ICD 08241

Amateur Radio

http://www.cq-amateur-radio.com

CQ

SERVING AMATEUR RADIO SINCE 1945

JANUARY 2000

Now including

CQ VHF

CQ is Now Bigger and Better With More VHF Coverage

In This Issue:

- ***CQ Interviews:***
  "Riley the Enforcer" (p. 13)
- **Best Band Conditions in 8 Years! (p. 124)**
- **Build a Junk Box Power Supply (p. 38)**
- ***CQ Reviews:***
  Alinco DJ-V5 Dual-Band Handheld (p. 24)
- **Announcing the 2000 CQ World-Wide WPX Contest (p. 40)**

U.S. $3.99 / Canad

0 75470 08241 2

's Riley Hollingsworth, K4ZDH
(Details on p. 110)

THE RADIO AMATEUR'S JOURNAL

ICOM IC-706MKIIG

HF+6M+2M+70CM

(100W) (100W) (50W) (20W)

Icom's third generation IC-706 ...sweeping the world with proven performance, reliability and fun!

The IC-706MKIIG includes:
- All Mode, 100% Duty Cycle
- Unmatched Sensitivity In Its Class
- Icom's "Smart Menu" System
- Graphic Window for System Status
- SSB and CW Plug & Play Filter Options

and many more "Out of this World" features!

ICOM Connect 2000

Offer valid until 12/31/99* **$50 SAVE**

ACTUAL DIMENSIONS: 6.6"(W) X 2.3"(H) X 7.9"(D), 5.5 LBS

Call for a free brochure: 425-450-6088

BAND	70cm 440-450 MHz	70cm 430-440 MHz	70cm 420-430 MHz	2M	2M	2M	6M	6M	6M	10M	10M	10M, 15M 40M, 80M	10-160M
MODE	FM & Packet	Satellite SSB & CW	ATV & Digital + PSK 31	FM & Packet+ PSK31	SSB	CW	FM & Packet+ PSK31	SSB	CW	FM & Packet	SSB	CW	CW, SSB, & Data
SATELLITE	N/A	3000 + Miles	N/A	World Wide Digital	*1 3000 + Miles	*1 3000 + Miles	N/A	N/A	N/A	N/A	N/A	*2 3000 + Miles	*2 3000 + Miles
DX	N/A	2000 Miles	N/A	Yes, Computer	1000+ Miles**	1000 Miles**	3000 Miles**	3000 Miles**	3000 Miles**	World Wide**	World Wide**	World Wide**	World Wide**
REPEATER	100 Miles	N/A	80 Miles	80 Miles+	N/A	N/A	100 Miles	N/A	N/A	N/A	N/A	N/A	10 Meters+ =100 Miles
SIMPLEX	75 Miles	100 Miles	50 Miles	10 Miles	200 Miles	200 Miles	15 Miles	125 Miles	125 Miles	10 Miles	40 Miles	40 Miles	50 Miles
MINIMUM LICENSE	No Code Tech			No Code Tech			No Code Tech			Novice & Technician +			General

Receive 30kHz-199.99MHz • 400-470MHz

*1 = Mode A 2M/10M Semi Duplex
*2 = Mode K 15M/10M, Semi Duplex
** = E-Layer Summertime Range (Sporadic E-Skip)
+ = Typical World Wide Possible
N/A = Not a Usual Use

ICOM
www.icomamerica.com

LEGACY

ICOM IC-746

HF/6M/2M with IF-DSP and 100 Watts, Even On 2 Meters

PC Remote Control
Windows™ software, RS-746, developed by ICOM

Pull out more signals. DX'ing? Even faint signals buried in noise can't hide from the '746's adjustable IF-DSP noise reduction.

Eliminate adjacent channel interference with Twin Passband Tuning, 3 optional filter slots (front panel selectable), and a selectable DSP Audio Peak Filter (320/160/80 Hz). The '746's DSP Auto Notch eliminates multiple heterodyne signals.

One look at the large LCD display says it all. A glance "above the line" instantly lets you know all operating conditions and settings. Look "below the line" for menu selection, 5 soft key functions (which vary with the menu), passband width, and a band scope to search for signals.

SAVE $200

NOW IN STOCK

see your ICOM dealer for details

limited time special savings

***QST* bottom line:**
"An impressive transceiver for HF, 50 MHz and 144 MHz work. With loads of those features desirable to the serious HF operator *and* all modes at 100 W on both 6 and 2 meters, the IC-746 is a fine choice in a mid-priced rig."
– *QST*, September, 1998

SPECIFICATIONS

Transmit: ..... HF/6 Meter/2 Meter, 100% Duty Cycle
Receive: ..... 30 kHz-60 MHz, 108-174 MHz Quadruple conversion superheterodyne
Mode: ..... AM, FM, FM-N, SSB, CW, RTTY
Power: ..... 5-100 Watts (2-40W, AM)
Power Supply Requirement: ... 13.8 V DC
Memory Channels: ..... 102 total, 99 regular, 2 scan edges, and 1 call
Size: ..... 11.3(W) x 4.7(H) x 12.5(D) in. 287(W) x 120(H) x 316.5(D) mm.
Weight (approx.): ..... 19 lb, 10 oz / 8.9 kg

