AA	2013	33,276,270
Multi-One Low	HI3A	2014	9,545,150
Single Operator - High Power			
High ALL	EA8BH (N5TJ)	2000	18,010,765
High 10M	ZD8X (OH2KI)	2013	2,423,123
High 15M	FY5KE (F6FVY)	2014	2,475,510
High 20M	CN2M (OH2MM)	2008	2,026,725
High 40M	CN3A (IK2QEI)	2009	2,156,652
High 80M	CN2FB (UA2FB)	2007	1,590,288
High 160M	CN2FF (UA2FF)	2007	618,849
Single Operator - Low Power			
Low ALL	V26K (AA3B)	2014	10,780,224
Low 10M	D2QV	2011	1,477,440



www.cqww.com/scoresph.htm

CQ World Wide DX Contest

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Searchable Score Database

CQ WW SSB Contest - All Years

Filter Results

Continent: North America | Zone: -- | Country: W9 – United States

Category: Multi-Single High

Call: | Also search call in operators

Show band totals | Show club name | Show all operators | Sort by: Score

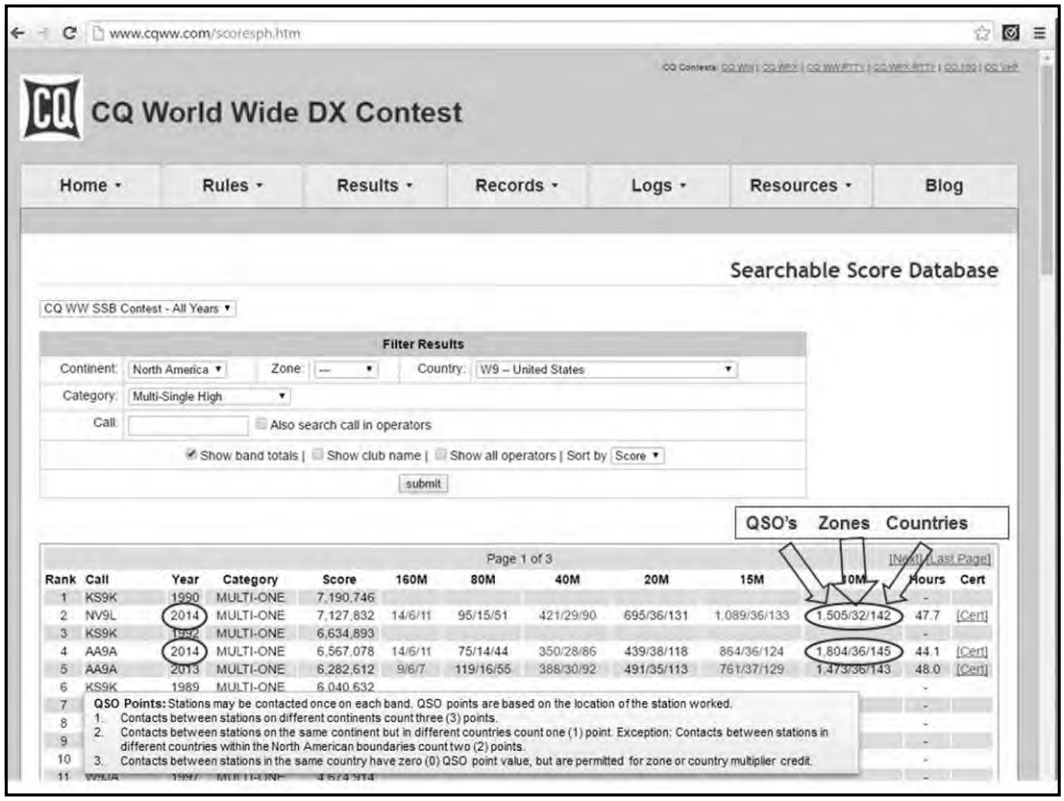
submit

Page 1 of 3 [Next] [Last Page]

Rank	Call	Year	Category	Score	160M	80M	40M	20M	15M	10M	Hours	Cert
1	KS9K	1990	MULTI-ONE	7,190,746							-	
2	NV9L	2014	MULTI-ONE	7,127,832	14/6/11	95/15/51	421/29/90	695/36/131	1,089/36/133	1,505/32/142	47.7	[Cert]
3	KS9K	1992	MULTI-ONE	6,634,893							-	
4	AA9A	2014	MULTI-ONE	6,567,078	14/6/11	75/14/44	350/28/86	439/38/118	864/36/124	1,804/36/145	44.1	[Cert]
5	AA9A	2013	MULTI-ONE	6,282,612	9/6/7	119/16/55	388/30/92	491/35/113	761/37/129	1,473/36/143	48.0	[Cert]
6	KS9K	1989	MULTI-ONE	6,040,632							-	
7											-	
8											-	
9											-	
10											-	
11	W4IA	1997	MULTI-ONE	5,674,914							-	

QSO Points: Stations may be contacted once on each band. QSO points are based on the location of the station worked.

1. Contacts between stations on different continents count three (3) points.
2. Contacts between stations on the same continent but in different countries count one (1) point. Exception: Contacts between stations in different countries within the North American boundaries count two (2) points.
3. Contacts between stations in the same country have zero (0) QSO point value, but are permitted for zone or country multiplier credit.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Category: Multi-Single High
Call:
Also search call in operators
Show band totals | Show club name | Show all operators | Sort by Score
submit
QSO's Zones Countries
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Rank Call Year Category Score 160M 80M 40M 20M 15M 10M Hours Cert
1 KS9K 1990 MULTI-ONE 7,190,746 -
2 NV9L 2014 MULTI-ONE 7,127,832 14/6/11 95/15/51 421/29/90 695/36/131 1,089/36/133 1,505/32/142 47.7 [Cert]
3 KS9K 1992 MULTI-ONE 6,634,893 -
4 AA9A 2014 MULTI-ONE 6,567,078 14/6/11 75/14/44 350/28/86 439/38/118 864/36/124 1,804/36/145 44.1 [Cert]
5 AA9A 2013 MULTI-ONE 6,282,612 9/6/7 119/16/55 388/30/92 491/35/113 761/37/129 1,473/36/143 48.0 [Cert]
6 KS9K 1989 MULTI-ONE 6,040,632 -
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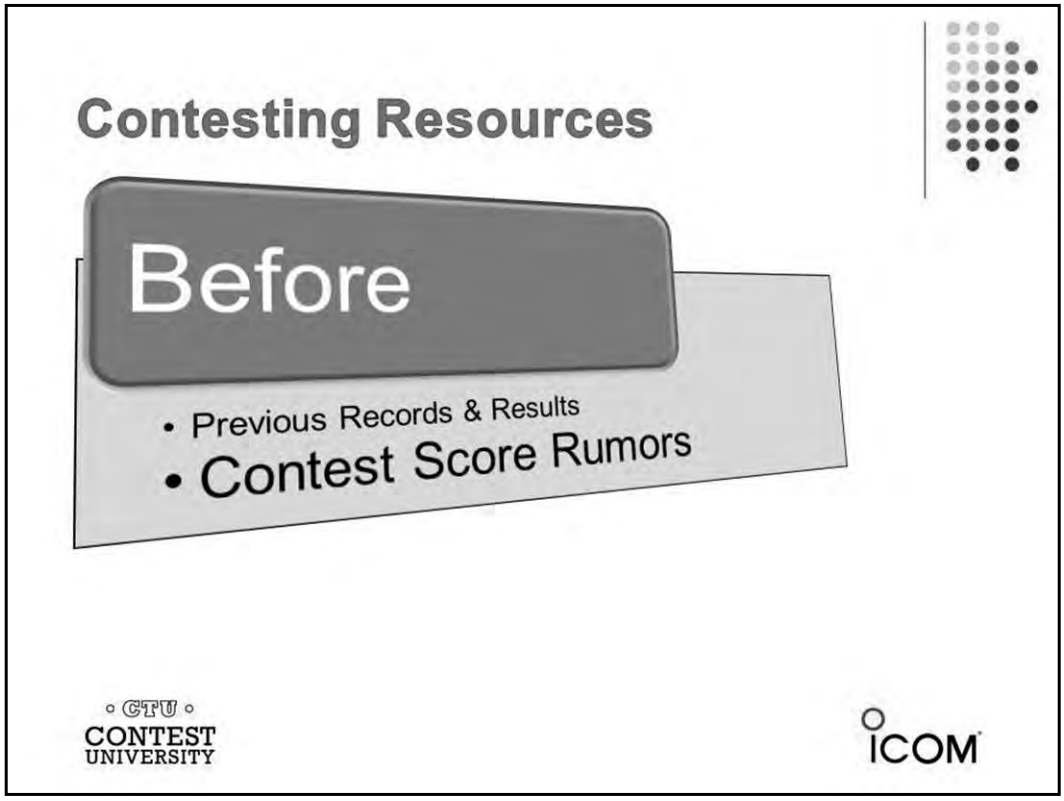
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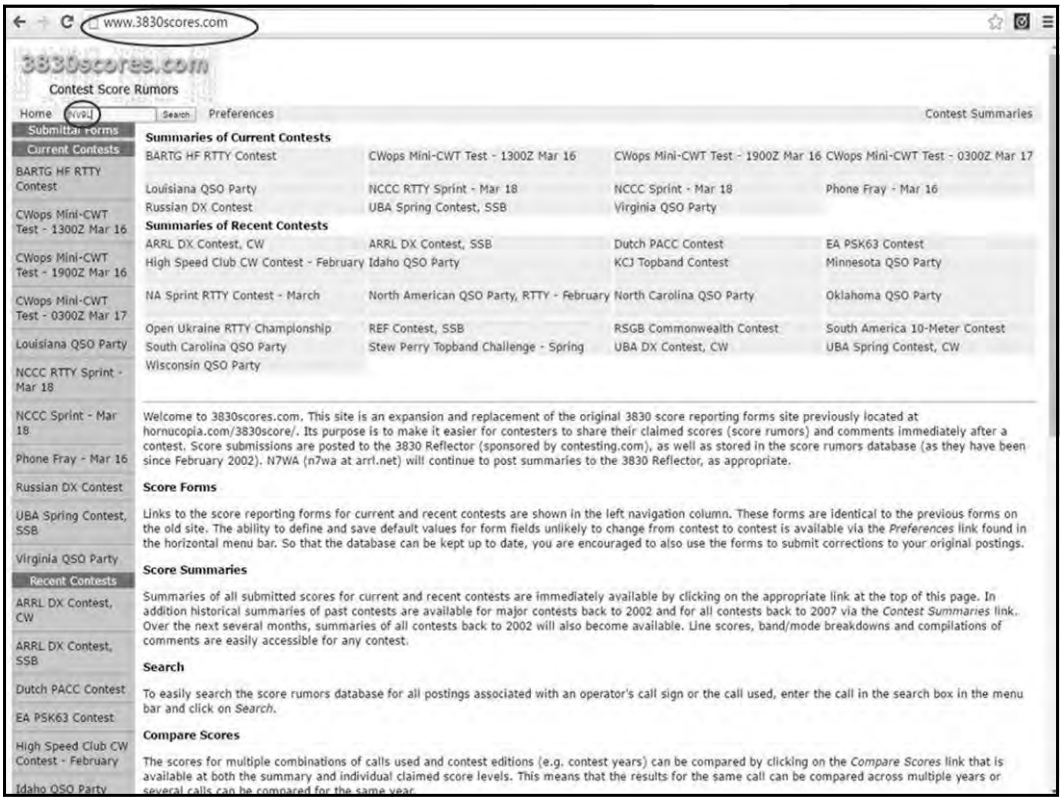
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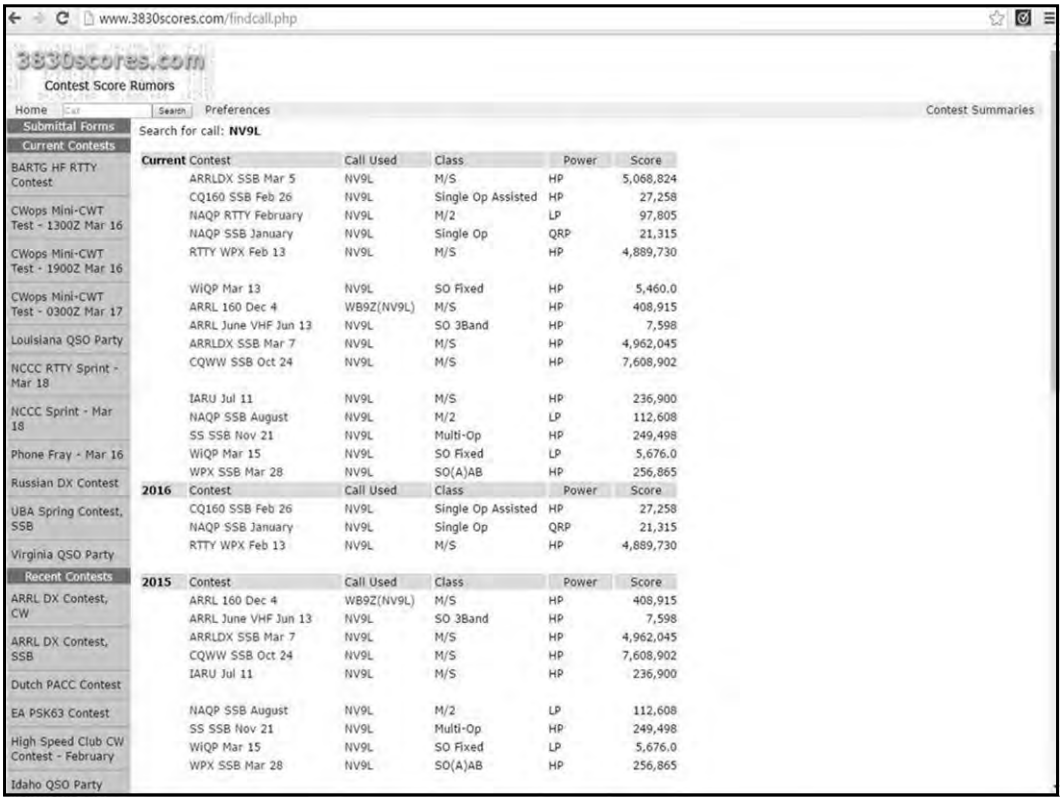
Minnesota QSO Party
NA Sprint RTTY Contest - March
North American QSO Party, RTTY - February
North Carolina QSO Party
Oklahoma QSO Party
Open Ukraine RTTY Championship
REF Contest, SSB
RSGB Commonwealth Contest
South America 10-Meter Contest
South Carolina QSO Party
Stew Perry Topband Challenge - Spring
UBA DX Contest, CW
UBA Spring Contest, CW
Wisconsin QSO Party
Welcome to 3830scores.com. This site is an expansion and replacement of the original 3830 score reporting forms site previously located at hornucopia.com/3830score/. Its purpose is to make it easier for contesters to share their claimed scores (score rumors) and comments immediately after a contest. Score submissions are posted to the 3830 Reflector (sponsored by contesting.com), as well as stored in the score rumors database (as they have been since February 2002). N7WA (n7wa at arrl.net) will continue to post summaries to the 3830 Reflector, as appropriate.
Score Forms
Links to the score reporting forms for current and recent contests are shown in the left navigation column. These forms are identical to the previous forms on the old site. The ability to define and save default values for form fields unlikely to change from contest to contest is available via the Preferences link found in the horizontal menu bar. So that the database can be kept up to date, you are encouraged to also use the forms to submit corrections to your original postings.
Score Summaries
Summaries of all submitted scores for current and recent contests are immediately available by clicking on the appropriate link at the top of this page. In addition historical summaries of past contests are available for major contests back to 2002 and for all contests back to 2007 via the Contest Summaries link. Over the next several months, summaries of all contests back to 2002 will also become available. Line scores, band/mode breakdowns and compilations of comments are easily accessible for any contest.
Search
To easily search the score rumors database for all postings associated with an operator's call sign or the call used, enter the call in the search box in the menu bar and click on Search.
Compare Scores
The scores for multiple combinations of calls used and contest editions (e.g. contest years) can be compared by clicking on the Compare Scores link that is available at both the summary and individual claimed score levels. This means that the results for the same call can be compared across multiple years or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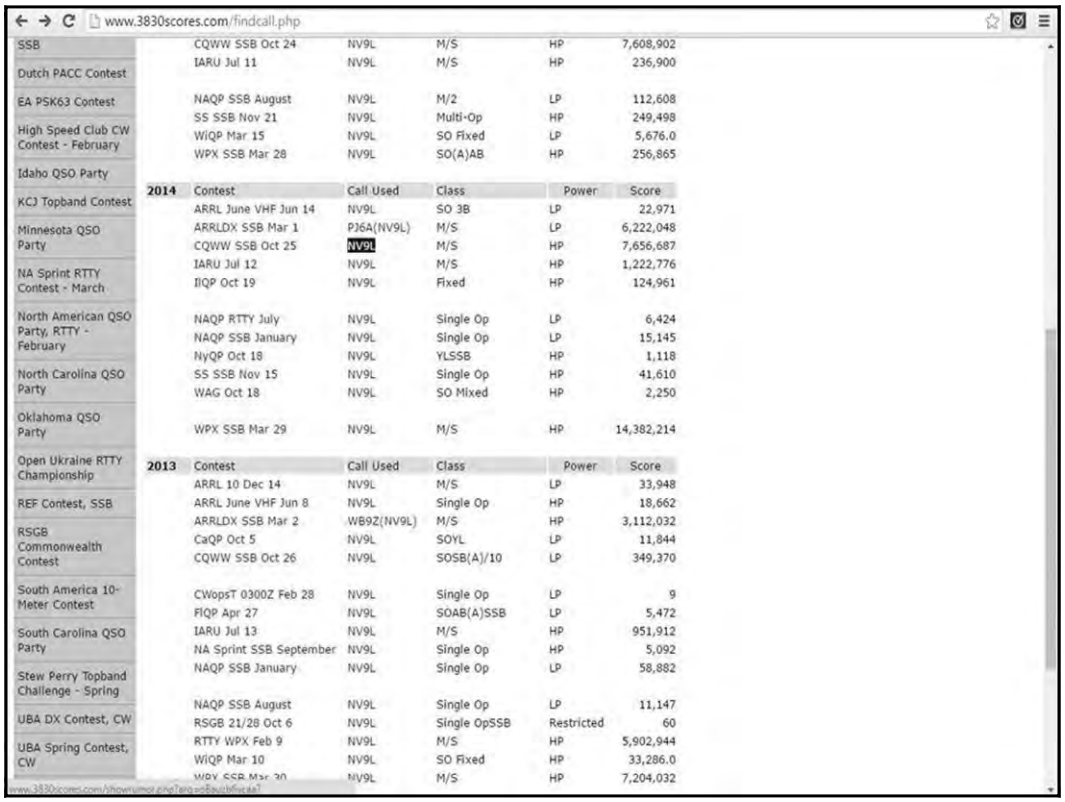
Search for call: NV9L
Current Contest Call Used Class Power Score
ARRLDX SSB Mar 5 NV9L M/S HP 5,068,824
CQ160 SSB Feb 26 NV9L Single Op Assisted HP 27,258
NAQP RTTY February NV9L M/2 LP 97,805
NAQP SSB January NV9L Single Op QRP 21,315
RTTY WPX Feb 13 NV9L M/S HP 4,889,730
WiQP Mar 13 NV9L SO Fixed HP 5,460.0
ARRL 160 Dec 4 WB9Z(NV9L) M/S HP 408,915
ARRL June VHF Jun 13 NV9L SO 3Band HP 7,598
ARRLDX SSB Mar 7 NV9L M/S HP 4,962,045
CQWW SSB Oct 24 NV9L M/S HP 7,608,902
IARU Jul 11 NV9L M/S HP 236,900
NAQP SSB August NV9L M/2 LP 112,608
SS SSB Nov 21 NV9L Multi-Op HP 249,498
WiQP Mar 15 NV9L SO Fixed LP 5,676.0
WPX SSB Mar 28 NV9L SO(A)AB HP 256,865
2016 Contest Call Used Class Power Score
CQ160 SSB Feb 26 NV9L Single Op Assisted HP 27,258
NAQP SSB January NV9L Single Op QRP 21,315
RTTY WPX Feb 13 NV9L M/S HP 4,889,730
2015 Contest Call Used Class Power Score
ARRL 160 Dec 4 WB9Z(NV9L) M/S HP 408,915
ARRL June VHF Jun 13 NV9L SO 3Band HP 7,598
ARRLDX SSB Mar 7 NV9L M/S HP 4,962,045
CQWW SSB Oct 24 NV9L M/S HP 7,608,902
IARU Jul 11 NV9L M/S HP 236,900
NAQP SSB August NV9L M/2 LP 112,608
SS SSB Nov 21 NV9L Multi-Op HP 249,498
WiQP Mar 15 NV9L SO Fixed LP 5,676.0
WPX SSB Mar 28 NV9L SO(A)AB HP 256,865



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KCJ Topband Contest
Minnesota QSO Party
NA Sprint RTTY Contest - March
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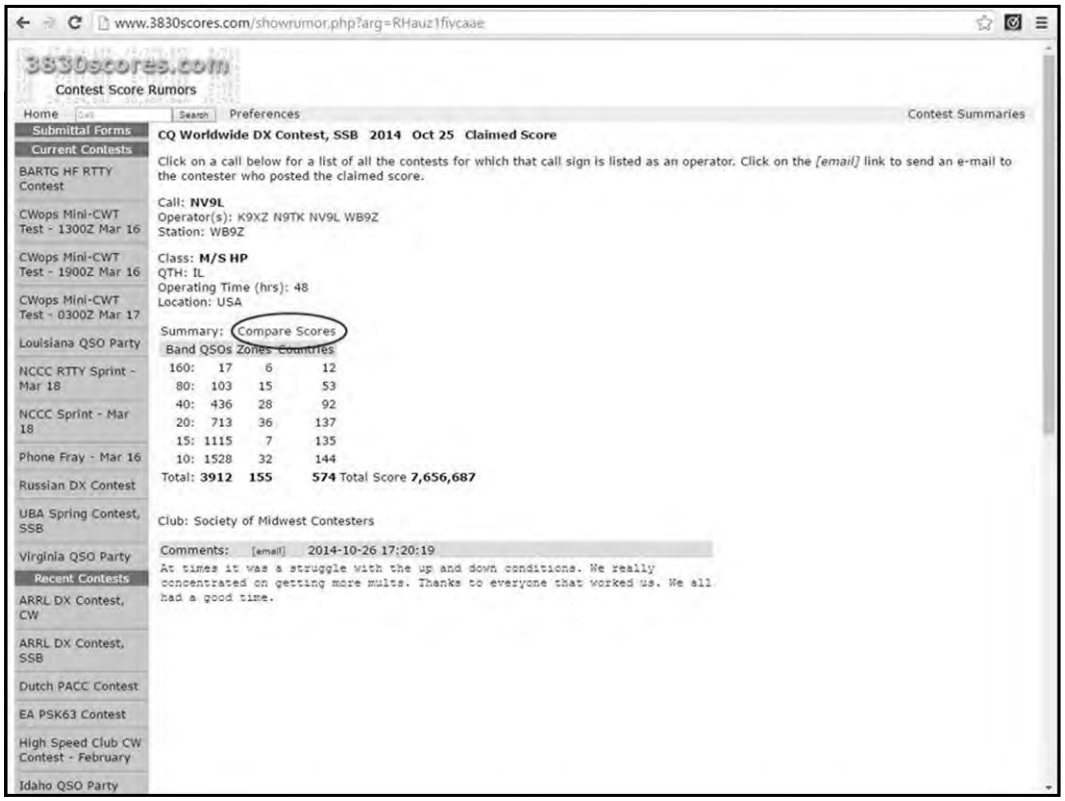
Oklahoma QSO Party
Open Ukraine RTTY Championship
REF Contest, SSB
RSGB Commonwealth Contest
South America 10-Meter Contest
South Carolina QSO Party
Stew Perry Topband Challenge - Spring
UBA DX Contest, CW
UBA Spring Contest, CW

	CQWW SSB Oct 24	NV9L	M/S	HP	7,608,902
	IARU Jul 11	NV9L	M/S	HP	236,900
	NAQP SSB August	NV9L	M/2	LP	112,608
	SS SSB Nov 21	NV9L	Multi-Op	HP	249,498
	WiQP Mar 15	NV9L	SO Fixed	LP	5,676.0
	WPX SSB Mar 28	NV9L	SO(A)AB	HP	256,865
2014	**Contest**	**Call Used**	**Class**	**Power**	**Score**
	ARRL June VHF Jun 14	NV9L	SO 3B	LP	22,971
	ARRLDX SSB Mar 1	PJ6A(NV9L)	M/S	LP	6,222,048
	CQWW SSB Oct 25	NV9L	M/S	HP	7,656,687
	IARU Jul 12	NV9L	M/S	HP	1,222,776
	IIQP Oct 19	NV9L	Fixed	HP	124,961
	NAQP RTTY July	NV9L	Single Op	LP	6,424
	NAQP SSB January	NV9L	Single Op	LP	15,145
	NyQP Oct 18	NV9L	YLSSB	HP	1,118
	SS SSB Nov 15	NV9L	Single Op	HP	41,610
	WAG Oct 18	NV9L	SO Mixed	HP	2,250
	WPX SSB Mar 29	NV9L	M/S	HP	14,382,214
2013	**Contest**	**Call Used**	**Class**	**Power**	**Score**
	ARRL 10 Dec 14	NV9L	M/S	LP	33,948
	ARRL June VHF Jun 8	NV9L	Single Op	HP	18,662
	ARRLDX SSB Mar 2	WB9Z(NV9L)	M/S	HP	3,112,032
	CaQP Oct 5	NV9L	SOYL	LP	11,844
	CQWW SSB Oct 26	NV9L	SOSB(A)/10	LP	349,370
	CWopsT 0300Z Feb 28	NV9L	Single Op	LP	9
	FIQP Apr 27	NV9L	SOAB(A)SSB	LP	5,472
	IARU Jul 13	NV9L	M/S	HP	951,912
	NA Sprint SSB September	NV9L	Single Op	HP	5,092
	NAQP SSB January	NV9L	Single Op	LP	58,882
	NAQP SSB August	NV9L	Single Op	LP	11,147
	RSGB 21/28 Oct 6	NV9L	Single OpSSB	Restricted	60
	RTTY WPX Feb 9	NV9L	M/S	HP	5,902,944
	WiQP Mar 10	NV9L	SO Fixed	HP	33,286.0
	WPX SSB Mar 30	NV9L	M/S	HP	7,204,032



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CQ Worldwide DX Contest, SSB 2014 Oct 25 Claimed Score

Click on a call below for a list of all the contests for which that call sign is listed as an operator. Click on the *[email]* link to send an e-mail to the contester who posted the claimed score.

Call: **NV9L**
Operator(s): K9XZ N9TK NV9L WB9Z
Station: WB9Z

Class: **M/S HP**
QTH: IL
Operating Time (hrs): 48
Location: USA

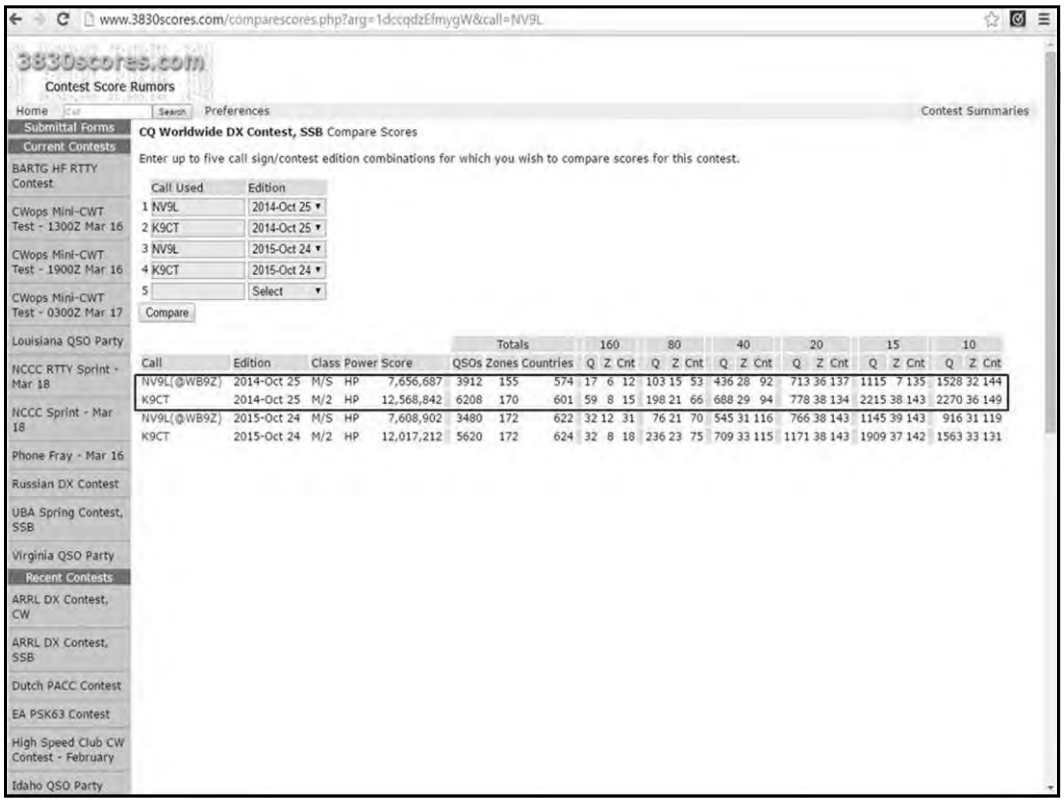
Summary: Compare Scores

Band	QSOs	Zones	Countries
160:	17	6	12
80:	103	15	53
40:	436	28	92
20:	713	36	137
15:	1115	7	135
10:	1528	32	144
Total:	**3912**	**155**	**574** Total Score **7,656,687**

