·CTU·
CONTEST UNIVERSITY

Dayton Contest University
May 15, 2014
Crowne Plaza Hotel
Dayton, Ohio

DX ENGINEERING

WRTC 2014 World Radiosport Team Championship
Major Sponsor
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DX Engineering can provide you with everything you need to stay competitive, including advice from our team of serious Amateur Operators and the fastest shipping in the industry.

DX Engineering Receive Preamplifier

The RPA-1 has been tested to be the best low-noise preamp available. It's better than most radio front-ends, using an advanced push-pull design to virtually eliminate harmonic distortion. The preamp also has a high quiescent current to help handle strong signals without overloading. It covers 300 kHz-35 MHz, and offers the best results for HF DXing or Contesting.

Hi-Z Antenna Products

Hi-Z makes some of the best HF/MF receive systems available, and they are only available at DX Engineering. The components work exceptionally well in high-RF fields and are perfect for contesting (or if you've got a powerful AM broadcast station nearby). The compact arrays won't take up a lot of space on your lot. Hi-Z offers a complete line of Array Systems, Preamps, Filters and Transformers.

KD9SV 160/80 Meter Systems

Since the development of his groundbreaking 160 meter preamplifier in 1987, Gary Nichols KD9SV, has spent the last 25 years on a quest to create the best "Top-Band" gear on the planet. DX Engineering carries the full line of KD9SV products, including preamplifiers, antenna switches, relays, Beverage systems and KD9SV's unique Front-End Saver.

2X Arrays TX38 Yagi Antenna

This tri-band eight-element Yagi offers exceptionally high performance on the 20/15/10 meter bands. It only weighs about 30 pounds and carries a 5.3 sq. ft. wind load, which means it can survive up to 100 mph winds. Its durability makes it ideal for permanent installations, but it's still compact and light enough to be used during Field Day. The TX38 is so versatile in fact, that it was selected as the official tri-band antenna of WRTC-2014.

Stay competitive. Get the right parts and blazing-fast shipping. If your order is in by 10 pm Eastern and the parts are in stock, DX Engineering will put it on a truck the same day. Request your catalog and shop online 24 hours a day, 7 days a week at DXEngineering.com.

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digital HFDSP

Icom's pioneering work in Digital Signal Processing lets today's ham isolate weak signals without needing to buy expensive optional filters.

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IC-7800 HF + 6m

200 Watt Output (50W AM)

RX: 0.030–60.000MHz*

2 Independent Receivers

+40 dBm 3rd Order Intercept Point

Four 32 Bit IF-DSPs
+ 24 Bit AD/DA Converters

3 1st IF "Roofing Filters" (15/6/3 kHz)

Built-in Digital IF Filtering,
Twin Passband Tuning with
Selectable Width and Shape

RS232/Ethernet Control, S/P DIF Audio

New Firmware Update!
(Visit www.icomamerica.com for details)

IC-7700 HF + 6m

200 Watt Output (50W AM)

RX: 0.030–60.000MHz*

Single Receive

+40 dBm 3rd Order Intercept Point

32 Bit IF-DSPs + 24 Bit AD/DA
Converters

3 1st IF "Roofing Filters" (15/6/3 kHz)

Built-in Digital IF Filtering,
Twin Passband Tuning with
Selectable Width and Shape

RS232/Ethernet Control, S/P DIF Audio

New Firmware Update!
(Visit www.icomamerica.com for details)

IC-7600 HF + 6m

USB Control Audio

100 Watt Output (30W AM),
Optional PS-126

RX: 0.030–60.000MHz*

Digital Twin Passband Tuning

+30dBm 3rd Order Intercept Point

3 1st IF "Roofing Filters" (15/6/3 kHz)

Built-in Digital IF Filtering,
Twin Passband Tuning with
Selectable Width and Shape

USB Port - Allows for CI-V
Commands, Transmit Modulation
& Audio Receive

you can't work 'em if you can't hear 'em

WRTC World Radiosport Team Championship 2014

CTU CONTEST UNIVERSITY

ICOM®

WRTC 2014

World Radiosport Team Championship

July 8 - 14, 2014

Contesting's Best are Coming to New England!

In July 2014 the world's top radio contesters will converge on the Northeast United States for the 7th World Radiosport Team Championship. This will be the first WRTC held in the United States since 1996.

Removing the variables of geography, power, and antennas, 59 two-operator all-star teams will battle for personal and national pride on a world stage.

More than just a competition, WRTC is an opportunity for competitors, referees, and visitors from around the world to make and renew friendships.

WRTC2014 needs you

Funding for construction of the 59 identical stations comes from the generosity of the contesting community. Donations via PayPal to *donations@wrtc2014.org*.

WRTC2014, Inc. is an IRS approved 501(c)(3) public charity.

What is WRTC?

Contesting is a unique sporting challenge. Everyone is trying to make the best score they can, but inequities such as location, power, antennas, and more make it difficult to compare one score with another. Held every four years, the World Radiosport Team Championship brings some of the world's best operators together to compete on a level playing field. The result is an intense all-star competition and showcase of amateur radio capabilities.

Qualifying to be a competitor in WRTC2014 was based on contest scores among 55 events over a 3 year period. Operators who earn a coveted entry are truly some of the best in their region of the world.

Want to be involved?

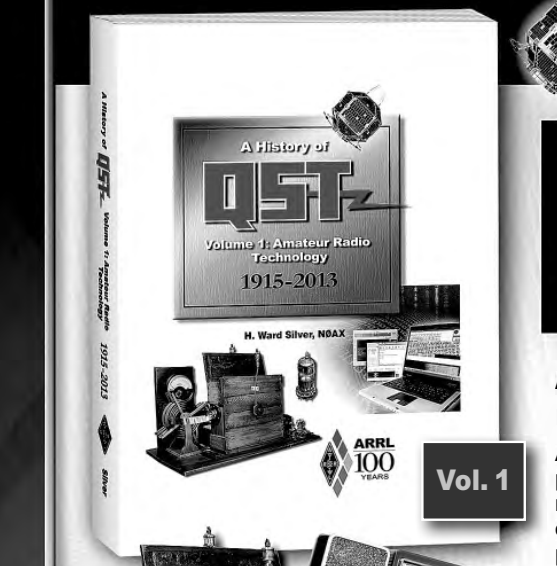
In addition to the 118 competitors and 59 referees, there are hundreds of people who help make the competition possible. We need help with station setup, drivers, hosts, and logistics support. Be a part of WRTC2014 and take advantage of this rare opportunity to meet and learn from these top operators.

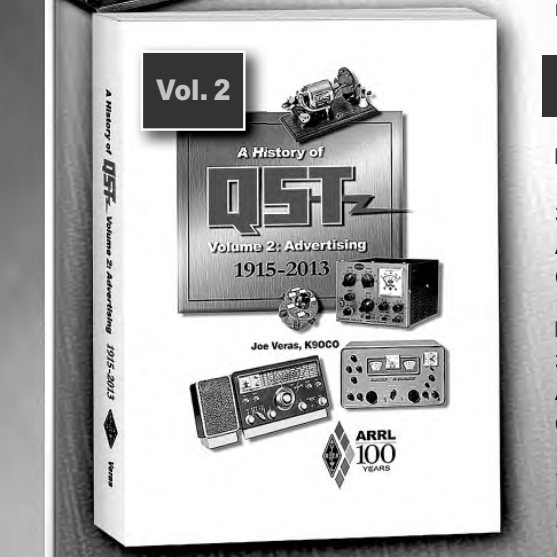
If you can't make it to New England, you can still participate by working the WRTC stations and submitting your log to help with the log checking. There will be prizes for stations that work all 59 teams and for working the most band modes.

Participate in person or on the air…Plan to be a part of WRTC2014!

Feel the excitement – Watch the video at www.wrtc2014.org

Celebrate the ARRL Centennial with Two Special Volumes





As seen in QST

*For nearly a century, **QST**, the official journal of ARRL, has been a primary source of timely, engaging, and valuable information for radio amateurs. These two volumes feature a large collection of important highlights told through the pages of **QST**, published from 1915 to 2013.*

A History of *QST*—Volume 1: Amateur Radio Technology

Edited by **Ward Silver NØAX**

As you wander through these pages from ***QST*** and other works published by ARRL, you'll discover the technical contributions made throughout Amateur Radio's first century. Begin in the era of spark and continue through advances in radio electronics, signal propagation theory, antenna design, and the dawn of satellites and digital communications. Includes commentary from multiple authors.

A History of *QST*—Volume 2: Advertising

By **Joe Veras, K9OCO**

Do you remember your first radio? Trace the history of receivers, transmitters, antennas, and other station gear through this collection of ***QST*** pages. It's a nostalgic journey, as told through the creative marketing, advertising and photography of yesteryear.

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∘ CTU ∘
CONTEST UNIVERSITY

May 15, 2014
Crowne Plaza Hotel
Dayton, Ohio USA

First Edition

Welcome

On behalf of the CTU Board of Directors K1DG, N9JA and K1AR and the 11 Professors of Dayton Contest University 2014 we are pleased you are here and we extend a warm welcome to you!

This is the 23rd Contest University in eight years. Eight have been held here in Dayton, two in South America (Brazil), twelve in Europe (England, Germany, Finland and Italy) and one in Australia.

Over 20 presentations are available here at Dayton Contest University 2014. They are the work product of many hours of hard effort by your Professors and the CTU staff (special thanks to K8MNJ, W3YQ, 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*, ARRL, Superbertha, Remote Ham Radio and INRAD 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

2014 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 2014 – K3LR – ALL – 10 minutes
8:10 ALL SALON A & B – Contesting the RIGHT Way – K5ZD – ALL 40 minutes

9:00 CONTEST TOPIC SESSION #1 – attend ONE of 4 sessions – 60 minutes
SALON A – Contest Hints and Kinks – NØAX
SALON B – Receiving Antennas, What happened to the Beverages at K3LR & W3LPL – W3LPL
SALON C/D – CW Skimmers, DX Cluster, and the Reverse Beacon Network – N6TV
HARDING – VHF Contesting – W5ZN

10:00 ALL – *CONTEST SNACK* – 15 minutes

10:15 CONTEST TOPIC SESSION #2 – attend ONE of 4 sessions – 60 minutes
SALON A – Contesting 201: Making and Keeping your Score – K5ZD
SALON B – Propagation Trends 2014–2015 – W3LPL
SALON C/D – All Coaxial Cables are not Created Equal – VE3EJ
HARDING – The Essentials of RTTY Contesting – WØYK

11:20 CONTEST TOPIC SESSION #3 – attend ONE of 4 sessions – 55 minutes
SALON A – Contest Tips for Little Pistols – K2YWE
SALON B – Preparations for Multi–op Contests and Field Day – W3LPL
SALON C/D – Using Waterfall Displays as a Contesting Advantage – N6TV
HARDING – Advanced RTTY Contesting – WØYK

12:15 ALL SALON A & B – *CONTEST LUNCH* – ALL – 35 minutes

12:50 ALL SALON A & B – 2014 Eye Ball Sprint Contest **"LIVE"** – K1DG – ALL – 10 minutes
1:00 ALL SALON A & B – WRTC2014 for "The Rest of Us" – K1DG – ALL – 15 minutes
1:15 ALL SALON A & B – Radio Contesting's Future – K3LR – ALL – 20 minutes

***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 – Getting Started – Little Pistol Discussion Q&A – K2YWE
SALON B – Low Band Receive Antenna Discussion Q&A – W3LPL
SALON C/D – CW Skimmer, Waterfall, RBN and Contest Computers Q&A – N6TV
HARDING – VHF Contesting Discussion Q&A – W5ZN

3:15 CONTEST OPEN DISCUSSION Q&A GROUPs Attend ONE of 4 sessions – 30 minutes
SALON A – Which Radio is Best for My Station? Q&A – NCØB
SALON B – Tower, Antenna & Feedline Maintenance & Improvements Q&A – W3LPL & VE3EJ
SALON C/D – Station Design Discussion Q&A – K1DG and K5ZD
HARDING – RTTY Contest Discussion Q&A – WØYK

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

4:00 ALL SALON A & B – 2014 Contest Radio Performance – NCØB – ALL – 50 minutes
4:50 ALL SALON A & B – 2014 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

Frank Donovan, W3LPL
Frank's contesting career began in 1959 as a 12 year old at the Providence Radio Assn., W1OP/1, ARRL Field Day two miles from his home in Providence, RI. Soon afterwards, he began to build a small contest station on 1/10 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. Immediately after college, US Air Force 2nd Lieutenant Frank Donovan's first military assignment was working with PVRC member W3GN and his multi-multi mentor, W4BVV. W3LPL finished first place USA single operator in four CQ WW CW and four ARRL CW DX contests from 1973-78. His first multi-multi experience was with the 1974 PJ9JT CQ WW CW team. W3LPL multi-multi teams started with a small entry in the 1978 CQ WW Phone DX contest. During the 1982 ARRL Phone DX Contest, two incredible long nights of 10 meter JA runs unexpectedly produced our first USA multi-multi win. Our multi-multi teams have completed nearly one million QSO's and achieved 45 first place USA finishes (so far) out of 137 consecutive entries (without a single missed entry) in the CQ WW and ARRL DX Contests. Frank is a member of the prestigious CQ Contest Hall of Fame.

Tim Duffy, K3LR
Tim has been an active contest operator for over 40 years. He has hosted 125 different operators as part of the K3LR Multi-Multi DX contest efforts since 1992. 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 over 20 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 31 years. He is a founding member and President of the North Coast Contesters. K3LR serves as chairman of Contest University (8 years) and the Dayton Contest Dinner (22 years), chairman of the Top Band Dinner – as well as coordinator of the Contest Super Suite (29 years) in Dayton. He is founder and moderator of the popular RFI Reflector (RFI@contesting.com). He has been a guest on Ham Nation nine 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 and the Radio Club of America (RCA) as Vice President and a member of the RCA executive committee. Tim is President of the Mercer County Amateur Radio Club (W3LIF). Tim was elected to the CQ Contesting Hall of Fame in 2006. He was honored with the prestigious Barry Goldwater Amateur Radio service award by the RCA in 2010. K3LR is the Chief Marketing Officer and General Manager at DX Engineering.

Doug Grant, KD1G
Doug has been licensed since 1967. Over the years, he has managed to collect plaques for first-place scores in single-op, single-op assisted, multi-single, multi-2 and multi-multi categories from his own station and numerous host stations. In addition, he was a competitor in 5 WRTC events, winning one gold and two bronze medals.

Doug is past president of the Yankee Clipper Contest Club, past member and Chairman of the ARRL Contest Advisory Committee, member of the CQWW Contest Committee and has chaired the Dayton Hamvention Contest Forum for over 10 years. He is Director of Contest University and the World Wide Radio Operators Foundation, and Chairman of the WRTC2014 Organizing Committee.

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 call sign 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. 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.

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 as his early learning came from multi-multi experience at KØRF. 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 seven 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. This is his seventh year at CTU delivering the two RTTY presentations and Q&A.

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. While originally in printed form, my receiver test data is now web based with over 100 transceivers and receivers included at www.nc0b.com.

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. As with many areas of life, new is not always better. In 2009 I made a presentation at the Dayton Hamvention Antenna Forum on ground systems for vertical antennas.

Speaking invitations at ham events have included WØDXCC, W9DXCC, W4DXCC, YCCC, New Orleans, Austin and Huntsville hamfests. Locally around Colorado I have discussed receiver performance at the Boulder Amateur Radio, Northern Colorado Amateur Radio and the Colorado QRP clubs.

2014 will be my seventh year to have the privilege of making the wrap-up presentation at Contest University. CTU is an all day seminar with dozens of presentations on Thursday before the Dayton Hamvention.

Eight 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 all the top transceivers in major contests in a real-world environment that can never be duplicated in a laboratory.

This rural setting has allowed me to focus my interest on effective antennas. Six towers support a myriad of monoband yagis and wire antennas from 160 – 2 meters. Ham radio has been a wonderful hobby where we can all share our experiences.

Ward Silver, NØAX

Ward has been an active contester since before receiving his Novice license in 1972, participating with his high school club friends as WAØWBJ and WBØDQI. He credits contesting and later DXing as guiding his early interests in ham radio and propelling him to a career in electrical engineering. Ward is the Lead Editor of the ARRL Handbook and the ARRL Antenna Book. He also serves as a Contributing Editor to the ARRL Publications Department, writes the popular monthly *QST* column "Hands-On Radio," and consults on a variety of projects and programs in the ARRL Contest Branch. He is a founder of the World Radiosport Team Championships and is a member of the YASME Foundation Board of Directors. Ward is the author of all three ARRL *License Manuals* and the *Q&A* Study Guides and you will find his byline in the popular Wiley "for Dummies" series; *Ham Radio for Dummies* - now in its second edition, *Two-Way Radios and Scanners for Dummies*, and *Circuitbuilding Do-It-Yourself for Dummies*. He just published a ham radio detective novelette, *Ray Tracy - Zone of Iniquity*. Outside of ham radio, Ward plays the mandolin, dabbles in digital photography, and enjoys camping, canoeing, kayaking, and Ultimate Frisbee.

John Sluymer, VE3EJ

- First licensed February 1972 as VE3AKG.
- Calls held: VE3AKG (1972 – 1979), PA9YI (1973), VE6OU (1979 – Present), VE3OZU (1985-1990), VE3EJ (1990 – Present), 8P9EJ (1998), VP8DEJ (2002), VP2EEJ (2004), VC3J (2006, 2007).
- Contest participant at K3LR, KC1XX, A61AJ, HC8N, WP2Z
- DX Pedition team member: VP8THU (South Sandwich, 2002), VP8GEO (South Georgia, 2002), FT5XO (Kerguelin, 2005) and VP8ORK (South Orkney 2011).
- Canadian team leader at WRTC 1996 (4^{th} place as K6P), WRTC 2000(11^{th} place as S581I), WRTC 2002 (6^{th} place as OJ5A), WRTC 2006 (First place as PT5M) and WRTC 2010 (22^{nd} place as R34C). WRTC partner VE7ZO (VE3IY) on all 5 occasions. Will join K9VV (NP2X) as team mate at WRTC 2014.
- CQ contest hall of fame – May 2011
- CW Ops member since 2010
- FOC member since 2011

Randy Thompson, K5ZD
Randy Thompson, K5ZD, has been licensed and active in contesting since 1973 at age 13. He is an accomplished contester, having multiple single-operator wins in the ARRL Sweepstakes, CQ World Wide DX Contest, and the CQ WPX Contest, among others. Randy is a past editor of the *National Contest Journal* (a post he has held three separate times) and a co-founder of the eHam.net website. Randy was the Director of the CQ WPX Contest from 2008 until 2012, and is currently the Director of the CQ World Wide DX Contest. He is a member of the CQ Magazine Contest Hall of Fame. He has competed in five World Radiosport Team Championships and is a member of the organizing committee for WRTC2014. When not in front of a radio, Randy is in technical sales for an Internet software company.

Robert A. Wilson, N6TV
N6TV aka “TV Bob” is an active CW contester and Win-Test supporter. Licensed for over 40 years, Bob competed at the World Radiosport Team Championship (WRTC) in San Francisco (1996), Slovenia (2000), and Moscow (2010). He earned numerous Top Ten finishes in the CW NA Sprints from his home station in Silicon Valley, a small suburban lot with a single tower loaded with monobanders. Bob was an early adopter of the Perseus SDR and CW Skimmer, and has recently been analyzing signal reports using data from the Reverse Beacon Network (RBN). He volunteers to support Win-Test users via the Win-Test Reflector, and also helps update the documentation. He was an original member of K2KW’s “Team Vertical” group (6Y4A, 4M7X), and has been a member of the multi-op teams at HC8N, K3LR, and W7RN. Bob finished in First Place in the 2013 ARRL CW Sweepstakes Contest, operating at W7RN.

Dan Zeitlin, K2YWE
Dan was first licensed in 1956, in White Plains, NY. Until 1995 K2YWE operated CW mostly with very little contesting. When Dan attended the 1995 Field Day with W3LPL, K3MM, and K3RA he got “hooked” on contesting and joined PVRC, even getting a few years education at the W3LPL Multi Multi. K2YWE has been doing contesting from home ever since, occasionally operating at other multi op stations too. Dan has a modest 100W home station and continues to learn from good Ops. He has enjoyed moderate success and has some top 10 (up to 2nd) US and World finishes along with some Regional first place awards.

2014 CONTESTING RELATED EVENTS

May 14 – Wednesday night – Contest Super Suite at the Crowne Plaza opens for the first of 4 nights at 7 PM in the Harding, Harrison and McKinley Ballrooms. Hosted by Contest University 2014. CTU 2014 Registration is from 8 PM to 10 PM. 10:30 PM Pizza Party sponsored by Contest University 2014 **http://contestsupersuite.com**

May 15 – Thursday all day – Dayton Contest University 2014 at the Crowne Plaza – 2nd floor. CTU Registration opens at 7 AM. Must sign up in advance – **http://www.contestuniversity.com**

May 15 – Thursday 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). 10:30 PM QSL Wings and Pizza Party in the Harding, Harrison and McKinley Ballrooms sponsored by K8CC, K3WW and K3LR. **http://www.contestsupersuite.com**

May 15 – Thursday night – 1st Annual RTTY Contest Dinner at the Crowne Plaza – Presidential Ballroom. Speaker is Larry Gauthier, K8UT. 7:15 PM – Tickets in advance from **http://rttycontestdinner.com**

May 16 – Friday – Antenna Forum at HARA Arena
2:30 p.m. – 4:45 p.m. Room 1 Moderator: Tim Duffy, K3LR
“The Loop Fed Array Yagi” by Justin Johnson, GØKSC
“Building Antennas at the K9CT Station” by Craig Thompson, K9CT
“High Impedance Low Frequency Receiving Arrays” by Lee Strahan, K7TJR
“The Shared Apex Loop Array” by Mark Bauman, P.E., KB7GF

May 16 – 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). 10:30 PM “Spurious Emission Band” Live in the Harding, Harrison and McKinley Ballrooms. 11 PM Pizza Party sponsored by the Potomac Valley Radio Club (PVRC). **http://contestsupersuite.com**.

May 16 – Friday night – 24th Annual Top Band Dinner at the Crowne Plaza – Presidential Ballroom. Speaker is Craig Thompson, K9CT. 7:30 PM – Tickets in advance from **http://topbanddinner.com**

May 17 – Saturday – Contest Forum at HARA Arena
12:30 p.m. – 2:30 p.m. Room 1 Moderator: Doug Grant, K1DG
"Introducing N1MM Logger PLUS – The Next Generation" by Tom Wagner, N1MM & Larry Gauthier, K8UT
"Technologies for Making Contest Station’s Wireless" by Craig Thompson, K9CT
"Remote Contesting via the Web" by Ray Higgins, W2RE
"2O1R – A New Way to do Multi–single" by Paul Young K1XM

May 17 – Saturday evening – 22nd Annual Dayton Contest Dinner hosted by North Coast Contesters at the Crowne Plaza Presidential Ballroom. Dinner Speaker is Doug Grant, K1DG. Space is limited. Details and tickets in advance are available at **http://www.contestdinner.com**

May 17 – Saturday 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), Harding, Harrison and McKinley Ballrooms with a 11 PM Pizza Party sponsored by the Yankee Clipper Contest Club (YCCC). **http://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.
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Table of Contents

Advertising

CTU Presents

Contesting the RIGHT Way

Randy Thompson, K5ZD

Purpose of this Session

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

Why do we play games?

- What is a game?
  - A contest with rules to determine a winner
  - An amusement or pastime
- 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.

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

Is this Radio Contesting?

Is this Radio Contesting?

No! Its Birdwatching!

Birders keep track of “life lists” of bird species seen (“DXCC”)

Audubon started the “Christmas Day Bird Count” in 1900.

Competition got serious after an innocent comment in the book **Wild America**, when Roger Tory Peterson wrote: ***“My year’s list at the end of 1953 was 573 species”***

Radiosport vs Birding

	Contesting	Birding
Premier Event	CQWW, WRTC	Big Year
Smaller event	Sprint	Big Day
Spotting	DX Cluster	Birdingonthe.net
Travel	Zone 9, 10, 33…	Migratory paths
Book/Movie	“To Win the World”	“The Big Year”
Conventions	Dayton, Visalia	Annual, moves around

They have pileups, too!

Why do we do radio contests?

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

Internal

- Peer Recognition

External

What is this peer recognition?

- You are recognized by the sum total of your achievements and how you went about achieving those results
- Your recognition is strongly influenced by what other people say about you

Negative Peer Recognition Examples

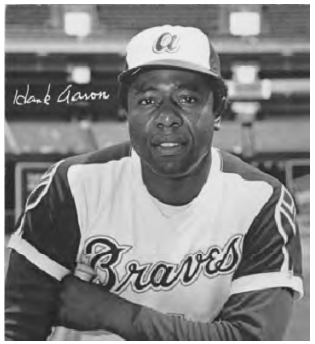
- That station was too loud in the NAQP.
- That guy uses a pair of 8877s and has remote receivers in Europe.
- Joe uses packet but claims unassisted.
- Ken had a second operator help him.
- Larry operated with a broad signal to push the QRM away.

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

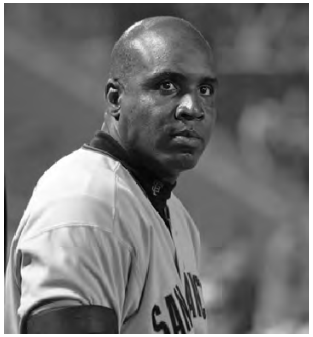
What do we mean … Ethics?

- Ethics denote the theory of right and wrong actions
  - Written and unwritten codes of principles and values that govern decisions and actions
- Morals indicate their practice within guidelines
  - Standards for determining the difference between good and bad decision making and behavior
- Ethics are… knowing the difference between right and wrong and choosing to do what is right.

Why do ethics matter?



Hank Aaron
755 Home Runs



Barry Bonds
762 Home Runs

Explaining Radio Contesting to a non-ham (or non-contester)

"We operate for 4/24/48 hours, log all the stations we contact, and see who can make the most contacts in the most states, countries"

"How do you know who won?"

"We send our logs to the sponsor, and they check them"

"How do you prevent cheating?"

Ethics in Contesting

- Choosing to do the right thing even when no one is looking
- With SDR technology, people *are* looking at what happens on the air
- Unobservable rules require participants to apply ethics

How do we know what to do?

- Written Rules
  - Specified in the contest rules
  - Black and white
- Unwritten "Rules"
  - Interpreted norms
  - Gray

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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More Examples of Written Rules

- Off times must be a minimum of 60 minutes in length.
- The log MUST show the correct serial number sent and received for each contact.
- The exchange consists of signal report and serial number. Serial numbers sent must be progressive, starting with 001 (16 comments).
- Self-spotting or asking other stations to spot you is not allowed.

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Essence of Unwritten Rules

- Just because it's not specifically prohibited in the written rules doesn't mean you can do it!
- Keep the contest on the radio and within the contest period
- Don't give or take unfair advantage

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Examples of Unwritten "Rules"

- Do not make pre-arranged schedules
- Do not ask friends to work you … only
- Do not ask for needed multipliers (VY1?)
- Do not have friends hold your frequency
- Do not work friends with club calls
- Do not call multipliers on the phone
- Do not have others "help" with your single op effort

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Play fair

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

(Search YouTube for "Spinal Tap" "these go to 11" – or watch the whole movie).
See also: "smoke", "gas", "soup", "smash", "Eimac antenna tuner". . .

No log washing

- "Research" using QRZ.com, Spot history, 3830 reports, LoTW
- Using utilities to analyze and correct the log
- Recording the contest and replaying to change log entries
- Asking others who they worked or if a callsign is correct
- Do not email stations you think you worked

How do people justify cheating?

- Everybody does it
- I like being an outlaw
- It was exciting to push the limits
- Nobody was getting hurt
- Nobody was watching
- Rules don't mean much to me, I'm bigger than that
- It doesn't make a difference anyway
- Little to lose and much to gain by it
- It helped me overcome my unfair disadvantage
- I had to do it to win!
- The rules weren't clear but it seemed to me it might be OK
- The rule I broke was unfair anyway

Hat tip: AB7E

"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 don't last long
- This belief is the primary reason for cheating - in virtually every sport studied!

“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.”

Honor Code

- You are responsible for your own reputation
  - Follow the rules!
  - Don’t participate with people who cheat
- 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

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."

From “The Code of Birding Ethics”

- If you witness unethical birding behavior, assess the situation, and intervene if you think it prudent. When interceding, inform the person(s) of the inappropriate action, and attempt, within reason, to have it stopped. If the behavior continues, document it, and notify appropriate individuals or organizations.

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
- Choose the right time
  - Can they listen without feeling attacked?
- Don't be angry or accusatory
  - 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

Communication Success is Defined by the Receiver

Scenario 1

- You discover a local contester uses cluster spotting and enters as single operator unassisted. What do you do?
  - He doesn't win anything so assume it doesn't matter
  - Avoid speaking to him ever again
  - Publicly call him a cheater at the next club meeting
  - Send a letter to the contest sponsor
  - Call him up and ask if he is aware of the rules for the single-operator category

Scenario 2

- You are invited to a multi-op and upon arrival, you discover they are running 2.5 kW. What do you do?
  - You are there, loud is good, operate anyway
  - Turn the power down to 1500W when you are operating
  - Loudly encourage the other ops to follow your example
  - Quietly ask the owner if he always runs this much power
  - Leave
  - Send a note to the contest sponsor and FCC

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 callsign/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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WWROF Contest code of Ethics

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

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

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

Power, frequency limits, licensing

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

When it's over, it's over

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Contest Code of Ethics, expanded

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

No whining on CQ-Contest, no lawsuits **(or threats)**

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!

www.wwrof.org

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The RIGHT way to do contesting

- Play fair
  - Obey the rules, remember this presentation
- Try to do better next time
  - Improve your skills, station
- Make your enjoyment of contesting be about the journey, not the destination

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Who are you?

- What does winning the contest mean to you?
- How important is your radio identity to you?

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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

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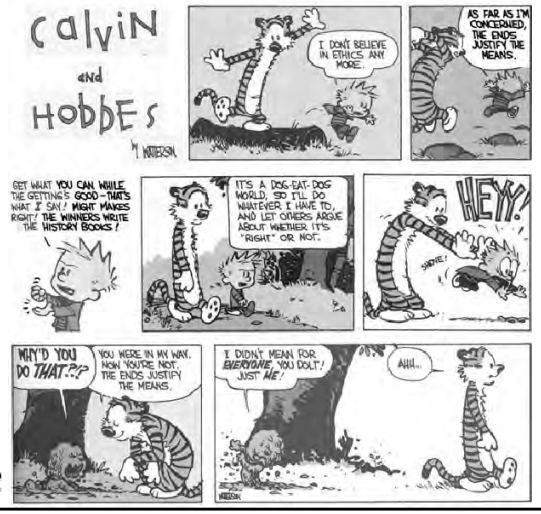
Final Thought



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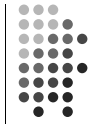

- This presentation draws on material developed by Ken Adams, K5KA (SK), Randy Thompson, K5ZD, Doug Grant K1DG, Larry Tyree N6TR, and Dave McCarty K5GN
- Analogies with birding originally developed by Dick Norton, N6AA

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CTU Presents

Contest Hints and Kinks

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?

Goals of the Session

- Provide tips, suggestions, and guidelines
- Give you ideas for your own circumstances
- Find “Score dB’s” and “low-hanging fruit”
- Develop confidence in your own abilities
- Laff

Assumptions about you

- Contesting for a couple of years
- You feel comfortable with CQ or S&P
- Maybe a Division, State, or Regional winner?
- Decent radios and antennas
- Taken and given some lumps
- Want to give some more lumps
- What's the best way to get better?

How To Use This Course

- Not a how-to cookbook
- Follow in the text
- Take short notes
- Record those ideas!

Continuous Improvement

- When asked what was the most powerful force in the Universe, Albert Einstein replied, "Compound interest."

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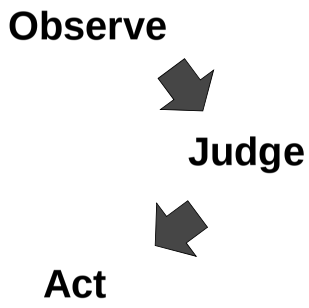
Continuous Improvement

- When asked what was the most powerful force in the Universe, Albert Einstein replied, “Compound interest.”
- Incremental improvement, applied relentlessly, is unstoppable.
- Plaques are won a dB at a time
- Hints & Kinks are the ham radio equivalent of incremental improvement.

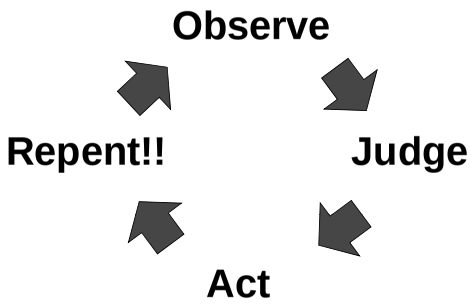
Most Powerful Improvements

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

Cycle of Life



Cycle of Life



The Operator

- Ergonomics
  - Incredibly important
  - Fun or Slog? – Choose!
  - Maintain concentration, remove distractions
  - Make it **EASY** to do the right thing!
    - Especially when you are tired…
  - Labels and logical layout
  - Preserve and enhance accuracy

The Operator

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

Fitness

- Personal fitness
  - Blood flow and stamina
- Techniques for remaining alert
  - Diet, Catnaps, Breaks
- Understand your body rhythms
- Pacing - trade low-rate periods for sleep
  - Review old logs to find the right off-times
- The 90-minute magic

Knowledge

- Know your station equipment
- Study propagation – include possible events
- Learn your software
  - Turn OFF unneeded features and options
- Recognize calls
- Learn the goofy prefixes and zones
- Memorize approximate bearings by zone

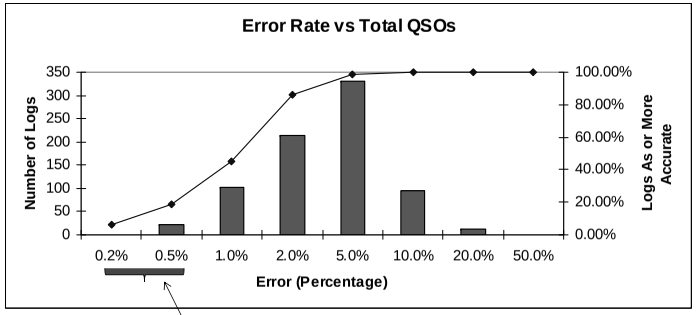
Technique

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

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
- Learn when **NOT** to log it! Avoid penalties!
- Type – send – speak – copy accurately
- Breathe, be consistent, find a rhythm
- The second radio – make it play

Technique - Accuracy



Here are the Top Ten – get there!

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
- Avoid databases and be wary of prefill
- Don't trust spots from *any* source
- Learn not to guess and when to move on

Technique – Managing Time

- Running is key
- Rate meter – QSOs per multiplier
- Distractions
  - Spots and DX-ing
  - Fiddling with the antennas and rig controls
- Plan your operating time but be flexible
- Go get that next contact!
  - No TV, no Facebook, no browsing, no chat

Technique – Managing Score

- Watch for & move mults (Sunday!)
- Avoid penalties at all costs
- Expeditions – work 'em all!
- Make skeds – during the contest
  - Plan for propagation before the contest starts
  - Know the grey line
- Quick reviews of the situation now and then
- Compare to last year or the competition

The Second Radio

- Start simple
  - Spare transceiver
  - Amp not necessary
  - Vertical and 100 watts can work a lot of stuff
  - Filters are worth it – build or buy
- Learn your program's keystrokes
- Make SO2R *normal*

The Second Radio

- Taking it up a level
- The quick QSY – be ready!
- Running and tuning at the same time
  - Learn to listen to two audio streams at one time
  - Practice shifting your focus
- Automate to beat fatigue
  - Build or buy a single-box controller
  - Make the layout match the equipment

Pileup Management

- Don't panic – set a rate you can maintain
- Respond in a consistent amount of time
  - This establishes a rhythm and keeps order
- Pick the fast guys first
- Listen for "DX sound" and odd first letters
- Manage your RF Gain and Attenuation
- Learn to rely on your ears for filtering

Interstation Interference

- Filters at the exciter, stubs on the amp
  - Wide-band noise must be filtered **at the xmtr**
- QRP (and maybe LP) can S&P on the same band as the run radio!
  - Protect the receiver front end
- Bypass diodes connected to wires
  - Rotor control boxes, relay kickback diodes
- Good RF bonding of all equipment

Antenna Selection

- Hear the next level (they already hear you)
- Think in terms of steps
  - Hear better, then transmit better, step-by-step
- Simplify switching and aiming
  - Contesting is not DX-ing
- A "temporary" tribander for mult-rich area
- Explore receive antennas on low-bands
- Still the biggest bang for the buck

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
- Put the monitor where you can see it easily
- Be familiar with several major programs

Resources

- Other contesters & your contest club
- SO2R page - www.k8nd.com/Radio/SO2R/K8ND_SO2R.htm
- Amps, Towertalk, Top Band, cq-contest email reflectors
- W2VJN's "Managing Interstation Interference" from International Radio
- W4RNL Antenna design via antennex.com
- ARRL *Contest Update* and NCJ

Most Powerful Improvements

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

Thanks!

- And go get 'em!

Receiving Antennas

- or -

What happened to the Beverages at K3LR and W3LPL?

- directive antennas for small lots
- higher performance for larger lots
- very high performance for multi-acre lots

Frank Donovan

W3LPL

Dayton 2014

Why Receiving Antennas?

- Much better performance than transmitting antennas, especially on 160 and 80 meters
  - greatly reduced footprint
  - greatly reduced height
  - greatly reduced mutual coupling between elements
    - simplifies receiving antenna design
  - greatly reduced need for high efficiency
  - greatly reduced cost
  - large arrays actually perform equivalent to huge multi-element Yagis!
- Combining two antennas with a variable phase controller
- Diversity reception with dual phase locked receivers

All dimensions in this presentation are for 160 meters

Receiving Directivity Factor (RDF)

- RDF is an accurate, proven measure of receiving antenna performance
  - forward gain at the desired azimuth and elevation angle compared to average gain over the entire hemisphere
- Nearby antennas and power lines degrade actual RDF, **especially high RDFs**
- 4 dB: small diameter loop
- 5 dB: a single vertical antenna (1/4 wavelength vertical and short verticals)
- 4 - 6 dB: 250 - 400 foot Beverages and Beverage on Ground (BOG)
- 6 - 8 dB: array of small loops (flag, pennant, ewe, K9AY, shared apex loop array)
- 9 dB: two element array of short verticals or a triangle array (65 foot spacing)
- 10 dB: 500 - 600 foot Beverage
- 11 dB: two close spaced 500 - 600 ft Beverages staggered 65 feet
- 12 dB: 800-900 foot Beverage
- 12 dB: 4-square array of short verticals only 65 feet on a side (1/10 acre)
- 13-14 dB: 4 short verticals or a steerable 8-circle array of short verticals (1 - 3 acres)
- 14 dB 2 broadside, staggered 800-900 ft Beverages separated 350 ft (8 acres or more)
- 14-16 dB: 3 broadside 800-900 ft Beverages and arrays of 8 short verticals (5 - 20 acres)

Size Matters!