FEATURES

- **IF-DSP (15.625 kHz)**
  - Noise Reduction
  - Automatic Notch Filter
  - Selectable Audio Peak Filter
- **Twin Pass Band Tuning (PBT)**
- **Multi-Function LCD Display**
  - Band Scope, Memory Names, Key Assignments, PBT Settings, Split Frequency, Memory Keyer Contents
- **3 Optional Filter Slots**
  - 2 for 9 MHz, 1 for 455 kHz
  - All Front Panel Selectable
- **Digital, Multi-Function Metering**
  - Signal Strength, RF Output, SWR, and ALC levels
- **Auto Antenna Tuner**
- **Speech Compressor**
- **Tone Squelch and Tone Scan**
- **Auto Repeater Duplex Setting for 2 Meters**
- **Quick Split Function**
- **Complete CW Functions**
  - 4 Ch. Memory Keyer
  - Electronic Keyer
  - CW Pitch Control
  - Full Break In (QSK)
- **VOX**
- **Voice Synthesizer (opt)**
- **Triple Band Stacking Register**
  - Remembers tuner selection, preamp, antenna, mode and frequency for last 3 frequency selections

Call Button
One touch recall of user programmed frequency and mode

RF Gain and Squelch
Programmable RF gain, squelch, or both

Continuously Adjustable Power Level
5-100 watts variable

3 Antenna Connectors
Two for HF & 6M, and one for 2M

Digital Metering (on LCD)
Measures three parameters, all at once

SmarTune™
Automatically senses how fast you want to tune by how fast the knob is turned

Quick RIT/XIT Access
with zeroing function for today's crowded bands

Built in Auto Antenna Tuner
No external antenna tuner is required for HF and 6M operation.

ICOM options required for PC operation:
CT-17 Level converter
RS-746 Windows™ Remote Control Software
OPC-478 Connection Cable

PC Ready!

ICOM Connect 2000

Get more out of your HF. Let the digitally-advanced '746 give you the edge, and still hand you the best of 6 & 2 meters. For a brochure, call **425-450-6088**

ICOM®

www.icomamerica.com

As we enter a new century, CQ *enters a new era—combining the best of* CQ VHF *magazine into a bigger, better* CQ. *Here's a thumbnail sketch of the changes you'll find, starting with this issue.*

Welcome to the New *CQ* (including *CQ VHF*)!

BY RICH MOSESON, W2VU
Editor, *CQ*

Welcome to a new year, a new century, a new millennium, and a new *CQ!* If this month's issue seems a lot fatter to you than last month's, it is—by nearly a third. And with good reason. As we announced last month, *CQ VHF* magazine has been merged into *CQ*, and the combined magazine now incorporates several columns and other features from *CQ VHF*. In addition, we've taken the advantage of the fact that we're reorganizing things anyway to add in a few new columns that hadn't been in either magazine before, but which represent areas of considerable interest among hams. And while we're at it, we decided to simplify a few column titles. Here's a thumbnail sketch of what's new and different, starting this month.

In the front of the magazine you'll see that we've added a news column to keep you up to date on important developments in amateur radio. We will also be introducing several interactive features from *CQ VHF* over the next few months, including an "Op-Ed" column, "Q&A," "Reader Feedback," and periodic reader surveys.

Columns moving over from *CQ VHF* include "Beginner's Corner" by Peter O'Dell, WB2D; "How it Works" by Dave Ingram, K4TWJ (who will continue to do his "World of Ideas" column plus a new one we'll introduce below); "Amateur Television" (formerly "In Focus") by Ed Manuel, N5EM; "Public Service" (formerly "In the Public Interest"), by Bob Josuweit, WA3PZO; "Antennas," by new columnist Arnie Coro, CO2KK; and "Amateur Satellites" (formerly "Orbital Elements"), by another new member of our staff, Phil Chien, KC4YER.

The additions to our column line-up include: "QRP" (low-power communication), by Dave Ingram, K4TWJ (alternating with "How it Works"); a "Radio Classics" column by Joe Veras, N4QB; and a computers/Internet column by Don Rotolo, N2IRZ. In addition, John Dorr, K1AR's "Contest Calendar" is being renamed "Contesting" to reflect the fact that it's much more than just a contest calendar. Finally, beginning in April, the "Digital Dipole" column by Karl Thurber, W8FX, will be retitled "What's New" and will incorporate "CQ Showcase," taking a monthly look at all sorts of new and interesting goodies for the active ham, not just those relating to antennas and software. Other than that, there are *no changes to existing* CQ *columns.*

Our schedule right now calls for K4TWJ's "How it Works" and "QRP" columns to take turns, starting this month with "How it Works." CO2KK's antenna column also begins this month, and will alternate with "Amateur Satellites," which will be launched in the February issue. "Amateur Television," "Radio Classics" and "Computers and Internet" will rotate quarterly, starting with "Amateur Television" this month, followed by "Radio Classics" in February and "Computers and Internet" in March.

So pull up your favorite reading chair, relax, and enjoy this expanded and better-than-ever issue of *CQ*. And welcome to the 21st century (even if you think it doesn't start 'til next year)! ■

New *CQ* Columns

Title	*/**	Author	Freq.	First Issue
Amateur Satellites	*	Phil Chien, KC4YER	S	Feb.
Amateur Television	*	Ed Manuel, N5EM	Q	Jan.
Antennas	*	Arnie Coro, CO2KK	S	Jan.
Beginner's Corner	*	Peter O'Dell, WB2D	M	Jan.
Computers & Internet	**	Don Rotolo, N2IRZ	Q	Mar.
How it Works	*	Dave Ingram, K4TWJ	S	Jan.
Public Service	*	Bob Josuweit, WA3PZO	M	Jan.
QRP	**	Dave Ingram, K4TWJ	S	Feb.
Radio Classics	**	Joe Veras, N4QB	Q	Feb.