Club: Society of Midwest Contesters

Comments: [email] 2014-10-26 17:20:19

At times it was a struggle with the up and down conditions. We really concentrated on getting more mults. Thanks to everyone that worked us. We all had a good time.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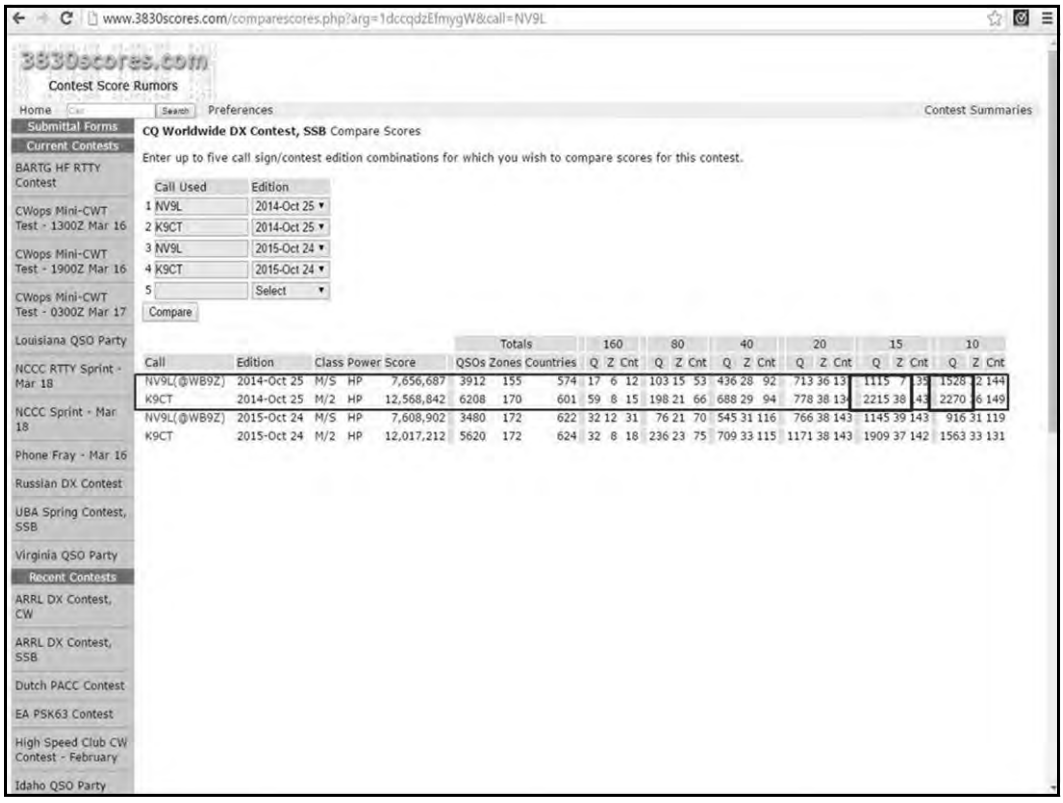
CQ Worldwide DX Contest, SSB Compare Scores
Enter up to five call sign/contest edition combinations for which you wish to compare scores for this contest.
Call Used
Edition
1 NV9L 2014-Oct 25
2 K9CT 2014-Oct 25
3 NV9L 2015-Oct 24
4 K9CT 2015-Oct 24
5 Select
Compare
Totals 160 80 40 20 15 10
Call Edition Class Power Score QSOs Zones Countries Q Z Cnt Q Z Cnt Q Z Cnt Q Z Cnt Q Z Cnt Q Z Cnt Q Z Cnt
NV9L(@WB9Z) 2014-Oct 25 M/S HP 7,656,687 3912 155 574 17 6 12 103 15 53 436 28 92 713 36 137 1115 7 135 1528 32 144
K9CT 2014-Oct 25 M/2 HP 12,568,842 6208 170 601 59 8 15 198 21 66 688 29 94 778 38 134 2215 38 143 2270 36 149
NV9L(@WB9Z) 2015-Oct 24 M/S HP 7,608,902 3480 172 622 32 12 31 76 21 70 545 31 116 766 38 143 1145 39 143 916 31 119
K9CT 2015-Oct 24 M/2 HP 12,017,212 5620 172 624 32 8 18 236 23 75 709 33 115 1171 38 143 1909 37 142 1563 33 131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Submittal Forms
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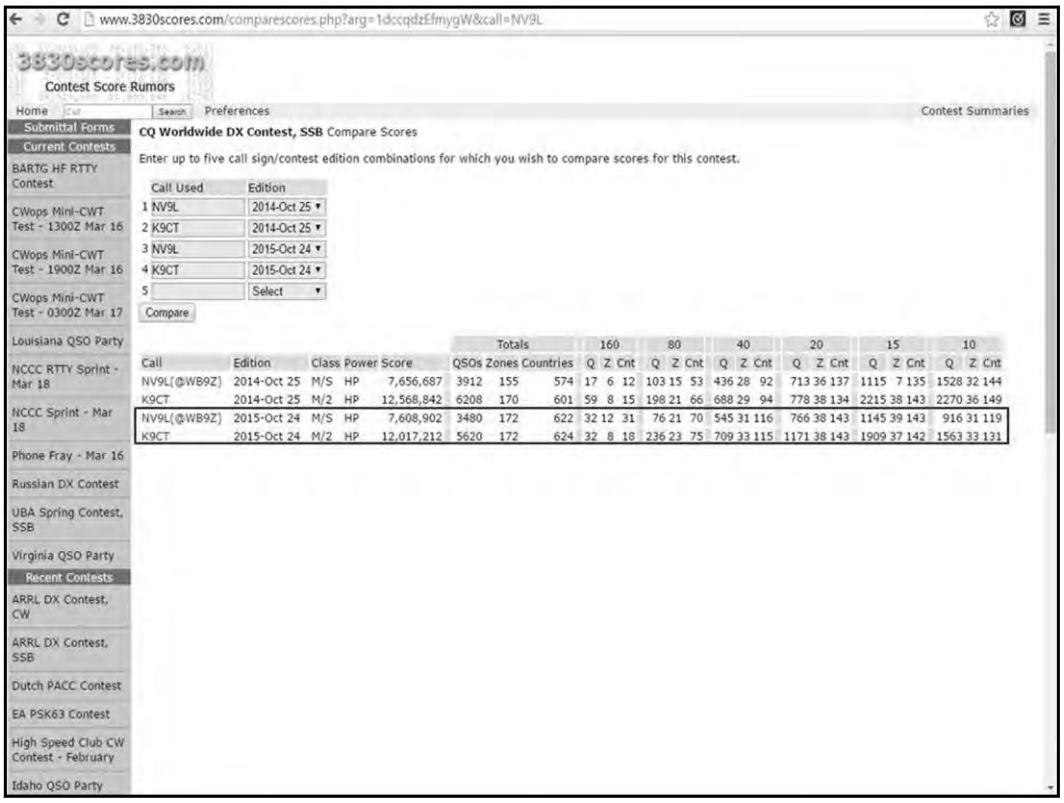
BARTG HF RTTY Contest
CWops Mini-CWT Test - 1300Z Mar 16
CWops Mini-CWT Test - 1900Z Mar 16
CWops Mini-CWT Test - 0300Z Mar 17
Louisiana QSO Party
NCCC RTTY Sprint - Mar 18
NCCC Sprint - Mar 18
Phone Fray - Mar 16
Russian DX Contest
UBA Spring Contest, SSB
Virginia QSO Party
Recent Contests
ARRL DX Contest, CW
ARRL DX Contest, SSB
Dutch PACC Contest
EA PSK63 Contest
High Speed Club CW Contest - February
Idaho QSO Party
CQ Worldwide DX Contest, SSB Compare Scores
Enter up to five call sign/contest edition combinations for which you wish to compare scores for this contest.
Call Used
Edition
1 NV9L 2014-Oct 25
2 K9CT 2014-Oct 25
3 NV9L 2015-Oct 24
4 K9CT 2015-Oct 24
5 Select
Compare
Totals 160 80 40 20 15 10
Call Edition Class Power Score QSOs Zones Countries Q Z Cnt Q Z Cnt Q Z Cnt Q Z Cnt Q Z Cnt Q Z Cnt Q Z Cnt
NV9L(@WB9Z) 2014-Oct 25 M/S HP 7,656,687 3912 155 574 17 6 12 103 15 53 436 28 92 713 36 13 1115 7 35 1528 2 144
K9CT 2014-Oct 25 M/2 HP 12,568,842 6208 170 601 59 8 15 198 21 66 688 29 94 778 38 134 2215 38 43 2270 6 149
NV9L(@WB9Z) 2015-Oct 24 M/S HP 7,608,902 3480 172 622 32 12 31 76 21 70 545 31 116 766 38 143 1145 39 143 916 31 119
K9CT 2015-Oct 24 M/2 HP 12,017,212 5620 172 624 32 8 18 236 23 75 709 33 115 1171 38 143 1909 37 142 1563 33 131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4 K9CT 2015-Oct 24
5 Select
Compare
Totals 160 80 40 20 15 10
Call Edition Class Power Score QSOs Zones Countries Q Z Cnt Q Z Cnt Q Z Cnt Q Z Cnt Q Z Cnt Q Z Cnt
NV9L(@WB9Z) 2014-Oct 25 M/S HP 7,656,687 3912 155 574 17 6 12 103 15 53 436 28 92 713 36 137 1115 7 135 1528 32 144
K9CT 2014-Oct 25 M/2 HP 12,568,842 6208 170 601 59 8 15 198 21 66 688 29 94 778 38 134 2215 38 143 2270 36 149
NV9L(@WB9Z) 2015-Oct 24 M/S HP 7,608,902 3480 172 622 32 12 31 76 21 70 545 31 116 766 38 143 1145 39 143 916 31 119
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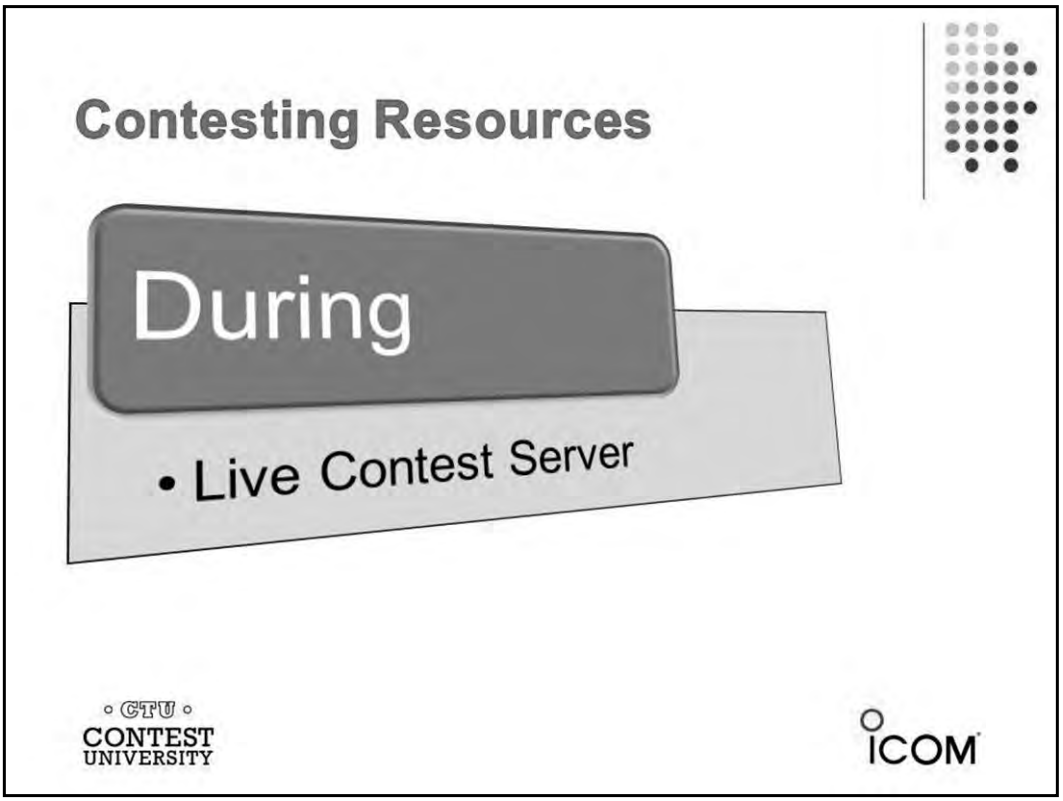
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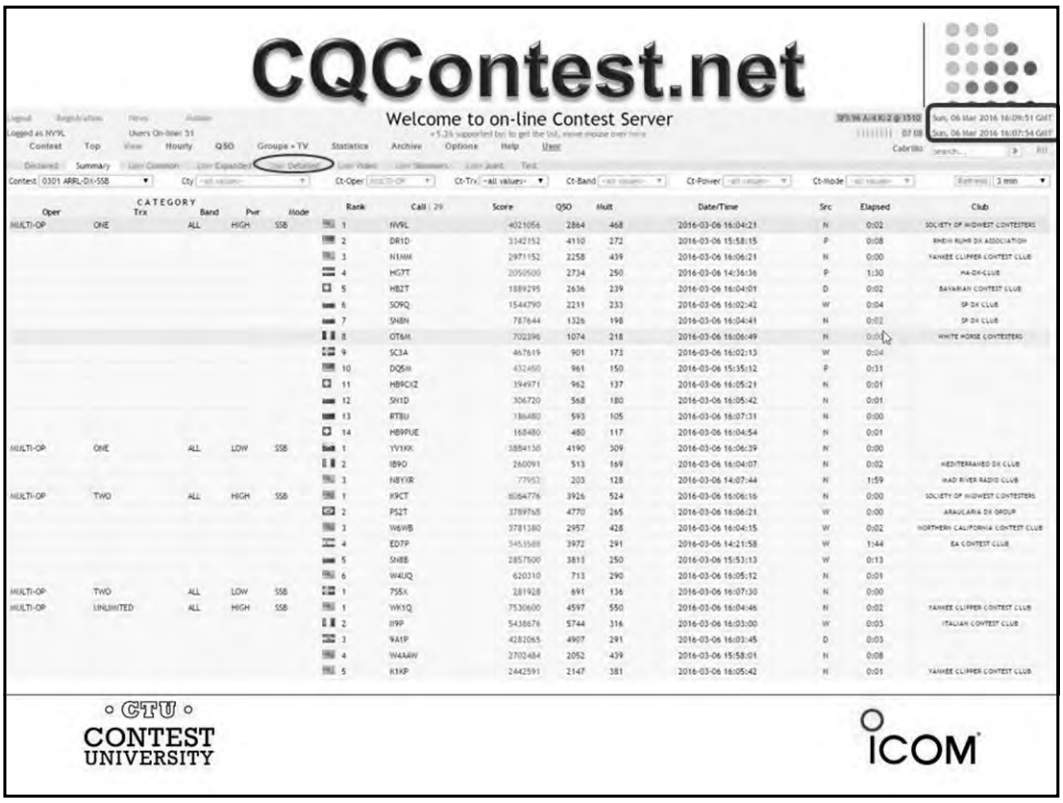
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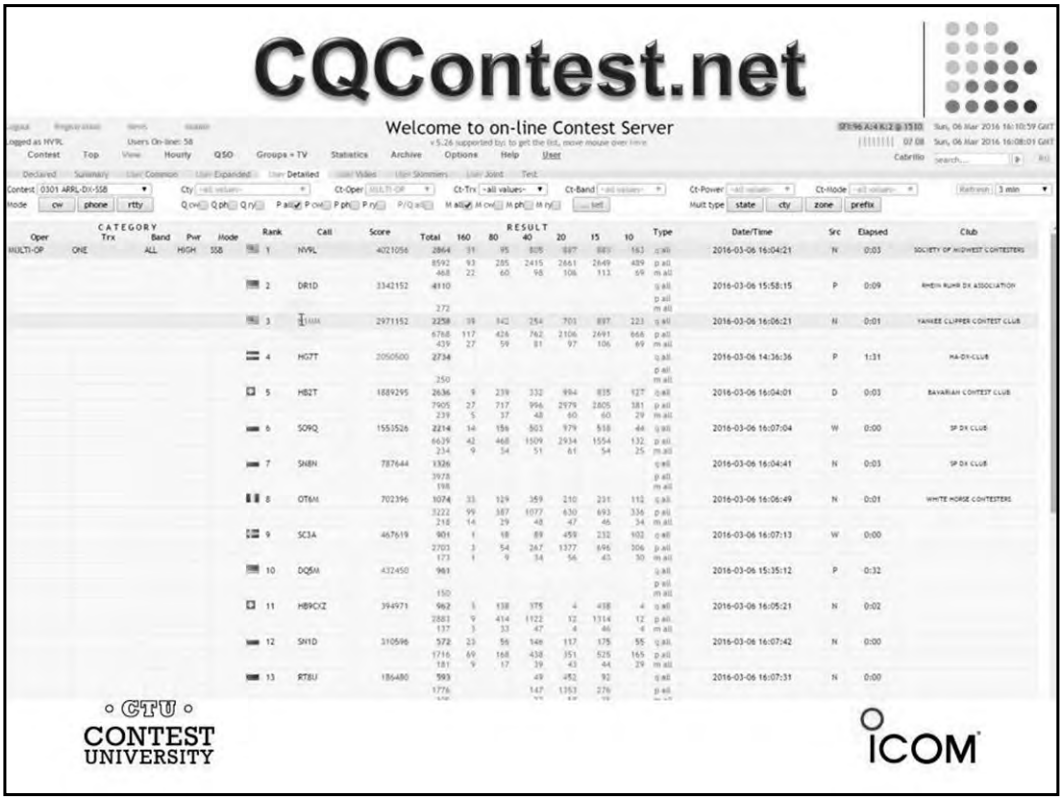
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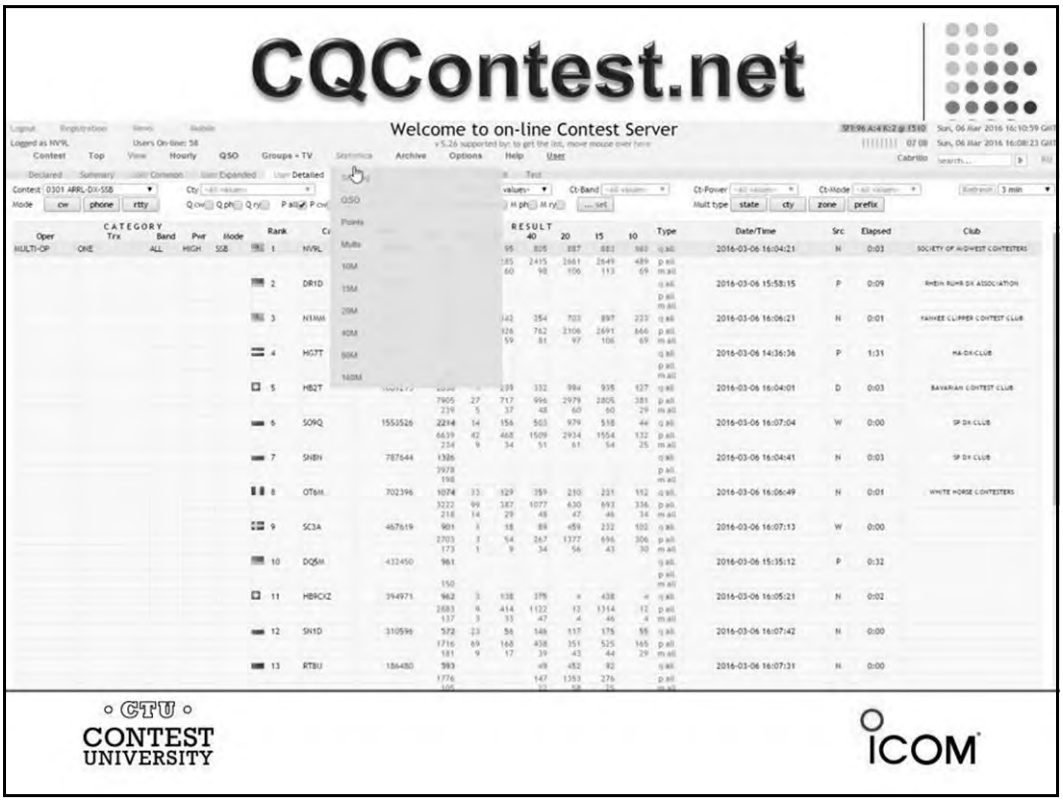
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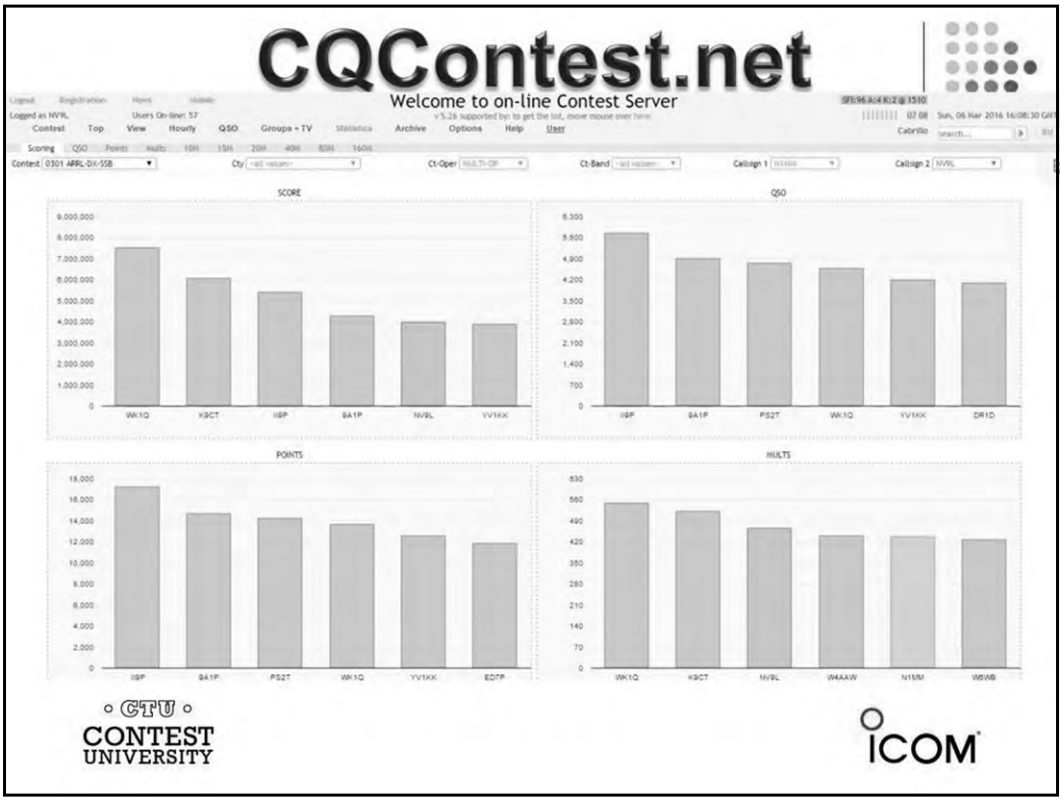
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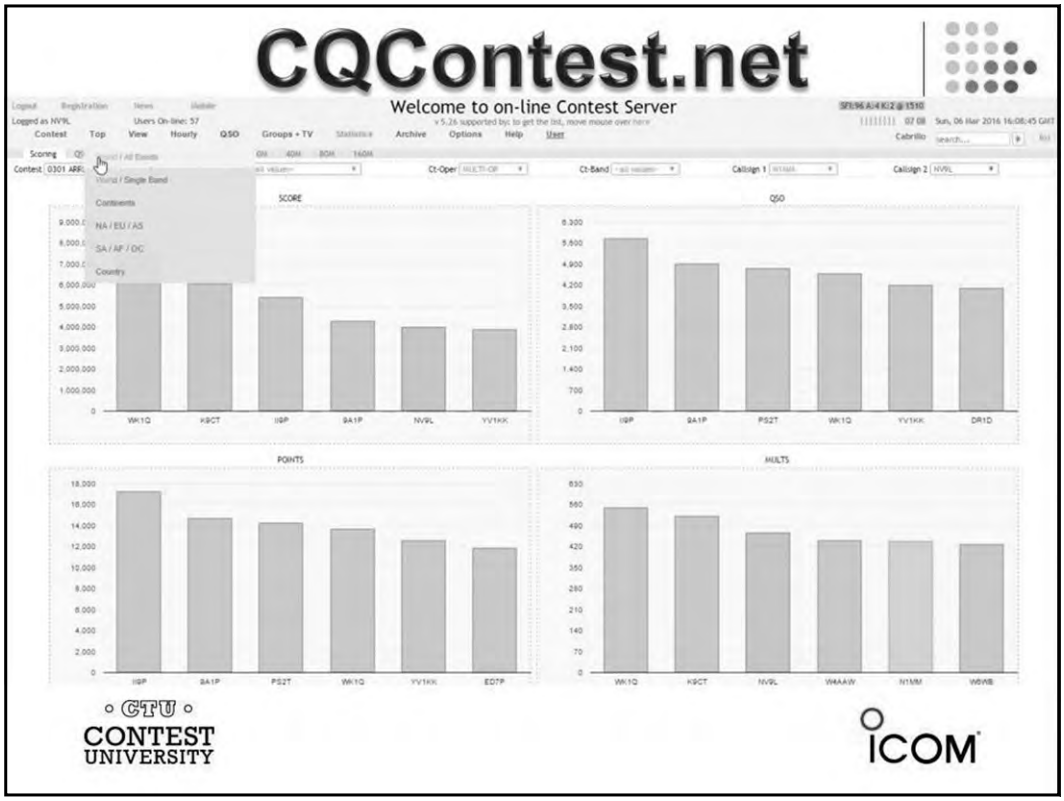
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Welcome to on-line Contest Server
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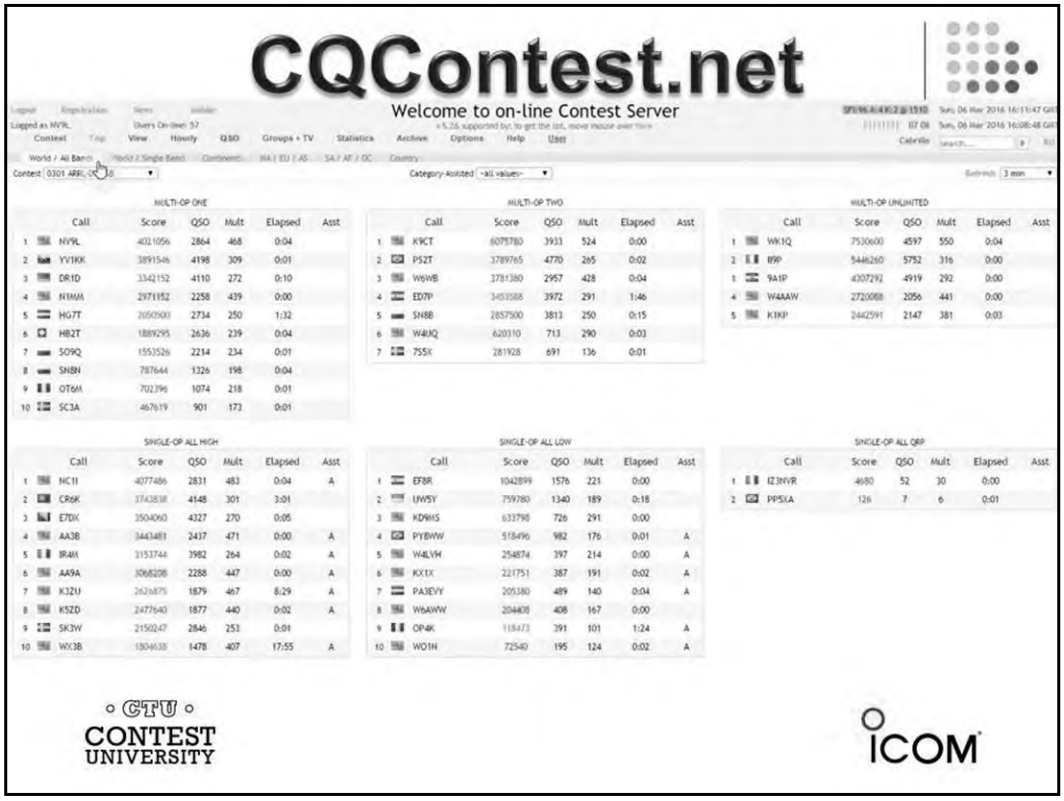
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Welcome to on-line Contest Server
MULTI-OP ONE
MULTI-OP TWO
MULTI-OP UNLIMITED
SINGLE-OP ALL HIGH
SINGLE-OP ALL LOW
SINGLE-OP ALL QRP
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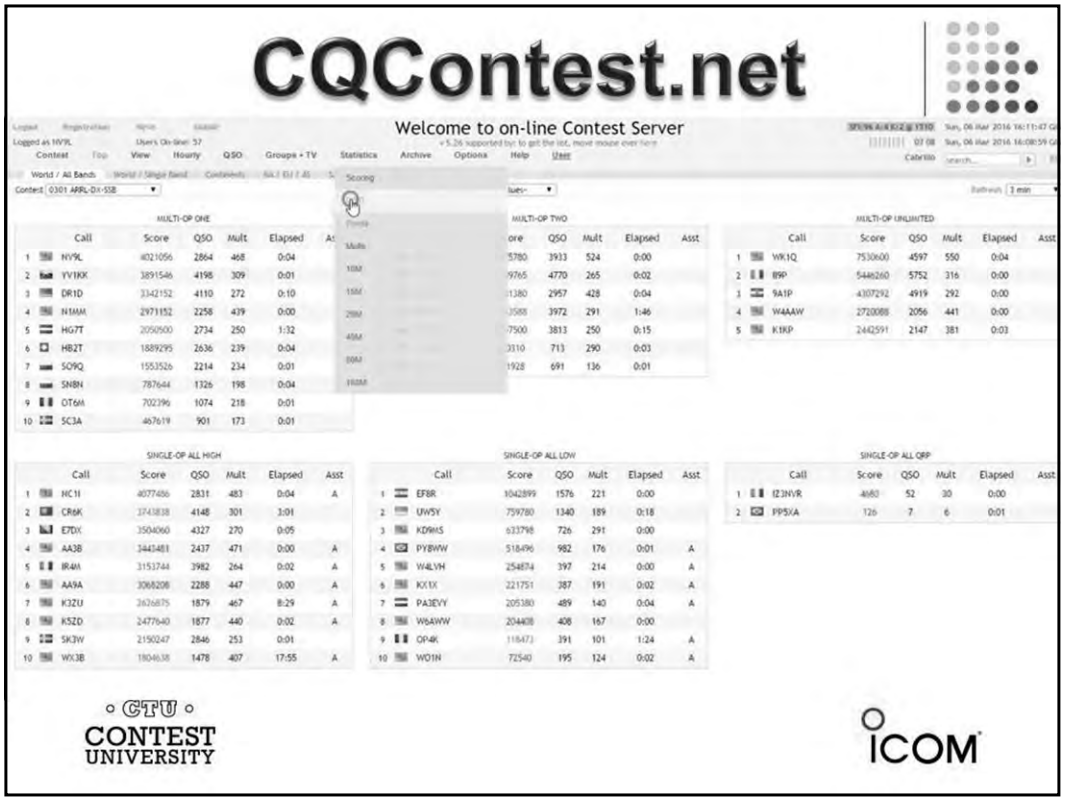
ICOM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Welcome to on-line Contest Server
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MULTI-OP TWO
MULTI-OP UNLIMITED
SINGLE-OP ALL HIGH
SINGLE-OP ALL LOW
SINGLE-OP ALL QRP
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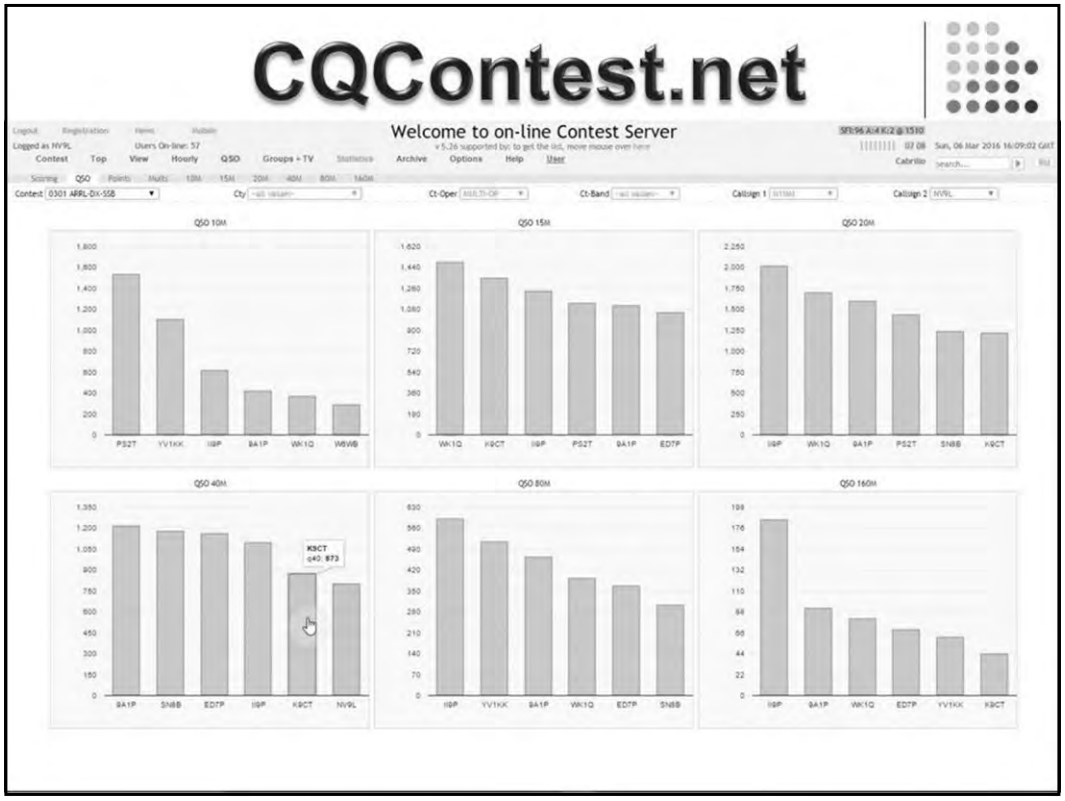
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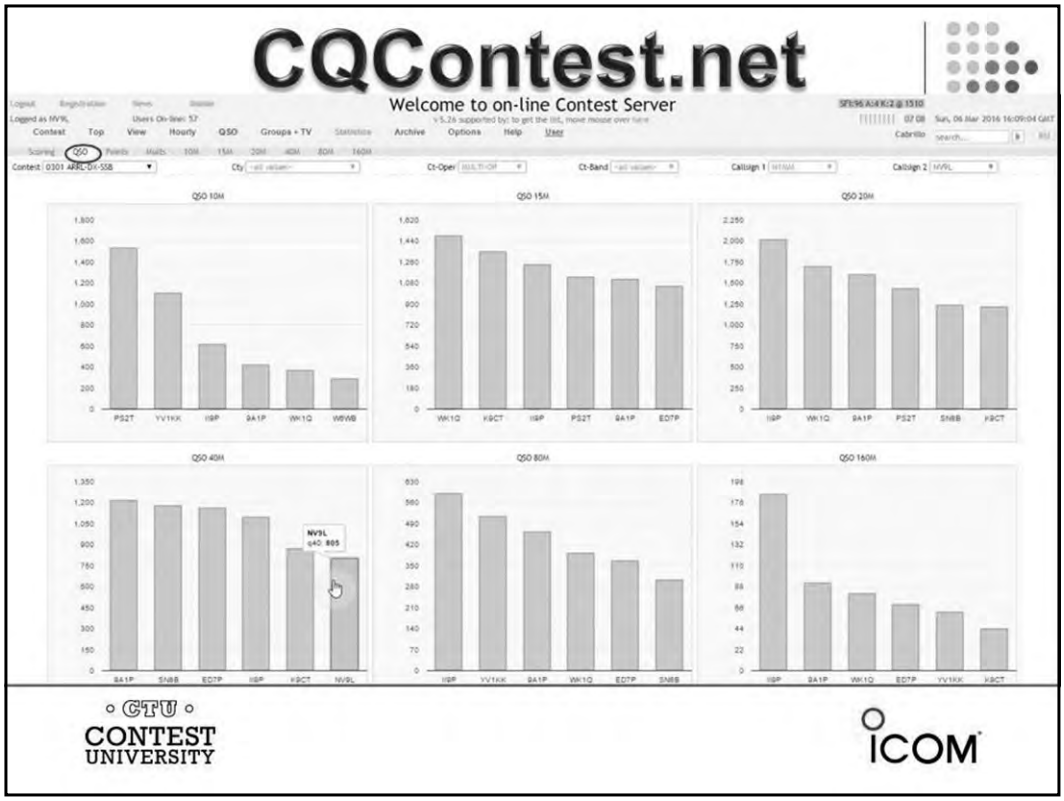
Welcome to on-line Contest Server
QSO 10M
QSO 15M
QSO 20M
QSO 40M
QSO 80M
QSO 160M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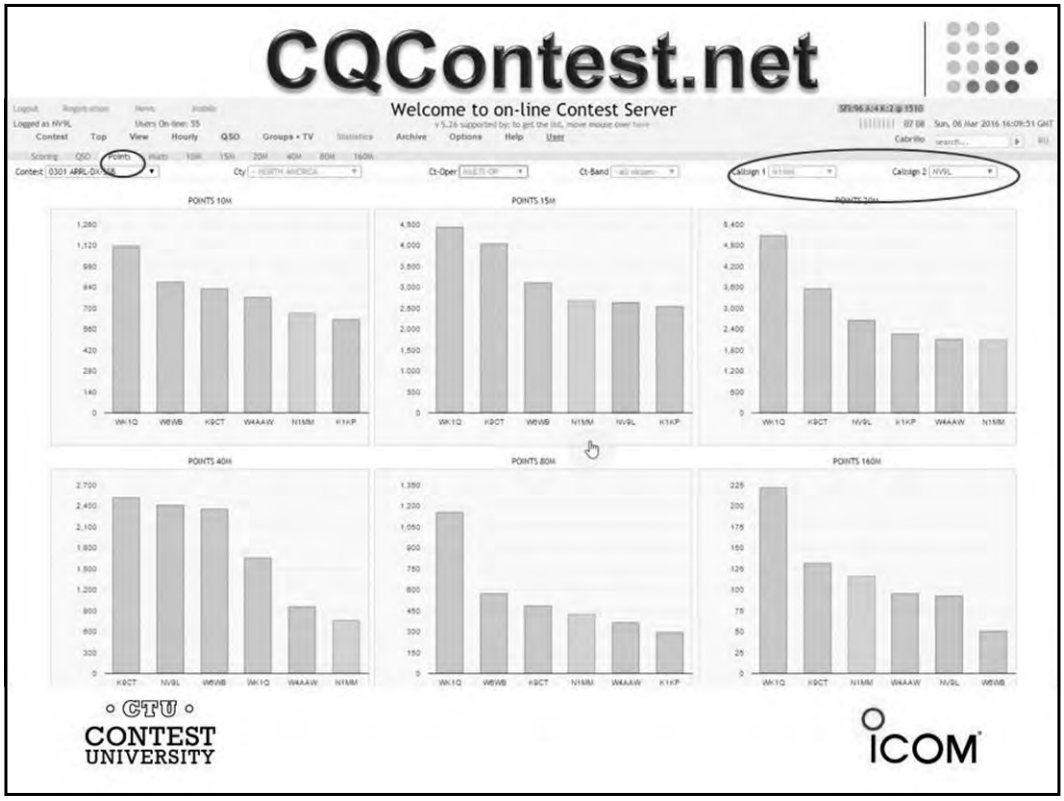
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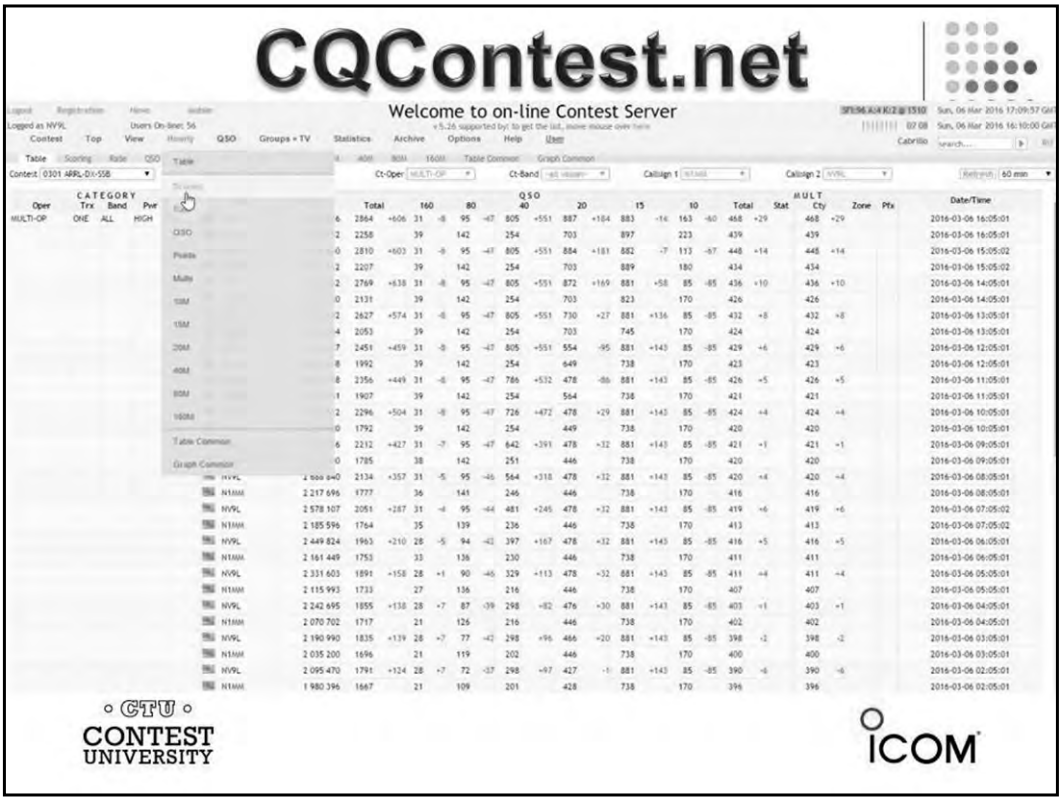
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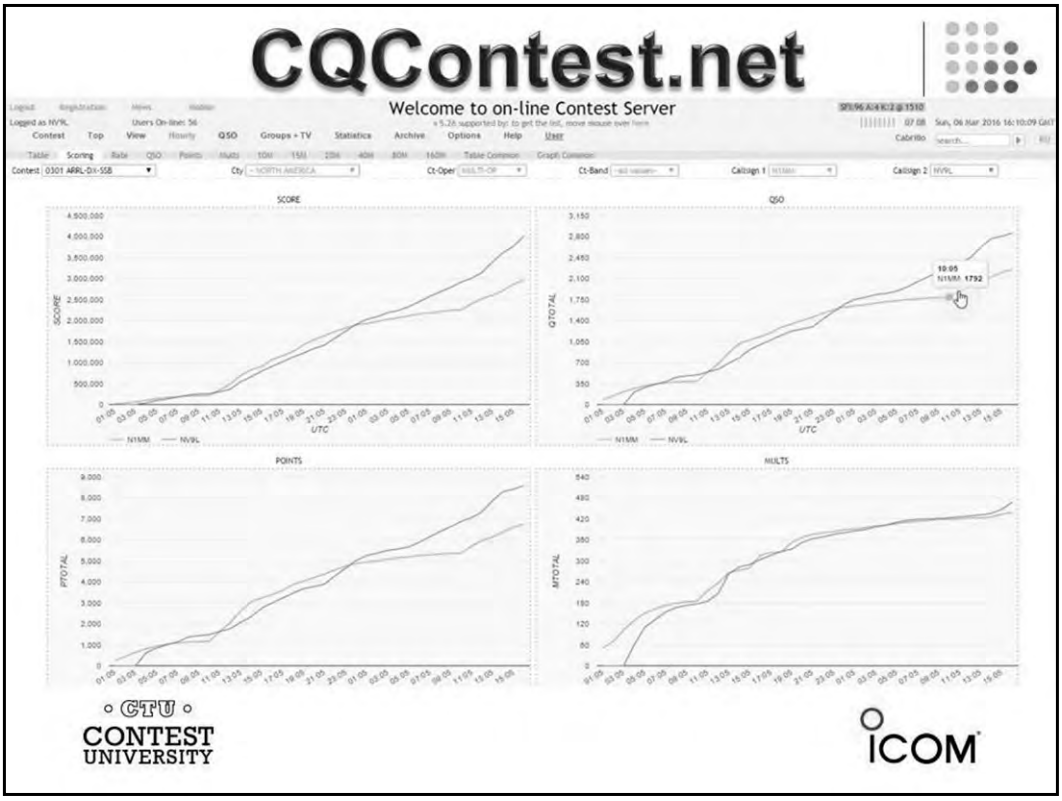
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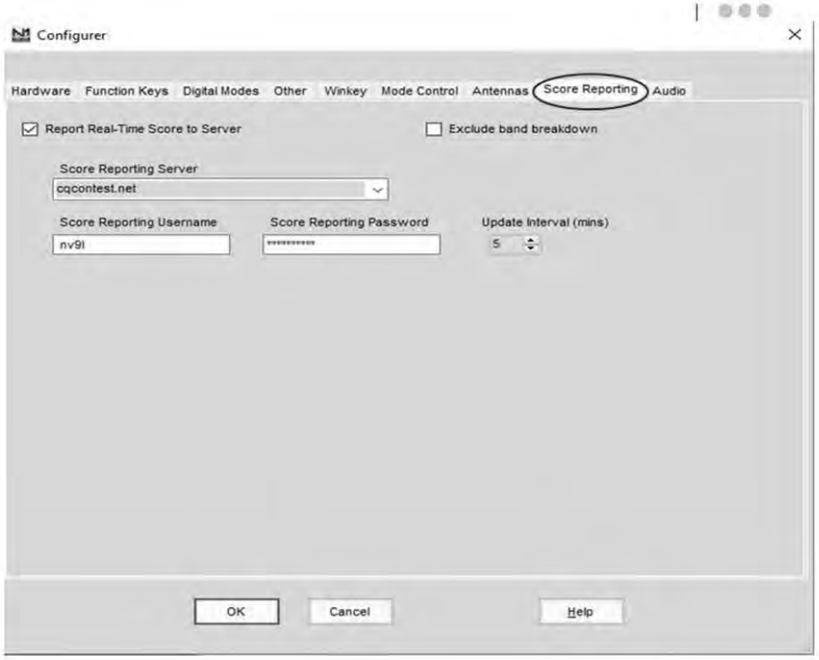

