QST

Official Journal of ARRL The national association for AMATEUR RADIO

Devoted entirely to **Amateur Radio**

www.arrl.org

October 2008

QST reviews:

ICOM IC-7700
HF and 6 Meter Transceiver

Inside:

Wideband 10 Meter Yagi

An RF Spectrum Analyzer

Use Coax Inside and Window Line Outside

The Radiosport Issue

Special Radiosport Section Inside!

$4.99 US $6.99 can.

10>

19260

0 843655 9

Visit the *ARRLWeb* at www.arrl.org



NEW IC-7200 HF for the Adventurer

It's what makes the outdoors great!

With a remarkable balance between cost and performance, the IC-7200 opens the door for any new EmComm operator or the long experienced HF operators wanting to work contacts while outdoors. Don't let the small size fool you, this radio is packed full of indoor radio performance. Whether you are involved in emergency planning, on your dream DXpedition, or at your home base, this radio is built for wherever your adventures may take you. *Make your trek to an authorized Icom dealer today!*

Features:

- Class Leading IF DSP and Digital Functions Built-in
- AGC Loop Management Controlled by DSP
- Flexible Selectable Filter Width and Shape
- 6kHz Roofing Filter
- USB Port for CI-V Format PC Control and Audio In/out
- 201 Alphanumeric Memory Channels

ICOM®

Designed for the track...

NEW IC-RX7 Stylish Scanner with Smart Interface

Sleek, fast, and able to hit the track even during a rain storm, the 'RX7 is Icom's first receiver to achieve the IPX4 water resistant rating. Besides its sleek and aerodynamic design, it's what's under the hood that will really put you in the race — power and performance! A newly developed user-interface allows you to zip around the track and frequencies, qualifying you for pole position with Li-ion battery performance that will have your friends hitting the pits way before you. Join the winning circle and visit an authorized Icom dealer today!

Features:

- 0.150 - 1300.000 MHz*
- AM, FM, WFM
- 1650 Alphanumeric Memory Channels
- High Speed Scan and Search
- Computer Programmable (Optional CS-RX7)
- Water Resistance Equivalent to IPX4

...and good for everyday use.

During recent "on-track" tests, the 'RX7 passed expectations with flying colors! Here's what some enthusiasts had to say:

"We were able to listen at all three races, including practice and qualifying without recharging!"

"The ability to select a channel by the car number made listening to the races even more fun!"

"We were able to see the car number, the driver's name, and the race type all at the same time!"

*Frequency specs may vary. Refer to owner's manual for exact frequency specs.

ICOM®

hy-gain® ROTATORS

. . . the first choice of hams around the world!

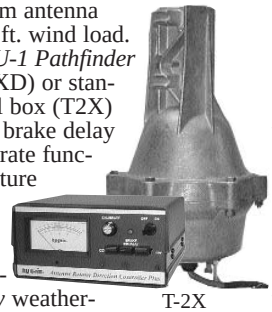
HAM-IV

HAM-IV
$559.95

The most popular rotator in the world! For medium communications arrays up to 15 square feet wind load area. *New* 5-second brake delay! *New* Test/Calibrate function. *New* low temperature grease permits normal operation down to -30 degrees F. *New* alloy ring gear gives extra strength up to 100,000 PSI for maximum reliability. *New* indicator potentiometer. *New* ferrite beads reduce RF susceptibility. *New* Cinch plug plus 8-pin plug at control box. Dual 98 ball bearing race for load bearing strength and electric locking steel wedge brake prevents wind induced antenna movement. North or South center of rotation scale on meter, low voltage control, max mast size of 2 1/16 inches.

HAM IV and HAM V Rotator Specifications	
Wind Load capacity (inside tower)	15 square feet
Wind Load (w/mast adapter)	**7.5 square feet**
Turning Power	800 in.-lbs.
Brake Power	**5000 in.-lbs.**
Brake Construction	Electric Wedge
Bearing Assembly	**dual race/96 ball bearings**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	26 lbs.
Effective Moment (in tower)	**2800 ft.-lbs.**

TAILTWISTER SERIES II



For large medium antenna arrays up to 20 sq. ft. wind load. Available with *DCU-1 Pathfinder* digital control (T2XD) or standard analog control box (T2X) with *new* 5-second brake delay and *new* Test/Calibrate function. Low temperature grease, alloy ring gear, indicator potentiometer, ferrite beads on potentiometer wires, *new* weatherproof AMP connectors plus 8-pin plug at control box, triple bearing race with 138 ball bearings for large load bearing strength, electric locking steel wedge brake, North or South center of rotation scale on meter, low voltage control, 2 1/16 inch max. mast.

T-2X
$699.95

T-2XD
$1129.95
with DCU-1

TAILTWISTER Rotator Specifications	
Wind load capacity (inside tower)	20 square feet
Wind Load (w/ mast adapter)	**10 square feet**
Turning Power	1000 in.-lbs.
Brake Power	**9000** in.-lbs.
Brake Construction	Electric Wedge
Bearing Assembly	**Triple race/138 ball brngs**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	31 lbs.
Effective Moment (in tower)	**3400 ft.-lbs.**

CD-45II

CD-45II
$389.95

For antenna arrays up to 8.5 sq. feet mounted inside tower or 5 sq. ft. with mast adapter. Low temperature grease good to -30 F degrees. *New* Test/Calibrate function. Bell rotator design gives total weather protection, dual 58 ball bearing race gives proven support. Die-cast ring gear, stamped steel gear drive, heavy duty, trouble free gear train, North center scale, lighted directional indicator, 8-pin plug/socket on control unit, snap-action control switches, low voltage control, safe operation, takes maximum mast size to 2 1/16 inches. MSLD light duty lower mast support included.

CD-45II Rotator Specifications	
Wind load capacity (inside tower)	8.5 square feet
Wind Load (w/ mast adapter)	**5.0 square feet**
Turning Power	600 in.-lbs.
Brake Power	**800 in.-lbs.**
Brake Construction	Disc Brake
Bearing Assembly	**Dual race/48 ball brings**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight	22 lbs.
Effective Moment (in tower)	**1200 ft.-lbs.**

HAM-V

HAM-V
$1049.95
with DCU-1

For medium antenna arrays up to 15 square feet wind load area. Similar to the HAM IV, but includes *DCU-1 Pathfinder* digital control unit with gas plasma display. Provides automatic operation of brake and rotor, compatible with many logging/contest programs, 6 presets for beam headings, 1 degree accuracy, auto 8-second brake delay, 360 degree choice for center location, *more!*

ROTATOR OPTIONS

MSHD, $99.95. Heavy duty mast support for T2X, HAM-IV and HAM-V.
MSLD, $39.95. Light duty mast support for CD-45II and AR-40.
TSP-1, $34.95. Lower spacer plate for HAM-IV and HAM-V.

AR-40

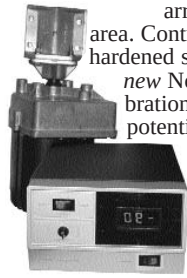
AR-40
$289.95

For compact antenna arrays and large FM/TV up to 3.0 square feet wind load area. Dual 12 ball bearing race. Automatic position sensor never needs resetting. Fully automatic control -- just dial and touch for any desired location. Solid state, low voltage control, safe and silent operation. 2 1/16 inch maximum mast size. MSLD light duty lower mast support included.

AR-40 Rotator Specifications	
Wind load capacity (inside tower)	3.0 square feet
Wind Load (w/ mast adapter)	**1.5 square feet**
Turning Power	350 in.-lbs.
Brake Power	**450 in.-lbs.**
Brake Construction	Disc Brake
Bearing Assembly	**Dual race/12 ball bearings**
Mounting Hardware	Clamp plate/steel bolts
Control Cable Conductors	**5**
Shipping Weight	14 lbs.
Effective Moment (in tower)	**300 ft.-lbs.**

HDR-300A

HDR-300A
$1379.95



For ***king-sized*** antenna arrays up to 25 sq.ft. wind load area. Control cable connector, *new* hardened stainless steel output shaft, *new* North or South centered calibration, *new* ferrite beads on potentiometer wires reduce RF susceptibility, *new* longer output shaft keyway adds reliability. Heavy-duty self-centering steel clamp and hardware. Display accurate to 1°. Machined steel output.

HDR-300A Rotator Specifications	
Wind load capacity (inside tower)	25 square feet
Wind Load (w/ mast adapter)	**not applicable**
Turning Power	5000 in.-lbs.
Brake Power	**7500 in.-lbs.**
Brake Construction	solenoid operated locking
Bearing Assembly	**bronze sleeve w/rollers**
Mounting Hardware	stainless steel bolts
Control Cable Conductors	**7**
Shipping Weight	61 lbs.
Effective Moment (in tower)	**5000 ft.-lbs.**

Digital Automatic Controller

DCU-1
$749.95

Automatically controls T2X, HAM-IV, V rotators. 6 presets for favorite headings, 1° accuracy, 8-sec. brake delay, choice for center of rotation, crisp *plasma* display. Computer controlled with many logging/contest programs.

AR-35 Rotator/Controller

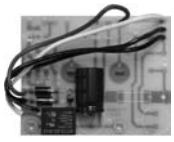
AR-35
$79.95

For UHF, VHF, 6-Meter, TV/FM antennas. Includes automatic controller, rotator, mounting clamps, mounting hardware. 110 VAC. One Year Warranty.

http://www.hy-gain.com
Nearest Dealer, Free catalog, To Order . . .
800-973-6572
Voice: 662-323-9538 **Fax:** 662-323-6551

NEW! Automatic Rotator Brake Delay

RBD-5
$29.95



Provides automatic 5-second brake delay -- insures your rotator is fully stopped before brake is engaged. Prevents accidentally engaging brake while rotator is moving. Use with HAM II, III, IV, V, T2Xs. Easy-to-install. Includes pre-assembled PCB, hardware.

hy-gain®

Antennas, Rotators & Towers

308 Industrial Park Road,Starkville, MS 39759, USA

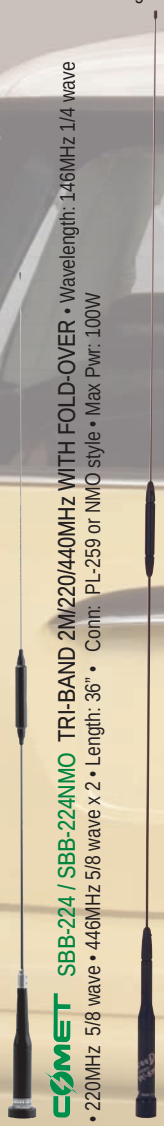
Life is a JOURNEY. Enjoy the ride!

Maldol MH-511 TRI-BAND 6M/2M/70CM HT ANTENNA • Length: 4" • Conn: Male SMA

Maldol MH-510 TRI-BAND 6M/2M/70CM HT ANTENNA • Wavelength: 6M 1/4 wave top-load • 2M 1/4 wave • 440MHz 1/2 wave • Length: 20.75" • Conn: Male SMA

COMET HT-224 TRI-BAND 2M/220/70CM HT ANTENNA • Wavelength: 2M 1/4 wave • 220MHz 1/2 wave • 440MHz 1/2 wave • Length: 11.5" • Conn: Male SMA

Maldol MH-610 TRI-BAND 2M/220/70CM HT ANTENNA • Wavelength: 2M 1/4 wave • 220MHz 1/2 wave • 70cm 5/8 wave • Length: 14" • Conn: Male SMA



COMET SBB-224 / SBB-224NMO TRI-BAND 2M/220/440MHz WITH FOLD-OVER • Wavelength: 146MHz 1/4 wave • 220MHz 5/8 wave • 446MHz 5/8 wave x 2 • Length: 36" • Conn: PL-259 or NMO style • Max Pwr: 100W

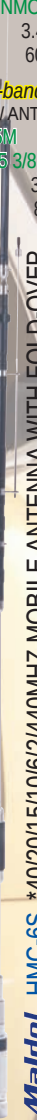
Maldol EX-510B / EX-510BNMO TRI-BAND 6M/2M/440MHZ WITH FOLD-OVER • Wavelength: 52MHz 1/4 wave • 146MHz 1/2 wave • 446MHz 5/8 wave x 2 VSWR • Length: 37" • Conn: PL-259 or NMO style • Max Power: 50W FM

COMET SB-15 TRI-BAND 6M/2M/440MHZ WITH FOLD-OVER • Wavelength: 52MHz 1/4 wave • 146MHz 6/8 wave • 446MHz 5/8 wave x 3 • Length: 58" • Conn: PL-259 • Max Pwr: 120W

COMET UHV-4 QUAD-BAND 10M/6M/2M/440MHZ WITH FOLD-OVER • Wavelength: 10M & 6M 1/4 wave • 2M 1/2 wave • 70cm 5/8 wave x 2 • Length: 55" • Max Power: 10M 120W SSB 6M2M/70cm 100W FM • Conn: PL-259 • 10M and 6M bands have individual tuning stubs

COMET UHV-6 HF/6M/2M/440MHZ MOBILE ANTENNA *80/*20/*17/40/15/10/6/2M/70cm Mobile antenna with fold-over hinge• Wavelength: 2M 1/2 wave • 70cm 5/8 wave x 2 • VSWR: HF 1.6:1 or less, 6M-70cm 1.5:1 or less • Length: 44" (min), 78"(max) • Max Pwr: HF 120W SSB, 6M 200W SSB/100W FM, 2M/70cm 100W FM • **L-14 optional 20M coil *L-18 optional 17M coil *L-3.5 optional 80/75M coil • Features: • 6M/2M/ 70cm operation is constant. You CHOOSE the HF coils you want to add, up to four stock or optional. One vertical, the rest horizontal. • Easily mounts to standard trunk/door mount in minutes • Economical • Fold-over hinge built in• Select the duplexer or triplexer for your specific radio(s). CF-706A, CF-530, CFX-514N • Conn: PL-259

UHV-6 in fold-over position.
Fold-over hinge included for easy entry to garage, parking structure, drive-thru etc.... SB-15 / UHV-4 / UHV-6 / HMC-6S fold-over hinge has a threaded collar to lock the hinge vertically in place. It can't fold-over by itself at highway speed!



Maldol HMC-6S *40/20/15/10/6/2/440MHZ MOBILE ANTENNA WITH FOLD-OVER Wavelength: HF 1/4 wave • 2M 1/2 wave • 70cm 5/8 wave x 2 • VSWR: HF-6M 1.6:1 or less 2M/70cm 1.5:1 or less • Length: 66" • Max Power: HF 120W SSB 6/2/70cm 150W FM*HMC-7C optional 40M coil • Conn: PL-259

MINI COOPER SHOWN WITH CP-5M UNIVERSAL LIP MOUNT ON THE DOOR EDGE.

All the mounts attach to van doors, truck side doors, SUV doors, etc... and require no holes. Includes 16' 6" deluxe cable assy w/18" mini RG-1888A/U type coax for weather seal entry.

Choose a mount depending on the antenna size and vehicle mounting location space.

For Small Antennas & Limited Space

MODEL / ANT CONN / COAX CONN	
Maldol EM-5M	SO-239 / PL-259
Footprint:	1.1"x .75"
Max Antenna:	40"

For Medium Size Antennas

MODEL / ANT CONN / COAX CONN	
COMET CP-5M	SO-239 / PL-259
COMET CP-5NMO	NMO / PL-259
Footprint:	3.4" x 1.25"
Max Antenna:	60"

For Tall or Multi-band HF Antennas

MODEL / ANT CONN / COAX CONN	
COMET HD-5M	SO-239 / PL-259
COMET HD- 5 3/8-24	3/8-24 / PL-259
Footprint:	3.75" x 1.1 "
Max antenna:	80"

COMET and Maldol Mobile

For a complete catalog, call or visit your local dealer.
Or contact NCG Company. 15036 Sierra Bonita Lane, Chino, CA 91710
909-393-6133 • 800-962-2611 • FAX 909-393-6136 • www.natcommgroup.com

Public Service

Advocacy

Education

Technology

Membership

Contents

In this month's Radiosport Issue

October 2008 **Volume 92 Number 10**

QST (ISSN:0033-4812) is published monthly as its official journal by the American Radio Relay League, Inc, 225 Main Street, Newington, CT 06111-1494, USA. Periodicals postage paid at Hartford, CT, USA and at additional mailing offices.

POSTMASTER: Send address changes to: QST, 225 Main St, Newington, CT 06111-1494, USA. Canada Post: Publications Mail Agreement #40612608. Canada Returns to be sent to Bleuchip International, PO Box 25542, London, ON N6C 6B2.

Technical

News and Features

Radiosport
Following page 32 is an 8 page special section all about Radiosport. Geared for all levels of contesters, articles and resources provide tips on how to operate Sweepstakes and other contests, how to submit an electronic log and how to interpret your Log Checking Report. Find out why 2009 is the Year of the State QSO Party. *Discover the fun of Amateur Radio contesting!*

US & Possessions: Membership in the ARRL, including a one year subscription to *QST*, is available to individuals at $39. Age 65 and over, with proof of age, $36. Licensed radio amateurs age 21 and under and the eldest licensee in the household may qualify for the rate of $20. Life Membership, including a subscription to *QST* is available at $975.* Age 65 and over, $900.* Membership and *QST* cannot be separated. Libraries and institutions, $39 per year. Single copies $5.

International
To compensate for additional postage for mailing outside the US, the following rates apply:

Canada: Membership in the ARRL, including a one year subscription to *QST*, $49, payable in US funds. Life Membership, including a subscription to *QST* is available at $1225.* Libraries and institutions, $49 per year.

All Other Countries: Membership in the ARRL, including a one year subscription to *QST*, $62, payable in US funds. Life Membership, including a subscription to *QST* is available at $1550.* Libraries and institutions, $62 per year.

*Payment arrangements available. Please write for details.

Membership without *QST* is available to the immediate family of a member living at the same address, and to anyone who is legally blind, for $8 per year.

Foreign remittances should be by international postal or express money order or bank draft negotiable in the US and for an equivalent amount in US funds.

QST is available to blind and physically handicapped individuals on audio cassette from the Library of Congress, National Library Service for the Blind and Physically Handicapped. Call 1-800-424-8567.

Indexed by Applied Science and Technology Index, Library of Congress Catalog Card No: 21-9421.

QST Workbench

Radiosport

Our Cover
In our first ever issue with a Radiosport theme, you'll find (following page 32) an 8 page insert crammed with articles and practical information you can use to enhance your enjoyment of the competitive side of Amateur Radio. Our top cover photo shows Rod Johnson, WE7X, of Issaquah, Washington, who made his way to this nifty spot near Mount Rainier for the 2007 ARRL September VHF Contest. Photo by Rod Johnson, WE7X. The inset photo shows George Brandon, K5PI, of Austin, Texas, getting active on 10 meters at the shack of Jim George, N3BB, also of Austin. Photo by Bob Wilson, N6TV.

Departments

The Hottest Field Gear Anywhere!

HF/VHF/UHF Portable Operation Just Got a Lot More Powerful!

FT-897D

TCXO DSP 60 m Band

HF/50/144/430 MHz
100 W All Mode Transceiver
(144 MHz 50 W/430 MHz 20 W)

HF/VHF/UHF Multimode Mobile Transceiver, now Including Built-in DSP

FT-857D

DSP 60 m Band

HF/50/144/430 MHz
100 W All Mode Transceiver
(144 MHz 50 W/430 MHz 20 W)

Automatic Matching for FT-897/857 Series Transceivers

FC-40

Automatic-Matching 200-Memory Antenna Tuner
(160 m ~ 6 m Band)

WATERPROOF

Mobile Auto-Resonating 7~430 MHz for FT-897/857 Series Transceivers

ATAS-120A

Active Tuning Antenna System
(no separate tuner required)

VHF/UHF Base RadialKit ATBK-100 for ATAS-120A.

REAL PERFORMANCE, REALLY PORTABLE

FT-817ND

HF/50/144/430 MHz
5 W All Mode Transceiver
(AM 1.5 W)

60 m Band

ATAS-25
Manually-Tuned Portable Antenna

YAESU
Choice of the World's top DX'ers℠

Vertex Standard
US Headquarters
10900 Walker Street
Cypress, CA 90630 (714)827-7600

For the latest Yaesu news, visit us on the Internet: http://www.vertexstandard.com

Specifications subject to change without notice. Some accessories and/or options may be standard in certain areas. Frequency coverage may differ in some countries. Check with your local Yaesu Dealer for specific details.

A radio For Every Need - Yaesu VHF/UHF Mobiles and Handhelds

Imagine the Future of the Mobile Radio ...
It's Now All Yours ! ... YAESU FTM-10SR

DUAL BAND DUAL RECEIVE

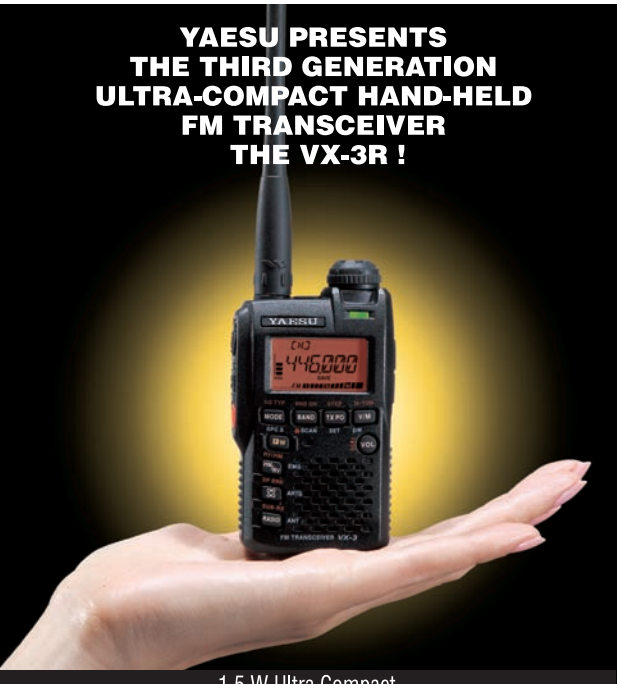
10 W 2 m/70 cm*
Dual Band FM Mobile
FTM-10SR *70 cm 7 W

Great New Features to Support Outdoor Motor Sports Activities
Mobile Transceiver... Great Appearance ... Easy to Operate

DUAL BAND DUAL RECEIVE

50 W 2 m/70 cm*
Dual Band FM Mobile
FTM-10R *70 cm 40 W

YAESU PRESENTS THE THIRD GENERATION ULTRA-COMPACT HAND-HELD FM TRANSCEIVER THE VX-3R !



2 m / 70 cm Dual Band

1.5 W Ultra Compact
2 m/70 cm Dual Band FM Hand held
VX-3R

50 W 2 m Ultra Rugged VHF FM Mobile
FT-1802M *2 m Band*

65 W 2 m Rugged FM Mobile
FT-2800M *2 m Band*

QUAD BAND DUAL RECEIVE

50 W 10 m/6 m/2 m/70 cm*
Quad Band FM Mobile
FT-8900R *70 cm 35 W

DUAL BAND DUAL RECEIVE

50 W 2 m/70 cm*
Dual Band FM Mobile
FT-8800R *70 cm 35 W

DUAL BAND

50 W 2 m/70 cm*
Dual Band FM Mobile
FT-7800R *70 cm 35 W

5 W Ultra-Rugged, Submersible
6 m/2 m/70 cm Tri-Band FM Hand held
6 m / 2 m / 70 cm Tri-Band
VX-7R/VX-7RB

5 W Heavy Duty Submersible
2 m/70 cm Dual Band FM Hand held
VX-6R

5 W Heavy Duty
2 m/70 cm Dual Band FM Hand held
FT-60R

5 W Heavy Duty Submersible
2 m FM Mono Band Hand Helds
VX-120 (8 key Version) **VX-170** (16 key Version)

70 cm FM Mono Band Hand Helds
VX-127 (8 key Version) **VX-177** (16 key Version)

Ultra-Rugged 5 W Full Featured
2 m FM Hand helds
VX-150/VX-110 *2 m Mono Band*

YAESU
Choice of the World's top DX'ers℠

Vertex Standard
US Headquarters
10900 Walker Street
Cypress, CA 90630 (714)827-7600

For the latest Yaesu news, visit us on the Internet:
http://www.vertexstandard.com

The radio... YAESU
Choice of the World's top DX'ers

Loaded with Leading-edge Performance Capabilities. . .
The First Triumph in the 2nd Generation of the FT DX 9000 Lineage:
The Powerful FT-2000!

HF/50 MHz Transceiver
FT-2000
100 W Version (Internal Power Supply)

DMU-2000
Data Management Unit

Photograph shows 100-Watt version. Computer display and keyboard are after-market items, not supplied with the FT-2000.

HF/50 MHz Transceiver
FT-2000D
200 W Version
(External Power Supply)

Options

SP-2000
External Speaker
with Audio filters

RF μ-Tune Kits

160m Band	80/40m Band	30/20m Band
RF μ-Tune Kits A	RF μ-Tune Kits B	RF μ-Tune Kits C

- Up to three μ-Tune Kits may be connected.
- μ-Tune Kit is included in purchase price of μ-Tune Unit.

For the latest Yaesu news, visit us on the Internet:
http://www.vertexstandard.com

Specifications subject to change without notice. Some accessories and/or options may be standard in some areas. Frequency coverage may differ in some countries. Check with your local Yaesu dealer for specific details.

YAESU
Choice of the World's top DX'ers℠

Vertex Standard
US Headquarters
10900 Walker Street
Cypress, CA 90630 (714)827-7600

Public Service

Advocacy

Education

Technology

Membership

"It Seems to Us"

Pooling Our Resources

"Radio amateurs have a long tradition of working together to achieve goals they could not reach alone. It stands to reason that collaboration should come naturally to us — after all, a radio operator with no one else to talk to will be mighty lonely!"

An early and much celebrated example of radio amateurs pooling their resources to achieve great things is the 1921 station 1BCG in Greenwich, Connecticut. In the space of less than three weeks, six members of the Radio Club of America assembled an amateur station that turned out to be the first to span the Atlantic. In 1960, two teams of amateurs in Massachusetts and California became the first to complete a moonbounce contact. After concluding that 1296 MHz offered the best prospects for success, it had taken them a year to assemble the necessary equipment and antennas. At around the same time another group of West Coast amateurs was pursuing an even more ambitious goal: the launch of an amateur-built satellite. Their achievement, barely four years after Sputnik 1, blazed the trail for dozens more to follow right up to the present day — every one of them the result of a group effort.

At a more down-to-earth level, the construction, installation, maintenance and operation of a repeater is typically a group undertaking. Repeaters are more than "black boxes" that extend the range of our small VHF stations. They are important community resources. A well-run repeater can serve as a "watering hole" — for the socialization of newcomers, for training and information exchange, and simply as a place "where everybody knows your name and they're always glad you came." A repeater is often the focal point for public service and emergency communications (although there must be a "Plan B" in case the repeater itself becomes a casualty). Many repeaters offer ties outside the local area through Internet and radio links.

Since a repeater is a rather substantial asset and its operation raises management issues as varied as the user community it serves, formal agreements and rules are often necessary in order to avoid misunderstandings and ensure smooth functioning of the group over a long period of time. Forming a club, if one does not exist already, is the most common way to provide such a framework.

There are more than 2,000 active ARRL-affiliated clubs, many if not most of them either owning or actively supporting one or more repeaters. Through their sponsorship and support of repeaters, these clubs provide their members — and often the amateur community at large — with solutions to many of their needs. Yet, with the exception of college and university clubs, as far as we know there are relatively few clubs that provide their members with a solution of another kind: routine access to a well-equipped HF station.

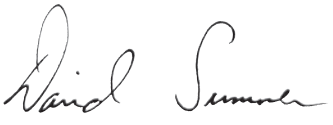
If you are a long-time amateur and were able to choose your current residence with Amateur Radio in mind, you may not realize the barriers that face many new amateurs and those with less flexibility in their choice of housing. Installing an effective HF antenna at one's home may not be possible for a variety of reasons, restrictive covenants among them. The ARRL has been pursuing legislative solutions to restrictive covenants for years and will continue to do so, and in the meantime various compromises are often possible. However, for now the bottom line is that a well-equipped HF station in their own home is beyond the reach of a growing number of amateurs and prospective hams.

In some countries in Eastern Europe, club stations are often the focal point of local activity. There are social gatherings throughout the week, not just on formal meeting nights. If the bands are open, operators take turns; if not, they work on construction projects or QSL cards, or just talk. Some of the reasons for the popularity of club stations there do not translate to North America; we are, after all, a society that prefers installing elaborate "home theaters" to going out to an occasional movie. On the other hand, if you can't have what you'd like for yourself, perhaps you can join forces with some of your friends and put together something that's even better.

Recent advances in remote operation have opened another window of opportunity. Quoting from a recent report by the ARRL Contest Advisory Committee (available at **www.arrl.org/announce/reports-2008/july/29_CAC.pdf**), "…with the widespread deployment of broadband Internet, it has now become technically feasible and cost effective to remotely operate a radio station located almost anywhere in the world. Although there are still issues with latency in CW applications, other modes are currently feasible…. These technical breakthroughs have resulted in greater interest in remote operating by contesters, and it is expected that interest will grow. Remote operating offers the possibility of conveniently using a station with greater capabilities than one's own, or of operating a station in a highly competitive contest location."

Of course, the potential benefits of remote operating are not limited to contesting. Indeed, most operating applications are not nearly as demanding, and therefore would be easier to implement.

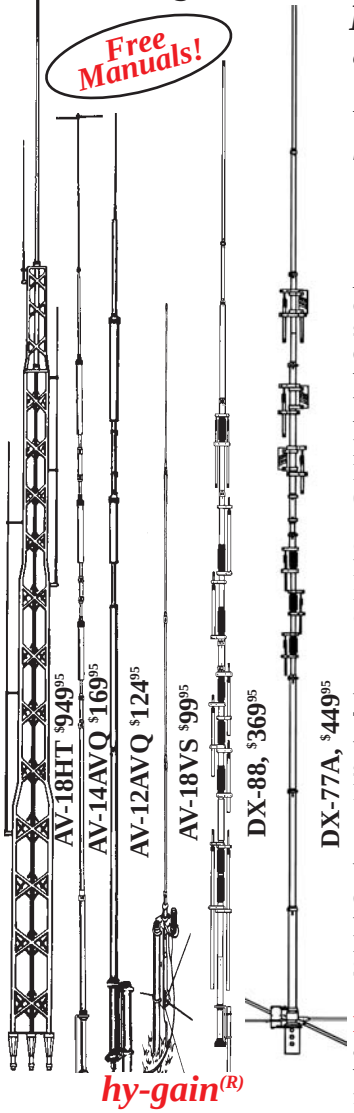
Tell us about your experiences. Does your club have a station that members can routinely access and operate? If so, does it get much use? What sorts of problems have you encountered, and how have they been addressed? Would you be interested in sharing access to a remote station? Would your friends? If you have experience with a remote station, what have you learned that would be helpful to others?



David Sumner, K1ZZ
ARRL Chief Executive Officer

hy-gain® HF VERTICALS

Self-supporting -- no guys required . . . Remarkable DX performance -- low angle radiation, omnidirectional . . . Handles 1500 Watts . . . Low SWR . . . Automatic band switching . . . Aircraft quality aluminum tubing . . . Stainless steel hardware . . . Recessed SO-239 connector . . . Two year limited Warranty . . .



hy-gain(R) Classics

All hy-gain multi-band vertical antennas are entirely self supporting -- no guys required.

They offer remarkable DX performance with their extremely low angle of radiation and omnidirectional pattern.

All handle 1500 Watts PEP SSB, have low SWR, automatic band-switching (except AV-18VS) and include a 12-inch heavy duty mast support bracket (except AV-18HT).

Heavy duty, slotted, tapered swaged, aircraft quality aluminum tubing with full circumference compression clamps is used for radiators.

Includes all stainless steel hardware. Recessed SO-239 prevents moisture damage.

Hy-gain verticals go up easily with just hand tools and their cost is surprisingly low. Two year limited warranty.

AV-18HT, $949.95. (10,12,15,20,40,80 M, 160, 17 Meters optional). 53 ft., 114 lbs. **Standing** 53 feet tall, the famous *Hy-Gain HyTower* is the world's best performing vertical! The AV-18HT features automatic band selection achieved through a unique stub-decoupling system which effectively isolates various sections of the antenna so that an electrical 1/4 wavelength (or odd multiple of a 1/4 wavelength) exists on all bands. Approximately 250 kHz bandwidth at 2:1 VSWR on 80 Meters. The addition of a base loading coil (**LC-160Q, $109.95**), provides exceptional 160 Meter performance. **MK-17, $89.95**. Add-on 17 Meter kit. 24 foot tower is all rugged, hot-dip galvanized steel and all hardware is iridited for corrosion resistance. Special tilt-over hinged base for easy raising & lowering.

AV-14AVQ, $169.95. (10,15,20,40 Meters). 18 ft., 9 lbs. **The** Hy-Gain AV-14AVQ uses the same trap design as the famous Hy-Gain Thunderbird beams. Three separate air dielectric Hy-Q traps with oversize coils give superb stability and 1/4 wave resonance on all bands. Roof mount with Hy-Gain AV-14RMQ kit, $89.95.

AV-12AVQ, $124.95. (10, 15, 20 Meters). 13 ft., 9 lbs. **AV-12AVQ** also uses Thunderbird beam design air dielectric traps for extremely Hy-Q performance. This is the way to go for inexpensive tri-band performance in limited space. Roof mount with AV-14RMQ kit, $89.95.

AV-18VS, $99.95. (10,12,15,17,20,30,40,80 Meters). 18 ft., 4 lbs. **High** quality construction and low cost make the AV-18VS an exceptional value. Easily tuned to any band by adjusting feed point at the base loading coil. Roof mount with Hy-Gain AV-14RMQ kit, $89.95.

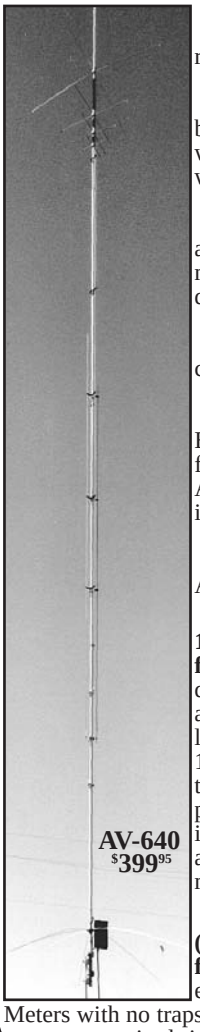
DX-88, $369.95. (10, 12, 15,17,20,30,40,80 Meters, 160 Meters optional). 25 ft., 18 lbs. **All** bands are *easily* tuned with the DX-88's *exclusive* adjustable capacitors. 80 and 40 Meters can even be tuned from the ground without having to lower the antenna. Super heavy-duty construction. DX-88 OPTIONS: 160 Meter add-on kit, KIT-160-88, $199.95. Ground Radial System, GRK-88, $99.95. Roof Radial System, RRK-88, $99.95.

DX-77A, $449.95. (10, 12, 15, 17, 20, 30, 40 Meters). 29 ft., 25 lbs. ***No*** *ground radials required!* Off-center-fed Windom has 55% greater bandwidth than competitive verticals. Heavy-duty tiltable base. Each band independently tunable.

Model #	Price	Bands	Max Power	Height	Weight	Wind Surv.	Rec. Mast
AV-18HT	$949.95	10,15,20,40,80	1500 W PEP	53 feet	114 pounds	75 MPH	------
AV-14AVQ	**$169.95**	**10,15,20,40**	**1500 W PEP**	**18 feet**	**9 pounds**	**80 MPH**	**1.5-1.625"**
AV-12AVQ	$124.95	10/15/20 M	1500 W PEP	13 feet	9 pounds	80 MPH	1.5-1.625"
AV-18VS	**$99.95**	**10 - 80 M**	**1500 W PEP**	**18 feet**	**4 pounds**	**80 MPH**	**1.5-1.625"**
DX-88	$369.95	10 - 40 M	1500 W PEP	25 feet	18 pounds	75 mph no guy	1.5-1.625"
DX-77A	**$449.95**	**10 - 80 M**	**1500 W PEP**	**29 feet**	**25 pounds**	**60 mph no guy**	**1.5-1.625"**

hy-gain(R) PATRIOT

Hy-Gain's new PATRIOT HF verticals are the best built, best performing and best priced multiband verticals available today. For exciting DX make full use of your sunspot cycle with the PATRIOT's *low 17 degree angle* signal.



No ground or radials needed

Effective counterpoise replaces radials and ground.

Automatic bandswitching

Single coax cable feed. Each band is individually tunable. Extra wide VSWR bandwidth. End fed with broadband matching unit.

Sleek and low-profile

Low 2.5 sq. ft. wind surface area. Small area required for mounting. Mounts easily on decks, roofs and patios.

Full legal limit

Handles 1500 Watts key down continuous for two minutes.

Built-to-last

High wind survival of 80 mph. Broadband matching unit made from all *Teflon*® insulated wire. Aircraft quality aluminum tubing, stainless steel hardware.

hy-gain® warranty

Two year limited warranty. All replacement parts in stock.

AV-640, $399.95. (6,10,12, 15,17,20,30,40 Meters). 25.5 ft., 17.5 lbs. The AV-640 uses quarter wave stubs on 6, 10, 12 and 17 meters and efficient end loading coil and capacity hats on 15, 20, 30 and 40 meters -- no traps. Resonators are placed in parallel not in series. End loading of the lower HF bands allows efficient operation with a manageable antenna height.

AV-620, $299.95. (6,10,12,15,17,20 Meters). 22.5 ft., 10.5 lbs. The AV-620 covers all bands 6 through 20 Meters with no traps, no coils, no radials yielding an uncompromised signal across all bands.

Free Hy-Gain Catalog
and Nearest Dealer . . . 800-973-6572
Call your dealer for your best price!

hy-gain®

Antennas, Rotators & Towers
308 Industrial Park Road, Starkville, MS 39759 USA
Toll-free Customer Sales Hotline: 800-973-6572
• **TECH:** 662-323-9538 • **FAX:** 662-323-6551
http://www.hy-gain.com

Introducing the Yaesu FT-950 transceiver for DX enthusiasts
Superb receiver performance
Direct lineage from the legendary FT DX 9000 and FT-2000

HF/50 MHz 100 W Transceiver

FT-950

- Triple-conversion super-heterodyne receiver architecture, using 69.450 MHz 1st IF
- Eight narrow, band-pass filters in the RF stage eliminate out of band interference and protect the powerful 1st IF
- 1st IF 3 kHz Roofing filter included
- High-speed Direct Digital Synthesizer (DDS) and high-spec Digital PLL for outstanding Local Oscillator performance
- Original YAESU IF DSP advanced design, provides comfortable and effective reception. IF SHIFT / IF WIDTH / CONTOUR / NOTCH / DNR
- DSP enhancement of Transmit SSB/AM signal quality with Parametric Microphone Equalizer and Speech Processor
- Built-in high stability TCXO (±0.5 ppm after 1 minute@77 ° F)
- Built-in automatic antenna tuner ATU, with 100 memories
- Powerful CW operating capabilities for CW enthusiasts
- Five Voice Message memories, with the optional DVS-6 unit
- Large Multi-color VFD (Vacuum Fluorescent Display)
- Optional Data Management Unit (DMU-2000) permits display of various operating conditions, transceiver status and station logging.
- Optional RF μ -Tune Units for 160 m, 80/40 m and 30/20 m Bands

Optional, YAESU Exclusive, Fully-Automatic μ -Tuning Preselector System!

Fully automatic, Ultra-sharp, External μ -Tuning Preselector (optional) features a 1.1" (28 mm) Coil for High Q

On the lower Amateur bands, strong signal voltages impinge on a receiver and create noise and intermod that can cover up the weak signals you're trying to pull through. YAESU engineers developed the μ (Mu) Tuning system for the FT DX 9000/FT-2000, and it is now available as an option for the FT-950. Three modules are available (MTU-160, MTU-80/40, MTU-30/20); these may be connected externally with no internal modification required! When μ -Tuning is engaged, the VRF system is bypassed, but the fixed Bandpass Filters are still in the received signal path.

Optional External Data Management Unit (DMU-2000) Provides Many Display Capabilities

Enjoy the ultimate in operating ease by adding the DMU-2000! Enjoy the same displays available with the FT DX 9000 and FT-2000: Band Scope, Audio Scope, X-Y Oscilloscope, World Clock, Rotator Control, Extensive Transceiver Status Displays, and Station Logging Capability. These extensive functions are displayed on your user-supplied computer monitor.

Shown with after-market keyer paddle, keyboard, and monitor (not supplied).

DMU-2000
Data Management Unit (option)

YAESU
Choice of the World's top DX'ers℠

Vertex Standard
US Headquarters
10900 Walker Street
Cypress, CA 90630 (714)827-7600

For the latest Yaesu news, visit us on the Internet:
http://www.vertexstandard.com

This Just In

Joel P. Kleinman, N1BKE
jkleinman@arrl.org

In Brief

- ARRL Lab Manager Ed Hare, W1RFI, chaired a Technical Session at this year's Institute of Electrical and Electronics Engineers International Symposium on Electromagnetic Compatibility in Detroit.
- Thanks to the efforts of the Bangladesh Amateur Radio League, that country's IARU Member-Society, the Bangladeshi government will once again issue ham licenses.
- During a record six ARRL Teachers Institutes this summer, instructors and participants found new ways of bringing the excitement of wireless technology to classrooms across the country.
- Carolyn, NØLAL, and Steven Baily, NØUS, were found dead in their home near Lincoln, Nebraska August 9.
- Special Event stations for the 2008 Beijing Olympic Games began operating on May 18 and are scheduled to continue through September 17.
- On July 25, the National Conference of Volunteer Examiner Coordinators held their annual meeting via teleconference.
- Former ARRL Headquarters staffer Glenn P. Swanson, KB1GW, of North Granby, Connecticut, died August 1 after a brief illness.
- To celebrate the UN's World Environment Day, the Vienna International Amateur Radio Club, 4U1VIC, received permission from the UN to use 4U1WED as a special call sign for the month of June.
- The FCC announced that the cost of an Amateur Radio vanity call sign will increase 60 cents, from $11.70 to $12.30.
- The winner of the *QST* Cover Plaque Award for July is Jack B. Morgan, KF6T, for his article "Portable Two Element 15 Meter Yagi."
- The following conventions were held during August: Texas State, Austin; Pacific Northwest DX, Portland, Oregon; 3.905 Century Club Eyeball, Hanover, Pennsylvania; Alaska State, Anchorage; Illinois State, Bolingbrook; Dakota Division, Rochester, Minnesota; Southeastern Division, Huntsville, Alabama; Kansas State, Salina; New England Division, Boxboro, Massachusetts; Roanoke Division, West, West Virginia; Western Pennsylvania Section, New Kensington.
- The ARRL UHF Contest was August 2-3, and the ARRL 10 GHz and Up Contest was August 16-17.
- These ARRL online course sessions begin September 19: Amateur Radio Emergency Communications Level 2 (EC-002); Amateur Radio Emergency Communications Level 3 (EC-003R2); Antenna Modeling (EC-004); HF Digital Communications (EC-005); VHF/UHF — Life Beyond the Repeater (EC-008), and Radio Frequency Propagation (EC-011).

Media Hits

Allen Pitts, W1AGP

- An unexpected and unusual Field Day media hit is still happening long after the picnics are over. Ted Randall, who hosts "QSO," the ham radio interview and talk show on WBCQ (7415 kHz) Saturday nights 11 PM EDT, was doing a live call-in for Field Day when he was surprised by the Baghdad Amateur Radio Society at Camp Taji and Captain Jeff Hammer, N9NIC (152nd Cavalry Rgmt) phoning in to say they were also working FD. While propagation from Iraq wasn't great, the interest it generated was considerable and is resulting in needed donations to the club's gear and an excellent article about the uses and technologies of modern Amateur Radio. "Soldiers ride the radio waves at Taji" appeared July 23 in *The Expeditionary Times* published by and for the military in Iraq.
- A final FD hit came in when Oregon's Governor Ted Kulongoski proclaimed August 17 as Amateur Radio Week in his state, making 13 state proclamations for this year. Better late than never!
- Walletpop.com published an inaccurate article "Top 25 things vanishing from America: #16-Ham Radio." This was copied on several other outlets. While it had very good things to say about Amateur Radio overall, other hams quickly pounced upon the faulty statistics of doom. Meanwhile, *Electronic Design* published "Ham Radio's Rejuvenation" by Don Tuite, NR7X, on July 28. His view from Silicon Valley is just the opposite — that since CW proficiency is no longer a license requirement, more and more people, especially engineers, are becoming hams.
- KSTP-TV Channel 5 (St Paul, MN) continued this theme with a video feature story about 13 year old Cal Darula, KØDXC, who mixes his hobbies of Amateur Radio with athletic sports.
- The connection between Amateur Radio and space exploration created two media hits on the same day. The July 30 Associated Press story about space tourist Richard Garriott's plans to fly on a *Soyuz* spacecraft and use ham radio to speak with his astronaut father, Owen, got national coverage and also highlighted modern Amateur Radio capabilities. Also on July 30, NASA published "Communication From Space Inspires Young Minds" as part of their Behind The Scenes features about the space shuttle (**www.NASA.gov**). The following week Lee Badman, KI2K, wrote a Sunday column about Amateur Radio, satellites, GPS and APRS published in the *Post-Standard* (Syracuse, NY).
- Pro Football Hall of Fame member Gary Zimmerman may no longer be wearing pads for the Vikings or Broncos, but his continuing activity as N7ZIM was a key piece of the article about him in the *Rocky Mountain News* (Denver).
- Finally, we are all used to seeing the standard photos of a ham sitting at a desk with a radio. But I have never seen a photo of such a happy, friendly grin as was shown in the July 28 *Charlottesville Daily Progress* story "Ham radio ambassador: Nothing amateur about this form of communication." There was Harry Dannals, W2HD, past President of the ARRL (1972-1982), joyfully explaining Amateur Radio to reporter David Maurer. Well done Harry! You're a great ham-ambassador indeed.

W1HQ Gets New Tower

On August 13, the ARRL Headquarters Station, W1HQ, the Laird Campbell Memorial HQ Operators Club, got a new 40 foot tower on top of the ARRL Headquarters building. ARRL Contest Branch Manager Sean Kutzko, KX9X, president of the W1HQ club, commented: "I am pleased to report that the W1HQ tower replacement and installation of the 40-30 meter dipole element on the SteppIR antenna was successful. HQ hams may now enjoy a rotating dipole for these bands at the push of a button on the SteppIR controller. The crew from XX Towers did a fine job; thanks to their regular inspections, we were able to avoid a more costly removal of the 50 foot, 35 year old tower."

Matt Strelow, KC1XX, of XX Towers, on the newly installed antenna support structure atop the ARRL HQ building in Newington, Connecticut.

S. KHRYSTYNE KEANE, K1SFA

Hams Provide Public Service at Publix

When the yearly Get Ready Alachua County (Florida) hurricane preparedness expo lost its venue, local hams found another way to perform a public service by volunteering to program NOAA weather radios for free at local grocery stores. Emergency Coordinator Jeff Capehart, W4UFL, contacted the district manager for Publix Supermarket Stores and received permission to conduct the weather radio programming event at all 12 stores in the county. Advance publicity was widely covered on local TV, radio, and newspaper. Two dozen members from organizations including ARES®/RACES, CERT, Alachua County Fire-Rescue Reserves, Gator Amateur Radio Club and the Gainesville Amateur Radio Society set up tables on the morning of June 14, offering their technical skills and knowledge.

Armed with plenty of hurricane preparedness literature, pet preparedness pamphlets, and storm tracking charts, they programmed more than 300 NOAA weather radios. The event was so successful that the hams are considering repeating it next year, possibly in advance of tornado season. — *Melissa Royce, KE4WBQ and Jeff Capehart, W4UFL*

MELISSA ROYCE, KE4WBQ

Hams and others representing several Gainesville, Florida groups offered to program NOAA weather radios for shoppers at a supermarket chain in June. Here, CERT member Diane Warfield programs a WeatherAlert radio for a customer.

J. ERVIN BATES, W8ERV

Tom Shaver, KC8NJK, Emergency Coordinator of Ingham County, accepts congratulations and the Lansing (MI) Hometown Hero Award from Mayor Virg Benero's assistant, Jerry Ambrose. The award was presented to the Ingham/Lansing ARPSC Group (and four other organizations) for their volunteer assistance in the wake of a series of tornadoes and torrential rains that hit the area.

Inside HQ

Ready to Rumble? Try Radiosport!

This is our special Radiosport issue that includes an 8 page insert devoted entirely to Radiosport and Contesting. Sean Kutzko, KX9X, our Contest Branch Manager, previews these special features and articles in his column "This Month in Contesting" on page 81.

Here at HQ we administer 11 individually named ARRL contests each year. We also manage Straight Key Night and Field Day. Yes, I know Field Day is not a contest, but the operational aspects require the same resources. We also oversee the IARU HF World Championship on behalf of that organization. This makes for a total of 14 annual events. This does not count other non-contest operating events such as Jamboree On The Air, Simulated Emergency Tests and Kids Day.

We believe that these contests and events are important to Amateur Radio. To quote ITU Secretary-General Dr Hamadoun I. Toure, HB9EHT: "Participation in radioamateur contests, field days, or any other amateur radio exercises and activities are the best training for all of us, and during non disaster periods it's also a great fun and sport competition — part of our hobby."

We process more than 20,000 contest logs annually. Over 95% of these are submitted electronically. We do not know the exact ratio between the actual number of contest participants and log submissions. We believe that it varies depending on the contest, but based on a recent analysis of the ARRL International DX Contest — SSB, only about 13% of contest participants submitted a log. This becomes a difficult analysis because it is not easy to define who is a contest participant. For example, are stations that make just one or two QSOs in order to put a new state or country in their log a contest participant? Our answer is: yes, they are!

The contests for which we receive the most log submissions are The ARRL International DX Contest, The IARU HF World Championship, November Sweepstakes and The 10 Meter Contest. These four events constitute about 50% of all our log submissions, with The ARRL International DX Contest receiving the most logs, about 25% of all those we receive. Despite the decreasing sunspot activity, the total number of contest log submissions has grown incrementally each year for the last four years.

It takes a dedicated and committed group of staffers and volunteers to make these events happen. Sean Kutzko, KX9X, our Contest Branch Manager, along with experienced contesters like Dave Patton, NN1N, Member and Volunteer Programs Manager; Norm Fusaro, W3IZ, Assistant MVP Manager, and Ward Silver, NØAX, editor of the *ARRL Contest Update* newsletter, all assist with managing our contest efforts. We also have an internal administrative staff in the MVP Department that provides support for contests and awards. We could not possibly manage this much work without the many volunteers who work with us on contests and events. These volunteers include members of our Board who deal with Contest and Radiosport policies, The Contest Advisory Committee, log-checkers and programmers. Thanks to all of you for your efforts.

73,

Harold Kramer, WJ1B
ARRL Chief Operating Officer
wj1b@arrl.org

Guide to ARRL Member Services

ARRL, 225 Main Street ♦ Newington, Connecticut 06111-1494, USA

Public Service

Advocacy

Education

Technology

Membership

Tel: 860-594-0200, Mon-Fri 8 AM to 5 PM ET (except holidays)
FAX: 860-594-0303
e-mail: hqinfo@arrl.org
ARRLWeb: www.arrl.org

VISITING ARRL HEADQUARTERS AND W1AW
Tours Mon-Fri at 9, 10, 11 AM; 1, 2, 3 PM
W1AW guest operating 10 AM to noon, and 1 to 3:45 PM (bring your license).

JOIN or RENEW or ORDER Publications
tel. **Toll Free 1-888-277-5289** (US)
International callers
tel. +1 (860) 594-0355

INTERESTED IN BECOMING A HAM?
www.arrl.org/hamradio
e-mail: newham@arrl.org
tel. 1-800-326-3942

News Center

ARRLWeb: www.arrl.org

ARRL Letter and Audio News:
www.arrl.org/arrlletter

Public Relations/Advocacy

Government Relations and Spectrum Protection:
www.arrl.org/govrelations
e-mail: govrelations@arrl.org

Public and Media Relations: www.arrl.org/pio

Membership Benefits

Membership Benefits (all):
www.arrl.org/benefits

ARRL "All Risk" Ham Radio Equipment Insurance: www.arrl.org/insurance

ARRL Visa® Credit Card: www.arrl.org/visa

ARRL.NET E-mail Forwarding:
www.arrl.org/arrlnet

Awards: www.arrl.org/awards

Contests: www.arrl.org/contests

FCC License Renewal / Modification:
www.arrl.org/arrlvec

QSL Service: www.arrl.org/qsl

Regulatory Information
www.arrl.org/regulations

Technical Information Service
www.arrl.org/tis
e-mail: tis@arrl.org
tel. 860-594-0214

Contributions, Grants and Scholarships

ARRL Development Office:
www.arrl.org/development
e-mail: mhobart@arrl.org
tel. 860-594-0397

- ARRL Diamond Club/Diamond Terrace
- Spectrum Defense Fund
- Education & Technology Fund
- Planned Giving/Legacy Circle
- Maxim Society

ARRL Foundation Grants and Scholarships:
www.arrl.org/arrlf

Public Service

Public Service Programs:
www.arrl.org/publicservice

Amateur Radio Emergency Service® (ARES®):
www.arrl.org/ares

ARRL Field Organization:
www.arrl.org/volunteer

Clubs, Recruitment, Instructors and Teachers

Find an Affiliated Club: www.arrl.org/clubsearch

Mentor Program: www.arrl.org/mentor

Find a Licensing Class:
www.arrl.org/coursesearch

Support to Instructors: www.arrl.org/instructor

Find an Exam Session: www.arrl.org/examsearch

Volunteer Examiner Coordinator (VEC):
www.arrl.org/arrlvec

Publications & Education

QST — Official Journal of ARRL:
www.arrl.org/qst
e-mail: qst@arrl.org

QEX — Forum for Communications Experimenters:
www.arrl.org/qex
e-mail: qex@arrl.org

NCJ — *National Contest Journal*:
www.arrl.org/ncj
e-mail: ncj@arrl.org

Books, Software and Operating Resources:
tel. 1-888-277-5289 (toll-free in the US);
www.arrl.org/shop

Advertising:
www.arrl.org/ads
e-mail: ads@arrl.org

Certification and Continuing Education / Online Courses: www.arrl.org/cep

The American Radio Relay League, Inc.

The American Radio Relay League, Inc. is a noncommercial association of radio amateurs, organized for the promotion of interest in Amateur Radio communication and experimentation, for the establishment of networks to provide communication in the event of disasters or other emergencies, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

ARRL is an incorporated association without capital stock chartered under the laws of the State of Connecticut, and is an exempt organization under Section 501(c)(3) of the Internal Revenue Code of 1986. Its affairs are governed by a Board of Directors, whose voting members are elected every three years by the general membership. The officers are elected or appointed by the directors. The League is noncommercial, and no one who could gain financially from the shaping of its affairs is eligible for membership on its Board.

"Of, by, and for the radio amateur," the ARRL numbers within its ranks the vast majority of active amateurs in the nation and has a proud history of achievement as the standard-bearer in amateur affairs.

A *bona fide* interest in Amateur Radio is the only essential qualification of membership; an Amateur Radio license is not a prerequisite, although full voting membership is granted only to licensed amateurs in the US.

Membership inquiries and general correspondence should be addressed to the administrative headquarters:
ARRL, 225 Main Street, Newington, Connecticut 06111-1494.

Officers, Division Directors and Staff

As an ARRL member, you elect the director and vice director who represent your division on ARRL policy matters. If you have a question or comment about ARRL policies, contact your representatives at the addresses shown.

Officers

Founding President (1914-1936)
Hiram Percy Maxim, W1AW

President
JOEL M. HARRISON,* W5ZN
528 Miller Rd, Judsonia, AR 72081
w5zn@arrl.org

First Vice President
KAY C. CRAIGIE,* N3KN
570 Brush Mountain Rd
Blacksburg, VA 24060
540-552-3903; n3kn@arrl.org

Vice President
RICK RODERICK, K5UR
PO Box 1463, Little Rock, AR 72203
501-988-2527; k5ur@arrl.org

International Affairs Vice President
RODNEY STAFFORD, W6ROD
5155 Shadow Estates
San Jose, CA 95135; 408-238-4671
w6rod@arrl.org

Chief Executive Officer
DAVID SUMNER,* K1ZZ

Secretary
DAVID SUMNER, K1ZZ

Treasurer
JAMES McCOBB Jr, K1LU

Chief Financial Officer
BARRY J. SHELLEY, N1VXY

Chief Operating Officer
HAROLD KRAMER, WJ1B

Chief Development Officer
MARY HOBART, K1MMH

Chief Technology Officer
PAUL RINALDO, W4RI

Staff

General Counsel
Christopher Imlay, W3KD

Business Services Manager
Debra Jahnke, K1DAJ

Education Services Manager
Debra Johnson, K1DMJ

Laboratory Manager
Ed Hare, W1RFI

Membership & Volunteer Programs Manager
Dave Patton, NN1N
Dennis Dura, K2DCD
Emergency Preparedness & Response Manager

Production & Editorial Manager
Steve Ford, WB8IMY

Sales & Marketing Manager
Bob Inderbitzen, NQ1R
Katie Breen, W1KRB
Membership Manager
Amy Hurtado, KB1NXO
Circulation Manager

VEC Manager
Maria Somma, AB1FM

Web & Software Development Manager
Jon Bloom, KE3Z

Business Staff

Business Manager
Barry J. Shelley, N1VXY

Comptroller
LouAnn Campanello

Information Services Manager
Don Durand

*Executive Committee Member

Atlantic Division

Bill Edgar, N3LLR*
22 Jackson Ave, Bradford, PA 16701
(814-362-1250); **n3llr@arrl.org**

Vice Director: **Tom Abernethy, W3TOM**
PO Box 73, Accokeek, MD 20607
(301-292-6263); **w3tom@arrl.org**

Central Division

George R. Isely, W9GIG*
736 Fellows St, St Charles, IL 60174
(630-584-3510); **w9gig@arrl.org**

Vice Director: **Howard S. Huntington, K9KM**
25350 N Marilyn Ln, Hawthorn Woods, IL 60047
(847-438-3452); **k9km@arrl.org**

Dakota Division

Jay Bellows, KØQB
1925 Bidwell St, West St Paul, MN 55118
(651-238-4444); **k0qb@arrl.org**

Vice Director: **Gregory P. Widin, KØGW**
13457 Sixth St N, Stillwater, MN 55082
(651-436-8811); **k0gw@arrl.org**

Delta Division

Henry R. Leggette, WD4Q*
7335 Ginger Snap Cove, Memphis, TN
38125-4732 (901-757-0444); **wd4q@arrl.org**

Vice Director: **Karl Bullock, WA5TMC**
321 CR 458, Ripley, MS 38663
(662-512-8053); **wa5tmc@arrl.org**

Great Lakes Division

Jim Weaver, K8JE
5065 Bethany Rd, Mason, OH 45040-8130
(513-459-0142); **k8je@arrl.org**

Vice Director: **Gary L. Johnston, KI4LA**
3056 Hergott Dr, Edgewood, KY 41017
(859-391-6399); **ki4la@arrl.org**

Hudson Division

Frank Fallon, N2FF
30 E Williston Ave, East Williston, NY 11596
(516-746-7652); **n2ff@arrl.org**

Vice Director: **Joyce Birmingham, KA2ANF**
235 Van Emburgh Ave, Ridgewood, NJ
07450-2918 (201-445-5924); **ka2anf@arrl.org**

Midwest Division

Bruce Frahm, KØBJ
1553 County Rd T, Colby, KS 67701
(785-462-7388); **k0bj@arrl.org**

Vice Director: **Cliff Ahrens, KØCA**
65 Pioneer Trail, Hannibal, MO 63401
(573-221-8618); **k0ca@arrl.org**

How to Find an ARRL HQ Staff Member

Can't find the department you're looking for? Call 860-594-0200 or e-mail **hq@arrl.org**. Sending e-mail to any ARRL Headquarters staff member is a snap. Just put his or her call sign (or first initial and last name) in front of **@arrl.org**. For example, to send to Allen Pitts, W1AGP, Media Relations manager, use **w1agp@arrl.org** or **apitts@arrl.org**. If all else fails, send a message to **hq@arrl.org** and it will get routed to the right person or department.

New England Division

Tom Frenaye, K1KI*
PO Box J, West Suffield, CT 06093
(860-668-5444); **k1ki@arrl.org**

Vice Director: **Mike Raisbeck, K1TWF**
85 High St, Chelmsford, MA 01824
(978-250-1235); **k1twf@arrl.org**

Northwestern Division

Jim Fenstermaker, K9JF
1525 NW 57th St, Seattle, WA 98107
(360-256-1716); **k9jf@arrl.org**

Vice Director: **William J. Sawders, K7ZM**
51442 Mac Ct, La Pine, OR 97739
(541-536-5963); **k7zm@arrl.org**

Pacific Division

Bob Vallio, W6RGG
18655 Sheffield Rd, Castro Valley, CA 94546
(510-537-6704); **w6rgg@arrl.org**

Vice Director: **Andy Oppel, N6AJO**
1308 Burbank St, Alameda, CA 94501-3946
(510-864-2299); **n6ajo@arrl.org**

Roanoke Division

Dennis Bodson, W4PWF
233 N Columbus St, Arlington, VA 22203
(703-243-3743); **w4pwf@arrl.org**

Vice Director: **Patricia Hensley, N4ROS**
164 N Main St, PO Box 70, Richburg, SC
29729-8223 (803-789-5810); **n4ros@arrl.org**

Rocky Mountain Division

Brian Mileshosky, N5ZGT
PO Box 20186, Albuquerque, NM 87154-0186
(505-463-9468); **n5zgt@arrl.org**

Vice Director: **Dwayne Allen, WY7FD**
PO Box 191, Beulah, WY 82712
(605-210-2005); **wy7fd@arrl.org**

Southeastern Division

Greg Sarratt, W4OZK
912 Pine Grove Rd, Harvest, AL 35749;
(256-337-3636); **w4ozk@arrl.org**

Vice Director: **Sandy Donahue, W4RU**
PO Box 9424, Dothan, AL 36303
(404-403-1513); **w4ru@arrl.org**

Southwestern Division

Richard J. Norton, N6AA
21290 West Hillside Dr, Topanga, CA 90290
(310-455-1138); **n6aa@arrl.org**

Vice Director: **Marty Woll, N6VI**
21301 Candice Pl, Chatsworth, CA 91311-1404
(818-773-9655); **n6vi@arrl.org**

West Gulf Division

Coy C. Day, N5OK*
20685 SW 29th St, Union City, OK 73090-9726
(405-483-5632); **n5ok@arrl.org**

Vice Director: **Dr David Woolweaver, K5RAV**
2210 S 77 Sunshine Strip, Harlingen, TX 78550
(956-425-3128); **k5rav@arrl.org**

*Executive Commitee Member

ARRL Section Managers

www.arrl.org/sections

The 15 divisions of ARRL are arranged into 71 administrative *sections*, each headed by an elected *section manager* (SM). Your section manager is the person to contact when you have news about your activities, or those of your club. If you need assistance with a local problem, your section manager is your first point of contact. He or she can put you in touch with various ARRL volunteers who can help (such as technical specialists). Your section manager is also the person to see if you'd like to become a section volunteer. Whatever your license class, your SM has an appointment available. Visit your section page on the Web at **www.arrl.org/sections/**.

Atlantic Division (DE, EPA, MDC, NNY, SNJ, WNY, WPA)

Delaware: Frank T. Filipkowski, Jr, AD3M, 1130 N Hilton Rd, Oak Lane Manor, Wilmington, DE 19803-5216 (302-656-0409); **ad3m@arrl.org**

Eastern Pennsylvania: Eric Olena, WB3FPL, 284 Blimline Rd, Mohnton, PA 19540 (610-775-0526); **wb3fpl@arrl.org**

Maryland-DC: James E. Cross III, WI3N, 16013 Dorset Rd, Laurel, MD 20707-5314 (301-725-6829); **wi3n@arrl.org**

Northern New York: Tom Valosin, WB2KLD, 117 Warrior Way, Middleburgh, NY 12122-4712 (518-827-4800); **wb2kld@arrl.org**

Southern New Jersey: Jean Priestley, KA2YKN, 7158 Chandler Ave, Pennsauken, NJ 08110 (856-662-3587); **ka2ykn@arrl.org**

Western New York: Scott Bauer, W2LC, 1964 Connors Rd, Baldwinsville, NY 13027 (315-638-7551); **w2lc@arrl.org**

Western Pennsylvania: John Rodgers, N3MSE, 803 S Main St, Butler, PA 16001 (724-287-0424); **n3mse@arrl.org**

Central Division (IL, IN, WI)

Illinois: Tom Ciciora, KA9QPN, 1887 Irene Rd, Sandwich, IL 60548 (815-498-4929); **ka9qpn@arrl.org**

Indiana: James S. Sellers, K9ZBM, 54676 County Road 8, Middlebury, IN 46540-8710 (574-825-5425); **k9zbm@arrl.org**

Wisconsin: Donald Michalski, W9IXG, 4214 Mohawk Dr, Madison, WI 53711 (608-274-1886); **w9ixg@arrl.org**

Dakota Division (MN, ND, SD)

Minnesota: Richard H. "Skip" Jackson, KSØJ, 1835-63rd St E, Inver Grove Heights, MN 55077 (651-260-4330); **ks0j@arrl.org**

North Dakota: Lynn A. Nelson, WØCQ, 6940 4th St SW, Minot, ND 58701 (701-839-8200); **w0cq@arrl.org**

South Dakota: Richard L. Beebe, NØPV, 913 S Gordon Dr, Sioux Falls, SD 57110-3151 (605-376-4241); **n0pv@arrl.org**

Delta Division (AR, LA, MS, TN)

Arkansas: David Norris, K5UZ, 640 Josephine, Batesville, AR 72501 (870-793-6431); **k5uz@arrl.org**

Louisiana: Gary L. Stratton Sr, K5GLS, 8424 Kaw Court, Shreveport, LA 71107 (318-309-0023); **k5gls@arrl.org**

Mississippi: Malcolm Keown, W5XX, 64 Lake Circle Dr, Vicksburg, MS 39180 (601-636-0827); **w5xx@arrl.org**

Tennessee: Glen Clayton, W4BDB, 238 Old Parksville Rd NE, Cleveland, TN 37323; (423-472-7751); **w4bdb@arrl.org**

Great Lakes Division (KY, MI, OH)

Kentucky: Jim Brooks, KY4Z, 7099 Louisville Rd, Cox's Creek, KY 40013 (502-349-2099); **ky4z@arrl.org**

Michigan: Dale Williams, WA8EFK, 291 Outer Drive, Dundee, MI 48131 (734-529-3232); **wa8efk@arrl.org**

Ohio: Joe Phillips, K8QOE, 2800 Jupiter Dr, Fairfield, OH 45014-5022 (513-874-0006); **k8qoe@arrl.org**

Hudson Division (ENY, NLI, NNJ)

Eastern New York: Pete Cecere, N2YJZ, 329 W Saugerties Rd, Woodstock, NY 12498 (845-246-4359); **n2yjz@arrl.org**

NYC-Long Island: Tom Carrubba, KA2D, 226 Sheffield Ave, West Babylon, NY 11704 (631-422-9594); **ka2d@arrl.org**

Northern New Jersey: Richard Krohn, N2SMV, 23 Sweetmans Ln, Manalapan, NJ 07726; **n2smv@arrl.org**

Midwest Division (IA, KS, MO, NE)

Iowa: Jim Lasley, NØJL, PO Box 5, Chillicothe, IA 52548 (641-935-4337); **n0jl@arrl.org**

Kansas: Ronald D. Cowan, KBØDTI, PO Box 36, LaCygne, KS 66040 (913-757-3758); **kb0dti@arrl.org**

Missouri: Dale C. Bagley, KØKY, PO Box 13, Macon, MO 63552-1822 (660-385-3629); **k0ky@arrl.org**

Nebraska: Matthew N. Anderson, KAØBOJ, 2342 Clay St, Ashland, NE 68003 (402-944-7488); **ka0boj@arrl.org**

New England Division (CT, EMA, ME, NH, RI, VT, WMA)

Connecticut: Betsey Doane, K1EIC, 92 Mohegan Rd, Shelton, CT 06484-2448 (203-929-7759); **k1eic@arrl.org**

Eastern Massachusetts: Arthur S. Greenberg, K1GBX, 123 Pond St, Georgetown, MA 01833 (978-352-2095); **k1gbx@arrl.org**

Maine: William Woodhead, N1KAT, 68 Madison St, Auburn, ME 04210 (207-782-4862); **n1kat@arrl.org**

New Hampshire: Alan K. Shuman, K1AKS, PO Box 681, New Boston, NH 03070-3520 (603-487-3333) **k1aks@arrl.org**

Rhode Island: Bob Beaudet, W1YRC, 30 Rocky Crest Rd, Cumberland, RI 02864 (401-333-2129); **w1yrc@arrl.org**

Vermont: Paul N. Gayet, AA1SU, 11 Cherry St, Essex Junction, VT 05452 (802-878-2215); **aa1su@arrl.org**

Western Massachusetts: Ed Emco, W1KT, 37 Bullard Ave, Worcester, MA 01605 (508-853-3333); **w1kt@arrl.org**

Northwestern Division (AK, EWA, ID, MT, OR, WWA)

Alaska: Jim Larsen, AL7FS, 3445 Spinnaker Dr, Anchorage, AK 99516-3424 (907-345-3190); **al7fs@arrl.org**

Eastern Washington: Mark Tharp, KB7HDX, PO Box 2222, Yakima, WA 98907-2222 (509-965-3379); **kb7hdx@arrl.org**

Idaho: Edward Stuckey, AI7H, 2300 W Polo Green Ave, Post Falls, ID 83854-9680 (208-457-0354); **ai7h@arrl.org**

Montana: Doug Dunn, K7YD, 216 Fiddle Creek Rd, Livingston, MT 59047-4116 (406-686-9100); **k7yd@arrl.org**

Oregon: Bonnie Altus, AB7ZQ, 7770 Harmony Rd, Sheridan, OR 97378 (971-237-0711); **ab7zq@arrl.org**

Western Washington: Jim Pace, K7CEX, PO Box 1602, Centralia, WA 98531 (360-736-2221); **k7cex@arrl.org**

Pacific Division (EB, NV, PAC, SV, SF, SJV, SCV)

East Bay: James Latham, AF6AQ, 1798 Warsaw Ave, Livermore, CA 94550-6140; (925-447-6136); **af6aq@arrl.org**

Nevada: Joe Giraudo, N7JEH, 720 Holyoke Dr, Spring Creek, NV 89815-5306 (775-738-7110); **n7jeh@arrl.org**

Pacific: Bob Schneider, AH6J, PO Box 131, Keaau, HI 96749-0131 (808-966-8146); **ah6j@arrl.org**

Sacramento Valley: Ronald D. Murdock, W6KJ, 998 Bogue Rd, Yuba City, CA 95991-9221 (530-674-8533); **w6kj@arrl.org**

San Francisco: Bill Hillendahl, KH6GJV, PO Box 4151, Santa Rosa, CA 95402-4151 (707-544-4944); **kh6gjv@arrl.org**

San Joaquin Valley: Charles P. McConnell, W6DPD, 1658 W Mesa Ave, Fresno, CA 93711-1944 (559-431-2038); **w6dpd@arrl.org**

Santa Clara Valley: Bill Dale, N2RHV, 142 N Milpitas Blvd #264, Milpitas, CA 95035 (408-263-5325); **n2rhv@arrl.org**

Roanoke Division (NC, SC, VA, WV)

North Carolina: Tim Slay, N4IB, 141 Queens Cove Rd, Mooresville, NC 28117-9609 (704-382-4646); **n4ib@arrl.org**

South Carolina: James F. Boehner, N2ZZ, 525 Barnwell Ave NW, Aiken, SC 29801-3939 (803-641-9140); **n2zz@arrl.org**

Virginia: Carl Clements, W4CAC, 4500 Wake Forest Rd, Portsmouth, VA 23703 (757-484-0569); **w4cac@arrl.org**

West Virginia: L. Ann Rinehart, KA8ZGY, 1256 Ridge Dr, South Charleston, WV 25309 (304-768-9534); **ka8zgy@arrl.org**

Rocky Mountain Division (CO, NM, UT, WY)

Colorado: Jeff Ryan, KØRM, 9975 Wadsworth Pky K2-275, Westminster, CO 80021 (303-432-2886); **k0rm@arrl.org**

New Mexico: Donald D. Wood, W5FHA, 9100 Wimbledon Dr NE, Albuquerque, NM 87111 (505-828-0988); **w5fha@arrl.org**

Utah: Mel Parkes, NM7P, 2166 E 2100 North, Layton, UT 84040 (801-547-1753); **nm7p@arrl.org**

Wyoming: Lee Anne Allen, WY7DTW, 82 Wenger Dr, Devils Tower, WY 82714-8700 (307-756-3916); **wy7dtw@arrl.org**

Southeastern Division (AL, GA, NFL, PR, SFL, VI, WCF)

Alabama: Jay Isbell, KA4KUN, 2290 Quail Dr, Bessemer, AL 35022 (205-424-9993); **ka4kun@arrl.org**

Georgia: Susan Swiderski, AF4FO, 772 Camelot Way, Norcross, GA 30071 (770-449-0369); **af4fo@arrl.org**

Northern Florida: Paul L. Eakin, KJ4G, PO Box 625, Panacea, FL 32346 (850-591-0442); **kj4g@arrl.org**

Puerto Rico: Roberto Jimenez, KP4AC, PO Box 360536, San Juan, PR 00936-0536 (787-756-7276); **kp4ac@arrl.org**

Southern Florida: Sharon T. "Sherri" Brower, W4STB, 736 34th Ter, Vero Beach, FL 32968-1226 (772-562-3240); **w4stb@arrl.org**

Virgin Islands: John Ellis, NP2B, PO Box 24492, Christiansted, St Croix, VI 00824 (340-773-9643); **np2b@arrl.org**

West Central Florida: Dee Turner, N4GD, 10132 64th St N, Pinellas Park, FL 33782 (727-548-7474); **n4gd@arrl.org**

Southwestern Division (AZ, LAX, ORG, SDG, SB)

Arizona: Thomas J. Fagan, K7DF, 10650 E Bridgeport St, Tucson, AZ 85747-5925 (520-574-1129); **k7df@arrl.org**

Los Angeles: Phineas J. Icenbice Jr, W6BF, 19323 Halsted St, Northridge, CA 91324 (818-349-3186); **w6bf@arrl.org**

Orange: Carl Gardenias, WU6D, 20902 Gardenias St, Perris, CA 92570 (951-443-4958); **wu6d@arrl.org**

San Diego: Stephen M. Early, AD6VI, 4724 Maple Ave, La Mesa, CA 91941 (619-461-2818); **ad6vi@arrl.org**

Santa Barbara: Robert Griffin, K6YR, 1436 Johnson Ave, San Luis Obispo, CA 93401-3734 (805-543-3346); **k6yr@arrl.org**

West Gulf Division (NTX, OK, STX, WTX)

North Texas: Tom Blackwell, N5GAR, Box 25403, Dallas, TX 75225 (214-361-5275); **n5gar@arrl.org**

Oklahoma: John Thomason, WB5SYT, 1517 Oak Dr, Edmond, OK 73034-7408 (405-844-1800); **wb5syt@arrl.org**

South Texas: E. Ray Taylor, N5NAV, 15426 Spring Coral, San Antonio, TX 78247 (210-233-8971); **n5nav@arrl.org**

West Texas: John Dyer, AE5B, 9124 County Road 301, Cisco, TX 76437 (254-442-4936); **ae5b@arrl.org**

FT DX 9000 Series Option and Accessories Chart Diagrams

	FT DX 9000 Contest	FT DX 9000D	FT DX 9000MP (Special Order Version)
Second Receive Unit **RXU-9000**	Option	○	○
VRF Unit (Second Receiver) **VRF-9000**	Option	○	○
RF μ-Tuning Unit A (160 m Band) **MTU-160**	Option	○	Option
RF μ-Tuning Unit B (80/40 m Bands) **MTU-80/40**	Option	○	Option
RF μ-Tuning Unit C (30/20 m Bands) **MTU-30/20**	Option	○	Option
Data Management Unit (Includes 64 MB Compact Flash Memory Card and Card Slot) **DMU-9000**	Option Allows interconnection of external LCD display (not supplied) when TFT Unit is not installed.	○	○
TFT Display Unit **TFT-9000** Installation of the TFT Unit requires the concurrent installation of the Data Management Unit. Installation of the TFT Unit after the date of original transceiver purchase involves an installation fee; contact WDXC for details.	Option (DMU-9000 required)	○	Option
Display Color ●Light Blue Display option ●Umber Orange Display option	please specify when ordering.	please specify when ordering.	please specify when ordering.
Transmitter Power Output	200 W		400 W
AC Input	Universal Input (100-240 VAC) without re-wiring		FPS-9000H AC Power Supply with Dual Speakers and Audio Filters
Appearance and Features	LCD + 2 Dual Meters, no Sub Receiver Main Receiver includes VRF	Large 6.5" TFT Display Main/Sub Receiver includes VRF	LCD + 2 Dual Meters, Main/Sub Receiver includes VRF

●Additional installation charges will apply if accessories are ordered after original purchase date for transceiver.

YAESU HF Series

Shown with after-market keyboard, and monitor (not supplied). Optional Data Management Unit (DMU-2000)

HF/50 MHz Transceiver
FT-2000D
200 W Version (External Power Supply)

HF/50 MHz Transceiver
FT-2000
100 W Version (Internal Power Supply)

Shown with after-market keyer paddle, keyboard, and monitor (not supplied). The MD-200ax Desktop Deluxe Dynamic Microphone, the FH-2 Remote Control Keypad and the DMU-2000 Data Management Unit are optional items.

HF/50 MHz 100 W Transceiver
FT-950

Compact size : 9" X 3.3" x 8.5" and Light weight : 7.9 lb

HF/50 MHz 100 W
All Mode Transceiver
FT-450
Automatic Antenna Tuner
ATU-450 optional

■**FT-450AT**
With Built-in ATU-450
Automatic Antenna Tuner

YAESU
Choice of the World's top DX'ers

"The Best of the Best Just Got Better"

Vertex Standard **US Headquarters** 10900 Walker Street, Cypress, CA 90630 (714) 827-7600
For the latest Yaesu news, visit us on the Internet: http://www.vertexstandard.com

The radio... FT DX 9000

Overwhelming, eminent presence.
Nothing to compromise,
seeking perfection in all areas of transceiver design.

HF/50 MHz Transceiver
FT DX 9000D
200 W Version

HF/50 MHz Transceiver
FT DX 9000 Contest 200 W Custom-Configurable Version

HF/50 MHz Transceiver
FT DX 9000MP 400 W Special Order Version

If you inspect this life-size photograph yourself,
you'll realize that words do not do justice to its beauty.

Photograph: FT DX 9000D, Actual Size

AMERITRON . . . 800 Watts . . . $899!

More hams use Ameritron AL-811/H amplifiers than any other amplifier in the world!

AL-811H
$899
Suggested Retail
4-Tubes, 800 Watts

AL-811
$749
Suggested Retail
3-Tubes, 600 Watts

Only the Ameritron AL-811H gives you four *fully neutralized* 811A transmitting tubes. You get absolute stability and superb performance on higher bands that can't be matched by un-neutralized tubes.

You get a quiet desktop linear that's so compact it'll slide right into your operating position -- you'll hardly know it's there . . . until QRM sets in. And you can conveniently plug it into your nearest 120 VAC outlet -- no special wiring needed.

You get all HF band coverage (with license) -- including WARC and most MARS bands at 100% rated output. Ameritron's *Adapt-A-Volt*™ hi-silicon core power transformer has a special buck-boost winding that lets you compensate for high/low power line voltages.

You also get efficient full size heavy duty tank coils, slug tuned input coils, operate/standby switch, transmit LED, ALC, dual illuminated meters, QSK with optional QSK-5, pressurized cooling that you can hardly hear, full height computer grade filter capacitors and more. 13¾Wx8Hx16D inches.

AL-811, $749. Like AL-811H, but has three 811A tubes and 600 Watts output.

AMERITRON ***no tune*** Solid State Amplifiers

ALS-500M 500 Watt Mobile Amp

ALS-500M
$849
Suggested Retail

500 Watts PEP/400W CW output, 1.5-22 MHz, instant bandswitching, no tuning, no warm-up. SWR, load fault, thermal overload protected. On/Off/Bypass switch. Remote on/off control. DC current meter. Extremely quiet fan. 13.8 VDC. 9Wx3½Hx15D in., 7 lbs. **ALS-500RC, $49,** Remote Head.

ALS-600 Station 600 Watt FET Amp

ALS-600
$1299
Suggested Retail

No tuning*, no fuss, no worries -- just turn on and operate.* 600 Watts PEP/500W CW, 1.5-22 MHz, instant bandswitching, SWR protected, extremely quiet, SWR/Wattmeter, ALC control. 120/220 VAC. Inrush protected. 9½Wx6Hx12D in. **ALS-600S, $1428,** ALS-600 with 10 lb. switching power supply.

AL-80B . . . *Desktop Kilowatt* 3-500G Amp

AL-80B
$1399
Suggested Retail

AL-80B kilowatt output *desktop* linear amplifier doubles your average SSB power output with high level RF processing using our exclusive *Dynamic ALC*™!

You get cooler operation because the AL-80B's exclusive *Instantaneous RF Bias*™ completely turns off the 3-500G tube between words and dots and dashes. Saves hundreds of watts wasted as heat for cooler operation and longer component life.

You get a full kilowatt PEP output from a whisper quiet desktop linear. Compact 15½Wx8½Hx14D inches. Plugs into your nearest 120 VAC outlet. Covers 160 to 15 Meters, including WARC and MARS (user modified for 10/12 Meters w/license).

You get 850 Watts output on CW, 500 Watts output on RTTY, an extra heavy duty power supply, genuine 3-500G tube, nearly 70% efficiency, tuned input, Pi/Pi-L output, inrush current protection, multi-voltage transformer, dual Cross-Needle meters, QSK compatability, two-year warranty, plus much, much more! Made in U.S.A.

Near Legal Limit ™ Amplifier

AL-572
$1595
Suggested Retail

New class of *Near Legal Limit*™ amplifier gives you 1300 Watt PEP SSB power output for *60%* of price of a full legal limit amp! 4 rugged 572B tubes. Instant 3-second warm-up, plugs into 120 VAC. Compact 14½Wx 8½Hx15½D inches fits on desktop. 160-15 Meters. 1000 Watt CW output. Tuned input, instantaneous RF Bias, dynamic ALC, parasitic killer, inrush protection, two lighted cross-needle meters, multi-voltage transformer.

HF Amps with Eimac 3CX800A7

Suggested Retail

AL-800
$1995
1 *Eimac*(R) tube, 1250 W

AL-800H
$2995
2 *Eimac*(R) tubes, 1.5 kW *Plus*
With Imported Tube
AL-800F, $1825
AL-800HF, $2695

These *compact* desktop amplifiers with 3CX800A7 tubes cover 160-15 Meters including WARC bands. Adjustable slug tuned input circuit, grid protection, front panel ALC control, vernier reduction drives, heavy duty 32 lb. silicone steel core transformer, high capacitance computer grade filter capacitors. Multi-voltage operation, dual lighted cross-needle meters. 14¼Wx8½Hx16½D in.

AMERITRON ***full legal limit*** amplifiers

AMERITRON legal limit amps use a super heavy duty Peter Dahl Hypersil(R) power transformer capable of 2.5 kW!

Most powerful -- 3CX1500/8877

AL-1500
$3495
Eimac(R) Tube

AL-1500F
$3095
Imported tube

Suggested Retail

Ameritron's *most powerful* amplifier uses the herculean 3CX1500/8877 ceramic tube. 65 watts drive gives you full legal output -- it's just loafing with a 2500 Watts power supply.

Toughest -- 3CX1200A7

AL-1200
$3459
Suggested Retail

Get ham radio's *toughest* tube with the Ameritron AL-1200 -- the *Eimac*(R) 3CX1200A7. It has a 50 Watt control grid dissipation. What makes the Ameritron AL-1200 stand out from other legal limit amplifiers? The answer: A super heavy duty power supply that loafs at full legal power -- it can deliver the power of more than 2500 Watts PEP two tone output for a half hour.

Classic -- Dual 3-500Gs

AL-82
$2645
Suggested Retail

This linear gives you full legal output using a *pair* of *genuine* 3-500Gs. Competing linears using 3-500Gs *can't* give you 1500 Watts because their lightweight power supplies *can't* use these tubes to their full potential.

Call your dealer for your best price!

Free Catalog: 800-713-3550

Ameritron brings you the finest high power accessories!

ARB-704 amp-to-rig interface. . . $59.95

Protects rig from damage by keying line transients and makes hook-up to your rig easy!

ADL-1500 Dummy Load with oil . . . $74.95

Oil-cooled. 50 Ohms. 1500 Watts/5 minutes. SWR< 1.2 to 30 MHz. Low SWR to 400 MHz.

ADL-2500 fan-cooled Dry Dummy Load, $209.95

Whisper quiet fan, 2.5kW/1 minute on, ten off. 300W continuous. SWR< 1.25 to 30 MHz.<1.4 to 60 MHz.

ATP-100 Tuning Pulser . . . $69.95

Safely tune up for full power, best linearity. Prevents overheating, tube damage, power supply stress, component failure.

AMERITRON®

. . . the world's high power leader!

116 Willow Road, Starkville, MS 39759
TECH (662) 323-8211 • **FAX** (662) 323-6551
8 a.m. - 4:30 p.m. CST Monday - Friday
For power amplifier components call (662) 323-8211
http://www.ameritron.com

AMERITRON . . . the world's high power leader!

TARHEEL ANTENNAS

Little Tarheel II
200 Watts P.E.P.
3.5 Mhz - 54.0 Mhz
$379

TARHEEL ANTENNAS
The Little Tarheel II

Model 100A-HP 10-80 Mtrs $389
Model 200A-HP 10-80 Mtrs $409

The LITTLE TARHEEL II is the best selling compact motorized antenna and has been built to meet the same high standards as the entire Tarheel line of antennas. When properly installed on your vehicle. The LITTLE TARHEEL II will provide continuous coverage from 3.5 to 54 MHz.

The LITTLE TARHEEL II was born from the amateurs desire to enjoy HF mobile but was deterred by the original design of our larger antennas. The Little Tarheel II enables the operator to mount the antenna higher than before, giving less ground loss, which enables higher performance. Also the compact size and light weight make it easy to mount on most vehicles.

The LITTLE TARHEEL II motorized antennas and stainless steel mounts are designed with the avid HAM radio operator in mind. They are constructed of the best materials and top of the line workmanship.

ANTENNA SPECIFICATIONS
Lower Mast Size -- 1 1/2"
Lower Mast Length -- 16"
Whip Length -- 32"
Total Length of Antenna in 54 MHz -- 48"
Total Length of Antenna in 3.5 MHz -- 54"
Freq. Coverage Continuous -3.5 to 54 MHz
Power Rating -- 200 watts P.E.P.
Typical SWR 1.5 or less
Weight -- 1.9 lbs.

Model 300A 10-160 Mtrs $389
Model 400A 10-160 Mtrs $409

For a full list of our products OR CALL OUR HOTLINE

www.tarheelantennas.com TEL: 877-671-9409

18511 CR 304 St. Joseph, MO 64505

Searching for peak HF performance?

"This is the first receiver we've tested with better than 100 dB IMD dynamic range at the closer signal spacings." *QST* Product Review, April 2008

Introducing the Elecraft K3 transceiver

No other rig in this price class comes close to the K3's performance. Its high dynamic range, down-conversion architecture provides roofing filter bandwidths as narrow as 200 Hz, while its 32-bit I.F. DSP handles advanced filtering and noise reduction. The K3 also offers an optional fully independent, high-performance subreceiver, as well as innovative new features like variable-bandwidth, DSP-tracking roofing filters, and 8-band RX/TX EQ.

Then there's the K3's unmatched versatility. It provides state-of-the-art performance as a primary home station, yet its size and weight make it ideal for DXpeditions, RV operation, and Field Day. You *can* take it with you!

- 100-W model starts at $1849; upgradable 10 W model, $1399
- 160-6 m; SSB/CW/AM/FM/data modes
- Up to five crystal roofing filters in both main and subreceivers
- 4"H x 10" W x 10"D; only 8 pounds
- Factory-assembled or *no-soldering* kit (all PC boards pre-built, 100% tested)
- Fully isolated soundcard interface
- Built-in PSK31/RTTY for data-mode QSOs with or without a computer
- Unsurpassed customer support

ELECRAFT®

Elecraft is a registered trademark of Elecraft, Inc.

www.elecraft.com • 831-662-8345
P.O. Box 69, Aptos, California 95001-0069

Up Front in QST

upfront@arrl.org

Collage Honors Family's Hams

Paul Deppe, N4NEH

My dad Roger Deppe, N9FEC, was one of four brothers, all of whom were long-time hams. Their father owned several businesses during this time, including a hardware store and radio repair shop, so the brothers were exposed to radio at an early age. They all served in the military during and after World War II, and they all earned college degrees in engineering.

Les Deppe, WØRYX, 1920-2006. Served as a radio operator in the Navy in WWII, earned a BSEE, worked as an electrical engineer for a taconite mining company in northern Minnesota. Les was fluent in Swedish, Norwegian and Danish and had many long-time ham friends in Scandinavia.

Roger Deppe, N9FEC, 1922-2005. Served as a Navy pilot in WWII, earned BSME, worked as an industrial engineer for Eli Lilly & Co in Indianapolis. After his retirement he worked for the Indianapolis Motor Speedway in public relations. Dad and I got our Novice tickets together at the local Red Cross in 1971.

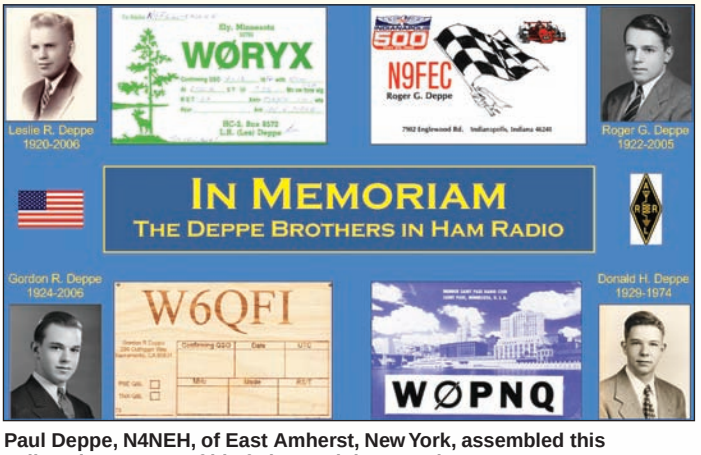
Gordon Deppe, W6QFI, 1924-2006. Served in the Navy during and after WWII, earned a BSEE, worked as an instrumentation engineer for a nuclear power companies in Los Angeles and Sacramento. Gordy also hosted local radio shows on music from the Big Band Era.

Donald Deppe, WØPNQ, 1929-1974. Served in Army Intelligence during and after the Korean War, earned a BSEE, worked in the electronics industry in Minneapolis until his tragic death in a fire in 1974. Don was a talented homebrewer and I still have the schematic for a MOSFET-based HF transceiver he designed and built in 1973.

After my dad passed away, I had the idea to make a plaque for our vacation home in Minnesota. My folks bought a small cabin on a lake near Ely, Minnesota about 25 years ago and dad and I put up a dipole and took our HF and VHF rigs there each summer. One corner of the cabin has a small desk for the shack and I thought a plaque would be nice to remember them by. I had many summer QSOs with dad, Les and Gordy from our home and cabin. My daughter Colette (8) likes to work 20 meter PSK31 at the cabin with me almost as much as fishing!

I should also mention that my mother Bea Deppe is also a ham (KB9WHD), as is my aunt (Les' wife) Phyllis (KAØLWU).

PAUL DEPPE, N4NEH



Paul Deppe, N4NEH, of East Amherst, New York, assembled this collage in memory of his father and three uncles.

Field Day Group Encourages Drop-Ins

When the Marin ARS and Redwood Empire DX Association decided to join forces for Field Day, most of the focus was on radios and antennas. Operating as W6SG "2A," we knew that band conditions were not perfect but we would make a fair score using the club's new SteppIR 3L, a SteppIR 2L and a "shorty 40" on three surplus military towers.

We also needed to earn some bonus points. One category is "*Site Visitation by . . . an agency… as a result of an invitation . . .*" The REACH Medical Helicopter Service was invited and they certainly did "drop in"! At 1500, a helicopter circled the site. Then the pilot gracefully brought the helicopter in right on target! They gave us a tour of the aircraft and they toured our Field Day site. REACH provides air ambulance services in Northern California. Their mission is to transport patients despite any adverse weather conditions to area hospitals. In the end, W6SG submitted 1250 bonus points. — *Doug Bender, WW6D, and Jim Robinson, KE6UAR*

MARILYN BAGSHAW, N6VAW

With the FD antennas in the background, the REACH helicopter pays a visit to the W6SG Field Day site at the Marin Rod and Gun Club on San Francisco Bay.

Hawk Prefers Horizontal Polarization

For some time I have been finding my magnetic 144/440 MHz antenna on the roof of my S-10 pickup lying on its side. I didn't have a clue if birds were hitting it, kids were messing with it or what. As I was looking out the bedroom window one day, I saw the reason for the tipped over antenna. Evidently, a red tailed hawk is an anti-ham radio activist. This mount has a rare earth magnet and will stand up to 80 mi/h highway speeds, tornado/storm chasing and ice. But not a determined red tailed hawk. — *Troy Creed, W8TCC*

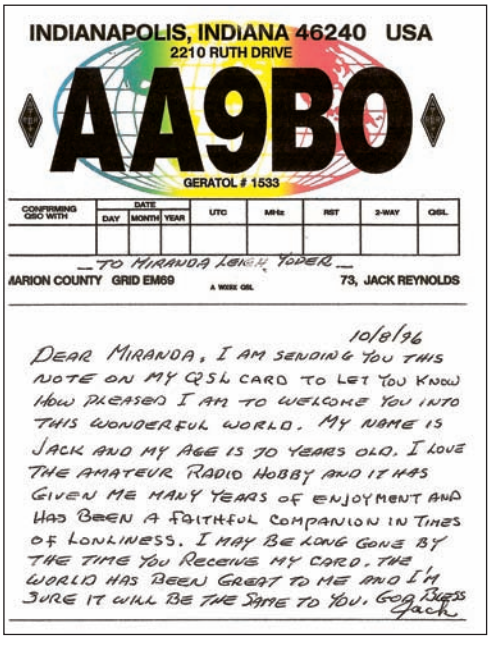
TROY CREED, W8TCC

A Lansing, Michigan ham has a hawk with an attitude.

Not Yet Licensed... But on her Way to WAS!

Thirteen years ago when my granddaughter was born, I began asking fellow hams on the Geratol Net to send an extra QSL card with a note to her about ham radio. It was my plan to give them to her if she ever expressed an interest in my hobby. At that time I lived in Ohio and I got cards to Miranda Yoder from 48 of the 50 states.

Recently she and I were talking and she asked me about the QSLs I had lying on the table. She was surprised to hear me say that she had 48 of them addressed to her in a notebook in my radio room! As we perused the cards, there was one from Jack Reynolds, AA9BO, a local ham here in Indianapolis. Jack and Miranda were both amused that when he sent the card 13 years age to welcome her "into this wonderful world," he said, "I may be long gone by the time you receive my card." Well, Jack is still here and still filling the airwaves with his golden, easily recognizable voice. — *Ed Jackson, W8WJ*


INDIANAPOLIS, INDIANA 46240 USA
2210 RUTH DRIVE
AA9BO
GERATOL # 1533

CONFIRMING QSO WITH | DATE DAY MONTH YEAR | UTC | MHz | RST | 2-WAY | QSL

— TO MIRANDA LENEE YODER —
MARION COUNTY GRID EM69 | A WEEE QSL | 73, JACK REYNOLDS

10/8/96

DEAR MIRANDA, I AM SENDING YOU THIS NOTE ON MY QSL CARD TO LET YOU KNOW HOW PLEASED I AM TO WELCOME YOU INTO THIS WONDERFUL WORLD. MY NAME IS JACK AND MY AGE IS 70 YEARS OLD. I LOVE THE AMATEUR RADIO HOBBY AND IT HAS GIVEN ME MANY YEARS OF ENJOYMENT AND HAS BEEN A FAITHFUL COMPANION IN TIMES OF LONLINESS. I MAY BE LONG GONE BY THE TIME YOU RECEIVE MY CARD. THE WORLD HAS BEEN GREAT TO ME AND I'M SURE IT WILL BE THE SAME TO YOU. GOD BLESS Jack

ED JACKSON, W8WJ

When his granddaughter was born, Ed Jackson, W8WJ, asked his ham friends to send her a "welcome to the world" QSL card. He recently shared the 48 cards with her, including one from Jack Reynolds, AA9BO (right), who lives nearby.

K1SS: A Ham for 78 Years

Edward Rubin, N2JBA

NEV DUNN, N2CPP

Sid Shore, K1SS, of Sharon, Connecticut, addresses a recent meeting of the Southern Berkshire ARC in Sharon, Connecticut.

Sid Shore received his amateur license (W2AXG) in 1930 while attending high school in New York City. At age 15 his aunt and uncle persuaded him to move to Austin, Texas and attend the University of Texas at Austin. He was not yet 16.

During the pre-World War II years, Sid qualified for the DX Century Club with his initial 100 contacts; following the war, he was able to increase his country tally to 326. His call sign was changed from W2AXG to K2FC. In 1976, Sid moved to Sharon, Connecticut, and he received his present call sign of K1SS.

Sid had some experience with quartz crystal oscillators, since his father had been involved with building receivers and transmitters that used quartz crystals. Following a stint from 1941 to 1943 teaching high school, he went to work for North American Philips at a facility that manufactured quartz crystals used in military aviation radios. The manufacturing process had a 70% rejection rate; the crystals also tended to undergo a significant frequency change when they experienced the temperature changes associated with high altitude aviation.

Sid devised a cutting procedure which was able to cut the crystals much more accurately. During the war years, nine companies eventually used the process, which improved crystal performance and reduced the rejection rate to 5%.

After experiencing some health problems, Sid offered his services to the military, and was a CW operator on a Liberty Ship loaded with vehicles and ammunition. By May 1944, the ship was in Scotland, and in June 1944 the ship went to England and then on D-Day to Utah Beach where it took two months to unload its supplies.

In 1956 Sid and a friend of his started their own company, Shorex, which was involved in the importation of goods from Japan. Sid traveled to Asia 49 times to a number of countries. He later developed a series of training seminars to encourage creativity and inventiveness called "Creativity in Action." In the course of presenting these seminars, he made more than 80 trips to many European countries. In each country he got to know ham radio operators and made life-long friends. In turn, he and his wife Gabrielle have entertained visiting hams from abroad who have visited them in Sharon.

Sid has been a long-time member of F.O.C. — First Class Operators — a worldwide network of CW ops who maintain close relationships. Through that association and through the almost 80 years of ham radio contacts he has made, his life is one great example of the value of ham radio in getting to know people all over the world. Sid is a founding member of the Southern Berkshire Amateur Radio Club in Sharon, Connecticut and has been licensed for 78 years.

BOB BESLEY, K4NJN

Katie Besley, KI4LSZ, now a sophomore at Aiken (SC) High School, dedicated her summer toward advancing Amateur Radio. She participated in Field Day and promoted emergency communication to children during Kids Day. She also served as net control station for a session of the weekly South Carolina ARES® net. — *Bob Besley K4NJN*

One Microphone,
One Pair of Headphones,
One Pair of Speakers,
One Sound Card Interface, One Computer

TWO RADIOS!

station integration console

RIGblaster duo

Make your station neater and easier to operate! Never get tangled up in your mic. and headphone cords again.

The first station integration console to conveniently control your station almost any way you wish.

All the best features of a RIGblaster for two radios, not just one.

As simple to setup and operate as possible yet allowing extreme versatility with the function and intuitive ergonomics of an aircraft audio panel.

A built-in dual USB to serial converter to run two Amateur Radio programs at the same time.

Dual isolated CW keying, dual FSK, dual rig control via either virtual COM port.

Fully functional computer audio, unlike external audio device interfaces. The RIGblaster duo controls, selects and amplifies the sound for your station, with HiFi stereo for the computer.

Works with almost any make or model microphone and most any two make or model radios; and almost any stereo headphones or any pair of speakers.

West Mountain Radio www.westmountainradio.com

ORDER ON-LINE OR CALL TOLL FREE (888) 937-8686, (888) WESTMTN

It shouldn't feel like work.

OMNI-VII. It's that simple.

So sit back in your chair and relax. The Omni-VII not only has top of the line receiver performance and everything else you need in a high-end transceiver -- it's also very easy to use. Spend your time on the air instead of reading the operator's manual. For complete information on the Omni-VII and our Amateur Radio product line, visit our website or call (800) 833-7373 for our current catalog.

Proudly made in Sevierville, Tennessee USA

TEN-TEC

www.tentec.com

1185 Dolly Parton Pkwy., Sevierville, TN 37862. Sales: 800-833-7373 M-F 8:00-5:30 (Eastern Time) sales@tentec.com. Office: (865) 453-7172. FAX: (865) 428-4483.
Service: (865) 428-0364 M-F 8:00-5:00 (Eastern Time), service@tentec.com. We accept Visa, MC, American Express and Discover.

CORRESPONDENCE

PL-259s AT ALL LEVELS

♦ I had to laugh regarding Neil Schwanitz's, WD8CRT/V73NS, complaint regarding yet another article about PL-259s or J-Poles ["Correspondence," August 2008, page 24]. In that same August issue, there are articles on pages 49 and 71-72 regarding soldering of the venerable PL-259. To be honest, page 71 was actually about the use of soldering torches; then again, it was a PL-259! As for me, pages 71-72 gave me a new idea on how to prep coax for a PL-259. It's an odd method to be sure, but I'll keep it in mind.

JOHN POWELL, KF6EOJ
Downey, California

♦ An appliance operator? I consider the term, to be a slap in the face. You see, I'm an appliance operator. I really admire hams with real electronic skill and understanding. Ham radio gives me a glimpse into what that electronic world is all about. Can I build useful radio gear with ease or real understanding of what I'm doing? No. Will I ever? I doubt it.

I'm also an appliance operator professionally. As a commercial helicopter pilot, I operate a large appliance; highly trained mechanics do the building and maintaining. I really admire and appreciate their skills, believe me. So to all of you designers and builders: Bless you. Let us appliance operators do what we enjoy doing without having to listen to electronic top guns.

PAUL KEARNS, KJ7LB
Coos Bay, Oregon

TRIPPING TO NEWINGTON

♦ On July 2, 2008 I and four other hams from the Albany (New York) Amateur Radio Association made our annual post-Field Day trip to Newington. As usual, we were greeted by Penny Harts, N1NAG, in her exuberant friendly manner. After dropping off our outgoing QSL cards, we submitted cards for DXCC updates to DXCC Manager Bill Moore, NC1L. Bill and his staff were very efficient in handling the cards for those of us who were doing a "walk-in" submission. Then we went on a tour of HQ (we have been doing such tours at least once or twice a year for the last eight or nine years). Every time we visit the League, we learn something new during the tours.

We also had the honor of meeting ARRL Archivist Perry Williams, W1UED, and talking to him about the legislation that set up the VEC and VE program. The HQ club station, W1HQ, was a pleasant surprise since our last visit; the station has been made into a first class club station. After lunch, we visited W1AW and talked to Station Manager Joe Carcia, NJ1Q, about recent improvements and additions to W1AW. As expected, Joe was most cordial and informative. Our compliments to the staff at ARRL for the great work the League is doing.