** = Column moved from CQ VHF / ** = new column*
M = monthly / S = semi-monthly / Q = quarterly

Table I– Here at a glance is a "scorecard" of the new columns that will be gracing the pages of CQ, *most starting this month. Some (marked with one *) have moved over from* CQ VHF*; others (marked with two ** s) are completely new. We hope you enjoy them all.*

An APRS® transceiver built for tomorrow's communication needs with advanced features available today.

NEW!

TM-D700A DATA COMMUNICATOR 144/440MHz FM Dual Bander

Conspicuous with its extra-large amber & black display, Kenwood's new TM-D700A is fully equipped to make the most of the exciting opportunities offered by the Kenwood Skycommand System, SSTV, GPS and APRS® –the Automatic Packet/ Position Reporting System that is rapidly gaining popularity worldwide. This mobile transceiver with built-in TNC offers a wide range of data communications options, including simple packet operation using the AX.25 protocol. You can also send and receive SSTV images using Kenwood's VC-H1. Ham radio is truly entering a new era.

APRS® (Automatic Packet/Position Reporting System)

- **Position/directional data**
  With an NMEA-0183 compatible GPS receiver you can transmit position data for automatic calculation of distance, current speed and heading. Last 4 digits can be masked for position ambiguity. Manual input of latitude/longitude is also possible.
- **Versatile messaging**
  Transmission of position data can be accompanied by a choice of programmable status text (up to 28 characters), position comments (15 settings), icons and bulletins. For added messaging flexibility, individual alpha messages (up to 64 characters) can also be sent.
- **Station list**
  Store received APRS® data in up to 40 station reports.
- **Grid square locator**
  Position data is displayed on the grid square locator for visible reference.
- **BCON TX interval (0.2/0.5/1/2/3/5/10/20/30 min.)**
- **Packet path selection for Digipeat**
- **Weather station & PHG data reception**
- **Digipeat station and DIGI function capability**
- **Auto Message Reply**
- **Audible APRS® message receive (call sign) notification (requires VS-3)**
- **Waypoint position data output**

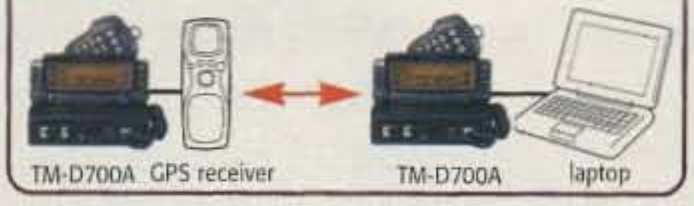
FEATURES

◗ Full Dual-band operation: VHF x VHF/ VHF x UHF/UHF x UHF ◗ Wide-band receive: 118–524, 800–1300 MHz (excluding cellular blocked + frequencies) ◗ Detached panel (extension cable and panel holder supplied) with extra-large (188 x 54 dots) backlit LCD and multifunction key display (reversible) ◗ Improved key operation announcement with optional VS-3 voice synthesizer ◗ Built-in 1200/9600bps TNC compliant with AX.25 protocol and KISS mode ◗ Simplified packet monitoring ◗ SSTV functions with Fast FM for transmission of images in just 14 secs (approx.) and dual receive for voice and image transmissions (two frequencies simultaneously) ◗ 200 memory channels with 8-character memory name input ◗ Up to 10 programmable memory scan banks ◗ Easy-to-use menu system similar to the TH-D7A ◗ Built-in DCS (Digital Code Squelch) and CTCSS encode and decode ◗ CTCSS tone frequency scan ◗ DCS code scan ◗ 9600bps PC-based packet communications for chat, BBS ◗ Kenwood Skycommand System (KSS) II for remote control of fixed HF transceiver (TS-570S/D(G) or TS-870S) ◗ DX packet cluster monitoring ◗ Cross-band repeater ◗ Wireless remote controller ◗ 1750Hz tone burst ◗ D-sub 9 pin terminal (for PCs) ◗ GPS input terminal (NMEA-0183) ◗ Visual band scope ◗ Mute function ◗ Memory control program available via Internet access ◗ New backlit microphone with alphanumeric message input.

NOTICE:

The TM-D700A has not been approved by the F.C.C. This device is not, and may not be, offered for sale or lease, or sold or leased until the approval of the F.C.C. has been obtained. Pending approval in December, 1999.

Example A: with GPS receiver & laptop



Example B: with VC-H1

ISO 9001
JQA-1205

Communications Equipment Division
Kenwood Corporation
ISO9001 Certification

KENWOOD

Amateur Radio Products Group

KENWOOD COMMUNICATIONS CORPORATION
AMATEUR RADIO PRODUCTS GROUP
P.O. Box 22745, 2201 E. Dominguez St., Long Beach, CA 90801-5745, U.S.A.
Customer Support/Brochures (310) 639-5300

KENWOOD ELECTRONICS CANADA INC.
6070 Kestrel Road, Mississauga, Ontario, Canada L5T 1S8

99ARD-1950

INTERNET

Kenwood News & Products
http://www.kenwood.net
Kenwood Bulletins
ftp://ftp.kenwood.net