Popular Receiving Antennas

- Loops
  - small diameter loop (“magnetic” loop)
  - fixed unidirectional loop (flag, pennant, ewe, K9AY)
  - mechanically rotatable unidirectional loop (rotatable flag)
  - electrically steerable compact array of loops (K9AY, Shared Apex Loop Array)
- Beverages
  - single wire Beverage
  - Beverage on ground (BOG)
  - two wire bi-directional Beverage
  - two close spaced Beverages, staggered 65 feet
  - phased broadside Beverages spaced 350 feet
  - phased broadside staggered Beverages (350 feet broadside, staggered 65 feet)
- Arrays of short verticals (2 elements to 8 elements or more)
  - active high impedance verticals with amplifiers at the base of each vertical
  - passive low impedance verticals with radials and umbrella wires

Small Diameter Loop Antenna

"magnetic" loop

- Excellent for nulling a single RFI source
  - the RFI must be vertically polarized
  - the RFI must be received via ground wave
- Excellent for very accurately locating RFI sources
- Bi-directional figure-8 pattern
- Deep nulls off both ends of the loop
  - mechanically rotate the loop until the single RFI source is nulled
- Loop antennas produce very low signal levels
  - requires a high gain, low noise, high dynamic range preamplifier
  - requires careful attention to isolation of stray pickup from:
    - coaxial feedline
    - control cable
    - bury cables about 12 inches deep for best null depth

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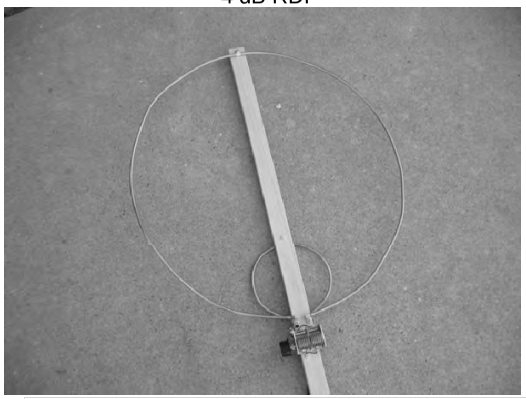
Small Diameter Loop

inexpensive and very easy to build and use
24 - 36 inch diameter
bidirectional 160 degree 3 dB beamwidth
4 dB RDF



http://tomthompson.com/radio/ReceivingLoop/loop.html

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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 beamwidth
  - 7 dB RDF
- Shared Apex Loop Array
  - switchable in eight directions
  - footprint is only 50x50 feet and 25 feet tall
  - 75 degree 3 dB beamwidth
  - 8 dB RDF
- Loop antennas produce very low signal levels
  - high gain, low noise, high dynamic range preamplifier
  - requires careful attention to isolating stray pickup from:
    - coaxial feedline
    - control cable
    - bury cables about 12 inches deep for best null depth

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Two K9AY Loops

25x25 foot square footprint
switchable in four directions
120 degree 3 dB beamwidth
7 dB RDF

www.arraysolutions.com/Products/lowbandrcv.htm

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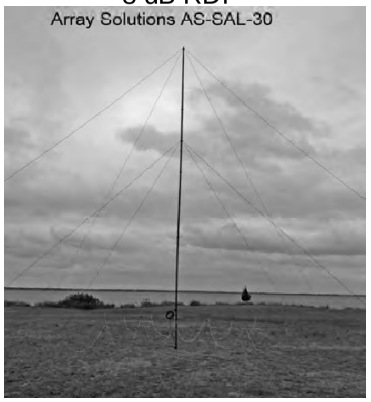
Shared Apex Loop Array

50x50 foot square footprint
switchable in eight directions
75 degree 3 dB beamwidth
8 dB RDF



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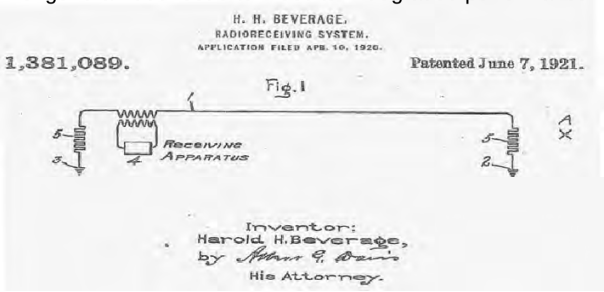
Single Wire Beverage

a very simple and inexpensive antenna

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

longer than 900 feet often results in degraded performance


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

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

Fig. 1

Receiving Apparatus

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

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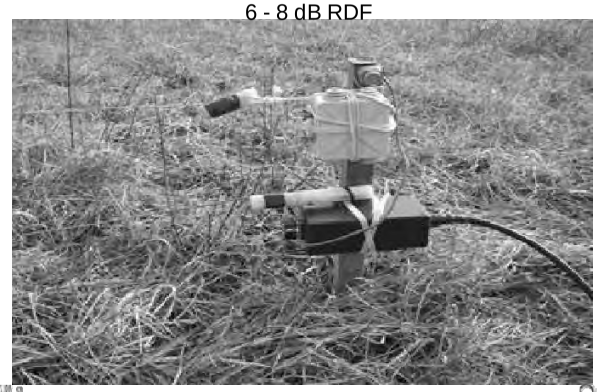
http://www.w8ji.com/beverages.htm

ICOM

Beverage on Ground

a good choice when stealth is important
about 220 feet long
longer lengths often degrade performance
70 - 100 degree 3 dB beamwidth
6 - 8 dB RDF



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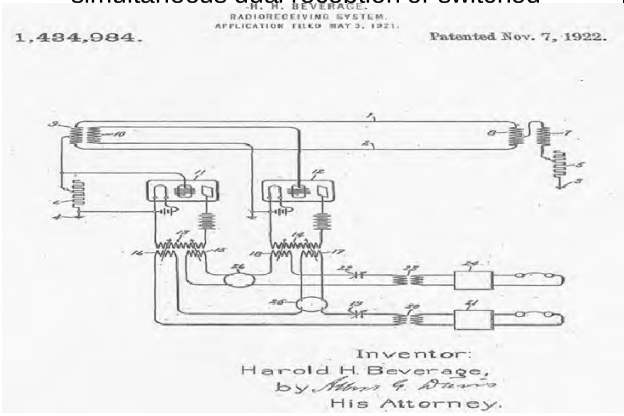
http://n4dj.com/Beverage.html

ICOM

Two Wire Bidirectional Beverage

two directions with full Beverage directivity
simultaneous dual reception or switched


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

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

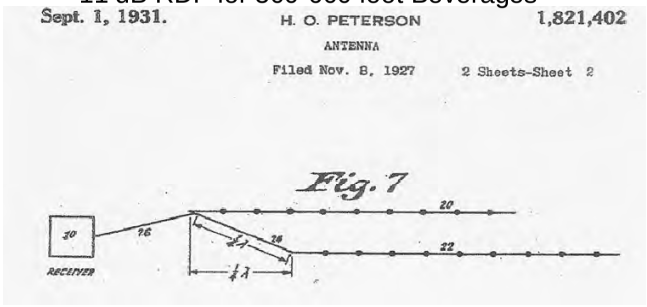
Inventor:
Harold H. Beverage,
by Albert G. Davis
His Attorney.

CONTEST UNIVERSITY

ICOM

Staggered Pair of Beverages

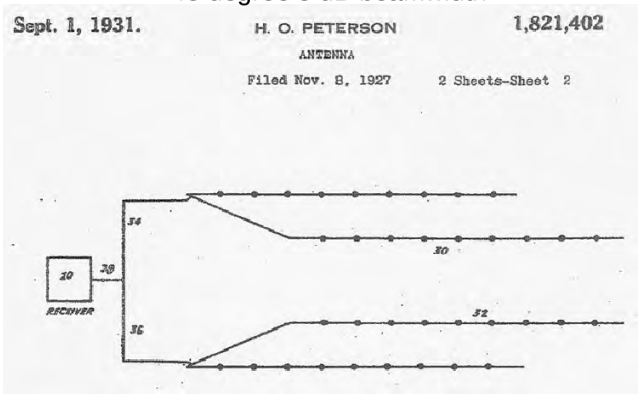
Significantly enhanced front-to-back ratio
compared to a single wire Beverage
The deep rear null can be steered
by a variable phase combiner
11 dB RDF for 500-600 foot Beverages



http://www.w8ji.com/echelon-log_beverages.htm

Broadside Pair of Staggered Beverages

800-900 foot Beverages
45 degree 3 dB beamwidth



Phased Short Verticals

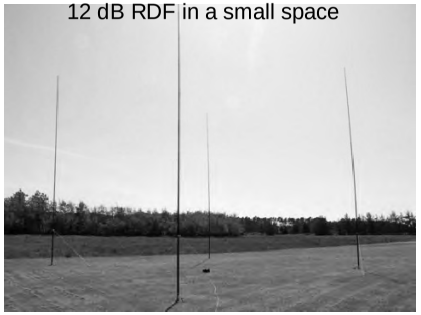
two or more high impedance 24 foot verticals

- No radials
- No umbrella wires
- As little a 65 foot element spacing
  - closer spacing is possible with precise phase and amplitude alignment
- Needs a high gain amplifier at the feed point of each vertical
- Requires careful attention to all construction details
- Switchable in multiple directions
- Cannot be installed within ten feet of nearby objects
  - trees
  - any other conductive or partially conductive structure

http://www.hizantennas.com

Electrically Steerable 4-Square Vertical Array

four high impedance 24 foot verticals
no umbrella wires, no radials
80x80 foot square footprint
requires a high gain amplifier at the base of each vertical
switchable in four directions
100 degree 3 dB beamwidth
12 dB RDF in a small space



Hi-Z-4-LV2-80

Phased Short Verticals

two or more low impedance 25 foot verticals

- Requires eight 70 foot radials per vertical
  - or sixteen 35 foot radials
  - laid on the ground or shallow buried
- Requires four 25 foot umbrella wires per vertical
  - or four 35 foot verticals with no umbrella wires
- As little a 65 foot element spacing
  - closer spacing is impractical for optimum performance
- No amplifiers are needed at the base of each vertical
- Switchable in multiple directions
- Tolerant of nearby objects
- Easy to homebrew your own antenna
  - large arrays are very tolerant of moderate amplitude and phase errors

Electrically Steerable 4-Square Vertical Array

- four low impedance 25 foot umbrella verticals
- four 25 foot umbrella wires per vertical
- eight 70 foot or sixteen 35 foot radials per vertical
- 65x65 foot square footprint
- switchable in four directions
- easy and inexpensive to build
- 100 degree 3 dB beamwidth
- 12 dB RDF in a small space

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

Electrically Steerable 8-Circle Vertical Array

eight high impedance 24 foot verticals
no umbrella wires, no radials
requires a high gain amplifier at the base of each vertical
200 foot array diameter
switchable in eight directions
45 degree 3 dB beamwidth similar to a 5 element Yagi
14 dB RDF

Hi-Z-8A-LV2-160-2

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
300 - 350 foot array diameter
switchable in eight directions
easy and inexpensive to build
45 degree 3 dB beamwidth similar to a 5 element Yagi
13 dB RDF

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

Receive Antenna Variable Phasing Controller

combine two receiving antennas to create a directional pattern with steerable nulls

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DX Engineering NCC-1

ICOM

Phase Synchronous Diversity Reception

two widely spaced antennas (500-1000+ feet) feeding two identical full performance phase synchronous receivers

CONTEST UNIVERSITY

Elecraft K3 with KRX3 subreceiver

ICOM

CW Skimmers, DX Cluster, and the Reverse Beacon Network

Presented by N6TV
n6tv@arrl.net

Overview

- **What is CW Skimmer?**
- **What is the Reverse Beacon Network?**
- **How does it work?**
- **What can the RBN do for *me*?**
- **How can I help?**
- **What's new?**

It all starts with one developer

- Alex Shovkoplyas, VE3NEA
  (b. 1965, ex-UR5EMI, in Canada since 1998)

What is CW Skimmer?

1. Hardware: PC + Software Defined Radio (SDR)

SDR Antenna

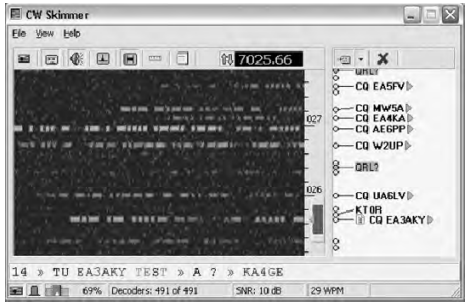
2. Wideband RX Antenna, 1.8-30 MHz

Pixel Tech. Loop RF Pro-1B:

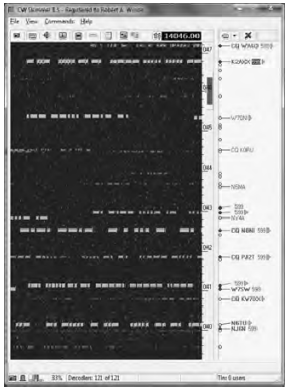
DX Engineering Active Horizontal ARAH3-1PE:

Software

3. CW Skimmer *or* Skimmer Server

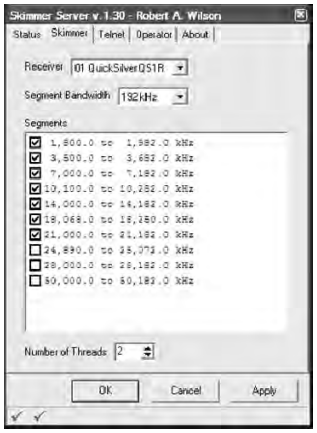


CW Skimmer by VE3NEA



- Works with many SDRs
- Decodes *multiple* CW signals in real time
- Can monitor *entire* CW band
- Waterfall Display
- Uses MASTER.DTA
- Telnet Server (emulates a DX Cluster)

Skimmer Server by VE3NEA



- *Only* supports QS1R SDR
- Decodes multiple CW signals in real time
- Monitors *multiple bands* with single SDR
- *No* Waterfall Display
- *No* MASTER.DTA
- Telnet Server

Telnet server (localhost port 7300)

- Emulates a DX Cluster Node

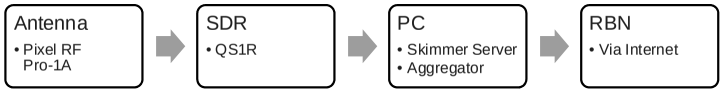
```
DX de N6TV-#:     14058.7  VR2HE          24 dB  31 WPM  CQ          2350
DX de N6TV-#:     14039.6  NM2D           29 dB  35 WPM  CQ          2350
DX de N6TV-#:     14059.5  YV4D           35 dB  31 WPM  CQ          2350
DX de N6TV-#:     14022.6  J39BS          11 dB  25 WPM  CQ          2350
DX de N6TV-#:     14066.8  NP6A           38 dB  30 WPM  CQ          2350
DX de N6TV-#:     14054.4  N5UM           26 dB  28 WPM  CQ          2350
DX de N6TV-#:     14021.2  NM5J           35 dB  31 WPM  CQ          2350
DX de N6TV-#:     14061.4  VX5S           12 dB  28 WPM  CQ          2350
DX de N6TV-#:     14064.2  WQ5L           15 dB  28 WPM  CQ          2350
DX de N6TV-#:     14032.2  VE7XF          18 dB  27 WPM              2350
DX de N6TV-#:     14042.9  NT5C           45 dB  31 WPM              2350
DX de N6TV-#:     14032.2  VE7XF          18 dB  27 WPM  CQ          2350
DX de N6TV-#:     14039.2  EA3FP          15 dB  31 WPM  CQ          2350
DX de N6TV-#:     14052.5  W0VR           20 dB  28 WPM  CQ          2350
DX de N6TV-#:     14022.9  AB7E           32 dB  25 WPM  CQ          2350
DX de N6TV-#:     14028.4  VH6R            2 dB  29 WPM              2350
DX de N6TV-#:     14065.6  KH7B           25 dB  29 WPM  CQ          2350
To ALL de SKIMMER <0952Z> : Clicked on "VE7XF" at 14032.2
DX de N6TV-#:     14069.6  KP6I           13 dB  28 WPM  CQ          2350
DX de N6TV-#:     14069.1  NK0M           25 dB  28 WPM  CQ          2350
To ALL de SKIMMER <0952Z> : Clicked on "" at 14031.4
DX de N6TV-#:     14035.5  KP8GE          12 dB  26 WPM              2350
DX de N6TV-#:     14028.4  VH6R            7 dB  29 WPM  CQ          2350
DX de N6TV-#:     14036.1  NZ1U           16 dB  28 WPM  CQ          2350
DX de N6TV-#:     14062.7  N4QS           11 dB  29 WPM  CQ          2350
DX de N6TV-#:     14045.1  YV1FM          20 dB  29 WPM  CQ          2350
DX de N6TV-#:     14059.6  YV4D           35 dB  31 WPM              2350
```

Reports Signal to Noise ratio, CW Speed, CQers

What is the Reverse Beacon Network (RBN)?

- Uses *any* CW signal as a beacon
- Multiple CW Skimmers world-wide record signal strength (S/N ratio in dB) and CW speed (WPM)
- A free "Aggregator" program forwards CW Skimmer spots to a central server
- Central server distributes spots via web page and public telnet servers
- You don't need to have an SDR to use it

How do spots get to the RBN server?



Acknowledgements

- RBN web site and first aggregator originated by PY1NB (similar to his other web site, www.dxwatch.com). Felipe pays all the bills.
- Lots of code by W3OA (aggregator), F5VIH (Spots analysis tool)
- CW Skimmer evangelized and tested by N4ZR (also publishes RBN blog) – "RBN Chief Propagandist"
- Telnet server support by K5TR, W2QO, KM3T

Felipe Ceglia, PY1NB

- Created and maintains the Reverse Beacon Network
- Hosts dxwatch.com and reversebeacon.net

Dick Williams, W3OA

- Created the newest RBN Aggregator software

Nick Sinanis, F5VIH

- Wrote the RBN Spots Analysis Tool

Pete Smith, N4ZR

- RBN Chief Evangelist
- Skimmertalk Reflector: http://dayton.contesting.com/mailman/listinfo/skimmertalk

What can the RBN do for *me*?

- It can improve your score
  - Fills spots in band map (SOA, Multi-op)
  - Spots *you* very often, if you CQ "properly"
- Entering a contest?
  - Before: Check antenna F/B, signal strength
  - During: See where you are being heard
  - After: Compare signal strength with the competition

How can I use RBN to improve my score?

- Make sure the Skimmers find *you*
- When permitted, use RBN as DX Cluster for CW and RTTY contests
  - Far more spots, with smaller pileups than human-posted Cluster spots
  - Quickly fills up your logging software band map
  - Helps you find clear spots (between stations you can't hear)
  - Shows where *you* are being heard
    - E.g. at K3LR on 15m: "Spotted by S50ARX-#" (First EU answered our 15m CQs 25 minutes later)

How do I CQ "properly"?

- Send *everything* at the *same consistent speed*
  - *Never* use >/< or +++/--- to change speed in messages
- Call CQ or TEST and send your call twice
  - CQ N6TV N6TV
  - TEST N6TV N6TV
  - CQ N6TV N6TV TEST
- Use proper spacing (let computer send)
  - Don't send with paddles and rusheverythingtogether
- Change your freq. *slightly* to get spotted again

How to improve your chances in a Skimmer-generated pileup

- Use XIT or the "randomize TX" feature of your logging program to call a bit off frequency.

How do I use the RBN to Check My Antennas?

- To test performance, just call CQ on CW, check RBN web site (turn beam, repeat)
- Use RBN web site's "Spots Analysis Tool" to compare your signal to the competition
- Download raw data files for deeper analysis
  - Every RBN spot posted since February, 2009 is archived on the site

Accessing the RBN (SOA, Multi)

1. telnet.reversebeacon.net port 7000 (DX Spider software)
2. arcluster.reversebeacon.net port 7000 (V6 AR-Cluster software)
3. dxc.ve7cc.net port 23 (CC Cluster software – removes bad spots!)
4. Some clusters combine RBN *and* human spots (VE7CC, W9ZRX, N7TR)
5. http://www.reversebeacon.net

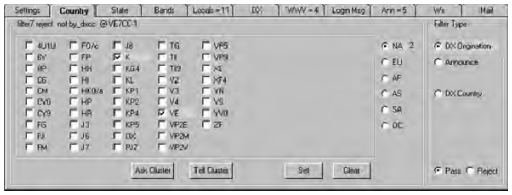
Filtering Spots (old way)

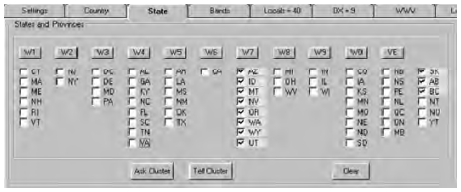
- telnet.reversebeacon.net port 7000
  - `accept/spots by_zone 1,3,4,6,7,31 and not by WZ7I or call N6TV`
  - http://www.dxcluster.org/main/filtering_en.html#toc1
- arcluster.reversebeacon.net port 7000
  - `set dx filter call=N6TV or (unique>1 and (spotterstate=CA or spotterstate=NV or spotterstate=UT))`
  - http://www.ab5k.net/ArcDocsVer6/UserManual/ArcDx.htm

Filtering Spots (new way)

- Use CC User software by VE7CC to log in to dxc.ve7cc.net and program filters with a full-feature Graphical User Interface
- CC Cluster nodes *automatically* reject "unique" (busted) spots
- Tutorial:
  - http://reversebeacon.blogspot.com/2010/11/using-rbn-telnet-server-brief-tutorial.html
- Reference:
  - http://www.bcdxc.org/ve7cc/default.htm#download

CC User Filter Dialogs





Some nodes combine RBN and “legacy” (human) spots

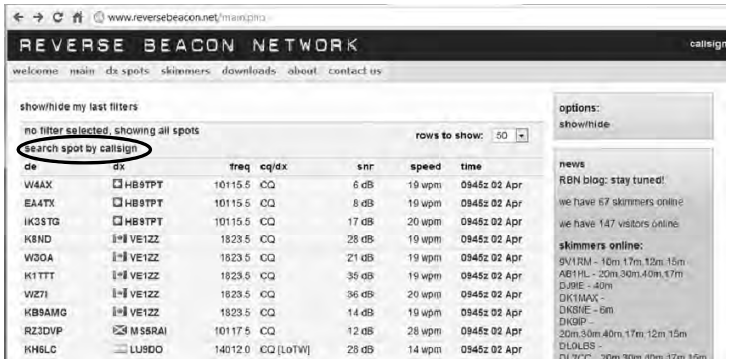
- dxc.ve7cc.net port 23 (CC Cluster, many filtering options, use CC User to set them)
- dxc.w9zrx.net port 7373 (AR Cluster)
- dxc.n7tr.com port 7373 (AR Cluster, but pre-filters to show only spots from Zones 3 and 4)

Using www.reversebeacon.net

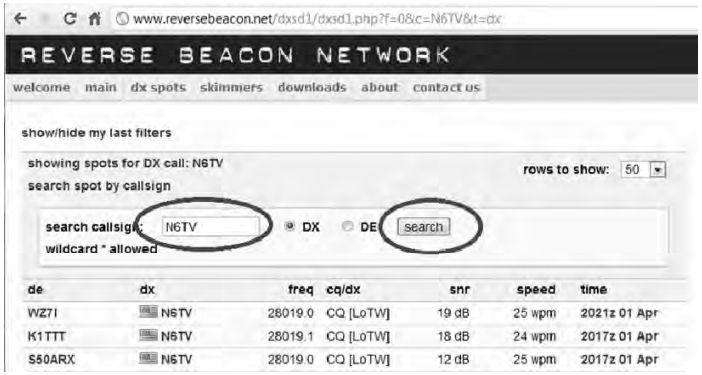
- Great for post-contest analysis
- Plot signal strengths
- Raw data files can be downloaded / analyzed
  - Millions of spots archived

www.reversebeacon.net

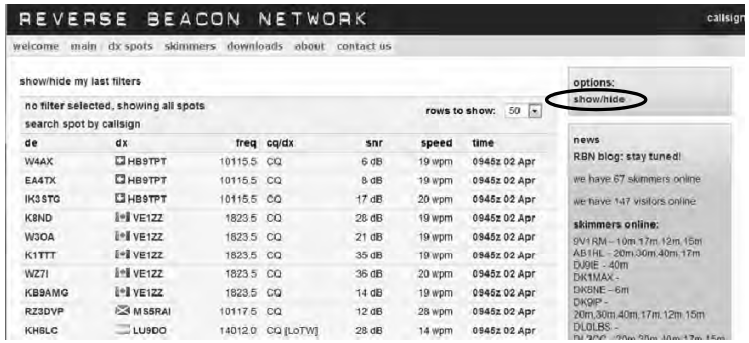
www.reversebeacon.net main



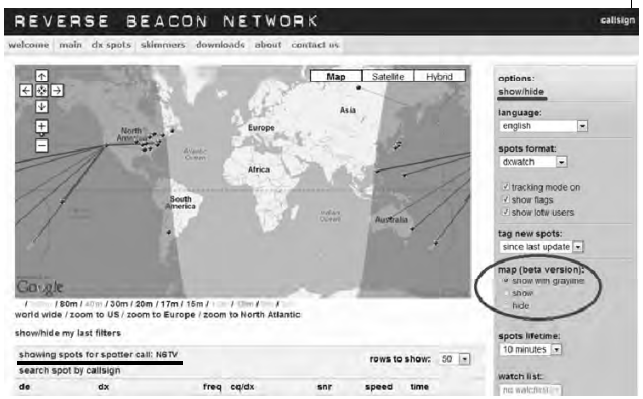
Where was I heard?



Plot spots on a map

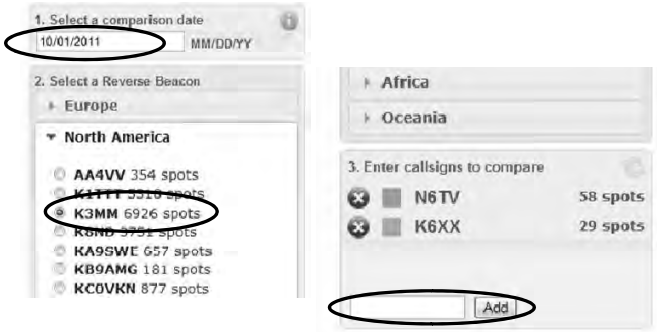


Which bands are open at *my* QTH?

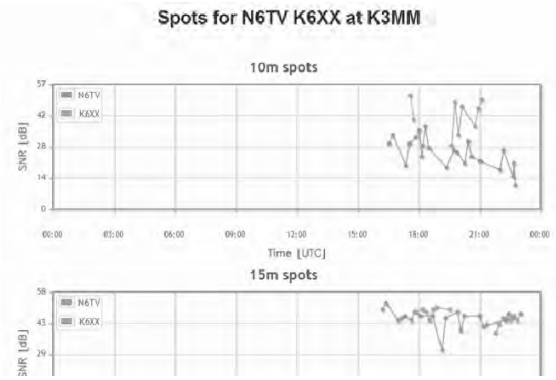


Spots analysis tool

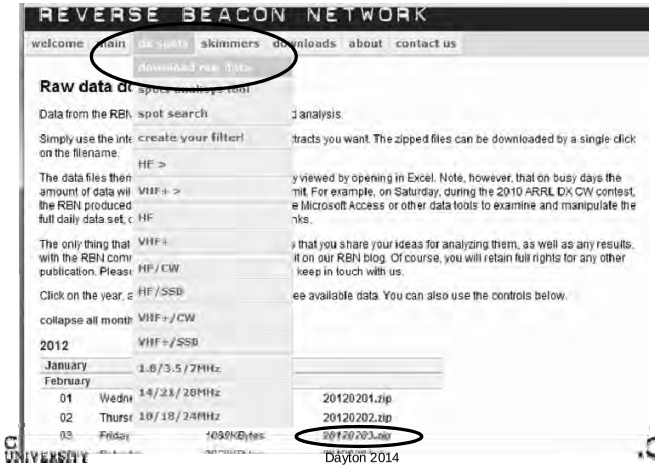
Pick a Date, a Skimmer, add callsigns to compare



And the winner is … K6XX!



Raw data downloads



Raw data is text file, Comma Separated Values

```
callsign,de_pfx,de_cont,freq,band,dx,dx_pfx,dx_cont,mode,db,date,speed,tx_mode
    JE1SGH,JA,AS,28032.6,10m,K6UW,K,NA,CQ,29,2014-02-15 00:00:00,32,CW
    XV4Y,3W,AS,14041.1,20m,PT5T,PY,SA,CQ,22,2014-02-15 00:00:00,28,CW
    XV4Y,3W,AS,14021,20m,PX2F,PY,SA,CQ,23,2014-02-15 00:00:00,23,CW
    NC7J,K,NA,28005.5,10m,N2IC,K,NA,CQ,11,2014-02-15 00:00:00,33,CW
    NC7J,K,NA,7020,40m,N0NI,K,NA,CQ,27,2014-02-15 00:00:00,27,CW
    NC7J,K,NA,7000.9,40m,W1VE,K,NA,CQ,14,2014-02-15 00:00:00,35,CW
```

Total World-Wide RBN CW spots, CQ WW:

- 2012: 3,163,126 (18.3 spots per *second*)
- 2013: 5,743,545 (33.2 spots per second) – up 81.5%

ARRL DX CW:

- 2013: 3,937,108 (82,023 spots per hour)
- 2014: 4,146,399 (86,383 spots per hour) – up 5.3%

What's the Average CW Speed?

- 2013 CQ WW CW: 30.6 WPM
- 2014 ARRL DX CW: 29.6 WPM
- How did I calculate these statistics?
- Simple one line Unix/Cygwin command:

```
grep -e ",CW *$" 2013112?.csv | gawk -F,
   '{sum+=$12} END { print "2013 CQ WW CW Spots =
   ",NR; print "Avg Speed = ",sum/NR}'
```


How can I help?

- Set up an SDR, feed Skimmer Spots to the RBN, using the Aggregator program
  - More skimmers needed in Asia/Africa/South America
- Call a bit off frequency

What's New?

- NCDXF and other HF Beacons can be spotted on RBN (see RBN blog)
- CW Skimmer 1.83 Released
- Aggregator v3.0 Released

For more information

- http://www.reversebeacon.net
- http://www.bcdxc.org/ve7cc/default.htm#download
- http://www.dxatlas.com/CwSkimmer
- http://www.dxatlas.com/SkimServer
- http://www.srl-llc.com/ (QS1R SDR)
- http://microtelecom.it/perseus/ (Perseus SDR)
- http://www.pixelsatradio.com/product/shortwave-magnetic-loop-antenna/ (RF Pro-1B loop antenna)
- http://www.dxengineering.com/parts/dxe-arah3-1pe (ARAH3-1PE horizontal antenna)

For more information

- http://www.pvrc.org/~n4zr/rbn.pdf
- http://reversebeacon.blogspot.com
- http://www.ve7cc.net/
- http://www.qrz.com/db/n6tv

Questions?

CTU Presents

VHF Contesting

Joel Harrison, W5ZN

2014 CTU VHF Contesting Presentation

Special Thanks to:

Bob Striegel, K2DRH

VHF Contest winner & record holder Low Power

Jeff Klein, K1TEO

VHF Contest winner & record holder High Power

Steve Kostro, N2CEI

VHF Contest Winner & Record hold – Rover and K1WHS Multi-op

VHF Contesting – Expectations

- **Magic Bands**

with

- **Super Results**

from

- **Average Stations**

What Contests are Available?

- **ARRL**
  - January
  - June
  - September
- **CQ**
  - July
- **Many others throughout the year**

Categories

- **Standard**
  - Single OP
  - Multi Op
- ***Unique***
  - Rover
  - Single Op 3 Band (50, 144 and 432 MHz)
  - FM Only

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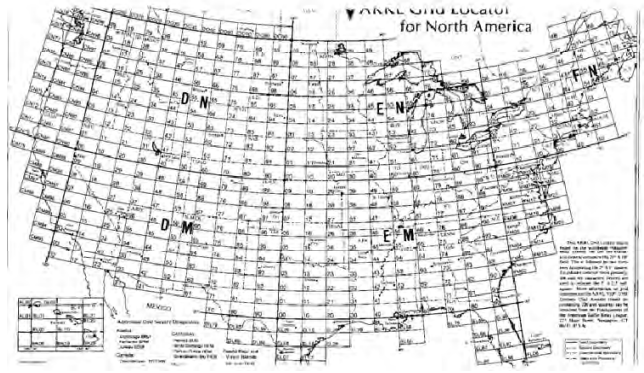
Contest Exchange Grid Squares



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Station Basics

- **6 Meters**
  - Radio or transverter is fine
  - 50 watts is great, 100 watt is outstanding
  - 3 element antenna at 30 ft is good
- **2 Meters**
  - Radio or transverter is fine
  - >50 watts
  - 13 element beam @ ~50 ft

CONTEST UNIVERSITY ICOM

Station Basics

- **222 – 432 MHz**
  - >50 watts
  - 16 element & 25 element @ ~50 ft
  - Boom length
- **902 MHz & Up**
  - >10 watts
  - Loop yagis & parabolic (dish) antennas

CONTEST UNIVERSITY ICOM

Station Basics - Noise

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

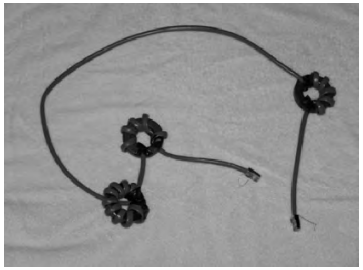
- Sky Noise
- Atmospheric Noise
- Line Noise
- Other man-made noise

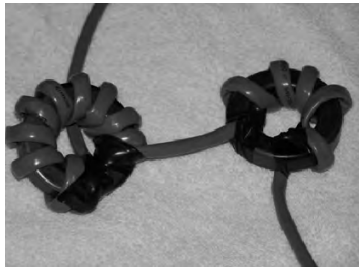
Station Basics - Noise

- **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!***

Station Basics - Noise

Internet Router noise can be significantly reduced or eliminated.





Also utilize shielded CAT5 cable and connectors

Station Basics - Noise

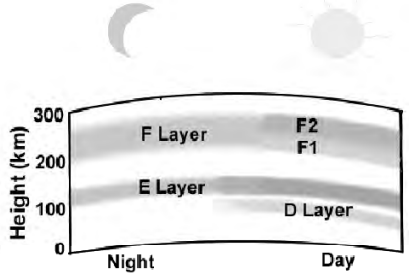
- **Some Actual Results**
  - All "birdies" are gone
  - Noise floor dropped 8 dBm !!!
- **More technical info:**
  - A Ham's Guide to RFI, Ferrites, Baluns and Audio Interfacing - Jim Brown, K9YC
    - http://audiosystemsgroup.com

Propagation – What can I Expect

- **Sporadic E – "Es"**
- **Tropospheric Ducting – "Tropo"**
- **Meteor Scatter – "MS"**
- **Even EME!!!!!**

Propagation

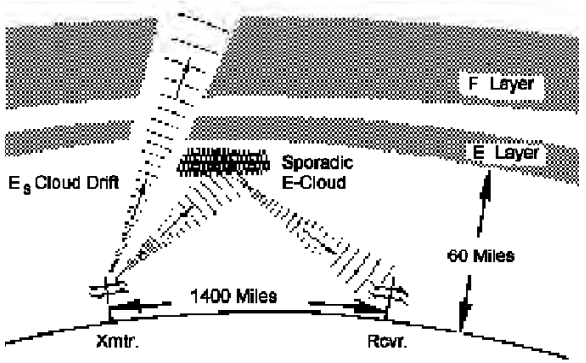
At night the E layer and F layers are present. During the day, a D layer forms and the E and F layers become much stronger. Often during the day the F layer will divide into F1 and F2 layers.