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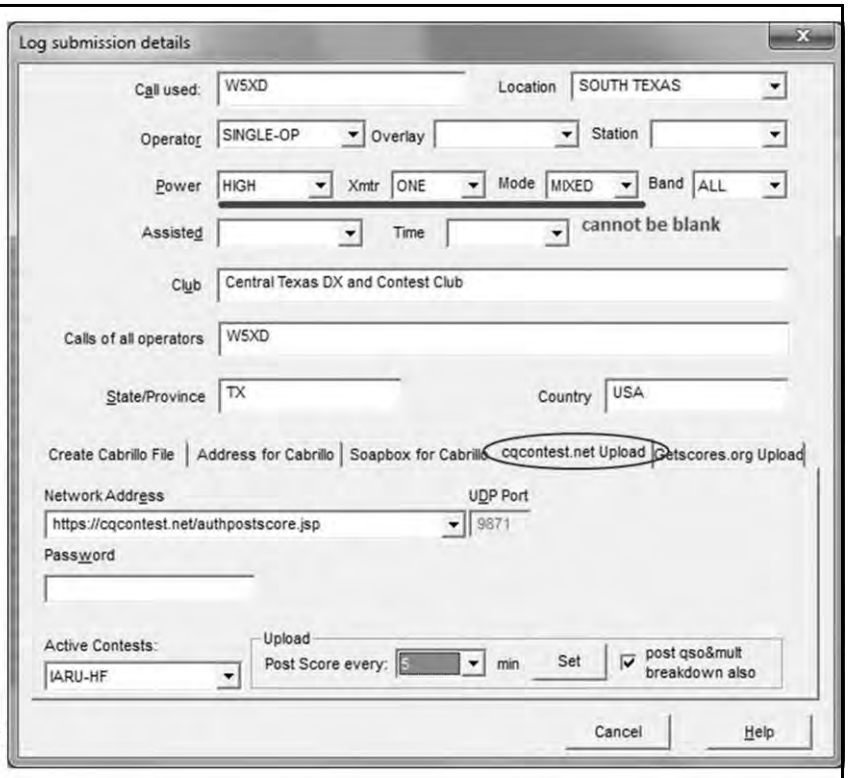

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Contesting Resources

After

- Log Analyzers
- Uniques, Busted & Not in the Log Report (UBN)

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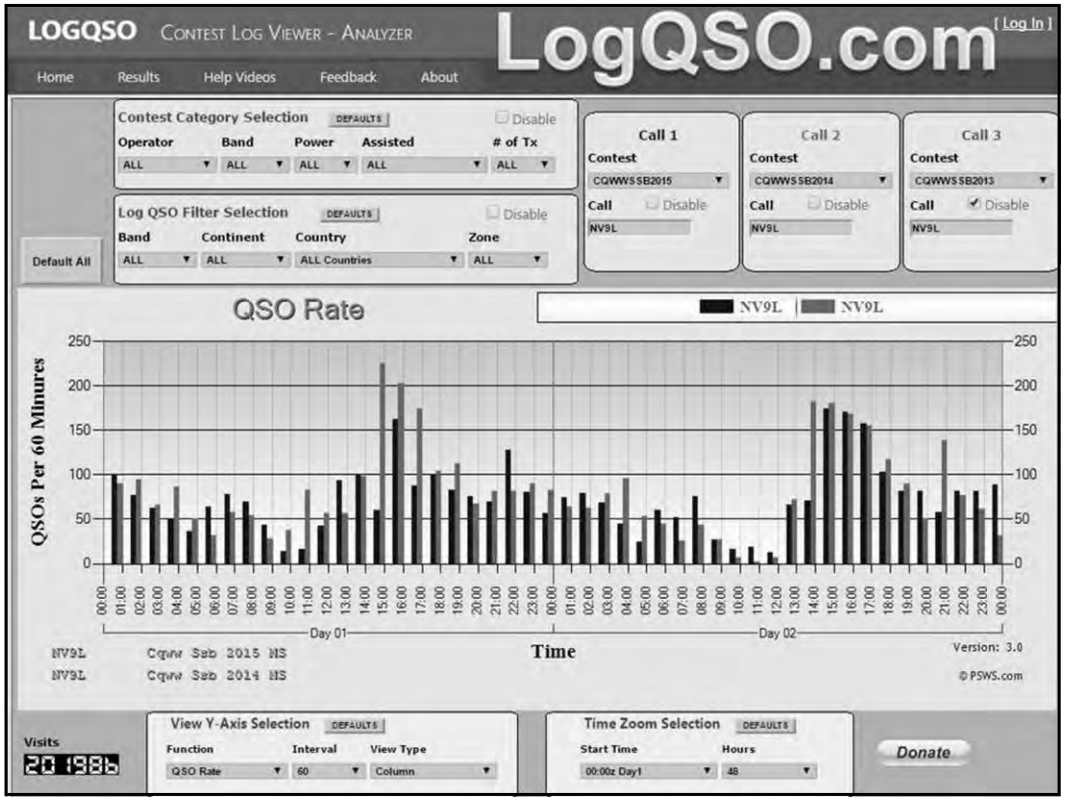

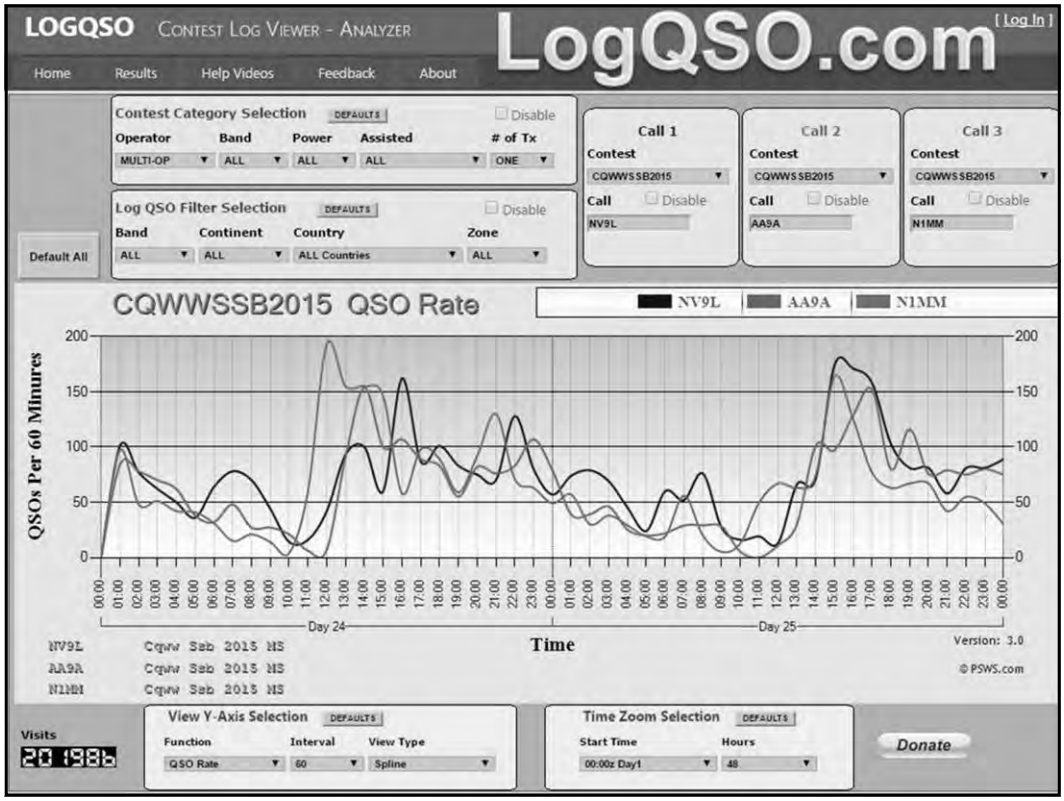
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ALL
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DEFAULTS
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Band
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Country
Zone
ALL
ALL
ALL Countries
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Default All
Call 1
Contest
CQWWSSB2015
Call
Disable
NV9L
Call 2
Contest
CQWWSSB2015
Call
Disable
AA9A
Call 3
Contest
CQWWSSB2015
Call
Disable
N1MM
CQWWSSB2015 QSO Rate
NV9L
AA9A
N1MM
QSOs Per 60 Minures
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150
100
50
0
Day 24
Day 25
Time
NV9L Cqww Ssb 2015 NS
AA9A Cqww Ssb 2015 NS
N1MM Cqww Ssb 2015 NS
Version: 3.0
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Visits
20 1886
View Y-Axis Selection
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Hours
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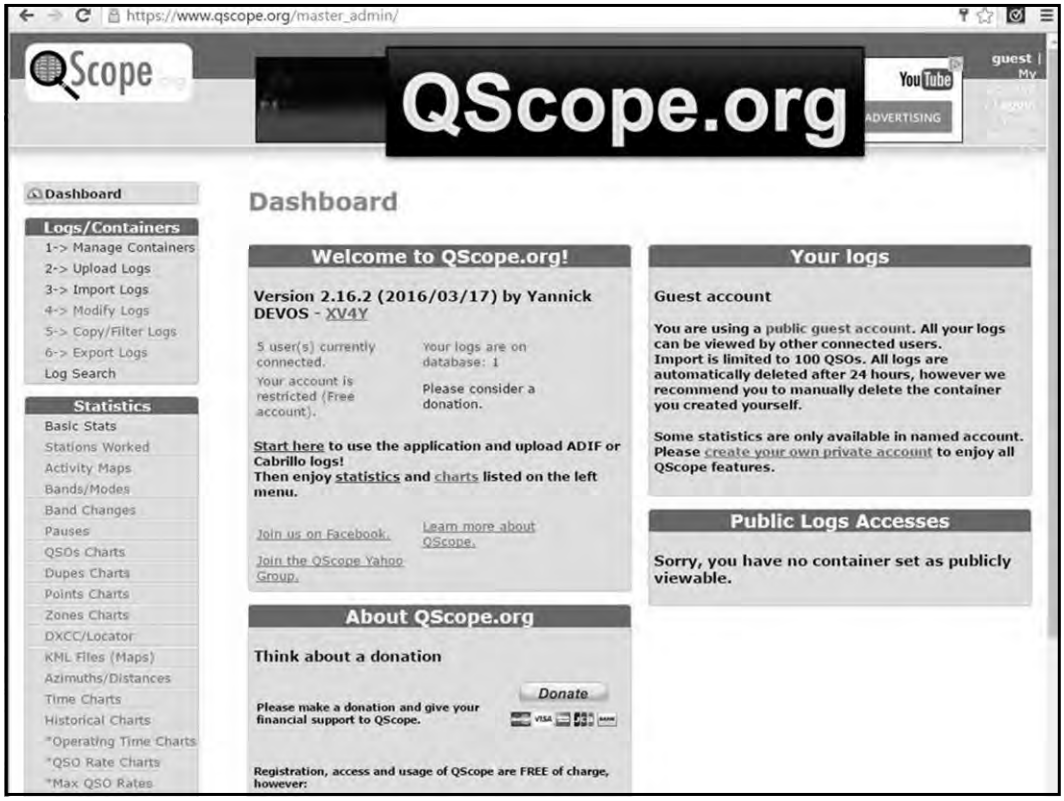
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1-> Manage Containers
2-> Upload Logs
3-> Import Logs
4-> Modify Logs
5-> Copy/Filter Logs
6-> Export Logs
Log Search
Statistics
Basic Stats
Stations Worked
Activity Maps
Bands/Modes
Band Changes
Pauses
QSOs Charts
Dupes Charts
Points Charts
Zones Charts
DXCC/Locator
KML Files (Maps)
Azimuths/Distances
Time Charts
Historical Charts
*Operating Time Charts
*QSO Rate Charts
*Max QSO Rates
Dashboard
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Version 2.16.2 (2016/03/17) by Yannick DEVOS - XV4Y
5 user(s) currently connected.
Your account is restricted (Free account).
Your logs are on database: 1
Please consider a donation.
Start here to use the application and upload ADIF or Cabrillo logs!
Then enjoy statistics and charts listed on the left menu.
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About QScope.org
Think about a donation
Please make a donation and give your financial support to QScope.
Donate
Registration, access and usage of QScope are FREE of charge, however:
Your logs
Guest account
You are using a public guest account. All your logs can be viewed by other connected users.
Import is limited to 100 QSOs. All logs are automatically deleted after 24 hours, however we recommend you to manually delete the container you created yourself.
Some statistics are only available in named account.
Please create your own private account to enjoy all QScope features.
Public Logs Accesses
Sorry, you have no container set as publicly viewable.


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https://www.qscope.org/stats/basic/analyze
QScope
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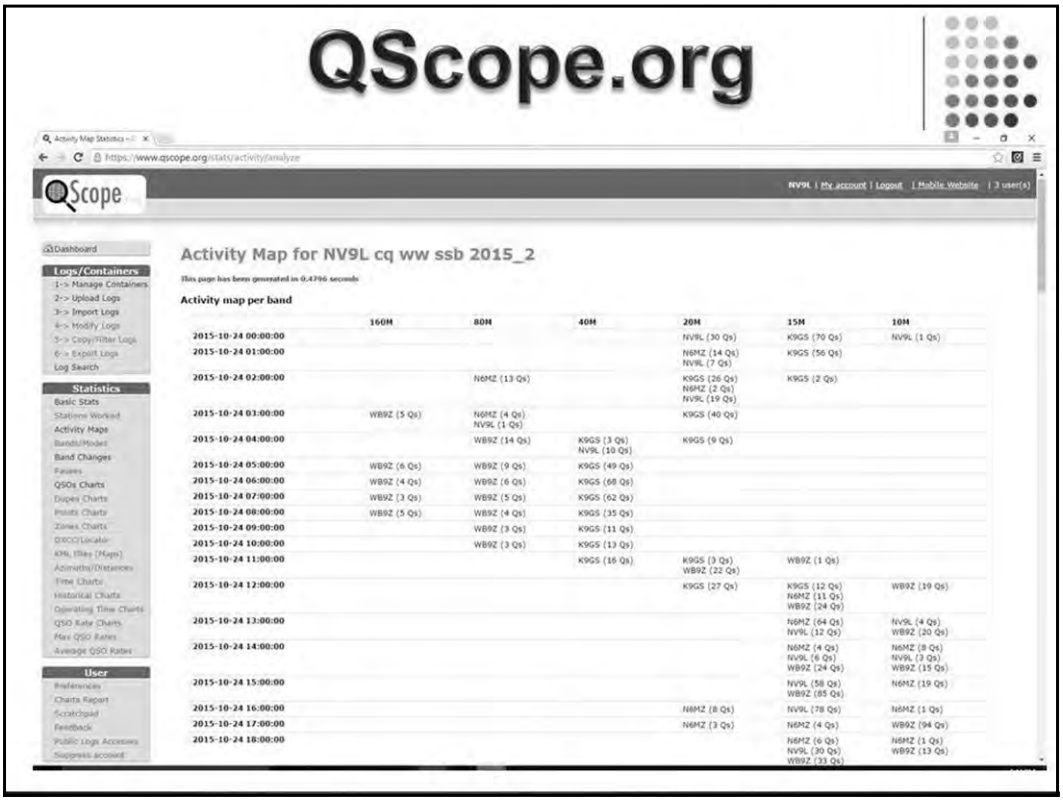
3-> Import Logs
4-> Modify Logs
5-> Copy/Filter Logs
6-> Export Logs
Log Search
Statistics
Basic Stats
Stations Worked
Activity Maps
Bands/Modes
Band Changes
Pauses
QSOs Charts
Dupes Charts
Points Charts
Zones Charts
DXCC/Locator
KML Files (Maps)
Azimuths/Distances
Time Charts
Historical Charts
Operating Time Charts
QSO Rate Charts
Max QSO Rates
Average QSO Rates
User
Preferences
Charts Report
Scratchpad
Feedback
Public Logs Accesses
Suppress account
Basic statistics for NV9L cq ww ssb 2015_2
This page has been generated in 7.225 seconds
Number of QSOs 3518
Number of Dupe QSOs (same Call, Band, Mode) 38
Imported on 2016-03-21
Operator(s) 5
First QSO at 2015-10-24 00:01:22+00
Last QSO at 2015-10-25 23:58:36+00
Event duration 1 day 23:57:14
Operating time (Not counting pauses if 10 minutes or longer) 45:14:32
Longest pause duration (Counting pauses if 10 minutes or longer) 11:31:10
Band changes number (Not relevant for multi-transmitters) 604
Band changes max duration (Not relevant for multi-transmitters) 02:41:23
Band changes min duration (Not relevant for multi-transmitters) 00:00:01
Average rate 77.77 QSOs/h
Average rate per operator 15.55 QSOs/h
Best QSO Rate for 10 minutes period 264 QSOs/hour at 2015-10-25 14:16:00
Best QSO Rate for 30 minutes period 228 QSOs/hour at 2015-10-25 14:34:00
Best QSO Rate for 60 minutes period 176 QSOs/hour at 2015-10-25 16:50:00
Distinct callsigns 2599
Distinct CQ Zones (if specified in the ADIF log) 40
Distinct ITU Zones (if specified in the ADIF log) 57
Distinct DXCC (if specified in the ADIF log) 163
Distinct Locators/Grid Squares (if specified in the ADIF log) 5


QScope.org
https://www.qscope.org/stats/activity/analyze
QScope
NV9L | My account | Logout | Mobile Website | 3 user(s)
Dashboard
Logs/Containers
Statistics
User
Activity Map for NV9L cq ww ssb 2015_2
This page has been generated in 0.4796 seconds
Activity map per band
160M 80M 40M 20M 15M 10M
2015-10-24 00:00:00 NV9L (30 Qs) K9GS (70 Qs) NV9L (1 Qs)
2015-10-24 01:00:00 N6MZ (14 Qs) NV9L (7 Qs) K9GS (56 Qs)
2015-10-24 02:00:00 N6MZ (13 Qs) K9GS (26 Qs) N6MZ (2 Qs) NV9L (19 Qs) K9GS (2 Qs)
2015-10-24 03:00:00 WB9Z (5 Qs) N6MZ (4 Qs) NV9L (1 Qs) K9GS (40 Qs)
2015-10-24 04:00:00 WB9Z (14 Qs) K9GS (3 Qs) NV9L (10 Qs) K9GS (9 Qs)
2015-10-24 05:00:00 WB9Z (6 Qs) WB9Z (9 Qs) K9GS (49 Qs)
2015-10-24 06:00:00 WB9Z (4 Qs) WB9Z (6 Qs) K9GS (68 Qs)
2015-10-24 07:00:00 WB9Z (3 Qs) WB9Z (5 Qs) K9GS (62 Qs)
2015-10-24 08:00:00 WB9Z (5 Qs) WB9Z (4 Qs) K9GS (35 Qs)
2015-10-24 09:00:00 WB9Z (3 Qs) K9GS (11 Qs)
2015-10-24 10:00:00 WB9Z (3 Qs) K9GS (13 Qs)
2015-10-24 11:00:00 K9GS (16 Qs) K9GS (3 Qs) WB9Z (22 Qs) WB9Z (1 Qs)
2015-10-24 12:00:00 K9GS (27 Qs) K9GS (12 Qs) N6MZ (11 Qs) WB9Z (24 Qs) WB9Z (19 Qs)
2015-10-24 13:00:00 N6MZ (64 Qs) NV9L (12 Qs) NV9L (4 Qs) WB9Z (20 Qs)
2015-10-24 14:00:00 N6MZ (4 Qs) NV9L (6 Qs) WB9Z (24 Qs) N6MZ (8 Qs) NV9L (3 Qs) WB9Z (15 Qs)
2015-10-24 15:00:00 NV9L (58 Qs) WB9Z (85 Qs) N6MZ (19 Qs)
2015-10-24 16:00:00 N6MZ (8 Qs) NV9L (78 Qs) N6MZ (1 Qs)
2015-10-24 17:00:00 N6MZ (3 Qs) N6MZ (4 Qs) WB9Z (94 Qs)
2015-10-24 18:00:00 N6MZ (6 Qs) NV9L (30 Qs) WB9Z (33 Qs) N6MZ (1 Qs) WB9Z (13 Qs)

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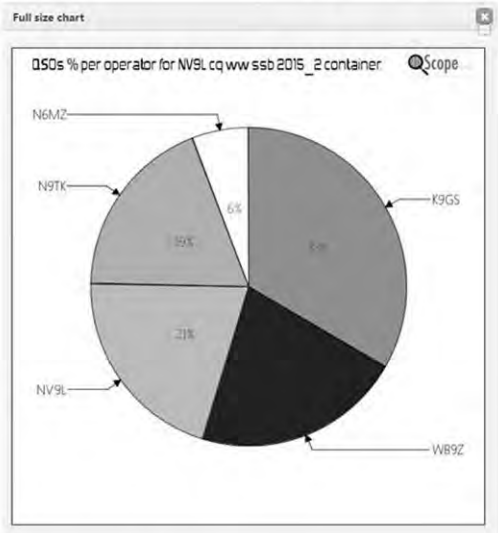

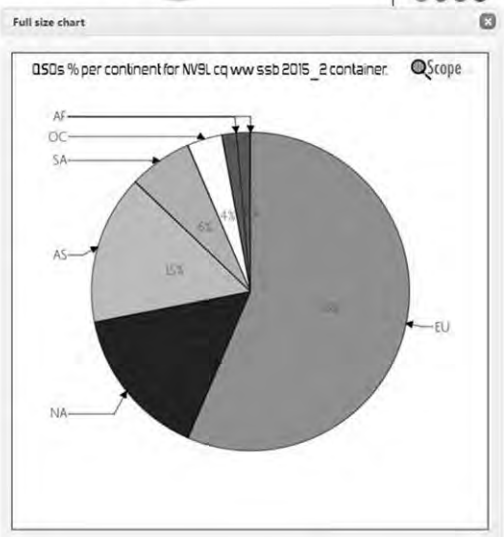

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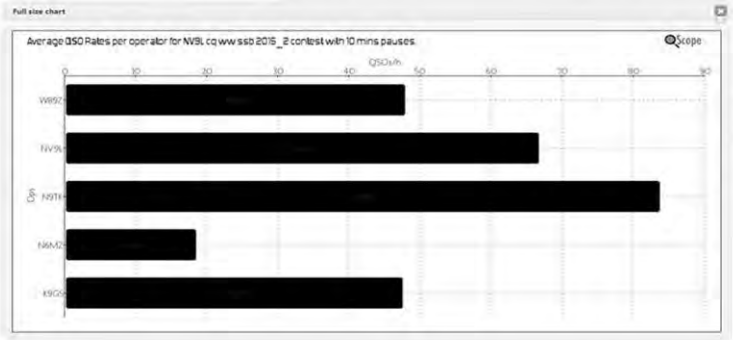
Max rates per operator



Average QSO rates per operator

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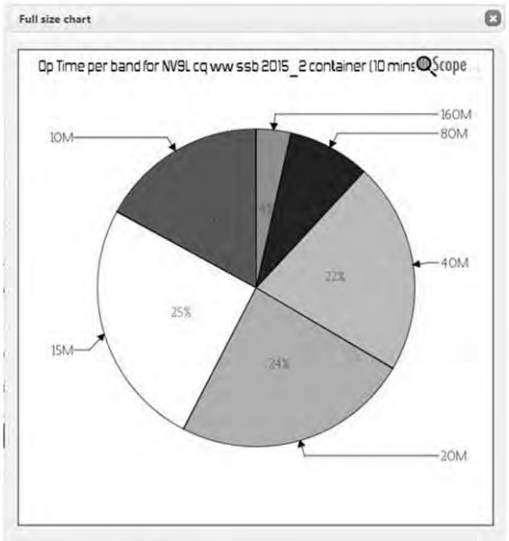

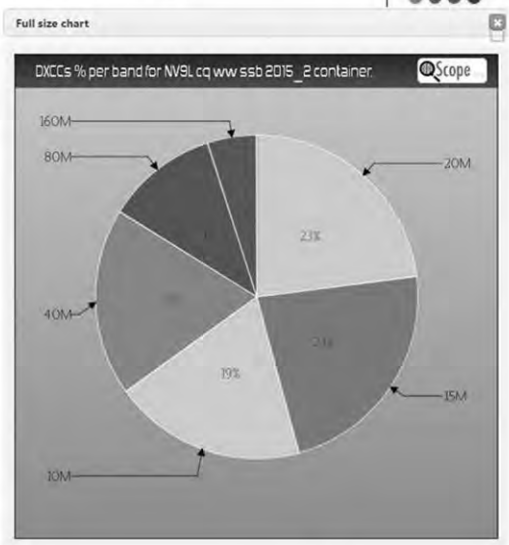

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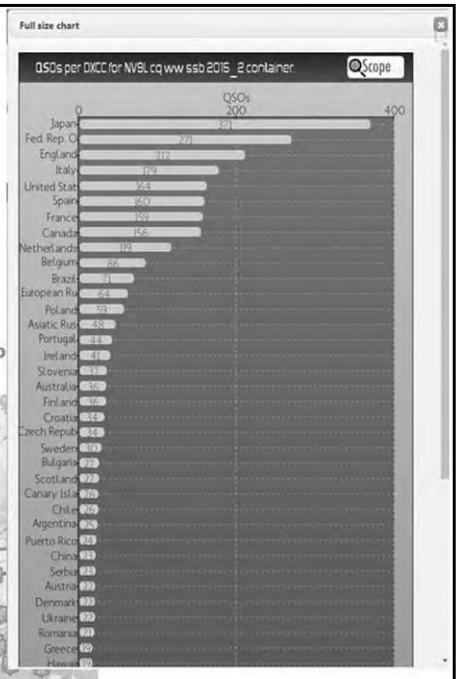

KML/KMZ Files for Google Maps overlay for NV9L cq ww ssb

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Contesting Resources

After

- Log Analyzers
- Uniques, Busted & Not in the Log Report (UBN)

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Contest:     2015 CQ WW DX SSB CONTEST
Call:        NV9L
Category:    Multi-Single High Power
Operator(s):NV9L, WB9Z, K9GS, N6MZ, N9TK

Thank you for submitting a log in the 2015 CQ WW DX SSB Contest.

Your log checking report is below. We believe it is helpful for
participants to receive information on how their log was scored.

Log checking details for CQ WW SSB 2015:
    8,251 Logs total
4,861,315 QSOs total
4,049,144 (83.3%) QSO checked against another log
3,941,462 (97.3%) QSO checked good when checked against another log
   64,296 ( 1.6%) Busted calls
   13,921 ( 0.3%) Busted exchange
   29,465 ( 0.7%) Not in log

Average Score Reduction for all logs: 10.8%  (Median 7.4%)
Average Error Rate for all logs: 3.7%

Explanation of the report sections:

Summary - A summary of the log checking results and final score for
your entry.

Results by Band - This is a band-by-band breakdown of the QSOs,
points and multipliers for your entry.

Not In Log - These contacts were not found in the other station's
log. QSO removed with additional penalty of 2x QSO points.

Incorrectly Copied - The call logged for these contacts was
determined to be incorrect. QSO removed with additional penalty
of 2x QSO points.

Incorrect Exchange Information - The information you copied does not
match what was in the other station's log. The QSO was removed.

Band Change Violations (Multi-One or Multi-Two only) - These contacts
violated the band change rules for the category. The QSO was removed.

Unique Calls Worked - These calls were not found in any other log.
They have not been removed, but our experience indicates they are
often the result of copying errors.

Lost Multipliers - This section lists the multipliers that were lost
in your log due to callsign, exchange, or other copying errors.
-C indicates lost country and -Z indicates lost zone.

Multipliers by band - This section lists the zones and countries
that were counted as multipliers in your log.

Stations Copying Your Exchange Incorrectly - This is a list of
contacts where the station you worked copied your exchange
incorrectly. You do not lose credit for these contacts.  They
are provided for your information.