CQ now including CQ VHF

JANUARY 2000 VOL. 56, NO. 1

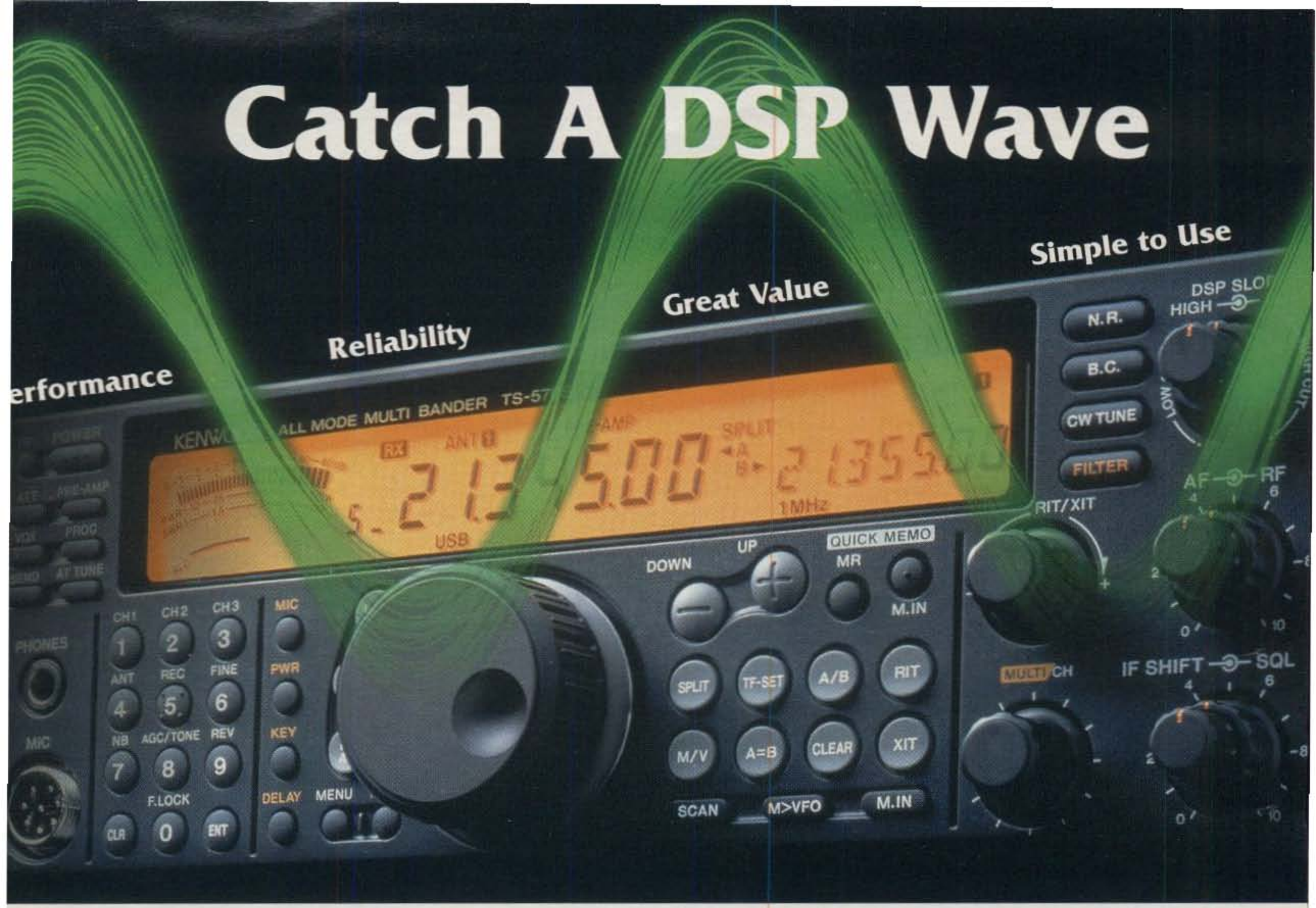
FEATURES

page 22

page 46

DEPARTMENTS

Catch A DSP Wave



TS-570D(G) HF TRANSCEIVER/TS-570S(G) HF + 6M TRANSCEIVER

Kenwood has not been standing still since the introduction of the TS-570D/S HF Transceiver last year. Now you can command even more of Kenwood's advanced DSP technology with the G model.

The **DSP** filters and extracts signals with digital technology that is unmatchable with standard analog circuits. It provides **CD-class transmit and receive audio quality** that can be shaped to your needs, and two powerful noise reduction systems: **Line Enhancer Method** for SSB/AM modes, and **Speech Processing by Auto Correlation** (SPAC) for CW mode. DSP also enables the **CW-Auto Tune** feature that automatically zero-beats CW signals.

The **Extensive Memory Functions** provide a bank of 100 memory positions split into 90 standard channels for general operation and 10 for programmable VFO, programmable scan and long-term memory. Memory contents can be scrolled, copied or locked out. In addition there are **5 quick memories** for storing frequencies and modes on the fly, perfect for the busy DX contester.

The powerful **Menu System** incorporates **46 menu features** and an **on-line guide** for instant reference. The **large amber backlit LCD display** provides 4 light levels for clear readability under any lighting conditions.

The TS-570D/S has no shortcomings in the construction and performance area. The **continuous-duty 100 watt transmitter** incorporates a large heavy-duty heat sink with integrated cooling fan for non-stop operation even under extreme environmental conditions. The **wide-band receiver** is rock-stable from 500 kHz through 30 MHz with **dual pre-amps** and **dual bandpass filters** for exceptional selectivity and sensitivity.

With the features and performance of a high-end radio integrated into an affordable mobile-size package, the TS-570D/S is the perfect choice for the field or to build a full station around at home.