Propagation – Es

- **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**

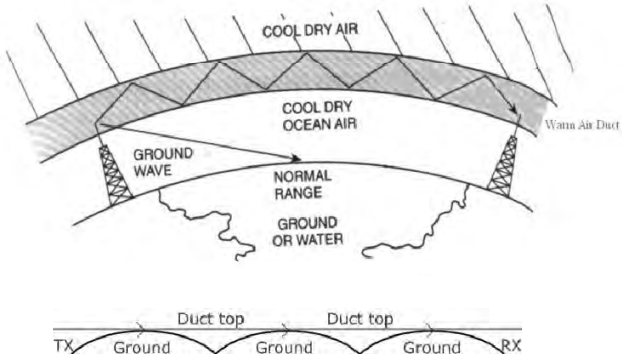
Propagation – Es



Propagation - Tropo

- **Natural atmospheric ducts that form due to temperature inversion and can shuffle VHF and UHF radio waves long distances**
  - All bands
  - Any time, but mostly warm weather months

Propagation - Tropo

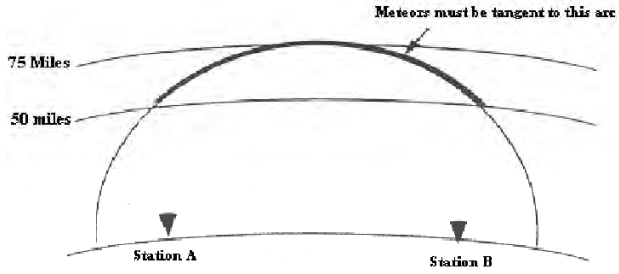


Propagation – MS

- **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**

Propagation – MS

Reflection will occur when the trail is oriented as shown



Propagation – MS

- **Excellent for 50 & 144 MHz, possible at 222 MHz**
- **Very Predictable Paths**
  - Best times between midnight & approx 9 AM
  - Peak during “showers” – Anytime with high speed procedures like ***WSJT***

Equipment

- **Antennas**
- **Receive Preamplifiers**
- **Amplifiers**

Equipment - Antennas

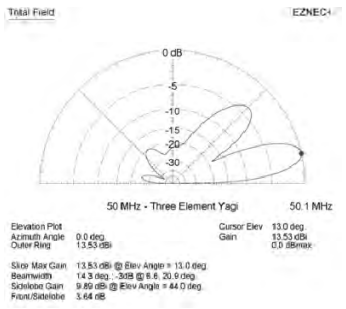
- **VHF antennas are small in comparison to HF antennas**
- **Boom lengths can be large, 30’ to 50’, but elements length & diameter is much smaller**
- **Antenna stacking for added gain is much easier at VHF**

Equipment - Antennas

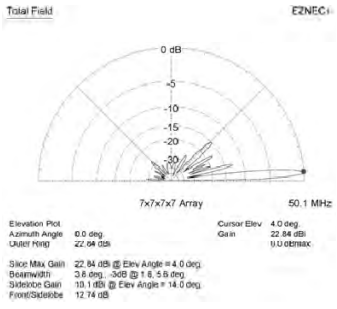
- **What is the best height for my antenna?**
  - You will always have dead zones and nulls regardless of height
  - Get your antennas as high as you reasonable can
- ***Antenna Rule of Thumb #1***

  Get your VHF antennas above the tree line

Equipment - Antennas



Single 3 element @ 20ft



7x7x7x7 Array

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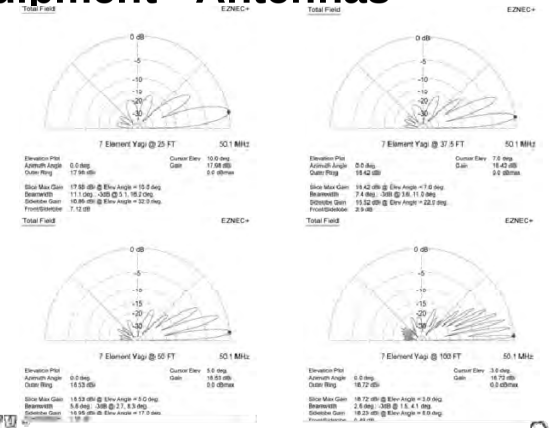
Equipment - Antennas



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Equipment - Antennas

HFTA

- **Terrain analysis works for 50 MHz**
- **Elevation angle statistics may not be accurate**
  - Based on IONCAP/VOACAP which are only accurate up to 30 MHz

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Equipment - Antennas

Aiming

- **Pointing your antenna in right direction is MUCH more critical than on HF**
- **Unless two stations are aimed very close at each other you most likely will fail.**

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Equipment - Receive Preamps

- **Preamp may not be needed unless your receiver has a really bad noise figure**
- **What is a "bad" noise figure??**
  - Total system noise figure depends more on antenna & sky temperature – they will dominate & you can't change them
- **At VHF and above, gain is NOT as important as a low noise figure**

Equipment - Receive Preamps

- **Assume T_{ant} = 3000°K**
- **If RX nf is 20 dB and you add a preamp with only 12 dB gain but it's nf is 2 dB you will improve your system nf by 10 dB!**
- **If RX nf is 10 db and you add a preamp with 25 dB gain but it's nf is 10 dB you will improve by 0 dB and cause other problems.**

Equipment - Receive Preamps

RX Noise figure (nf) to Noise Factor (NF)

$$\frac{nf\ (db)}{10}\ \text{Inv Log}$$

Noise Factor to Temp (K) = NF - 1 x 290

Total System Temp = TANT + TRX

$$\text{Improvement (dB)} = 10 \log \frac{\text{Temp 1}}{\text{Temp 2}}$$

Equipment - Receive Preamps

The Simple Bottom Line on Preamps

- ***Preamp Rule of Thumb #1***
  - Approx 90% of the entire receive system noise figure is determined by the NF of the first stage after the antenna. If that first stage is "passive coax" then the coax loss determines 90% of your entire system NF

Equipment - Receive Preamps

- ***Preamp Rule of Thumb #2***
  Every time you cut your system noise figure in half you gain approx 3 dB in signal to noise ratio until you are limited by sky/antenna noise temperature
- ***Preamp Rule of Thumb #3***
  Mast mounting a preamp is like bringing the RX front end right up to the top of the tower.

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Equipment - Receive Preamps

- **50 MHz**
  - Not needed unless your radio is really deaf
    - Most new radios do need a preamp!!!!!
- **144 MHz**
  - Recommended for radios, DEMI xvtrs are FB
- **222 & 432 MHz**
  - STRONGLY recommended
- **902 & Above**
  - ***Mandatory!***

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Equipment - Amplifiers

- **Before you sink a lot of money into a high power amplifier, learn the real facts about "gain"!**
- **Only needed if you want to enter the high power category**
- **There are no "multiband VHF/UHF amplifiers**
- **Outstanding gain can be achieved by stacking antennas**

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Contest Strategy

- **Once you decide what you want to do, you must fully understand what will be required to achieve that objective.**
  - How many points do I need?
    - How many Q's? How many grids (multipliers) ?
  - What equipment do I need.
  - When are the prime propagation times to particular areas

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Contest Strategy

- **Determine what others are accomplishing**
  - Evaluate top 10 scores for past 10 years
- **Its not all about making the most QSO's**
  - Maximize grid multipliers

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Contest Strategy
How To Maximize Your Score

Night time Satellite Photo Reveals Population Density

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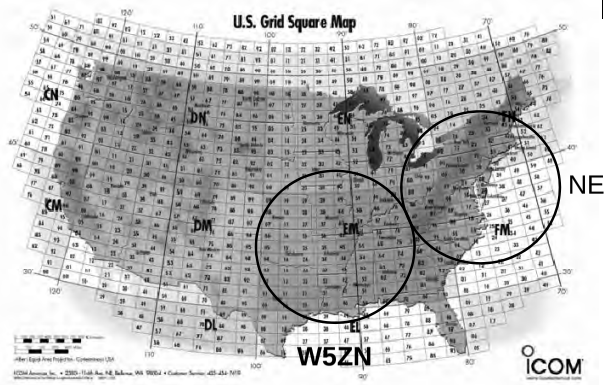
Contest Strategy
Grids Within 500 Mile Radius



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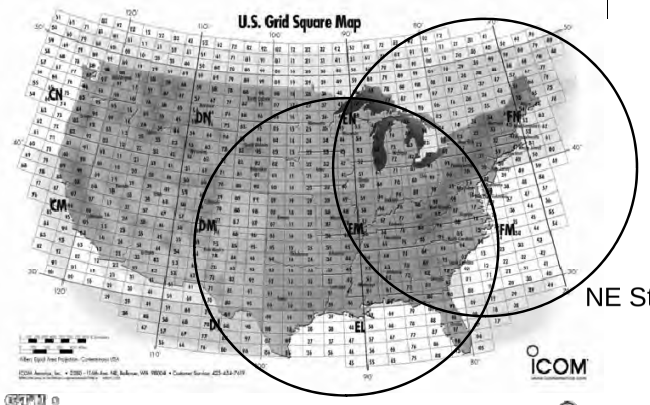
Contest Strategy
Sporadic E 1000 mi Radius



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Contest Strategy
How Can "Dead Grids" be Activated?

- **So you want to be a Rover?**
  - What route should I plan?
  - How do I know where I am when I get there?
  - What equipment do I need?
  - What else should I plan for?

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Contest Strategy
Rovers

- **What route should I plan?**
  - 6 meters can open to just about anywhere no matter where you are.
  - For higher bands you should plan an approx 400 mile radius of other stations.
  - Use GPS (Smart Phone) to identify your exact location

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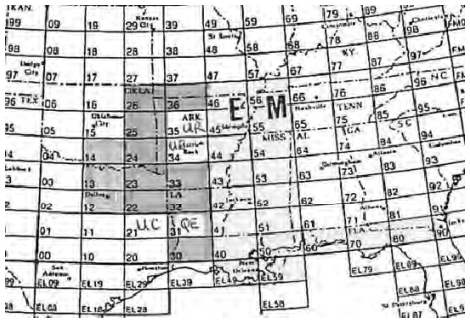
Contest Strategy
Rovers

- **What route should I plan?**



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Contest Strategy
Rovers

- **What equipment do I need?**
  - Multi-band VHF radios that cover 50 through 432 MHz are great!! (FT-847, FT-736, TS-2000)
  - Smaller antennas

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Contest Strategy
Rovers


N2CEI / K4SME Rover Station

Contest Strategy
Rovers

Contest Strategy
Rovers


N5AC Rover Station


W5ZN Rover Station

Contest Strategy
Rovers

- **What else should I plan for?**
  - Bad weather
    - K4SME/N2CEI got in a tornado in 2011
  - Vehicle breakdown
  - Adequate rest over a 36 hour contest period
  - Emergency Medical Assistance

Contest Strategy
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.**

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Contest Strategy
K1JT Digital Modes

- **Can Provide Outstanding access to new grid multipliers from moderate stations**
  - FSK441 for Meteor Scatter
  - JT65 for EME
- **EME for Single Yagi stations**

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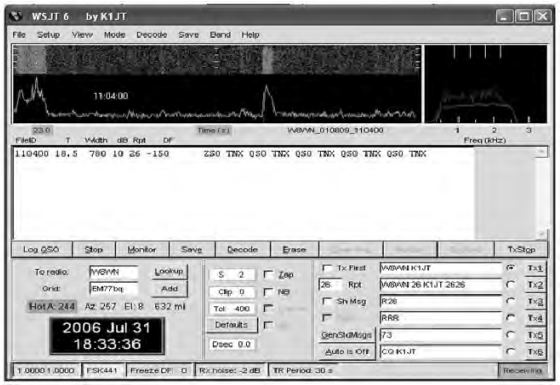
Contest Strategy
K1JT Digital Modes



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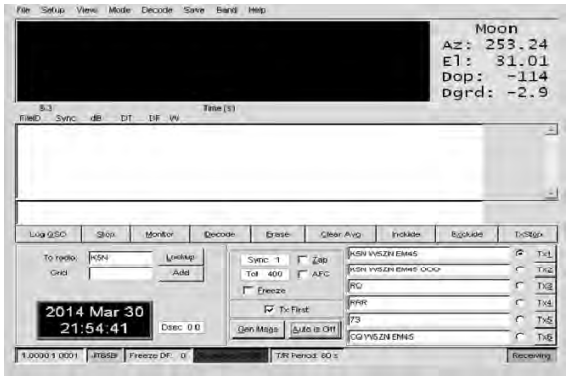
Contest Strategy
K1JT Digital Modes



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Contest Strategy
K1JT Digital Modes

- **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

Operating Technique

- **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
- **CAUTION!! Stay within the rules for your operating category when using the above!**

Operating Technique

- **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!!

Operating Technique

- **6 Meters**
  - Daylight hours, early evening
  - ***PRIORITY band when it is open***
- **144 MHz & Up**
  - Anytime
- **Sunday Morning – DO NOT MISS**
- **Midnight to 5 AM – DEAD!!!**
  - Some Rovers may still be roaming
  - Meteors & EME with JT Modes

Operating Technique

- **2 Meter FM**
  - FM is NOT a four-letter word
  - The Q's count and can add up nicely
  - Excites the local club and introduces them to contesting
  - They get to be a part of the big winning team!
  - Give a presentation at the local club, most new hams have an HT.

Operating Technique

- **Call CQ in several directions**
  - Keep rotating the antennas every few minutes
  - Just because you heard nothing in one direction an hour ago doesn't mean no one is there. A station may now have their antennas your way and listening / CQ'ing
  - If you hear a weak partial move your antennas

Operating Technique

- **Keep Track of Grids Not Worked**
  - Keep track of grids not worked. If you know there are stations there keep going back to that beam heading and listen / call CQ.
- **Move Stations to Other Bands**
  - If you work a station on 2 meters (or 6 meters within range) ask them to move to another band for a quick QSO.

Other Important Points

- **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

Where Can I Learn More?

- 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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Contesting 201: Making and Keeping your Score

Randy Thompson, K5ZD

Purpose of this Session

- Discuss factors important to creating winning scores
- Discuss how to avoid score reductions
- Use CQWW Contest as real-world example

Choose the Game

- Select category
  - All band or single band?
  - Power – High, low, QRP?
  - Assisted or unassisted?
- Set a goal
  - Have fun?
  - Win a certificate?
  - Set a record?

Understand Scoring

- Points for each QSO?
  - Per mode?
  - Per continent?
  - By band?
- What is a multiplier?
  - Section? Zone? Country? Prefix?
- Constantly evaluate what you are doing against the final score

Score - 3,774,014 Points

Band	QSOs	Pts	Cty	ZN
1.8	7	14	5	5
3.5	143	408	42	21
7	761	2252	59	24
14	401	1142	64	28
21	2021	5980	70	27
28	118	322	14	14
Total	3451	10118	254	119

Score: 3,774,014

Example - ARRL Sweepstakes

- You have 1000 QSOs x 80 sec
  = 160,000 points
- Which is more valuable?
  - 1 more section or 10 contacts?

1001 x 81 sections = 162,162 points
1010 QSOs x 80 sec = 161,600 points

It takes 14 contacts to equal that new section!

@60 QSOs/hour – 14 minutes
@30 QSOs/hour – 28 minutes

Example – CQ WW

- You have 1000 QSOs, 100 Zones, 250 countries **~ 980,000 points**
- Which is more valuable?
  - Getting the 40th zone on 20 meters?
  - Working 10 more contacts?

1001 x 352 = 986,586 points
1010 x 350 = 989,800 points

Each mult is only worth 2.8 QSOs!

@60 QSOs/hour – 4 minutes
@30 QSOs/hour – 7 minutes

All scores assume 2.8 points/QSO

Tips

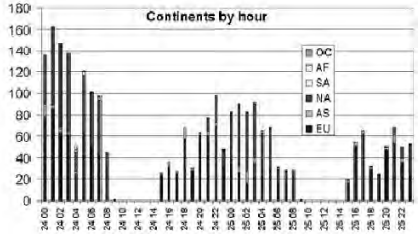
- Calculate trade offs based on expected final score!
- Short cut method
  - $Mult\ value = \frac{QSOs}{Mults}$
  - $Time\ value = \frac{QSOs}{Mults} * \frac{60}{Rate}$

The higher the rate…
The less time you can spend!

- Your logging software can display this calculation for you – use it!

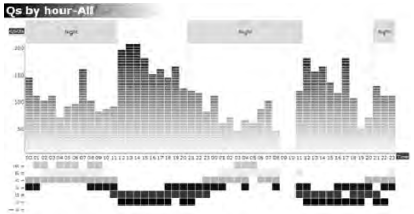
Log Analysis

- Study past results and logs
  - Do the winners focus on QSOs or multipliers?
  - Where do the QSOs come from?
  - Do activity patterns repeat?

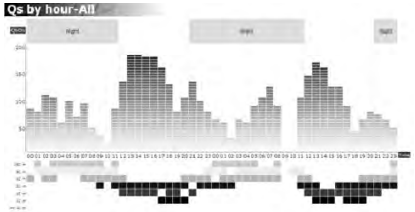


Activity Patterns Repeat

K5ZD/1
WW CW
2013



K5ZD/1
WW CW
2006



Rate charts by SH5 software

Make a Plan

- CQWW and WPX logs are open…what did your closest peer do differently?
  - Where do the QSOs come from?
  - Do activity patterns repeat?
  - What hours to be on the air?
  - Expected opening times for each band
  - When to "run" and when to "search"

Make Good QSOs

- Know who you are calling
  - NEVER NEVER TRUST CLUSTER SPOTS!
- Know who is calling you!
  - Does the prefix make sense for the situation?
- Ask for repeats if you are not sure

- *ERRORS REDUCE YOUR SCORE!!!!*

Cost of Errors

- Many contests have a penalty for errors
  - Loss of QSO
  - Loss of QSO + 1x, 2x, or 3x penalty

- Errors happen
- Focus on yours and how to prevent them
- Post contest "log washing" is not an acceptable practice

Improve your Vocabulary

- English has 180,000 words
  - Average person uses 10,000 – 12,000 words
  - College educated uses 15,000 – 20,000 words
- CQ WW SSB 2013 logs had 108,210 calls
- 60,991 only appeared in only one log
  - Experience says >95% of these are errors
- 18,343 appeared in 20 or more logs
  - You should “know” 5,000 – 10,000 calls

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Common Busts

SSB

- V and W
- E and I
- G and J
- WW SSB Most Busted
  - HA3ØS
  - B9/BY9GA
  - DFØHQ
  - TC9ØA
  - ES9C

CW

- I, S, H, 5
- V and 4
- B and 6
- WW CW Most Busted
  - JS3CTQ
  - ES9C
  - HF9Q
  - V47T
  - HA3ØS

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Which of these calls are bad?

C73NL	FY5KE	LY7A	RG8U
CD6416	GT8IOM	OB9DCM	TM6M
E2E	1B1B	M5O	W0ASH
EY8MM	HI3TIJ	P3W	YU15OTC

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Which of these calls are bad?

C73NL	FY5KE	LY7A	RG8U
CD6416	GT8IOM	OB9DCM	TM6M
E2E	1B1B	M5O	W0ASH
EY8MM	HI3TIJ	P3W	YU15OTC

Correct Calls

C37NL	FY5KE	LY7A	RG8U
CD6416	GT8IOM	HB9DCM	TM6M
E2E	IB1B	M5O	W0AIH
EY8MM	HI3TEJ	P33W	YU15OTC

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BIC – Butt in Chair

- No other single thing will help you more to improve your scores
- It only works if you spend your time working people

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BIC Strategy

- Plan your life to meet your contest goal
  - Work, family, food, rest, station repairs
- Part time?
  - BIC for the best rate or at different times each day
- Have a goal!

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Sleep Facts

- You can not train for lack of sleep
- You can not store sleep
- Under sleep deprivation, highly practiced skills will deteriorate more slowly than those which require new or creative thought

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Contest Sleep Strategy

- Preparation
  - Have good physical fitness
  - Stay on your normal sleep schedule
  - Get extra sleep 4-7 days before the contest
  - Take 3 hour nap before contest starts
- During the contest
  - Sleep for 90 or 180 minutes
  - Avoid caffeine until needed

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Remember your goal!

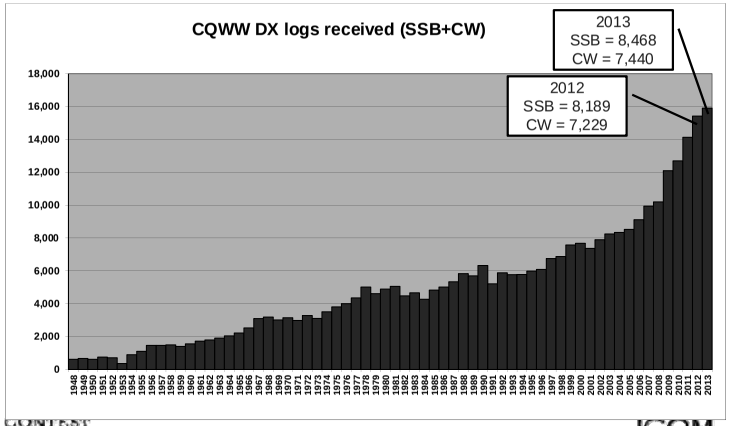
- Fatigue will make you want to quit
- A short nap is better than quitting
- Sleep during low rates so you are fresh during the high rate periods

Keep Pushing

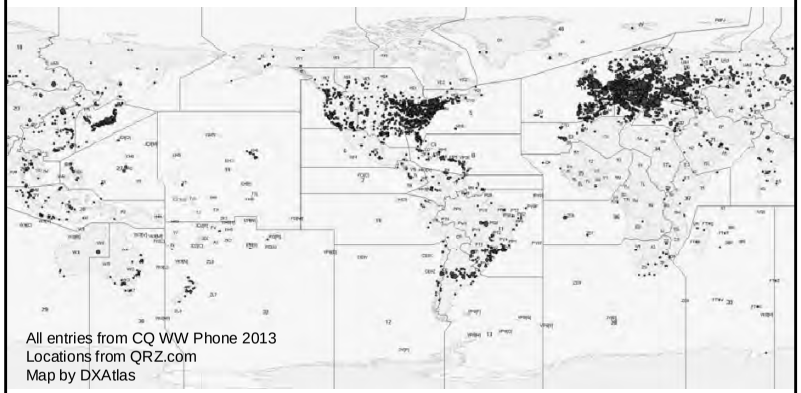
- Use time wisely
  - The clock never stops
- The next QSO could make the difference!
  - Pay attention to accuracy
- Everyone is experiencing the same conditions!
  - Don't get frustrated

CQ WW DX Contest

CQ WW is the Big One!



Entries - CQ WW Phone 2013



All entries from CQ WW Phone 2013
Locations from QRZ.com
Map by DXAtlas

Thanks to ZL2HAM

Entry Categories

	1500 W	100 W	5 W
Single Op All Bands	X	X	X
Single Op Single Band (160, 80, 40, 20, 15, 10)	X	X	X
Single Op Assisted All Bands	X	X	X
Single Op Assisted Single Band (160, 80, 40, 20, 15, 10)	X	X	X
Overlay – Rookie (All Bands)	X	X	
Overlay – Classic (All Bands)	X	X	
Multi-Op Single-Transmitter	X		
Multi-Op Two-Transmitter	X		
Multi-Op Multi-Transmitter	X		
Checklog	X		

New Overlay Categories!

- Overlay Categories (Single Op Only)
  - Rookie – Licensed <3 years
  - Classic – One radio, no assistance, 24 hours
- Enter by adding line to Cabrillo header
  - CATEGORY-OVERLAY: ROOKIE
  - CATEGORY-OVERLAY: CLASSIC
- Entrants will have two scores in results
  - Traditional category score
  - Overlay category score calculated as All Bands regardless of log entry category

Classic Overlay

- One Operator
- One Radio
- No DX Cluster (no Assisted)
- 24 hours of operating time
  - >60 minutes with no QSO is considered “off-time”
  - You may operate more time, but only first 24 hours of operating time will count for Overlay score

0000 – 0200z	2:00
0500 – 0900z	4:00
1200 – 2200z	10:00
0400 – 0900z	5:00
1300 – 1600z	3:00
	24:00
1600 – 1800z	n/a

Entry Categories – 2013 SSB

	1500 W	100 W	5 W	Total
Single Op All Bands	960	2104	118	3182
Single Op Single Band (160, 80, 40, 20, 15, 10)	489	1049	134	1672
Single Op Assisted All Bands	974	765	24	1763
Single Op Assisted Single Band (160, 80, 40, 20, 15, 10)	472	396	49	917
Overlay – Rookie (All Bands)	29	227		256
Overlay – Classic (All Bands)	295	500		795
Multi-Op Single-Transmitter	375			
Multi-Op Two-Transmitter	115			
Multi-Op Multi-Transmitter	68			
Checklog	376			

Submit your log!

- Use Cabrillo format
- One log per callsign
- Put the correct callsign in the log!
- Confirm entry category is correct
- All dates/times are within contest period
- Read the robot confirmation email
- Visit logs received web page to confirm

Log Check Tool

http://www.cqww.com/logcheck/

Penalties for Logging Errors

- Duplicate contacts or Incorrect exchange
  - Removed, no penalty
- Call sign errors or Not-In-Log (NIL)
  - Removed + 2x the QSO point value for that contact
- Multi-operator band change errors
  - Removed, no penalty

Log Checking Notes

- QSOs must match within a time window (+/-30 minutes)
  - No match = Not In Log
  - Please check the time on your logging computer!
  - Log every QSO you make including dupes!
- Exchange information will be checked
  - Use extra attention when working USA stations

Log Checking Report

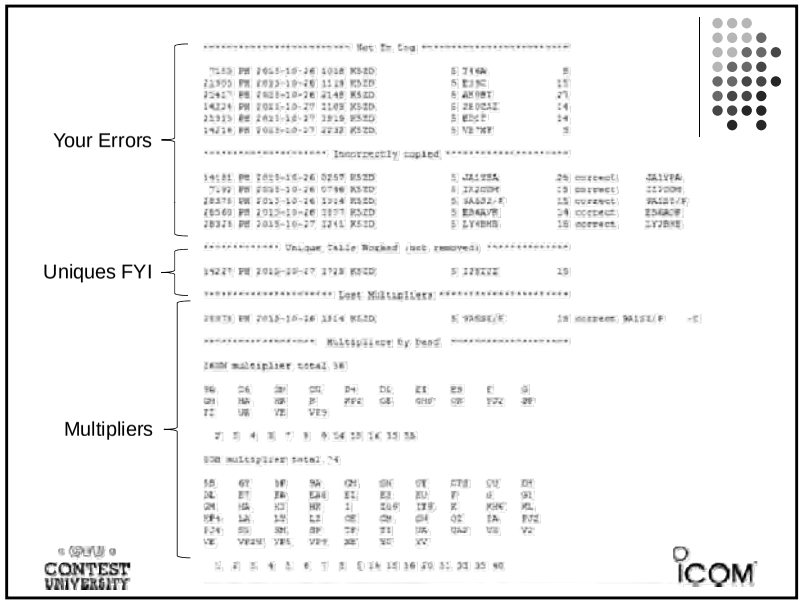
- All entrants in CQ WW will be sent a log checking report
- LCR shows
  - How score and penalties were calculated
  - Lists all errors detected
  - Shows all multipliers counted
  - List of how other stations made mistakes when working you

```
Contest:     2013 CQ WW DX SSB CONTEST
Call:        K9ZO
Category:    Single Op All Band High Power
Overlay:     Classic

Thank you for submitting a log in the 2013 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.
In addition to being fun, contesting helps us practice and develop
our skills.

Explanation of the report sections:

************************** Summary **************************

    3144 Claimed QSO before checking (does not include duplicates)
    3133 Final   QSO after  checking reductions

    9114 Claimed QSO points
    9021 Final   QSO points

     465 Claimed countries
     464 Final   countries

     152 Claimed zones
     151 Final   zones

     617 Claimed mults
     615 Final   mults

 5623338 Claimed score
 5547915 Final   score

     1.3% Score reduction
     0.3% Error Rate based on claimed and final qso counts
        5 (0.2%) calls copied incorrectly
        3 (0.0%) exchanges copied incorrectly
        0 (0.0%) band change violations
        6 (0.2%) not in log
       15 (0.5%) duplicates (Removed without penalty)
        1 (0.0%) calls unique to this log only (not removed)
```

$$\text{Error rate} = \frac{\text{Errors}}{\text{Claimed QSOs} - \text{Dupes}}$$

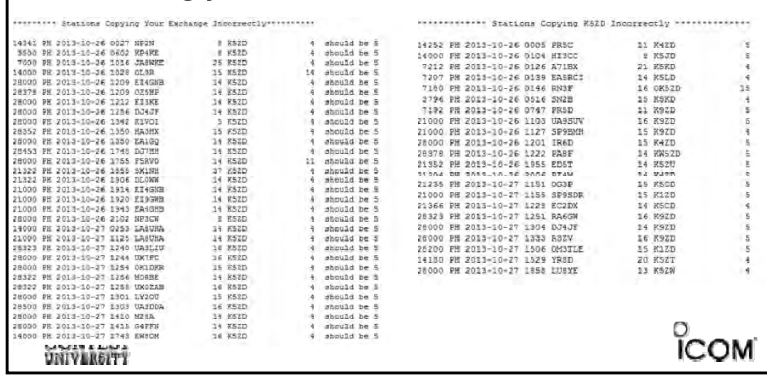
How We Calculated Your Score

```
********************** Results By Band **********************

          Band   QSO  QPts  Zone Cty Mult

Claimed   160M    44   110    12  24   36
Final     160M    44   110    12  24   36

Claimed    80M   153   425    17  57   74
Final      80M   153   425    17  57   74

Claimed    40M   200   555    25  71   96
Final      40M   198   540    25  71   96

Claimed    20M   582  1695    33 102  135
Final      20M   579  1671    33 102  135

Claimed    15M   880  2547    33 106  139
Final      15M   877  2520    33 106  139

Claimed    10M  1285  3782    32 105  137
Final      10M  1282  3755    31 106  135

Claimed    All  3144  9114   152 465  617  Score  5623338
Final      All  3133  9021   151 464  615  Score  5547915
```



Mistakes Made By Others

- Study the errors that others make when working you



Summary

- Have a goal and a plan
- Understand the scoring
- Expand your callsign vocabulary
- B.I.C.
- Submit log
- Study your LCR
- Have fun!

World Wide Radio Operators Foundation

- Non-profit corporation focused on support of radio contesting
- Developed contester's code of ethics
- WWROF funds
  - CQWW infrastructure including the robot, web site, log checking software/hardware
  - Webinar series
  - Other projects that support contesting
- Learn more and donate at www.WWROF.org

Questions?

Hour 43 – The "look"

Propagation Trends 2014-2015

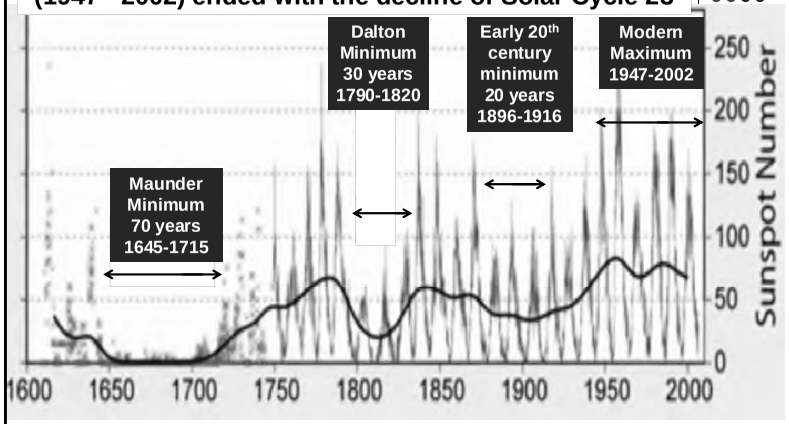
Solar Maximum!

But the slow decline to solar minimum in 2020 is likely to begin later this year

Dayton 2014

400 Years of Sunspot Observations

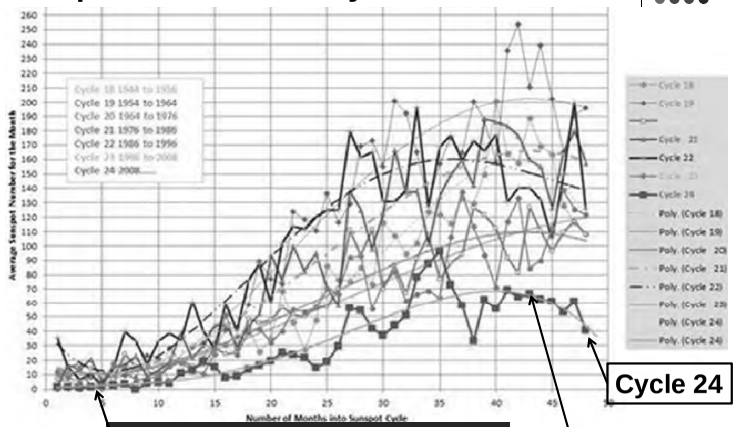
55 years of unusually high sunspot activity (1947 - 2002) ended with the decline of Solar Cycle 23



The 80 year Gleissberg cycle is clearly visible in this data

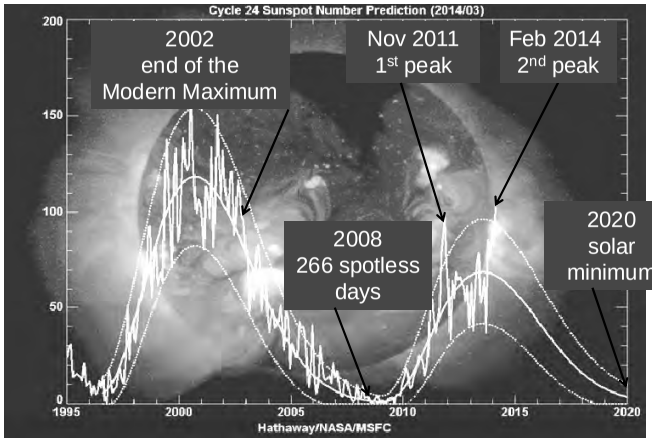
Solar Cycle 24

compared to all solar cycles since 1944



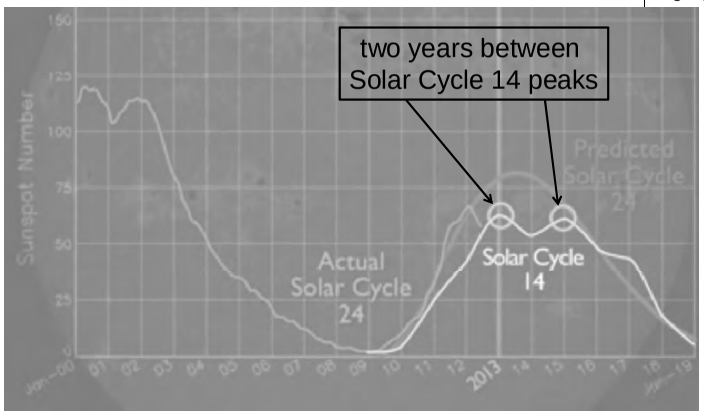
Solar Cycle 24 Progress

the ongoing second peak is stronger than expected



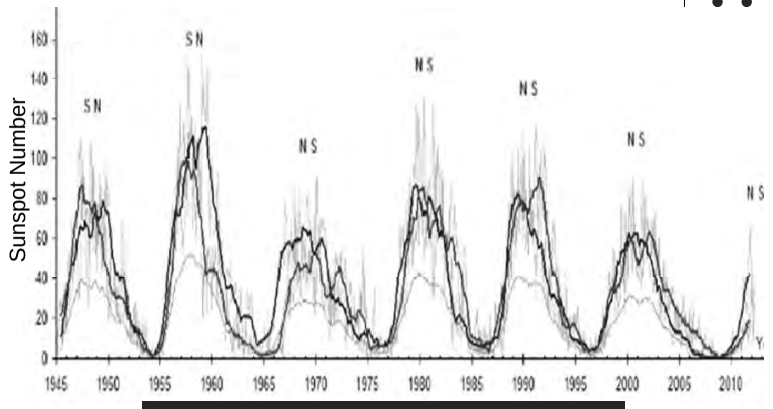
http://solarscience.msfc.nasa.gov/images/ssn_predict_l.gif

Solar Cycle 24
compared to similar Solar Cycle 14



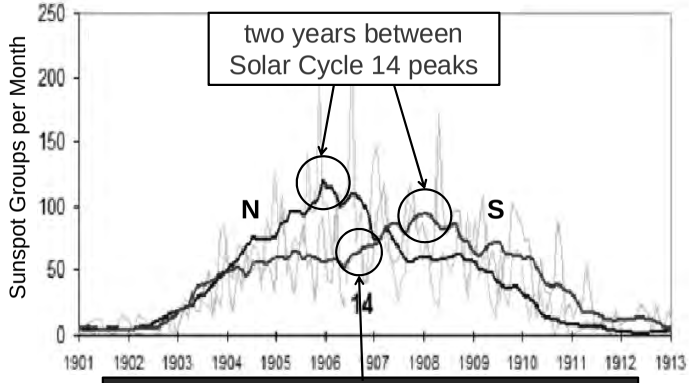
Ongoing Solar Cycle 24 is also double peaked

Why are there often two solar cycle peaks?



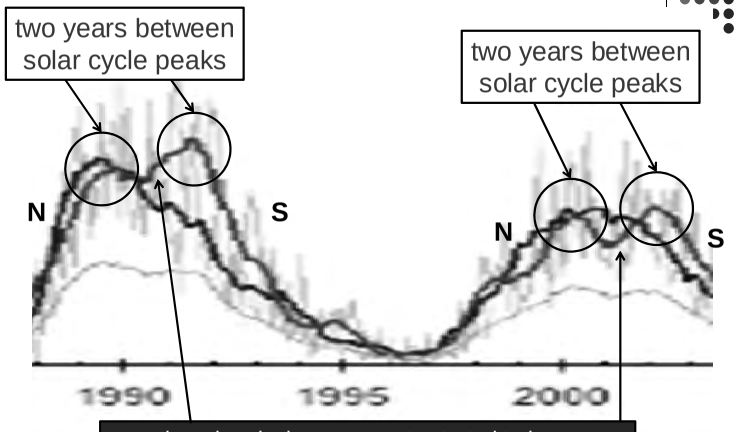
The northern and southern solar hemisphere solar cycle peaks never occur at the same time

Solar Cycle 24 is similar to Cycle 14
the solar southern hemisphere sunspot peak occurred two years after the northern hemisphere sunspot peak



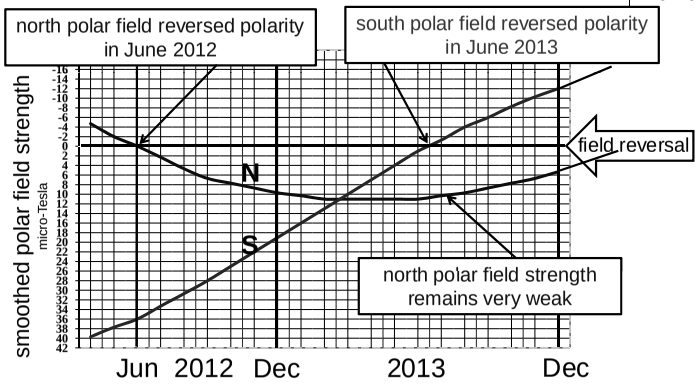
Southern hemisphere sunspots started to increase one year after the northern hemisphere sunspot peak

The Last Two Solar Cycles also had Double Peaks but much higher than Solar Cycle 24



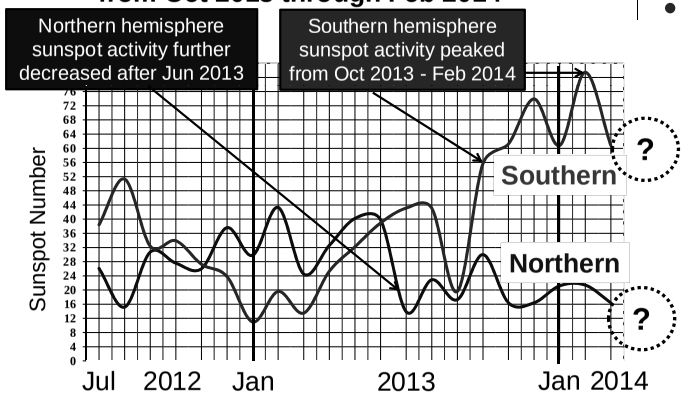
southern hemisphere sunspots started to increase one year after the northern hemisphere sunspot peak

Solar North-South Polar Field Reversal
solar maximum usually occurs after both polar fields have reversed polarity



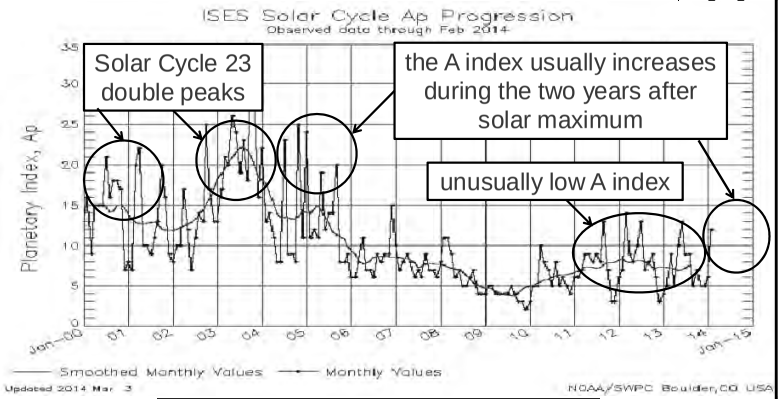
Both poles had reversed polarity by June 2013

Sunspot Activity in each Solar Hemisphere
Solar Cycle 24 achieved its second peak from Oct 2013 through Feb 2014



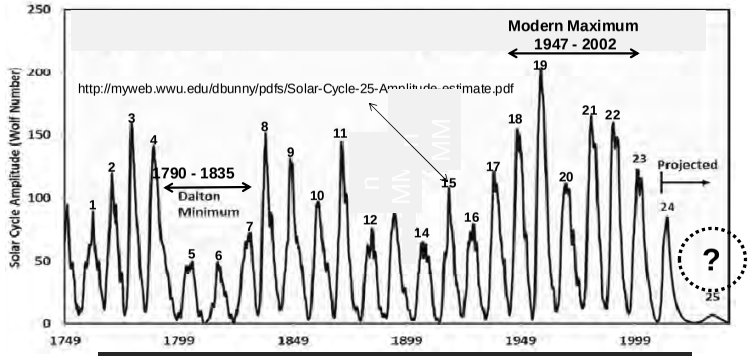
Southern hemisphere sunspot activity is now significantly greater than northern hemisphere activity

Weak Solar Cycle 24 has been unusually favorable for 160 and 80 Meters
The A-index has been much lower than prior sunspot cycles



The A-Index may increase moderately for the next two years

A Long Range Estimate of Solar Cycle 25
could sunspots nearly disappear by 2025?