Stations Copying Call Incorrectly - This is a list of all contacts we
could identify where the station you worked copied your call incorrectly.
You do not lose credit for these contacts. They are provided for your
information. If you have many similar errors, you should concentrate
on ways to send your call differently that may be easier for others
to correctly copy.
```

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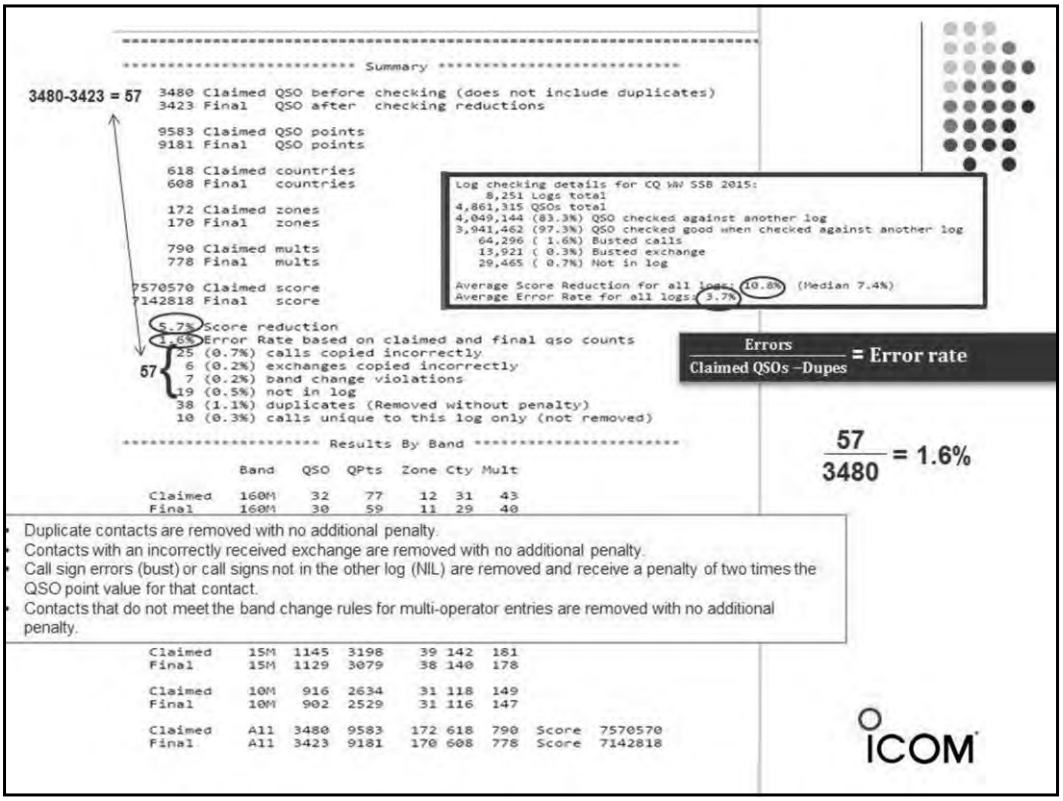
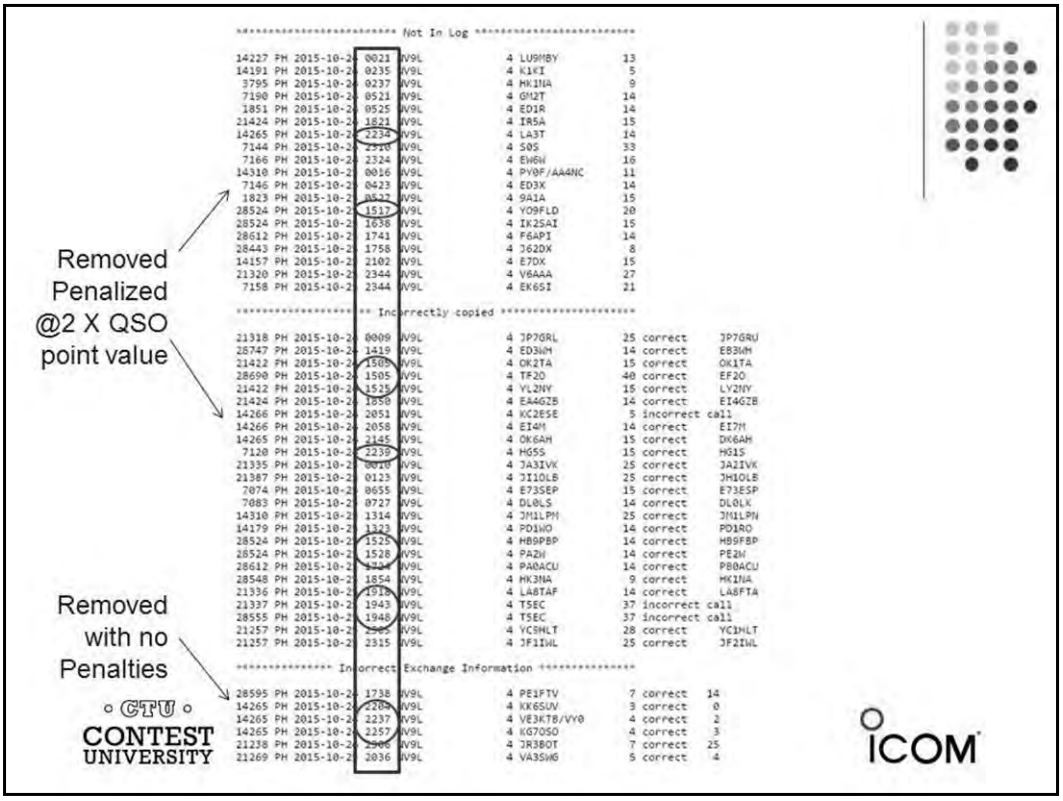

********** Summary **********
3480-3423 = 57
3480 Claimed QSO before checking (does not include duplicates)
3423 Final QSO after checking reductions
9583 Claimed QSO points
9181 Final QSO points
618 Claimed countries
608 Final countries
172 Claimed zones
170 Final zones
790 Claimed mults
778 Final mults
7570570 Claimed score
7142818 Final score
5.7% Score reduction
1.6% Error Rate based on claimed and final qso counts
57
25 (0.7%) calls copied incorrectly
6 (0.2%) exchanges copied incorrectly
7 (0.2%) band change violations
19 (0.5%) not in log
38 (1.1%) duplicates (Removed without penalty)
10 (0.3%) calls unique to this log only (not removed)
Log checking details for CQ WW SSB 2015:
8,251 Logs total
4,861,315 QSOs total
4,049,144 (83.3%) QSO checked against another log
3,941,462 (97.3%) QSO checked good when checked against another log
64,296 (1.6%) Busted calls
13,921 (0.3%) Busted exchange
29,465 (0.7%) Not in log
Average Score Reduction for all logs: 10.8% (Median 7.4%)
Average Error Rate for all logs: 3.7%
Errors / Claimed QSOs –Dupes = Error rate
57 / 3480 = 1.6%
Duplicate contacts are removed with no additional penalty.
Contacts with an incorrectly received exchange are removed with no additional penalty.
Call sign errors (bust) or call signs not in the other log (NIL) are removed and receive a penalty of two times the QSO point value for that contact.
Contacts that do not meet the band change rules for multi-operator entries are removed with no additional penalty.
********** Results By Band **********
Band QSO QPts Zone Cty Mult
Claimed 160M 32 77 12 31 43
Final 160M 30 59 11 29 40
Claimed 15M 1145 3198 39 142 181
Final 15M 1129 3079 38 140 178
Claimed 10M 916 2634 31 118 149
Final 10M 902 2529 31 116 147
Claimed All 3480 9583 172 618 790 Score 7570570
Final All 3423 9181 170 608 778 Score 7142818
ICOM


********** Not In Log **********
14227 PH 2015-10-24 0021 JV9L 4 LU9MBY 13
14191 PH 2015-10-24 0235 JV9L 4 K1KI 5
3795 PH 2015-10-24 0237 JV9L 4 MK1NA 9
7190 PH 2015-10-24 0521 JV9L 4 GM2T 14
1851 PH 2015-10-24 0525 JV9L 4 ED1R 14
21424 PH 2015-10-24 1821 JV9L 4 IR5A 15
14265 PH 2015-10-24 2234 JV9L 4 LA3T 14
7144 PH 2015-10-24 2310 JV9L 4 S0S 33
7166 PH 2015-10-24 2324 JV9L 4 EW6W 16
14310 PH 2015-10-25 0016 JV9L 4 PY0F/AA4NC 11
7146 PH 2015-10-25 0423 JV9L 4 ED3X 14
1823 PH 2015-10-25 0522 JV9L 4 9A1A 15
28524 PH 2015-10-25 1517 JV9L 4 YO9FLD 20
28524 PH 2015-10-25 1638 JV9L 4 IK2SAI 15
28612 PH 2015-10-25 1741 JV9L 4 F6API 14
28443 PH 2015-10-25 1758 JV9L 4 J62DX 8
14157 PH 2015-10-25 2102 JV9L 4 E7DX 15
21320 PH 2015-10-25 2344 JV9L 4 V6AAA 27
7158 PH 2015-10-25 2344 JV9L 4 EK6SI 21
Removed Penalized @2 X QSO point value
********** ** Incorrectly copied **********
21318 PH 2015-10-24 0009 JV9L 4 JP7GRL 25 correct JP7GRU
28747 PH 2015-10-24 1419 JV9L 4 ED3WM 14 correct EB3WM
21422 PH 2015-10-24 1505 JV9L 4 OK2TA 15 correct OK1TA
28690 PH 2015-10-24 1505 JV9L 4 TF2O 40 correct EF2O
21422 PH 2015-10-24 1525 JV9L 4 YL2NY 15 correct LY2NY
21424 PH 2015-10-24 1858 JV9L 4 EA4GZB 14 correct EI4GZB
14266 PH 2015-10-24 2051 JV9L 4 KC2ESE 5 incorrect call
14266 PH 2015-10-24 2058 JV9L 4 EI4M 14 correct EI7M
14265 PH 2015-10-24 2145 JV9L 4 OK6AH 15 correct DK6AH
7120 PH 2015-10-24 2239 JV9L 4 HG5S 15 correct HG1S
21335 PH 2015-10-25 0010 JV9L 4 JA3IVK 25 correct JA2IVK
21387 PH 2015-10-25 0123 JV9L 4 JI1OLB 25 correct JH1OLB
7074 PH 2015-10-25 0655 JV9L 4 E73SEP 15 correct E73ESP
7083 PH 2015-10-25 0727 JV9L 4 DL0LS 14 correct DL0LX
14310 PH 2015-10-25 1314 JV9L 4 JM1LPH 25 correct JM1LPN
14179 PH 2015-10-25 1323 JV9L 4 PD1KO 14 correct PD1RO
28524 PH 2015-10-25 1525 JV9L 4 HB9PBP 14 correct HB9FBP
28524 PH 2015-10-25 1528 JV9L 4 PA2W 14 correct PE2W
28612 PH 2015-10-25 1724 JV9L 4 PA0ACU 14 correct PB0ACU
28548 PH 2015-10-25 1854 JV9L 4 HK3NA 9 correct HK1NA
21336 PH 2015-10-25 1916 JV9L 4 LA8TAF 14 correct LA8FTA
21337 PH 2015-10-25 1943 JV9L 4 T5EC 37 incorrect call
28555 PH 2015-10-25 1948 JV9L 4 T5EC 37 incorrect call
21257 PH 2015-10-25 2305 JV9L 4 YC9MLT 28 correct YC1MLT
21257 PH 2015-10-25 2315 JV9L 4 JF1IWL 25 correct JF2IWL
Removed with no Penalties
********** Incorrect Exchange Information **********
28595 PH 2015-10-24 1738 JV9L 4 PE1FTV 7 correct 14
14265 PH 2015-10-24 2204 JV9L 4 KK6SUV 3 correct 0
14265 PH 2015-10-24 2237 JV9L 4 VE3KTB/VY0 4 correct 2
14265 PH 2015-10-24 2257 JV9L 4 KG7OSO 4 correct 3
21238 PH 2015-10-24 2308 JV9L 4 JR3BOT 7 correct 25
21269 PH 2015-10-25 2036 JV9L 4 VA3SWG 5 correct 4
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Removed with no Penalties

********** Band Change Violations **********

3751	PH	2015-10-24	0716	NV9L	4	FY5KE	9
3696	PH	2015-10-24	0718	NV9L	4	FG4KH	8
28310	PH	2015-10-24	1443	NV9L	4	CN8VO	33
21257	PH	2015-10-24	1706	NV9L	4	PZ5RA	9
28458	PH	2015-10-24	1931	NV9L	4	TO2A	9
21321	PH	2015-10-24	2215	NV9L	4	FY5KE	9
7166	PH	2015-10-24	2310	NV9L	4	N9TK	4

********** Unique Calls Worked (not removed) **********

7134	PH	2015-10-24	0812	NV9L	4	VK7GGT	30
14265	PH	2015-10-24	2215	NV9L	4	VE7AAT	3
14265	PH	2015-10-24	2215	NV9L	4	KD4AOZ	5
14265	PH	2015-10-24	2240	NV9L	4	W2RIK	5
21240	PH	2015-10-24	2344	NV9L	4	[illegible]	25
7148	PH	2015-10-25	0950	NV9L	4	VK3HP	30
28524	PH	2015-10-25	1627	NV9L	4	DL0ABW	3
28612	PH	2015-10-25	1729	NV9L	4	[illegible]	3
21257	PH	2015-10-25	2316	NV9L	4	[illegible]	24
21257	PH	2015-10-25	2320	NV9L	4	JJ1CZR	25

Not removed & No Penalties

********** Lost Multipliers **********

3795	PH	2015-10-24	0237	NV9L	4	HK1NA	9	Not in log	-C
1851	PH	2015-10-24	0525	NV9L	4	ED1R	14	Not in log	-C
7144	PH	2015-10-24	2310	NV9L	4	S0S	33	Not in log	-C
14310	PH	2015-10-25	0016	NV9L	4	PY0F/AA4NC	11	Not in log	-C
1823	PH	2015-10-25	0527	NV9L	4	9A1A	15	Not in log	-C
1823	PH	2015-10-25	0527	NV9L	4	9A1A	15	Not in log	-Z
28443	PH	2015-10-25	1758	NV9L	4	J62DX	8	Not in log	-C
21337	PH	2015-10-25	1943	NV9L	4	T5EC	37	incorrect call	-C
21337	PH	2015-10-25	1943	NV9L	4	T5EC	37	incorrect call	-Z
28555	PH	2015-10-25	1948	NV9L	4	T5EC	37	incorrect call	-C
21320	PH	2015-10-25	2344	NV9L	4	V6AAA	27	Not in log	-C
7158	PH	2015-10-25	2344	NV9L	4	EK6SI	21	Not in log	-C

********** Multipliers by band **********

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********** Stations Copying Your Exchange Incorrectly**********

14289	PH	2015-10-24	0032	PJ2T	9	NV9L	5 should be 4
14000	PH	2015-10-24	0405	VE2ZT	5	NV9L	5 should be 4
7160	PH	2015-10-24	0448	TM0T	14	NV9L	5 should be 4
7000	PH	2015-10-24	0701	EA3HSD	14	NV9L	8 should be 4
7000	PH	2015-10-24	1115	VE2ZT	5	NV9L	5 should be 4
21312	PH	2015-10-24	1302	SN5X	15	NV9L	5 should be 4
28578	PH	2015-10-24	1406	YT0Z	15	NV9L	5 should be 4
21422	PH	2015-10-24	1522	YT5IVN	15	NV9L	5 should be 4
21000	PH	2015-10-24	1530	LZ1BY	20	NV9L	5 should be 4
28595	PH	2015-10-24	1753	IU7BOE	15	NV9L	5 should be 4
28295	PH	2015-10-24	1922	OH1Z	15	NV9L	5 should be 4
7000	PH	2015-10-25	0048	A61BK	21	NV9L	5 should be 4
7000	PH	2015-10-25	1329	KJ4QML	5	NV9L	5 should be 4
28[illegible]	P[illegible]	2015-10-25	1341	9A3B	15	NV9L	5 should be 4
28[illegible]	P[illegible]	2015-10-25	16[illegible]	[illegible]NO	14	NV9L	5 should be 4
28523	P[illegible]	2015-10-25	16[illegible]	[illegible]Q	14	NV9L	5 should be 4
28523	PH	2015-10-25	16[illegible]	[illegible]	14	NV9L	5 should be 4
28611	PH	2015-10-25	17[illegible]	[illegible]TG	14	NV9L	5 should be 4
28612	PH	2015-10-25	1744	P[illegible]	14	NV9L	5 should be 4
14156	PH	2015-10-25	2104	MW6PMO	14	NV9L	5 should be 4

Not Removed & No Penalties

********** Stations Copying NV9L Incorrectly**********

21000	PH	2015-10-24	0052	R4Q	28	NF9L	4
3719	PH	2015-10-24	0227	[illegible]	14	NE9L	4
14191	PH	2015-10-24	0237	VE6FI	14	NV9I	4
3764	PH	2015-10-24	0302	LZ9W	14	NV9L	4
14000	PH	2015-10-24	0355	K9QVB	14	NV9L	4
7151	PH	2015-10-24	0449	VE2PIB	14	NV9L	4
7150	PH	2015-10-24	0714	F1UBA	14	N9VL	4
7158	PH	2015-10-24	0759	CU4DX	14	N9VL	4
21210	PH	2015-10-24	1335	IQ2MI	15	NV2L	4
21345	PH	2015-10-24	1435	HB2T	14	NE9L	4
21422	PH	2015-10-24	1541	LA3ZPA	14	NV1L	4
21000	PH	2015-10-24	1547	US4IQS	16	NV1L	4
21000	PH	2015-10-24	1825	F2AR	14	NV1L	5
21312	PH	2015-10-24	1935	PY5ZD	11	NV8L	4
21228	PH	2015-10-24	1959	CV3D	13	NV9ML	4
14000	PH	2015-10-24	2148	EA5/LA7VK	14	NV1L	4
7127	PH	2015-10-24	2310	RK4FD	16	NV5L	4
21304	PH	2015-10-25	0015	DU1RB	27	NW9L	4
14227	PH	2015-10-25	0149	RK3VWA	16	NW9L	4
7199	PH	2015-10-25	0444	9A1P	15	ENV9L	16
14178	PH	2015-10-25	1322	RL4F	16	NV1L	5
28523	PH	2015-10-25	1531	SQ7OVT	15	NW9L	4
28000	PH	2015-10-25	1539	DF9IX	14	N9VL	4
28415	PH	2015-10-25	1658	EA3CCN	14	NV7L	4
28612	PH	2015-10-25	1742	OO7P	14	NV1L	4
28388	PH	2015-10-25	1835	KP4QQ	8	NV9LA	4
28000	PH	2015-10-25	1850	CU2AF	14	NE9L	4
21337	PH	2015-10-25	1935	LA2ONA	14	NW9L	4
21380	PH	2015-10-25	2047	JA2AXB	25	NV9V	4
21000	PH	2015-10-25	2143	JA1NFD	25	N69L	4
21000	PH	2015-10-25	2208	PY3PA	11	NV3L	4

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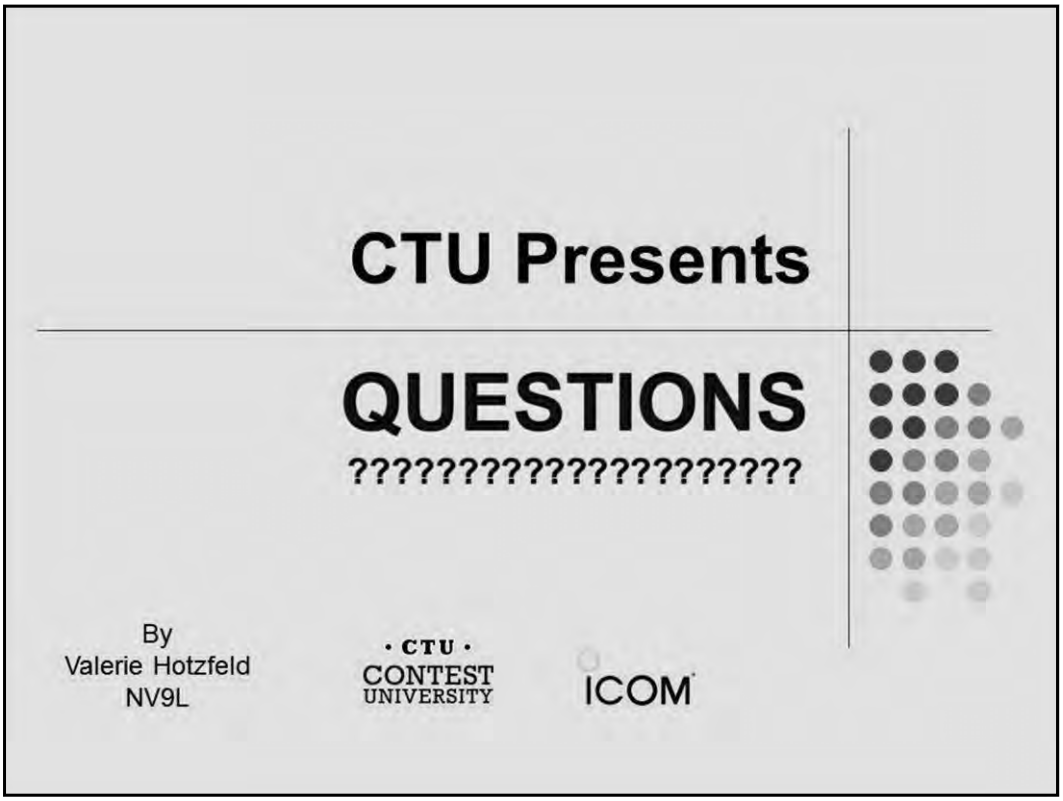
CTU Presents
QUESTIONS
??????????????????????
By
Valerie Hotzfeld
NV9L
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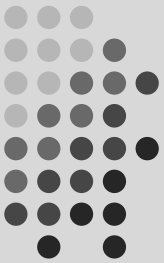
How to Record an Entire Contest and Learn From Your Mistakes

Presented by N6TV
n6tv@arrl.net



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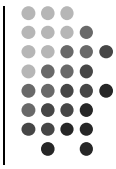
Presentation Overview



- Why record a contest?
- How to record an entire contest
- How to record analog audio on a PC sound card
- How to record digital audio from a radio's sound card
- How to record two radios (SO2R) at once
- How to record with Logging Software
- How to learn from your mistakes (and mine)
- Q & A

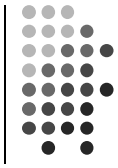
Why record the entire contest?

- You can learn a lot
  - Review highlights (and lowlights) with your contest Elmer
  - Send audio excerpts to friends
  - Review Log Check Report, improve skill & accuracy
- You can help others
  - Publish web page where people can listen to their QSOs with you
  - Bad audio? Bad keying? Send them a clip
- Got intermittent noise?
  - Analyze audio spectrum, send clip to RFI experts
- For top competitors, a recording may be required

CQ WW Rule XII.C – Audio Recordings

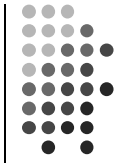
- "Any single operator entrant competing for a top three finish at the (a) World, (b) Continent, or (c) USA levels, must record the transmitted and received audio as heard by the operator for the duration of the contest operation.
- "The recording must be in a common format (e.g., mp3) and should include the audio to each ear as a separate channel
- "The recording may be requested by the Committee within 90 days after the log deadline to help adjudicate the log
- "The recording files must be provided by the entrant within 5 days of the request.
- "If no recording is made available, the Committee may reclassify or disqualify the entry."

Can I use a recording to fix my log?



- CQ WW Rule IX.9:
  "Correction of logged call signs and exchanges after the contest by using any database, recordings, email or other methods of confirming QSOs is not allowed."
- So, do *not* use a recording make corrections

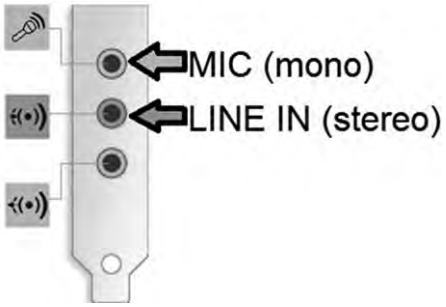
How do I make a recording?



- Connect headphone output to PC
- Before the contest starts, start recording
- Simple enough, right?
- Nope
  - Headphone level much too high for MIC or LINE inputs
  - Any recorded audio will be severely distorted
  - Interface circuit required

First challenge

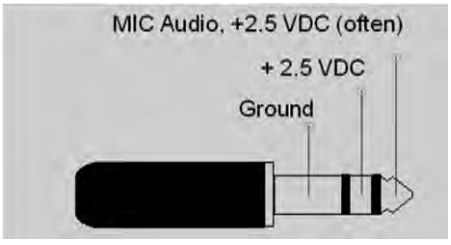
- Headphone audio is stereo, PC MIC input is MONO (even though it uses a stereo plug)



- Most notebook PC do not have a LINE IN

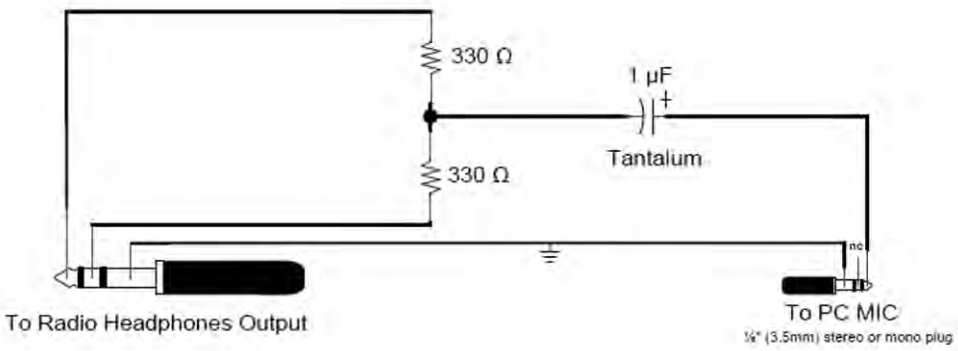
Second challenge

- "Stereo" PC MIC jack provides DC power to small condenser mics:



- Must block this DC voltage
  - Using mono plug grounds RING, but does *not* block DC on TIP
- Must attenuate headphone audio to mic. level

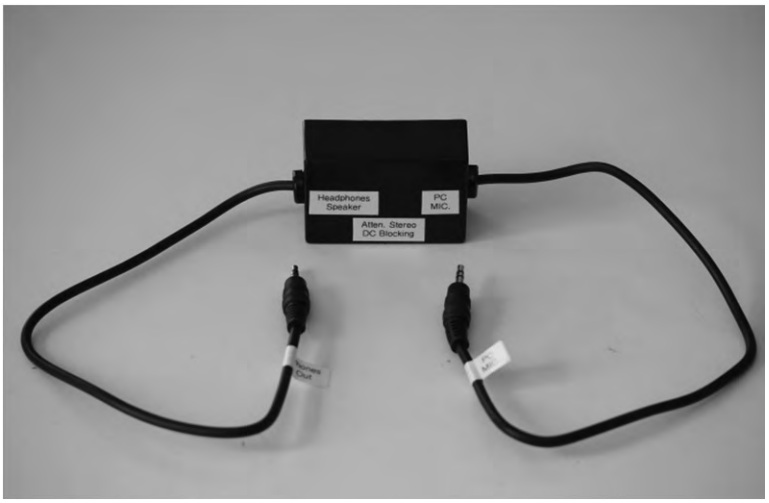
Solution – mix audio, block DC



(Mono recording not good enough for “Top 3” CQ WW competitors, but OK for everyone else)

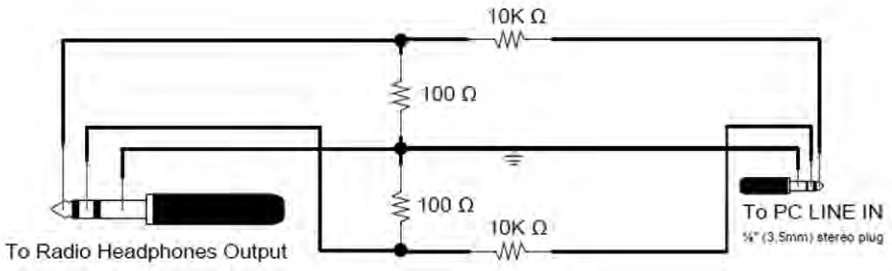
Fit inside ¼” stereo headphone plug

For 1/8” plugs, use a project box

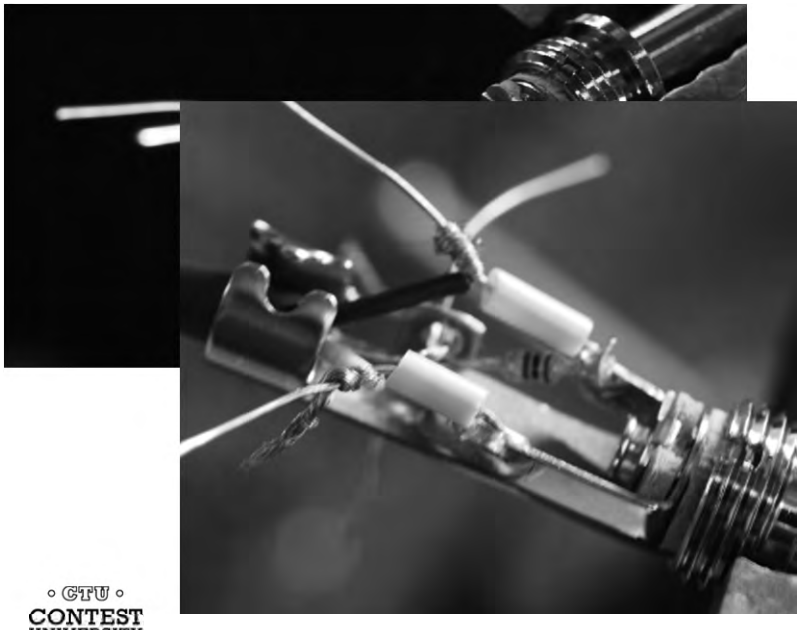


For recording stereo via LINE IN

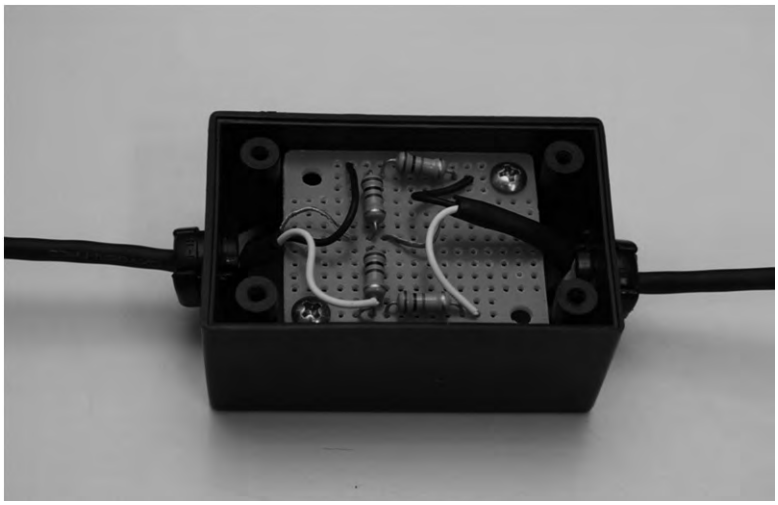
- DC blocking cap. not needed
- Use impedance pad to attenuate to line level



LINE IN circuit inside ¼" stereo headphones plug



LINE IN circuit in a project box



You may also buy rather than build

Olympus KA-333 Compaticord, Connects Earphone or Headphone Jack Output to Mic Input Jack
by Olympus
13 customer reviews | 8 answered questions

"Can't I just connect LINE OUT to LINE IN?"

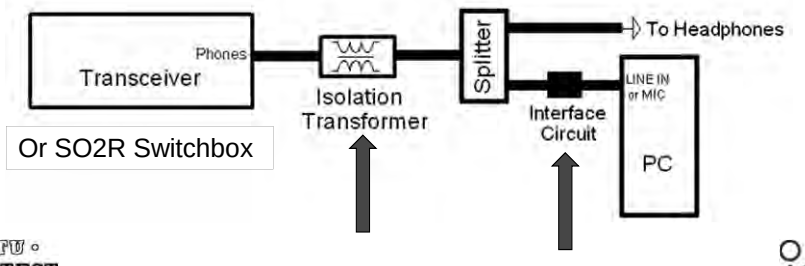
- Yes, but that's not what you heard in your headphones
- Many radios do *not* forward audio monitor to LINE OUT
  - Transmissions will not be recorded
- Elecraft K3 works OK, has nice isolated stereo LINE OUT jack
  - Simple stereo patch cable from LINE OUT to PC LINE IN or MIC
  - LINE IN will record stereo
  - MIC will record MONO
- But …
  - LEFT channel will be VFO A (Main) only
  - RIGHT channel will be VFO B (SubRx), but *only* when SUB activated, otherwise *nothing!*
  - Transmitted audio is forwarded to *both* channels
- Recording will not match your contest experience

For radios with two headphone jacks

- Connect headphones to first jack
- Connect PC interface circuit to second
- If no change in headphone audio, you're good to go

For radios with one headphone jack

- Using a simple stereo "T" or Y-adapter (splitter)
  - Will probably cause unacceptable noise from PC
  - Ground loops
- Solution: Use **line isolation transformer** between radio and splitter



Radio Shack® "Ground Loop Isolator"

- Works quite well (though not shielded)
- Requires phono adapters
- May be hard to find
- Cat. No. 270-054

Ebtech Hum Eliminator

- Two isolated LINE IN / OUT pairs, shielded
- Four ¼" MONO phono connectors
- Requires phono to stereo adapters

Avoiding the Analog Problems

- Some radios have a S/PDIF (digital optical) audio output
- Requires sound card with S/PDIF input:

S/PDIF IN (Analog Stereo Line IN)

HDE 6 Channel 5.1 Surround Sound USB 2.0 External Optical Audio Sound Card Adapter for PC Laptop
by HDE
77 customer reviews
| 20 answered questions

List Price: ~~$39.99~~
Price: $12.95 + $2.99 shipping
You Save: $27.04 (68%)

Newest HF transceivers look like external USB sound cards

- Radio treated as external sound card named **USB AUDIO CODEC**
- USB Sound Card Radios:
  - Elecraft K3S
  - Icom IC-7300, IC-7851
  - Kenwood TS-590S, TS-990S
  - Yaesu FT-991
  - FlexRadio 6700
- No need for isolation transformer, splitter, or level conversion circuit
- Use USB Audio CODEC as recording source

However …

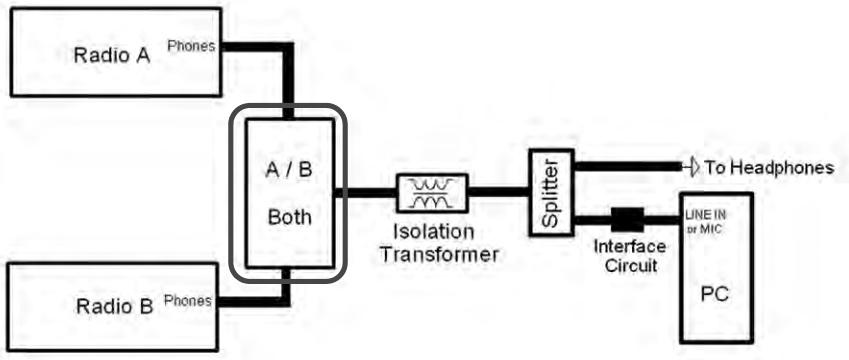
- Transmitted audio may *not* be recorded
  - IC-7851 records transmitted SSB OK
  - IC-7851 does *not* record transmitted CW at all (yet)
- It *may* be possible to use radio USB sound card as *both* voice keyer and contest recorder at same time (works OK in IC-7851)
- TS-590S? Elecraft K3S? FT-991?

Recording SO2R (now it gets complicated)

- Easiest (but most expensive) solution: microHAM MK2R+ (does it all)

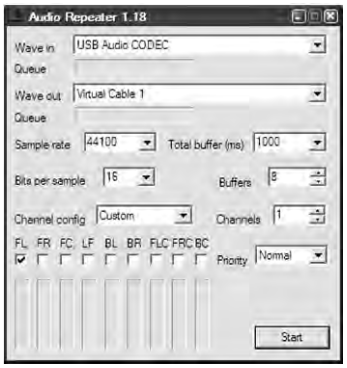
- Includes two USB Sound Cards (DVK + Stereo Recording)
- Will record “What You Hear” in headphones
- Set recording source to microHAM **USB Audio CODEC**

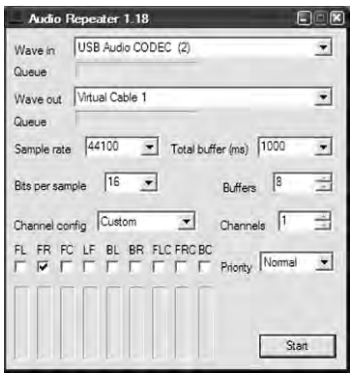
For SO2R, record output of headphone switch



SO2R Digital Recording

- Can use Virtual Audio Cable (VAC) “Repeaters” to mix digital stereo inputs together



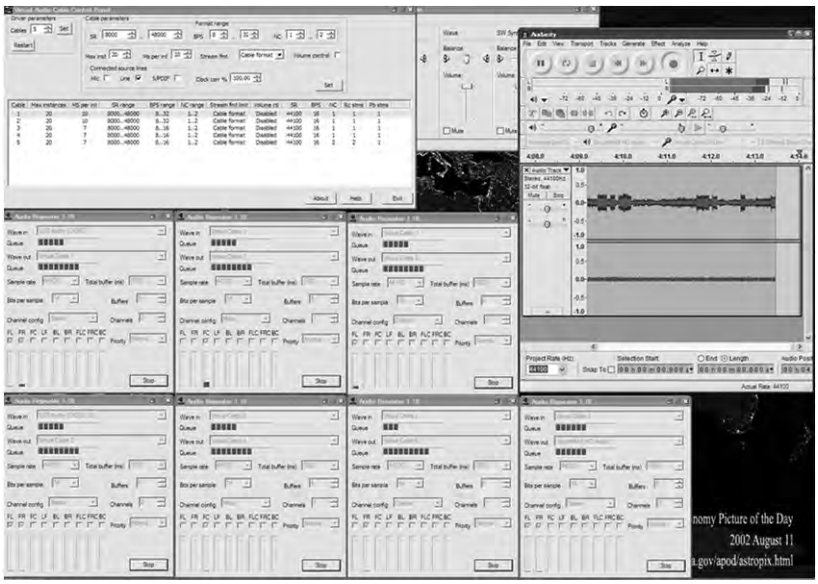


- But … radio USB sound card may not record transmitted audio

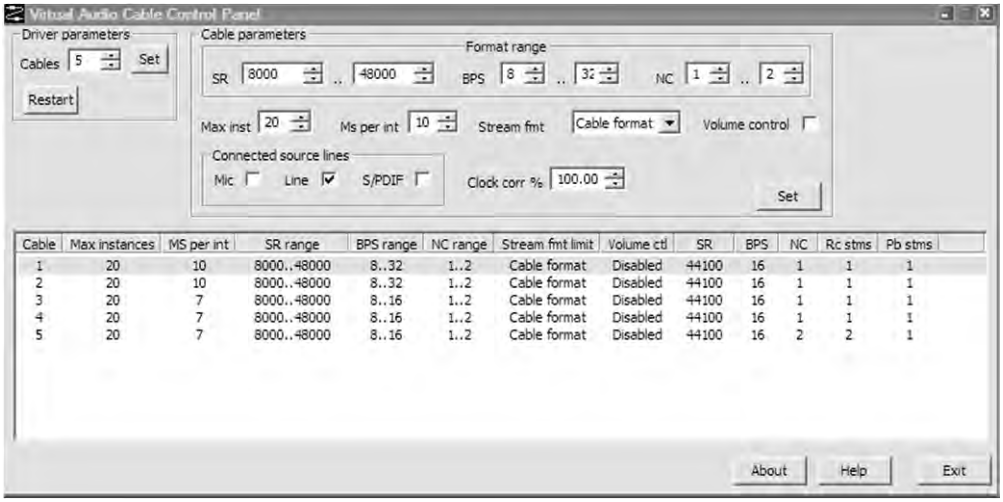
A Test – Mix *four* audio sources

- Four audio channels mixed into a single Virtual Cable for recording in stereo
  - Left Channel: Rig A Main + SubRx (stereo-to-mono mix)
  - Right Channel: Rig B Main + SubRx (stereo-to-mono mix)
- Had to define of five (5) VACs
- Had to start six (6) VAC Audio Repeaters

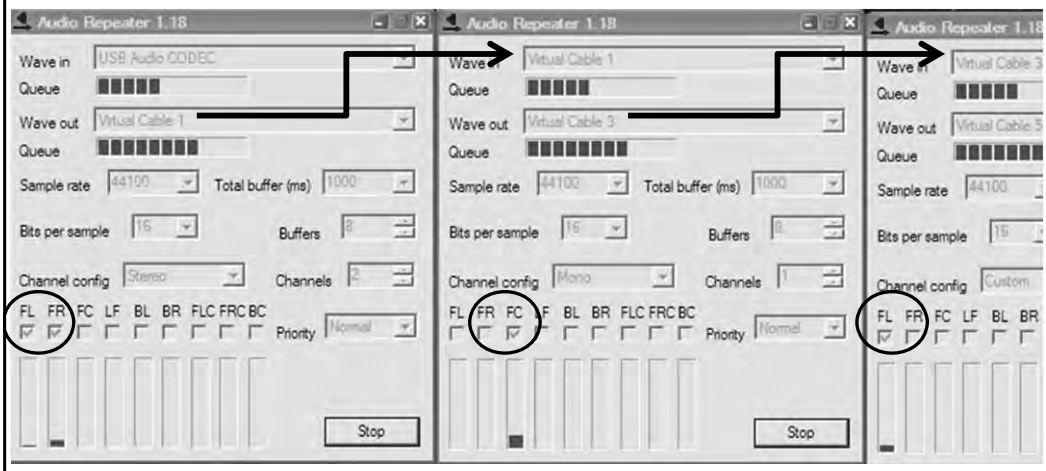
Here's what it looked like



Defining Five VACs



Chaining VAC repeaters to mix Stereo to Mono to Left Channel



How to Autostart Audio Repeaters

- Can use Windows shortcut, but batch file can automate startup:
  - Left Channel:

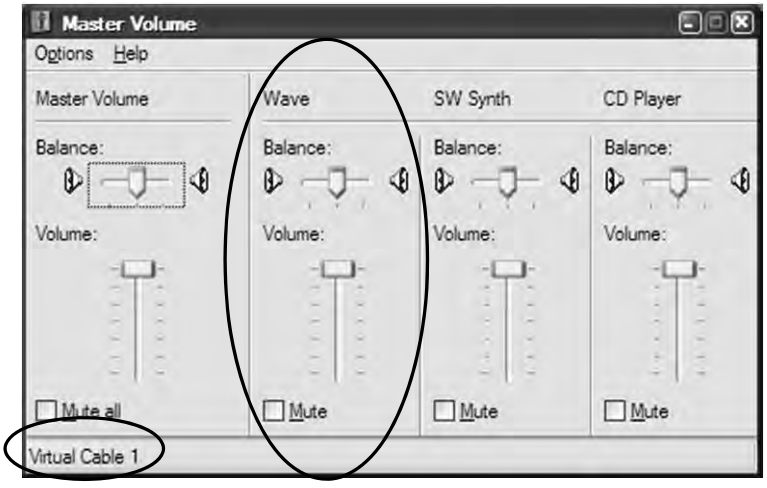
```
"C:\Program Files\Virtual Audio Cable\audiorepeater.exe"
/Input:"USB Audio CODEC " /Output:"Virtual Cable 1"
/Channels:1 /ChanCfg:custom=1 /SamplingRate:44100
/BitsPerSample:16 /AutoStart
```

  - Right Channel:

```
"C:\Program Files\Virtual Audio Cable\audiorepeater.exe"
/Input:"USB Audio CODEC  (2)" /Output:"Virtual Cable 1"
/Channels:1 /ChanCfg:custom=2 /SamplingRate:44100
/BitsPerSample:16 /AutoStart
```

- Had to use extra blanks in CODEC names!
- Arguments are *case-sensitive*

Rec. volume set by VAC WAV *Output*



What if <u>two computers</u> are used for SO2R?

- You need two sound cards in one PC
- Use Virtual Audio Cable to mix them
  - USB Audio CODEC (From Rig A, local, digital)
  - USB Audio CODEC 2 (USB Sound Card)
    LINE IN/MIC (From Rig B, remote, analog)
    -or-
    S/PDIF IN (digital)
- Supports single combined stereo recording of two radios on single PC
- Recording analog headphone output is simpler, but that requires interface circuits

How to add a second sound card?

- Try external USB (HDE 6 shown previously)
- Turtle Beach Audio Advantage Amigo II

Downloading and Buying Virtual Audio Cable

- http://software.muzychenko.net/eng/vac.htm
  - ~$25 (self-support), $35 (basic support), $50 (extended support)

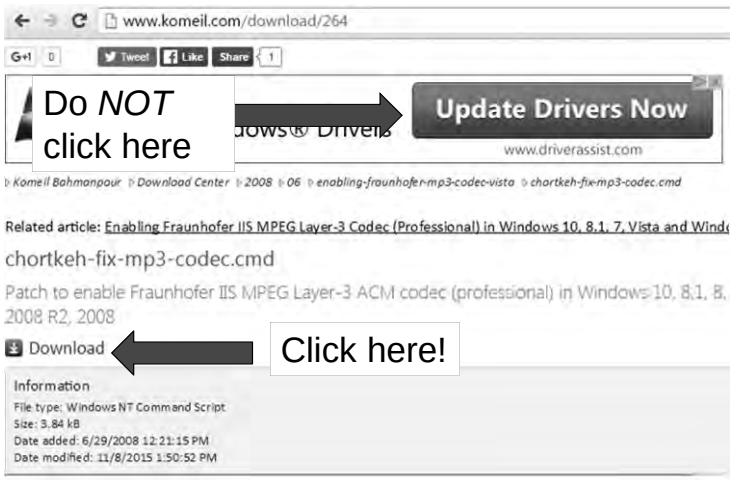
Using Logging Software to Record

- Example is from Win-Test (others briefly)
- Recording to MP3 using the Fraunhofer CODEC (built-in to Windows, but hidden)
- Compressed audio files < 1.4 GB / 48 hours
- Play back any QSO using logging window
- Just move cursor to QSO and click **Play** button

First, we need Fraunhofer MP3 CODEC

- Windows XP has it already
- For Windows Vista to Win10, enable CODEC by running batch file:
  The Chortkeh fix (updates the Windows registry)
- Download from
  http://www.komeil.com/download/264

Getting the Chortkeh Fix

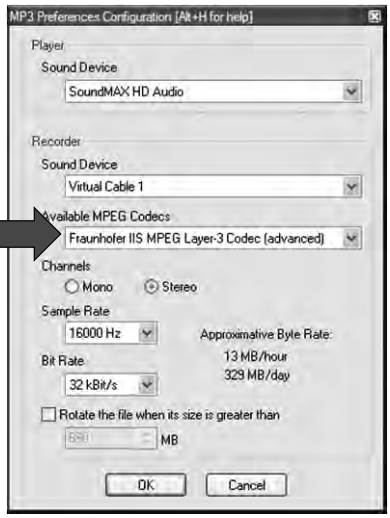


Running the Chortkeh fix batch file (.cmd)

- Download the .cmd file
- Right click on the .cmd file and select **Run as an Administrator**
- No reboot required, just restart Win-Test

Set Recording Parameters (Win-Test)

- From the menu, select **Options | MP3 Configuration…** or type **MP3SETUP** [Enter] in the logging window



Before the contest starts, start recording

- From the menu, select **Windows | Contest Recorder**
- Click the record button

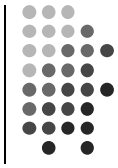
- Check **start recording automatically**, click **OK**

Recorder starts recording

- Recording normally:

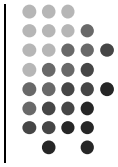
- Record level too high!

Setting record levels



- Better to **record low** than too high (amplify later)
- Don't let audio peaks get into red zone
- Adjustment varies by **recording source**:
  - Headphone jack –
    Radio volume control + PC Sound Card MIC or LINE IN slider
    Recording Devices > Properties > Levels
  - LINE OUT jack – Fixed level, a radio setting
    K3 CONFIG:LIN OUT
  - USB Audio CODEC (radio sound card) – Icom Menu
    USB MOD LEVEL
  - USB Audio CODEC (microHAM MK2R+) –
    Turn level **knobs** on SO2R box, top right corner
  - Virtual Cable 1 –
    WAV OUT slider

Setting sound card record level



- Right click on speaker icon in Windows task bar, select **Recording Devices**
- (Or Control Panel, Search: **Manage Audio Devices > Recording** tab)
- Select recording device (MIC, LINE, S/PDIF, etc)
- Click **Properties** button
- Click **Levels** tab

Windows 7 Recording Levels

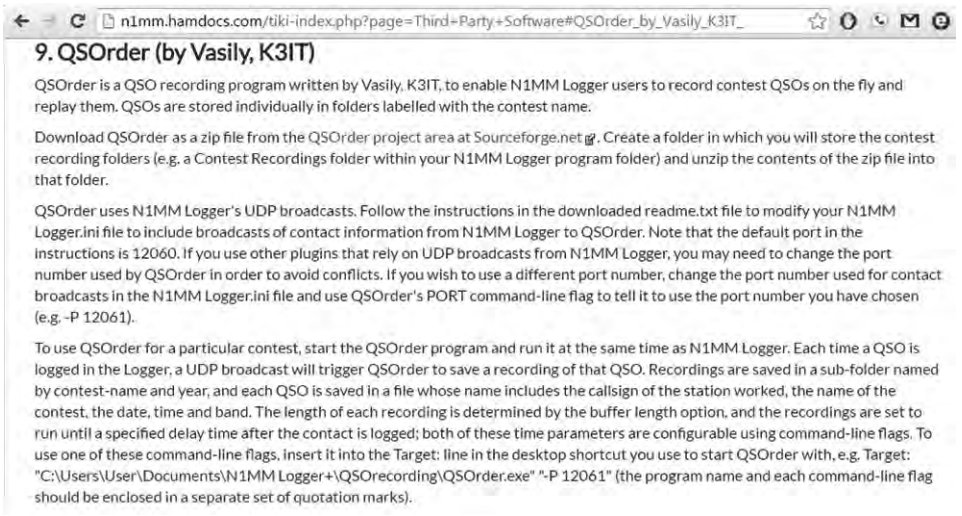
Publish contest audio on the web

- Win-Test QSO Player
  http://download.win-test.com/utils/wtQsoPlayer.zip
- Generates Web Page, e.g. http://bit.ly/R39Maudio

Listen to your QSO with R39M during the 2010 World Radiosport Team Championship (WRTC) contest!

Enter your callsign : Search

Recording with N1MM Logger



n1mm.hamdocs.com/tiki-index.php?page=Third+Party+Software#QSOrder_by_Vasily_K3IT_

9. QSOrder (by Vasily, K3IT)

QSOrder is a QSO recording program written by Vasily, K3IT, to enable N1MM Logger users to record contest QSOs on the fly and replay them. QSOs are stored individually in folders labelled with the contest name.

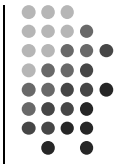
Download QSOrder as a zip file from the QSOrder project area at Sourceforge.net. Create a folder in which you will store the contest recording folders (e.g. a Contest Recordings folder within your N1MM Logger program folder) and unzip the contents of the zip file into that folder.

QSOrder uses N1MM Logger's UDP broadcasts. Follow the instructions in the downloaded readme.txt file to modify your N1MM Logger.ini file to include broadcasts of contact information from N1MM Logger to QSOrder. Note that the default port in the instructions is 12060. If you use other plugins that rely on UDP broadcasts from N1MM Logger, you may need to change the port number used by QSOrder in order to avoid conflicts. If you wish to use a different port number, change the port number used for contact broadcasts in the N1MM Logger.ini file and use QSOrder's PORT command-line flag to tell it to use the port number you have chosen (e.g. -P 12061).

To use QSOrder for a particular contest, start the QSOrder program and run it at the same time as N1MM Logger. Each time a QSO is logged in the Logger, a UDP broadcast will trigger QSOrder to save a recording of that QSO. Recordings are saved in a sub-folder named by contest-name and year, and each QSO is saved in a file whose name includes the callsign of the station worked, the name of the contest, the date, time and band. The length of each recording is determined by the buffer length option, and the recordings are set to run until a specified delay time after the contact is logged; both of these time parameters are configurable using command-line flags. To use one of these command-line flags, insert it into the Target: line in the desktop shortcut you use to start QSOrder with, e.g. Target: "C:\Users\User\Documents\N1MM Logger+\QSOrecording\QSOrder.exe" "-P 12061" (the program name and each command-line flag should be enclosed in a separate set of quotation marks).

Recording with WriteLog

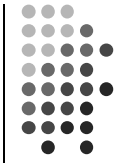
Reviewing your Log Check Report



- http://www.arrl.org/contest-log-checking-reports
  Sign in to see your LCRs
- http://www.cqww.com/lcr/
  http://www.cqwpx.com/lcr/

  "An email with the link to your private log checking report is sent to the email account you used to submit the log."

What you'll see in the LCR



- CROSS CHECK RESULTS