BUD HOVEY, WF2B, ARRL Life Member
Troy, New York

NEW TECHNOLOGIES SHOULD INCORPORATE THE OLD

♦ While I would agree to the need to consider developing new systems and new technologies, there remains the principle: "When all else fails" ["Op-Ed," August 2008, page 100]. Systems that rely on landline links, such as EchoLink — or cellular-based technologies depending on umbilical sources for power and/or transmissions — fail this criterion unless they are equipped with uninterruptable source of power. Amateur Radio has always been known for its stand-alone self-sufficiency; new systems and technologies should maintain that fundamental requirement.

ALBERT J. DERR, N3QIJ
Lansdale, Pennsylvania

SETTING THE RECORD STRAIGHT ON *SPUTNIK*

♦ Your articles on *Sputnik* ["The Wake-Up Call," pages 50-51 and "Old Radio," page 84, October 2007] provide an accurate account of what happened the night of October 5, 1957 when most of the world learned the Soviet Union had launched *Sputnik*. What most of the world didn't know was that one day earlier — before the word *Sputnik* was on the lips of every American — an Amateur Radio operator was the first person in the US to officially spot and track what was then known as *1957 Alpha 1*, or *Sputnik*.

I was that ham. In January 1957, I was selected by the Smithsonian to establish and operate a tracking station in Indiana. That year, the US planned to launch a Vanguard rocket into space; stations across the country were built as back-ups to the main stations in Maryland down to Chile that would be tracking this rocket. With 16 telescopes, my Indiana station was the largest visual tracking station in the country. On the evening of October 4, I was recording with a Bell Record-o-Phone and receiving on a Hallicrafters SX-100. During my practice satellite tracking session, I spotted *Sputnik* rising in the north-northwest, thinking it was an off-course Civil Air Patrol plane. I alerted the 16 fixed observers — one at each telescope — and told my radio operator (an electrical engineer, but not a ham) to zero-beat WWV on 20 Mc. In tuning, he inadvertently went up 5 kc and heard the *beep-beep-beeps*. We recorded the *beeps* and the rest is history.

NUNZIO ADDABBO, W4VYD (ex-K9EWC)
Tucson, Arizona

HEY, MR POSTMAN

♦ I just wanted to say thank you for your article about "How *QST* Gets to Your Mailbox" ["Inside HQ," August 2008, page 13]. It was a real education for me to learn how far things have to be done in advance of when we receive *QST*. I will get my renewal notice in sooner next time for all of my subscriptions.

WENDY JOHNSON, KD6OAX
Mountain View, Arkansas

Your opinions count! Send your letters to "Correspondence," ARRL, 225 Main St, Newington, CT 06111. You can also submit letters by fax at 860-594-0259, or via e-mail to: **qst@arrl.org**. We read every letter received, but we can only publish a few each month. We reserve the right to edit your letter for clarity, and to fit the available page space. Of course, the publishers of *QST* assume no responsibility for statements made by correspondents.

FLEX-5000A
HF-6M Transceiver

Contester and DXer's Dream Machine!

Unmatched Flexibility. Ultra High-end Performance. Affordable Price.

The FLEX-5000A brings the highest level of features and performance to an affordable price. Its high resolution display gives you lab grade performance with a panadapter that allows you to see the weak signals before you hear them. With the optional second receiver installed the FLEX-5000A is SO2R ready. Easy upgrades and powerful features are a click away for NO extra cost with open source PowerSDR™ software! The FLEX-5000A introduces a new paradigm of Ham Radio where the radio continuously improves over time.

"The FLEX-5000A offers more features and flexibility than virtually any other transceiver I've ever seen and possibly any other radio on the market." (Rick Lindquist, N1RL, QST product review July 2008)

For Detailed Specifications and Features
www.flex-radio.com sales@flex-radio.com
(512) 535-5266

FlexRadio Systems®
Software Defined Radios

High Sierra

www.cq73.com

AntennAs and Amateur Radio Products

Professional Antennas and Products for the Amateur Since 1993

Super "Online" Sale

Sierra Slim Antennas
75/80, 40, 20, 17, 15 and 10 Meters
Standard 3/8-24 Thread
250 Watt Rating
Regular $35
Online Sale $20

Jaws
Stainless Steel
Standard 3/8-24 Antenna Mount
Regular $65
Online Sale $35

Dual Band Antenna for Handhelds
Either SMA or BNC
Very Flexible &
About 7 Inches Tall
Regular $20
Online Sale $10

Professional Crimping Tool for Coax Connectors
Two Dies for Most Connectors
Regular $100
Online Sale $50

5 Inch Magnet Mount with NMO Base
Approximately 16 Feet of Coax with Connector Installed
Regular $35
Online Sale $22

Automatic Wire Stripper
Strips 12 to 26 Gauge
Regular $30
Online Sale $15

Crimp Type PL-259's
Silver Plated
For RG8 & RG213
6 Connectors
Regular $20
Online Sale $15

VHF/UHF Dual Band Antenna
NMO Type Base,
144 MHz & 440 MHz
Commercial Quality
Regular $40
Online Sale $20

Limited Quantities

D-STAR:
CONNECT ACROSS MILES INSTEAD OF METERS!

ANALOG + DIGITAL
All in one!

D-STAR optional

IC-2820H & UT-123

D-STAR UPGRADEABLE 2m & 70cm & GPS MODULE AND ANTENNA

- 50/15/5 Watt Output Power
- RX: 118-173.995, 375-549.995, 810-999.99MHz**
- Analog/Digital Voice with GPS (Optional UT-123)
- 500 Alphanumeric Memory Channels
- Diversity Receive Capable

DIGITAL

D-STAR ready

IC-92AD & HM-175GPS

MILITARY RUGGED AND SUBMERSIBLE

- 5/2.5/0.1 Watt Output Power
- RX: 0.495-999.990MHz**
- Shown with Optional GPS Speaker Mic (HM-175GPS)
- 1304 Alphanumeric Memory Channels
- IPX7 Submersible*

ANALOG + DIGITAL
All in one!

ID-RP2C
REPEATER CONTROLLER

The cornerstone of the D-STAR system. Handles up to four RF modules. Basic in-band or cross-band operation. Linking capabilities through the internet and future 10GHz backbone products.

ID-RP2D
1.2GHZ DATA MODULE

Access point with a data rate of up to 128kbps. Depending on the system setup, set up an email and/or file server for EmComm support. Perfect for web applications or support via internet connection.

ID-RP2V
1.2GHZ DIGITAL VOICE MODULE

ID-RP2000V
2M DIGITAL VOICE MODULE

ID-RP4000V
70CM DIGITAL VOICE MODULE

Finally, commercially available crossband systems! Together, with proper call sign programming in any D-STAR compatible mobile or portable, the Icom D-STAR system will automatically route your signal to any other RF module connected to a common RP2C. With simple system commands, you can direct your communications through any of the RF modules or across the world via the gateway.

Visit your Icom dealer today!
Free literature: 425.450.6088
or www.icomamerica.com

*IP-X7: tested to work after being under 1 meter of water for 30 minutes.
**Frequency coverage may vary. Refer to owner's manual for exact frequency specs.

ICOM®

TOKYO HY-POWER

Two of the LIGHTEST and MOST COMPACT Amplifiers in the Industry!

600W OUT, Weighing only 22.5lbs.

HL-1.1KFX

Lightweight HF Linear

This world-class compact HF amplifier has built-in switching mode power supply to save the weight. It is compatible with wide AC line of 100 to 250V, and is best suited for DX-peditioners.

Features

- The amplifier allows operation in full break-in CW mode due to the use of the amplifier's high speed antenna relays.
- The amp utilizes a sophisticated circuit to run the various high speed protection circuits such as overdrive, high antenna SWR, DC overvoltage, band mis-set etc.
- An analog multimeter allows the operator to monitor Pf (Forward output power), Pr (Reflected power), Vd (Drain voltage of power FET), Id (Drain current) etc.

Specifications

Frequency:
1.8 ~ 28MHz all amateur bands including WARC bands
Mode:
SSB, CW, RTTY
RF Drive:
75 ~ 90W
Output Power:
SSB 600W PEP max.
CW 600W.
RTTY 500W (5 minutes)
Final Transistor:
SD 2933 x 4
(MOS FET by ST micro)
Circuit:
Class AB parallel push-pull
Cooling Method:
Forced Air Cooling
Multi-Meter:
Output Pf 1kW, Reflected Power 100W, Drain Voltage Vd 60V, Drain Current Id 50A
Input/Output Connectors:
Type M-J (UHF SO-239)
AC Power:
1.4kVA max. when TX
AC 100 ~ 250V (Auto Select)
Dimensions:
9.1 x 5.6 x 14.3 inches
(WxHxD)
Weight:
Approx. 22.5 lbs.

HL-2.5KFX

HF Linear Amplifier

NEWEST and MOST POWERFUL Full Legal Limit!

The HL-2.5KFX is the lightest and most compact self-contained 1.5kW output HF LINEAR amplifier in its class. The amplifier's decoder changes bands automatically with most modern ICOM, Kenwood, and Yaesu HF transceivers. It also has a built-in AC power supply – selectable for 220/230/240/250 VAC input, 3kVA max, and a multifunctional LCD display for instant readout of operating parameters. The HL-2.5KFX is equipped with a control cable connection socket for the HC-1.5KAT, automatic antenna tuner by Tokyo Hy-Power Labs for seamless auto tuning operation.

Specifications

SOLID STATE
Freq. Band:
1.8~28 MHz all HF amateur bands
Operation Mode:
SSB, CW, RTTY
Exciting Power (RF Drive):
100W max. (85W, typical)
Output Power (RF Out):
1.5kW min. SSB/CW
(1.2kW on 28MHz)
1kW RTTY (5 minutes key down)
Auto Band Set:
With most modern ICOM, Kenwood, Yaesu HF Transceivers
Antenna Tuner:
Compatible with external Tokyo Hy-Power HC-1.5KAT
RF Power Transistors:
ARF 1500 by Microsemi x 2
Antenna Relay:
QSK (Full break-in compatible)
Power Supply:
Built-in 220/230/240/250VAC, 3kVA max.
Dimension and Weight:
12.8 x 5.7 x 15.9 inches
(WxHxD),
Approx. 57.3lbs.

More Fine Products from TOKYO HY-POWER

HC-1.5KAT
HF 1.5KW Auto Tuner

HL-350VDX
VHF 330W Amplifier

HC-200AT
HF/6m 200W Auto Tuner
Lightning Tuning Speed

TOKYO HY-POWER

TOKYO HY-POWER LABS., INC. – USA
Technical Support
28301 Tomball Parkway, Suite #500-210
Tomball, TX 77375
Phone 713-818-4544
e-mail: thpsupport@airmail.net

TOKYO HY-POWER LABS., INC. – JAPAN
1-1 Hatanaka 3chome, Niiza Saitama 352-0012
Phone: +81 (48) 481-1211 FAX: +81 (48) 479-6949
e-mail: info@thp.co.jp
Web: http://www.thp.co.jp

KENWOOD
Listen to the Future

Kenwood & AvMap

The Ultimate APRS® Combination

TM-D710A

AvMap G5

Two Great Companies...Providing One Outstanding Solution!

KENWOOD U.S.A. CORPORATION
Communications Sector Headquarters
3970 Johns Creek Court, Suite 100, Suwanee, GA 30024
Customer Support/Distribution
P.O. Box 22745, 2201 East Dominguez St., Long Beach, CA 90801-5745
Customer Support: (310) 639-4200 Fax: (310) 537-8235

www.kenwoodusa.com
ADS#51507

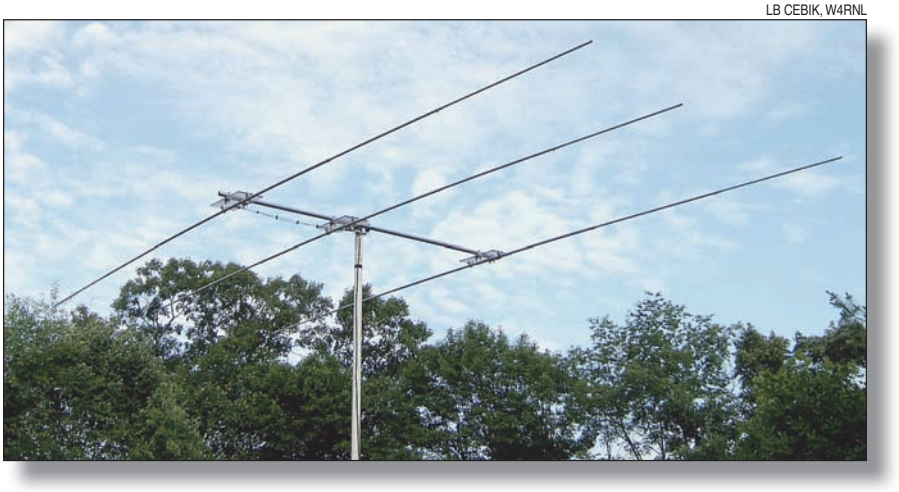
JQA-1205 091-A
ISO9001 Registered
Communications Equipment Division
Kenwood Corporation
ISO9001 certification

AvMap SATELLITE NAVIGATION
Tele Atlas Maps
www.avmap.us • e-mail: info@avmap.us
1.800.363.2627

A Short Boom, Wideband, Three Element Yagi for 10 Meters

L. B. Cebik, W4RNL (SK)

LB CEBIK, W4RNL



Although there are many two and three element Yagi designs for 10 meters, most cover much less than the full band. For this Yagi, I set four requirements:

- The beam must show less than 1.5:1 SWR from 28 to 29 MHz.
- The driven element must use a direct 50 Ω feed with no matching network, such as a gamma or beta match, required.
- The antenna should have the shortest feasible boom length and turning radius.[1]
- Finally, the beam may require careful but not finicky construction.

When we combine all of these requirements, some of which are admittedly just builder/operator preferences, we find only a few candidates.

Traditional Yagi designs that are worth considering have been around since the 1980s. If we check the 10 meter performance of these antennas, we have a basis for comparison.

A normal wideband two element reflector-driver Yagi is about 5.5 feet long. The beam manages about 6.0 dBi free-space gain across the band with only 10 to 12 dB front-to-back ratio (F/B).

A wideband three element Yagi with a direct 50 Ω feed point is close to 11.5 feet long. It provides about 7.1 dBi free-space gain and averages about 20 to 21 dB F/B across the band.

Now suppose that we could find a way to achieve about 6.7 dBi gain with about 16 or 17 dB F/B and still keep the beam only 5.5 feet long. That beam would be worth at least a second look. The proposed design consists of a three element beam, but instead of the usual reflector, driven element and director configuration, it uses a close spaced dual driven element and a single director.

The differences among the beams amount to more than numbers. Figure 1 overlays the free-space E-plane (azimuth) patterns for the three antennas. The weaker gain of the two element design shows up almost as clearly as the poorer F/B. The gain deficit of the proposed design is far less evident. As well, even though the worst case F/B of the proposed design is a bit weaker, the average F/B is not too dissimilar from the rear pattern of the standard longer-boom three element Yagi.

[1]Notes appear on page 32.

The proposed design shares a possibly significant property with the standard three element Yagi. Both use directors and therefore show a rising gain value as we increase frequency across the band. As shown in Figure 2, this characteristic contrasts sharply with the descending gain curve of the standard driver-reflector two element Yagi.

All three small Yagi designs share a common trait — they cover the first MHz of 10 meters with less than 1.4:1 SWR. They all provide for a direct connection to a 50 Ω coaxial cable with no matching network (although a common-mode current balun is always a good idea). In fact, if we reset the element lengths for a slightly higher frequency (about 28.9 MHz), the beams will cover all of 10 meters (28-29.7 MHz) with less than 2:1 50 Ω SWR.

The Short-Boom Wideband Phase-Driven Three Element Yagi

The performance improvement over a standard two element wideband Yagi with the same boom length comes at a price — an extra element and a phase line. If we were working with a 40 meter Yagi, the third element would add a considerable load on the mast and rotator. At 10 meters, however, elements are much lighter. So a third element does not come close to stressing any part of the support system. The array that we are exploring has two driver elements spaced 25 inches apart with a single director 39 inches forward of the first driver. The total length is 64 inches plus a few inches at the boom ends. A 6 foot boom using 1.25 inch aluminum or similar material would serve very well. The antenna is short enough to allow for a PVC schedule 40 boom without significant sag. Let's examine the structure in small steps.

The Elements

We can build beams to be light or to withstand heavy winds. To give you a choice, I shall provide two sets of dimensions. One set uses heavier elements for wind loads up to about 90 to 100 mi/h. The lighter version might be rated to the 60 to 70 mi/h level.

The dimensions in Table 1 apply only to the two different element diameter taper schedules. If you change the material diameters or the interior lengths of wider tubing, the beam may not perform as advertised. Remember to add about 2 to 3 inches to the lengths of the smaller tubes to ensure sufficient material for a secure overlap.

Both versions provide essentially identical performance across the band. The gain varies from 6.4 dBi at 28 up to 7.1 dBi at 29 MHz. The F/B peaks at almost 18 dB at mid-band. Its lowest value is about 14.5 dB at 29 MHz.

The Overall Design

The general layout of the beam is shown in the lead photo. In this design, I started with a simple narrow band driver director array. All two element driver director Yagis have a very narrow bandwidth. I then changed the driver system to a pair of phased drivers in order to

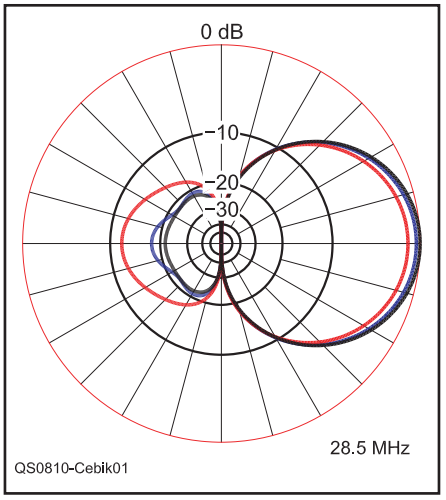


Figure 1 — Overlaid free space *EZNEC* E-plane (azimuth) patterns of the three wide-band Yagi designs for 10 meters at 28.5 MHz. Blue plot is the phased design, black the three element reflector/director and red a two element Yagi.

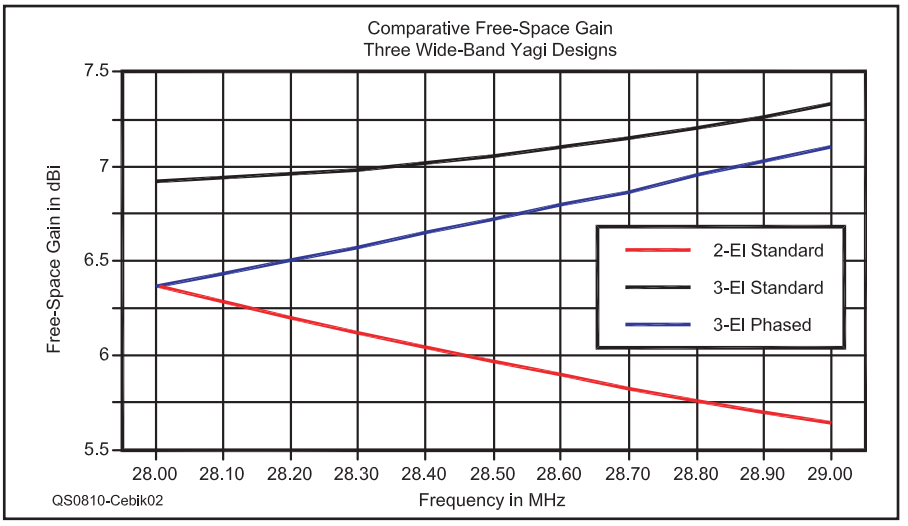


Figure 2 — 10 meter (28-29 MHz) free-space gain curves for the three wide-band Yagis. Blue plot is the phased design, black the three element reflector/director and red a two element Yagi.

broaden the antenna's operating bandwidth. By the judicious selection of element spacing, element length and the phase-line characteristic impedance, I ended up with a beam that spreads the relatively good driver director performance across the entire first MHz of 10 meters.

The phase line consists of a parallel transmission line with a 250 Ω characteristic impedance. The line requires one (and only one) half twist between the two drivers in order to provide the correct phasing for broadband service on 10. The coax connector — that is, the feed point for the main transmission line — goes on the forward driver. This position is convenient, since the position is fairly close to the mast.

Making Your Own Phase Line

Since you need only 25 inches of phase line (plus a bit extra for connections to the elements), you likely should make your own. Table 2 lists the center-to-center spacing for 250 Ω lines using some common bare copper wire.

You will need spacers about every 3 inches to accurately maintain the wire spacing. The best way to make spacers is to drill wire size holes in a long strip of plastic, such as polycarbonate. Then cut the spacers to size after you complete the drilling. Do not make the holes too large; you want a tight fit. If you do not deburr the holes, the spacer will tend to stay in place through all kinds of weather. The velocity factor of this phase line will be very close to 1.0.

You may already be tempted to substitute 300 Ω TV twinlead for the specified homemade line. I do not recommend the substitution. Even high quality 300 Ω line has a velocity factor of about 0.8 to go with its characteristic impedance that is already 20% higher than optimal. Using a taut line will make the TV phase line about 25% longer electrically than the value needed to create the right conditions for the drivers to operate well. Two elements with a phase line use a fairly critical combination of element dimensions and spacing — along with a fairly critical phase line characteristic impedance and electrical length — to get the job done. The job involves dividing the current at the feed point so that each driver element receives the correct current magnitude and phase angle for maximum gain from the pair, in the presence of the director element.

Putting it all Together

There are many ways to construct Yagis. In this design, all of the dimensions apply to elements that are well insulated and isolated from a conductive boom. If you use a 6 foot section of aluminum tubing as a boom, you will need polycarbonate or similar nonconductive plates for the boom-to-element junctions. I prefer to use stainless steel U bolts with saddles to grip the boom and the elements without crushing them. I prefer them to the typical muffler style fixture with a U shaped saddle that contacts the tubing in two lines.

The director will be a continuous element, with no break in the center. Both drivers require a small gap (¼ inch is fine) for connections. Note that the gap is included in the tip to tip element length shown. Do not add the gap to the element length. I prefer to place a fiberglass rod inside the largest tube and extend it to the ends of the plate. This system has two advantages. First, it places an extra support under the element U bolts and it also aligns the whole element with only two element U bolts near the outer edges of the plate. Second, the rod allows good support for #6 or #8 stainless steel hardware that secures the connections to the phase line and to the coax connector leads. Figure 3 shows the general scheme (U bolts removed for clarity).

The side view shows the elements below the boom for best stability. As well, the boom helps to keep ice and snow off the phase lines. The bottom view shows the phase line and coax connection points. Keep the phase line taut. The sharp twist in the sketch will become in reality a gradual twist along the

Table 1

Dimensions of the Yagi for Different Construction Methods

Heavy Duty Version Using 0.75/0.625/0.5" Diameter Elements with 250 Ω Parallel Phase Line. Inner (0.75") 24", Mid (0.625") 18" Each Side.

Element	*Total Length*	*Tip (0.5") Length*	*Spacing from Rear Element*
Rear Driver	205"	60.5"	
Forward Driver	193"	54.5"	25"
Director	190"	53"	64"

Medium Duty Version Using 0.625/0.5/0.375" Diameter Elements with 250 Ω Parallel Phase Line. Inner (0.625") 36", Mid (0.5") 33" Each Side.

Element	*Total Length*	*Tip (0.375") Length*	*Spacing from Rear Element*
Rear Driver	206"	34"	
Forward Driver	194"	28"	25"
Director	191"	26.5"	64"

line length. There will be enough spacing between the phase line and the boom to minimize interaction if ¼ inch thick insulation plates and saddle U bolts are used.

The coax connector can sit on a small metallic plate attached to the forward edge of the forward driver plate. Just be sure that the screws you use to secure the coax connector plate do not contact the boom. Of course, all hardware should be stainless steel, which you can obtain from most home centers these days. I use stainless steel nuts to separate copper wire ring connections from the aluminum in the element.

Final Adjustments

Final adjustments should be negligible if you have constructed the phase line carefully. I performed initial tests with the antenna 10 feet above ground on a temporary mast. The usual test for determining correct construction is to sample the SWR across the operating passband (28.0 to 29.0 MHz, in this case). Modeling showed that the 50 Ω SWR curves vary only a little as you increase the height from about 10 to 33 feet (1 λ). Thus, you can be confident that any adjustments you make at a low test height will hold at the ultimate operating height.

For the initial tests, I left the ⅜ inch diameter tip sections unfastened. I fastened all other parts of the antenna in final form. I held the tip sections in place with electrical tape for possible adjustment. However, my prototype needed no changes in the lengths of the elements.

Performance

The antenna performs as modeled. The added gain over a two element driver reflector design is less evident than the improved F/B. The SWR measurements overlay the modeled curves in Figure 4 too closely to need a new chart.

Part of the successful translation of the design models to a physical antenna involves the use of high quality parts throughout. Home center tubing — when available — tends to use thinner walls than 6063-T832 tubing with 0.058 inch wall thickness. The latter nests very well so that sheet metal screws used as element section fasteners do not vibrate loose over the seasons. UV protected polycarbonate boom to element plates endure the sun for many years. Stainless steel hardware is weather impervious. Unless you are building a short-lived trial version of this (or virtually any) antenna, I do not recommend junk box materials.

There are only two HF amateur bands that might call for a design like the short-boom wideband three element phased-driver Yagi: 10 and 40 meters. In fact, this 10 meter version evolved from a 40 meter design exercise. I lack the shop space and the support system needed to build and test a 40 meter prototype.

Table 2
250 Ω Transmission Line Dimensions

AWG Wire Size	*Wire Diameter*	*Center-to-Center Spacing*
#14	0.0641"	0.262"
#12	0.0808"	0.330"
#10	0.1019"	0.416"
# 8	0.1285"	0.525"

I have included all of the models referenced in these notes for availability on the ARRL Web site.[2] The 40 meter design that covers 7 to 7.3 MHz with under 1.5:1 50 Ω SWR is in the collection. When modeling these antennas in either *NEC-2* or *NEC-4*, be certain to apply the Leeson corrections. Even *NEC-4* will drift off the mark with the large element-diameter taper required by 40 meter elements. The Web material also includes additional figures and design details that should prove helpful to the builder.

The 10 meter version of the antenna is not for everyone. However, it supplies a Yagi design that fills a niche between standard two element and three element wideband Yagis. It improves performance while retaining the short two element boom. The wideband aspect of the design may prove as important in allowing for construction variations as it is in obtaining a low SWR across the band. Hence, it is a beam that the home craftsperson can — with care — successfully build.

Notes
[1]Turning radius is the distance from the mast to the farthest tip of any element.
[2]**www.arrl.org/files/qst-binaries/.** QST

LB CEBIK, W4RNL

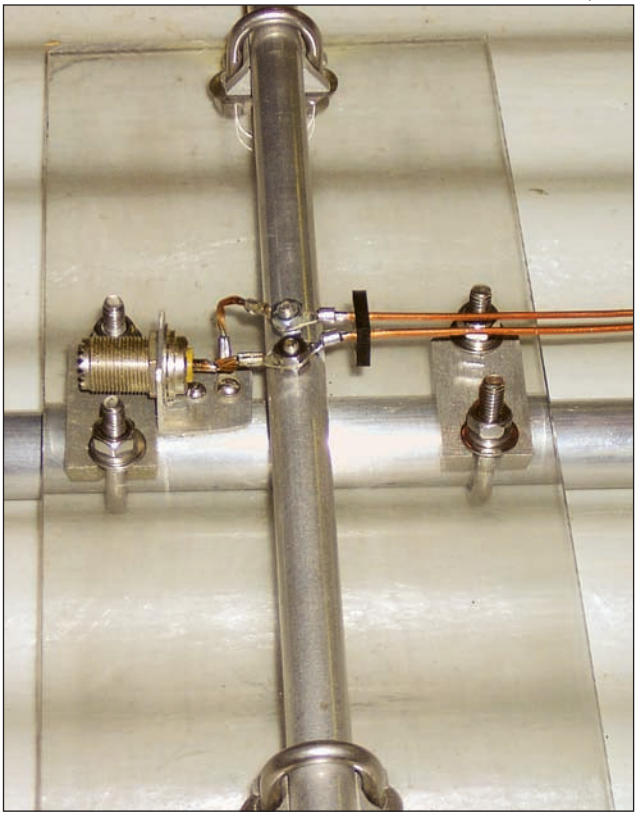


Figure 3 — Closeup view of the feed point assembly.

The last *QST* article authored by longtime contributor L. B. Cebik, W4RNL (SK)

L. B. Cebik, W4RNL, ARRL Technical Advisor and antenna authority, passed away in April 2008. He had submitted this article prior to his death and we publish it as a memorial to a life that added an immense amount of knowledge to the study of antennas by amateurs and professionals throughout the world.

Cebik was 68. An ARRL Life Member, he was known to many hams for the numerous articles he wrote on antennas and antenna modeling. He had articles published in most of the US ham journals, including *QST*, *QEX*, *NCJ*, *CQ*, *Communications Quarterly*, *Ham Radio*, *73*, *QRP Quarterly, Radio-Electronics* and *QRPp*.

Those of us who worked with L. B. along with the entire Amateur Radio community miss him very much. — *Joel R. Hallas, W1ZR, QST Technical Editor*

RADIOSPORT

"CQ test CQ test this is...."

What's Inside:

- How to Operate Sweepstakes (and Other Contests)
- Submitting an Electronic Contest Log
- Interpreting Your Log Checking Report
- Year of the State QSO Party
- Contest Resources Directory
- Calendar of Events ~ 2009

Radiosport ~ ***From Wikipedia***

The term "Radiosport" is of modern Eastern European origin and is used to describe one of several competitive amateur radio activities — Amateur Radio Contesting, Amateur Radio Direction Finding, High Speed Telegraphy

How to Operate Sweepstakes (and Other Contests)

H. Ward Silver, NØAX

[The following article is based on the author's eham.net article 4191, available at **www.eham.net/articles/4191**. — *Ed.*]

This article is for those readers who would like to give contesting a try but might be a little intimidated by the fast talking and sending. Here's a secret — *everybody feels that way at first!* Since trying to explain all contesting is impossible in a single page, this discussion covers how to operate in the upcoming ARRL Sweepstakes (see page 83, this issue). Many of the techniques discussed here apply equally well to other contests, so once you learn them, you'll be ready for almost every other contest! (A calendar of major contests is provided elsewhere in this section.)

The annual ARRL CW Sweepstakes runs on the first full weekend in November, from 2100Z Saturday until 0300Z Monday (or 5 PM Saturday to 10 PM Sunday Eastern Time) on 160 through 10 meters (but not on 30, 17 or 12 meters). Phone Sweepstakes is held on the third full weekend of November with the same UTC start and end times.

The CW Contest

Let's start with the CW Sweepstakes. While you might recoil in horror at the high code speeds, tune high in the bands and there will be some folks going nice and slow. Don't be afraid to jump in there and give 'em a call. I *guarantee* your code speed will double with just a few hours at the key. Here's how it works:

1) You hear somebody calling CQ SS CQ SS de W1AW

2) Send your call *once* — KX9X. Don't send their call and don't send yours more than once. If they don't copy your call on the first try, they'll send AGN or ? or just CQ again. So call 'em again. If they're going too fast, send QRS and they'll slow down.

3) If they hear you, they'll send something like this: KX9X 107 U W1AW 36 CT. What the heck does that mean? It's called the "exchange" — what stations send to each other during each contest QSO.

- KX9X is your call to let you know they're talking to you
- 107 is the "serial number," the number of the contact in the contest for them (their next contact will be 108, etc)
- U (for Unlimited) is their entry category — also called precedence — there are A, B, M, Q, S and U categories. See the Sweepstakes rules at **www.arrl.org/contests** for a description of each category.
- Then they send their call
- 36 is the last two digits of the first year they were licensed — it's called a "check"
- CT means Connecticut, their ARRL Section. There are 80 sections — some are states, others aren't, all are two or three letters and the abbreviations are given in the contest rules. Be sure to log the right abbreviation — Missouri's abbreviation is MO, not MI or MS!

4) If you don't copy it all the first time, it's perfectly okay to send QRS PSE, AGN which means "Slow down, send it again, please."

5) If you do get it — way to go! Here's what you send in return:

- Their call
- The number this contact is in the contest for you — if it's your first send "1" and pat yourself on the back
- Your category (see above)
- Your call
- The last two digits of the first year you were licensed — if you got your license last year, it's 07, for example
- Your section (see above)

6) If they don't get it, they may say...with a question mark, maybe...

- AGN — send everything all over again
- NR — repeat just the serial number a couple of times
- PREC or just PR — repeat your category; "precedence" refers to the similar part of radiogram headers
- CALL — repeat your call (this is rare)
- CK — repeat the two digits of the year, your check
- SEC or QTH — repeat your section

7) If you find yourself flustered in the middle of the contact, try making a "cheat sheet" with the exchange written out. They may ask *you* to QRS, you speed demon, so do it with a smile!

8) If they copy everything, they'll say a short TU (for thanks) or R (for Roger) or QSL (for received okay) and then just send their CQ or maybe just their call, and away you both may go.

9) Sometimes, it just doesn't work out due to QRM (interference) or ORN (static) or QSB (fading) or the cat could cough up a hairball on the rug requiring immediate action. Don't take it personally; just go find somebody else to call. It's a no-fault deal.

10) If you get tired of "Searching and Pouncing," then tighten your belt, mop your brow, cock your hat at a jaunty angle and call CQ! It's easy — don't have a cow, man, just call CQ SS CQ SS DE KX9X KX9X and listen, repeat if necessary. Soon you'll get an answer. Just play back the above steps with you as the call-ee.

What about Sweepstakes Phone? The phone bands are considerably more crowded than CW. A single phone QSO takes up more, at least six times more, bandwidth than a CW signal! More non-contest activity is present, such as the nets, rag chews, and scheduled contacts with which you need to coexist. Please work around the other band occupants — contesters or not.

Some folks have picked up the bad habit of using "the last two" to call a station, meaning using just the last two letters of your call. Please use your entire call sign. Nine times out of 10, the other station will copy all of it the first time. And use standard phonetics, such as those at **www.arrl.org/FandES/field/forms/fsd220.html**.

Signal quality is much more of an issue on phone. Before the contest, have a friend check your signal at full power — is the audio clear and splatter-free? If not, take steps to make it so — you will make more contacts and cause fewer problems on adjacent frequencies. When you do make a contact, first take a deep breath, then give your whole exchange clearly as you exhale, repeating nothing. If the other station needs a "fill," they'll ask you.

Otherwise, Phone Sweepstakes is a lot like CW Sweepstakes. The exchanges are identical, the scoring is the same, and it's a lot of fun — the hours will fly by. Keep a simple paper log the first time out to make it easy — you can worry about entering it on a computer later. There are complete rules and instructions for operating and scoring and sending in the log on the ARRL Web site, **www.arrl.org/contests**. (This insert also includes an article on how to submit your log.) Come spring of 2009, you can click on over to the contest results and wonder-of-wonders, there your call will be with the mighty titans just a few lines away.

Why sit on the sidelines? Go for it!

Submitting an Electronic Contest Log

"What's this Cabrillo Log Format I've been hearing about?"

Sean Kutzko, KX9X

Most contesters today log their QSOs with a computer. Computer logging offers many advantages over paper logging, especially real-time stats and scores, keeping track of multipliers, and huge time savings in submitting a log! Many contest sponsors, including the ARRL, require electronic logs to be in "Cabrillo format." I've received a lot of questions regarding *Cabrillo*, so I thought it would be good to provide a basic overview.

What Is Cabrillo?

Cabrillo is the standard file format used by the ARRL and other major contest sponsors for log checking and scoring. The Cabrillo standard only specifies how the text in a file is to be structured – specific items in a specific format. It does not affect the scoring of the log and it does not guarantee the validity of QSOs. The name Cabrillo has no significant meaning, other than it is the name of the place in California where Trey Garlough, N5KO, developed the format. Refer to the Cabrillo Web page at **www.kkn.net/~trey/cabrillo** for more detailed information.

Log files in Cabrillo format are e-mailed to a server (affectionately called "The Robot") that automatically collects your log and stores it for future analysis by the contest sponsors. By creating a log in a standardized format, it allows the contest sponsors to analyze thousands of entries quickly and accurately — something not possible before Cabrillo when logs in literally dozens of different formats were received.

Cabrillo files are broken into two parts: the *header* and the *QSO data.* Let's take a look at how each part of a Cabrillo file needs to be constructed.

The Cabrillo Header

The header contains all the information *about* your contest entry, such as what contest you're entering, what call sign was used in the contest, how much power you were running, and other administrative information. The header is normally created by the logging software. Each piece of information is called a *tag.* There are several different tags included in a Cabrillo header. A sample Cabrillo header is shown in Figure 1.

Start-of-log: 3.0: the very first line of a log file. It tells the Robot that this is the beginning of your log file and what version of the Cabrillo format was used to construct the file. As of this writing, the latest version is 3.0.

Location: where you operated the contest from. For ARRL contests, W/VE stations list the standard two or three letter abbreviation of your ARRL/RAC section such as CT for Connecticut, or LAX for Los Angeles. Your logging program will prompt you for this information when setting up your contest file.

Contest: the name of the contest you are entering. The Robot handles many different contests; this line tells the Robot which one. There are standard abbreviations for over forty contests; see the Cabrillo Web site I mentioned earlier for specifics.

Callsign: the call sign used during the contest.

Category-Operator: categories for how many operators participated. The choices are Single-op, Multi-op or Checklog. Checklogs allow you to submit your log, but it will not be scored for the final contest results. These logs are very helpful to the contest scoring process.

Category-Transmitter: the number of transmitters you used on the air simultaneously. The three choices are One, Two or Unlimited.

```
START-OF-LOG: 3.0
LOCATION: CT
CONTEST: ARRL-DX-SSB
CALLSIGN: W1AW
CATEGORY-OPERATOR: SINGLE-OP
CATEGORY-TRANSMITTER: ONE
CATEGORY-POWER: HIGH
CATEGORY-ASSISTED: NON-ASSISTED
CATEGORY-BAND: ALL
CLAIMED-SCORE: 1000000
OPERATORS: KX9X
CLUB:
NAME: Sean Kutzko
ADDRESS: 225 Main Street
ADDRESS: Newington, CT 06111
SOAPBOX: I had a lot of fun at W1AW!
```

Figure 1 — Cabrillo Header for a W/VE station entering the ARRL DX Contest.

Category-Power: the power you used during the contest. Your choices are High, Low and QRP.

Category-Assisted: indicates whether you used any type of spotting assistance, such as a spotting network (like Packet Cluster™) or an Internet chat room, to get information about stations you worked in the contest (such as their frequency). Your choices are Assisted or Non-Assisted.

Category-Band: identifies the bands used during the contest. Your choices are any single band ("80m," "40m," etc) or All.

Claimed-Score: the score you are claiming for your contest effort. This is usually computed automatically by your logging software.

Operators: calls of all operators that participate — critical for Multi-operator entrants.

Name: name of the log submitter.

Address: mailing address of the log submitter.

Soapbox: a line for comments about the contest. Do not use *Soapbox:* for questions to the contest sponsors or for scoring information about your log — e-mail the sponsors separately if you have questions. There may be multiple Soapbox lines in the log.

There are more types of Cabrillo tags. For example, many VHF+ contests use a *Category-Station:* tag to indicate whether you operated from a fixed location, as a portable station or as a rover (mobile). While logging software will often ask questions to fill in the tags during the export process, double-check the rules and read your Cabrillo file before submitting it, just to make sure you're including all needed information in your header.

The QSO Data

This section of the Cabrillo file contains the log of the stations you worked in the contest. Each line *must* contain *all* elements of the QSO from *both* stations: the date, time (in UTC), frequency, mode, both stations' call signs, and the contest exchange information sent and received. A sample *Cabrillo* QSO section is shown in Figure 2.

Each line of QSO data begins with *QSO:* The first item is the frequency on which the QSO took place. The frequency can be generic (such as 14000 for 20 meters), but the exact frequency may be shown (14254, for example).

The next item is the mode used. The standard abbreviations are PH for an SSB or AM QSO, CW for CW, FM for FM, and RY for RTTY/digital modes. Next comes the date of the QSO. It must be listed in YYYY-MM-DD format; a QSO made on March 1, 2008 must be listed as 2008-03-01. Next comes the time, in UTC.

The call you used comes next, followed by the contest exchange. In Figure 2, the exchange sent by W1AW is the signal report (59) and state (CT) in which W1AW is located.

After that, the call of the station *worked* is listed, followed by the

```
QSO: 14000 PH 2008-03-01 1456 W1AW     59 CT  6Y5/NN1N   59 100
QSO: 14000 PH 2008-03-01 1459 W1AW     59 CT  G0ABC       59 400
QSO: 14000 PH 2008-03-01 1504 W1AW     59 CT  EA8XYZ      59 500
QSO: 21000 PH 2008-03-01 1508 W1AW     59 CT  XE1ABC      59 100
END-OF-LOG:
```

Figure 2 — A Cabrillo file QSO area for W1AW, entering the ARRL DX Contest.

contest exchange you received. Figure 2 is based on the ARRL DX Contest, so the exchange received by W1AW would be a signal report and the transmit power sent by the DX station. Every QSO must be reported in this format. Remember: Different contests use different information in the exchange; read the rules of each specific contest so you know what data is to be exchanged.

After the last line of QSO data, "End-of-log:" must appear on its own line, to tell the Robot that there is no more QSO information.

Submitting Your Log

Once your Cabrillo log file has been created, send it to the Robot as an e-mail attachment. The file should be named with the call you used in the contest in the form *[yourcall]*.log. For example, my log file would be named *kx9x.log*. Each ARRL contest uses a different e-mail address; for example, CW Sweepstakes logs are sent to **sscw@arrl.org**. The official rules for the contest will include the e-mail address. The subject of your e-mail should be the call used in that contest (W1AW, for example). No text in the body of your e-mail will be read. Do not send any other files except your Cabrillo-formatted log; the Robot doesn't need them and it could cause your submission to get rejected.

After you send your log, you should get a reply within a few minutes showing you the details of how the Robot interpreted your log file and whether there were any problems. You should check this note very carefully and make sure there aren't any discrepancies. (The robot does *not* check your QSOs against other logs.) If there are any, check the Cabrillo file to be sure you entered the correct data in the header and that your QSO: lines contain the correct information. Figure 3 shows a sample reply message.

If there aren't any problems listed in the details of the note, your log has been accepted and you've entered the contest. Save the reply message and your confirmation number.

```
2008 ARRL DX SSB Contest
Callsign: W1AW
Operator(s): KX9X
Category-Operator: SINGLE-OP
Category-Transmitter: ONE
Category-Power: HIGH
Category-Assisted: NON-ASSISTED
  Location: CT
    Name: Maxim Memorial Station W1AW
  Address: 225 Main Street
    Newington, CT 06111
    USA
  Log Deadline: 2008-04-3 00:00:00 UTC
  Received at: 2008-03-04 21:23:23 UTC
  Reported QSOs: 494
  Confirmation #: 4025031.arrl-dx-ssb
Thank you for entering the contest and submitting your log in
Cabrillo format. Please review the information listed above and, if
necessary, resubmit the log to make any corrections.
73.
ARRL Contest Branch
```

Figure 3 — A typical reply from the contest log robot.

Help! I Have a Problem with My Log

If you have a problem with your log, the robot will tell you the exact problem in the message. There are two types of problems: *Fatal* and *Non-Fatal.* A Fatal Problem means the Robot cannot accept your log. Examples would be improperly formatted QSOs in your log file, lack of a call sign in your log, or in the case of a multi-operator entry no list of operators.

Non-Fatal problems may occur if the log is generally sound, but has a minor issue such as ambiguous information. Examples include not stating your power or choosing an improper entry category. In each of these cases, the Robot will automatically default to the most inclusive value possible, such as "High Power" or "Single Operator" for the problems listed above. If the Robot cannot completely ascertain your logging category, it may reclassify your log as a Checklog, so be sure to check that your log information was noted as you expected.

Common Problems

Some of the more common problems when submitting a log are:

No value set for "LOCATION" to tell the Robot where you operated the contest from. See the rules of the contest for the information required.

Incorrect times or dates. If you get a message back that says some (or all) of your QSOs aren't being accepted, check to make sure your log's dates and times fall within the contest period. We see a lot of logs where the times are off by a few hours, which is a sure sign that the submitter's PC clock was set to local time instead of UTC.

Improperly formatted QSO data. The QSO area of the Cabrillo file has to have the data listed in the exact format of the standard. If your reply message from the Robot says QSOs are not being accepted, check to make sure the QSO data is formatted properly.

I Still Log on Paper. Can I Use Cabrillo?

You can use an on-line converter tool created by Bruce Horn, WA7BNM, which will walk you through the steps to create a Cabrillo file from your paper log. The Web applet will ask you a series of questions about your contest operation. Then you will manually enter the QSO information into the online form. Once you're done, the Web site will send you a copy of your log in Cabrillo format and mail a copy of it to the appropriate Robot. While the process can be time-consuming (especially if you have a large paper log), the rewards of instantaneous log acceptance are well worth it. The address for Bruce's online form is **b4h.net/cabforms/**.

Conclusion

Computer logging is here to stay. The benefits are enormous, and the Cabrillo format is not difficult to learn. I hope this primer has encouraged you to give computer logging a try. Have questions? Call me or e-mail me at the ARRL Contest Branch or visit the Cabrillo Web page. Here's hoping to see your Cabrillo log soon!

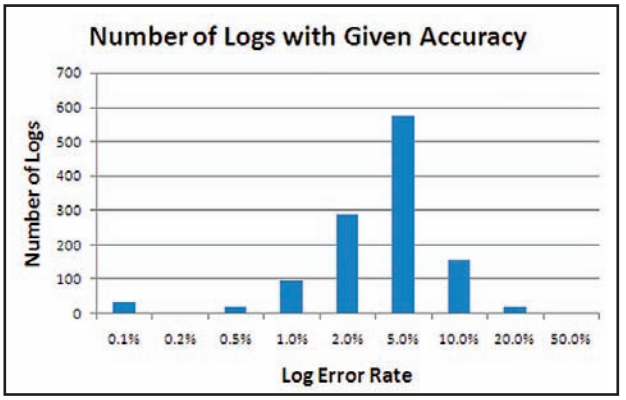
Interpreting Your Log Checking Report

H. Ward Silver, NØAX

In "The Old Days," you sent in your paper log (and the Operating Aid No. 6 dupe sheet and a paper summary sheet) and waited. Eventually, *QST* appeared with the results, but little information was available about differences between your "claimed score" and what *QST* published next to your call.

Today, things are different. Instead of sending in paper logs, you can e-mail the log file to the sponsor within minutes of the contest's finish and, even better, you will get a complete report from the log checking team about what they found in that electronic log. This article is a guide to your Log Checking Report or *LCR* and how to use the information it contains.

First, let's clear up a common misconception: If the log checkers find an error in your log, they are not accusing you of cheating. They just found an error. As in most sports, committing an error carries with it a small penalty — backing up 5 yards or awarding foul shots — and so it is in radiosport. If you "bust" a call sign, for example, then in addition to removing the bad QSO from the log, an equivalent number of QSO points may also be removed. Back up 5 yards and run the play again! Everybody gets penalized at some point — it's just part of the game. Each contest and contest sponsor treats penalties differently. The ARRL Contest Web page (**www.arrl.org/contests**) contains the rules and penalties for all ARRL contests.



The blue bars show how many logs were submitted with an error rate in the range indicated. For example, the bar labeled "2.0%" shows the number of logs that had an error rate greater than 1.0% but lower than 5.0%. The goal is to move your log to the left by lowering your error rate.

Got Discrepancies?

Now, the LCR. It contains information about every discrepancy between the contacts you claim that you made and what the log checking software found as it attempted to cross-check your QSOs with those in corresponding logs. With 90% or more of logs being submitted in electronic form, log checking has never been better! Here's what the log-checking process finds and how the LCR tells you about it (LCR samples are from the W1AW LCR for the 2007 Phone Sweepstakes):

Busted Calls — "Bust" means to log incorrectly. You either miscopied or mistyped the call sign because a QSO with your station was found in the log from a station with a similar call sign at the same time.

```
N57WF is a busted call. The correct call
is N7VF.
```

Busted Exchanges — A contact with the other station was found, but you miscopied the exchange information they sent.

```
QSO #31 KB0CQ : B 60 Mn should be A 60 Mn
```

Not-In-Log (NIL) — No corresponding contact was found in the log of the station with which you claimed the QSO.

```
QSO #949: QSO not found in log of AA6G
```

Unique — No log was submitted for that call and the call does not appear in any other log. Most "uniques" are call signs that are so badly busted that a Bust or NIL can not be determined, but some uniques are valid contacts. Most contest sponsors do *not* remove the QSO or assess a penalty for QSOs with unique call signs.

```
KF4NSJ is a unique call. Received QSO# = 4.
```

The LCR also lists all of the errors it found in other logs claiming QSOs with your station (you're not penalized for them):

```
N0AX: QSO #417: Received QSO# 494
should be 394 W1AW
```

How It Works

Armed with all of this information, how does it help you become a better operator — the goal of radiosport in the first place?

Start by looking for patterns in the busted calls and exchanges. For example, in a CW contest are you confusing letters with lots of dots, such as S and H? In a phone contest, do you get letters that sound alike, such as B and P, mixed up? Does your copying accuracy get better or worse as the contest progresses? Once you can see your errors, you can begin to improve your technique. We all have our weaknesses and the LCR will shine a spotlight on them.

The LCR list of errors by other stations claiming QSOs with you is also helpful. For example, perhaps you should be using a different phonetic if other stations copy OSCAR instead of ALFA. If your transmitter keying is slightly delayed and clipping the first bit of a CW character, other stations may turn K into A or 4 into V. Look for patterns because that's where the most potential for improvement lies.

Another source of errors becoming more common has nothing to do with your copying ability — the use of databases and "pre-fill" to provide exchange information. It's just not a good idea to *assume* that a data base has the right section or name for a station. They might have moved or have a guest operator or just be using a different name for fun. By not logging what you hear, you penalize yourself in two ways: your score takes a hit and you deprive yourself of an opportunity to improve your operating skills.

How do you measure improvement? Take a look at the error percentages contained in the LCR:

```
Final score = 179200
Error rate = 4.3% (100 X (Busted QSOs /
Duped QSO total))
```

In each running of the contest, that error rate number should drop. The graph (from this year's ARRL DX Phone Contest) shows the error rate of all logs in a typical contest. The Top Ten stations are typically toward the left-hand side of the graph where the low error rates are found. Your error rate may be higher, but you will be surprised and *proud* to learn that a little effort — those few seconds spent being sure of a call instead of guessing — will pay big dividends in your score and your skills.

Year Of the State QSO Party Award

In recognition of the organizations that sponsor State QSO Parties and to encourage all hams to participate in these exciting on-the-air activities, the ARRL announces the Year Of the State QSO Party Award for 2009! This award is available to any amateur who makes a contact with stations participating in their own State QSO Party during 2009.

Similar to collecting the state quarter coins, a certificate may be downloaded from the award Web site, **www.arrl.org/ysqso**, with blanks for state flag stickers from all 50 states. The stickers are available as a page of graphic images that can be printed on a sheet of standard labels (see the Web site for details). As the applicant makes QSOs in each state, the appropriate flag is attached to the certificate, until all of the states have been contacted.

Here are the simple rules for the award:

✔A particular state flag sticker may be affixed to the certificate when a contact is made with that state during any of the following:

1) the State QSO Party for that state
2) a QSO Party for any region that includes the state
3) any contest sponsored by the ARRL or *National Contest Journal* after (1) and (2) have passed or if no such event is conducted during 2009

An SWL may claim credit for a state by logging a QSO by a station in that state during any of these events. It is preferred that contacts be made or logged during (1) or (2).

✔Following the contact, the applicant must submit a log containing the contact to the contest sponsor within the time limit specified by the sponsor. Any log format and submission method accepted by the sponsor will be satisfactory. Submitting a checklog is acceptable for the purposes of this award. (See the article "Submitting an Electronic Contest Log" elsewhere in this insert.)

✔All contacts must conform to the rules of the contest in which they are made.

✔Contacts can be made using any band, mode or power level accepted by the contest sponsor. The applicant can self-endorse a particular style of operating as noted on the award's Web site.

✔Applicants who submit a written list showing that all QSOs for the award were made solely during state or regional QSO parties will be listed on the Year Of the State QSO Party Web site.

✔All contacts must be completed between 0000Z Jan 1, 2009 and 2359Z Dec 31, 2009.

For a schedule of State and Regional QSO Parties, see WA7BNM's Contest Calendar Web site at **www.hornucopia.com/contestcal/stateparties.html**. As of July 2008, no State or Regional QSO Parties are scheduled for Alaska, Iowa, Kansas, New York, North Dakota or South Dakota. If your club would like to sponsor a QSO Party for any of these states, please contact **contest@arrl.org** for help with suggested rules and announcing the event.

Contest Resources Directory

What do Little Pistols, Medium Guns and Big Guns all have in common? They rely on a wide variety of resources for information, guidance, news and enjoyment of their favorite radiosport activities. This page lists a number of useful resources that any ham can enjoy. Even if you're not a contester, you'll find that these sources provide a lot of good information about propagation, antennas, station design and other types of "radio know-how."

Newsletters and E-Mail Reflectors

ARRL Contest Update: **www.arrl.org/contests/update**

CQ-contest reflector
lists.contesting.com/mailman/listinfo/cq-contest

3830 Contest Results reporting
www.hornucopia.com/3830score

Towertalk reflector: **lists.contesting.com/mailman/listinfo/towertalk**

Books and Magazines

ARRL Operating Manual: **www.arrl.org/shop**

National Contest Journal
www.ncjweb.com

ON4UN's Low-Band DXing
www.arrl.org/shop

ARRL Antenna Book
www.arrl.org/shop

Web Sites — General

ARRL Contest Branch: **www.arrl.org/contests**

ARRL Contest Glossary: **www.arrl.org/contests/glossary.pdf**

Contesting.com: **www.contesting.com**

Radio-sport by NS3T: **www.radio-sport.net**

World-Wide Young Contesters: **www.wwyc.net**

K1SFA

Web Sites — Operating and Results

RTTY by AA5AU: **www.rttycontesting.com**

Cabrillo Log Submittal: **b4h.net/cabforms**

Real-time Contest Scores: **www.getscores.org**

Contest Score Archives: **www.kkn.net/~k5tr/scoredb**

Single-Op, Two Radios: **www.k8nd.com/Radio/SO2R/K8ND_SO2R.htm**

Contest Calendars and Events

ARRL Contest Corral
www.arrl.org/contests

WA7BNM Contest Calendar
www.hornucopia.com/contestcal

SM3CER Contest Service
www.sk3bg.se/contest

N2CQ QRP Contest Calendar
www.amqrp.org/contesting/contesting.html


CONTEST CORRAL — SEPTEMBER 2008

Start & Finish	HF	VHF+	Contest Title	SSB	CW	Dig	Exchange	Sponsor's Web Site
1 Sep 2300Z - 2 Sep 0300Z	1.8-28	50	Labor Day Sprint		✗		RST, S/P/C, MI QRP nr or power	www.qsl.net/migrpclub
6 Sep 0000Z - 7 Sep 2400Z	3.5-28		All Asia Contest	✗			RS and age ("00" for YL)	www.jart.or.jp/English
6 Sep 0000Z - 6 Sep 2400Z	3.5-28		Russian Radio RTTY WW			✗	RST and oblast or WAZ zone	www.radio.ru/cq/contest/rule-results/index2.shtml
6 Sep 1300Z - 7 Sep 1300Z	1.8-28		IARU Region I Field Day	✗			RS and serial	See IARU Society Web pages
6 Sep 1600Z - 6 Sep 2400Z	3.5-28	50,144	Ohio State Parks On the Air	✗	✗	✗	RS(T), serial, "Ohio" or S/P/C, and park nr	parks.portcars.org
7 Sep 0000Z - 7 Sep 0400Z	3.5-14		North American Sprint		✗		Call signs, serial, name, and state	www.ncjweb.com
7 Sep 1100Z - 7 Sep 1300Z	28		DARC Digital 10m Corona			✗	RST and serial	www.darc.de/referate/dx/cqdlcont/fgdcc.htm
7 Sep 1800Z - 8 Sep 0300Z	1.8-28	50+	Tennessee QSO Party	✗	✗	✗	RS(T) and county or S/P/C	www.tnqp.org
12 Sep 8 PM - 13 Sep 2 AM	3.5		070 Club 80 Meter Autumn Sprint			✗	RST and S/P/C	www.podxs070.com
13 Sep 0000Z - 14 Sep 2400Z	3.5-28		WAE DX Contest	✗			RS and serial	waedc.de
13 Sep 0600Z - 14 Sep 2400Z	3.5-28		Arkansas QSO Party	✗	✗	✗	RS(T), county or S/P or "DX"	www.arkanhams.org
13 Sep 1800Z - 15 Sep 0300Z		50+	ARRL September VHF QSO Party	✗	✗	✗	Grid square	www.arrl.org/contests
13 Sep 1800Z - 13 Sep 2400Z	1.8-28		Second-Class Operators Sprint		✗		RST, S/P/C, SOC nr or power	www.qsl.net/soc
14 Sep 0000Z - 14 Sep 0400Z	3.5-14		North American Sprint	✗			Call signs, serial, name, and state	www.ncjweb.com
18 Sep 1400Z - 20 Sep 0200Z	7-28		YLRL Howdy Days	✗	✗		YLRL member or nonmember	www.ylrl.org/ylcontests.html
20 Sep 6 AM - 21 Sep 12 Mid		100+	ARRL 10 GHz and Up Contest	✗	✗	✗	6-char grid locator	www.arrl.org/contests
20 Sep 0000Z - 21 Sep 2400Z		2.3G+	ARRL EME Contest	✗	✗	✗	Call signs, signal rpt, acknowledgment	www.arrl.org/contests
20 Sep 1000Z - 21 Sep 0400Z	1.8-28	50+	Colorado QSO Party	✗	✗	✗	Call sign, name, and county or S/P/C	www.ppra.org/cocp
20 Sep 1200Z - 21 Sep 1200Z	3.5-28		Scandinavian Activity Contest		✗		RST and serial	www.sk3bg.se/contest/sacnac.htm
20 Sep 1300Z - 21 Sep 2100Z	3.5-28	50+	South Carolina QSO Party	✗	✗	✗	RS(T) and county or S/P/C	csc.ham-radio-op.net
20 Sep 1600Z - 21 Sep 2400Z	3.5-28		Washington State Salmon Run	✗	✗	✗	RS(T) and county or S/P/C	www.wwdxc.org
20 Sep 1800Z - 21 Sep 0200Z	1.8-28	50	SE DX Club 50th Anniversary	✗	✗	✗	RS(T), name, serial (nonmember)	www.sedxc.org/50thcontest

Major Contest Sponsors

ARRL: **www.arrl.org/contests**

CQ World Wide (WW and WPX contests): **www.cqww.com**

Worked All Europe (WAE): **www.waedc.de**

Russian DX Contest (RDXC): **www.rdxc.org**

World Radiosport Team Championship (WRTC): **wrtc.info**

National Contest Journal (NA QSO Parties and Sprints): **www.ncjweb.com**

So When's the Next One? A Year-Long Contest Calendar

This is a schedule of "major" contests sponsored by the ARRL, *CQ Magazine*, RAC, and the *National Contest Journal*. Worked All Europe (WAE) and All Asia are included, as well. Contests are generally scheduled on an "ordinal" weekend — first, second, last — and not by specific dates. This allows you to know long in advance when to plan for your favorite on-the-air event. Always check the sponsor's Web site, though — contests have been known to change dates! "Weekend" means "full weekend," requiring both Saturday and Sunday to fall in the same month. Calendar **dates** for the contests follow the weekend.

RADIOSPORT 2009

January

♦ARRL RTTY Roundup
— first weekend (**3-4**)

North American QSO Party, CW
— second weekend (**10-11**)

♦ARRL January VHF Sweepstakes
— third weekend (**17-18**)

North American QSO Party, Phone
— third weekend (**17-18**)

CQ WW 160 Meter, CW
— last weekend (**24-25**)

February

North American Sprint, CW
— first weekend (**8**)

School Club Roundup
— first full week (**9-13**)

CQ WPX RTTY
— second weekend (**14-15**)

North American Sprint, Phone
— second weekend (**15**)

♦ARRL DX, CW
— third weekend (**21-22**)

North American QSO Party, RTTY
— (**Feb 28-Mar 1**)

CQ WW 160 Meter, SSB
— last weekend (**Feb 27-Mar 1**)

March

♦ARRL DX, Phone
— first weekend (**7-8**)

North American Sprint, RTTY
— second weekend (**15**)

Russian DX Contest
— second weekend (**14-15**)

CQ WPX, Phone
— last weekend (**28-29**)

April

No major contests

May

CQ WPX, CW
— last weekend (**23-24**)

Comprehensive Contest Calendars

ARRL Contest Corral —
www.arrl.org/contests

WA7BNM Contest Calendars —
www.hornucopia.com/contestcal

SM3CER Contest Calendar —
www.sk3bg.se/contest

June

♦ARRL June VHF QSO Party
— second weekend (**13-14**)

All Asia Contest, CW
— third weekend (**21-22**)

♦ARRL Field Day
— fourth weekend (**27-28**)

July

RAC Canada Day
— **July 1**

IARU HF Championship
— second weekend (**11-12**)

North American QSO Party, RTTY
— third weekend (**18-19**)

CQ WW VHF
— third weekend (**18-19**)

August

North American QSO Party, CW
— first weekend (**1-2**)

♦ARRL UHF Contest
— first weekend (**1-2**)

Worked All Europe, CW
— second weekend (**8-9**)

♦ARRL 10 GHz And Up Contest
— third weekend (**15-16**)

North American QSO Party, Phone
— third weekend (**15-16**)

September

North American Sprint, CW
— first weekend (**6**)

All Asia, Phone
— first weekend (**5-6**)

♦ARRL September VHF QSO Party
— second weekend (**12-13**)

North American Sprint, Phone or CW
— second weekend (**13**)

Worked All Europe, Phone
— second weekend (**12-13**)

♦ARRL 10 GHz and Up Contest
— third weekend (**19-20**)

CQ WW, RTTY
— last weekend (**26-27**)

October

North American Sprint, RTTY
— second weekend (**12**)

CQ WW Phone
— last weekend (**25-26**)

November

♦ARRL Sweepstakes, CW
— first weekend (**7-8**)

Worked All Europe, RTTY
— second weekend (**14-15**)

♦ARRL Sweepstakes, Phone
— third weekend (**21-22**)

CQ WW, CW
— last weekend (**28-29**)

December

♦ARRL 160 Meter, CW
— first weekend (**5-6**)

♦ARRL 10 Meter
— second weekend (**12-13**)

RAC Winter Contest
— fourth weekend (**27**)

A Look at the Rohde and Schwarz XK2100 HF Transceiver

A high performance commercial HF transceiver as seen through amateur eyes.

Michael Tracy, KC1SX

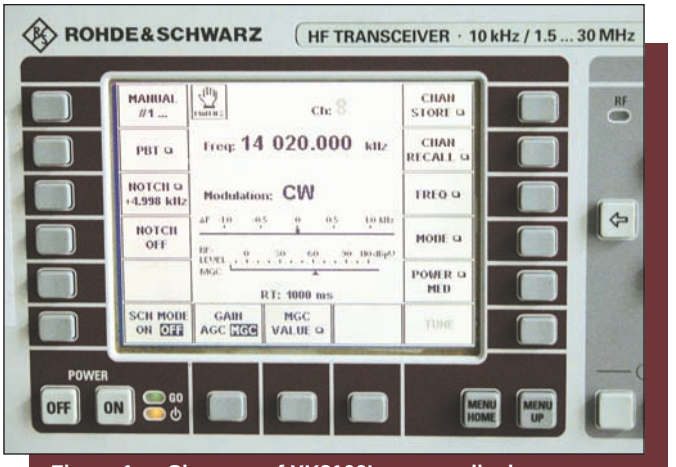


Figure 1 — Close-up of XK2100's sparse display.

We Have a Sample Transceiver

It is well-known that the military and government have extensive HF allocations outside the amateur bands, but there are other services to be found in the same range. These include aircraft, marine, shortwave broadcasters, utility stations, time signal stations, land mobile service, radio navigation and much more. With its predominantly commercial nature, much of this equipment is more expensive than most Amateur Radio gear, and very few hams indeed would ever add this equipment to their shacks. Still, our curiosity makes us wish for at least a glimpse into the kind of performance and features that a budget well beyond the amateur realm can provide. With that in mind, I set out to take a closer look at the Rohde and Schwarz model XK2100L HF transceiver that was donated for use at W1AW.[1] This is not a Product Review (indeed far from it), but rather a general description of the radio and a short look at its performance.

A Radio with Good Genes

Regular readers of *QST* and *QEX* know the expertise of Dr Ulrich L. Rohde, N1UL, in radio design — particularly receiver design. He has authored many books and magazine articles exploring various concepts to improve the performance of individual circuits as well as complete systems. He is both a partner of Rohde and Schwarz (R&S) in Germany and owner of Synergy Microwave in the US. Not surprisingly, the products of both firms are focused on high levels of performance.

Dr Rohde shares his expertise widely, in hopes of improving the abilities of equipment we all use. In fact, many of the concepts incorporated into the initial design of the XK2100 transceiver were outlined in a series of *QST* articles on receiver performance that were published in 1994.[2] The XK is not just a product of R&S, but is Ulrich's favorite transceiver for amateur use, and he uses them at each of his fixed locations as well as on his boat, the *Dragon Fly*.[3]

Let's Take a Look

The front panel of the XK2100 is sparse, as seen in the title photo. The display close-up in Figure 1 shows the large LCD display, the 15 "soft key" menu buttons, and two labeled buttons for menu control. The arrow buttons scroll through various menu item selections, the numeric keypad with additional ENTER and CLEAR buttons provides for direct parameter entry, while the remaining buttons control display contrast and the speaker mute.

At the far right is the speaker and, in the version donated to W1AW, the tuning knob (a special retrofit item not normally included), plus two multi-pin jacks for headphones and CW key input. In addition to the front panel controls, the transceiver is completely remote controllable via its computer interfaces.

Beyond the obvious physical differences, there are many features familiar to amateur

[1]Notes appear on page 47.

operators — CW, SSB, AM and FM modes (and several less common modes), a preamplifier, notch filter, noise reduction, adjustable filter bandwidths, adjustable BFO offset; squelch, passband tuning, RIT, RF gain adjustment, VOX, voice compressor, frequency memories and power level adjustment.

The XK2100 also has an automatically tuning preselector. Unlike some in high-end amateur gear, this one does not reduce the receiver sensitivity and it is also active in transmit mode to reduce transmitted phase noise. Although we commonly think of phase noise in connection with receiver measurements, transmitter phase noise is actually more of a problem because the noise from single transmitter will affect multiple receivers — those tuned to frequencies adjacent to the noisy transmitter that are within propagation range.

The transceiver has a large number of features and options not relevant to ham radio use, voice scrambling as one example, but I won't be covering those.[4] Although the control system is largely menu driven, the learning curve is surprisingly short compared to recent high end amateur transceivers, some of which have as many as a hundred (or more) buttons, controls and menu settings. There are no multiple button combinations used to access setup menus — those are simply accessed with a MENU HOME button. The menu is softkey based.

The setup (CONFIG) menu consists of six screens or pages with which infrequently changed parameters can be set. There are up to 12 items per page, so there aren't a lot of button presses, nor any scrolling, required to get to the item of interest. Two items to note here are CW HOLDTIME and RELEASE TIME (separately adjustable for CW and SSB), both of which affect AGC action in a manner similar to the decay time found on other IF DSP transceivers. Installed options, such as the digital preselector, are also enabled in the CONFIG pages.

The standard control menus are organized into just two pages, MANUAL #1 and MANUAL #2, with MANUAL denoting user control instead of computer control. The MANUAL #1 page controls the preamp, squelch, noise blanker, noise reduction, tuning step, memory store and recall, frequency control, mode, receive bandwidth, BFO offset, VOX and the voice compressor. MANUAL #2 controls the PBT, notch frequency, notch type, scan mode, gain (AGC or MGC, and MGC value), power output value (100, 28 or 8.5 W) and also accesses the memory and frequency controls.

There are some significant differences here from the typical ham rigs that warrant a closer look. However, before I get into the functional details, I want to discuss a particularly notable feature — the receive signal strength indicator. Note that I did not say *S-meter*. Rather than

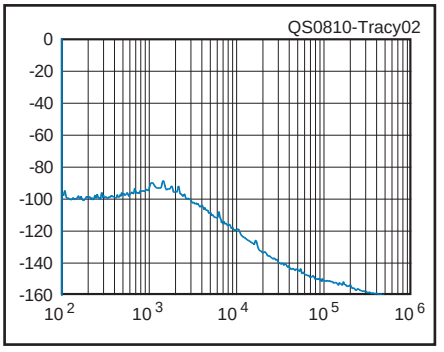


Figure 2 — Worst-case spectral display of the XK2100 transmitter output during composite-noise testing. Power output is 100 W at 14.2 MHz. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 100 Hz to 1 MHz from the carrier.

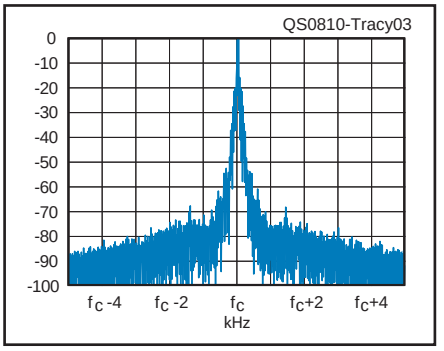


Figure 3 — Worst-case spectral display of the XK2100 transmitter during keying sideband testing. Equivalent keying speed is 60 WPM using external keying. Spectrum analyzer resolution bandwidth is 10 Hz, and the sweep time is 30 s. The transmitter was being operated at 100 W PEP output at 14.2 MHz.

give a relative indication of the signal strength, the meter on this radio actually measures the received signal voltage and reports it in dB relative to a microvolt (dBμV). Another important difference is that, in most ham transceivers, the S-meter does not begin to respond at all until the received signal level is at least several microvolts. On the XK2100, the meter is calibrated down to –15 dBμV (0.177 μV). At the high end of the scale, most ham rig S-meters top out at S9+40 dB or S9+60 dB; these levels aren't usually calibrated either, but if they were, S9+60 dB would be 50 mV. The XK's meter extends to 110 dBμV, which is over 300 mV. As you might imagine, such signal levels are quite rare, but when you want to make sure the transceiver's user can communicate from locations anywhere in the world, that's the kind of signal-handling performance to aim for.

The memories store receive and transmit frequencies (which can be locked together or separate), mode, preamp on/off and IF bandwidth. There are 300 programmable memories plus additional fixed channels for marine frequencies.

You May Get What You Pay For

As would be expected in a transceiver with a higher price tag, the types of components and circuits used in a commercial transceiver produce a level of performance that is generally better than a typical amateur market transceiver. Let's explore some of the details. Splatter and wide-band noise from transmitters are perhaps the most frequent complaints heard on the ham bands of late. One of the causes of splatter is transmitter IMD.

Compare the transmitter IMD levels shown in Table 1 to typical amateur rigs, and the difference is evident. The same is true of the phase noise as shown in Figure 2.

Part of the reason for this difference is that these final transistors are rated for 600 W peak power dissipation. Because of this, the transmitter is specified for 100% duty cycle at 100 W for all modes, with no time limit. This also comes into play in the operation of the speech processor, which will be discussed a little later. The CW equivalent of SSB splatter is keying sidebands, and this is shown in Figure 3. This very narrow transmission is the result of a very well tailored keying envelope shape, as shown in Figure 4.

On the receive side, the numbers are pretty impressive as well. Although the CW sensitivity is not quite up to the levels seen in dual-preamp receivers, it is more than adequate for virtually any location. The dynamic range and intercept figures are higher than found on most designs that use a VHF first IF, particularly the closer spacing numbers. The 5 kHz offset IMD dynamic range was higher than the recently tested Elecraft K3, which uses an HF first IF and a narrow bandwidth filter.

Even though the basic hardware design of the XK2100 stems from over a decade ago, there is a lot of control and functionality provided by the digital signal processor (DSP). The firmware can readily be updated via connection to a PC. The firmware DSP code has been updated numerous times since the radio's inception with the most recent update in 2007.

One of the enhanced features of the DSP is the noise reduction, which could be set as high as 30 dB, with the reduction fairly even across an SSB bandwidth. By comparison, the best ham rigs top out at about 20 dB with a fair amount of variation over the audio range. Another DSP feature is the automatic notch filter, which provides notching at both IF and audio frequencies. The notch depth measured an impressive 55 dB. Enabling the notch doesn't have a detrimental effect on the signal to noise ratio.

Another feature of the DSP is the auto-

Table 1

Rohde and Schwarz XK2100L, serial number 100824

Manufacturer's Specifications	Measured in the ARRL Lab
Frequency coverage: Receive and transmit, 1.5-30 MHz.	Receive and transmit, as specified.
Power requirement: 88-264 V ac; 800 VA (max out).	As specified.
Modes of operation: SSB, CW, AM, FM, FSK, AFSK.	As specified.

Receiver

Receiver Dynamic Testing

CW sensitivity, 300 Hz bandwidth, 10 dB S+N/N: 0.2-30 MHz: 0.4 μV.	Noise Floor (MDS), 600 Hz bandwidth:	
	Preamp	*Off* / *On*
	3.5 MHz	–127 dBm
	14 MHz	–130 dBm / –132 dBm
Noise figure: Preamp off, preselector on, 17 dB; preselector off, 13 dB.	14 MHz, preamp off/on: 17/15 dB, preselector off, preamp on, 9 dB.	
Blocking gain compression: <3 dB attenuation for 2 mV signal with 5 V signal offset 30 kHz.	Gain compression, 600 Hz bandwidth:	
		20 kHz offset Preamp off / *5/2 kHz offset Preamp off*
	14 MHz	147 dB / 111/102 dB
Reciprocal Mixing: Not specified.	20/5/2 kHz offset: –99/–75/–63 dBc.	

Two-Tone IMD Testing

Band/Preamp	*Spacing*	*Input level*	*Measured IMD level*	*Measured IMD DR*	*Calculated IP3*
14 MHz/Off	20 kHz	–24 dBm	–130 dBm	106 dB	+29 dBm
		–11 dBm	–97 dBm		+32 dBm
		0 dBm	–71 dBm		+36 dBm
14 MHz/Off	5 kHz	–27 dBm	–130 dBm	103 dB	+24 dBm
		–9 dBm	–97 dBm		+35 dBm
		0 dBm	–70 dBm		+35 dBm
14 MHz/Off	2 kHz	–32 dBm	–130 dBm	98 dB	+17 dBm
		–20 dBm	–97 dBm		+19 dBm
		0 dBm	–40 dBm		+20 dBm

Second-order intercept: >+60 dBm.	Preamp off: +67 dBm.
S-meter sensitivity: Calibrated in dBμV.	See text.
Audio output power: 4 W into 4 Ω at 10% THD.	4.6 W at 10% THD into 4 Ω.
IF/audio response: Bandwidth specified at –3 dB points (see text for list).	Range at –6 dB points (bandwidth): CW (600 Hz): 466-942 Hz (476 Hz)* Equivalent Rectangular BW: 496 Hz USB: 113-3225 Hz (3112 Hz) LSB: 88-3283 Hz (3195 Hz) AM: 148-3102 Hz (2954 Hz).
Spurious and image rejection: 70 dB.	First IF rejection, 14 MHz, >150 dB; image rejection, 14 MHz, >150 dB.

Transmitter

Transmitter Dynamic Testing

Power output, HF: CW, 100 W; SSB, 150 W PEP.	CW, typically 102 W high.
Spurious suppression: 70 dB typical; harmonic suppression, 60 dB typical.	Harmonic suppression, 56 dB worst case; spurious suppression, as specified.
SSB carrier suppression: 70 dB typical	69 dB.
Undesired sideband suppression: >60 dB	70 dB.
Third-order intermodulation distortion (IMD) products: –32 dB PEP.	3rd/5th/7th/9th order (worst case band): HF, –36/–50/–52/–54 dB PEP.
CW keying characteristics: Key time, 15 ms.	See Figures 3 and 4.
Transmit-receive turnaround time (PTT release to 50% audio output): 15 ms.	S9 signal, 14 ms. Unit is suitable for use on AMTOR.
Receive-transmit turnaround time (tx delay): 10 ms.	SSB, 9 ms.
Composite transmitted noise: –150 dBc/Hz at 10% frequency offset.	See Figure 2.

Size (height, width, depth): 5.0 × 17.4 × 15.2 inches; weight, 33.1 pounds (not including power supply or accessories).

*Varies with BFO offset.

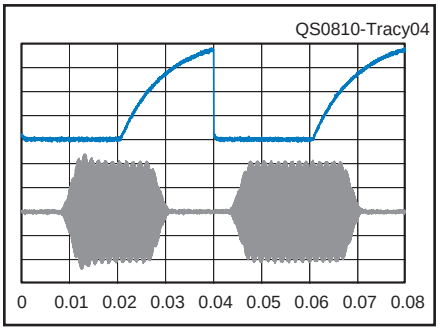


Figure 4 — CW keying waveform for the XK2100 showing the first two dits in full-break-in (QSK) mode using external keying. Equivalent keying speed is 60 WPM. The upper trace is the actual key closure; the lower trace is the RF envelope. (Note that the first key closure starts at the left edge of the figure.) Horizontal divisions are 10 ms. The transceiver was being operated at 100 W output on 14.2 MHz.

matic gain control (AGC). With an extended length communication in mind (as would be typical in commercial service), the AGC decay time has a fairly long delay setting by default (although this is also adjustable). The effect is a smoothness that helps conversations sound more natural, as if one were face to face with the other person, instead of many miles away.

The speech processor is also DSP based, with a unique algorithm that boosts the average power output sufficiently to create a received signal that is about 2 S-units stronger than the non-processed level, yet without the over processed quality in the transmit audio found in many amateur signals. This was verified on many contacts over a period of a number of months.

The strength of the receiver performance was also notable in a unique situation. As mentioned earlier, this radio was donated for use at W1AW. While the bulletin station is on the air, the combination of the multiple transmitters at 1.2 kW renders nearby receivers deaf to other signals. Yet with the XK2100, I was able to work other stations without difficulty, only a few tens of kHz away, using an antenna mere feet from the bulletin antennas.

The receiver's filter shape is a complex composite of linear and elliptical type designs (another DSP implementation) that was devised to produce excellent selectivity (at 2.4 kHz on SSB, the opposite sideband is reduced 55 dB at a 200 Hz offset), while exhibiting no ringing at all with bandwidths as narrow as 50 Hz (the filter bandwidth range is 50 Hz to 8 kHz).

In Conclusion

As can be seen, commercial HF transceiver

[Continued on page 47.]

Experimenter's RF Spectrum Analyzer

Your computer, some software and a few low cost parts combine to make an unusual FFT-based spectrum analyzer.

George R. Steber, WB9LVI

One of the most valuable pieces of equipment available to experimenters is the RF spectrum analyzer. It can be used for a myriad of purposes including analyzing and measuring equipment, testing components and observing parts of the radio spectrum. Unfortunately, commercial spectrum analyzers are very expensive, running into the thousands of dollars.

A Better (or Less Expensive) Way

Presented here is a different kind of spectrum analyzer that uses only a handful of readily available parts and your computer. It can easily be built for less than $100 and does not require extraordinary skill with RF circuits. In fact it makes a nice weekend project, once the material is on hand. It does have some limitations and does not have all the features of a full blown unit but it does produce good results in a variety of situations. For your measuring tasks, it can be used to observe the noise and drift of signal generators, check the harmonics of a signal, measure the intermodulation products of amplifiers and more.

As an educational tool, AM and FM signals from signal generators, including modulation properties, can be demonstrated and observed in real time. And for those fun tasks, it can be used to obtain wide band scans of the ham bands and other parts of the radio spectrum. And finally, it can be used as a digitally controlled signal generator and direct conversion CW/SSB/AM receiver.

If building is not your strong point, read along anyway and learn more about spectrum analysis, RF mixers, attenuators, intermodulation products, direct digital synthesis (DDS) generators, fast Fourier transforms (FFTs), images, aliases, decibels and the dBm. Numerous examples using the analyzer will be presented including spectrum plots of selected results.

It Takes Some Hardware

This spectrum analyzer is easy to build and uses a readily available DDS generator that plugs into the USB port of your computer.

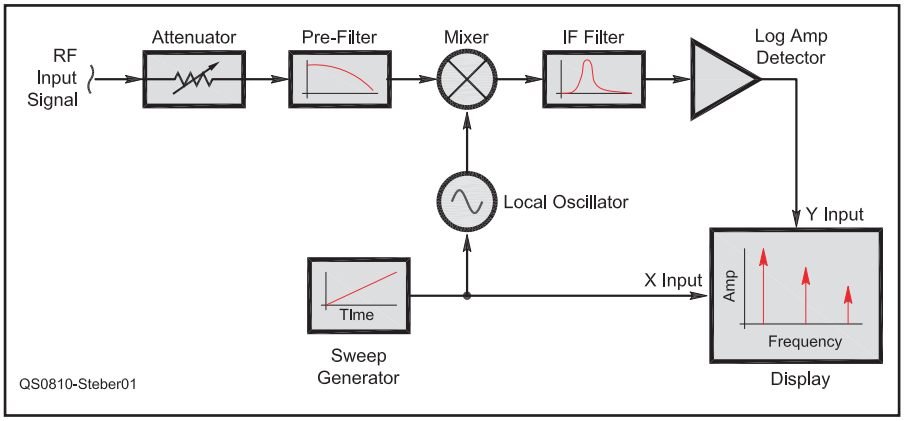


Figure 1 — Simplified diagram of a typical superheterodyne spectrum analyzer.

In addition, two ICs are needed, an SA612A RF mixer and an operational amplifier. The RF signals are fed directly to the SA612A and converted to audio and then processed by the op-amp. The audio is then fed to the audio input of a computer sound card to calculate and display the spectrum. While this simple approach has its limitations, on the plus side it is easy to build and low in cost, and it offers the possibility of a 96 dB dynamic range with low distortion and noise.

Using the DDS generator as the local oscillator of the mixer allows complete computer control of the spectrum analyzer frequency range and permits fast changing of frequencies to provide some unusual capabilities. For example, smaller parts of the spectrum can be pieced together to form larger ranges and images can be removed in software using a method that has not been seen before, at least to the author's knowledge. Another interesting application of the DDS is to use its aliases to greatly extend the frequency range.

And It Takes a Computer

You will need a PC running *Windows*, a USB port and a low noise sound card for the project. Of course, there are no guarantees that this project will work with your system. But it has been tested with a 200 MHz Pentium Pro, a 500 MHz Pentium III, and a 1.1 GHz AMD Athlon processor running *Windows 98SE* and *Windows XP* with Sound Blaster (SB) Live! Value Edition sound card. To get started it will be helpful to review some fundamentals.

Spectrum Analysis Concepts

Most of us are familiar with an oscilloscope. A spectrum analyzer and an oscilloscope are similar but complementary instruments. The oscilloscope works in the time domain and plots signal strength versus time. The spectrum analyzer works in the frequency domain and plots signal strength versus frequency. It can show information not readily recognizable in the time domain such as the frequency content of a signal containing a fundamental sine wave and its harmonics.

The most common type of spectrum analyzer, especially at radio frequencies, is the superheterodyne spectrum analyzer shown in the simplified diagram of Figure 1. It operates in a fashion similar to a superheterodyne AM radio receiver, with the output in this case going to a display rather than a speaker. Since this analyzer has several points in common with the FFT based spectrum analyzer, discussed later on, let's review how it works.

It can be seen that the RF input signal enters through an attenuator and a low pass filter to a mixer, at which point it combines with a signal from the local oscillator (LO). It is important that the input power be limited by an attenuator as the mixer circuitry is extremely sensitive and easily damaged by excessive power. The function of the mixer device is to convert the signal to a different

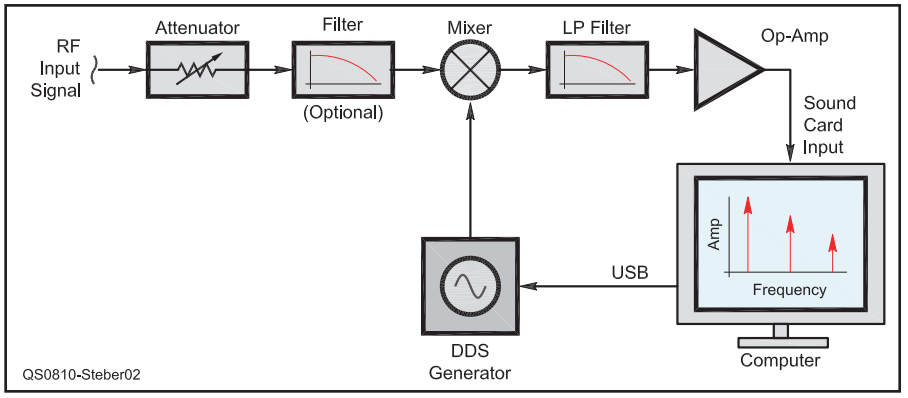


Figure 2 — Block diagram of the spectrum analyzer described in this project.

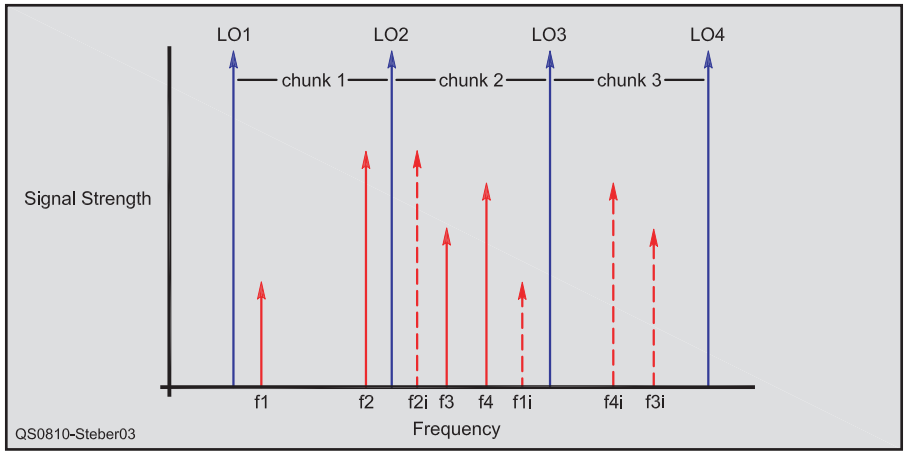


Figure 3 — FFT spectrum analyzer frequency chunks and images.

frequency. Since the mixer is non-linear, its output includes not only the two original signals (RF and LO), but also their harmonics and the sums and differences of the original frequencies and their harmonics. The narrow IF filter serves to reject many of the undesired components.

Since the LO frequency and the IF filter center frequency are known exactly, the unknown frequency components emerging from the narrow IF filter can be determined in both amplitude and frequency. The resulting ac voltage at the IF output is proportional to the input signal's amplitude. The output is processed by a logarithmic amplifier and converted to a dc voltage by an envelope detector. The results are displayed on the vertical or y-axis of the display.

A sweep generator creates the horizontal or x-axis across the display from left to right. The sweep also tunes the LO so that its frequency change is in proportion to the sweep voltage. The narrower the bandwidth of the IF, the more information we can get from the signal. But a narrow bandwidth filter may be a major drawback since sweeping the LO too fast will result in display distortion. As we'll see this is not a problem for the FFT analyzer described later on.

The response is typically displayed in units of decibels referenced to a milliwatt, or dBm. The log scale (dB scale) is used because it is a good way to cover an extremely large dynamic range. The usual definition for power ratio is given below, assuming identical loads,

$$dB = 10 \log(P_o/P_{in}) \qquad [Eq\ 1]$$

where P_o is the output power and P_{in} is the input power. To calculate dBm use 1 mW for P_{in}. To illustrate, a P_o of 0.1 mW corresponds to –10 dBm.

To see the advantage of the dB consider signals as far apart in power ratios as 1 to 0.000000001 which need to be displayed simultaneously. This range corresponds to 0 dB to –80 dB. Obviously a dB scale works better in this case.

In terms of voltage, the definition of voltage transfer ratio in dB, is given by:

$$dB = 20 \log(V_o/V_{in}) \qquad [Eq\ 2]$$

where V_o is the output voltage and V_{in} is the input voltage. To convert a voltage V_o in RMS volts, across 50 Ω, to dBm, use 0.225 for V_{in} in the above equation. To illustrate, a V_o of 71 mV corresponds to –10 dBm.

To learn more about spectrum analyzers download "Spectrum Analyzer Basics" application note, AN150, from the Agilent Technologies Web site, or see the recent *QST* articles by John Stanley, K4ERO.[1,2]

FFT Spectrum Analyzer

A block diagram of the spectrum analyzer described in this project is shown in Figure 2. It is basically a direct conversion (DC) design. As before, the RF input signal enters through an attenuator and an optional filter to a mixer, where it combines with the signal from the local oscillator (LO), in this case a DDS generator. Recall that it is important that the input power be limited by an attenuator to avoid damaging the mixer. The filter after the attenuator may be needed if there are strong undesired signals present at the RF input terminal that need to be suppressed. Here the mixer is used to down convert the signal to a lower audio frequency band of 0 to 24 kHz.

As noted previously, the mixing device is non-linear and its output includes the two original signals (RF and LO), their harmonics and the sums and differences of the original frequencies and their harmonics. The filter at the mixer output removes most of the undesirable frequencies such as the LO, RF and sum frequencies. In the ideal case we would be left with only the difference frequency (RF and LO) in the desired audio range. Unfortunately in the real world spurious responses will appear. Our hope is to reduce them to a negligible level and if this doesn't work at least identify them and ignore them.

The output of the amplifier is fed to the left sound card input. Using a sample rate of 48,000 samples per second, 1024 samples of data are captured that correspond to a 21.33 ms time slice. Once the data is obtained, an FFT is applied to obtain a magnitude spectrum consisting of 512 frequency bins ranging from 0 to 24,000 Hz. Note that the spectrum actually corresponds to the real range, LO to LO + 24 kHz, and the image range, LO to LO –24 kHz, because of the mixer. This may seem like a small piece of spectrum to observe but it has been found to work well in many cases. It has very good resolution at 46.875 Hz per FFT bin.[3]

The frequency scale of the spectrum is known accurately since a precise DDS generator is used as the LO. If we want to observe a larger range of spectrum, chunks of spectrum can be pieced together. It works this way. Grab a 24 kHz chunk of spectrum, increase the LO by 24 kHz and grab another chunk. Put these two pieces together as a single 48 kHz spectrum and display it. This works fairly well except for some artifacts that appear in the stitched together spectrum. They appear, near the low frequency and high frequency ends of the sound card response where it tends to roll off. It's easy to keep the important parts of the spectrum away from these spots by adjusting the LO. Examples are shown later on.

[1]Notes appear on page 40.

The agility of the DDS can also be put to use in observing harmonics of a signal. Say we are observing a signal at 3.85 MHz and we want to look at the 3rd harmonic. We simply change the DDS by a factor of three (11.55 MHz.). This is done by clicking the X3 button on the screen and looking at the display, which will now show it.

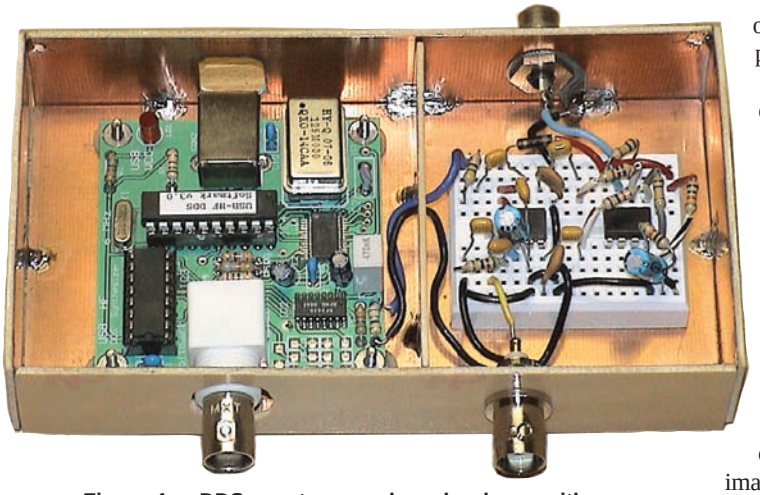


Figure 4 — DDS spectrum analyzer hardware with cover removed. DDS signal generator is in the left compartment and the mixer and op-amp are in compartment on the right.

Images

One major problem of the DC spectrum analyzer is image response. As you may recall, an image is a signal that appears below the LO frequency while tuning a real signal above the LO. It is inherent with DC receivers and is one of the major reasons for the popularity of the superheterodyne receiver that can eliminate or reduce this problem.

Note the chunks of spectrum and the corresponding LO frequencies (LO_1, LO_2 and LO_3) shown in Figure 3. There are four real frequencies involved here, namely f_1, f_2, f_3 and f_4. Assume that chunk 2 is what we want to display using our DC spectrum analyzer. Since the mixer produces the difference frequencies f–LO_2, we see that four frequencies will be shown in our spectrum, namely f_{2i}, f_3, f_4 and f_{1i}. The two components f_{2i} and f_{1i} don't belong there and are said to be images from the previous chunk. To reiterate, if we set the LO to the frequency LO_2, capture the data and calculate the FFT we will see these four components on our display.

There is an easy way to tell which component is an image and which is real. Just increase the LO_2 frequency slightly and note the movement of the components in the spectrum. If the component moves to the right, it is an image, while if it moves to the left it is real. This is easily seen on Figure 3 since the difference between the image signals corresponding to f_1 and f_2 and the LO_2 increases while the opposite is true of the real components.

Mulling this over, I wondered if the images could be removed with software. One way to do it would be to change the LO slightly, say by an amount Δf and capture a new FFT. Then move the spectrum back an amount Δf by re-numbering bins in the FFT and compare the component magnitudes of the original spectrum to this new one. The real components will lie on top of each other while the images will have shifted by 2 × Δf from their original positions. Then simply compare the original spectrum and the new one, bin by bin, in the two sets of FFT data. Choose the smallest value between the two.

Expanding on this concept, if we shift the LO to LO_3 to obtain the next chunk (chunk3), the images seen in chunk2 would not appear in it at all. But the images corresponding to the real components in the second chunk and possibly some new real frequencies would be there. See Figure 3 chunk3 for an example of this. So if we fold chunk3 back around and compare it to chunk2, only the real and image components f_3 and f_4 will match exactly. Hence by comparing the bins in chunk2 and folded chunk3 we can identify the real components. This is done by selecting the small-

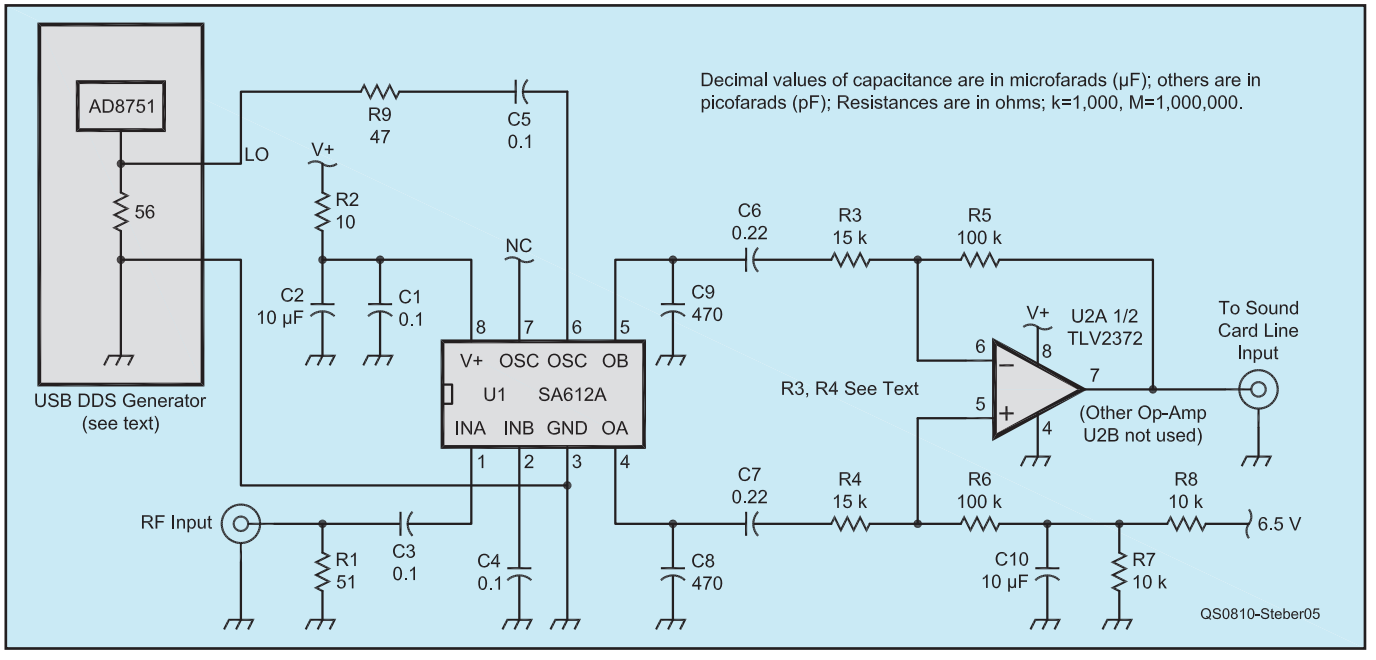


Figure 5 — Circuit diagram of spectrum analyzer and DDS module.

C1, C3-C5 — 0.01 μF, 50 V ceramic or monolithic capacitor.
C2, C10 — 10 μF, 25 V electrolytic capacitor.
C6, C7 — 0.22 μF, 50 V ceramic or monolithic capacitor.
C8, C9 — 470 pF, 50 V ceramic or monolithic capacitor.
R1 — 51 Ω, ¼ W, 5% resistor.
R2 — 10 Ω, ¼ W, 5% resistor.
R3, R4 — 15 kΩ, ¼ W, 5% resistor.
R5, R6 — 100 kΩ, ¼ W, 5% resistor.
R7, R8 — 10 kΩ, ¼ W, 5% resistor.
R9 — 47 Ω, ¼ W, 5% resistor.
U1 — SA612A RF mixer and amplifier integrated circuit.
U2A — TVL2372 dual op-amp (one half used).

est component in the compared bins.

This simple method is used in the program. In practice it works well and I have achieved 70 to 90 dB of image suppression using this method, while maintaining the correct magnitudes of the real components. I have happily noticed that some other spurs are also reduced which helps to clean up the displayed spectrum. It's great fun clicking a checkbox on the screen and watching the images disappear. Examples are shown later on comparing spectrums with and without software image removal.

Figure 6 — Various attenuators used in the project. Step attenuator shown at top and 10 W power attenuator at the bottom.

Spectrum Analyzer Circuit

Figure 4 shows the hardware arrangement of my spectrum analyzer with the cover removed. I used a homemade enclosure constructed of copper PCB to house the components. The DDS generator is shown on the left and is in its own compartment. There is an opening in the enclosure at the rear for attachment of the USB cable. A BNC connector from the DDS module is at the front and used for the signal generator function. In the adjacent compartment is the mixer and amplifier on a small breadboard. On the front of that compartment is a BNC connector for the RF input signal. The rear panel has an RCA type phono jack for the AUDIO OUTPUT to the sound card LINE INPUT. Use a shielded cable to connect to the sound card jack on the back of the computer. Sound cards typically have a 3.5 mm stereo jack for an input so you will need to make your cable accordingly.

The spectrum analyzer circuit schematic is shown in Figure 5. The main component is the USB DDS module from Softmark, available as an assembled module.[4] This device comes with a 125 MHz crystal oscillator installed in a socket. If you are inclined, this oscillator may be replaced by a 30 MHz crystal oscillator to achieve 180 MHz operation using the internal six times multiplier of the DDS IC, the AD8751. But there may be reasons, discussed later on, not to do that. There are no aliasing filter components installed on the PCB but that does not affect its operation in this application. The aliased frequencies (also called images) can be useful and are discussed in more detail later on.

In addition there is a fairly straightforward two IC circuit that must be constructed. The mixer (SA612A) and the TLV2372 op-amp are available from many sources such as Digi-Key. Other op-amps could probably be used here, but definitely not an LM358, as it does not have a symmetrical output. The circuit is easy to build and requires a power supply of between 4.5 and 6.5 V with a current requirement of less than 10 mA. This can be obtained from a small power supply or from four AA or AAA size flashlight batteries connected in series. The DDS module has 5 V available but I'm reluctant to suggest using it as a mistake in construction could cause a problem with your computer. Other reasons for not using it is that there are spurs on the 5 V line, and it is not the best voltage as discussed later on.

The local oscillator signal and ground from the DDS module is taken across the 56 Ω resistor at the output (pin 21) of the AD8751 chip. I just carefully tack soldered the two signal wires (LO and GND) to the resistor. This resistor is located in the lower right corner of the module as shown in Figure 4. The signal is taken from this point since the level is high enough to drive the mixer, and because it is not filtered. That signal on the DDS PCB is also run through an attenuator and then to a BNC connector but is too low at that point to adequately drive the mixer. For other uses, however, that signal can be used as a general purpose signal generator output.

Only one sound card channel (left) is used. Notice that the schematic shows a single line for clarity, but it is in fact one channel of the sound card LINE IN stereo jack. The gain of the op-amp is controlled by the two equal valued resistors, R3 and R4.

Attenuator Notes

As noted previously, an attenuator is needed at the input of the spectrum analyzer. This is because the mixer is very sensitive and powerful signals can easily overload it and cause damage. Figure 6 (upper part) shows an example of a commercial attenuator that was used by the author in this project. It was obtained on an internet auction site. Most attenuators have switches (rotary or toggle) to select the amount of attenuation. There are even voltage controlled attenuators but that would be over the top for this project.

Attenuators, or pads as they are sometimes called, should be controlled in 1 dB, 2 dB, 3 dB, 5 dB, 10 dB and 20 dB steps. The one in the photo can go from 0 to 101 dB in 1 dB steps. In many applications it is not necessary to have that many steps. Attenuators also have a characteristic impedance, often 50 or 75 Ω. For this analyzer a 50 Ω pad provides the best match to the 50 Ω impedance of the mixer.

The power dissipation of the attenuator is important. If you are just checking low power devices such as signal generators, a pad of ½ or 1 W may suffice. But if you are checking QRP rigs more dissipation is needed. Sometimes a fixed attenuator with enough power dissipation can be inserted ahead of the low power switched attenuator to absorb the power. Figure 5 (lower part) shows an example of a fixed 20 dB attenuator rated at 10 W. For this case if we apply 10 W to its input only 0.1 W emerges, which is low enough for a following low power attenuator to handle.