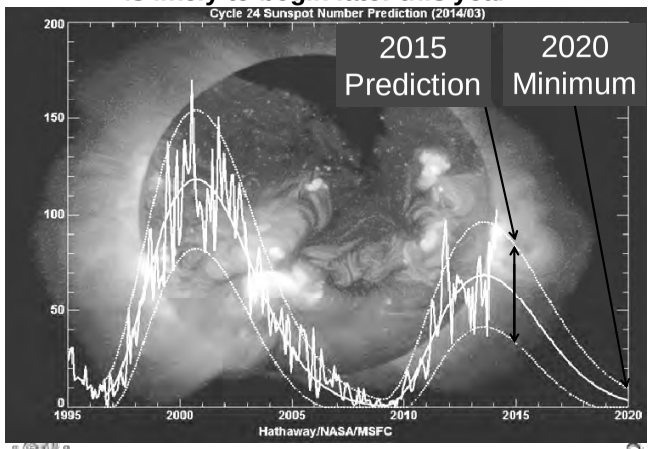


some solar scientists expect Cycle 25 to be the weakest solar cycle (SSN=7) in more than 300 years

http://www.landscheidt.info/?q=node/280

Solar Cycle 24 Prediction

the slow decline to solar minimum in 2020 is likely to begin later this year



http://solarscience.msfc.nasa.gov/images/ssn_predict_l.gif

1

CTU Presents

"All Coaxial Cables are not Created Equal"

Selection parameters while shopping the flea market

John Sluymer, VE3EJ

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Value – The tradeoff between price and specifications.

- Lowest price may not be the best choice.
- Highest price is likely also not be best choice.
- Somewhere in between usually lies a product that meets the needs.
- One needs to define the requirements and understand the specifications.

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What is coaxial cable?

- Coaxial cable or "Coax" is a type of cable that has an inner conductor surrounded by an insulating layer, surrounded by a tubular conducting shield. The term coaxial comes from the inner conductor and the outer shield sharing a geometric axis.

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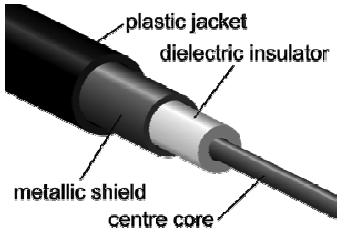
Coaxial cable



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Applications

- Coaxial cable is used as a transmission line for radio frequency (RF) signals. The primary use is in connecting transmitters and receivers with antennas or other RF components.

Main Parameters - electrical

- Shunt capacitance.
- Series inductance.
- Characteristic impedance.
- VSWR
- Voltage breakdown.
- Power handling.
- Loss / Attenuation - efficiency.
- Velocity factor.
- Phase stability.
- Shielding effectiveness.
- IMD products.

Physical parameters – variables

- Length of the cable: h
- Outside diameter of inner conductor: d
- Inside diameter of outer conductor: D
- Dielectric constant of the dielectric insulator: Є
- Magnetic permeability of dielectric insulator: μ

Shunt capacitance & series inductance

- Shunt capacitance: $\frac{C}{h} = \frac{2\pi\epsilon}{\ln(D/d)}$
- Series Inductance: $\frac{L}{h} = \frac{\mu}{2\pi}\ln(D/d)$

Characteristic Impedance

- For frequencies above about 1MHz, the characteristic impedance of a coaxial cable line depends only on the dielectric constant of the inner insulator and the ratio of the diameter of the inner conductor to the inner diameter of the outer conductor.
- Characteristic Impedance = $Z_0 = \sqrt{L/C}$

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VSWR (Voltage Standing Wave Ratio)

- VSWR is a function of how well the cable maintains its characteristic impedance (Zo) over its length.
- Function of how well the geometry of the cable is maintained over its length.
- Function of how consistent the dielectric material is maintained over its length.

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Voltage Breakdown

- Generally a function of:
  - Dielectric material
  - Environmental conditions – Moisture or contaminants.
- Often limited by choice of connectors.
- Instantaneous issue with possible carbon tracking = permanent damage.

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Power Handling

- Limited by:
  - Breakdown Voltage.
  - Thermal dissipation capability of the cable.
- Directly related to size of cable (surface area).
- Directly related to attenuation per unit length.
- Frequency dependant.
- Time rather than instantaneous problem.
- Specifications need to be de-rated for temperature and VSWR.

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Loss & Attenuation

- Conductor losses
  - Type of metal
    - Copper
    - Aluminum
    - Copper clad
  - Size – surface area of inner and outer.
  - Skin effect at RF – currents travel on surface only.

Loss & Attenuation (cont ...)

- Dielectric losses
  - Type of material (In order of increasing loss)
    - Air (*Nitrogen*) with polyethylene spiral. HJ5-50
    - PTFE (*Teflon*). RG142
    - PF (*polyethylene foam*). RG6
    - PE (*Polyethylene*). – RG213

Power/Voltage/Efficiency tradoffs

- Why are 50 Ohm cables in such common use?
- It's a tradeoff between power, voltage and attenuation.
- Bell Laboratories (1929) testing showed:
  - 30 Ohms best for power handling.
  - 60 Ohms best for voltage rating.
  - 77 Ohms best for attenuation.
  - 50 Ohms best overall compromise.

Velocity Factor

- The velocity factor (**Vf**) is the speed an electromagnetic wave travels along a coax cable relative to the speed in a vacuum.
- **Vf** is directly related to the dielectric material of the cable.
- Denser dielectric material = lower **Vf**.
- A cable with a lower **Vf** is physically shorter than a cable with a higher **Vf** for the same electrical length.
- Important consideration for phased applications.

Phase stability

- Length or phase variation with temperature.
- Thermal expansion or contraction rates.
- Important for phasing – especially as frequency rises.
- Cable types should not be mixed for phased applications.

Shielding effectiveness

- Signal leakage from cable to outside world.
- Signal ingress from outside world. (It's a two way issue)
- Function of continuity and bonding of outer conductor.
- Solid (or corrugated copper) best.
- Braided shield percentage coverage is largest factor.
- Continuity at connectors very important.

IMD Products (Inter Modulation Distortion)

- IMD is the generation of undesirable signals as a result of two or more desired signal mixing together through some medium.
- IMD products occur when two or more signals cross a non linear junction and are rectified.
- IMD products most often occur across ferromagnetic or oxidized surfaces.
- Poor cable to connector or connector to connector connections are the most likely sources.
- Connectors with greater surface areas are desired.

IMD Products (Inter Modulation Distortion) cont ...

- Properly soldered connections are essential.
- Proper connector torque is essential.
- Moisture free connections are essential.
- IMD issues very important in Multi transmitter. environments – including SO2R.
- IMD issues can be the source of TVI or other interference situations.

Main parameters - Mechanical

- Conductor materials.
- Jacket material.
- Dielectric material.
- Air vs solid dielectric.
- Size.
- Weight.
- Bending radius.
- Crush strength.

Conductor Materials

- Outer conductor
  - Copper braid (Single or double)
  - Aluminum braid (Single or double)
  - Aluminum foil (Often with braid)
  - Corrugated copper (annular or spiral)
  - Corrugated aluminum (annular or spiral)
  - Solid copper
  - Solid aluminum

Conductor Material

- Inner conductor material:
  - Braided copper.
  - Solid copper wire.
  - Solid copper heavy gauge.
  - Hollow copper (straight) cylinder.
  - Hollow copper spiral cylinder.
  - Copper clad aluminum.

Jacket Material

- Cable jacketing designed to protect from environmental factors – moisture, chemical, solar as well as abrasion.
- Jacket materials:
  - Polyvinyl-chloride
  - Polyethylene
  - Polyurethane
  - Teflon
  - Neoprene
  - EPDM
  - Silicone rubber
  - Natural rubber
  - Bare – no jacket

Fire retardant and plenum rated cables generally have blue or white jackets and are made of non-halogenated materials to reduce smoke and production of toxic gases.

Dielectric Material

- Air (*Nitrogen*) with polyethylene spiral. HJ5-50
- PTFE (*Teflon*). RG142
- PF (*polyethylene foam*). RG6
- PE (*Polyethylene*). – RG213

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Air vs. solid dielectric

- Air cables have large voids in dielectric material.
- Air cables need to be pressurized at all times with positive dry air (dehydrator) or Nitrogen source.
- Failure to pressurize will lead to condensation within the cable = water accumulation.
- From outside it is difficult to determine if cable is foam or air dielectric. Be careful unless pressurization requirements can be met.

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Cable Size

- Large range of sizes to meet large set of applications.
- Smallest cables – approximately 1/8 inch diameter.
- Largest cables – approximately 6 inch diameter for “flexible” – 9 inch for rigid.
- Size generally refers to inside diameter of outer conductor – not outside dimension over jacket.

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Sample of different cable types

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Cable Weight

- Sample weights:
  - RG 213 - .13 lbs/foot
  - LDF4-50A (1/2” foam dielectric) - .15 lbs/foot
  - LDF5-50A (7/8” foam dielectric) - .54 lbs/foot
  - HJ9-50 (5” air dielectric) – 3.3 lbs/foot

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Bending Radius

- Two issues:
  - One time – installation issue only - cable left in place.
  - Repeated – cables that are allowed to move like jumpers and rotation loops on antennas.
- Exceeding specified bending radius can kink outer conductor or deform the dielectric material. Both cases result in VSWR and power handling issues as well as decreased mechanical strength of the cable.

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Crush Strength

- Rating of cable that identifies force required to deform the outer jacket and outer conductor.
- Exceeding crush force results in deformation of cable with resulting VSWR and Voltage breakdown issues.
- Damage can result from traffic over buried cables, falling ice or other material from higher elevations or from other issues at time of installation.

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The real world – practical objectives for Amateur Radio.

- Power handling:
  - 1.5 kW + head room for VSWR and temperature compensation = 2.0 kW.
- Cable attenuation – efficiency:
  - Rule of thumb – 1dB or less of attenuation TX to antenna = 80% efficiency.

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Cable Attenuation charts (W3LPL data)

CABLE ATTENUATION (dB per 100 ft)

	1.8	3.5	7.0	14.0	21.0	28.0	50.0	144	440	1296
LDF7-50A	.03	.04	.06	.08	.10	.12	.16	.27	0.5	0.9
FM7-7	.03	.05	.07	.10	.12	.15	.20	.37	0.8	1.7
LDF5-50A	.04	.06	.09	.14	.17	.19	.26	.45	0.8	1.8
FXA78-50J	.06	.08	.13	.17	.23	.27	.39	.77	1.4	2.8
3/4" CATV	.06	.08	.13	.17	.23	.26	.38	.62	1.7	3.0
LDF4-50A	.03	.13	.17	.25	.31	.36	.48	.84	1.4	2.5
RG-17	.10	.13	.18	.27	.34	.40	.50	1.3	2.5	5.0
SLA12-50J	.11	.15	.20	.28	.35	.42	.56	1.0	1.9	3.0
FXA12-50J	.12	.16	.22	.33	.40	.47	.85	1.2	2.1	4.0
FXA38-50J	.16	.23	.31	.45	.53	.64	.85	1.5	2.7	4.9
9913	.16	.23	.31	.45	.53	.66	.92	1.6	2.7	5.0
RG-213	.25	.37	.55	.78	1.0	1.2	1.6	2.8	5.1	10.0
RG-8X	.49	.68	1.0	1.4	1.7	1.9	2.5	4.5	8.4	

CABLE ATTENUATION (Ft per dB)

	1.8	3.5	7.0	14.0	21.0	28.0	50.0	144	440	1296
LDF7-50A	3333	2500	1666	1250	1000	833	625	370	200	110
FM7-7	2775	2000	1390	1040	833	667	520	310	165	92
LDF5-50A	2500	1666	1111	714	588	526	385	222	125	67
FXA78-50J	1666	1250	769	588	435	370	256	130	71	36
3/4" CATV	1666	1250	769	588	435	385	275	161	59	33
LDF4-50A	1111	769	588	400	323	266	200	119	71	40
RG-17	1000	769	556	370	294	250	200	77	40	20
SLA12-50J	909	667	500	355	285	236	175	100	53	34
FXA12-50J	834	625	455	300	250	210	150	83	48	25
FXA38-50J	625	435	320	220	190	155	115	67	37	20
9913	625	435	320	220	190	155	110	62	37	20
RG-213	400	270	180	130	100	83	62	36	20	10
RG-8X	204	147	100	71	59	53	40	22	12	

FEET REQUIRED FOR 1 DB ADVANTAGE LDF5-50A VS:

	1.8	3.5	7.0	14.0	21.0	28.0	50.0	144	440	1296
LDF4-50A	2000	1430	1250	910	715	625	435	250	165	100
RG-17	1666	1430	1320	770	580	475	400	125	60	30
FXA12-50J	1250	1000	770	525	435	355	255	120	75	40
9913	835	590	455	320	290	220	150	85	53	29

FEET REQUIRED FOR 1 DB ADVANTAGE LDF4-50A VS:

	1.8	3.5	7.0	14.0	21.0	28.0	50.0	144	440	1296
RG-17	-	-	-	-	-	-	-	320	80	40
FXA12-50J	-	-	2000	1250	1100	835	625	250	145	65
9913	1430	1000	750	500	415	345	230	135	75	40
RG-213	910	600	385	290	230	200	90	45	20	10

CABLE ATTENUATION (dB per 100 ft)

	1.8	3.5	7.0	14.0	21.0	28.0	50.0	144	440	1296
LDF7-50A	.03	.04	.06	.08	.10	.12	.16	.27	0.5	0.9
FM7-7	.03	.05	.07	.10	.12	.15	.20	.37	0.8	1.7
LDF5-50A	.04	.06	.09	.14	.17	.19	.26	.45	0.8	1.8
FXA78-50J	.06	.08	.13	.17	.23	.27	.39	.77	1.4	2.8
3/4" CATV	.06	.08	.13	.17	.23	.26	.38	.62	1.7	3.0
LDF4-50A	.03	.13	.17	.25	.31	.36	.48	.84	1.4	2.5
RG-17	.10	.13	.18	.27	.34	.40	.50	1.3	2.5	5.0
SLA12-50J	.11	.15	.20	.28	.35	.42	.56	1.0	1.9	3.0
FXA12-50J	.12	.16	.22	.33	.40	.47	.85	1.2	2.1	4.0
FXA38-50J	.16	.23	.31	.45	.53	.64	.85	1.5	2.7	4.9
9913	.16	.23	.31	.45	.53	.66	.92	1.6	2.7	5.0
RG-213	.25	.37	.55	.78	1.0	1.2	1.6	2.8	5.1	10.0
RG-8X	.49	.68	1.0	1.4	1.7	1.9	2.5	4.5	8.4	

LDF7-50A : 1 5/8 inch foam dielectric
LDF5-50A : 7/8 inch foam dielectric
LDF4-50A : 1/2 inch foam dielectric

CABLE ATTENUATION (Ft per dB)

	1.8	3.5	7.0	14.0	21.0	28.0	50.0	144	440	1296
LDF7-50A	3333	2500	1666	1250	1000	833	625	370	200	110
FM7-7	2775	2000	1390	1040	833	667	520	310	165	92
LDF5-50A	2500	1666	1111	714	588	526	385	222	125	67
FXA78-50J	1666	1250	769	588	435	370	256	130	71	36
3/4" CATV	1666	1250	769	588	435	385	275	161	59	33
LDF4-50A	1111	769	588	400	323	266	200	119	71	40
RG-17	1000	769	556	370	294	250	200	77	40	20
SLA12-50J	909	667	500	355	285	236	175	100	53	34
FXA12-50J	834	625	455	300	250	210	150	83	48	25
FXA38-50J	625	435	320	220	190	155	115	67	37	20
9913	625	435	320	220	190	155	110	62	37	20
RG-213	400	270	180	130	100	83	62	36	20	10
RG-8X	204	147	100	71	59	53	40	22	12	

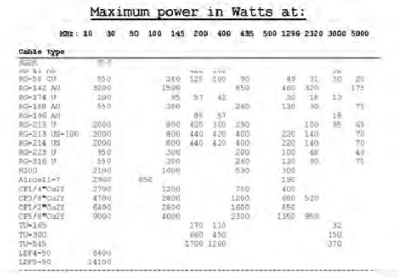
FEET REQUIRED FOR 1 DB ADVANTAGE LDF5-50A VS:

	1.8	3.5	7.0	14.0	21.0	28.0	50.0	144	440	1296
LDF4-50A	2000	1430	1250	910	715	625	435	250	165	100
RG-17	1666	1430	1320	770	580	475	400	125	60	30
FXA12-50J	1250	1000	770	525	435	355	255	120	75	40
9913	835	590	455	320	290	220	150	85	53	29

FEET REQUIRED FOR 1 DB ADVANTAGE LDF4-50A VS:

	1.8	3.5	7.0	14.0	21.0	28.0	50.0	144	440	1296
RG-17	-	-	-	-	-	-	-	320	80	40
FXA12-50J	-	-	2000	1250	1100	835	625	250	145	65
9913	1430	1000	750	500	415	345	230	135	75	40
RG-213	910	600	385	290	230	200	90	45	20	10

Power Handling



Maximum power in Watts at:

MHz:	10	30	50	100	145	200	400	435	500	1296	2320	3000	5000
Cable type													
RG-58 C/U	550			240	125	100	90		49	31	30	20	
RG-142 A/U	3200			1500			850		460	320		175	
RG-174 U	290			95	57	42			30	18	13		
RG-188 A/U	550			300			260		130	90		75	
RG-196 A/U					85	57					18		
RG-213 U	2000			800	420	300	280			100	95	65	
RG-213 U8-100	2000			800	440	420	400		226	140		70	
RG-214 U8	2090			800	440	420	400		220	140		70	
RG-223 U	950			300			200		100	68		40	
RG-316 U	550			300			260		130	90		75	
H100	2100			1000			530		300				
Aircell-7	2900		850						190				
CF1/4"CuAZY	2700			1200			750		400				
CF3/8"CuAZY	4700			2000			1200		680	520			
CF1/2"CuAZY	6400			2800			1600		850				
CF5/8"CuAZY	9000			4000			2300		1350	950			
TU-145						170	110					32	
TU-300						460	450					150	
TU-545						1700	1200					370	
LDF4-50	8490												
LDF5-50	14100												

Cable size conclusions

- For HF work, RG 213 type cables are adequate for 1.5 kW power levels.
- For HF work with cable runs up to 100 feet – RG213 type OK.
- For HF work with cable runs up to approximately 300 feet – 1/2 inch LDF4 cable OK.
- For HF work and cable runs over 300 feet, 7/8 inch LDF5 or larger cables should be considered.
- For all VHF and UHF work, nothing less than ½ inch cable should be used even for short runs.

Connectors

- Single biggest failure point in most RF systems.
  - Installation issues
  - Weatherproofing
  - Connector type
  - Connector series

Connector installation issues

- Proper connector for cable type.
- Proper cut back dimensions.
- Use prep tools where available.
- Follow installation instructions.
- Keep all parts including cable clean and dry.
- For solder connections – lots of heat for short time. Make sure solder flows to connector and cable.

Prep Tools

Connector weatherproofing

- Connections must stay dry.
- Use conformable rubber splicing tape like 3M type 130C (or equiv) as weather seal.
- Protect from UV and hold in place using 3M type 88 vinyl tape (or equiv).
- Cut – do not stretch final tape wrap.
- For large connectors use butyl rubber tape as gap filler before taping.
- In hard to reach locations use UV rated heat shrink.

Connector types

- Use proper connector for cable type.
- Be aware that there are different manufacturers of various cable sizes and that connectors are not interchangeable. (exception MIL spec cables)
- For a given manufacturer there are different generations of cable and connectors will not be interchangeable.
- Avoid home made connectors. They are not long term solutions.

Connector Series

- Choose the right connector series for the application. (Power rating, VSWR and impedance)
  - UHF (PL 259 series)
  - Type “N”
  - 7/16 DIN
  - BNC
  - “F” series
  - EIA Flanged connectors (7/8, 1 5/8, 3 1/8 etc…)
- Avoid inter-series adaptors where possible.
- Avoid “cheap” Elbows and “Tees” – they have power issues and can be sources for IMD.

Installation

- Cable support.
  - Cable hangers or Ty wraps – avoid tape.
  - Use UV resistant Ty wraps – never use white nylon.
  - Hoisting grips for larger cables.
  - Leave a little extra at the top.
  - Drip loop at bottom.

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Installation cont ....

- Be careful not to nick cable jacket – source of water entry.
- Make sure no cable rub locations – future sources of water.
- Plan rotator loop – sufficient clearance and length.
- Ground kits – top, middle (for long runs), bottom and entry point to radio room.
- Bury horizontal runs for cables so rated or use overhead centenary wire for support.
- Do not bury connectors or splices.
- Bury below frost line.
- Weatherproof all connections.

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Inspections and maintenance

- Benchmark performance at time of installation. VSWR or swept VSWR – TDR + photograph installation.
- Keep records.
- Regularly re-test – changes are signs of trouble.
- Physically inspect on regular interval.
- Photograph and compare pictures.
- Deal with the problems promptly – they rarely fix themselves!

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Bottom Line

- Understand your needs and objectives.
- Understand the specifications for what you are proposing to buy.
- View coax runs as systems – cable, connectors and jumpers. It's a series circuit and any single component failure is a system failure. All components are equally important.
- Make sure the products meet or exceed your needs.
- Apply your best negotiating techniques to obtain best value.

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Thank you for your attention!

73, John, VE3EJ

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Sources and credits

- http://www.dxengineering.com/search/product-line/dx-engineering-coax-cable-stripping-tools/cable-prep-tool-type/drop-cutter
- http://www.electronics-lab.com/blog/?p=18953
- http://en.wikipedia.org/wiki/Coaxial_cable
- http://www.harbourind.com/images/stories/datasheets/Power_Handling.pdf
- http://www.k1ttt.net/technote/coaxloss.html#tables
- Frank Donavan, W3LPL

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CTU 2014 Presents

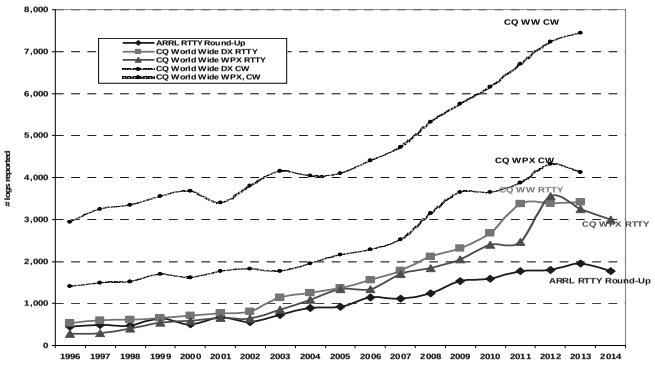
The Essentials of RTTY Contesting

Ed Muns, W0YK

RTTY Contesting

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

Three Largest RTTY Contests



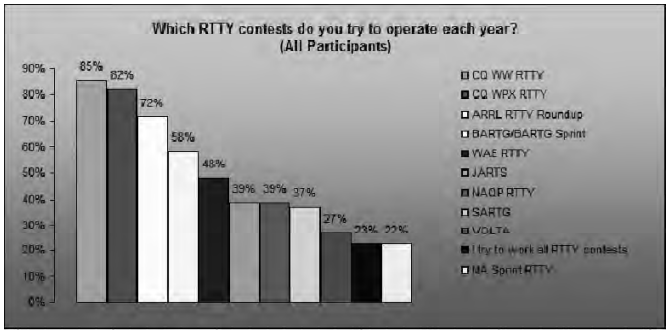
Lots of RTTY Contests

> 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

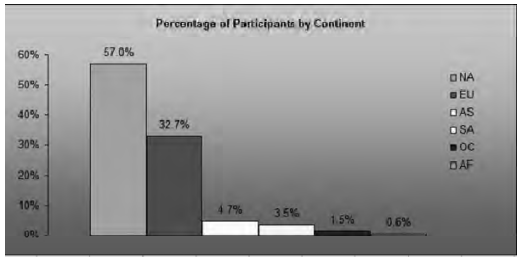
Contest Popularity

2010 survey



RTTY Contesters

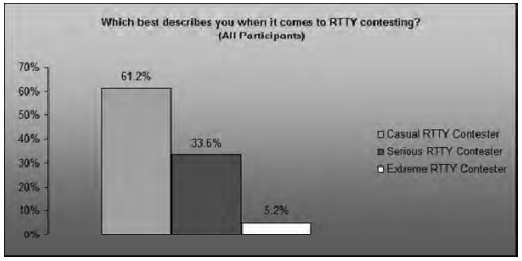
2010 survey



- 825 participants; 13 questions
- conducted in February 2010

RTTY Contesters

2010 survey



- The percentage of Casuals is much higher than shown, because few took the survey

RTTY Contesters

contester styles

- Casual
  - New
  - Making QSOs
  - Chasing awards

  ➔ majority of participants … sometimes slower operators
- Serious
  - High rates; snappy QSOs; no chit-chat

  ➔ minority of participants … faster operators (and easily annoyed by slower operators!)

RTTY Contesters

contester types

- "Gentleman RTTYers"
  - RTTY is the gentleman's *mode* (similar to 160 being the gentleman's *band)*
- RTTY contest junkies
  - Years of experience; many different contests
- New contesters
  - Many with extensive PC skill
- Multi-Mode contesters
  - Strong growth

What Makes a Great RTTY Contester?

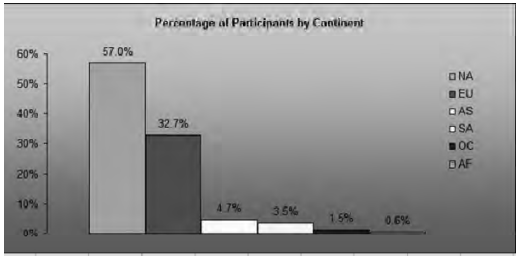
- Contester who happily logs casual callers
- Uses CW & SSB techniques where useful
- Strives to exploit RTTY uniqueness
  - Auto-decode frees operator time … use it to do things difficult with CW & SSB, e.g., SO3R!
  - Speed is ~2x CW
- Applies learning back to CW & SSB

Giving Back

- Open logs
  - Allows others to learn
  - Raises level of competition
- Sharing
  - Improves operating quality and skill
  - Raises level of competition
- Growing the sport
  - "Lighthouse": AA5AU & www.rttycontesting.com

RTTY Contesters

2010 survey



- 825 participants; 13 questions
- conducted in February 2010

What is RTTY?

compared to CW

CW

- ***One*** RF carrier
- Local audio ***pitch***
- On ***or*** off
  - key up is data 0
  - key down is data 1
- ***Morse*** code
  - typically 25-40 wpm

RTTY

- ***Two*** RF carriers 170 Hz apart *(Space & Mark; Shift)*
- Local audio ***tones***
- One on ***and*** other off
  - Space is data 0
  - Mark is data 1
- ***Baudot*** code
  - constant 60 wpm *(or 45.45 Baud)*

What is RTTY?

Space & Mark

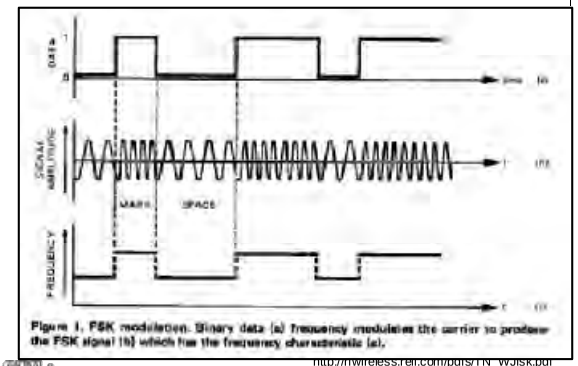
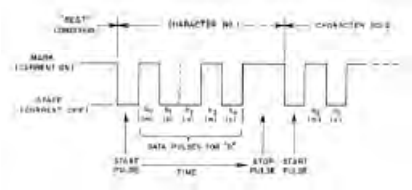


Figure 1. FSK modulation. Binary data (a) frequency modulates the carrier to produce the FSK signal (b) which has the frequency characteristic (c).

http://hfwireless.nrl.com/pdfs/TN_WJISK.pdf

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)

What is RTTY?

code history

- 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 (1967)
  - 7-bit ITA5 code

Code	Control Characters			
11111	LTRS			
11011	FIGS			
00000	Null			
00100	Space			
01000	LF			
00010	CR			
	Letters	Figures		
		ITA2	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	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 †TA2	‡USTTY
00011	A	-	
11001	B	?	
01110	C	:	
01001	D	ENQ	$
00001	E	3	
01101	F		!
11010	G		&
10100	H		#
00110	I	8	
01011	J	BELL	'
01111	K	(	
10010	L	)	
11100	M	.	
01100	N	,	
11000	O	9	
10110	P	0	
10111	Q	1	
01010	R	4	
00101	S	‡	BELL
10000	T	5	
00111	U	7	
11110	V	;	
10011	W	2	
11101	X	/	
10101	Y	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

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)*

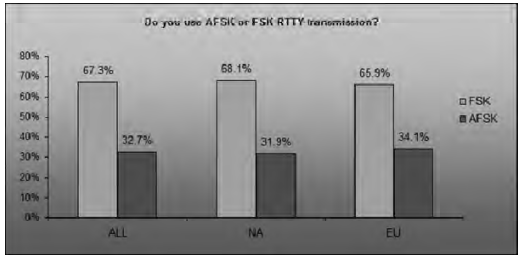
What is RTTY?

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

AFSK vs. FSK

2010 survey



- AFSK has been overtaken by FSK since it first appeared in radios, circa 1990

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.

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)*

What is RTTY?

AFSK vs. FSK

AFSK	FSK
• Indirect *(tones → Mic input)*	• Direct *(like CW keying)*
• Any SSB radio *(esp. legacy)*	• "Modern" radios
• SSB (wide) filtering	• RTTY (narrow) filtering
• Dial = sup. car. frequency	• Dial = Mark frequency
• VOX	• PTT
• Audio cable *(same as PSK31)*	• COM FSK keying cable
• Must use high tones	• Can use low tones
• *NET (automatic TX tone control)*	• *No audio level adjust*
• *Less bandwidth (depends on radio)*	• *No disabling speech proc.*
	• *No erroneous sound keying*
• *Easier hook-up; NET*	• *Less pitfalls*

What is RTTY?

summary

- Uses 5-bit Baudot … er … 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

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

How Do I Set it Up?

RTTY decoder/encoder

- RTTY ***receive*** decoder converts printed characters from the two RTTY frequencies
  - 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 RTTY frequencies
  - 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)*

How Do I Set it Up?

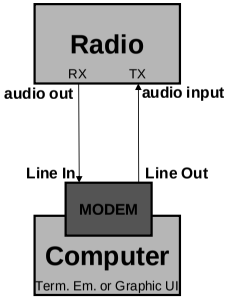
decoder/encoder terminology

- 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

How Do I Set It Up?

hardware *MODEM*

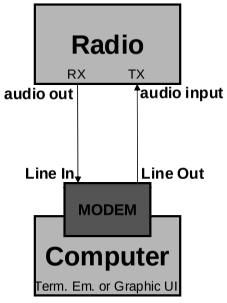
AFSK



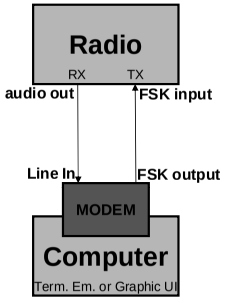
How Do I Set It Up?

hardware *MODEM*

AFSK



FSK



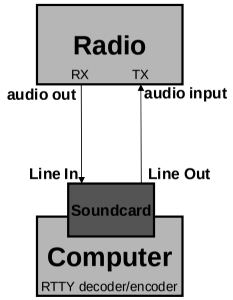
How Do I Set It Up?

hardware *MODEM*

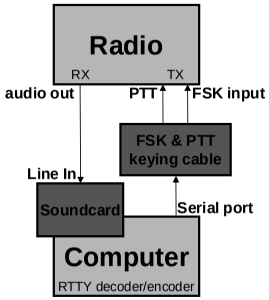
How Do I Set It Up?

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)

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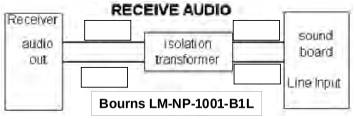
How Do I Set It Up?

homebrew audio isolation



-90 dBc 3rd order IMD

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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

How Do I Set It Up?

commercial interface audio isolation

Rascal

How Do I Set It Up?

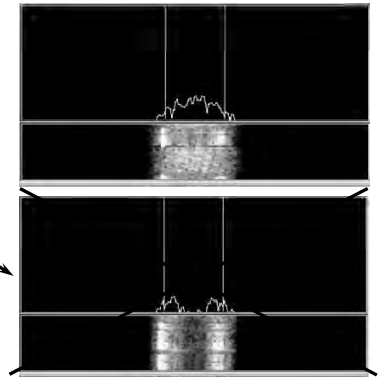
radio audio isolation

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
- Audio filtering
  - JPS NIR-10/12
  - Timewave DSP-599zx
  - Modern DSP rigs



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??
    - Icom Twin Peak Filter
    - K3 Dual-Tone Filter
- Audio filtering
  - JPS NIR-10/12
  - Timewave DSP-599zx
  - Modern DSP rigs

How Do I Set It Up?

soundcard levels

- Adjust levels in Windows Volume Control
  *(or, in MMTTY **Options/Soundcard** …)*
  - Use isolation transformer
  - Avoid over-drive
  - 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.)

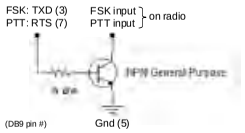
How Do I Set It Up?

PTT vs. VOX

- AFSK uses VOX (or PTT); FSK uses PTT
- PTT by:
  - Computer control via Serial COM port
  - Footswitch *(not recommended)*
- FSK to use semi-break-in in the future?

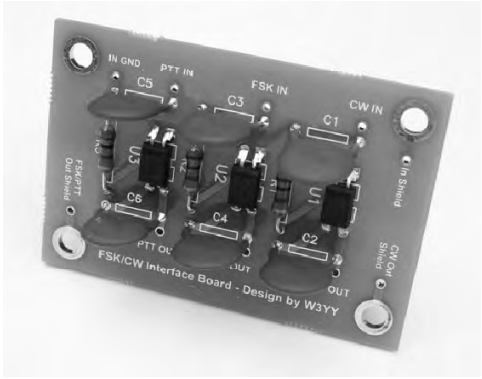
How Do I Set It Up?

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

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

How Do I Set It Up?

RigExpert Interfaces

How Do I Set It Up?

microHAM interfaces

One Radio

SO2R

How Do I Set It Up?

RigExpert & microHAM interfaces

Vendor	Model	Price	PC Info	PTT	Soundcard	Level ctrl	FSK	CW	WinKey	Voice	Radio info	SO2R
RigExpert	Tiny	$ 120	USB	√	√		√	√		√	√	
RigExpert	Standard	$ 265	USB	√	√	√	√	√	√	√	√	
RigExpert	TI-S	$ 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 10% of full-scale

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

How Do I Set It Up?

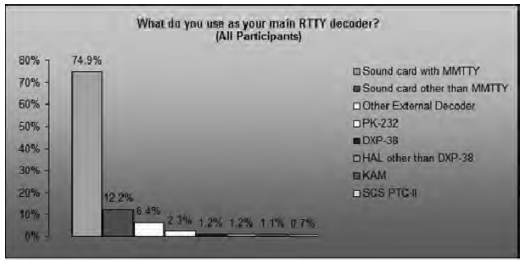
summary - FSK

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.

Decoders

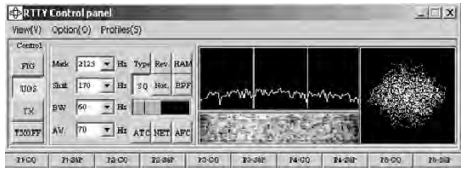
2010 survey



- 87% use soundcard decoding/encoding
- 86% of soundcard users run MMTTY
- 2Tone introduced late 2012

Decoders

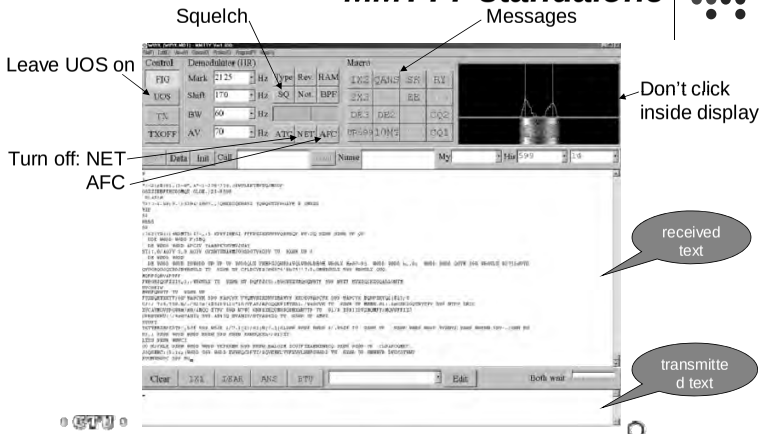
MMTTY



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

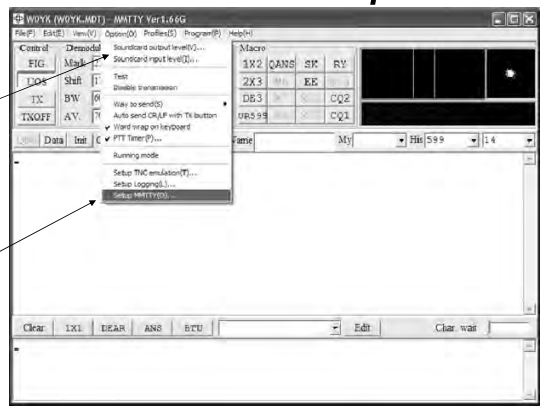
How Do I Set It Up?