```
------------------
QSO #151: Received QSO# 59 should be 69
N0IJ
QSO #220: QSO not found in log of WA1S
QSO #533: Received QSO# 5 should be 56
KS7T
QSO #546: QSO not found in log of VE3MM
QSO #638: Received QSO# 281 should be 28
VE4DXR
```

- Go back and listen to these QSOs and figure out what happened
- Cross check results not perfect, but usually *very* good
- Best way to learn is from your mistakes, so *listen* to them

To Review

- Recording mono to a sound card is easy
- Recording stereo is harder
- Recording two stereo radios (SO2R) is even harder
- Recording what you hear in the headphones – **best choice for SO2R**
- Use real cables / isolators
- USB Sound Card digital mixing can work too; use virtual cables
- It really works – try it!

Questions?

- http://www.k6jrf.com/FT_HUM.html
  K6JRF Technical Review of Audio Isolators
- http://www.qrz.com/db/N6TV
  Links to this and other presentations
- http://www.audiosystemsgroup.com/publish.htm
  K9YC on “Hum, Buzz, RF Interference”

CTU 2016 Presents

Advanced RTTY Contesting

Ed Muns, W0YK

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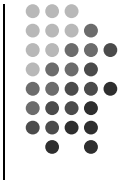
Advanced RTTY Contesting



- 1st CTU session: *"Getting Started in RTTY Contesting"*
- Radio Configuration
- Messages
- Keyboard Optimization
- Super Check Partial & Pre-Fill
- Callsign Stacking
- Multiple Decoders
- SO2V, SO2R-SOnR
- Logging Software
- Ergonomics

Radio Configuration

AGC

- Turn off AGC
  - or, at least minimize
- AGC increases error rate in modern software decoders
- Use minimum discernible headphone volume
  - Ear protection from loud signals

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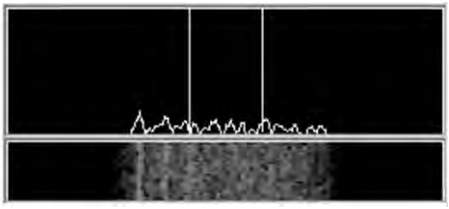
Radio Configuration

decoder level

- Decoder audio level
  - Band noise 5% of full-scale
- Note 500 Hz IF filtering



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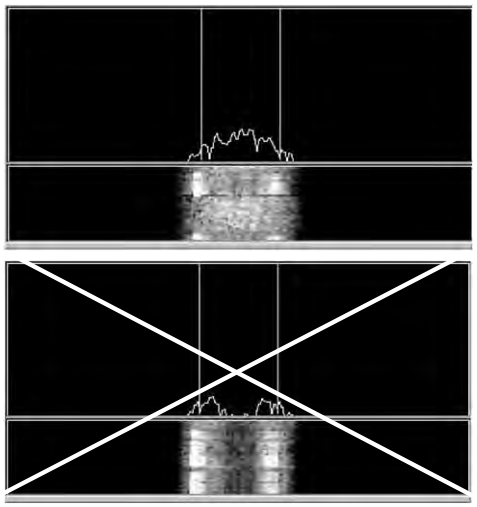
Radio Configuration

IF filtering

- PC Audio isolation
  - Transformer
  - Commercial interface
  - Some radios (K3)
- Narrow IF filters (Roofing & DSP)
  - 500 Hz - normal
  - 250 Hz - strong QRM only
  - Tone filters – don't use!
    - Icom Twin Peak Filter
    - K3 Dual-Tone Filter
- Audio filtering
  - JPS NIR-10/12
  - Timewave DSP-599zx
  - Modern DSP rigs



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Radio Configuration

soundcard levels

- Adjust levels in Windows Volume Control
  *(or, in MMTTY **Options/Soundcard** …)*
  - Use isolation transformer, if needed
  - Mute other inputs and outputs
- RX audio goes to LINE IN (or, MIC w/pad)
  - ***Options/Soundcard input level***
- TX AFSK audio (mic) comes from LINE OUT
  - ***Options/Soundcard output level***
  - Turn off radio compression (speech proc.)
  - Avoid over-drive

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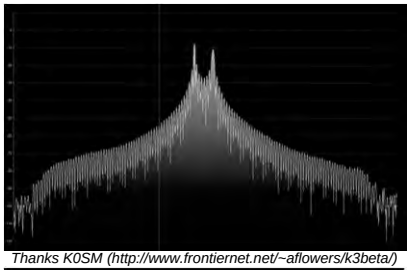
Radio Configuration

FSK bandwidth

Old K3 FSK bandwidth

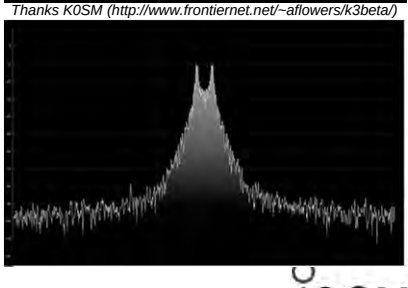
- No waveshaping
- < DSP281 firmware
- Typical of all radios
- 50 watts



Thanks K0SM (http://www.frontiernet.net/~aflowers/k3beta/)

New K3 FSK bandwidth

- Optimal DSP filter
- DSP281+ firmware, March 2013
- Lobby other mfrs



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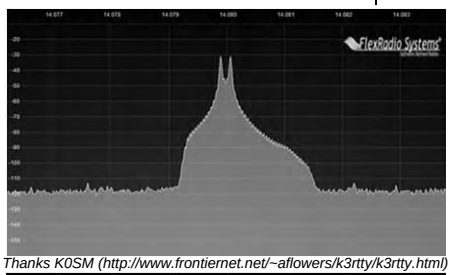
Radio Configuration

AFSK bandwidth

MMTTY - AFSK

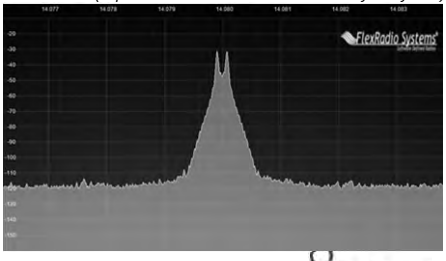
- No filtering
- K3 @ 1 mW



Thanks K0SM (http://www.frontiernet.net/~aflowers/k3rtty/k3rtty.html)

MMTTY - AFSK

- Default 48-tap TX BPF
- K3 @ 1 mW



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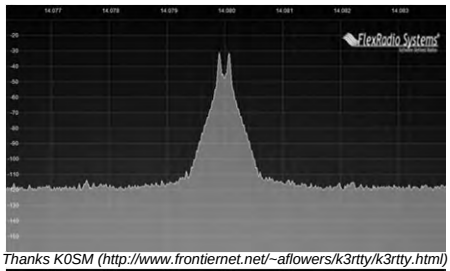
Radio Configuration

AFSK bandwidth

MMTTY - AFSK

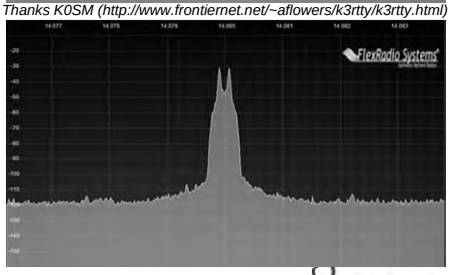
- Default 48-tap TX BPF
- K3 @ 1 mW



Thanks K0SM (http://www.frontiernet.net/~aflowers/k3rtty/k3rtty.html)

MMTTY - AFSK

- 512-tap TX BPF
- K3 @ 1 mW



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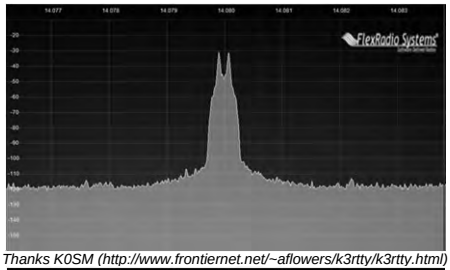
Radio Configuration

AFSK bandwidth

MMTTY - AFSK

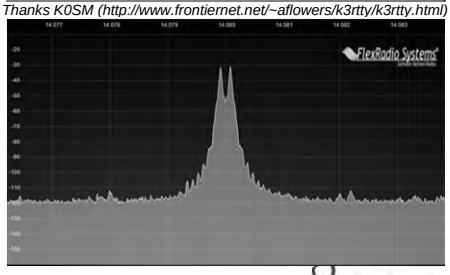
- 512-tap TX BPF
- K3 @ 1 mW



Thanks K0SM (http://www.frontiernet.net/~aflowers/k3rtty/k3rtty.html)

2Tone - AFSK

- Default “AM” setting
- K3 @ 1 mW



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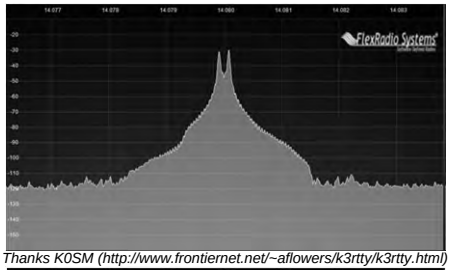
Radio Configuration

PA IMD impact on AFSK bandwidth

MMTTY - AFSK

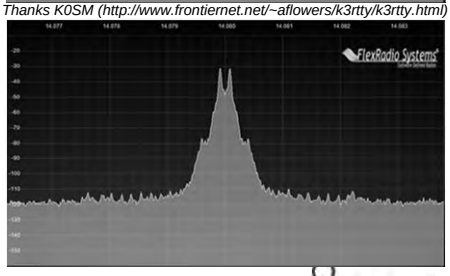
- No filtering
- K3 @ 100 watts



Thanks K0SM (http://www.frontiernet.net/~aflowers/k3rtty/k3rtty.html)

MMTTY - AFSK

- 512-tap TX BPF
- K3 @ 100 watts



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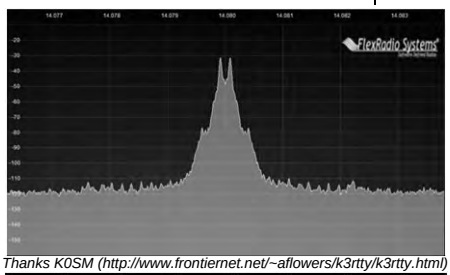
ICOM

Radio Configuration

PA IMD impact on AFSK bandwidth

MMTTY - AFSK

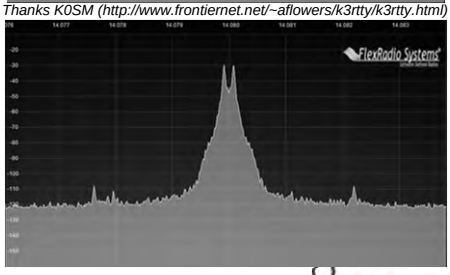
- 512-tap TX BPF
- K3 @ 100 watts



Thanks K0SM (http://www.frontiernet.net/~aflowers/k3rtty/k3rtty.html)

MMTTY - AFSK

- No MMTTY filter
- K3 AFSK filter
- K3 @ 100 watts



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Radio Configuration

FSK & AFSK bandwidth

FSK

- Use radio FSK filter
  - DSP TX filter (K3)
  - Crystal TX filter (K3)
  - Lobby other mfrs
- Otherwise, use AFSK
  - With TX filtering
  - Properly adjusted

AFSK

- Use radio AFSK filter
  - DSP TX filter (K3)
  - Crystal TX filter (K3)
  - Lobby other mfrs
- Use MODEM TX filter
  - MMTTY 512-tap
  - 2Tone default

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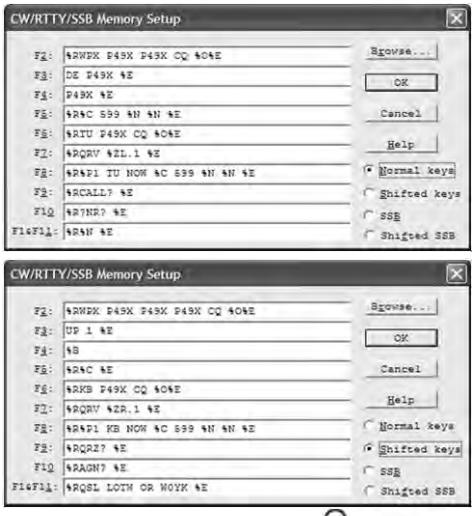
Messages

- Short, as with CW/SSB
- No extraneous info
- 599 (not 5NN) once
- Serial number twice
- Space (not hyphen)
- Omit ‘DE’
- RTTY chars (%R, %E)

www.rttycontesting.com/tutorials/messages



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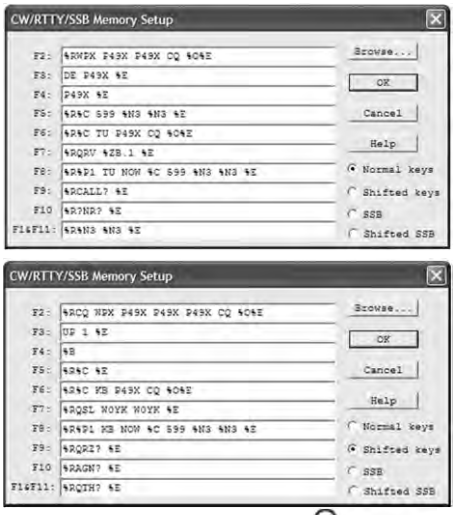
Messages

optimize

- Modular
  - Chaining
- Group logically
- Supports a cadence



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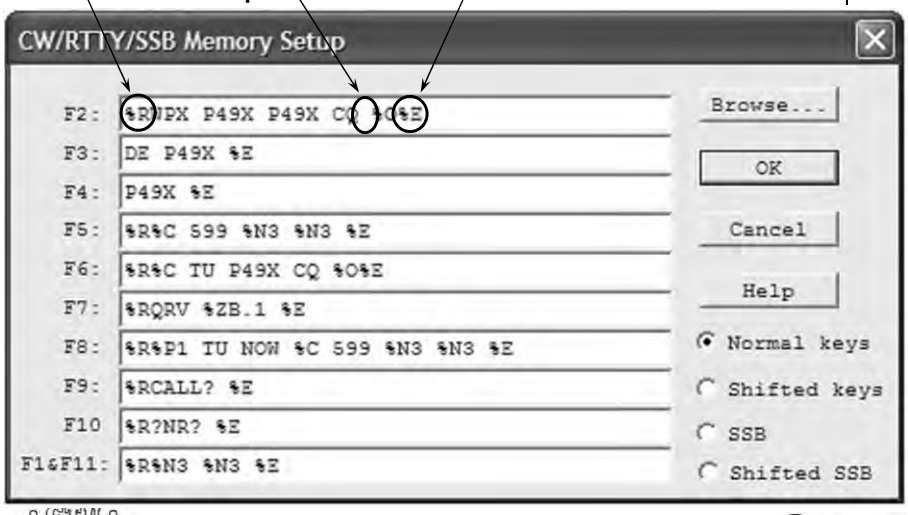
Messages

formatting

CR/LF Space Receive



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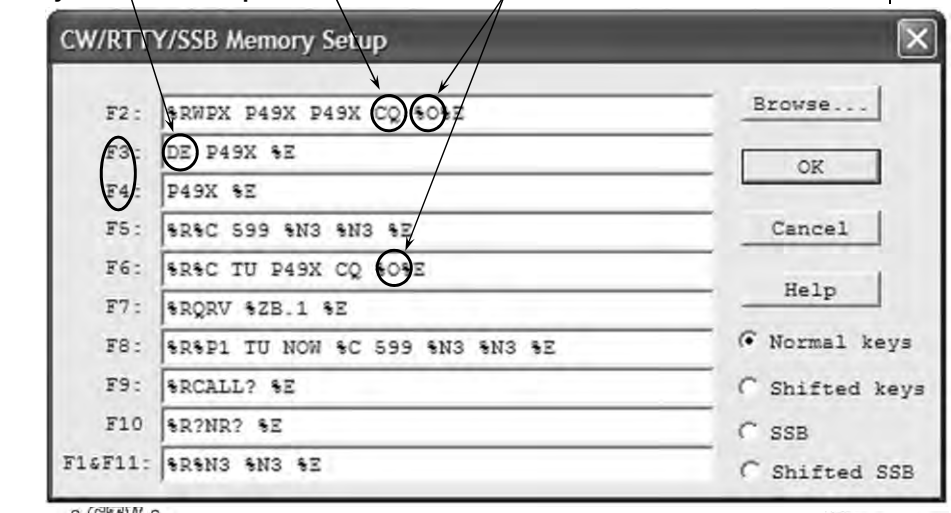
Messages

efficiency



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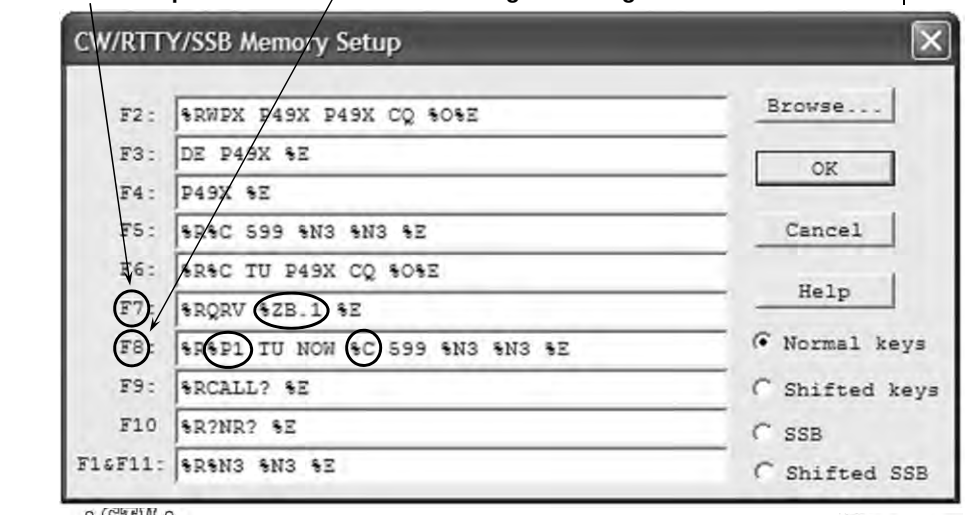
Messages

special



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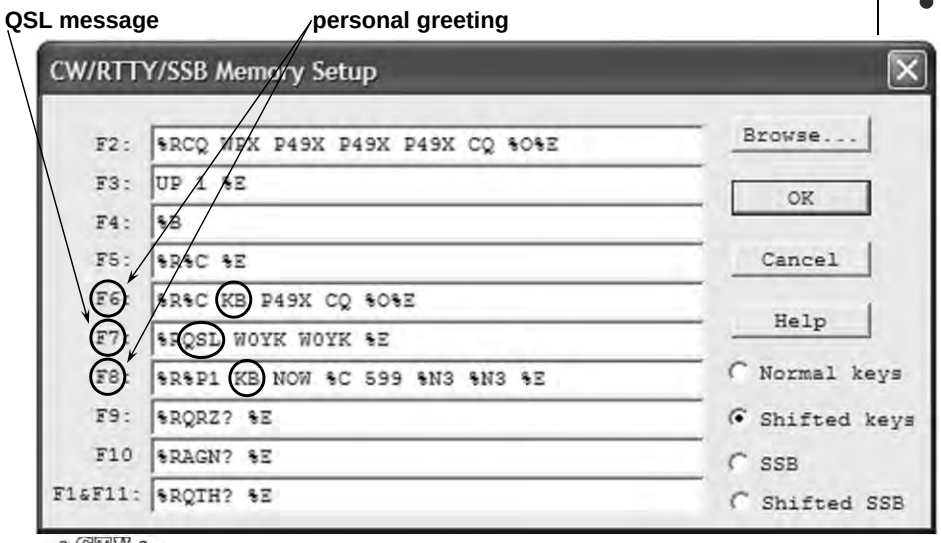
Messages

personal



Messages

CQ WW RTTY

- WW W1UE W1UE CQ
- <his call> 599 05
  (TU) 599 05
- TU W1UE CQ

- W1UE
- ZN
- AGN
- ?

Messages

CQ WPX RTTY

- WPX AK1W AK1W CQ
- <his call> 599 1867 1867
  (TU) 599 1867 1867
- TU AK1W CQ

- AK1W
- NR
- AGN
- ?

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Messages

NA RTTY Sprint

- NA N0NI N0NI CQ
- <his call> N0NI 154 154 TONI TONI IA IA
  <his call> 154 154 TONI TONI IA IA N0NI
- TU

- N0NI
- NR
- NAME
- QTH
- AGN
- ?

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Messages: Space Delimiter

*UnShift On Space**

UOS or USOS

TX RX	599 123 123	599 CA CA
UOS on	f599 f123 f123	f599 CA CA
UOS on	f599 f123 f123	f599 CA CA
UOS on	f599 f123 f123	f599 CA CA
UOS off	f599 f123 f123	f599 :- :-
UOS off	f599 123 123	f599 lCA CA
UOS on	f599 QWE QWE	f599 lCA CA
UOS off	f599 123 123	f599 lCA CA
UOS off	f599 123 123	f599 lCA CA

f: FIGS character
l: LTRS character

Garbled copy

- Protocol that provides some noise immunity for shift characters by:
  - forcing the Letters set after a received Space
  - sending a FIGS character after a Space when the next character is in the Figures set
- MMTTY:
  - RX UOS and TX UOS can be independently enabled or disabled

Messages: Space Delimiter

UOS and a noise hit

	TX RX	599 123 123	599 123 123	599 CA CA	599 CA CA
best case	UOS on	f599 f123 f123	f599 f123 f123	f599 CA CA	f599 CA CA
	UOS on	xT00 f123 f123	f599 xQWE f123	xT00 CA CA	f599x:- CA
	UOS on	f599 f123 f123	f599 f123 f123	f599 CA CA	f599 CA CA
	UOS off	xT00 f123 f123	f599 xQWE f123	xT00 CA CA	f599x:- :-
	UOS off	f599 123 123	f599 123 123	f599 lCA CA	f599 lCA CA
	UOS on	xT00 QWE QWE	f599xQWE QWE	xT00 lCA CA	f599 x:- CA
worst case	UOS off	f599 123 123	f599 123 123	f599 lCA CA	f599 lCA CA
	UOS off	xT00 QWE QWE	f599xQWE QWE	xT00 lCA CA	f599 x:- :-

f: FIGS character
l: LTRS character

Garbled copy

Turning on UOS for both RX and TX is the best hedge:

- Most other stations will be that way
  - MMTTY default; 78% of survey respondents use MMTTY
- With only one noise hit, at least one of the important exchange elements is received properly

Messages: Hyphen Delimiter?

UOS is defeated: so all four cases have identical noise results

TX RX	599-123-123	599-123-123	599-CA-CA	599-CA-CA
UOS on	f599-123-123	f599-123-123	f599-1CAf-1CA	f599-1CAf-1CA
UOS on	xTOOAQWEAQWE	f599x123-123	xTOOA1CAf-1CA	f599-x:-f-1CA
UOS on	f599-123-123	f599-123-123	f599-1CAf-1CA	f599-1CAf-1CA
UOS off	xTOOAQWEAQWE	f599x123-123	xTOOA1CAf-1CA	f599-x:-f-1CA
UOS off	f599-123-123	f599-123-123	f599-1CAf-1CA	f599-1CAf-1CA
UOS on	xTOOAQWEAQWE	f599x123-123	xTOOA1CAf-1CA	f599-x:-f-1CA
UOS off	f599-123-123	f599-123-123	f599-1CAf-1CA	f599-1CAf-1CA
UOS off	xTOOAQWEAQWE	f599x123-123	xTOOA1CAf-1CA	f599-x:-f-1CA

f: FIGS character
l: LTRS character

Garbled copy

- Sending Hyphen instead Space “defeats” UOS and speeds up the message slightly by eliminating the FIGS character
  - However, if the first FIGS character is hit by noise, then the entire exchange is garbled
- Space with USO enabled is a slightly better hedge
  - Majority of stations use MMTTY with UOS enabled so at least one of the important exchange elements is received

Messages: “Double Shift”

LTRS/FIGS noise immunity

- MMTTY Double Shift may be enabled to send two LTRS or FIGS characters instead of one
- Eliminates single noise hits on LTRS and FIGS characters
- Moderate speed penalty for all transmissions

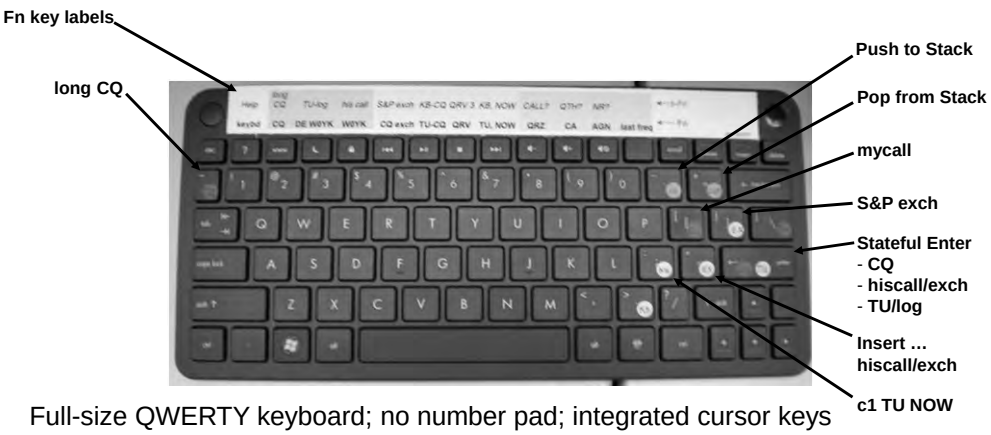
Probably not a good trade-off

Keyboard Optimization

- Accelerator keys
  - Insert: grab call sign & send exchange
  - +: log QSO & send TU/CQ message
- ESM (Enter Sends Message)
  - Enter sends CQ, exchange or TU/CQ message
- Key remapping
  - Most-used messages
  - Group around Enter key

Keyboard Optimization

key re-mapping



Full-size QWERTY keyboard; no number pad; integrated cursor keys

Super Check Partial

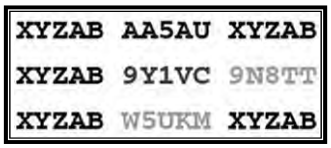
- SCP (Super Check Partial) enables computer to pick out call signs in receive window
  - Call signs
  - New mults and double mults
  - Dupes

N1MM Logger

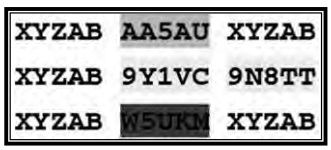
- Use main SCP from CW/SSB/RTTY contests
  - RTTY SCP is a subset

Super Check Partial

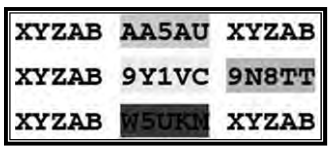
logger differences



N1MM Logger



WriteLog



Win-Test

Pre-Fill

"Danger, Will Robinson!"

- Pre-fill is a ***typing aid*** using prior log data
- Each logger is unique:
  - N1MM: Call History Lookup File (text file)
    - User-created with Excel from prior logs
  - WriteLog: Pre-fill File (ADIF file)
    - User-created with text editor from prior ADIF logs
  - Win-Test: Database File
    - Provided for specific contests by the Win-Test team
- **Log what is communicated to you!**

Callsign Stacking

"Slow Down to Win"

- Sailboat racing analogy:
  - Pinwheel effect at mark-rounding
- Let pile-up continue 1-3 seconds after getting first call sign
  - Increase chance for another call sign or two
  - Increase chance for QSO-phase-skip
- Apply same tactic for tail-enders … pause before sending TU/CQ message

The 4 Phases of a QSO

- Normal Run mode flow:
  1. Enter or F1 (CQ)
     - repeat
     - AGN?
  2. pile-up
  3. Insert or ‘ (grab call sign, send exchange)
     - Send fill(s)
  4. receive exchange
  - ➢ check pre-fill, click their exchange
     - AGN? or NR? or QTH? or NAME?
  1. Enter or + (log contact, send TU/CQ)
     - optionally send F7 (QRV message)

- Normal S&P mode flow:
  1. CQ
  2. Enter or F4 (mycall)
     - repeat
  3. receive exchange
  - ➢ check pre-fill, click their exchange
     - AGN? or NR? or QTH? or NAME?
  4. Enter or F5 (send exchange)
     - send fill(s)
  1. find next CQ

Callsign Stacking

skip 2 phases

Normal	***Shortened***
1. WPX P49X P49X CQ, or TU P49X CQ	1. (skip CQ)
2. K3LR K3LR K5ZD K5ZD	2. (skip pile-up)
3. K3LR 599 2419 2419	*3. K3LR TU NW K5ZD 599 2420 2420*
4. TU 599 842 842	*4. TU 599 1134 1134*

Callsign Stacking

tail-ender

Normal	***Shortened***
1. WPX P49X P49X CQ, or TU P49X CQ	1. (skip CQ)
2. K3LR K3LR	2. (skip pile-up)
3. K3LR 599 2419 2419 K5ZD	*3. K3LR TU NW K5ZD 599 2420 2420*
4. TU 599 842 842	*4. TU 599 1134 1134*

Callsign Stacking

- Efficiently work:
  - multiple callers in a pile-up, and
  - tail-enders to a completing QSO
- Calls pushed onto the stack as they arrive
- Message parameter pops call off of the stack into the Entry window
- Eliminates 2 of 4 QSO phases, which doubles rate

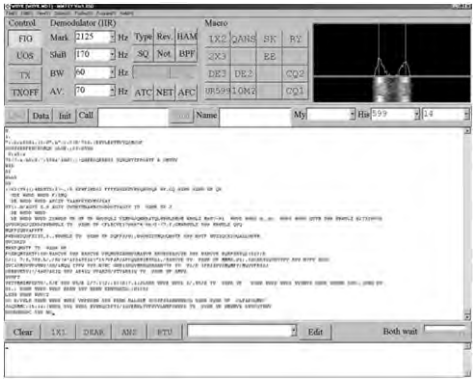
Multiple Decoders

choice of Tones

- Low tones are less fatiguing
- Low/High tones can be mixed to put two audio streams in one ear:
  - SO2R plus SO2V per radio
  - SOnR

Multiple Decoders

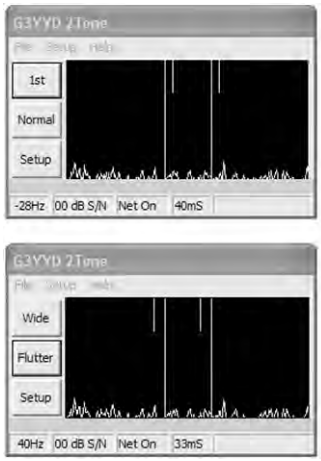
MMTTY



- Dominant SC MODEM
- Standalone, or …
- Contest loggers:
  - N1MM Logger+
  - WriteLog
  - Win-Test
- Introduced June 2000
- Mako Mori, JE3HHT

Multiple Decoders

2Tone



- Outperforms MMTTY ?
- Uses less CPU cycles
- Contest loggers:
  - N1MM Logger+
  - WriteLog
  - Win-Test
- Introduced late 2012
- David Wicks, G3YYD

Multiple Decoders

GRITTY

- Best accuracy ?
- Bayesian statistics
- Standalone, or …
- Contest loggers:
  - N1MM Logger+ only
- Introduced late 2015
- Alex Shovkoplyas, VE3NEA

Multiple Decoders

hardware MODEM

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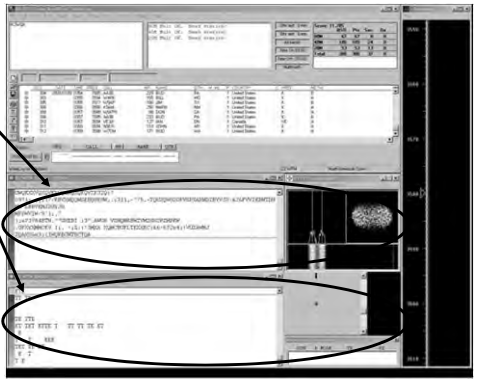
Multiple Decoders

MMTTY & DXP38 - WriteLog

- Parallel decoding
  - Software, e.g., MMTTY
  - Hardware, e.g., DXP38
- Diverse conditions
  - Flutter
  - Multi-path
  - QRM, QRN
  - Weak signals
  - Off-frequency stations



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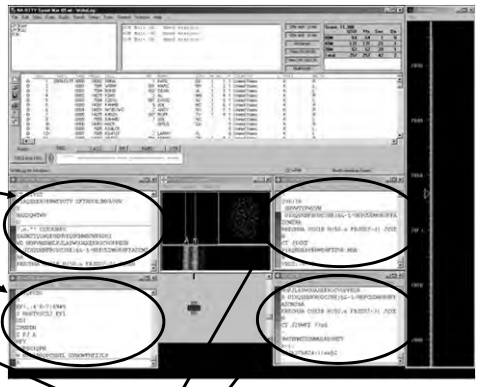
Multiple RTTY Decoders

multiple MMTTY profile windows

- Parallel decoding
  - same audio stream
  - switching takes too long
- Multiple profile windows
  - Standard
  - Fluttered signals
  - Fluttered signals (FIR)
  - Multi-path
  - hyper sensitive
  - EU1SA
  - AA6YQ-FIR-512
    - weak signals in QRN



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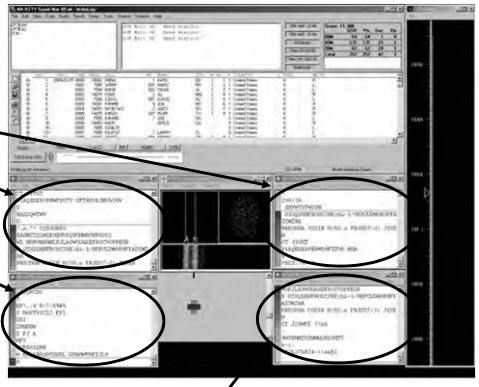
Multiple Decoders

two IF bandwidths

- Narrow IF filtering (main RX)
  - Hardware modem, i.e. DXP38
  - MMTTY profiles
    - Standard
    - Fluttered signals
    - Fluttered signals (FIR)
    - Multi-path
    - hyper sensitive
    - EU1SA
- Wide IF filtering (sub RX)
  - MMTTY profiles
    - AA6YQ-FIR-512
      - Dual Peak Filter
      - "Matched filter"



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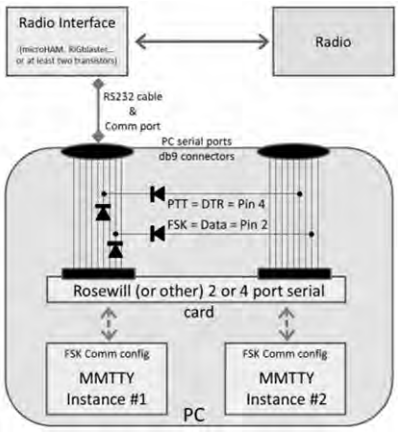
SO2V

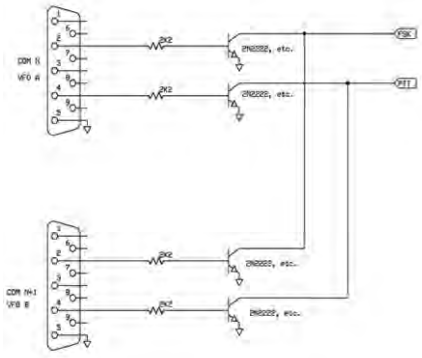
1. If Assisted and running on VFO-A, then
   - A<>B
   - Click spot, tune, ID station, work station
   - A<>B, resume running
2. Or, set up decoder windows on VFO-A and VFO-B
   - Radio must have two true receivers
   - Monitor both frequencies simultaneously with right/left channels of sound card
     - Left-click call from 2nd RTTY window into VFO-B Entry Window
   - Two ways to transmit on VFO-B:
     I. A<>B, work the mult, A<>B
     II. SPLIT, work the mult, SPLIT, resume running
       - Requires "wire-OR'd" FSK or AFSK and two transmit RTTY windows
       - K3/WriteLog invokes SPLIT when call is right-clicked

SO2V

Wire-OR FSK/PTT



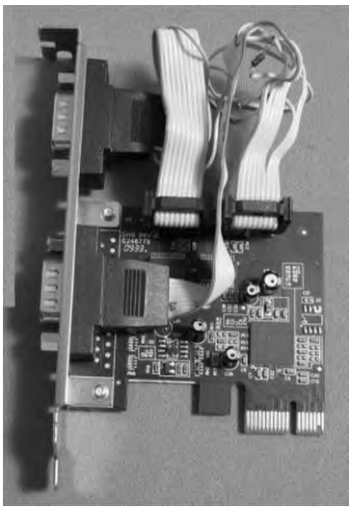
Serial Signals (K8UT)



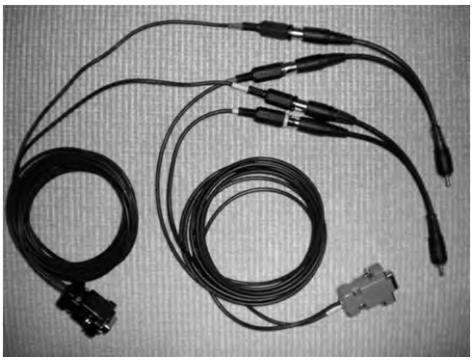
FSK/PTT Signals (W0YK)

SO2V

Wire-OR FSK/PTT



Serial Signals (K8UT)



FSK/PTT Signals (W0YK)

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SO2R

- Eliminates SO1R RTTY boredom
- Think beyond run and S&P:
  - Dueling CQs; run on two bands simultaneously
  - S&P on two bands simultaneously, esp. w/Packet
  - SO2V on one or both radios (SO4V!)
- Two networked computers:
  - Eliminates PC focus swapping
  - RTTY doesn't require much typing
    - Mini-keyboards ideal for RTTY
  - 2 x SO2V=SO4V for picking up mults on both run bands
  - Easily extendible to SO4R

No time to watch TV or read spy novels!

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SO2R

M2 configuration

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SO2R in the NA Sprint

- Set VFOs at least 10 kHz apart on both radios
- Find a clear spot on one radio and CQ while you tune the other radio for a station to work
- If you don't find a station to work quickly (within a minute), find a clear frequency and duel CQ
- After a QSO swap VFOs on that radio, search for up to a minute, then resume dueling CQ
- Don't waste time trying to work the "couplet" … CQing is OK in Sprint!

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SOnR

> 2 radios

- Simplify antenna/filter band-decoding:
  - Dedicate a band/antenna to the 3rd (or 4th) radio
- Networked PC/radio simplifies configuration
- RTTY (vs. CW or SSB) easier for operator
  - PC decodes for operator
  - Low tones & high tones allows two radios per ear
    - Classic audio headphone mixer provides radio 1, radio 2 or both

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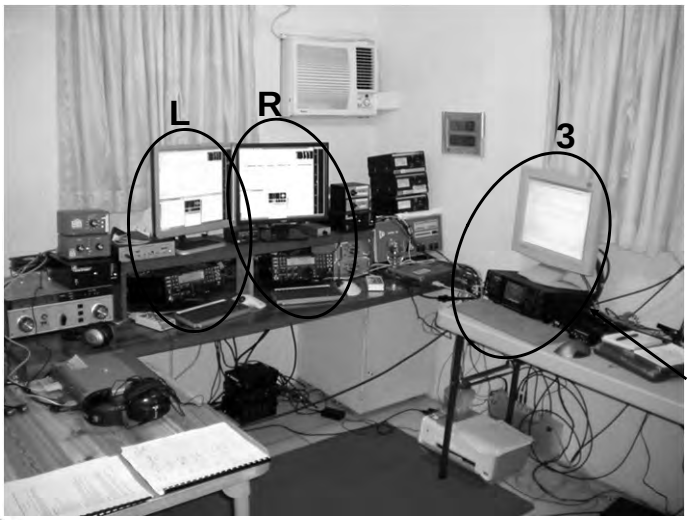
SOnR

Multi-Multi configuration



dedicated to 10 meters

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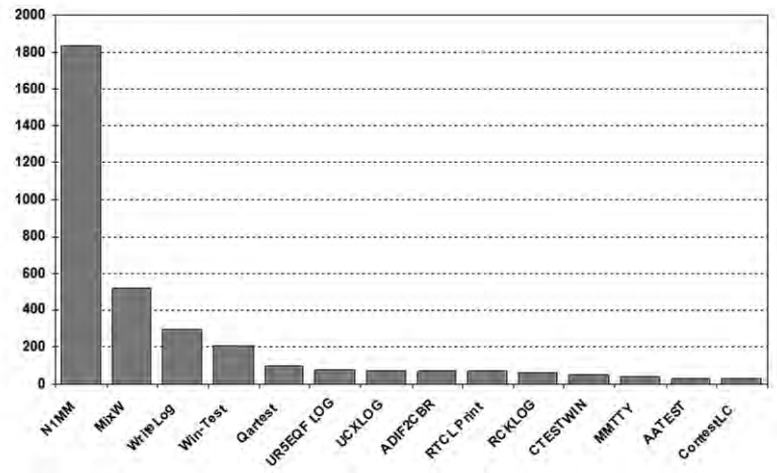
Logging Software

2012 CQ WPX RTTY



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Logging Software

The Big Three

- WriteLog *(1994)*
  - created for RTTY *(CW & SSB came later)*
  - *www.rttycontesting.com/tutorials*
- N1MM Logger+ *(2000; free)*
  - dedicated RTTY software designer
  - *www.rttycontesting.com/tutorials*
- Win-Test *(2003)*
  - RTTY is low priority.

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Logging Software

	WriteLog	N1MM	Win-Test
MMTTY	☻	☻	☻
2Tone	☻	☻	☻
other decoders	☻	☻	none
Call sign acquisition	☻	☻	☻
Contests supported	☻	☻	fewer
Advanced RTTY	☻	☻	none

- *All three are entirely adequate for basic RTTY contesting*
- *Use the logger you are already familiar with for CW & SSB*

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Logging Software

N1MM Logger, WriteLog, Win-Test

- 13 features compared
  - Simplifying assumption: features equally weighted
  - Rated 0 to 5
- All three score ‘5’ on:
  - MMTTY integration
  - Stateful Enter key (ESM: Enter Sends Message)
  - Accelerator keys
  - QRV message parameter
- Another 9 advanced RTTY features distinguish these loggers

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RTTY Contest Loggers

relative ratings

WL	*N1*	*WT*	*Logger*
5	5	5	• RTTY window readability
5	4	0	• Multiple decoders
4	5	0	• MMTTY, 2Tone, GRITTY
0	5	3	• ESM mouse ctrl & Sprint mode
5	5	0	• SO2V
5	3	3	• M2 SO2R configuration
5	4	5	• Re-mapped keys
5	5	3	• Call sign stacking
5	4	4	• AFSK/FSK flexibility
39	***40***	***23***	***Overall***

Logging Software

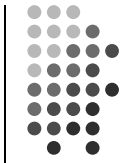
multiple decoders

- N1MM Logger limited to 4 total, but has best DXP38 & GRITTY support
- WriteLog has 10 additional decoders per rcvr and the most hardware MODEMs
- Win-Test only supports one instance of MMTTY or 2Tone

- WriteLog & N1MM Logger only
- Multiple parallel decoders for marginal copy

Logging Software

ESM mouse control



- Left-click enters call sign or exchange
- Right-click (ESM) sends exchange or TU/CQ
- QSOs can be worked entirely with mouse action, except for the rare instance where a call or exchange must be typed in
- Particularly suited to unique non-prefillable exchanges such as serial numbers

- N1MM Logger only
- Eliminates keyboard for efficiency

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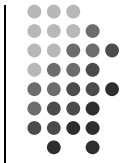
SO2V



- Basic capability with two VFOs
- Advanced capability with two receivers
  - Requires second receiver in radio
  - Independent RTTY window for second receiver
  - radio/logger SPLIT mode

- N1MM Logger & WriteLog
- Interleave S&P QSOs on Run band

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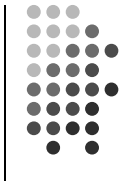
SO2R

M2 configuration



- PC & UI per radio; networked
- Single signal interlock
- Extendible to SOnR

- Only WriteLog
- Another user preference alternative; SOnR

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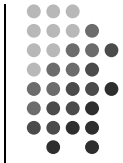
Logging Software

key re-mapping



- Soft re-definition of keyboard keys
- Examples:
  - Insert → ‘
  - = → PopCallFromStack
- WriteLog provides a rich built-in function set for key shortcuts

- WriteLog & Win-Test remap keys and functions
- N1MM Logger uses HotKeys
- Relocates keys for efficiency

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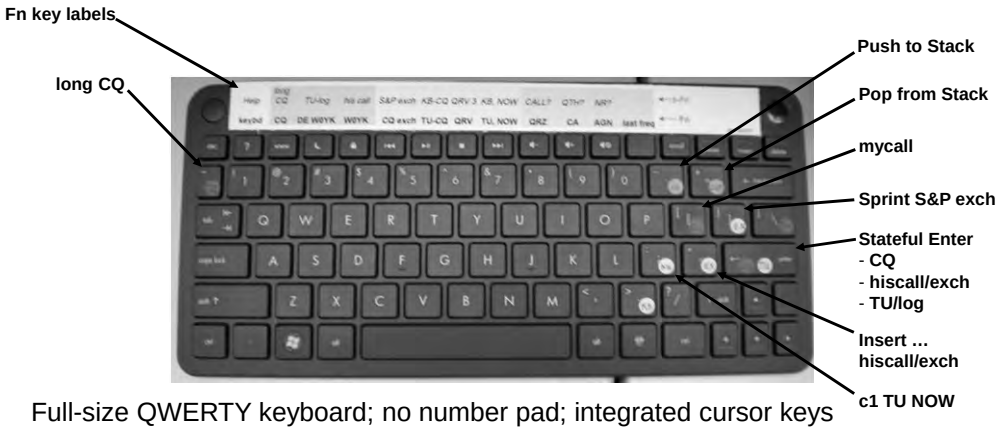
Logging Software

re-mapped keys



Full-size QWERTY keyboard; no number pad; integrated cursor keys

Logging Software

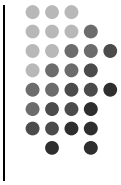
callsign stacking

- N1MM Logger can automatically fill stack
- WriteLog has convenient stack management
- Win-Test script can use partner stack

- All three loggers
- Doubles rate by skipping CQ & pile-up

Logging Software

callsign stacking

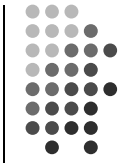


- N1MM Logger automatically pushes calls into the Grab window.
  - It can also explicitly push calls onto the Call Stack (like WriteLog and Win-Test)
  - There is a rich list of stack functions and ESM integration
- WriteLog explicitly right-clicks calls onto the call stack
- Win-Test requires a LUA script to push calls onto the Partner Stack

Automatic vs. explicit pushing is personal pref.

Logging Software

AFSK & FSK flexibility



- WriteLog has built-in AFSK & FSK
- N1MM relies on MODEM for AFSK or FSK

- WriteLog
- Independence from MODEM for transmit

RTTY Contest Loggers

relative ratings

WL	*N1*	*WT*	*Logger*
5	5	5	• RTTY window readability
5	4	0	• Multiple decoders
4	5	0	• MMTTY, 2Tone, GRITTY
0	5	3	• ESM mouse ctrl & Sprint mode
5	5	0	• SO2V
5	3	3	• M2 SO2R configuration
5	4	5	• Re-mapped keys
5	5	3	• Call sign stacking
5	4	4	• AFSK/FSK flexibility
39	***40***	***23***	***Overall***

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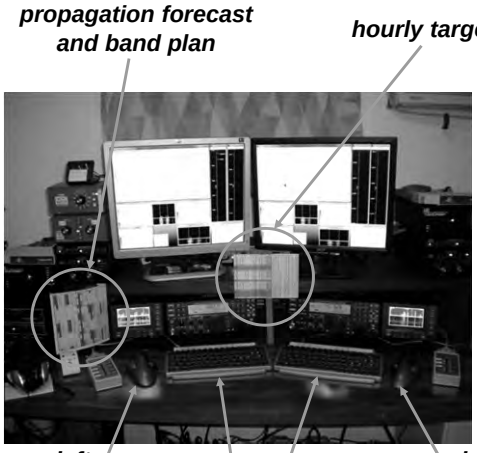
Ergonomics

user interface



- Comfortable heights, reaches, layout
- Right-sized keyboard
  - Fn keys template
  - Label re-mapped keys
- Right & left trackballs
- Bose QC2 phones
  - Minimal volume
  - Stereo

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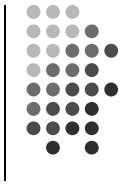
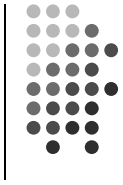
Ergonomics

keyboard or mouse?



- Keyboard – minimal typing in RTTY
  - Either:
    - F1, Insert and + … or,
    - Enter, Insert and Enter (ESM – Enter Sends Message)
    - Plus Fn keys or re-mapped Fn keys
  - Mouse click received exchange, if not pre-filled
- Mouse/trackball
  - 100% (N1MM Logger)
  - 80% (WriteLog and Win-Test)

Resources



- www.rttycontesting.com
  - Tutorials and resources (beginner to expert)
  - WriteLog, N1MM Logger+ and MMTTY
- rtty@contesting.com
  - Email reflector
  - RTTY contester networking
  - Q&A
- Software web sites
  - mmhamsoft.amateur-radio.ca/ (MMTTY)
  - n1mm.hamdocs.com/tiki-index.php (N1MM Logger+)
  - www.writelog.com (WriteLog)
  - www.wintest.com (Win-Test)
- Software Reflectors
  - mmtty@yahoogroups.com (MMTTY)
  - N1MMLoggerplus@yahoogroups.com (N1MM Logger+)
  - N1MMLogger-Digital@yahoogroups.com (N1MM Logger+ RTTY & PSK)
  - writelog@contesting.com (WriteLog)
  - support@win-test.com (Win-Test)

CTU Presents

How Contesting Contributes To Ham Radio

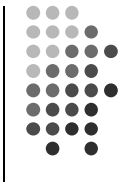
Tim Duffy K3LR

CTU Chairman

Contest University Update

- **10th year for Dayton CTU**
- **Icom has supported CTU - ALL TEN YEARS!**
- **Over 4700 students have now attended CTU**
- **CTU Live Stream thanks Icom**
- **Strategic Partnership with the NCDXF**
- **Support the vendors that support CTU**
- **YouTube and slide decks available on web**
- **Icom Show us your Shack promotion**

Getting the most out of CTU 2016



There is a note pad in your bag – how many ideas have you written down today? You have access to some of the finest contesters – ask questions!

- **You meet lots of people during contests – try calling "CQ" here at CTU – you just might make a new friend. Hit F1!**
- **Everyone has a contesting story – tell yours and listen to others. Commit to giving a new program at your local club in the next 12 months.**

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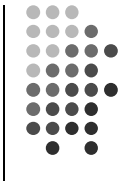
K3LR 2016 Notebook



- Make sure you use the best coax connectors possible. There are no short cuts.
- Always weatherproof your outdoor connections. Moisture will cause failures.
- Check, Double Check, Re-Check
- Develop a pre contest "Proof Of Performance" plan – KEEP A NOTEBOOK!
- How many wall warts are causing RFI?
- Let me introduce you to Mr. Ferrite

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What are you doing to improve Contesting?

- Congratulate the CTU “SCHOLARS”!
- Take an interest in helping new hams to become involved in contests.
- Maintain the radio contesting good name – do the right thing – be a model operator. Lots of SWLs.
- Find a way to “give back” to our hobby.
- Set goals for your contest self improvement. Set something achievable for you and then go hard after your goal.
- Remember as a CTU Graduate you are mentor!

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It’s 0000 Zulu – Are you worried about your connectors? Did W8WWV scare you yet?

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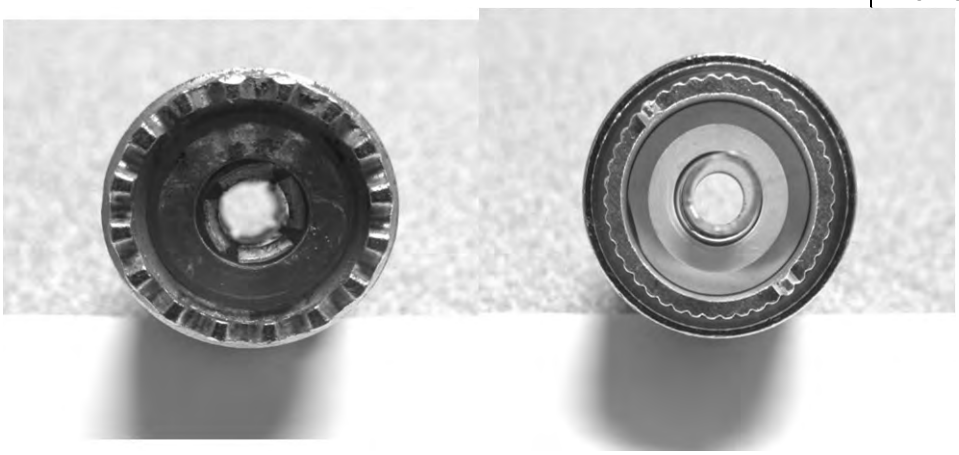
Keep the water out!



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The best UHF Male connector

The Amphenol 83-1-SP

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Channel Lock
CNL-426

"Tighten Up"

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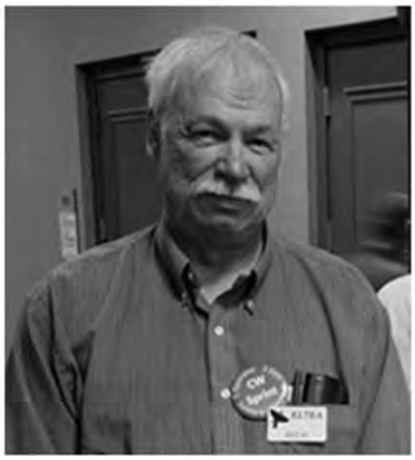
IN MEMORY OF RICHARD A. STRAND KL7RA



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Having Fun with Contesting

- **Be the best example of a model contest operator**
- **Share your contesting passion with others – help THEM put up or fix an antenna. Please be SAFE!**
- **Get on the air and operate. Teach others how to operate in a contest.**
- **Have an open heart to all who are willing to learn – encourage and send congratulations emails.**
- **Be active in your local club – not just Field Day. Join, pay dues and contribute your time and experience!**

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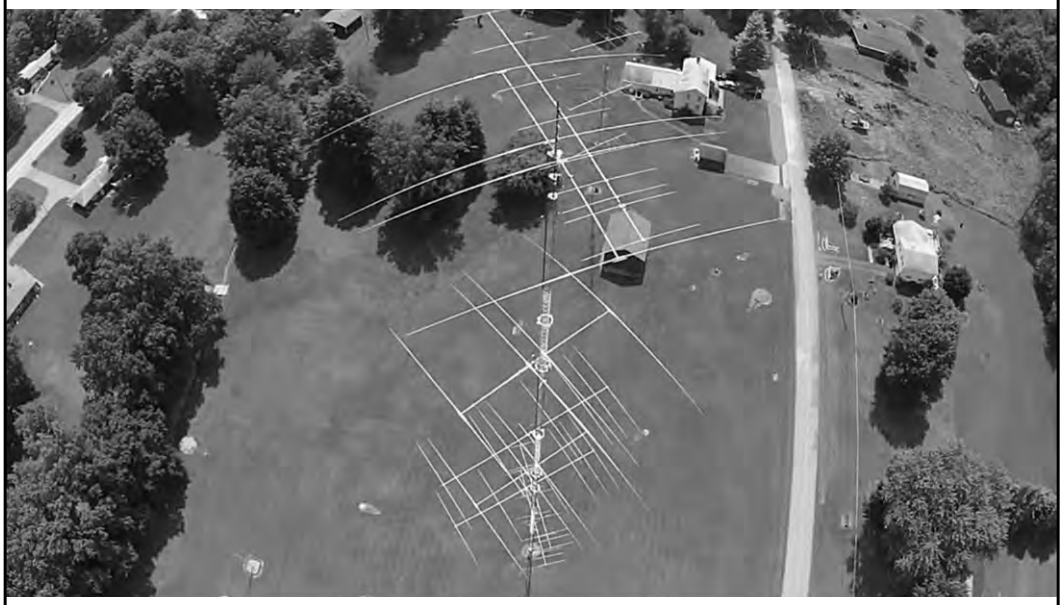
The REAL reason we do this…

Best Friends!

Towers and Antennas

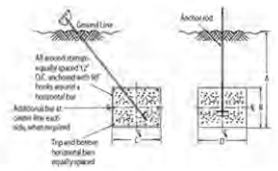
Tim Jellison W3YQ/KL7WV

- Know what you're getting into when planning a tower
- Be safe when working on antennas and towers



- Do it right - or don’t do it
- Follow the manufacturers’ design rules
- Get advice from others
- Be professional (not a cheap ham)

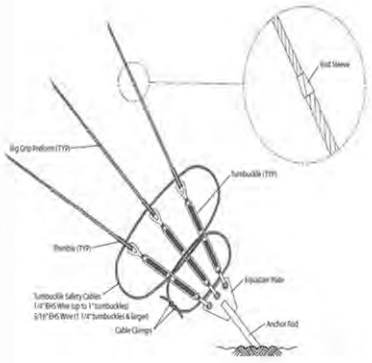
STANDARD ANCHOR BLOCKS



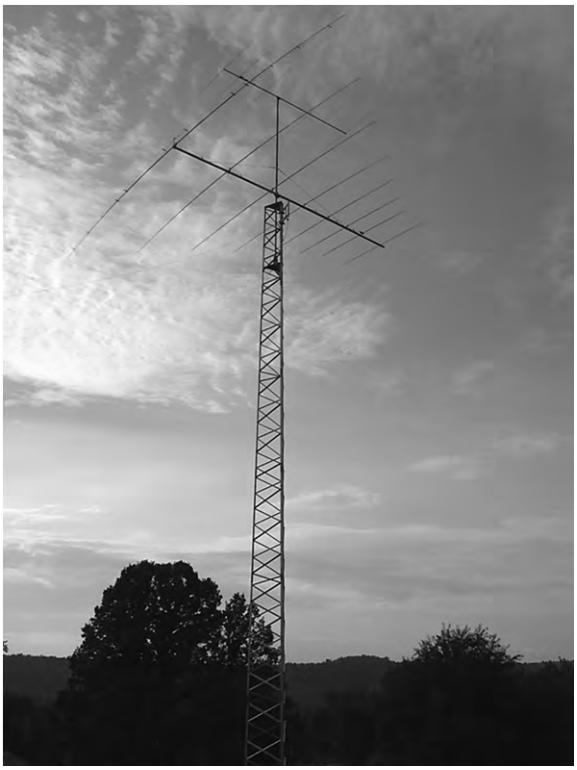
Refer to page 68 for anchor rod installation angles.

Block	Anchor Dimensions (in.) A	B	C	D	Horizontal Bars (Qty. & Size)	Stirrup Size & Spacing	Concrete Vol. (Cu. Yds.)
AB2	4'-0"	1'-6"	4'-0"	6'-0"	(5) #6 Bars, Top Layer (5) #6 Bars, Bottom Layer (0) Additional Bar, Each Side	#3 @ 12" O.C.	1.33 Per Block 4.0 Total for 3
AB3	6'-0"	1'-6"	3'-0"	6'-0"	(4) #6 Bars, Top Layer (4) #6 Bars, Bottom Layer (0) Additional Bar, Each Side	#3 @ 12" O.C.	1.0 Per Block 3.0 Total for 3
AB4	6'-0"	1'-6"	4'-0"	9'-0"	(5) #6 Bars, Top Layer (5) #6 Bars, Bottom Layer (0) Additional Bar, Each Side	#4 @ 12" O.C.	2.0 Per Block 6.0 Total for 3
AB5	8'-0"	2'-0"	3'-0"	10'-0"	(6) #7 Bars, Top Layer (6) #7 Bars, Bottom Layer (1) Additional Bar, Each Side	#4 @ 12" O.C.	2.22 Per Block 6.7 Total for 3
AB6	8'-0"	2'-0"	4'-0"	10'-0"	(5) #7 Bars, Top Layer (5) #7 Bars, Bottom Layer (1) Additional Bar, Each Side	#4 @ 12" O.C.	2.95 Per Block 8.9 Total for 3

GUY ANCHOR CONNECTION DETAILS



Anchor Connection



Item	Amount
Tower - AN HD60	$4,450
Tower - Rohn TB3 Thrust Bearing	$160
Tower - Mast	$832
Tower - Shipping	$250
Tower - Concrete Work	$4,500
Tower - Crane	$420
Tower - Labor	$3,830
Rotator - M2 Orion 2800	$1,803
6M Yagi - M2 6M5XHP	$350
HF Antenna - M2 7-1030LP8	$2,200
Coax - BuryFlex Wireman #103A	$632
Rotor Cable - Wireman #306	$376
Entrance Panels, Strap, Clamps, Arrestors	$850
Machinging of rotor plates	$50
Installation of Entrance Panels/Grounding	$900
* Total *	$21,603

NO SK's

Some of the risks

- Falling
- Electrocution
- Medical issues while climbing
- Structural failure (including crank-up and tilt-over towers)

- Use the proper equipment
- Watch for power lines!
- What about the ground crew?
- Take a safety training course

Finally a nice day!

New transceiver options since CTU 2015
+
Performance – What's Possible & What's Needed?

Rob Sherwood
NCØB

How to optimize what you currently own

Sherwood Engineering

- **What is important in a Contest Environment?**
- We need Good Dynamic Range to hear weak signals in the presence of near-by strong signals.
- In a Dxpedition the pile-up is typically:
- CW signals "Up 2" or SSB signals "Up 5"
- Contests – DX pile-up, it is the same problem
- You need a better receiver for CW than for SSB.
- **How does published test data relate to reception of weak signals?**

State-of-the-Art in Dynamic Range today

- Close-in dynamic range (DR3) > 105 dB
- Phase noise @ 10 kHz ≤ -145 dBc / Hz
- Reciprocal Mixing (RMDR) > 115 dB

- Rigs with this kind of performance:
- Icom IC-7851, Flex 6700 & Elecraft K3S
- Apache ANAN-200D not far behind

What is new since last year?

- Icom 7851 Flagship up-conversion transceiver

- Icom 7300 Direct-Sampling transceiver

- Elecraft K3S update of the K3

- New software for Apache ANAN-200D

Icom IC-7851 numbers

- Greatly improved synthesizer (phase noise)
- New 1.2 kHz VHF roofing filter

- 20 kHz dynamic range: 110 dB
- 2 kHz dynamic range: 105 dB
- 20 kHz RMDR: 125 dB
- 2 kHz RMDR: 115 dB