Making your own attenuator is also a good way to go. Attenuators consist of nothing more than resistors arranged in a specific pattern in a shielded box. An example of a 10 dB pad is shown in Figure 7. Note that there is a switch to allow insertion or bypass of the pad. A nice step attenuator design is presented by Bramwell, K7OWJ, that can be built with ordinary shop tools.[5]

Sound Card Comments And Settings

A low distortion, low noise full duplex sound card is desirable. Many of the audio cards available on the market are quite good. Several of them offer sampling rates of 48 kS/s, 98 kS/s and higher. The popular Sound Blaster Audigy offers 24 bit data and sampling at rates to 96 kS/s. Unfortunately, many higher rate sound cards on the market today have some limitations when one tries to use them as A/D converters. They often have filtering on the inputs that starts to roll off above 20 kHz. and are pricey. So, in keeping with the idea of making this a low cost, easy to build project it was decided to stay with the popular 48 kS/s 16 bit sound cards that are in many computers now.

My older Sound Blaster Live (SBL) Value Edition fills the bill and probably many others will, too. Since we are using the left channel line-input it is necessary that it be enabled in the *Windows* audio mixer. Set its value to maximum. All other inputs should be muted. My SBL works fine with this setting. Your setting may be slightly different depending on the gain of the line input circuit of your sound card.

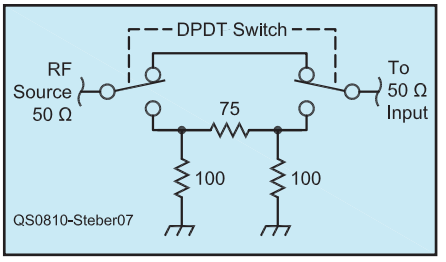


Figure 7 — Circuit of a switched 10 dB resistive attenuator.

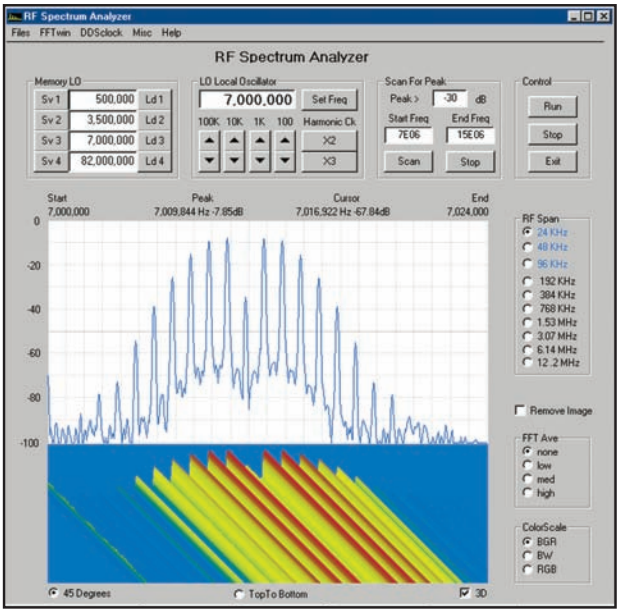


Figure 8 — The main window of the spectrum analyzer program.

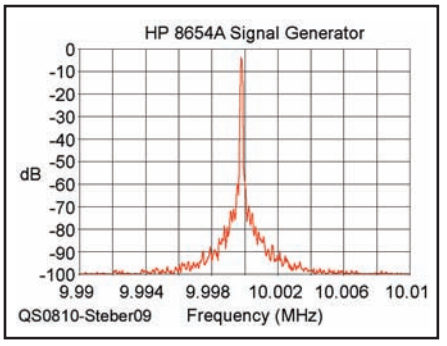


Figure 9 — Example of a typical signal generator spectrum.

Earlier Sound Blaster sound cards such as the SB16 and AWE 32 are not recommended for this project as they are noisy. The same may be said of SB16 compatible cards, so be wary. My advice is not to use any of these cards.

Spectrum Analyzer Program Setup

The spectrum analyzer software is available on the ARRL Web site and is zipped for fast downloading. Unzip it to a new folder and you are ready to go. It was tested with *Windows 98* and *XP*. You need to use three third party ActiveX controls. One is the Softmark DDS control and the other two are the plot programs for the Spectrum and Waterfall plots from Ultima. The latter may show a small ad-line on the plots from time to time but may be removed by contacting them and asking for removal as a non-commercial user.[5] The controls normally do not need special installation if located in the same folder as the program. If you wish to install them elsewhere they can be installed/removed by using a small freeware program dllregsvr.exe included with the software.

When you run the software you may get a message such as "Required DLL file MSVBVM60.DLL was not found." This is a *Visual Basic* run time file and is on many systems. If not found, you will need to obtain it and install it on your system. It is freely available from Microsoft and other sites on the Web. It is usually available as *Visual Basic 6.0 SP5: Run-Time Redistribution Pack* (VBRun60sp5.exe) and is a self-extracting file. Download takes about 6 minutes at 28.8 kb/s.

If you get the message "Component 'COMDLG32.OCX' or one of its dependencies is not correctly registered: a file is missing or invalid" when you try to run the program, you will need to register it on your system. It is freely available from Microsoft and other sites on the Web. More details are included with the software.

The program was tested with *Windows 98se* and *XP*. A screen shot of the spectrum analyzer is shown in Figure 8. There are two main displays, one for the spectrum and one for the waterfall plot. The spectrum plot shows the scan start frequency, peak signal and end frequency. A mouse enabled cursor can be used if the plot is stopped. The waterfall is handy for observing signals over time such as a drifting signal generator or ham band activity. There are various buttons for controlling the LO frequency, RF span and so on. Data may be saved or loaded as spreadsheet style CSV files. Example spectrum files are included. To run the spectrum analyzer, make sure the circuit is powered, connected to the sound card line and USB and then click RUN.

Spectrum Analyzer Checkout

Assuming the software and circuit are now working, let's try out our spectrum analyzer. As it stands it should work reasonably well, but we'll want to tune it up as described in the ARRL Web piece including calibration as well as software ware and applications.[6] For now let's just get it going and put a spectrum on the screen. Start the program and connect a RF signal generator, through an attenuator, to the mixer input.

Set the LO to the desired *start* frequency. Adjust the RF signal generator frequency slightly above the LO frequency. Next choose one of the frequency spans available. If you're not sure which one to choose at this point, pick a single scan mode large enough to encompass your signal generator frequency and click RUN. After the scan, note the frequency of the peak and set the LO slightly below it. Then select the 24 kHz real time mode and you should see a spectrum similar to that shown in Figure 9. Yours may look better or worse depending on the quality of the generator. Now experiment with the controls to gain familiarity with the spectrum analyzer's capabilities. Notice particularly that if you overdrive the RF input that quite a lot of distortion components will appear on the screen as shown in Figure 9.

The analyzer has frequency spans ranging from 24 kHz to 96 kHz in near real time and from 192 kHz to over 12 MHz with single scans. Resolution bandwidth (RBW) ranges from 46 Hz to 24 kHz. Maximum frequency range is about 90 % of the crystal frequency, which for a 125 MHz crystal is over 100 MHz. Above half the crystal frequency (62.5 MHz) aliases are used. Filters may be required with aliases depending on the application.

Notes

[1]Agilent Technologies, Spectrum Analyzer Basics (AN 150). Available at **www.home.agilent.com/USeng/nav/-536902453.0/pc.html**.

[2]J. Stanley, K4ERO, "The Beauty of Spectral Analysis," Part 1 — *QST*, Jun 2008, pp 35-38, Part 2 — *QST*, Jul 2008, pp 33-35.

[3]The author is aware of 96 kS/s sound cards, but for reasons discussed later decided not to use one.

[4]Softmark, **www.ar.com.au/~softmark/**.

[5]D. Bramwell, K7OWJ, "An RF Step Attenuator," *QST*, Jun 1995, pp 33-36. Also on the ARRL Web at **www.arrl.org/tis/info/pdf/9506033.pdf**.

[6]**www.arrl.org/files/qst-binaries/**.

George R. Steber, PhD, is Emeritus Professor of Electrical Engineering and Computer Science at the University of Wisconsin-Milwaukee. He was an active researcher there and taught in the graduate program for 35 years before retiring a few years ago. George, WB9LVI, has an Advanced class license and is a life member of the ARRL and IEEE. He is a registered professional engineer. He has written several articles for QST *such as "A Low Cost Automatic Curve Tracer" in the July 2006 issue. George has worked with NASA and the USAF on various projects and also has extensive industrial experience, with 18 patents issued. He still occasionally serves as a consultant and product designer. In his spare time, aside from Amateur Radio, he enjoys reading, racquetball, astronomy, music projects, video editing and playing his trumpet in local bands. You may reach George at 9957 N River Rd, Mequon, WI 53092 or at* **steber@execpc.com** *with e-mail mode set to text and "Spectrum Analyzer" in the subject line.* QST

PRODUCT REVIEW

ICOM IC-7700 HF and 6 Meter Transceiver

Reviewed by Rick Lindquist, WW3DE
National Contest Journal Managing Editor

Is the ICOM IC-7700 the very competent IC-756PROIII writ large or the top-shelf IC-7800 writ small?[1,2] That's the nub of the debate raging in Amateur Radio cyberspace. Perhaps it's a bit of both, but the larger question may be: Is this a contester's radio, a DXer's radio or just a big, general-purpose box for someone with a lot of room in the shack and around $7000 of discretionary income?

I've owned a PROIII for about three years and had a PROII before that, so I feel familiar with that segment of ICOM's product line. A collective gasp went up when ICOM came out with the original '7800 back in 2004 and set the retail price above $10,000 — the top of the scale at the time. The advent of the similarly sized but less pricey IC-7700 puts many of the more expensive radio's capabilities within reach of a larger segment of the Amateur Radio population. The overall focus of this review will be to evaluate this radio on its own terms and as a possible next step up the ladder for PROIII owners like me. Let's see how it stacks up.

By the Pound

Like the IC-7800, the '7700 radiates *gravitas*. Yesteryear's heavy metal gear has nothing on this baby! The IC-7700 has a slightly different — some say better — look to its case and is a little lighter than the IC-7800. Both units come with rack-mounting hardware, which lends it a professional air but mostly just gets in the way. The handles *are* handy to lift the radio into place in the shack, though.

This massive transceiver's myriad capabilities and features more than make up for any inconvenience in handling it — or, for that matter, fitting it onto your operating desk. The IC-7700's front panel layout is similar enough to the PROIII's that I got it up and running in no time.

Comparison/Contrast

A manifestation of upward mobility for those owning "lesser" radios, the IC-7700 retains many of the niceties ICOM included in the IC-7800, such as a built-in ac power supply, 200 W output on all bands, 6 meter coverage, an attractive and capacious display screen, adjustable DSP filtering, notching, noise blanking, noise reduction, selectable crystal roofing filters and plug-and-play RTTY and PSK31 operation. What it does *not* offer compared to the IC-7800 may be less obvious.

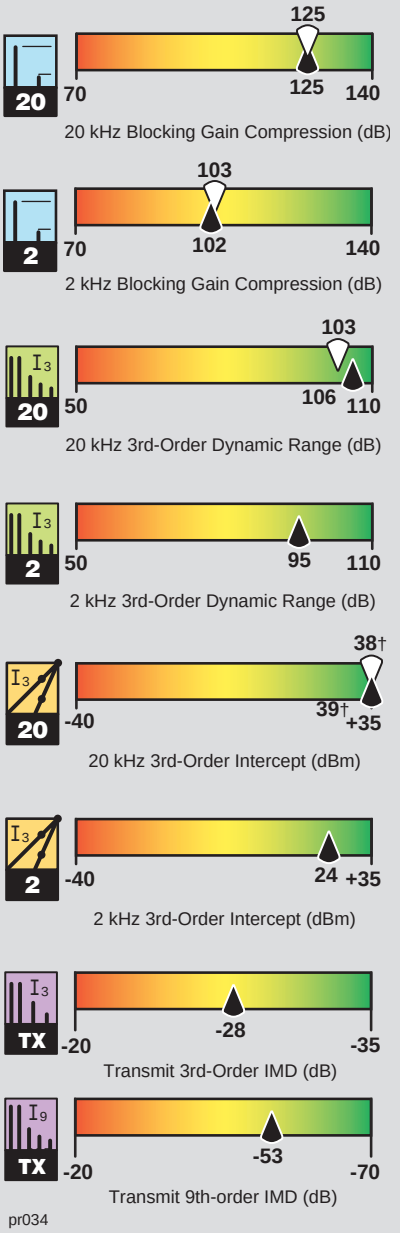
Inside the IC-7700 are two independent and identical DSP units — one for transmit and receive functions and one for spectrum scope functions. Unlike the IC-7800, the '7700 is a *single-receiver* design, although it does have two VFOs. It does not have *Dual Watch* capability, something even the PROIII boasts. More on this topic later.

Similar to the IC-7800 design, the MOSFET power amplifier transistors in the

[1]R. Lindquist, N1RL, "ICOM IC-756PROIII HF/6 Meter Transceiver," Product Review, *QST*, Mar 2005, pp 56-59. *QST* Product reviews are available on the Web at **www.arrl.org/members-only/prodrev/**.

[2]D. Patton, NN1N, "ICOM IC-7800 HF and 6 Meter Transceiver Revisited," Product Review, *QST*, Mar 2007, pp 60-65

Key Measurements Summary



Bottom Line

The IC-7700's attributes seem shaped more toward the serious contester and DXer, but it's a superior performer with features enough to attract any active HF or 6 meter enthusiast.

Mark J. Wilson, K1RO ♦ Product Review Editor ♦ k1ro@arrl.org

IC-7700 run at 48 V dc, providing 200 W at 100% duty cycle on every mode but full-carrier AM, which provides 200 W PEP, or 50 W carrier. The IC-7700 uses MRF-150s, while the IC-7800 has SD-2931s.

Other Similarities

Both radios include the DigiSel automatic tracking preselector, to minimize the effects of strong, out-of-band signals, plus a choice of 15, 6 or 3 kHz roofing filters to pair with each mode's three user-settable bandwidth filter settings. There's a separate front end for 6 meters.

The IC-7700 also includes the handy audio peak filter (APF), which ICOM wisely has resurrected (it was a popular feature on the original-flavor IC-756 but was omitted from the PRO series). Not only is it back, but it's improved, with narrow, mid and wide settings and a number of menu options.

The IC-7700's front end is similar to that of the '7800's, with narrow band-pass filters followed by the DigiSel preselector. The IC-7700 incorporates later-generation DSP chips that boast a slightly higher processing speed than the ICs inside the '7800.

A simulated analog multifunction meter that almost looks like the real thing graces the gorgeous 7 inch TFT LCD display; both radios include provisions for an external VGA video display (the LCD and external displays function simultaneously). I found the '7700's LCD display to be an order of magnitude better than the PROIII's already-terrific display. In fact the difference is *so* great that the PROIII's display — notwithstanding the praise I heaped upon it when reviewing that radio a few years ago — began looking positively primitive to me. Even so, using an external monitor is the best option if you plan to use the IC-7700 for more than just the occasional RTTY or PSK31 contact. Otherwise, you'll strain your eyes trying to read the text that appears in the tiny decoder window.

One complaint we voiced in the IC-7800 Product Review was that the vertical viewing angle of its display was too narrow. The same appears to be true of the IC-7700's display; it's best with the radio approximately at eye level with respect to the operator. ICOM does provide "lifts" for the front support legs, but these offered insufficient additional elevation with the radio sitting at typical desk height. While the display does fade somewhat when viewed from above or below a line perpendicular to its center, it remains readable at viewing angles of ±45°.

Screen setup offers two display types, A and B, plus a choice of five character fonts. The A screen is a basic black background, while the B screen has a blue background. The screen saver is an eye-catcher. It's a mini-sized floating version of the active display screen as it was wherever you left the radio when you walked away and the display timed out. There are three menu modes for this: BOUND, ROTATION and TWIST.

The IC-7700 offers a choice of three meter styles — standard (analog), edgewise and bar, but you're limited as to which style(s) can appear on either the normal or the wide (expanded) screen at any given time. Using the menu, you can pick any of the three as the default for the normal screen. With the standard meter selected for the normal screen, however, your only wide screen choice is the bar style meter. Otherwise, you're restricted to either a bar meter or an edgewise meter for the normal and wide screens. This means if you go to

Table 1
ICOM IC-7700, serial number 0201528

Manufacturer's Specifications	Measured in the ARRL Lab
Frequency coverage: Receive, 0.03-60 MHz; transmit, 1.8-2, 3.5-4, 5.33-5.40, 7-7.3, 10.1-10.15, 14-14.35,18.068-18.168, 21-21.45, 24.89-24.99, 28-29.7, 50-54 MHz.	Receive, as specified; transmit, as specified.
Power requirement: 85-265 V ac; receive, 210 VA (max audio); transmit, 800 VA (200 W out).	As specified.
Modes of operation: SSB, CW, AM, FM, FSK, AFSK.	As specified.

Receiver

SSB/CW sensitivity, 2.4 kHz bandwidth, 10 dB S/N: 0.1-1.8 MHz, 0.5 μV; 1.8-30 MHz, 0.16 μV; 50-54 MHz, 0.13 μV.	
Noise figure: Not specified.	14 MHz, preamp off/1/2: 18/7/4 dB.
AM sensitivity, 6 kHz bandwidth, 10 dB S/N: 0.1-1.8 MHz, 6.3 μV; 1.8-30 MHz, 2 μV; 50-54 MHz, 1 μV.	10 dB (S+N)/N, 1-kHz, 30% modulation: 1.0 MHz 2.7 0.75 0.53 μV; 3.8 MHz 2.2 0.62 0.44 μV; 50 MHz 2.4 0.68 0.55 μV (Preamp off / 1 / 2)
FM sensitivity, 12 dB SINAD: 28-30 MHz, 0.5 μV; 50-54 MHz, 0.32 μV.	For 12 dB SINAD: 29 MHz 1.2 0.27 0.2 μV; 52 MHz 0.9 0.25 0.2 μV (Preamp off / 1 / 2)
Blocking gain compression: Not specified.	Gain compression, 500 Hz bandwidth: 3.5 MHz 125/112/106 dB 103/103 dB; 14 MHz 125/116/105 dB 103/102 dB; 50 MHz 124/115/103 dB 96/96 dB (20 kHz offset Preamp off/1/2; 5/2 kHz offset Preamp off)
Reciprocal mixing (500 Hz BW): Not specified.	20/5/2 kHz offset: –109/–91/–78 dBc.

ARRL Lab Two-Tone IMD Testing*

Band/Preamp	Spacing	Input level	Measured IMD level	Measured IMD DR	Calculated IP3
3.5 MHz/Off	20 kHz	–130 dBm	–27 dBm	103 dB	+24 dBm
		–97 dBm	–7 dBm		+38 dBm
14 MHz/Off	20 kHz	–129 dBm	–23 dBm	106 dB	+30 dBm
		–97 dBm	–6 dBm		+39 dBm
		–72 dBm	0 dBm		+36 dBm
14 MHz/One	20 kHz	–141 dBm	–26 dBm	115 dB	+31 dBm
		–97 dBm	–17 dBm		+23 dBm
14 MHz/Two	20 kHz	–144 dBm	–32 dBm	112 dB	+24 dBm
		–97 dBm	–23 dBm		+37 dBm
14 MHz/Off	5 kHz	–129 dBm	–33 dBm	96 dB	+15 dBm
		–97 dBm	–15 dBm		+26 dBm
		–48 dBm	0 dBm		+24 dBm
14 MHz/Off	2 kHz	–129 dBm	–34 dBm	95 dB	+13 dBm
		–97 dBm	–16 dBm		+24 dBm
		–50 dBm	0 dBm		+25 dBm
50 MHz/Off	20 kHz	–130 dBm	–32 dBm	98 dB	+17 dBm
		–97 dBm	–11 dBm		+32 dBm

Receiver	Receiver Dynamic Testing
Second-order intercept: Not specified.	Preamp off/1/2, +96/+96/+96 dBm.
FM adjacent channel rejection: Not specified.	20 kHz offset, both preamps on: 29 MHz, 84 dB; 52 MHz, 83 dB.
FM two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset, both preamps on: 29 MHz, 84 dB;** 52 MHz, 84 dB.** 10 MHz channel spacing: 52 MHz, 98 dB.
S-meter sensitivity: Not specified.	S9 signal at 14.2 MHz: preamp off, 59 μV; preamp 1, 15.5 μV; preamp 2, 7.1 μV.
Squelch sensitivity: SSB, CW, RTTY, 5.6 μV; FM, 1 μV.	At threshold, both preamps: SSB, 1.1 μV; FM, 29 MHz, 0.1 μV; 52 MHz, 0.09 μV.
Audio output: 2.6 W into 8 Ω at 10% THD.	2.6 W at 10% THD into 8 Ω.
IF/audio response: Not specified.	Range at –6 dB points, (bandwidth)†: CW (500 Hz filter): 348-795 (447 Hz)‡; Equivalent Rectangular BW: 502 Hz; USB: 230-2730 Hz (2500 Hz); LSB: 230-2723 Hz (2493 Hz); AM: 135-3171 Hz (3036 Hz).
Spurious and image rejection: HF & 50 MHz, (except IF rejection on 50 MHz): 70 dB.	First IF rejection, 14 MHz, 96 dB; 50 MHz, 87 dB; image rejection, 14 MHz, 104 dB; 50 MHz, 120 dB.
Transmitter	**Transmitter Dynamic Testing**
Power output: HF & 50 MHz: SSB, CW, FM, 200 W (high), 5 W (low); AM, 50 W (high), 5 W (low).	HF: CW, SSB, FM, typically 205 W high, <1 W low; AM, typ 52 W high, <1 W low; 50 MHz: CW, SSB, FM, typ 190 W high, <1 W low; AM, typ 47 W high, <1 W low.
Spurious-signal and harmonic suppression: ≥60 dB on HF, ≥70 dB on 50 MHz.	HF, 61 dB; 50 MHz, 68 dB. Meets FCC requirements.
SSB carrier suppression: ≥63 dB on HF, ≥63 dB on 50 MHz.	As specified on HF, >70 dB on 50 MHz.
Undesired sideband suppression: ≥80 dB.	>70 dB.
Third-order intermodulation distortion (IMD) products: Not specified.	3rd/5th/7th/9th order (worst case band): HF, –28/–41/–47/–53 dB PEP; 50 MHz, –28/–52/–58/–65 dB PEP.
CW keyer speed range: Not specified.	6 to 48 WPM.
CW keying characteristics: Not specified.	See Figures 1 and 2.
Transmit-receive turn-around time (PTT release to 50% audio output): Not specified.	S9 signal, 15 ms.
Receive-transmit turn-around time (tx delay): Not specified.	SSB, 11 ms; FM, 9 ms. Unit is suitable for use on AMTOR
Composite transmitted noise: Not specified.	See Figure 3.

Size (height, width, depth): 5.9 × 16.7 × 17.2 inches; weight, 50 pounds.

Price: $7000.

*ARRL Product Review testing now includes Two-Tone IMD results at several signal levels. Two-Tone, 3rd-Order Dynamic Range figures comparable to previous reviews are shown on the first line in each group. The "IP3" column is the calculated Third-Order Intercept Point. Second-order intercept points were determined using –97 dBm reference.

**Measurement was noise-limited at the value indicated.

†Default values; bandwidth and cutoff frequencies are adjustable via DSP.

‡Varies with PBT and Pitch control settings.

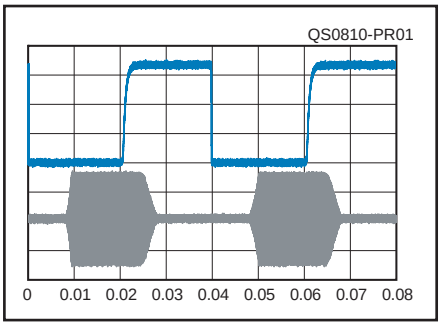


Figure 1 — CW keying waveform for the IC-7700 showing the first two dits in full-break-in (QSK) mode using external keying. Equivalent keying speed is 60 WPM. The upper trace is the actual key closure; the lower trace is the RF envelope. (Note that the first key closure starts at the left edge of the figure.) Horizontal divisions are 10 ms. The transceiver was being operated at 200 W output on the 14 MHz band.

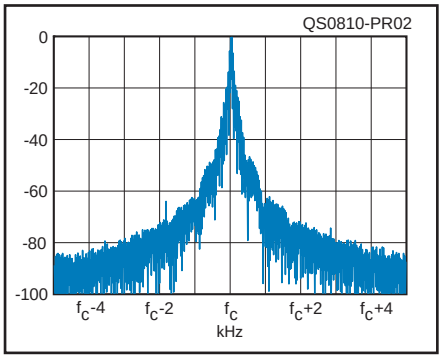


Figure 2 — Spectral display of the IC-7700 transmitter during keying sideband testing. Equivalent keying speed is 60 WPM using external keying. Spectrum analyzer resolution bandwidth is 10 Hz, and the sweep time is 30 seconds. The transmitter was being operated at 200 W PEP output on the 14 MHz band, and this plot shows the transmitter output ±5 kHz from the carrier. The reference level is 0 dBc, and the vertical scale is in dB.

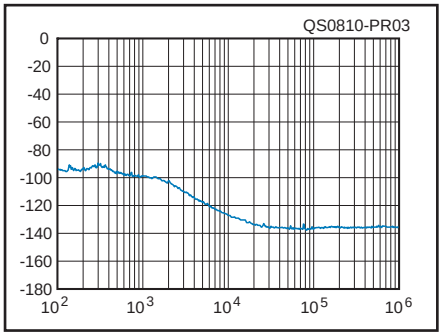


Figure 3 — Spectral display of the IC-7700 transmitter output during composite-noise testing. Power output is 200 W on the 14 MHz band. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 100 Hz to 1 MHz from the carrier. The reference level is 0 dBc, and the vertical scale is in dB.

the wide screen, either two bar meters *or* a bar and an edgewise meter will appear on the screen for the S meter and power output functions.

The radio includes two USB ports on the front panel for a flash drive and/or keyboard. The IC-7800 has a single USB port on the rear apron and a CF card port on the front panel.

Smooth Sailing

This radio feels *really* solid, and it definitely will impress visitors to your shack. Everyone who's touched the almost larger-than-life main tuning knob has remarked on its silky-smooth feel. I consider it exceptional; it's a sheer joy to use. I also appreciated that the stem controls along the lower apron of the front panel can hide away

when you're done adjusting things. These include settings for DRIVE, COMP, MONI GAIN, VOX GAIN, ANTI VOX, CONTRAST and BRIGHT (for the maximum LCD brightness level).

By and large the whole front panel is user friendly with controls and buttons sensibly grouped, albeit with some exceptions. For example, the SPLIT button on the IC-7700 mysteriously turns up next to the CW PITCH control, not grouped with the other VFO functions as it is on the PRO series transceivers.

I found it was *very* easy to confuse the vertically aligned and similar-looking MW and MP-W buttons when I wanted to enter a frequency into the "memory pad" (or "scratch pad") memory bank. For that, the MP-W button is the one you want. The IC-756PROIII has a superior implementation. Its memory pad buttons not only are side by side but larger and light gray, which further helps further to distinguish them from the other buttons. The '7700's scratch pad memories will retain a user-selectable 5 or 10 frequencies on a last-in, first-out basis.

A feature I yearned for on the IC-7700 was backlighting for all button and dial labels, particularly those that comprise the keypad. The two-color keypad buttons on the PROIII are smaller, but they're also easier to read than the '7700's when selecting bands or directly entering a frequency. Nonetheless, the front panel controls generally are easy to locate, even if they're not all ideally illuminated or highlighted.

On some concentric controls, I found myself wishing the control I used more often was the inner knob. NOTCH is one of my favorite features for doing a little CW filter shaping, but it's on the ring, making it more difficult to grasp, especially with the rack-mounting hardware in place. Offhand, it strikes me that the NOTCH should switch places with DIGI-SEL, which, quite honestly, I didn't find helpful at all. Unless you are operating in the presence of strong out-of-band signals that might degrade receiver performance, the DigiSel feature is not one that most North American operators will need to take advantage of. It *might* come in handy in a multi-transmitter environment, however.

The IC-7700 lets you stack three frequency/mode registers in each VFO, A and B, for a total of six on each band. When you "equalize" the VFOs for any reason, you'll overwrite the last-selected settings in the other VFO's register. You can program each band register to recall one of the four antenna port selections.

Using transmit and receive incremental tuning (XIT and RIT), you can shift either or both by up to 9.999 kHz up or down the band. Some operators, me included, occasionally find it more convenient to use the XIT instead of the SPLIT button for split-frequency operation. That way, pressing RIT lets you listen to your transmit frequency *and* more conveniently tune for a clear spot (it beats holding in the XFC button while trying to tune the main VFO knob, sometimes with the same hand!).

Sshhhhhhh!

Many IC-7700 users have remarked on how quiet the receiver is. Some also feel the IC-7700 has bragging rights over the IC-7800 when it comes to CW reception. My impression was that the receiver is exceptionally quiet, a real plus in digging out the puny signals prevalent at this point in the sunspot cycle.

The IC-7700's filter menu goes a step beyond what's available on the PROIII. On the '7700 you can set up three discrete filter settings and shape (sharp or soft) as well as one of three preset roofing filter settings, 15 kHz, 6 kHz and 3 kHz. A separate filter shape set mode lets you establish default filter shapes for SSB, SSB data and CW on both HF and 50 MHz. For example, if you set the HF SSB (600 Hz –) filter shape to "sharp," that shape automatically applies when the IF filter is set at 600 Hz or wider. Likewise, if you set the HF CW (– 500 Hz) filter shape for "soft," that shape automatically applies when the IF filter is set at 500 Hz or narrower.

The DSP filters work hand in hand with the passband tuning (PBT) control to permit quickly setting just the right degree of filtering to hear the desired signal. Others who have used the IC-7700 came away with the impression that excellent, flexible selectivity is its strongest suit. The very effective noise reduction system also helps. DSP noise reduction on the '7700 is far superior to the implementation on the PROIII. For starters, there's a lot less high-frequency rolloff and overall distortion with the IC-7700's NR system; the audio remains fairly clean throughout. Advancing the NR control much beyond about 10 o'clock will begin to affect the AF output level, however, but that's probably a trade-off most of us can live with. In any event, I never found it necessary to engage extremely aggressive noise reduction.

By the same token, even while wearing headphones I sometimes felt a little starved for AF gain when using the IC-7700, especially at narrower IF bandwidth settings. As a result, I found myself punching P.AMP 1 to get a little more punch. Even at its highest setting the audio never knocked me out of the chair, although a handy menu feature allows independent adjustment of the headphone level.

Whither Dual Watch?

It actually took me a few hours of using the IC-7700 before it dawned on me that it did not have a sub-receiver or Dual Watch capability. *Could this be?* My PROIII has Dual Watch; why wouldn't ICOM include it on this much more expensive model?

That seems to be the question of the day on various Internet discussion sites, and for some potential owners, the lack of Dual Watch is a deal breaker. Dual Watch is handy for capturing the "big picture" — by letting the operator listen to the rare DX and the pileup at the same time, for example. The two receivers of the IC-7800 let you listen to one in each ear, a big plus compared to the Dual Watch's single audio channel. Still, many find the Dual Watch helpful. On the other hand, not everyone needs Dual Watch, and most contesters and DXers can work around it by using handy XFC button or by using RIT and XIT.

Related to this discussion is the fact that the display does not show the frequency of the other VFO, unless the transceiver is in split-frequency mode. Otherwise, you can only see the frequency of the selected VFO plus that of a memory channel.

Doing the Numbers Game

We measured the two-tone third-order IMD dynamic range of the PROIII on 14 MHz at 5 kHz spacing, preamp off, at 77 dB. More recent offerings, including the later IC-7800, Elecraft's new K3 and the FLEX-5000A, have raised the bar for this important receiver parameter considerably. Let's look at the hard numbers from the ARRL Lab.

The two-tone third-order IMD dynamic range of the latest IC-7800 model on 14 MHz at 5 kHz spacing, preamp off, came in at 96 dB, noise limited (see "Product Review," Mar 2007 *QST*). The IC-7700's measurement at the same settings was identical. *But wait! There's more!* The IC-7700's two-tone third-order IMD dynamic range measurement of 95 dB on 14 MHz at *2 kHz* spacing, preamp off, was 9 dB *better* than that of the IC-7800 at the same settings. In both cases, the '7700 measurement was *not* noise limited. Figure 3 shows that the ARRL Lab measured lower levels of close-in composite noise for the IC-7700 compared to the IC-7800. The '7800 does hold a 117 dB to 102 dB advantage in blocking dynamic range on 14 MHz at 2 kHz spacing, preamp off.

On a busy band, it's possible to hear the discrete layers of stations on top of one another. Most times you also can pick out just the signal you want by using the passband tuning and/or APF features. During one operating event, I was able to work two stations of differing signal strength that were almost on the same frequency by using the 200 Hz filter setting coupled with the APF working

in tandem with the NOTCH. It wasn't easy copy on either station, but I *was* able to put the points in the log.

The manual doesn't seem to mention this, but you can disable the DigiSel function and instead use the DIGI-SEL knob to adjust the otherwise-fixed APF. The DIGI-SEL button does nothing in this instance. It strikes me that the adjustable APF should be the default control, not the DigiSel.

Digi-Mania!

The ability to operate RTTY or PSK31 without a computer on the IC-7700 is a huge plus and adds a whole new dimension of fun without using an external computer and software. The IC-7800 offers similar capability. Like the PROIII, the IC-7700 includes a twin-peak audio filter for RTTY.

PSK31 operation using the '7700 differs from the typical soundcard/software method. You must tune signals manually rather than clicking on them on a PC waterfall display and having them spring into place. Using the finest (1 Hz) tuning step eases tuning, but you have to be dead on before the signal starts to decode on the screen. The tiny signal phase indicator is nearly useless when viewed on the radio's display panel, but it's easily visible with an external monitor. A small waterfall display assists in tuning, and it looks pretty much like the one used with popular computer software.

RTTY and PSK memories are separate, so you can tailor one without having to disturb the other. Attempting to toggle between RTTY and PSK could be smoother, however. Pushing the button to switch from RTTY to PSK or vice versa does not automatically display the decoding screen for the new mode. You *also* must exit from the decoding screen that's there and bring up the correct one. The radio does display a text advisory — in red letters — that you have to select the other mode's decoding screen.

The decoded text on the radio's display screen is small, and if your eyesight is at all degraded, you'll have trouble reading it. This is where connecting an external monitor to the port on the back apron really comes in handy. Otherwise, the IC-7700 works just fine for casual PSK31 and RTTY operation. Those who contest seriously in these modes most likely will continue to prefer their favorite software running on a PC instead.

The Written Word

The *Owner's Manual* reflects the IC-7700's status as a high-end radio. This is no paper-cover, center-stapled collection of mangled sentences and typographical errors. The '7700's manual comes in a rugged *four*-ring binder and includes a fairly comprehensive table of contents, a full set of schematics and block diagrams (get out your magnifying glass, though) and detailed user information. Step-by-step instructions range from such activities as how to install the main tuning knob — which arrives *unattached* to the radio to prevent possible shaft or encoder damage during shipping — to programming and editing the various memories and making the multitude of menu selections.

Figure 4 — The rear panel of the IC-7700 includes four antenna connectors, provisions for a separate receive antenna or preamp, and various accessory connections.

The manual is well organized, with sections for basic operation, receive and transmit functions and the transceiver's various features, such as memories, digital voice recorder and automatic antenna tuner. It does lack a comprehensive index, however. On a couple of occasions I could not find sufficient information about a particular feature (Digi-Sel comes to mind), but for the most part this well-designed and written manual tells you nearly anything you need to know about the IC-7700. Updates and an even closer look at some features are available on ICOM's Web site, **www.icomamerica.com**.

The Spoken Word

At the press of the SPEECH button, a virtual female voice announces the current S meter reading and the frequency (out to four decimal places, 100 Hz — for example, "seven point zero two three six megahertz"). Press *and hold* the SPEECH button and the announcement adds the operating mode. Oddly, there's no beep or double beep to distinguish between pressing the button and pressing *and holding* the button, so initially this was confusing.

Our particular model included a choice of English and Japanese. The menu offers "high" and "low" (speed) voice rates plus the ability to turn off the S meter announcement. The speech feature works in transmit and receive.

The digital voice recorder (DVR) is competent. It lets you set up four canned messages of up to 90 seconds each (the remaining time is counted down on the screen) that you can transmit. The user must step through a few menu screens to get to the spot where it's possible to record or play back transmit memories (it's the same for the other modes). You may apply names to DVR/CW/digital memories. It's possible to save both receive memory and transmit memory contents to USB memory.

Unfortunately, the handy VOICE MEMORY REC and PLAY controls on the front panel only let you record audio off the air, if you're so inclined. The radio can record up to 30 seconds of audio (a total of 209 seconds across as many clips as you record). Press the PLAY button to hear the most recently recorded clip. Sorry, but I don't see myself taking advantage of this function and would prefer these controls somewhere other than on the front panel. It is a great feature for shortwave and broadcast band listeners, though.

Audio Tailoring

Like most higher-end transceivers these days, the IC-7700 includes provisions to tweak both receive and transmit audio to suit your personal taste, although I felt the IC-7700's equalizers were a bit rudimentary and limited for a transceiver in this price class. The menu offers two ways to accomplish these tasks.

To equalize your receive audio, the IC-7700 has separate EQ controls — essentially treble and bass controls — for *each* voice mode plus the option of accomplishing the same thing by setting high-pass and low-pass filter (HPF/LPF) limits within a range of 100 to 2900 Hz (a maximum bandwidth of 2.8 kHz). *Only* HPF/LPF limits are available for CW, RTTY and PSK reception. These menu settings let you get the audio timbre just right for whatever mode you're using and can help decipher any really muddy audio you might encounter.

On the transmit side, the menu permits adjusting TX TONE using similar treble and bass controls. There are separate TX TONE

A Contest Operator's Perspective

The hardest part about using an IC-7700 is simply getting it out of the shipping box! It is packed very well, no doubt about it, but get someone to help you carry the box and empty its contents. The rack handles are not attached to the rig from the factory, so you need to get the rig out of the box without them. If you install them first, it will be easier to move the radio to its final resting position. But then you will want to remove them as they do interfere with easy access to frequently used knobs.

The radio is gorgeous in every respect. (Unless, of course, you really can't stand the appearance of modern sleekness with a high-tech flourish and vivid colors wrapped into a shiny black form.) There is just the right amount of space on the front panel between buttons and knobs, especially compared to the '7800. The LEDs on the black, momentary switches are highly useful and can be adjusted via a menu. For fun, and it ended up being useful, I plugged a USB-powered fan/spotlight into the rig's front panel USB port. The light can illuminate your dark keyboard!

On the Air

I didn't have a lot of motivation to get on the air with the IC-7700 as the station is mostly disconnected for summer and I'm just a bit burned out with it all right now. As I hauled the box into the shack, though, I thought of my time with the IC-7800 and how much I enjoyed using it. That little spark was all it took for me to jump in and explore the '7700.

Five minutes later it was on the air. Rick, WW3DE, who wrote the full review, had set up the rig prior to my use, but honestly, it was a snap to get this rig going. I didn't have to consult the manual about anything until using it on RTTY and only then to find what key to punch to toggle between transmit and receive (F12 on the keyboard). The only other item I had to look up involved finding the menu item to set the RIT/XIT CLEAR button to "Quick Clear." Out of the box, it was set to require holding the button for one second to clear.

This radio reminds me of my trusty old Kenwood TS-930S because of its excellent front panel layout. The use of the XFC button to listen to your transmit frequency is exactly like the TF SET button on the TS-930. Without two receivers or a Dual Watch function, the XFC operation is a pretty nice alternative. I do enjoy operating split, but never learned to really like using a Dual Watch function. I like not being able to hear my transmit frequency continuously — nowadays when you are in a large, split-frequency pileup, *everybody* seems to be moving up and down pouncing on the last guy called, so the advantage is gone. You either need to be extremely loud or lucky. Now it is frequently better to rely on the skill of the operator at the other end and plant yourself in the clear — which is easily done without even listening thanks to the great spectrum scope. The scope has great resolution and is entirely useful! I can see a time not far off in the future when an application for broadband CW decoding such as VE3NEA's *CW Skimmer* is built right into a rig like this.

The built-in RTTY operation is simple and effective. Plug in a USB keyboard and you're on the air. The North American QSO Party RTTY was going one weekend, so I jumped in and made some contest contacts. The waterfall display is good enough to line up signals, the keyboard function is perfect, and the memories were easy to set up. I was easily able to run two QSOs a minute while logging by hand — using the memories gave me enough time to write. For a serious effort I'd opt for integrated contest logging and RTTY software on a PC, but the '7700 is perfect for casual RTTY operating.

On 6 meters the IC-7700 easily handled the bone-crushing signals of neighbors. I could operate much more closely to the splatter than I can with other 6 meter gear in my shack. The 6 meter receiver is terrific all around. It's very quiet, and I observed no interference from all the loud New England signals. It was a joy to tune around the band. The big tuning knob added to that joy as it is silky smooth and feels very heavy.

Separating CW and SSB signals is a breeze. Running some small pileups while adjusting the PBT and engaging the APF yielded clean copy immediately without having to adjust the RIT. The auto-tune function works well to zero in on CW signals. The CW pitch control is the best I've used. I am frequently asked about QSK (full break-in) operation on various rigs. The full break-in of the '7700 was flawless and nearly silent.

With the IC-7800, the audio output from the front panel never seemed loud enough for me. The '7700 has plenty of audio with the Heil noise canceling headphones I use. The noise blanker instantly removed the pulse noise from a neighbor's electric fence.

IARU Contest Operation

I made a few hundred QSOs with the rig during the IARU HF World Championship using both CW and phone. Depending on band conditions, I found myself trying the preamps on and off and settled on using preamp 1. There wasn't much of an increase in the noise levels with the preamps on, but loud signals with key clicks were more noticeable.

I really enjoyed working phone. The sampled audio sounds spectacular, and the reports received were equally complimentary. Mic adjustments were easily made, and it was hard to overdo it. The simple amplifier connection to my Ameritron AL-1200 amplifier worked flawlessly. The IC-7700's ability to put out up to 200 W allowed me to easily drive this stingy amp to 1500 W without overtaxing the transceiver.

For me, this radio is just about perfect. Some may balk at the IC-7700's higher than average price, but this beautiful piece of equipment basically has everything you need in one box. If you're like me and try to do some on-air operating every day, the cost per use is easily justified. With this radio in the shack, my poor old TS-930 will get lonely. — *Dave Patton, NN1N, Membership and Volunteer Programs Manager*

settings for SSB, AM and FM. In addition, it's possible to establish wide, mid and narrow SSB transmit bandwidth (TBW) settings for voice equalization, again within the 100 to 2900 Hz limits.

The IC-7700's SSB transmit audio quality is commendable. "Sounds really good" and "Really punches through," were typical reports.

Risky Business?

As with the IC-7800, it's possible to upgrade the IC-7700's firmware. This is accomplished in the IC-7700 either via an Internet connection using the ETHERNET jack on the radio's rear panel or by downloading the new version onto a flash drive, then uploading it to the radio via one of the USB ports on the radio's front panel. This procedure involves a certain amount of risk, however.

A heart-stopping message greets you at

the upgrade menu: "CAUTION," it reads. "Updating the firmware is very risky. If you make a mistake, the IC-7700 may not operate properly, and repair at Icom Inc. (Japan) may be the only way to fix it."

Whoa!

"You undertake the updating of the firmware at your own risk and responsibility," ICOM's ominous message continues. "Please refer to the firmware download homepage and/or the *Owner's Manual* for the correct procedures in updating the firmware."

Part of the correct procedure requires that you let the IC-7700 format your flash drive first. I passed on upgrading the radio's firmware, but judging from the manual, it doesn't appear to be nearly as difficult as the on-screen warning makes it out to be.

ICOM USA noted that the same warning now appears on the IC-7800. Their service staff recommend to those with unreliable power that a computer type UPS be used to power the radio during upgrades. In four years they have not had a report of a single case of this kind of failure.

Kudos

- Some IC-7700 user comments to the Internet singled out the spectrum scope for special praise, and it's difficult to disagree. One called it "a true spectrum analyzer" and "a real piece of test equipment." The spectrum scope does cover a greater range than the one in the PRO series. Press the CENT/FIX key and you can view the landscape of an entire amateur band, with the exception of 10 and 6 meters, where the spectrum scope covers just the first 500 kHz of the band. The spectrum scope on this radio is a truly useful feature, in my opinion.
- The automatic antenna tuner seemed to work quietly, quickly and efficiently. It matched nearly every oddball load it had to confront in my shack. It will recall previously established settings (as preset points within 100 kHz steps). I found "manually" tuning (by pressing and holding the TUNER button, worked nearly as well while moving among various bands and modes, typically getting the job done within 10 to 20 seconds and sometimes much faster. To tune an antenna, the ATU needs at least 8 W on HF and 15 W on 50 MHz.
- The '7700 lets you enable *both* preamps in the LF and MW bands, something not possible with the PRO series.
- The notch works very well to tighten the receive passband as well as to ward off offending extraneous signals. It offers narrow, mid and wide settings.
- The AGC VR is handy to tweak the AGC, although this is not something you'd expect to be doing on the fly in the midst of a contest. It might help in pulling out that very weak — and very rare — DX station.
- The internal speaker fires upward. It sounds just fine although it's vulnerable to being covered up by something placed on top of the radio.
- The AUTO TUNE feature is pretty slick. Press the little button, and the transceiver automatically tunes CW or AM signals with precision.
- The '7700 provides BNC jacks on the rear panel to connect an external preamp or RF filter. A menu setting activates or deactivates this feature, thus eliminating the need for a jumper cable.
- The VSC — voice squelch control — is not something you'll find on most transceivers, although similar implementations exist elsewhere. Enable this and the transceiver avoids unmodulated signals while scanning. This function could have been relegated to a menu setting.

Quibbles

- The operation of the UP and DOWN arrow keys with the frequency memory list displayed was logical but counterintuitive. Pressing the DOWN icon moves the cursor in descending order on the memory list, which, in fact, scrolls the list in an upward direction. Pressing the UP arrow moves the cursor in ascending order on the list, which scrolls visually downward. On the other hand, the UP and DOWN keys work just the opposite with the DVR, CW, RTTY or PSK memories displayed.
- It's not possible to "hold" — or freeze — the mini scope. You can still only do this when the full-sized scope is on the display. There may be occasions when you'd want to be able to freeze the mini scope, however, such as when you've brought up the transmit memories screen.
- The entire digital metering suite must be enabled to see a graphical display-style primary meter. It would be great to have a choice between the *faux* analog meter and a graphical-display readout, which makes it much easier to determine signal peaks.
- The AF control makes a low humming sound as it's rotated while in CW mode and using narrow filter settings (500 Hz or tighter). It does not do this on SSB or with wider filter settings on CW.
- The TIMER button could have easily been omitted from the front panel and relegated to a menu. It brings up a plethora of timer setting choices that would likely be of great advantage to an SWL or BCL, but not to the average radio amateur. There are five timers in all.

So, Who's Buying?

The IC-7700 is a terrific general-purpose transceiver, allowing the user, as it does, to sample all popular modes without having to go outside the box. I was initially astounded to see an Internet posting from an unlicensed SWL who had purchased an IC-7700 merely for listening; after noting the various features only an SWL or BCL might value, I had a better understanding.

The IC-7700's attributes seemed shaped more toward the serious contester and DXer, although the lack of a second receiver — or even Dual Watch — could cause those enthusiasts to cross the IC-7700 off their want lists. On the other hand, if they can afford to adapt a second receiver (or transceiver) into their system, that problem's a non-starter.

So this radio's appeal may be broader than it might appear at first glance, with features to attract and hold the HF or 6 meter generalist *or* specialist and even the occasional SWL/BCL. Likely buyers in any category will be those willing to go the extra few miles to own a genuinely superior piece of radio gear that practically does it all — and one that more than fills the average ham's desires, not to mention ham radio desk.

Manufacturer: ICOM America, 2380 116th Ave NE, Bellevue, WA 98004; tel 800-872-4266; **www.icomamerica.com**. QST

XK2100 Transceiver

[Continued from page 35.]

have features and performance that demonstrate that there is still quite a bit of room for improvement within the amateur transceiver market. Hopefully, equipment designers will take careful notice of these possibilities.

Notes

[1]See "This Just In," Dec 2006 *QST*.

[2]U. Rohde, N1UL (then KA2WEU), "Key Components of Modern Receiver Design," Parts 1-3, *QST*, May-Jul 1994. Also by the same author, "Key Components of Modern Receiver Design: A Second Look," *QST*, Dec 1994, pp 38-41.

[3]**www.marcoisland.org/ka2weu.htm** and **www.saildragonfly.com**.

[4]For complete information, see **www2.rohde-schwarz.com/en/products/secure_communications/product_categories/global_radiocommunications/XK2100L.html**.

Michael Tracy, KC1SX, was first licensed as KA1TZA in 1989, currently holds an Amateur Extra class license and is a Life Member of the ARRL. He is a testing supervisor for Synergy Microwave Corporation in Paterson, New Jersey. He previously worked at ARRL Headquarters for 17 years, with the last 10 years as the ARRL Lab Test Engineer. He can be contacted via e-mail at **kc1sx@arrl.net**, *or at 601 Riverside Ave, Unit 419, Lyndhurst, NJ 07071.* QST

K4GUN on Becoming a Rove Warrior

How I discovered the joys of roving — mobile operating in VHF+ contests — and some lessons and tips from my first roving operation.

Steve Clifford, K4GUN

I keep getting lucky. For years, I thought about ham radio but didn't realize I could get started without first learning code, so I put it off. Finally, I decided to suck it up and learn only to discover that the code requirements were being dropped. (I am now learning CW, but that's another story!)

Six months after getting into Amateur Radio, I was bitten by the contesting bug. Because I enjoy driving and because my house isn't well suited for ham radio, I decided that roving was the way to go. I started investigating and saw the most amazing contraptions I've ever seen! I learned terms like *grid circling*, *brick* and *microwave*. Being obsessive, I was disappointed to think that I could not be competitive as a rover unless I was on 10 bands and coordinated with several other rovers to rack up astronomical scores. That was when I realized two new rover categories were created in time for the 2008 VHF contests! "Limited Rover" had my name written all over it — established just for people like me who are ambitious and competitive, but lack the time, experience and money to run with the Big Dogs.

While preparing for my first rove, I found almost limitless ways to go about it, but a lot of them were well outside my league, both technically and financially. There are many articles to help others fine-tune their skills and stations, but it was difficult to get a first timer's perspective. I figure that there must be others out there who could use a nudge in the right direction so I'm going to describe what I went through in preparing for my first roving adventure.

Vertical Doesn't Stand Up

The very first thing I learned was the vertical antenna you use for repeaters is just about useless in a contest. In the September 2007 ARRL VHF QSO Party my local club, W4IY, set up on its usual mountaintop — Flagpole Knob in West Virginia. When looking at the map, I noticed that four grid squares converged only a couple of miles out of the way. Since I already had a multiband, multimode radio in the truck, I figured I'd operate as a rover while driving up on Sunday.

This wasn't a serious attempt to rove — it was something to do while driving. I told the guys in the club and they told me to expect some serious reduction in performance unless I used a horizontally polarized antenna. It didn't really sink in what "about 20 dB loss" meant. I figured my Diamond SG7900 was a good gain antenna and was well installed and well grounded. How bad could it really be? After all, my HF mobile antenna worked just great and it's a vertical.

Boy, did I ever learn quickly! I managed a whopping 16 contacts in 4 grids over a 2 hour drive each way and each one was a struggle. I could barely hear the other stations, even with the volume at maximum. The only ones

Figure 1 — Effective operation while mobile or portable is made a lot easier if the radios and logging gear are neat and secure. Today's all-band, all-mode radios put out a great signal on 6 meters, 2 meters and 70 cm.

I could hear clearly were right next to me or running the legal limit. The only ones that could hear *me* were Big Guns with preamps. Most of those few QSOs were with the K8GP operation and thank goodness for them!

Even with that handicap, I did have fun and I learned a lot about operating in a contest while mobile and about my radio's neat features such as voice record and playback. I also had a lot of fun looking at maps, plotting a route and formulating a strategy. It was all enough to make me determined to actually compete and do it right.

Picking a Rig

I was living in a townhouse when I got my ticket, so I decided that mobile HF was the only way I was going to be able to make contacts effectively. I did a lot of research and ended up with an ICOM IC-7000 installed in my truck shown in Figure 1. This radio turns out to not only be great for mobile HF, but also gets me on three VHF bands pretty effectively.

You don't have to go all the way to that level. There are several multiband HF rigs that have 6 and 2 meters and some that also have 70 cm. The ICOM IC-706MKIIg and the Yaesu FT-857D also make great mobile radios. The Kenwood TS-2000 and Yaesu FT-897 are a bit larger, but still not impossible to mount as mobile rigs. The ICOM IC-746PRO is nice, does 100 W on 2 meters, but lacks 70 cm.

It may be elementary for most readers, but I'll mention it anyway: You need a radio that will do single sideband (SSB) on the VHF/UHF frequencies. Your dual-band FM rig will not do the trick. There is some FM activity during contests, but very little and it is concentrated in the larger metropolitan areas.

Selecting a Skyhook

Antennas for roving break down into three categories: omnidirectional or "omni," compact beam and large beam. Because this is about getting started, I'll only talk about the omnis and compact beams. The large beams are the same as used at home on a large mast. They are sometimes used by rovers, but limit mobility.

The most common omni is the halo, also known as a hoop, loop, square loop or "squalo." It's made from aluminum tube or rod folded into a loop split in half opposite the feed point. They can be used by themselves or stacked with a phasing line. There are several makers and prices vary from roughly $35 to $75 each. For 2 meters and 70 cm, I purchased antennas from **www.ku4ab.com**. For 6 meters, I used one from **www.kb6kq.com**. [Unfortunately, KB6KQ recently became a Silent Key. His family is looking for someone to take over the antenna business. — *Ed.*]

I selected the **www.elkantennas.com** log periodic for 2 meters and 70 cm. M-Squared, Cushcraft and others make small Yagis, including some that use a single feed line for both bands. All of these antennas have booms shorter than 3 feet. I will not make this a product review but I will say the Elk did prove capable of doing what I needed.

For 6 meters, it is a bit more complicated to get a small antenna with gain and direction. Even the smallest Yagi will be too wide to fit on top of a vehicle unless the antenna has telescoping or quick-attach elements. I decided instead to build a Moxon antenna. In my usual manner, I overbuilt the thing on the first attempt and today it resides in my garage's Hall of Shame. I now use a **www.parelectronics.com** "Stressed Moxon," weighing less than 3 pounds and with very good reviews.

You'll note that I have both beam and omni antennas for all three bands. Because all of them are fairly small and light, this wasn't a big problem. I used switches in the cab to toggle between them. I had a copilot in the truck and he helped operate while we were in motion, which made having the omnis well worth it.

Because of the advantages of gain, nulling and directionality, I did want beam antennas. I didn't, however, want anything complicated to set up. I wanted to be on the air within 5 minutes of arriving at a location and didn't want to spend more time than that to tear down to move. This brings us to the next topic.

Putting Antennas in Their Place

Like everything else in the article, there is not just one way to do this. My solution works for me and it's one I haven't seen before. Like many other trucks, mine has a multipurpose utility rail. A number of accessories work with this rail, including a steel cargo divider that makes for a very easy attachment point for two painter's poles attached with U-bolts. My first attempt to drive like this demonstrated that they were not stiff enough to handle a long trip or high speeds. I then encased the poles in 1.25 inch PVC pipe and bonded them with a foaming sealant. Now they are rigid enough for high speed and long drives.

The halo antennas go on the lower sections of the poles. In the lowered position, the overall height above ground is about 11 feet, which is low enough for all bridges while driving. When I park and raise the poles, as in Figure 2, they are about 19 feet above ground. Because the antennas are light weight, guying isn't needed. I have quick attachments for both beams so I just snap them in and raise them up. To rotate the antennas, I just move

Figure 2 —To raise the antennas in a new location, Steve attaches the beams at the top of the telescoping painter poles and then pushes them up. The loops are always attached. The poles reach 19 feet above the ground when fully extended.

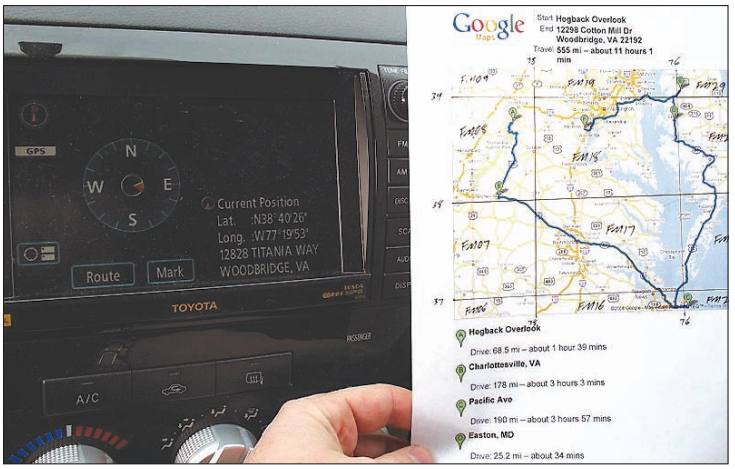


Figure 3 — Half the fun of roving is planning the route and going places you might otherwise never go. Steve used his vehicle's GPS and Internet mapping services to guide him along the way.

What is Roving?

Roving is a contest operation conducted from a vehicle. Those who participate in such an operation are termed "rovers." Essentially, the rover is a self-contained VHF+ station on wheels that is operated in a contest for the purpose of activating two or more grid squares for that contest. There are three classes of rover: Rover, Limited Rover and Unlimited Rover.

Rover class is an operation of no more than two operators that transports all equipment to each site and can operate on all bands and power levels. *Limited Rover* class is the same as *Rover* class except it is limited to only four bands with power outputs of 200 W on 50 MHz and 144 MHz, 100 W on 222 MHz and 432 MHz, and 10 W above 902 MHz. *Unlimited Rover* class allows more than two operators and the station equipment does not have to be transported in the vehicle to each site.

Maidenhead Grid Squares

Grid squares are derived from the *Maidenhead Locator System,* which divides the Earth into squares based on latitude and longitude. A grid square measures 1° latitude by 2° longitude and is approximately 70 × 100 miles in the continental US. A grid square is indicated by two letters and two numbers, as in FN31, the grid square of W1AW. Each grid square is subdivided into subsquares measuring 2.5 minutes latitude by 5 minutes longitude, roughly corresponding to 3 × 4 miles. The subsquare is designated by the addition of two letters after the grid square, as FN31pq for W1AW. More information on grid squares, including a *Grid Square Locator*, can be found at **www.arrl.org/locate/gridinfo.html**.

Want to Give Roving a Try?

There are many VHF+ contests held each year in which you can try your hand at roving. These are listed in *QST*, the *National Contest Journal* and on the ARRL Web site (**www.arrl.org/contests**). So pick a contest, gas the car, grab the rig and start roving! — *Steve Sant Andrea, WB2GYK, QST Assistant Editor*

the truck. Use a map and compass of a GPS to figure out exactly where you're pointed.

Making Your Getaway

This is where I really had a lot of fun. Obviously, you need to know your own tolerance for time in the seat and how much gas you want to use. I just love driving! I found out that two grids about 3 hours away from me are fairly rare. One of those is almost unpopulated. Unfortunately, it's also right at sea level. There are some nice mountains nearby but in a grid that isn't terribly hard to work. I settled on a plan in which I started out in the mountains to boost the number of grids I could count as multipliers and then moved to the rare grids.

I realized that a couple of short detours would cut through three grids that normally would not have been on my way. It only added a few minutes to my trip for these extra multipliers. Another couple of hours could have added two more, but I decided that my time would be better spent in a fixed position with the beams pointing toward population centers.

There are a number of excellent sources online to help you plan a route such as Google Maps, as shown in Figure 3. Look for corners and borders of grid squares where you can duck in to pick up a few QSOs and the multiplier. You want to get a lot of points for yourself, but part of being a rover is helping other stations pick up different grids. There's a balance, and as long as you plan carefully you can make the most of things.

Practice Makes the Master

I'll admit to being a bit obsessive, but I enjoy it. I decided that since I had never done anything like this, I needed to make a trial run. I drove to Virginia Beach and scouted for good parking lots with good visibility. I timed how long it took me to get from one spot to the next. I set up and took down the antennas several times. I made sure all the equipment worked and did what I needed it to do. I found some operating locations that I never expected. I discovered a couple of quirks of my equipment and was generally able to get a good game plan together.

I can't stress enough how much benefit I got from this scouting mission. I made some contacts along the way, including one with a station 275 miles away. The amazing part was, I did this while moving with the 2 meter stacked loops lowered. This QSO demonstrated how well things could go, but also made it clear that I need a preamp on 2 meters. I was able to exchange information, but had to strain to hear him. I later found a used Mirage amplifier with a preamp and used it in the contest.

Lessons Learned

I'm not even sure I can quantify everything learned in that first serious rove. I've almost completely revamped my antenna system since, but not because the simple system didn't work. I've now set up a small tower in the bed of the truck with several beam antennas and a rotator. You don't need to do all of that to get started, not even to be competitive. A small dual-band beam and a 6 meter loop will get you in the game.

Final Thoughts

The new Limited Rover class really opens things up for new operators like me. I can compete with stations using similar bands and power. Being able to look at the scores and compare my results to those of similarly equipped stations tells me where I have room for improvement. If you're new to ham radio or contesting, give the new Limited Rover class a try. Just two bands with horizontally polarized antennas and a good road map will get you started.

Photos by the author.

Steve Clifford, K4GUN, comes from a nontechnical background and is employed in the sales side of the automotive industry. An ARRL member, he was licensed in 2007 as part of an overall emergency preparedness plan with great inspiration from his grandmother, KK6S, and grandfather, KA6JJJ (SK). He can be reached at **k4gun@arrl.net**. QST

The Life and Times of a Master Contester — An Interview with Tim Duffy, K3LR

H. WARD SILVER, NØAX

K3LR at the International DX Convention, Visalia, California.

K3LR is one of the best-known Radiosport contest call signs with a team and a station to match. What has Amateur Radio and contesting taught K3LR? The same things it can bring to you!

H. Ward Silver, NØAX

Every year after the Dayton Hamvention, an e-mail or two will be seen asking, "I saw this incredible station near the Interstate, just over the Ohio-Pennsylvania border! Is that *Voice of America* or something?" In a manner of speaking — it is the station of Tim Duffy, K3LR (**www.k3lr.com**) and the 100+ operators that make up the "K3LR Contest Team." Over the past 20+ years, Tim has spent countless hours building this station and a talented team to maintain and operate it. In the past few years, these efforts have paid off with a string of wins in major DX contests, such as the ARRL DX Phone (five consecutive wins), the results of which were in *QST* last month.

This article is not about how to duplicate what Tim has built — that would take up a whole year's worth of *QST*! Rather, we'll tell Tim's story as a way of talking about how ham radio — and radiosport specifically — enabled him to grow and led to a satisfying career inside and out of Amateur Radio. The lessons he's learned are useful whether you have one radio or a dozen.

Call the Kid!

From his current position as an executive with the largest telecommunications company in the world, it's quite a look back to growing up in western Pennsylvania, oldest of four children. His mother died from cancer five months before he got his Novice license (WN3SZX) in 1972 at age 12. The same year he enjoyed 26 crystal-controlled QSOs from the Novice station in his first Field Day with W8GFG/3, joined traffic nets and, thanks to WA3BGE (now K8MR), experienced CW Sweepstakes. Later in high school, even during basketball practice, he couldn't wait to get home and build something or get on the air.

One of Tim's first "real" jobs came soon after he got his First Class Commercial Radiotelephone license. Recommended by K3ULJ, the owner of a broadcast station hired Tim to be Chief Engineer (CE) of the AM/FM side of the business. Only one week into his new job the FM exciter failed and a call for quick help went out to the young CE — they had to get him out of his sophomore math class to fix the transmitter!

Tim drew on his ham radio troubleshooting experiences and determined that the exciter couldn't be fixed there at the station. In consultation with the manufacturer in Philadelphia, he decided to take the exciter back to the factory. Imagine taking commercial broadcast equipment back to the factory at age 16! And getting it fixed!

This first job turned out pretty well as Tim stayed with it for 4 years. After college and a 2 year stint of teaching, he was then hired by W8EKO, the owner of another broadcast station who was taking a chance on a new technology called "cellular mobile telephones." You may have heard of them. In this small company — not unlike ham radio — everybody did a little of everything. Tim installed "car phones," maintained the three tower cell sites, and the system grew to about 1000 subscribers by the end of 1986. The regional wireless company was eventually bought by Dobson/Cellular One in 1998. By that time, Tim was sufficiently knowledgeable that Dobson retained him as Chief Technology Officer. Dobson was recently purchased by AT&T — you may have heard of them, too — and Tim moved into his current position. Not bad from starting out fixing FM exciters and keeping an AM/FM station on the air during high school!

Management 101

Tim gives a *lot* of credit for his success to ham radio and ham radio contesting, specifically. It's not just the technical expertise the makes the difference; it's the ability to manage technical complexity and a team. For example, he characterizes his early Field Day organizing as "Management 101." All the aspects of running a business are there — hardware, scheduling, logistics, a team. Those early Field Day efforts resulted in category high scores in 1A, 2A and 3A.

"Ham radio opens doors and builds up your personal feeling of worth as an individual. It gives you the opportunity to become technologically literate, just like Scouting does for other fields. Radio contesting adds discipline in that equipment and antennas have to be used and made to work as-is with a firm deadline. You have to be ready at 0000Z when the contest starts — no excuses! You work with different team personalities under stress. Most importantly, you learn

Table 1

K3LR Station Equipment

Transceivers

IC-781, IC-7700 or IC-7800

Amplifiers

Single-band, single-tube 8877 homebrew

Transmit Antennas

160 m: 37-meter insulated base tower with 4 parasitic elements
75/80 m: Two 4-square vertical arrays, rotating dipole at 74 meters
40 m: 4-element stack at 59 and 36 meters, 2-element stack at 57 and 37 meters
20 m: 6-element stack at 71/52/34/15 meters, 6-element stack at 46 and 31 meters
15 m: 7-element stack at 60/37/25/12 meters, 6-element stack at 25 and 12 meters
10 m: 8-element stack at 30/20/10 meters, 7-element stack at 65/25/15 meters

Receive Antennas

160/80/40 share 4 Beverage antennas
160 m: DX Engineering 4-square receive array
160/80 m: low dipoles
20 m: 4-square vertical array
10 m: 4-square vertical array

Filtering

W3NQN transmit/receive filters, W2PV receive filters, harmonic suppression stubs

Computers

Contest software is the latest *Win-Test* version on custom-built Pentium *Windows XP* computers

about decision-making and learning from these decisions. From this, you develop the self-confidence to lead a team and make decisions." Right or wrong, make the best decision possible and move forward.

Building, Running and Keeping a Competitive Multi-Multi Contest Team

Ben Franklin, when asked what kind of government the Constitutional Convention had created, replied, "A republic, if you can keep it!" It's a little like that for a big Multi-Multi contest station. As the complexity grows, it's harder and harder to get all of it working at the same time through the 48 hours of intense operation in hyper-competitive "Monster Station" class.

Tim's first station was a Heath SB-102 kit, earned by mowing lawns and paper routes. It rapidly grew, adding all of the SB-600 series of station accessories. An SB-200 amplifier was added after he upgraded to Extra at age 14, using a slide rule on the FCC exam in Buffalo, New York. He traded WA3SZX for K3LR at age 16. Soon he added his first rotatable antenna, a TA-33jr. The station has since grown a bit as you can see from Table 1, Figure 3 and the photos on Tim's Web site!

Those of us that have been fortunate enough to operate from K3LR always come away impressed by the attention to detail and the level of preparation. Nothing escapes Tim's attention: from the antenna system, to the team of operators, to having a full refrigerator and topped off coffee-making supplies. Every PL-259 at K3LR is hand-soldered by Tim, for example. Every one! There are hundreds of them in service at K3LR. And they never fail, nor do poor connections cause interstation interference.

Tim designs and builds the station with leading-edge, but not breaking-edge, equipment. ICOM is his chosen radio manufacturer, with a collection of IC-7800, IC-7700 and IC-781 transceivers in use at K3LR that are known for their exceptional receivers. The amplifiers for each of the stations are based on the same single-tube 8877 design. The computer network was custom-built by Tim's close friend and Multi-Multi station owner, Dave, W9ZRX. The K3LR station is built so that should something fail, replacement with a nearly identical piece of equipment is straightforward. By using common elements over and over, repairs and maintenance are greatly simplified and reliability improved.

Antenna systems are designed for the station to maximize contacts with the locations necessary to win contests. (The K3LR Web site includes the topography around the station.) Because the K3LR operators need to hear as well as transmit, special receive antennas are available on each band, as well.

With a station of this size, the fall and winter weather take their toll. Before each major contest, a team opens the station and gives it a thorough checkout, including amplifiers and antenna systems. Problems are fixed *before* the operating team begins to show up on Friday afternoon. Tim wants to make sure that the team operators can concentrate on operating, so everything is there ahead of time. Paraphrasing the Great Gretsky, "You lose 100% of the contests in which you can't operate!"

The result of all this painstaking design,

TIM DUFFY, K3LR

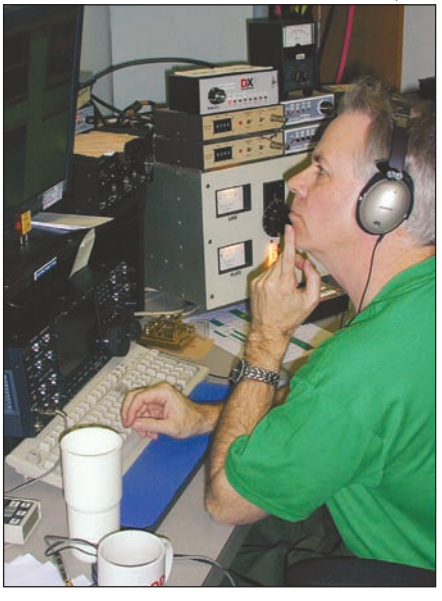


Figure 1 — Station owner K3LR right where he wants to be — 160 meter CW as the gray line sweeps across the planet. "No Place on Earth I'd Rather Be — Right here, Right now" (Jesus Jones 2005)

TIM DUFFY, K3LR

Figure 2 — The station's precise engineering is evident around the base of one of the eight elements that make up the dual K3LR 80 meter phased 4-square vertical arrays.

construction and testing is more than 350,000 QSOs over the past 17 years in Multi-Multi contesting, walls full of certificates, and a lot of #1 USA finishes! Lest you think K3LR is located on prime saltwater beachfront, his location is possibly the most western third district station, only a mile from Ohio in the eighth district! Many told Tim that the team would never be able to win from a "Western PA QTH."

Tim's father always told him that anything is possible. Dream big! It took lots of years and hard work, but in 1998 they won for the first time. Since then 13 K3LR USA #1 scores are "in the books." In 2006, the same year Tim was inducted into the CQ Contest Hall of Fame, the K3LR team had the highest (Phone + CW) total score in the world in the CQ World Wide!

Lessons for Smaller Stations

You might say, "I can't buy all those radios and stuff!" but that's not the point. Tim assembled the K3LR station step by step and team member by team member. To owners of smaller stations, Tim's wise suggestions apply to anyone trying to build the most effective station, whether for contesting or some other facet of ham radio. (Note that on Tim's Web site, the design page includes "HF Emergency Communications Response" right alongside contesting. The K3LR station is on the RACES net every Sunday morning and has helped during several tornados and hurricanes.)

"First, build up as much experience as you can with a smaller station. It will make you a better operator as your station grows or when you operate at a big one. Devour as many contest write-ups and articles as possible in *QST* and on the ARRL Contest Web page (**www.arrl.org/contest**), *National Contest Journal* (**www.ncjweb.com**), *CQ* (**www.cq-amateur-radio.com**), the free *ARRL Contest Update* newsletter (**www.arrl.org/contests/update**), and the 3830 and CQ Contest reflectors at **www.contesting.com**. Use the line scores and searchable databases as motivation and to set goals for your next contest.

"Make 'lists' of what changes you want to make to your station and what needs to be done to get ready for the next contest." Tim's current "list" contains over 40 projects to prepare for CQWW this fall.

"Contact the better operators and take advantage of opportunities to operate at multi-op stations with them. Learn how to call CQ effectively. Get in touch with the 'Big Guns'— they are quite approachable!" Long ago, on a road trip with a friend, Tim visited the famous station of Jim Lawson, W2PV, and got an invitation to operate. He remembers viewing the young operator team of K1AR and N2NT operating at W2PV just as they do today at K3LR! Talk about dreams coming true.

TIM DUFFY, K3LR

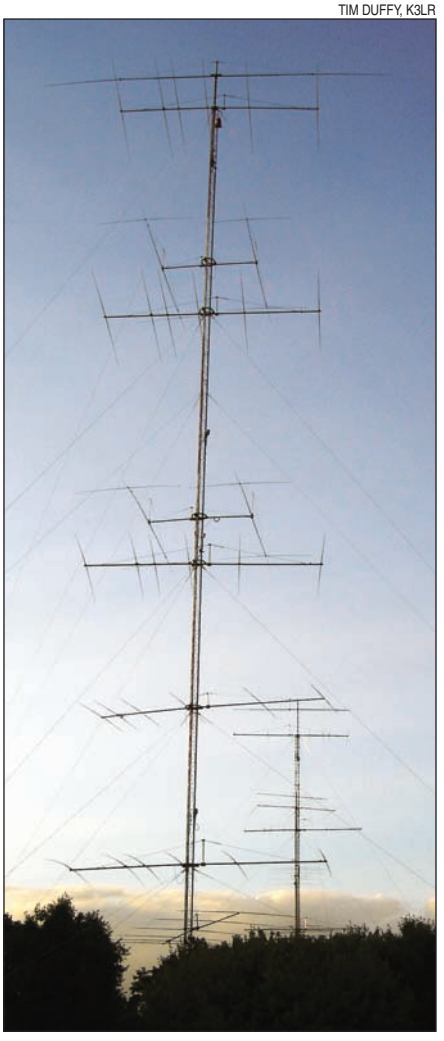


Figure 3 — One of the largest amateur antenna towers in the world, this "stick" holds the 24-element 20 meter WA3FET OWA stack, a pair of 40 meter W6NL Moxon beams, a 14-element 15 meter stack and a rotatable 75/80 meter dipole at the top!

It is vital to have a "vision" of where you want your life and your hobby to take you. Tim has three "vision boards," one each for Family, Career and Amateur Radio. He keeps them in constant view. It works!

"Establish relationships with other contesters, such as by joining a contest club." Tim is a member of three contest clubs and a past President and Charter member of North Coast Contesters. (A list of contest clubs is available at **www.ac6v.com/clubs.htm**.) "Ask questions without fear and ask to look at logs, breakdowns and rate sheets. Find out when they are working all those Europeans on 40 meters! Do they stay up all 48 hours? Look for unexpected scores and efforts, such as W2GD winning Sweepstakes from New Jersey. Most important — be enthusiastic!" Even after 36 years of ham radio, Tim is still one of the most enthusiastic hams you'll ever meet.

"Learn to delegate. It's important to understand what you can and can't control. Keep the important stuff in focus. Have a good time — it helps build a solid team! You never know whether propagation or circumstances such as weather are favorable until after the contest, so keep going even in the face of poor conditions."

Guidelines to Wireless Success

"Do what you love and the rest will follow." Don't forget to "give back;" it's not all Dayton (Tim has moderated the Antenna forum for more than 25 years) and big contests. Participate in local clubs (Tim is a founding member and eight term past President of the Mercer County Amateur Radio Club) and enjoy the other members. Learn to get along with other hams, no matter how they got into the hobby.

"Give-back rewards the hams that helped you and acknowledges those resources. Remember that the license carries responsibility as well as granting access to the public resource of the radio spectrum. Participating in local and community organizations fulfills that responsibility. Join the ARRL to help protect and further Amateur Radio."

"It's *so* important to have ethics for trust and reputation. It's key to maintaining relationships and the long-term friendships. It's cool to have trust in your competition that they are complying with the rules so that it's a contest between the teams and the propagation. Respected long-term contesters figure it out in contesting — the same attributes work in life."

Even as he continues to enhance his station, despite the heavy professional demands of his new position, Tim will keep on giving back, whether it's teaching a small antenna class at the local Field Day operation, running this year's Dayton Hamvention Contest University for more than 200 contesters, or organizing Hamvention Contest Dinner for the 16th straight year.

Ham radio has been very good to Tim and he wants to help others have the same great experiences. "I want my legacy to be one who gave back and enhanced others' enjoyment of the best hobby in the world — like many others who provided me with a lot of opportunities. I want to experience more of ham radio, support more things and show appreciation for the entire hobby — not just contesting."

The results, seen in contest write-ups every year, attest to the value of these guidelines. They are useful for just about any part of Amateur Radio you care to sample!

H. Ward Silver, NØAX, is a QST Contributing Editor. He can be reached at **n0ax@arrl.org**.

CQ CONTEST!
A History of Radiosport

A short history of Amateur Radio contesting through the pages of QST.

Gil McElroy, VE3PKD

It's not uncommon to see letters to the editor in *QST* in which writers complain of the contests that they argue seem to fill the ham bands from wall-to-wall on virtually every weekend. Such letters in fact date back as far as 1922! But it's also not uncommon to see letters to the editor mounting a passionate defense of contesting's "weekend warriors."

Contesting is clearly a hot topic for many hams. But few of us are aware of just how it has been instrumental in the very establishment, preservation and success of Amateur Radio. In fact, without contests, there may very well have been no ham radio today.

Cover of the March 1930 issue of *QST* drawing attention to the International Test, a contest in which stations passed serialized messages to earn points.

QST editorialized in the December 1964 issue that "ARRL contests are the granddaddies of nearly all others," and the two oldest contests still in existence today — the International DX Contest and the Sweepstakes — tell the story of how Amateur Radio survived and thrived.

But it didn't start the way you might think.

Humble Beginnings

The idea of contests associated with Amateur Radio is just a few months younger than the ARRL itself. It appeared first in the pages of *QST* in August 1916 with the announcement of a "QST SUBSCRIPTION CONTEST." Participants vied not to make the most on-air contacts, but rather to sell the most subscriptions to *QST* in the hopes of winning one of a number of prizes offered.

Obviously this isn't what we consider today as "contesting." Yet humble as these origins might be, the subscription contests played a vitally important role in creating what we've come to know as Amateur Radio. Without them, the ARRL might very well not have survived the early challenges it faced and Amateur Radio itself might never have taken root at all.

Three subscription contests in all were held by *QST*, the first in 1916. The idea was straightforward:

"Many of the most promising amateurs are held back for the want of money to buy first class equipment. We have arranged for twenty different pieces of the latest wireless equipment and all of it is to be distributed among those amateurs who are willing to put in a little work for *QST*."[1]

That year, two DeForest Audion Detectors and a pair of Brandes headphones made up the top prizes. It was hard-to-get, quality equipment and just the kind of stuff a ham needed to make his station as up-to-date as possible, or even to get started in the first place. The importance to ham radio of these subscription contests is made clearly evident in the name of the second place winner in the 1920 contest: John Reinartz, K6BJ (ex-1XAM, SK), who would go on to become one of the giants of early Amateur Radio and the winner of the first Hiram Percy Maxim Medal presented by the ARRL in 1964.

But there was also the bigger picture here: the development of Amateur Radio as an institution. Owing to the success of the first contest, and in an effort to "spread the wealth," the second subscription contest in December 1916 was aimed specifically at radio clubs. First prize was a wave meter, an invaluable piece of equipment at a time when few hams had the equipment to determine exactly on what frequency they were operating. Such equipment could make all the difference in the world for many amateurs.

Amateur Radio was shut down the following year when the United States entered World War I. Following the end of hostilities, its reinstatement was very much in doubt as commercial and military interests wanted to eliminate amateur use of the spectrum completely. The institutional strength of the ARRL coupled with the determination of individual amateurs skilled in this new medium of radio saved the day. Three prewar subscription contests that helped create this thing we call Amateur Radio played a real role in ensuring that it happened.

First DX

In the early 1920s, amateur attentions were focused on bridging the Atlantic Ocean and it was a contest that started it all. In late 1920, *Everyday Engineering* magazine ran an ad in *QST* for "Transatlantic Sending Tests" scheduled for February 1921. Prizes

[1]Notes appear on page 56.

were offered for the winning amateurs who succeeded in getting across. Before it could happen, the magazine shut down and the ARRL quickly took over the project just as the first, unsuccessful tests got underway. Better organization prevailed, and only a few months later, in December 1921, we got across. DX became a reality and the spirit of Amateur Radio contesting was born.

"Coming — An International Relay Party," was the article headline in the March 1927 issue of *QST*. "Here you are, OM!" the article continued, "Here's a contest in which every amateur in the whole world can have a part…"

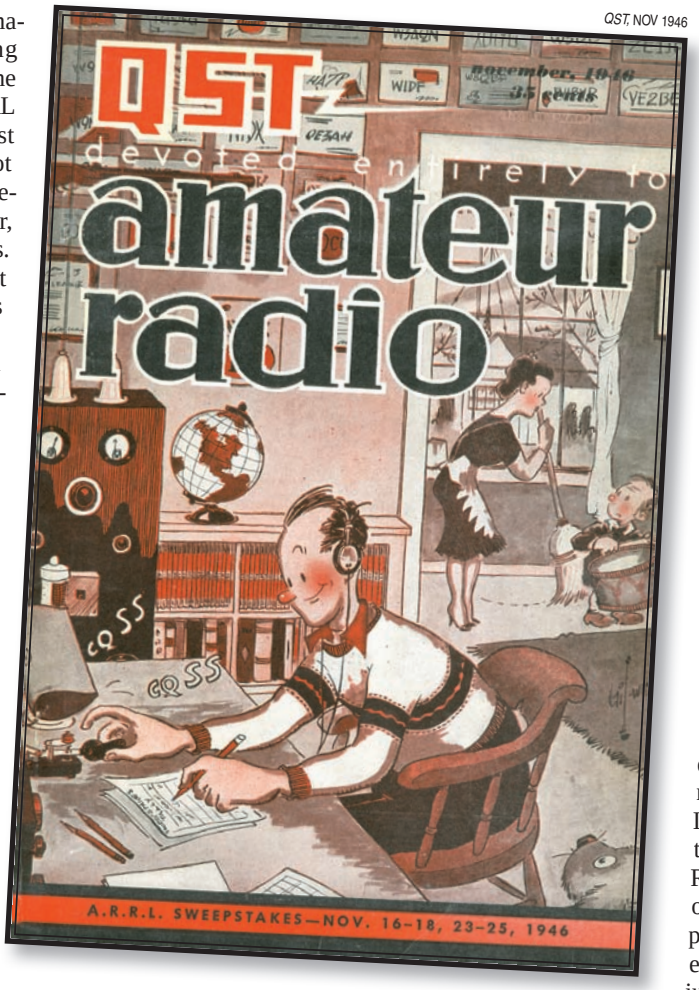
The First International Relay Party, held in February 1928 (over an entire 2 week period with no time limitations!), is considered the first real Amateur Radio contest. And it's still going strong today — we know it now as the ARRL International DX Contest. Beyond the change in name (which occurred in 1936), the rules governing the contest have of course evolved over time. Back in 1928, for example, pre-registration for US and Canadian stations was mandatory and each entrant was provided with a special "test message" and unique serial number to transmit. The rules noted that:

"United States and Canadian amateurs may each send and receive just ONE test message to any one particular station in a given foreign locality….Evidence of more than one test message to any one station from a single U.S. or Canadian station will make a contestant ineligible for either a prize award or honorable mention in *QST*."[2]

Contest scoring was, not surprisingly, low. A single point was awarded for each test message successfully transmitted by a US or Canadian station, another point for reception of an overseas message and two points for a third-party message to a North American station. The August issue of *QST* gave the final results: a first-place score of 305 points! It also noted that every ARRL district had been represented in the contest as among the top 25 stations. Prizes ranged from receivers and transmitters to transformers and tubes — and even a scholarship to a radio school in Boston!

Multipliers

"During the last several months," wrote ARRL Communications Manager F. E. Handy in the December 1929 issue of *QST*, "a number of amateurs have expressed increasing interest in taking part in more message handling contests…"[3]



QST, NOV 1946

And so in addition to the second international DX competition scheduled for February 1930, a brand new contest for January was announced. Advance registration was not required for the All-Section Sweepstakes Contest that would run for a 2 week period beginning in mid-January. Two points would be awarded for each complete QSO, and for the first time, a formula familiar to contesters today — the multiplier — made its appearance.

"Certificates of Performance" were given to the winners in each ARRL Section and the top three high-scorers were each presented with an unusual trophy:

"A sweep-broom, significant of victory, emblazoned with our ARRL emblem, and approximately three feet long has been selected as a basis for our trophies. The League colours, black and gold, are used throughout the design…. [T]hese sweepstakes' insignias are also fashioned of radio materials. A symbolic vacuum tube is firmly affixed to the handles of our three prizes."[4]

The "Clean Sweep" had arrived!

Contesting quickly became an established and popular amateur activity and so new ones proliferated: the Canada-U.S.A. Contact Contest initiated in 1932 (for which an Ontario ham reminded his southerly neighbors that "we don't have snow all year 'round and hunt polar bears in the summer time for amusement"[5]); Field Day in 1933 meant to "test 'portables' wherever they may be available" as F. E. Handy wrote in the June issue that year; the 28 Mc Contest, starting in October of 1934 and which ran for a full year, that was intended get hams building equipment and getting active on this band; the Copying Bee in December of the same year meant to sharpen-up code skills; the 56 Mc International DX Contest in 1936 — and the list goes on.

Strange Tales of DX

Over the years contesting developed its own lore and legend, but perhaps nothing quite matches the story of the 1938 International DX Competition and the experiences of OE3AH, His Royal Highness Archduke Anton of Hapsburg. An Austrian ham and passionate DXer, he was deeply engrossed in the contest that year just as Austria succumbed to the Nazis. As reported in the June 1938 issue of *QST*:

"OE3AH had worked right on through to almost the end of the contest, apparently oblivious to the historic events occurring around him….A week after the contest ended a London Exchange Telegraph dispatch from Budapest reported that he had been imprisoned in an Austrian Nazi concentration camp."[6]

There were claims that his amateur station had been mistaken for a clandestine radio station at his castle home. According to the report in *QST*, about a month after his arrest and imprisonment he was released to house arrest.

Despite all the adversity, *QST* reported that in late April the Archduke's contest log was successfully submitted to the ARRL. But the remarkable story doesn't end there, for *QST* recalled:

"The log submitted for the 1937 battle… lingers in our memories as the most unique supplied by any station. Carefully hand-lettered in elaborate tabulation, with illuminated initials and headings, it merited a special award of its own."[7]

The entry of the United States into World War II in 1941 shut ham radio down for the duration (though in 1943 Argentina re-opened its 5 meter band, which was of

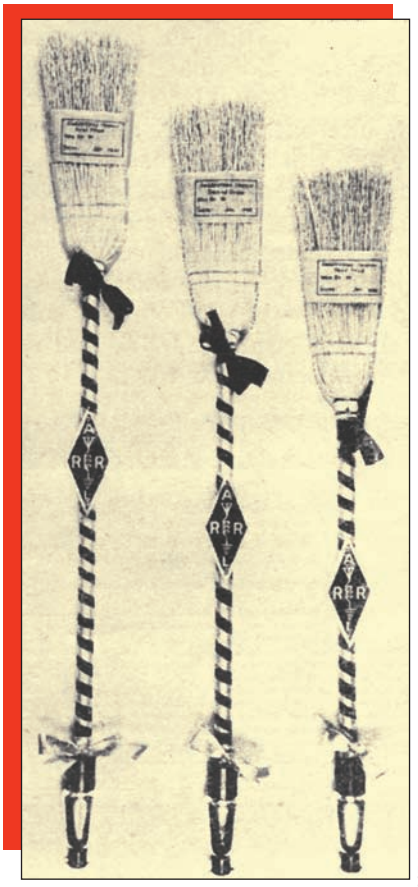
course immediately put to use for a contest!). But as soon as the bands reopened, the ARRL wasted no time in getting contesting up and running again, starting with the "ARRL Band-Warming Party" in the winter of 1946 and the "ARRL Get-Acquainted Party" in the fall of the same year intended to acquaint pre-war hams with those new to Amateur Radio. The Sweepstakes was back in November of that year and by January 1947 *QST* was announcing the "ARRL's 13th International DX Competition."

Contesting was back — bigger and better than ever.

Other contests would come along — the Novice Round-up begun in 1951, for instance, that aided new hams in developing the proficiency and on-air skills that would help them in moving up the licensing ladder of the period. And there have been significant changes in many of the rules (*QST* editorialized in December 1964 that the plan to reduce the Sweepstakes operating period to one weekend instead of two meant that the ARRL could "expect a flood of comments… arriving at HQ either endorsing or damning the changes…"). But contesting had been firmly established as an amateur way of life.

Along the way, it just happened to help save Amateur Radio from oblivion, fostered the development of technical proficiency, promoted international friendship and goodwill and developed hams into highly skilled emergency communicators.

Not bad for a bunch of "weekend warriors."



The top three scoring stations in the first Sweepstakes took home a sweep-broom trophy.

Notes

[1]*QST*, Aug 1916, p 228.
[2]F. E. Handy, "Announcement of Another International Test," *QST*, Dec 1927, p 33.
[3]F. E. Handy, "Coming — Operating Activities," *QST*, Dec 1929, p 37.
[4]F. E. Handy, "Trophies and Certificates for the January and February Contests," *QST*, Jan 1930, p 16.
[5]"Canada-U.S.A. Contact Contest," *QST*, Jan 1932, p 34.
[6]"Hamdom, *QST*, Jun 1938, p 25.
[7]"Hamdom, *QST*, Jun 1938, p 26.

Though his interest in Amateur Radio goes back to his childhood encounter with his father's Zenith Trans-Oceanic shortwave receiver, Gil McElroy, VE3PKD, was first licensed in 1991 at the age of 35. An art gallery curator and writer who has contributed many articles for QST, he has a keen interest in Amateur Radio history. An ARRL member, Gil an active CW operator and rarely touches a microphone, preferring his bug and straight key. He lives in a small village on the north shore of Lake Ontario and can be contacted via e-mail at **ve3pkd@arrl.net**, *or at PO Box 7, Colborne, ON K0K 1S0, Canada.* QST

In The September/October 2008 Issue:

- Mark Spencer, WA8SME, describes a VLF receiver system that automatically logs received signal data so we can learn about some propagation conditions such as sudden ionospheric disturbances during solar cycle 24 in "SID: Study Cycle 24, Don't Just Use It."
- Phil Anderson, WØXI, gives us a detailed analysis of crystal set receiver circuitry in "A Great Teacher: The Crystal Set."
- Bertrand Zauhar, VE2ZAZ, brings us another great project that goes well beyond a simple battery charger with his "Rechargeable Battery Cycler."
- Jim Kocsis, WA9PYH, presents "Press-n-Peel Circuit Boards," a simple, reliable way to make your own circuit boards using Techniks, Inc Press-n-Peel Blue etch-resist material.
- Henry J. Rech offers some thoughts about "Receiver Performance Measurement and Front End Selectivity."
- Frank Witt, AI1H, describes "Optimum Lossy Broadband Matching Networks for Resonant Antennas," in this reprint of an April 1990 *RF Design* article.

QEX is edited by Larry Wolfgang, WR1B, (**lwolfgang@arrl.org**) and is published bimonthly. The subscription rate (6 issues) for ARRL members in the US is $24. For First Class US delivery, it's $37; in Canada and internationally by airmail it's $31. Nonmembers add $12 to these rates. Subscribe to *QEX* today at **www.arrl.org/qex**.

Would you like to write for *QEX*? It pays $50/printed page. Get more information and an *Author's Guide* at: **www.arrl.org/qex/#aguide**. If you prefer postal mail, send a business-size self-addressed, stamped envelope to *QEX* Author's Guide, c/o Maty Weinberg, ARRL, 225 Main St, Newington, CT 06111-1494.

Strays

LETTERS, LETTERS, WE GET LETTERS

...but a few more would be fine.

Something bugging you? Something (or someone) about whom you have some nice things to say? Have an opinion about something you've read in *QST*? As long as it's in good taste, isn't more than 300 words and isn't a personal attack on a person or entity, we're happy to consider your letter to the editor for publication. Send your letter via e-mail to **qst@arrl.org** (subject line: Letter to the Editor) or via the Postal Service to Letter to the Editor, *QST*, 225 Main St, Newington, CT 06111.

I would like to get in touch with...

◊ someone who can wind single and multilayer coils for a Theremin project. — *Craig Kendrick Sellen, 164 South Main St, Carbondale, PA 18407-2655;* **kendricksellen@hotmail.com**

◊ anyone who may have a QSL card (1960s and '70s) from a friend's mother and father, who are now Silent Keys: Harold (W9LIV and later W9CD) and Mildred (W9OIU) McMaster. — *Tim McDonough, N9PUZ, 127 S Oaklane Rd, Springfield, IL 62712, tel 217-523-8625;* **n9puz@gmail.com**

ARRL Board of Directors Plans for League's Future at Second 2008 Meeting

In its July meeting, the ARRL Board of Directors set a course for 2009 and beyond.

S. Khrystyne Keane, K1SFA
ARRL News Editor

The ARRL Board of Directors held its second meeting of 2008 July 18-19 in Windsor, Connecticut, with Directors, Vice Directors and ARRL Board officers in attendance. Radio Amateurs of Canada President David Goodwin, VO1AU/VE3AAQ, was a guest of the Board. The Board considered many items, including organizational issues and Field Organization matters, as well as regulatory and operating topics.

ARRL President Joel Harrison, W5ZN, and Radio Amateurs of Canada President Dave Goodwin, VO1AU/VE3AAQ. Goodwin attended the meeting as a guest of the Board.

Organizational Issues

The Board voted to follow a timeline to review and revise the ARRL Strategic Plan. The Board directed Chief Executive Officer David Sumner, K1ZZ, to release the Plan's long-range goals to the membership and to solicit comments from members "on the future direction and priorities of their national organization." For more information, see the September 2008 issue of *QST* ["It Seems to Us," page 9].

Member input will be presented to the Board at its meeting in January 2009. At the following Board meeting in July 2009, the Board will review the Plan and will select the initial strategies to be implemented in 2010. The current Strategic Plan was adopted by the Board in October 2006.

The Board also decided to hold the 2009 ARRL National Convention at the Dayton Hamvention®. Carl Rose, K8CPR, chair of the Dayton Hamvention Committee, extended an invitation to the League to hold the convention at Dayton May 15-17, 2009. The last ARRL National Convention was in 2007 at the Huntsville Hamfest.

The Board directed Sumner, who also serves as Secretary to the Board, to cast the ARRL's ballot in favor of the nominations for IARU President and Vice President. Current IARU Vice President Tim Ellam, VE6SH, was nominated in June to be the next IARU President, succeeding Larry Price, W4RA. Price had previously announced he was not available to serve another term. IARU Region 1 Chairman Ole Garpestad, LA2RR, was nominated to serve as Vice President. Both men, if elected, will serve five year terms beginning on May 9, 2009.

ARRL First Vice President Kay Craigie, N3KN, and Southwestern Division Vice Director Marty Woll, N6VI, watch the Fathom Web site presentation Friday morning.

Lisa Kustosik, KA1UFZ, ARRL Meeting Planner and Assistant to the Chief Executive Officer, prepares materials for the Board Meeting outside the meeting room in Windsor, Connecticut.

Summary of Major Board Actions

The *Minutes* of the 2008 Second Meeting of the Board, Moved and Seconded, are published only on the ARRLWeb at **www.arrl.org/announce/board-0807**. If you are an ARRL member and do not have Internet access, you may request a written copy of the *Minutes* by writing: ARRL Secretary, 225 Main St, Newington, CT 06111.

Minute	*Purpose*	*Action*
Organizational		
24	IARU Elections *Instructed Secretary to cast "aye" votes in the upcoming IARU elections.*	To Secretary
29	ARRL Strategic Plan *Membership to be solicited and input considered at 2009 Annual Meeting in order to review and revise Strategic Plan.*	To CEO
30	Strategy Selection for Operational Plan *Recommendations of Executive Committee to be included in 2009 Operational Plan.*	Approved
31	ARRL 2009 National Convention *ARRL will hold its 2009 National Convention at the Dayton Hamvention.*	Approved
Field Organization		
26	Section Manager Terms *Extend terms of Section Managers from two to three years.*	Defeated
27	Section Manager Election Cycle *All Section Manager elections to be in the fall with terms beginning on January 1.*	Defeated
28	Official Observers to File Online Reports *OOs will be able to file their reports directly with the ARRL online.*	Approved
33	ARRL to Study Section Manager Surveys *Membership and Volunteer Programs Department to review results of three surveys of Section Managers.*	To MVP
Operating		
23	Triple Play Award *Earning this award will require working all states on voice, CW and digital modes.*	Approved
Regulatory		
32	Ad Hoc Committee to Study Part 97 Rules *Committee to review rules pertaining to wideband digital modes while minimizing potential interference to narrowband modes.*	To President
Award and Recognitions		
17	*2008 Hiram Percy Maxim Award* to Jim Fagan, KE7IDC *Mr Fagan is an active and involved young amateur and Scout who exemplifies the character acknowledged in conferring this award.*	Conveyed
18	*2007 Doug DeMaw, W1FB Technical Excellence Award* to John Stanley, K4ERO *Mr Stanley wrote "Observing Selective Fading in Real Time with* Dream *Software" for the January/February 2007 issue of* QEX.	Conveyed
19	*2008 Herb S. Brier Instructor of the Year Award* to Doug Loughmiller, W5BL *Mr Loughmiller has demonstrated his commitment to teaching Amateur Radio both in and out of the classroom.*	Conveyed
20	*2008 Technical Innovation Award* to Dave Bernstein, AA6YQ *Mr Bernstein wrote and published* DXLab *and put it in the public domain for free use and collaborations.*	Conveyed
21	*2008 Phillip J. McGan Memorial Silver Antenna Award* to Walter Palmer, W4ALT *Through conventional media outlets, Mr Palmer has brought public awareness of Amateur Radio to the people of Delaware.*	Conveyed
22	*ARRL Technical Merit Award* to Ed Hare, W1RFI *Mr Hare has been the voice of Amateur Radio to the BPL industry; through his efforts, BPL systems have reduced their interference potential to manageable levels.*	Conveyed
Other Items		
34	ARRL to Partner with VanityHQ *ARRL to join with Vanity HQ to provide electronically searchable Silent Key data.*	Approved

Summary prepared by S. Khrystyne Keane, K1SFA

The ARRL has chosen Hartford-based Fathom — a Web Development company — to redesign the ARRL Web site. Fathom President Brent Robertson, KB1PYY, presented the vision of the new Web site — designed with hours of input from ARRL staff — to the Board.

Field Organization

The Board acted on a report by the League's Programs and Services Committee (PSC), chaired by Midwest Division Director Bruce Frahm, KØBJ. The committee conducted a Section Governance Study and survey that found that there is a need for a Section Manager candidate nomination packet that is more in line with what those aspiring to be Director or Vice Director are sent. The purpose of the packet is to ensure that Section Manager candidates are fully informed as to the responsibilities of the position and the resources available. It will include a statement for Section Manager candidates to sign, attesting not only to their willingness to serve, but to serve ethically and uphold the objectives of the ARRL.

The Board directed the Membership and Volunteer Programs Department to review the surveys of Section Managers conducted by the PSC. The review will identify beneficial and practical modifications to the Section Manager Workbook, Section Manager training seminars, the Section Manager-only Web site and Field Organization processes.

The Board defeated a motion for Section Manager terms to be extended to three years, with the term starting on January 1 of the year following an autumn nomination and election cycle. Currently, Section Managers serve two year terms with election cycles ongoing throughout the year.

With regard to the Official Observer (OO) program, the Board directed ARRL HQ staff to implement an online method for Official Observers to file OO reports that could then be delivered from ARRL headquarters on behalf of the OO; currently, OOs forward their reports to their Section Manager and Official Observer Coordinators, who then file the reports with the League.

Operating Issues

The Board voted to create a Triple Play Award. This new award, set to begin by January 2009, will be given to those amateurs who achieve Worked All States (WAS) on voice, CW and digital modes. All 150 QSLs must be exclusively via Logbook of The World (LoTW). Only those contacts made after the award's start date will be eligible.

The Board also acted on another PSC recommendation, voting to eliminate Rule 5 from Section III of the DXCC Rules. The Committee realized that while publishing log data can have a detrimental effect on operating awards, it was not possible to control such

After a long absence, Hiram Percy Maxim's, W1AW, original straight key was returned by the Antique Wireless Association to ARRL Headquarters. The key was formally presented to the Board at its July meeting.

New England Division Vice Director Mike Raisbeck, K1TWF (left), and Delta Division Director Henry Leggette, WD4Q (right), confer with New England Division Director Tom Frenaye, K1KI, during a short recess Friday morning. ARRL Chief Financial Officer Barry Shelley, N1VXY, is in the background.

actions and the rule cannot be enforced. As part of an effort to maintain the integrity of operating awards programs, the Board called on staff to create resources and guidelines for QSLing and for QSL managers. These guidelines will help people who QSL to understand the "best practices" and help to support the work of the QSL manager so that access to log data won't degrade Amateur Radio's long tradition of the honor system.

Regulatory Matters

The Board voted to establish an ad hoc study committee to review Part 97 of the rules governing the Amateur Radio Service to ascertain what rule change(s) would be beneficial to promote wideband digital modes, while at the same time minimizing potential interference to narrowband modes.

Other Items

The Board decided to partner with the VanityHQ Web site (**www.vanityhq.com**) to get the ARRL Silent Key data that has been published in *QST* included in the VanityHQ Web site history project in an electronically searchable format.

The complete Minutes of the 2008 Second Meeting of the ARRL Board of Directors are available at **www.arrl.org/announce/board-0807**. Committee reports are also available online at **www.arrl.org/announce/reports-2008/july**.The next meeting of the ARRL Board of Directors is scheduled for January 16-17, 2009.

All photos by the author. QST

ARRL Board Names Award Recipients for 2007-2008

S. Khrystyne Keane, K1SFA
ARRL News Editor

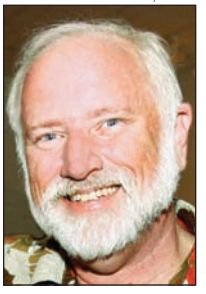
The ARRL Board of Directors named six ARRL award recipients at its July 18-19 meeting in Windsor, Connecticut. The six awards conferred were the 2008 Philip J. McGan Memorial Silver Antenna Award; the 2007 Herb S. Brier Instructor of the Year Award; the 2007 Hiram Percy Maxim Award; the 2007 Doug DeMaw, W1FB, Technical Excellence Award; the 2008 ARRL Technical Innovation Award, and the ARRL Technical Merit Award.

The Philip J. McGan Memorial Silver Antenna Award

The recipient of the 2008 McGan Award is Walter Palmer, W4ALT, of Lewes, Delaware. Palmer, the ARRL Delaware Section Public Information Coordinator (PIC), has demonstrated outstanding volunteer public relations success on behalf of Amateur Radio at both the local and state levels. Palmer wrote a television script for the Sussex County (Delaware) Emergency Operations Center, providing the public with an awareness of Amateur Radio and its relationship with Emergency Preparedness. This show was broadcast on the largest television station in the Delaware market. Through his positive messages and commitment to Amateur Radio, membership in the Sussex Amateur Radio Association increased almost 200 percent, gaining 69 new members; participation in ARES® grew from just one lone member to 60.