- ***FREE* operating manual via FTP site**
  ftp://ftp.kenwood.net
- Beat cancel
- 2 position antenna switch
- CW auto tune adjust (a world's first)
- Channel scan, program band scan, memory scan with channel lock-out and group channel scan, all with TO (time operated) or CO (carrier operated) resume modes
- Compact 10-5/8 inch by 3-3/4 inch front panel size for any travel or installation requirement
- Preset auto antenna tuner with 18 sub-bands
- Variable electronic keyer (0 and 100 wpm)
- Packet and FSK features
- RCP-2 software for PC-based display and memory configurations available via the Internet
- Full functionality on 6M (TS-570S) including DSP, 100 watts output and preset Auto Antenna Tuner

TS-570D/S (G) new features

■ TX sound quality monitor with 9-step monitor volume for absolute control over voice quality ■ NR1 (SSB) is operator controllable in 9-step increments, or automatically tracks input signal strength ■ New CW DSP Filters (80 Hz, 150 Hz and 500 Hz) give you a total of 11 user-selectable filters ■ NR1 and NR2 settings can now re-configure automatically when changing mode groups (SSB/AM/FM to CW/FSK) ■ Manual weight feature (with built-in electronic keyer) for adjusting the relative length of dots and dashes in 16 steps between 1:2.5 and 1:4.0 ■ Equalize receive signals, and use different settings for both TX and RX ■ "One-touch" DSP filter wide mode allows 'resurfacing' to check the band conditions when operating in narrow mode ■ Dual selectable Beat Cancel (BC) works against intermittent beat interference (except in CW mode) ■ CW auto tune mode links only with the RIT frequency without changing the transmit frequency.

Advance Technology Upgrade is available in new production models and for pre-existing TS-570D/S; contact you dealer for details.

ISO 9001
JQA-1205
Communications Equipment Division
Kenwood Corporation
ISO9001 certification

KENWOOD
Amateur Radio Products Group

KENWOOD COMMUNICATIONS CORPORATION
AMATEUR RADIO PRODUCTS GROUP
P.O. Box 22745, 2201 E. Dominguez St., Long Beach, CA 90801-5745, U.S.A.
Customer Support/Brochures (310) 639-5300
99ARD-1871-SCV/#033099

INTERNET
Kenwood News & Products
http://www.kenwood.net

Zero Bias

An Editorial

Happy new year, and welcome to the future. For at least the past 50 years, prognosticators peering into the distant future have been predicting what life will be like "in the year 2000." Well, it's here, folks. The future is now, and our cars still drive on the ground, most of us don't have personal helicopters, most of our houses are not fully-automated, and most of our homes are still heated by fossil fuels (as opposed to, say, backyard nuclear reactors). Reality, it seems, didn't read those predictions and doesn't match up with the "seers'" perceptions of what the future would be like.

Of course, perceptions and reality often don't match up, even in the present tense. For example, if you base your perception of current-day America on what you see and hear in broadcast advertising, you'd assume that most people today make most of their purchases online. It seems that nearly every other commercial on the TV or radio is for this "dot-com" or that "dot-com," or maybe a "dot-com" to help you sort through the maze of dealing with all those other "dot-coms." Someone arriving in America after, say, five years in Nepal, would assume from these ads that most people, most of the time, use the internet to pay bills, to do banking, and to buy stocks, books and CDs, toys, airline tickets, hotel rooms, mortgages, and who knows what else. This is exactly the perception all of the "dot-com" advertisers are trying to create in the hope that you'll "join the crowd" and start doing business online "just like everybody else."

There's only one little problem here: According to the latest government statistics, only 33% of Americans have internet access, either from home or from someplace else. This means that two thirds of the nation's consumers couldn't buy toilet paper online, even if they wanted to. Plus, of these 33% of Americans who *do* have internet access, fewer than half have *ever* made an online purchase. Overall, this means that about 15% of Americans have made at least one online purchase. That's pretty impressive, but it also means that *85% of Americans have never bought anything online.* Now these statistics are a couple of years old, so let's *double* them. The 15% becomes 30%, and you still have at least *70% of Americans who have never made a single online purchase.*

Let's look at e-commerce's biggest "success story"—amazon.com. The online bookseller has never turned a profit. In fact, in the third quarter of 1999 it *lost* $86 million, or *nearly $1 million a day!* But investors push and shove to buy a piece of it, because they buy into the perception that the internet is the place to put your money.

We hams seem to have bought into this internet myth as well. A recent headline in the *Palm Beach Post* read, "Ham Operators Dwindling," followed by a second-page head of "Many blame internet for drop in hams." The article itself starts out saying, "There's a worldwide shortage of hams . . . " and was primarily about the difficulty that officials in south Florida had during Hurricane Floyd in finding enough active hams to staff evacuation shelters. The reporter said Palm Beach County RACES Coordinator Dennis Hamilton told him that "younger retirees —along with the general public—are moving away from ham radio . . . and toward its successor: the internet."

This perception—that the number of active hams is dropping and that the internet is replacing amateur radio—is widespread among hams, who in turn spread the story to the news media and the general public, further reinforcing the perception that ham radio is in decline.

Now let's look at reality. The number of hams is not "dwindling." There continue to be more new hams entering the hobby each year than those who die or let their licenses lapse. In 1997, we had well over 700,000 licensed hams —more than double the number of licensees just two decades earlier, in 1978. The rate of growth has slowed, to be sure, but how much of that is due to dealing with larger base numbers? If we'd gotten 35,000 new hams licensed in 1979, that would have been a 10% increase over 1978. License that same number in 1998 and it's only a 5% increase. Same with age. The median age of hams is rising steadily. Why? Two reasons: (1) the median age of our population is rising at about the same rate; and (2) many new hams are coming from the ranks of the recently-retired, artificially pushing the age statistics upward.

I could go on with other examples of how the commonly-held perceptions of a hobby in decline are wrong, but that won't help the real problem here, and that problem is that perceptions, right or wrong, often become reality. That's what the dot.com advertisers and investors are banking on—that if enough people buy into the perception that the internet is *the* place to do business, then they'll actually start doing more business there. Once that happens, they're hoping that a snowball effect will change perception into reality. Well, the same rules of advertising apply to ham radio, and they work just as well in the negative direction as in the positive. If we tell enough people enough times that ham radio is dying, they'll see no point in joining or staying active in "a dying hobby," and this perception, too, will become reality.