MMTTY standalone



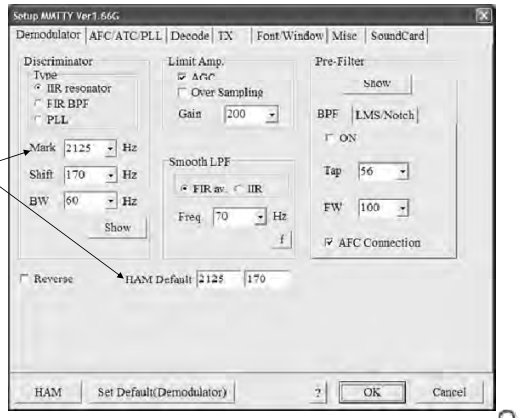
How Do I Set It Up?

MMTTY Option menu



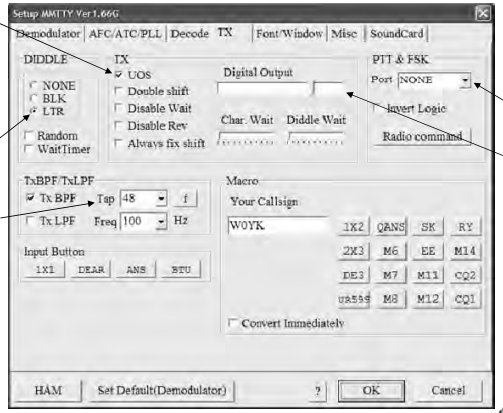
How Do I Set It Up?

MMTTY Option/Setup/Demodulator



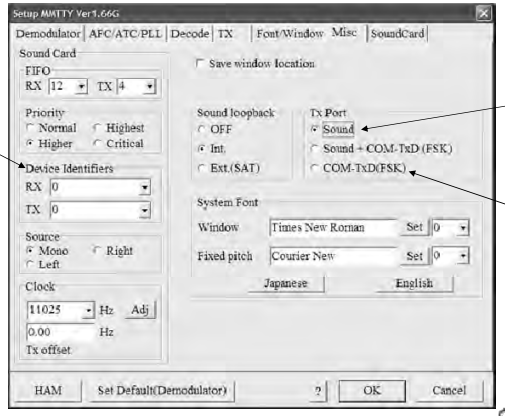
How Do I Set It Up?

MMTTY Option/Setup/TX



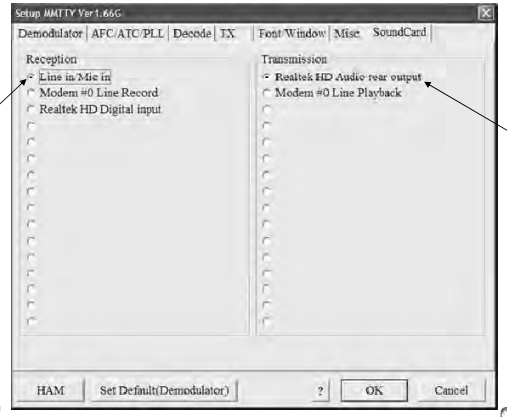
How Do I Set It Up?

MMTTY Option/Setup/Misc



How Do I Set It Up?

MMTTY Option/Setup/SoundCard



Select receive Soundcard

Select transmit Soundcard (AFSK only)

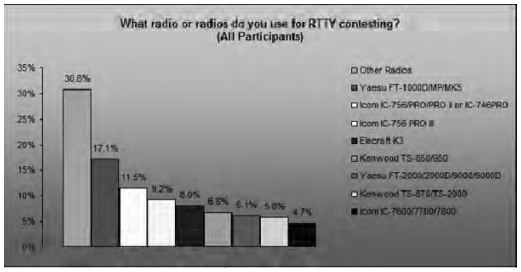
How Do I Set It Up?

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

2010 survey



- Icom 756Pro series most popular
- Elecraft K3 growing rapidly

RTTY Radios

FSK & AFSK bandwidth

FSK

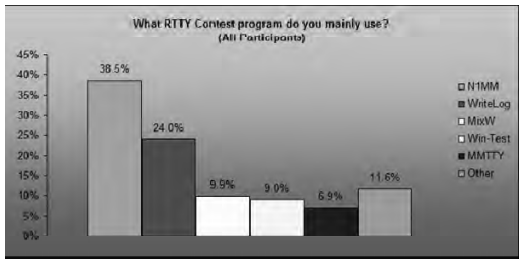
- Use radio FSK filter
  - DSP TX filter (K3)
  - Crystal TX filter (K3)
  - Lobby other mfrs
- Otherwise, use AFSK
  - With TX filtering
  - Properly adjusted

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

RTTY Contest Loggers

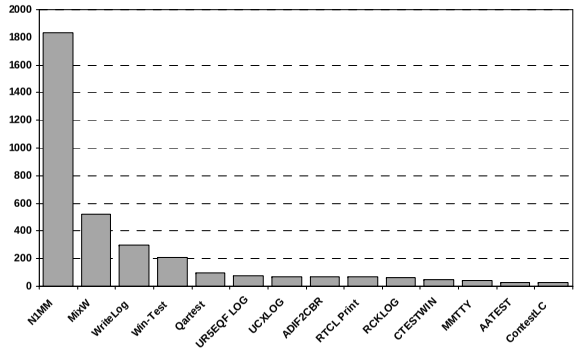
2010 survey



- MixW ahead of Win-Test
- MMTTY used stand-alone

2012 CQ WPX RTTY

3550 submitted logs



RTTY Contest Loggers

- WriteLog *(1994)*
  - created for RTTY *(CW & SSB came later)*
  - *www.rttycontesting.com* tutorials
- N1MM Logger *(2000; dedicated RTTY software designer)*
  - Free
- 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, ...

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

RTTY Sub-Bands

- 10 meters: 28080-28100, during contests 28060-28150
- 15 meters: 21080-21100, during contests 21060-21150
- 20 meters: 14080-14100, during contests 14060-14150
  - JA: 14070-14112
- 40 meters: 7025-7050 and 7080-7100, during contests 7025-7100
  - JA: 7025-7045
  - EU: below 7050
- 80 meters: 3580-3600, during contests 3560-3600
  - JA: 3520-3530 and 3599-3612
- 160 meters: No RTTY contesting

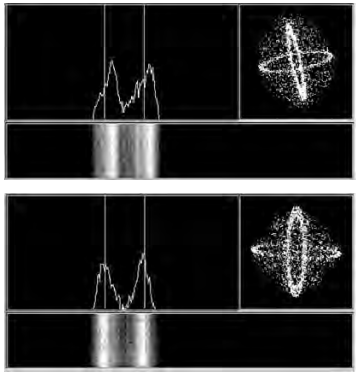
RTTY Sub-Bands

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/gettingstarted/rtty_subbands.htm

Receiving

- Set RX audio level
  - noise 10% 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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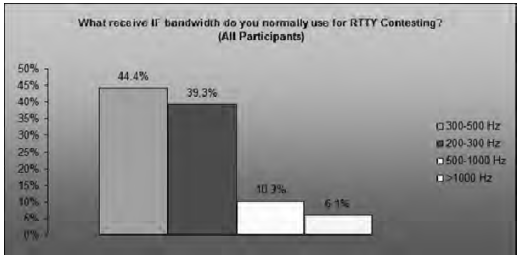
IF Bandwidth

2010 survey



- Like FSK, narrow IF filtering for RTTY appeared in radios in the early 1990s

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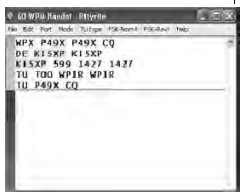
Tips

“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
  - Use AFC/NET for S&P (only avail. with AFSK)
- Mode-independent skills, e.g.,
  - Bandmap usage
  - QSO B4
  - Roving mult: “Squat & Shoot” *(Cajun-speak!)*

and … More Tips

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

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

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

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

RTTY Messages

CQ WW RTTY

- WW W1UE W1UE CQ
- <his call> 599 5 5 (TU) 599 5 5 *S&P exchange*
- TU W1UE CQ
- W1UE

- CALL
- ZN 5 *your Zone*
- AGN
- ?

RTTY Messages

CQ WPX RTTY

- WPX AK1W AK1W CQ
- <his call> 599 1867 1867 (TU) 599 1867 1867 *S&P exchange*
- TU AK1W CQ
- AK1W

- CALL
- NR %N *your Serial Number*
- AGN
- ?

RTTY Messages

NA RTTY Sprint

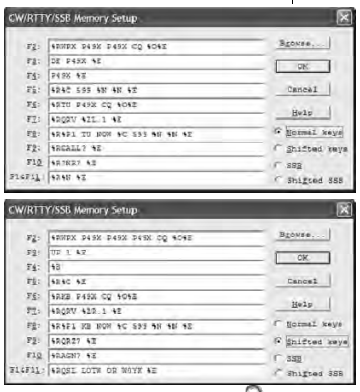
- NA N0NI N0NI CQ
- <his call> N0NI 154 154 TONI TONI IA IA
  <his call> 154 154 TONI TONI IA IA N0NI *S&P exchange*
- TU
- N0NI

- CALL
- NR %N
- NAME TONI } *your Exchange elements*
- QTH IA
- AGN
- ?

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/rttymessages.htm



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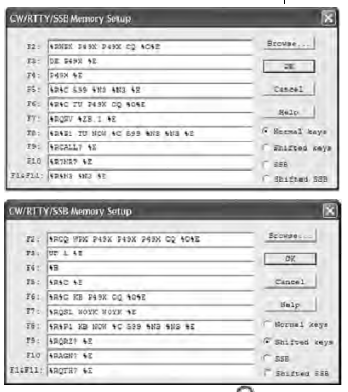
RTTY Messages

optimize

- Modular
  - Chaining
- Group logically
- Supports a cadence



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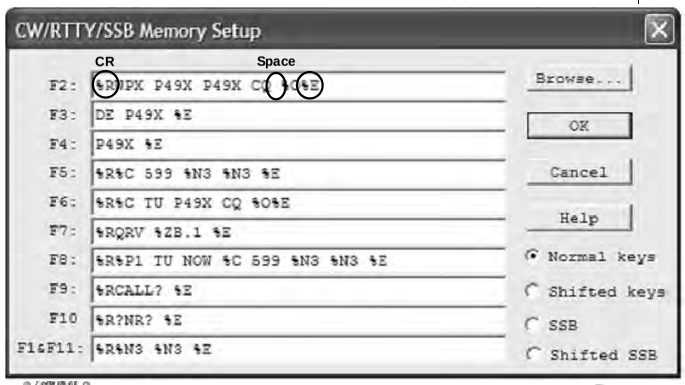
RTTY Messages

formatting



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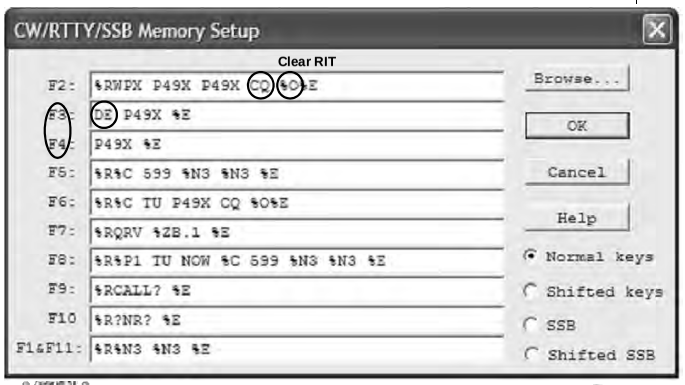
RTTY Messages

efficiency



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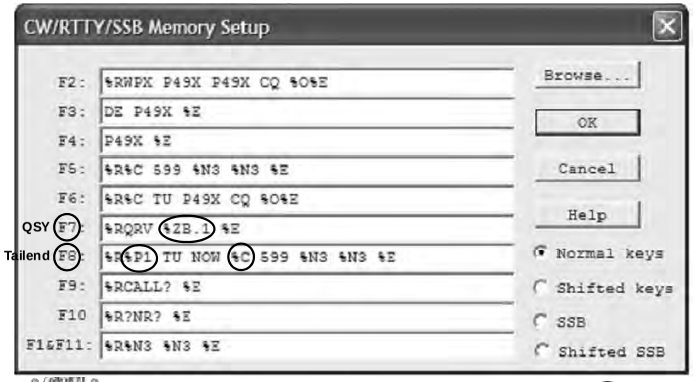
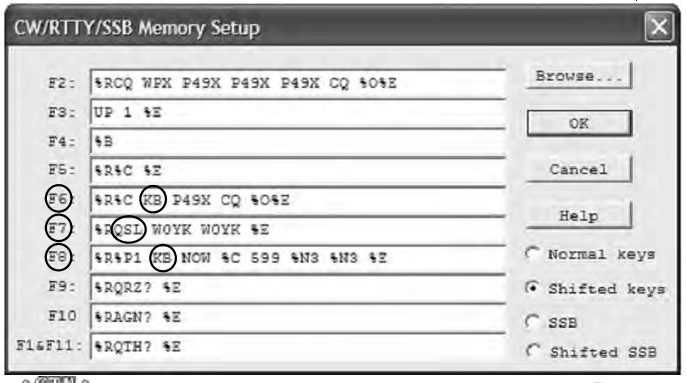
RTTY Messages

special



RTTY Messages

personal



Interim Summary

- Predominantly casual RTTY contest participants
- RTTY sub-bands; 10-80 only; avoid PSK & beacons
- Narrow (CW) 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, exchange twice, Space delimiter

Super Check Partial

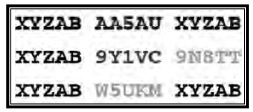
- SCP (Super Check Partial) enables computer to pick out call signs in receive window
  - Call signs
  - New mults and double mults
  - Dupes

N1MM Logger

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

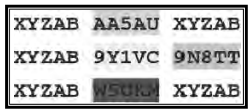
Super Check Partial

logger differences



N1MM Logger

WriteLog



Win-Test

Resources

- www.rttycontesting.com
  - Tutorials and resources (beginner to expert)
  - WriteLog/MMTTY/2Tone (N1MM Logger coming)
- 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)
  - N1MMLogger@yahoogroups.com (N1MM Logger general)
  - N1MMLogger-Digital@yahoogroups.com (N1MM Logger RTTY & PSK)
  - writelog@contesting.com (WriteLog)
  - support@win-test.com (Win-Test)

Contest Tips for Little Pistols

Collected Wisdom and Lessons Learned

K2YWE (K3AU)

Dayton 2013

Agenda

- What's this about?
- Who is K2YWE?
- Elements of Success
- Preparation
- Contest Basics (refresher)
- Strategy
- Station Considerations
- Antennas
- Software
- My favorite Software Features
- Operating Tips and 'Best Practices'
- About SO2R
- Conclusion
- Appendix A - Best Practices Collection
- Appendix B – Selected Loggers

Dayton 2013

What's this about?

Ways modest stations can improve their scores

- **Objective**
  - Improved Scores for Little Pistols
- **Intended Audience**
  - Modest HF stations, especially low power
  - But - principles & most tips apply universally
- **How?**
  - Make the most with what you have
  - Adopt successful operating practices

Who am I?

Licensed in 1956 . . . always a little pistol

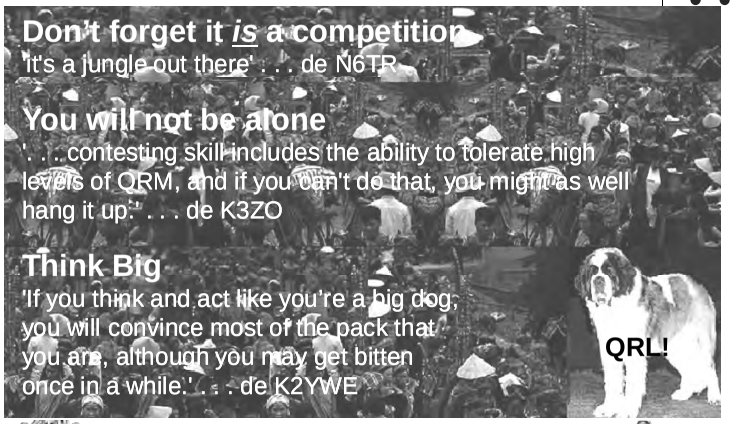
- **Licensed 1956 in White Plains, NY**
- **Mostly CW, very little contesting until 1995**
- **1995 Field day with W3LPL, K3MM, and K3RA**
  - Got 'hooked' on contesting, joined PVRC
  - A few years education at W3LPL MM
- **Contesting from home since**
  - Occasional Op at MM stations too
- **Modest 100W home station**
- **Continue to learn from good Ops**
- **Moderate Success (K2YWE/K3AU)**
  - Top ten (up to 2nd) US & World finishes, Regional firsts

Elements of Success

Same principles that apply to most successful endeavors

- **The Right Frame of Mind**
- **Preparation**
- **Attention to Detail**
- **Practice**
- **Improvement and Learning**
- **Perseverance**

The Right Frame of Mind



Preparation

'Now the general who wins a battle makes many calculations in his temple ere the battle is fought. The general who loses a battle makes but few calculations beforehand.' . . . Sun Tzu

- **Have a strategy – write it down**
  - Provides baseline guidance
  - Try to optimize within your constraints
  - Modify as needed in 'battle'
- **Reassess your strategy during the contest**
  - Expect to change the details
  - Take big departures only if you have good reason to, like one or more of your assumptions is wrong

Preparation

Get your act in order before the performance

- **Check your set-up well before the start**
  - Antennas, Hardware, Software, support files
  - Set appropriate software defaults
  - Provide enough time for fixing any problems
- **Be well rested for the contest**
- **Listen day(s) before to get a feel for Condx**
- **Have a simple means to restart software**
  - What did I call this file . . .?
  - Re-use the same name for the current contest files. Rename after the contest

INS Key is sticking!

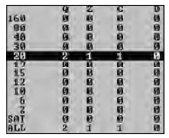
Review of Contest Basics

It's all about accuracy and Q's & Mults

- **Rules are published well in advance**
- **Valid contacts exchange two-way information**
  - Contest rules define the specific information

```
31  W6IXB 59 59 SCV
32  W5AFX 59 59 STX
```

- **Final score is composed of two pieces**
  - **QSO points** – Based on number of valid contacts
    - Points per contact may vary
  - **Multipliers** – Based on a unique characteristic
    - Usually location - State, Country, Zone, Grid
  - Total Score is **QSO points times Multipliers**
  - Same station may provide multiple Qs or Mults
    - QSO's on different bands or modes may each count



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High Level Thoughts

Some reasoning to frame the problem

- **Q's fuel the engine, Mults provide the turbo boost**
  - Both are important
- **More Q's are key to producing higher scores**
- **Operating Time is fixed, thus Rate must go up!**
- **Rate Drivers**
  - Being Heard and Hearing others
    - At fixed power level, this mainly means better Antennas
  - Operating Efficiency - Less wasted time in & between QSOs
    - Look to Operating Practices and Shack Arrangement
  - Attracting the other stations
    - Operating Practices
  - Successful Running is part of rate generation

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Strategy

Having a game plan pays off during the contest

- **Class Selection**
- **Band(s), modes, assistance, number of Ops, …**
  - Leverage your strengths
- **Bands and Modes**
  - Which, when?
- **Propagation**
  - What's best for Q's and Mults
- **ON/OFF times selection**
  - Time limits
  - Meals, sleep, 'real life' periods
  - Operation
  - Run vs. S&P, Rates, Speeds and Timing

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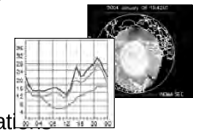
Strategy

Remember that maximizing Q's is primary to success

- **Focus on making the most Q's**
  - Block out expected S&P and Run times, ground rules
  - Balance with periodic short checks for Mults
- **Base primarily on expected Propagation**
  - Range of prediction tools are available
    - 'Rules of Thumb'
    - QST or CQ tables – simplest
    - Models – better
  - Temper predictions with your own observati
  - Gray Line info can help, especially on 160m and 80m
- **Allow for time-of-day considerations**
  - What's going on outside your area



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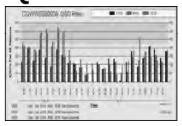
ON/OFF Times

Make the best use of your time

- **Choose OFF times at lowest expected Q rates**
  - Base on your own or other stations' history
  - Don't forget minimum OFF time rules



- **Ensure using your full time allotment**
- **Allow possibility you may want a late slot**
  - Don't get caught short of time at the end
  - I usually leave a late half-hour insurance slot
  - It's tricky, considering the statement above

- **Sync with your personal needs (of course)**

Rates Rules

Setting Rate Rules helps you achieve QSO goals

- **Set an average rate you want to achieve**
  - (Total Q's) / (Operating Hrs)
- **Set minimum rates you'll accept**
  - Acceptable rate will vary over the contest period
- **Include minimum rates in your Strategy**
- **Make a change if you drop below the Rate**

1,000/24 = 40

00-04z	60
04-08z	45
08-12z	30
12-16z	40
16-20z	50
20-24z	25

- Change Freq, Band, Mode
- Swap Running and S&P
- Chase some Mults
- Change your Shirt
- ***Change Something!***

Practice

It may not make you perfect, but it will make you better!

- **Be thoroughly familiar with your software**
  - A contest is **not** the time for **first trial**
  - **Gain** familiarity in day-to-day use
  - **Exploit** helpful features
  - Try different modes
  - Modify settings to suit your style

Contest Hound Practices Win-Test

- **Be comfortable with Run techniques**
  - **Practice** with a simulator (Morse Runner)
  - Try to operate 'run style' (5NN MD DAN BK . . . TU)
  - Pick a day with a good conditions on your best band
  - Use the **Best Practices** mentioned later in this presentation

Station Improvements

Put method behind your madness

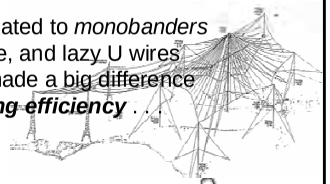
- **Assess Station Strengths and Weaknesses**
  - Take **band by band inventory** *based on performance history*
- **Attack Weaknesses with biggest payoffs first**
  - Incrementally **fill in the holes**
  - Expect Antennas to rank high
  - Don't forget to pick 'low hanging fruit'
- **Assess your Operating Practices**
  - Bounce your operation against the ***Best Practices*** (later)
  - Adjust accordingly
- **Improved Antennas & Running payoff most**
  - But ***every*** improvement counts – **they all add up**

My Experience

Performance improved with incremental changes

- **Operation**
  - Exploited software features (Bandmap, SCP, …)
  - Discovered and incrementally adopted **Best Practices**
  - Started Running
    - Had assumed not possible for Little Pistol
    - Running rates improved with experience
    - Learned when and when not to try running

- **Station**
  - Improved antennas – eventually migrated to *monobanders*
    - Not exotic – Delta loop, bent dipole, and lazy U wires
    - Added low small triband Yagi* - made a big difference
  - Made shack mods for better ***operating efficiency*** . . .



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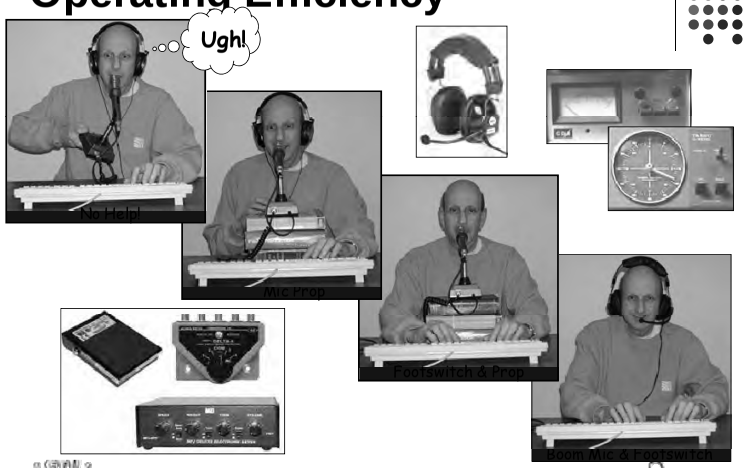
Operating Efficiency



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Station Improvements K2YWE

Improvements aimed at higher rates

- **Footswitch**
  - SSB - Frees hands for keyboard use
  - CW - Quick T/R transition without listening to QSK noise
- **Boom or Headset Mic**
  - Less fatigue, **freedom** to move, respond to local 'QRM'
- **Antenna Switching**
  - **Quicker** band changes. Connector Swaps -> Switches -> SixPack
- **Added and Improved Antennas**
  - More chances to sustain Run, snag S&P Q's with less calls
  - More '**second tier**' QSOs
- **Rearranged Equipment**
  - More **efficient**, quicker, easier operation

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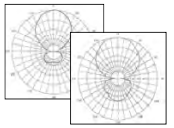
Antenna Improvements

Be innovative within your constraints

- **What assets exist to hang antennas on?**
- **Use all the property lines to full advantage**
- **Add/change antenna to help your weakest band**
- **Try to design a system using monobanders**
- **Consider fixed antenna with gain to high QSO area**
- **Enable a new band, like 160m**
  - New Mults and more Q's during slow times



- **Put up even a minimal Yagi if possible**

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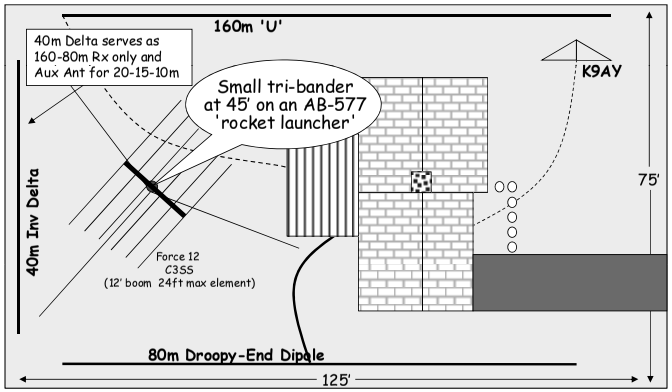
Antenna Farmette (K2YWE)

Squeezed in three wire monobanders and a 12' tribander



Began with Multi-band loop and uneven performance. Made incremental improvements to fix deficiencies.

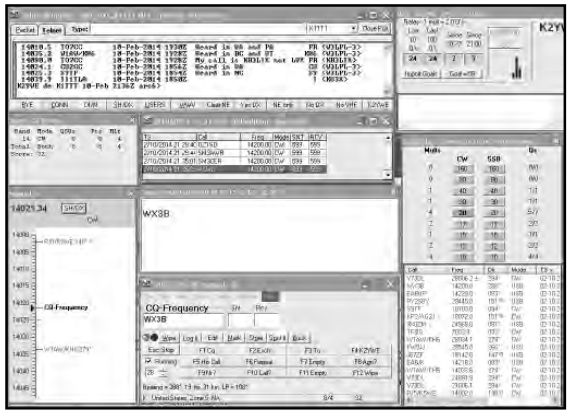
Software (S/W)

Use a contest-oriented program set up to facilitate high rates

- **Use the Radio and Keying interfaces**
  - Build or buy and integrate them if you haven't already
  - Make sustaining high rates much more possible
- **Recommended S/W Setup (CT keywords SHOWN)**
  - WORKDUPES
  - CORRECT call signs
  - Super Check Partial
  - Stop on auto CQ
  - BANDMAP & ANNOUNCE Windows
  - RATE Window
  - SCP Window
  - SCORE Window
- **Spotting Network?**
  - It's a strategic decision
  - Can be a valuable asset, especially in S&P
  - Does not alleviate you from **confirming** all entries
  - Be careful **not** to get too caught up in **chasing Mults**

Typical Logger Screen (N1MM)

Contest loggers provide tactical information and control



Software Features Most Useful to Me

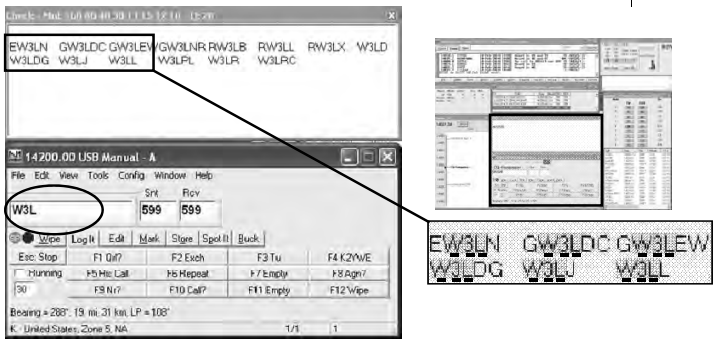
Rate (N1MM and CT screens)

QSO Rate provides feedback on how you are doing

- **Helps check performance against expectations**
  - Remember about setting **Rate Goals**?
- **Aids in making S&P/Run and band decisions**

Super Check Partial (N1MM screen)

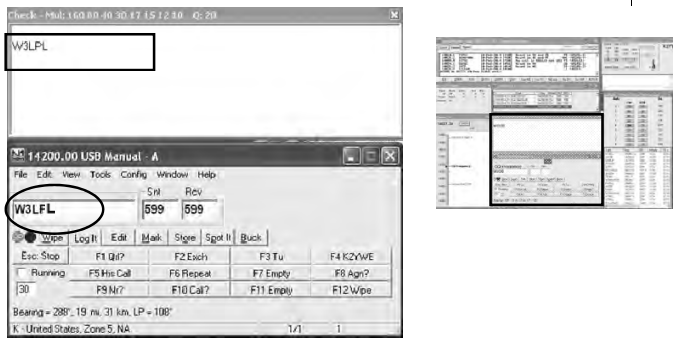
Call fragments yield possible known contester callsigns



Matches callsign fragments against database created from recent contest logs and current logged contacts . . . *anywhere in the callsign*

Super Check Partial (N1MM screen)

Call fragments yield possible known contester callsigns



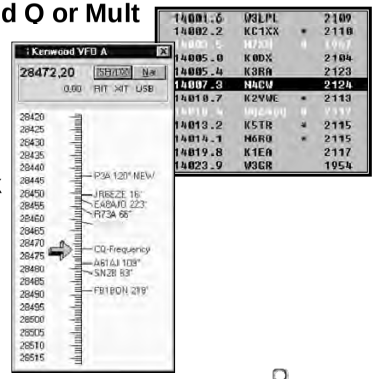
More letters narrow the possibilities, but . . .

Log only what you copy – SCP is just a guess!

Bandmap (CT and N1MM screens shown)

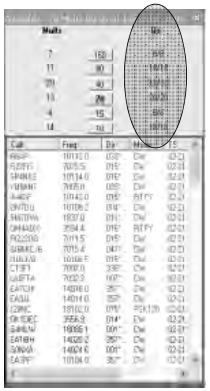
The bandmap saves time in Search & Pounce mode

- **Shows who is spotted on what frequency, if worked before, if needed Q or Mult**
  - **Data is entered by hand or automatically from spots**
  - **Map updates periodically to expunge stale data**
- **Useful for Dupe or 'check later,' even if unassisted**



Available Mults & Qs (N1MM screen)

Available Mults & Qs aids in band change decisions



- **Band-by-band info on number of new & worked Mults and Qs spotted**
  - **Supplements propagation info**
- **'Point and shoot' listing of spots**
  - **Jump to spot if interfaced with radio**

Tips and Best Practices

Some CW Tips

Don't let code speed keep you from enjoying CW contests

- **Do not be intimidated by code too fast for you to copy**
  - Start with the slower stations higher in the band
  - Don't worry if you have to hear a call several times to get it
  - As the contest goes on you will improve!
- **Try moving frequency a bit if you can't seem to be heard**
  - Often receiver bandwidths in a crowded band are set very narrow
  - Spotted frequencies put everyone on the same frequency
- **Call CQ high in the band at a speed comfortable for you**
- **It's sometimes OK to send QRS**
  - When your CQ gets answered too QRQ (you can also ignore)
  - During S&P when the CQing station has 'run dry'

**Some tips on this page are courtesy of the 1999 YCC 'Cookbook'*

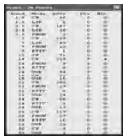
Some Phone Tips

Apply these basic Phone tips for starters

- **Use conventional or unmistakable phonetics**
  - 'Duck Soup' are poor phonetics for 'D S'
  - Use Standard or 'Common Use' phonetics (countries, cities . ..)
- **Maintain a 'friendly sense of urgency' in your QSOs**
  - Chattiness will slow your rate and lose you contacts
- **Do not be intimidated by stations talking fast or unintelligibly**
  - Firmly ask until you get all the exchange info. Use 'again?'
  - It is usually better to ask for one piece of missing info at a time
- **Listen to what's on your frequency when calling split**
  - If you can hear it, you can better time your call or defer until later

Best Practices Basics - Overall

Overall



- **Every point counts!**
  - There's **no** such thing as '**not worthwhile**'
  - When really slow, call for 'anybody'
- **A rule of thumb strategy**
  - **Work bands that may close first.** Move with propagation
  - This often means 10-15-20 in a.m. then 40-80-160 later on
  - **Try running** rather than chasing spots when high bands are open
  - Chase the Mults when 20 has slowed, but 40 hasn't opened yet.
- **Keep multipliers in mind**
  - **'Move' Multipliers** if you can do so efficiently
  - Have frequencies on each band set up for quick jaunt
  - **Balance** the effect on **rate** & total score when chasing Mults

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**Some tips on this page are courtesy of the 1999 YCC 'Cookbook'*

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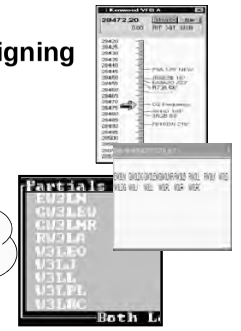
Best Practices Basics - Overall

Overall - continued

- **Verify the callsign of the station you're working**
  - BV6U and 5C8N are not real callsigns (6V6U and HC8N) Don't log them that way
- **Always HEAR the call the station is signing and log what you hear**



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**Some tips on this page are courtesy of the 1999 YCC 'Cookbook'*

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Best Practices Basics - Overall

Overall - continued

- **S&P rates can be very high early in the contest**
  - **Everyone** is 'fresh meat' for you.
  - You can quickly hop from station to station with little fear of Dupes
  - You are usually safe to call first and then fill-in the call
- **Use early S&P to find a spot to CQ**
  - You can maintain a **high rate** while **searching for** a **clear** spot
  - It beats the alternative of establishing a frequency before the Test
- **Be sure to try CQing late in the contest**
  - You will **be fresh meat** to many that have been CQing all along
- **Repeat only what is missing when asked for a fill**
  - Repeating known parts **wastes time** and possible 'clear times'
- **QRL? . . .**

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Do you really want to ask QRL?

'Can anyone honestly believe that there is a single KHz anywhere in the relevant portion of the 20 meter band that is NOT in use somewhere in the world during the CQWW?'
. . . de K3ZO

One Approach . . .

- Pick a 'clear' spot and CQ without 'QRL?'
  - You will only invite others to take the frequency by asking QRL?
  - You'll find out quickly if the Freq is in use by calling a short CQ.
  - ***This is controversial****. Many hams feel that not asking is rude.* ***You Decide.*** *Use 'QRL?' if you have doubts or are thin-skinned!*

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Best Practices

General

- **Use K3ZO's 'Rule of TWICE'**
  - If you can't get a station **after calling TWICE, move on**
  - If he doesn't ID after transmitting TWICE, move on
  - Modify 'TWICE' as sensible for your station and circumstances
- **Don't waste time repeatedly calling DX that has moderate signals when the band is otherwise quiet from their area**
  - They are probably '**opening the band**' with lots of ERP
- **Enable and use the band map in your logging software**
  - Us for **dupes and 'call later' in S&P** as well as for new Mults and Q's
- **Insist on fills until you get all the info.**
  - **Don't log** the QSO **without complete info**. 'Sorry, No QSO'
- **Be mindful of SSB signal bandwidth**
  - Be far enough from strong runner not to be covered by an **unheard pileup**

Best Practices . . .

Running

- **Call CQ when the band is active**
  - If **CONDX** are **good** for your station
  - If you can find a frequency and hold it
- **CQ when bands are dead for the day or worked out**
- **Use the widest IF bandwidth you can stand**
  - Less chance to miss **off-freq callers**, especially on CW
- **Use only a quick 'thanks' if stations are waiting**
  - **They know your call**. Don't waste time on it.
  - Throw in your call every few Q's for newcomers or if none waiting
- **Always work Dupes (set software to allow it)**
  - You **might not be in his log** and it's usually **quickest**

Best Practices . . .

Running - continued

- **Send out a full exchange with a partial call**
  - Most **Ops will correct you**, many without a missing a beat
  - Fix the entry during his transmission
- **Send the corrected call as part of your 'bye message**
  - **Enable call sign correction** in your software
- **Don't break a run to pull one station through**
  - **Your rate will suffer** if you take too long
  - You will drive away impatient waiting stations
- **If you can't drag a call through after trying TWICE, ignore him and start calling CQ again**
  - This is part of K3ZO's 'Rule of TWICE'

Best Practices . . .

Running - continued

- **Speed up if your run is being sustained**
  - This is especially true in contests like SS where the exchange includes your call sign.
  - **Slow back down again** appropriately
- **Hit the SEND key as soon as the call is in your head**
  - **Finish typing** in the log **while the exchange is sent**
  - Some programs can do this automatically after *n* characters
- **Move Multipliers to other bands if you have the time**
  - **Picking frequencies** in advance makes it easier to jump

Best Practices . . .