The McGan award is named for Philip J. McGan, WA2MBQ (SK), the first chairman of the ARRL's Public Relations Committee. After his death, friends in the New Hampshire Amateur Radio Association joined with the ARRL Board of Directors to pay a lasting tribute to the important contributions he made on behalf of Amateur Radio. The McGan Award goes to that ham who has demonstrated success in Amateur Radio public relations and best exemplifies the volunteer spirit of Phil McGan. Public Relations activities for which the McGan Award is presented include efforts specifically directed at bringing Amateur Radio to the public's attention (and most often the media's) in a positive light. This may include traditional methods, such as news releases, or non-traditional methods, such as hosting a radio show or being an active public speaker.

COURTESY WALTER PALMER, W4ALT



Walter Palmer, W4ALT

Herb S. Brier Instructor of the Year Award

The recipient of the 2007 Herb S. Brier Instructor of the Year Award is Doug

Loughmiller, W5BL, of McKinney, Texas. Since 2003, Loughmiller has worked to bring together the Fannin County Amateur Radio Club and the Fannin County Community Emergency Response Team (CERT) by creating and teaching ongoing Amateur Radio classes. Loughmiller advertises the classes and recruits students; graduates of the classes usually end up joining both clubs. He mentors his many students about the wide-ranging facets of Amateur Radio, including high altitude balloon flights and real-world emergency response in the aftermath of Hurricanes Katrina and Rita. Loughmiller's classes are so popular, it is common for licensed amateurs to re-enroll or even take his class for a first time knowing they will walk away from it having learned something new.

COURTESY DOUG LOUGHMILLER, W5BL

Doug Loughmiller, W5BL

Herb S. Brier, W9AD, long-time *CQ* Novice Editor, represented the spirit of effective, caring Amateur Radio instruction. The ARRL, in conjunction with the Lake County (Indiana) Amateur Radio Club, sponsors this award in his memory to recognize the very best in volunteer Amateur Radio instruction and recruitment.

The Hiram Percy Maxim Award

The recipient of the 2007 Hiram Percy Maxim Award is Jim Fagan, KE7IDC, of Tucson, Arizona. Fagan, an ARRL Life Member, is the ARRL Arizona Assistant Section Manager for Youth; he also serves as secretary/treasurer of the Tucson Repeater Association. He is 13 years old. Fagan teaches the Radio and Electronics merit badges, as well as hands-on radio demonstrations and kit building in his Scouting activities. Outside of Boy Scouts, Fagan helps out with bike races, walkathons and Red Cross drills. He serves as the Tucson Repeater Council's representative to the Arizona Radio Council. Every month, he writes a Youth and Scouting article for the ARRL Arizona Section newsletter.

TOM FAGAN, K7DF

Jim Fagan, KE7IDC

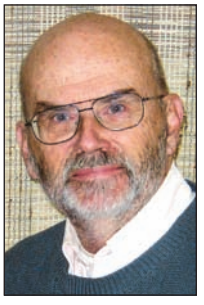
This award, given annually to a licensed radio amateur under the age of 21, takes into account the nominee's most exemplary nature of accomplishments and contributions to both the community of Amateur Radio and the local community.

The Doug DeMaw, W1FB, Technical Excellence Award

The recipient of the 2007 Doug DeMaw, W1FB, Technical Excellence Award is John Stanley, K4ERO, of Rising Fawn, Georgia, for his article "Observing Selective Fading in Real Time with *Dream* Software" published in the January/February 2007 issue of *QEX*. Stanley was first licensed as KN4ERO more than 50 years ago, gradually working his way up to Amateur Extra class. He graduated from the Massachusetts Institute of Technology with a degree in electrical engineering in 1962 and did six years of graduate studies in theology and foreign languages.

With Ruth, WB4LUA, his wife of 40 years, Stanley has visited 62 countries and operated from about a dozen of them while working as a broadcast engineering consultant and educator. He has taught in several universities and has worked for all of the major religious broadcasters, but spent the majority of his time with HCJB in Quito, Ecuador where he oversaw the use of a 24-element quad antenna for broadcasting on the 21 MHz shortwave broadcast band. While at HCJB, Stanley designed and built several transmitters and did major work on the 20 kW unit presently used by HCJB for SSB and Digital Radio Mondiale (DRM) broadcasts.

COURTESY JOHN STANLEY, K4ERO



John Stanley, K4ERO

Established in 1975 as the ARRL Technical Excellence Award, the name was changed in 1997 to honor the late Doug DeMaw, W1FB, a former ARRL Headquarters technical editor and well-known Amateur Radio author. The award consists of an engraved 9 inch pewter cup.

The ARRL Technical Innovation Award

The recipient of the 2008 ARRL Technical Innovation Award is Dave Bernstein, AA6YQ, of Wayland, Massachusetts. Bernstein authored and published the *DXLab* (**www.dxlab.com**) suite of programs for radio amateurs; he has placed these programs in the public domain for free use and collaboration. Bernstein, an avid DXer, was one of the earliest logging program authors to investigate functions for ARRL's Logbook of The World (LoTW), as well as programs for other developers. His *DXLab* suite consists of eight programs that cover every aspect of station operation. Bernstein goes beyond simply supporting *DXLab*; he mentors users in other aspects of programming and Amateur Radio.

COURTESY DAVE BERNSTEIN, AA6YQ

Dave Bernstein, AA6YQ

The ARRL Technical Innovation Award is granted annually to the licensed radio amateur or to individuals who are licensed radio amateurs whose accomplishments and contributions are of the most exemplary nature within the framework of technical research, development and application of new ideas and future systems in the context of Amateur Radio activities.

ARRL Technical Merit Award

The ARRL Technical Merit Award, last given in 1976, is awarded to ARRL Laboratory Manager Ed Hare, W1RFI. Since 2003, Hare has diligently and skillfully led the ARRL laboratory staff in studying the detrimental effects of Broadband over Powerline (BPL) usage on the Amateur Radio community. Going beyond the dictates of his job, Hare conducted field studies of geographically dispersed BPL deployments in his personal HF-equipped car, interfacing with amateurs in many different areas of the country to provide them with reliable and objective technical advice in identifying and addressing harmful interference from BPL systems.

S. KHRYSTYNE KEANE, K1SFA

Ed Hare, W1RFI

Hare's extensive technical studies and solid factual data effectively supported ARRL's Court of Appeals submissions against the FCC, thus contributing substantially to the League's success in causing the FCC's flawed BPL rules to be remanded to the FCC. This action positively impacts ARRL membership and the whole amateur community.

Hare has earned the respect of technical representatives in the BPL industry and standards organizations, such as the IEEE P1775 BPL EMC Committee; the IEEE EMC Society Standards Development Committee (serving as Chairman of the BPL Study Project), and the ASC 63 EMC Committee (serving as Chairman of Subcommittee 5 — Immunity and the Ad hoc BPL Working Group). Through these committees, Hare has contributed to the implementation of advancements in BPL technology, directly resulting in the capability of current generation BPL systems to reduce interference potential to manageable levels. QST

ARRL Brokers New 70 cm PAVE PAWS Coordination Agreement for New England

In the next step of developing a long-term procedure to mitigate interference to the Air Force PAVE PAWS radar site at Cape Cod Air Force Station in Massachusetts, the ARRL has brokered a deal that will allow new coordinations to be considered by the New England Spectrum Management Council (NESMC) on the 70 cm band.

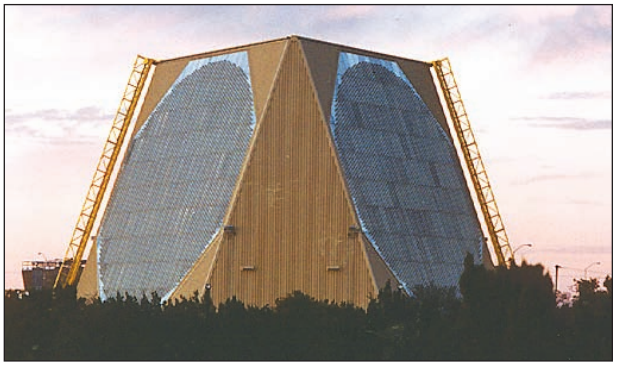
ARRL Regulatory Information Manager Dan Henderson, N1ND, has been engaged in discussions with Lou Harris, N1UEC, of NESMC; USAF Colonel Chris Gentry, commander of the Cape Cod PAVE PAWS Radar installation, and Dave Pooley of Air Force Space Command Headquarters, to craft additional procedures that would allow NESMC to consider new or modified 70 cm repeater applications.

"The plan being put into place will allow NESMC to resume 70 cm coordination while putting into place some checks and procedures which will allow the Air Force to be notified when a new repeater is going on the air within the area around the radar sites," Henderson said. "NESMC continues as the frequency coordinator for amateur repeaters, which is their role."

The ARRL will work with NESMC on Longley-Rice modeling to obtain an estimated signal strength at the radar of the new repeater. Once this occurs, Henderson said the ARRL will "then make a recommendation — based on our knowledge of current repeater signals — if the proposed repeater should be at or near limits that that should allow it to operate without interference to the radar." For more information on Longley Rice modeling, see **www.softwright.com/faq/engineering/prop_longley_rice.html**.

Henderson added that this is not an exact science: "Some levels of degradation of the radar receiver levels are only detectable by precise testing. The unit of the Air Force that provides that testing only visits the Cape Cod site about once a year. It is possible that a repeater that had been in operation for a while under the new procedures would have to address an interference issue when that future testing is performed."

Calling it "fortunate" to have Harris, Pooley and Skinner involved in the process, Henderson said, that if successful, "The procedures being put into place can serve as a model for addressing the same issues in other situations which might arise, such as the mitigation project around the PAVE PAWS site at Beale Air Force Base in California."



Part of the new agreement includes the ARRL serving as the point of contact for the Air Force if new interference is detected. "The ARRL is providing a mechanism whereby future interference issues can be immediately addressed and hopefully resolved," said Henderson. "It makes sense to have a 'first step' whereby an amateur is given the opportunity to address concerns before a more formal FCC interaction would have to be considered by the Air Force. This plan hopefully provides that step."

The agreement does not inject the ARRL into a formal role in repeater coordinations; the role of the League in the coordination process will be simply to provide the NESMC coordinator with an assessment of the proposed repeater's signal strength, as well as potential for interference at the radar site. "While we do not have the specific receiver sensitivity requirements, Air Force officials have indicated our previous calculations for repeaters already involved are 'in the ball park,'" Henderson stated. "We should be able to provide NESMC with a relatively informed assessment for any new repeater, but the final decision on whether to coordinate a repeater remains in the hands of NESMC."

AMATEUR RADIO STATION AT SMITHSONIAN GOES QRT

After more than 32 years on the air from the nation's capital, the Amateur Radio station at the Smithsonian Institution's National Museum of American History, NN3SI, became silent on July 31. Originally located in the Nation of Nations exhibit, the station first went on-the-air in 1976 in celebration of the US Bicentennial. The FCC caught the patriotic spirit, giving the station a temporary call sign — NN3SI — standing for Nation of Nations, Smithsonian Institution. The Commission later made the call sign allocation permanent.

According to Hal Wallace, NN3SI Station Manager and Associate Curator for the Museum's electricity collections, there will be no appropriate place to house the station once the Museum reopens this fall after undergoing an extensive renovation. "NN3SI ceased operating from the National Museum of American History on July 31," Wallace told the ARRL. "As you may know, NMAH has been undergoing a renovation of the building's infrastructure and interior for some time. The renovation forced us to remove the Information Age exhibition — the station's home since 1990. We placed the station in a temporary location for the duration of the renovation but it cannot remain there when we reopen to the public later this year. The Information Age exhibit will not be reinstalled, and since we have no other appropriate exhibition areas within the Museum, the station had to cease operations at

S. Khrystyne Keane, K1SFA ♦ ARRL News Editor ♦ k1sfa@arrl.org

FCC News

♦ **FCC Issues *Citation* to Georgia Company for Selling, Importing Unauthorized RF Devices**: On July 21, the Federal Communications Commission issued a *Citation* to the owner of a Georgia company for selling unauthorized radio frequency devices (specifically wireless video transmitters) and importing radio frequency devices without filing the proper FCC forms with the US Customs office and the US Border Patrol.

The FCC found that Vladimir "Vova" Reznik, owner of RangeVideo, was "marketing in the United States unauthorized radio frequency devices, specifically, wireless video transmitters." The Commission sent Reznik a *Letter of Inquiry* (*LOI*) regarding this and noting the following specific items he had for sale on the RangeVideo Web site: 900 MHz 100 mW audio/video transmitters; 900 MHz 500 mW audio/video transmitters; 1.3 GHz 300 mW audio/video transmitters; 2.4 GHz 200 mW audio/video transmitters; 2.4 GHz 500 mW audio/video transmitters; 2.4 GHz 1000 mW audio/video transmitters, and 2.4 GHz 1000 mW cased audio/video transmitters.

According to the FCC, the 900 MHz devices are capable of operation on 980 MHz, 1010 MHz and 1040 MHz; the 1.3 GHz device is capable of operating on 1240 MHz, 1320 MHz and 1360 MHz, and the 2.4 GHz devices are capable of operating on 2490 MHz. "Thus, these transmitter devices cannot comply with the FCC's technical standards and therefore cannot be certified or marketed," the *Citation* reads.

The FCC also noted that Reznik stated that before he ships a transmitter device, he "switch[es] it to operate only in the Amateur Radio Service ('ARS') bands. While radio transmitting equipment that transmits solely on ARS frequencies is not subject to the equipment authorization requirement prior to manufacture or marketing, it appears that the seven transmitter devices marketed on your website are equipped with external toggle switches on the unit, which if engaged would allow operation of the device on the restricted frequencies."

The FCC warned Reznik that if he violates the Communications Act or the Commission's Rules "in any manner described herein" after receipt of the *Citation*, "the Commission may impose monetary forfeitures not to exceed $11,000 for each such violation or each day of a continuing violation." Reznik was given 30 days to reply to the Citation, either through a personal interview at the FCC's Atlanta Field Office or via a written statement. Through the *Citation*, Reznik was told that his response "should specify the actions that you are taking to ensure that you do not violate the Commission's Rules governing the marketing of radio frequency equipment in the future."

NATIONAL MUSEUM of American History
KENNETH E. BEHRING CENTER

NMAH. Various alternate locations throughout the Smithsonian have been considered but none are viable at this time."

NN3SI has been situated in several different exhibitions in the Museum; it was most recently housed in the former Information Age exhibit. This exhibit chronicled the birth and growth of the electronic information age — from Samuel Morse's invention of a practical telegraph in the 1830s through the development of the telephone, radio, television and computer. The Museum has been closed since 2006 while undergoing a major renovation and is scheduled to reopen to the public this fall.

The station participated in many special events throughout its history. During the dedication of the World War II Memorial on the National Mall, station operators made many contacts and taught children visiting the Museum how to spell their names in Morse code. Over the years, operators at NN3SI — who hailed from the District of Columbia, Maryland and Virginia (and the occasional guest operators from various parts of the globe) — have logged contacts with amateurs in all parts of the world and with astronauts and cosmonauts in orbit. By operating the station, NN3SI ops promoted Amateur Radio as a national resource for emergency communications, trained operators, technicians and engineers — as well as an outstanding hobby — to the more than 4 million people who visit the Museum each year.

Wallace said that the station's license is valid until 2013 and its equipment will go into storage: "John Johnston, W3BE — NN3SI's trustee — assures me that a renewal of the license would not be an issue if we need one. Should a suitable exhibition area elsewhere in the [Smithsonian] Institution be found, we will be able to reactivate the NN3SI activity."

W1HQ NOTES ICOM DONATIONS

In July, ARRL Contest Branch Manager Sean Kutzko, KX9X, presented ICOM's Amateur and Receiver Products Division Manager Ray Novak, N9JA, and ICOM Sales Representative Pat Marcy, W7PZ, with a plaque, thanking ICOM for its support of ARRL stations W1AW and W1HQ throughout the years. ICOM recently donated an IC-756PROIII and an IC-746PRO to W1HQ, the ARRL's Laird Campbell Memorial HQ Operators Club station.

Kutzko, who serves as President of W1HQ, said it was "a real treat to get W1HQ operational again as a thriving club station. ICOM has been an enormous help in getting the W1HQ back on the air. With the addition of the 756PROIII, we are able to take our DXing and contesting pursuits to the next level at the club. The 746PRO has also been a valuable addition; we are now on the air on 6 and 2 meter SSB and CW."

S. KHRYSTYNE KEANE, K1SFA

ARRL Contest Branch Manager and President of W1HQ Sean Kutzko, KX9X (right), presents ICOM's Amateur and Receiver Products Division Manager Ray Novak, N9JA (left), and ICOM Sales Representative Pat Marcy, W7PZ, with a plaque, thanking ICOM for its support of ARRL stations W1AW and W1HQ.

Kutzko said he is proud that several newly licensed employees at ARRL HQ have also had the opportunity to operate VHF+: "This has allowed some of our Technician licensees to go from working amateurs on the local repeater system to working stations in Spain, Portugal and the Canary Islands on 6 meters. I am grateful to ICOM for opening those doors for us and continuing the education — and recreation — of our employee amateurs."

FORMER HQ STAFF MEMBER GLENN P. SWANSON, KB1GW (SK)

RICK LINDQUIST, WW3DE

Glenn P. Swanson, KB1GW (SK)

Former ARRL Headquarters staffer Glenn P. Swanson, KB1GW, of North Granby, Connecticut, died August 1 after a brief illness. He was 54. In the mid-1990s, Swanson was very active in contesting activities and served a term as Yankee Clipper Contest Club (YCCC) Connecticut Area Manager and was a contributor to the YCCC newsletter. Swanson was extremely interested in new Amateur Radio equipment and products — especially transceivers — and authored several *QST* product reviews.

First licensed in 1987 as a Novice, Swanson credited Peter Budnik, KB1HY W2HD who became a fellow ARRL staffer W2HD for getting him involved in Amateur Radio. Swanson told then-*QST* Product Review Editor Rick Lindquist, WW3DE (ex-N1RL) in 1996 that "Peter was my best friend, and he was really into CB. I became involved, too. Later, when Peter decided to take an Amateur Radio licensing class, it was natural that I'd go along with my buddy and take the class, too!" Swanson said he and Budnik "climbed the licensing ladder together," from Novice to General. "And here we are years later, both Advanced class and both working at ARRL HQ — in the same department."

Swanson first came to the ARRL in January 1993 as the Assistant to Bart Jahnke, , KB9NM, then-ARRL VEC Manager. Two years later, Swanson moved to the former Educational Activities Department (EAD) — later merged with Field Services — for several years. In his role in EAD, Swanson was involved with the Shuttle Amateur Radio Experiment (SAREX, the predecessor to the Amateur Radio on the International Space Station [ARISS]), scouting's Jamboree on the Air (JOTA) and the ARRL Instructor of the Year Award.

"Glenn was an enthusiastic ARRL staff member and Amateur Radio operator," said Lindquist. "He would even stay after hours to assist me in the product review process, and he made me feel at home when I first arrived at ARRL HQ. In addition, he got me involved with YCCC and serious contesting. Glenn was a great guy." Swanson wrote more than a dozen articles and product reviews for *QST* between 1995 and 1997.

Former EAD Manager Rosalie White, K1STO, his former supervisor, said, "I always liked Glenn and was happy to have him in the department. His death was such a shock!"

Swanson left ARRL HQ in 1998, going to work for the West Hartford (Connecticut) public school system as a technology support specialist. He was employed there at the time of his death.

In Brief

● **Georgia Hams Meet with FEMA**: On July 30, representatives from the ARRL Southeastern Division and Georgia Section participated in the FEMA Region IV, Regional Emergency Communications Coordination (RECC) Working Group meetings near Atlanta. Southeastern Division Director Greg Sarratt, W4OZK; Georgia Section Manager Susan Swiderski, AF4FO, and Georgia Section Official Observer Coordinator Michael Swiderski, K4HBI, represented ARRL and Amateur Radio. In the meetings, Sarratt talked about ARRL, ARES®, Amateur Radio and their value to FEMA, while Susan Swiderski gave a talk on MARS. "We are proud to be a part of FEMA's RECC," Sarratt said. "This will help to enhance FEMA and ARRL's working partnership. It is very beneficial to meet any of the communications leadership of FEMA and other agencies in the region. These meetings, coordination and learning about each other are critical elements before the disaster strikes. I was also very happy to meet several Amateur Radio operators attending the meeting in their professional capacity."

COURTESY OF GREG SARRATT, W4OZK

From left to right: ARRL Georgia Section OOC Michael Swiderski, K4HBI; Georgia Section Manager Susan Swiderski, AF4FO; ARRL Southeastern Division Director Greg Sarratt, W4OZK, with local FEMA employee Will Perkins, W1ZRV.

SECTION MANAGER NOMINATION NOTICE

To all ARRL members in the Arizona, Arkansas, Iowa, Kentucky, Mississippi, Montana, North Texas, Orange and Wyoming Sections: You are hereby solicited for nominating petitions pursuant to an election for Section Manager (SM). Incumbents are listed on page 16 of this issue.

To be valid, a petition must contain the signatures of five or more full ARRL members residing in the Section concerned. Photocopied signatures are not acceptable. No petition is valid without at least five signatures, and it is advisable to have a few more than five signatures on each petition. Petition forms (FSD-129) are available on request from ARRL Headquarters but are not required. A sample nomination form is available on the ARRL Web site, **www.arrl.org/FandES/field/org/smterms.html#sample**.

We suggest the following format:

(Place and Date)

Membership and Volunteer Programs Manager, ARRL
225 Main St
Newington, CT 06111

We, the undersigned full members of the _____ ARRL Section of the _____ Division, hereby nominate _____ as candidate for Section Manager of this section for the next two-year term of office.

(Signature___ Call Sign____ City___ ZIP__)

Any candidate for the office of Section Manager must be a resident of the Section, an Amateur Radio licensee of Technician class or higher and a full member of the League for a continuous term of at least two years immediately preceding receipt of a nominating petition. Petitions must be received at Headquarters by 4 PM Eastern Time on December 5, 2008. If more than one member is nominated in a single Section, ballots will be mailed from Headquarters on or before January 2, 2009, to full members of record as of December 5, 2008, which is the closing date for nominations. Returns will be counted February 24, 2009. Section Managers elected as a result of the above procedure will take office April 1, 2009.

If only one petition is received from a Section, that nominee shall be declared elected without opposition for a two-year term beginning April 1, 2009. If no petitions are received from a Section by the specified closing date, such Section will be resolicited in the April 2009 *QST*. A Section Manager elected through resolicitation will serve a term of 18 months. Vacancies in any Section Manager's office between elections are filled by the Membership and Volunteer Programs Manager. — *David Patton, NN1N, Membership and Volunteer Programs Manager* QST

Mapping the Incident — The Baldwin County ARES® Location Finder

Hal Reid, K6DPL
halreid@cox.net

When I became the Emergency Coordinator for Baldwin County, Georgia, the first thing I needed to know was who we supported and what we supported them with. I found that our one client (at that time) was the local American Red Cross. While we could provide emergency communications for significant disasters — floods, tornados, etc — the primary incidents that they responded to (their priorities), were local house fires, which are not a typical Amateur Radio Emergency Service (ARES®) function. It seemed logical that support shouldn't stop at communications.

One of the responses to a house fire is damage assessment, which is also true for ARES, and I thought that it would help to know the nature of the structure involved prior to damage. It would also be handy to have directions to the structure when responding. The answer to these issues was a *Google Maps* type solution. In ARES, however, we have to be oriented toward handling emergencies when the Internet and commercial power is not available, plus, a solution needs to be portable. Further, we needed to be able to use data from local governments, such as points, parcels, streets and, where available, current aerial imagery so the maps would be up to date. The American Red Cross support concept is simple. Type in an address, ask for directions — (to and from), see the resulting map and data, print them out and then take them with you to the incident.

In addition to our local American Red Cross support, we have a relationship with the next county (Putnam). They have a communication van and are involved in search and rescue using dogs. They could use access to digital maps and imagery as well.

> ***In ARES, however, we have to be oriented toward handling emergencies when the Internet and commercial power is not available, plus, a solution needs to be portable.***

I was able to obtain some software donated by ESRI[1] and my son, Hal, KB1LWG, wrote an interface that focused the maps on Baldwin County. The software comes with a national dataset and imagery and it allows for adding local data in common formats. It also includes a database of 18 million businesses in the US, adding to its potential for local fire incident support. The application is Web or local network based using a Web browser. It is now running on the local network at our American Red Cross chapter and you can even try it yourself at **http://routemap.esri.com:8080/baldwincounty**. Remember, this is still a work in progress, so it is not yet perfect. This link contains the national dataset so you should be able to locate your home town or address by typing it in the address box — include the ZIP code. The initial interface is shown in Figure 1 (the map/aerial slider shifts the view from map to imagery). Figure 2 shows a typical route for traveling to the incident.

[1]The donated software is called *RouteMAP IMS* and comes from ESRI, the world's largest mapping software company. **www.esri.com/software/routemapims/index.html**

A Real ARES Application

Well, how would this work for an actual emergency that involved ARES? Our October Simulated Emergency Test (SET) exercise involved a hypothetical tornado damaging part of the local power plant and the highway connecting Putnam and Baldwin counties. The Putnam County Dog Search and Rescue (SAR) teams needed a map and imagery of the areas they were to search in. Figure 3 shows a general map of the area around the affected power plant and highway. Figure 4 shows a combination Aerial/Map view of the same area. Figure 5 is a tactical view of simulated highway damage and Figure 6 shows a view of the dog SAR team's search area.

Next Steps

There are several other things I would like to do with this application.

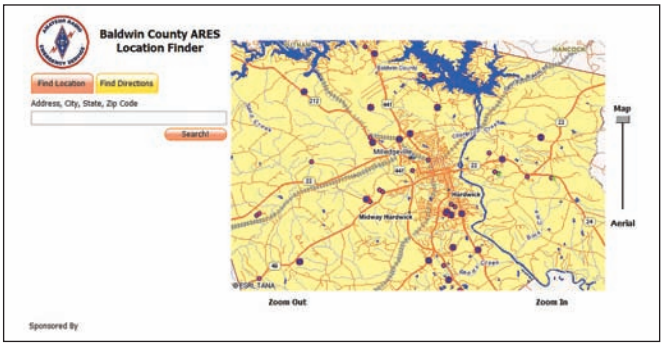


Figure 1 — The red, blue and green dots on the map are local data of commercial antennas, cell towers and water towers.

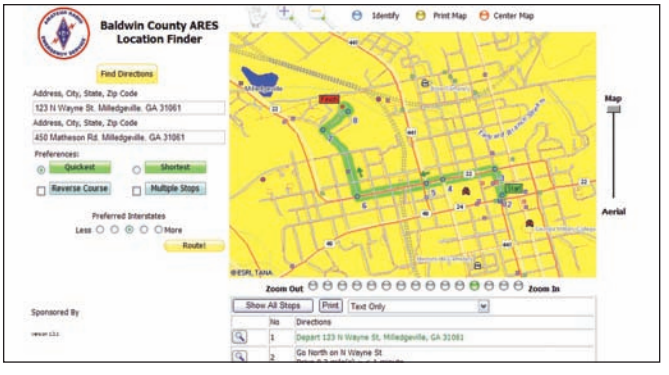


Figure 2 — A view of the routing interface.

Steve Ewald, WV1X ♦ Public Service Specialist ♦ sewald@arrl.org

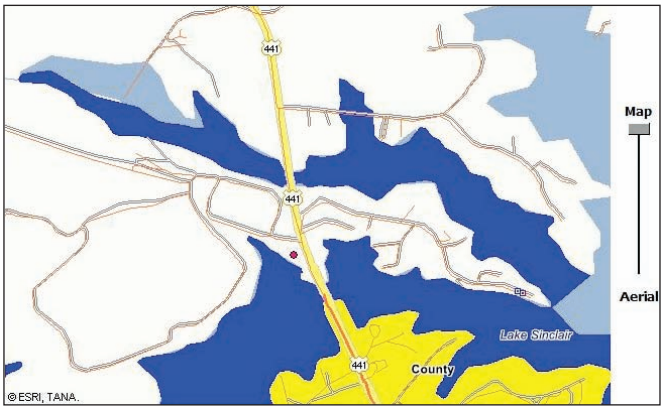


Figure 3 — Baldwin County is in yellow at the bottom of the map and the small red dot is the power plant. The highway just below the red dot is damaged by the hypothetical tornado.

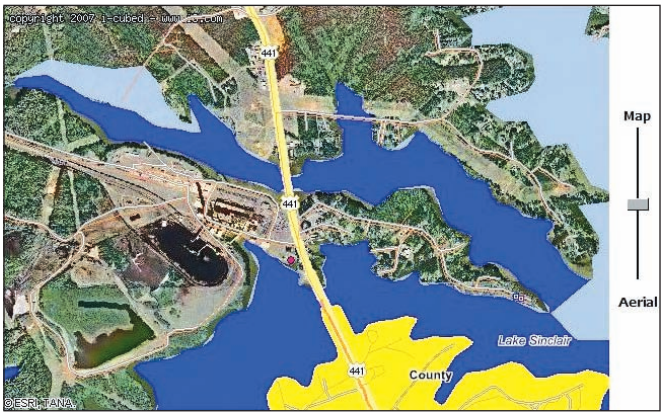


Figure 4 — When the original map is set up the colors can be changed to emphasize target areas. In this image Baldwin County has been colored yellow.

Figure 5 — In this screen shot you can see the red circle where the hypothetical highway damage occurred.

Figure 6 — For the Dog SAR teams, their search area was just to the right of our power plant, on the small peninsula. Of course, this Map/Aerial can be zoomed in/out and panned to the appropriate area and then printed out.

First, the City of Milledgeville (the county seat), has a wireless initiative, which is to be put in place during the summer of 2008. I would like to get a hard Internet protocol (IP) address on that system so it can be accessible on a local server, in addition to the one that runs within the local American Red Cross. If this application is part of the community, the incentive to use current local data is higher. To that end, for their wireless initiative vendors, I have made available the water tower, cell tower and commercial antenna data files.

Second, this could be a natural application for the display of Automatic Position Reporting System (APRS) data. It would give us a platform for distributed APRS viewing of where the SAR units are located, current mobile outstation locations, etc. Our local ARES group is working on a digipeater for APRS and a new location (larger, more flexible) for our net control station. Both of these will provide the ability to add mapping to the total of ARES support. The display of APRS data will require a little code to automate the addition and updating of APRS data.

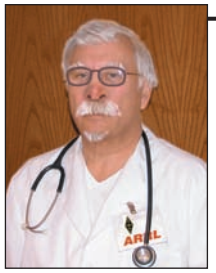
Third, the Georgia Department of Homeland Security has put an HF/VHF station in the local hospital, which will be part of the Georgia Hospital net and part of our ARES support. Since the software allows for outputting maps and/or images in *jpg* format, potentially we could move situation maps to the hospital or the local Emergency Operations Center (EOC) via VHF packet.

Remember, this is a portable application. All that is needed is a server (which can be a laptop) and a local network. It can also run stand-alone on just a laptop. The program will also serve up multiple maps of disparate geographies at the same time. This way it can be useful to entities with different geographical interests. For example, Putnam County could have a base map centered on their county.

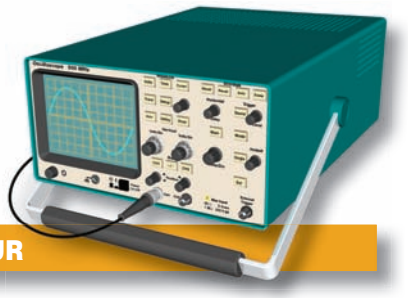
So as we expose this system to more people, the potential for additional applications increases. If you have any other ideas of how this might be useful to your ARES group, I would certainly be glad to hear them.

Graphics courtesy of Hal Reid, K6DPL.

QST



The Doctor is IN



PROJECTS AND INFORMATION FOR THE ACTIVE AMATEUR

Q Don, W8WOJ, asks: Although I am not a frequent user of 2 meters yet, I do want to be available for emergency activity. I have a 2 meter handheld transceiver at the ready, but wonder what the preferred procedure is to ensure that my transceiver's nickel-cadmium (NiCd) batteries are charged and ready for service?

A Unfortunately, NiCds might not be the choice for such an application with intermittent use. If you run down a NiCd battery pack too low, any strong cells may reverse charge the weaker cells, damaging the weak cells. On the other hand, they also don't like being constantly topped off without actual hard use — this promotes crystal formation which can short out the cells.

They are most happy in applications in which they are used until they discharge significantly, but not all the way and then are just charged until fully recharged. Thus, the idea of having a spare pack that is just kept charged up, but never actually used, is not a good plan.

If you have two packs, they will both last longer if one is used until it runs down and then you switch to the other and promptly recharge the depleted one. Perhaps have the radio turned on a few days a week monitoring the local repeater.

Many handheld radios offer battery cases for non-rechargeable Alkaline cells that can be used in place of the rechargeable battery. These are a good choice since they have long shelf life, generally have a longer operating life than a charge with similar sized NiCds, and are usable in field situations in which charging sources are not available.

Another choice, if you must have a rechargeable battery, is to use sealed lead acid or gel cell batteries — they love to be kept on a float charge until needed, but are bulky and require a separate cable to the handheld.

Q Chris, WØBKR, asks: Antenna advertisements sometimes express gain figures in dBi, sometimes in dBd. Which is most meaningful and what is the relationship between them?

A Decibels define a power ratio, meaningful only if compared to something.

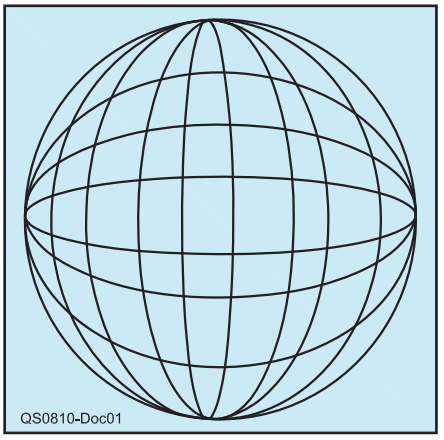


Figure 1 — Spherical radiation pattern of ideal isotropic antenna in free space.

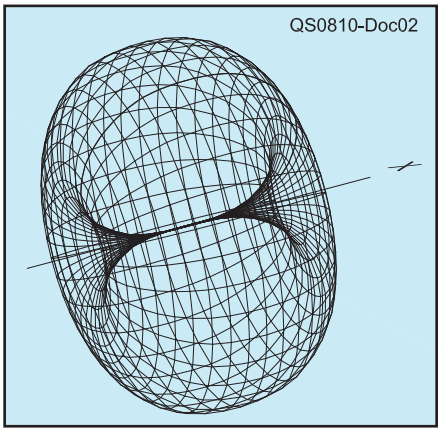


Figure 2 — Radiation pattern of ideal dipole antenna in free space.

Keep in mind that antennas don't have a gain in the same sense that amplifiers do. Rather, antenna gain is an indication of redistribution of the available power. If we have a stronger signal in one direction, it means we have a weaker signal somewhere else — sometimes beneficial, sometimes not.

If the power were distributed uniformly in all directions in free space (picture the flame from a candle, see Figure 1), we would say that we have an isotropic source. Such a source is not possible to make in a real world, but it can be useful as a point of comparison. Continuing in the same vein, let's say with some kind of reflector we could make all the power going downward add to the power going upward so that we have a pattern that is uniform over a hemisphere, instead of a sphere. The power on that side would be twice as high as before, although the power in the bottom would be zero. Thus we have achieved a gain of 3 dB in the upward direction compared to the spherical pattern of the isotropic antenna. This we would call a gain of 3 dBi, the *i* meaning an isotropic reference.

In free space, a dipole antenna radiates more power in its preferred direction because there is a null along the wire axis as shown in Figure 2. The signal in its maximum direction has a gain of 2.14 dB compared to an isotropic antenna, or 2.14 dBi. A dipole's gain compared to a dipole, of course, is a factor of 1.0. Thus, the same dipole with a gain of 2.14 dBi also has a gain of 0 dBd. Any antenna's gain can be expressed equally validly in either terms. Some manufacturers prefer to use dBi because the numbers are bigger (would you rather have an 8 ounce or a ½ pound steak?).

Q Ed, N3SDO, asks: I've recently upgraded to General, and have been enjoying recent *QST* articles on HF antennas for beginners. I'm currently using a version of the antenna from the July 2008 issue, a tuner and ladder line fed 80 meter dipole. I'm experiencing some RFI issues in the house from what I suspect is feed-line radiation from my ladder line. I am using the built-in balun in the tuner, but suspect that my asymmetrical installation is more than it can handle.

A An imbalance between the sides of a balanced feed line system will result in two effects that could cause RF in the shack. The first is radiation. The line acts like a transmission line rather than an antenna only if the two currents are equal and opposite. Any difference current will act like an end-fed single wire antenna driven by the difference current going along the same path. Since the unbalanced current wants to complete a circuit somewhere, it will try to find a path to ground. This will result in a current going through your equipment to get

to ground somewhere.

In my experience, the second factor is usually the cause of the RF in shack problems, although the former may have RF safety issues, as with other indoor antennas. This is not likely to be a problem at power levels of 100 W and below, but is something to consider. If you are having trouble throughout the house, such as getting into phones, or other devices, it may be radiation. There are a couple of likely solutions:

- Take a look at your antenna configuration and see if you can achieve better balance. This is a good idea even if you do other things as well.
- Transition to coax outside your house (or outside the shack) with a multiple turn coax "choke" (perhaps 6 to 8 turns of coax 6 inches in diameter) after the connection to the window line. You will incur some additional loss in the coax, but if it is good quality low loss coax and can be kept short, it probably will not be much to lose.[1] The optimum configuration is to have a solid ground connection to the coax shield just after the choke (on the radio side of the coil).
- If you reduce the impedance of your radio ground connection, the ground current may stay the same, but the voltage on the radio will be reduced, reducing or eliminating the problem symptoms. MFJ makes an "artificial ground" that can be tuned to reduce the voltage on your equipment. You can also have the same effect if you can lay insulated λ/4 wave "radials" out along the floor from your radio ground terminal. You will likely need one for each band that has problems. The far end needs to be insulated. The open at the far end will translate to a low impedance at the radio.

Q Richard, KC7KJB, asks: In my reading of articles in *QST*, I often see a reference to sound cards in personal computers. What is the function of a sound card? I have a speaker connected to my computer, but have never heard anything from it. How can I tell if it's working?

A Richard, in general, sound card refers to a function that formerly was provided by a special plug-in card inserted in the backplane of a PC. A popular brand was the Creative Labs Soundblaster series, for example.

The sound card function can take digitally stored (or received) audio signal files from your computer, music is very popular, and convert the digital files to analog audio signals and play them on your computer speakers. Going the other way, an audio signal plugged into the MIC or LINE-IN jack will be converted to a digital file that can be stored on disk or sent over the Internet.

In recent years the functionality has been included on the motherboard of most PCs. The capabilities have expanded, and now almost any kind of analog to digital processing and digital to analog operation can be accomplished by them. There have been a number of recent *QST* technical articles about test equipment that used the sound function as an interface to the PC for processing and display. For an excellent review of capabilities, see the May 2007 *QST* product review, available on the members Web site at **www.arrl.org/members-only/prodrev/pdf/pr0705.pdf**.

In order to hear sounds from your speakers, the sound functions must be installed, activated and not muted. The specifics about how to do that are very much dependent on the particular PC, sound card, and even more the computer operating system (OS). If you let us know what kind of PC, and especially what OS (*Windows XT, Vista, MAC OS-10*, etc) we might be able to offer you some suggestions on how to do it. If you have an Internet connection, click on the Web page of a local NPR radio station and click on something such as "Listen now" and see what happens.

Q Fred, WA2VJLI, asks: I have a multiband λ/4 vertical antenna mounted on my garage roof with two radials cut at λ/4 for each band. If I increase the 40 meter radials by two or more, will it improve my receiving capability? Will it improve my received signal to noise ratio on that band?

A Adding two additional radials to your vertical will provide a slight improvement in both received and transmitted signal strength in the direction of the radials. For example if your current radials are 180° apart, you will have somewhat better performance in perpendicular directions by about 1 to 2 dB. Adding two more will smooth out your pattern to omnidirectional. Any more than that won't make much difference with elevated radials — and four elevated radials will work as well as perhaps 60 buried ones.

Unfortunately, this won't do much for noise, except signals from the direction of the new radials will be slightly stronger. If the noise is coming from those directions, your S/N will remain the same. About all you can do is try some kind of noise canceller or DSP noise reduction circuitry.

If you operate CW you can also decrease the bandwidth to perhaps 200 Hz. That will give you about 10 dB improvement in S/N than listening to CW with an SSB filter. Unfortunately, you can't go very far with that approach on SSB without destroying the signal as well.

Q Terry, KØTHD, asks: How do I protect my Amateur Radio equipment from electromagnetic pulse shockwaves as the result of a high atmosphere nuclear explosion? Or, can I?

A high atmosphere nuclear explosion generates an electromagnetic pulse (NEMP).[2] Such pulses consist of a high-energy waveform (peak around 50 kV/m with less than 1 μsec risetime) that can be picked up by any conductors, including antennas, powerlines, phone lines and other cables. A station that is well protected against lightning will be more likely to survive such an intrusion.

Since the risetime is faster than even greased lightning, inductances in ground leads that might help protect against coupled lightning signals will pass a larger portion of the leading edge of the NEMP waveform.

It is thus quite likely that any solid state equipment connected to an antenna or ac power lines, even with quality surge arrestors, will be damaged. The answer, in my opinion based on some years of professional work in just this specialty, of how to survive a NEMP attack is:

- Keep your radios disconnected when not in use.
- Have a standby radio that is not hooked to *anything*, in case you get a pulse while your primary radio is connected.
- Have a vacuum tube set-up on hand, since vacuum tubes are much less susceptible than solid state devices.

In the military environment, NEMP hardened equipment was located in shielded rooms to avoid direct pickup, with surge arrestors on all connections penetrating the shield.

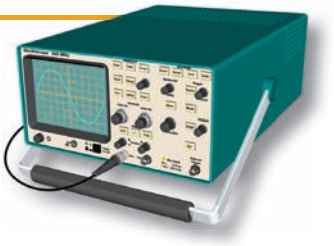
Fortunately, I think our world political environment makes NEMP much less likely than it was some years back. Note that there is a similar, but less intense, lightning induced EMP (LEMP) effect, which seems much more likely, so it's not bad to plan for survivability since you will be even more likely to survive the more likely LEMP case.

[1] D. Cornell, W9LD, "Feeding that Zepp with Coax," this issue, p 70.

[2] D. Bodson, "Electromagnetic Pulse and the Radio Amateur," Parts 1-4, *QST*, Aug-Nov 1986. Also available on the ARRL Web. See ***QST*/*QEX* Index Search**.

Do you have a question or a problem? Ask the Doctor! Send your questions (no telephone calls, please) to "The Doctor," ARRL, 225 Main St, Newington, CT 06111; doctor@arrl.org; www.arrl.org/tis/. QST

Through the Glass HF Antenna and Tuner at K7ZX/MM



Greg Combs, K7ZX

In January 2007, I took a job as radio officer on the SS *Flickertail State*. She was to take a two month trip from near Williamsburg, Virginia to Guatemala and back. This was the first ship I had been on in which I could not erect an outside wire antenna either by drilling a hole in the steel bulkhead or squeezing a heavily insulated wire through a window opening.

Figure 1 — A view of the antenna wire as the SS *Flickertail State* passes through the Miraflores locks of the Panama Canal.

The Solution Comes Together

It occurred to me that perhaps aluminum disks fastened to the port light glass would provide enough capacitance to effectively couple the radio to the antenna. I calculated the capacitance of two 14½ inch disks spaced by ½ inch of glass to be a bit more than 700 pF. I had space for a 66 foot wire antenna, which I could end feed it on 80 and 75 meters as a λ/4 Marconi antenna, and on 40 meters and its harmonics as a voltage fed wire.

The antenna sloped away from the deck at an angle of around 50° for about 30 feet and then out toward the foremast, forming a lopsided inverted V. See Figure 1. I also had available an ICOM AT-130 marine antenna tuner, somewhat similar to their amateur AH-4 tuner except it is a bit larger and covers the frequency range of 1.6 to 30 MHz.

Making it Happen

I laid out the aluminum foil and made a double fold so there would be a flap in the middle. Then I cut the disk out with scissors. The foil disk was fastened to the inside of the glass (see Figure 2) by spraying it with a light coat of spray contact cement and letting it set for about 3 minutes before smoothing it down. After the glue is allowed to dry, and when time for the foil to be removed, any residue on the glass can be easily scraped off. The wire from the ATU was clamped to the flap using a #6 brass bolt and nuts with two large brass washers. The tuner's ground connection was tied to the steel structure adjacent to the port light.

The outside foil disk blew away our first day at sea, so I cut a disk from aluminum flashing and secured it to the glass with a few pieces of thin double-sided tape, leaving a small tab on the aluminum flashing as a connection point for the antenna. The outside connection should be weatherproofed by painting with spray paint or even nail polish. See Figure 3.

Figure 2 — Inside capacitor plate and connections to AT-130 tuner. Note ground connection.

Figure 3 — Outer capacitor plate and end support of antenna wire.

Ringing it Out

I ran an on-the-air test on 80 meter CW with former ARRL staffer Curt Holsopple,

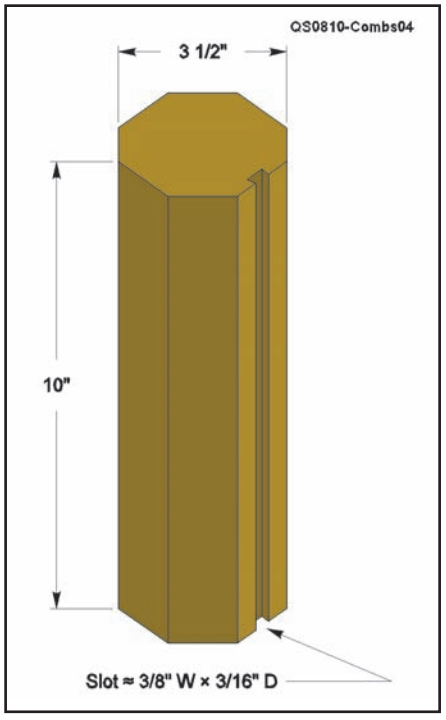


Figure 4 — Drawing of the coil form before winding.

K9CH, in Hopewell, Virginia, about 30 miles away. Curt reported a S9+20 signal from my little ICOM IC-706MkIIG transceiver. He was even able to copy me well with the power reduced to 5 W. While still at the pier I joined the North American Sprint and worked 183 stations from all over the US, Canada and Belize — 16 of them on 160 meters. The antenna worked better than I expected.

While at sea I could work anyone I could hear — even VK9DNX on Norfolk Island on 30, 40 and 80 CW. I could even check into the Oregon Emergency Net on 3980 kHz SSB from the Atlantic, Pacific and Caribbean.

The Nuts and Bolts

The antenna was made of #18 stranded insulated wire. I recommend this type of wire for use at sea, as it is both strong and flexible. It also resists corrosion and can be tied in knots without compromising strength. I use nylon mason's string for halyards.

It is normal to have some RF in the shack with voltage fed antennas, particularly at the higher frequencies (see sidebar on RF safety). I was unable to use this antenna on 18 and 24 MHz SSB due to RF feedback.

Oops — We Need a Tuner

After happily using a few commercial antenna tuners, I suddenly found myself without one a week or so before the Field Day 2006.

Although I had a decent variable capacitor in my junk box, I had no coil stock, no PVC pipe, not even any solid heavy-gauge wire for the coil. The ship did, however, have quite a lot of wood, including some 4 × 4 inch timbers. I cut about 10 inches off of one of those pieces and with a table saw was able to cut the corners off to make it octagonal. I also cut a wide slot in one side to accommodate alligator clips to be used for adjustment. See Figure 4 for details of the coil form.

There was plenty of 14 gauge stranded wire in the electrical locker, so I unrolled about 35 feet of it, stripped off the insulation wound it on the wooden form and secured it with crimp connectors and screws. The schematic of the high and low Z (80, 75 and 30 meters) and configurations is shown in Figure 5. It worked well on all bands, and I was able to enter the Field Day fray with confidence. A photo of the completed tuner is shown in Figure 6.

A Word About RF Safety

An antenna system of this type includes three areas of possible concern from an RF safety standpoint. It is important that such a system receive a thorough RF safety assessment as described in the references and required by the FCC.[1,2] As with all amateur communication, the lowest power needed to maintain communication should be used.

- Any antenna that is directly fed from the transmitter, rather than through a transmission line to a location away from the operating position, is likely to be in close proximity to the operator, providing an opportunity for RF exposure. This must be assessed and compared to the FCC *controlled environment* requirements.
- Since the outside antenna run starts from an area with possible crew presence, their possible proximity should be taken into account as part of the safety evaluation.
- In addition to exposure to RF fields, this antenna includes the possibility of direct human contact, especially to the surface of the glass coupling capacitor plates. Contact to human skin can result in nasty RF burns. Such burns can be quite deep and painful, depending on the RF voltage at the contact point even at these power levels. Any such surface should be well installed in a way that avoids accidental personal contact.

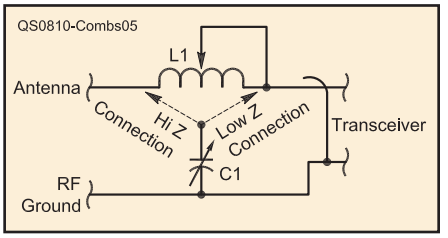


Figure 5 — Schematic of tuner. Note that the capacitor can be connected to either end of the coil with the clip lead. For a 66 foot antenna, the low-Z position should be used for 80, 30 and 17 meters. The inductance is adjusted by shorting out turns with the clip lead. Make all clip lead adjustments with power off.

C1 — Available transmitting variable, typically 250 pF, 1 kV. Additional fixed capacitors may be required in parallel for some configurations.

L1 — See text.

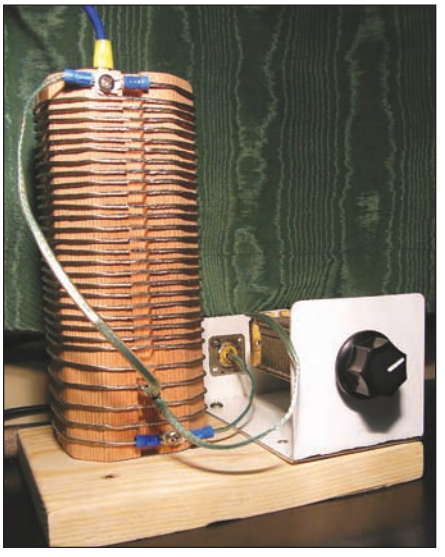


Figure 6 — Completed tuner. Note position of clip leads at bottom of slot.

Notes

[1]See **www.fcc.gov/Bureaus/Engineering_Technology/Documents/bulletins/oet65/oet65b.pdf**.

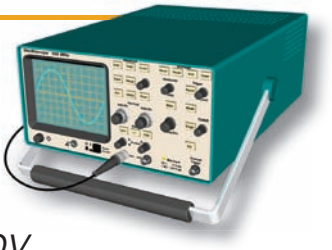
[2]E. Hare, W1RFI, *RF Exposure and You*, available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 6621. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/**; **pubsales@arrl.org**.

Photos by the author.

Greg Combs, K7ZX, received his Novice class license in 1959 along with the call KN7KKA. Since then he has held calls K7KKA, K4CRB, W7KAS, TI2ZQ and VQ9ZX and has an Amateur Extra class license. He is an ARRL member. He earned BTh, MDiv and ThD degrees in pastoral ministry and served as a missionary in Costa Rica from 1977 to 1988. From 1991 until his retirement earlier this year, Greg was a merchant marine radio officer.

You can reach Greg at 1536 Vera Dr, Springfield, OR 97477-1634 or at **k7zx@yahoo.com**. QST

Feeding that Zepp with Coax



Avoid problems getting that balanced feed into the house by transitioning to coax cable.

Dave Cornell, W9LD

In *QST* for July 2008, Joel Hallas, W1ZR, presented a simple HF antenna that provides efficient operation on the band at which it is a λ/2 long, and on all higher frequency HF bands as well.[1] The multi-band capability stems from use of balanced window or open wire line rather than a coaxial feed line. Window line has much lower loss than coax, especially in situations with a high SWR.

However helpful it is at reducing losses, window line is not always convenient to use indoors. It will not work as expected unless it is kept clear of other objects, especially metal, making it harder to route through the house. Coaxial cable is more forgiving and allows excess cable to be coiled as well. Thus, coax is often the feed line choice for the portion of the route inside a building.

How we can transition between these two media to gain the benefits of both is the topic of this article. There are at least two answers to the question. The answer for you may depend upon the length of coax from your radio to your building wall.

Option 1 — Tuner at Radio

In order to use a tuner at the radio, as you would if you brought the balanced feed line all the way back, requires an untuned transition as shown in Figure 1. In this case the coax will be mismatched and would have excessive losses, especially on the higher bands, were it not quite short. Thus, option 1 is appropriate if the length of coax from your radio to the building wall is short enough to make losses tolerable on the bands you wish to use. Check Table 1 and Figure 2 of the article referenced in Note 1 to determine your losses. For example, a 10 foot length of RG-58 coaxial cable should give about 1.0 dB loss with 10:0 SWR at 28 MHz. If your coaxial run needs to be much longer than 10 feet, you may wish to consider option 2, which keeps the coax SWR down to 1:1 by using a remote antenna tuner.

The setup for option 1 appears in the block diagram, Figure 1. The radio connects to the tuner with any reasonable length of 50 Ω coaxial cable. Out of the tuner, run coax inside the house to just outside the building wall. Connect the coax to a current (common-mode) balun, consisting of 22 feet of RG-8 low-loss coax. This balun is wound into a coil 8 inches in diameter held in place by electrical tape, as shown in Figure 2. Opposite ends of the balun connect to window line (to antenna) and coaxial cable (to tuner.) The inductance of the balun inhibits current from flowing on the outside of the cable shield to equalize currents in the balanced feeder.

Figure 2 — The author's current balun fits on a clipboard. An SO-239 connector provides coax cable input on upper right while two banana jacks connect to window line at upper left.

Option 2 — Remote Tuner

Select option 2 if your coaxial feed line needs to be so long that losses at high SWR are prohibitive. This probably applies to a situation in which the length of coax (including that in the choke) needs to be more than 30 feet depending on the band. Again, check the article referenced in Note 1 to determine your losses.

Option 2 uses a remote antenna tuner in the position of the choke balun in Figure 1. The balanced line connects to the balanced terminals of a tuner equipped for balanced line or to the ANTENNA and GROUND terminals of a tuner designed for unbalanced or single wire feed. The radio connects to the tuner through any reasonable length of 50 Ω coaxial cable. Even though this coax is matched, pay attention to losses as shown in Table 1 of the article referenced in Note 1.

Results

Now you have a system that fits your needs, including convenient coax inside the house and efficient window line outside going the distance to the antenna. You can expect good results if your antenna follows some simple guidelines — the higher, and the clearer, the better.

Dave Cornell, W9LD, is an Amateur Extra class licensee and ARRL member. He can be reached at 18624 Blue Ridge Dr, Lynnwood, WA 98037 or at **davidcornell123@comcast.net**.

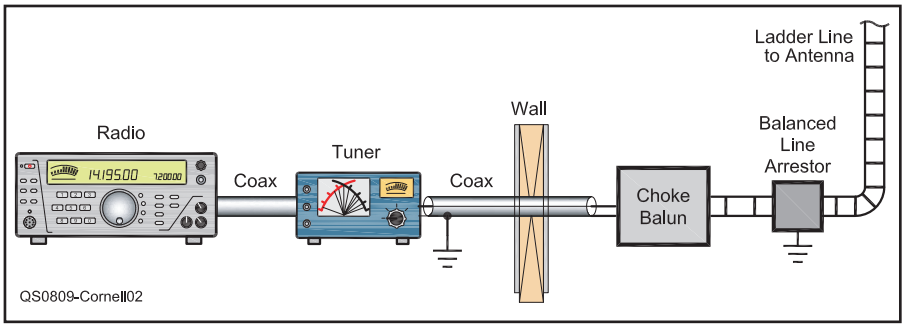
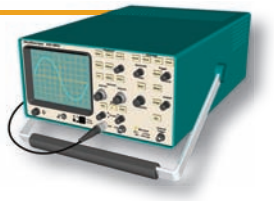


Figure 1 — Short coaxial cable runs from radio and tuner position to the building wall can be made with low loss. Insert a current balun as described in the text to resist current on the outside of the coaxial cable. For option 2, the balun is replaced with a remote antenna tuner and the tuner at the radio is bypassed.

[1] J. Hallas, W1ZR, "Getting on the Air — Your Second HF Antenna," *QST*, Jul 2008, pp 69-70.

NØAX

HANDS-ON RADIO



Experiment #69 — Phase-Locked Loops, Applications

Last month's column introduced the basic functions of a phase-locked loop (PLL). What is the PLL used for besides locking onto a signal? What is that locking mechanism good for? The original PLL generated a signal locked to the sync signals embedded in a video waveform, an example of clock recovery in which the PLL reproduces a timing signal. PLLs can recover such a signal even if it's very noisy, such as from a weak spacecraft signal or in the presence of other signals carrying several data streams.

FM Demodulation

PLLs can also perform FM demodulation. You demonstrated this last month while measuring the loop's capture and lock ranges. By varying the frequency of the input signal, albeit very slowly, you created an FM signal. The PLL locked onto and followed it as long as the input signal frequency remained within its lock range. You also observed the error signal changing along with the input signal frequency. If you had graphed the input signal frequency and the error signal versus time, you would have seen that the error signal represented the variations of the input signal frequency. In other words, the error signal reproduced the modulating signal. Let's demonstrate that ability.

You can make a simple FM generator from a 555 timer IC as shown in Figure 1. See Hands-On Radio Experiment #5 for more information on the 555 timer.[1] The 555 has a CONTROL VOLTAGE input connected directly to the resistive divider at the point that determines the ⅔ V_{CC} threshold. By changing that threshold with an external voltage, the timing of the circuit is altered. In most 555 circuits, the CONTROL VOLTAGE pin (pin 5 on the DIP package) is bypassed to ground with a small capacitor to prevent noise from causing false triggers or unwanted shifts in the threshold.

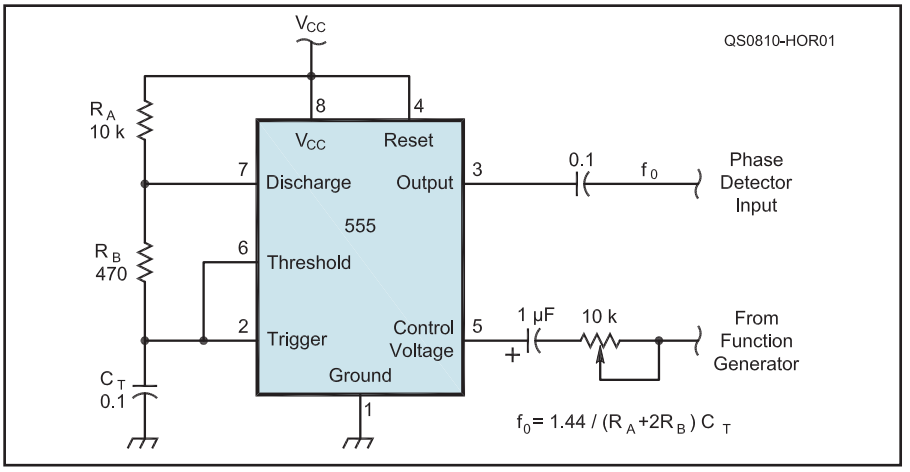


Figure 1 — The 555 timer wired for its astable mode can be made into a simple FM generator by applying the modulating signal to its Control Input pin.

An FM signal can be created by varying the voltage at the ⅔ V_{CC} threshold. If the threshold voltage is lowered, the timing capacitor will be discharged more frequently and the output frequency will be higher (and vice versa). If a sine or square wave is applied to the CONTROL VOLTAGE input, the output frequency will vary with the amplitude of the input waveform.

■ Start by constructing the circuit shown in Figure 1. A stand-alone function generator with FM capability can also be used.[2] If you use a 1 µF polarized capacitor at the CONTROL INPUT, its positive side should be connected to the IC where a dc voltage of ⅔ V_{CC} is present. Similarly, the 0.1 µF capacitor at the IC's OUTPUT pin blocks the dc component of the output signal. Don't connect the CONTROL VOLTAGE input (FROM FUNCTION GENERATOR) to anything just yet.

■ Power up the circuit and verify that the output frequency is close to the 565 VCO's free-running frequency, f_0. Adjust the VCO frequency until it's within 100 Hz of the 555 output frequency. If the frequencies are too far apart to adjust, replace the 555 circuit's 10 kΩ resistor with a 10 kΩ potentiometer in series with a 4.7 kΩ resistor and adjust the 555 output frequency to be closer to the 565's f_0.

■ Now set your function generator to output the modulating signal, a 1 Hz sine wave of about 1 V_{PP} (the exact amplitude isn't critical). Set the 10 kΩ potentiometer connected to the CONTROL INPUT to provide about 5 kΩ of resistance. Connect the modulating signal to the pot and monitor the timer output frequency with an oscilloscope or counter. You should see it increasing and decreasing in step with the modulating signal — higher input voltage will lower the frequency. Adjust the sine wave amplitude so that the output frequency swings up and down about 200 Hz. If you are using a counter, you may have to reduce its frequency resolution to get it to update quickly enough to see the output frequency changing. If you do not see the frequency changing, reduce the 10 kΩ pot's value or increase the function generator output amplitude until you do.

■ Next, connect the 555 output to the PLL's phase detector input. The frequencies of both circuits — the 555 oscillator and the 565's VCO — should be the same. The error signal at the input to the 565's VCO (pin 7) should be going up and down along with the modulating signal. You've just created an FM demodulator!

■ Increase the modulating signal's fre-

[1]Hands-On Radio experiments are available online to ARRL members at **www.arrl.org/tis/info/HTML/Hands-On-Radio**. The first 61 experiments are also available as *ARRL's Hands-On Radio Experiments.* Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 1255. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/**; **pubsales@arrl.org**.

[2]Some function generators have a fixed-frequency FM capability built in or have an input labeled FM IN. If the former, when the FM function is activated, a tone will modulate the output. If the latter, any signal connected to the FM IN jack will frequency-modulate the output signal.

H. Ward Silver, NØAX ♦ PO Box 927, Vashon, WA 98070 ♦ n0ax@arrl.org

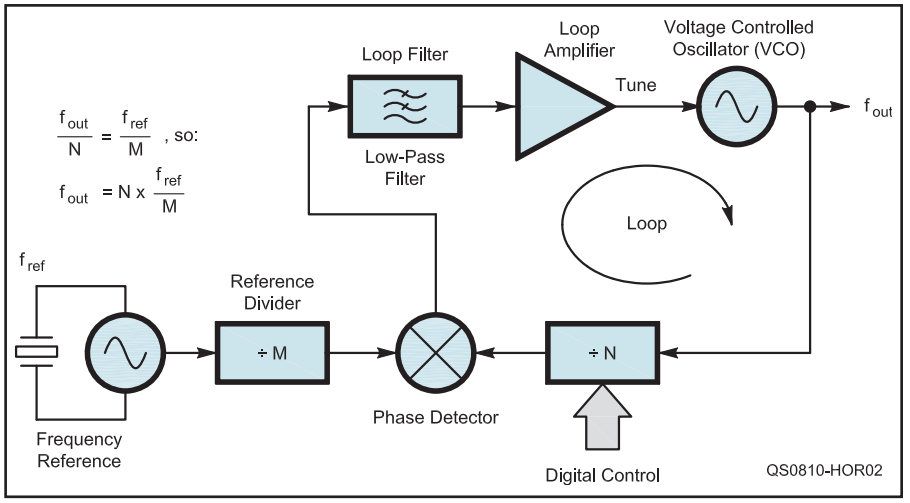


Figure 2 — A PLL acting as a frequency synthesizer divides both the reference and VCO output frequencies to lock at a series of frequency steps of the VCO output.

quency and watch the error signal to see what happens. Checking to be sure that the modulating signal amplitude stays the same (within 5% or so), at what frequency does the amplitude of the error voltage fall to 0.7 times its low-frequency value? That frequency is approximately the loop's bandwidth.

■ Change the value of the capacitor connected to pin 7 of the 565 to 1 µF and see if that changes the bandwidth. A smaller value for this capacitor allows the VCO input voltage to change more rapidly so that the PLL can track faster changes in the input frequency and reproduce higher frequency input signals.

■ Change the modulating signal to a square wave and vary its frequency. Assuming you are using a 'scope, trigger on an edge of the modulating square wave and zoom in on the error voltage as the input square wave changes voltage. You'll see the loop's transient response as it adjusts the VCO frequency to track the sudden change in input frequency.

Loop Gain and Filtering

What would happen if the error signal — a dc signal — were multiplied by a factor of two before it was input to the VCO? The loop would lock faster. Why? Because the error signal would be twice as large for the same amount of phase error as before, causing the VCO to react that much faster.[3] All of the loop's components — the phase detector, the filter, and the VCO — have some characteristic amount of gain in volts per volt, or in phase or frequency per volt. *Loop gain* is the product of all three gains — phase detector, loop filter, and VCO.

The frequency response of the loop filter is also important. The 565 PLL circuit uses a simple *lead* (low pass) filter formed by an internal resistor between the VCO input and VCC in parallel with the 10 µF capacitor. The capacitance in this low-pass filter can be reduced to allow the loop to change frequency quickly, but the loop's average frequency will be less stable.

For higher-speed uses such as data recovery, the loop may have to track very abrupt changes in input frequency. A common solution is the *lead-lag* filter in which the filter changes from a single-order filter (a single RC combination) to a second-order filter. A lead-lag filter combines a low-pass (lead) and high-pass (lag) response. These filters are used with PLLs recovering FSK RTTY or packet radio data.

The tradeoff between frequency stability and the speed at which a PLL can track an input signal is important. Instability results in more phase noise in the PLL output. The faster a PLL can track changes in the input frequency, the noisier its output is likely to be. It is a difficult design challenge to achieve both a very quiet output and a very fast tracking response.

Frequency Synthesizer

While a full discussion of the use of PLL circuits as frequency synthesizers is beyond the scope of Hands-On Radio experiments, Figure 2 shows the basic structure. Instead of the loop tracking a varying input signal, the input is a very stable reference frequency, usually a low-noise crystal oscillator.

The VCO output frequency is divided by some integer value, N, before being applied to the phase detector. (Assume that the value of divider M = 1.) If the value of N is two, then the loop will be locked when the VCO's output frequency is twice that of the reference signal. By changing the value of N, the VCO frequency in lock will also change. In this way, the VCO output can have very nearly the same low-noise characteristics of the reference signal, but still have a variable frequency.

If we let the value of M change, too, the situation gets a little more complicated. For any value of M and N, the loop will be locked when the frequency of the VCO output divided by N (VCO/N) is equal to the reference frequency divided by M (REF/M). Thus, the VCO frequency will equal REF × N/M. By selecting the right reference frequency and values for M and N, the VCO's output can be made to change in steps, such as the 15 or 20 kHz steps between repeater frequency channels!

Parts List

- Capacitor — 0.1 µF, 25 V ceramic, quantity 2.
- Capacitor — 1 µF, 25 V electrolytic.
- Integrated circuit — 555 timer.
- Resistor — 10 kΩ, ¼ W.
- Resistor — 470 Ω, ¼ W.
- Potentiometer — 10 kΩ linear taper.

Recommended Reading

The URL given last month for "AN535 — PLL Fundamentals" was incorrect. The downloadable PDF can be found at **www.lansdale.com/Articles/an535.pdf**. *The ARRL Handbook* has an extensive discussion on both PLL and frequency synthesizer circuits.[4]

Next Month

Construction techniques can have a major effect on how a circuit performs. Next month, we'll build the same filter three ways, but it won't act like the same filter!

[3]Higher loop gain also reduces capture and lock range because it takes less frequency change to reach the maximum phase shift limits.

[4]*The ARRL Handbook for Radio Communications,* 2008 Edition. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 1018. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/**; **pubsales@arrl.org**. QST

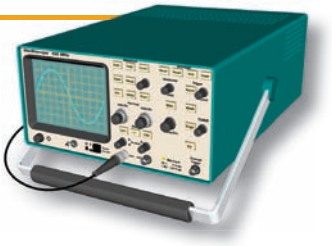
Feedback

◊ K. G. Macleish, W7TX, was listed as a Silent Key in the September 2008 issue as having lived in Chicago, Illinois. He actually lived in Tucson, Arizona.

◊ In "Converting a Heathkit SB-220 Amplifier to 6 Meters" [Apr 2008, pp 38-40], the author reports that the specified 100 pF 4 kV air variable plate tuning capacitor has been found to have too high a minimum capacitance to be resonant in some units. He suggests substituting a 35 pF 4 kV air variable.

◊ The photo at the bottom of page 54 of the July 2008 issue was taken by Dan Klobe, W7FOT. — *tnx Dan Fisher, AI4GK*

The Pileup Buster



An easy to use, easy to build, inexpensive voice keyer.

George Badger, W6TC

Building things and chasing DX have always been my favorite interests in Amateur Radio, and CW has always been my favorite mode. When the ARRL introduced the DXCC Award Listing, I became an enthusiastic participant. The listing sparked competition and brought more fun to DXing. However, on my list, most entities were confirmed on CW but many were missing on phone. So for a while, most of my DXing was on phone. The needed entities were fairly rare so much of the DXing involved pileups.

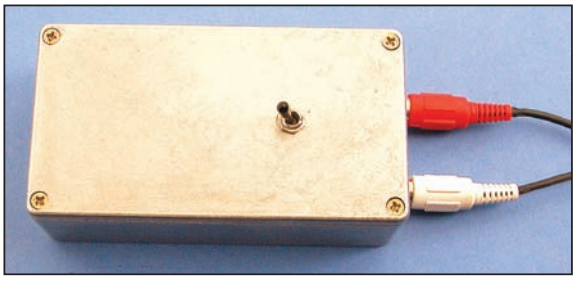


Figure 1 — Photograph of the finished pileup buster. Note the simplicity. It consists of an enclosure, a momentary-on toggle switch and two RCA audio cables.

CW Pileups

CW pileups are challenging and fun. To get through quickly requires skill and finesse. It is easy to find the last station worked, judge the DX station's pattern and make the contact. With a good signal and a little luck the process is most satisfying.

Phone Pileups

On phone, the situation is different. It is difficult to find the last station worked unless his signal is loud. The best strategy seems to be to find a quiet frequency in the pileup and call, and call, and call and call. On phone the process seems to me to be hard work — slow and boring. Success seems to depend on signal strength, patience and lots of luck.

Quest for a Voice Keyer

I decided a voice keyer might ease the pain. I wanted a very simple one. The available keyers were too complicated and had too many bells and whistles. They required complicated connections to a computer or were expensive. I decided to build a simple one. I tried a variety of cordless phone memory chips but I found that circuits based on them are too complicated, have strict power supply requirements and, when used in this application, require too many switches and relays. They are also extraordinarily sensitive to RF and ground loops.

I had just about given up when I saw a TV ad for a device called a *Mini Talking Memo*. A Google search revealed MaxiAids.com. This company sells a 2.8 × 2.1 × 0.33 inch digital voice recorder for use as a memory aid. The price was about $10 so I purchased one.

I found this device to be exactly what I was looking for. It forms the basis for an extremely simple 20 second voice keyer — just right for busting pileups.

Voice Keyer Description

This keyer consists only of an enclosure, a momentary-on toggle switch and two RCA connectors, one for transceiver microphone input and the other for PTT. That's all on the outside as shown in Figure 1.

On the inside, the keyer consists only of the talking memo, the momentary-on isolation transformer, audio volume adjustment, audio output, PTT control and RF bypassing (see Figure 2). The total cost of all parts should be less than $26.

Build the Pileup Buster

Remove the three small Phillips head screws from the talking memo. Carefully open the enclosure. Care is necessary because when the enclosure is open, nothing is holding the two operating switches in place. Discard the moving parts of the push-to-talk mechanism on the left. Keep the REC/PLAYBACK switch as is. Carefully solder a 6 inch wire pair to the remaining fixed switch contacts plated on the circuit board at A and B. See Figure 4. Carefully solder another 6 inch wire pair to the two outside

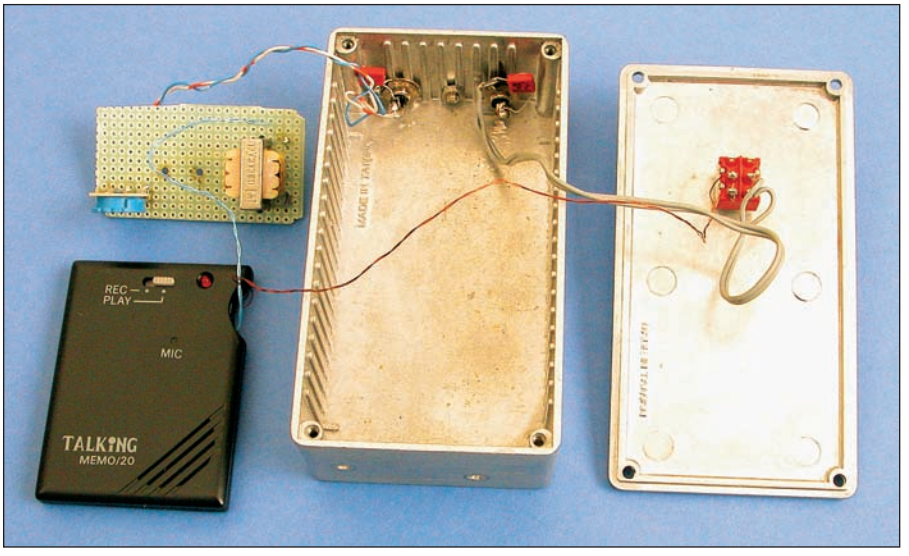


Figure 2 — The modified talking memo device is at the lower left, the PC board with audio level adjustment and audio isolation transformer is just above. The enclosure with two RCA sockets and RF bypass capacitors is in the center. The top of the enclosures with momentary toggle switch is at the right.

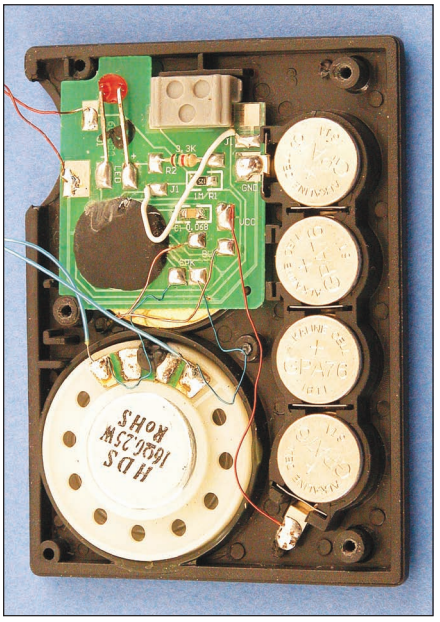


Figure 3 — Interior view of the Mini Talker. The opening left by the removal of the moving parts of the push-to-talk control is at the upper left. A twisted pair is soldered to the circuit board pads at the upper left. The speaker is at the lower left. The speaker is soldered to the outside terminals at the top of the speaker. Four size 357A batteries are on the right.

connections on the loudspeakers at C and D. Use small wire such as lightly twisted 26 gauge enameled wire.

The reason for the small wire is that the contacts are fragile and the talking memo should be acoustically isolated from the outside enclosure as shown in Figure 3. Note that the transformer is used as a level reducer not an impedance matching device. This 1000 Ω winding is connected to the speaker.

Reassemble the talking memo, bringing the two twisted pairs out through the opening caused by removal of the push-to-talk switch mechanism. Replace the Phillips screws.

Circuit Features

Fortunately the talking memo playback continues only as long as the control is keyed. It then resets to start the next time the control is keyed. This is a much better arrangement for a pileup voice keyer than one which completes the message each time.

To operate the pileup buster properly, it is necessary to hear the transmitted audio. On earlier versions I fed audio into the transceiver receive audio amplifier. This was an unnecessary complication. In this version I left the talking memo speaker connected and listened to it directly through the enclosure. The audio level is just right.

Rather than build a power supply, I decided to leave the batteries in place. Four 357A size batteries are included with the talking memo. Because the keyer is used only occasionally, a power supply is an unnecessary complication. An ON/OFF switch is not required because the standbycurrent is so low. My batteries are like new after a year.

Programming

To program the keyer, leave it open as shown in Figure 6. Place the REC/PLAY switch in the REC position. I used a very simple message as follows: WHISKEY SIX TANGO CHARLIE, WHISKEY SIX TANGO CHARLIE, WHISKEY SIX TANGO CHARLIE GO AHEAD. Move the REC/PLAY switch to PLAY. Using the momentary toggle switch, you can stop the message after the first call, after the second or at the end, depending on the pileup situation. I usually use only the first call.

Connect the two cables to your transceiver MIC input and PTT. Adjust the potentiometer so that the keyer kicks up the meters to about the same as your natural voice. Bolt the top of the enclosure in place. You're finished.

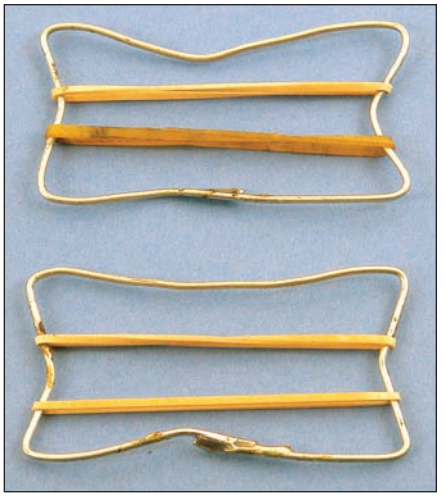


Figure 5 — Wire frames for mounting the talking memo. The frames are made from 16 gauge bare wire dimensioned to fit the PC slots in the enclosure. Note the rubber bands to provide acoustic isolation.

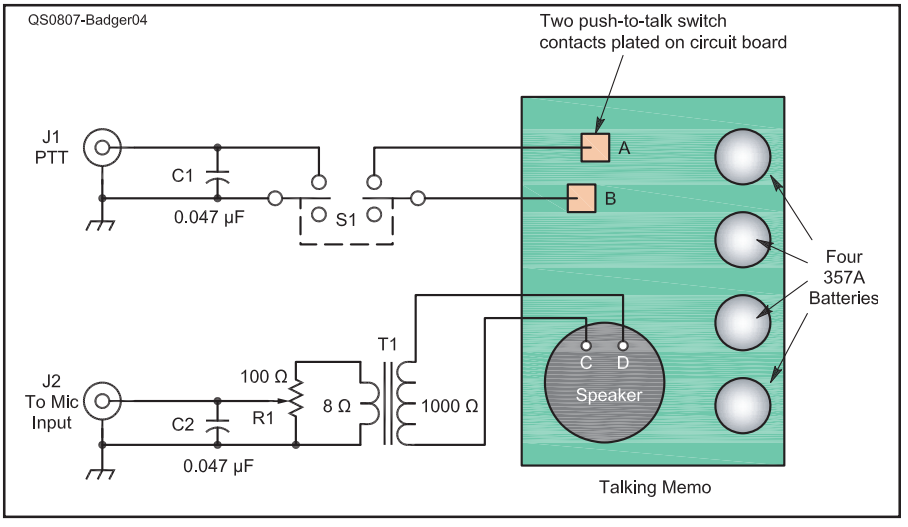


Figure 4 — Pileup Buster circuit diagram and parts list. Mount the audio transformer and 100 Ω potentiometer on a piece of perforated board cut to fit the slots in the aluminum enclosure as shown in Figure 6. Mount the RCA sockets and momentary toggle switch as shown.

C1, C2 — 0.047 µF, 25 V ceramic capacitor.
J1, J2 — RCA type phono jack.
R1 — 100 Ω potentiometer. See text.
S1 — DPDT momentary contact toggle switch. See text.
T1 — Miniature audio transformer, 1000 Ω:8 Ω. See text.

Voice Quality

The Pileup Buster is certainly not hi-fi. The audio is concentrated in the higher ranges. It is crisp, bordering on harsh, with good intelligibility. It is ideal for the intended purpose, slicing through interference.

Pileup Etiquette

Because the pileup buster is so convenient and easy to use, it is also easy to misuse. My thanks to Carl Smith, N4AA, and John Devoldere, ON4UN, for suggestions in the following list of good voice keyer and DX etiquette.[1,2]

- Never key the Pileup Buster unless you can hear the DX station.
- Set transmit audio level accurately so you do not splatter.
- Never call on the DX frequency when working split (the DX station listening on another frequency).

[1]Notes appear on page 75.

Table 1

Required Parts for the Pileup Buster

Digi-Key parts are available at **www.digikey.com**. Jameco parts are from **www.jameco.com**. MaxAids from **www.maxaids.com.**

C1, C2 — 0.047 μF ceramic or polystyrene capacitors, Jameco 57621CM.

R1 — 100 Ω PC mount potentiometer, Digi-Key 3306-101-ND.

Talking Memo, MaxiAids 99*6689.

Cast aluminum enclosure, Jameco11965CL.

DPDT miniature momentary contact switch, Jameco 105814CM.

Audio output transformer, 1 kΩ primary to 8 Ω secondary, RadioShack 273-1380.

Two RCA jacks, Jameco 159484CM.

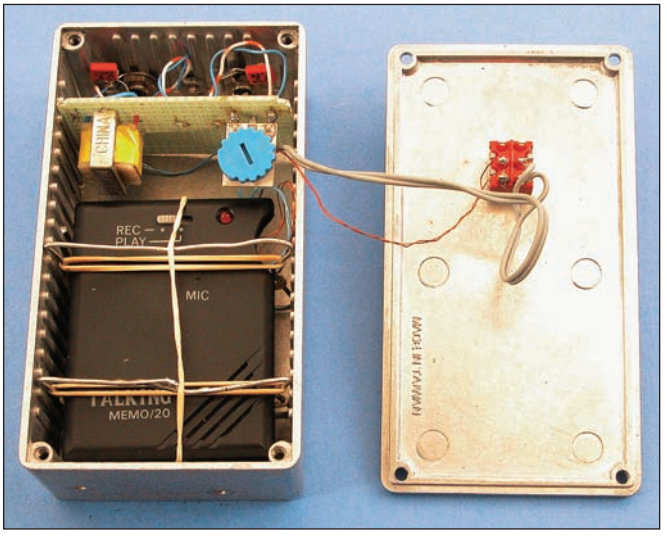


Figure 6 — Pileup Buster ready for programming.

- Know your equipment. Double check your VFO/XIT/RIT selections.
- The DX station is in charge of the pileup. Follow his instructions *exactly*.
- Do not call incessantly. You cannot hear the DX call you while you are calling him.
- In a split operation, listen to the pileup. Learn where and when the DX station is listening, so you will be calling where he will be listening.
- Do not knowingly call on the same frequency as another caller.
- If the DX is calling for sixes, do not call if you are not a six. If he is calling for Asia, do not call unless you are in Asia.
- Let the last station worked complete his or her QSO.
- If the operation is not split, call infrequently. Try to determine the rhythm and stay with it. Emphasize listening, not transmitting. Pray for the DX station to listen on a different frequency.
- Tail-end only when the DX station is taking tail-enders (people calling at the end of someone else's transmission) and when you can hear the DX clearly. Listen to the timing of the successful tail-enders and get with the rhythm.
- Do not confuse the DX station by changing phonetics. Use the same phonetics as programmed into your keyer.
- Depend on your ears more than the DX cluster.
- Above all, think before you key the pileup buster and listen, listen, listen.

Notes

[1]C. Smith, N4AA, "Suggestions for DX Pile-ups," *QRZ DX* newsletter. See **www.dxpub.com**.

[2]J. Devoldere, ON4UN, *Low Band DXing,* Fourth Edition, pp 2-7, 2-17. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 9140. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/**; **pubsales@arrl.org**.

George Badger, W6TC, was originally licensed as W6RXW in 1939 and has been a member of the ARRL continuously for 68 years. After WWII service with the 89th Infantry Signal Company in Europe, George graduated from UC Berkeley with a degree in Electrical Engineering. He holds seven patents on microwave tubes and circuits. He was Marketing Director for EIMAC, President of Svetlana and now consults for CPI Econco. He has published many technical articles professionally and in the amateur press. He is a fellow in the Radio Club of America. His Amateur Radio interests include building equipment, antennas and DX. He holds DXCC Honor Roll #1, 5BDXCC and 5BWAZ. You can reach the author at **gbadger@sbcglobal.net**. QST

New Products

ATV DOWNCONVERTERS FROM PC ELECTRONICS

◊ Three new PC Electronics downconverters for amateur television (ATV) reception offer improved sensitivity and frequency stability. The series includes models TVC-4S for the 420-450 MHz (70 cm) band, TVC-9S for the 902-928 MHz (33 cm) band and TVC-12S for the 1240-1300 MHz (23 cm) band. Each converter has a five-channel switch programmed for the most commonly used ATV frequencies in the respective bands. The downconverter output is on TV channel 3 or 4 (TVC-4S and TVC-9S) and channel 7 or 8 for the TVC-12S. Each unit uses a preamplifier rated at 0.4 dB noise figure and a GaAsFET mixer for 15 to 25 dB of conversion gain depending on the band. With the local oscillator frequency determined by a synthesizer locked to a crystal, the frequency (and received picture) remain stable even if the temperature changes appreciably or someone accidentally bumps the tuning knob. Each converter is packaged a 4.7 × 3.7 × 2.1 inch diecast aluminum enclosure and requires 12 V dc. (A wall plug power supply is included.) Price range: $149 to $159. The individual downconverter boards are also available for those who want to upgrade their variable tuning

downconverters and ATV transceivers. Price for the board only is $99 to $109, including the rotary panel switch for channel selection. For more information, visit **www.hamtv.com**.

A Shower Head Microphone

A simple weekend project that will yield a low cost and functional mic.

Dave Holdeman, N9XU

After replacing a grungy shower head and arm in the master bathroom, I noticed how much the shower head and arm resembled my vacuum tube era Astatic D-104 mic. It looked almost the same except that the shower head had more of a teardrop shape. Now I love to sing in the shower, but that has nothing to do with the subject at hand and I don't use a microphone there.

I recently purchased a new HF transceiver that came equipped with a hand mic only. I checked my amateur retailer and noted that most suitable desk mics cost $100 and up depending on the model. The brain cells started to glimmer and I headed for the nearest well equipped hardware store.

Hardware Store Saves the Day!

I have always been amazed by what one can find at such a store that can be used for ham radio purposes. I have built several antennas using PVC, copper tubing, threaded rod, plastic spacers and the like. All have worked well.

In the plumbing department I selected another 6 inch shower arm and escutcheon similar to the one I had just installed in the shower. The escutcheon normally covers the hole in the wall from which the shower arm extends. I didn't purchase a shower head just yet, as I thought I could find one cheaper somewhere else.

I still needed some sort of a base heavy enough so the mic would not be top heavy and large enough to house a push-to-talk (PTT) switch and associated wiring. Sure enough, still in the plumbing department, I spotted a 3 inch PVC end cap and a bin containing round black iron floor flanges that had the same threads as the shower arm. The flange selected would just fit up into the PVC end cap and was heavy enough so the whole works, when assembled, would not topple. I noticed some of the flanges in the bin had burrs on them. A little work with a bench grinder would smooth off the edges and enable the flange to fit snugly up into the end cap.

I still needed a practical way of feeding a microphone cable out of the PVC end cap base to the transceiver without fraying. Since the PVC base is quite thick, a rubber grommet would not do. A walk through the electrical aisle provided the solution.

In the section marked *Lamp Parts*, there were assorted lengths of threaded hollow brass plated tubes used to hang lamps. I picked out what I needed along with the matching nuts and washers and headed for the checkout lane. On the way home I bought an electret microphone element from the local RadioShack and a DPDT toggle switch to act as a PTT switch. The next day on a shopping trip to my big box discount store, I spotted a box of shower heads in the plumbing department. Although cheap, they looked very nice. A picture of all the items purchased is shown in Figure 1.

Mic Assembly

Line the interior of the PVC end cap (domed portion) with masking tape and push the iron flange up and in as far as it will go. Using a pencil, trace around the hole in the flange onto the masking tape. Remove the flange and drill a pilot hole through the domed portion of the end cap at the exact center of the traced hole. Remove all the masking tape and, using a paddle drill slightly larger than the chrome tube, drill out the pilot hole. A drill press would be handy here.

Push the iron flange up into the PVC end cap and screw the chrome shower arm through the PVC hole into the flange. Push the escutcheon over the tube and down onto the domed portion of the end cap. Screw the shower head onto the top end of the chrome tube and step back to admire your nearly finished product.

In case the floor flange is not snug inside the PVC end cap when everything is assembled, a good solution is to insert a very short piece of 3 inch PVC into the end cap up against the flange and secure it with PVC cement. I chose to drill three holes through the end cap sides and the PVC tube and secure it with stainless steel 6/32 screws and nuts.

At this point you still have two more holes to drill. One is to mount the PTT switch and the other to route the cable to your rig. I chose to use a full-sized bat handle DPDT toggle switch mounted on the front side of the PVC base where it would be most handy. The hole for the mic cable could be at the back or the side, whichever is convenient. A bottom view of the mic showing the end cap, the flange, PVC anchor, push to talk switch and wiring is shown in Figure 2.

Wiring

I leave the wiring up to you. It will

Figure 1 — The results of my shopping expeditions.

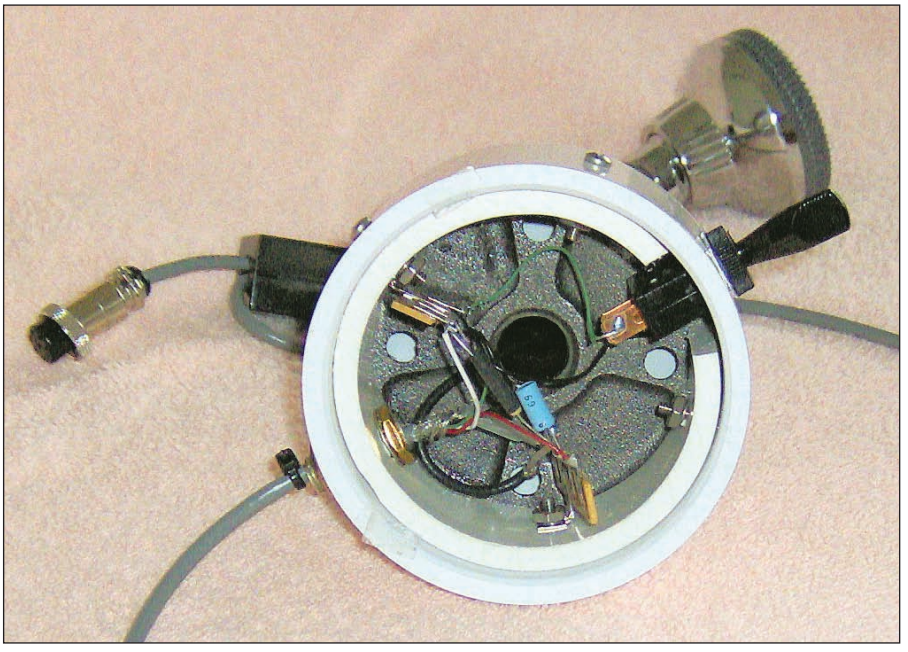


Figure 2 — View of the underside of the completed mic. Note the PTT switch and wiring arrangement.

Table 1

The Required Parts, the Cost and My Source

Item	*Cost*	*Source*
Shower head	$ 1.96	Wal-Mart
PVC end cap	$ 3.70	Home Depot
Escutcheon and 6 inch shower arm	$ 3.99	Home Depot
Floor flange with ½ inch pipe thread	$ 1.63	Home Depot
Lamp tubing	$ 2.50	Home Depot
Mic cartridge	$ 2.35	RadioShack (Part # 270-092)
Mic switch	$ 3.99	RadioShack (Part # 275-709)
Total	*$20.12*	

depend on your radio model, the type of PTT circuitry you require, the type of cartridge you have chosen and your choice of shower head. Check your transceiver manual for mic wiring details. I used miniature coax for both the audio and voltage leads from the electret cartridge to the mic base. I was able to epoxy a rubber grommet inside the shower head to hold the electret cartridge snugly. After soldering the wires to the cartridge I mounted the cartridge in the grommet, threaded the wires down through the shower arm to the base of the mic and screwed the rest of the parts together.

Because the PVC end cap is rather thick, I cut a notch out of the PVC anchor so I could mount the press to talk switch through a hole in the end cap without going through two layers of PVC. A standard size DPDT switch fit perfectly. The end cap housing is large enough that it will accommodate the switch, soldering lugs and perhaps a miniature mic preamp if needed. The sources of my parts and their cost are shown in Table 1.

I enjoyed this project and the mic looks very nice in front of my ICOM IC-718. I used the mic for the first time during the annual 2006 Western Electric QSO Party and got good reports. Non-ham friends often do a double take when they enter the shack, however.

Possible Variations

After building the microphone, I noticed that a Planters Peanut 3 inch plastic cap fit perfectly over the bottom of the microphone. I secured it to the end cap with a couple of drops of silicone sealant. I also noticed later that the local Farm & Fleet store had 4 inch end caps that were flat and not domed. This would make for easier drilling and mounting of the floor flange. I prefer the 3 inch domed end cap, however, because it looks nicer.

Photos by the author.

Dave Holdeman, N9XU, was born and raised in Muskegon, Michigan. After graduation from Muskegon High School, Dave joined the Army Signal Corps. He attended signal school in Ansbach, Germany and met his future wife, Christa, in Berlin while on temporary duty there. In the service he worked on BC610s, BC342s and other radio and cable carrier systems.

After his army tour, Dave studied broadcast engineering, received his FCC First Class Radiotelephone license and joined the staff of WONW-AM in Defiance, Ohio. After licensed engineers were no longer required at broadcast stations, Dave became a microwave communications craftsman at AT&T. He performed acceptance testing on new microwave radio installations and worked the microwave test bench.

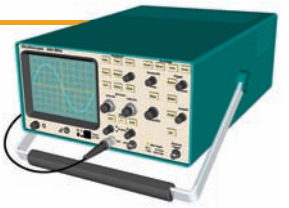
In 1958 Dave passed his Novice exam and received the call KN8OIO. Later he passed his Technician and General class exams and became K8OIO. In 1963 he was promoted to AT&T Chicago Engineering and received the new ham call W9HJL. He now holds an Amateur Extra class license and is a member of the ARRL. You can reach Dave at 415 Barnaby Dr, Oswego, IL 60543 or at **holdex@att.net**.

Strays

2008 ASIA PACIFIC DX CONVENTION

♢The 2nd Asia Pacific DX Convention will be held at the Osaka International House in Osaka, Japan November 7-9, 2008. Plan to arrive by November 6, as the APDXC 2008 Program starts early November 7 with a guided tour of the ICOM Factory in Wakayama. Additional tours include Nipponbashi (electronics area) and the city of Nara, Japan's capital in the 8th century. Our Web site is at **apdxc.org**. — *APDXC press release*

HINTS & KINKS



USB TO ICOM TRANSCEIVER INTERFACE

◊ Adapting equipment for Amateur Radio use is a long-standing ham radio tradition. So I was intrigued when I learned about a RadioShack Scanner Programming Cable that could be used to connect my ICOM IC-7000 to the shack computer and provide the hardware interface required by various remote control software programs. I now have computer-controlled radio at KQ4BY!

The $29.95 Interface Solution

I discovered this programming cable while monitoring a long thread on transceiver control from the Yahoo IC-7000 Group (**groups.yahoo.com/group/ic7000/**). Since my shack computer has USB ports, when I read a message describing success with the Full-Speed USB to Scanner Programming Cable, part number 20-047, I was motivated to plunk down my $29.95 plus tax and bring one home to try.

The 20-047 cable is designed to interface RadioShack's popular scanners to a personal computer Universal Serial Bus (USB) port and allow the scanners to be programmed using software available from third party vendors. Fortunately for us ICOM owners, those scanners require the same voltage-level conversions as our transceivers! As you can see in Figure 1, the package contains the interface cable assembly, a stereo to mono converter (required for my IC-7000), a driver CD and instructions to install the drivers.

Hardware Installation

I installed the drivers, per the instructions, on my Compaq laptop running *Windows XP*. The only trick is to make sure that Windows does not install the Microsoft-provided drivers for the USB serial converter and the USB serial port. So, after my computer reported that the installation was complete, I opened the *Device Manager*, found the "USB Serial Converter" device and the "USB Serial Port (COM5)" device and verified that the "Driver Provider" entries read "FTDI." With the installation complete and verified, I connected the radio end of the cable to the CI-V Remote Control Jack on the rear panel of the IC-7000.

Adding Software

I had been wanting to try the *Ham Radio Deluxe* (HRD) CAT control software, by Simon Brown, HB9DRV, since reading about it in "Short Takes" [*QST*, Apr 2007, p 56]. So, I dug out the April issue, found the Web site (**www.ham-radio-deluxe.com**) and downloaded and installed the latest version. When I clicked on the program icon, the "Connect" wizard was displayed. From the "Company" tab, I chose "ICOM" and then selected "IC7000" from the "Radio" tab. I noted the default settings (COM Port = Auto-Detect, Speed = 19200, CI-V Add = 70, DTR = not checked, RTS = not checked) and clicked on "Connect." After a short pause, I noticed that the red and green lights on the interface were blinking and the Status window displayed the connect messages. A moment later, the HRD window changed to display the data from my radio! I disconnected and then reconnected to verify that the COM Port entry had changed to "COM5."

I also downloaded and tested the *TRX Manager* control and logging program (demo version), by Laurent Labourie, F6DEX, from **www.trx-manager.com**. I had to manually configure the interface settings and I used the information that I had recorded when I set up the HRD software. After that, the program connected to the IC-7000 and I was able to explore the functions of that software package also. In short order, I downloaded, installed and tested the *CI-V CAT* program/memory manager software, by Jr Spolestra, PE1BYW, from **www.tellina.nl/software** and the *IC-7000BKT ICOM IC-7000 CAT Control* software (free version), by Mauro Capelli, IZ2BKT, from **iz2bkt.altervista.org/ic7000bkt_en.htm**, as well. Like *TRX Manager*, I had to input the settings before the programs would connect and allow the software to control the radio.

LARRY KEITH, KQ4BY

Figure 1 — The package contains the interface cable assembly, a 3 inch stereo to mono adapter, a driver CD and instructions to install the drivers.

Hardware Test Complete!

So, I consider my RadioShack interface cable to be a keeper! Now, all I have to do is figure out which of those excellent software packages to use. — *73, Larry Keith, KQ4BY, 231 Shenandoah Trl, Warner Robins, GA 31088-6289*, **kq4by@rocketmail.com**

GO PORTABLE WITH AN MFJ-1775 ROTATABLE MINI-DIPOLE

◊ When MFJ introduced its rotatable, half-wave horizontal mini-dipole for 40, 20, 15, 10, 6 and 2 meters designed for home use, I immediately thought, "RV and portable operation?" So I purchased one and was entirely pleased. It's rugged and lightweight, has lower ground loss than quarter-wavelength mobile antennas, exhibits lower noise than a vertical, has moderate directivity, is capable of full legal power and is small enough to use on a recreational vehicle (RV). These are big

Steve Sant Andrea, WB2GYK ♦ Assistant Editor ♦ h&k@arrl.org

advantages compared to what many hams employ for RV and portable operation.

Basic Concept of the Antenna

The fundamental design of the antenna is technically sound and offers better performance than most ham antennas seen on RVs. For the HF bands it consists of four shortened end-loaded dipoles on a common boom. Six and 2 meters are included as a fan dipole.

The MFJ-1775 loading coils are stacked end-on-end on the same boom and top whips are replaced by capacitive hats made up of four short radials. A metal strap on the side connects the bases of all the loading coils together. Now, when RF is applied to the antenna, the currents "ignore" all but the one pair of loading coils and capacitive hats that brings the antenna to resonance on that frequency. The others appear as high impedances; that is, essentially switched out of circuit. My own experience bears this out. There is only modest interaction between bands.

There was, however, a problem. For RV use, the antenna is awkward to transport fully assembled. I had to perform constant assembly and disassembly on my first trip. It wasn't because the antenna was too large; it was because the capacitive-hat radials just "stuck" out inconveniently in all directions. But the solution was easy: I bent the radials at right angles near the boom. Now I can easily rotate them in against the boom for transport or storage (Figures 2 and 3). This configuration also makes fine tuning easier. Rotate the radials on any band toward the others and the tuned frequencies will decrease.

I wasn't sure if bent radials would disturb the tuning too much, so I first assembled the antenna with the unmodified parts as supplied and then compared the resonant frequencies, before and after bending, with an MFJ-259 Standing Wave Ratio (SWR) analyzer. I mounted the antenna on a 6 foot wooden ladder over average soil out in the clear. In the worst case, 10 meters, the resonant frequency increased by 600 kHz, easily within the tuning range afforded by trimming radials as supplied.

To bend the radials, use pliers to grasp each radial while installed on the antenna and make a right angle bend roughly ½ inch from the outer edge of the center mounting ring (Figure 2). The exact distance isn't critical, but do not bend right at the ring. This little extra space is necessary to let the radials remain clear of the aluminum strap that connects the loading coils together. Then trim the now-bent radials to bring each band to resonance, following the guidelines in the brochure. These work well and my bent-radial version performs as advertised on my RV.

JOHN PORTUNE, W6NBC

Figure 3 — View of radials ready for stowing.

As modified, I have found it to be the best of many RV antennas I have ever used. It is also a good choice for Field Day and portable situations. As a home antenna, it is not much larger than a TV antenna. The neighbors may not even notice it. — *73, John Portune, W6NBC, 1095 W McCoy Ln #99, Santa Maria, CA 93455,* **jportune@aol.com**

JOHN PORTUNE, W6NBC

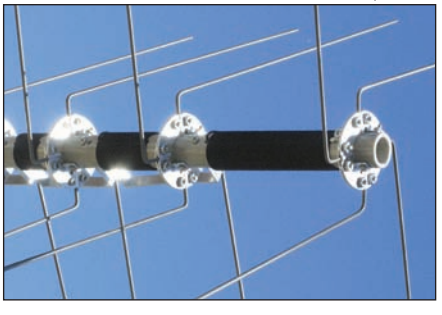


Figure 2 — Put a right angle bend in the radial about a ½ inch from the mounting ring.

TRANSCEIVER SUPPORT SHELF

♢ Recently I upgraded my main station antenna tuner to an autotuner, as this new autotuner is particularly well-suited for use with an amplifier. As a full legal limit autotuner, it is larger than my previous tuner. I resolved the space issue by building a transceiver support shelf that is high enough for the autotuner to fit under.

The main shelf consists of a leftover piece of 12 inch deep veneered particle board, two 4×1×12 inch pieces of oak and two 1×1×12 inch pieces of oak. I needed to stack the 4×1×12 inch and the 1×1×12 inch pieces of wood together since the autotuner is 4 inches high and the 4 inch high piece of oak is really 3.75 inches high. I held all the pieces together with countersunk #6 flat head wood screws.