- Noise floor as low at -141 dBm Preamp 2

Icom IC-7300 numbers

- First direct-sampling SDR from the big three!
- Tunes with knobs & touch LCD, no computer

- 20 kHz dynamic range: 103 dB (IP+)
- 2 kHz dynamic range: 94 dB (IP+)
- 20 kHz RMDR: 113 dB
- 2 kHz RMDR: 100 dB

- Noise floor as low at -142 dBm Preamp 2

Elecraft K3S numbers

- Greatly improved synthesizer
- Improved receive audio
- New 6-pole roofing filters, low passive IMD
- 20 kHz dynamic range: 107 dB
- 2 kHz dynamic range: 106 dB
- 20 kHz RMDR: 118 dB
- 2 kHz RMDR: 113 dB
- New internal preamp 12 – 6 meters
- Noise floor as low as -145 dBm

Apache ANAN new software features

- Open Source code = new features fast
- Better DSP filter defaults, particularly CW
- Spectral NB works in contest conditions
- New NR algorithms
- Midi support for DJ Console for mechanical knobs or control via a tablet
- For the “techie” new band noise measurement capabilities

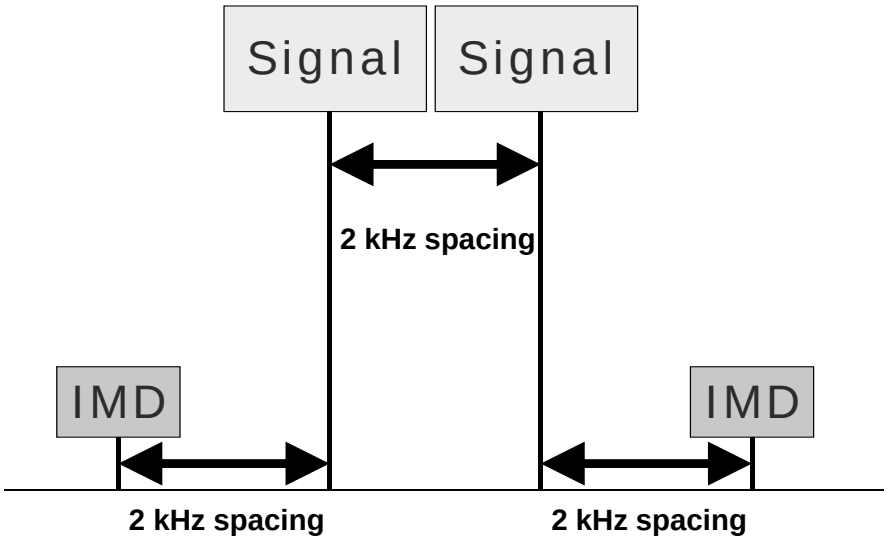
Time for the numbers

- What do these state-of-the-art numbers mean?
- How do we cope with a more typical radio?
- Optimize performance of what we own

What does dynamic range mean?

- Two equal signals are fed into the receiver.
- Third-order IMD is dominant.
- Level increased until distortion = noise floor
- This level vs. the noise floor = dynamic range
- Defined in QST 1975
- Noise floor = -128 dBm, test level = -28 dBm
- -128 dBm minus -28 dBm = 100 dB
- Dynamic Range (DR3) = 100 dB

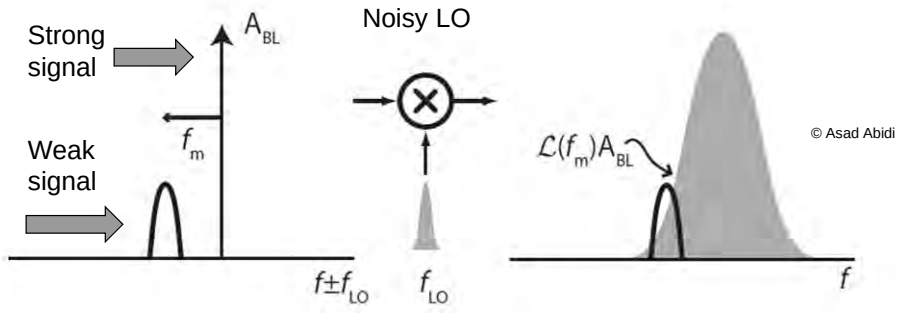
Third Order IMD to Measure Dynamic Range



A note on phase noise / RMDR

- Reciprocal Mixing Dynamic Range (RMDR)
- Only since late in 2013 has the ARRL consistently emphasized the importance of good phase noise performance (RMDR).
- Read Bob Allison's sidebar April 2012 QST & latest update May 2016 QST for details.
- Peter Hart (G3SJX) for RSGB has long published RMDR data.

Reciprocal mixing puts LO noise on top of weak signal



Noisy local oscillator (LO) transfers its noise to the strong out-of-passband signal and on top of the weak signal we are trying to copy.

RMDR often dominates over DR3

- Only a few “legacy” transceivers, plus direct-sampling SDR radios have RMDR > DR3.

- Elecraft K3 w/ new synthesizer, K3S or KX3
- Hilberling PT-8000A
- Icom IC-7850, IC-7851 & IC-7300
- Flex 6700, 6500 & 6300
- Apache ANAN-200D

How do you relate to this data?

- Typical receiver, preamp OFF
- Noise floor = -128 dBm
- “Holy grail” 100 dB DR3 radio (@ 2kHz)
- Can handle signals -28 dBm = S9 +45 dB
- Note: That is above the receiver’s noise floor
- How does that relate to band noise?
- Will get to that in a moment.

Luckily we can live with 85 dB radios

- What performance is usually good enough?
- From the advent of “up-conversion” radios around 1979 (TR-7) until 2003 with the Orion I, all we had were 70 dB DR3 radios at 2 kHz.
- These were barely adequate on SSB and not acceptable on CW in DX pile-ups or contests.
- If we operate our 85 to 90 dB radios properly, they perform well in most environments.
- Most of the time our radios are not stressed to their limits.

Close-in 2-kHz Test @ 500 Hz BW

Dynamic Range of Top 14 Transceivers

• Elecraft K3S	106 dB	
• Icom 7851	105 dB	
• Flex 6700	99 / 108 dB	(preamp Off/On)
• Hilberling	105 dB	
• Elecraft KX3	104 dB	
• FTdx-5000D	101 dB	
• Flex 5000	96 dB	
• Elecraft K3	95 dB	(original synthesizer)
• Orion II	95 dB	
• Icom 7300	94 dB	(IP+)
• Orion I	93 dB	
• TS-590SG	92 dB	
• TT Eagle	90 dB	
• Flex 3000	90 dB	

Why is higher DR3 needed on CW?

- Transmitted bandwidth of an adjacent strong signal may be the limit, not receiver overload.
- A CW signal is about 1 kHz wide at -60 dB.
- An SSB signal is about 10 kHz wide at -60 dB.
- A CW pile-up may overload your receiver.
- On SSB, splatter will likely dominate before the receiver dynamic range is exceeded.

What is the Bandwidth of a CW Signal?

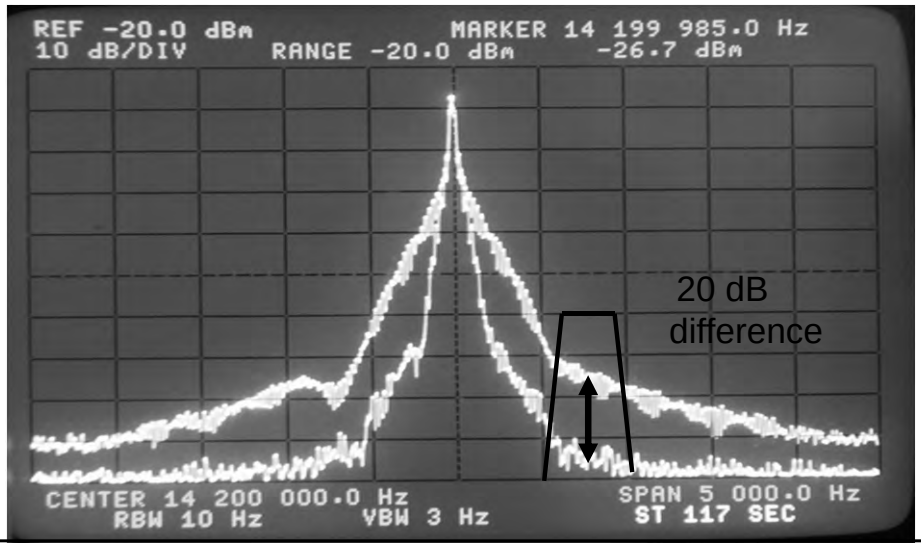
On-channel signal = S9 + 40 dB (-33 dBm)
Receiver = K3, 400 Hz 8-pole roofing + 400 Hz DSP Filter
Transmitter = Omni-VII with adjustable rise time
Undesired signal 700 Hz away, continuous "dits" at 30 wpm

Rise time of Omni-VII Signal	Strength of CW sidebands S9 + 40	-33 dBm	Ref
3 msec	S7	-83 dBm	-50 dB
4 msec	S6	-88 dBm	
5 msec	S6	-88 dBm	
6 msec	S5	-93 dBm	22 dB !
7 msec	S4	-99 dBm	
8 msec	S4	-99 dBm	
9 msec	S4	-99 dBm	
10 msec	S3	-105 dBm	-72 dB

Many rigs are much faster than 3 msec

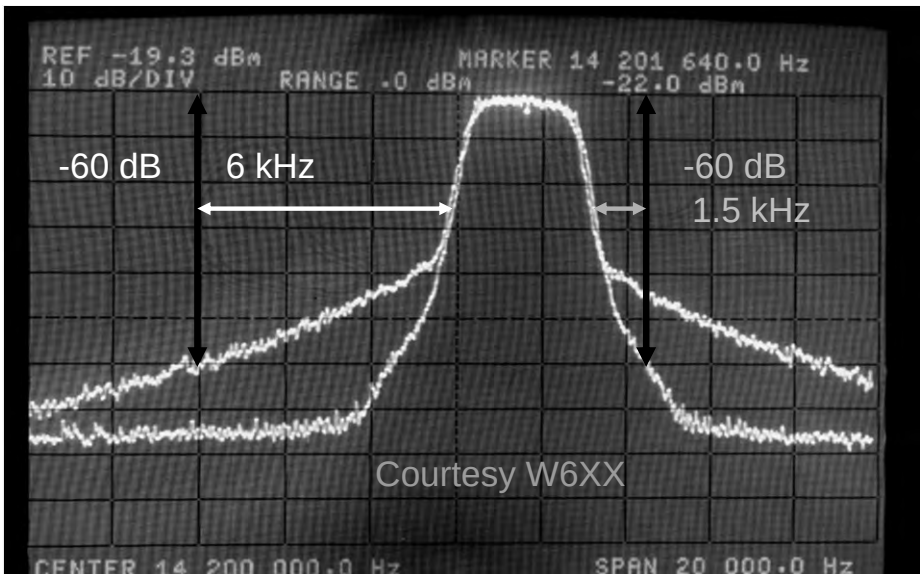
Spectrum of CW Signal on HP 3585A Analyzer

Comparison of 3 msec vs 10 msec rise time



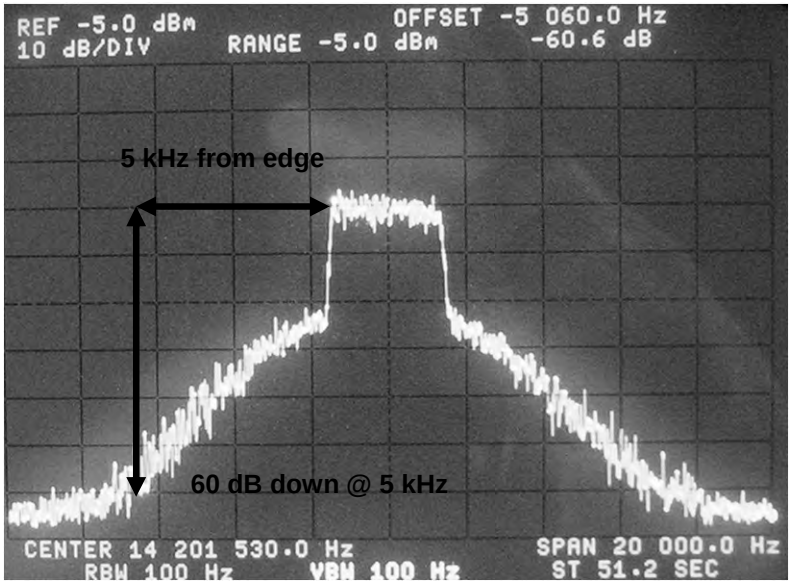
Apache PureSignal much like class A

White Noise Mk V Class A vs. K3 Class B @ 75 Watts



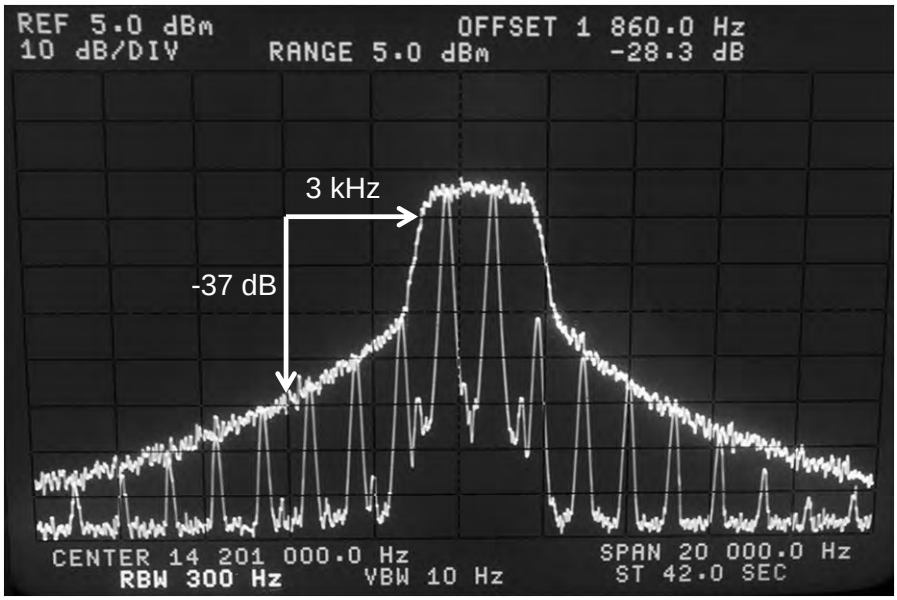
Noise source = GR 1381, 5-kHz -3 dB BW

Icom IC-7410 Class AB, White Noise



How Wide Is Your Signal ?

Comparison 2-Tone vs. Noise Intermodulation Bandwidth



How do we optimize what we have?

- While we might own a 100+ dB DR3 radio, many of us have somewhat less performance.
- My TS-990S is around a 90 dB radio @ 2 kHz.
- Consider dynamic range a “window” of performance that can be moved around in absolute level by properly using your attenuator or preamp.

Receiver Noise Floor vs. Band Noise

When is the spec for noise floor significant?

Why does it rarely matter on most bands?

Noise Floor is usually significantly lower than Band Noise.

An ITU graph published in the ARRL Handbook gives us a starting point to relate band noise to noise floor.

This ITU data is in a 500-Hz bandwidth, just like typical noise floor data.

Band Noise vs. Frequency from ARRL Handbook

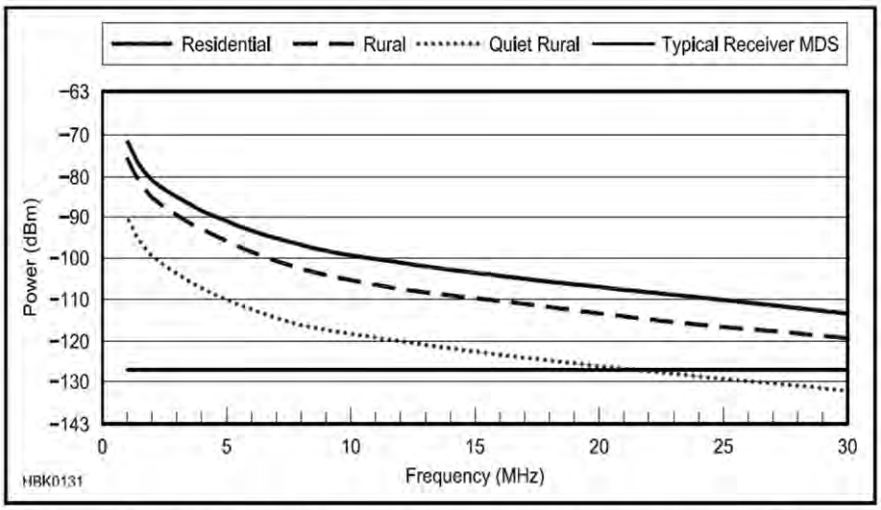


Fig 1 — Typical noise levels versus frequency for various environments. (Man-made noise in a 500-Hz bandwidth, from Rec. ITU-R P.372.7, *Radio Noise*)

Most Radios are designed for 10 meters

Typical rural band noise on 10 meters is -120 dBm

Typical rural band noise on 20 meters is -110 dBm

On 20 meters, band noise is almost 20 dB higher than typical receiver noise with the preamp OFF !

Optimally receiver noise should be 8 to 10 dB lower than band noise to have minimal effect on receiving weak signals.

Even on 10 & 15 meters, a preamp isn't needed all the time in a rural environment.

A simple test with only an analog meter

- Most hams don't own a calibrated signal generator.
- How do you evaluate your receiver?
- This also evaluates your antenna !

- Measure the noise gain when you connect your antenna.

- All you need is an analog meter with a dB scale, hooked up to your speaker.

Measure the noise gain

- Disconnect your antenna and set the volume so your dB meter reads -10 dB.
- (Put a dummy load on the rig, though open circuit usually works OK, too.)
- Connect the antenna and see how many dB the noise goes up when tuned to a dead spot on the band.
- Do this with Preamp OFF and ON.
- Also rotate your Yagi 360 degrees.
- Noise can easily change 10 dB with azimuth!

15 & 10 meters noise gain

Rig = Icom IC-756 Pro III

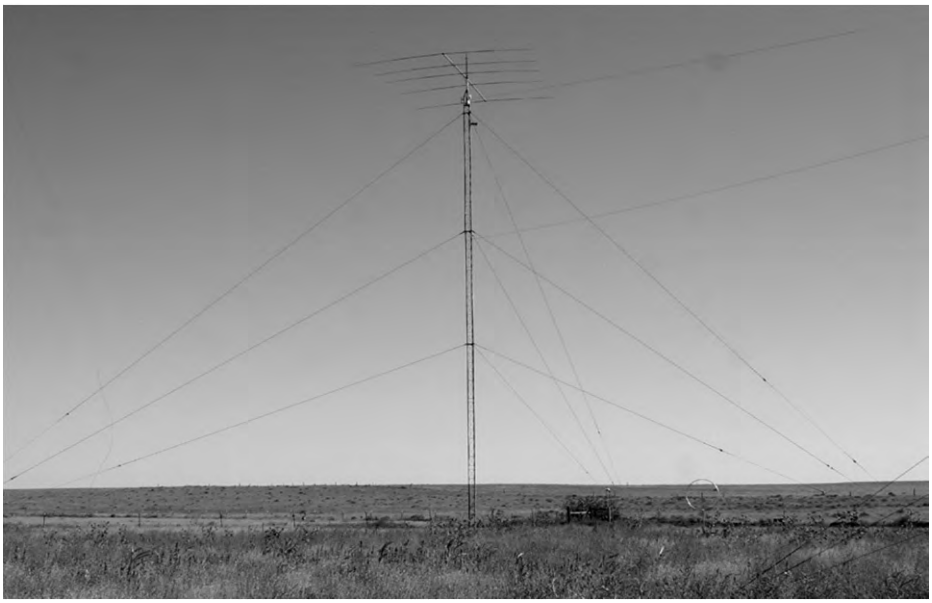
10 meter antenna = Hy-gain 105CA @ 65 feet

15 meter antenna = Hy-gain 155CA @ 70 feet

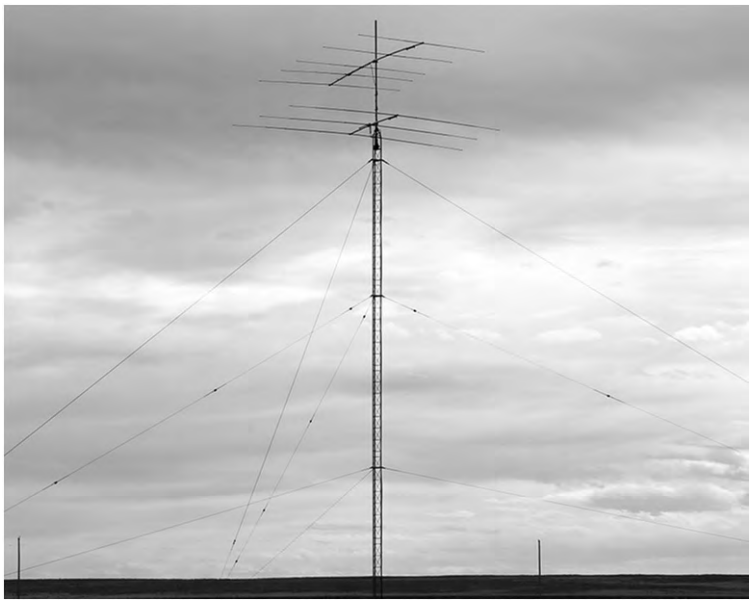
Preamp	15m	10m
None	4 dB	3 dB*
Preamp 1	11.5 dB	9.5 dB
Preamp 2	13.0 dB	11.0 dB

* @ 3 dB, receiver noise = band noise = not OK

LJ-155CA Yagi in band noise example



LJ-105CA in band noise example



How does band noise vary by band?

If we take the ITU rural data as a starting point, what is typical?

160 meters:	-87 dBm *
80 meters:	-93 dBm *
40 meters:	-101 dBm *
20 meters:	-109 dBm #
15 meters:	-114 dBm #
10 meters:	-119 dBm #

That's a 30+ dB difference in band noise
* = nighttime # = daytime

Measured band noise at NC0B

160 meters 8:00 AM MST:	-105 dBm	January 2014
160 meters 4:00 PM MST:	-101 dBm	160 meter CQ
160 meters 6:30 PM MST:	-91 dBm	CW Contest
ITU rural nominal value:	-87 dBm	

Beam Heading, October 2013	15 meters	10 meters
0 degrees beam heading:	-124 dBm	-129 dBm
30 degrees:	-124 dBm	-123 dBm
60 degrees:	-118 dBm	-120 dBm
90 degrees:	-114 dBm	-120 dBm
120 degrees:	-113 dBm	-122 dBm
150 degrees:	-114 dBm	-122 dBm
ITU rural nominal value:	-114 dBm	-119 dBm

ITU / ARRL Data is generally correct

- Those numbers = starting point for a rural QTH
- On a give day there can be ± 10 dB differences
- In 2014 ARRL 10 Meter SSB my noise floor was 10 dB lower than the rural ITU value, pointed West between 3 and 5 PM local time while working ZL, VK & JAs.
- (5 element monoband Yagi @ 65 feet)

- Urban QTH with RFI noise, all bets are off
- How's your neighbor's Plasma TV ?

A note about the ITU data

- The ITU data assumes an omni-directional antenna.

- Your Yagi or directional low-band antenna (4-square) can significantly improve on your band noise in some directions.

Numbers with Preamp-1 ON

Noise Floor Quite Consistent in Top 12

● Flex 6700	-135 dBm	
● Icom 7851	-135 dBm	
● Elecraft K3s	-138 dBm	
● Elecraft KX3	-138 dBm	
● FTdx-5000D	-135 dBm	
● Flex 5000	-135 dBm	
● Orion II	-133 dBm	
● Icom 7300	-141 dBm	
● Orion I	-135 dBm	
● T-T Eagle	-132 dBm	
● Flex 3000	-139 dBm	
● TS-590SG	-135 dBm	
● Drake R-4C	-138 dBm	(For comparison)

What does all this imply?

- For most radios: Up-conversion / down-conversion
- On the lower bands at night, attenuation is often appropriate.
- There is no point in band noise reading upscale on your S meter.
- A preamp is usually NOT needed on 20 meters.
- A preamp would ***never*** be needed at night on 40 meters and below, assuming the transmit antenna is used on receive.

Contests: 2015 / 2016

February CQ SSB Contest 160m

Using a TS-990S during the day attenuator = 6 dB
During nighttime, attenuator = 12 dB, occasionally 18 dB !

Set the AGC threshold about 6 dB above band noise.

January CQ CW Contest 160m
Using Apache ANAN-200D, I set the AGC threshold about 6 dB above band noise. Time of day dependent

(December 2014 ARRL 160 m CW contest set AGC-T)

March 2016 ARRL SSB DX Contest using TS-990S
10m – Preamp & 6 dB pad or occasionally 12 dB pad !

Times of day can break the general rules

- In a rural environment, daytime band noise on 80 and 40 meters can be quite low.
- Noon at my QTH 40 meters -115 dBm
- 8:30 AM my QTH 80 meters -120 dBm
- Flex 6300 has no preamp below 30 meters*
- There are times when you need a -128 dBm noise floor on 40 and 80 meters.

* Flex says this will be corrected, likely 2nd quarter 2016. Cost to retrofit unknown.

How do we evaluate & optimize a transceiver?

- 160 – 40m receivers are too sensitive at night.
- Make the most of the radio's dynamic range by properly using the attenuator and using the preamp only when necessary on the high bands.
- Published dynamic range can be misleading, depending on how it is measured. This could be a complete presentation on its own.
- Look at RMDR, as this typically dominates.
- (RMDR* = Reciprocal Mixing Dynamic Range)
- [*QST April 2012 for sidebar – Bob Allison]
- It is a numbers game today!
- Evaluation in pile-up conditions is critical.
- A lab setup can never approximate CQ WW !

http://www.NC0B.com

Sherwood Engineering

Videos from past CTU presentations

CTU 2015 (select from all presenters)

https://www.youtube.com/playlist?list=PLRSwUN4qr1Lq50amRtsZm-y2nKPHHRz0v

CTU 2013 & 2014 (Select desired year)
http://www.contestuniversity.com/main/page_videos.html

CTU 2011
http://www.pvrc.org/webinar/radioperformance.wmv

Notes

Glossary – by Patrick Barkey, N9RV

10-minute rule

The 10 minute rule restricts band changes for some multi-operator categories for certain contests. The implementation of the rule depends on the contest -- in some cases it has been replaced by a band change rule. The rule was designed to prevent the interleaving of QSO's on different bands for "single" transmitter categories by stations which actually have multiple transmitters on different bands.

Categories: contest specific concept, operating classification,

See Also: Band change rule, MS, M2, rubber clocking

175 mile radius

A geographic requirement for groups of stations jointly submitting their scores as part of the club competition in ARRL contests. In the “unlimited” category of club competition, stations submitting their scores as part of a club for the club competition must either be within a single ARRL section, or within a 175 mile radius of a centroid, to be eligible to contribute their score to the club total.

Categories: contest specific concept, log checking and reporting

See Also:

3830

The frequency on the 75 meter band where stations congregate at the end of a contest to exchange scores informally. In actual practice, most of this now takes place on internet. The listserv, or reflector, where much of this takes place is called the 3830 reflector. It is hosted by contesting.com. A separate site, 3830scores.com, has comprehensive summaries of (unverified) contest scores reported by participants.

Categories: log checking and reporting

See Also:

4-square

An increasingly common array of four vertical antennas arranged in a square that is electronically steered in four, switchable directions using torroidal or coaxial delay lines. Once used mostly as transmit antennas, particularly on lower frequencies where yagis are not practicable, these arrays are also becoming common as receive antennas. 4-square controllers, which perform the switching, are both homebrew and commercially available.

Categories: station hardware

See Also: Receive antennas

ADIF

Amateur Data Interchange Format. A transport format for contest logs used for inporting/exporting files between different logging software and other programs. Similar in function to Cabrillo.

Categories: operating software/hardware

See Also:

AFSK

Audio Frequency Shift Keying is a RTTY mode where two audio tones are fed into the Mic or auxiliary audio input to the SSB transmitter to create the two RTTY RF frequencies.

Categories: general

See Also:

Assisted

Assisted is an "overlay" category that is interpreted in most contests as meaning that use of spotting information delivered from internet or packet radio based networks which give real-time information on frequencies and call signs of stations in the contest is allowed. It is a single operator overlay -- most multi-operator categories already allow spotting assistance.

Categories: operating classification

See Also: SOA, unassisted

Band change rule

A rule which restricts band changes for certain multi-operator categories in some contests. A band change rule says that a station can, say, only make 8 band changes per hour. Note that moving to a band to work something, and then returning counts as two band changes.

Categories: contest specific concept

See Also: 10-minute rule, MS, M2

Band Decoder

A band decoder either operates through hardware or software to switch station hardware (e.g., antennas, filters) based upon the band selection of the radio. They are a fundamental part of most top tier stations.

Categories: station hardware

See Also:

Band Edge

The band edge generally refers to the lowest (or highest) frequency in the band where one can legally operate within the limits of his/her license. For US operators, for example, this would be approximately 21200.4, say, for 15 (USB), but would be about 7127 or so for 40 (LSB). The reverse is true for the upper band edge – e.g., on USB on 15 meters the practical limit for transmit frequency is approximately 21448. The lower band edge is sometimes desirable for US operators who are running since QRM from other W stations can only be on one side of your signal.

Categories: operating technique, ethics,

See Also:

Band Map

A graphical, real time display of stations arranged by frequency presented by most popular contest software. The map is either populated by telnet/packet spots from clusters and skimmers, and/or may be filled in using data entered by the user. Most software allows users to then click on stations on the map to be taken directly to the frequency the station is reported to be on. Stations listed on the map are color coded – with new multipliers distinctly noted. (Stations previously worked may not be listed at all). The accuracy of these maps is only as good as the data used to construct it – errors in call signs are frequently encountered. Use of band maps (or packet/telnet and skimmer spots) are not permitted for Single Operator Unassisted categories.

Categories: operating software/hardware

See Also:

Beacon

Fixed, automated transmitters which transmit signals (typically CW) continuously to allow operators to check propagation. These transmitters are located around the globe and on HF are mostly found on bands such as 10 meters above 28.1 MHz. They typically use low power and omni-directional antennas. It can be good operating strategy to tune to these stations during contests to learn when propagation might support QSO's even if activity and thus stations in the contest are not heard

Categories: operating techniques

See Also: RBN

Bip/Bop

A hardware switching arrangement for stacked yagis or other all driven antenna arrays that allows the operator to select both in phase (BIP) or both out of phase (BOP) operation. The latter can be dramatically better for very high angles of radiation.

Categories: station hardware

See Also: Stack, Yagi

Blind skimmer

A mode of operation for a CW skimmer that disables the decoding of call signs as well as the integration with internet spots. In this blind mode, the operator only sees (potentially) a waterfall display showing recent historical activity across the band as with a panadaptor. Blind mode is legal for single operator, unassisted entrants in most major contests.

Categories: contesting hardware/software

See Also: skimmer, panadapater, spots, SOAB, SOA

Breakdown

The disaggregation of one's contest score into QSO's and multipliers worked, usually separately tallied for each band (or even additionally, for each hour).

Categories: log checking and reporting

See Also:

Bust

A bust is a QSO that is incorrect in some way -- the callsign or exchange was inaccurately recorded. May also refer to spots which are incorrect.

Categories: log checking and reporting, ethics,

See Also: Spot

Cabrillo

Cabrillo is a very flexible and generalized computer file format that is supported for score reporting by all modern contest software. Most contests have moved to require that electronic log submissions provide contest logs in this format. In most cases contest software will do this automatically.

Categories: log checking and reporting

See Also:

Check

A two digit number that corresponds to the first year that you obtained your ham radio license. The check is part of the exchange in the ARRL SS contest. Multi-operator stations use the same check regardless of who is

Categories: contest specific concept

See Also: Exchange

Checklog

A category for log submissions which removes the entrant from any competition or score listing. Instead, the log information is submitted solely for log checking purposes by the contest sponsor.

Categories: operating classification

See Also:

Claimed Score

The contest score that is computed before any deductions for incorrectly logged information (conducted after the contestant submits the log to the contest sponsor) take place.

Categories: log checking and reporting

See Also:

Cty.dat

Cty.dat, or sometimes wl_cty.dat, also known as a "country file." is the computer file containing the lookup information that translates prefixes of call signs into country and/or zone multipliers. Software would use this file, say, to tell you that N9RV counts as a W, and is in CQ zone 4 (or ITU zone 6). Since worldwide prefixes are frequently in a state of flux, an up-to-date country file is always desirable. More recent country files also contain data that may help determine a station'szone. Such information can be inaccurate and in all cases operators should gather such information from the contest exchanges themselves.

Categories: operating software/hardware

See Also: Mult, Exchange

Deadline

The latest day that logs can be submitted to the contest sponsor to be included in the competition.

Categories: log checking and reporting

See Also:

Digital Voice Keyer

Hardware which digitally records one's voice for CQ's, contest exchanges and other frequently spoken information. The recording is played back using keystrokes defined by software (or by pushing a button for a stand alone box), thus saving the operator the fatigue of doing it manually. Most modern software uses computer sound cards for this purpose. Older software used specially designed cards (e.g., the DVP by K1EA, the W9XT card) or even a stand alone box.

Categories: operating software/hardware

See Also:

DQ

Disqualifaction (DQ) is the disallowal of a contest entry by the sponsor of the contest, for serious rule violations. DQ is a serious step, which can have ramifications for WRTC eligibility and participation in future contests.

Categories: log checking and reporting

See Also: red card, yellow card

Dual-CQ

Dual-Cqing (or dueling CQ's) is supported by some contest software in a SO2R environment, where a CQ is called alternatively on each radio (typically on separate bands). It adds complexity, but can increase your transmitted presence.

Categories: operating technique, operating software/hardware,

See Also:

Dummy CQ

A dummy CQ is a CQ sent out by a SO2R station as a means of holding a frequency (e.g., discouraging others who might start Cqing themselves). Although it sounds just like any ordinary CQ, in a dummy CQ scenario the SO2R station is not prepared to answer responding stations until his/her QSO on the other radio is completed.

Categories: operating technique, operating software/hardware,

See Also:

Dupe

A dupe is a second contact with a station that does not count for additional points. Most contest software will inform you whether or not a station is a "dupe" so you don't waste time working it.

Categories: log checking and reporting

See Also:

ESM Mode

Enter Sends Message mode. A concept for logging software that uses the Enter key on the keyboard to accomplish multiple tasks, depending on the context. While this is implemented differently in specific software, the general concept allows the user to press the Enter key at different stages to, say, start a CQ message, respond to a call by sending the exchange, or send one's own call, depending on the context in which the key is pressed. If a program does not enable ESM mode, then pressing a specific key always produces the same result.

Categories: operating software/hardware

See Also:

Exchange

The information that is passed between stations in a contest (in addition to the call sign). In the CQ WW, for example, the exchange is RST and the two digit CQ zone number.

Categories: contest specific concept, operating software/hardware,

See Also:

Firmware

Computer code that controls a device. The code is generally resident in a chip, and can be updated using whatever communications protocols are set up for this purpose. Many contesting devices are now microprocessor controlled, and the ability to update firmware (generally made available by the manufacturer but sometimes customizable by the user) can greatly add to the capabilities and functionality of the device. The Elecraft K3 tranceiver, for example, has a rich and vibrant community developing new firmware to improve its operation.

Categories: station hardware

See Also:

Flutter

A propagation phenomenon that is characterized by very rapid QSB (fading signal strength), often accompanied by Doppler shift in frequency, which can produce a warbling tone on CW. Signals displaying flutter are most often associated with paths that travel close to or through the auroral zones around each pole of the globe, but during periods of high auroral disturbances flutter can affect almost all signals. For this reason the presence of flutter on a signal gives a useful clue for the callsign of a (possibly weak) station.

Categories: general, operating technique

See Also:

FSK

Frequency Shift Keying is a RTTY mode where the transmitter is keyed directly, similar to CW.

Categories: general

See Also:

Gab

Gab is a feature of many contest software packages that allows computers setup at different operating positions in a multi-operator station to send and receive messages at the keyboard to/from each other.

Categories: operating software/hardware

See Also:

Gab file

Gab file is the record of gab messages recorded by the software during the contest.

Categories: operating software/hardware

See Also:

Gas

A derogatory term that refers to running more transmitter power than is allowed by the terms of your radio license. Some contests (e.g., the CQ WW) limit transmitter power to a maximum of 1500W output no matter what the rules for one's country say.

Categories: ethics

See Also:

Golden Log

A log which survives the contest sponsor's log checking process with zero errors and no change to its claimed score. A golden log is the mark of a careful and skillful operator.

Categories: log checking and reporting

See Also:

Gray Line

The gray line, or daylight/darkness terminator, is a constantly moving circle around the earth where a daylight/darkness transition is taking place. When this circle is over your QTH, potentially enhanced propagation along the terminator is possible, especially on lower frequencies. The timing and potential for gray line propagation depend on a number of predictable (season of the year) and unpredictable (solar conditions) factors. Gray line QSO's can produce new multipliers and/or memorable contest experiences.

Categories: general, operating technique

See Also: long path

Grid Square

An alphanumeric geographical coordinate system, based on the Maidenhead Locator System developed by VHF enthusiasts in 1980, in which the entire globe is divided into equal-sized rectangles which are denoted by alphanumeric codes. E.g., the four digit grid square for N9RV (western Montana) is DN36. Four (or more) digit grid squares have found increasing popularity as contest exchanges, particularly for VHF contests, as they offer both an increased challenge for successfully completing contest QSOs with accuracy, as well as giving universal location information for all countries/states.

Categories: contest specific concept

See Also: exchange, http://en.wikipedia.org/wiki/Maidenhead_Locator_System

Great Circle

The bearing between two points on the globe which minimizes the physical distance is known as a great circle bearing. Thus the great circle bearing for working, say, India from the central U.S. is approximately due north. Great circle bearings can vary considerably from what might be suggested from the Mercator projection maps posted in most grade schools. During most openings on HF, great circle bearings are optimal for directional antennas. Long path (180 degrees different) or skew path (aiming towards the equator) are less frequent, but sometimes better, strategies for aiming antennas.

Categories: general

See Also:

K3

A popular HF transceiver available from Elecraft that is used by many contesters.

Categories: station hardware

See Also:

Keyboard focus

An attribute of contest software that controls more than one radio at a time. Keyboard focus is the particular radio that your keyboard is entering information for. This is the "active radio" for purposes of logging. If the software is well designed, keyboard focus will flow naturally between radios as the situation requires. In a two radio situation where radio 1 is on 40 meters and radio 2 is on 20 meters, while your radio 2 is CQing your keyboard focus should probably be on radio 1, and vice versa.

Categories: operating software/hardware

See Also: SO2R

LCR

An acronym for Log Checking Report. A report from the contest sponsor to each individual competitor that details the scoring adjustments to their submitted contest log, reflecting dupes, busted calls, NIL's and other errors. The LCR is very useful as a means of improving your accuracy in future contests.

Categories: general, ethics,

See Also: bust, dupe, NIL

Lid

A lid, generally, is someone whose operating behavior shows a lack of awareness, competence or consideration for other amateurs.

Categories: general, ethics,

See Also:

Lockout

A means of preventing two transmitters from keying or transmitting simultaneously. A hardware lockout accomplishes this task by inhibiting the transmit/key line on the different radios with a lockout circuit. A software lockout does the same thing using software. This prevents the station from violating the rules of the contest. E.g., it could prevent a multi/multi station from having more than one transmitted signal on the same band, or it might prevent a single operator station from transmitting simultaneously on multiple bands.

Categories: operating software/hardware, ethics

See Also:

Long Path

A situation where HF propagation exists between two stations in the inverse direction of the great circle heading. "Beaming long path" means pointing your antenna 180 degrees different from the "short path," or great circle heading, for a particular station. Long path propagation, for example, might allow a North Carolina station to work a station in Hong Kong on 10 meters in the morning by beaming southeast. Depending on the season of the year and the propagation on any particular day, this can be an extremely effective event in a DX contest, allowing for long distance QSOs not possible during short path openings. Gray line QSOs, for instance, are frequently long path. Learning and checking the long path openings, in terms of times, bands and geographies, from your QTH can be very valuable for increasing your multipliers and contest scores in DX contests.

Categories: general, operating technique

See Also: gray line, skew path

M2

Shorthand for the multi-operator, two-transmitter category offered in some contests. This is a relatively new category that was intended to allow greater flexibility that older single transmitter categories, but with less hardware requirements than the open ended multi transmitter category.