How can we change this perception? The answer is simple and difficult at the same time. The simple part is this prescription: Use the same techniques responsible for creating a negative perception about ham radio to start creating a positive perception. There are positives and negatives to everything, so stop griping and talk up the good stuff. For example, I'm writing this just after the 1999 CQ World-Wide DX Contest (SSB). My "horizontal Vee-beam sloper dipole" antenna wouldn't give me a decent match on 40 or 15 meters, and while I managed to fool the rig into thinking I had a decent SWR on 80, 20, and 10 meters, I couldn't fool many stations out there into thinking I had an audible signal. Nevertheless, the bands were sizzling, and my "below the noise" signal managed to get through here and there. So I have a choice: I can either gripe about the fact that only about 1 in 20 (1 in 50?) stations that I heard could hear me, or I can marvel at the fact that even though I clearly had a minimal station on the air, I managed in the course of the weekend to work 41 countries on five continents (I couldn't get through to Asia.), 10 and 20 meters seemed to be open to everywhere all at once, and there were points at which I could hear stations on five continents on the same band at the same time. Which one do you think creates the better perception, the better image, of ham radio? Which one might stimulate your interest in our hobby if you weren't already a ham? As I said, this is the easy part.

So what's the hard part? Making it happen. Accepting personal responsibility for the future of our hobby. It's up to each and every one of us to start talking up what's *good* about ham radio and to stop focusing on the negatives. It's not up to the ARRL. It's not up to *CQ*. It's not up to the club's publicity chairman. It's not up to anybody *else*. It's up to you. And me. And each one of our fellow hams. We need to think about what we're saying about ham radio—on the air, on the internet, in person—and think about the image our words create. Are we sharing the excitement of sitting in our houses and talking all over the world? Or are we complaining about our stations' deficiencies, bad-mouthing each other, and painting an otherwise gloomy picture of our hobby's future?

BIG THUNDER SERIES

10, 15, 20 Meters
9 Elements on a 28 ft (8.6m) Boom
Optional 40 Meter Kit

X9

X7

10, 15, 20 Meters
7 Elements on an 18 ft (5.5m) Boom
Optional 40 Meter Kit

Boom to Mast Clamp

Element to Boom Mounting

The Performance Tribander for the DX Years Just Ahead

- **New High Efficiency Computer Optimized Design for Maximum Gain and Ultra Clean Radiating Pattern**
- **100+ MPH Construction for Best Reliability and Long Life**
- **NEW *4L Log Cell* Driven Elements for better VSWR Bandwidth**
- **Trapless Driven Elements and Reflectors for Reliable Power Handling**
- **Interleaved Element Design for Mono-Band Performance**
- **Add-on kits available for 40 Meters**

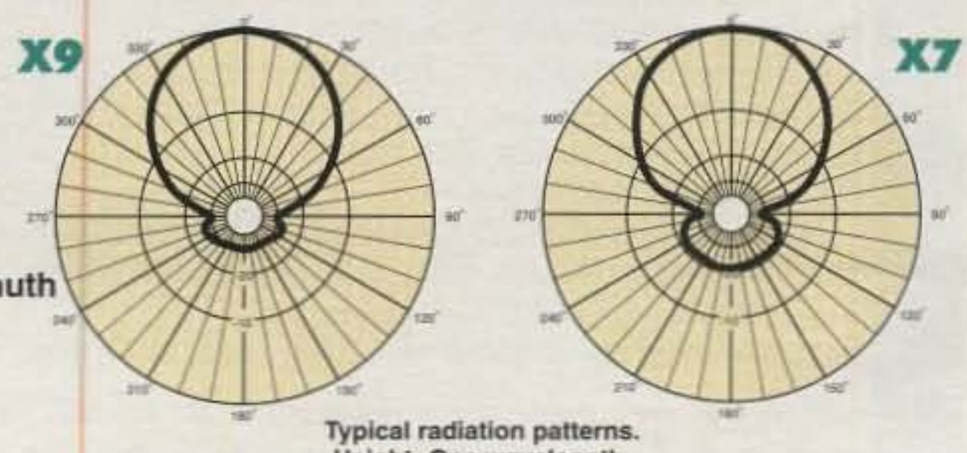
The new X9 and X7 Triband Yagis are geared to set new standards in both radiating performance and mechanical reliability. Cushcraft's product development team has employed the latest computer modeling technology to achieve a superior electrical design as well as elegant new mechanical hardware and assembly techniques.

Each mechanical component was designed to 100+ MPH wind survival with a 1.25 safety factor. Traps were eliminated from the high current driven elements and reflectors using the new *4L Log Cell* design, which yields virtual monoband performance and maximum power handling capability. Traps are employed only in the lower current directors for increased gain and sharper pattern. The result is a truly high performance antenna family which will easily handle the legal limit.