Figure 4 shows the pieces prior to staining and assembly. Figure 5 shows the assembled shelf in the process of being installed as part of my station and Figure 6 shows the final result. Besides helping to keep my station compact,

PHIL SALAS, AD5X

Figure 4 — The parts used to make the shelf.

the new shelf also puts my transceiver closer to eye level, which makes operating even more of a pleasure! This is a good idea even if you don't have extra equipment to place under your transceiver, as you can also use this under-transceiver space for housing your logbook, key, microphone and anything else that normally clutters up your operating position. — *73, Phil Salas, AD5X, 1517 Creekside Dr, Richardson, TX 75081,* **ad5x@arrl.net**

CARE OF SOLDERING IRON TIPS

♢ K4ZA mentions iron plated tips briefly in his article "Soldering — Tips for Shopping, Survival and Success" [*QST,* Mar 2006, p 51]. Here's how to maximize the lifespan of an iron plated tip. Never wipe the tip on the sponge after a soldering operation. Wipe it before soldering only. When shutting down the iron, clean the tip on the sponge, shut off the power, then tin the tip with solder and let it cool down. Never shut down an iron with an iron plated tip dry; always wet it with solder. — *73, Dennis R. Murphy, KØGRM, 111 W Arikara Ave, Bismarck, ND 58501-2604*

POOR MAN'S WIND SOCK

♢ If you have a beam antenna (or several) on a tower, it is prudent to face the antenna elements perpendicular to the wind direction rather than broadside to it — particularly in high winds — to reduce the chance that the elements will be damaged. A simple wind direction finder can be made from a large plastic trash bag, available in various colors to "blend in." Cut a few small holes in the bottom to release any air or water and mount the bag near the top of the tower. It will indicate the direction and relative strength of the wind. — *73, Richard Mollentine, WAØKCC, 7139 Hardy, Overland Park, KS 66204-1710*

FT-817 POWER CONDITIONER KIT CONSTRUCTION MODIFICATIONS

♢ Phil Salas, AD5X, wrote an article ["Input Voltage Conditioner — and More — for the FT-817," *QST,* Jun 2005, pp 53-55] that

described an external modification to add fusing, reverse-voltage protection and over-voltage protection in one small box for the Yaesu FT-817 low power (QRP) transceiver. Brian Riley, N1BQ, improved this by offering an inexpensive kit (**www.wulfden.org/ft817.shtml**) for these functions. Here are some simple mechanical changes to supplement Brian's well-written instructions. Fumble-fingered tinkerers, take note.

There are three primary changes to address, described in the approximate sequence encountered while I built this kit.

1. Input voltage selection switch
2. Internal power connection point
3. Input power connection

Input Voltage Selection Switch

A simple double-pole double-throw (DPDT) slide switch is mounted with two 4-40 by ½ inch bolts to hold it in the case. Builders may find the inside dimensions very crowded, despite the very low parts count. Substitution of shorter bolts, such as ¼ inch, frees up valuable volume in the box. It may be necessary to slightly move or reposition the switch. Enlarge the mounting holes in the switch's ears and the plastic box to give some wiggle room.

Input Power Connection Point

This is the point inside the assembly's box where the power leads attach to the voltage regulation circuitry. Once again, the fit is tight. There is less room for those of us who squeeze or cram components in.

These leads connect to the Powerpoles' internal connection tabs — the wire insertion end, not the springy tongue that holds the mating connectors in place. These hold the wire leads in the plastic shells. Once inserted in the shell, they cannot be removed easily and this is the advantage. Carefully cut off about a ¼ inch of the plastic on the inside end of each of the red and black shells. Cut all four sides of each of the two shells. A small, fine-toothed hacksaw blade works for me. As with any tool, use proper eye and hand protection. Use care when using a soldering iron, which may melt the shell into an unusable blob.

If you anticipate a space problem, do the cutting before inserting the tabs in their shells. It is okay to insert the tabs in the shells, but do not solder the Powerpole leads to the other components of the circuit yet. After cutting off this ¼ inch by ½ inch volume and when installed in the case's cutout slot, there will be extra volume gained to compensate for construction technique.

Input Power Connection

Anderson Powerpoles provide polarity protection. Once made properly [that is, consistently with the ARES® norm; see "More Power to You," *QST*, Mar 2006, pp 31-33], cables and equipment become almost totally interchangeable. The kit instructions provide a simple diagram for measuring and cutting a slot for the two plastic shell assemblies, with suggested orientation. Once again, good construction technique ensures a good fit. However, other techniques (such as mine) mandate additional cutting or nibbling with a nibbler tool that can munch its way through the thin, soft plastic case very easily and quickly.

Measure carefully! Fortunately or not, extra cutting allows slew or slop room for repositioning the mated Powerpole pair, which allows forgiveness for cramped components inside the case. At this point, attach the top cover as instructed to hold the pair in place in its "adjusted" position and use hot-melt glue to fill any gaps. Use sufficient glue to fill the gaps on all sides except the top cover space, if any. Squeeze extra glue into the case's cavity for extra holding and support. The space between the Powerpole pair and top cover can be filled with thin sponge rubber or other filler material. Hold in position carefully until cool; it'll only be a minute or two.

Finished Result

When the job is complete, the electrical integrity is maintained, the mechanical fit fits and, cosmetically, the case looks just as it should. This set of changes does not add to the functionality of the Power Conditioner circuit or kit, but it compensates for construction challenges present in the design. — *73, Eric Falkof, K1NUN, 2 Hickory Hill Rd, Wayland, MA 01778,* **k1nun@arrl.net**

PHIL SALAS, AD5X

Figure 5 — A good fit.

Figure 6 — The shelf in use giving the shack a clean and professional look.

PHIL SALAS, AD5X

Hints and Kinks items have not been tested by *QST* or the ARRL unless otherwise stated. Although we can't guarantee that a given hint will work for your situation, we make every effort to screen out harmful information. Send technical questions directly to the hint's author.

QST invites you to share your hints with fellow hams. Send them to "Attn: Hints and Kinks" at ARRL Headquarters, 225 Main St, Newington, CT 06111, or via e-mail to **h&k@arrl.org**. Please include your name, call sign, complete mailing address, daytime telephone number and e-mail address on all correspondence. Whether praising or criticizing an item, please send the author(s) a copy of your comments. QST

This Month in Contesting

Sean Kutzko, KX9X
ARRL Contest Branch Manager, kx9x@arrl.org

GENTLEMEN, START YOUR ENGINES....ER, RIGS!

In case you haven't noticed yet, this issue of *QST* highlights Radiosport, and in a big way. ARRL members in general have asked for more information on the art and science of Radiosport in *QST* for some time; the feedback on the new look of the Radiosport section in *QST* has been *very* favorable. We hope that you will enjoy the extra articles in this, the first special Radiosport issue of *QST*.

The timing of the special Radiosport *QST* is not coincidental, as October is generally viewed as the beginning of "Contest Season." October features the Oceania DX Contests (SSB and CW), the California QSO Party and the biggest of the Big Ones, the CQ World Wide DX SSB Contest. In addition, the premier W/VE event, the ARRL November Sweepstakes is just around the corner. Nothing like heralding the beginning of another contest season with a bang!

Three Features — and an Insert

This issue features three excellent articles on the art of contesting itself: Steve Clifford, K4GUN, is a recent convert to "roving," or operating in a VHF+ contest from a mobile station. Steve provides insight as to why he loves to rove and some of the things he's learned since becoming a rover. Gil McElroy, VE3PKD, presents some of the history of contesting and how contests came to be a part of Amateur Radio. Last comes an interview with one of the best contesters on the planet, Tim Duffy, K3LR. Tim's station is world-famous and his results in major contests are legendary. Take some time and read what one of the "best of the best" has to say about our favorite on-air activity.

But wait — there's more! The special 8-page Radiosport insert presents articles and reference material for everyone interested in contesting. There's an article on how to interpret your Log-Checking Report (one of the great tools to improve your performance), and some practical guidelines for contesting. To help answer one of the more common questions received here at the Contest Branch, I've provided a short primer on the Cabrillo logging format and submitting your log electronically. You'll also find a year-long 2009 contest calendar, just the ticket for planning your Radiosport activities. And there's a page of various and sundry contesting resources.

Two New Programs

We are also announcing two major ARRL programs for this coming contest season. The ARRL Contest Branch is declaring 2009 to be the Year of the State QSO Party. State QSO Parties are excellent middle-tier competitions for newcomers, focusing attention on a specific state or region for an entire event. Some aren't so "middle-tier," with the larger state contests being major events in their own right! To encourage all amateurs to get involved in their state's QSO Party in 2009, the ARRL is offering a free downloadable certificate and state flag stickers to track your progress in working all 50 states during their QSO Parties or in regional contests. The rules are in the Radiosport insert.

The second big announcement concerns the November Sweepstakes. "SS" is the longest-running stateside contest, borne of the Hiram Percy Maxim Birthday Relay Party of 1929. As noted in "CQ Contest!" elsewhere in this issue, the first actual Sweepstakes contest was held in January 1930. With the exception of 1942-1945, when Amateur Radio was halted during World War II, Sweepstakes has been held every year since. That makes 2008 the 75th running of SS!

To commemorate this Diamond Anniversary of Sweepstakes, the ARRL is offering special awards for 2008. Any station that completes a "Clean Sweep" by working all 80 ARRL/RAC sections in either the Phone or CW Sweepstakes will receive a Clean Sweep whisk broom *free*. These are similar to the whisk brooms we gave out in 1983 for the 50th Sweepstakes. We will also give away a free refrigerator magnet to any station that submits a log and works 75 sections for the 75th anniversary of SS.

"But what of the coffee mugs?" you ask. Not to worry — Clean Sweep coffee mugs will still be available for purchase. We can't quite afford diamond mugs, so we'll do the next best thing — lead crystal. These are sure to be highly sought after and will definitely look good on your desk. Participation pins for submitting a Sweepstakes log with 100 QSOs will also be available for purchase, as in years past.

Jump Right In

Contests continue to be a major source of operating enjoyment for the serious and casual operator alike. The serious contester gets the thrill of the competition on a big stage; the casual operator enjoys the fun at a more leisurely pace, working toward a DXCC or WAS award, or merely getting a chance to work more DX in a weekend than they normally would in a month.

Whatever the individual motivation, the fact remains that more amateurs are enjoying Radiosport than ever before. Don't sit on the sidelines. Even with no sunspots to speak of, this contest season promises to be one of the best ever!

October 2008 QUALIFYING RUNS

♦ W1AW Qualifying Runs are 10 PM EDT Monday, October 6 (0200Z October 7) and 4 PM EDT (2000Z) Wednesday, October 22. The West Coast Qualifying Run will be transmitted on 3590 kHz by station K6YR at 9 PM PDT Wednesday, October 15 (0400Z October 16). Unless otherwise indicated, code speeds are from 10-35 WPM.

In the September/October "Contesting 101"

Kirk Pickering, K4RO talks about contest station construction, and what makes a contest station different from a "ragchew" station. "Contesting 101" can be found in the *National Contest Journal*, published six times per year. For subscription information, visit **www.arrl.org/ncj**.

Operating Tip of the Month

"QRS, OM!" If you're trying your hand at a CW contest for the first time, don't be afraid to ask stations to slow their sending down. QRS is what you send to make that request. You can also find slower CW stations higher in the band (above .050) during most major contests.

CONTEST CORRAL

In association with the *National Contest Journal*

OCTOBER 2008

Start & Finish	HF	VHF+	Contest Title	SSB	CW	Dig	Exchange	Sponsor's Web Site
3 Oct 1400Z - 5 Oct 0200Z	1.8-28		YLRL Anniversary Party		✘		Serial, RST, and section/province/country	www.ylrl.org
4 Oct 0000Z - 4 Oct 2400Z	1.8-28	50	PSK Rumble — The Fall Classic			✘	Name and S/P/C	www.n2ty.org
4 Oct 0800Z - 5 Oct 0800Z	1.8-28		Oceania DX Phone Contest	✘			RS and serial	www.oceaniadxcontest.com
4 Oct 1600Z - 4 Oct 1959Z	3.5-14		EU Autumn Sprint	✘			Both call signs, serial, name	www.eusprint.com
4 Oct 1600Z - 5 Oct 2159Z	1.8-28	50,144	California QSO Party	✘	✘		Serial and state/prov/"DX" or CA county	www.cqp.org
5 Oct 0700Z - 5 Oct 1900Z	21,28		RSGB 21/28 MHz Contest	✘	✘		Serial and UK district	www.rsgbhfcc.org
8 Oct 7 PM - 8 Oct 11 PM		432	Fall VHF Sprints	✘	✘	✘	Grid square	www.svhfs.org
10 Oct 0001Z - 10 Oct 2359Z	28		10-10 Sprint	✘	✘	✘	Call, name, 10-10 number, S/P/C	www.ten-ten.org
10 Oct 1400Z - 12 Oct 0200Z	1.8-28		YLRL Anniversary Party	✘			Serial, RS, and section/province/country	www.ylrl.org
11 Oct 0800Z - 12 Oct 0800Z	1.8-28		Oceania DX CW Contest		✘		RST and serial	www.oceaniadxcontest.com
11 Oct 1200Z - 12 Oct 1200Z	14-28		Worked All Britain HF Contest	✘			RS, serial, DXCC entity or WAB area	www.worked-all-britain.co.uk
11 Oct 1600Z - 11 Oct 1959Z	3.5-14		EU Autumn Sprint		✘		Both call signs, serial, name	www.eusprint.com
11 Oct 1600Z - 12 Oct 2200Z	1.8-28	50,144	Pennsylvania QSO Party	✘	✘	✘	Serial and ARRL/RAC section	www.nittany-arc.net/paqso.html
11 Oct 1700Z - 11 Oct 2100Z	3.5-28		FISTS Fall Sprint		✘		RST, S/P/C, name, FISTS number or pwr	www.fists.org
12 Oct 0000Z - 12 Oct 0400Z	3.5-14		North American RTTY Sprint			✘	Both call signs, serial, QTH, name	www.ncjweb.com
12 Oct 0000Z - 12 Oct 2359Z	3.5-28		SKCC Weekend Sprint		✘		S/P/C, SKCC number or power	www.skccgroup.com/sprint/wes
12 Oct 1300Z - 13 Oct 0700Z	1.8-28	50,144	Classic Exchange		✘		Name, RS, S/P/C, type of equipment	qsl.asti.com/CX
18 Oct 0000Z - 19 Oct 2400Z	3.5-28		JARTS WW RTTY Contest			✘	RST and age (YL may send '00')	www.edsoftz.com/JARST
18 Oct 0000Z - 19 Oct 2359Z		50-1296	ARRL EME Contest	✘	✘	✘	Both call signs, signal report	www.arrl.org/contests
18 Oct 0000Z - 18 Oct 2359Z	1.8-28	50,144	FOC Bill Windle QSO Party		✘		RST, name and FOC number if member	www.firstclasscw.org.uk
18 Oct 1200Z - 19 Oct 2400Z	1.8-28		QRP ARCI Fall QSO Party		✘		RS(T), S/P/C, QRP ARCI number or pwr	www.qrparci.org
18 Oct 1500Z - 19 Oct 1500Z	1.8		Stew Perry Warmup Contest		✘		Grid square	web.jzap.com/k7rat/stew.rules.txt
18 Oct 1500Z - 19 Oct 1459Z	3.5-28		Worked All Germany	✘	✘		RS(T) and serial or DOK code	www.darc.de/referate/dx/fedcg.htm
18 Oct 1600Z - 19 Oct 2359Z	1.8-28	50	W/VE Islands QSO Party	✘	✘	✘	RS(T) and S/P/C or island designator	www.usislands.org
18 Oct 8 PM - 19 Oct 2 AM	1.8		Great Pumpkin Sprint			✘	RST and S/P/C	www.podxs070.com
18 Oct 2200Z - 18 Oct 2400Z	1.8,3.5,7,21,28		Feld-Hell Spooky Sprint			✘	RST, S/P/C, name, Feld-Hell nr or age	www.feldhellclub.org
18 Oct 2300Z - 19 Oct 0300Z		50	Fall VHF Sprints	✘	✘	✘	Grid square	www.svhfs.org
19 Oct 0000Z - 19 Oct 0200Z	14-21		Asia-Pacific Sprint		✘		RST and serial	jsfc.org/apsprint/aprule.txt
19 Oct 1700Z - 20 Oct 0100Z	1.8-28	50,144	Illinois QSO Party	✘	✘		RS(T) and S/P/C or county	www.w9awe.org
20 Oct 1300Z - 24 Oct 2400Z	1.8-28	50+	School Club Roundup	✘	✘	✘	RST, class, S/P/C	www.arrl.org/SCR
22 Oct 0000Z - 22 Oct 0200Z	1.8-28		SKCC Straight Key Sprint		✘		S/P/C, SKCC number or power	www.skccgroup.com/sprint/sks
25 Oct 0000Z - 26 Oct 2359Z	3.5-28		CQ WW SSB Contest	✘			RS and CQ zone	www.cqww.com
25 Oct 0001Z - 10 Oct 2359Z	28		10-10 Fall CW QSO Party		✘		Call, name, 10-10 number, S/P/C	www.ten-ten.org
25 Oct 0001Z - 10 Oct 2359Z	28		10-10 Fall Digital QSO Party			✘	Call, name, 10-10 number, S/P/C	www.ten-ten.org
25 Oct 6 AM - 25 Oct 12 PM		902+	Fall VHF Sprints	✘	✘	✘	Grid square	www.svhfs.org

All dates refer to UTC and may be different than calendar date in North America. No contest activity occurs on 30, 17, 12 meters.
Refer to the contest Web sites for full rules, scoring information, operating periods or time limits, and log submission information.
Serial — Sequential number of the contact. S/P/C — State, Province, DXCC Entity
Publication deadline for Contest Corral listings is the first of the second month prior to publication.

Check for updates and a downloadable PDF version online at www.arrl.org/contests

Gear Up for ARRL November Sweepstakes

A landmark event in Amateur Radio Contesting: The 75th running of the November Sweepstakes

CW: 2100Z Saturday, November 1 – 0300Z Monday, November 3, 2008

Phone: 2100Z Saturday, November 15 – 0300Z Monday, November 17, 2008

Since 1930, the ARRL November Sweepstakes has been the premier domestic Radiosport event. This contest brings out all levels of operator and is guaranteed fun for everybody. Can you get a Clean Sweep? How many QSOs can you make? You'll never know if you don't try! Complete rules can be found at

www.arrl.org/contests

- Special prize for working 75 sections in the 75th Sweepstakes!
- An old ARRL tradition returns: Free "Clean Sweep" whisk brooms for all stations that work all 80 ARRL/RAC sections!
- Lead crystal Clean Sweep mugs will be available for purchase.
- Participation pins available for making 100 contacts!

Help us celebrate the diamond anniversary running of ARRL November Sweepstakes...this year's SS is going to be something special. Get in on the fun!

Sean's Picks

- **State QSO Parties this month:** California, Illinois, Pennsylvania.
- **Oceania DX SSB Contest (October 4-5):** Point those beams west and work as many stations in the Pacific area as you can. A good event to snag VK, ZL and other Pacific DX.
- **10-10 Sprint (October 10):** 24 hours of activity on 10 meters. SSB, CW and Digital modes are allowed. Exchange is your call, name, 10-10 number and State/Province/Country. Don't have a 10-10 number? Work 10 stations that do and request your own from Ten-Ten International (**www.ten-ten.org/**)! A great contest for Technician licensees.
- **Worked All Britain HF Contest (October 11-12):** Monty Python asked, "Who are the Britons?" Here's your chance to find out! Work as many 10 km × 10 km areas in Great Britain as possible. Visit **www.worked-all-britian.co.uk** for complete information.
- **W/VE Islands QSO Party (October 18-19):** Numerous islands throughout the US and Canada qualify for this fun event, which stresses portable operation. How many islands can you talk to? Join in on the fun from home, or operate from an island yourself!
- **CQ World Wide Phone DX Contest (October 25-26):** The biggest worldwide DX contest on the planet. Everybody works everybody. This is the event to work a lot of DX in a short amount of time.

School Club Roundup 2008

Enthusiasm was high during last season's two SCRs. Next up: October 20-24, 2008 and February 9-13, 2009.

Lew Malchick, N2RQ
n2rq@arrl.net

The 2007-2008 school year had two School Club Roundups (SCR) for the second time. There was a small reduction in entries: 31 in October 2006 to 29 in October 2007 and 54 in February 2007 to 49 in February 2008, even though entries from high schools increased in February 2008 from 10 to 17. Reported numbers of participating operators also dropped from 403 to 377 in October 2007 and 565 to 439 in February 2008. (Reported operator numbers are highly variable because some entrants only count licensed operators, while others count all visitors to the station.) Phone (Voice) is the predominant mode followed by both CW and PSK31.

RONNY RISINGER, KC5EES

Nathan Szalwinski, KE5OES, holds the homebrew PSK31 interface that he built for use by the LBJ High School ARC, K5LBJ, Austin, Texas. The club placed second in the Senior High division (see February Soapbox).

In spite of these reductions, there were some individual standouts that had significantly higher scores, especially in February 2008. Contributing factors include the low of the sunspot cycle and numerous reports of school radio operations shut down because of severe weather that caused schools to close.

Frequent elementary school leader Kermit King Elementary School, N6KKS, Paso Robles, CA, topped the October and February 2008 list with less than half the October score and only a slightly higher February score compared to the previous year. The competition between K5LSU, Louisiana State University, college leader in October 2006 and 2007 and February 2007, and W7ASU, Arizona State University, the February 2008 leader, continues. Although most college entries showed lower scores, year to year, K5LSU and W5YM (University of Arkansas) and W7ASU bucked the trend. Perhaps their new "permanent" shack helped W7ASU to top the nearest contender, WD5AGO (Tulsa Community College), by more than 10 times.

The Junior High/Middle schools showed consistent scores, year to year, in October, with KD5VVI, McMichael Middle School Nacogdoches Independent School District ARC, overtaking K4WBM. The February scores, however, were substantially lower for most, with K4WBM overtaking K7BZN to exchange places in 2008.

High schools were a bright spot showing increased participation, with 9 entries in both October sessions, 10 in February 2007 and 17 in February 2008. William Byrd HS, WB4HS, Vinton, Virginia, repeated as October leader as did Wagoner Windtalkers, WI5ND, Wagoner, Oklahoma, for February 2007 and 2008.

It seems that each year communities where our school participants are located have had to deal with serious situations. These were usually weather related. There have been snow, ice storms, tornados and earthquakes. This year our friends at W9NIU, Northern Illinois University, ceased operation shortly after the shooting incident on their campus. Their abbreviated entry made no mention of it, but other operators took note in comments with their entries. We are grateful that none of them were directly affected.

Complete score listings may be found at **www.arrl.org/scr.**

The next SCR sessions will be October 20-24, 2008 and February 9-13, 2009. See **www.arrl.org/scr** and join our group **SCR-L@yahoogroups.com** for more information.

Soapbox Comments from October 2007

Not the best conditions but always a lot of fun to talk to the kids. — *K3FBI*

In listening I was very happy to hear so many hams making contacts with our clubs. They have been just super! — *Marty, KA2NRR*

It was tons of fun! Thanks! — *SV2KBS*

Thanks for a great fall SCR. The effort is being used as a warm-up for the November Sweepstakes. Every time we operated a frequency, we had a pileup on 20 meters. Never realized that Arkansas could be considered a rare DX station. Even after SCR was over on Friday, we had people trying to contact us for a couple of hours afterwards. It was really nice chatting with one group in Alabama where 10 different scouts came on the air and said hello Razorbacks! — *W5YM*

Despite the poor conditions, students were able to ragchew with friendly amateurs in the US, Canada and Europe — *Kermit King ARC, N6KKS*

We didn't score as well but we sure exposed a lot of kids to Amateur Radio — our main objective. — *K4WBM*

Soapbox Comments from February 2008

I caught the bug in August when a ham in Virginia mentioned the SCR. I operated in the fall of 2007 and was totally hooked. I was fortunate enough to have the week off from work and several hours a day to spend in the shack hunting for schools. Pure ham heaven! 73, see you in the fall. — *Jon, KC2PNF*

Poor conditions and lower number of schools logged. Made use of 80 meter phone and CW to get QSOs up. Even a little moonbounce. — *WD5AGO*

K2GXT is back on the air! We had a great turnout. Thanks to all the school clubs that got on the air this year as well as all the stations that gave the school points. 2008 February SCR was awesome! 73 and hope to see everyone next year! — *K2GXT*

We worked 2 hours because of 2 snow days, a 2 hour delay and an early dismissal. It was fun anyway and memorable. — *Gloria, N3IOP, W3NCS*

SCR has been a wonderful tool to promote Amateur Radio in our school! Thanks for all of the support from the Amateur Radio community! — *W8BYC*

This was the year of PSK31 for our club. One of our club members, Nate, KE5OES, built an interface from scratch. It functioned beautifully and allowed us to enjoy a successful SCR despite poor band conditions. Students operating Amateur Radio using homebrewed equipment. It doesn't get better than that. — *Ronny Risinger, KC5EES* (Sponsor of K5LBJ)

Terrible conditions on Monday and Tuesday on 20 meters. Thursday was better. Student ops did nearly all the operating. — *W2CXN*

Well, it happened again. Our club operated on Monday after school and then our school closed at noon on Tuesday and remained closed on Wednesday because of snow and ice. Although we did get to operate on Thursday after school, the bands were so bad that other than two CW contacts we were not able to work anyone else, even on 2 meter simplex. — *Hal Messer, K3ATO*

First time to try our hand at making contacts. The students seemed to enjoy it. Thanks for a great week. — *K5LHS*


W3ZZ

THE WORLD ABOVE 50 MHz

The Summer of 2008

Every VHF summer season has its own peculiar characteristics and 2008 is no different. This month I want to review some of the more interesting occurrences from summer 2008 and provide some details about events that space constraints prevented being covered in the previous 2 months. None of this would be possible without the many e-mails from my readers and without the propagation reflectors at **DxWorld.com**, DX Summit (**www.dxsummit.fi**) and DX Sherlock (**www.vhfdx.net/spots/index.php**).

Six Meters: SSSP Propagation to Japan

As we mentioned last month, there has been an unusual amount of propagation to Japan, much of it from areas like the East Coast, Midwest and Southeast that do not usually get openings to that area. In 1996 Han Higasa, JE1BMJ, published an article in *CQ Ham Radio* (Japan) entitled "SSSP: Short-Path Summer Solstice Propagation" that addresses long (~10,000 km or more) polar path contacts most likely via the sporadic E (E_s) layer and describes a heretofore unrecognized possible propagation mode that could explain many of the US to JA contacts seen this summer and last summer.

Briefly, Han believes that, especially the longest of these contacts, is not likely to be the result of multi-hop (6 hops for the East Coast or more) E_s because the signal degradation of that many reflections would render the signals inaudible. The situation for JA to Europe would be even less likely because all the hops would require reflection from land surfaces; the US/JA path is mostly over water. Instead, Han raises the possibility that such contacts are the result of a process that includes chordal refraction followed by propagation across the polar regions along a region at E layer height containing ice crystals called the Polar Mesosphere Summer Echo (PMSE) that is known to reflect radar echoes. On the other side of the pole the signal emerges from the PMSE and is propagated by chordal E_s to the receiving station.

We don't have to agree with all parts of Han's theory to see its overall value as a concept. Han describes certain markers of SSSP propagation: 2100-0200Z timeframe; direct short path azimuth; weak but undistorted signals with slow cyclic fading; irregular openings varying from day to day, and usually requiring high power and high, big antennas to participate. The latter point can be violated as the opening on July 10 noted below reached essentially only stations with lower "ordinary" antennas on the East Coast and produced numerous contacts for such stations in the 8th and 4th districts. The diurnal time around the gray line path points to a different mechanism from the "traditional" JA openings to the Northwest and West Coast, which normally occur later around 0200-0400Z; by normal E_s these would have ~4 hops crossing Alaska and most often Alaska is heard in association with these openings. SSSP openings often do exhibit E_s to beacons in northern WI, MN and nearby VE locations but almost never to Alaska.

Propagation via the PMSE is certainly possible but there is no reason to believe that "normal" mechanisms involving marginal MUFs might be sufficient to keep the signal from touching ground over two or more chordal hops and deliver a copiable signal over the 10,000 km distance. Some of the best but longest contacts have gone to Florida; the path here at best grazes the auroral zone. This path appears around the summer solstice — June 21 in the Northern Hemisphere. It has been discovered during the sunspot minimum and thus may have something to do with solar-minimum magneto-ionic conditions. One test is to see if this path disappears or becomes much less frequent when solar geomagnetic conditions increase during the upcoming solar cycle. On days when the field approaches disturbed levels this year, SSSP path propagation appears to diminish. The one important fact is that there are stations on both sides of the path looking for propagation where none had been expected in the past. For this JE1BMJ deserves a lot of credit. First, he and then other JAs have faithfully appeared every day early in their morning looking for this opening. In many respects it resembles what is observed at those local times by very well equipped US stations like K1TOL and K1SIX over shorter distances well into Europe, openings that stations 1000 km south do not normally get. [I thank N3DB and KH6/K6MIO for discussions of this subject.]

The other interesting event this summer was the second instance in recorded history where Alaska has worked stations in Europe. The Alaskan end of the path was again Kevin, NL7Z (BP51) as it was in 2006. Kevin says he worked a narrow slice into Europe, first Tadas, LY2BAW, at 1144Z July 3 and then four OH stations, OH1BC, OH1ND, OH1TV and OH1O. SP5EWY was at the noise floor and ultimately could not be worked. Signals were clear like E_s with no auroral flutter. Kevin was running the same equipment as before, a pair of 3CX800A7 to 2×6 element Hy-Gain 66DX. He says working Europe on 6 for the second time was just as exciting at the first time in 2006.

Other than Japan, similar openings from Europe to Japan and the KL7/Europe contacts, 2008 has imitated 2007 and not been particularly outstanding especially from the US to Europe. Openings have remained numerous but signals have been relatively weak and at levels more suitable for CW Stations with the bigger antennas appearing to have had an advantage and real perseverance has been even more important than usual. The interesting point is the predominance of northern Europeans later in June [OY, SM, LA, LY, OH, OZ in KP, JP fields rarely heard on E_s] noted by N3DB and AC4TO before the band reverted to a more southerly path after early July. Earlier in the summer like

This Month

October 8	432 MHz Sprint
*October 12	Good EME conditions
October 17-18	2008 Microwave Update Bloomington, Minnesota
October 18-19	ARRL International EME Competition
October 19-20	50 MHz Sprint
October 25	Microwave Sprint

*Moon data from W5LUU

Gene Zimmerman, W3ZZ ♦ 33 Brighton Dr, Gaithersburg, MD 20877 ♦ w3zz@arrl.org; (301-948-2594)

in 2007 stations east of the Mississippi and on the East Coast worked Hawaii especially Fred, KH7Y.

Two Meter E_S

This has been a banner year for 2 meter E_S in the US but still much less impressive than in Europe (see below). The late May opening began ~2322Z May 29 and ended around 0015Z May 30. Contacts were generally northeast to southwest with a few north/south from FL to the Midwest (see Figure 1). The E_S cloud appeared to start in central WV and drifted southwest into KY. A number of very long contacts were made with an ODX of 1478 mi/2378 km between K1WHS (FN43mj) and K5EMP (EM30mx).

The June VHF QSO Party featured one of the most wide ranging and persistent 2 meter E_S openings in recent memory. The two known 222 E_S MHz contacts were covered last month. There were two separate openings: an early one 1340-1553Z and a late one 1744-2121Z. AA4ZZ, N4QWZ, AA5JG, K5DYY, K5LLL, W5KI, W5UWB, WA5IYX, K7ICW, K7XC, K8TQK, KØGU, KAØRYT and **DxWorld.com** and DX Sherlock contributed to the map in Figure 2. The early opening extended east to WV/NC, north to MN, south to the boot of TX and west to CO and the AZ/NM border. ODX was 2176 km from K8GP (FM08fq) to W3DHJ/R (DM78rf). The late opening had two branches: the major branch extended west to NV, NW to WA, north to MN, east to AR; a minor branch went from TX to FL. ODX was 2102 km between W5KI (EM36cl) and W7ID (DN13pp).

Figure 1 — 2 meter E_S opening May 29-30.

A second East Coast to Midwest opening with a reflecting point over Ohio ran between 1707 and 1745Z on June 4. I received only three reports, two from Joe, N3JNX (FN11) and Matt, WV1K (FN41) both on 146.52 FM simplex and one on SSB from Ron, N4XD (FM05) to EN45. The other reports from the propagation reflectors generate the map in Figure 3. On June 13 a mostly NW to SE opening developed between 0131 and 0323Z. Reports displayed in Figure 4 were received from Jay, KØGU (DN70) Todd, N4QWZ (EM66) and the prop reflectors. ODX was 2006 km between KØGU (DN70mq) to W4WA (EM84ei). On June 28 Ivars, KC4PX (EL98qg) worked EN32, 40, 41, 50 around 0100Z.

Two meter E_S events in July appear in "On the Bands" below.

Two Meter E_S in Europe. This was another real good year for 2 meter E_S in Europe but not as good as some in the recent past. Strong/long openings were rarer than in the past few years and the usual strong concentration in southwest Europe was absent with the exception of an unusual number of contacts with CT1HZE (IM57nh) on some days. Information from the Make More Miles on VHF site at **www.mmmonvhf.de/es.php** indicates an E_S frequency of 6 days/10 hrs in May; 12d/9h in June; and 12d/4h in July or a total of 30d/23h for the season through July. Double hop openings were rare. Among the ODX I saw were RA6BU-EA6VQ (2890 km) 05/27; DF1VW-EA8ACW/p (3028 km) 06/22; GØJJG-EA8TX (3023 km) 06/28; and DK2MAX-EB8AYA (3161 km) 07/30.

Next month among other things we will look at some of the many DXpeditions that enlivened 2008. Until then enjoy the tropospheric ducting that we often get in October.

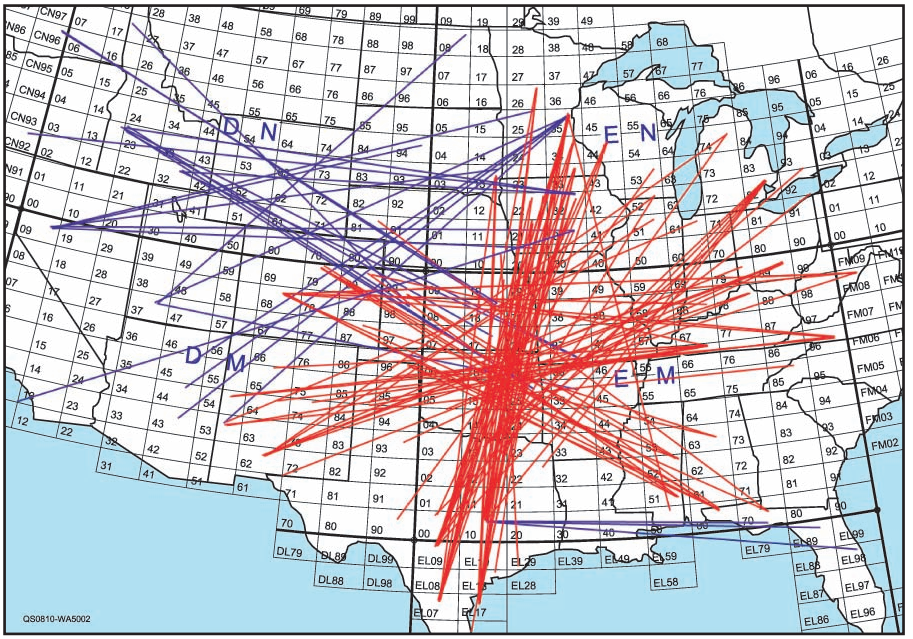


Figure 2 — 2 meter E_S on June 15 during the ARRL VHF QSO Party. Early opening in red; later opening in blue.

ON THE BANDS

First 70 MHz/50 MHz Crossband Contact Between Europe and US. On July 12 at 1651Z Joaquin Kraft, CT1HZE (IM57nh) and Emil Pocock, W3EP (FN31vp) completed the first known Europe-US 70/50 MHz crossband contact at a distance of 5334 km, a new 70 MHz crossband record. This contact coincided with a period of excellent propagation to southwestern Europe from the US on 6 meters. The first Europe-North America 70/50 crossband contact was between G7CNF and VE9AA in 2007. CT1HZE was on 70.200 CW and both stations were on 50.133 SSB. CT1HZE was at least 559 on 70.2 for about 40 seconds. W3EP was using a 70-28 MHz converter (thanks to GØGXP) and GaAsFET preamp to an ICOM IC-706 transceiver with an HB 4-element Yagi at 50 feet. He was using a two-cavity filter between the preamp and the antenna to filter out Channel 4 TV. CT1HZE was using a Yaesu FT-736R transceiver with a Spectrum Transverter and a 100 W power amplifier to a 6 element WiMo Yagi. Congratulations to Joe and Emil. (Thanks W3EP)

Microwaves. At 2100Z June 24 Guy, F2CT/p, on Roc de Montalet (JN13iq) running 7 W set a new 24 GHz world distance record working Marc, F6DWG/p, near Beauvais, Oise, Picardie (JN19aj) running 2.5 W via rain scatter with the scatter point around JN17. The new record, 637 km, bests the previous record of 544 km between W5LUA and WW2R set in 2002. Guy then came close to completing with LX1DB (JN39) with 4 W at 710 km lacking only the final rogers for still another record. Congratulations to all!

6 Meters. Though conditions were variable, there were still reports of working DX while mobile (CT1HZE by W4RVZ) or with little or no antenna. Thanks to my correspondent's e-mails and to KI2L, WB2AMU, WD4ELG, AA4H, WB4SLM, KD5IHZ, W7RV, N9HF and XE1JPP not otherwise mentioned.

The big news again is Japan to the US including areas other than the West Coast. Han, JE1BMJ (QM05br) tells Al, K3TKJ, that Han worked 50 Ws on 7/8-9; 85 W + XE2 on 7/10-11

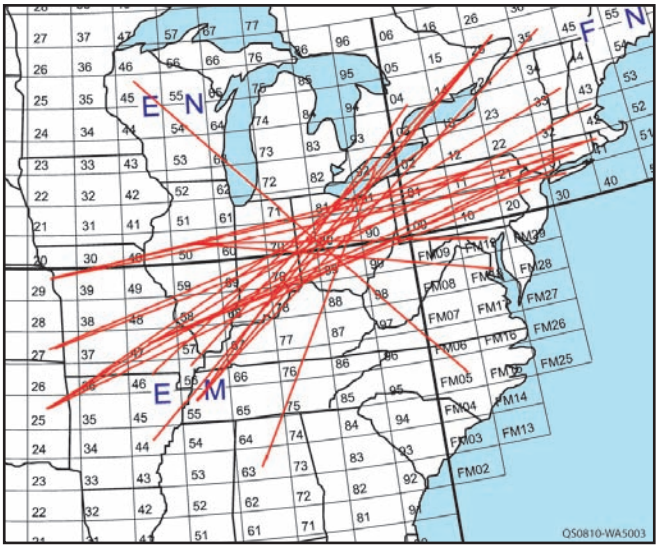


Figure 3 — 2 meter E_s on June 4.

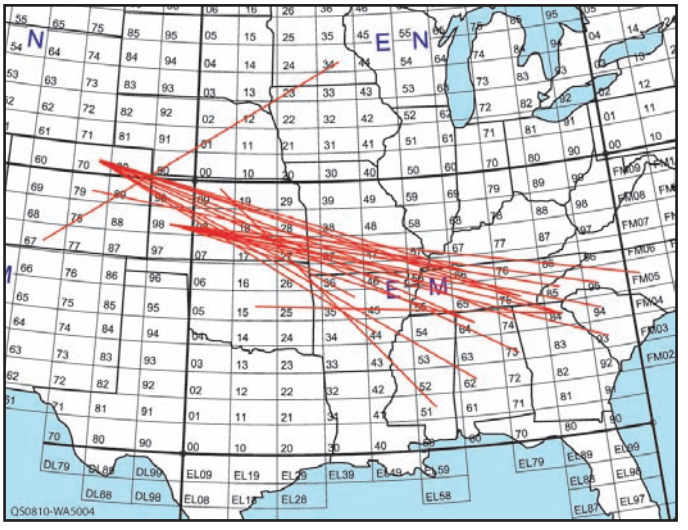


Figure 4 — 2 meter E_s on June 13.

and 30 Ws on 7/11-12. For the summer Han tells me that he worked 450 Qs with W, KL7, KH6, XE2 and HI3 and 50 Qs with Europe. His ODX is 13101 km to HI3TEJ on June 12. In summary I have received reports of JAs on the following days: July 8-9 K3TKJ (FM28), N3DB (FM18), K4CIA (FM05), W4TJ (FM08), W3TC (FN00), K4QI (FM06), K7JA (DM03); July 9-10: K3TKJ, N3EB, N4XD (FM05), AC4TO (EM70), K5SW (EM25), K6QXY (CM88), WZ8D (EM89) 13 JA, NØKE (DM69); July 10-11 K4PI (EM73) 11 JA, K4CIA, K4QI 27 JA, K5SW, K8KS (EN82) 25 JA, WZ8D 50 JA, KØGU (DN70); July 11-12 KØGU; July 12 K4QI, W4MW (EM95) 8 JA; July 15 K5SW, KØGU, NØKE; July 29 AH6FC/W7 (CN85) 6 JA; KØGU 60 JA in all call districts; NØKE. Walt, AJ6T (CM87) worked HL3IUA and Roger, W4MW (EM95) heard the HL on the 11th; Roger may have heard a UAØ at that time.

Openings to Europe reverted to primarily southern and southwestern European paths. Correspondents indicated openings on at least 12 days. Several openings extended west of the Mississippi and a few reached California. Of the latter Chip, K7JA (DM03) worked CT3, EA8 and EA; Leo, KJ6HI (DM03) and Keith, K6GXO (DM04) worked EA8. Jay, KØGU (DN70) in northern CO worked EA, EA6, CT, I, ISØ on the 11th. Several stations in the Southwest and Midwest made it into Europe including John, W5UWB (EL17) [7/8], Bill, WAØKBZ (EM48) [7/9] and Al, K7ICW (DM62) [7/2]. The south and the northeast worked some interesting countries from time to time: K4QI on 6 days to such countries as 4O, HA, HBØ, LZ, S5, SP; N3DB numerous days including E77, LY, OH.

Multihop transcontinental E_s was noted on July 7, 8, 10, 23, 25, 26 and 31 by K4QI, KD4HXT/6 and KJ6HI. After a dearth of Caribbean contacts during the last half of June and the first week in July, many areas of the country, including the Pacific Northwest, worked into that area. On a few days PYs were worked as far away as W7. From the other end Julio, NP3CW, reports strong US openings on July 13, 14 and 22 as well as numerous openings into Europe.

Next month when we have more space, we will review the several 6 meter DXpeditions that took place during the summer.

2 Meter E_s. On July 2 a strong opening with a center over southern TN occurred between ~0045-~0145Z. Ken, KE2N (FM18) worked EM51 and EM40 near the Delta. **DxWorld.com** and DX Sherlock reports contacts in almost every direction through the center: EM12-FM14; EM21-FM05, EM95; EM51-FM19, FN10, EM89; EM60-EN92; EM70, 74-EN61; EL87-EN10, 61, EM29; EL98-EN32, 40; EL99-EN50; EM80-EN40; EM81-EN41, EN50. Around 0200Z July 4, Jay, KØGU (DN70) reports a short opening to the Pacific Northwest CN87, 88, 96. On July 9 KØGU worked a single contact into CN87. Earlier DX Sherlock reports a contact between EM13 and DN13. On July 22 there was a thin opening from 1644 to 1725Z. Mike, WB3JVD/8 (FM19) worked stations in EM25, 26. DX Sherlock reported contacts from EN45-FM02, 16 EL19; EN10-FM05; DN81-EM55. On July 26 around 2100Z Dave, K1RZ (FM19) worked EN35. **DxWorld.com** shows contacts between FN34-EM29, EN10; EM85-EN58; EM29-FN03, 25. Thus, like the July European openings, ours were rather thin.

CQWW VHF Contest. Coming so late in the season on July 19-20, this contest is at the mercy of the E_s gods. This year conditions on 6 meters were only fair with somewhat limited openings from the northeast to the southwest and from southern CA to the Pacific Northwest. Big numbers were not possible on 6 meters but 2 meter activity was better than usual in spite of flat conditions in the east, although N7DB reports enhanced tropo in the Northwest.

Tropospheric Ducting. Tropo is relatively rare on 6 meters but Jon, NØJK (EM18) reports a contact into EN21 mobile on July 31 and a contact between KS and IL.

HERE AND THERE

Automated 2 Meter E_s Reporting. Frank, PA4EME, one of the operators of the fine Make More Miles on VHF site (**www.mmmonvhf.de**), has indicated a willingness and desire to provide the same accurate reporting of 2 meter E_s openings in North America as they do for Europe. This is a service that has long been needed here. The result will be a listing of all North American 2 meter E_s openings complete with detailed maps. To make this work we need to send them the data by e-mail in the proper form. At a later date, prior to next year's E_s season, I will publish more details as to how we can all participate in this exciting venture.

Microwave Update (MUD). The 2008 Microwave Update will be held in Bloomington, Minnesota October 17-18 under the sponsorship of the Northern Lights Radio Society. The program is filled with high quality technical presentations representing the state-of-the-art in microwave radio. Complete details are available at **www.microwaveupdate.org** or by contacting any of the people listed at the bottom of the site page.

2008 ARRL International EME Competition. The second full 48 hour period covers 50 through 1296 MHz from 0000Z to 2359Z October 18-19 on both analog and/or digital modes. Please see the September column for more details and be sure to read the full set of rules at **www.arrl.org/contests/rules/2008/eme.html**.

Fall Sprints. Continued from last month whose column contains further details, the 432 MHz Sprint is held October 8, 7-11 PM local time; the 50 MHz Sprint starts 2300Z October 18 and ends 0300Z October 19 and the Microwave Sprint is 6 AM-12 noon local time October 25. See **www.svhfs.org/fall_sprint_rules.htm** for complete information.

K6MXI SK. Well respected VHF operator Allen Ferrera, K6MXI, passed away on July 4, 2008. Best known to the community for his work on the K6QXY station, Allen was a Renaissance man in many ways, a pioneer in laser technology, the founder of Grand Cru Vineyards and a telecommunications operator and planner most recently as CEO of Pogowave Communications, the largest wireless Internet provider in Sonoma County. He was a good friend and I will miss him.

AA5XE SK. From Bill, W3XO, I have learned of the passing of Dale Richardson, AA5XE. Dale was the long-time Secretary/Treasurer of SMIRK and acted as its Webmaster. His many friends will miss him.

W4EMB SK. Longtime Miami (Florida) 2 meter stalwart Marshall Goldblatt, W4EMB, died recently after a long illness. A very active ham with a passion for 2 meters, in particular, Marshall was a popular and well-known VHFer for many decades. QST

W3UR

HOW'S DX?

UK DXpedition To Syria: YK9G — *Part 2*

Roger Western, G3SXW, and
Nigel Cawthorne, G3TXF

This is the second and final installment of the YK9G DXpedition to Syria. Part 1 appeared last month. — Ed.

Setting Up the Station

The flat roof of the STE building had plenty of space for antennas. The existing YKØRJ HF tribander and 40 meter beam were on a short tower at one end of the 150 foot long roof. The two 12, 17 and 30 meter band antennas were quickly installed at the other end of the roof. The antennas consisted of a full-size 30 meter quarter-wave with four radials and a 12 and17 meter trap vertical dipole.

As the proximity of the 40 meter beam to the triband beam would have made operating on 40 meter and an HF band impossible, it was soon decided to string out a separate 40 and 80 meter dipole. Later on in the operation Fred, G4BWP, imaginatively used a long length of twin lighting flex (line cord) to make a combined 80 meter and 160 meter dipole.

Once the HF antennas had been set up, the idea was to get on the air (QRV) as soon as possible. The first hour's operation was quite frantic. G3SXW started out on 20 meter CW while G3TXF opened up on 17 meters. During the first full hour 400 CW QSOs were made by the two stations, both at this stage still running barefoot.

Once the stations were more fully installed with the ACOM linears, an operating "rota" (rotation) was introduced. This had been carefully designed by Roger, G3SXW, and proved most effective while all five operators were present. It ensured that the station was fully manned at all times and that operators got a reasonably equivalent amount of 'off time.' At the beginning and end of each operating session there was a 20 minute walk (or short taxi ride) to or from the hotel.

Fred, G4BWP, had masterminded the wireless network in the shack. The two stations at YK9G used *Win-Test* linked to a third PC, which was acting as a backup log. *Win-Test* worked faultlessly throughout. The copious application of ferrite rings solved the majority of the RFI problems in the shack caused by the proximity of some of the antennas directly outside the window.

Fred, G4BWP, pulls out weak stations on 160 meters. A 160 meter dipole was erected for the last 2 days of the YK9G operation.

Operators had 5 hours on the air followed by either a 5 or 10 hour break. This rota worked well. There was always enough activity to keep two stations fully occupied during the daytime and for the early part of the night. During the last few hours before dawn there was usually only one station able to work anything. Immediately after dawn more bands sprang into life, however, and both stations could be fully QRV again running CW pileups.

Our hotel accommodation was about 1 mile from the station. The ultra-modern hotel was in a shopping mall, which included a restaurant. This made logistics really easy. Operators would meet up at various meal times, depending on their shift.

Single Mode — CW Only

In its original two-man format the DXpedition to Syria would have been CW only. Even when the operation was expanded into a UK DXpedition and the number of operators was expanded to five, it seemed sensible to continue to focus on doing one mode well and on working as many stations as possible on that one mode across as many bands as possible, rather than diluting effort by working the same station again on other modes.

CW is the favorite mode of the five operators at YK9G, so we stuck to it. Yes, it probably meant that several diehard SSB types may have had to make a special effort to work us with their computer sending software and their CW decoders. This was evident from some of the "strange format" QSOs we had on CW. Several stations were seemingly locked into PC generated "standard format QSOs" on CW. They were probably not familiar with the more snappy QSO procedures used on CW DXpeditions. But if it encouraged them to make a QSO with YK9G on CW, in whatever form, then so much the better!

After the first day or two of working thousands of Europeans (we made 6400 contacts on the first day alone) we were able to hunt out those more elusive openings to more distant areas, such as Japan on 30 meters. We knew that North America would be the most difficult area to work and found that the best opening was on 20 meters in our early evening hours. This opening lasted about 2 hours every evening but the band opened to the West Coast on only one occasion, with very weak signals. The rest of the world cooperated by standing by while this rare opening lasted.

LoTW — the Lucky Break

We were particularly lucky with Logbook of The World (LoTW). Uploading any DXpedition log immediately after a trip has always been our rule. (We would strongly argue that there's no excuse whatsoever for the deliberate delaying of the uploading of a DXpedition log, but realize that others may disagree with this, for whatever reason.)

For the YK9G trip we dared to hope to go one stage even further. Prior to the YK9G operation the ARRL DX Desk had told us, quite rightly, that because of the relative rarity of Syria, they could not issue us with an LoTW certificate until we got back from the DXpedition and had provided them with the relevant documentation. There was no surprise there.

It was then that we had a major stroke of luck. As it happens there was an IARU meeting being held in London over the weekend just prior to our departure for Syria and Dave, K1ZZ, of the ARRL was in attendance. Not only that, Dave was also due to visit G3TXF's neighbor Olof, GØCKV, on the evening before the YK9G team were due to leave for Damascus.

During a brief visit to the G3TXF station we were able to show Dave all the detailed documentation that we already had for the trip to Syria, including tickets, visas, licenses, letters of authority from the STE and our detailed correspondence with Omar,

Bernie McClenny, W3UR ♦ 3025 Hobbs Rd, Glenwood, MD 21738-9728 ♦ w3ur@arrl.org

YK9G used a K2 and this FT2000D plus two ACOM 1010 amplifiers. Note the Daily QSO Rate Graph posted on the shack wall!

If you worked YK9G you probably already have their QSL card thanks to the speedy work of the UK team.

YK1AO. Thanks to the positive support from the ARRL we were able to upload the YK9G logs to LoTW during the operation. This was a great boost to us all.

In practice, however, uploading the logs to both LoTW (and to Marios', 5B4WN, excellent *LogSearch* facility) was not quite as straightforward as it might seem. The only Internet access easily available to the team was back in the hotel. This meant that at the end of each operating session a copy of the log would be put onto a spare laptop that was then taken back to the hotel and uploaded to both LoTW and Marios', 5B4WN, online *LogSearch*.

With the non-operating breaks sometimes being only 5 hours long, G3TXF found several times that by the time he had walked back to the hotel, had a bite to eat and then sorted out and uploaded the latest YK9G logs to both LoTW and *LogSearch*, it was then already time to walk back to the YK9G shack for the next operating session!

We hope that the live uploading of the log both to the ARRL's LoTW and to Marios', 5B4WN, *LogSearch* added to the fun of chasing YK9G around the bands.

The Radios at YK9G

We had brought three radios with us. Roger, G3SXW, and Rob, GM3YTS, brought their Elecraft K2 transceivers. We also brought along a new Yaesu FT-2000D transceiver. The two main stations were the FT-2000D and G3SXW's K2, each with an ACOM 1010 amplifier brought along by G3TXF. The second K2 was on standby in case of any problems with the other rigs. In practice there were no problems and the second K2 returned home to Scotland without being used.

As a token of support to the SSTARS organization (which is also a member society of the IARU) the YK9G group of operators left behind the FT-2000D at the end of the operation. Hopefully, this nice new Yaesu radio will be used from time to time by various members of the YKØRJ club station.

YK9G Nine Band Breakdown

With Syria being positioned just on the *periphery* of Europe it is not surprising that the vast majority (77%) of QSOs were with Europe. Despite the difficult path to North America, and in particular the auroral path to the West Coast, every effort was made to work the USA during the short openings available. 20 meters provided the only contacts with the West Coast. Roger, G3SXW, ensured that any possible opening to the West Coast on 20 meters was not missed.

There were just two nine-band QSOs. One was Chiltern DX Club (CDXC) member Alan, 5B4AHJ, on Cyprus and the other was Omar, YK1AO, who made every effort to work us from his home QTH on the other side of Damascus. Thanks to Fred, G4BWP, and his valiant efforts in getting a 160 meter antenna to work, we were QRV on Top Band for the last 2 nights. 20 meters was the powerband with over 8100 QSOs, followed by over 6000 QSOs on both 30 meters and 17 meters. In total, 29,473 CW QSOs were made in the 6 days and 19 hours of virtually continuous operation at YK9G.

We were delighted with the one short opening to North America on 160 meters, working 10 USA and 2 VE stations. Our inverted-V dipole was evidently working fairly well. Around 1800 GMT one evening we had an opening to the West Coast on 20 meters, working some fifty 6s and 7s. It's hard to know these days whether a '6' is actually transmitting from California, but they sounded weak and watery and then along came a few pals who I *knew* were on the left coast. It was disappointing that the mountains blocked low angle signals, restricting the number of contacts to the West Coast.

Return Journey

QSOs were still being made right up to the last possible minute before closing down just under 1 week before starting up. As Lionel, G5LP, had left for home a few days early, it was just four of us who were taken to Damascus airport by Omar's colleagues. We were once again whisked effortlessly through the various formalities. At the airport we said goodbye to Fred, G4BWP, who was heading back to Dubai. Meanwhile Roger, G3SXW; Rob, GM3YTS, and Nigel, G3TXF, were once again back on an Austrian Airlines flight, but this time we were heading back home to London, via Vienna.

QSLs — Flowing Fast

Despite the potentially delaying effects of the Orthodox Easter and of the May Day celebrations in the Ukraine, Gennady, UX5UO, was able to get the first wave of YK9G QSLs delivered to us within 3 weeks of our return.

Within 2 months of the end of the operation, 5600 QSLs had already been shipped representing about 20% of the QSOs made. In addition to those requesting QSLs direct in the mail, packages of YK9G QSLs have already been airmailed directly to about 25 major QSL Bureaus around the world with the reply YK9G cards for requests received by e-mail.

Thanks to the SSTARS!

The YK9G UK CW DXpedition happened for three main reasons. First there was the chance meeting of Omar, YK1AO, with RSGB President Angus Annan, MM1CCR, in Damascus. Secondly, this initial contact was then followed up *assiduously* by Roger, G3SXW, who, with the occasional help from Nigel, G3TXF, turned it into a successful CW DXpedition. Angus, MM1CCR, continued to help significantly during this period too. Thirdly, there was the magnificent support of the three top-notch CW operators Rob, GM3YTS; Fred, G4BWP, and Lionel, G5LP, who took the plunge into the unknown and joined the YK9G team. The key player in the YK9G operation was Omar, YK1AO, President of the SSTARS and leading light of Amateur Radio in Syria. *Shukran, Omar*!

Photos courtesy of Nigel Cawthorne, G3TXF

SPECIAL EVENTS

Contact these stations and help commemorate history. Many provide a special QSL card or certificate!

Sep 1-Sep 15, 0000Z-2359Z, Salt Lake City, UT. Utah DX Association, K7T. 81st Anniversary of the invention of the electronic TV. 14.260 7.260. QSL. Wesley Wilkinson, W7WES, 7363 Galaxy Hill Rd, West Jordan, UT 84081.

Sep 12-Sep 14, 1300Z-0000Z, Angle Inlet, MN. Northwest Angle Amateur Radio Club, NWØAA. Activating northernmost radio club in the contiguous US. 14.070 14.245 7.245 3.945. QSL. Dan Whipple, WAØFJJ, 11726 Norway St NW, Coon Rapids, MN 55448.

Sep 13-Sep 15, 1800Z-0300Z, Whitetop, VA. Ashe County Amateur Radio Club, WK4P. September VHF QSO Party operation from famed Whitetop Mountain VA. 432.115 222.115 144.195 50.161. QSL. Adam Lawler, 355 Page Dr, West Jefferson, NC 28694. **whitetop.embarqspace.com**

Sep 19-Sep 20, 1500Z-0000Z, Kinston, NC. Kinston Amateur Radio Society Inc, W4OIX. 60th Anniversary of Kinston Amateur Radio Society. 21.395 14.295 7.245. Certificate. Kinston Amateur Radio, PO Box 1778, Kinston, NC 28503.

Sep 20-Sep 21, 1600Z-0000Z, Peoria, IL. Peoria Area Amateur Radio Club, W9UVI. 50th Anniversary of Peoria Superfest. 14.240 7.240. Certificate. PAARC, PO Box 3508, Peoria, IL 61612-3508. **www.w9uvi.org**

Sep 26-Oct 5, 1800Z-1400Z, Southington, CT. Southington Amateur Radio Association, W1ECV. Southington Apple Harvest Festival. 28.450 14.250 14.050 7.250. Certificate. Rick Lukas, KB1PAJ, 123 Pondview Dr, Southington, CT 06489. **www.chetbacon.com/sara.htm**

Sep 27-Sep 28, 1300Z-1800Z, Malone, NY. North Franklin Amateur Radio Society, N2NNY. Almanzo Wilder Farm 75th Anniversary. 14.280 14.050 7.270 7.050. QSL. Jeff Jones, 190 Reagan Flats Rd, Bombay, NY 12914.

Oct 1-Oct 6, 2200Z-0500Z, Cleveland, OH. NASA Glenn Amateur Radio Club, NA8SA. 50th Anniversary of the beginning of NASA operations. 14.280 7.280 3.880 1.880. QSL. NASA Glenn Amateur Radio Club Lewis Field, 21000 Brookpark Rd, MS 8-1, Cleveland, OH 44135-3191. **www.grc.nasa.gov/WWW/Clubs/NA8SA**

Oct 3-Oct 5, 2200Z-2200Z, Buffalo, OK. Great Bison Amateur Radio Group, W5HFZ. Buffalo Annual Homecoming Celebration. 28.400 14.322 7.230 3.918. QSL. Luke Kunkel, KE5NWW, PO Box 87, Buffalo, OK 73834. **www.geocities.com/great.bison**

Oct 4, 1300Z-1700Z, Anamosa, IA. Jones County Amateur Radio Club, WØCWP. 20th Annual Anamosa Pumpkinfest, pumpkin capital of Iowa. 14.260. Certificate. Jones County Amateur Radio Club, 304 S Ford St, Anamosa, IA 52205. **pumpkinfest.anamosachamber.org** *or* **www.qsl.net/kc0lgb/index.html**

Oct 4, 1300Z-2000Z, Radioville, IN. Starke County Amateur Radio Club, W9JOZ. Radioville is the town that never was. 21.350 14.250 7.225 146.520. QSL. Starke County Amateur Radio Club, 7495 South 500 West, North Jundson, IN 46366. **w9joz.org**

Oct 4, 1400Z-2200Z, Forest, VA. Lynchburg Amateur Radio Club, N4J. Archeology Open House at Thomas Jefferson's Poplar Forest. 21.360 14.260 7.260 14.070 PSK. QSL. Dick Hiner, 3977 Waugh Switch Rd, Big Island, VA 24526. **www.k4cq.net**

Oct 4, 1400Z-2200Z, Kings Mountain, NC. Cleveland County Amateur Radio Service, NA4CC. Battle of Kings Mountain. 28.350 14.250. Certificate. Cleveland County Amateur Radio Service, PO Box 864, Shelby, NC 28151. **www.ccarsnc.org**

Oct 4, 1400Z-2000Z, Robbinsville, NC. Smoky Mountains Amateur Radio Team, N4GSM. Opening of Cherohala Skyway. 14.242 7.242. QSL. SMART, PO Box 983, Robbinsville, NC 28771-0983. **trliving@hotmail.com**

Oct 4-Oct 5, 0000Z-2359Z, Holtsville, NY. Symbol Technologies Amateur Radio Club, WB2MOT. Celebrating Motorola's 80th Anniversary. 28.410 14.310 14.070 7.280. Certificate. STARC, Mail Stop B-19, One Motorola Plaza, Holtsville, NY 11742. **www.jsconsulting.com/starc**

Oct 4-Oct 5, 0000Z-2359Z, Libertyville, IL. Motorola Amateur Radio Club, KMØTO. Celebrating Motorola's 80th Anniversary. 21.350 14.310 7.280 3.860. Certificate. Motorola Amateur Radio Club, 1931 Prairie Square #211, Schaumburg, IL 60173-4130. **www.qsl.net/k9mot/activities/80.html**

Oct 4-Oct 5, 0000Z-2359Z, Plantation, FL. Motorola Amateur Radio Club, W4MOT. Celebrating Motorola's 80th Anniversary. 14.310 14.045 7.280 7.035. Certificate. Motorola Amateur Radio Club, Room 2200, 8000 West Sunrise Blvd, Plantation, FL 33322-4104. **w4mot.org**

Oct 4-Oct 5, 0000Z-2359Z, Schaumburg, IL. Motorola Amateur Radio Club, K9MOT. Celebrating Motorola's 80th anniversary. 21.350 14.310 7.280 3.860. Certificate. Motorola Amateur Radio Club, 1931 Prairie Square #211, Schaumburg, IL 60173-4130. **www.qsl.net/k9mot/activities/80.html**

Oct 4-Oct 5, 1400Z-2200Z, Daytona Beach, FL. Daytona Beach Amateur Radio Association, K4BV. Celebrating DBARA's 50th Anniversary. 14.270 14.070 7.270 7.070. Certificate and QSL. DBARA, PO Box 9852, Daytona Beach, FL 32120-9852. **dbara.org**

Oct 4-Oct 5, 1500Z-2100Z, Middletown, RI. Newport County Radio Club, W1SYE. Norman Bird Sanctuary Harvest Fair. 14.265 7.250 3.940. Certificate. Newport County Radio Club, Box 3103, Newport, RI 02840. *Emphasis on family and Emcom.* **www.w1sye.org**

Oct 4-Oct 5, 1500Z-2200Z, Pittsburgh, PA. Rotarians of Amateur Radio, K3R. Public demonstration of Amateur Radio under FD 1E conditions. 14.330 14.245 7.195 7.100. QSL. Bob Mente, 305 Ewing Rd, Carnegie, PA 15106-1509. **www.kb3nuq.com**

Oct 5-Oct 12, 1800Z-2359Z daily, Cookeville, TN. York Foundation, N4Y. Sgt Alvin C. York Appreciation Week. 28.370 14.270 7.270 3.870 124.270 FM EchoLink N4ECW-R. Certificate. Dennis M. Barrett, N4ECW, 1035 E 6th St, Cookeville, TN 38501. **n4ecw@arrl.net**

Oct 6-Oct 12, 1200Z-0300Z, Alexandria, MN. Runestone Radio Club, WØW. Commemorating the Discovery of the Kensington Runestone. 21.070 14.245 7.245 3.890. Certificate. WØALX c/o Bill Klundt, 509 Pine St S, Sauk Centre, MN 56378.

Oct 10-Oct 19, 0000Z-0000Z, Quincy, IL. Western Illinois Amateur Radio Club, K9L. 150th Anniversary of Lincoln Douglas Debates. 14.250 17.150 7.250. Certificate. Robert Mitchell, 6825 Gardner Expy, Quincy, IL 62305.

Oct 10-Oct 19, 2359Z-0000Z, Rockville, IN. Wabash Valley Amateur Radio Association, W9P. Parke County Covered Bridge Festival. 28.430 14.250 7.265 3.870. Certificate. W9UUU, PO Box 81, Terre Haute, IN 47808-0081. **www.w9uuu.org**

Oct 11, 1300Z-2000Z, Woodbridge, VA. K4 National Wildlife Refuge Amateur Radio Club, K4NWR. 2008 National Wildlife Refuge Week from Occoquan Bay NWR. 18.155 14.265 14.073. QSL. Brad Farrell, K4RT, 7423 Salford Ct, Alexandria, VA 22315. **www.k4nwr.org**

Oct 11, 1400Z-2300Z, Athens, TX. Athens Amateur Radio Club, K5EPH. Celebration of Black Eye Pea Festival at East Texas Arboretum. 28.410 21.410 14.260 7.230. Certificate. AARC, PO Box 1641, Athens, TX 75751. **www.athensarc.org**

Oct 11, 1600Z-2300Z, San Diego, CA. USS *Midway* CV-41 Museum Radio Room, NI6IW. US Navy Birthday in 1775. SSB 14.325 7.250 CW 14.060 7.040 BPSK 7.070-7.080 MT63 14.109 7.037 RTTY 14.080 7.080. QSL. USS *Midway* CV-41 Museum Radio Room, 910 N Harbor Dr, San Diego, CA 92101. **af6ha@yahoo.com**

Oct 11, 1800Z-2300Z, St Charles, IL. Fox River Radio League, W9CEQ. 23rd Annual Scarecrow Festival. 14.265 7.265. QSL. FRRL, PO Box 673, Batavia, IL 60510. **scarecrow@frrl.org** *or* **www.frrl.org**

Oct 11-Oct 12, 1200Z-0000Z, Gnadenhutten, OH. Tusco Amateur Radio Club, W8ZX. First Non-native American Child in Ohio. 28.430 14.230 7.230 3.823. Certificate. Tusco ARC, Box 725, New Philadelphia, OH 44699. **k8wfn@tusco.net** *or* **tuscoarc.org**

Oct 11-Oct 12, 1500Z-2100Z, Durant, OK. Durant Amateur Repeater Association, W5I. President Eisenhower's Birth in Denison, TX. 28.355 14.250 147.39+. QSL. David Booth, K5YM, 409 Umstead Dr, Colbert, OK 74733. **k5ym@yahoo.com**

Oct 11-Oct 12, 1700Z-2359Z, Corona and Norco, CA. Corona Norco Amateur Radio Club, W6PWT. Barney Oldfield Days — 1913-1915 Auto Races. 28.400 14.250 7.180. QSL. Fred Roberts, W6TKV, 5464 Peacock Ln, Riverside, CA 92505. **www.w6pwt.org**

Oct 11-Oct 19, 1500Z-2000Z, Newburyport, MA. Pentucket Radio Association, K1W. National Wildlife Refuge Week: 105 Years of Service. 21.310 14.265 7.240 3.880. QSL. Larry Caruso, K1LGC, 77 Whittier Rd, Haverhill, MA 01830. **www.pra625.org**

Oct 11-Oct 19, 1600Z-1900Z, Seney, MI. Lake Effect Amateur Radio Club, KD8DKU. National Wildlife Refuge Week — 105 Years of Conservation. 21.295 14.295 14.070 7.295 7.095 QRS. Certificate and QSL. Lake Effect ARC/NWR2008, 36 Southfork St, Marquette, MI 49855. **www.lakeeffectarc.info/N8W-Seney**

Oct 14-Oct 16, 1300Z-2100Z, Moultrie, GA. Colquitt County Ham Radio Society, KØW. 26th Annual Sunbelt Ag Exposition. 14.320 14.060 7.250. QSL. CCHRS, PO Box 815, Moultrie, GA 31776. **www.wd4kow.org**

Oct 17-Oct 19, 0400Z-0359Z, Branchland, WV. KC8SKK Rest and Radios Club, W8V. West Virginia Bridge Day. 50.135 28.400 14.300 7.180. QSL. Brian S. Floutz,

Maty Weinberg, KB1EIB ♦ Special Events ♦ events@arrl.org

6140 S Huron River Dr, South Rockwood, MI 48179.

Oct 18, 0400Z-1200Z, Buchanan, TN. USCG Auxiliary Flotilla 082-08-10, W4D. 69th Anniversary of USCG Auxiliary. 28.340 21.320 14.240 7.230. QSL. Kenny Johns, 52 Buttonwood Dr, Jackson, TN 38305. *Operating from Shore Side Detachment, SSD, Cutter base.* **ab4eg@eplus.net**

Oct 18, 1200Z-2300Z, Calhoun, GA. Cherokee Capital Amateur Radio Society, K4W. Celebrating 10 years of ARRL Affiliation. 14.245 14.110 7.245 7.110. Certificate. Felton Floyd, AF4DN, 1054 Mountain Loop Rd NW, Sugar Valley, GA 30746. **www.k4woc.com**

Oct 18, 1300Z-2200Z, Delaware City, DE. US Coast Guard Auxiliary, N3G. 69th Anniversary of USCG Auxiliary. 7.035 14.055 50.135 146.52. QSL. Robin M. Begley, 3 Pancoast Ave, Aston, PA 19014-2109. **nd3e@comcast.net**

Oct 18, 1300Z-2000Z, Fort Lauderdale, FL. United States Coast Guard Auxiliary, K4Z. USCG Auxiliary 69th Anniversary. 28.405 21.405 14.345 7.240. QSL. Don Drennon, 11500 NW 35 Pl, Sunrise, FL 33323.

Oct 18, 1300Z-2000Z, Hyattsville, MD. US Coast Guard Auxiliary, K3A. USCG Auxiliary 69th Anniversary. 28.350 21.350 14.280 7.282. QSL. W. Joe Saunders, 1520 Jutewood Ave, Hyattsville, MD 20785. **K3UAL2@juno.com**

Oct 18, 1300Z-2100Z, Kingston, MA. Taunton Area Communications Group, KC1TAC. JOTA at Camp Norse. 147.430 14.290 7.090-190 18.140. QSL. Taunton Area Communications Group KC1TAC, 81 Fremont St, Taunton, MA 02780. **www.freewebs.com/kc1tac**

Oct 18, 1300Z-2100Z, Lighthouse Point, FL. USCG Auxiliary District 7, N4Z. USCG Auxiliary 69th Anniversary. 28.310 21.230 14.175 7.150. QSL. Elizabeth Clark, 2231 NE 46th St, Lighthouse Pt, FL 33064. **captmm@bellsouth.net**

Oct 18, 1300Z-2000Z, Londonderry, NH. United States Coast Guard Auxiliary, N1C. Anniversary of US Coast Guard Auxiliary. 14.250. QSL. N1BPO, 28 Devonshire Ln, Londonderry, NH 03053. **gstapleford@verizon.net**

Oct 18, 1300Z-2000Z, Media, PA. US Coast Guard Auxiliary, K3G. US Coast Guard Auxiliary 69th Anniversary. 28.330 21.330 14.270 7.270. QSL. Daniel Amoroso, 196 Dam View Dr, Media, PA 19063.

Oct 18, 1400Z-2200Z, Cartersville, GA. USCG Auxiliary Div 2 Dist 7, N7Z. US Coast Guard Auxiliary 69th Anniversary. 28.385 21.385 14.275 7.272. QSL. Jim Farley, KG4FXV, PO Box 641, Smyrna, GA 30081-0641. *Operating may continue through the 19th if activity warrants.* **kg4fxv@arrl.net**

Oct 18, 1400Z-2200Z, Coeur d'Alene, ID. US Coast Guard Auxiliary District 13, K7A. USCG Auxiliary 69th Anniversary. 28.415 21.415 14.342 7.286. QSL. Bob Kesson, K7CGA, 2531 E Hanley Ave, Coeur d'Alene, ID 83815-9542. **k7cga@arrl.net**

Oct 18, 1400Z-2100Z, Fond du Lac, WI. United States Coast Guard Auxiliary, K9Z. US Coast Guard Auxiliary 69th Anniversary. 28.335 21.325 14.330 7.235. QSL. Pat Knowles, 418 Wilson Ave, Fond du Lac, WI 54935. **patandlisa2@charter.net**

Oct 18, 1400Z-2200Z, Holden, MA. US Coast Guard Auxiliary District 1-NR, W1D. US Coast Guard Auxiliary 69th Anniversary. 28.330 21.330 14.270 7.270. QSL. William Latimer, WA4DDH, PO Box 159, Holden, MA 01520.

Oct 18, 1400Z-2200Z, Merchantville, NJ. Amateur Radio Lighthouse Society, KC2HOU. USCG Auxiliary 69th Anniversary. 21.370 14.270 7.270 3.970. QSL. James H. Weidner, 114 Woodbine Ave, Merchantville, NJ 08109-1854. **weidner@waterw.com**

Oct 18, 1400Z-2200Z, Merchantville, NJ. USCG Auxiliary Flotilla 65, 5NR, K2JXW. USCG Auxiliary 69th Anniversary. 21.373 14.273 7.273 3.973. QSL. James H. Weidner, 114 Woodbine Ave, Merchantville, NJ 08109-1854. **weidner@waterw.com**

Oct 18, 1400Z-2200Z, Merritt, NC. USCG Auxiliary Dist 5-SR, Div 20, W4C. 69th Anniversary of the USCG Auxiliary. 28.355 21.380 14.290 7.265. QSL. KB2NNC, 35 Bayview Dr, Merritt, NC 28556. **kb2nnc@arrl.net**

Oct 18, 1400Z-2200Z, Miami, FL. US Coast Guard Auxiliary, W4B. 69th Anniversary of USCG Auxiliary. 28.464 21.264 14.264 7.264. QSL. James Carlin, 9450 SW 51 St, Miami, FL 33165.

Oct 18, 1400Z-2200Z, Moneta, VA. USCG Auxiliary Dist 5-SR, Div 8, N4V. USCG Auxiliary 69th Anniversary. 28.407 21.362 14.292 7.268. QSL. Jeffrey D. Demers, 3201 Evington Rd, Evington, VA 24550. **kd4oom@arrl.net**

Oct 18, 1400Z-2300Z, Plano, TX. US Coast Guard Auxiliary Div 10, Dist 8-CR, W5A. USCG Auxiliary 69th Anniversary. 28.335 21.370 14.285 7.242. QSL. Jerrel B. Jones, 2025 Meadowcreek Dr, Plano, TX 75074. **jerrelj@gte.net**

Oct 18, 1400Z-2100Z, Rowlett, TX. US Coast Guard Auxiliary 08C 10-01, K5K. USCG Auxiliary 69th Anniversary. 28.340 21.320 14.240 7.230. QSL. Charlie Myers, 9405 Waterview Pkwy, Rowlett, TX 75089-8427. **ke5nrf@arrl.net**

Oct 18, 1400Z-2200Z, Sewaren, NJ. US Coast Guard Auxiliary Flotilla 4-4 Dist 1SR, K2S. Commemorating USCG Auxiliary 69th Anniversary. 28.395 21.395 14.282 7.247. QSL. Brad Williams, 355 Remsen Ave, Avenel, NJ 07001.

Oct 18, 1400Z-2200Z, Trinity, AL. USCG Auxiliary District 8ER, K4C. 69th Anniversary of the United States Coast Guard Auxiliary. 28.365 21.340 14.290 7.260. QSL. Joe Kleri, 105 Meadowview Dr, Trinity, AL 35673-6508. **N8ESI@arrl.net**

Oct 18, 1400Z-2200Z, US Coast Guard Training Center - Yorktown, VA. USCG Auxiliary 05SR-Division 06, W4Y. 69th Anniversary of US Coast Guard Auxiliary. 28.315 21.365 14.295 7.260. QSL. Joe Safranek, K4JJS, 8778 Marlfiled Rd, Gloucester, VA 23061-3118. **k4jjs@arrl.net**

Oct 18, 1400Z-2200Z, Yorba Linda, CA. US Coast Guard Auxiliary Division 15, District 11S, W6A. USCG Auxiliary 69th Anniversary. 28.320 21.315 14.310 7.262. QSL. Roy L. Lay, 219 Beal Ave, Placentia, CA 92870.

Oct 18, 1600Z-2359Z, Puyallup, WA. US Coast Guard Auxiliary Flotilla 33, Division 3, N7A. USCG Auxiliary 69th Anniversary. 28.380 21.375 14.275 7.275. QSL. Larry Smith, 10902 141st St Ct E, Puyallup, WA 98374. **ab7fj@comcast.net**

Oct 18, 1700Z-2000Z, Arnold, MO. Jefferson County Amateur Radio Club, KBØTLL. Great Ozark Chili Cook Out. 147.075 14.250 7.245. QSL. Roy Nelson, KAØUMJ, 8080 Hwy 21, Hillsboro, MO 63050. s**danaj8@wildblue.net**

Oct 18, 1700Z-2200Z, St Thomas, VI. US Coast Guard Auxiliary, N2A. 69th Anniversary of US Coast Guard Auxiliary. 28.366 21.366 14.266 7.266. QSL. Deborah Thomas, PO Box 9280, St Thomas, VI 00801. **np2dj@arrl.net**

Oct 18-Oct 19, 1300Z-0300Z, Panama City Beach, FL. US Coast Guard Auxiliary, N4P. 69th Anniversary of the USCG Auxiliary. SSB 21.345 14.320 7.280 CW 14.050 7.050 AO-51 SO-50 satellites. QSL. Jim Clary, ND9M, PO Box 18095, Panama City Beach, FL 32417-8095. **vq9jc@gimail.af.mil**

Oct 18-Oct 19, 1400Z-0200Z, Plano, TX. United States Coast Guard Auxiliary, N5A. Anniversary of United States Coast Auxiliary. 28.335 21.325 14.330 7.225. QSL. Walt Evanyk, W8KSW, 3200 Sherrye Dr, Plano, TX 75074-4693. **shaneford@aol.com**

Oct 18-Oct 19, 1600Z-2359Z, Camano Island, WA. BEARONS/SCARC, K7P. First new state park in 10 years at Cama Beach. 14.265 7.250. QSL. Mark McLauchlin, 2625 176th St SE, Bothell, WA 98012. *(Boeing Employees Amateur Radio Operators North Society and Stanwood/Camano Amateur Radio Club.)* **www.scarcwa.org** *or* **mysite.verizon.net/EvernhamMS91/bearons.htm**

Oct 18-Oct 19, 1700Z-2100Z, San Ramon, CA. Mount Diablo Amateur Radio Club, K6BSA. Pacificon and the 51st Boy Scout Radio Jamboree. 21.360 14.290. QSL. MDARC, PO Box 23222, Pleasant Hill, CA 94523. **www.pacificon.org**

Oct 22-Oct 27, 1800Z-2359Z, Lynchburg, TN. ARES, W4J. Jack Daniels Invitational World Championship BBQ. 28.450 21.305 14.255 7.238 other bands possible CW RTTY PSK31. QSL. Jimmy Floyd, PO Box 511, Tullahoma, TN 37388. **nq4u@mtars.org**

Oct 23-Oct 25, 1200Z-1800Z, Newcastle, DE. Air Mobile Radio Operator Society, K3P. Frank Piasecki Aviation Pioneer. 146.52 28.355 14.070 7.200. QSL. William G Begley, 3 Pancoast Ave, Aston, PA 19014-2109. **nd3e@comcast.net**

Oct 25, 1800Z-2200Z, Olathe, KS. Johnson County ARES, KSØJC. Honoring Marshall and Loretta Ensor code teachers. 14.300 14.250 10.115. Certificate and QSL. Dan Reed, 29545 West 152nd Ter, Gardner, KS 66030. **dmreed10@embarqmail.com**

Oct 25-Oct 26, 1200Z-0400Z, Bladenboro, NC. Bladen Amateur Radio Society, W4BLA. Beast of Bladenboro as seen on the History Channel. 146.985 14.250 17.250 3.900. QSL. Bladen Amateur Radio Society, 5342 NC Hwy 87 W, Elizabethtown, NC 28337. **ki4syk@aol.com**

Oct 26, 1600Z-2000Z, Sandy Hook Lighthouse, NJ. Roseland Amateur Radio Club, K2A. Fort Hancock Establishment Day. 14.270 7.270. QSL. Roseland ARC, 300 Eagle Rock Ave, Roseland, NJ 07068. *Operating from Sandy Hook Lighthouse, USA-731.* **ab2sv@arrl.net** *or* **www.qsl.net/k2gq**

Certificates and QSL cards: To obtain a certificate from any of the special-event stations offering them, send your QSO information along with a 9×12 inch self-addressed, stamped envelope to the address listed in the announcement. To receive a special event QSL card (when offered), be sure to include a self-addressed, stamped business envelope along with your QSL card and QSO information.

Special Events Announcements: For items to be listed in this column, you must be an Amateur Radio club, and use the ARRL Special Events Listing Form, at **www.arrl.org/contests/spevform.html**, or if you prefer, forms are available via the Internet (**info@arrl.org**), or for an SASE (send to Special Requests, ARRL, 225 Main St, Newington, CT 06111, and write "Special Events Form" in the lower left-hand corner). Off-line completed forms may be mailed, faxed or e-mailed to ARRL, Attn: Special Events. Submissions must be received by ARRL HQ no later than the 1st of the second month preceding the publication date; that is, a special event listing for **Dec** *QST* would have to be received by **Oct 1**. In addition to being listed in *QST*, your event will be listed on the ARRLWeb Special Event page. QST

K2TQN

OLD RADIO

Antiquing

You've probably figured out by now that I'm not into transistor radios like I am the older tube radios. True. But this month I have an exception to my norm. I went antiquing recently and found a real treasure for my collection.

Every once in a while antique shops will have something interesting and sometimes very affordable. It depends a lot on luck and your past history with the dealer. In my case I have done business with this dealer several times a year for the past few years. He's local and he knows I collect radios and local history items. But I have also taken my wife there and we have bought some nice furniture for our home. So he knows about every other time I come in, I spend money. This relationship has worked out well for me, as one time he alerted me to some historic papers he had just picked up in a "house cleanout." (This is when the dealer buys everything in a home because the seller is only interested in having an empty home to sell.) The historic papers were three ledger books from a general store, dating back to 1824. These were really interesting, historically. But the amazing thing is it turned out that the 1824 general store owner was one of my great-great-grandparents. And on some of the pages were some pencil and pen drawings of schooners that were done by my great-grandfather when he was a boy. Of course when he saw how excited I became, he priced the books accordingly, and I paid. (I'm not good at poker either.) But since it was family — I figured I should pick them up. I'll never know how they became separated from my family, but they're back now.

He's made it up to me in other ways though. Several times after that I got rock bottom prices. In the big picture, it has equaled out.

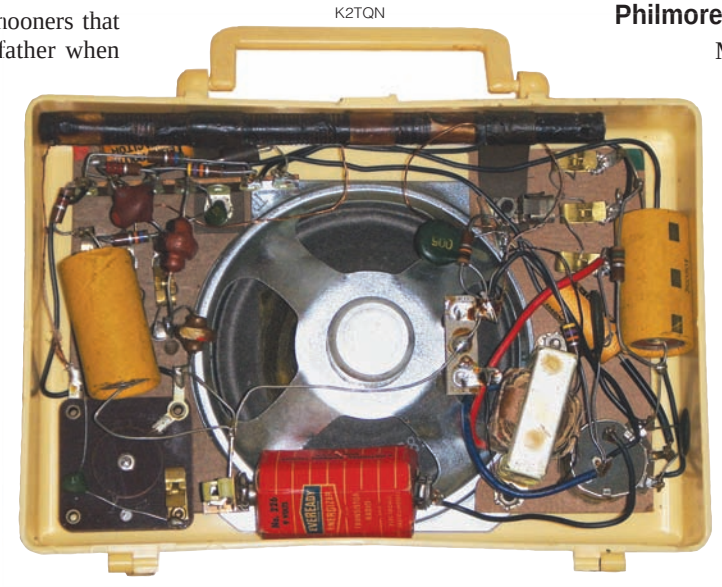
The lesson here is, cultivate a relationship with the dealer. Send him some business if you can. Buy things off and on so he knows you will spend money. And don't expect him to call you when something comes in. He may, but probably will not. And the reason is, people tend to not want that color, or they already have one, or are short of cash that week. And speaking of cash — dealers prefer cash. You should be able to negotiate a better price using cash. (The advice given here is for dealer-owned shops that buy their inventory from individuals and home cleanouts. Multi-dealer shops have different rules and cash doesn't seem to work as well with them.)

My last trip turned up a classic 1957 Philmore transistor radio and a rare Art-Deco speaker dating from 1923 through the 1930s, made by Western Electric. I'll share these with you.

K2TQN

The Philmore TR22 two transistor radio.

K2TQN



Inside the Philmore TR22 two transistor radio.

My First Transistor Radio

I think it was around September 1956 that I spotted an article and advertisement in an electronics magazine about a one-transistor radio. The kit was $4.95 for the basic radio (a crystal set) and an additional $4.95 for a Raytheon CK-722 transistor. It all fit in a cigarette-pack sized plastic box and came with a small earphone, not much bigger than a hearing aid type. I promised the world to my father to get him to write the check and send for the kit. In a short time it came and I built my first receiver and it worked quite well. It had a loopstick coil for tuning and a single battery. I was pretty excited.

Later during the World Series I took it to school and sitting near the window during English class I was following the game and passing notes with the scores to my friends. The teacher almost caught me when she asked "What is that thing in your ear?"

And for the only time in my life, I lied. (Wink.) I told her it was a hearing aid, as I pulled the radio out of my shirt pocket to show her. For some reason she bought that and I didn't get sent to the principal, who knew me well and would have seen through my scheme because he was an ex-ham. Relieved, I put the radio away and didn't take it to school after that. But all my friends thought that it was great.

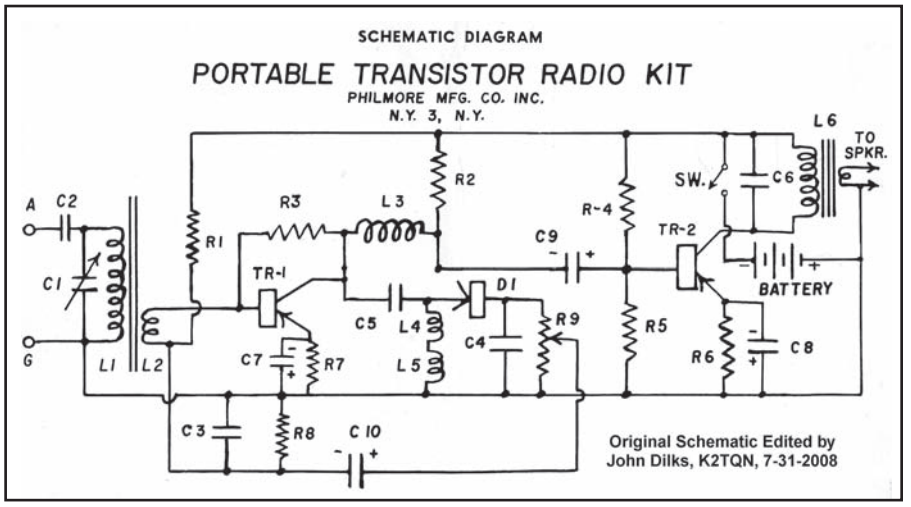
Philmore TR22

My dealer friend had this radio sitting on the floor, in a pile of newly received items. I picked it up and it went home with me for $5. It had a broken hinge, but looked okay inside. I also bought the Art Deco speaker that was sitting next to it.

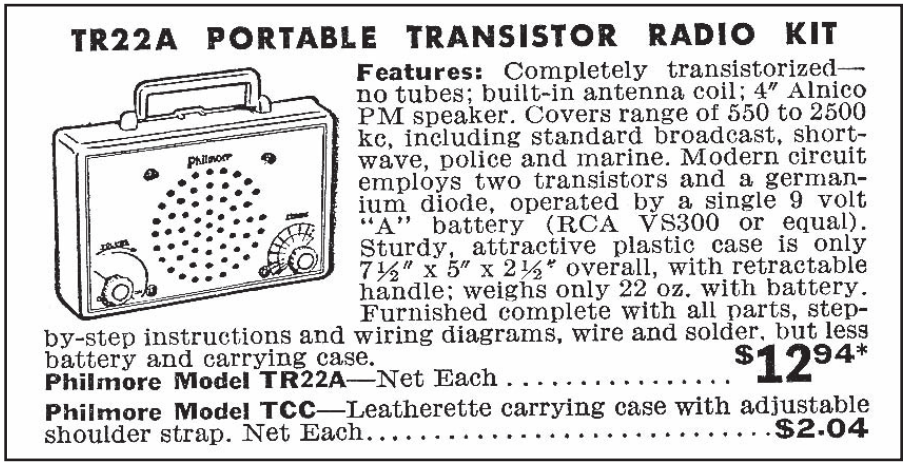
Doing some research on the radio, I found an online article written by Herb Parsons, a radio collector from Massachusetts. He called his a model TR201. The TR22 appears to be the same radio. He had built one as a kid in 1957 and over the years it had been lost. He found a replacement by running a "want ad" for 2 years in *Antique Radio Classified* maga-

John Dilks, K2TQN ♦ 125 Wharf Rd, Egg Harbor Township, NJ 08234-8501 ♦ k2tqn@arrl.org

HERB PARSONS



1960 HARVEY RADIO CATALOG



zine (**www.antiqueradio.com**). It came with the original instruction manual, which he was kind enough to share with me.

Herb was delighted with the radio and of it said: "To my delight, this TR201 is performing just as mine did many years ago. This set still amazes me today. The reflex circuit allows the first transistor to act as two by assigning double duty to it. The circuit used is quite unique. This radio tunes in most of the strong local stations with ample speaker volume and requires no external antenna!"

Mine still needs a good cleaning and part checking before I put in a new 9 V battery and try it out. How I would have loved to have had one of these back then. In 1956 and 1957 if you had a transistor radio, especially if you built it yourself, you were elevated to some super-genius level by all your friends.

Here are the schematic and a photo of the insides so you can see what makes it work. I will have the entire 1957, 8 page set of instructions on my Web site and a link to Herb Parsons' article. I think you'll enjoy reading that, too.

K2TQN

The Western Electric speaker is 12 wide × 14 high × 6 inches deep.

The Western Electric Speaker

Radio collectors covet Western Electric speakers. They are well designed, solidly built and always sound very good. I already have two in my collection. One is a horn speaker and the other is a double-cone speaker. Both are nice and work great. I always look for WE speakers at swap meets, but they are usually priced high enough to keep me from buying more.

In all the years I have been collecting, I have not seen this speaker before and it is not marked with any brand name. I recognized the stamped model numbers on the base, not the numbers themselves, but the way they were stamped. In my 30 some years working for Western Electric, I used those stencils at work many times. Later, taking the speaker apart I discovered the patent number and a circuit diagram inside. It was clearly a Western Electric.

I contacted Buford and Jane Chidester about the speaker. They have written *Classic Cones*, which has become a "must have reference book" for speaker collectors. They had not seen it before and didn't know anything about this speaker. I would be interested to hear if anyone has one of these. In the meantime, I'll connect it to one of my early radios and try it out. It will look great sitting on the shelf, too. It was a good day antiquing.

K2TQN

Inside the speaker case showing the 8 inch cone.

Please visit **www.k2tqn.com**. I'll have links and additional photos on my Web page about this speaker, the *Classic Cones* book and more Philmore TR22 radio information. — *K2TQN* QST

WB8IMY

ECLECTIC TECHNOLOGY

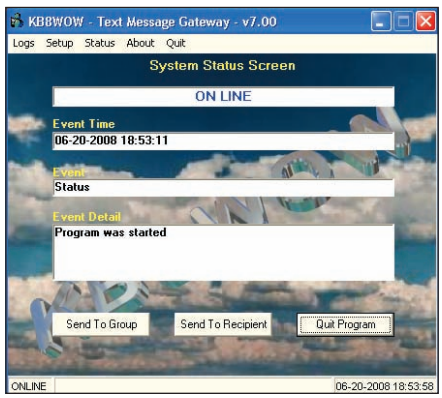
SDR on the March

If what I'm picking up at conferences and on the Internet is a reliable indicator, Software Defined Radio (SDR) is becoming the hot ticket among Amateur Radio experimenters. This is especially true among the younger amateurs I've encountered. Where traditional homebrewers worked with soldering irons and discrete components, these "softbrewers" are crafting their SDR brainchildren at their computer keyboards.

In case you're unfamiliar with SDR, and possibly wondering what the fuss is all about, the fundamental concept is surprisingly simple. You use hardware (we aren't doing SDR at the antenna — *yet*) to receive the desired RF signal and convert it to InPhase (I) and Quadrature (Q) information. The I/Q data is fed to a computer where the SDR software processes the raw information, plucking out almost any signal you desire.

When it is time to transmit, the same process happens in reverse. The software creates the desired modulation as an audio signal, which is then converted to RF (now we're back to the hardware stage) and amplified. Regardless of whether you are transmitting or receiving, the "radio" isn't just the hardware, it is the entire system including software. In fact, the software *defines* the function of the radio, hence the name.

There are a number of hams, young and old, getting their feet wet in SDR with tiny SoftRock receivers (**www.hamsdr.com/**). Others are using FlexRadio rigs and still more are experimenting with HPSDR boards (**http://hpsdr.org/**), the new QS1R Versatile Radio Board (**www.philcovington.com/QuickSilver/**) and the Microtelecom Perseus receiver, just to name a few.



The KB8WOW *Text Message Gateway* status screen.

To give you a small taste of what is possible, at least in a visual sense, see Figure 1. The image is remarkable when you realize that you're looking at the entire RF spectrum from virtually zero all the way to 50 MHz. This was achieved with a QS1R board and *SDRMAXII* panadaptor software.

I have a feeling that we may be witnessing the beginning of an enormous change in Amateur Radio. SDR is already making a significant impact in the homebrew world, and we have one manufacturer (FlexRadio) selling complete SDR transceivers. Will other manufacturers follow suit?

And what of *cognitive transceivers*, SDR rigs that "sniff" the RF environment and automatically configure themselves to receive or transmit at whatever frequency or modulation format is necessary? Yes, there are hams exploring this dizzying concept as well.

Text Message Gateway

Tony Gargasz, KB8WOW, has created a neat *Windows XP* application that will allow you to send "canned" messages to cell phones or e-mail accounts via Amateur Radio. The *Text Message Gateway*, as it is called, uses a computer sound card to monitor the audio output of a receiver. The software "listens" for DTMF (*TouchTone*®) signals and responds by sending e-mail messages to individuals or groups. Not any old DTMF string will do; it has to be a specific "command sequence."

The software is entirely free and easy to set up. You can download it at **www.kb8wow.com/Download_Now.htm**. There is an informative instruction manual available on the same page.

Streetlights as Digital Networks?

Not streetlights, really, but streetlight *poles*. Think about it. Pack enough homes and businesses in one place and pretty soon you have streetlights everywhere. Imagine every streetlight pole as a radio mast complete with on-site power.

Sunrise Technologies has grasped the obvious and created what they call their BrownBetty system, a 2.4 GHz network for communications between ground-based utility sensors and control devices.

The BrownBetty nodes are plugged into a streetlight's standard NEMA twist lock receptacle, replacing the light's dusk-to-dawn photocontrols. (The BrownBetty nodes have photocontrols, too.) The nodes use low output power and can't communicate very far on their own, but all they have to do is reach the nearest light poles, which are usually nearby. With BrownBetty nodes at each pole, they all link up to create a vast "smart" network that changes its routing on the fly. If one node goes offline, data is automatically rerouted to compensate. This is classic *mesh network* architecture.

Hams are experimenting with WiFi mesh networks as well. The same idea applies — scatter a number of inexpensive, low-power nodes over a wide area and you have an instant high-speed (and highly flexible) digital network! QST

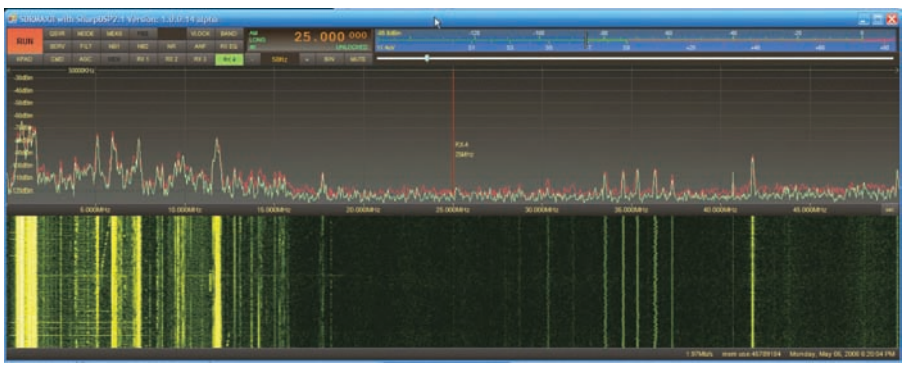


Figure 1 — You're looking at the entire RF spectrum from virtually zero all the way to 50 MHz, courtesy of a QS1R Software Defined Radio board and *SDRMAXII* panadaptor software.

Steve Ford, WB8IMY ♦ *QST* Editor ♦ sford@arrl.org

W1GHZ

MICROWAVELENGTHS

Sequencers for Transverter Control

Several recent Microwavelengths columns have described all the microwave components that comprise a microwave transverter. In future columns, we will describe how to assemble them into a complete transverter system, capable of transmitting and receiving. The one piece we haven't discussed is the circuitry that controls switching between transmit and receive. Since the switching must be done in a careful sequence, the control circuitry is often called a sequencer.

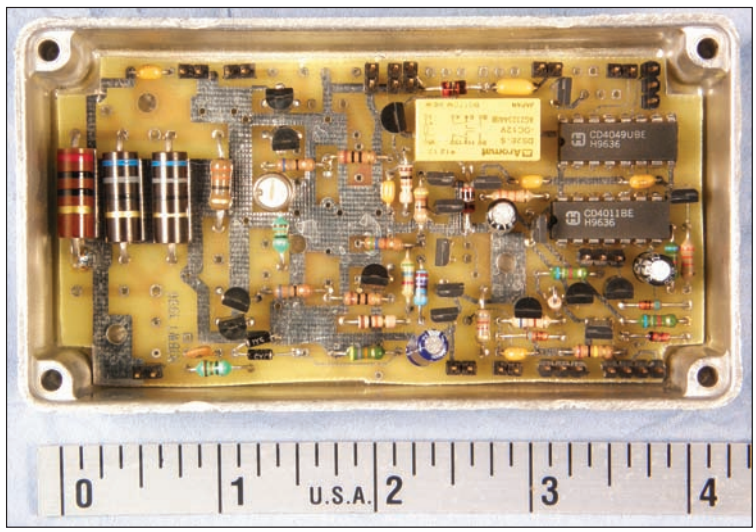


Figure 1 — The tightly packed design of the "Fool-Resistant" Sequencer.

The reason for the switching sequence is to prevent damage to components. Obviously, we don't want to transmit into the receive preamplifier, so we must switch the antenna relay before transmitting. More important is to be sure that the relay contacts are completely closed — microwave relays are easily damaged by hot-switching with any significant amount of RF power present, but can handle the power just fine with the contacts closed and stationary. Microwave power amplifiers can also be damaged if operated without a proper load. Finally, both power amplifiers and preamplifiers can oscillate if not terminated properly while powered — and the oscillation may be destructive.

So the switching sequence must be planned. A typical sequence might be:

1. Detect PTT from IF radio
2. Remove power from preamplifier
3. Switch antenna relay to transmit position
4. Wait for relay to complete switching
5. Apply power to power amplifier
6. Transmit

The sequence is reversed to return to receive.

A typical transceiver has a similar sequence of internal operations, but they are hidden from the operator — he just pushes the microphone button or the key. One difference is that HF transceivers switch quickly, for break-in operation, while most microwave transverters switch relatively slowly to accommodate high-performance microwave relays. Mine take at least a half second for changeover, so I sometimes miss part of a call from someone with a quick thumb.

A sequencer may also be called on to dissipate some IF power — a typical VHF transceiver has an output power of at least a few watts, while the mixer in a transverter tolerates only about a milliwatt. It is easy to attenuate the excess power, but we really don't want the loss on receive as well — it's hard enough to hear weak signals. We would prefer to switch out the attenuator while receiving. Some commercial transverter modules include the switched attenuator, but they still recommend a sequencer if the system includes an additional power amplifier.

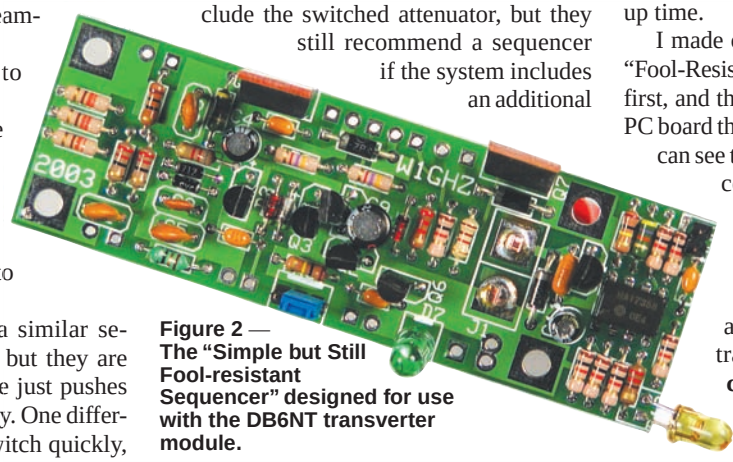


Figure 2 — The "Simple but Still Fool-resistant Sequencer" designed for use with the DB6NT transverter module.

My first sequencer was based on the article by Zack Lau, KH6CP (now W1VT), "T/R Switching Low-Power 903 and 1296 Transverters," *QEX*, July 1992, p 16. He left some attenuation inline all the time and switched from additional transmit attenuation to a small monolithic microwave integrated circuit (MMIC) receive amplifier using a small RadioShack relay. The rationale is that a MMIC is a cheap fuse if the switching fails, while microwave mixers are more expensive and harder to replace.

I liked the idea of fail-safe switching and expanded on it in my article "A 'Fool-Resistant' Sequenced Controller and IF Switch for Microwave Transverters," *QEX*, May 1996, p 14. I added a step to the sequence described above, so that RF power from the IF transceiver is detected and absorbed until the switching sequence is complete — there is no RF sent to the transverter until everything is ready. As an option, the RF detection may be used to initiate the switching sequence, as is common in "brick" amplifiers. Switching by RF detection is not recommended, but allows operation to continue when an IF rig fails — even an FM handheld transceiver can be used in a pinch. I also added an interlock signal for power amplifiers needing a warm-up time.

I made one classic error in designing the "Fool-Resistant" Sequencer — I chose the box first, and then had to cram everything onto a PC board that fit into the box. In Figure 1, you can see that there is very little room left for connectors and wiring. This cramming made it more difficult to build and only a couple of dozen copies have been made.