Categories: operating classification

See Also: MS, MM

Master.dta

The master.dta, or "master database" file is a collection of so-called "known good calls" -- e.g., call signs of stations that have been worked in previous contests. It can be used as an operating aid with most contest software to suggest complete calls when only partial information is copied over the air.

Categories: operating software/hardware

See Also:

MM

The multi-operator, multi-transmitter category involves an unlimited number of operators and transmitters, with only one transmitted signal allowed per band.

Categories: operating classification

See Also: M2, MS

Moving Multipliers

An operating technique where one asks over the air for a station who is a multiplier (e.g., a new country, state or section) to move (QSY) to a different band so that an additional multiplier can be added to one's score. To be done successfully, there must be propagation between the stations on the new band, and the asking station must be able to move quickly. It is not good contest etiquette to ask a CQ-ing station with a pileup to move bands, but even rare DX that comes back to your own CQ's is fair game for this technique. For contests like SS and WPX that only count multipliers once (instead of once per band) this does not apply.

Categories: operating technique

See Also:

MS

The multi-operator, single-transmitter category found in many contests has evolved to have different definitions in individual contests. Once understood as a "one transmitted signal" category, its exceptions and specific band change rules make it among the most complex, yet most popular, categories.

Categories: operating classification

See Also: 10-minute rule, band change rule

Mult

Most, but not all, contests compute the final score as the product of (i) QSO points and (ii) a tally of zones, countries, prefixes or other unique characteristics. Since they impact the score multiplicatively, this second item is called the multiplier. For example, in the SS contest, the multiplier is the number of unique ARRL sections worked (maximum of 80). Thus when a new (e.g., unique) section is worked, it has a greater impact on the final

Categories: contest specific concept, operating technique,

See Also:

Mult station

The station in a multi-transmitter environment that is working only mulitpliers -- new countries, zones, or prefixes, depending on the contest. This usually entails tuning and answering others who are calling CQ.

Categories: contest specific concept

See Also: S&P, Run station

Multiplier

See the discussion under mult above.

Multiplier Bell

A frequently used motivational device for multioperator contests. The sound of a bell going off in a room of operators when a new multiplier is worked by one of them manning different radios is familiar to many successful multi-operator stations.

Categories: operating technique

See Also:

NIL

Not-in-log. A deduction made by the contest sponsor that refers to the situation where a contact claimed by one station is not confirmed by a record in the second station's log. In most cases an NIL results for you when there is nothing even "close" to your call in the other station's log at the time you claimed the contact.

Categories: log checking and reporting

See Also:

Off-by-1

A "one off" call is a call that differs by one character -- W9RV, N7RV, and N9RE are all one off calls for N9RV.

Categories: log checking and reporting

See Also: SCP

Off-time

Off-time is the amount of time during the contest period that a station is off the air -- no listening or transmitting taking place. Some contests (e.g., Worked All Europe, ARRL SS) require that single operator entrants take a minimum amount of off time. Off time lengths are usually restricted to a minimum block size (30 minutes in SS, for example).

Categories: contest specific concept, operating technique,

See Also: Rubber clocking

Online scoreboard

A web site that delivers real-time score information of participants in a contest, such as those at cqcontest.net. In most cases these scoreboards are designed to seamlessly interface with contest software at participating stations so that one can see at a glance the relative standings of the competitors in any category. Participation in live scoreboards is gaining popularity, but some have questioned whether or not the use of such information during a contest is consistent with unassisted operation.

Categories: operating hardware/software

See Also: unassisted

Packet

Packet originally referred to packet radio spotting networks, which were an application of (typically) VHF packet radio networks that were created in the late 1980's as a means of exchanging real-time spot information during contests. The rise of high speed internet since that time has caused almost all of these networks to migrate to the net, greatly increasing their speed and scope. Although no real connection to packet radio networks still exists, the term "packet" has survived, referring to spotting networks in general

Categories: operating software/hardware, operating technique

See Also: spot

Panadaptor

A band scope that displays signals on a band visually, usually as a line or area graph, allowing for a view of activity across an entire band at once. The display show signal strength on the vertical axis and frequency on the horizontal, and is sometimes combined with a waterfall display which presents a brief historical view of activity on a frequency instead of an instantaneous view. This can be a stand alone piece of hardware, integrated into a radio, or software produced by a product like a skimmer.

Categories: contesting hardware/software

See Also: skimmer

Partial

Partial calls are bits and pieces of full call signs. They contain valuable information but cannot be logged until they are complete.

Categories: operating software/hardware, operating technique,

See Also: SCP, Super Check

Pass

Passing is an action where a station worked on one band is requested to QSY to a second band, typically in order to obtain additional multiplier credit. Proper contest etiquette holds that only stations who respond to your CQ can be passed -- it is not good manners to ask a station who has established his or her own running frequency to QSY to another band.

Categories: operating technique, operating software/hardware,

See Also:

Penalty

Penalties are additional deductions made for unverified or inaccurate information submitted as part of one's claimed score. For example, a NIL in the ARRL SS contest results in the loss of the claimed QSO as well as an additional penalty QSO deducted. Penalties and other score reductions are incurred by all contest competitors, both new and experienced, and are generally nothing to be ashamed or fearful of. Part of contest competition is acquiring operating habits that minimize these deductions.

Categories: log checking and reporting

See Also:

Pileup

Multiple stations calling a CQing station at the same time. Modest pileups are concentrated on a single frequency. Rare DX might result in a pileup that is spread out across multiple frequencies. The skill of picking calls out of a pileup, or alternatively, successfully breaking through a pileup to get a CQing station to respond to your call, is a critical contest skill.

Categories: operating technique

See Also:

Poaching

Poaching is when a third station strays onto the frequency of a station who is running in order to make contact with one of the responding stations. If N9RV is running stations on 14024, say, and you attempt to call one of the stations that he has just worked, you are poaching. As the term implies, this is aggressive and unethical contest

Categories: operating technique, operating software/hardware, ethics

See Also:

Point and shoot

Also known as point and click. A refinement of the search and pounce operating method which is supported by most major logging software programs. With this method, the operator clicks on calls presented in a window on the monitor, so that the frequency of the radio is immediately changed to the frequency of the call which is listed. Thus one may quickly hop around the band, each time landing on the frequency of a CQing station who can be called. The technique is only allowed for operating categories which allow access to packet/internet spotting networks. The technique, while very attractive, has two major difficulties: (i) calls which are spotted may be incorrect – unless one independently verifies the call one runs a very high risk of incurring penalties for busted QSOs, and (ii) when dozens or hundreds of stations in a contest use this technique simultaneously, it results in big pileups calling on exactly the same frequency, which are hard for CQing stations to disentangle.

Categories: operating technique, operating hardware/software

See Also: S&P, spot, bust, skimmer

Points per q

The number of QSO points that any particular contest contact contributes. In some contests, for example the NA Sprint or ARRL SS, the points per QSO is constant. Most DX contests employ points per q rules that give more credit for contacts outside your continent. Some give zero points for contacts within your own country.

Categories: contest specific concept, operating technique,

See Also:

Prec

Part of the exchange in the ARRL SS contest. It consists of a single letter, once soley based upon your transmitter power: Q = 5 watts or lower, A = 5-100 watts, B = more than 100 watts. Recently additional Prec's were added for multi-operator and assisted categories. See rules for ARRL SS contest.

Categories: contest specific concept

See Also: Exchange

Prefill

Prefill refers to the features of some software packages which automatically fill in exchange information based upon information obtained either before or during the contest. Prefill software might enter "Pat" in the name field for the NA Sprint, for example, if you work N9RV, either based upon previous contests, or based on working N9RV on a different band in the current contest. If the prefill information is different from what the station actually changes, of course, it is up to the operator to manually correct it.

Categories: operating software/hardware, operating technique,

See Also: Exchange

Prefix

The portion of a callsign that contains the beginning of the all, up to, and including, the number. The prefix of N9RV is N9. The prefix of 3DA0X is 3DA0. Prefixes count as multipliers in some contests – e.g. the WPX contest. In most cases, prefixes also reveal the geographical location of the station as well.

Categories: general

See Also:

QRP

QRP in contesting is generally where one's maximum output power is no more than 5 watts. In many contests, power is an overlay category. E.g., you can be QRP and SOAB.

Categories: operating classification

See Also:

Q-signals

A three letter code beginning with the letter Q. In theory, each code has a slighly different meaning when used with a ? appended. ARRL and other groups publish the codes and their text meaning. In contesting only a few of these codes are used, sometimes in ways that have evolved from their "official" meaning.

Categories: general

See Also:

Qso b4

QSO b4 is the CW message sent to tell responding stations that they have been worked for point credit previously in the contest and no second QSO is necessary/desirable.

Categories: operating technique

See Also: Dupe

Rate

Rate refers to the speed of making contest QSOs. It is typically measured in QSOs per hour, even when the time span referred to is longer or shorter than 60 minutes. E.g., if N9RV's 10 minute rate is 70.4, it means that if he continued to make QSOs at the same rate for 60 minutes as he just made in the last 10, he would have 70.4 QSOs in the log. The rate statistics provided by most contest software give valuable information on operating

Categories: operating technique, operating software/hardware,

See Also:

RBN

Reverse Beacon Network is a internet-based network of dedicated wide band receivers around the world which decode CW signals in real time and generate “spots” which contain frequency, signal strength and other information. The effect is that of a traditional beacon in reverse – instead of checking propagation by tuning one’s receiver to a transmitting beacon at a particular frequency, one merely transmits (usually by calling CQ on CW) while connected to a RBN to see which of the receivers on the network hears you.

Categories: operating software/hardware

See Also: spot, skimmer, skimmer network, beacon

RDF

Receiving Directivity Factor is a measure of receiving antenna performance which compares the forward gain of an antenna at the desired azimuth and elevation grade to its average gain over the entire hemisphere (thanks W3LPL for this definition).

Categories: station hardware

See Also: receive antenna, receive diversity

Receive Antenna

Generally refers to an antenna that is used for receive purposes only – e.g., not the same as the transmitting antenna. These include specialized antennas, such as loops, short verticals, pennants or beverages. Receive antennas can be used singly or in combination – e.g., fed into separate receivers simultaneously – the latter is used for what is known as diversity reception. Most modern receivers allow for this. Receive antennas are often non-resonant, and are of particular advantage on lower frequencies to improve directivity and the signal to noise ratio.

Categories: station hardware

See Also: 4-square

Receive Diversity

The practice of using two antennas, each feeding a separate receiver locked onto the same frequency, to better capture a weak signal. This frequently is an advantage due to the differences in polarization, wave angle, noise susceptibility and other characteristics of propagation at any time. Receive diversity is especially important on the low bands where signal to noise ratios are low. Common practice feeds the audio from each receiver into a separate ear.

Categories: station hardware

See Also: receive antenna, RDF

Remote Operation

This generally describes a situation where the physical location of the transmitter/receiver is different from that of the controlling operator. This can be supported by software that allows receiver audio and other information to be sent to a remote computer (possibly located thousands of miles away) that also controls transmit, rotor, and other station functions. Contest and DX rules are still evolving on the validity of this configuration. Most seem to allow remote operation as long as the transmitters and antennas are in a single physical location.

Categories: station hardware, ethics

See Also:

Robot

The contest robot, or simply "robot," refers to the automated process that examines contest logs that are submitted to contest sponsors (either via email or a web page) for proper syntax and formatting. Most contest robots will "bounce," or reject with error messages, logs which fail to conform to the proper Cabrillo format, fail to include required information, or which contain other errors.

Categories: log checking and reporting

See Also: Cabrillo

Rover

A rover is a mobile station that travels during a contest to activate multiple geographic locations (typically grid squares) during the course of a contest. Rover stations are especially common in VHF contests, and often involve sophisticated setups that can activate multiple bands as well as high profile (elevation) locations. Rovers can make the contest more fun for everyone by making more multipliers available and thus adding to contest scores. The so-called "captive" rover refers to a rover whose express purpose is to work only a single competitor. The ethics of this variant to the rover concept is dubious at best.

Categories: operating classification, ethics

See Also:

Rubber Clocking

A slang term used to refer to the adjusting of times in the contest log to make QSOs appear to conform to the rules of a category and contest. This includes, for example, to make reported off-times in time-limited contests such as the ARRL SS conform to rules that require them to be at least 30 minutes in length, or making times of QSOs appear to obey the 10-minute rule for multi-operator categories in DX contests. Such changes are unethical and not allowed by contest rules and are grounds for disqualification.

Categories: ethics, log checking and reporting, contest specific concept

See Also: DQ, red card, yellow card, 10-minute rule

Run

Running refers to staying on one frequency and calling CQ to solicit new contacts. Running may, or may not, be the fastest way to make QSOs and/or build your score at any given time. Whether or not to run is a fundamental decision made during the entire duration of a contest.

Categories: operating technique

See Also: Run station

Run station

The station in a multi-transmitter environment that is "running" stations -- e.g., calling CQ and taking all who

Categories: contest specific concept

See Also: Running

S&P

Search & Pounce is the operating method where one tunes a band and responds to other stations who are running (e.g., calling CQ). The "traditional" tuning by spinning the receiver knob has been augmented by contest software that allows one to jump instantly to a spot frequency (for categories which allow this) and more recently through the use of panadaptors and other visual displays that allow operators to jump to a frequency based on visual

Categories: operating technique

See Also: spot, point and shoot

Schedule

Schedules are advance arrangements to make QSO's with specific stations at specific frequencies and times. Schedules are often made during a contest to try to work additional multipliers on times and frequencies when propagation is favorable. E.g., N9RV may work NH2T on 15 meters at 0100z and set up a schedule for 40 meters on 7030 kHz at 0700z. When 0700z rolls around, if NH2T and N9RV remember to go to 7030 kHz and they hear each other, a new QSO (which may be a new multiplier for one or both) can be made. Schedules made on the air during the contest can be an important and effective contest tactic. Schedules made via non-amateur means (e.g, email) and/or schedules made before the contest starts are not allowed by most contest rules. Even if rules do not explicitly forbid it, such practices are not considered ethical and should be avoided.

Categories: operating technique, ethics

See Also: mult

Sec

Abbreviation for ARRL section. Loosely corresponds to US states and Canadian provinces, but larger entities (e.g., NY or California) are divided, resulting in a total of 80 sections. Sections count as multipliers for some ARRL contests.

Categories: contest specific concept

See Also: Mult

Serial Number

A counter that begins at 1 for the first contest QSO, and increments by 1 for each successive contact. The serial number is part of the exchange for some contests (e.g., the CQ WPX, the Worked All Europe contest).

Categories: contest specific concept

See Also: Exchange

Single-Band

Competitors in the single band categories restrict their competitive efforts to one frequency band (e.g., 40 or 20). In some contests they are allowed to make contacts on other bands, but only their "single" band QSOs count towards their score.

Categories: operating classification

See Also:

Six-Pack

A six pack is a relay controlled matrix coax switch with two inputs and six outputs. It is used by many stations who use SO2R as a means of allowing either station to have access to any antenna. Newer variants of matrix switches allow for more than six outputs, but the term has stuck.

Categories: station hardware

See Also:

Skew Path

A propagation phenomenon where the ionosphere does not support direct-line propagation (along a great circle heading) between two stations, but contacts can be made by aiming closer to the equator (due east or west) so that the path is skewed, so that the first hops travelling in a more southerly direction (for northern hemisphere stations). For a North American station, for example, a skew path opening to Japan might make signals peak due west or even south of west. Skew path openings can take place at frequencies below the MUF, or maximum usable frequency, between two points on the globe, which is often the case under poor propagation conditions. Turning your antenna to explore skew path propagation is a very useful technique that can make a previously inaudible signal suddenly appear and make a QSO possible.

Categories: general, operating technique

See Also:

Skimmer

A CW Skimmer is a product developed by VE3NEA which combines a CW code reader with a broadband receiver, providing real time spotting information without the use of a spotting network.

Categories: station hardware, operating software/hardware, ethics

See Also: skimmer network

Skimmer Network

The global network of internet-connected skimmer stations which continuously copy and post call sign, frequency information and signal strength data for ever station they decode (CW and digital modes). The data stream can be used in real time by a variety of applications and contest programs to allow “point and shoot” operating during contests. Note that unassisted categories are not allowed to access skimmer networks.

Categories: station hardware, operating software/hardware, operating technique, ethics

See Also: skimmer, point and shoot

SO1R

Single operator single radio is not a formal category in most contests, but describes the less complex hardware/software setup where the operator tunes and transmits on one radio at a time.

Categories: operating classification, operating technique,

See Also:

Snow/rain static

QRN caused by electrically charged precipitation hitting antennas. Low antennas and quads are usually less susceptible than high yagis.

Categories: general

See Also:

SO2R

Single operator two radio operation involves using audio feeds from two radios simultaneously (but with only one transmitted signal at a time allowed), which enables an operator to tune and listen on a second radio (usually on a second band) while the primary radio is transmitting.

Categories: operating classification, operating technique,

See Also: Dual-CQ, Dummy CQ

SO2R Controller

A homebrew or commercially made accessory which automates the switching of station peripherals (e.g., headphone audio, key paddle input, microphone) between two radios to enable more effective and efficient two radio operation. These accessories typically integrate with contest software to manage two radio operation as seamlessly as possible.

Categories: station hardware, operating software/hardware

See Also: SO2R

SOA

Single operator assisted is a single operator category where packet/internet spotting assistance is allowed (see Assisted).

Categories: operating classification

See Also: Assisted

SOAB

Single operator all band is an operating category common to most contests. In most contests, packet/internet spotting assistance is not allowed, but the WAE and some other contests allow it. Due to the popularity of internet assistance, and the difficulty in detecting the (intentional or unintentional) use of this assistance by contest sponsors judging the results, this situation is changing. This category is sometimes referred to as "SOAB Classic" to reflect its legacy to the pre-spotting era. In all cases a single person is responsible for all operating and logging during the contest.

Categories: operating classification

See Also:

SOHP

Single operator high power refers to a SOAB, SOA, or SOSB station that runs more than 100 watts output from the transmitter.

Categories: operating classification

See Also:

SOLP

Single operator low power is a single operator who runs a maximum of 100 watts output.

Categories: operating classification

See Also:

SOQRP

Single operator QRP stations run a maximum of 5 watts from the transmitter.

Categories: operating classification

See Also:

SOSB

Single operator single band is a single operator station who operates a single band. It also may mean unassisted, although this is ambiguous.

Categories: operating classification

See Also:

SOU

Single operator unlimited is used interchangeably with single operator assisted as described above. Unfortunately, both terms "unlimited" and "assisted" have connotations (especially when translated from English) that are inconsistent with their intended meaning. They both are supposed to denote a single operator who receives spotting assistance via packet radio or internet.

Categories: operating classification

See Also: SOA, Assisted

SPG

Single point ground is a lightning protection practice that physically binds all of the entry wiring into a house/shack to a single ground -- e.g., RF, AC power, water pipes, telephone.

Categories: station hardware

See Also:

Split

Describes the situation where a CQing station is listening on a frequency that is different from his/her transmit frequency.

Categories: operating classification, operating technique,

See Also:

Sporadic E

Propagation that utilizes the E layer of the ionosphere. Since this layer is inconsistently ionized and is lower than the F layers that support more reliable HF propagation, such propagation is more rare. When it occurs (usually in the summer months) it can support long distance QSOs especially on 10 and 6 meters.

Categories: general

See Also:

Spot

A spot generally refers to a posting of information on the frequency and callsign of a station in the contest, usually received from an internet or packet radio network.

Categories: operating software/hardware, operating technique,

See Also: Assisted

Sprint

A short contest that emphasizes frequency agility. The original Sprint contest is the North American Sprint, held in February and September of each year, sponsored by the National Contest Journal. The most unique aspect of Sprint contests is the QSY rule – when a CQing station receives a response, they must QSY and leave the frequency to the calling station at the end of the QSO. Thus sprint contests do not allow the “running” of stations on a single frequency that is characteristic of most other contests.

Categories: operating classification, operating technique,

See Also:

Stack

A stack generally refers to two or more yagi antennas which are pointed in the same direction, aligned vertically on a tower or mast, and fed (typically) in phase to increase gain and better control the take-off angle of the antenna system’s forward lobe.

Categories: station hardware

See Also: Bip/Bop

SteppIR

A commercially manufacturer yagi which works on multiple bands. The antenna elements consist of hollow fiberglass tubes which support a conductive ribbon that is adjusted in length with microprocessor controlled motors.

Categories: station hardware

See Also Yagi

Super check

Super check is another term for super check partial, as described above.

Categories: operating software/hardware

See Also: SCP

SWL

A station that only listens and does not transmit. This may be because the operator is not licensed to transmit. There is a long tradition of short wave listening (SWL) enthusiasts who compete for awards in a manner very much like amateur radio.

Categories: general

See Also:

UBN

An acronym for "unique, bad, not-in-log" which became slang for a log checking report.

Categories: log checking and reporting

See Also: LCR

Unassisted

Unassisted is the opposite of assisted, in that the use of spotting information delivered from internet or packet radio networks that is allowed in the latter is not allowed. It is a single operator overlay -- most multi-operator categories already allow spotting assistance.

Categories: operating classification

See Also: assisted, SOA

Unique

A claimed contact that is unique to all of the submitted logs in a particular contest. Such calls are much more likely to have been incorrectly copied.

Categories: log checking and reporting

See Also:

Unique+1

A unique+1 is a call that is (i) “one off" from a unique call and (ii) is a call of someone who was active in the contest. If you claimed contact with N9RU, and no one else in the contest worked N9RU, it is a unique. If N9RV was active in the contest, that is a unique+1. (N9RD might also be a U+1 if he was active).

Categories: log checking and reporting

See Also:

Unlimited

Unlimited means the same as assisted -- e.g., spotting network assistance is allowed.

Categories: operating classification

See Also: Assisted, SOA, SOU

Waterfall Display

A useful mode of a panadaptor which gives an animated depiction of band activity over the chosen frequency range. In a waterfall display, received signals show up as solid points at a spot on a horizontal display that indicates their frequency. The pattern of the points gives visual information about what kind of signal it is – e.g., a carrier, a station sending CW or some other mode.

Categories: station hardware

See Also: Panadaptor

WRTC

World Radio Team Championship. Begun in 1990 at the World Cup Games in Seattle, the WRTC is a unique competition that occurs approximately every four years in July coincident with the IARU contest. WRTC assembles the competitors – two-person teams drawn from the top operators worldwide – in a single physical area, using identical antennas and power levels, to present a more level playing field in the competition. WRTC's have been held on three continents and in five different countries. WRTC 2014 will be held in New England in the United States.

Categories: general

See Also:

WWROF

The World Wide Radio Operators Foundation is an independent organization committed to supporting radio contesting worldwide.

Categories: general

See Also:

Yagi

A directional antenna typically consisting of a dipole element that is directly fed by the transmitter and a number of closely spaced "parasitic," or indirectly energized, elements which re-radiate RF energy to produce a directional pattern.

Categories: station hardware

See Also:

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