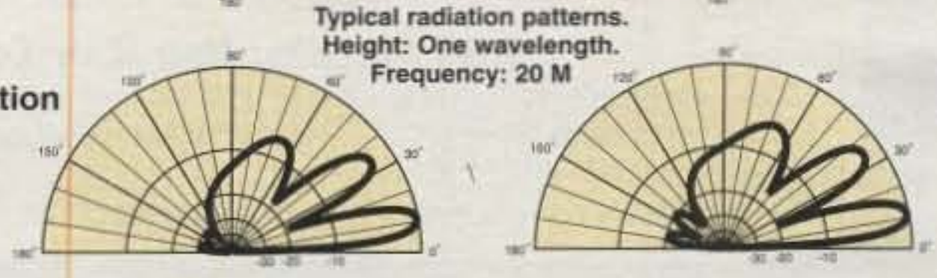
SPECIFICATIONS		X9	X7
Frequency Coverage (Meters)		10, 15, 20	10, 15, 20
Total number of Elements		9	7
Maximum Gain (dB)	20M	13.0 @ 14 deg	12.5 @ 14 deg
@ One Wavelength	15M	13.9 @ 12 deg	13.0 @ 12 deg
	10M	14.0 @ 15 deg	12.9 @ 14 deg
Maximum Front to Back Ratio (dB)		30	30
Number of Elements per Band		4	3
VSWR Minimum		1.1:1	1.1:1
VSWR 1.5:1 Bandwidth (KHz)	20M	350	600
	15M	450	750
	10M	1500	1700
Longest Element, ft (m)		36.5 (11.12)	37.2 (11.33)
Turning Radius, ft (m)		21.7 (6.61)	20.0 (6.09)
Boom Length, ft (m)		28 (8.53)	18 (5.49)
Boom Diameter, in (cm)		2-1/2 (6.35)	2-1/2 (6.35)
Maximum Mast Diameter OD, in (cm)		2-1/2 (6.35)	2-1/2 (6.35)
Maximum Wind Survival, mph (kph)		>100 (>161)	>100 (>161)
Maximum Wind Surface Area, ft² (m²)		9.9 (.92)	7.9 (.73)
Windload @ 80 mph, lb (kg)		255 (116)	202 (92)
Maximum Power Handling (KW)		2	2
Weight, lb. (kg)		85 (38.5)	60 (27.2)
List Price		$995	$675

X9 **X7**

Azimuth



Elevation



Typical radiation patterns.
Height: One wavelength.
Frequency: 20 M

CUSHCRAFT
COMMUNICATIONS ANTENNAS

48 Perimeter Rd, Manchester, NH, USA 03103 • 603-627-7877 • FAX: 603-627-1764
Email: hamsales@cushcraft.com • Web Site: http://www.cushcraft.com

What do *you* enjoy about ham radio? Why do *you* choose the radio over the internet? There's magic in ham radio, but part of the magic is that it has to be shared. Don't keep it a secret.

Speaking of ham radio's future, we asked our columnists this month to take a look into the future of their special area of ham radio and tell us where they think that part of the hobby is heading. I'm going to take my last few paragraphs here to do a broad-brush look at where *I* think ham radio as a whole is heading (and I'm writing this before reading what most of our columnists have to say).

First and foremost, I think ham radio *has* a future, and a bright one. The internet will be put to use in a tremendous number of ways to support and improve ham radio, but it will *not* replace it. Next, we're going to be seeing much greater use of microprocessors and microcontrollers in and around our radios; the radios themselves will become more dependent on software to define what they do and how they do it.

Satellites will take on a greater role in ham radio, and will lead large numbers of hams to populate our microwave bands, which will be necessary if they're going to *remain* our microwave bands. Communicating with hams in space will become much more commonplace (think of it as a DXpedition). Here on Earth, repeaters will digitize our audio and be linked via high-speed microwave networks to do things we can only dream about now, and our digital networks will be upgraded (sharing the same bandwidth as the digitized voice signals) to transmit text, pictures, and sound at speeds even greater than the copper wires connected to your modem can handle.

On HF we could end up with *more* frequencies than we currently have, as commercial and government users migrate to microwave-based satellite systems. There will be innovations in antenna technology to expand the options of hams living in antenna-restricted areas, and we will see an increase in remote-base operation—perhaps via the internet—so hams who can't put up antennas at their homes will be able to remotely operate a rig set up where there are fewer limitations.

Finally, ham radio will continue to play a major role in public service and emergency communications. Anyone who thinks that cell phones and the internet will provide communication needs in a disaster (or even that they'll work) has his head in the sand. Anything that depends on the wired telephone network and the electric grid cannot be counted on when disaster strikes. Plus, our radios are only a part of our value in emergency communications. The other part is *us*. We're there to communicate and we're trained to do so quickly, concisely, and effectively. (If you're not trained, find your local ARES or RACES group and sign up now. These groups are always looking for new blood, and *you* need to know what to do if you're thrust into the role of emergency communicator.)

What will ham radio look like 25 years from now? As different as it looks today from 25 years ago. Will ham radio still be here 25 years from now? That, my friends, is up to *us*. 73, Rich, W2VU

K5RT New WAZ Award Manager

We are pleased to announce the appointment of Paul Blumhardt, K5RT, as *CQ*'s Worked All Zones (WAZ) Award Manager. Paul succeeds Jim Dionne, K1MEM, who passed away last year. A ham for nearly 30 years, Paul is an active and respected DXer and contester. He is on the ARRL's DXCC Honor Roll for Mixed, Phone, and CW; and he holds 5-Band DXCC, 5-Band Worked All States, and has 199 zones towards his 5-Band WAZ award. All WAZ correspondence should be directed to Paul at 2805 Toler Road, Rowlett, TX 75088, or via e-mail to: <K5RT@cq-amateur-radio.com>.

A publication of

CQ Communications, Inc.
25 Newbridge Road
Hicksville, NY 11801 USA.