More recently, I constructed a 10 GHz system using a DB6NT transverter module (**www.db6nt.com**). The module incorporates the switched attenuator, but recommends a sequencer for use

Paul Wade, W1GHZ ♦ 161 Center Rd, Shirley, MA 01464 ♦ w1ghz@arrl.org

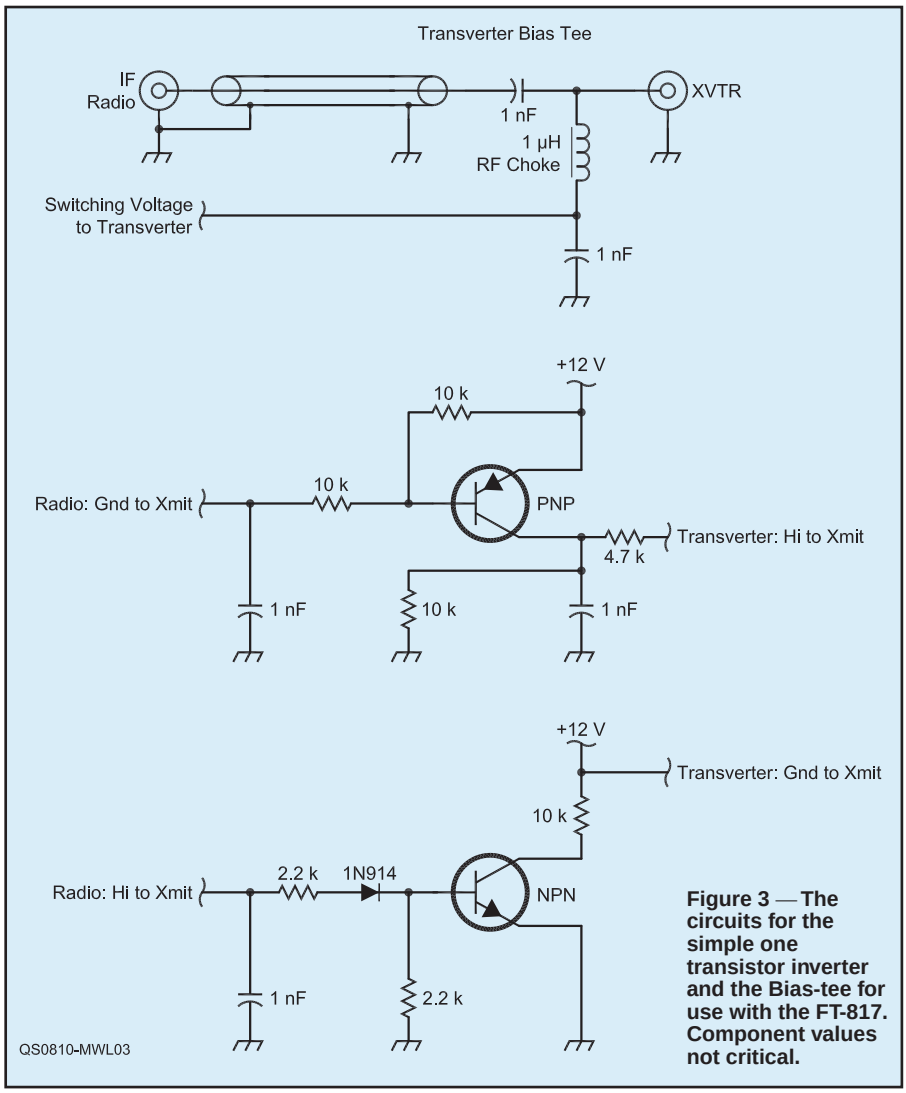


Figure 3 — The circuits for the simple one transistor inverter and the Bias-tee for use with the FT-817. Component values not critical.

Figure 4 — The complete Bias-tee mounted on the FT-817 ready for action.

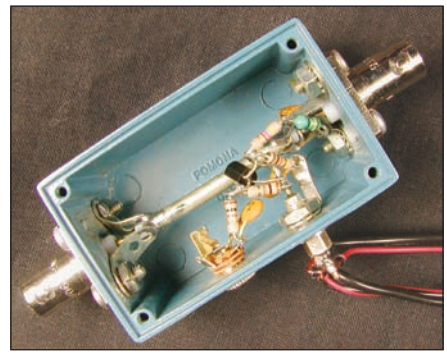


Figure 5 — A view of the dead-bug construction techniques used to build the Bias-tee.

with a power amplifier. A simpler sequencer was in order, so I designed the "Simple but Still Fool-resistant Sequencer" shown in Figure 2. No RF switching is included, only dc power, so it is completely solid-state. This version has proven easy-to-build and many copies are in use. Kits are available from WA3IAC at **chuckwa3iac@yahoo.com**.

Other sequencer designs have been published, ranging from simple ones with just a time delay to programmable ones using a Programmable Interface Controller (PIC) microprocessor. Commercial units are available from DB6NT and Down East Microwave (**www.downeastmicrowave.com**). The DEMI TC (Transverter Control) uses only relays, including an inexpensive RF relay intended for wireless networks. Relays are easier to understand than PIN diode switching and allow more flexibility. I'm still considering what to use in my future transverters — perhaps an improved "Fool-Resistant" design is in order.

Reliable Control Lines

A transverter is often at a distance from the operator and IF transceiver — from a few feet for a portable operation, to the top of a tower for a home station. The control line, or PTT, that switches between transmit and receive, is one more wire to connect, in addition to dc power and IF coax. On portable rigs, the connectors are often small and unreliable, which is one reason why I include RF sensing in my sequencers. A better way is to send the control signal as a voltage on the IF coax; inside the transverter box, a capacitor keeps the dc voltage out of the mixer while an RF choke connects the dc but not the RF to the sequencer. One fewer wire and coax connectors are usually more robust.

Some of the older IF transceivers, like the venerable IC-402, connected a switching voltage to the RF output connector — typically, 8 V on transmit and 0 V on receive.

This is so convenient that many of us modified other rigs to do the same; an RF choke and a current-limiting resistor for safety are all that is needed. The newer rigs, like the popular FT-817, however, cover many bands and have more complicated switching. They also have very tiny parts. I looked over the schematic and layout, but didn't find a simple way to make the modification. Instead, I chose to insert the voltage onto the coax, using a device often referred to as a Bias-tee. This is simply a small box with three connectors, using an RF choke and a capacitor to combine the voltage onto the coax, as shown in Figure 3.

Since the FT-817 Accessory jack grounds the TR pin on transmit, the opposite of previous rigs, I faced another choice: fix this or modify all my transverters. This would make the transverters incompatible with other rigs, so I added a simple one-transistor inverting circuit, shown in Figure 3, to the Bias-tee. Figure 4 shows a complete Bias-tee in action and Figure 5 shows the "dead-bug" style construction inside the Bias-tee.

Whether you homebrew everything or buy all the pieces, it will be necessary to provide the switching and control — there aren't any turnkey microwave radios yet. And don't choose the box until you know what must go inside.

Microwave Update

Microwave Update 2008, the worldwide gathering of microwavers, will be held October 17-18 in Bloomington, Minnesota. See **www.microwaveupdate.org** for details.

I hope to see you there.

All photos by Paul Wade, W1GHZ QST

SILENT KEYS

It is with deep regret that we record the passing of these amateurs:

NW1A **Dyk**, Robert P., Falmouth, ME
KB1GW **Swanson**, Glenn P., North Granby, CT
W1HFC **Link**, Charles A., Cranston, RI
W1LTC **Nobrega**, Julio S., Burlington, MA
N1MDL **Foss**, Brian W., Auburn, ME
W1MGB **Mayers**, Howard G., Brockton, MA
N1NYZ **Dauphinais**, Gardner, Londonderry, NH
N1PJZ **Rice**, Scott C., Manchester, NH
NC1S **Golding**, Donald R., Holden, ME
K1TAV **Broomfield**, Richard, Narragansett, RI
K1YGY **O'Connell**, Thomas A., East Greenwich, RI
W2AIT **Lento**, Frank A., Asheboro, NC
W2DDZ **Coffield**, Joseph, East Northport, NY
K2DQR **Lewandowski**, Joseph L., Edgewater Park, NJ
W2EEA **Yeomans**, Robert E., Syracuse, NY
W2FNT **Kakstys**, John A., Linden, NJ
W2HRT **Balter**, Leslie M., Deerfield Beach, FL
KF2JI **Furtaw**, Daniel J., Central Square, NY
N2LAE **Burke**, Mearl B., Chittenango, NY
W2MJL **Lee**, Malcolm J., Raleigh, NC
ex-W2NKJ **Marchetto**, Albert V., Mountainside, NJ
KD2NL **Ryan**, John S., Crawfordville, FL
WA2OZJ **Katz**, Peter Jr, Watervliet, NY
KB2SVJ **Schneider**, Joseph G., Yarmouth Port, MA
K2UPB **Gustavson**, Richard E., Liverpool, NY
WB2ZWI **Mortimer**, Howard, Baldwinsville, NY
W3EV **Hottinger**, Albert W., Catasauqua, PA
KA3KWS **Dorsman**, Harry J., Missoula, MT
W3LNA **Smith**, Laurence L., Greenville, PA
KE3MD **Tough**, George H., Sabillasville, MD
♦K3SS **Maddocks**, Hugh C., Gainesville, VA
N3SSQ **Kennedy**, George L., Kennedyville, MD
N3UK **Hollifield**, Tom, Pottstown, PA
N4AAX **Broughton**, Randolph, Eutaw, AL
K4BAC **Spafford**, Ralph B., Daphne, AL
KD4BOY **Winslow**, Glenn J., Birmingham, AL
KD4EUQ **Brand**, Chris J., Austell, GA
W4FIX **Gates**, Harry B., Goldsboro, NC
K4FQU **Spencer**, Earl R., Fort Myers, FL
N4FQZ **Dillson**, Clarence W., Hixson, TN
W4GJM **Moore**, Gregory J., Crawfordville, FL
W4IEO **Parrish**, Howard Jr, Ozark, AL
KK4IX **Cook**, John H., Marion, NC
♦AG4J **Clark**, George W., Erie, PA
W4JGU **Jones**, Wylie, Madisonville, KY
K4JMG **Noyer**, Robert O., Vienna, VA
W4JYV **Lewis**, G. Bryson, Hermitage, TN
♦K4KH **Faatz**, George J., Fort Myers, FL
N4MUF **Matthews**, Frederic G., Merritt Island, FL
N4NFK **Hart**, Aubrey C. Sr, Quitman, GA
KD4NOR **Henry**, Robert L. Jr, Stanton, TN
KC4QO **Green**, Robert L., Panama City, FL
KA4TNN **Yates**, Charles O., Kingsport, TN
KN4TZ **Ruby**, George S., Hendersonville, NC
KA4UOK **Byrd**, George C., Norway, ME
KE4WEO **Saunders**, Reginald A., Somerville, AL
KC5AP **Fulwiler**, Robert J., Waco, TX
♦WA5ATK **Hoskins**, Dan Jr, Fayetteville, AR
K5ATW **Jackson**, Donald B., Buchanan Dam, TX
WB5B **Roberts**, Ralph W., Ludlow, KY
WD5ECL **Carroll**, Charles J., Brunswick, GA
W5FLA **Smith**, Claude B., Kermit, TX
N5JTY **Tyson**, Edmund T., Alamogordo, NM
W5LGY **Douglass**, Helen M., Commerce, TX
KD5NWV **Rogers**, Oscar L., Spring, TX
KB5OND **Adams**, Rex M., Hot Springs Village, AR
K5RDD **Ramirez**, Paul, Galveston, TX
NZ5S **Lea**, Richard B., Shreveport, LA
KD5UF **Welch**, Harry, Raymond, MS
KA5WAL **Newman**, John W. Jr, Fort Worth, TX
AA5XE **Richardson**, Dale N. Jr, Kerrville, TX
W5YGI **Peck**, Gordon H., Las Cruces, NM
KB5YU **Hughes**, William E. Jr, McAllen, TX
W5ZBC **Shell**, Edwin T., Bossier City, LA
K6AJA **King**, E. G. MD, El Dorado Hills, CA
KT6A **Dilley**, Warren G., Chula Vista, CA
KR6AT **Woolsey**, Samuel D., Danville, CA
WD6BKY **Strom**, John S., Victorville, CA
AH6CK **Buffalano**, Frank A., Honolulu, HI
K6CX **Palmer**, Edward D., Poulsbo, WA
WB6FOA **Nikkel**, Edith S., Pleasant Hill, CA
KI6HVP **Gunn**, William A., Benicia, CA
WB6IIV **Rogue**, Francis, Eden, NC
KG6JKG **Hamp**, Andreva L., Maricopa, AZ
WA6KNX **Grady**, George S., Davis, CA
N6LHF **McNamara**, Norman, El Monte, CA
KF6MBH **Thomas**, Judith L., Minden, NV
K6MXI **Ferrera**, Allen B., Santa Rosa, CA
W6NSN **Lundquist**, Clifford R., Riverside, CA
N6OPY **Kemp**, Edward E., Firebaugh, CA
KA6RKK **Marsden**, Elizabeth, Redwood Valley, CA
K6SQ **Foss**, James E., Yerington, NV
WB6TLH **Tewell**, Louis E., Kingman, AZ
WB6UYJ **Bacom**, Burnus, Pinole, CA
♦KD6VFJ **Calvert**, Loran K., Vallejo, CA
ex-W6YE **Behrens**, Thomas A. L., San Francisco, CA
W7KDV **Ebert**, Bruce, Oakesdale, WA
W7PMV **MacDonald**, Lloyd J., Bellingham, WA
N7PNR **Amdahl**, Ingeborg T., Coquille, OR
WB7TBR **Zumbrunnen**, Victor, Mesa, AZ
N7VSG **Erichsen**, Kurt D., Coquille, OR
WD8BKG **Sheffer**, Jack S., Wauseon, OH
N8EHV **Johnson**, Emberly, Kalkaska, MI
KD8IMD **Golden**, Rick L., Delta, OH
W8IQQ **Hamburg**, Stanley J., Zeeland, MI
N8IYC **Cardwell**, Glen D., St Augustine, FL
W8NDR **Root**, George N., Shepherd, MI
N8RYG **Fillion**, Jane E., Orlando, FL
K8WEB **Bennett**, William, Tucson, AZ
KA8YNB **Kissee**, Charles E., Lansing, MI
WB8YTL **Roy**, Josephine C., Bridgeport, WV
W9AVX **Van Someren**, Frank J., Baldwin, WI
W9CZS **Schoch**, Elmer C., Peoria, IL
K9DUX **Zastrow**, William E., Manitowoc, WI
K9DWJ **Schultz**, Fred M., Ligonier, IN
W9JCP **Setzer**, Arnold L., Anderson, IN
N9LUC **Joiner**, Paul K., Evansville, IL
K9PDZ **Anderson**, Harris A., Rockford, IL
N9UAR **Foster**, Robert A., Wisconsin Rapids, WI
♦K9VWX **Hoge**, Donald W., Wenona, IL
♦W9YE **Martin**, Robert D., Lafayette, IN
WØAWD **Gantzer**, Frederick C., White Bear Lake, MN
KØHUB **Ennis**, Adaline A., Cedar Rapids, IA
WØMHJ **Williams**, Laurence O., Alliance, OH
NØNWZ **Clendenin**, Donald E., Pittsburg, MO
WBØONO **Sonnek**, Muriel E., Aberdeen, SD
WAØPTH **Fluent**, Glen E., Newcastle, NE
ABØQI **Manthe**, Lawrene L., Bismarck, ND
WBØRTF **Pierce**, Moe L., Colorado Springs, CO
KCØTIG **Thomas**, Edward C., Kansas City, KS
♦WBØTPK **Witthar**, Robert L., Jefferson City, MO
WAØVNW **Waterman**, Le Roy R., Manhattan, KS
VE3DJ **McArthur**, A.A., Ancaster, ON, Canada
VE3GHN **Dodds**, Leonard, Scarborough, ON, Canada
YU2OH **Stancl**, Vladimir, Zagreb, Croatia

♦ Life Member, ARRL

Note: Silent Key reports must confirm the death by one of the following means: a letter or note from a family member, a copy of a newspaper obituary notice, a copy of the death certificate, or a letter from the family lawyer or the executor. Please be sure to include the amateur's name, address and call sign. Allow several months for the listing to appear in this column.

Many hams remember a Silent Key with a memorial contribution to the ARRL Foundation or to ARRL. If you wish to make a contribution in a friend or relative's memory, you can designate it for an existing youth scholarship, the Jesse A. Bieberman Meritorious Membership Fund, the Victor C. Clark Youth Incentive Program Fund, or the General Fund. Contributions to the Foundation are tax-deductible to the extent permitted under current tax law. Our address is: The ARRL Foundation Inc, 225 Main St, Newington, CT 06111. QST

Amy Hurtado, KB1NXO ♦ Silent Keys Administrator ♦ sk@arrl.org

Field Organization Reports

Public Service Honor Roll
July 2008

This listing recognizes radio amateurs whose public service performance during the month indicated 70 or more points in six categories. Details on the program are at this Web page: **www.arrl.org/FandES/field/pshr/**.

770	218	140	112	K2AN	81
W7TVA	W4CAC	K7BFL	WB2LEZ	K8RDN	NA7G
		AA3SB	W4ZJY	KA4LRM	K5MC
528	205	W1PLW		N4MEH	
AC6C	KØBLR		111		80
		137	KJ7NO	99	KE7DVV
512	200	N4EJF		K6RAU	K7MQF
W2LTB	WA2WMJ		110		KE5DKV
		135	W7QM	98	WA2TWS
437	192	N7BEC	W7GB	KM1N	KB2BAA
N2LTC	AC8AL	W3YVQ	N2VC	W5XX	K8KV
		WB6UZX	N8OD	KD8FNN	AB8SY
485	185		NX1Q		KC4PZA
WB-	WA2BSS	130	N7XG	97	
7WOW	KB2RTZ	N2QZ	N7YSS	K4BEH	78
		N1UMJ	KB3LNM		W4QAT
421	175	W4FAL	N4ABM	96	
KD1SM	N7CM		K7BC	WB8OIF	77
	KK3F	126	N1IQI		W6SX
370		K4GK	K1YCQ	95	WB2WAK
AK2Z	174		K2GW	WG8Z	KA3NZR
	KBØDTI	125	W2EAG	N1CKM	
328	NY3H	NN7H	NØMEA		76
NC4VA		W7EKB		94	WDØGUF
	171	KC5OZT	109	N8NMA	W5GKH
315	K2HJ	N2GJ	W5PY		KB3LFG
KA2ZNZ		N5NVP		90	
	170		107	W2CC	74
310	KE5HYW	120	KC2JCB	N1JX	K2YDD
KI4GWC		KA4FZI		N8DD	K8VFZ
	168	KK5GY	106	WD8Q	
301	KK1X	K6JT	AD4BL	KA1RMV	72
WB8RCR		N3RB	KB1NMO	KA1GWE	KK7TN
	164	W8UL		WB4BIK	W7VSE
283	KB5ILY	AG9G	105	K4BG	
KC8NTE	W2SFD	WØLAW	KE4CB	K3IN	70
		WD5TL	K8AE	N3ZOC	W2MGT
290	162	W7IG		KM5VM	K1HEJ
W2MTA	KA8ZGY	KW1U	101	KI4JQB	KB1NAL
		N1LKJ	N7EIE	WA2CUW	WA2WKV
287	160	W1GMF		KI4YV	N2RLD
KI4KWR	W5DY	K1YCQ	100		K2JAN
	KGØGG	K4IWW	W7GHT	88	KA2EJD
265		WB9JSR	KB5KKT	AL7N	WA2YBM
KD1LE	155		N2GS		WØADZ
	KØIBS	118	N8IO	87	NØDUW
271		W3CB	WB8SIQ	AA4BN	NØDUX
KB2ETO	150		N5OUJ		NUØF
	WA4UJC	117	KS3Z	85	KAØFUI
250	K7EAJ	WB2KNS	N3SW	KT5SR	AAØLD
N2KPR	WB5ZED		W3TWV	KD5TXD	NØMHJ
	K8AMR	115	WV8RG		KØRXC
248	AC8AR	N7IE	WC5M	83	NØUKO
KI4GEM		KD1LE	K4SCL	W5ESE	WAØVKC
	145		WB4FDT	W3ZQN	KØRXC
238	K9LGU	114	KB2KLH	WD8DHC	
W2KFV		KB9KEG	K2TV		
	144		N2RDB	82	
223	K4DND	113	K2UL	W5CU	
WD4FLJ		K5SFM	W4TTO	KØBXF	

The following stations qualified for PSHR in previous months but were not recognized in this column: (Jun) WA9APQ 117, W2XAD 116. (May) KC9IED 163, WA9APQ 78. (Apr) WA9APQ 117. (Mar) KC9IED 128, W9XAN 99, WA9APQ 85.

Section Traffic Manager Reports
July 2008

The following ARRL Section Traffic Managers reported: AK, AL, CO, CT, EB, EMA, ENY, EWA, GA, ID, IL, KS, KY, LA, MDC, MI, MN, MO, MS, NC, NH, NLI, NNJ, NNY, NTX, OH, OK, OR, SC, SD, SFL, SNJ, STX, TN, UT, VA, WCF, WI, WMA, WNY, WTX, WV, WWA, WY.

Section Emergency Coordinator Reports
July 2008

The following ARRL Section Emergency Coordinators reported: AZ, CT, EWA, GA, IN, KS, KY, LA, MDC, ME, MI, NC, NM, NTX, OH, OK, SD, SNJ, STX, SV, VA, WPA, WTX, WV.

Brass Pounders League
July 2008

The BPL is open to all amateurs in the US, Canada and US possessions who report to their SMs a total of 500 or more points or a sum of 100 or more origination and delivery points for any calendar month. Messages must be handled on Amateur Radio frequencies within 48 hours of receipt in standard ARRL radiogram format.

Call	*Orig*	*Rcvd*	*Sent*	*Dlvd*	*Total*
WB5ZED	12	1639	1733	41	3425
W4ZJY	0	658	774	0	1432
N1IQI	0	324	1079	0	1403
KA9EKG	44	609	598	7	1258
WB5NKD	17	118	1196	0	1125
W8UL	0	530	483	1	1014
WB5NKC	45	48	721	24	838
WB9JSR	0	391	359	7	757
KW1U	0	363	305	0	668
N1UMJ	26	316	320	12	674
W1GMF	0	150	483	0	633

The following station achieved BPL with originations plus deliveries: K8LJG 119. QST

75, 50, AND 25 YEARS AGO

October 1933

- The cover photo shows Jim Lamb's rig, which provides "crystal control with fewer tubes."
- The editorial discusses the importance of international radio conventions to the future of Amateur Radio, and reminds us that the next such convention will take place in Cairo in 1937.
- *QST* Technical Editor Jim Lamb describes his "Tritet Multi-Band Crystal Control" rig that covers all five HF bands with only two tubes, using plug-in coils for band changes.
- G. F. Lampkin, W8ALK, tells us about "Automatic Temperature Compensation for the Frequency Meter."
- "The Ultra-High-Frequency World" reports on some of ham radio's recent accomplishments on 56 Mc.
- Clyde Anderson, W6FFP, describes his design of "Inexpensive Individual-Band Transmitters."
- "Midget Transmitters" discusses two tiny transmitters built by Fred Tredrea, VK6FT, and Frank Orcutt, W4JO … the former uses a pair of type '10 tubes and the latter uses only one.
- This month's "Amateur Radio Stations" column showcases the stations of W3ZD in Chevy Chase, Maryland; OK1AW in Mestec Kralove, Czechoslovakia, and K7BAQ, Skagway, Alaska.

October 1958

- The cover photo shows the neat little rig designed and built by W3HH, Deputy Director for Electronics for the US Navy Bureau of Ships.
- The editorial recounts some of the many recent times Amateur Radio has been noticed by high-ranking government officials, including instances of Vice President Richard M. Nixon's telling such tales from his own experiences.
- In "Pygmy Powerhouse Model II," Gil Countryman, W3HH, describes his 1/7 cubic foot rig that will run 75 watts on any of the HF bands.
- "Remote Control of a Grid-Dip Meter," by William Burks, W8HNX, tells us how we can check antenna resonance at a distance.
- Ed Tilton, W1HDQ, provides information of "A Versatile 50-Mc. Transmitter" that can run between 10 and 50 watts, using only two tubes.
- James O'Hern, W2WZR, discusses "Simple Low-Pass Filter Design."
- Jack Livingston, K2POO, eliminates the need for relays, with "An All-Electronic Key and Keyer."
- Lew McCoy, W1ICP, tells us how to build a receiving converter for 10 and 15 meters using only one crystal, in "The 'Bonus' 21-Mc. Converter."
- In "A Voice Key for the Handicapped," James Watt, VE4VJ, tells how he helped a cerebral palsy patient become a ham.

October 1983

- The cover photo is an aerial view of Houston, soon to host the 1983 ARRL National Convention.
- The editorial discusses deregulation of Amateur Radio by the FCC, volunteer examiners and the costs of such a program.
- Colin Lamb, K7FM, presents "New Ideas for the VHF Wattmeter," which were used in his inexpensive but effective homebrew wavemeter.
- In "A Tunable CW Filter," Richard Nelson, WBØIKN, tells how his use of cascaded bandpass filters with voltage-controlled center frequencies yields high selectivity and low ringing.
- John Webb, W1ETC, describes his "High-Pass Filters for Receiving Applications," that keeps local AM broadcast stations from crunching the front end of his 160 meter receiver.
- Oh-oh … contesting is getting automated: Jerry Hess, W9KTP, describes his automation ideas in "The Would-Be Contest Killer." Jerry wrote his own computer program in BASIC.
- Doug DeMaw, W1FB, writes about "Building and Using 30-Meter Antennas."
- Reed Valleau, N1BEG, tells us how to "Build an Amateur Radio Modem," so we can put our computers to work in the ham shack. Computers are firmly taking their place in the ham shack nowadays.
- "Happenings" reports that ARRL has asked the FCC for action in RM-4040, the League's proposal to get cable TV signals out of the ham bands.

Al Brogdon, W1AB ♦ Contributing Editor

W1AW SCHEDULE

W1AW's schedule is at the same local time throughout the year. From the second Sunday in March to the first Sunday in November, UTC = Eastern US Time + 4 hours. For the rest of the year, UTC = Eastern US Time + 5 hours.

♦ **Morse code transmissions:** Frequencies are 1.8175, 3.5815, 7.0475, 14.0475, 18.0975, 21.0675, 28.0675 and 147.555 MHz.

Slow Code = practice sent at 5, 7½, 10, 13 and 15 WPM.

Fast Code = practice sent at 35, 30, 25, 20, 15, 13 and 10 WPM.

Code bulletins are sent at 18 WPM.

♦ **W1AW Qualifying Runs** are sent on the same frequencies as the Morse code transmissions. West Coast Qualifying Runs are also transmitted monthly. See "This Month in Contesting" in this issue for further details on the Qualifying Runs. Underline one minute of the highest speed you copied, certify that your copy was made without aid, and send it to ARRL for grading. Please include your name, call sign (if any) and complete mailing address. The initial certificate is available for a $10 fee. Subsequent endorsement stickers are available for a $7.50 fee.

♦ **Digital transmissions:** Frequencies are 3.5975, 7.095, 14.095, 18.1025, 21.095, 28.095 and 147.555 MHz.

Bulletins are sent at 45.45-baud Baudot and 100-baud AMTOR, FEC Mode B. 110-baud ASCII will be sent only as time allows.

On Tuesdays and Fridays at 6:30 PM Eastern Time, Keplerian elements for many amateur satellites are sent on the regular teleprinter frequencies.

♦ **Voice transmissions:** Frequencies are 1.855, 3.99, 7.29, 14.29, 18.16, 21.39, 28.59 and 147.555 MHz.

♦ **Notes:** On Fridays, UTC, a DX bulletin replaces the regular bulletins. W1AW is open to visitors 10 AM to noon and 1 PM to 3:45 PM on Monday through Friday. FCC licensed amateurs may operate the station during that time. Be sure to bring your current FCC amateur license or a photocopy. In a communication emergency, monitor W1AW for special bulletins as follows: voice on the hour, teleprinter at 15 minutes past the hour, and CW on the half hour.

During 2008, Headquarters and W1AW are closed on New Year's Eve Day and New Year's Day (Dec 31 and Jan 1), Presidents Day (Feb 18), Good Friday (Mar 21), Memorial Day (May 26), Independence Day (Jul 4), Labor Day (Sep 1), Thanksgiving and the following day (Nov 27 and 28) and Christmas (Dec 25).

For more information, see **www.arrl.org/w1aw.html**.

PACIFIC	MTN	CENT	EAST	MON	TUE	WED	THU	FRI
6 AM	7 AM	8 AM	9 AM		FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
7 AM-1 PM	8 AM-2 PM	9 AM-3 PM	10 AM-4 PM	VISITING OPERATOR TIME (12 PM-1 PM CLOSED FOR LUNCH)				
1 PM	2 PM	3 PM	4 PM	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
2 PM	3 PM	4 PM	5 PM	CODE BULLETIN				
3 PM	4 PM	5 PM	6 PM	DIGITAL BULLETIN				
4 PM	5 PM	6 PM	7 PM	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE
5 PM	6 PM	7 PM	8 PM	CODE BULLETIN				
6 PM	7 PM	8 PM	9 PM	DIGITAL BULLETIN				
6^{45} PM	7^{45} PM	8^{45} PM	9^{45} PM	VOICE BULLETIN				
7 PM	8 PM	9 PM	10 PM	FAST CODE	SLOW CODE	FAST CODE	SLOW CODE	FAST CODE
8 PM	9 PM	10 PM	11 PM	CODE BULLETIN				

COMING CONVENTIONS

QCWA INTERNATIONAL CONVENTION

October 3-5, Virginia Beach, Virginia

S

The QCWA International Convention, sponsored by the Quarter Century Wireless Assn, will be held at the Cavalier Oceanfront Hotel, Oceanfront at 42nd St. Doors are open 7 AM-10 PM. Features include programs and forums, Meet 'n Greet Reception with buffet dinner (Friday, 6 PM; $32.50), Hospitality Suite, banquet (Saturday, $45), Special Event Station WQ4CWA, several escorted tours of the cities and region. Talk-in on 146.895. Registration is $37.50 (spouse $10, guest/friend $25, under 18 $5). Contact Vic Culver, W4VIC, 1020 Lyndhurst Pl, Virginia Beach, VA 23464, 757-495-2679; **vic.w4vic@verizon.net**; **www.qcwa-ch119.org**.

FLORIDA STATE CONVENTION

October 11-12, Melbourne

F D V S

The Florida State Convention, sponsored by the Platinum Coast ARS, will be held at the Melbourne City Auditorium, 625 E Hibiscus Blvd. Doors are open for setup Friday 6-9 PM and Saturday 7:30-9 AM; public Saturday 9 AM-5 PM, Sunday 9 AM-2 PM. Features include 43rd Annual Event, large indoor swap area, great outdoor tailgate area ($10 per space; first-come, first-serve basis), commercial vendors, excellent forums and meetings, consignment table, on-site VE sessions, ARES® Badging (all day Saturday), ARRL Awards Checking (Saturday), youth program and special guests. Talk-in on 146.85. Admission is $6 in advance (before Sep 30), $7 at the door or after Sep 30. Swap tables are $20 each. Contact Jan Heise, K4QD, c/o PCARS Melbourne Hamfest, Box 1004, Melbourne, FL 32902-1004; 321-956-2482; **hamfest2008@pcars.org**; **www.pcars.org**.

CONNECTICUT STATE CONVENTION

October 12, Wallingford

F D V S

The Connecticut State Convention (16th Annual Event), sponsored by the Nutmeg Hamfest Alliance, will be held at the MountainRidge Resort, 300 High Hill Rd. Doors are open for indoor vendor setup and tailgating at 6 AM; public 8 AM-1 PM. Features include the largest flea market in Southern New England; indoor exhibitors; unlimited tailgating space; major vendors (**vendors@nutmeghamfest.com**); new and used equipment; forums; demonstrations; emcomm equipment and vehicles on display; special guest speaker Ed Hare, W1RFI (ARRL Lab Manager); YCCC Annual Meeting; VE sessions (Don Mitchell, KE1AY, **dmitchell1273@sbcglobal.net** or **vetest@nutmeghamfest.com**); plenty of free parking; excellent food at good prices. Talk-in on 147.36. Admission is $7 (under 12 free). Tables are $30 each (8-ft and chair; includes 1 admission); outside spaces are $20 each (bring your own tables and tents, no electricity outside; includes 1 admission). Contact John Bee, N1GNV, 30 Tremont St, Meriden, CT 06450; 203-440-4468; **info@nutmeghamfest.com**; **www.nutmeghamfest.com**.

September 19-20
W9DXCC, Elk Grove Village, IL*

September 20
EMCOMM East, Rochester, NY*
South Dakota Section, Sioux Falls*

September 20-21
Virginia Section, Virginia Beach*

September 26-27
San Francisco Section, Ferndale, CA*

September 26-28
ARRL/TAPR Digital Communications, Chicago (Elk Grove Village), IL*

September 27
Washington State, Spokane Valley*

October 3-5
Pacific Northwest VHF, Moses Lake, WA*

October 5
Western New York Section, West Seneca*

November 15-16
Indiana State, Fort Wayne

December 6-7
West Central Florida Section, Palmetto

*See September *QST* for details.

MICHIGAN STATE CONVENTION

October 12, Kalamazoo

F V S

The Michigan State Convention, co-sponsored by the Kalamazoo ARC and the Southwest Michigan AR Team, will be held at the Kalamazoo County Fairgrounds, 2900 Lake St. Doors are open for setup at 6 AM; public 8 AM-1 PM. Features include 26th Annual Event, computer sales, educational and technical forums, trunk sales ($5 per space), DXCC card checking, VE sessions (10 AM), awards banquet (1-3 PM; $26, must be purchased by Oct 1), campsites available with electricity and water, free parking, refreshments. Talk-in on 147.04 (94.8 Hz). Admission is $5. Tables are $22 with electricity, $12 without electricity (8-ft). Contact Ruth Bates-Hill, WB8VEV, 9176 Shade Tree Cir, Galesburg, MI 49053; 269-665-7419 (home), 269-833-3351 (work), 269-207-9955 (cell); **ruthbateshill@hotmail.com** or **info@kalamazoohamfest.com**; **www.kalamazoohamfest.com**.

AMATEUR RADIO LIGHTHOUSE SOCIETY CONVENTION

October 17-18, St Simons Island, Georgia

The Amateur Radio Lighthouse Operating Specialty Convention, sponsored by the Amateur Radio Lighthouse Society, will be held at St Simons Island, 609 Beachview Dr. Doors are open 9 AM-5 PM. Features include presentations on restoration and preservation of lighthouses; programs on activation of lighthouses; dinner (Friday, 6 PM), eyeball QSOs, ARLHS annual meeting (Saturday, 9 AM), guest speakers, awards programs, Saturday eve dinner. Talk-in on 145.33. Registration is $35 in advance, $45 at the door. Contact James Buffington, K5JIM, Box 52, 402 S Matubba St, Aberdeen, MS 39730; 662-319-6288; fax 662-369-3440; **jim@jimbuffington.com**; **www.arlhsconvention.com**.

PACIFIC DIVISION CONVENTION

October 17-19, San Ramon, California

F D H V S

The Pacific Division Convention (Pacificon 2008), sponsored by the Mt Diablo ARC, will be held at the San Ramon Marriott Hotel, 2600 Bishop Dr. Doors are open Friday 7 AM-5 PM, Saturday 6 AM-7 PM, Sunday 6 AM-1 PM. Features include antenna seminar (Friday, 8 AM-4 PM, $10); Legal Seminar (Friday, 9 AM-noon); QRP and HFpack Dinner and Meeting (Friday, 6:30 PM) and other activities; opening breakfast buffet with keynote speaker Gordon West, WB6NOA (Saturday, 6:45-8 AM, $14); electronics swapmeet (Sunday, 6 AM-noon in hotel parking lot; admission is free to buyers, sellers $20 for double car slot); vendors; latest ham radio and electronic equipment on display and for sale; manufacturers; outstanding technical forums and presentations; live ATV demonstration; T-hunts (Sunday 8 AM beginners; 9 AM advanced); banquet with special guest speaker "The Ultimate DXer" Jill Tarter, Director of SETI (Saturday, 7 PM, $39); Wouff-Hong ceremony (Saturday at midnight); one-day technician license class (Saturday, 8 AM-5 PM; exam at 5 PM); VE test sessions (Saturday and Sunday, 9 AM-noon; Technician through Extra Class, $14 fee); 51st JOTA and JOTI (Saturday, 9 AM-5 PM, Sunday 9 AM-1 PM; Pleasanton Room); ARRL forum (Sunday, 1 PM); handicapped accessible. Talk-in on 147.06 (100 Hz). Admission is $15 in advance, $20 at the door. Exhibit tables are $150. Contact Dick Brown, KT6X, c/o PACIFICON, Box 272613, Concord, CA 94527; 925-288-1730; fax 925-676-9048; **pacificoninfo@astound.net**; **www.pacificon.org**.

GEORGIA STATE CONVENTION

November 1-2, Lawrenceville

F D V S

The Georgia State Convention (Stone Mountain Hamfest and Computer Expo), sponsored by the Alford Memorial RC, will be held at the Gwinnett County Fairgrounds, 2405 Sugarloaf Parkway. Doors are open Saturday 8 AM-4 PM, Sunday 8 AM-2 PM. Features include indoor flea market, huge boneyard ($8 per space, good both days, plus admission), commercial tailgating ($20 per space with electric connections; includes 1 admission), major manufacturers and vendors, forums, youth lounge, contests, VE sessions (both days; registration 8-8:30 AM, testing at 9 AM sharp), on-site camping, free parking, refreshments. Talk-in on 146.76 (107.2 Hz), 145.45. Admission is $6 in advance (until Oct 31), $8 at the door. Tables are $20 ($25 with electrical hookup; includes 1 admission per table). Contact Randy Bassett, KR4NQ, Box 1282, Stone Mountain, GA 30086-1282; 770-978-9181; **hamfest@totr-radio.org**; **www.totr-radio.org**.

ALABAMA SECTION CONVENTION

November 8, Montgomery

F D H V S

The Alabama Section Convention, sponsored by the Montgomery ARC, will be held at the South Alabama State Fairgrounds Garrett Coliseum, 1555 Federal Dr. Doors are open 9 AM-3 PM. Features include Hamfest and Computer Show, flea market, tailgating ($5 per

Gail Iannone ♦ Convention and Hamfest Program Manager ♦ giannone@arrl.org

space), new equipment vendors, exhibits, technical forums, VE sessions (8 AM), RV parking and camper hookups (334-242-5597), handicapped accessible, free parking. Talk-in on 146.84, D-Star 146.92. Admission is $6. Tables are $15 in advance for the 1st table, $10 for each additional table; $15 each at the door. Contact Rik Doll, KU4PY, 142 Oldfield Dr, Montgomery, AL 36117; 334-277-0864; **ku4py@arrl.net**; or Phil Salley, K4PO, 334-396-8369; **hamfest@w4ap.org**; **www.w4ap.org**.

F = FLEA MARKET
D = DEALERS / VENDORS
H = HANDICAP ACCESS
V = VE SESSIONS
S = SEMINARS / PRESENTATIONS

Attention Hamfest and ConventionSponsors:

ARRL HQ maintains a date register of scheduled events that may assist you in picking a suitable date for your event. You're encouraged to register your event with HQ as far in advance as your planning permits. Hamfest and convention approval procedures for ARRL sanction are separate and distinct from the date register. Registering dates with ARRL HQ doesn't constitute League sanction, nor does it guarantee there will not be a conflict with another established event in the same area.

We at ARRL HQ are not able to approve dates for sanctioned hamfests and conventions. For hamfests, this must be done by your division director. For conventions, approval must be made by your director and by the executive committee. Application forms can be filled out online at **www.arrl.org/FandES/field/hamfests/regform.html**.

Note: Sponsors of large gatherings should check with League HQ for an advisory on possible date conflicts before contracting for meeting space. Dates may be recorded at ARRL HQ for up to two years in advance. QST

HAMFEST CALENDAR

Attention: The deadline for receipt of items for this column is the **1st of the second month preceding publication date**. For example, your information must arrive at HQ by **October 1** to be listed in the **December** issue. Hamfest information is accurate as of our deadline; contact sponsor for possible late changes. For those who send in items for Hamfest Calendar and Coming Conventions: Postal regulations prohibit mention in *QST* of prizes or any kind of games of chance such as raffles or bingo.

Abbreviations: *Spr* = Sponsor, *TI* = Talk-in frequency, *Adm* = Admission.

Alabama (Fayette) — Oct 11. David Bash, KI4IKM, **ki4ikm@gmail.com**.

Alabama (Headland) — Oct 18 F V
8 AM-noon. *Spr:* Wiregrass ARC. Headland Town Square, 10 Park St. Tailgating, ARRL booth, VE sessions. *TI:* 145.43. *Adm:* Free. Tables: $5. James Nelson, KE4GWW, 415 Gwaltney Dr, Dothan, AL 36303; 334-685-1642; **ke4gww@arrl.net**; **www.wb4zpi.org**.

Alabama (Montgomery) — Nov 8, Alabama Section Convention. See "Coming Conventions."

Arizona (Tucson) — Oct 18 F D V
Set up 6 AM; public 7 AM-noon. *Spr:* Old Pueblo RC assisted by the Radio Society of Tucson. Kino Sports Park, 2500 E Ajo Rd. Swapmeet, vendors (parking fee $5), VE sessions, ARCA meeting, free parking, refreshments. *TI:* 147.3 (110.9 Hz). *Adm:* Free. John Clor, N7SQQ, 1934 S Avenida Planeta, Tucson, AZ 85710; 520-400-6446; **w7gv@cox.net**.

California (San Ramon) — Oct 17-19, Pacific Division Convention. See "Coming Conventions."

Connecticut (Wallingford) — Oct 12, Connecticut State Convention. See "Coming Conventions."

Florida (Eustis) — Nov 1 V
8 AM-3 PM. *Spr:* Lake ARA. Eustis Senior Center, 301 W Ward St. VE sessions. *TI:* 147.255 (103.5 Hz). *Adm:* advance $4.50, door $5. Tables: $10. David Nachbaur, KR4OW, 26722 Pelican St, Eustis, FL 32736; 352-357-3485; **pkmaint@yahoo.com**; **www.k4fc.org**.

Florida (Melbourne) — Oct 11-12, Florida State Convention. See "Coming Conventions."

Florida (Miami) — Oct 25 V
8 AM-5 PM. *Spr:* Dade Radio Club of Miami. Miami Mahi Shrine Temple, 1480 NW North River Dr. VE sessions, free wifi, boat dock space available if coming by boat. *TI:* 146.925 (103.5 Hz). *Adm:* advance $5, door $7. Tables: $25. Robert Cruz, KE4MCL, c/o Dade Radio Club of Miami, Box 452253, Miami, FL 33245; 305-513-8255; **hamtoberfest@gmail.com**; **www.hamboree.org**.

Georgia (Evans) — Oct 11 V S
9 AM-2 PM. *Spr:* ARC of Augusta. Evans Middle School, 4781 Hereford Farm Rd. ARRL and MARS forums, VE sessions. *TI:* 145.49. *Adm:* $5. Tables: $10. Doug Pugh, KE4JSJ, 1806 Birch Dr, N Augusta, SC 29860; 803-279-6725; **doug9945@yahoo.com**; **www.w4dv.org**.

Georgia (Lawrenceville) — Nov 1-2, Georgia State Convention. See "Coming Conventions."

Georgia (St Simons Island) — Oct 17-18, Amateur Radio Lighthouse Society Convention. See "Coming Conventions."

Illinois (Decatur) — Oct 18 F V
8 AM-1 PM. *Spr:* Cenois ARC. Richland Community College, corner of Rea's Bridge and Brush College Rds. Old-fashioned hamfest, outdoor flea market, VE sessions. *TI:* 146.73 (123 Hz), 442.25 (103.5 Hz). *Adm:* $5. Tables: $5. Will Jahr, K9VQA, 2123 S Windsor Rd, Decatur, IL 62521; 217-429-6434; fax 217-692-2424; **k9vqa1@juno.com**; **www.cenois.com**.

Illinois (Logan) — Oct 11 F V
7 AM-1 PM. *Spr:* Little Egypt ARS. Old Logan Grade School, Logan Rd. Free outdoor tailgating, VE sessions. *TI:* 146.805 (88.5 Hz). *Adm:* $5. Tables: $5. Jason Sample, KF9CZ, 7551 Grammer Rd, Sesser, IL 62884; 618-525-6871; **kf9cz@arrl.net**; **www.learsradio.com**.

Indiana (Bedford) — Oct 5 F D V
Set up Saturday (Oct 4); public Sunday 6 AM-2 PM. *Spr:* Hoosier Hills Ham Club. Lawrence County 4-H Fairgrounds, US Hwy 50 W. 47th Annual Hamfest, vendors, VE sessions, free chili supper (Saturday eve), free parking. *TI:* 146.73 (107.2 Hz). *Adm:* $8 (under 12 free). Tables: $10. Keith Harris, N9KH, 1618 Windwood Dr, Bedford, IN 47421; 812-275-3415; **n9kh@comcast.net**; **www.hoosierhillshamfest.org**.

Indiana (Crown Point) — Oct 11 V
8 AM-1 PM. *Spr:* Lake County ARC. Lake County Fairgrounds, Industrial Arts Building, 889 S Court St. All indoors, VE sessions. *TI:* 147.0 (131.8 Hz), 146.52. *Adm:* $5. Tables: Free (electricity available). Rich Gilles, KA9SVS, 156 S Ridge St, Crown Point, IN 46307; 219-662-0594; **paris156@yahoo.com**; **www.qsl.net/w9lj**.

Indiana (Greenfield) — Sep 28 F D H
8 AM-1 PM. *Spr:* Hancock ARC. Hancock County 4-H Fairgrounds, 400 N Apple St. Free outside covered tailgate area, indoor commercial vendors, free parking, handicapped accessible, breakfast and lunch available on grounds. *TI:* 145.33. *Adm:* $4. Tables: $10. Mike Mallory, NE9O, 5855 S State Rd 9, Fountaintown, IN 46130; 317-861-1916; **mjmal@att.net**; **www.w9atg.org**.

Iowa (Davenport) — Nov 2 F D H
8 AM-2 PM. *Spr:* Davenport RAC. Clarion Hotel (formerly the Holiday Inn), 5202 N Brady St (Hwy 61 N). 37th Annual Hamfest/Computer Show, commercial vendors, free parking, handicapped accessible. *TI:* 146.88 (192.8 Hz). *Adm:* advance $6, door $7 (under 12 free). Tables: $12. Bill Bolton, WBØBBM, 28755 Utica Ridge Rd, Long Grove, IA 52756; 563-285-4324; **wb0bbm@arrl.net**; **www.arcsupport.com/drac/hamfest.html**.

Louisiana (Pineville) — Oct 11 D V S
7 AM-2 PM. *Spr:* Central Louisiana ARC. Pineville Community Center, 708 Main St. Vendors, forums (ARRL, ARES, Wx Spot), VE sessions. *TI:* 147.33 (173.8 Hz). *Adm:* Free. Tables: $10. Charles Standlee, AC5PW, 2747 Hwy 28 E, Apt 902, Pineville, LA 71360; 318-448-8088 or 318-880-1537; **ac5pw10@yahoo.com**; **www.clarc.us**.

Maryland (Westminster) — Oct 26 F D V S
8 AM-1 PM. *Spr:* Carroll County ARC. Carroll County Agricultural Center, 700 Agriculture Center Dr. 19th Annual Mason-Dixon Hamfest, indoor and outdoor vendors, VE sessions, Microcontrollers and Ham Radio Seminar. *TI:* 145.41 (114.8 Hz). *Adm:* $5. Tables: $18. Pat Kilroy, N8PK, GSFC Bldg 5, Mail Code 568, Greenbelt, MD 20771; 301-286-1984; fax 410-583-4149; **n8pk@arrl.net**; **www.qis.net/~k3pzn**.

Massachusetts (Bourne) — Nov 8 D V
Set up 7 AM; public 9 AM-noon. *Spr:* Falmouth ARA. Upper Cape Cod Regional Vocational Technical School, 220 Sandwich Rd. Vendors,

VE sessions, talk-in station, displays, ARRL table. *TI:* 146.655 (88.5 Hz). *Adm:* $5. Tables: advance $9 (by Nov 1), door $10. Ralph Swenson, N1YHS, 99 Fox Run Ln, E Falmouth, MA 02536; 508-548-0422 (phone and fax); **depsher911@comcast.net**; **www.falara.org**.

Massachusetts (Cambridge) — Oct 19. Nick Altenbernd, KA1MQX, 617-253-3776; **w1gsl@mit.edu**; **www.swapfest.us**.

Michigan (Holland) — Oct 18 F D V S
8 AM-noon. *Spr:* Holland ARC. West Ottawa South Campus, 3600 152nd Ave. 6th Annual Great Lakeshore Super Swap, vendors, forums, outside displays, test table, VE sessions. *TI:* 147.06 (94.8 Hz). *Adm:* $6. Tables: 8-ft $10. John Seidelman, WD8BWK, 46 W 21st St, Holland, MI 49423; 616-394-9821; **swap@hollandarc.org**; **www.hollandarc.org**.

Michigan (Kalamazoo) — Oct 12, Michigan State Convention. See "Coming Conventions."

Michigan (Sterling Heights) — Oct 26 F V
8 AM-1 PM. *Spr:* Utica Shelby Emergency Communications Assn. Polish-American Century Club, 33204 Maple Lane Dr. 23rd Annual Swap, VE sessions, buffet following swap ($8). *TI:* 147.18 (100 Hz). *Adm:* $5. Tables: $15 (first), $10 (for each additional). Larry Logarta, W8NIC, Box 46331, Mt Clemens, MI 48046; 586-864-4563; **w8nic@yahoo.com**; **www.usecaarc.com**.

Mississippi (Ocean Springs) — Oct 18
8 AM-2 PM. *Sprs:* ARRL Mississippi Section and Mississippi Coast ARA. Davis Bayou Campground, 3500 Park Rd. Annual "ARRL Day in the Park." *TI:* 146.73. *Adm:* Free. Malcolm Keown, W5XX, 64 Lake Circle Dr, Vicksburg, MS 39180; 601-636-0827; **w5xx@arrl.org**; **www.arrlmiss.org** or **www.qsl.net/kd5ahg**.

Missouri (Grandview) — Oct 18 F V
8 AM-1 PM. *Spr:* South-Side ARC. Grandview Middle School (East Jr High), 12650 Manchester Ave. Octoberfest 2008, American Red Cross, VE sessions. *TI:* 147.12. *Adm:* advance 4 for $5; door 3 for $5 or $3 each. Tables: $15. Donna Quick, KBØYJN, Box 1670, Lee's Summit, MO 64063; 816-537-7464; **kb0yjn@juno.com**; **southsidearc.org**.

Missouri (Kirkwood/St Louis) — Oct 25 F D V
7:30 AM-12:30 PM. *Spr:* St Louis ARC. Kirkwood Community Center, 111 S Geyer Rd. 17th Annual Halloween Hamfest, 100 indoor swap/sell tables, vendors, VE sessions, made-to-order breakfast, free parking. *TI:* 147.15 (141.3 Hz). *Adm:* advance $3 each or 3 for $7; door $5. Tables: $15. Bob Sluder, NØIS, 47 Will Dr, Fenton, MO 63026; 636-349-6584; **bcsluder@msn.com**; **www.halloweenhamfest.org**.

Montana (Bozeman) — Oct 11 F D H V S
Set up 9 AM; public 10 AM-3 PM. *Spr:* Gallatin Ham Radio Club. Sacajawea Middle School, 3525 South 3rd Ave. 12th Annual Hamfest, flea market, dealers, seminars, VE sessions, NWS Skywarn Weather Spotter Training, hidden transmitter foxhunt, handicapped accessible, refreshments. *TI:* 146.88 (100 Hz), 447.7 (77 Hz), 146.52. *Adm:* $2. Tables: $10. Tom Lewis, AB5CK, **mail@gallatinhamradio.com**; **www.gallatinhamradio.com**.

Nebraska (Omaha) — Oct 5 V S
9 AM-2 PM. *Spr:* Ak-Sar-Ben ARC. Millard American Legion Hall, 4618 S 139th St. Forums, VE sessions. *TI:* 146.94. *Adm:* $3. Tables: $7. Jim Harper, KCØSHZ, 637 S 126th St, Omaha, NE 68154; 402-659-0102; fax 402-559-6782; **hamfest@aksarbenarc.org**; **www.aksarbenarc.org/main/**.

New Hampshire (Deerfield) — Oct 10-11. Michael Crestohl, W1RC, **info@near-fest.com**; **www.NEAR-Fest.com**.

New Mexico (Socorro) — Oct 25 V S
7:30 AM. *Sprs:* Socorro ARA and the City of Socorro. NM Firefighters Academy, 600 Aspen Rd. ARES forum, VE sessions. *TI:* 146.68 (100/123 Hz), 444.75. *Adm:* Free. Tables: $10. Al Braun, AC5BX, 602 Western Ave, Socorro, NM 87801; 575-835-1061 (home) or 575-835-3370 (work); **ac5bx@juno.com**; **socorroara.org**.

New York (Hicksville) — Oct 26 F D H V
Set up 7:30 AM; public 9 AM. *Spr:* Long Island Mobile ARC. Levittown Hall, 201 Levittown Parkway. Long Island Indoor Hamfair and Electronics Show, vendors, VE sessions (11:30 AM), tune-up clinic, free parking, handicapped accessible, refreshments. *TI:* 146.85 (136.5 Hz). *Adm:* $6. Tables: $20. Richard Cetron, K2KNB, 198 Haypath Rd, Old Bethpage, NY 11804; 516-694-4937; fax 631-574-4851; **hamfest@limarc.org**; **www.limarc.org**.

New York (Lindenhurst) — Oct 19 D H
8:30 AM-1 PM. *Spr:* Town of Babylon AR Emergency Services. Fireman's Memorial Park, Hartford St. Indoor and outdoor vendors, handicapped accessible. *TI:* 146.685 (110.9 Hz). *Adm:* $6. Tables: $25. Walter Wenzel, KA2RGI, Box 1222, W Babylon, NY 11704; 631-957-0218; **tobares@optonline.net**; **www.tobares.org**.

North Carolina (Maysville) — Oct 12 F
8 AM-3 PM. *Spr:* Maysville Hamfest Club. Community Center, Rte 58. Free tailgating, affordable catered lunch. *TI:* 146.685 (88.5 Hz). *Adm:* Free. Byron Highland, K4BMH, 3753 Thorne Dr, Farmville, NC 27828; 252-753-2895; **agriffith003@ec.rr.com**.

North Carolina (Pfafftown) — Oct 11 F
Set up 6 AM; public 8 AM-noon. *Spr:* Forsyth ARC. West Central Community Center, 6130 Yadkinville Rd. Free coffee and donuts (starting at 7 AM), free inside space available (first-come, first-served). *TI:* 146.64, 145.47 (both 100 Hz) . *Adm:* $5. Tables: Bring your own. Hamfest Committee, W4NC, Box 11361, Winston-Salem, NC 27116-1361; 336-245-5740; **pfafftown08@w4nc.org**; **www.w4nc.com**.

Nova Scotia (Greenwood) — Oct 18. Eric Smith, VE1CFY, 902-765-4468, **ve1cfy@rac.ca**; **greenwoodarc.org**.

Ohio (Georgetown) — Nov 8 F D V
8 AM-2 PM. *Spr:* Grant ARC. ABCAP Building, 406 Plum St. Flea market (all indoors), vendors, VE sessions, great food. *TI:* 146.73. *Adm:* $2. Tables: Free. Rodney Crawford, WD8CTX, 2585 SR 138, Sardinia, OH 45171; 937-446-2338 (phone and fax); **wd8ctx@juno.com**; **www.garcohio.net/**.

Ohio (Massillon) — Oct 26 F H V
Set up 6 AM; public 8 AM-2 PM. *Spr:* Massillon ARC. Massillon Boys and Girls Club Complex, 730 Duncan St SW. 48th Annual Hamfest, auction, VE sessions, handicapped accessible. *TI:* 147.18 (110.9 Hz). *Adm:* $5. Tables: $12. Terry Russ, N8ATZ, 3420 Briardale Circle NW, Massillon, OH 44646; 330-837-3091; **truss@sssnet.com**; **www.marcradio.org**.

Oklahoma (Ardmore) — Oct 24-25 F D V S
Friday 5-8 PM; Saturday 8 AM-1 PM. *Spr:* Texoma Hamarama Assn. Ardmore Convention Center, 2401 N Rockford Rd. Indoor flea market, dealers, ARRL forum, VE sessions, RV parking available (no hookups). *TI:* 146.97. *Adm:* advance $7, door $8. Tables: $10. Henry Allen, K5BUG, Box 425, Caddo Mills, TX 75135; 903-527-4163; fax 214-388-2706; **k5bug@arrl.net**; **www.angelfire.com/tx5/TexomaHamarama/**.

Oklahoma (Enid) — Nov 1. Tom Worth, N5LWT, 580-233-8473, **enidhamfest@yahoo.com**; **www.enidhamfest.com**.

Oklahoma (Tulsa) — Oct 4 F
8 AM-noon. *Spr:* Green Country Hamfest, Inc. AEP-PSO Covered Parking Lot, 600 S Frankfort. Swapmeet. *TI:* 146.88 (88.5 Hz or 141.3 Hz). *Adm:* Free. Tables: Free. Merlin Griffin, WB5OSM, Box 470132, Tulsa, OK 74147-0132; 918-520-7668; **wb5osm@hotmail.com**; **www.greencountryhamfest.org**.

Oregon (Rickreall) — Oct 25 F V
9 AM-3 PM. *Spr:* Mid-Valley ARES. Polk County Fairgrounds, 520 S Pacific Hwy W. 14th Annual "Swaptoberfest," ARES meetings, VE sessions. *TI:* 146.86 (186.2 Hz). *Adm:* advance $8, door $9. Tables: $20 (non power), $22 (with power); must pre-register. Chris Portal, W7CLP, Box 603, Dallas, OR 97338; 503-559-7837; fax 503-623-2395; **w7clp@arrl.net**; **www.swaptoberfest.net**.

Pennsylvania (Sellersville) — Oct 19 F D H V
Set up 6 AM; public 7 AM-1 PM. *Spr:* RF Hill ARC. Sellersville Firehouse, 2 N Main St. Flea market, vendors, VE sessions (10 AM-noon, all elements; walk-ins welcomed, bring required documents), free parking and transportation from remote lot (6:30 AM-12:30 PM), handicapped parking, refreshments. *TI:* 145.31 (131.8 Hz). *Adm:* $6 (nonham spouses and children free). Tables: $12 (indoor); $8 (outdoor spaces; bring your own table), plus admission. Jim Soete, WA3YLQ, 215-723-7294; fax 215-257-0724; **wa3ylq@arrl.net**; **www.rfhill.ampr.org**.

Pennsylvania (Washington) — Nov 2 D V
8 AM. *Spr:* Washington Amateur Communications. Washington County Fairgrounds, 2151 N Main St. Indoor vendors, tailgating, VE sessions. *TI:* 145.49. *Adm:* $5. Tables: $10. Ed Oelschlager, N3ZNI, 60 Carl Ave, B-2, Eighty Four, PA 15330; 724-746-9235; fax 724-484-0998; **n3zni@arrl.net**; **www.wacomarc.org**.

Quebec (Longueuil) — Oct 25. David Chadufaud, VE2EDF, 450-672-9791; **ve2edf@videotron.ca**; **www.ve2clm.ca/articles.php?lng=fr&pg=120**.

South Carolina (Sumter) — Oct 25 F D
8 AM-5 PM. *Spr:* Sumter ARA. Jaycee Hut, 314 Pine St. Sumter "Open-Air" Hamfest, dealers, tailgating, famous smoked chicken. *TI:* 147.015 (156.7 Hz). *Adm:* advance $5, door $6. Tables: $8. Carl Ecabert, AA1MD, 6105 Dubose Siding Rd, Sumter, SC 29153; 803-464-4290; fax 803-499-3590; **aa1md@ftc-i.net**; **www.geocities.com/CapeCanaveral/2695/sara.htm**.

Tennessee (East Ridge) — Oct 25 F D H V
8 AM-2 PM. *Spr:* Chattanooga ARC. Camp Jordan Pavilion, Camp Jordan Pkwy. Swapfest Chattanooga (rain or shine event), large boneyard area, dealers, VE sessions, free parking, handicapped accessible, breakfast and lunch. *TI:* 146.79. *Adm:* Free. Tables: Bring your own. Bill Dobbs, K4TSF, 4330 Esterbrook Dr, Chattanooga, TN 37412; 423-308-3477; **k4tsf@arrl.net**; **w4am.org**.

Tennessee (Gray) — Oct 18 V S
6 AM-2 PM. *Spr:* GrayHamfest Assn. Appalachian Fairgrounds, 101 Lakeside St. Youth forum, innovations in the hobby, group presentations for emergency and public services, VE sessions. *TI:* 146.7. *Adm:* $6. Tables: $10. Charlie Stuchell, K4CWA, 222 River Rd,

Bluff City, TN 37618-2431; 423-538-3868; fax 423-538-4811; **k4cwa@arrl.net**; **GrayHamfest.com**.

Tennessee (Pigeon Forge) — Sep 27. Lynn Lamb, W4NL, 865-681-2279; **w4nl@charter.net**; **sedco.homestead.com/**.

Texas (Paris) — Oct 10-11 F D H V
Set up Friday at noon, Saturday 6 AM; public Friday 5 PM, Saturday 8 AM. *Spr:* Paris Texas Radio Group. Red River Valley Fairgrounds Coliseum, 570 E Center St. 4th Annual Hamfest, indoor flea market, new radio vendors, outdoor tailgating (unlimited, $10 per space), contests, VE sessions (both days), dance to live music (Friday, 7 PM), camping available with hookups, handicapped accessible, refreshments. *TI:* 147.04 (100 Hz). *Adm:* $2 (good both days). Tables: $15. Richard Lenoir, KI5DX, 2150 Plum St, Paris, TX 75460; 903-783-0968; **ki5dx@yahoo.com**; **www.paristexasradio.com**.

Virginia (Virginia Beach) — Oct 3-5, QCWA International Convention. See "Coming Conventions."

Washington (Bremerton) — Oct 11 F V S
9 AM-2 PM. *Spr:* North Kitsap ARC. Kitsap County Fairgrounds (President's Hall), 1200 NW Fairgrounds Rd at Nels Nelson Rd. Hamfest and Electronics Swapmeet, new and used equipment, live antique radio station, VE sessions, county emergency communications vehicle display. *TI:* 146.62 (103.5 Hz), 146.52. *Adm:* $5, under 12 free. Tables: $20 (Commercial spaces $30). Christopher McGraw, KB2SKP, c/o NKARC, Box 2268, Silverdale, WA 98383; 360-830-4363 (phone and fax); **kb2skp@arrl.net** or **nkarc@yahoo.com**; **www.nkarc.org/hamfest.html**.

Washington (Lynden) — Oct 25 F V
9 AM-2 PM. *Spr:* Mt Baker ARC. Northwest Washington Fairgrounds, 1775 Front St. 9th Annual Flea Market and Electronics Show, display of emergency communications vehicles, VE sessions. *TI:* 146.74 (103.5 Hz). *Adm:* $5 (US). Tables: $15 each ($12 each for 4 or more). Al Norton, K7IEY, 1008 Liberty St, Lynden, WA 98264; 360-354-4622; **k7iey@netscape.net**; **www.mtbakerarc.org**.

Wisconsin (Milwaukee) — Nov 1 F V
8 AM-2 PM. *Spr:* Milwaukee Repeater Club. Elk's Lodge, 5555 W Good Hope Rd. Swapfest, VE sessions. *TI:* 146.91 (127.3 Hz). *Adm:* $6. Tables: $10. Dean Hoover, KB7QDI, c/o Milwaukee Repeater Club, Box 2123, Milwaukee, WI 53201; 414-507-8939; fax 262-784-0687; **swapfest@mrc91.org**; **www.mrc91.org**.

F = FLEA MARKET
D = DEALERS / VENDORS
H = HANDICAP ACCESS
V = VE SESSIONS
S = SEMINARS / PRESENTATIONS

Attention All Hamfest Committees!
Get official ARRL sanction for your event and receive special benefits such as an announcement in these listings, donated ARRL publications, handouts, discounted rates for display advertising, and other support.

It's easy to become sanctioned. Contact the Convention and Hamfest Branch at ARRL Headquarters, 225 Main St, Newington, CT 06111, 860-594-0262, or send e-mail to **giannone@arrl.org**. The application form can be filled out online at **www.arrl.org/FandES/field/hamfests/regform.html**.

Promoting your event is guaranteed to increase attendance. As an approved event sponsor, you are entitled to special discounted rates on *QST* display advertising and *ARRL Web* banner advertising. Call the ARRL Advertising Desk at 860-594-0207, or e-mail **ads@arrl.org**.

VHF/UHF Century Club Awards

Compiled by Sharon Taratula
Administrative Manager

The ARRL VUCC numbered certificate is earned by amateurs who submit written confirmation for contacts with the minimum number of Maidenhead grid locators (indicated in italics) for each band listing. The numbers preceding call signs indicate total grid locators claimed. The numbers following the call signs indicate claimed endorsement levels. The totals shown are for credits given from May 16, 2008 to July 17, 2008.

The VUCC application form, field sheets and complete list of VHF Awards Managers can be found on the VUCC Web site at **www.arrl.org/awards/vucc**. An SASE to ARRL is required if you cannot download these forms. Send questions relating to VUCC to **vucc@arrl.org**.

50 MHz
100

1632	W1ATV
1633	KK9H
1634	N8NJA
1635	NA2R
1636	W4AVY
1637	W2AJM
1638	K7PAP
K8VFV	200
ON5UE	225
W9GKA	325
K8TL	375
N4HN	400
WA2IIE	400

144 MHz
100

K8TL	150

432 MHz
50

324	N4TUT
G4RGK	220

1296 MHz
25

N9LR	60

5.7 GHz
5

W5ZN	30

10 GHz
5

182	VE3TFU
183	K8EB

24 GHz
5

W5LUA	15

Satellite
100

164	XE2RV
165	N5KI
166	N8DZM
167	ZS2ACP
WA5BKH	150
K8ZZU	250

Strays

NAQCC SEEKS CW ENTHUSIASTS

◊ The mission of the North American QRP CW Club is to preserve and encourage CW activity on our amateur bands. The NAQCC is for all CW enthusiasts around the world. Our members include "Big Gun" contesters, hard-core low-power (QRP) operators, experimenters, ragchewers and short-wave listeners, young and old alike.

We welcome all who want to help support CW and have at least some interest in using QRP from time-to-time. Our club runs monthly sprints and challenges, and we sponsor some additional special on-air activities during the year. Membership is free and once you join you're automatically a lifetime member. — *Paul Neuman, KD2MX*, **www.arm-tek.net/~yoel/**

GOT PHOTOS?

◊ We enjoy receiving photos related in some way to Amateur Radio. Here are a few tips to help your photo get considered for publication in *QST* or elsewhere.

Photos should:

- ✔ be high-resolution digital images. Use a 3 MP or higher camera set at the maximum image resolution. (That said, attaching more than two high-res photos to a single e-mail message might exceed our e-mail system's size limit. To be safe, keep messages to no more than 5 MB; if you have several high-res photos to send, send them one or two at a time. They can also be burned to a CD and mailed to us.)
- ✔ be well lit, properly exposed and well composed; try to avoid having lamps protrude from your subject's head, for example.
- ✔ be taken from several different vantage points; it's preferable for us to have the choice of several different views of the same event, if possible.

DAVID SARAULT, N3XF

- ✔ include captions that tell us what is going on in the photo, where it was taken and so on. If people are shown prominently, supply their names and/or call signs.
- ✔ include complete photo credit information; if you're not the photographer, be sure that person knows you're sending us his or her photo.
- ✔ not have a date stamp; turn off that function before taking your photos.

By the way, the 2009 ARRL Photo Contest is coming. Details will appear in a spring issue of *QST*.

QST congratulates…

◊ Robert Weller, N6NE, who has been appointed Chief, Technical Analysis Branch, at the FCC's Office of Engineering and Technology. OET advises the Commission concerning engineering matters. The Technical Analysis Branch studies proposed new technologies for impacts on existing radio services to ensure efficient use of the radio spectrum. The Branch also is responsible for conducting electromagnetic propagation studies, modeling, frequency allocations, and ensuring the safe use of RF energy.

◊ Dave Zeph, W9ZRX, of Westfield, Indiana, who was named the winner of the 2008 Technical Excellence Award for the Indiana Radio Council.

◊ new Technician licensee Annalisa Gugler, KE7VJO, age 6. Proud dad is Doug, KC7OVN, mom is Shawnna, KD7GPI, and older (age 8) sister is Abigail, KE7QVB. The Guglers live in Sahuarita, Arizona. — *tnx Tom Fagan, K7DF*

◊ Array Solutions/Kintronic Labs, cited for two best new product awards at the 2008 National Association of Broadcasters Convention in Las Vegas. Both awards recognized the company's Power Aim 120 Vector Impedance Analyzer for commercial broadcasters.

HAMSPEAK

The following are brief descriptions of Amateur Radio related terms found in this month's issue of *QST*. More information on most can be found in *The ARRL Handbook*, or other specialized ARRL publications.[1] See also **www.arrl.org/qst/glossary.html**.

Experimenter's RF Spectrum Analyzer

Aliases — Spurious signal products that result from digitally sampling an analog signal at a frequency less than twice per cycle of the highest frequency component.

Attenuator — Device used to reduce the level of a signal. Attenuators are available as both fixed and variable devices with calibration usually in decibels (dB). See **www.arrl.org/tis/info/pdf/9506033.pdf** for an example of a homemade step attenuator.

Decibel — Logarithmic expression of a power or voltage ratio. See J. Hallas, W1ZR, "Making Sense of Decibels," *QST*, Apr 2007, pp 61-62 for more information.

Direct conversion receiver — Radio receiver architecture in which the incoming signal is heterodyned directly to output audio rather than to an intermediate frequency. See **www.arrl.org/members-only/tis/info/pdf/71hb137.pdf** for a description of such a receiver.

Direct digital synthesis — Method of digitally generating a waveform of a specific frequency through direct calculation of the amplitude of the sinusoid as a function of time. See **sss-mag.com/dds.html** for more information.

Dynamic range — The ratio of the maximum signal to which a system can respond to the minimum signal it can detect, usually expressed in terms of the distortion allowed.

Fast Fourier transform — Computational technique for determining the frequency components of a waveform from the time domain expression. See **mathworld.wolfram.com/FastFourierTransform.html** for details.

Full duplex — System that can transmit and receive simultaneously. An example is an ordinary telephone connection. Most amateur voice and data communication is *half-duplex* in which both directions of transmission are supported, but only one at a time.

Image — One type of spurious product from the heterodyning or mixing process.

RF mixer — Circuit that accepts two signals in the radio frequency spectrum and outputs signals at their sum and difference frequencies.

Sound card — Generic name for an audio to computer processing interface device. Originally available as an internal plug-in accessory card for a PC, the functionality is now generally available in the PC itself.

USB — Universal serial bus. Connection arrangement intended to allow computer peripherals to be connected to a PC. See **www.usb.org**.

Feeding that Zepp with Coax

Common mode — The usual and desired mode of transmission line operation is *differential mode* in which the signals exist between the two transmission line conductors. Common mode refers to signals that are on both conductors in common with respect to ground. Common mode currents occur because of improper line termination or coupling directly from the antenna to the transmission line.

Current balun — A balanced to unbalanced transformer or choke in which the currents on the two transmission line conductors are forced to be equal and opposite. See **www.arrl.org/qex/2005/qx9roos.pdf**.

Remote tuner — An antenna system matching device that is located away from the station and controlled either automatically through the use of internal sensors, or via a remote control unit at the station.

A Look at the Rohde and Schwarz XK2100 HF Transceiver

AGC — Automatic gain control. Circuitry, generally in a receiver, that adjusts the receiver gain automatically so that the output remains nearly constant in the presence of input signals of varying levels.

BFO — Beat frequency oscillator. Circuit in a receiver that is used to generate a carrier signal used to demodulate SSB or CW signals.

Duty cycle — Fraction of time a system is in operation, often expressed as a percentage. The average power consumption of a device is thus the power during on time, times the duty cycle.

IMD — Intermodulation distortion. Undesired products of systems handling signals of two or more frequencies resulting from unintended mixing in stages that are not quite linear.

LCD — Liquid crystal display. Structure that allows the transmission of light when energized. Multiple LCD segments are combined together to form display screens that are only visible upon application of light.

MGC — Manual gain control. Unlike AGC (above), MGC systems require operator intervention to change the output level of a signal with changing amplitude.

Softkey — Push-button control that changes function with different display screens.

Voice compressor — Automatically controlled transmitter microphone amplification system that increases gain in the presence of low level input and decreases gain with high level signals.

VOX — Voice operated transmit. Transceiver subsystem that switches the unit from receive to transmit mode automatically in the presence of a signal at the microphone.

The Pileup Buster

DX — Long distance communication — generally with stations in other countries. Often used to refer to desired countries and prefixes needed for various operating awards.

DXCC award — Award offered by the ARRL for demonstrated proof of legitimate amateur contact with stations in 100 countries or entities, as identified on *The ARRL DXCC List*.[2] See **www.arrl.org/awards/dxcc** for more information.

HF — High frequency. That portion of the radio spectrum between 3 and 30 MHz. Often called *short waves*, these frequencies are characterized by long-range propagation via ionospheric refraction.

Pileups — Term describing the situation in which a large number of stations are simultaneously calling the same DX station on about the same frequency.

Voice keyer — Device, sometimes included in an HF transceiver, that can transmit prerecorded messages. This is useful for calling DX stations as well as for contest exchanges.

A Short Boom, Wide Band, Three Element Yagi for 10 Meters

F/B — Front to back ratio. The ratio of the power in the main beam of a directional antenna to that to its rear.

Phase line — Transmission line used to result in a delay of a signal to provide the proper phase for connection between elements of a driven array.

SK — Silent key. Euphemism for a deceased Amateur Radio operator.

SWR — Standing wave ratio. Measure of the match between a transmission line and its load. A ratio of 1, expressed as 1:1, reflects a perfect match.

Velocity factor — Multiple by which a wave travels more slowly than in free space. Transmission lines have velocity factors ranging from around 0.6 to 0.95, depending on the dielectric material between the conductors. A higher number indicates more efficient lines.

Yagi — Multielement directive antenna array in which one or more elements are driven by connection to a transmission line and the others are parasitically coupled.

[1] *The ARRL Handbook for Radio Communications,* 2008 Edition. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 1018. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/**; **pubsales@arrl.org**.

[2] *The ARRL DXCC List* – Feb 2008 Edition. Available from your ARRL dealer or the ARRL Bookstore, ARRL order no. 1212. Telephone 860-594-0355, or toll-free in the US 888-277-5289; **www.arrl.org/shop/**; **pubsales@arrl.org**.

ANAHEIM, CA
(Near Disneyland)
933 N. Euclid St., 92801
(714) 533-7373
(800) 854-6046
Janet, KL7MF, Mgr.
anaheim@hamradio.com

BURBANK, CA
1525 W. Magnolia Blvd, 91506
(818) 842-1786
(800) 854-6046
Eric, K6EJC, Mgr.
Magnolia between
S. Victory & Buena Vista
burbank@hamradio.com

OAKLAND, CA
2210 Livingston St., 94606
(510) 534-5757
(800) 854-6046
Mark, WI7YN, Mgr.
I-880 at 23rd Ave. ramp
oakland@hamradio.com

SAN DIEGO, CA
5375 Kearny Villa Rd., 92123
(858) 560-4900
(800) 854-6046
Tom, KM6K, Mgr.
Hwy. 163 & Claremont Mesa
sandiego@hamradio.com

SUNNYVALE, CA
510 Lawrence Exp. #102, 94085
(408) 736-9496
(800) 854-6046
Dan, K6DN, Mgr.
So. from Hwy. 101
sunnyvale@hamradio.com

NEW CASTLE, DE
(Near Philadelphia)
1509 N. Dupont Hwy., 19720
(302) 322-7092
(800) 644-4476
Rick, K3TL, Mgr.
RT.13 1/4 mi., So. I-295
newcastle@hamradio.com

PORTLAND, OR
11705 S.W. Pacific Hwy.
97223
(503) 598-0555
(800) 854-6046
Leon, W7AD, Mgr.
Tigard-99W exit
from Hwy. 5 & 217
portland@hamradio.com

DENVER, CO
8400 E. Iliff Ave. #9, 80231
(303) 745-7373
(800) 444-9476
John, N5EHP, Mgr.
denver@hamradio.com

PHOENIX, AZ
1939 W. Dunlap Ave., 85021
(602) 242-3515
(800) 444-9476
Gary, N7GJ, Mgr.
1 mi. east of I-17
phoenix@hamradio.com

ATLANTA, GA
6071 Buford Hwy., 30340
(770) 263-0700
(800) 444-7927
Mark, KJ4VO, Mgr.
Doraville, 1 mi. no. of I-285
atlanta@hamradio.com

WOODBRIDGE, VA
(Near Washington D.C.)
14803 Build America Dr. 22191
(703) 643-1063
(800) 444-4799
Steve, W4SHG, Mgr.
Exit 161, I-95, So. to US 1
woodbridge@hamradio.com

SALEM, NH
(Near Boston)
224 N. Broadway, 03079
(603) 898-3750
(800) 444-0047
Chuck, N1UC, Mgr.
sales@hamradio.com
Exit 1, I-93;
28 mi. No. of Boston
salem@hamradio.com

12 STORE BUYING POWER

HAM RADIO OUTLET®

WORLDWIDE DISTRIBUTION

HRO Specials & Yaesu coupons good thru 10/31

YAESU

FT-897D VHF/UHF/HF Transceiver

- HF/6M/2M/70CM • DSP Built-in
- HF 100W (20W battery)
- Optional P.S. + Tuner • TCXO Built-in

Call Now For Our Low Pricing!

FT-950 HF + 6M TCVR

- 100W HF/6M
- Auto Tuner built-in
- 3 roofing filters built-in
- DMU-2000 Compatible

NEW!

Call Now For Low Pricing!

FT-8800R 2M/440 Mobile

- V+U/V+V/U+U operation
- V+U full duplex • Cross Band repeater function
- 50W 2M 35W UHF
- 1000+ Memory channels
- WIRES ready

Call Now For Low Pricing!

Competitive pricing!

VX-3R 2M/440 HT

- Ultra-Compact Dual-Band HT w/ Wide band RX
- 1.5W RF out 2m/ 1w RF out 440
- WiRES Compatible
- 1000 Memory channels
- AA Battery compatible w/Optional FBA-37

NEW!

Call For Low Intro Price!

FT-60R

- 2m/440 HT
- 5W Wide-band receive
- CTCSS/DCS Built-in
- Emergency Auto ID

Low Price!

VX-7R/VX-7R Black

50/2M/220/440 HT

- Wideband RX - 900 Memories
- 5W TX (300mw 220Mhz)
- Li-Ion Battery
- Fully Submersible to 3 ft.
- Built-in CTCSS/DCS
- Internet WIRES compatible

Now available in Black!

VX-6R

2M/220/440HT

- wideband RX – 900 memories
- 5W 2/440 , 1.5W 220 MHz TX
- Li-ION Battery - EAI system
- Fully submersible to 3 ft.
- CW trainer built-in

NEW Low Price!

VX-150

2M Handheld

With new high capacity battery!

- Direct Keypad Entry
- 5w output
- 209 memories
- Ultra Rugged

Call Now For Special Pricing!

FT-857D

Ultra compact HF, VHF, UHF

with FREE YSK-857

- 100w HF/6M, 50w 2M, 20w UHF
- DSP included • 32 color display
- 200 mems • Detachable front panel (YSK-857 required)

Call for Low Price!

FT-7800R 2M/440 Mobile

- 50w 2m, 40w on 440mHz
- Weather Alert
- 1000+ Mems
- WIRES Capability
- Wideband Receiver (Cell Blocked)

Call Now For Your Low Price!

FT-2000/FT2000D HF + 6M tcvr

- 100 W w/ auto tuner • built-in Power supply
- DSP filters / Voice memory recorder
- 200W (FT-2000D)
- 3 Band Parametric Mic EQ • 3 IF roofing filters

Call For Low Pricing!

FT-450AT HF + 6M TCVR

- 100W HF/6M • Auto Tuner built-in • DSP Built-in
- 500 Memories • DNR, IF Notch, IF Shift

Call Now For Special Pricing

AZ, CA, CO, GA, VA residents add sales tax. Prices, specifications, descriptions, subject to change without notice.

Look for the HRO Home Page on the World Wide Web
http://www.hamradio.com

#1 in Customer Service

COAST TO COAST FREE SHIPPING
UPS - Most Items Over $100
Rapid Deliveries From The Store Nearest To You!

12 STORE BUYING POWER

HAM RADIO OUTLET

WORLDWIDE DISTRIBUTION

D-STAR EXPERTS!

World's LARGEST HAM RADIO INVENTORY in stock for quick delivery

DISCOVER THE POWER OF DSP WITH ICOM!

IC-706MKIIG All Mode Transceiver

• Proven performance • 160-10M*/6M/2M/70CM • All mode w/DSP • HF/6M @ 100W, 2M @ 50W, 440 MHz @ 20W • CTCSS encode/decode w/tone scan • Auto repeater • 107 alphanumeric memories

IC-7000

• 160-10M/6M/2M/70CM • 2x DSP • Digital IF filters • Digital voice recorder • 2.5" color TFT display

IC-718 HF Transceiver

• 160-10M* @ 100W • 12V operation • Simple to use • CW Keyer Built-in • One touch band switching • Direct frequency input • VOX Built-in • Band stacking register • IF shift • 101 memories

IC-V8000 2M Mobile Transceiver

• 75 watts • Dynamic Memory Scan (DMS) • CTCSS/DCS encode/decode w/tone scan • Weather alert • Weather channel scan • 200 alphanumeric memories

ID-800H Digital Dual Band Mobile

• 55 watt VHF/50 watt UHF • Wide RX: 118-173, 230-549, 810-999 MHz (cellular blocked on US versions) • Analog/Digital Voice & Data • Callsign squelch • CTCSS & DTCS Encode/Decode w/tone scan

IC-7800 All Mode Transceiver

• 160-6M @ 200W • Four 32 bit IF-DSPs+ 24 bit AD/DA converters • Two completely independent receivers • +40dBm 3rd order intercept point

IC-756PROIII All Mode Transceiver

• 160-6M • 100W • Adjustable SSB TX bandwidth • Digital voice recorder • Auto antenna tuner

IC-7700 Transceiver. The Contester's Rig

• HF + 6m operation • +40dBm ultra high intercept point • IF DSP, user defined filters • 200W output power full duty cycle • Digital voice recorder

IC-2200H 2M Mobile Transceiver

• 65W Output • Optional D-STAR format digital operation & NEMA compatible GPS interface • CTCSS/DTCS encode/decode w/tone scan • 207 alphanumeric memories • Weather alert

IC-92AD Analog + Digital Dual Bander

• 2M/70CM @ 5W • Wide-band RX 495 kHz - 999.9 MHz** • 1304 alphanumeric memories • Dualwatch capability • IPX7 Submersible*** • Optional GPS speaker Mic HM-175GPS

IC-746PRO All Mode 160M-2M

• 160-2M* @ 100W • 32 bit IF-DSP+ 24 bit AD/DA converter • Selectable IF filter shapes for SSB & CW • Enhanced Rx performance

IC-2820H Dual Band FM Transceiver

• D-STAR & GPS upgradeable 2M/70CM • 50/15/5W RF output levels • RX: 118-173.995, 375-549.995, 810-999.99 MHz** • Analog/digital voice with GPS (optional UT-123) • 500 alphanumeric memories

IC-T90A Triple Band Transceiver

• 6M/2M/70CM @ 5W • Wide-band RX 495 kHz - 999.999 MHz** • 500 alphanumeric memories • Dynamic Memory Scan (DMS) • Backlit keypad & display • CTCSS/DTCS encode/decode w/tone scan • Weather alert

IC-91AD Digital Dual Band Transceiver

• 2M & 70CM @ 5W • 1304 Memory channels • Independent (dual watch) wide-band RX 495 kHz - 999.999 MHz** • Full dot matrix LCD • New "duplex scan" • D-STAR digital voice • Compliments the ID-800H mobile

IC-V82 2M Transceiver

2M @ 7W • Optional D-STAR format digital operation features include callsign calling, up to 20 character text message, & position exchange*◊ • CTCSS/DTCS encode/decode w/tone scan • Also available in a sport version and a 70CM version (IC-U82)

ICOM®

*Except 60M Band. **Frequency coverage may vary. Refer to owner's manual for exact specs. ***Tested to survive after being under 1m of water for 30 minutes. *◊ AA Alkaline batteries not included, radio comes with a AA alkaline battery tray. *◊ For shock and vibration. *◊ When connected to an external GPS. ✦Icom rebate promotion offers guaranteed through September 30, 2008. Purchase must be made from HRO between 07/01/08 and 9/30/08. Contact HRO for details.

CALL TOLL FREE

Phone Hours: 9:30 AM – 5:30 PM
Store Hours: 10:00 AM – 5:30 PM Closed Sun.

Toll free, incl. Hawaii, Alaska, Canada; call routed to nearest store; all HRO 800-lines can assist you, if the first line you call is busy, you may call another.

West.....800-854-6046
Mountain.....800-444-9476
Southeast.....800-444-7927
Mid-Atlantic...800-444-4799
Northeast.....800-644-4476
New England..800-444-0047

Look for the HRO Home Page on the World Wide Web
http://www.hamradio.com

#1 in Customer Service

AZ, CA, CO, GA, VA residents add sales tax. Prices, specifications, descriptions, subject to change without notice.

ANAHEIM, CA
(Near Disneyland)
933 N. Euclid St., 92801
(714) 533-7373
(800) 854-6046
Janet, KL7MF, Mgr.
anaheim@hamradio.com

BURBANK, CA
1525 W. Magnolia Bl., 91506
(818) 842-1786
(800) 854-6046
Eric, K6EJC, Mgr.
Magnolia between S. Victory & Buena Vista
burbank@hamradio.com

OAKLAND, CA
2210 Livingston St., 94606
(510) 534-5757
(800) 854-6046
Mark, WI7YN, Mgr.
I-880 at 23rd Ave. ramp
oakland@hamradio.com

SAN DIEGO, CA
5375 Kearny Villa Rd., 92123
(858) 560-4900
(800) 854-6046
Tom, KM6K, Mgr.
Hwy. 163 & Claremont Mesa
sandiego@hamradio.com

SUNNYVALE, CA
510 Lawrence Exp. #102
94085
(408) 736-9496
(800) 854-6046
Dan, K6DN, Mgr.
So. from Hwy. 101
sunnyvale@hamradio.com

NEW CASTLE, DE
(Near Philadelphia)
1509 N. Dupont Hwy., 19720
(302) 322-7092
(800) 644-4476
Rick, K3TL, Mgr.
RT.13 1/4 mi., So. I-295
delaware@hamradio.com

PORTLAND, OR
11705 S.W. Pacific Hwy.
97223
(503) 598-0555
(800) 854-6046
Leon, W7AD, Mgr.
Tigard-99W exit
from Hwy. 5 & 217
portland@hamradio.com

DENVER, CO
8400 E. Iliff Ave. #9, 80231
(303) 745-7373
(800) 444-9476
John N5EHP, Mgr.
denver@hamradio.com

PHOENIX, AZ
1939 W. Dunlap Ave., 85021
(602) 242-3515
(800) 444-9476
Gary, N7GJ, Mgr.
1 mi. east of I-17
phoenix@hamradio.com

ATLANTA, GA
6071 Buford Hwy., 30340
(770) 263-0700
(800) 444-7927
Mark, KJ4VO, Mgr.
Doraville, 1 mi. no. of I-285
atlanta@hamradio.com

WOODBRIDGE, VA
(Near Washington D.C.)
14803 Build America Dr.
22191
(703) 643-1063
(800) 444-4799
Steve, W4SHG, Mgr.
Exit 161, I-95, So. to US 1
virginia@hamradio.com

SALEM, NH
(Near Boston)
224 N. Broadway, 03079
(603) 898-3750
(800) 444-0047
Chuck, N1UC, Mgr.
Exit 1, I-93;
28 mi. No. of Boston
salem@hamradio.com

ANAHEIM, CA
(Near Disneyland)
933 N. Euclid St., 92801
(714) 533-7373
(800) 854-6046
Janet, KL7MF, Mgr.
anaheim@hamradio.com

BURBANK, CA
1525 W. Magnolia Blvd, 91506
(818) 842-1786
(800) 854-6046
Eric, K6EJC, Mgr.
Magnolia between
S. Victory & Buena Vista
burbank@hamradio.com

OAKLAND, CA
2210 Livingston St., 94606
(510) 534-5757
(800) 854-6046
Mark, WI7YN, Mgr.
I-880 at 23rd Ave. ramp
oakland@hamradio.com

SAN DIEGO, CA
5375 Kearny Villa Rd., 92123
(858) 560-4900
(800) 854-6046
Tom, KM6K, Mgr.
Hwy. 163 & Claremont Mesa
sandiego@hamradio.com

SUNNYVALE, CA
510 Lawrence Exp. #102, 94085
(408) 736-9496
(800) 854-6046
Dan, K6DN, Mgr.
So. from Hwy. 101
sunnyvale@hamradio.com

NEW CASTLE, DE
(Near Philadelphia)
1509 N. Dupont Hwy., 19720
(302) 322-7092
(800) 644-4476
Rick, K3TL, Mgr.
RT.13 1/4 mi., So. I-295
newcastle@hamradio.com

PORTLAND, OR
11705 S.W. Pacific Hwy.
97223
(503) 598-0555
(800) 854-6046
Leon, W7AD, Mgr.
Tigard-99W exit
from Hwy. 5 & 217
portland@hamradio.com

DENVER, CO
8400 E. Iliff Ave. #9, 80231
(303) 745-7373
(800) 444-9476
John, N5EHP, Mgr.
denver@hamradio.com

PHOENIX, AZ
1939 W. Dunlap Ave., 85021
(602) 242-3515
(800) 444-9476
Gary, N7GJ, Mgr.
1 mi. east of I-17
phoenix@hamradio.com

ATLANTA, GA
6071 Buford Hwy., 30340
(770) 263-0700
(800) 444-7927
Mark, KJ4VO, Mgr.
Doraville, 1 mi. no. of I-285
atlanta@hamradio.com

WOODBRIDGE, VA
(Near Washington D.C.)
14803 Build America Dr. 22191
(703) 643-1063
(800) 444-4799
Steve, W4SHG, Mgr.
Exit 161, I-95, So. to US 1
woodbridge@hamradio.com

SALEM, NH
(Near Boston)
224 N. Broadway, 03079
(603) 898-3750
(800) 444-0047
Chuck, N1UC, Mgr.
sales@hamradio.com
Exit 1, I-93;
28 mi. No. of Boston
salem@hamradio.com

12 STORE BUYING POWER

HAM RADIO OUTLET

WORLDWIDE DISTRIBUTION

* Kenwood Coupons Expire 9-30-08

HOT Summer Specials From Kenwood

KENWOOD

World's LARGEST HAM RADIO INVENTORY in stock for quick delivery

TM-D710A 2M/440 Dualband

- 50w 2M & UHF
- Optional Voice synthesizer
- 1000 memories • Dual receive
- Advanced APRS Features
- Echolink ® Ready w/ 10 memories
- Built-in TNC • Sky Command II+
- GPS I/O Port
- Choice of Green/Amber LCD backlight

NEW!

Call Now For Special Introductory Price!

TM-271A 2 Mtr Mobile

- 60 Watt, 200 Mems, CTCSS/DCS
- Mil-Std specs, Hi-Quality Audio

NEW!

Call Now For Special Low Price!

TH-F6A

2M/220/440

- Dual Chanel Receive
- .1 - 1300 mHz (cell blocked) Rx
- FM, AM, SSB
- 5w 2M/220/440 TX, FM
- 435 Memories
- Li-Ion Battery

Call For Low Price!

TS-2000 HF/VHF/UHF TCVR

TS-2000 $80. Kenwood Coupon

TS-2000X $150. Kenwood Coupon

- 100W HF, 6M, 2M • 50W 70CM
- 10W 1.2 GHz w/opt UT-20 module
- Built-in TNC, DX packet cluster
- IF Stage DSP • Backlit Front Key Panel

Call Now For Special Price!

TS-480AT/HX HF+6M Transceiver

- 480SAT 100w HF & 6M w/AT
- 480HX 200w HF & 100w 6M (no Tuner)
- DSP built in
- Remotable w/front panel/speaker

$180. Kenwood Coupon

Call Now For Your Low Price!

TM-V71A 2m/440 Dual Band

- High RF output (50w) • Multiple Scan
- Dual Receive on same band (VxV, UxU)
- EchoLink® memory (auto dialer)
- EchoLink® Sysop mode for node terminal ops
- Invertible front panel
- Choice of Amber/Green for LCD panel
- 104 code digital code squelch
- "Five in One" programmable memory
- 1,000 multifunction memory

NEW!

Call Now For Your Low Price!

RC-D710

- Standalone 1200/9600 bps TNC w/ APRS firmware
- Transforms TM-V71A to Functionality of TM-D710A when combined with Optional PG-5J adds APRS/TNC to TM-D700A/G707A/V7A/732A/733A/255A/455A

NEW!

Call Now For Your Low Price!

World's LARGEST amateur radio dealer!

TH-K2AT

2M Handheld

2m 5w • VOX • CTCSS/DCS/1750 Burst Built In • Weather Alert •

Call For Special Low Price!

AZ, CA, CO, GA, VA residents add sales tax. Prices, specifications, descriptions, subject to change without notice.

Look for the HRO Home Page on the World Wide Web
http://www.hamradio.com

#1 in Customer Service

COAST TO COAST FREE SHIPPING
UPS - Most Items Over $100
Rapid Deliveries From
The Store Nearest To You!

12 STORE BUYING POWER

HAM RADIO OUTLET®

ALL sales staff are ACTIVE HAMS

WORLDWIDE DISTRIBUTION

TOKYO HY-POWER

FLASH! Now with 12m and 10m built-in! Complies with new FCC rules!

HL-1.5KFX

NEW!

- Fully Solid-state 1 KW HF 650W 6m
- Built-in Power supply (110 or 220v)
- 2 Ant ports selectable
- auto band switched w/ most ICOM/Kenwood/Yaesu tcvrs

CALL FOR ADDITIONAL THP PRODUCTS!

KANTRONICS

KAM XL

- DSP modem offers great performance on Packet 300/1200,G-tor,Pactor, Amtor,PSK-31
- RTTY, Navtex, ASCII, Wefax, CW, GPS NMEA-0183 and more!

Call Now For Special Pricing!

KPC-3 Plus/KPC-9612 Plus

High-performance, low power TNC.
Great for packet, and APRS compatible.

Call For Special Low Price!

ICOM

IC-R20 Wide Band Receiver

- Wide RX .150–3304 mHz*
- SSB, CW, AM, FM, WFM
- 32mb digital recorder
- 1,000 memories
- VSC • 100 ch/sec. scanning

$20. mail-in rebate* *good thru 9/30/08

NEW!

IC-R5 Wide Band Receiver

- Wide RX .150–3309 mHz*
- 1250 memories
- Alphanumeric labels
- DMS scan
- AM, FM, WFM

$10. mail-in rebate* *good thru 9/30/08

IC-R3 Wide Band Receiver

- 500 kHz - 2.45 GHz*
- 450 Alphanumeric Memories
- CTCSS w/Tone Scan
- 4 Level Attenuator
- Telescoping Antenna w/BNC Connector
- Lithium Ion Battery
- 2" Color TFT Display
- Audio/Video Output
- Four Way Action Joystick
- PC Programmable w/Optional Cable & Software

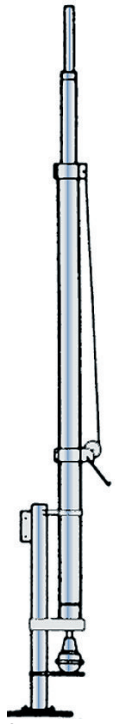
(Limited Availability)

*cell bands blocked
*816-901.995 MHz blocked; unblocked versions available to FCC approved users. FM video range for the IC-R3 is 900-1300 MHz & 2250-2450 MHz

GEOCHRON

Detailed illuminated map shows time, time zone, sun position and day of the week at a glance for any place in the world.Continuously moving – areas of day and night change as you watch.
• Mounts easily on wall. Size: 34 1/2" x 22 1/2"

US TOWER



Shown with Optional Rotor Base

MA-40

40' Tubular Tower

Call For Latest Pricing!

MA-550

55' Tubular Tower

Handles 10 sq.ft. at 50mph
Pleases neighbors with tubular streamlined look

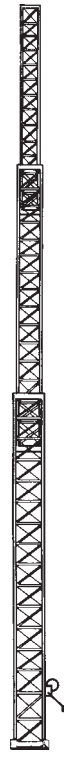
Call For Latest Pricing!

TX-455

55' Freestanding Crank-Up
Handles 18 sq. ft. @ 50 mph
No guying required
Extra-strength const.
Can add raising and motor drive acces.

Towers Rated to EIA Specifications
Other Models at Great Prices!

Call For Latest Pricing!



Buy From HRO, World's Largest U.S. Tower Dealer

All US Towers shipped by truck; freight charges additional

CALL TOLL FREE

Phone Hours: 9:30 AM – 5:30 PM
Store Hours: 10:00 AM – 5:30 PM Closed Sun.

Toll free, incl. Hawaii, Alaska, Canada; call routed to nearest store; all HRO 800-lines can assist you, if the first line you call is busy, you may call another.

West.....800-854-6046
Mountain.....800-444-9476
Southeast.....800-444-7927
Mid-Atlantic...800-444-4799
Northeast.....800-644-4476
New England..800-444-0047

HRO Owned and operated by ACTIVE HAMS

Look for the HRO Home Page on the World Wide Web
http://www.hamradio.com

AZ, CA, CO, GA, VA residents add sales tax. Prices, specifications, descriptions, subject to change without notice.

ANAHEIM, CA
(Near Disneyland)
933 N. Euclid St., 92801
(714) 533-7373
(800) 854-6046
Janet, KL7MF, Mgr.
anaheim@hamradio.com

BURBANK, CA
1525 W. Magnolia Blvd, 91506
(818) 842-1786
(800) 854-6046
Eric, K6EJC, Mgr.
Magnolia between S. Victory & Buena Vista
burbank@hamradio.com

OAKLAND, CA
2210 Livingston St., 94606
(510) 534-5757
(800) 854-6046
Mark, WI7YN, Mgr.
I-880 at 23rd Ave. ramp
oakland@hamradio.com

SAN DIEGO, CA
5375 Kearny Villa Rd., 92123
(858) 560-4900
(800) 854-6046
Tom, KM6K, Mgr.
Hwy. 163 & Claremont Mesa
sandiego@hamradio.com

SUNNYVALE, CA
510 Lawrence Exp. #102, 94085
(408) 736-9496
(800) 854-6046
Dan, K6DN, Mgr.
So. from Hwy. 101
sunnyvale@hamradio.com

NEW CASTLE, DE
(Near Philadelphia)
1509 N. Dupont Hwy., 19720
(302) 322-7092
(800) 644-4476
Rick, K3TL, Mgr.
RT.13 1/4 mi., So. I-295
newcastle@hamradio.com

PORTLAND, OR
11705 S.W. Pacific Hwy. 97223
(503) 598-0555
(800) 854-6046
Leon, W7AD, Mgr.
Tigard-99W exit from Hwy. 5 & 217
portland@hamradio.com

DENVER, CO
8400 E. Iliff Ave. #9, 80231
(303) 745-7373
(800) 444-9476
John, N5EHP, Mgr.
denver@hamradio.com

PHOENIX, AZ
1939 W. Dunlap Ave., 85021
(602) 242-3515
(800) 444-9476
Gary, N7GJ, Mgr.
1 mi. east of I-17
phoenix@hamradio.com

ATLANTA, GA
6071 Buford Hwy., 30340
(770) 263-0700
(800) 444-7927
Mark, KJ4VO, Mgr.
Doraville, 1 mi. no. of I-285
atlanta@hamradio.com

WOODBRIDGE, VA
(Near Washington D.C.)
14803 Build America Dr. 22191
(703) 643-1063
(800) 444-4799
Steve, W4SHG, Mgr.
Exit 161, I-95, So. to US 1
woodbridge@hamradio.com

SALEM, NH
(Near Boston)
224 N. Broadway, 03079
(603) 898-3750
(800) 444-0047
Chuck, N1UC, Mgr.
sales@hamradio.com
Exit 1, I-93;
28 mi. No. of Boston
salem@hamradio.com

DX ENGINEERING

We will beat any competitor's prices!

ANTENNAS CAN BE SHIPPED WORLDWIDE AT LOW COST! Ask for a quote.

PSK-31 SSTV

ENJOY THE FUN OF DIGITAL COMMUNICATIONS!

RTTY & More

ORDER NOW!

SignaLink™ From Tigertronics

TIG-SL-USB.....$86.95

Then choose a cable for each radio!

Any Radio Interface Cable.....only **$12.95** when purchased with SignaLink™ unit

YOUR TOTAL $99.90

For your complete digital solution!

A Complete Digital Solution for Less

- Easiest installation and setup—Macintosh or PC
- Just plug in two cables
- Software CD ROM included
- Comprehensive & easy to follow instructions
- Built-in low noise sound card
- USB port powered
- Works with ALL radios
- Uses Mic, Data, or Accy port
- Supports all sound card digital and voice modes
- Requires radio interface cable, sold separately below

Radio Interface Cables

TIG-SL-CAB4R	4-pin round mic connector	$14.95
TIG-SL-CAB8R	8-pin round mic connector	$14.95
TIG-SL-CABRJ1	RJ-11 mic connector	$14.95
TIG-SL-CABRJ4	RJ-45 mic connector	$14.95
TIG-SL-CAB5PD	5-pin DIN	$14.95
TIG-SL-CAB8PD	8-pin DIN	$14.95
TIG-SL-CAB13I	13-pin DIN Icom	$19.95
TIG-SL-CAB13K	13-pin DIN Kenwood	$19.95
TIG-SL-CAB6PM	6-pin mini-DIN	$14.95
TIG-SL-CABNC	Unterminated cable	$7.95

Ground Strap Assemblies

- Three widths available in various lengths
- Ground your rig for RFI and lightning protection
- Ideal for vehicle noise reduction with mobile systems, ground radial plate or balun to antenna
- Preassembled with lugs for both #10 and 1/4" bolt sizes
- Call to order custom cable/connector assemblies

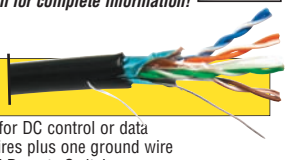
See DXEngineering.com for complete information!

Low Loss Coax Cable Assemblies

- All connectors are soldered, not crimped
- Connectors have silver plated body and barrel with center Teflon® dielectric
- Highest quality Belden coaxial cable is used
- All cable assemblies are high voltage tested to handle full rated power
- Watertight seal between connectors and coax
- Call to order custom cable/connector assemblies

See DXEngineering.com for complete information!

9-Conductor Control Cable



- Cat5e **shielded** cable for DC control or data
- Eight insulated #24 wires plus one ground wire
- Ideal for use with DXE Remote Switches

DXE-CW9-1K	1000 ft. reel	$214.00
DXE-CW9	Order by the foot	$0.29/ft.

Heavy Duty Verticals—Why Pay More??

New!

Great Performance from the Vertical Experts

JUST IN TIME FOR HOT WINTER DX!

Dual-Band 40 and 30 Meters High Performance Vertical

New!

DXE-4030VA-1.....Only **$299.50**

Introductory Sale Price .....~~$349.99~~

- Large diameter reinforced 6063-T832 aircraft tubing
- All stainless steel element clamps and hardware
- Optimum performance—29+ feet tall
- Maximum legal power handling
- Low SWR—less than 1.5:1 over each band
- No tuner required—fast QSY—auto bandswitching!
- Rugged fiberglass base insulator—not cheap plastic!
- Freestanding to 60mph+ wind—no guys!
- Rugged stainless steel tilt base included

MORE MULTI-BAND COVERAGE!