Running - continued

- **If another station calls CQ on your frequency, try 'QRL' or 'Frequency in use, please QSY'**
- **Don't engage in extended frequency fights**
  - **If QRL/QSY fails**, it almost always pays to **move**
  - Sometimes you can move up or down a bit to lessen the QRM and still hang on to 'your' frequency
- ***NEVER NEVER NEVER* acknowledge a 'jammer'**
  - **NEVER**. Just keep your pace, and **don't change** your tone of voice on phone or even synchronize your calls to his QRM.
  - Often throwing in a few fake Q's will discourage the jammer

The Complete Best Practices Collection appears in Appendix A

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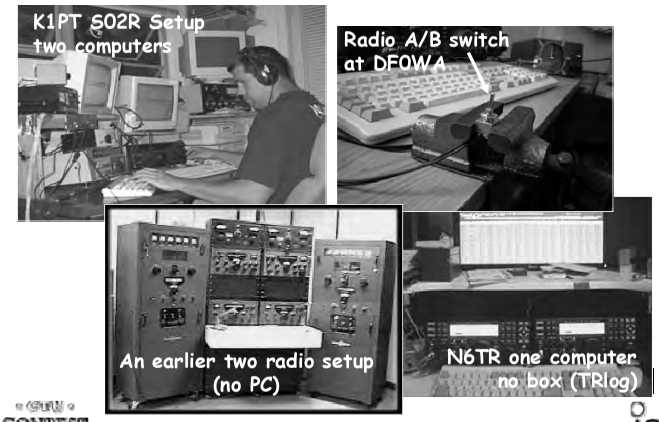
A Word About SO2R [single op 2 radio]

Everyone has their own idea of an efficient SO2R layout . . .



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A Word About SO2R

Save SO2R until other improvements are nearly exhausted

- **It's easy for SO2R to be a distraction**
- **KISS (Keep It Simple Stupid) is key**
  - Start with a **simple to use** setup
  - Use SO2R only when things are **slow**
    - CQ A - S&P B or Alternate CQs
    - Modify your setup and operation with experience
- **Most top Ops swear by it**
  - **Potential** to add significantly to your score
- **Some don't use it at all**

I'm at level one – a few SO2R Q's per contest - dbz

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Internet Links

Here are a few of the many available resources

- **Contest Organizations, Calendars, Info, & Sponsors**
  - WA7BNM Calendar — hornucopia.com/contestcal
  - SM3CER Calendar — sk3bg.se/contest
  - Contesting.com — contesting.com
  - National Contest Journal (NAQP …) — ncjweb.com
  - ARRL (Sweepstakes, Field Day, DX …) — arrl.org
  - CQ Magazine (CQWW, WPX …) — cq-amateur-radio.com
- **Popular Contest Logging Programs** *Treated in Appendix B*
  - N1MM — pages.cthome.net/n1mm\
  - Win-Test — win-test.com
  - Writelog — writelog.com
  - TR Log, TR4W — tr4w.com
  - CT & CTWin — k1ea.com

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Conclusion

Little Pistols with modest stations can successfully compete

- **Prepare and pay attention to detail**
  - Remember **Sun Tzu**
- **Strategies are important**
  - Pick and **plan** your contests. Use the plan for guidance
- **Adopt proven practices**
  - Try the **Best Practices**. Keep what works for you
- **Run, big dog, run**
  - Try to **Run** if at all possible
- **Start now to make incremental improvements**
  - Make a **list** and work it down
- **There are lots of resources for help**

' It's not the size of your station, it's how you use it! '

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Best Practices

Appendix A

K2YWE
0 of 9

note: Order in the table was arranged for fit and is not necessarily logical

CONTEST UNIVERSITY ICOM

Best Practices

Appendix A

K2YWE
1 of 9

Best Practice	Rationale
General Operating	
• Assume a big dog attitude	• If you act like a big dog, most will believe you. If they bite back painfully, you can find other turf.
• Maintain an "friendly sense of urgency" in your QSOs	• Chattiness will slow your rate and lose you contacts
• Always work Dupes • Set your software accordingly	• You may *not* be in *their* log • It usually takes more time to rebuff than work
• Enable and use the Bandmap feature of your logging software even if you are not Assisted. • The Bandmap allows you to enter stations yourself on the fly	• If you need to check back later, the Bandmap will have the call sign and frequency noted for you • You'll waste less S&P time on waiting for station ID or on calling Dupes

CONTEST UNIVERSITY ICOM

Best Practices

Appendix A

K2YWE
2 of 9

Best Practice	Rationale
General Operating - continued	
• In general, use K3ZO's 'Rule of TWICE' • Modify 'TWICE' to suit your station capabilities and contest situation: • If you can't get a station after calling him TWICE, move on • If the station doesn't ID after transmitting TWICE, move on	• Your time can be better spent increasing your rate • A multiplier can quickly become worth less than the QSOs lost trying • You can put his frequency into the Bandmap to check back later
• Try moving frequency a bit if you don't seem to be heard	• Often receiver bandwidths in a crowded band are set very narrow

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Best Practices

Appendix A

K2YWE 3 of 9 Best Practice	Rationale
General Operating - continued	
• Do not waste time repeatedly calling DX stations that have moderate signals when the band is otherwise quiet from their part of the world • This is likely to happen when big guns are just 'opening the band' or 'keeping it open' • Try another time	• Many stations running high power will be heard when propagation is poor, but will not hear you despite elaborate antennas • Remember that 1.5kW vs. 100W is roughly the difference between S-7 and S-3. These are the guys that are S9 or more under better conditions.
• Send only the missing or wrong part when asked for a correction (FILL) • The response to K3? would be 'ABC' (a few times if needed) not all of 'K3ABC' since K3 wasn't in question • Similarly in SS if queried for your CK, don't send the entire exchange	• Time spent sending known information is wasted. • You may squander a clear interval or QSB peak on resending known info The time spent sending known info may be a missed opportunity for the Fill to be heard

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Best Practices

Appendix A

K2YWE 4 of 9 Best Practice	Rationale
Running	
• Call CQ when the band is active if you are able to find and hold a frequency	• You will usually beat your S&P rate • An exception is the start of the contest when everyone is 'fresh meat' for you and your S&P rate can be very high
• Call CQ when the bands are dead for the day or worked out near the end of the contest	• That's when the stations that have been CQing will S&P for 'fresh meat'
• Consider *not* asking if the frequency is busy before CQing. You'll find out soon enough if it is. • *Do ask if you're uncomfortable not asking*	• QRL? is an announcement to others that it's clear at your end • Someone else may jump in and CQ

CONTEST UNIVERSITY ICOM

Best Practices

Appendix A

K2YWE 5 of 9 Best Practice	Rationale
Running - continued	
• Use the widest receiver bandwidth you can stand	• Less chance to miss off-frequency callers, especially on CW
• If another station calls CQ on your freq and fails to respond to your QRL-QSY message, carry on for a while to see if he leaves. But, don't do this for very long	• Even though he is not hearing you, if you are being heard by others he may not get many responses and might give up quickly. No one likes to waste time
• Don't engage in long frequency fights. Try 'QRL' or 'frequency in Use, QSY.' If that fails, it almost always pays to move. • Sometimes you can move up or down a bit in order to lessen the QRM and still hang on to "your" frequency	• It costs you QSO time • You may be in QRM at the other end

CONTEST UNIVERSITY ICOM

Best Practices

Appendix A

K2YWE 6 of 9 Best Practice	Rationale
Running - continued	
• Don't break a run to pull one station through	• Your rate will suffer if you take long • You will drive away impatient waiting stations
• If you can't drag a station's call through after trying TWICE, ignore him and start calling CQ again • This is part of K3ZO's /Rule of TWICE./ Modify TWICE to suit your station capabilities and contest circumstances	• Running has to do with how fast you can accurately get Q's into the log. You don't want your rate to slow or waiting callers to lose interest • Equally important, on a crowded band you must transmit often to keep "your" frequency clear
• Speed up if your run is being sustained. This is especially true in contests like SS where the exchange includes your call sign.	• Waiting callers likely have your info • More stations will be inclined to wait • Your rate will go up with speed

CONTEST UNIVERSITY ICOM

Best Practices

Appendix A

K2YWE 7 of 9 Best Practice	Rationale
Running - continued	
• Use only a quick "Thanks" or "TU" without your call sign or QRZ if you heard multiple callers. • Throw in your call every few Q's for new listeners. • Keep it up until there are no more responses, then build back to your "full" QRZ message and CQ. • If you get no responses after just 'Thanks', try only your call and 'TEST' before resuming a full CQ	• Most waiting stations will know your call. Don't waste time on it. • Minimizing the time stations have to wait for you will help to keep the impatient ones hanging around and will increase your QSO rate. • Less experienced contesters may not realize you are waiting for them. "TEST" will alert them you are ready for another station to call
• Send any call you have corrected as part of your goodbye message • Enable call sign correction in your software on CW	• Stations want assurance that you have them correctly. This will keep them from asking QSL? It might also save your from a mistake

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Best Practices

Appendix A

K2YWE 8 of 9 Best Practice	Rationale
Running - continued	
• When the call sign of a responder is questionable, send a complete exchange using the questionable call Correct it during his exchange. • You can use SCP to help guess incomplete calls on the first round • *Make sure* you have it right before you let him go	• Nearly all contest stations will correct you on their transmission, good Ops without missing a beat • It saves an extra exchange devoted only to getting the callsign right • You can revert to "normal" fill-in procedures if this practice fails
• Maintain an "friendly sense of urgency" in your QSOs	• Chattiness will slow your rate and lose you contacts
• Move Multipliers if you have the time (a slow run) • Pick frequencies in advance. Give up if you don't connect in a short while	• It's a quick way to gain band-Mults. • Many Ops will go with you • You probably won't make the Q if you don't connect quickly

CONTEST UNIVERSITY ICOM

Best Practices

Appendix A

K2YWE 9 of 9 Best Practice	Rationale
Running - continued	
• Hit the Send key as soon as the call is in your head, and finish typing it into the log during your outgoing exchange transmission Some software can be set to do this after *n* callsign keystrokes (TR4W and N1MM, for example)	• If your fingers are like mine, they slightly lag my brain and I am still typing when the other station stops sending. • This practice reduces the lag between when the other station finishes calling and when you respond, increasing your rate
• NEVER NEVER NEVER acknowledge a 'jammer.' NEVER! • Just keep your pace, and don't change your tone of voice on phone or even synchronize your calls to his QRM	• With no response to his jamming, he can't be sure he is even bothering you, and it isn't 'fun' for him if he doesn't get a reaction

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Got More?

ICOM

Selected Contest Loggers Appx B

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Popular Contest Loggers Appx B

Similar capabilities with varying implementations

- **All run under Windows OS**
- **Need varying amounts of learning to fully utilize**
  - **N1MM (Free)**
    - Most popular Win logger. Continuous cooperative development
  - **Win-Test ($)**
    - Many features and options. Easy transition for CT users
  - **Writelog ($)**
    - Popular Windows full-featured contest program
  - **TR4W (Free)**
    - Very flexible. Behavior taken from popular TR DOS program
  - **CTWin (Free)** – Grandaddy of them all
    - Windows character mode version of DOS program

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Popular Contest Loggers Appx B

Facilitate operating, logging, and exploiting opportunities

- **Contesting-specific with advanced features**
  - Band Maps with S&P "point & shoot"
  - SO2R Support (and Multi)
  - Spotting through a Telnet connection
  - Radio, CW & voice keying, and rotator Interfaces
  - Sound card support
  - Most provide sound card voice keyer
  - Some provide sound card Receive recording
  - Some support external voice keyer control
  - Varying levels of RTTY and other digital mode support
  - Most generate and read digital modes using the sound card
  - Some provide only logging functions

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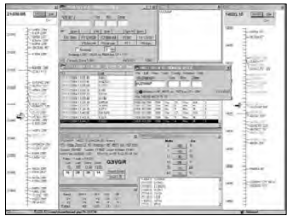
N1MM by N1MM et. al. (N1MM, N2AMG, K3CT, N2IC, NA3M)

Newest and most popular Windows contest logger

- **Cooperative project with multiple participants/coders**
  - Over 200,000 lines of code and growing
  - Mainly Visual Basic & Access
  - Large user community
- **Requires fast machine and substantial RAM**
- **Multiple Configurable Windows**
  - 110 supported contests
- **Allows User-Defined contests**
  - Sound card voice keyer
- **Pre-record files**
- **RS-232, Parallel, USB support**
- **Free**



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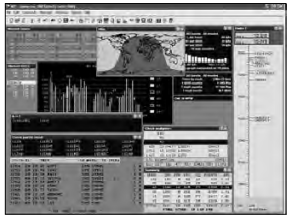
Win-Test by F5MZN

Mature written-for-Windows high performance logger

- **Efficient with minimal processing and memory needs**
- **Strong CT keystroke emulation**
- **Over 100 supported contests**
- **Sound card voice keyer**
  - Built-in editor
- **RS-232, Parallel, USB support**
- **~$70 (50€)**
  - Proceeds support Radio Amateur Club de Kourou contest activities, including FY5KE (French Guiana)

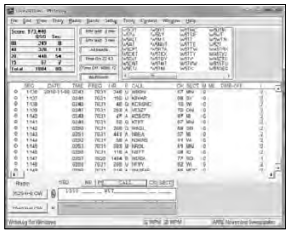


CONTEST UNIVERSITY ICOM

Writelog by Contesting Software, LLC

Mature written-for-Windows high performance logger

- **Efficient with minimal processing and memory needs**
- **Single Main Window**
- **110 supported contests**
  - Also GP logging
- **Sound card voice**
  - On-the-fly recording
- **RS-232, Parallel, USB support**
- **$30 (incl 1 yr updates)**
  - Previous version @ $18



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TR4W by UA4WLI

Win version of mature world-class adaptive contest logger

- Small and fast 100% Windows API code
  - Only 100,000 lines of code in 160KB of memory
- Substantially same features as DOS TRlog by N6TR
  - N6TR provided TRlog source code as basis
  - Continuously adding more features
- Over 140 supported contests
- S&P/Run Mode Adaptive
- Sound card voice keyer
  - Flexible functionality
- RS-232, LPT, USB support
  - USB I/O includes log backup
- Free!

CONTEST UNIVERSITY ICOM

CTWin by K1EA

Win version of first serious contest logger, still in use

- **Windows character mode. Minimal system needs**
- Same features as original premier CT logger
  - Includes extensive set of utilities
- Support files actively maintained by AD1C & WA1Z
  - No longer supported by K1EA
  - User Group support
- All major contests and a few others
  - No new contests, no changes
  - Limited user-defined contest capability
- RS-232 and LPT I/O
  - USB only with converter
- Controls some voice keyers
- Free!

Not recommended for new starts because new contests are not being added. but Good if you have old computer hardware. Good to know as guest Op in existing station.

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N3FJP by N3FJP [Info Only – Not Recommended]

Basic contest logger – Lacks important functionality

- Recently re-written in C#.NET (was VB6)
- Single resizable Main Window
- 52+ supported contests (31 +21 State QPs and more)
- Sound card voice
- RS-232, Parallel, USB support
- **No Band Map**, Limited Spot Window
  - No dupe or mult indicators . . .
- **Limited Partial Call Check – Only dupes**
- **No SO2R support**
- $49 all programs or
  - $ 9 each contest separately

Not recommended for serious contesting because of lack of important features

CONTEST UNIVERSITY ICOM

CTU Presents

Preparations for Multi-op Contests and Field Day

Many Kinds of Multi-op Opportunities

- Field Day - by far the most popular multi-op activity
- HF CW, SSB and RTTY contests from the U.S.
- HF CW, SSB and RTTY contest Dxpeditions
- VHF/UHF/microwave contest fixed stations
- VHF/UHF/microwave contest portables (often mountaintop)
- Small multi-single and multi-2 contest stations
- Medium multi-single, multi-2 and multi-multi contest stations
- Large multi-2 and multi-multi contest stations
- Casual
- Competitive, top ten finisher
- Highly competitive, top three finisher

Planning and Hosting a Multi-op

- Planning
  - start well in advance
  - what contest and category to enter? (answer this early in planning)
  - should we attempt a serious competitive effort?
  - full time operators, its difficult to integrate part-timers into competitive efforts
  - operator band assignments and schedules
  - try to appropriately match your operator and station resources
- Team building, leadership, operator training and station familiarization
- Creature comforts and safety
  - seating, sleeping quarters, food, restrooms, shower, fire extinguishers
- Protect your family's privacy and all of their usual weekend activities
- Pre-contest preparations
  - checklist of equipment, software and antennas to be verified before the contest

Team Roles and Skills

- Leadership and strategic planning
- Broad technical skills and expertise
  - technical planning
  - every detail of radios, amplifiers, computers, software and networks
  - antenna and tower design, construction, installation and maintenance
  - RFI mitigation techniques
  - skills and knowledge to fix anything quickly during 48 hours of operation
- Highly skilled operators
  - high rate runners with very low error rates
    - multiplier and QSO passing skills
  - search and pounce operators with CW Skimmer and DX Cluster skills
- Contest tacticians
  - skills and experience to make tactical operating decisions
  - detailed expertise and comprehensive knowledge of contest rules
  - propagation expertise

Station Equipment

- Well matched to operator capabilities and competitive goals
- Networked computers
  - one computer per operator with computerized CW and voice messages
  - connected to external DX Cluster and CW Skimmer networks
- Protect every receiver from all co-located transmitters
  - a band pass filter to protect every receiver
- Minimize or eliminate all sources of locally generated RFI
  - excessive signal levels from other bands
  - RFI from "RF flooding" of switching power supplies and other electronics
- Two stations per band (run and S&P) for highly competitive multi-multi
  - a lockout is mandatory to make two simultaneous signals per band impossible
  - S&P station capable of listening through the run station with little QRM
    - requires widely spaced receiving antennas

CTU CONTEST UNIVERSITY ICOM

Towers and Antennas

- One tower , one tribander, 80 and 40 meter dipoles
  - entry level for multi-single
- One tower, at least two Yagis, 80 and 40 meter dipoles, 160 inverted-L
  - top ten multi-single competitor
  - entry level for multi-2
- 2 towers, 40-10M Yagis, 80M dipole, 160 inverted-L, receiving antenna
  - top three multi-single competitor
  - top ten multi-2 competitor
  - entry level for multi-multi
- 3 towers, 40-10M Yagis, 80M gain antenna, 160 Inverted-L, receiving ant
  - top three multi-two competitor
  - top ten multi-multi competitor
- 4+ towers, 40-10M Yagis, 80M 4-square, 160 verticals, 2+ receiving ants
  - top three multi-multi competitor

CTU CONTEST UNIVERSITY ICOM

Field Day!

- By far the most popular multi-op activity
  - local clubs always need your help and expertise
- Most Field Day teams are casual or semi-serious
  - but not all…
- Excellent opportunity to develop multi-op skills (valuable life skills too!)
  - leadership
  - planning
  - team work
  - operating
- Lots of fun and camaraderie

CTU CONTEST UNIVERSITY ICOM

Your Role as an Operator

- Many skills to be learned, practiced and perfected
  - high rate running
  - improving your logging error rate
  - passing multipliers and QSOs between bands
  - efficient, effective use of CW skimmer spots and packet spots
  - working effectively with operators on the same band and other bands
- Teamwork
  - competitive teams have high expectations of every team member
  - accommodating unavoidable non-contest commitments during the contest
  - team operating schedules, sleep schedules, meals
  - inevitably the best laid plans will occasionally go wrong
    - don't lose your cool!
    - contribute to the solution, never be part of the problem
- Enjoy the fun and camaraderie!

CTU CONTEST UNIVERSITY ICOM

How do I get invited as an operator ?

- Develop some of the skills needed by a multi-op team
  - operating is just one of the many needed skills
- Get to know the station owners and team members
- Volunteer to help
  - even to just contribute unskilled labor when needed
- Don't wait to be invited… volunteer

What to do after you're invited ?

- Understand the goals of the team
- Understand the role you're expected to fill
- Don't underestimate (or misrepresent!) your skill level
  - practice and perfect your operator skills
- Always ask what you can bring or contribute
  - radios, headphones, keyers, food, soft drinks etc
- Don't expect to be a primary operator the first time out
- Remember, you're a guest in the station owner's home
  - treat the host's family and property with respect
  - thank the XYL and the host after the contest!

And Above All

Contribute to the enjoyment of the team members

- contribute to the success of the team
- learn and improve from your experiences
- and have fun!

Using Waterfall Displays as a Contesting Advantage

Presented by N6TV
n6tv@arrl.net

Presentation Overview

- Legacy “Panadapters”
- CW Skimmer’s SDR waterfall
- Current radios with waterfall displays
- Waterfall display advantages
- How to use waterfall in a contest
- Q & A

Legacy Panadapters

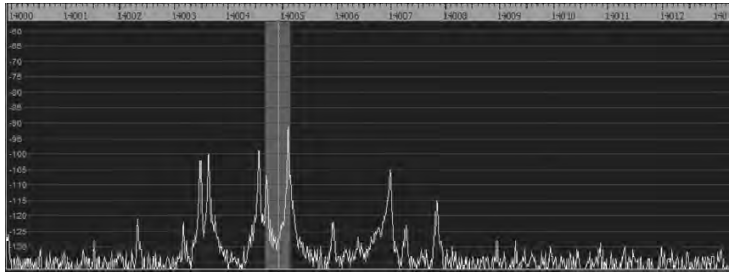
- Kenwood SM-230 Station Monitor (25, 100, or 250 KHz):

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

Legacy Panadapters

- “Band Scopes” in Icom IC-781, IC-756ProIII, IC-7800 (before V3.0), IC-7700, etc.

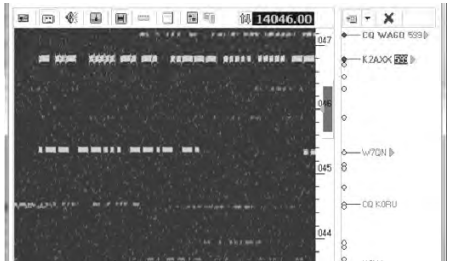
Spectrum Displays Hide Weak Signals



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* useable on phone

Better Waterfall Displays

- The Elecraft P3 Panadapter

- Major improvement over legacy designs

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

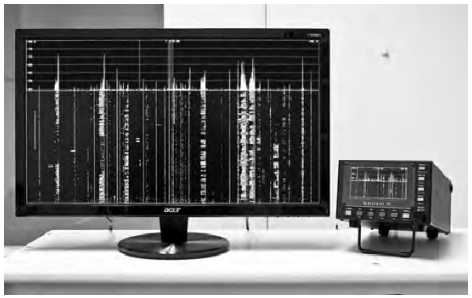
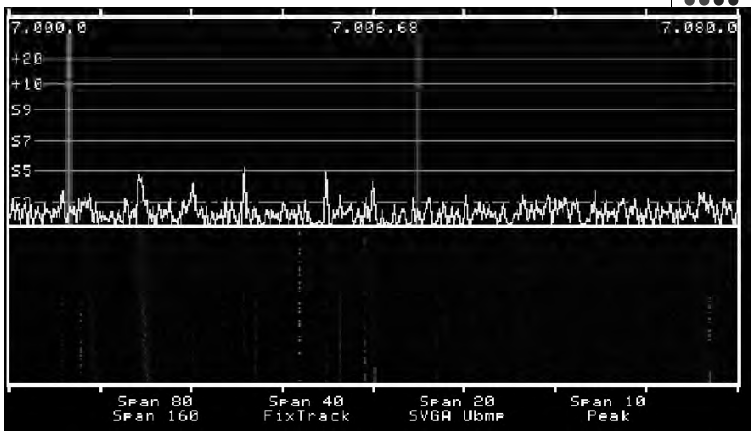
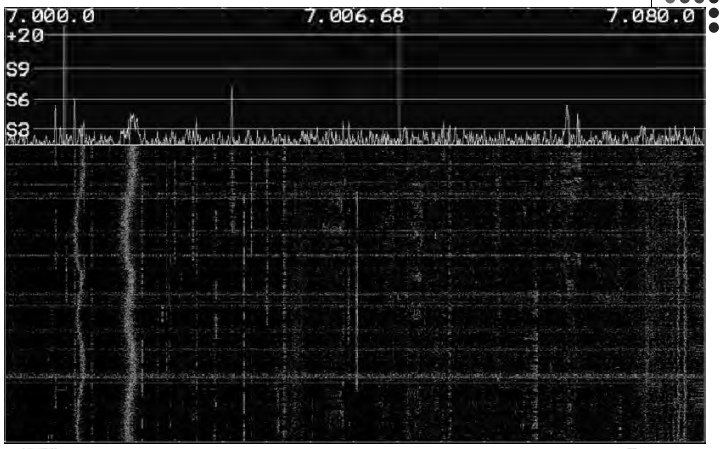


Photo courtesy http://www.elecraft.com

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

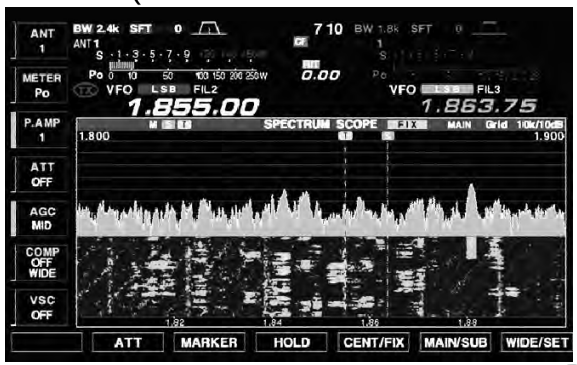
Icom IC-7800 with V3.0 firmware

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)



Kenwood TS-990S

Photo courtesy http://www.kenwoodusa.com

TS-990S screen shot

- 800 x 600 or 848 x 480 pixels

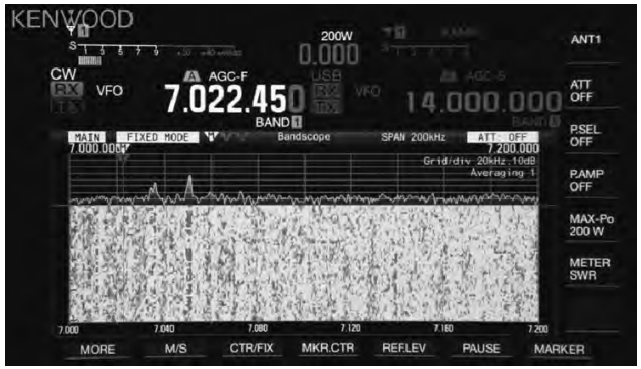
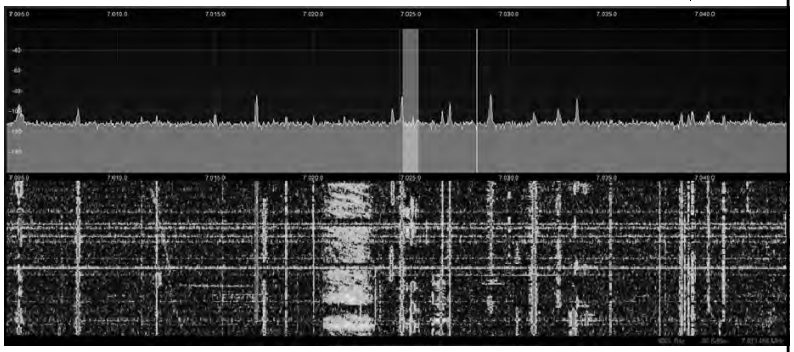


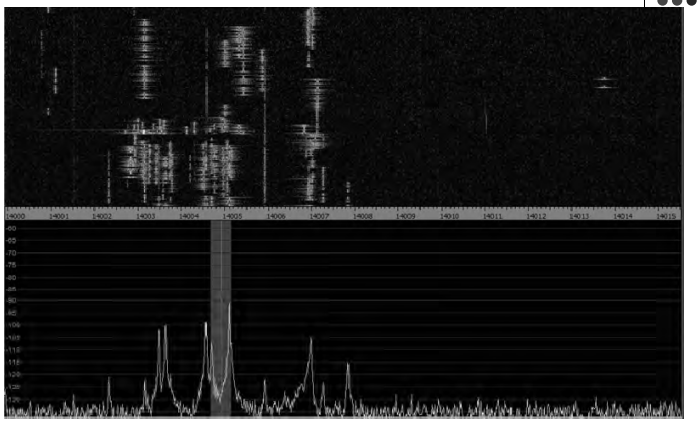
Image courtesy http://www.kenwoodusa.com

FlexRadio FLEX-5000™, FLEX-6700™

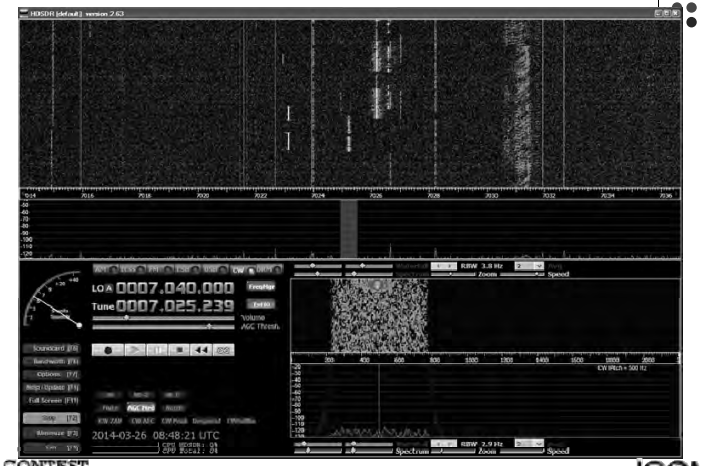
PowerSDR™ Software for FlexRadio



Winrad Software

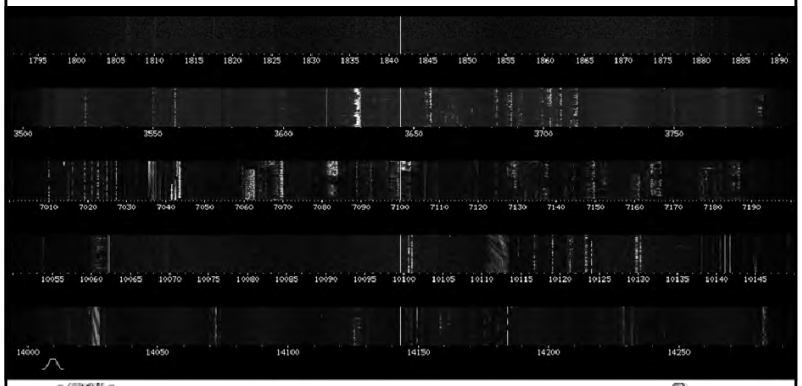


HDSDR Software



WebSDR: Waterfalls on the Web

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

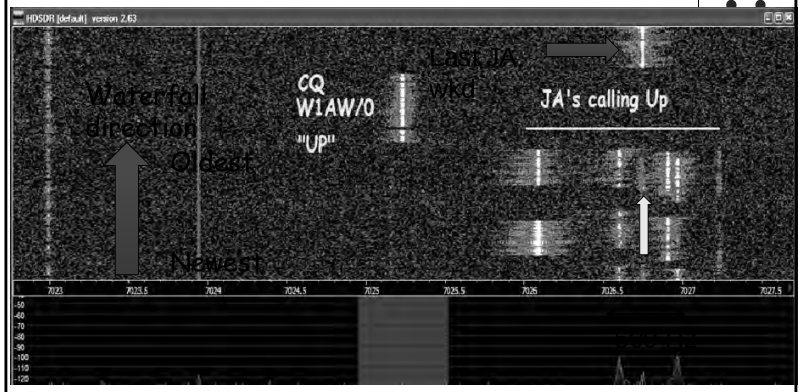


Watch 5 Bands at once!

Waterfall Display Advantages

- "Click to Tune" – direct access using a mouse
  - IC-7800 V3.0, PowerSDR, HDSDR (but not K3/P3)
- Weak signals easy to spot (faint traces)
- Many zoom levels: 7.5, 15, 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



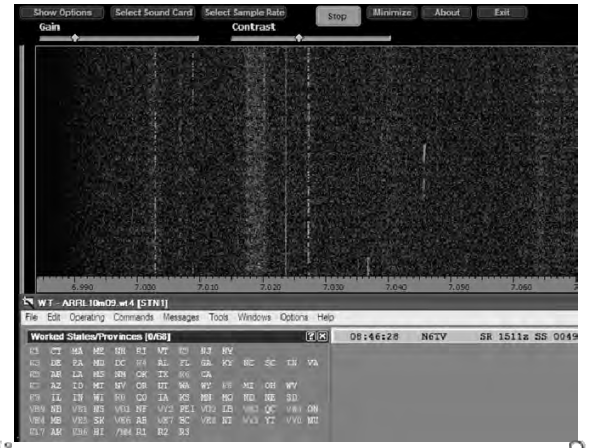
Who will W1AW/0 answer next?

Using Waterfall in a Contest

- Find clear spots to call CQ
- QRM? You can *see* where to move your VFO to minimize it
- Find "good spots to call" in a CW pileup
- During S&P, find the "next" signal fast (no more slow 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

Winrad on Top, Win-Test on Bottom

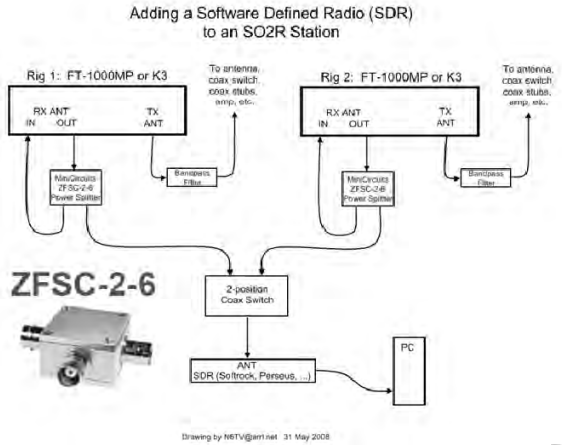
Winrad & Win-Test (zoomed)



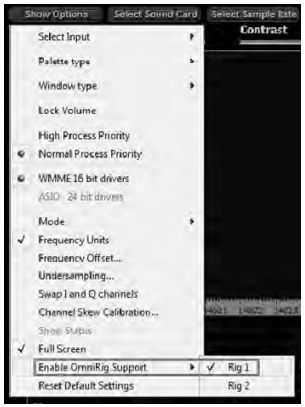
Waterfall Display *Disadvantages*

- Radios don't automatically jump 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
- Can be visually distracting to some
- **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"

Click-To-Tune with a "Legacy" Transceiver + SDR



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



Demo of Winrad's Waterfall

- 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://www.kkn.net/~n6tv - Winrad demo file
- http://www.qrz.com/db/n6tv - Links to this and other presentations

CTU 2014 Presents

Advanced RTTY Contesting

Ed Muns, W0YK

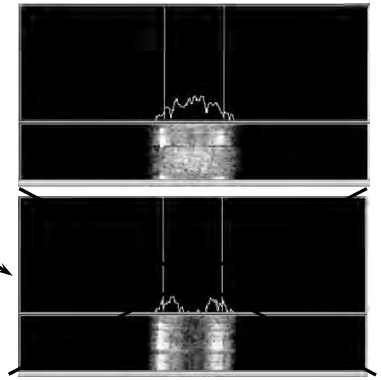
Advanced RTTY Contesting

- 1st CTU session: *"The Essentials of RTTY Contesting"*
- RTTY considerations, e.g., RX & TX bandwidths
- Optimize message buffers
  - UnShift On Space (USOS or UOS)
  - Space vs. Hyphen
- Accelerator keys; stateful Enter key (ESM); key re-mapping
- Super Check Partial & Pre-Fill
- Callsign stacking ("slow down to win")
- Multiple decoders
- SO2V, SO2R-SOnR
- Logging Software: WriteLog vs. N1MM Logger vs. Win-Test
- Ergonomics

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
- Audio filtering
  - JPS NIR-10/12
  - Timewave DSP-599zx
  - Modern DSP rigs



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??
    - Icom Twin Peak Filter
    - K3 Dual-Tone Filter
- Audio filtering
  - JPS NIR-10/12
  - Timewave DSP-599zx
  - Modern DSP rigs

How Do I Set It Up?

soundcard levels

- Adjust levels in Windows Volume Control
  *(or, in MMTTY **Options/Soundcard** …)*
  - Use isolation transformer
  - Avoid over-drive
  - 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.)

CONTEST UNIVERSITY 5/91 ICOM

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

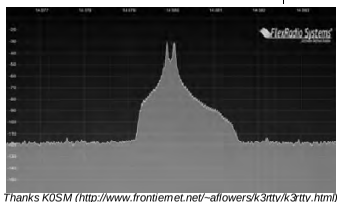
- Use radio AFSK filter
  - DSP TX filter (K3)
  - Crystal TX filter (K3)
  - Lobby other mfrs
- Use MODEM TX filter
  - MMTTY 512-tap
  - 2Tone default

CONTEST UNIVERSITY 6/91 ICOM

RTTY Radios

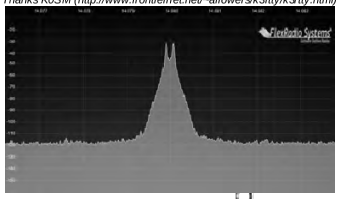
AFSK bandwidth

MMTTY - AFSK
- No TX filter
- K3 @ 1 mW



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

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



CONTEST UNIVERSITY 7/91 ICOM

RTTY Radios

AFSK bandwidth

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

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

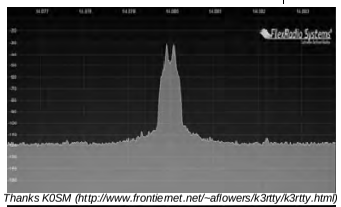
MMTTY - AFSK
- 512-tap TX BPF
- K3 @ 1 mW

CONTEST UNIVERSITY 8/91 ICOM

RTTY Radios

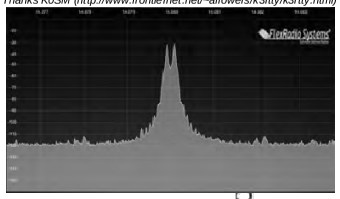
AFSK bandwidth

MMTTY - AFSK
- 512-tap TX BPF
- K3 @ 1 mW



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

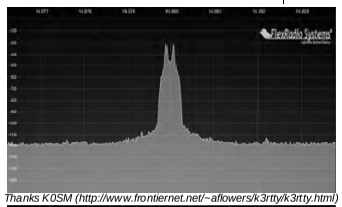
2Tone - AFSK
- Default “AM” setting
- K3 @ 1 mW



RTTY Radios

PA IMD impact on AFSK bandwidth

MMTTY - AFSK
- 512-tap TX BPF
- K3 @ 1 mW



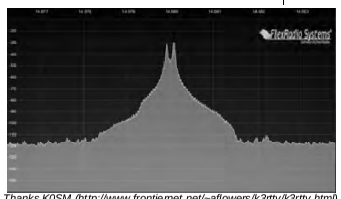
Thanks K0SM (http://www.frontiernet.net/~aflowers/k3rtty/k3rtty.html)

MMTTY - AFSK
- 512-tap TX BPF
- K3 @ 100 watts

RTTY Radios

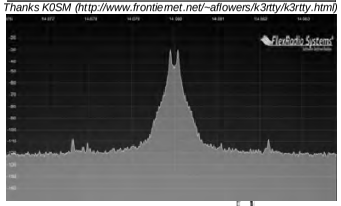
PA IMD impact on AFSK bandwidth

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



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

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



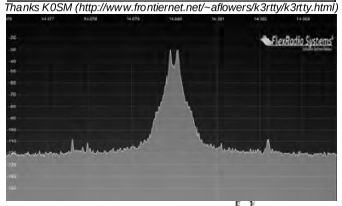
RTTY Radios

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

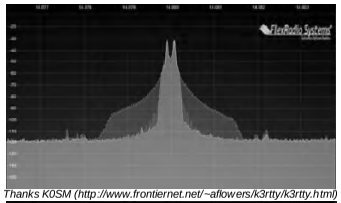


RTTY Radios

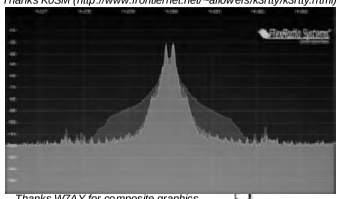
PA IMD impact on RTTY bandwidth

FSK/MMTTY/2Tone
- FSK unfiltered
- MMTTY 512-tap BPF
- 2Tone “AM” setting
- K3 @ 1 mW

FSK/MMTTY/2Tone
- Same encoders
- K3 @ 100 watts



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

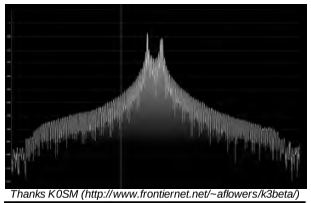


Thanks W7AY for composite graphics

RTTY Radios

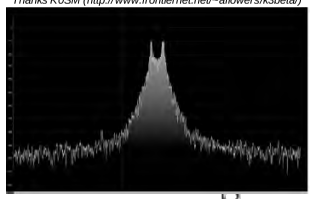
FSK bandwidth

Old K3 FSK bandwidth
- No waveshaping
- < DSP281 firmware
- Typical of all radios
- 50 watts



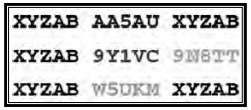
Thanks K0SM (http://www.frontiernet.net/~aflowers/k3beta/)

New K3 FSK bandwidth
- Optimal DSP filter
- DSP281+ firmware
- Lobby other mfrs to add a FSK filter!