43 Foot MULTI-BAND 10 to 160 Meter Vertical

- 6063 T832 corrosion-resistant aircraft aluminum tubing and stainless steel hardware
- 43 ft. optimal length vertical radiator—monoband on 60 meters!
- Easy tuning design—correct length and taper
- No coils or linear loading elements
- Rugged fiberglass base insulator—not cheap plastic!
- Freestanding—just like the other guy's
- Requires DXE-BAL200-H10-AT Balun for multi-band use with your wide range tuner

DXE-MBVE-1 .....Only **$299.50**

33 Foot MULTI-BAND 10 to 80 Meter Vertical

- 6063 T832 corrosion-resistant aircraft aluminum tubing and stainless steel hardware
- 33 ft. long vertical radiator—monoband on 40 meters!
- Easy tuning design—correct length and taper
- No coils or linear loading elements
- Rugged fiberglass base insulator—not cheap plastic!
- Freestanding—just like the other guy's
- Requires DXE-BAL200-H10-AT Balun for multi-band use with your wide range tuner

DXE-MBVE-2 .....Only **$279.50**

Accessories

DXE-RADP-1P	Radial Plate with 20 stainless bolt sets	$54.50
DXE-363-SST	Bulkhead Grounded Cable Connector	$6.95
DXE-BAL200-H10-AT	5kW/10kW SSB Balun	$119.95
DXE-VFCC-BRKT	Insulated Balun Mount	$14.95
DXE-CAVS-2P	V-Saddle Clamp for DXE-VFCC-BRKT	$10.95
DXE-GUY400-KIT	Optional Guying Kit	$47.95

BUILD YOUR OWN ANTENNAS!

New!

6063 Aluminum Tubing

- High strength Type 6063-T832 drawn aluminum tubing
- Sections with 0.058 inch wall thickness are perfect for telescoping antenna elements
- Most sizes are pre-slit on one end for element clamps
- Available in 3 and 6 foot lengths

Aluminum Tubing, 0.058" Wall, 3 Foot Length

Part Number	Diameter/End Type	Price	Cost/Foot
DXE-AT1240	0.375", no slit	$2.70	$0.90
DXE-AT1241	0.500", one end slit	$3.30	$1.10
DXE-AT1242	0.625", one end slit	$3.60	$1.20
DXE-AT1243	0.750", one end slit	$3.90	$1.30
DXE-AT1244	0.875", one end slit	$4.20	$1.40
DXE-AT1245	1.000", one end slit	$4.50	$1.50
DXE-AT1246	1.125", one end slit	$4.95	$1.65
DXE-AT1247	1.250", one end slit	$5.55	$1.85
DXE-AT1248	1.375", one end slit	$6.15	$2.05
DXE-AT1249	1.500", one end slit	$6.75	$2.25
DXE-AT1250	1.625", one end slit	$7.65	$2.55
DXE-AT1251	1.750", one end slit	$8.40	$2.80
DXE-AT1252	1.875", one end slit	$9.15	$3.05
DXE-AT1253	2.000", one end slit	$9.90	$3.30
DXE-AT1254	2.125", one end slit	$11.40	$3.80

Aluminum Tubing, 0.058" Wall, 6 Foot Length

Part Number	Diameter/End Type	Price	Cost/Foot
DXE-AT1189	0.375", no slit	$5.40	$0.90
DXE-AT1205	0.500", one end slit	$6.60	$1.10
DXE-AT1206	0.625", one end slit	$7.20	$1.20
DXE-AT1207	0.750", one end slit	$7.80	$1.30
DXE-AT1208	0.875", one end slit	$8.40	$1.40
DXE-AT1209	1.000", one end slit	$9.00	$1.50
DXE-AT1210	1.125", one end slit	$9.90	$1.65
DXE-AT1211	1.250", one end slit	$11.10	$1.85
DXE-AT1212	1.375", one end slit	$12.30	$2.05
DXE-AT1213	1.500", one end slit	$13.50	$2.25
DXE-AT1214	1.625", one end slit	$15.30	$2.55
DXE-AT1215	1.750", one end slit	$16.80	$2.80
DXE-AT1216	1.875", one end slit	$18.30	$3.05
DXE-AT1217	2.000", one end slit	$19.80	$3.30
DXE-AT1218	2.125", one end slit	$22.80	$3.80

Aluminum Tubing, 2.000" Diameter, 0.125" Heavy Wall

Part Number	Length/End Type	Price	Cost/Foot
DXE-AT1255	3', no slit	$14.85	$4.95
DXE-AT1204	6', no slit	$29.70	$4.95

All Stainless Steel Element Clamps

DXE-ECL-020	1/2" and smaller tubing	$1.90
DXE-ECL-040	5/8" tubing	$1.90
DXE-ECL-060	3/4" and 7/8" tubing	$1.90
DXE-ECL-10SS	1" and 1 1/8" tubing	$1.90
DXE-ECL-12SS	1 1/4" tubing	$1.90
DXE-ECL-16SS	1 3/8" and 1 1/2" tubing	$1.90
DXE-ECL-20SS	1 5/8" and 1 3/4" tubing	$1.90
DXE-ECL-24SS	1 7/8" and 2" tubing	$1.90
DXE-ECL-28SS	2 1/8" and 2 1/4" tubing	$1.90
DXE-ECL-32SS	2 3/8" and 2 1/2" tubing	$1.90
DXE-ECL-36SS	2 5/8" and 2 3/4" tubing	$1.90
DXE-ECL-40SS	2 7/8" and 3" tubing	$1.90
DXE-ECL-44SS	3 1/4" maximum tubing	$1.95

65 ft. Telescopic Aluminum Tubing Kit

- 65 ft. slow taper from HD 2" O.D. base to 7/8" O.D. top
- Build your own vertical antennas or arrays
- Use with DXE Insulated Base Assemblies

DXE-ATK65 .....$194.50

Insulated Vertical Base Assemblies for 2" O.D. Antenna Masts

New!

Standard Base

- Tilt Base optional
- Two DXE-CAVS-1P mounting clamps required to attach base to mounting post

DXE-VE-BASE .....Only **$99.50**

DXE-CAVS-1P	V-Saddle Clamp	$8.95
DXE-TB-3P	Tilt Base Assembly	$62.50

Heavy Duty Base

- Tilt Base included
- Two DXE-CAVS-2P mounting clamps required to attach base to mounting post

DXE-VA-BASE		$149.50
DXE-CAVS-2P	V-Saddle Clamp	$10.95

Want the World's Biggest Ears?

Join the growing list of DXers and Contesters who know and use the best!

VP6DX DXPEDITION 2008 DUCIE ISLAND

Worked the Whole World Using DX Engineering Beverage Antennas!

FOUR-SQUARE RECEIVE CONTROLLER

Receive Four-Square Antenna Controller

- Switchable in four 90 degree spaced directions
- Reduced susceptibility to high angle signals compared to EWE, Flag, Pennant, and K9AY antennas
- Better signal-to-noise ratio
- Wideband time delay phasing
- Excellent directivity in a small space
- Usable over a very wide frequency range with optional DXE-ARAV2-4P Active Antenna
- Less physical space than a Beverage antenna
- Enhanced relay contact reliability

DXE-RFS-2P Receive Four-Square Antenna Controller & Switch Package.....**$359.95**

Complete Receive Four-Square Package with DXE-ARAV2-4P Active Antenna Kit

- 4 Active Vertical Antennas
- RFS-2 Four Square Switch
- CC-8 Controller
- 1,000 ft. of direct-bury F6, 75 Ω CATV Coax
- 25 Snap-N-Seal Coax Connectors
- Snap-N-Seal Connector Crimp Tool
- Coax Prep Tool

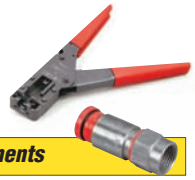
DXE-RFS-TS2P Complete Receive Four-Square Package.....**$1,525.00**

HAM-SWL

Active Receive Antenna

- Close spacing from transmit antennas
- Weak signal sensitivity rivaling full size antenna
- Operates from 100 kHz to 30 MHz
- Excellent strong signal handling with +30 dBm third order intercept
- Reduced Noise—quiet FET followers and exceptional feedline shield isolation
- Available in vertical or dipole configuration

DXE-ARAH2-1P Single horizontal antenna.....**$289.00**
DXE-ARAV2-1P Single vertical antenna.....**$259.00**



Receiving System Components

DXE-F6-1000 75 Ω, F6 style direct bury flooded cable, 1,000 ft. **$149.95**
DXE-F6-CTL 75 Ω F6 cable by the foot .....**$0.19/ft.**
DXE-SNS6-25 Watertight F6 Connectors, 25 pack **$25.50**
DXE-SNS-CT1 F6 Connector Installation Tool **$52.00**

See Our Complete Selection of Components and Tools at DXEngineering.com

BEVERAGE ANTENNAS

Reversible Beverage System

- Broad operating range—0.2 to 30 MHz
- Fully isolated grounds used to prevent common-mode noise and unwanted signals
- 75 Ω design enables the use of high quality, low cost cable
- Metal housings used for superior shielding and improved life

DXE-RBS-1P Reversible Beverage Feed System....**$149.00**

See DXEngineering.com for complete Beverage product listing!

MAXI-CORE™

Current Baluns and Feedline Current Chokes

- 5, 10 and 10 kW+ Baluns and Current Chokes
- High efficiency, low loss—W8JI design
- All standard ratios available

Feedline Current Chokes

- Reduce RFI and pattern distortion

Starting at just $69.95 for FCC050-H05-A

STAINLESS STEEL—WON'T DISSOLVE LIKE ALUMINUM!

Stainless Radial Plate with Coax Attachment

Makes radial attachment a snap!

- Fits 2" pipe, 4x4 and 6x6 posts
- 0.125" thick 304 stainless steel
- Accommodates up to 120 radials
- Patented high current coax connection to radials

DXE-RADP-1P Complete with 20 stainless bolt sets.....**$54.50**
DXE-RADP-1HWK 20 sets of 1/4" stainless hardware ...**$7.50**
DXE-CAVS-2P Stainless Saddle Clamp for attachment to round tube 1.0" to 2.0" O.D. **$10.95**
DXE-363-SST Silver/Teflon® bulkhead connector...**$6.95**
DXE-VFCC-H05-A Vertical Feedline Current Choke.....**$94.95**

NEW—Biodegradable Anchor Pins

DXE-RADW-500KBD Radial Wire Kit, 500 feet of wire, 20 lugs, 100 anchor pins.....**$61.90**
DXE-RADW-1000KBD Radial Wire Kit, 1000 feet of wire, 40 lugs, 200 anchor pins.....**$123.95**
DXE-STPL-100BD Biodegradable Radial Wire Anchor Pins, 100-pack.....**$16.00**

DXERS 1ST CHOICE!

Remote Antenna Switches

- Best SWR and port isolation on the market!
- Weatherproof, welded stainless steel housing for best RF shielding
- 8-position switch, controller included
- Better than 1.1:1 SWR below 30 MHz

5 kW Key-Down RF Switch

- Better than 70 dB of port-to-port isolation

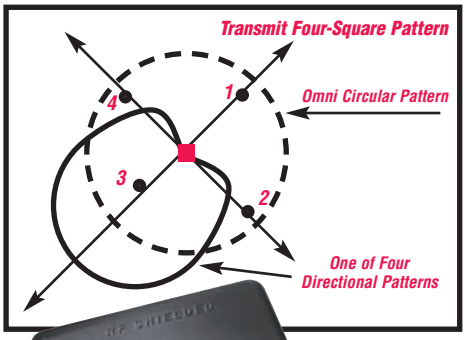
RR8-HP-P.....**$375.00**

10 kW Key-Down RF Switch

- Better than 60 dB of port-to-port isolation

RR8-SD-P.....**$495.00**

FOUR-SQUARE TRANSMIT CONTROLLER!



Transmit Four-Square Hybrid Controller—4 Directions plus Omni

- Four directions plus Omni—versatile
- Classic Hybrid design—easy to install
- 5 kW CW power rating—high reliability
- Hot switching lock-out—disables amplifier
- Drop-in replacement for Comtek—easy upgrade
- Proven DX Engineering RF relays—high performance
- RF Shielded weatherproof housing—unique protection

DXE-TFS4-160 160 Meter Four-Square Controller with Control Console.....**$419.90**
DXE-TFS4-80 80 Meter Four-Square Controller with Control Console.....**$409.90**
DXE-TFS4-40 40 Meter Four-Square Controller with Control Console.....**$399.90**

SWITCHING PROTECTION

Time Variable Sequencer Unit

- Protect receiver front end, preamplifiers, linear amplifiers, or other sensitive equipment from damage due to improper switching during the receive/transmit transition
- Five outputs tied to the CW keying or push-to-talk (PTT) lines each have adjustable delay from 0-30 ms in 2 ms increments
- Side-tone generator follows input of keyer, not transmitter
- Supports full CW break-in
- Ideal for protecting DXE-ARAV-2 or DXE-ARAH-2 Active Antennas from RF damage

DXE-TVSU-1 Time Variable Sequencer Unit **$159.95**

DXEngineering.com
1.800.777.0703

Order by 2:00 pm ET for Same-Day Shipping

8:30 am to 4:30 pm ET
1230 to 2030 UTC (March-October)
1330 to 2130 UTC (November-February)

Tech/International:
330.572.3200

SOURCE CODE: 0810QS

Prices effective through November 15, 2008

The #1 Line of Autotuners

LDG ELECTRONICS

NEW! KT-100

The new KT-100 Autotuner fills a need for Kenwood transceiver owners after Kenwood discontinued the Kenwood AT-300 antenna tuner. The KT-100 is a flexible, low cost, easy to use unit just right for an AT-300 compatible Kenwood transceiver. Of course, most any LDG tuner will work just fine with a Kenwood transceiver, but wouldn't it be great if you could use that Tune button on the radio. The KT-100 allows you to do just that as LDG's first dedicated autotuner for Kenwood Amateur transceivers.

The LEDs on the front panel indicate tuning status, and will show a match in seconds, or even less of you've tuned on or near that frequency before. The KT-100 has 2,000 memories for instant recall of the tuning parameters for your favorite bands and frequencies.

If you have an AT-300 compatible Kenwood radio, you can simply plug the KT-100 into your transceiver with the provided cable; the interface powers the tuner, and the Tune button on the radio begins a tuning cycle. The supplied interface cable makes the KT-100 a dedicated tuner for most modern Kenwood transceivers. ***Suggested Price $199***

AT-1000Pro

Building on the success of the AT-1000, LDG Electronics has refined and expanded its 1KW tuner. The AT-1000Pro has an Automode that automatically starts a tuning cycle when the SWR exceeds a limit you set. Other features include: • Operates at any power level between 5 and 1,000 watts peak. RF Relay protection software prevents tuning at greater than 125 watts. • 2 Antenna connections • Tunes from 1.8 to 54.0 MHz (inc. 6 meters) • Tuning time usually under 4 seconds, transmitting near a frequency with stored tuning parameters, under 0.2 seconds. • 2000 memories.• All cables included. ***Suggested Price $599***

AT-100Pro

This desktop tuner covers all frequencies from 1.8 – 54 MHz (including 6 meters), and will automatically match your antenna in no time. It features a two-position antenna switch, allowing you to switch instantly between two antennas. The AT-100Pro requires just 1 watt for operation, but will handle up to 125 watts. All cables included. ***Suggested Price $219***

radio not included

AT-7000

The AT-7000 is the ideal tuner for IC-7000 & other Icom Radios: Covers all frequencies from 1.8–54 MHz (including 6 meters), and will automatically match your antenna. Requires just 0.1W for operation, but will handle up to 125W (100 W on 6 m), making it suitable for everything from QRP (IC- 703 Plus) to a typical 100 W Icom transceiver. All cables included. ***Suggested Price $169***

Z-100

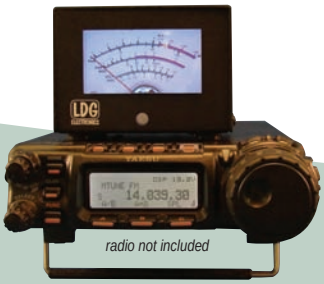
Designed from the ground up to provide 100 watt power handling in a small, lightweight package. Perfect for portable as well as sitting on your desk in your shack! The Z-100 will tune with 0.1 to 125 watts (50 watts on 6 meters), making it an excellent choice for almost any radio or operating style. Backpackers and QRP operators will appreciate the latching relays. Power can be removed from the tuner once you have tuned. Additionally, when it's not tuning, it draws nearly zero amps. ***Suggested Price $149***

FREE DIPOLE KIT WITH ANY AUTOTUNER PURCHASE!*

Purchase any LDG Electronics autotuner between September 15th 2008 and January 31st, 2009 and you will receive a free dipole kit buildable for 20, 17, 15,12, 10 or 6 meters (a $20 value) through the mail. Visit www.ldgelectronics.com for your rebate form or write to: 1445 Parran Rd. St. Leonard, MD 20685 USA. Limit one rebate per address.

*Free dipole kit applies to any new LDG autotuner $149 (suggested retail price) or higher in price. User supplies coax cable and support rope.

Now with FREE Dipole Kit with any Autotuner Purchase*!



radio not included

FT Meter

LDG's new version of its popular FT-Meter presents a lush, highly readable 2.5" meter face with calibrated scales for signal strength and discriminator reading on receive, and power output, SWR, modulation, ALC action and supply voltage on transmit. Each function is selectable from the radio's menu. On/Off switch for the light.

- LED back-illuminated in cool, high-visibility blue.
- Calibration adjustment is on the back of the unit; makes it easy to calibrate.
- Backlight brightness adjustment is also on the back of the unit; so you can set the backlight to your desired level brightness.

The FT-Meter comes fully assembled and ready to go; just plug it into the radio and you're in the picture like never before. ***Still Only $49***

Z-11Pro

The original portable Z-11 was one of LDG's most popular tuners, accompanying adventurous hams to their backyards, or to the ends of the earth. Now meet the Z-11Pro, everything you always wanted in a small, portable tuner. Designed from the ground up for battery operation. Only 5" x 7.7" x 1.5", and weighing only 1.5 pounds, it handles 0.1 to 125 watts, making it ideal for both QRP and standard 100 watt transceivers from 160 - 6 meters.

"With 8,000 memories in LDG's exclusive "3-D Memory" array, the Z-11Pro uses LDG's state-of-the-art processor-controlled Switched-L tuning network. It will match dipoles, verticals, inverted-Vs or virtually any coax-fed antenna. With an optional LDG balun, it will also match longwires or antennas fed with ladder-line. All cables included. ***Suggested Price $179***

NEW! SLS-2

LDG introduces the SLS-2 microphone switch with RJ-45 mic connectors for modern transceivers. The SLS-2 features two switched and one common jack. You can switch one mic between two radios, or one radio between two microphones. A push-in/push-out button on the front selects the port, and an LED lights to indicate the selection. The SLS-2 makes switching radios or microphones a breeze. ***Suggested Price $59.99***

NEW! ALK-2

The ALK-2 two-port Audio/Linear/Key switch is a versatile Amateur Radio accessory. The ALK-2 electronically switches a common 1/8" stereo jack and stereo RCA jacks between two other sets of 1/8" stereo/RCA jacks. Although the intended purpose of the ALK-2 is to switch stereo audio, code keys, or linear amplifier interface signals; virtually any pair of low voltage signals can be switched between the two ports. On the front panel there is one pushbutton and two LED indicator lights. The button is a pushbutton toggle switch which selects between the two sets of cables connected to the rear ports. The LED's indicate which port is selected. ***Suggested Price $49.99***

radio not included

AT-897 for the Yaesu FT-897

If you own a Yaesu FT-897 and want a broad range automatic antenna tuner, look no further! The AT-897 Autotuner mounts on the side of your FT-897 just like the original equipment. We even added the ability to mount the "feet" on the side of the tuner so when you're transporting your rig by the handle, you can safely set it down and not worry about scratching the case. The AT-897 takes power directly from the CAT port of the FT-897 and provides a second CAT port on the back of the tuner so hooking up another CAT device couldn't be easier. ***Suggested Price$199***

AT-200Pro

The AT-200 features LDG's new "3-D memory system" allowing up to eight antenna settings to be stored for each frequency. Handles up to 250 watts SSB or CW on 1.8 – 30 MHz, and 100 watts on 54 MHz (including 6 meters). Rugged and easy-to-read LED bar graphs show power and SWR, and a function key on the front panel allows you to access data such as mode and status. All cables included.
Suggested Price $249

Call or visit your favorite dealer today!

Visit www.ldgelectronics.com for a complete dealer list.

LDG Electronics, Inc.
1445 Parran Road
St. Leonard, MD 20685
Phone 410-586-2177
Fax 410-586-8475

LDG

TM-271A *2M FM Mobile*

• TX: 144-148 MHz • RX: 136-174 MHz
• Power: 60/25W • Memories: 200

$169.99

TM-V71A

Dualband FM Mobile

• TX: 144-148, 430-450 MHz
• RX: 118-524, 800-1300 MHz (cell blkd)
• Power: 50/10/5W • Dual receive (V+V) (U+U)
• Cross-band repeat • EchoLink® ready

$399.99

G5

WSF-21000

TM-D710A

Dualband FM Mobile w/TNC

• TX: 144-148, 430-450 MHz
• RX: 118-524, 800-1300 MHz (cell blkd)
• Power: 50/10/5W • Dual receive (V+V) (U+U)
• Built-in TNC for APRS (needs GPS)
• Cross-band repeat • AvMap G5, Peet Bros Utimeter WX Station & EchoLink® ready

$599.99

AvMap G5

APRS Ready GPS Navigator

• Bright non-glare 5 inch color touchscreen
• Preloaded with Tele Atlas street maps of N. America
• AV input; enjoy films, video games & pictures
• Import extra POI's with no extra costs
• Kenwood ready APRS cable included

$649.99

Peet Bros WSF-21000

APRS Ready Weather Station

• Displays: Barometric and numeric pressue change over a 3 hour period, storm alert, wind speed, wind direction, indoor/outdoor temperature, wind chill, rain fall, time & date • Kenwood TM-D710A cable $9.99

$299.99

TH-K2AT

TH-F6A

TH-K2AT *2M FM HT*

• TX: 144-148 • RX: 136-174 • Power: 5/1.5/0.5W • Memories: 100

$139.99

TH-F6A *Triband FM HT*

• TX: 144-148, 222-225, 438-450 MHz • RX: 0.1-1300 MHz (cell blkd)
• Power: 5/0.5/0.05W • Memories: 435 • Dual band RX

$329.99

TS-480HX *200W HF/6M Mobile/Base*

• TX: HF/6M • RX: 0.5-60 MHz
• Power: 10-200W (with two optional 22A PS's) • Memories: 99
• IF/stage DSP on main band, AF/stage DSP on sub-band

$1094.99 after instant ©oupon

TS-480SAT

100W ver. with built-in auto antenna tuner.

$989.99 after instant ©oupon

TS-2000 *100W HF/VHF/UHF Base*

• TX: HF/6M/2M/440 MHz • RX: 0.03-60, 142-152, 420-450 MHz
• Power: 10-100W (10-50W on 440 MHz) • Memories: 99
• HF/6M Auto Antenna Tuner
• IF/stage DSP on main band, AF/stage DSP on sub-band

$1594.99 after instant ©oupon

TS-B2000

Same as the TS-2000 with high-tech "silver box" look and no front panel controls. Includes PC control software.

$1399.99 after instant ©oupon

TS-2000X

Same as the TS-2000 with 1.2 GHz @ 10W.

$2064.99 after instant ©oupon

AES
AMATEUR ELECTRONIC SUPPLY

5710 W. Good Hope Rd.
Milwaukee, WI 53223
414-358-0333
800-558-0411
milwaukee@aesham.com

4640 South Polaris Ave.
Las Vegas, NV 89103
702-647-3114
800-634-6227
lasvegas@aesham.com

621 Commonwealth Ave.
Orlando, FL 32803
407-894-3238
800-327-1917
orlando@aesham.com

28940 Euclid Ave.
Cleveland, OH 44092
440-585-7388
800-321-3594
cleveland@aesham.com

1-800-558-0411

aesham.com

We accept I.M.P.A.C.®
Government Credit Cards

Prices subject to change without notice.
© After Instant coupon.
Coupons guaranteed though 10/31/08

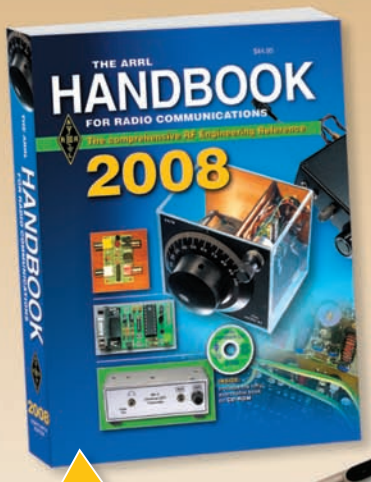
TRADE UP TO KENWOOD
CALL NOW FOR A QUOTE!

Radios by KENWOOD

NewHamStore.com

VISA MasterCard DISCOVER

Dedicated to New Hams — **Website: www.newhamstore.com**



The ARRL Handbook for Radio Communications and FREE Forever Flashlight

This is a must have for any ham radio operator. It's so big you will need two hands to hold it!

Regular ~~$60~~ –

Web Special $35

Combination Digital & Analog Multimeter

Hard Shell Case,
Big Display

Regular ~~$60~~ –

Web Special $30

FREE Forever Flashlight!

PL-259 Nickel Plated Good Quality Coax Connectors

Package of 6

Regular ~~$8~~

Web Special $4

Lightning Arrestor

Good Quality

Regular ~~$8~~ –

Web Special $4

RG8X Coax Cable

Ready to Go
Connectors Installed
20 Feet

Regular ~~$30~~ –

Web Special $12

Low Prices, Top Quality

PL-259ST	Silver-Teflon	$1.49
PL-259GT	Goldr-Teflon	$1.99
Coax and Cable Prices	**prices per foot**	<100'/100'+
RG-8X	95% shield - Premium	35¢/30¢
Super240 RG-8X	Low loss, 100% shield, 1.5 kW	42¢/37¢
RG-213+	Top quality, 97% shield	80¢/73¢
#14	7x22 hard-drawn copper	16¢/16¢
#14 FlexWeave	168-strand, bare copper	22¢/22¢
Ladder Line	Stranded #16 conductors	40¢/35¢
Ladder Line	Stranded #14 conductors	60¢/50¢
Tinned Copper Braid	½" 85¢ 1" $1.29/ft	
LadderLock	Center insulator for ladder line	$13.95

Special RG-8X 100' $42.00
With two PL-259s installed and molded-on strain relief
RG-8X Jumpers 18" $6.25, 3' $6.75

Very Important - prices are subject to change. See our web site www.radioworks.com or call for prices.

Pulleys - for antenna rope. Highest quality, marine quality with swivels to prevent twisting. Made for Dacron® rope.
For 3/16" rope @ $17.95 and for 5/16" rope @ $19.95

New

RFI Quick Fix™

Built-in ground strap
Breaks up ground loops
Ends RF feedback problems

For really tough RFI problems, the new T-4G is the ultimate fix, shunting stray RF on your coax directly to ground. Stray RF and coax radiation doesn't have a chance. It solved my RF feedback problems in my 2nd floor shack. (W4THU)

Antenna Support Line

Dacron® Antenna Support Line, Mil Spec, single braid, strong, long-life, mildew and sun resistant support line.

3/16"	single braid 770# test, black	**14¢ per foot**
3/8"	single braid 2000# test, black	**22¢ per foot**
.075" Kevlar®	no stretch, 500# test, black	**200'** spool **$20**
1/8" Kevlar®	no stretch, 800#++ test, black	**15¢ per ft.**

RADIO WORKS™

Antenna Fever

All RADIO WORKS' antennas are rated for 1500 watts SSB/CW except for LP models which are rated for 600 watts

SuperLoop 80	116' long, 80-10m. Exceptional performance	$165
CAROLINA WINDOM® 160	265', 160-10m, Big Sig on 160 Killer Sig on 80 - 10m	$165
CAROLINA WINDOM® 80	135', 80-10m If you hear one, you'll want one!	$130
CAROLINA WINDOM® 40	66', 40-10m It helped set two 40m world records	$120
CAROLINA WINDOM® Short 80	100', 80-10m, full CAROLINA WINDOM performance	$150
CAROLINA WINDOM® 160 Special	132', 160-10 m 500W max on 160, 1.5 kW 80-10	$160
G5RV Plus,	102', 80-10m, high power current balun, #16 ladder line, 1.5 kW+	$75

NEW! "Apex™" Antenna - Patent pending design, featuring "Linear Compression Engineering™. A new line of shortened antennas, ½ size or smaller. No lossy coils or traps. Ladder line and coax fed models. At last, work 80 - 10 m with an antenna only 46 feet long. Tuner required. Built exclusively by the RADIO WORKS™ for quality you can count on. Visit our website for full details.

CURRENT BALUNS

B1-2K+	1:1	2kW current-type	80-6m	$36.95
B1-4K Ultra	1:1	4kW High isolation version of B1-5K		$49.95
B1-5K+	1:1	5 kW current-type	160-6m	$51.95
Y1-5K+	1:1	5 kW Current Yagi balun	160-6m	$51.95
B1-200	1:1	500W "LP" (small size)	80-10m	$37.95
B4-2K	4:1	Voltage Balun	80-10m	$49.95
B4-2KX	4:1	Current Balun	160-10m	$62.95
RemoteBalun™	4:1	Coax-to-ladder line	160-10m	$63.95

Line Isolators™ - often copied, still unequaled

T-4	Ultra high isolation, the RFI Quick Fix™	$44.95
T-4G	As above, direct grounding version	$47.95
T-4-500	Smaller, convenient size, 500W PEP	$38.95

Ferrite Snap-on cores #31 type, 1-250 MHZ
1/4" hole (RG-8X size) $2.50 each ½" hole (RG-213 size) $4.50 ea

Check out our Web Site and Web Store
radioworks.com
e-mail w4thu@radioworks.com

Catalog

New Mini-catalog - Complete, high performance antenna systems, baluns, Line Isolators, cable, coax, station goodies. **If your don't shop here, you won't get the best prices! Download the catalog from our web site.** The latest prices and deals are on our web site.

The RADIO WORKS™
Order Hotline (800)280-8327
FAX (757) 483-1873
Box 6159 Portsmouth, VA 23703
VISA or MC welcome Give card #, security code, exp. date, phone number

Visit our Web Store

IC-V8 Sport 2M FM HT

- TX: 144-148 • RX: 136-174 • Power: 0.5-5.5W
- AA Battery Case • Memories: 107

$99.99

IC-V82 2M FM HT

- TX: 144-148 • RX: 136-174 • Power: 7W • Memories: 200
- D-Star upgradable with optional UT-118

$129.99 after mail in Ⓡebate

IC-T90A 6M/2M/440 MHz Triband FM HT

- TX: 50-54, 144-148, 420-450 MHz • RX: 0.495-999 MHz (cell blkd)
- Power: 0.5-5W • Memories: 555

$264.99 after mail in Ⓡebate

IC-V8000 2M FM Mobile

- TX: 144-148 MHz • RX: 136-174 MHz
- Power: 75/25/10/5W • Memories: 207

$219.99 after mail in Ⓡebate

IC-706 MK II-G Multi Band Mobile

- TX: HF/6M/2M/440 MHz • RX: 0.03-199, 400-470 MHz
- Power: 100W (HF/6M), 50W (2M), 20W (440 MHz)
- Memories: 107• AF-DSP • IF Shift • Preamp/attenuator

$849.99 after mail in Ⓡebate, RMK-706 included!

IC-718 All Band HF Transceiver

- TX: HF • RX: 0.03-30 MHz • Power: 5-100W
- Memories: 101 • DSP built-in
- SSB, CW, RTTY and AM (40W)

$549.99 after mail in Ⓡebate

IC-746PRO Multimode HF/VHF Transceiver

- TX: HF/6M/2M • RX: 0.03-60, 108-174 MHz • Power: 5-100W
- Memories: 102 • 32-bit floating DSP & 24-bit AD/DA converter
- Automatic HF/6M antenna tuner

$1499.99 after instant Ⓒoupon & mail in Ⓡebate, PS-125 included!

PW-1 HF/6M 1KW Linear Amplifier

- TX: 160-15M/6M • Power: 1000W (180-264 VAC), 500W (90-132 VAC) • Automatic band change & antenna tuner • Easily connects to any current Icom HF transceiver • Two input & Four output connectors

$4699.99

IC-7700 Multimode HF/6M Transceiver

- TX: HF/6M • RX: 0.03-60 MHz • Power: 5-200W
- Memories: 101 • 7 inch color screen • Two 32-bit floating DSPs
- Three roofing filters • External VGA connector
- Automatic antenna tuner • USB memory drive socket

$6999.99

AES
AMATEUR ELECTRONIC SUPPLY

5710 W. Good Hope Rd.
Milwaukee, WI 53223
414-358-0333
800-558-0411
milwaukee@aesham.com

4640 South Polaris Ave.
Las Vegas, NV 89103
702-647-3114
800-634-6227
lasvegas@aesham.com

621 Commonwealth Ave.
Orlando, FL 32803
407-894-3238
800-327-1917
orlando@aesham.com

28940 Euclid Ave.
Cleveland, OH 44092
440-585-7388
800-321-3594
cleveland@aesham.com

1-800-558-0411
aesham.com

We accept I.M.P.A.C.® Government Credit Cards

Prices subject to change without notice.
Ⓒ After Instant coupon
Ⓡ After Mail in rebate (USA only)
Coupons, Rebates & Included Items guaranteed through 9/30/08

Radios by ICOM

VX-170 2M FM HT

- TX: 144-148 • RX: 136-174 • Power: 5/2/0.5W • Memories: 200
- Extra large LCD display & speaker

$129.99 after instant ©oupon

VX-3R Compact 2M/440 FM Dual Band HT

- TX: 144-148, 430-450 • RX: 0.5-999 (cell blkd)
- Power: 1.5W (2M), 1W (440 MHz)

$179.99

VX-6R Submersible 2M/ 440 FM Dual Band HT

- TX: 144-148, 222-225, 430-450 • RX: 0.5-999 (cell blkd)
- Power: 5/2.5/1/0.3W (1.5W on 220) • Memories: 900
- Submersible 3 feet for 30 minutes

$249.99

FT-1802M 2M FM Mobile

- TX: 144-148 • RX: 136-174
- Power: 50/25/10/5W • Memories: 221

$139.99

FT-450 100W HF/6M Portable/Base

- TX: HF/6M • RX: 0.03-56 MHz • Power: 10-100W
- Memories: 500 • IF DSP Technology • Selectable AGC, IF width & shift, contour, digital noise reduction, manual notch filter & clarifier
- Optional Auto Antenna Tuner (ATU-450)

$649.99 after instant ©oupon

FT-450AT Same with Auto Antenna Tuner (ATU-450) installed

$749.99 after instant ©oupon

FT-7800R 2M/440 FM Mobile

- TX: 144-148, 430-450 MHz • RX: 108-520, 700-999 MHz (cell blkd) • Power: 50/20/10/5W (2M), 40/20/10/5W (440 MHz) • Memories: 1055

$264.99 YSK-7800 remote kit included!

FT-950 100W HF/6M Base

- TX: HF/6M • RX: 0.03-56 MHz • Power: 10-100W
- Memories: 100 • Auto Antenna Tuner • 32-bit Floating Point DSP
- Requires 12VDC PS

$1479.99

FTM-10R

2M/440 FM Dual Bander

- TX: 144-148, 430-450 • RX: 0.5-1.8, 76-222, 300-999 (cell blkd) • Power: 50/20/5W (2M), 40/20/5W (440 MHz) • Memories: 500
- Microphone & PTT button are built-into the water-proof front panel • Bluetooth capable

$319.99 after instant ©oupon

FTM-10SR

Small & Low Power FM Dual Bander

- Same as FTM-10R except RF output is 10W (2M), 7W (440 MHz) • Body is smaller
- Both Body and Front Panel are waterproof

$319.99 after instant ©oupon

FT-2000 100W HF/6M Base

- TX: HF/6M • RX: 0.03-60 MHz • Power: 10-100W
- Memories: 99 • Auto Antenna Tuner • 32-bit Floating Point DSP
- Dual In-Band Receive • Internal Power Supply

$2449.99

AES
AMATEUR ELECTRONIC SUPPLY

5710 W. Good Hope Rd.
Milwaukee, WI 53223
414-358-0333
800-558-0411
milwaukee@aesham.com

4640 South Polaris Ave.
Las Vegas, NV 89103
702-647-3114
800-634-6227
lasvegas@aesham.com

621 Commonwealth Ave.
Orlando, FL 32803
407-894-3238
800-327-1917
orlando@aesham.com

28940 Euclid Ave.
Cleveland, OH 44092
440-585-7388
800-321-3594
cleveland@aesham.com

1-800-558-0411

aesham.com

We accept I.M.P.A.C.® Government Credit Cards

Prices subject to change without notice.
© After Instant coupon. Coupons & Included Items guaranteed though 10/31/08

TRADE UP TO YAESU
CALL NOW FOR A QUOTE!

Radios by YAESU
Choice of the World's top DX'ers℠

Lentini Communications, Inc.
800-666-0908

Local (860) 666-6227
FAX (860) 667-3561
21 Garfield Street
Newington, CT 06111
www.lentinicomm.com

Austin Amateur Radio Supply
800-423-2604

Local (512) 454-2994
FAX (512) 454-3069
5325 North I-35
Austin, Texas 78723
www.aaradio.com

Radio City, Inc.
800-426-2891

Local (763) 786-4475
FAX (763) 786-6513
2663 County Road I
Mounds View, MN 55112
www.radioinc.com

Associated Radio
800-497-1457

Local (913) 381-5900
FAX (913) 648-3020
8012 Conser
Overland Park, KS 66204
www.associatedradio.com

Universal Radio, Inc.
800-431-3939

Local (614) 866-4267
FAX (614) 866-2339
6830 Americana Pkwy.,
Reynoldsburg, Ohio 43068
www.universal-radio.com

HamPROs ▪ HamPROs ▪ HamPROs

Prices, products and policies may vary between dealer locations. Not all dealers have all product lines. All prices and products subject to change. Not responsible for typographical errors.

MasterCard VISA DISCOVER

ICOM

Rebate promotion offers guaranteed through September 30, 2008.

IC-7800
HF/6m @ 200 Watts,
100% Duty Cycle HF/50 MHz
All Band

$10 Mail in Rebate

IC-T90A
Tri-Band
Operation

$300* Coupon

IC-756 Pro III
HF/50 MHz,
All Band

INCLUDED WITH YOUR PURCHASE PS125
$50 Mail in Rebate
$200 Coupon

IC-746 Pro + FREE PS-125
HF/6m/2m
Transceiver

$50 Mail in Rebate

IC-718
HF 100W on HF

IC-7700
No compromise
RX performance

IC-R5
AM, FM, WFM

$20 Mail in Rebate

IC-V8000
DTMF Encode,
200 Alpha Memories

$50 Mail in Rebate
INCLUDED WITH YOUR PURCHASE RMK706

IC-706MKIIG

NEW!

IC-7200
HF/6 100W Field Portable
IF DSP Filtering

$20 Mail in Rebate
FREE Bonito CS4.5*

IC-PCR 1500/2500 + FREE Bonito CS4.5
*Government Versions are excluded

IC-R20
150 kHz to
3304.999
MHz

IC-V82
2M HT
7 watts
output

Super Value!
$200 Coupon
INCLUDED WITH YOUR PURCHASE RMK7000

IC-7000
HF, 6M,2M, 440

RMK 7000

IC-208H
2M/440, wideband

D-STAR ★ Compatible

IC-2820H
2M/440 dual bander

$20 Mail in Rebate
$50 Coupon

D-STAR ★ Compatible

ID-800H
144–148, 440–450MHz

D-STAR ★ Compatible

IC-92AD
2 Meter, 70 cm,
144-148 MHz ,
440-450 MHz

$20 Mail in Rebate

D-STAR ★ Compatible

ID-1
1.2 GHz transceiver,
vital part of a
D-STAR system

D-STAR ★ Compatible

IC-91AD
D-Star
compatible.

Whether it's over the counter or over the phone, HamPROs is your Home Town Dealer!

KENWOOD

Coupons expire September 30, 2008

$80 TS-2000
$150 TS-2000X
Coupon

TS-2000/ TS-2000X
High performance true
IF/stage DSP on main band.
HF/VHF/UHF

TM-271A
2M FM Transceiver,
136-174MHz RX
CTCSS (42 subtones),
DCS (104 codes) and
1750 Hz tone burst.

TH-F6A
Dual Channel
Receive,
H144/220/440 MHz
with 5 WATTS
on all 3 bands

TM-V71A
1000 Alpha Memories,
Dual Display

TH-K2AT
2m HT -
5watts
w/NOAA
warning,
VOX

TM-D710A
2M/70cm
Mobile
50W/50W,
Optional Voice
Synthesizer,
Advanced
APRS Features

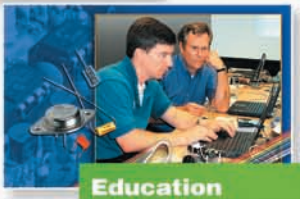
$180 Coupon

TS-480HX/TS-480SAT
HF/6M
All-Mode Transceiver
200W with a
DC 13.8V supply

Join or Renew!

Benefits that keep you On The Air.

Includes *QST*



www.arrl.org

Membership Application

Name _____ Call Sign _____

Street _____

City _____ State _____ ZIP _____

E-mail _____

Sign up my family members, residing at the same address, as ARRL members too! They'll each pay only $8 for a year's membership, have access to ARRL benefits and services (except QST) and also receive a membership card.

Family Member Name _____ Call Sign (if any) _____

☐ Sign up _____ family members @ $8 each = $ _____ .

☐ Total amount enclosed, payable to ARRL $ _____ .

☐ Enclosed is $ _____ ($1.00 minimum) as a donation to the Legal Research and Resource Fund.

☐ Charge to: ☐ VISA ☐ MasterCard ☐ Amex ☐ Discover

Card Number _____ Expiration Date _____

Cardholder's Signature _____

☐ If you do not want your name and address made available for non-ARRL related mailings, please check here.

Please check the appropriate one-year[1] rate:

☐ **$39 in US.**

☐ **Age 65 or older rate, $36 in US*.**

☐ **Age 21 or younger rate, $20 in US** (see note**).

☐ **Canada $49.**

☐ **Elsewhere $62.**

***Please indicate date of birth _____ .**

(US funds drawn on a bank in the US).

[1] 1-year membership dues include $15 for a 1-year subscription to QST. International 1-year rates include a $10 surcharge for surface delivery to Canada and a $23 surcharge for air delivery to other countries.

Other US membership options available: Blind, Life, and QST by First Class postage. Contact ARRL for details.

**Age 21 or younger rate applies only if you are the oldest licensed amateur in your household.

International membership is available with an annual CD-ROM option (no monthly receipt of QST). Contact ARRL for details.

Dues subject to change without notice.

Call Toll-Free (US)
1-888-277-5289
Join Online
www.arrl.org/join
or Clip and send to:

ARRL *The national association for AMATEUR RADIO*

225 Main Street
Newington, CT 06111-1494 USA

QST 10/2008

R&L Electronics

1315 Maple Ave HAMilton, Oh 45011
http://randl.com sales@randl.com
Local/Tech 513-868-6399
Fax 513-868-6574
(800)221-7735

JETSTREAM

1:1 Balun

JTBAL11

$22.95

Max power: 1500 watts, Connector: SO239, Transformer Type, Ratio 1:1, 3.5-30 Mhz

Dipole Rope

1/8" Nylon White Rope

JTRP50B *50'* **3.95**
JTRP100B *100'* **6.95**

Dipole Kits

JTD617K *6,10,12,15 or 17 Meter Kit, gray center insulator* **27.95**
JTD1017BK *10,12,15 or 17 Meter Kit, balun* **35.95**
JTD20K *20 Meter Kit, gray center insulator* **28.95**
JTD20BK *20 Meter Kit, balun* **36.95**
JTD40K *40/15 Meter Kit, gray center insulator* **29.95**
JTD40BK *40/15 Meter Kit, balun* **37.95**
JTD80K *80/75 Meter Kit, gray center insulator* **34.95**
JTD80BK *80/75 Meter Kit, balun* **42.95**

These kits include pretty much everything you need to make a dipole. Rope, antenna wire, end insulators, center insulator or balun.

Multi Color Center Insulators

Center Insulator

$14.95

Center insulators for dipoles. Power rating 2000 watts. Connector SO239. Available in 4 different colors

VX7R *VX6R* *FT60R* *VX3R*

VX7R/B

ADMS1G Software/Cable 39.95
CD15A Desktop Rapid Charger.....32.95
CLIP14 Swivel Belt Clip.....8.95
CSC88 Soft Case.....14.95
CT91 Mic Adapter 10.95
EDC5B DC Cable w/Noise Filter.....23.95
EDC6 DC Cable.....7.95
FBA23 AA Battery Case.....28.95
FNB80LI 7.4V 1400mAh LI-Ion 62.95
MH57A4B Speaker Mic 27.95
MH73A4B Waterproof Speaker/Mic....47.95

VX3R

ADMSVX3 Software/Cable 39.95
CSC92 Soft Case.....14.95
EDC21 DC Cable w/Noise Filter 36.95
FBA37 AA Battery Case.....17.95
FNB82LI 7.2V 1400mAh Ni-MH.....34.95
MH34B4B Speaker Mic 33.95

FT60R

ADMS1J Software/Cable.....39.95
EDC5B DC Cable w/Noise Filter 23.95
EDC6 DC Cable 7.95
FBA25A AA Battery Case 21.95
FNB83 7.2V 1400mAh Ni-MH.....49.95
MH34B4B Speaker Mic.....33.95
VAC370B Rapid Charger.....62.95

VX6R

ADMSVX6 Software/Cable 39.95
CD15A Desktop Rapid Charger 32.95
CLIP14 Swivel Belt Clip.....8.95
CSC91 Soft Case 14.95
CT91 Mic Adapter.....10.95
EDC5B DC Cable w/Noise Filter.....23.95
EDC6 DC Cable.....7.95
FBA23 AA Battery Case 28.95
FNB80LI 7.4V 1400mAh LI-Ion 62.95
MH57A4B Speaker Mic 27.95
MH73A4B Waterproof Speaker/Mic ...47.95

YAESU
Choice of the World's top DX'ers℠

FT8800R

ADMS2I Software and cable.....39.95
JTPS14M Jetstream Power Supply 49.95
MLS100 External Speaker.....46.95
MMB60 Quick Release Mobile Bracket29.95
YSK8900 Separation Kit.....39.95

FT7800R

MEK2 Microphone Extension Kit.....42.95
JTPS14M Jetstream Power Supply 49.95
MLS100 External Speaker.....46.95
MMB60 Quick Release Mobile Bracket29.95
YSK7800 Separation Kit.....54.95

R&L Electronics

1315 Maple Ave HAMilton, Oh 45011
http://randl.com sales@randl.com
Local/Tech 513-868-6399
Fax 513-868-6574
(800)221-7735

FT2000/D

DMU2000 Data Management Unit.....889.95
FH2 Remote Keypad.....84.95
SP2000 External Speaker.....175.95
UTUNINGKIT A, B, or C model.....479.95
YF122C 500 hz CW filter.....159.95
YF122CN 300 hz CW filter.....164.95

FT950

DMU2000 Data Management Unit.....889.95
FH2 Remote Keypad.....84.95
MD100A8X Desk top mic.....139.95
MD200A8X Desk top mic.....379.95
SP2000 External Speaker.....175.95
UTUNINGKIT A, B, or C model.....479.95

FT450/AT

ATAS120 Auto tuning antenna.....279.95
ATU450 Auto antenna tuner.....149.95
FC40 Auto antenna tuner.....249.95
MD100A8X Desk top mic.....139.95
MD200A8X Desk top mic.....379.95
MMB90 Mobile mount.....33.95

FT897D

ADMS4B Programming software/cable51.95
ATAS120 Auto tuning antenna.....279.95
CD24 Charge adapter for FNB78.....119.95
CT39 Packet Cable.....9.95
CT62 Computer Interface Cable.....29.95
FC30 Bolt on auto antenna tuner.....189.95
FNB78 NiMH Internal Battery.....115.95
FP30 Internal Power Supply.....209.95
MD100A8X Desk top mic.....139.95
MH59A8J Remote Control Mic.....64.95
YF122S 2.3 kHz SSB Filter.....164.95

FT857D

ADMS4B Programming software/cable51.95
ATAS120 Auto tuning antenna.....279.95
CT39 Packet Cable.....9.95
CT62 Computer Interface Cable.....29.95
FC30 Auto antenna tuner.....189.95
JTPS28 Jetstream Power Supply.....79.95
MD100A8X Desk top mic.....139.95
MH59A8J Remote Control Mic.....64.95
YF122S 2.3 kHz SSB Filter.....164.95
YSK857 Separation Kit.....44.95

FT817ND

CSC83 Soft Case.....23.95
CT39 Packet Cable.....9.95
CT62 Computer Interface Cable.....29.95
EDC5B Lighter Cable.....23.95
EDC6 DC Power Cable.....7.95
FNB72 Ni-Cd Battery Pack.....59.95
MH36E8J DTMF Mic.....56.95
YF122S 2.3 kHz SSB Filter.....164.95

YAESU
Choice of the World's top DX'ers℠

FTM10R/SR

BH1 Bluetooth Headset.....84.95
BLUETOOTHKIT BH1, BU1, CAB1159.95
BU1 Bluetooth Unit.....71.95
CAB1 Charger Sleeve for BH1.....8.95
JTPS14M Jetstream Power Supply.....49.95
MEKM10 Microphone Jack.....12.95
MH68A6J DTMF mic.....44.95

FT2800M

ADMS2J Cloning Software + Cable.....38.95
JTPS14M Jetstream Power Supply.....49.95
MLS100 External Speaker.....46.95
MLS200 External Speaker.....64.95
MX2 Hustler 2m Mag Mount.....32.95

FT1802M

JTPS14M Jetstream Power Supply.....49.95
MLS100 External Speaker.....46.95
MLS200 External Speaker.....64.95
MX2 Hustler 2m Mag Mount.....32.95

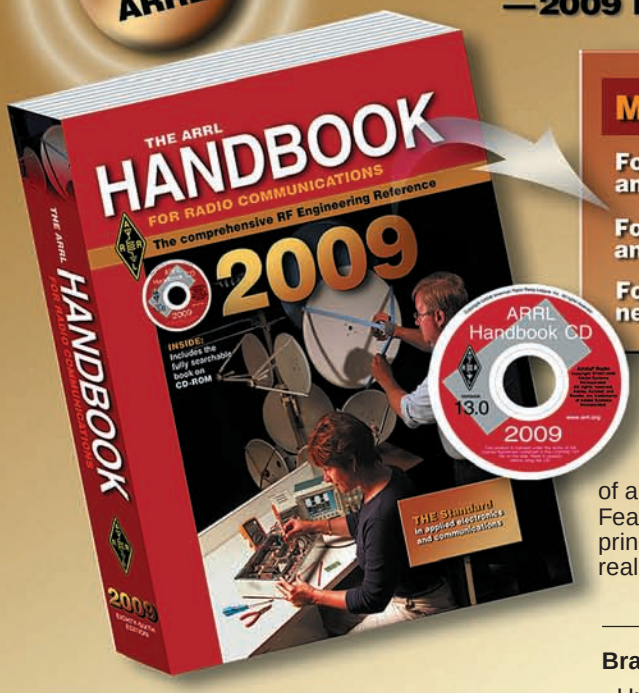
Yaesu Closeout Items

2M726 *2m replacement module FT726*.....149.95
ATU767 *Replacement tuner for FT767*.....99.95
CSC62 *Soft Case for 11/41 w/FNB31*.....4.95
CT30 *Mic "Y" Connector for 10/40/50*.....7.95
CT58 *Band Data Cable FT100/857*.....25.95
FBA17 *AA Holder 23/411/470*.....17.95
FM8800 *FM Wide kit for FRG8800*.....19.95
FRC6 *DTMF Pager Unit 2400/2500*.....39.95
FTT10A16 *16 DTMF Keypad FT10/40*.....9.95
PA4B *117VAC adapter for FRG9600*.....14.50
XF117CN *300hz CW filter for FT100*.....49.95
XF455C *CW Filter for FT102*.....49.95

NEW ARRL Books and CDs

NEW from ARRL!

The ARRL Handbook
—2009 Edition



Must-Have

For the radio amateur...

For the technician and engineer...

For the newcomer...

This 86th Edition stays ahead of the pack—taking its place as the most comprehensive source of applied electronics and communications know-how. Featuring the most current material on the state-of-the-art, topics include principles of electronics, radio communication fundamentals and design, real-world applications and operating, references and much more.

CD-ROM Included! The CD-ROM at the back of the book includes the fully searchable text and illustrations in the printed book, as well as companion software, PC board templates and other support files.

2009 ARRL Handbook Hardcover. Includes book and CD-ROM.
ARRL Order No. 0292 ..... **$59.95***

2009 ARRL Handbook Softcover. Includes book and CD-ROM.
ARRL Order No. 0261 ..... **$44.95***

Brand-new material:

- Updated **amateur satellite** content, including details for today's fleet of operational satellites.
- Updated versions of **accessory software** on the CD-ROM.
- **New Projects:**
  - **RockMite QRP CW transceiver**. Now expanded to cover 80, 40, 30 or 20 meters.
  - **Audio Interface** for Field Day or Contesting. Audio and mic connections for two operators sharing a radio.
  - **Remote Power Controller**. Turn high current devices off and on.
  - **Audible Antenna Bridge**. Tune for the lowest SWR by ear.

...and MORE!

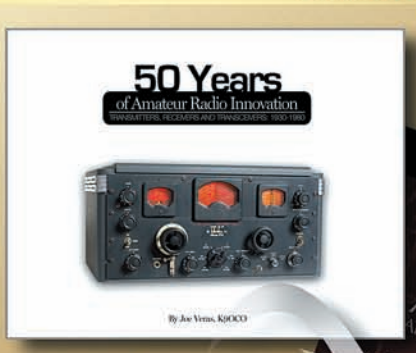
Limited time BONUS offer!

50 Years of Amateur Radio Innovation Transmitters, Receivers and Transceivers: 1930-1980

This guided tour of more than 400 legendary radios from 1930 to 1980, depicts the "golden age" of American radio technology. Restored and gorgeously photographed by Joe Veras, K9OCO, each photo includes a brief description, the year the radio was introduced and its selling price at the time. Many of the radios are quite rare, others are sure to bring fond memories of equipment you may have owned yourself!

Book with Bonus Calendar
ARRL Order No. 0228 ..... **Only $39.95***

Calendar if purchased separately
ARRL Order No. 0302 ..... **Only $12.95***



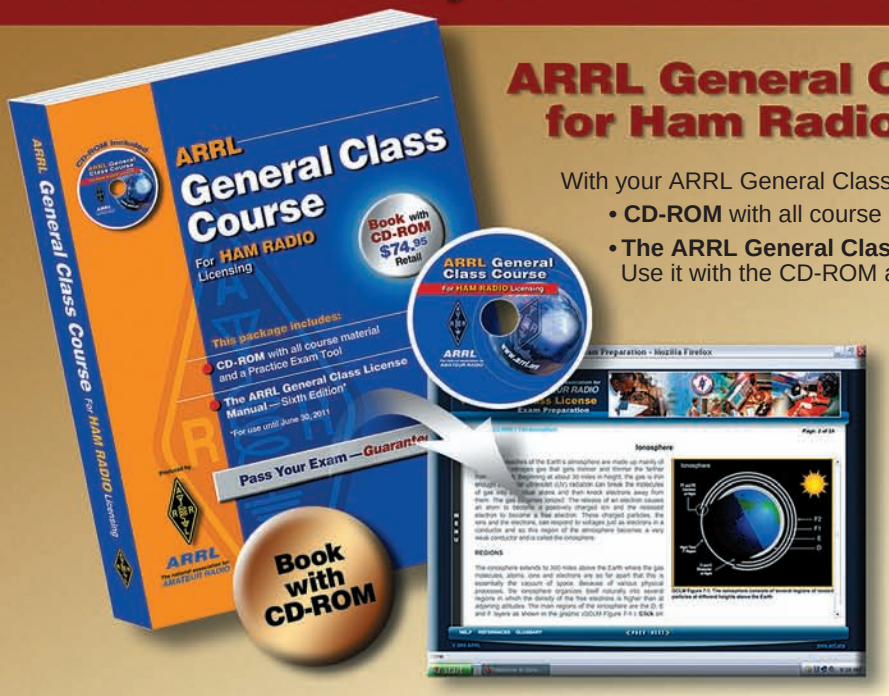
DELUXE 13 MONTH 2009 ARRL Amateur Radio Calendar

Featuring the Vintage Radio Photography of Joe Veras, K9OCO

—when you order by November 30, 2008!

Bonus "2009 ARRL Calendar" premium cannot be redeemed for cash. No returns. Exchanges must be accompanied by premium. Valid only on orders direct from ARRL. This offer may be cancelled or modified at any time due to system error, fraud or other unforeseen problem. Void where prohibited.

The Fastest Way to General Class License Success!



ARRL General Class Course for Ham Radio Licensing

With your ARRL General Class Course you get:

- **CD-ROM** with all course material and a Practice Exam Tool
- **The ARRL General Class License Manual**—Sixth Edition. Use it with the CD-ROM as a reference or to review important points!

CD-ROM features:

- Each topic is divided into bite-sized lessons. You learn at your own pace!
- Visual animations, colorful illustrations and audio—make your learning experience exciting and fun!
- Take short on-screen quizzes based on the official exam questions—and help reinforce your learning. Take practice exams again and again!

Upgrade with confidence!

Order Risk-Free—*Guaranteed!*
If not completely satisfied, return within 30 days for a prompt, friendly refund.

- **ARRL General Class Course.** Includes CD-ROM and The ARRL General Class License Manual. Valid through June 30, 2011. ARRL Order No. 1387……..**Only $74.95***
- **additional ARRL General Class License Manual.** Valid through June 30, 2011. ARRL Order No. 9965……**Only $24.95***

The ARRL Digital Technology for Emergency Communications Course —Version 1.0

In this course, we will introduce you to all the ways Amateur Radio operators are using digital technology as a valuable emergency communications tool. The topics covered in the course include:

Packet radio APRS	D-STAR
Winlink 2000	APCO25
IRLP	HF sound card modes
EchoLink and WIRES-II	Automatic Link Establishment (“ALE”)

Illustrations, screenshots, Internet links and audio are used to demonstrate transmission modes and equipment configurations. Bite-sized units make learning interesting and fun!

ARRL Order No. 1247 ..... **Only $49.95***

Course System Requirements (minimum) – Microsoft Windows® Vista/XP/2000/NT/98/95 or Apple OS X, 200 MHz processor, 32 MB RAM, sound card and speakers, 4-speed CD-ROM drive or higher. Requires Web browser; Microsoft Internet Explorer™ 6.0, Mozilla Firefox 2.0, Apple Safari 3.0—or later versions. Some documents require Adobe® Reader®.

*Shipping and handling charges apply. Sales Tax is required for all orders shipped to CA, CT, VA, and Canada. Prices and product availability are subject to change without notice.

ARRL *The national association for AMATEUR RADIO*
225 Main Street, Newington, CT 06111-1494 USA
SHOP DIRECT *or call for a dealer near you.*
ONLINE WWW.ARRL.ORG/SHOP
ORDER TOLL-FREE 888/277-5289 (US)

QST 10/2008

ARRL The national association for AMATEUR RADIO

Contesting Contacts

Products & Services

Advertisers

American Radio Relay League
225 Main Street
Newington, Connecticut 06111-1494 USA
www.arrl.org

Alinco gives you Mobiles for all Seasons and for all Reasons!

Work the DX on 6 and 10 Meter FM

- **DR-03T** (pictured) 10 meters
- **DR-06T** 6 meters

- Same key-operations as DR-135-435 series mobile radios.
- EJ-41U internal TNC board is available as an option for 1200/9600bps packet (DR-06T only), no need to remove mic for packet operation.
- DR-03T 10 watts, H(10W)/M(5W)/L(2W) power settings.
- DR-06T 50 watts, H(50W)/M(20W)/L(5W) power settings.
- 100 memory channels
- Front panel data port
- Rear panel DSUB9 computer connection (DR-06T only)
- CTCSS, DCS encode+decode, DTMF encode and Tone-burst are all standards
- Clean, clear Alinco audio
- Super-wide 7 character alphanumeric display
- Wide and narrow FM modes (16K0 & 8K50F3E / DR-03T is fixed for NFM)
- Theft alarm feature
- A large, palm-fitting commercial-grade backlit microphone with an 8 pin metal connector (not a modular plug) as well as direct frequency input and direct multi-function access such as monitor, call channel, power setting,memory to VFO plus more!
- Stays in mode you select (voice/packet) through power off cycles
- Ten autodial memories

Work simplex and the VHF and UHF Repeaters

- **144 MHz DR-135TMkIII** 50 watts, H/M/L power settings
- **220 MHZ DR-235TMkIII** (pictured) 25 watts, H/M/L power settings
- **440 MHZ DR-435TMKIII** 35 watts, H/M/L power settings

- EJ-41U internal TNC board is available as an option for 1200/9600bps packet
- 100 memory channels
- Front panel data port
- Rear panel DSUB9 computer connection
- No need to remove mic for packet operation
- Ignition key on/off feature
- CTCSS, DCS encode+decode, DTMF encode and Tone-burst are all standards
- Clean, clear Alinco audio
- Super-wide 7 character alphanumeric display
- Wide and narrow FM modes (16K0 & 8K50F3E)
- Theft alarm feature
- A large, palm-fitting commercial-grade backlit microphone with an 8 pin metal connector (not a modular plug) as well as direct frequency input and direct multi-function access such as monitor, call channel, power setting, memory to VFO plus more!
- Stays in mode you select (voice/packet) through power off cycles
- Ten autodial memories

Dual Band fun and versatility

- **DR-635T** 144 MHz/440MHz

- VHF/UHF full duplex operation includes V/U and U/V modes.
- Cross-band repeater function (where permitted: standard on DR-635T)
- 200 Memory channels
- H/M/L power output settings- VHF: 50/25/5W UHF: 35/20/5W
- Large 6 character alphanumeric display
- Selectable display color illumination (Blue, Violet or amber)
- Internal duplexer - single antenna connector
- Removable control head can be remotely mounted (requires optional EDS-9 separation kit) or allow transceiver to be inverted for optimal speaker placement.
- Expanded receive range includes FM broadcast band (WFM)
- Power supply voltage display
- Theft alarm feature
- Optional 1200 and 9600 bps packet operation with optional EJ-50U
- Digital voice communications with optional EJ-47U
- Illuminated DTMF EMS-57 microphone allows direct VFO frequency entry and remote control of transceiver
- CTCSS & DCS encode and decode plus four different tone bursts
- CTCSS Tone and DCS scan
- Programmable VFO and Memory scan modes
- "Time Out" timer
- Cable Clone feature
- AM Aircraft band reception
- Temperature Compensated Crystal Oscillator
- Ignition key activated power on/off feature
- Optional Accessories
  - EJ-47U digital modulation uint
  - EJ-50U TNC unit
  - EDS-9 Front-control unit separation kit

Specifications subject to change without notice or obligation. Performance specification apply only to the amateur bands. Permit required for MARS use. APRS is a registered trademark of Bob Bruninga, WB4APR. Check regulations prior to operating full duplex in US.

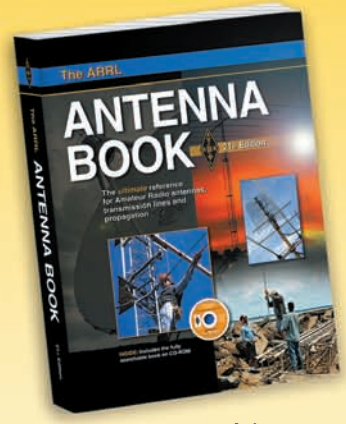
Distributed in North America by Ham Distributors,
1775 North Loop 336 East, Suite 8, Conroe, Texas 77301
Phone: 936-649-1497 • Fax: 800-824-3128 • email: USrep@Hamdistributors.com

ALINCO
www.alinco.com

The ARRL Antenna Book

21st Edition

The ultimate reference for Amateur Radio antennas, transmission lines and propagation.



The ARRL Antenna Book is THE SOURCE for current antenna theory and a wealth of practical, how-to construction projects. **Fully searchable CD-ROM included.**

Contents:

- Safety First
- Antenna Fundamentals
- The Effects of Ground
- Antenna Modeling and System Planning
- Loop Antennas
- Low-Frequency Antennas
- Multiband Antennas
- Multielement Arrays
- Broadband Antenna Matching
- Log Periodic Arrays
- HF Yagi Arrays
- Quad Arrays
- Long Wire and Traveling Wave Antennas
- Direction Finding Antennas
- Portable Antennas
- Mobile and Maritime Antennas
- Repeater Antenna Systems
- VHF and UHF Antenna Systems
- Antenna Systems for Space Communications
- Antenna Materials and Accessories
- Antenna Products Suppliers
- Antenna Supports
- Radio Wave Propagation
- Transmission Lines
- Coupling the Transmitter to the Line
- Coupling the Line to the Antenna
- Antenna and Transmission-Line Measurements
- Smith Chart Calculations

Book with CD-ROM.
ARRL Order No. 9876
Only $44.95*
*Shipping: $10 US (ground)/$15 International

ARRL *The national association for AMATEUR RADIO*

SHOP DIRECT *or call for a dealer near you.*
ONLINE WWW.ARRL.ORG/SHOP
ORDER TOLL-FREE 888/277-5289 (US)

QST 12/2007

Ultimate Antenna Systems

Get your SuperBertha!

- No guy wires
- Entire pole rotates
- Rotor at ground level
- Stack all your antennas
- 50ft to 300ft high
- Small yard footprint
- EIA-TIA-222-G
- Custom projects our specialty
- Starting at $37,799


Photo by K3LR

Get your

- OWA Long Boom Yagis
- 80m 9-circle array
- 160m 9-circle array

OWA...**O**ptimized **W**ideband **A**rray monobanders:

- Designed by WA3FET and K3LR
- Low SWR, high gain, high F/B, and clean pattern across entire CW, RTTY, SSB bands
- Pre-assembled elements standard most models
- Electrically and mechanically superior yagis
- 40m 4 element on 48ft boom
- 20m 6 element on 48ft boom
- 15m 7 element on 48ft boom
- 10m 8 element on 48ft boom

80m 9-circle array and 160m 9-circle array

- 9 element all-driven phased vertical arrays
- High gain, high F/B, and clean pattern
- Instantaneous 8 azimuth switching
- Be at the top of the lowband food chain

Visit www.SuperBertha.com
ScottW3TX@verizon.net
814-881-9258

THE PERFECT ANTENNA

For almost 2 decades GAP has stated there is no perfect antenna. No singular antenna can do it all. That is why we designed a family of antennas that utilize the patented (# 5.592.183), GAP Technology, to give you options. Within this family is the antenna or antennas right for you. If deed restrictions or visibility are a problem, take a look at the Eagle DX. If you are looking for a simple general coverage antenna with capture area, consider the Challenger DX. What about a low band antenna with great 40m and 80m performance? Then the Voyager DX is worth your attention. If you seek the most popular multiband antenna, then the Titan DX will end your search.

The GAP Technology eliminates traps, electromechanical devices and coils, which can increase loss and decrease reliability. Simplicity in design, results in a very user friendly assembly process. Slide one tube over another until the big hole lines up with the little and insert a screw. A GAP is pretuned, will handle 1500 watts PEP and provides instantaneous coverage with a VSWR under 2:1 across the entire band.*

CATCH THE WAVE

TITAN DX

10m, 12m, 15m, 17m, 20m, 30m, 40m, & 80m

25' tall 25 lbs

Mounts on 1-1/4" OD mast

No radials required.

***VSWR under 2:1 on 80m 100 KHz**

CHALLENGER DX

2m, 6m, 10m, 12m, 15m, 20m, 40m, & 80m

31.5' tall 21 lbs

Drop in ground mount supplied.

3 counterpoises required 25' long.

***VSWR under 2:1 on 80m 130 KHz**

VOYAGER DX

20m, 40m, 80m, & 160m

45' tall 39 lbs

Supllied with hinged ground mount.

3 counterpoises required 57' long.

***VSWR under 2:1 on 160m 90 KHz**

EAGLE DX

10m, 12m, 15m, 17m, 20m & 40m

21' tall 19 lbs

Mounts on 1-1/4" OD mast

No radials required.

***40m limited to 300 watts**

QUICK TILT

The easy way to raise and lower your antenna, support mast or flagpole. Works with most antennas.

GROUND MOUNT

Accomdates 1 1/4" 2" OD Mast

LADDER MOUNT

STAINLESS STEEL & ALUMINUM CONSTRUCTION

ANTENNA ACCESSORIES FOR ALL

GAP ANTENNA PRODUCTS

(772) 571-9922

Visit us at:

gapantenna.com

GUY KITS

Insure your antenna or support mast against the elements with a Guy Kit.

STAINLESS STEEL & ALUMINUM CLAMP

3/32" UV Protected Black Double Braided Polyester Rope

Life is a JOURNEY. Enjoy the ride!

UNIVERSAL LIP MOUNTS WITH COAX CABLE COMBINATIONS

Several mounts with coax combos are available to chose from depending on your vehicles available mounting space and antenna size.

No holes to drill, held securely in place with set screws and adjust in multiple planes. Attach to virtually any lip edge that is 1/4" thick or less: trunk lids, van doors, SUV doors, truck doors, hoods, etc...

Deluxe low loss cable assy included for easy entry thru the weather seal without causing water leaks, wind noise, and/or cable damage.

Max power: HF 200W
VHF 75W
UHF 50W

For small antennas & limited space

MODEL / ANT CONN / COAX CONN

Maldol EM-5M SO-239 / PL-259

Footprint: 1.1"x .75"
(Less than 1 sq inch!)
Max Antenna: 40"

For medium size antennas

MODEL / ANT CONN / COAX CONN

COMET CP-5M SO-239 / PL-259
COMET CP-5NMO NMO / PL-259

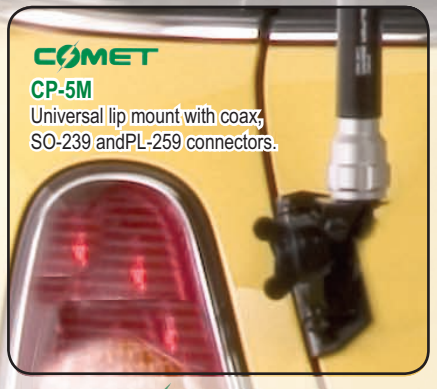
Footprint: 3.4" x 1.25"
Max Antenna: 60"

For tall or multi-band HF antennas

MODEL / ANT CONN / COAX CONN

COMET HD-5M SO-239 / PL-259
COMET HD- 5 3/8-24 3/8-24 / PL-259

Footprint: 3.75" x 1.1 "
Max antenna: 80"



COMET
CP-5M
Universal lip mount with coax, SO-239 andPL-259 connectors.

Combine the coax style and length you need with a bracket from below.
(assemblies also available with N-connectors)

COMET
3D5M / 3D4M
Standard low loss cable assy.
Gold plated SO-239 / PL-259 connectors.
3D5M length 16' 6"
3D4M length 13'

COMET
CK-3M5 / CK-3M
Deluxe low loss cable assy.
Includes 18" of mini RG-188A/U type coax for easy entry from a lip mount without causing water leaks, wind noise or coax damage.
CK-3M5 length: 16'6"
CK-3M length: 9'9"

Choose the bracket that best fits your antenna and vehicle. All have multiple adjustments and fit virtually any lip 1/4" thick or less. Soft rubber protects vehicle finish.

COMET
RS-840
Heavy-duty, 2 adjustment planes. For HF and heavier antennas up to 80".

COMET
RS-730
Heavy-duty, 4 adjustment planes, up to 60" antenna.

COMET
RS-720 / RS-720NMO
Med-duty, 3 adj planes, 60" ant.
RS-720: Accepts SO-239 conn
RS-720NMO: Accepts NMO conn

COMET
RS-520
Light-duty, 3 adjustment planes, up to 45" antenna.

Maldol
PRM-T
Heavy-duty, 3 adjustment planes, up to 80" antenna.

Maldol
MK-30H
12VDC motorized mount. Mounts to vertical or horizontal door lip. Up to 70"/19 oz. antenna.

Maldol
EM-B80
Light-duty, 2 adjustment planes, up to 40" antenna.

COMET
GRB-5M
Trunk lip mount, low-profile,black anodized stainless steel. Offset washers provide up to 17 deg. vertical adjustment of antenna.16'9" of deluxe cable included, 18" of mini RG-188A/U style coax for easy entry thru the weatherseal. Gold-plated SO-239/ PL-259 connectors.

The rear doors on newer trucks are the perfect place to mount antennas • No holes to drill • Above roof line • Easy access • When mounting to a van, SUV, truck, etc., use the CP-5M or build your own system with components shown above. There are several mount sizes, coax diameters and coax lengths from which to choose.

COMET and Maldol Mobile

For a complete catalog, call or visit your local dealer.
Or contact NCG Company. 15036 Sierra Bonita Lane, Chino, CA 91710
909-393-6133 • 800-962-2611 • FAX 909-393-6136 • www.natcommgroup.com

Thank You!
We hope you have enjoyed the Contesting pullout.

Visit us at www.arrl.org

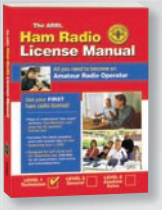
Contesting

Contacts
Products & Services

Special Advertising Section
QST October 2008

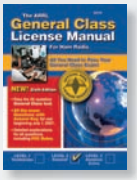
License Study Materials

Technician Class



Exam: 35-question Technician test (Element 2)
The ARRL Ham Radio License Manual.
Ham radio's most popular license manual! Organized in easy-to-understand "bite-sized" sections, this is all you need to become an Amateur Radio operator.
Order No. 9639 ..... **$24.95**
The ARRL Ham Radio License Course.
Register at **www.arrl.org/cep**. Includes *The ARRL Ham Radio License Manual*, a one year ARRL membership, and graduate support.
Book with online course – 100% Guaranteed! **$69**
ARRL's Tech Q & A—4th Edition. Order No. 9647 ..... **$17.95**
Ham University. Technician/General Edition. Order No. 8956 ..... **$24.95**
HamTestOnline™. Order No. 9571 ..... **$49.95**
Ham Radio for Dummies. Order No. 9392 ..... **$21.99**
The ARRL Instructor's Manual for Technician and General License Courses. 4th Edition. Order No. 1263 ..... **$19.95**
Technician Class Flash Card Set. Order No. 1345 ..... **$24.95**

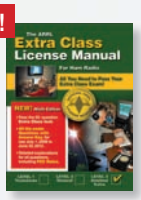
General Class (upgrade from Technician)



Exam: 35-question General test (Element 3)
NEW! ARRL General Class Course for HAM RADIO Licensing. The fastest way to General Class License Success! Includes CD-ROM with all course material and *The ARRL General Class License Manual*. Pass your exam – Guaranteed!
Order No. 1387 ..... **$74.95**
ARRL General Class License Manual—6th Edition.
Order No. 9965 ..... **$24.95**
ARRL's General Q & A—3rd Edition. Order No. 9957 ..... **$17.95**
General Class Flash Card Set. Order No. 1357 ..... **$39.95**

Extra Class (upgrade from General)

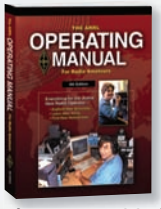
NEW!



Exam: 50-question Extra test (Element 4)
ARRL Extra Class License Manual—9th Edition.
Achieve the highest level of Amateur Radio licensing! Our expert instruction will lead you through all of the knowledge you need to pass the exam. Includes all the exam questions with answer key, for use through June 30, 2012.
Order No. 1352 ..... **$24.95**
NEW! ARRL's Extra Q & A—2nd Edition.
Order No. 1379 ..... **$17.95**
Extra Class Flash Card Set.
Order No. 1366 ..... **$39.95**

Ham University. Extra Class/Morse Code Edition
Order No. 1048 ..... **$24.95**
Ham University. Complete Edition (Tech, Gen, Extra, and Morse code.)
Order No. 8735 ..... **$39.95**

Operating and Reference

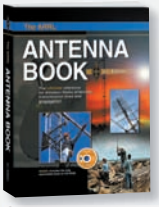


The ARRL Operating Manual—9th Edition.
The MOST COMPLETE book about Amateur Radio Operating. It contains everything you need to explore new activities, lean new skills, find new references, and more.
Order No. 1093 ..... **$29.95**
ARRL Repeater Directory®—2008/2009 Edition.
Pocket-sized (3.75" x 5.25"), Order No. 1271 ..... **$10.95**
Desktop Edition (6" x 9"), Order No. 1298 ..... **$15.95**
TravelPlus for Repeaters™—2008-2009 Edition.
CD-ROM, version 12.0. Order No. 1301 ..... **$39.95**
The ARRL DXCC List. February 2008 Edition. Order No. 1212 ..... **$5.95**
The ARRL DXCC Handbook. Order No. 9884 ..... **$19.95**
DXing on the Edge—The Thrill of 160 Meters.
Order No. 6354 ..... **$19.95** ~~$29.95~~
RF Exposure and You. Order No. 6621 ..... **$22.95**
Hints & Kinks. 17th Edition. Order No. 9361 ..... **$17.95**
Low Profile Amateur Radio. 2nd Edition. Order No. 9744 ..... **$19.95**
NEW! FCC Rules and Regulations for the Amateur Radio Service
2nd Edition. Now Including: ***The FCC Rules and You.***
Order No. 1173 ..... **$5.95**
Getting Started with Ham Radio. Order No. 9728 ..... **$19.95**
The ARRL Software Library for Hams. CD-ROM. Order No. 9825 ..... **$19.95**
Ham Radio FAQ. Order No. 8268 ..... **$9.95** ~~$14.95~~
Amateur Radio on the Move. Order No. 9450 ..... **$19.95**
ARRL's Vintage Radio. Order No. 9183 ..... **$19.95**
Your Introduction to Morse Code. Order No. 8314 ..... **$9.95** ~~$14.95~~
Two-Way Radios & Scanners for Dummies. Order No. 9696 ..... **$21.99**

MAPS

The Radio Amateur's World Atlas. Order No. 5226 ..... **$12.95**
ARRL Map of North America. 27 x 39 inches. Includes grids!
Order No. 8977 ..... **$15**
ARRL Map of the World (Azimuthal). 27 x 39 inches.
Order No. 7717 ..... **$15**
ARRL Map of the World (Robinson). 26 x 34.5 inches.
Order No. 8804 ..... **$15**
ARRL Worked All States (WAS) Map. 11 x 17 inches.
ARRL Frequency Chart on reverse side. Order No. 1126 ..... **$3**
Marine Amateur Radio. Order No. 9723 ..... **$12.95**
Shortwave DX Handbook. Order No. 9953 ..... **$34.95**
RSGB Radio Communications Handbook. 9th Edition.
Order No. 1215 ..... **$54.95**
NEW! RSGB LF Today. 2nd Edition.
Order No. 0220 ..... **$24.95**
RSGB The Low Frequency Experimenter's Handbook.
Order No. RLFS **$34.95**
RSGB Prefix Guide. Order No. 1136 ..... **$19.95**
RSGB Morse Code for Radio Amateurs. Order No. 9917 ..... **$15.95**

Antennas and Transmission Lines



The ARRL Antenna Book—21st Edition
The ultimate reference for Amateur Radio antennas, transmission lines and propagation. Fully-searchable CD-ROM included (for *Windows* and Macintosh).
Softcover. Order No. 9876 ..... **$44.95**
International Antenna Collection.
Volume 1. Order No. 9156 ..... **$19.95**
Volume 2. Order No. 9465 ..... **$21.95**
Antenna Zoning. Order No. 8217 .....
$40 Web Special ..... ~~$41.95~~
ON4UN's Low-Band DXing. Fourth Edition.
Order No. 9140 ..... **$39.95**
ARRL's Yagi Antenna classics. Order No. 8187 ..... **$17.95**
Simple and Fun Antennas for Hams. Order No. 8624 ..... **$22.95**
ARRL's Wire Antenna Classics. Order No. 7075 ..... **$14**
More Wire Antenna Classics—Volume 2. Order No. 7709 ..... **$17.95**
More Vertical Antenna Classics. Order No. 9795 ..... **$17.95**
Vertical Antenna Classics. Order No. 5218 ..... **$12**
ARRL's VHF/UHF Antenna Classics. Order No. 9078 ..... **$14.95**
ARRL Antenna Compendium. Vol. 1. Order No. 0194 ..... **$20**
ARRL Antenna Compendium. Vol. 2. Order No. 2545 ..... **$14**
ARRL Antenna Compendium. Vol. 3. Order No. 4017 ..... **$14**
ARRL Antenna Compendium. Vol. 4. Order No. 4912 ..... **$20**
ARRL Antenna Compendium. Vol. 5. Order No. 5625 ..... **$20**
ARRL Antenna Compendium. Vol. 6. Order No. 7431 ..... **$22.95**
ARRL Antenna Compendium. Vol. 7. Order No. 8608 ..... **$24.95**
RSGB Practical Wire Antennas. Order No. R878 ..... **$17**
RSGB Practical Wire Antennas 2. Order No. 9563 ..... **$24.95**
RSGBHF Antennas for All Locations. Order No. 4300 ..... **$34.95**
RSGB The Antenna Experimenter's Guide. Order No. 6087 ..... **$34.95**
RSGB HF Antenna Collection. Order No. 3770 ..... **$34.95**
RSGB The Antenna File. Order No. 8558 ..... **$34.95**
RSGB Antenna Toolkit 2. Order No. 8547 ..... **$49.95**
RSGB Backyard Antennas. Order No. RBYA **$34.95**
RSGB Antenna Topics. Order No. 8963 ..... **$34.95**
RSGB Radio Propagation - Principles and Practice. Order No. 9328 ..... **$29.95**
Tower Climbing Safety & Rescue. Order No. 1108 ..... **$29.95**
Electronic Applications of the Smith Chart. Order No. 7261 ..... **$75**
Radio-Electronic Transmission Fundamentals. Order No. RETF **$89**
Transmission Line Transformers. Order No. TLT4 ..... **$59**
Theory and Practice of Transmission Line Transformers.
CD-ROM Order No. 9088 ..... **$129**

CD-ROM Collections

QST on CD-ROM!

2007 Periodicals on CD-ROM. Order No. 1204 ..... **$19.95**
2006 Periodicals on CD-ROM. Order No. 9841 ..... **$19.95**
2005 Periodicals on CD-ROM. Order No. 9574 ..... **$19.95**
2004 Periodicals on CD-ROM. Order No. 9396 ..... **$19.95**
2003 Periodicals on CD-ROM. Order No. 9124 ..... **$19.95**
2002 Periodicals on CD-ROM. Order No. 8802 ..... **$19.95**
2001 Periodicals on CD-ROM. Order No. 8632 ..... **$19.95**
2000 Periodicals on CD-ROM. Order No. 8209 ..... **$19.95**
1999 Periodicals on CD-ROM. Order No. 7881 ..... **$19.95**
1998 Periodicals on CD-ROM. Order No. 7377 ..... **$19.95**
1997 Periodicals on CD-ROM. Order No. 6729 ..... **$19.95**
1996 Periodicals on CD-ROM. Order No. 6109 ..... **$19.95**
1995 Periodicals on CD-ROM. Order No. 5579 ..... **$19.95**
Radio Amateur Callbook CD-ROM. Summer 2008 Edition.
Order No. 1129 ..... **$49.95**
HamCall™ CD-ROM. Order No. 8991 ..... **$49.95**

Continued on page 142

VECTRONICS RF Accessories

300 Watt Antenna Tuner

VC-300DLP
$179.95

VECTRONICS uses the finest components available to build the highest quality 300 Watt antenna tuner ever made.

You can tune any *real* antenna 1.8-30 MHz. Custom 48 position switched inductor and 1000 Volt variable capacitors provide arc-free operation. Handles 300 Watts PEP SSB, (150 Watts on 1.8 MHz).

8 position antenna switch, 50 Ohm dummy load, peak reading backlit Cross-Needle SWR Power meter, 4:1 balun for balanced lines. Scratch-proof Lexan front panel. 10.2x9.4x3.5 inches. 3.4 pounds.

300 Watt Mobile Tuner

VC-300M
$129.95

The VC-300M *Mobile* Antenna Tuner is compact, lightweight, easy-to-operate and is our most economical tuner.

It's compatible with *any* mobile antenna, any HF transceiver and fits in the smallest car. It can also be used at home with any coax fed antennas -- dipoles, vees, verticals, beams or quads.

Backlit Cross-Needle meter simultaneously monitors Forward/Reflected power and SWR. Covers 1.8 to 30 MHz.

Handles 300 Watts SSB PEP, 200 Watts continuous, (150 Watts on 1.8 MHz). 7.25x8.75x3.6 inches. 3.4 pounds.

SWR/Power Meters

PM-30
$89.95
PM-30UV
$99.95

PM-30, $89.95, for 1.8 to 60 MHz.

Displays forward/reflected power, SWR simultaneously on Cross-Needle meter. True shielded directional coupler assures accuracy. Backlit meter displays peak or average power in 300/3000 Watt ranges. First-rate construction, scratch-proof case, durable paint, Lexan front panel. Lamp switch. SO-239 connectors. 5.3x5.75x3.5 in.

144/220/440 MHz, 30/300 SWR/Wattmeters

PM-30UV, $99.95, SO-239 connectors.
PM-30UVN, $99.95, N connectors.
PM-30UVB, $99.95, BNC connectors.

1.5 kW *dry* Dummy Load

DL-650M, $79.95 100 Watts continuous 1500 W/10 seconds to 650 MHz. *Ceramic* resistor. SWR less than 1.3. SO-239s. **DL-650MN, $84.95** has N connectors.

Low Pass TVI Filter

LP-30, $89.95 Eliminates TVI by attenuating harmonics at the source. Plugs between transmitter and antenna or tuner. 1.5 kW.

High Pass TVI Filter

HPF-2, $34.95 Installs between VCR/TV and cable TV/antenna cable. Eliminates or reduces interference caused by nearby HF transmitters.

http://www.vectronics.com
Nearest Dealer, Free catalog, To Order . . .
800-363-2922
Voice: 662-323-5800 **Fax:** 662-323-6551

VECTRONICS®
300 Industrial Park Road,Starkville, MS 39759, USA
Prices/specs subject to change without notice/obligation ©2008 Vectronics

VECTRONICS . . . the finest amateur radio products made!

MIRAGE. . .160 Watts on 2 Meters!

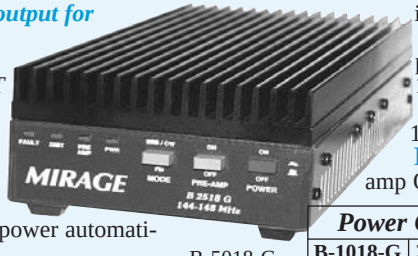
The MIRAGE B-5018-G gives you 160 Watts output for 50 Watts input on all modes -- FM, SSB, or CW!

Ideal for 25-50 Watt 2 Meter mobile or base. Weak signals pop out with its low noise *GaAsFET* preamp and its excellent 0.6 dB noise figure. Selectable 5, 8 or 14 dB preamp gain.

Exclusive MIRAGE *ActiveBias*™ circuit gives *crystal clear SSB* without splatter or distortion.

B-5018-G is legendary for its ruggedness and is fully protected -- high SWR or excessive input power automatically bypasses the B-5018-G to prevent damage.

Heavy-duty heatsink spans entire length of cabinet. Power transistors protected by MIRAGE's *Therm-O-Guard*™. Has adjustable delay *RF sense* Transmit/Receive switch *and* remote external keying. 16-20 Amps at 13.8 VDC.12x3x5½ in.



B-5018-G
$329

B-1018-G, $409. MIRAGE's most popular *dual purpose* HT/mobile/base amp. 160 Watts out/10W in. For 0.25-10W rigs.

B-2518-G, $329. Like B-5018-G but for 10-25 Watt mobile/base. 160W out/25W in.

RC-2, $49. Remote Control. On/Off, preamp On/Off, selects SSB/FM. 25 ft. cable.

Power Curve -- typical output power in Watts

B-1018-G	25	50	140	150	160	160	--	--	--	--
B-2518-G	5	7	40	60	80	100	125	160	160	160
B-5018-G	--	2	15	25	40	50	70	100	130	160
Watts In	.25	.5	3	5	8	10	15	25	35	50

FCC Type Accepted

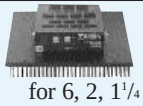
6 Meter Amplifier

A-1015-G, $389, *world's most popular* all mode FM/SSB/CW 6 Meter amplifier. 150 Watts out/10W in. For 1-15 W transceivers. 20 dB GaAsFET preamp.

300 Watts on 2-Meters, $739

3 models: 300 Watts out for 10, 25, or 50 Watts in. FM/SSB/CW. 15/20 dB gain, *GaAsFET* preamp.

Repeater Amps



11 models: *continuous* duty FM/SSB/CW *Repeater* Amps for 6, 2, 1¼ Meters, 70 cm, 450 MHz, ATV.

Commercial Amps, $159 to $429

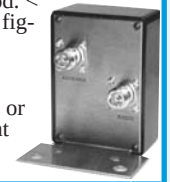
Commercial Amps for 150-174, 450-470 MHz, VHF marine bands, 70-130 Watts out.

70 cm Amplifiers (420-450 MHz)

D-3010-N, $389 -- 100 W out/30W in. For 5-45 Watt *mobile/base*. **D-1010-N, $419**, 100W out/10W in. *Dual purpose* -- for handhelds or mobile/ base. **D-26-N, $299**, 60W out/2W in, for *handhelds*.

Low Noise GaAsFET preamps

High gain ultra low noise *GaAsFET* preamps for receiving weak signals. Selectable 15-22 dB gain prevents intermod. < 0.8 dB noise figure, auto RF switching to 160W.



In-shack or Mast-Mount models.

Frequency, MHz	*In Shack, $149.95*	*MastMount, $199.95*
28-30	KP-1/10M	KP-2/10M
50-54	KP-1/6M	KP-2/6M
144-148	KP-1/2M	KP-2/2M
220-225	KP-1/220	KP-2/220
430-450	KP-1/440	KP-2/440

Accurate SWR/Wattmeters

Read SWR directly and Forward/ Reflected, Peak/Average power. Remote coupler. 1.8-30, 50-200, 420-450, 1260-1300 MHz band models.

Amateur TV Amps

Industry standard ATV amps: **D-1010-ATVN, $439**, 82 W PEP out/10W in. **D-100-ATVN, $449**, 82W PEP out/2W in. (without sync compression).

1¼ Meter Amps (223-225 MHz)

10 models -- 20-220 Watts out for 2-50W in, $169-$739.

http://www.mirageamp.com
Nearest Dealer, Free catalog, To Order . . .
800-647-1800
Tech: 662-323-8287 **Fax:** 662-323-6551

MIRAGE
300 Industrial Park Rd Starkville, MS 39759
Prices/specs subject to change without notice/obligation ©2008.

ELECTRONICS ENGINEERS/TECHNICIANS NEEDED!!

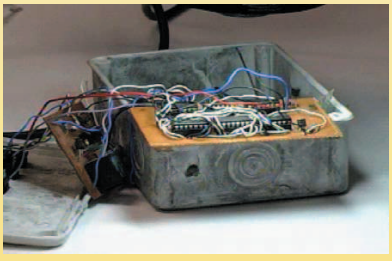
Salary potential of over $210,000

YOU CAN MAKE A DIFFERENCE IN THE DEFENSE OF THE NATION

You will exploit Improvised Explosive Devices (IEDs) and assist in the development of new Explosive Ordnance Disposal (EOD) tools and methods to counter emerging threats. Activities include the development of device theory of operation and basic electronic circuit analysis. The data you generate will be used by many organizations for counter terrorism operations. Extensive training is provided in preparation for periods of deployment.

You will work on a military facility within Iraq, Afghanistan, or other areas of operation. Planned deployment rotations of 3 months in theater are followed by 3 months in Indian Head MD; repeated and subject to change as required. **The successful candidate must possess a secret clearance or be able to obtain a secret clearance. TS clearance is desired.**

Please forward resume to EODTD_Employment_EE.fct@navy.mil if you are interested in applying for a position.



1.8-170 MHz *plus* 415-470 MHz
MFJ HF/VHF/UHF Antenna Analyzer

All-in-one handheld antenna test lab lets you quickly check and tune HF, VHF, UHF antennas anywhere. Covers 1.8-170 MHz and 415-470 MHz

Measures: SWR…Return Loss…Reflection Coefficient…Antenna Resistance(R), Reactance(X), Impedance(Z) and Phase Angle(degrees) . . . Coax cable loss(dB) . . . Coax cable length . . . Distance to short or open in coax … Inductance . . . Capacitance . . . Resonant Frequency . . . Bandwidth . . . Q . . . Velocity Factor . . . Attenuation . . . Has: LCD readout . . . frequency counter . . . side-by-side meters . . . Ni-MH/Ni-Cad charger circuit . . . battery saver . . . low battery warning . . . smooth reduction drive tuning . . . One year No Matter What™ warranty . . .

MFJ-269

$389.95

You can instantly get a complete picture, check and tune any antenna from 1.8 to 170 MHz and 415 to 470 MHz -- an MFJ-269 exclusive -- with this rugged easy-to-use hand-held antenna test lab! You can measure virtually every antenna parameter.

You won't believe its capability and versatility. This rugged handheld unit literally replaces a workbench full of expensive delicate test equipment.

SWR Analyzer

You can read SWR, return loss, reflection coefficient and match efficiency at any frequency simultaneously at a single glance.

Complex Impedance Analyzer

Read Complex Impedance (1.8 to 170 MHz)as series equivalent resistance and reactance (Rs+jXs) or as magnitude (Z) and phase (degrees). Also reads parallel equivalent resistance and reactance (Rp+jXp) -- *an MFJ-269 exclusive!*

Coax Analyzer

You can determine velocity factor, coax loss in dB, length of coax and *distance to short or open in feet (it's like a built-in TDR).*

CoaxCalculator™ lets you calculate coax line length in feet given electrical degrees and vice versa for any frequency and any velocity factor -- *an MFJ-269 exclusive!*

Use any Characteristic Impedance

You can measure SWR and loss of coax with *any* characteristic impedance (1.8 to 170 MHz) from 10 to over 600 Ohms, including 50, 51, 52, 53, 73, 75, 93, 95, 300, 450 Ohms -- *an MFJ-269 exclusive!*

Inductance/Capacitance Meter

Measures inductance in uH and capacitance in pF at RF frequencies, 1.8-170 MHz.

Frequency Counter/Signal Source

You can also use it as a handy frequency counter up to 170 MHz and as a signal source for testing and alignment.

Digital and Analog displays

A high contrast LCD gives precision readings and two side-by-side analog meters make antenna adjustments smooth and easy.

415 to 470 MHz Range features

Just plug in your UHF antenna coax, set frequency and read SWR, return loss and reflection coefficient simultaneously. You can read coax cable loss in dB and match efficiency.

You can adjust UHF dipoles, verticals,

yagis, quads and others and determine their SWR, resonant frequency and bandwidth.

You can test and tune stubs and coax lines. You can manually determine velocity factor and impedances of transmission lines.

You can adjust/test RF matching networks and RF amplifiers without applying power.

Has easy-to-read LCD *logarithmic* SWR bargraph and SWR meter for quick tuning.

Much Better Accuracy

New 12-bit A/D converter gives much better accuracy and resolution than common 8-bit A/D converters -- *an MFJ-269 exclusive!*

Super Easy-to-Use

Select a band and mode. Set frequency. Your measurements are instantly displayed! Smooth reduction drive tuning makes setting frequency easy.

Take it anywhere

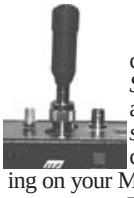
Take it anywhere - to remote sites, up towers, in cramp places. Fully portable -- battery operated, compact 4Wx2Dx6¾ in., weighs 2 lbs. *Free* "N" to SO-239 adapter.

Has battery saver, low battery warning and built-in charging circuit for rechargeables.

Use 10 AA Ni-MH or Ni-Cad or alkaline batteries (not incl.) or 110VAC with MFJ-1312D, $15.95.

MFJ SWR Analyzer Accessories

MFJ-39C, $24.95.
Tote your MFJ-269 anywhere with this *genuine* MFJ custom carrying case. Has back pocket with security cover for carrying dip coils, adaptors and accessories. Made of special foam-filled fabric, the MFJ-39C cushions blows, deflects scrapes, and protects knobs, meters and displays from harm. Wear it around your waist, over your shoulder, or clip it onto the tower while you work -- the fully-adjustable webbed-fabric carrying strap has snap hooks on both ends. Has clear protective window for frequency display and cutouts for knobs and connectors.



MFJ-66, $24.95.
Plug these MFJ dip meter coupling coils into your MFJ *SWR Analyzer™* and turn it into a sensitive and accurate *band switched* dip meter. Set of two coils cover 1.8-170 MHz depending on your MFJ-269 *SWR Analyzer™*.

MFJ-99C, $40.90.
SWR** Analyzer Power Pack.* 10 Pack MFJ *SuperCell™* Ni-MH batteries, and power supply for SWR analyzers. ***Save $5!

MFJ-98, $60.85.
MFJ-269** Accessory Pack.* MFJ-39C *custom* Carrying Pouch, MFJ-66 dip coils, power supply for MFJ-269. ***Save $5!

MFJ-98B, $88.90.
MFJ-269** Deluxe Accessory Pack.* Complete accessory pack! MFJ-39C Pouch, 10 Ni-MH batteries, dip coils, power supply. ***Save $7!

MFJ-269*PRO™* Analyzer

MFJ-269*PRO* $419.95 ***NEW!***

Like MFJ-269, but has extended coverage in UHF range ***(430 to 520 MHz)*** and ruggedized cabinet that protects LCD display, knobs, meters and connectors from damage.

Free MFJ Catalog

Visit: http://www.mfjenterprises.com or call toll-free 800-647-1800

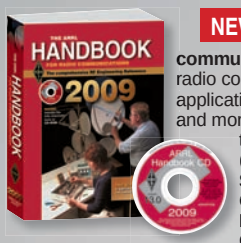
• 1 Year *No Matter What™* warranty • 30 day money back guarantee (less s/h) on orders direct from MFJ

MFJ ENTERPRISES, INC.
300 Industrial Pk Rd, Starkville, MS 39759 **PH:** (662) 323-5869
Tech Help: (662) 323-0549
FAX:(662)323-6551 8-4:30 CST, Mon.-Fri. ***Add shipping.***

http://www.mfjenterprises.com *for instruction manuals, catalog, info*

ARRL Publications—continued from page 138

Practical Circuits and Design



NEW! **The ARRL Handbook—2009**
THE Standard in applied electronics and communications. Features principles of electronics, radio communication fundamentals and design, real-world applications and operating, practical projects, references and more. Includes **The ARRL Handbook CD** – the fully searchable and complete book on CD-ROM (version 13.0).
Softcover. Includes book and CD-ROM.
Order No. 0261 ..... **$44.95**
Hardcover. Includes book and CD-ROM
Order No. 0292 ..... **$54.95**

Basic Radio—Understanding the Key Building Blocks.
Order No. 9558 ..... **$29.95**
Understanding Basic Electronics. Order No. 3983 ..... **$29.95**
Digital Signal Processing Technology.
Order No. 8195 ..... **$34.95** ..... ~~**$44.95**~~
ARRL's Hands-On Radio Experiments. Order No. 1255 ..... **$19.95**
NEW! **Hands-On Radio Parts Kit**.
Order No. 1255K **$79.95**
The ARRL RFI Book. 2nd Edition. Order No. 9892 ..... **$29.95**
Experimental Methods in RF Design. Order No. 8799 ..... **$49.95**
L/C/F and Single-Layer Coil Winding Calculator.
Order No. 9123 ..... **$12.95**
Introduction to Radio Frequency Design.
Order No. 4920 ..... **$39.95**
ARRL's RF Amplifier Classics. Order No. 9310 ..... **$19.95**
More QRP Power. Order No. 9655 ..... **$19.95**
W1FB's QRP Notebook. Order No. 3657 ..... **$10**
ARRL's Low Power Communication. 3rd Edition.
Order No.1042 ..... **$19.95**
ARRL's Low Power Communication with Cub CW Transceiver Kit.
Order No.1042K **$99.95**
Do-It-Yourself Circuitbuilding for Dummies. Order No. 0015 ..... **$24.99**
Electronics for Dummies. Order No. 9704 ..... **$21.99**
Electronics Projects for Dummies. Order No. 9944 ..... **$24.99**
Practical Digital Signal Processing. Order No. 9331 ..... **$46.95**
Power Supply Handbook. Order No. 9977 ..... **$29.95**
NEW! **Discrete-Signal Analysis and Design.**
Order No. 0140 ..... **$125**
RF Components and Circuits. Order No. 8759 ..... **$50.95**
Practical Radio Frequency Test & Measurement.
Order No. 7954 ..... **$63.95**
Communications Receivers. Order No. CR3E **$94.95**
Radio Receiver Design. Order No. RRCD **$95**
HF Radio Systems & Circuits. Order No. 7253 ..... **$89**
Build Your Own Low-Power Transmitters. Order No. 9458 ..... **$54.95**
AC Power Interference Handbook. Order No. 1103 ..... **$34.95**
Power Supply Cookbook. Order No. 8599 ..... **$54.95**
Instruments of Amplification. Order No. 9163 ..... **$19.95**
RSGB Low Power Scrapbook. Order No. LPSB **$19.95**
RSGB Practical Projects. Order No. 8971 ..... **$24.95**
RSGB Weekend Projects for the Radio Amateur.
Order No. 0123 ..... **$24.95**

Digital and Image Communications

VHF Digital Handbook— 1st Edition.
Everything you need to get started in digital radio applications. Includes Packet Radio, APRS, D-Star, digital applications in public service and emergency communications, and more!
Order No. 1220 ..... **$19.95**
ARRL's HF Digital Handbook. 4th Edition.
Order No. 1034 ..... **$19.95**
VoIP: Internet Linking for Radio Amateurs.
Order No. 9264 ..... **$17.95**
GPS and Amateur Radio. Order No. 9922 ..... **$18.95**
The ARRL Image Communications Handbook.
Order No. 8616 ..... **$19.95** ..... ~~**$25.95**~~
802.11 Wireless Networks: The Definitive Guide.
Order No. 9715 ..... **$44.95**
Building Wireless Community Networks. Order No. 9147 ..... **$29.95**

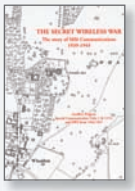
Public Service and Emergency Communications

NEW! **The ARRL Digital Technology for Emergency Communications Course.** CD-ROM, version 1.0 Order No. 1247 ..... **$49.95**
The ARRL Emergency Communications Handbook. Order No. 9388 .... **$19.95**
The ARRL Emergency Communication Library. CD-ROM, version 1.0
Order No. 9868 ..... **$19.95**
ARES Field Resource Manual. Order No. 5439 ..... **$12.95**
Emergency Power for Radio Communications. Order No. 9655 ..... **$19.95**
Amateur Radio Emergency Communications Course Book Level 1.
Order No. 8462 ..... **$19.95**
Amateur Radio Emergency Communications Course Book Level 2.
Order No. 9698 ..... **$19.95**

Space and VHF/UHF/Microwave Communications

The Radio Amateur's Satellite Handbook. Order No. 6583 ..... **$24.95**
The ARRL Satellite Anthology. 5th Edition. Order No. 7369 ..... **$15**
The ARRL UHF/Microwave Projects CD. Order No. 8853 ..... **$24.95**
Weather Satellite Handbook. Order No. 4483 ..... **$20**
RSGB Amateur Radio Astronomy. Order No. 9928 ..... **$32.95**
NEW! **RSGB Radio Nature.**
Order No. 0240 ..... **$24.95**
RSGB VHF/UHF Handbook. 2nd Edition. Order No. 1229 ..... **$29.95**
RSGB Microwave Projects. Order No. 9022 ..... **$29.95**
RSGB Microwave Projects 2.
Order No. 9682 ..... **$29.95**

History and Adventure



The Secret Wireless War.— 2nd Edition.
The Story of MI6 Communications--1939-1945 (World War II). This is an extraordinary story that includes hams among those patriots that undoubtedly helped the allied war effort.
Order No. 9437 ..... **$54.95**
YASME--The Danny Weil and Colvin Radio Expeditions.
Order No. 8934 ..... **$24.95**
Hiram Percy Maxim. Order No. 7016 ..... **$19.95**
200 Meters and Down. Order No. 0011 ..... **$12**
The Gil Cartoon Book. Order No. 0364 ..... **$15.95**
NEW! **The Story of W6RO and the Queen Mary.** DVD
Order No. 1344 ..... **$15.95**
NEW! **Don C. Wallace: W6AM, Amateur Radio's Pioneer.**
Order No. 0016 ..... **$29.95**
World War II Radio Heroes: Letters of Compassion. Order No. 1268 ..... **$15.95**
Perera's Telegraph Collector's Guide. Order No. 1277 ..... **$19.95**
Perera's Telegraph Collectors Reference CD-ROM. Order No. 1282 ..... **$15**
The Story of the Enigma CD-ROM. Order No. 1296 ..... **$15**
Keys II: The Emporium. Order No. 1372 ..... **$16**
Keys III: The World of Keys. Order No. 1381 ..... **$18**

Ordering Information

If you'd like a complete publications listing or would like to place an order, please contact us:

1. To order or obtain the address of an ARRL Dealer near you, call toll-free (US): 1-888-277-5289 (non-US call 860-594-0355) 8 AM-5 PM Eastern time, Monday-Friday.
2. Fax 1-860-594-0303 24 hours a day, 7 days a week.
3. By mail to: ARRL, 225 Main St, Newington CT 06111-1494
4. Visit our World Wide Web site: http://www.arrl.org/shop

Shipping and Handling
In the US, add the following amounts to your order to cover shipping and handling (S/H). Add an additional $5.00 to the US rate for shipment outside the US. US orders will be handled via ground delivery service. International Air and other specialty forwarding methods are available. Please call or write for information. Sales Tax is required for shipments to CT 6% (including S/H),VA 5% (excluding S/H), CA (add applicable tax, excluding S/H). Canadian Provinces NS, NB and NF add 14% HST, all other Provinces add 6% GST (excluding shipping/handling).