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

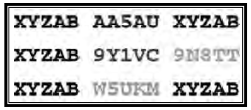


N1MM Logger

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

Super Check Partial

logger differences



N1MM Logger

WriteLog

Win-Test

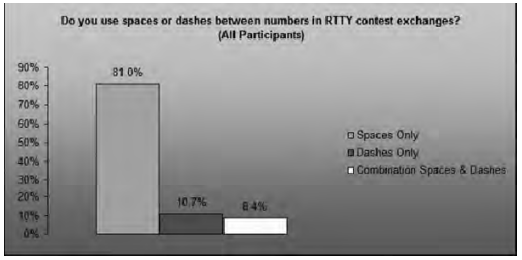
Pre-Fill

"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!**

Space Delimiters

2010 survey



Space Delimiters

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 QUE QUE	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

Space Delimiters

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	xIOO f123 f123	f599 xQUE f123	xIOO CA CA	f599x:- CA
	UOS on	f599 f123 f123	f599 f123 f123	f599 CA CA	f599 CA CA
	UOS off	xIOO f123 f123	f599 xQUE f123	xIOO CA CA	f599x:- :-
	UOS off	f599 123 123	f599 123 123	f599 lCA CA	f599 lCA CA
	UOS on	xIOO QUE QUE	f599xQUE QUE	xIOO lCA CA	f599 x:- CA
worst case	UOS off	f599 123 123	f599 123 123	f599 lCA CA	f599 lCA CA
	UOS off	xIOO QUE QUE	f599xQUE QUE	xIOO 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

Hyphen Delimiter?

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	xTOORQUERQUE	f599x123-123	xTOOA1CAf-1CA	f599-x:-f-1CA
UOS	on	f599-123-123	f599-123-123	f599-1QAf-1CA	f599-1QAf-1CA
UOS	off	xTOORQUERQUE	f599x123-123	xTOOA1CAf-1CA	f599-x:-f-1CA
UOS	off	f599-123-123	f599-123-123	f599-1CAf-1CA	f599-1CAf-1CA
UOS	on	xTOORQUERQUE	f599x123-123	xTOOA1CAf-1CA	f599-x:-f-1CA
UOS	off	f599-123-123	f599-123-123	f599-1CAf-1CA	f599-1CAf-1CA
UOS	off	xTOORQUERQUE	f599x123-123	xTOOA1CAf-1CA	f599-x:-f-1CA

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

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

LTRS/FIGS Characters

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

Basic RTTY Contest QSO

CQ WW RTTY

- ***WW K5AM K5AM CQ***
- ***ZC4LI ZC4LI***
- ***ZC4LI 599 4 4***
- ***[K5AM] TU 599 20 20***
- ***[ZC4LI] TU K5AM CQ***

K5AM: running station
ZC4LI: S&P station

RTTY Messages

CQ WW RTTY

- WW K5AM K5AM CQ
- <his call> 599 4 4 (TU) 599 4 4 *S&P exchange*
- TU K5AM CQ
- K5AM

- CALL
- ZN 4 *your Zone*
- AGN
- ?

RTTY Messages

CQ WPX RTTY

- WPX AK1W AK1W CQ
- <his call> 599 1867 1867 (TU) 599 1867 1867 *S&P exchange*
- TU AK1W CQ
- AK1W

- CALL
- NR %N *your Serial Number*
- AGN
- ?

RTTY 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 *S&P exchange*
- TU
- N0NI

- CALL
- NR %N
- NAME TONI } *your Exchange elements*
- QTH IA
- AGN
- ?

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

Callsign Stacking

S&P technique

- Understand RUN station technique and "dance" with them
- Short calls in pile-up
  - Your callsign 1-2 times, then listen (repeat)
  - Time your calls to the quiet times
- Tail-end the current QSO
  - Your callsign ONCE ONLY
  - Carefully timed between received exchange and QSL transmission

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*

RTTY Messages

callsign stacking

- WPX AK1W AK1W CQ
- <his call> 599 1867 1867 (TU) 599 1867 1867 *S&P exchange*
- TU AK1W CQ **TU <his call>, NOW <next call>** *stacking*
- AK1W

- CALL
- NR %N *your Serial Number*
- AGN
- ?

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

Pile-up Management

- Work calls in same order as received
  - If a mult, “it depends”
- Stick with the first call, until worked
- Use callsign stacking technique
  - Encourages short calls
  - Spreads stations out in time by encouraging them to call during lulls
  - Increases the “service rate”, reducing frustration

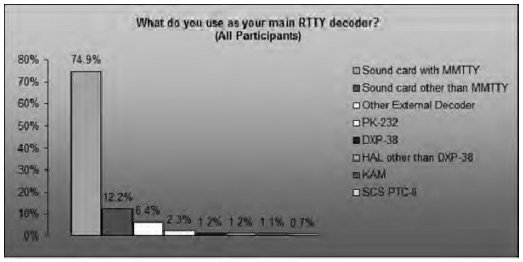
RTTY Decoders

choice of Tones

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

RTTY Decoders

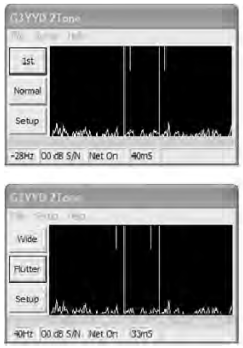
2010 survey



- 87% use soundcard decoding/encoding
- 86% of soundcard users run MMTTY

RTTY Decoders

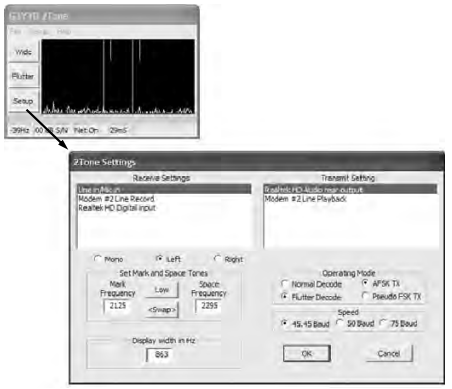
2Tone



- Outperforms MMTTY
- Uses less CPU cycles
- AFSK only
- Pseudo FSK
- Contest loggers:
  - N1MM Logger
  - WriteLog
- Introduced late 2012
- David Wicks, G3YYD

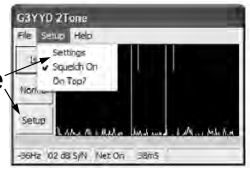
RTTY Decoders

2Tone



RTTY Decoders

2Tone



- Setup vs. Settings

- Window-width adjust

RTTY Decoders

logger support

Feature	MMTTY		2Tone	
	AFSK	FSK	AFSK	FSK
WriteLog	☻	☻	😐	☻
N1MM Logger	☻	☻	☻	☹
Win-Test			☹	☹

😐 NET on
☹ not available

RTTY Decoders

logger support

Feature	MMTTY		2Tone	
	AFSK	FSK	AFSK	FSK
WriteLog	☻	☻	😐	☺
N1MM Logger	☻	☻	☺	☹
Win-Test			☹	☹

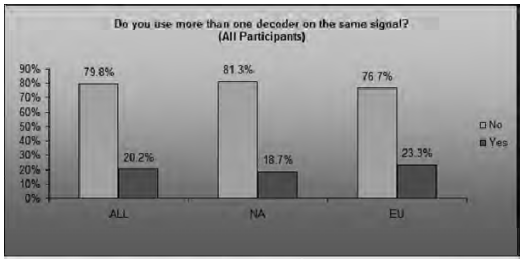
☺ The “Sweet Spots”

RTTY Decoders

hardware MODEM

Multiple RTTY Decoders

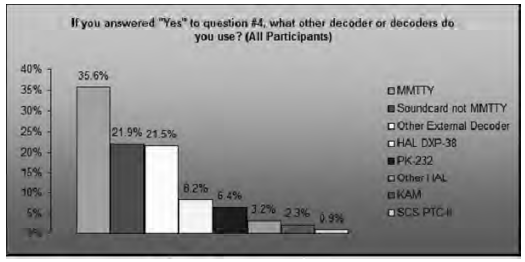
2010 survey



• 20% use multiple decoders

Multiple RTTY Decoders

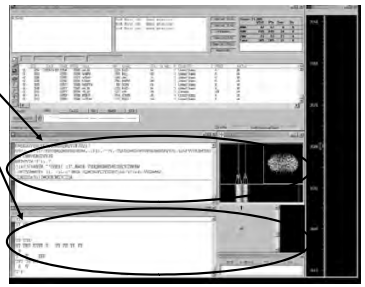
2010 survey



Multiple RTTY Decoders

MMTTY & DXP38 in WriteLog

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

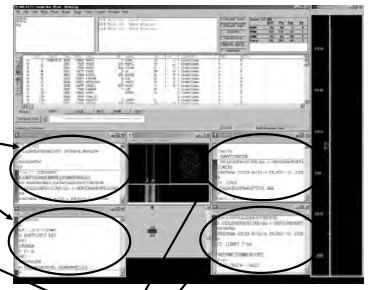


CONTEST UNIVERSITY 45/91 ICOM

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

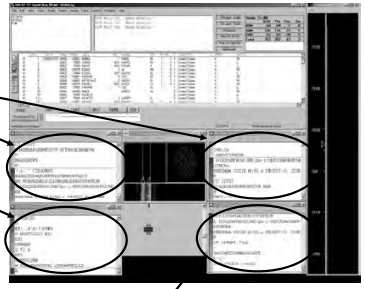


CONTEST UNIVERSITY 46/91 ICOM

Multiple RTTY 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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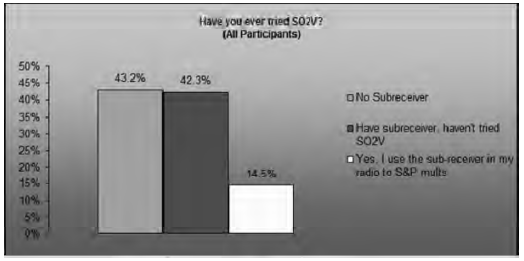
SO2V

2010 survey



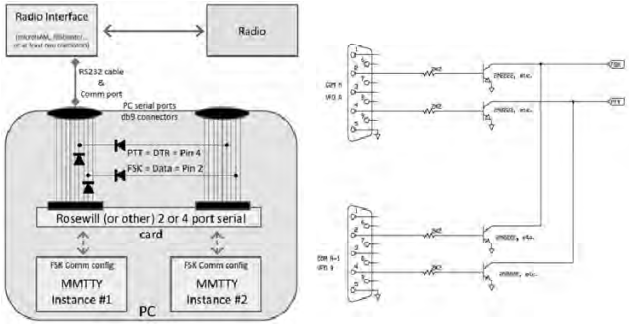
• Almost 15% have tried SO2V

CONTEST UNIVERSITY 48/91 ICOM

SO2V

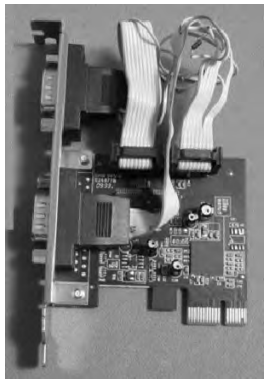
- If Assisted and running on VFO-A, then
  - A<>B
  - Click spot, tune, ID station, work station
  - A<>B, resume running
- Or, setup decoder windows on A and B
  - Radio must have two true receivers
  - Monitor both frequencies simultaneously with right/left channels of sound card
    - Right-click call from 2nd RTTY window into VFO-B Entry Window
  - Two ways to transmit on VFO-B:
    - A<>B, work the mult, A<>B
    - 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

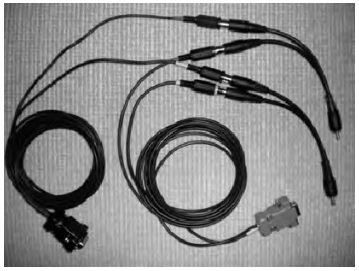


Serial Signals (K8UT) **FSK/PTT Signals (W0YK)**

SO2V Wire-OR FSK/PTT



Serial Signals (K8UT)

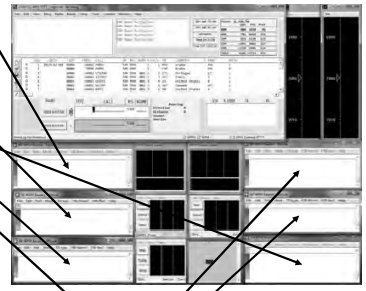


FSK/PTT Signals (W0YK)

Multiple RTTY Decoders

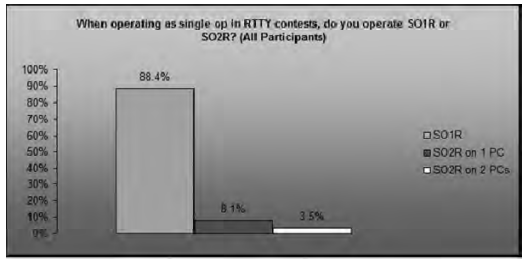
SO2V

- Main RX (4 decoders)
  - MMTTY (Winritty FSK)
  - 2Tone Standard
  - 2Tone Flutter
  - Hal DXP38 hardware
- Sub-RX (2 decoders)
  - MMTTY (Winritty FSK)
  - 2Tone Standard



SO2R

2010 survey



- 12% operate SO2R
- 30% of SO2R users use 2 PCs

SO2R

- Higher rate and mults; less 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 SOnR

No time to watch TV or read spy novels!

SO2R

M2 configuration

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!

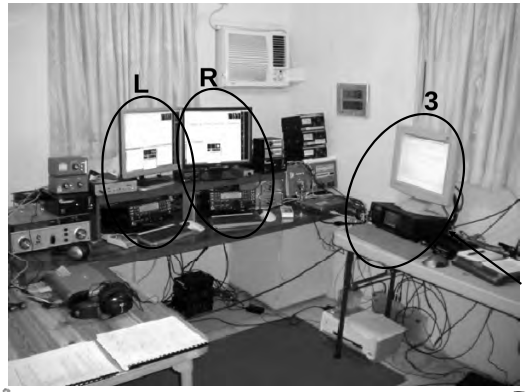
SOnR

> 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

SOnR

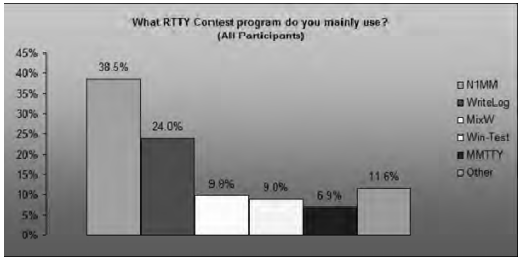
Multi-Multi configuration



dedicated to 10 meters

Logging Software

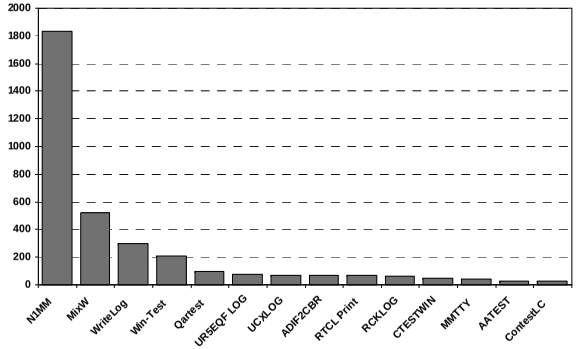
2010 survey



- MixW still ahead of Win-Test
- MMTTY used stand-alone

2012 CQ WPX RTTY

3550 submitted logs



Logging Software

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

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

Logging Software

	WriteLog	N1MM	Win-Test
MMTTY	☻	☻	☻
2Tone	☻	☻	-
other decoders	☻	some	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*

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

Logging Software

MMTTY integration

- Install free MMTTY software
- Logger integrates MMTTY
  - WriteLog requires additional MMTTY plug-in SW
- All three loggers
- Integrated excellent encoder/decoder

Logging Software
stateful Enter key

- Stateful Enter key (ESM=Enter Sends Message)
  - Cursor in call sign field:
    1. Sends CQ if Call Sign Window empty, else
    2. Sends call sign & exchange
  - Cursor in exchange field:
    3. Sends TU/CQ
- N1MM Logger highlights active key(s)

- All three loggers
- Efficient keyboarding

Logging Software
accelerator keys

- Insert grabs call sign & sends exchange
- + logs QSO & sends TU/CQ

- All three loggers
- Saves keystrokes

Logging Software
automatic QRV

- *QRV 28079.3*
- Message parameter for other radio's VFO

- All three loggers
- Efficient QSY, mult move or "self-spotting"

RTTY Contest Loggers
relative ratings

WL	*N1*	*WT*	*Logger*
5	3	4	• RTTY window readability
5	4	0	• Multiple decoders
5	4	0	• multiple MMTTY or 2Tone
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	3	5	• AFSK/FSK flexibility
40	***36***	***23***	***Overall***

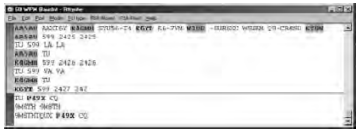
Logging Software

RTTY Window Readability

N1MM Logger

Colored text is difficult to read, especially the dark blue (unworked call) which has negligible contrast to black text or black background. The dark blue cannot be changed by the user. ***HOWEVER …***

WriteLog

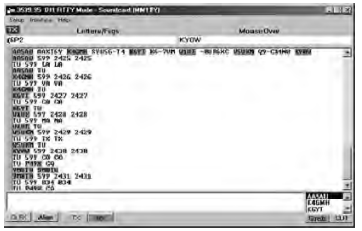


Colored highlighting has outstanding readability. The text all remains black for maximum contrast and the highlighting does not detract. Rather the large highlight area around the text make it extremely easy to zero in on the call sign of interest, especially when quickly moving one's eyes between multiple windows.

Logging Software

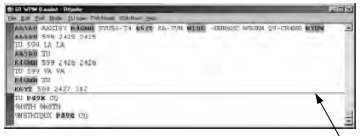
RTTY Window Readability

N1MM Logger



Colored text is difficult to read, especially the dark blue (unworked call) which has negligible contrast to black text or black background. The dark blue cannot be changed by the user. ***HOWEVER, there is now an option for highlighting like WriteLog and WinTest.***

WriteLog



Colored highlighting has outstanding readability. The text all remains black for maximum contrast and the highlighting does not detract. Rather the large highlight area around the text make it extremely easy to zero in on the call sign of interest, especially when quickly moving one's eyes between multiple windows.

WriteLog is unique in having a NON-SCROLLING RTTY window, so you don't have to chase text up the screen!

Logging Software

multiple decoders

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

- 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

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

SO2R

M2 configuration

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

- Only WriteLog
- Another user preference alternative; SOnR

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

Logging Software

re-mapped 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.

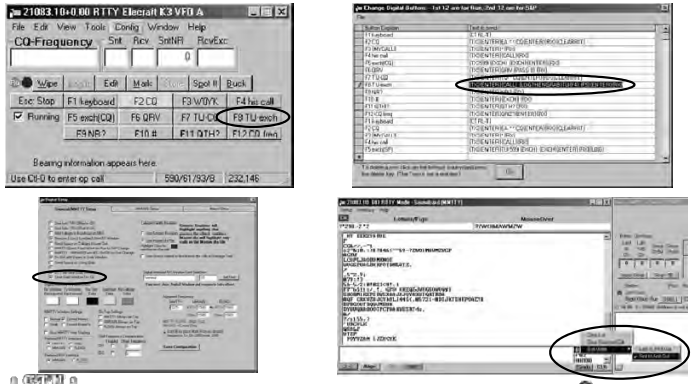
Logger Software

callsign stacking: N1MM Logger

- Setup:
  - Create a F8 message (macro):
    - {TX} ! {LOGTHENGRAB}TU NOW {F4}{F5}{RX}
    - ! or F4: his call; F5: CQ-exchange … your choice of Fn
  - Configure the Grab window:
    - Choose “Clear Grab window with CQ” (on DI tab of Configuration window)
    - Choose “First In, First Out” (right-click Grab window)
- Operate:
  - Each highlighted call in DI window automatically goes into Grab window
  - Send this macro in place of TU/CQ macro when you want to work the next call in stack
  - Sending the CQ message clears the Grab window
  - Delete calls from stack by right-clicking and choosing “Delete”

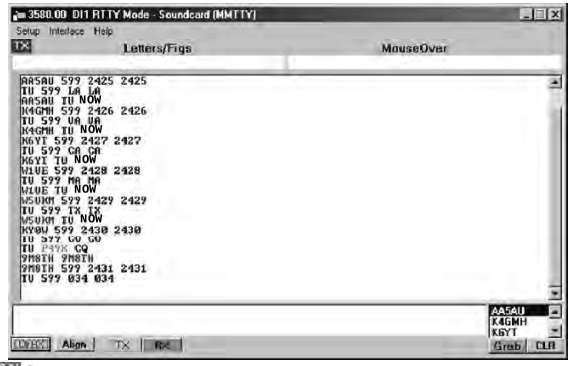
Logging Software

callsign stacking: N1MM Logger - 2



Logging Software

callsign stacking: N1MM Logger - 3



Logger Software

callsign stacking: N1MM Logger - 4

Alternatively, the Call Stack may be used:

- Setup:
  - Create a F8 message (macro):
    - {TX} ! {LOGTHENPOP}TU NOW {F4}{F5}{RX}
    - ! or F4: his call; F5: CQ-exchange … your choice of Fn
- Operate:
  - Alt-click a callsign to push it onto the Call Stack
  - Send this macro in place of TU/CQ macro when you want to work the next call in stack
  - Sending the CQ message clears the Call Stack
  - Delete calls from the Call Stack by right-clicking and choosing “Delete”

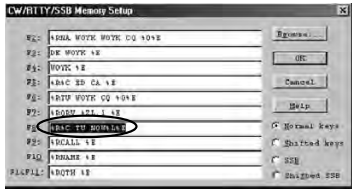
Logging Software

callsign stacking: WriteLog

- Setup:
  - Configure right-click for Push-only in writelog.ini:
    - [RttyContextMenuEntries]
    - 1=PUSHCALL
  - Define Push and Pop keys, using the Keyboard Shortcuts feature:
    - Push Call on the Graves (~) key
    - Pop Call on the Equals (=) key
  - Create <TU NOW msg>
    - %R%C TU NOW%L
- Operate:
  - Push calls onto stack
    - configure right-click for single menu item
    - right-click call in Rttyrite window
  - At the end of the current QSO, press <TU NOW msg> followed by the Insert key or Enter key (the normal CQ-exchange msg)
  - Press TU/CQ msg (rather than + or Enter) when you don’t want to pop the stack for your next contact
  - Pop/Push to rotate the desired call into Entry window without losing others (replace Push with Alt-W to delete a call, or do another Pop)

Logging Software

callsign stacking: WriteLog - 2

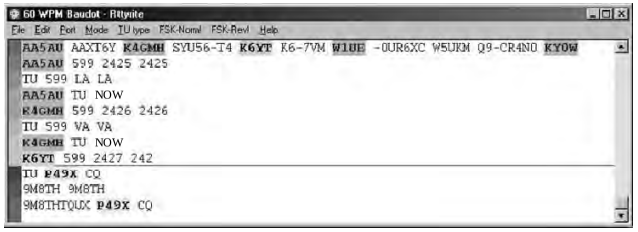


- Create Fn macro
  - %R%C TU NOW%L%E

- Push calls onto stack
  - Right-click call in Rttyrite window

Logging Software

callsign stacking: WriteLog - 3



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	3	4	• RTTY window readability
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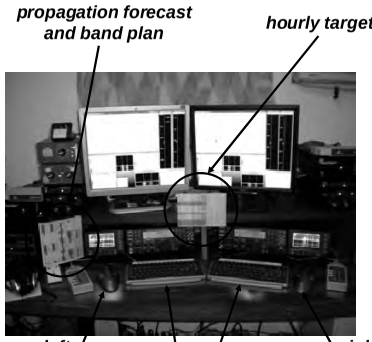
5	3	5	• AFSK/FSK flexibility
40	***36***	***23***	***Overall***

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

Ergonomics

right-sized keyboard

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

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/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)
  - N1MMLogger@yahoogroups.com (N1MM Logger general)
  - N1MMLogger-Digital@yahoogroups.com (N1MM Logger RTTY & PSK)
  - writelog@contesting.com (WriteLog)
  - support@win-test.com (Win-Test)

WRTC2014 for "The Rest of Us"

Doug Grant, K1DG

The Olympic Analogy

- The medal winners
- The other competitors
- Visitors/spectators on-site
- TV audience around the world

WRTC is a huge thrill for the winners

…and for everyone on-site

YOU can play a part

- Get on the air!
  - Teams need QSOs!
  - Spend a few minutes listening to the best in the world
  - Chase the awards
- Send in your log promptly!
  - Makes the log-checking more accurate
  - We have 36 hours to determine the winners

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How to Find The Teams

- Link at www.wrtc2014.org to K6TU.NET Propagation tools site
  - Enter your antenna, etc.
  - It tells you best time for each band
- All 1x1 1st-area calls will be WRTC2014 Teams
  - Calls not used: W/K/N 1 (J Q Y H E), N 1 I
  - Keep your checklist handy

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Awards

- "Worked All WRTC2014": work all 59 Teams
  - Any band, mode, combination
- Top 10 Band-mode totals
  - 590 maximum!
  - In 2013 (25 station Test Run), WK5T worked 132
- All logs submitted by 1600Z go into a drawing for 100 "WRTC2014 Assistant Judge" hats
  - Send logs to normal IARU robot (IARUHF@iaru.org)

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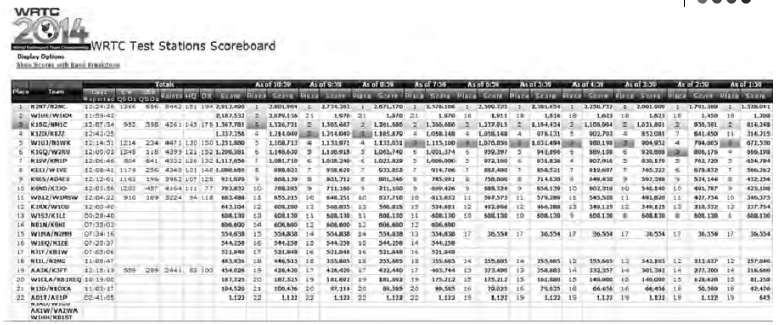
Watch the Real-Time Scoreboard



- Raspberry Pi system reads score from Team's networked PCs
- Decodes packets
- Uploads to Web via cellular modem
- Tested in 2013 with 22 stations, ran flawlessly

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Help us keep the game fair

- Work ***all*** the teams
  - Not just your friends/countrymen
- Please NO cheerleading!
  - Spot all teams
  - Don't identify them if you recognize the voice/fist
- Please NO "club roster" QSOs!
- "Unique" QSOs will not be counted

The World is Watching!

- The contest ***must*** be fair
- Highest possible levels of friendship and sportsmanship
- An excellent opportunity to promote ham radio to the public

Thank you!

CTU Presents

Radio Contesting's Future

Tim Duffy K3LR

CTU Chairman

Contest University Update

- 8th year for Dayton CTU
- Over 3500 students have now attended CTU
- CTU Live Stream thanks Icom
- Strategic Partnership with the NCDXF
- CTU at the ARRL Centennial this July
- Support the vendors that support CTU
- Look for more exciting CTU developments

Getting the most out of CTU 2014

Ask lots of questions this weekend and keep notes – if you are not asking questions you are falling behind!

- Meet someone totally new and ask them why they came to CTU and what interests they have
- Share some of your "secrets" with others here at CTU
- Commit to giving a CTU related talk or write a contesting article - in the next 12 months.

K3LR 2014 Notebook

- Make sure you use the best coax connectors possible.
- Always weatherproof your outdoor connections
- Check, Double Check, Re-Check
- Develop a pre contest "Proof Of Performance" plan – KEEP NOTES!
- The DX Engineering RG-5000 Receiver Guard is a good idea.

What will Contesting be in 10 years?

- Be voracious about reading contesting news.
- Take an interest in helping new hams to become involved in contests.
- Maintain the contesting good name – do the right thing – be a model operator.
- 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.

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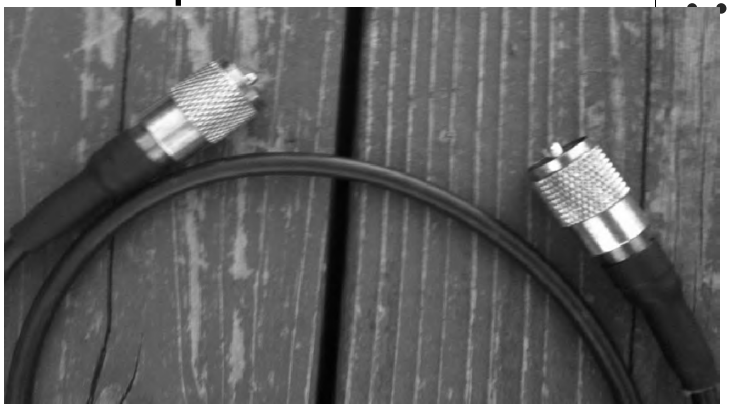
It's 2359 Zulu – Are you worried about your connectors?

CONTEST UNIVERSITY ICOM

Use the best connectors possible – here is a premade cable



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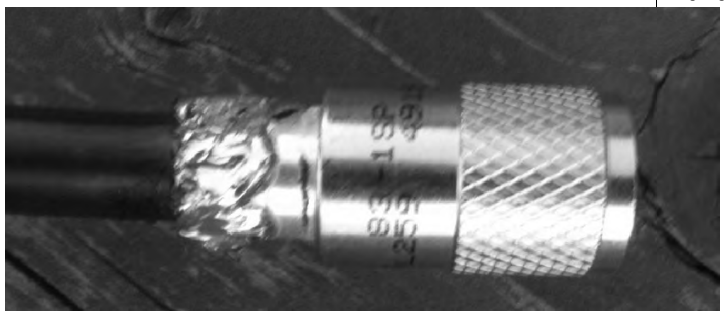
See Article in November 2012 QST



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Your Commitment to Contesting

- I hope you add to, change or improve your own antenna system this year! Try something different. BE CAREFUL!
- Share your contesting passion with others – help THEM put up or fix an antenna.
- Get on the air and operate. Teach others 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 experience!

CQ CONTEST UNIVERSITY

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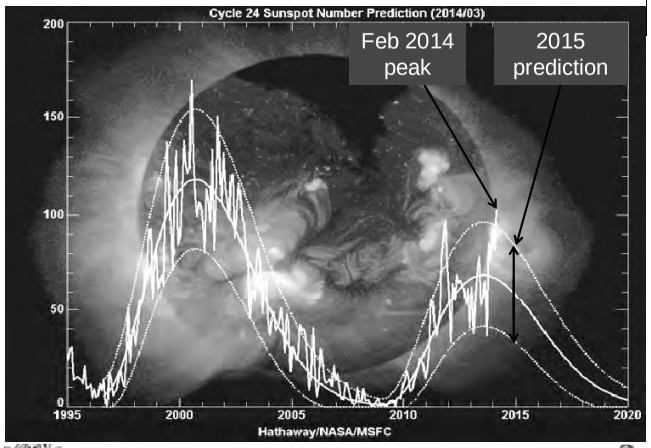
Tower, Antenna and Feedline Maintenance and Improvements

Improving the competitive performance and long term reliability of your tower, antennas and coaxial cables

Frank Donovan
W3LPL

Dayton 2014

This is a Great Time to Improve and Maintain Your Antennas!



http://solarscience.msfc.nasa.gov/images/ssn_predict_l.gif

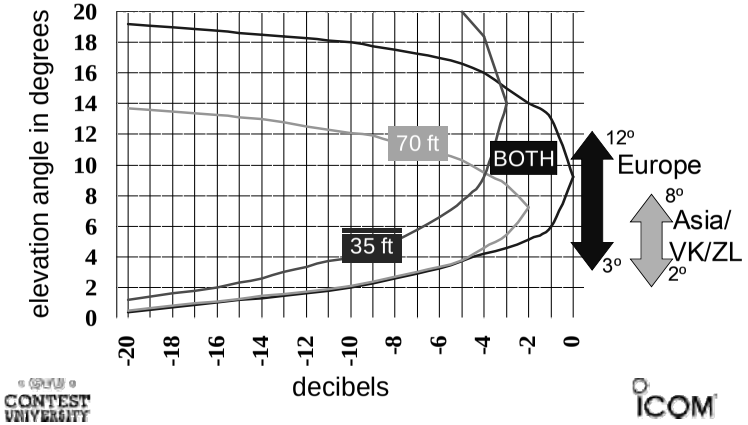
Improving the Competitive Performance of a Single Tower Station

- 50-60 foot tower and a small rotator (e.g., HyGain Ham-IV)
  - small tribander, 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 tribander such as the SteppIR 4 element Yagi
  - 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 HyGain LJ series on ring rotators
  - 80 meter dipole and a 160 meter inverted-L

Improving the Competitive Performance of 10 Meter Antennas

- 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 extensive radials
- Moderate gain: a tribander, small Yagi, Hex-beam or quad
  - a small Yagi 25-50 feet high will produce good results
  - a small Yagi at 30-50 feet high for Sweepstakes and Field Day
- High gain: a full size tribander, small monoband Yagi or quad, at 50-70 feet high for excellent DX results
- Highest gain: two stacked monoband Yagis on a 60-70 foot tower (or 90-120 feet high for three stacked Yagis)
  - stack switching (a “stackmatch”) provides high payoff at low cost

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



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The Array Solutions Stack Match

www.arraysolutions.com/Products/stackmatch.htm

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ICOM

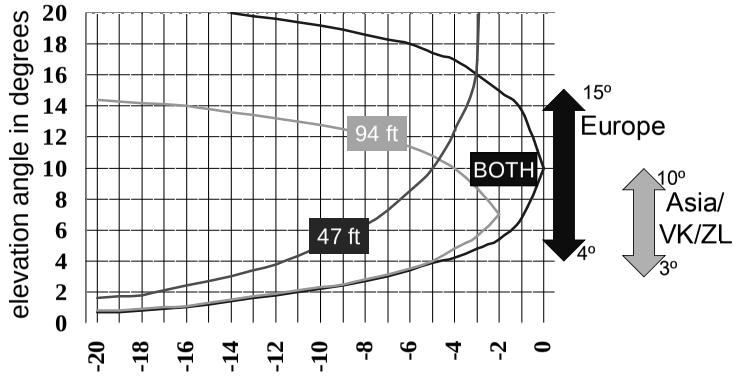
Improving the Competitive Performance of 15 Meter Antennas

- Horizontal polarization is always your best choice
  - if you can install your antenna 35 feet high or higher
  - otherwise use a four-square vertical array with extensive radials
- Moderate gain: a tribander, small Yagi, Hex-beam or quad
  - a small Yagi at 35-50 feet high will produce good DX results
  - a small Yagi at 35-50 feet high for Sweepstakes and Field Day
- High gain: a full size tribander, small monoband Yagi or quad at 70-90 feet high for excellent DX results
- Highest gain: two stacked monoband Yagis on a 80-100 foot tower (or 120-140 feet high for three stacked Yagis)
  - stack switching (a “stackmatch”) provides high payoff at low cost

CONTEST UNIVERSITY

ICOM

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



CONTEST UNIVERSITY

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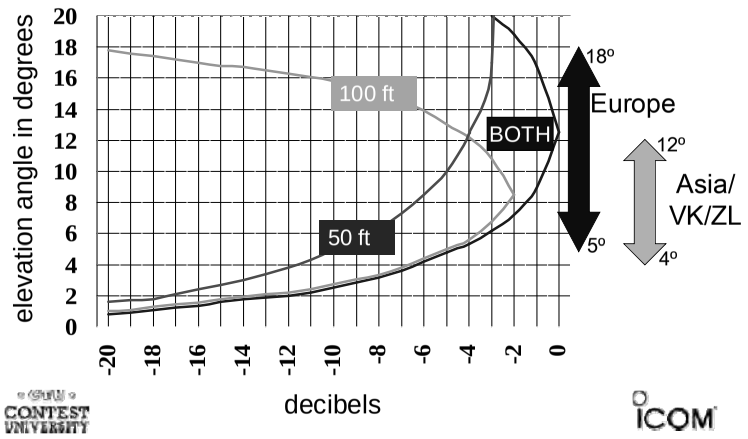
Improving the Competitive Performance of 20 Meter Antennas

- A horizontal Yagi or quad is always your best choice
  - if you can install your antenna 50 feet high or higher
  - otherwise use a four-square vertical array with extensive radials
- Moderate gain: a small tribander, Yagi, Hex-beam or quad
  - a small Yagi at 50-70 feet high will produce good DX results
  - a small Yagi at 40-50 feet high for Sweepstakes and Field Day
- High gain: full size triband Yagi, small monoband Yagi or a quad at 70-100 feet high for excellent DX results
- Highest gain: two stacked monoband Yagis on a 100-140 foot tower (or 170-200 feet high for three stacked Yagis)
  - stack switching (a "stackmatch") provides high payoff at low cost

CONTEST UNIVERSITY ICOM

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



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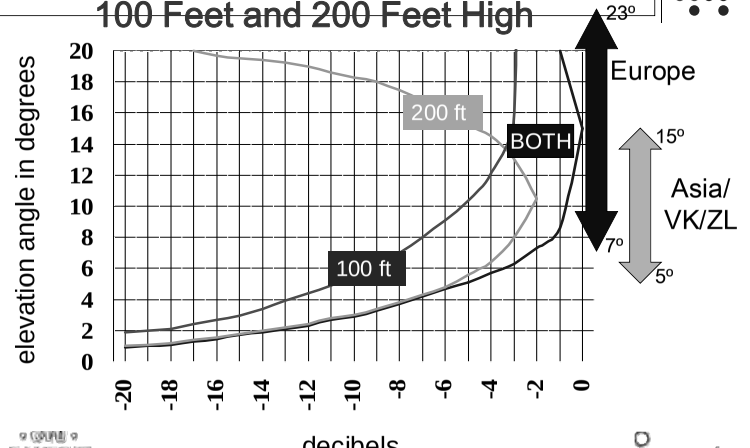
Improving the Competitive Performance of 40 Meter Antennas

- High horizontal dipole at least 70 feet high for DX contests
  - otherwise use a four-square vertical array with extensive radials
  - a dipole at 35-50 feet high 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 www.cushcraftamateur.com/Product.php?productid=XM-240
- 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
  - Beverages and arrays of short verticals

CONTEST UNIVERSITY ICOM

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



CONTEST UNIVERSITY ICOM

Improving the Competitive Performance of 80 Meter Antennas

- High horizontal dipole, at least 70 feet high for DX contests
  - 50-70 feet high for Sweepstakes and Field Day
- A single full size vertical or a vertically polarized delta loop
  - well separated from all nearby tall towers
    - at least 70 feet from nearby towers over 40 feet tall
    - much more than 70 feet of spacing optimizes performance
- A short inverted-L or T-vertical is a very good alternative
  - as little as 25 feet tall
  - supported from a tower or trees
- Use at least 32-64 shallow buried radials
  - at least 70 feet long, or
  - at least two (but preferably four or more) elevated 65 foot radials
    - but only if buried radials are impossible

CONTEST UNIVERSITY ICOM

Improving the Competitive Performance of 160 Meter Antennas

- A single full size vertical or a vertically polarized delta loop
  - well spaced from all nearby tall towers
    - at least 140 feet from nearby towers over 80 feet tall
    - spacing much more than 140 feet optimizes performance
- A short inverted-L or T-vertical is a very good alternative
  - as little as 50 feet tall
  - supported from a tower or trees
- Use at least 32-64 shallow buried radials
  - At least 130 feet long
  - or at least two (but preferably four or more) elevated 125 foot radials
    - but only if buried radials are impossible

CONTEST UNIVERSITY ICOM

4-Square Vertical Array for 80 and 40 Meters

- A four square vertical array is very competitive with very high horizontal Yagis and quads on 80 meters and is also an excellent receiving antenna
  - install at least 70 feet from all other towers
    - more spacing will significantly improve its performance
  - at least 30-60 slightly buried radials under each vertical
    - at least 70 feet long on 80 meters
    - at least 35 feet long on 40 meters

CONTEST UNIVERSITY ICOM

The Comtek 4-Square Controller

CONTEST UNIVERSITY www.dxengineering.com/search/brand/comtek ICOM

Receiving Antennas for 160 and 80 Meters

- What happened to the Beverages at K3LR and W3LPL?
  - Large arrays of short verticals with performance similar to a five element Yagi
- High performance 4-square receiving antennas in a small space
  - Significantly better performance than Beverages
- See the separate receiving antenna presentation by W3LPL at this years Contest University

CONTEST UNIVERSITY ICOM

Coaxial Cables Can Make or Break Competitive Performance

- How well you select, install, waterproof 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
  - inappropriate coaxial cable
  - inappropriate or incorrectly installed connectors
  - loose connectors
  - improper installation practices such as bundling cables
  - failure to perform annual inspections

CONTEST UNIVERSITY ICOM

Improving the Competitive Performance of Coaxial Feedlines

- Coaxial cable loss, proper connector and cable installation and annual inspections are the most important concerns
  - 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 flexible coaxial cable must be used 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 a short service life in the harsh environment of a tower
    - Never use for direct burial or laid on wet ground

CONTEST UNIVERSITY ICOM

Improving the Competitive Performance of Coaxial Cables for SO2R and Multi-Op Stations

- Andrew LDF4-50A Heliax is an ideal choice for lengths up to
  - 300 ft on 10 meters, 400 ft on 20 meters, 600 ft on 40 meters
- Eliminating common cross-station RFI sources:
  - Use Heliax to avoid RFI caused by the dissimilar metals in the aluminum foil and tinned braid shields of Davis RF Bury-Flex cable
  - Signal coupling between RG-213 single braid shielded coaxial cables when they are bundled or run together in conduits
  - Never use nickel plated connectors and adapters
  - Install connectors properly
  - Minimize the use of connectors and adapters as much as possible
    - use only brand name silver plated connectors and adapters

CONTEST UNIVERSITY ICOM

Improving the Competitive Performance of Coaxial Cables for Multi-tower Stations

- Coaxial cables longer than 300 feet are often used in multi-tower stations
  - Andrew LDF5-50A Heliax is an ideal choice for lengths up to
    - 600 feet on 10 meters
    - 700 feet on 15 meters
    - 900 feet on 20 meters
    - 1200 feet on 40 meters
- Be cautious of the windload and weight (including ice load) of large Heliax cables mounted on towers

CONTEST UNIVERSITY ICOM

Coaxial Cable Inspections

- Inspect all indoor and outdoor coaxial cables, connectors and waterproofing for evidence of damage, cuts, cracks, moisture intrusion or improper installation
  - antenna feedpoint 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 in your station
  - all SO-239 chassis connectors on equipment in your station
- if in doubt, remove the connector for detailed inspection
- verify that all indoor and outdoor connectors are wrench tight
  - ¼ turn

CONTEST UNIVERSITY ICOM

Selecting and Maintaining Low Loss Coaxial Cables

- Select appropriate low loss coaxial cables for each antenna
- Preserve your investment
  - water and moisture entry is a persistent threat
- Hard-line (e.g., Heliax or 75 ohm CATV) coaxial cables are the best choice for cable runs longer than 100 feet
  - RG-213 and other flexible jacket coaxial cables are very susceptible to physical damage and water entry
    - a pin hole can quickly cause a high loss cable
    - carefully protect your coax cables from physical damage and water entry
- Preserving long term performance
  - test and inspect your cables and connectors annually

CONTEST UNIVERSITY ICOM

Maintaining the Competitive Performance of your Antennas

- Annual inspections are the most effective step you can take *to* maintain the competitive performance of your tower, antennas and feedlines
  - the environment continually attacks and degrades tower, antennas and coaxial cables
  - degradations are often gradual and not noticed for years
  - inspections can help avoid unplanned mid-contest and mid-winter emergency repairs

CONTEST UNIVERSITY ICOM

Antenna Performance Measurements Inside Your Shack

- Immediately after installation, make a record of the following measurements at the hamshack end of every coaxial cable:
  - VSWR across the entire band(s)
  - Coaxial cable resistance
    - typically either a fraction of one ohm or many megohms
  - TDR and/or VNA plots
    - you should own at least one of these excellent tools!
- Well before your next competitive contest, repeat your measurements on every coax and verify that your measurements:
  - have not changed relative to your records
  - are not erratic
  - any change (better or worse) requires detailed investigation

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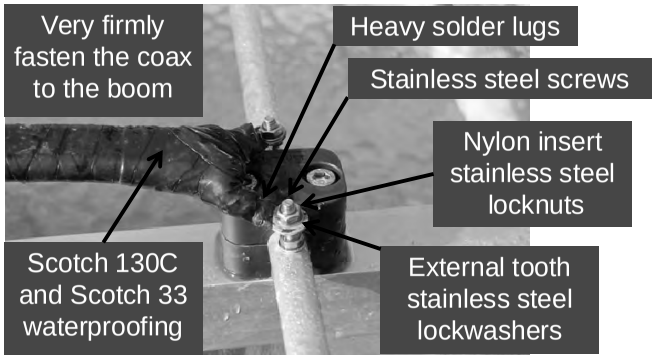
Antenna Feedpoint
Waterproof and Shakeproof Connections



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Antenna Rotation Coax Cable Installation and Inspection

- 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 the coax jacket
  - rotators with more than 360 degrees of rotation make this extremely difficult to achieve
- Name brand, high quality RG-213 is a good choice
  - 95% shield, stranded center conductor, solid dielectric
  - black UV-resistant jacket
- Replace the coax whenever you discover abrasion or damage during annual inspections
- Replace the antenna rotation coax at least once every ten years

CONTEST UNIVERSITY ICOM

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 concerns are unusually severe in your environment, implement additional protective measures
- Heliax and CATV hardline must be firmly fastened to the tower at least every to 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 cover plastic tie-wraps to protect them from ultra-violet radiation

CONTEST UNIVERSITY ICOM

Improving the Reliability of Coaxial Cable Connectors

- N and UHF connectors are the most common choices
- Insignificant loss in both N and UHF connectors at HF
- Insignificant difference in the VSWR of N and UHF connectors at HF
- High quality silver plated UHF connectors provide much more center pin mating force than N connectors
  - eliminates cross-station interference and connector failures from frequently unreliable N connector center pin mating force
  - avoid saving a few dollars on cheap unbranded hamfest connectors
- Avoid use of adapters, but if necessary be sure they are name-brand silver plated adapters, not nickel plated
- Always use a wrench to tighten UHF connectors 1/4 turn

CONTEST UNIVERSITY ICOM

Coaxial Cable
Amphenol 83-1SP PL-259 Connector

Mouser Electronics part number 523-831SP

http://www.mouser.com/MobileCatalog.aspx?page=1369

This is not the place to save money

CONTEST UNIVERSITY ICOM

High Reliability Coaxial Cable 83-1SP Connector Installation

http://wwwww.k3lr.com/engineering/pl259/

An unconventional but superior method

CONTEST UNIVERSITY ICOM

Coaxial Cable Connector Waterproofing

Cover the 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

CONTEST UNIVERSITY ICOM

Tower
Maintenance and Inspections

- Inspect all tower sections one year after installation
  - then at least once every three years
  - after every serious storm
  - after any structural damage to the tower
- Check plumb and twist of the tower
- Pay special attention to damaged, loose, missing or corroded:
  - diagonal and horizontal trusses, welds and hardware
  - especially at and close to the guy attachments

Beware of used or corroded tubular tower sections

Regular inspections are key to safety and long term tower survival

Tower Base
Maintenance and Inspections

- Inspect at least once every three years
- Pay special attention to:
  - corrosion at the tower-to-concrete interface
  - standing water on the foundation
  - dirt and debris accumulated on the foundation
  - settling and cracks

Dirt and debris accumulation on your tower foundation can lead to catastrophic tower failure

Guy Anchor
Maintenance and Inspections

- Inspect at least once every three years
  - dig down at least six inches to inspect for anchor rod corrosion
  - missing hardware
  - loose hardware
  - corroded hardware

Anchor rod corrosion is a very serious threat to tower safety survival

Guy Wire
Maintenance and Inspections

- Inspect at least once every three years
- Inspect after all serious storms
- Check guy wire tension (7-15% of breaking strength)
- Check for:
  - damage from rubbing of chaffing of guy wire
  - corrosion
  - loose hardware

Corroded guys and hardware risk catastrophic tower failure

Guy Attachment (tower and anchor) Maintenance and Inspections

- Inspect guys attachments at least once every three years
- Check all guy attachment hardware
  - missing or loose turnbuckle safety wires
  - loose, missing or corroded hardware
  - guy wire chaffing or rubbing
  - integrity of the tower structure in the vicinity of each guy attachment
    - damaged tower structural components
    - broken welds
    - loose or missing hardware

Replace all degraded or missing guy attachment hardware

Lightning Protection Maintenance and Inspections

- Inspect all ground wire connections at least once every three years
  - loose or missing hardware
  - missing wires
  - broken wires
  - corrosion

Repair all damaged or missing ground wires and connections

Rotator Maintenance and Inspections

- Inspect three months after installation
- Inspect every three years
- Check for:
  - excessive mechanical play in the wind
  - corroded hardware

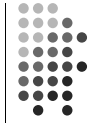
An under rated rotator will be a major maintenance problem

Antenna and Mast Maintenance and Inspections

- Inspect at least once every three years
  - loose or missing antenna hardware
  - loose or missing boom truss hardware
  - corroded hardware
  - ultra violet radiation damaged hardware
  - coaxial cable electrical connection to the antenna
    - water entry is a persistent threat
  - coaxial cable physical connection to the antenna
  - damaged structural components

Coaxial cable connections to your antenna are easily damaged by wind, rain and UV

Tower, Antenna and Coaxial Cable Inspections Summary



- Annual inspections are essential to long term tower, antenna and coaxial cable safety, reliability and station competitiveness
- Conduct major inspections
  - during the first year after construction or major modifications
  - at least every three years
  - after serious storms or damage

Annual inspections are essential to tower, antenna and coaxial cable safety, long term reliability and competitiveness

2013 / 2014 Rig Contest Results
+
Test Data Means What?

Rob Sherwood
NCØB

How to optimize rig performance

Sherwood Engineering

- **What is important in a contest or DX pile-up environment is still the same in 2014.**
- Good Dynamic Range to hear weak signals in the presence of near-by strong signals.
- You need a better receiver for CW than for SSB.
- 2013 / 2014 Contest performance observations
- **How does published test data relate to on-air chance of overload?**

What New Rigs have Shipped?

Announced rigs that actually shipped in 2013:

Hilberling PT-8000A @ $18,000

Kenwood TS-990S @ $8,000

Flex 6000 series @ $4,300 to $7,500

Ten-Tec Argonaut VI + 418 amp @ $1,780

Elecraft KX3 with KXPA100 amp* @ $1,750

(All of these used in contests in 2013 & 2014)

* The KXPA100 shipped in 2013

Comments about the new rigs?

Hilberling updated filter boards for better CW performance.

Kenwood TS-990 great bandscope with a very clean transmitter
Was my favorite contest rig in 2013.

Flex finally filled back orders and shipped V 1.00 & V 1.1 software
Excellent electrical performance. UI still being developed.

T-T Argonaut VI + 418 amp has excellent QSK (Any QRPers here?)

Elecraft KX3 + KXPA100 a flexible QRP / 100 watt option
(KX3 QSK not as good as K3 QSK or T-T QSK)

How did new rigs actually perform?

- Hilberling's new CW filter was a big improvement.
- The TS-990S was a joy to use on SSB & CW.
- Flex 6700 performed very well in CQ 160 CW contest, but required two computers.
- Argonaut VI + 418 + Acom 1000 performed well, but lacks some features.
- KX3 also worked well in W1BB CW contest but QSK was disappointing

Details - Hilberling PT-8000A

- Covers 160 – 2 meters
- 16-Pole crystal filters, plus audio DSP
- All factory hardware and software updates need to be installed.
- New 250 Hz crystal CW filter selection was mandatory for better CW performance.
- 250-Hz 16-pole Xtal + 200 Hz audio DSP OK
- 100-Hz audio DSP in QRM not satisfactory
- Used in ARRL 160-meter CW contest

Details – Kenwood TS-990S

- Main receiver down conversion all bands
- Third-order transmit IMD excellent at -40 dB
- Band scope very effective
- Excellent low-fatigue receive audio
- Price competitive with competing flagship products of other OEMs
- RMDR is its weakest point, but should rarely be an issue in most environments.
- Used in CQWW SSB, ARRL 10 M & ARRL 160 M CW contests. - Wonderful

Details – Flex 6700

Fantastic band scope with amazing resolution

Used 16 hours in CQ 160 meter CW contest

Clean audio, very low fatigue, minimal ringing

Tuned receiver with external Pod

UI is in an early stage of development.

Preamp gain selections are odd.

Required two separate computers, one for N1MM and SmartCAT for band data, plus second computer to actually run SmartSDR.

Will the need for two computers be a problem?

Ten-Tec Argonaut VI + 418 Amp

- QSK with 418 and Acom 1000 worked well
- DSP noise blanker limited below 725 Hz BW
- Used Timewave DSP-59+ for extra selectivity and to drive external speaker
- Reasonable choice for QRP contesters who operate at home and in the field.
- Does not cover 12 or 6 meters.
- Are missing bands a big problem? Hands?
- Ergonomics a bit sparse

Details – Elecraft KX3

- Amazing tiny radio that performs well
- Performed well in 2012 Stew Perry contest
- QSK a disappointment with lots of clicks on receive audio
- DSP provides good bandwidth control
- Needs KXPA100 to drive any linear 1.5 kW
- Opposite sideband rejection is its performance limit, being around 60 dB.
- May require frequent SSB null calibration
- Definitely a QRP contester consideration

How does published test data relate?

In 1975 QST and *Ham Radio Magazine* changed the way receivers were tested. Before that all we had was data on Sensitivity, Selectivity and maybe Cross Modulation.

Now reviews and advertisements touted Dynamic Range, Noise Floor and possibly Noise Figure.

(Noise Figure relates to Noise Floor, but is filter bandwidth independent.)

What is often not understood is 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

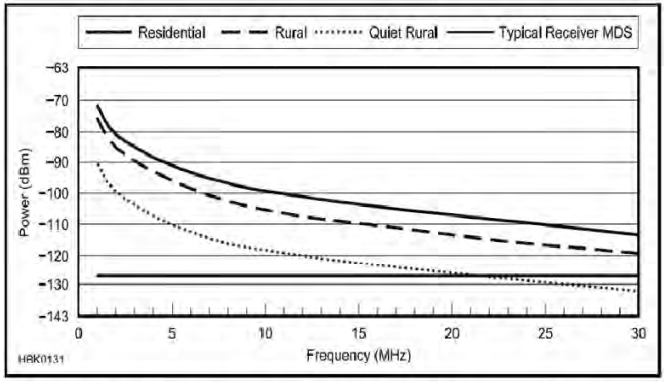


Fig 1 — Typical noise levels versus frequency for various environments. (Man-made noise in a 500-Hz bandwidth, from Rec. ITU-R P.372.7, *Radio Noise*)

Most Radios are designed for 10 meters

It is easy to assume that a -140 dBm noise floor is better than a -130 dBm noise floor.

If band noise on 20 meters is typically -110 dBm, of what value is a receiver noise floor that is 20 to 30 dB lower than band noise?

The short answer is that it isn't useful, unless we operate our receiver in an optimum way. (Use your attenuator on the lower bands.)

Two things to remember:

Band noise easily changes 10 dB depending on beam heading.

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

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

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

Typical receiver noise floor values

Rig	Preamp OFF	Preamp ON
Pro III	-132 dBm	-140 dBm
TS-990	-127 dBm	-138 dBm
K3	-130 dBm	-138 dBm

- ITU band noise on 40 meters is around -100 dBm, while typical receiver noise floor (no preamp) is -130 dBm, or 30 dB lower !

What does all this imply?

- For most radios: Up-conversion / down-conversion
- On the lower bands, attenuation is often appropriate.
- There is no point in band noise reading upscale on your S meter.
- A preamp is rarely needed on 20 meters.
- A preamp would never be needed on 40 meters and below, assuming the transmit antenna is used on receive.

Where do these examples not apply?

- Direct sampling radios are very different
- Their overload point is much higher, and the noise floor is also much higher without a preamp
- Examples of direct sampling radios:
- Perseus receiver (CW Skimmer)
- Apache ANAN-100D
- Flex 6500 or 6700

Some comparison data

Rig	Noise Floor Preamp Off / On	Noise Figure Preamp Off / On
Icom Pro III	-132 dBm / -140 dBm	12 dB / 4 dB
Elecraft K3	-130 dBm / -138 dBm	14 dB / 6 dB
Kenwood 990S	-127 dBm / -138 dBm	17 dB / 6 dB
Flex 6700	-118 dBm / -134 dBm	26 dB / 10 dB

For classic radios with normal mixers (up-conversion or down-conversion) attenuation is often helpful in potential overload conditions (contests / DX pile-ups) on 40 meters and below. Possibly even on 20 meters.

For direct sampling radios, attenuation would rarely be needed, but a preamp would be useful on 15 meters and up.

How do we chose a new transceiver?

- On most bands receivers are too sensitive.
- Make the *most* of the radio's dynamic range by properly using the attenuator and using the preamp only when necessary.
- Published dynamic range can be misleading, depending on how it is measured. Read the fine print, as I discussed last year.
- 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 contest conditions is critical.
- A lab setup can never approximate CQ WW !

Important factors to consider

- Note: Use of the 6, 10 or 12 dB attenuator does affect the AGC threshold, so there may be a compromise between AGC and potential overload improvement.
- Contest Fatigue is a subject I have been harping on for years.
- What makes us tired in a contest beyond just the hours on the air?

Examples of Contest Fatigue Issues

- Distortion in the audio from the product detector & audio amp or DSP artifacts.
- A very fast AGC decay, though at time necessary, fills holes between words on SSB or letters on CW with noise.
- Few radios have an adjustable AGC threshold, but can use RF gain control.
- Flex 6000 series does remember AGC threshold by band (not by mode/bandwidth).

How to cope on noisy bands

- Set the AGC threshold so punching in 6 dB attenuation definitely drops the band noise.
- If the band noise is as loud as a weak but Q5 signal, this adds to fatigue.
- If your receiver has hiss or hum in your phones, consider plugging your phones into a speaker that has high-pass and low-pass filters.
- Examples: Icom SP-20, SP-23 or SP-34
- Yaesu SP-2000 or Kenwood SP-990

Transmit IMD Needs to be improved

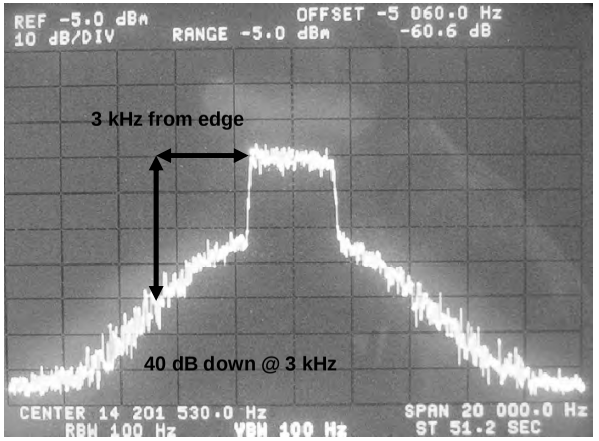
- Receivers have improved dramatically over the past 10 years, but rarely so transmitters.
- AI0L had complaints of being broad.
- Comparing rig A & amp A to rig B and amp B
- Desired sideband was S9 +15 dB
- Opposite sideband with “A” combo = S8
- Opposite sideband with “B” combo = S2
- “A” combo is current rig & solid-state amp
- “B” combo is 30 year old rig & 2x3CX800As

Transmit Intermodulation IC-7410

- White noise fed into mic jack to approximate speech using IC-7410.
- (This is a typical example, not just this rig.)
- Look at the “shoulders” of IMD close-in to the transmit passband.
- If this station is 3 kHz away and is strong, hearing a weak signal will be difficult.

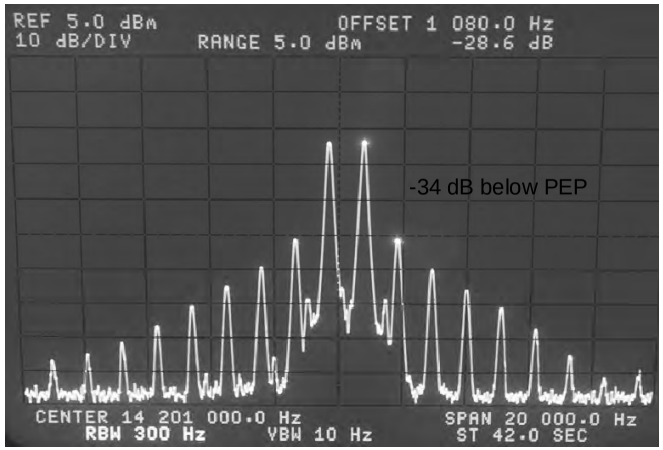
Noise source = GR 1381, 5-kHz -3 dB BW

Icom IC-7410 Class AB, White Noise



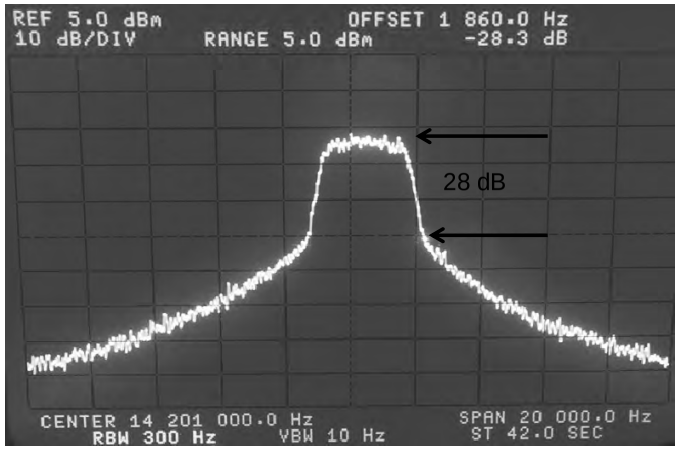
Tones are 700 Hz and 1800 Hz

Icom IC-781 Classic 2-Tone Test 3rd order -28 dB



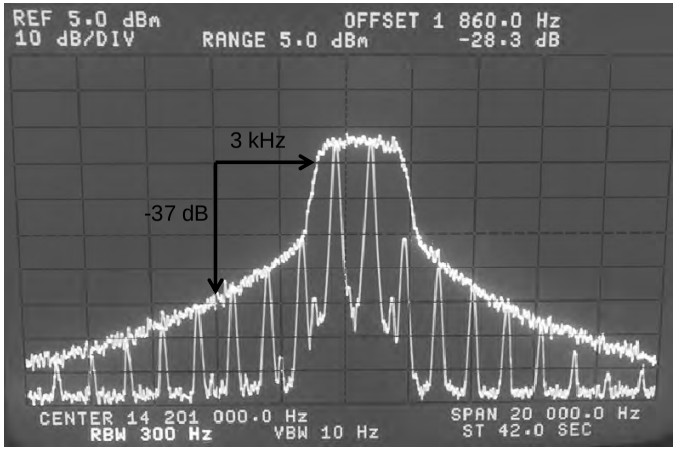
GR 1381 BW = 5 kHz @ -3 dB

IC-781 White Noise Intermodulation Occupied Bandwidth



How Wide Is Your Signal ?

Comparison 2-Tone vs. Noise Intermodulation Bandwidth

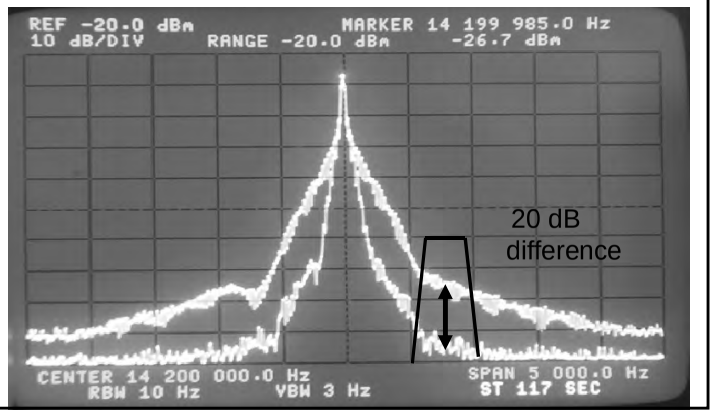


Broad signals Also Exist on CW

- The following slide shows the difference between a rise time of 3 milliseconds vs. 10 milliseconds.
- There is a 20 dB difference in the strength of the key click 700 Hz removed from the transmitting station.
- (Transmitter was a Ten-Tec Omni-VII that has a menu to adjust the rise time.)

Spectrum of CW Signal on HP 3585A Analyzer

Comparison of 3 msec vs 10 msec rise time



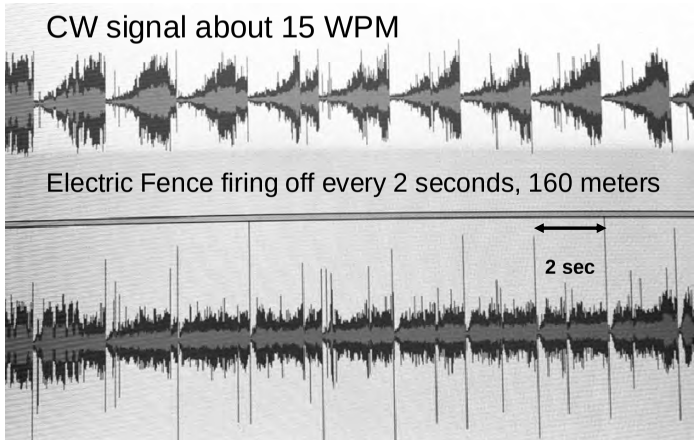
AGC Impulse Noise Anomaly

Most new radios since 2003 exaggerate impulse noise.

Elecraft K3, KX3 & updated Ten-Tec rigs incorporate DSP code that ignores clicks, ticks and pops.

Elecraft calls it the Sherwood Test.

Omni-7 on Top - Pro III on Bottom



Listen to 30 second audio clip

- Audio Icom 756 Pro III
- 160 meters, 4 PM, Dec 13, 2008
- Electric fence & CW signals
- KV4FZ calling DX station
- Note volume level relatively constant

Audio clip with DSP AGC problem

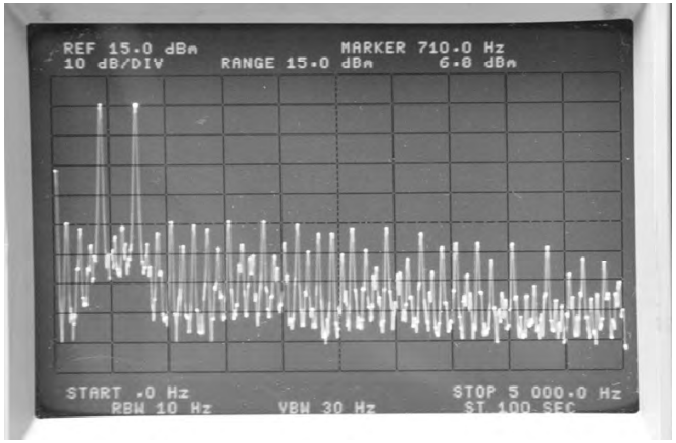
- Audio Ten-Tec Omni-VII
- 160 meters, 4 PM, Dec 13, 2008
- Electric Fence & CW signals
- Exact same signals as with Pro III
- Note AGC being hammered by impulses
- Other rigs with the same AGC problem:
- IC-7800, IC-7700, IC-7600 & IC-7000
- FTdx-9000, FTdx-5000, FTdx-3000
- Orion II & T-T Eagle now fixed.

Contest Fatigue from audio artifacts

- In the “good old days”, a pair of 6V6s in push pull were common. Audio was smooth and pleasant.
- Often today receive audio is an afterthought.
- The rig manufacturers need to be concerned about the noise and distortion beyond the 300 to 3000 Hz bandwidth. Our ears hear much more than 2700 Hz of bandwidth.

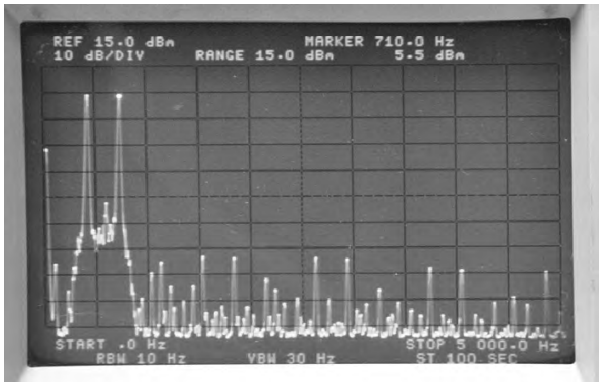
Factory Confirms K3 Audio Problem

Screen shot from Elecraft Lab Fall 2008



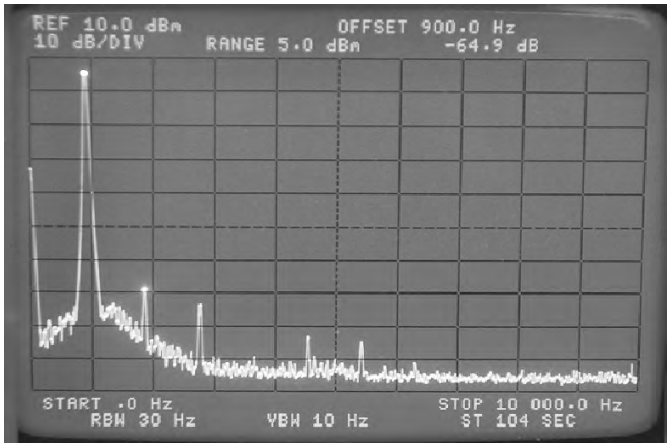
Factory Addresses K3 Audio Problem

K3 After New Choke Installed



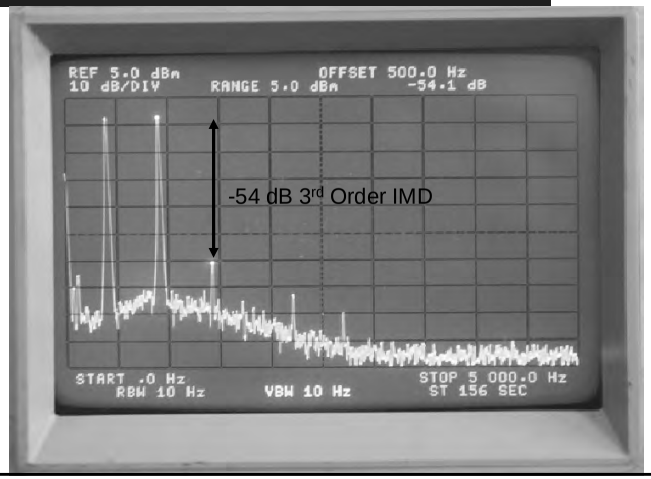
0.1 % distortion

Icom 756 Pro III Harmonic Distortion



< 0.3 % distortion

Icom 756 Pro III in-band IMD Distortion



Choices today on rig selection

- We have rigs from $1000 to $18,000 for sale.
- Many do well in contest conditions.
- It is hard to evaluate on-air performance from some of the published data.
- Many aspects of a radio affect contest scores
- In the end, hopefully you enjoy using your rig on the air !

http://www.NC0B.com

Sherwood Engineering

http://www.sherwood-engineering.com

Videos from past CTU presentations

CTU 2013
http://www.contestuniversity.com/main/page_videos.html

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

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 importing/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

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 call sign 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's zone. 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 standalone 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 standalone box.

Categories: operating software/hardware

See Also:

DQ

Disqualification (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 in a

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 transceiver, 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 call sign 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:

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

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 standalone 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:

Poach

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 solely 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 call sign 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 slightly 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

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

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 rules are still evolving on the validity of this configuration. Some contests, such as the CQ WW's Xtreme category, encourage it.

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 call sign 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

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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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
- 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.

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QTH.com is proud to donate web design and hosting services for Contest University, the Contest Dinner, the RTTY Contest Dinner, the Contest Super Suite and the Top Band Dinner.

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NEW ID-5100A

***Features*[*1]*:**

- Touch Screen Operation
- Analog FM / D-STAR DV Mode
- VS-3 Bluetooth® Headset[*2]
- Integrated GPS Receiver
- FM / DV Repeater List Function
- Enhanced D-PRS Functions with Object Format, etc.
- AM Airband Dualwatch
- RS-MS1A Free Android™ Application[*2*3]
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- SD Card Slot for Voice and Data Storage
- 50W Output Power on VHF/UHF Bands
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HF/VHF/UHF TRANSCEIVER
IC-7100

USB Control Audio

Features:

- Intuitive Touch Screen Interface, Angled Controller with Built-in Speaker
- 100/100/50/35 Watt Output*
- RX: 0.03-199.999, 400-470MHz*
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- 32-bit IF-DSP
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- External GPS Option
- Built-in SD Card Slot

WRTC World Radiosport Team Championship 2014

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*Frequency coverage may vary. Refer to owner's manual for exact specifications.
*1Preliminary features. Features based on preliminary information and may change on final production.
*2Optional UT-133 Bluetooth® headset required. *3Performance may vary, depending on Android™ devices used.

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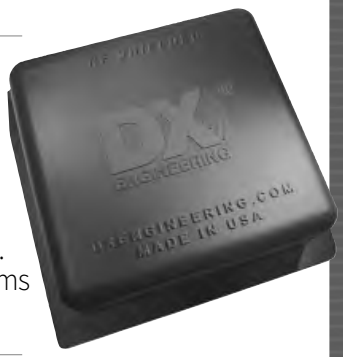
DX Engineering Transmit Four-Square Systems



Available for the 160, 80 and 40 meter bands, these systems let you receive or transmit with 5.5 dB of gain in four selectable directions or you can go omnidirectional with a push of a button. A 20+ dB front-to-back ratio helps reduce interference from unwanted directions. They feature a classic hybrid design and can handle 5 kW CW. These easy-to-setup systems let you listen "all around" and select the best receive direction.

Ameritron AL-1500 HF Power Amplifier

This amplifier lets your transmitter loaf while still delivering the legal limit of 1,500 watts of continuous output power. The AL-1500 features a 3CX1500A/8877 ceramic tube, heavy duty power supply with multiple input voltage ranges and grid overload circuit protection. The RF chamber is sealed to prevent RFI and TVI. This amplifier covers 160-15 meters and can be modified to add 12/10 meters.

RigExpert Antenna Analyzers

Professional broadcasters, telecommunications engineers and serious Amateur Operators all over the planet trust analyzers from RigExpert. They combine functionality, accuracy, durability and ease-of-use. These help you test, check, tune or repair your antennas and feedlines, plus they'll test coaxial cable assemblies and reduce antenna adjustment time.

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