Amount of Order	Add	Amount of Order	Add
$10.00 or less	$6.00	40.01 - 50.00	10.00
10.01 - 20.00	7.00	50.01 - 75.00	11.00
20.01 - 30.00	8.00	Over $75.00	12.00
30.01 - 40.00	9.00	CD-ROM only	6.00

We accept the following major credit cards: American Express, MasterCard, Visa and Discover. Prices and product availability are subject to change without notice.

MFJ *IntelliTuner*™ Automatic Tuner

Automatically tunes unbalanced/balanced antennas . . .Ultra fast . . . New 20,000 memories . . . Antenna Switch . . . Efficient L-network . . . Select 300 Watts (6-1600 Ohms) or 150 Watts (6-3200 Ohms) . . . 1.8-30 MHz . . . 4:1 current balun . . . Cross-Needle and Digital SWR/ Wattmeter . . . Audio SWR meter . . . Backlit LCD . . . Remote control port . . . Radio interface . . .

MFJ-993B
$259.95 New!

World's First dual power level 300/150 Watts SSB/CW Tuner --

Select 300 Watt SSB/CW power level and match 6-1600 Ohm antennas ***Or . . .*** select **150 Watt** SSB/CW power level and match *extra wide-range* 6-3200 Ohms!

The MFJ-993B *IntelliTuner*™ lets you tune any antenna *automatically* balanced or unbalanced -- *ultra fast*.

It's a comprehensive automatic *antenna tuning center* complete with SWR/Wattmeter, antenna switch for two antennas and 4:1 current balun for balanced lines.

MFJ's exclusive *IntelliTuner*™, *Adaptive Search*™ and *InstantRecall*™ algorithms give you *ultra fast* automatic tuning with over 20,000 *VirtualAntenna*™ Memories.

You get a highly efficient L-network, 6-1600 ohm matching at 300 Watts SSB/CW or *extra-wide* 6-3200 Ohm matching at 150 Watts SSB/CW, 1.8-30 MHz coverage, Cross-Needle *and* digital meters, audio SWR meter, *backlit* LCD, remote control port, radio interface, heavy-duty 16 amp/1000V relays.

It learns while you're having fun

As you're ragchewing, contesting or DXing, *your MFJ-993B is learning!*

When you transmit, the MFJ-993B automatically tunes for minimum SWR and remembers your frequency and tuner settings. The next time you operate on that frequency and antenna, these tuner settings are instantly restored and *you're ready to operate in milliseconds!*

MFJ's new *VirtualAntenna*™ Memory system gives you 4 antenna memory banks for *each* of 2 antenna connectors. Select up to 4 antennas on each antenna connector. Each antenna has 2500 memories, 20,000 total.

Intelligent ultra fast tuning

MFJ's *InstantRecall*™ first checks its memory to see if you have operated this frequency before. If so, tuning is instantaneous and you're ready to operate.

If not, MFJ's *IntelliTuner*™ algorithm -- based on MFJ's famous SWR Analyzer technology - - kicks in. It *measures* the complex impedance of your antenna. Next, it *calculates* the components it needs and instantly *snaps* them in. Then, it fine tunes to minimize SWR -- you're ready to operate. It's all done in a *fraction* of a second.

When the impedance is within its measurement range, the MFJ-993B is the *fastest automatic antenna tuner in the world.*

If it can't accurately determine impedance, MFJ's *AdaptiveSearch*™ algorithm goes into action. Frequency is measured and relevant components values are determined. Only those values are searched for ultra-fast tuning.

For even faster searches, you can set the target SWR to 2 (settable 1.0-2.0).

You can manually tune when you can't transmit (for listening out of ham bands).

Cross Needle and Digital SWR/Watt Meters

Lighted Cross-Needle and *digital* meters lets you accurately read SWR, forward and reflected power at a glance.

An *audio* SWR meter lets you *hear* the tuned SWR when you can't see/read meters.

Turn on a highly visible, instant response SWR LCD bargraph when you need it.

Backlit LCD Display

An easy-to-read *backlit* LCD displays SWR, forward/reflected power, frequency, antenna 1 or 2, L/C tuner values, on/off indicators and other information.

The MFJ-993B is a compact 10Wx2¾ Hx9D inches. Use 12 to 15 VDC at 1 amp or 110 VAC with **MFJ-1316, $21.95**.

Tune any Antenna

You can tune any antenna -- dipoles, verticals, beams, phased arrays, inverted vees, quads, random wires, mobile antennas, compact limited space antennas.

A 4:1 *true* current balun lets you tune any balanced antenna - - horizontal loops, vertical loops, multi-band doublets, quads, folded dipoles, Zepps.

Remote Control

Plug in the **MFJ-993RC, $39.95**, remote control and use your tuner elsewhere remotely.

MFJ-993B Interface Pre-wired Cables

Allows automatic tuning of your MFJ-991B/993B/994B *IntelliTuner*™ through radio.

MFJ-5124I, $19.95, *ICOM*. Supports IC-706, 707, 718, 725, 728, 736, 746, 756, 765, 775, others that support AH-3 or AH-4.

MFJ-5124A, $19.95, *ALINCO*. Supports DX-70, DX-77 and others.

MFJ-5124K, $59.95, *KENWOOD*. Supports TS-50S, 450S, 570S, 690S, 850S, 870S, 2000 and others that support AT-300.

MFJ-5124Y, $59.95, *YAESU*. Supports FT-100D, FT-857, FT-897, others.

MFJ-5124Y2, $59.95, *YAESU* FT-847.

Dual 300/150 Watt Auto Tuner

World's First dual power level Tuner

MFJ-991B
$219.95 New! -- Select **300 Watt** SSB/CW and match 6-1600 Ohm antennas ***Or*** select **150 Watt** SSB/CW and match *extra wide-range* 6-3200 Ohms. New 10,000 *VirtualAntenna*™ Memories. Like MFJ-993B, less digital SWR/Wattmeter/ LCD display, audio SWR meter/audio feedback, antenna switch or 4:1 current balun.

MFJ Weather-sealed Automatic Antenna Tuner, 1.8-30 MHz

MFJ-926, $399.95. Weather-sealed for outdoor/marine use. *Heavy duty* custom plastic enclosure has inner rubber gasket that seals interior electronics. Stainless steel mounting bracket. Handles 200 Watts PEP. Tunes wire in less than .2 seconds from memory (200 memories). Requires 13.8 VDC, 1.5A. Compact 9¼Wx14¼Hx3D inches, 4 lbs.

600 Watt MFJ Automatic Tuner

MFJ-994B
$359.95 New!

MFJ-994B, *600 Watt IntelliTuner*™! automatic antenna tuner with new 10,000 *VirtualAntenna*™ Memories. Like MFJ-993B but handles 600 Watts SSB/300 Watts CW, matches 12-800 Ohms. Does not have digital SWR/Wattmeter/LCD display, audio SWR meter/audio feedback, antenna switch or 4:1 current balun.

MFJ . . . the World Leader in Ham Radio Accessories!

Dealer/Catalog/Manuals
Visit: http://www.mfjenterprises.com or call toll-free 800-647-1800

• 1 Year *No Matter What*™ warranty • 30 day money back guarantee (less s/h) on orders direct from MFJ

MFJ ENTERPRISES, INC.
300 Industrial Pk Rd, Starkville, MS 39759 **PH:** (662) 323-5869
Tech Help: (662) 323-0549
FAX:(662)323-6551 8-4:30 CST, Mon.-Fri. ***Add shipping.***

KENWOOD

Listen to the Future

TS-480

The Perfect Remote Base Transceiver

Straight Out of the Box!

- The perfect internet base transceiver - straight out of the box!
- Easy to operate.
- The size makes it great for base, mobile or portable operation.
- Free VoIP/Control software downloads at Kenwoodusa.com.
- Incredible RX specifications.
- No expensive sound card interface needed.

KENWOOD U.S.A. CORPORATION
Communications Sector Headquarters
3970 Johns Creek Court, Suite 100, Suwanee, GA 30024
Customer Support/Distribution
P.O. Box 22745, 2201 East Dominguez St., Long Beach, CA 90801-5745
Customer Support: (310) 639-4200 Fax: (310) 537-8235

www.kenwoodusa.com
ADS#24008

JQA-1205 091-A
ISO9001 Registered
Communications Equipment Division
Kenwood Corporation
ISO9001 certification

MFJ TUNERS

New, Improved MFJ-989D 1500 Watt *legal limit* Antenna Tuner

World's most popular 1500 Watt Legal Limit Tuner just got better -- much better -- gives you more for your money!

New, improved MFJ-989D *legal limit* antenna tuner gives you better efficiency, lower losses and a new *true* peak reading meter. It easily handles *full* 1500 Watts SSB/CW, 1.8 to 30 MHz, including MARS/WARC bands.

New dual 500 pF *air variable capacitors* give you twice the capacitance for more efficient operation on 160 and 80 Meters.

New, improved *AirCore*™ *Roller Inductor* gives you lower losses, higher Q and handles more power more efficiently.

New *TrueActive*™ peak reading Cross-Needle *SWR/Wattmeter* lets you read *true* peak power on all modes.

MFJ-989D $389.95

New high voltage *current balun* lets you tune balanced lines at high power with no worries.

New *crank knob* lets you reset your roller inductor quickly, smoothly and accurately.

New larger 2-inch diameter *capacitor knobs* with easy-to-see dials make tuning much easier.

New cabinet maintains components' high-Q. Generous air vents keep components cool. $12^{7}/_{8}$Wx6Hx$11^{5}/_{8}$D inches.

Includes six position ceramic antenna switch, 50 Ohm dummy load, indestructible multi-color Lexan front panel with detailed logging scales and legends.

The MFJ-989D uses the superb time-tested T-Network. It has the widest matching range and is the easiest to use of all matching networks. Now with MFJ's new 500 pF air variable capacitors and new low loss roller inductor, it easily handles higher power much more efficiently.

***No Matter What*™ Warranty**

Every MFJ tuner is protected by MFJ's famous one year *No Matter What*™ limited warranty. We will repair or replace your MFJ tuner (at our option) for a full year.

More hams use MFJ tuners than all other tuners in the world!

MFJ-986 Two knob *Differential-T*™

MFJ-986 $349.95

Two knob tuning (differential capacitor and *AirCore*™ roller inductor) makes tuning foolproof and easier than ever. Gives minimum SWR at only one setting. Handles 3 KW PEP SSB amplifier input power (1.5 KW output). Gear-driven turns counter, lighted peak/average Cross-Needle SWR/Wattmeter, antenna switch, balun. 1.8 to 30 MHz. $10^{3}/_{4}$Wx$4^{1}/_{2}$Hx15 in.

MFJ-962D *compact* kW Tuner

MFJ-962D $299.95

A few more dollars steps you up to a KW tuner for an amp later. Handles 1.5 KW PEP SSB amplifier input power (800W output). Ideal for Ameritron's AL-811H! *AirCore*™ roller inductor, gear-driven turns counter, pk/avg lighted Cross-Needle SWR/Wattmeter, antenna switch, balun, Lexan front, 1.8-30MHz. $10^{3}/_{4}$x$4^{1}/_{2}$ x$10^{7}/_{8}$ in.

MFJ-969 300W *Roller Inductor* Tuner

MFJ-969 $219.95

Superb *AirCore*™ Roller Inductor tuning. Covers *6 Meters* thru 160 Meters! 300 Watts PEP SSB. *Active* true peak reading lighted Cross-Needle SWR Wattmeter, *QRM-Free PreTune*™, antenna switch, dummy load, 4:1 balun, Lexan front panel. $3^{1}/_{2}$Hx$10^{1}/_{2}$Wx$9^{1}/_{2}$D inches.

MFJ-949E *deluxe* 300 Watt Tuner

More *hams use MFJ-949s than any other antenna tuner in the world!*

MFJ-949E $179.95

Handles 300 Watts. Full 1.8 to 30 MHz coverage, custom inductor switch, 1000 Volt tuning capacitors, *full size* peak/average lighted Cross-Needle SWR/Wattmeter, 8 position antenna switch, dummy load, *QRM-Free PreTune*™, scratch proof Lexan front panel. $3^{1}/_{2}$Hx$10^{5}/_{8}$Wx7D inches. **MFJ-948, $139.95.** Economy version of MFJ-949E, less dummy load, Lexan front panel.

MFJ-941E *super value* Tuner

The *most for your money!*

MFJ-941E $139.95

Handles 300 Watts PEP, covers 1.8-30 MHz, *lighted* Cross-Needle SWR/Wattmeter, 8 position antenna switch, 4:1 balun, 1000 volt capacitors, Lexan front panel. Sleek $10^{1}/_{2}$Wx$2^{1}/_{2}$Hx7D in.

MFJ-945E HF/6M *mobile* Tuner

MFJ-945E $129.95

Extends your mobile antenna bandwidth so you don't have to stop, go outside and adjust your antenna. Tiny 8x2x6 in. *Lighted* Cross-Needle SWR/Wattmeter. Lamp and bypass switches. Covers 1.8-30 MHz *and* 6 Meters. 300 Watts PEP. **MFJ-20, $6.95,** mobile mount.

MFJ-971 *portable/QRP* Tuner

MFJ-971 $119.95

Tunes coax, balanced lines, random wire 1.8-30 MHz. Cross-Needle Meter. SWR, 30/300 or 6 Watt QRP ranges. Matches popular MFJ transceivers. Tiny 6x$6^{1}/_{2}$x$2^{1}/_{2}$ in.

MFJ-901B *smallest* Versa Tuner

MFJ-901B $99.95

MFJ's smallest (5x2x6 in.) and most affordable wide range 200 Watt PEP Versa tuner. Covers 1.8 to 30 MHz. Great for matching solid state rigs to linear amps.

MFJ-902 *Tiny Travel* Tuner

MFJ-902 $99.95

Tiny $4^{1}/_{2}$x$2^{1}/_{4}$x3 inches, full 150 Watts, 80-10 Meters, has tuner bypass switch, for coax/random wire.

MFJ-904H, $149.95. Same but adds Cross-needle SWR/Wattmeter and 4:1 balun for balanced lines. $7^{1}/_{4}$x$2^{1}/_{4}$x$2^{3}/_{4}$ inches.

MFJ-16010 *random wire* Tuner

MFJ-16010 $69.95

Operate all bands anywhere with MFJ's reversible L-network. Turns random wire into powerful transmitting antenna. 1.8-30 MHz. 200 Watts PEP. Tiny 2x3x4 in.

MFJ-906/903 *6 Meter* Tuners

MFJ-906 $99.95

MFJ-906 has lighted Cross-Needle SWR/Wattmeter, bypass switch. Handles 100 W FM, 200W SSB. **MFJ-903, $69.95**, Like MFJ-906, less SWR/Wattmeter, bypass switch.

MFJ-921/924 *VHF/UHF* Tuners

MFJ-921/924 $89.95

MFJ-921 covers 2 Meters/220 MHz. **MFJ-924** covers 440 MHz. SWR/Wattmeter. 8x$2^{1}/_{2}$x3 in.

MFJ-931 *artificial* RF Ground

MFJ-931 $109.95

Eliminates RF hot spots, RF feedback, TVI/RFI, weak signals caused by poor RF grounding. Creates artificial RF ground or electrically places far away RF ground directly at rig. **MFJ-934, $209.95**, Artificial ground/300 Watt Tuner/Cross-Needle SWR/Wattmeter.

Dealer/Catalog/Manuals

Visit: http://www.mfjenterprises.com or call toll-free 800-647-1800

• 1 Year *No Matter What*™ warranty • 30 day money back guarantee (less s/h) on orders direct from MFJ

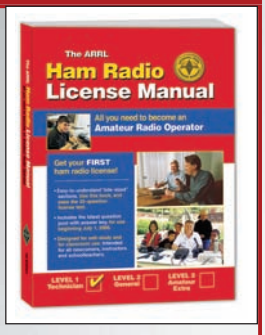
MFJ ENTERPRISES, INC.
300 Industrial Pk Rd, Starkville, MS 39759 **PH:** (662) 323-5869
Tech Help: (662) 323-0549
FAX:(662)323-6551 8-4:30 CST, Mon.-Fri. ***Add shipping.***

Make ARRL your first choice for license and upgrade training!

www.arrl.org/study

LEVEL 1 – TECHNICIAN

- 35-question Technician test (Element 2)

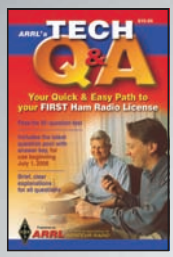


The ARRL Ham Radio License Manual

All you need to become an Amateur Radio Operator

ARRL Order No. 9639 ..... **$24.95**

This is ham radio's most popular license manual! Every page includes information you will need to pass the 35-question exam and become an effective operator. Includes the latest question pool with answer key. Designed for self-study and for classroom use.



ARRL's Tech Q & A

Your Quick & Easy Path to your FIRST Ham Radio License

4th Edition. ARRL Order No. 9647 .... **$17.95**

Don't be surprised on exam day! Review Questions & Answers from the entire Technician question pool and pass your first Amateur Radio license exam. Includes brief, clear explanations for all the questions.

The ARRL Ham Radio License Course

Book with online course ..... **$69** **100% Guaranteed!**

Register at **www.arrl.org/cep** and complete all of your ham radio license training online. Registration includes *The ARRL Ham Radio License Manual*, a one year ARRL membership, and graduate support.

The ARRL Instructor's Manual for Technician and General License Courses

Now including a General Class course too! **CD-ROM Included!**

4th Edition. ARRL Order No. 1263 ... **$19.95**

Ham University CD-ROM

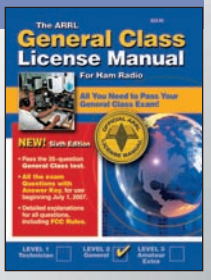
Quiz yourself using this feature-packed easy-to-use software (for *Microsoft Windows*).

Technician/General Class Edition.
ARRL Order No. 8956 ..... **$24.95**
Extra Class Edition (includes Morse code).
ARRL Order No. 1048 ..... **$24.95**
Complete Edition (Tech, Gen, Extra, and Morse code).
ARRL Order No. 8735 ..... **$39.95**

LEVEL 2 – GENERAL

Upgrade from Technician

- 35-question General test (Element 3)

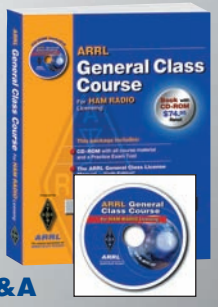


The ARRL General Class License Manual

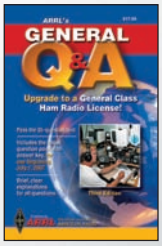
6th Edition. ARRL Order No. 9965.... **$24.95**
All the exam Questions with Answer Key, for use through June 30, 2011.

New!

ARRL General Class Course for HAM RADIO Licensing



ARRL Order No. 1387 ..... **$74.95**
Everything you need to upgrade your license. Includes CD-ROM with all course material and *The ARRL General Class License Manual*, for use through June 30, 2011.



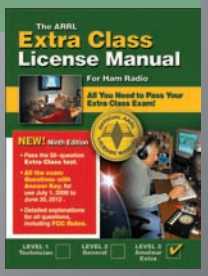
ARRL's General Q&A

3rd Edition. ARRL Order No. 9957 ... **$17.95**
Includes the latest question pool with answer key, for use through June 30, 2011.

LEVEL 3 – AMATEUR EXTRA

Upgrade from General

- 50-question Extra test (Element 4)



The ARRL Extra Class License Manual

9th Edition. ARRL Order No. 1352..... **$24.95**
All the exam Questions with Answer Key, for use July 1, 2008 to June 30, 2012.

New!

ARRL's Extra Q&A

2nd Edition. ARRL Order No.1379 ... **$17.95**
Includes the latest question pool with answer key, for use July 1, 2008 to June 30, 2012.

Shipping and Handling charges apply. Sales Tax is required for orders shipped to CA, CT, VA, and Canada. Prices and product availability are subject to change without notice.

ARRL *The national association for AMATEUR RADIO*
225 Main Street, Newington, CT 06111-1494 USA
SHOP DIRECT *or call for a dealer near you.*
ONLINE WWW.ARRL.ORG/SHOP
ORDER TOLL-FREE 888/277-5289 (US)

QST 8/2008

MFJ 2500 Watts *ContinuousCarrier*™ Tuner

Silver plated Edge-Wound Roller Inductor . . .1000/500 pF Variable Capacitors . . . Antenna Switch . . . 4-Core Balun . . . true Peak Cross-Needle SWR/Wattmeter . . . Dummy Load . . . Extremely Wide Matching Range . . . Patent Pending . . .

New!

MFJ-9982

$699.95

***The** MFJ-9982 ContinuousCarrier™ antenna tuner handles 2500 Watts continuous carrier output on all modes and all HF bands into most unbalanced antennas -- even on 160 Meters where even the best antenna tuners fail!*

The MFJ-9982 gives you every feature you'll ever want in a high power tuner -- wide matching range, 1.8 to 30 MHz coverage, 6-position antenna switch, 4-core balun, dummy load, true peak/average lighted SWR/Wattmeter, 6:1 reduction drives with detailed logging scales, 3-digit turns counter, extra large knobs.

New Components, New Technologies

The *Heart and Soul* of the MFJ-9982 is its roller inductor and variable capacitors.

MFJ's high power, high-Q *continuous current AirCore*™ roller inductor is no ordinary roller inductor! It's edge wound from thick .06-inch *silver-plated* solid copper strap.

It can carry huge circulating RF currents and withstand tremendous heat that'll melt or burn up ordinary roller inductors.

Self-insulating construction reduces stray capacitance -- keeps self-resonant frequencies high and out-of-the-way. Dual, *silver-plated* compression wheels give ultra low-resistance contacts. New fast-tune crank knob.

High-current, *high-capacitance* 1000 pF and 500 pF air variable capacitors have low minimum capacitance and are self-insulating.

These newly developed air variable capacitors give you *very high efficiency* on 160/80 Meters *and* MFJ's patent pending innovation gives you *extremely wide matching range* on 10/12/15 Meters at 2500 Watts -- a feat *only* the MFJ-9982 has achieved.

Hi-Voltage/Current Antenna Switch

The antenna switch is completely isolated to handle high-voltage, high impedance antennas. High-current, low impedance antennas are handled by parallel sets of high-current contacts of *two* ceramic switches.

New 4-Core Balun

Powerful balun -- Four 2½ inch cores, 12-gauge *Teflon*™ wire. Run balanced lines at full 2500 Watts SSB/CW continuous, 24/7.

New Balanced Line Feed-Thru Insulator

Allows massive transmitter currents to flow directly to the antenna without passing through lossy screws or bolts.

TrueActive™ Peak Reading Circuit

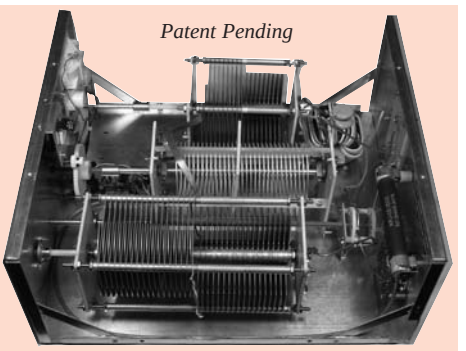
***New** TrueActive*™ circuit reads *true* peak or average power on all modes. *Cross-Needle* meter reads SWR/forward/reflected power.

1500 Watt Dummy Load

1500 Watt air-cooled non-inductive 50 Ohm resistor. 100W/10 min., 1.5kW/10 sec.

New Cabinet maintains high Q

***New** roomy cabinet maintains high Q. Vent holes. Heavy gauge, .08 inch aluminum braced chassis. Vinyl cover, non-stripping PEM nuts, heavy 10-gauge and copper strap wiring throughout. 13¾Wx7Dx16¼D inches. 15 pounds.*



MFJ 1500 Watt *Fully Balanced* Antenna Tuner

Fully balanced MFJ-976 handles 1500 Watts legal limit . . . Extra-wide 12-2000 Ohms matching range . . . continuous 1.8 to 30 MHz coverage including all WARC bands . . . Four separate 500 pF in two gangs gives you a total of 2000 pF capacitance . . . Heavy duty 1:1 current balun . . . more!

New!

MFJ-976

$499.95

The MFJ-976 is a 1500Watt full Legal Limit *fully balanced* antenna tuner.

You get *superb* current balance, very wide matching range (12-2000 Ohms) and *continuous* 1.8-30 MHz coverage including all WARC bands. Handles *full* 1500 Watts SSB *and* CW.

You can tune *any* balanced lines including 600 Ohm open wire line, 450/ 300 Ohm ladder lines, 300/72 Ohm twin lead -- shielded or unshielded. Also tunes random wires and coax fed antennas.

MFJ's *fully balanced* extremely wide-range T-network gives you simple, fast three knob tuning. No complicated switching between high and low impedance and switching in additional capacitance of L-networks.

Four separate 500 pF in two gangs gives you a total of 2000 pF for highly efficient low loss operation on 160 Meters.

You get excellent 10 Meter performance because of MFJ's low minimum capacitance and exclusive *Self-Resonance Killer*™ high-Q *AirCore*™ roller inductor with silver plated contacts.

Heavy duty 1:1 current balun gives you *superb balance* and stays cool even at 1.5kW.

True *active* peak reading lighted Cross-Needle SWR/Wattmeter lets you read SWR, *true peak* or average forward and reflected power all at a glance on 300/ 3000 Watt ranges. 12Wx6Hx15¾D inches.

Dealer/Catalog/Manuals

Visit: http://www.mfjenterprises.com or call toll-free 800-647-1800

• 1 Year *No Matter What*™ warranty • 30 day money back guarantee (less s/h) on orders direct from MFJ

MFJ ENTERPRISES, INC.
300 Industrial Pk Rd, Starkville, MS 39759 **PH:** (662) 323-5869
Tech Help: (662) 323-0549
FAX:(662)323-6551 8-4:30 CST, Mon.-Fri. ***Add shipping.***

MFJ . . . The World Leader in Ham Radio Accessories

AUTEK RESEARCH

ADVANCED ANTENNA ANALYSTS™

RF1 RF Analyst
1.2 to 34 MHz. Frequency, SWR, Impedance, L & C. Advanced and low priced. **$139.95** + S/H

VA1 Vector RX Analyst
0.5 to 32 MHz. Freq., SWR, Impedance, L & C, R & X. **Sign of X.** Much More! **$199.95** + S/H

RF5 VHF Analyst
35 to 75 MHz & 138 to 500 MHz Frequency , SWR, Impedance **$229.95** + S/H

WM1 Computing Deluxe Power/SWR Meter
$159.95 + S/H
What you want: SWR on one meter, power on the other! No adjusting or crossed needles! PEP or Average. Large lit meters. Remote RF head. 1.5 to 30 MHz. 1 to 2000 watts. Usable on 6M.

Each analysts has a low power "xmtr" to go anywhere in its range – not just the ham bands. Measures SWR, feedline loss, baluns, 1/4-wave lines. Measure at the antenna or in the shack. Adjust Yagis, quads, loops, dipoles, verticals, slopers, networks, traps and much more! Each is microprocessor-based and pocket-sized – about the size of the battery pack in others! Only about 8 oz. Uses one 9V standard battery. **For much more information, please visit our web site.**

Call to order with MC, VISA or send Check, MO. Add $9 S/H in 48 States ($11 for WM1). Add tax in FL. We ship worldwide. See our web site for all rates and combo discounts.

PO Box 7556, Wesley Chapel, FL, 33545 USA, (813) 994-2199
www.autekresearch.com

PowerPort

GearHarness
Hands free transport for your handheld and other gear.

Leather & Neo Pouches
Custom sizes to fit your handheld.

Radio Wallet
Travel case for your handheld and accessories.

831-427-8197 ▪ KC6QLB
www.powerportstore.com

208-852-0830 • Fax:208-852-0833
http://rossdist.com

Visit Our Web Site Often for News and Specials

Our 54th Year!

RDC ROSS DISTRIBUTING COMPANY
78 S. State Street, Preston, ID 83263

Advanced Specialties Inc.
"New Jersey's Communications Store"
YAESU ▪ ALINCO ▪ MFJ ▪ UNIDEN ▪ COMET
...and much, much more!
HUGE ONLINE CATALOG!
www.advancedspecialties.net
800-926-9HAM ▪ 201-843-2067
114 Essex Street, Lodi, NJ 07644

Go There...

with the LAST Portable HF Antenna System You Will Ever Need!

Portable 6-band, 3 Element Yagi Antenna

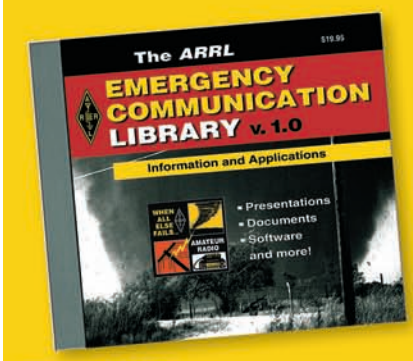
- 20m–6m range
- 12′ wide x 16′ long
- 36″ travel bag included
- 12 lb total weight
- 15 minute setup
- $495 Introductory Price

Order yours today!
Call Super Antennas at 916.434.9936

From the makers of the popular
MP-1 Portable HF Antenna
The best small HF Portable Screw-driver Antenna in the world!

For more information, please visit our website at www.superantennas.com

---



The *ARRL* EMERGENCY COMMUNICATIONS LIBRARY v. 1.0

QUICK ACCESS TO INFORMATION AND SOFTWARE:

- **Documents** and **presentations** on many aspects of emergency radio communication operating (many in PDF format)
- ***ARES® Field Resources Manual***
- **The *ARRL Public Service Communications Manual***
- **APRS** software
- **WinLink 2000** software
- ***Simulated Emergency Test*** *(SET)*, a video created by Bob Doherty, K1VV
- **Microsoft® Powerpoint® viewer** and **Adobe Acrobat Reader®** included

Minimum System Requirements: A 400 MHz Pentium PC with 256 MBytes of RAM and Microsoft® Windows® XP or Windows 2000.

The *ARRL* EMERGENCY COMMUNICATION LIBRARY

CD-ROM, version 1.0
ARRL Order No. 9868
Only $19.95*
*shipping: $6 US (ground)/$11.00 International

ARRL *The national association for AMATEUR RADIO*
SHOP DIRECT *or call for a dealer near you.*
ONLINE WWW.ARRL.ORG/SHOP
ORDER TOLL-FREE 888/277-5289 (US)

QST 4/2007

MFJ *giant* SWR/Wattmeter

World's *largest HF SWR/Wattmeter has* ***giant*** ***6½ inch meter!***

This one you can SEE! Extra-long scales gives you highly accurate SWR and power measurements. Huge numbers makes reading easy across your shack.

Like your analog watch, one glance at the meter needle gives you fast and accurate readings without actually examining the scale.

New!

MFJ's exclusive *TrueActive*™ peak reading circuit captures *true* peak or average forward and reflected power readings.

MFJ-868 $149.95

Has 20/200/2000 Watt ranges for accurate QRP or QRO operation.

Exclusive MFJ Wattmeter *Power Saver*™ circuit turns on meter only when RF power is being measured.

Covers 1.8-30 MHz. Use 9 volt battery or 12 VDC or 110 VAC with MFJ-1312D, $15.95. 7Wx5¹/2Hx5D in. SO-239 connectors.

New!
Giant 144/220/440 MHz SWR/Wattmeter
MFJ-867, $159.95. Like MFJ-868 giant SWR/Wattmeter, but for 144/220/440 MHz.

MFJ *Weather-Proof* Antenna *Feedthrough* Panel

Bring three coax-fed HF/VHF/UHF antennas, balanced line, random wire and ground into your hamshack without drilling through walls . . . ***New!*** MFJ-4602 $69.95

MFJ's Weather-proof *Antenna Feedthrough Panel* mounts in your window sill. Lets you feed three coax-fed antennas, balanced line, random wire and ground without drilling through walls.

Simply place in window sill and close window. One cut customizes it for any window up to 48 inches. Use horizontally or vertically. High-quality pressure-treated wood with excellent 3/4 inch thick insulating properties is painted with heavy coat of white outdoor enamel paint. Edges sealed by weather-stripping. Seals and insulates against all weather conditions. Gives years of trouble-free service. ³/4Dx3¹/2Hx48W in.

Inside/outside stainless steel plates bond all coax shields to ground. Stainless steel ground post brings outside ground connection inside. Three *Teflon*® SO-239 coax connectors, *ceramic* balanced line/randomwire feedthru insulators.


Stainless Steel Bonding Plate


Indoor View


Outdoor View

6-Band ***Rotatable*** mini-Dipole for 40,20,15,10,6,2 M

Low profile 14 ft . . . 7 ft. turning radius . . . 1.5 kW . . . Directivity focuses signal, reduces QRM/noise . . .

You can hardly see this mini 14 foot rotatable dipole from across the street!

Tiny 7-foot turning radius fits the smallest roof -- perfect for houses, apartments/condos.

The low-profile MFJ-1775 is not much bigger than a TV antenna and nicely blends into the sky. It's easily turned by a lightweight TV rotator.

It's no Wimp! Its *directivity* reduces QRM/noise and lets you *focus* your signal in the direction that you want -- so you can work some *real* DX.

Operate 6 bands -- 40, 20, 15, 10, 6 and 2 meters. Run *full 1500 Watts* SSB/CW on all HF bands!

Its entire length radiates. Each HF band uses a separate, highly-efficient end-loading coil wound on fiberglass forms with *Teflon*™ wire with capacitance hats at each end (no lossy traps). 6 and 2 meters are *full-length* halfwave dipoles.

Built-to-last -- incredibly strong solid rod fiberglass center insulator and 6063 T-6 aircraft strength aluminum tubing radiator. Assembles in an afternoon. Adjusting one band has little effect on other bands.

MFJ-1775W, $249.95. WARC band version for 12, 17, 30, 60 Meters only.

80/40/20 Meter Rotatable Dipole

MFJ-1785, $369.95. DX the *low bands* on 80, 40, and 20 Meters with an efficient full 33 foot *rotatable* dipole! Handles a full 1500 Watts. Balun included. 6063 T-6 aircraft strength aluminum tubing with a solid center fiberglass insulator. Requires a medium-duty rotator such as Hy-gain's AR-40.

Compact SWR/Wattmeter

MFJ-822
MFJ-842
$59.95
New!

Compact SWR/Wattmeter has huge 3 inch *lighted* Cross-Needle Meter, easily viewable from across shack. Read forward/reflected power, SWR *simultaneously*. 3¹/4Wx3¹/4Hx3¹/4D in.

MFJ-822 for 1.8-200 MHz, 30/300 Watts.
MFJ-842 for 140-525 MHz, 15/150 Watts.

2-Position *Remote* Ant. Switch

MFJ-4712 $79.95

Switch any two antennas remotely! *Single* coax feeds two antennas, DC power, control signals -- *no extra cable needed*. Use 1.8-150 MHz antennas. 1500 Watts. 50-75 Ohms. 4W x2⁵/8Hx1¹/2D in. fully enclosed, *weather protected* outside switch box has stainless steel bracket for 1¹/2 in. mast. 3 *Teflon*® SO-239s.

16-Element 2.4 GHz WiFi Yagi

MFJ-1800 $29.95

16-element WiFi Yagi antenna greatly extends range of 2.4 GHz, 802.11b/g WiFi signals. Turns slow/no connection into fast, solid connection. Highly directional -- minimizes interference. N-female connector. Tripod screw-mount. Wall/desk/shelf mounts. Use vertically or horizontally. 18Wx2³/4 Hx 1¹/4D in. 2.9 oz.

MFJ-5606SR, $24.95. Cable connects MFJ-1800/WiFi antennas to computer. Reverse-SMA male to N-male, 6 ft. RG-174.

MFJ-5606TR, $24.95. Same as MFJ-5606SR but Reverse-TNC male to N-male.

Glazed Ceramic Insulators

MFJ-16C06, $4.56, package of 6 authentic *glazed ceramic* antenna insulators. Extra-strong -- long antennas will not break, will not arc over or melt under full legal power. Extra-long ridges prevent high-voltage breakdown. Smooth wire holes prevent wire damage.

Dealer/Catalog/Manuals

Visit: http://www.mfjenterprises.com or call toll-free 800-647-1800

• 1 Year *No Matter What*™ warranty • 30 day money back guarantee (less s/h) on orders direct from MFJ

MFJ ENTERPRISES, INC.
300 Industrial Pk Rd, Starkville, MS 39759 **PH:** (662) 323-5869
Tech Help: (662) 323-0549
FAX:(662)323-6551 8-4:30 CST, Mon.-Fri. ***Add shipping.***

MFJ . . . the World Leader in Ham Radio Accessories!

10 Bands -- 1 MFJ Antenna!

Full size performance . . . No ground or radials

Operate 10 bands: 75/80, 40, 30, 20, 17, 15, 12, 10, 6 and 2 Meters with one antenna

Separate full size radiators . . . End loading . . . Elevated top feed . . . Low Radiation Angle . . . Very wide bandwidth . . . Highest performance no ground vertical ever . . .

Operate 10 bands -- 75/80, 40, 30, 20, 17, 15, 12, 10, 6 and 2 Meters with this MFJ-1798 vertical antenna and get *full size performance* with no ground or radials!

Full size performance gives high efficiency for more power radiated. Results? Stronger signals and more Q-5 QSOs.

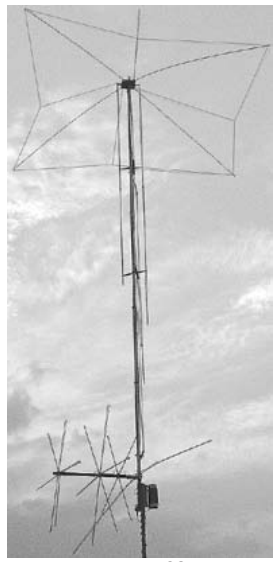
Full size performance also gives you exceptionally wide bandwidths so you can use more of your hard earned frequencies.

Full size performance is achieved using separate full size radiators for 2-20 Meters and highly efficient end loading for 30, 40, 75/80 Meters.

Get very low radiation angle for exciting DX, automatic bandswitching, omni-directional coverage, low SWR. Handles 1500 Watts PEP SSB.

MFJ's unique *Elevated Top Feed*™ elevates the feedpoint *all the way to the top* of the antenna. It puts the maximum radiation point high up in the clear where it does the most good -- your signal gets out even if you're ground mounted.

It's easy to tune because adjusting one band has minimum effect on the resonant frequencies of other bands.



MFJ-1798
$299.95
Ship Code F

Self-supporting and just 20 feet tall, the MFJ-1798 mounts easily from ground level to tower top -- small lots, backyards, apartments, condos, roofs, tower mounts.

Separate Full Size Radiators

Separate *full size* quarter wave radiators are used on 20, 17, 15, 12, 10 and 2 Meters. On 6 Meters, the 17 Meter radiator becomes a 3/4 wave radiator.

The active radiator works as a stub to decouple everything beyond it. *In phase* antenna current flows in all parallel radiators.

This forms a very large equivalent radiator and gives you incredible bandwidths.

Radiator stubs provide automatic bandswitching -- absolutely *no loss* due to loading coils or traps.

End Loading

On 30, 40, 75/80 Meters, end loading -- the most efficient form of loading -- gives you highly efficient performance, excellent bandwidth, low angle radiation and automatic bandswitching.

MFJ's unique *Frequency Adaptive L-Network*™ provides automatic impedance matching for lowest SWR on these low bands.

Tuning to your favorite part of these bands is simple and is done at the *bottom* of the antenna.

No Ground or Radials Needed

You don't need a ground or radials because an effective counterpoise that's 12 feet across gives you *excellent* ground isolation.

You can mount it from ground level to roof top and get awesome performance.

No Feedline Radiation to Waste Power

The feedline is decoupled and isolated from the antenna with MFJ's exclusive *AirCore*™ high power current balun. It's wound with *Teflon*® coax and can't saturate, no matter how high your power.

Built to Last

Incredibly strong solid fiberglass rod and large diameter 6061 T-6 aircraft strength aluminum tubing is in the main structure.

Efficient high-Q coils are wound on tough *low loss* fiberglass forms using highly weather resistant *Teflon*® covered wire.

MFJ's Super High-Q Loop™ Antennas

MFJ-1786
$419.95

MFJ's *tiny* 36 inch diameter loop antenna lets you operate 10 through 30 MHz *continuously* -- including the WARC bands!

Ideal for limited space -- apartments, small lots, motor homes, attics, or mobile homes.

Enjoy both DX and local contacts mounted vertically. Get both low angle radiation for excellent DX and high angle radiation for local, close-in contacts. Handles 150 watts.

Super easy-to-use! Only MFJ's super remote control has *Auto Band Selection*™. It auto-tunes to desired band, then beeps to let you know. No control cable is needed.

Fast/slow tune buttons and built-in two range Cross-Needle SWR/Wattmeter lets you quickly tune to your exact frequency.

All welded construction, no mechanical joints, welded butterfly capacitor with no rotating contacts, large 1.050 inch diameter round radiator -- not a lossy thin flat-strip -- *gives you highest possible efficiency*.

Each plate in MFJ's tuning capacitor is welded for low loss and polished to prevent high voltage arcing, welded to the radiator, has nylon bearing, anti-backlash mechanism, limit switches, continuous no-step DC motor -- gives smooth precision tuning.

Heavy duty thick ABS plastic housing has ultraviolet inhibitor protection.

MFJ-1788, $469.95. Same as MFJ-1786 but covers 40 Meters-15 Meters continuous. Includes super remote control.

MFJ-1782, $379.95. Like MFJ-1786 but control has only fast/slow tune buttons.

MFJ-1780, $299.95. *Box Fan* Portable Loop is about the same size (2x2 foot) as a box fan, complete with handle. Covers 14-30 MHz. Control has fast/slow tunes.

MFJ Apartment Antenna

MFJ-1622 $99.95

Covers 40 thru 2 Meters. Mounts outdoor to windows, balconies, railings. Works great indoors mounted to desks, tables, bookshelves. Highly efficient air wound *bug catcher* loading coil and telescoping 5½ foot radiator lets you really get out! Radiator collapses to 2½ feet for easy storage/carrying. Includes coax RF choke balun, coax feed line, counterpoise wire, safety rope. 200 Watts PEP.

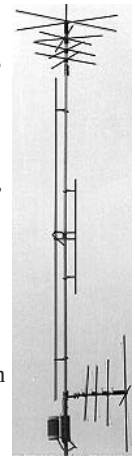
MFJ's G5RV Antenna

MFJ-1778
$44.95

Covers all bands, 160-10 Meters with antenna tuner. 102 feet long, shorter than 80 Meter dipole. Use as inverted vee or sloper to be more compact. Use on 160 Meters as Marconi with tuner and ground. Handles full legal limit power. Add coax feedline and some rope or other nonconductor and you're *on the air!*

MFJ halfwave vertical

6 bands: 40, 20, 15, 10, 6, 2 Meters . . . No radials or ground needed



MFJ-1796
$229.95

Only 12 feet high and has a tiny 24 inch footprint! Mount anywhere -- ground level to tower top -- apartments,small lots, trailers. Perfect for vacations, field day, DXpedition, camping.

Efficient end-loading, no lossy traps. Entire length is always radiating. Full size halfwave on 2/6 Meters. High power *air-wound* choke balun eliminates feedline radiation. Adjusting 1 band has minimum effect on others.

MFJ-1792, $189.95. Full size 1/4 wave radiator for 40 Meters. 33 feet, handles 1500 Watts PEP. Requires guying and radials.

MFJ-1793, $209.95. Like MFJ-1792 but has full size 20 Meter ¼ wave also.

Free MFJ Catalog

and Nearest Dealer . . . 800-647-1800

http://www.mfjenterprises.com

• 1 Year *No Matter What*™ warranty • 30 day money back guarantee (less s/h) on orders from MFJ

MFJ ENTERPRISES, INC.
Box 494, Miss. State, MS 39762
(662) 323-5869; 8-4:30 CST, Mon.-Fri.
FAX: (662) 323-6551; **Add s/h**
Tech Help: (662) 323-0549

MFJ . . . the world leader in ham radio accessories!

MFJ *Speech Intelligibility* Enhancer

. . . makes barely understandable speech highly understandable!

MFJ-616
$189.95

"What did you say?" ***Can you hear but . . . just can't always understand everything people are saying?***

As we get older, high frequency hearing loss reduces our ability to understand speech. Here's why . . .

Research shows that nearly *half* the speech intelligibility is contained in 1000 to 4000 Hz range, but contains a miniscule 4% of total speech energy.

On the other hand, the low frequencies, 125 to 500 Hz have most of the speech energy (55%) but contribute very little to intelligibility -- only 4%.

To dramatically improve your ability to understand speech, you must:

First, drastically increase the speech energy above 500 Hz, where 83% of the speech intelligibility is concentrated.

Second, drastically reduce speech energy below 500 Hz where only 4% of speech intelligibility lies.

The MFJ-616 splits the audio speech band into four overlapping octave ranges centered at 300, 600, 1200 and 2400 Hz. You can boost or cut each range by nearly 20 dB.

A balance control and separate 2½ Watt amplifiers let you equalize perceived loudness to each ear so both ears help.

By boosting high and cutting low frequencies and adjusting the balanced control, speech that you can barely understand become highly understandable!

Even if you *don't* have high frequency hearing loss, you'll dramatically improve your ability to understand speech. You'll get an edge in contesting and DXing and enjoy ragchewing more.

Here's what *QST* for April, 2001 said . . . *"I expected a subtle effect at best, but I was astonished . . . The result was remarkably clean, understandable speech without hissing, ringing or other strange effects . . . made a dramatic improvement . . ."*

Immuned to RFI. Has phone jack, on/off speaker switch, 2 inputs, bypass switch. 10Wx2½Hx6D". Needs 12 VDC.

MFJ-1316, $21.95. For 110 VAC operation. Provides 12 VDC/1.5 Amps.

MFJ-72, $69.80. *All-in-one MFJ-616 Accessory Pack.* Includes MFJ-392 headphones, two MFJ-281 speakers and MFJ-1316 power supply. ***Save $7!***

Try it for 30 Days

Order from MFJ and try it -- No obligation. If not delighted, return it within 30 days for refund less shipping.

MFJ Contest Voice Keyer

Transformer-coupled -- No RFI, hum or feedback . . . 75 seconds total, 5-messages . . . Records received audio . . .

MFJ-434B
$199.95

Let this *new* microprocessor controlled MFJ *Contest Voice Keyer*™ call CQ, send your call and do contest exchanges for you in your own natural voice!

Store frequently used phrases like "CQ Contest this is AA5MT", "You're 59" . . . "Qth is Mississippi" . . . Contest by pressing a few buttons and save your voice.

Record and playback 5 natural sounding messages in a total of 75 seconds. Uses *eeprom* -- no battery backup needed. Use your mic or its built-in mic for recording.

You can repeat messages continuously and vary the repeat delay from 3 to 500 seconds. Makes a great voice beacon and calling CQ is *so* easy.

You can also record and play back off-the-air signals -- great help if you didn't get it right the first time! No more "*Please repeat*".

A playing message can be halted by the *Stop Button*, your microphone's PTT/VOX, remote control or computer.

Has jack for remote or computer control (using CT, NA or other program). Lets you select, play and cancel messages.

Your mic's audio characteristics do not change when your MFJ-434B is installed.

All audio lines are RF filtered to eliminate RFI, audio feedback and distortion. An audio isolation transformer totally eliminates hum and distortion caused by ground loops.

New! **It's** easy to use -- just plug in your 8 pin round or modular mic plug, set the internal jumpers for your transceiver and plug in the appropriate (included) cable for your rig.

Built-in speaker-amplifier. Speaker/phone jack. Use 9 Volt battery, 9-15 VDC or 110 VAC with optional MFJ-1312D, $15.95. 6½Wx2½Hx6½D in.

MFJ-73, $34.95. MFJ-434B Remote Control with cable.

60 dB Null ***wipes out*** noise and interference

MFJ-1026
$199.95

Wipe out noise and interference *before* it gets into your receiver with a 60 dB null!

Eliminate all types of noise -- severe power line noise from arcing transformers and insulators, fluorescent lamps, light dimmers, touch controlled lamps, computers, TV birdies, lightning crashes from distant thunderstorms, electric drills, motors, industrial processes . . .

It's *more effective* than a noise blanker! Interference much stronger than your desired signal can be completely removed without affecting your signal.

It works on *all modes* -- SSB, AM, CW, FM -- and frequences from BCB to lower VHF.

You can null out strong QRM on top of weak rare DX and then work him! You can null out a strong local ham or AM broadcast station to prevent your receiver from overloading.

Use the MFJ-1026 as an *adjustable phasing network.* You can combine two antennas to give you various directional patterns. Null out a strong interfering signal or peak a weak signal at a push of a button.

Easy-to-use! Plugs between transmitting antenna and transceiver. To null, adjust amplitude and phase controls for minimum S-meter reading or lowest noise. To peak, push reverse button. Use built-in active antenna or an external one. MFJ's exclusive *Constant Amplitude Phase Control*™ makes nulling easy.

RF sense T/R switch automatically bypasses your transceiver when you transmit. Adjustable delay time. Uses 12 VDC or 110 VAC with MFJ-1312D, $15.95. 6½x1½x6¼ in.

MFJ-1025, $179.95. Like MFJ-1026 less built-in active antenna, use external noise antenna.

MFJ *tunable* Super DSP filter

MFJ-784B
$279.95

Only MFJ gives you *tunable* and *programmable* "brick wall" DSP filters.

You can continuously *tune* low pass, high pass, notch and bandpass filters and continuously *vary* bandwidth to pinpoint and eliminate interference.

Only MFJ gives you 5 factory pre-set and 10 programmable pre-set filters you can customize. **Automatic** notch filter searches for and eliminates multiple heterodynes. Advanced adaptive noise reduction silences background noise and QRM.

Free MFJ Catalog

Visit: http://www.mfjenterprises.com or call toll-free 800-647-1800

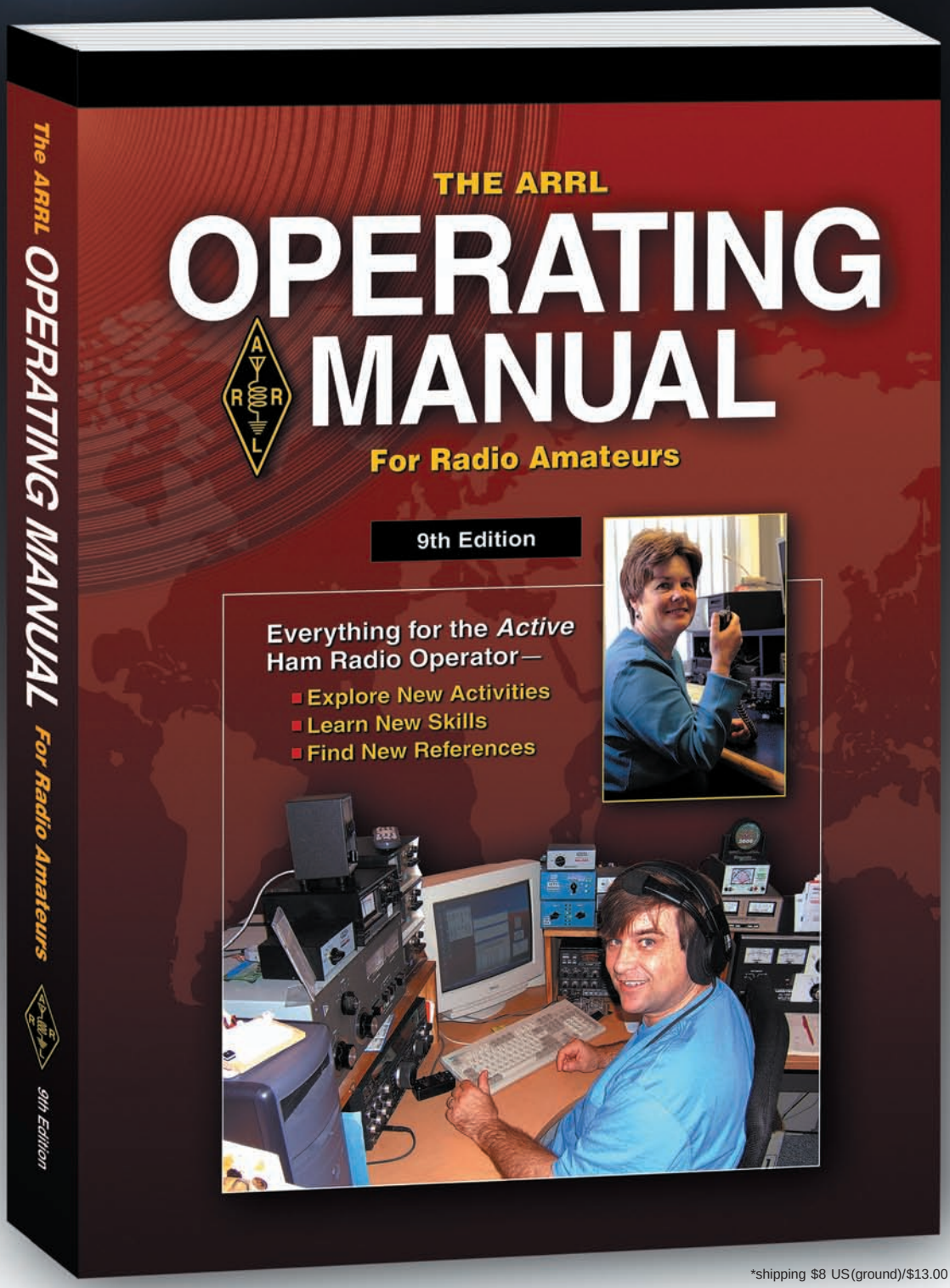
• 1 Year *No Matter What*™ warranty • 30 day money back guarantee (less s/h) on orders direct from MFJ

MFJ ENTERPRISES, INC.
300 Industrial Pk Rd, Starkville, MS 39759 **PH:** (662) 323-5869
Tech Help: (662) 323-0549
FAX:(662)323-6551 8-4:30 CST, Mon.-Fri. ***Add shipping.***

http://www.mfjenterprises.com *for instruction manuals, catalog, info*

The MOST COMPLETE book about Amateur Radio operating!

ARRL Order No. 1093 **Only $29.95***



*shipping $8 US(ground)/$13.00 International

ARRL The national association for AMATEUR RADIO

SHOP DIRECT *or call for a dealer near you.*
ONLINE WWW.ARRL.ORG/SHOP
ORDER TOLL-FREE 888/277-5289 (US)

QST 8/2008

MFJ *Switching* Power Supplies

Power your HF transceiver, 2 meter/440 MHz mobile/base and accessories with these new 15, 25, 45 or 75 Amp MFJ MightyLite™ Switching Power Supplies!

No RF hash . . . Super lightweight . . . Super small . . . Volt/Amp Meters . . .

MFJ's adjustable voltage switching power supplies do it all! Power your HF or 2M/440 MHz radio and accessories.

MFJ's *MightyLites*™ are so light and small you can carry them with one hand! Take them with you anywhere.

No more picking up and hauling around heavy, bulky supplies that can give you a painful backache, pulled muscle or hernia.

These babies are clean . . . Your buddies won't hear *any* RF hash on your signal! *None* in your receiver either! These super clean *MightyLites*™ meet all FCC Class B regulations.

Less than 35 mV peak-to-peak ripple under 25 or 45 amp full load. Load regulation is better than 1.5% under full load.

You won't burn up our power supplies!

MFJ Power supplies are *fully protected* with Over Voltage, Over-temperature and Over Current protection circuits.

MFJ *MightyLites*™ can be used anywhere in the world! They have switchable AC input voltage and work from 85 to 135 VAC or 170 to 260 VAC. Replaceable fuse.

A whisper quiet internal fan efficiently cools your power supply for long life.

The smallest and lightest power supply in ham radio!

MFJ-4125
25 Amp w/o Meters
$109.95

MFJ-4125 powers HF/2M/440 MHz rigs and accessories. 25 A max, 22 Amps continuous @ 13.8VDC. 110 or 220 VAC. 2.86 lbs. 5¾Wx3Hx5¾D in.

MFJ-4125P, $124.95. Like above, but adds 2-pair of Anderson PowerPoles™.

MFJ-4225MV
25 Amp with Meters
$149.95

MFJ-4225MV, 25 Amps max, 22 Amps continuous. Like MFJ-4125 but adds Volt/Amp meters, cigarette lighter plug. 5¼Wx4½Hx6D in. Weighs 3.7 lbs. Use 85 to 135 VAC or 170 to 260 VAC. Replaceable fuse.

MFJ-4245MV
45 Amp
$199.95

MFJ-4245MV, 45 Amps max, 40 Amps continuous. Like MFJ-4225MV but weighs 5.5 lbs. 7½Wx4¾Hx9D inches. It's a great workhorse for multi-rig base stations! Two sets of quick connects on rear of unit.

MFJ-4175
75 Amp
$359.95

MFJ-4175, 75 Amps *continuous*. 13.8-14.2 VDC. 7.8 pounds. 6½Wx3½Hx10D inches.108-132 VAC. Great for Ameritron ALS-500M mobile amplifier!

High Current Multiple DC Power Outlets

MFJ-1118 powers two HF/VHF transceivers and six or more accessories from your 12 VDC power supply . . . Choose versatile 5-way binding posts or Anderson PowerPoles™

MFJ-1118
$84.95

MFJ-1116
$59.95

MFJ-1112
$44.95

MFJ-1117
$64.95

MFJ-1128
$104.95

MFJ-1126
$84.95

MFJ-1129
$114.95

MFJ-1124
$64.95

MFJ-1118, $84.95. Power two HF and/or VHF rigs and six accessories from your main 12 VDC supply. *Built-in 0-25 VDC voltmeter*. Two pairs 35 amp 5-way binding posts, fused and RF bypassed for transceivers. Six pairs RF bypassed binding posts provide 15 Amps for accessories. Master fuse, ON/OFF switch,"ON" LED. 12½x2¾x2½ in.

MFJ-1116, $59.95. Similar to MFJ-1118. No 30 amp posts, "ON" LED or voltmeter. 15 Amps total.

MFJ-1112, $44.95. Similar to MFJ-1116. No on/off switch, LED, meter, fuse. 15 Amps total.

MFJ-1117, $64.95. For powering *four* HF /VHF radios (two at 35 Amps each and two at 35 Amps combined) simultaneously. 8x2x3 in.

MFJ-1128, $104.95. Three high-current outlets for transceivers. Nine *switched* outlets for accessories. Mix and match included fuses as needed (one-40A, one-25A, four-10A, four-5A, three-1A fuses installed). *Built-in 0-25 VDC Voltmeter*. Extra contacts, fuses. 12Wx1¼Hx2¾D inches.

MFJ-1126, $84.95. Factory installed fuses: two 1A, three 5A, two 10A, one 25A, one 40A. *Built-in 0-25 VDC Voltmeter*. Includes *extra PowerPole®* contacts and *extra* fuses -- *no extra cost*. 9Wx1¼Hx2¾ in.

MFJ-1129, $114.95. Three high-current outlets for rigs -- 2 *PowerPoles®* and 1 versatile high-current 5-way binding post. Seven *switched* outlets for accessories (20A max) -- 5 *PowerPoles®* and 2 versatile binding posts. Fuses include (1- 40A, 2-25A, 3-10A, 3-5A, 2-1A installed). *Built-in 0-25 VDC Voltmeter*. Includes extra *PowerPole®* 12½Wx1¼Hx2¾D inches.

MFJ-1124, $64.95. Four *PowerPoles®* and two high-current 5-way binding posts, Installed fuses: 1-40A, 2-25A, 2-10A, 1-5A, 1-1A. Includes 4 pair extra *Anderson PowerPole®* contacts, and 5 fuses -- at *no extra cost*.

15A Switching Power Supply

MFJ-4115 is 1½ lbs. and a tiny 3¾Wx2¼Hx 3¾D inches. Easily fits in an overnight bag and can power most VHF/UHF or QRP rigs. AC input 90 to 130 Volts. 13.8 VDC output, 17 Amps surge and 15A continuous. 1 set of 5-way binding posts.

MFJ-4115
$89.95

MFJ 35/30 Amp DC Power Supply

This 19.2 lb. transformer delivers 35 Amps max and 30 Amps continuously. Use any 110 VAC outlet. Highly regulated with load regulation better than 1%. Ripple voltage is less than 30 mV. Over-voltage, fold back short circuit and over-temperature protections. Adjustable voltage 1-14 VDC with detent @ 13.8 VDC. Voltage/current meters. Output terminals: pair of five-way binding posts, two pairs of quick-connects and a covered cigarette lighter socket for mobile accessories. Measures 9½Wx6Hx9¾D inches.

MFJ-4035MV
$149.95

Dealer/Catalog/Manuals

Visit: http://www.mfjenterprises.com or call toll-free 800-647-1800

• 1 Year *No Matter What*™ warranty • 30 day money back guarantee (less s/h) on orders direct from MFJ

MFJ ENTERPRISES, INC.
300 Industrial Pk Rd, Starkville, MS 39759 **PH:** (662) 323-5869
Tech Help: (662) 323-0549
FAX:(662)323-6551 8-4:30 CST, Mon.-Fri. ***Add shipping.***

Georgia ARRL State Convention

Georgia's Largest Hamfest!

Do not miss this hamfest!

The Stone Mountain Hamfest
and Computer Show

PLUS: 50th Reunion of the Atlanta Teenage Radio Club!

November 1 - 2 2008 Lawrenceville, GA

http://www.totr-radio.org/08hamfest

Advance tickets are available On-line NOW!

Brought to you by: The Alford Memorial Radio Club - W4BOC

Gates Open at: 8:00am

Close at: 4 pm Saturday
2 pm Sunday

Over $3,500. in door prizes

Talk-in: 146.760 pl 107.2

Youth Lounge and Special Events Station

On-site ARRL Testing - 9:00am each day.

In 2008 we won in court —but there's more work to do!

The ARRL will not rest until Amateur Radio is given the protection it is entitled to under international agreements and federal law.

Last year the ARRL went to court to challenge the FCC and its unwillingness to protect licensed radiocommunication services from harmful interference.

And on Friday April 25, 2008 we won a tremendous victory for all radio amateurs! **Thank you** to all the ARRL members and friends whose financial contributions helped make that victory possible.

But there is more work to do!

The ARRL will not rest until Amateur Radio is given the protection it is entitled to under international agreements and federal law. We must be prepared to take the next step, and the next and the next...

Your contribution now to the **2009 Spectrum Defense Fund** will provide the resources that ARRL must have to continue its efforts to protect our valuable spectrum.

Please make the most generous contribution you can by mail, phone or on the web at: **www.arrl.org/defense**.

For more information, contact:

Mary M. Hobart, K1MMH
Chief Development Officer
ARRL
225 Main Street
Newington CT 06111-1494
Telephone: **860-594-0397**
Email: **mhobart@arrl.org**

Connector Superstore

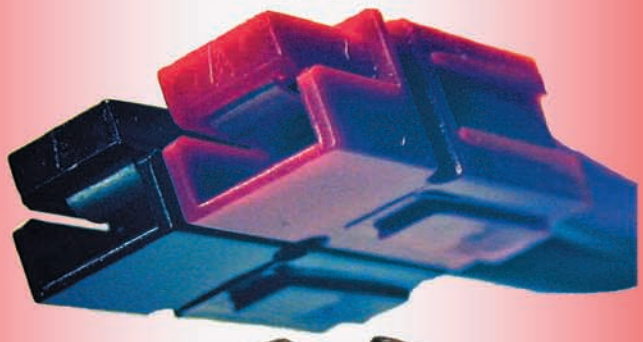
Magnet mounts, trunk lip mounts, railing brackets, and more, available with 3/8-24, NMO, or SO-239 fittings. Connectors and adapters to fit most types. Quick disconnects, premium grade PL-259s and reducers.

Coax Jumpers, Ladder Line, Antenna Wire, Rope, Pulleys, Insulators, Tensioners, Feed-Throughs, Premium Grade PL-259s, and much more.

Your Powerpole Headquarters

15A-30A-45A-50A-75A-120A
Panel, Cable, & Chassis Mounts
Pre-Assembled Cables In stock
More Powerpole Stuff Than

ANYBODY!



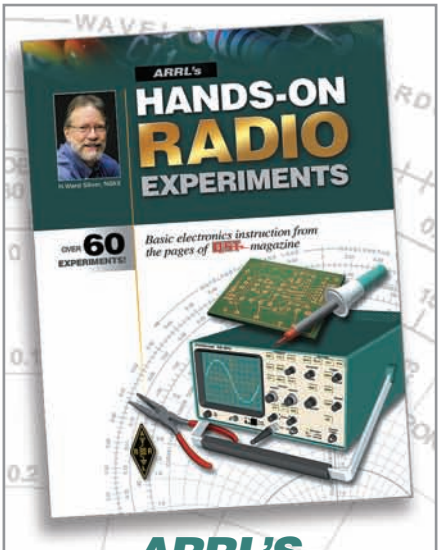
Your DC Power Headquarters

Connectors and Powerpole Cables for almost *anything*!

Quicksilver Radio Products
(almost) Everything but the Rig

See us at Hamfests from Maine to Maryland, and Beyond

www.qsradio.com



ARRL'S HANDS-ON RADIO EXPERIMENTS

By H. Ward Silver, NØAX

Over 60 short electronics experiments from the pages of *QST*. Step-by-step, Silver expertly leads you through each experiment – **and you'll make discoveries along the way!**

- Radio and Electronic Fundamentals
- Semiconductor Basics
- Building Block Circuits
- Power Supplies
- Filters
- Oscillators and Buffers
- Transmission Lines & Impedance Matching
- Workshop & Design Techniques

Includes a complete **parts list!**

HANDS-ON RADIO Parts Kit

Use the parts kit to build the experiments yourself! You'll enjoy heating up soldering irons, plugging in components, learning what makes your radio work and more! The kit is based on the parts list provided in the back of the book (sold separately).

ARRL'S HANDS-ON RADIO EXPERIMENTS
ARRL Order No. 1255
Only $19.95*
*shipping $7 US (ground)/$12.00 International

HANDS-ON RADIO Parts Kit
ARRL Order No. 1255K
Only $79.95*
*shipping $12 US (ground)/$17.00 International

ARRL *The national association for AMATEUR RADIO*
SHOP DIRECT *or call for a dealer near you.*
ONLINE WWW.ARRL.ORG/SHOP
ORDER TOLL-FREE 888/277-5289 (US)

QST 8/2008

When you're hungry for more than just basic HF...

IC–746PRO

This HF/6M/2M performer borrows much technology from its big brothers, the 756PRO series: Built-in 32-bit IF-DSP; 100 Watts on all bands, and 100% duty cycle; digital filtering (no need to buy optional filters!) with independently selectable tuning shapes for CW & SSB; menu-driven controls; auto and manual notch filter; built-in auto antenna tuner; band scope; and more.

- 100 Watt Output Power, Full Duty Cycle*
- All Mode, Including RTTY
- 32-bit IF-DSP & 24-bit AD/DA Converter
- Enhanced Rx Performance
- Selectable IF Filter Shapes for SSB & CW

Dig in!

For the love of ham radio.

*Frequency coverage may vary. See owner's manual for exact frequency specs.
©2008 Icom America Inc. The Icom logo is a registered trademark of Icom Inc.
All specifications are subject to change without notice or obligation. 30011

ICOM®

Ham Ads

Please contact the **Advertising Department** at **860-594-0231** or **hamads@arrl.org** for further information or to submit your ad.

1. Advertising must pertain to products and services which are related to Amateur Radio.

2. The Ham-Ad rate for commercial firms offering products or services for sale is $2.00 per word. Individuals selling or buying personal equipment: ARRL member 65¢ per word. Non-ARRL member $1 per word. **Bolding** is available for $2.25 a word. Prices subject to change without notice. You may pay by check payable to the ARRL and sent to: Ham-Ads, ARRL, 225 Main St., Newington, CT 06111. Or, you may pay by credit card sending the information by fax to 860-594-4285 or via e-mail to hamads@arrl.org. The credit card information we need is: the type of credit card, the exact name that appears on the credit card, the credit card number, the expiration date and the credit card billing address.

3. Remittance in full must accompany copy since Ham-Ads are not carried on our books. Each word, abbreviation, model number and group of numbers counts as one word. Entire telephone numbers count as one word. No charge for postal Zip code. No cash or contract discounts or agency commission will be allowed. Tear sheets or proofs of Ham-Ads cannot be supplied. Ads submitted in writing should be typed or printed clearly on an 8 1/2" X 11" sheet of paper.

4. Closing date for Ham-Ads is the 15th of the second month preceding publication date. No cancellations or changes will be accepted after this closing date. Example: Ads received August 16th through July 15th will appear in November *QST*. If the 15th falls on a weekend or holiday, the Ham-Ad deadline is the previous working day. Please contact the Advertising Department at 860-594-0255 or hamads@arrl.org for further information or to submit your ad.

5. No Ham-Ad may use more than 100 words. No advertiser may use more than two ads in one issue. A last name or call must appear in each ad. Mention of lotteries, prize drawings, games of chance etc is not permitted in *QST* advertising.

6. New firms or individuals offering products or services for sale must check with us to determine if a production sample (which will be returned) should be submitted for examination. Dealers are exempted, unless the product is unknown to us. Check with us if you are in doubt. You must stand by and support all claims and specifications mentioned in your advertising.

The publisher of *QST* will vouch for the integrity of advertisers who are obviously commercial in character and for the grade or character of their products and services. Individual advertisers are not subject to scrutiny.

The American Radio Relay League does not discriminate in its advertising on the basis of race, color, religion, age, sex, sexual orientation, marital status or national origin. The League reserves the right to decline or discontinue advertising for any other reason.

7. AN IMPORTANT NOTICE TO ALL HAM AD POSTERS AND RESPONDERS, FROM THE ARRL ADVERTISING DEPARTMENT Greetings from ARRL HQ! Please note that we have received reports from many ARRL members who have placed classified ads in these listings, and have received responses from individuals proposing "creative" payment schemes. These particular instances involved offers of overpayments for goods by bank check, followed by instructions to deduct the cost of your item from the overpayment, and to transfer the overage back or to another individual. This is a well-known scam. Unfortunately, we have no control over this and other scams of this type. Once your email address is posted, you are vulnerable to those individuals seeking to provide you with questionable information. See **http://www.arrl.org/news/features/2005/07/15/1/?nc=1** for further details. REMEMBER: TRANSACT CAREFULLY AND PROTECT YOURSELF.

QST Ham Ads on the Web – Updated Monthly!

www.arrl.org/ads/ham-ads.html

Club/Hamfests/Nets

After 25 years as a Hamfest Vendor, health is forcing me to slow down. The entire operation is for sale, including inventory, traveling show trailer with RV area, and all contacts. Buying, wholesale, all future locations which are always the best. Will assist as needed. All shows pre-paid now are included. Satellite Sam, KG4JMN. 434-942-8057.

FRIEND OF BILL W.?? – Join HAAM net Saturdays at 12:30 Eastern on 14.290; Sundays at 09:30 Pacific on 14.340/2. http://members.cox.net/k6lx/HAAM.HTM

MARCO The Medical Amateur Radio Council Ltd is a charitable non-profit group of health care professionals who meet weekly at 10:00am Eastern time Sundays for the "Grand Rounds of the Air" net on 14.307 MHz. All interested are welcome. Request info & free newsletter to Danny@w4dan.com or write MARCO, 2712 Bryant Dr, Cleveland, TN 37311. Ph 866-470-6160. Web site www.marco-ltd.org

RAINBOW AMATEUR RADIO ASSOCIATION Serving the gay/lesbian community since 1995. ARRL affiliated. Privacy respected. Four active weekly HF nets, newsletter, message board, chat room, VE teams, DXpeditions. Web site: www.rara.org. Information: PO Box 18541, Rochester, NY 14618-0541.

Property/Vacation/Rentals

A SPECIAL RARE FIND FOR HAMS. A lovely desert style home, built in 1987, and located on a ridgeline in the foothills of the Tucson Mountains, about 2 1/2 miles west of I10, on a cul-de-sac with 1 1/4 acres overlooking the valley of Tucson, AZ. A 1650+ sq ft house, 3 brms, one serving as a den, ham radio and computer rm, 2 baths, lv, rm, dn rom, lg kitchen, attach garage/shop and 2 lg porches. A 50 foot radio tower with 7 element rotating beam plus an excellent VHF/UHF antenna. 520-743-7149

ALASKA DX VACATION RENTAL – plus fishing and hunting in Homer, Alaska. 2 bedroom/2 bath deluxe accommodations + ham shack. Rigs, KW amps, antennas. AL7DB@ARRL.NET, www.diamondridgecottage.com 1-907-235-7526

ANTIGUA West Indies QTH with radio and 7 towers with antennas. Constant electricity. Contact Roy, V21N, 954-894-6675 or 954-801-6061 or Sam at wt3q@comcast.net www.n3oc.dyndns.org/v26b

BELIZE VACATION QTH www.wishwilly.net

COLORADO CHALET with ham gear for rent, www.lostcreekcabin.com. WØLSD, Buena Vista, CO.

COSTA RICA - www.yantis.us/ti5kd

Delray Beach, FL home for sale. 2br/2ba 1700sq ft house and garage in excellent condx in 55+ gated community. Mulitband KW vertical and operating position set up with 110/220. New coax. Large glassed in family room, large eat-in kitchen large yard. Available March '09. Call for more details. Dave Beckwith, W2QM. 561-278-8118

FOR SALE: House 2BR, 1BA with 51' Tower, KLM34 Beam (10-15-20) other antennas, (Royal Palm Sub/D). 1031 E. Hondo Ave., Apache Jct., AZ 85219. 928-587-6933 or 928-368-3660. Omer Robbins, W7DCA.

HAWAII DX VACATION RENTAL Big Signal KH6RC. 808-929-7101 www.leilanibedandbreakfast.com

HAWAII VACATION? Big Island HAM station. WiFi, info, brochure or DVD. KD4ML@JUNO.COM

MAUI HAWAII Radio station rental. www.seaqmaui.com KH6SQ@arrl.net

Nicaragua Rental www.YN2N.com

Vacation in Crystal River, FL. Private apartment, bedroom, private entrance, kitchen, pool and operating privileges. Reserve now for fall, winter and spring. AL7HG, 352-563-6007.

VIRGIN ISLANDS www.radioreef.com

VY2TT www.peidxlodge.com

"WANNA HAM in the Cayman Islands?"go to www.martykaiser.com/24.htm

Antique/Vintage/Classic

ANTIQUE RADIO CLASSIFIED. Free sample copy! Antique radio's largest-circulation monthly magazine. Old radios, TVs, ham equip., 40s & 50s radios, telegraph, books & more. Ads & articles. Free 20-word ad monthly. Subscribe today. Six-month trial: $19.95. Yearly rates: $39.49 ($57.95 by 1st Class). Foreign: write. ARC, PO Box 802-B22A, Carlisle, MA 01741. Phone: 978-371-0512, Fax: 978-371-7129, Web: www.antiqueradio.com

ANTIQUE WIRELESS ASSOCIATION. The organization for all enthusiasts of antique and historical radio! Publishes THE AWA JOURNAL, covering vintage ham gear, keys, telegraphy, contests, broadcast receivers, vacuum tubes, historical, technical articles, restoration, and much more. AWA produces the famous annual Rochester, NY meet. Maintains world-famous historical radio-electronics communications museum. Membership only $20/year USA, $25 elsewhere. Antique Wireless Association, PO Box 421, Dept. 1, Bloomfield, NY 14469. Check our Website: http://www.antiquewireless.org

CLASSIC REPAIR - Specializing in Collins, Drake and other fine tube radios. Steve, 661-822-6850. n6hk@hotmail.com

CODE PRACTICE OSCILLATOR MUSEUM: http://www.n4mw.com

HALLICRAFTERS MANUALS Ham.swl, All manuals are $9.00. Send model number needed. ARDCO ELECTRONICS, P O Box 24, Dept. Q, Palos Park, IL 60464. www.ardcoelectronics.com. wa9gob@aol.com

HT's wanted VX-2R Foundation for Amateur International Radio Service -- Pay your price or tax deductible donation - www.fairs.org

Pre1980 microcomputers wanted for historical collection - KK4WW 540-763-2321

TELEGRAPH KEYS wanted by collector. Bugs and unusual or unique straight keys or sounders, and tube electronic keyers. Also pre-1950 callbooks. Vince Thompson, K5VT, 3410 N. 4th Ave., Phoenix, AZ 85013. 602-840-2653.

TELEGRAPH MUSEUM / COLLECTOR'S INFORMATION: http://w1tp.com

Visit THE SOUTHERN APPALACHIAN RADIO MUSEUM! - www.saradiomuseum.org 828-299-1276. Asheville, NC.

W4QCF MANUALS - 828-298-1847 http://www.w4qcfmanuals.com

WTB: WWII radios, SCRs, BCs, antenna bases, mics, headphones, cabling. Fair price paid AND 501(c)(3) deduction available. Will pay all shipping and packing. WWII-Armor museum. Contact K4RN 505-269-2056 or dam@lobo.net

WTD: radio rack FRAME FM-41. This mounts an SCR 284 on top and a tray underneath with dynamotor. WWII items needed for Military vehicle project. About 24" wide, 12" deep, 30" tall with lower tray. Most are marked "FM-41" Contact K4RN 505-269-2056; dan@lobo.net

QSL Cards/Call Sign Novelties

WWW.THESIGNMAN.COM 888-426-8241

AFFORDABLE QSL CARDS, available in small quantities with lots of options. Parma Graphics, K2BKA, 5 Rondout Harbor, Port Ewen, NY 12466. 845-339-1996.

CALL SIGN NAME BADGES. Club logos our specialty. Certified ARRL engraver. Capital Engraving, 3109 Marigold St, Longview, Washington 98632-3415. Al, WA7UQE. capengrave@kalama.com. http://www.kalama.com/~capengrave/

EMBROIDERED HAM HATS $14.99 www.HOTPRESSTSHIRTS.COM

ENGRAVING: Callsign/name badges by WØLQV. Send for price list. Box 4133, Overland Park, KS 66204-0133. E-mail: w0lqv@arrl.net

FREE SAMPLES. The QSLMAN®, Box 73, Monetta, SC 29105. Phone/FAX (803) 685-7117 anytime. Email: w4mpy@qslman.com. Always 100% satisfaction guarantee on anything we do. Check the web site at: http://www.qslman.com

Get **Top Quality Full Color UV-Coated QSL Cards** direct from the printer. Chester QSL Cards is now Star Cards, Inc. Call (800) 748-7089 for info or visit www.star-cards.net

HANDCRAFTED OAK CALL SIGNS www.oakcallsigns.com 1-888-425-4332, KCØSDV

NAME TAGS BY GENE: In full color, our artwork or yours. See our web page for samples and prices. –**www.hampubs.com** Harlan Technologies 815-398-2683

OVERSEAS AIRMAIL POSTAGE plus complete line of airmail envelopes. Order directly from our web site – James E. Mackey, proprietor. www.net1plus.com/users/ryoung/index.htm

QSLKIT – CardBoxes – Dividers – MORE www.HamStuff.com by W7NN

www.quikcards.biz

General

ALUMINUM CHASSIS AND CABINET KITS. UHF-VHF Antenna Parts, Catalog E-mail: k3iwk@flash.net or http://www.flash.net/~k3iwk

ANTENNA COMPARISON REPORT: TRIBANDERS K7LXC & NØAX test Hy-Gain, KLM, CC, Bencher, Force 12, Mosley and others. $17 + $4 s/h. More info at www.championradio.com 206-890-4188

ANTENNA COMPARISON REPORT: VERTICALS. K7LXC & NØAX test CC, Butternut, MFJ, Force 12, Diamond, Hustler, GAP and other. $17 + $4 s/h. More info at www.championradio.com 206-890-4188

APRS Link Cables - for Garmin/Kenwood products - http://stores.ebay.com/Jabber-Electronics WE6G 480-905-8484

BEAM HEADINGS laser printout $20.00 Engineering Systems Inc., P.O. Box 1934, Middleburg, Virginia 20118-1934, w4het@aol.com

BIGGEST on-line ham classifieds: http://swap.QTH.com

CONTESTING with RCKLog www.RCKLog.de

DIGITAL FIELD strength meters: IC Engineering, http://www.digifield.com

ELECTRIC RADIO MAGAZINE: America's popular monthly publication devoted entirely to vintage amateur radio, military equipment, restorations, and radio history. Samples $1. Electric Radio, P O Box 42, Bailey CO 80421, www.ERmag.com

"EVERYTHING FOR THE MORSE ENTHUSIAST." **Morse Express**. Keys, keyers, kits, books. 303-752-3382. http://www.MorseX.com

FOR SALE: Arcom 706 MK IIG& simplex power supply SEC 1223. 321-213-6870, KM4XR

FOR SALE: GE Mastr Two-way radios and accessory items; 110 watt continuous duty repeater, will work on 2 meters. $800.00, 110 watt repeater, continuos duty, will work on 6 meters, $800.00. Base stations, 110 watt, VHF or low band, your choice $500.00 each. 100- watt continuos duty amplifiers, 2 meters, 6 meter, 440 MHz, $350.00 each. NEW GE/Ericsson MLS II UHF mobile radio with complete accessories, 40 watt, will do standard tone or digital tone or a combination of both, $225.00. Service Manuals from $35.00. Many hard to find GE and Motorola parts and accessories. Call anytime, 603-669-5771.

FREE!!! Ham Radio and other CD-Roms & Software disk catalog. **MOM 'N' POP'S SOFTWARE**, P. O. Box 15003-HA, Springhill, FL 34604-0111. 1-352-688-9108. momnpop@momnpopsware.com

Ham-M Rotor and Control Box. $175., K1BW. 413-538-7861

HEATHKIT AMATEUR RADIO REPAIR by RTO Electronics, 601 E 1st. St., Calexico CA 92231 269-468-7780. E-mail: hamtech@rtoham.com. www.rtoham.com

http://www.wb4aej.com/hamdomain

HY POWER ANTENNA COMPANY http://www.freewebs.com/hypower. Halfsquares, deltaloops,

LEARN CODE by Hypnosis, www.success-is-easy.com 800-425-2552.

MicroLog by WAØH .. Free download .. www.waØh.com

MORSE 0-20 WPM 90 days guaranteed! Codemaster V for IBM compatible PC $29.95. Morse Express, 800-238-8205. **http://www.MorseX.com**

PRINTED CIRCUIT BOARDS for projects shown in QST, QEX, HR, ARRL HB, 73 and more. Custom boards available. FAR Circuits, 18N640 Field Ct, Dundee, IL 60118; fax/phone 847-836-9148; www.farcircuits.net;, mail@farcircuits.net

REPEATERS, link systems, remote base, transmitters, receivers, 144/222/440. Available with basic to multi-port controllers. Two year warranty. Free catalog. Maggiore Electronic Lab., 645 Doe Run Road, Coatesville, PA 19320. 610-384-7555. www.hiprorepeaters.com

RFI Filters www.RFchoke.com

ROHN & NELLO Towers and Accessories, TENNADYNE: www.tennadyne.com, tennadyne@tennadyne.com, 616-868-9907

RoMAC 10 Band Equalizer. Turn your soundcard into a full featured equalizer. Details at www.romacsoftware.com $39.95 W8RJ

TEST EQUIPMENT AND MWAVE PARTS FOR SALE. WWW.A-COMM.COM PHONE 303-770-4855 EMAIL a-comm@earthlink.net

TOWER ACCESSORIES Gin Pole Kits - stand off brackets - antenna mounts - vehicle radio mounts for 30 years. IIX Equipment Ltd. 708-337-8172 www.w9iix.com

"WANTED: Azden AZ-21 HT repair: low TX/RX audio. Have manuals, circuit diagram. WB8VNV@arrl.net

WANTED: Hallicrafters SX-117 non-working or parts unit and speaker for same. John, W8JKS, 740-998-4518

WANTED: Motorola 30D coffin radio receiver FMTRU16V(A). WA6OAE, 805-736-5732

WANTED: VACUUM TUBES – commercial, industrial, amateur. Radio Daze, LLC, 7620 Omnitech Place, Victor, New York 14564, Phone: (585) 742-2020, Fax: (800) 456-6494, email: info@radiodaze.com

WANTED: Your inventory of quality new old stock items related to vintage electronics. Interested in transformers, chokes, connectors, sockets, shields, plugs, hardware, etc. Send us your list of items of which you have a meaningful quantity of each and we will promptly quote our offer. Radio Daze, LLC, 7620 Omnitech Pl., Victor, NY 14564. (585) 742-2020. Fax: (800) 456-6494. Email: info@radiodaze.com. Web: www.radiodaze.com

WE BUY/SELL RADIOS. #1 IN ESTATES – PROTECT YOUR INVESTMENT! www.recycledradio.com (603) 479-5854

www.SecondHandRadio.com Buy, sell, swap. Post your ad with photos for free.

YOU CAN LOG CONTACTS, manage QSLs, LoTW with DXtreme Station Log. www.dxtreme.com

AMSAT – WHO DECIDES THE FUTURE OF AMATEUR RADIO IN SPACE? YOU DO! Your membership in AMSAT will support exciting projects planned for launch in the years to come. In addition, you'll receive the bimonthly *AMSAT Journal* and substantial discounts on software distributed by AMSAT. Join now! Call 301-589-6062 or visit the AMSAT Web site at www.amsat.org. AMSAT®, 850 Sligo Avenue, Suite 600, Silver Spring, MD 20910-4703.

Index of Advertisers

Advertising Department Staff:

Debra Jahnke, K1DAJ, *Sales Manager, Business Services*
Janet Rocco, W1JLR, *Account Executive*
Lisa Tardette, KB1MOI, *Account Executive*
Diane Szlachetka, KB1OKV, *Advertising Graphic Design*

Toll Free: 800-243-7768
Direct Line: 860-594-0207 Fax: 860-594-4285
E-mail: ads@arrl.org Web: www.arrl.org/ads

For links to the Web sites of ARRL advertisers, visit www.arrl.org/ads/adlinks.html

Please patronize ARRL advertisers. Support those who support ARRL!

Your Customers are Reading...QST!

If your company provides products or services of interest to our Members, please contact the ARRL Advertising Department today for information on building your business.

QST Advertising Deadlines:

Issue	Reservation Date	Materials Due Date
November 2008	Tuesday, September 16, 2008	Friday, September 19, 2008
December 2008	Tuesday, October 14, 2008	Friday, October 17, 2008

MORE DEALS THAN YOU CAN SHAKE A STICK AT!

- Great Gear
- Great Deals
- Great Service
- Free UPS S/H!*

*On all radio orders shipped within the contiguous USA.

TEXAS TOWERS

Savings As Big As Texas!

Call for our new Ham Radio Catalog!

• Alpha-Delta • Ameritron • ARRL • Astron • Bencher • Butternut • Cal-Av • Comet • CQ • Cushcraft • Daiwa • Diamond • Force 12 • Gap • Glen Martin • Hustler • Hygain • Icom • Kantronics • Kenwood • Lakeview • Larsen • LDG Electronics • M2 • MFJ • Mirage • Palstar • Phillystran • Rohn • Tex-Com • Times Microwave • Unadilla • Universal Tower • US Tower • Vibroplex • Yaesu

KENWOOD

KENWOOD TS-2000

Huge Band Coverage, All Mode HF/6m/2m/70cm, Auto Tuner, CW Memory Keyer, Dual RX, Dual DSP, Built-In TNC, TCXO, and Much More!

$80 KENWOOD COUPON!

KENWOOD TS-480SAT

Mobile Performance, All Mode HF/6m, Automatic Tuner, Separate Front Control Panel, 16-Bit DSP, CTCSS Encode/Decode, Much More!

$180 KENWOOD COUPON!

KENWOOD TM-D710A

Mobile 2m/70cm FM XCVR With Built-In TNC, Separate Front Control Panel, CTCSS Encode/Decode, 1000 Memory Channels, and Much More!

CALL FOR YOUR LOW PRICE!

TIMES LMR COAX

High performance coax cable. Lower loss than RG-213/U without the water displacement problems common to 9913 and 9086 types.

HUGE LMR STOCK, CALL!

cushcraft

CUSHCRAFT X7

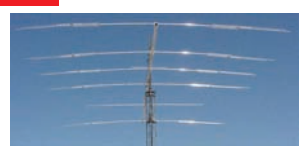
Seven element triband beam with optional 40m kit. Trapless, computer optimized design offers excellent gain and clean radiation pattern.

CALL FOR CUSHCRAFT!

ALUMINUM TUBING

O.D.	WALL	COST/FT.
6063-T832 DRAWN ALUMINUM TUBING		
.375"	.058"	$1.00
.500"	.058"	$1.10
.625"	.058"	$1.20
.750"	.058"	$1.30
.875"	.058"	$1.40
1.000"	.058"	$1.50
1.125"	.058"	$1.65
1.250"	.058"	$1.85
1.375"	.058"	$2.05
1.500"	.058"	$2.25
1.625"	.058"	$2.55
1.750"	.058"	$2.80
1.875"	.058"	$3.05
2.000"	.058"	$3.30
2.125"	.058"	$3.80

M2



M2 KT-36XA

Six element triband beam. Computer optimized for maximum performance, with dual driven elements for flat match and broad gain. Five elements are active on 15 and 20m, all six are active on 10m. Supplied with 3000W balun.

CALL FOR M2 ANTENNAS!

Yaesu G-1000DXA

ANTENNA ROTATORS

Hygain, CD-45II..... $369
Hygain, Ham-IV $509
Hygain, Ham-V..... $849
Hygain, T2X $569
Hygain, T2X Digital $929
Hygain, HDR-300A $1269
M2, OR-2800PX..... $1379
Yaesu, G-450A..... $249
Yaesu G-550..... $299
Yaesu, G-800SA..... $329
Yaesu, G-800DXA..... $409
Yaesu, G-1000DXA $499
Yaesu, G-2800DXA $1089
Yaesu G-5500 ..... $599

ROTOR CABLE IN STOCK!

US TOWER CORPORATION

TX SERIES

Heavy Duty Crankup towers, self-supporting heights range 38 to 106 feet. Supports up to 37 square feet of antenna wind load.

HDX SERIES

Extra heavy duty crankup towers. Self supporting heights from 38 to 106 feet. Support up to 70 square feet of antenna wind load.

We Ain't Braggin'

But we've helped so many Hams order US Towers over the years that we've become the US Tower experts. Please call for help selecting the perfect US Tower for your QTH!

Universal

B-18 SERIES

Light duty aluminum self supporting towers. Five models rangeing from 30 to 50 feet in height, and support up to 12 square feet of antenna wind load.

CALL FOR MORE INFO!

B-26 SERIES

Medium duty aluminum self supporting towers. Thirteen models ranging from 30 to 90 feet and support up to 34.5 square feet of antenna wind load.

CALL FOR MORE INFO!

B-30 SERIES

Heavy duty aluminum self supporting towers. Nineteen models ranging from 40 to 100 feet, and support up to 34.5 square feet of wind load.

CALL FOR MORE INFO!

TEXAS TOWERS

TOLL FREE **(800) 272-3467**

1108 Summit Avenue, #4 • Plano, TX 75074
Hours: M-F 9 AM–5 PM Central Time
Email: sales@texastowers.com

MASTERCARD
VISA • DISCOVER

Proudly Serving Ham Operators Since 1978!
Visit Our Website for More Great Deals:
http://www.texastowers.com

YOUR NUMBER FOR SAVINGS (800) 272-3467

- Great Gear
- Great Deals
- Great Service
- Free UPS S/H!*

*On all radio orders shipped within the contiguous USA.

TEXAS TOWERS
Savings As Big As Texas!

Call for Our New Ham Radio Catalog!

• Alpha-Delta • Alfa Spid • Ameritron • ARRL • Astron • Bencher • Butternut • Cal-Av • Comet • CQ • Cushcraft • Daiwa • Diamond • Force 12 • Gap • Glen Martin • Hustler • Hygain • Icom • Kantronics • Kenwood • Lakeview • Larsen • LDG Electronics • M2 • MFJ • Mirage • Palstar • Phillystran • Rohn • Tex-Com • Times Microwave • Unadilla • Universal Tower • US Tower • Vibroplex • Yaesu

ICOM

ICOM IC-7800
World Class, All Mode HF/6m XCVR, Huge 7" Color TFT-LCD Display with Bandscope Function, 32-Bit DSP, Auto Tuner, 200 Watts Output, CW & SSB Memory Keyers, and More!
CALL FOR YOUR LOW PRICE!

ICOM IC-756PROIII
World Class Performance. All Mode HF/6m XCVR, Big 5" Color TFT-LCD Display with Bandscope, 32-Bit DSP, Auto Tuner, and Much More!
$300 ICOM COUPON!

ICOM IC-746PRO
Affordable Performance. All Mode HF/6m/2m XCVR, Big LCD Display with Bandscope, 32-Bit DSP, Auto Tuner, More!
$50 ICOM COUPON!

ICOM

ICOM IC-7000
Mobile Performance, All Mode HF/6m/2m/70cm XCVR, 2.5" TFT-LCD Color Display with Bandscope, Built-in DSP, Built-in Voice Synthesizer, and Much More!
$200 ICOM COUPON!

ICOM IC-208H
Mobile 2m/70cm FM XCVR, Data Jack, Extended RX, CTCSS Tone Encode/Decode/Scan, DTCS Encode/Decode, 500 Memory Channels, More!
$20 ICOM COUPON!

ICOM IC-V8000
Rugged Mobile 2m FM XCVR, 75 Watts, Built-in CTCSS Tone Encode/Decode/Scan, 200 Memories, More!
CALL FOR YOUR LOW PRICE!

YAESU

YAESU FT-2000D
Competition Class, All Mode HF/6m XCVR, 32-Bit DSP, Auto Tuner, CW & SSB Memory Keyers, 200 Watts, and More!
$200 YAESU COUPON!

YAESU FT-2000
Built-In Power Supply, 100 W!
$100 YAESU COUPON!

YAESU FT-950
World Class Performance, HF/6m XCVR, 32-Bit Floating Point DSP, High Speed Auto Tuner, Built-in CW Keyer, and Much, Much More!
IN STOCK—FAST DELIVERY!

YAESU FT-450AT
Affordable Performance. Covers HF/6m. IF-Level DSP, Multi-color LCD Display, CW Keyer, Auto Tuner, and More.
$120 YAESU COUPON!

YAESU

YAESU FT-857D
Mobile All Mode Covers HF/6m/2m/70cm XCVR with Built-In DSP, CTCSS Encode/Decode, CW Memory Keyer. Optional ATAS-120A Antenna.
FREE YSK-857 REMOTE KIT!

YAESU FT-8800R
2m/70cm Dual Band Mobile. With AM RX, Cross-band RX, CTCSS Encode/Decode, Ext. RX, 1000 Memories and More.
FREE YSK-8900 REMOTE KIT!

YAESU FT-2800M
Rugged 2m Mobile XCVR. Features Special Front End Design to Reduce Intermod, Extended RX, 221 Memory Channels, and Much More.
$40 YAESU COUPON!

YAESU HTs
Rugged Single, Dual and Tri Band Models In Stock, Including the new VX-3R.
CALL FOR GREAT DEALS!

TEXAS TOWERS

1108 Summit Avenue, #4 • Plano, TX 75074
Hours: M-F 9 AM–5 PM Central Time
Email: sales@texastowers.com

TOLL FREE **(800) 272-3467**

Proudly Serving Ham Operators Since 1978!
MASTERCARD VISA • DISCOVER
Visit Our Website for More Great Deals:
http://www.texastowers.com

A TECHNOLOGY BREAKTHROUGH

MH-74A7A + FGPS-2*1	
SCALE	1/ 2

VX-8R	
SCALE	1/1
WEIGHT	8.5 oz

NEW

- All-in-one High-performance Tri-Band Transceiver with GPS/APRS® Operation *1
- Bluetooth® for Hands-free Operation *1
- Barometric Pressure and Temperature Sensors
- Waterproof/Submersible IPX7 rated – 3 feet for 30 minutes
- Dual Ham band Operation (V+V/U+U/V+U) while listening to AM/FM Broadcasts
- Wideband Receive for 500 kHz-999.99 MHz *2
- Completely independent AM/FM receiver included!
- Internal Bar Antenna for better AM Broadcast Band reception.
- Enjoy FM broadcasts in stereo, with your stereo headset/earphone!
- Optional 1 watt operation, using three AA batteries *1
- A large LCD backlit display in a compact case!
- Up to 9 hours *3 of Amateur Band operation with the optional FNB-102LI, high capacity Lithium-ion Battery.

50/144/(222)/430 MHz 5 W FM Transceiver
(50 MHz: AM 1 W; 222 MHz: 1.5 W (USA version Only))

VX-8R

The optional GPS unit can be attached to the radio.

*1 With optional accessories
*2 US Version - Cellular band blocked
*3 Assuming a duty cycle of 6-second transmit, 6-second receive, and 48-second standby (50 MHz 5 W)

* APRS® is a registered trademark of Bob Bruninga WB4APR.

For the latest Yaesu news, visit us on the Internet:
http://www.vertexstandard.com

Specifications subject to change without notice. Some accessories and/or options may be standard in some areas. Frequency coverage may differ in some countries. Check with your local Yaesu dealer for specific details.

YAESU
Choice of the World's top DX'ers℠

Vertex Standard
US Headquarters
10900 Walker Street
Cypress, CA 90630 (714)827-7600

KENWOOD

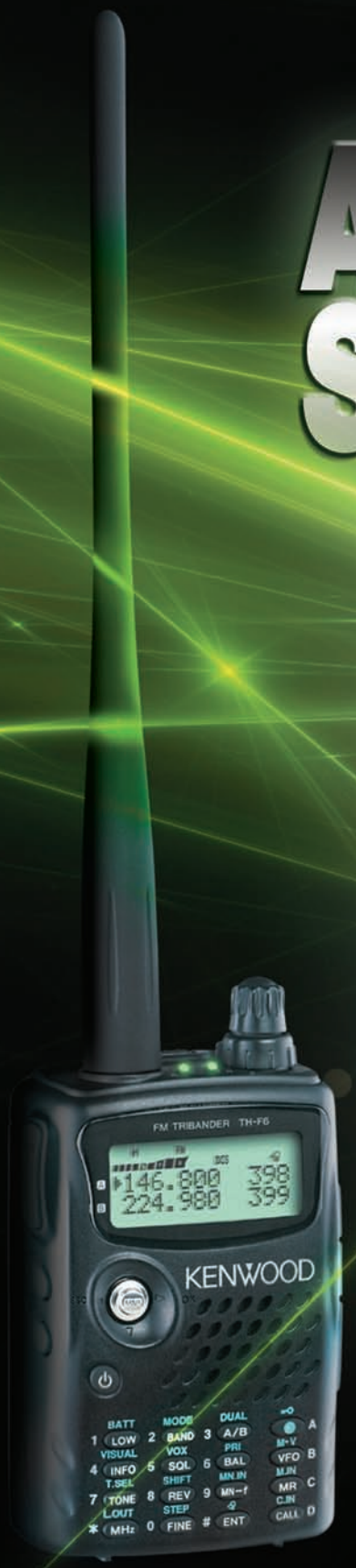
Listen to the Future

AIRWAVE SUPERIORITY

Never before has a compact HT offered as many features, and such high powered performance as the TH-F6A. Arm yourself with one today and gain your own airwave superiority.

- Triband (144/220/440 MHz)
- Receives 2 frequencies simultaneously even on the same band
- 0.1~1300MHz high-frequency range RX (B band)[1]
- FM/FM-W/FM-N/AM plus SSB/CW receive
- Bar antenna for receiving AM broadcasts
- Special weather channel RX mode
- 435 memory channels, multiple scan functions
- 7.4V 1550mAh lithium-ion battery (std.) for high output[2] and extended operation
- 16-key pad plus multi-scroll key for easy operation
- Built-in charging circuitry for battery recharge while the unit operates from a DC supply
- Tough construction: meets MIL-STD 810 C/D/E standards for resistance to vibration, shock, humidity and light rain
- Large frequency display for single-band use
- Automatic simplex checker
- Wireless remote control function
- Battery indicator • Internal VOX • MCP software

[1]Note that certain frequencies are unavailable. [2]5W output



TH-F6A
TRIBANDER

www.kenwoodusa.com

JQA-1205 091-A
ISO9001 Registered
Communications Equipment Division
Kenwood Corporation
ISO9001 certification

KENWOOD U.S.A. CORPORATION
Communications Sector Headquarters
3970 Johns Creek Court, Suite 100, Suwanee, GA 30024
Customer Support/Distribution
P.O. Box 22745, 2201 East Dominguez St., Long Beach, CA 90801-5745
Customer Support: (310) 639-4200 Fax: (310) 537-8235

ADS#31408