Offices: 25 Newbridge Road, Hicksville, New York 11801. Telephone: (516) 681-2922. FAX (516) 681-2926. E-mail cq@cq-amateur-radio.com. Website:http://www.cq-amateur-radio.com. CQ (ISSN 007-893X) is published monthly by CQ Communications Inc. Periodical postage paid at Hicksville, NY and additional offices. Subscription prices (all in U.S. dollars): Domestic—one year $27.95, two years $49.95, three years $71.95; Canada/ Mexico—one year $40.95, two years $72.95, three years $110.95; Foreign Air Post—one year $52.95, two years $99.95, three years $146.95. U.S. Government Agencies: Subscriptions to CQ are available to agencies of the United States government, including military services, only on a cash with order basis. Requests for quotations, bids, contracts, etc. will be refused and will not be returned or processed.

Printed in the United States of America.
Postmaster: Please send change of address to CQ Magazine, 25 Newbridge Road, Hicksville, NY 11801.

Ham Radio News

From The CQ Newsroom

PK TERM Offered Free to Schools

Timewave Technology and Creative Services Software say any school with a club callsign is eligible to receive a free copy of PK TERM '99 packet software, according to Timewave Sales Manager John Douglas, NØISL, who says there are no strings attached. "Just e-mail us with your school call and a mailing address and we will do all the rest," he says.

PK TERM '99 software runs on Timewave and AEA TNCs and requires Windows 95/98. Douglas says Timewave will help find the proper software — also for free — for schools that have TNCs that won't run PK TERM. In addition, Douglas is looking for donations of old, non-working, PK-232 TNCs. "If it can be repaired," he says, "we will donate it in your name to a school that does not have packet/HF digital equipment, either a school of your choice or any one that has applied for equipment." For details, contact Douglas via e-mail at <jdouglas@timewave.com>.

Restructuring on FCC's "Front Burner"

By the time you read this, the FCC may already have handed down its long-awaited decision on amateur license restructuring. The ARRL reported in mid-November—just before this issue went to press—that knowledgeable sources in Washington said the restructuring issue had "moved to the front burner at the FCC" and that "a Report and Order could be released before the end of 1999."

More than 2,000 comments were received on the Commission's 1998 proposal to reduce the number of license classes from six to four, and to possibly reduce the code speed requirements for HF access. Watch *CQ*'s website <http://www.cq-amateur-radio.com> for updates. We will post the FCC's decision as soon as it is announced.

FCC: Partial Callsigns Illegal

Identifying on the air with only part of your callsign, a common practice among some DXers and net participants, is a violation of FCC rules, according to Riley Hollingsworth, K4ZDH, the Commission's Special Counsel for Amateur Radio. The statement comes in a letter to Alan Strauss, WA4JTK, of Carol City, Florida. The main point of the letter was to clarify the fact that all amateur frequencies are shared and that no one ham or group of hams has any greater right to a given frequency than any other. "A net 'taking over' a frequency from existing legitimate communications, or deliberately operating disruptively close to existing legitimate communications, will be considered to be engaging in deliberate interference," Hollingsworth wrote.

But the letter added, "We also take this opportunity to point out that the practice of identifying only by the last two letters of an Amateur call sign is a violation of Part 97 of the Commission's rules. A station identifying by only part of its assigned call sign is *not complying* with the clearly written rules regarding station identification..."

In other recent enforcement actions, the FCC ordered several hams to be retested at Commission offices, revoked the licenses of several other hams who did not appear for ordered retests, and issued several warning notices regarding deliberate interference and unlicensed operation. In addition, the FCC continued its ongoing inquiry into multiple club callsign holders, and affirmed its decision to suspend for six months the HF operating privileges of a North Carolina ham who it determined was causing interference on 80 meters.

Repeater Coordinators Must Consider Needs of All Hams

Repeater coordinators, beware. If you ignore the needs of repeater *users* and other hams sharing VHF and UHF bands, you are not doing your job properly and could be replaced. This warning comes in a letter from the FCC's D'Wana Terry, Chief of the Public Safety and Private Wireless Division of the Wireless Telecommunications Bureau, to California Congressman David Dreier, who had contacted the Commission on behalf of two constituents who objected to recent decisions of the Southern California Repeater and Remote Base Association (SCRRBA). The Public Safety and Private Wireless Division regulates amateur radio, along with other services.

In her letter to Dreier, Terry said the FCC's amateur rules make coordinators responsible to *all* hams who are authorized to be licensees of repeater or auxiliary stations, and wrote that "(a)n entity that considers the concerns only of repeater owners ... would not be considering the concerns of other users of spectrum affected by repeater operation and, therefore, would appear at odds with the definition of a frequency coordinator in the amateur service." Terry continued, "We envision that an entity not considering the concerns of other users of spectrum affected by repeater operation can be replaced by a broad base of local amateurs choosing another frequency coordination entity..."

The letter, based on a 1986 Commission ruling, did not suggest how such a choice might be made, but noted that multiple coordinators are permitted, although they must cooperate with each other "so that station licensees may make the most effective use of amateur service frequencies..." It is too early to tell what fallout, if any, will result from this letter, which seems to encourage hams to replace frequency coordinators whom they feel are unresponsive to their needs. The two hams whose Congressman contacted the FCC have already announced the formation of a competing 70 cm coordination group in southern California.

Jean Shepherd, K2ORS, SK

Radio legend Jean Shepherd, K2ORS, died on October 16 at age 78. Shepherd entertained millions of listeners during more than 20 years at WOR radio in New York City with his stories and the characters he created to inhabit them. The stories occasionally made reference to ham radio, and Shepherd was active on the air for many years. In addition to his radio program, Shepherd produced several television specials and wrote several books, including *In God We Trust, All Others Pay Cash* and *The Ferrari in the Bedroom*.

License Exam Fee Set at $6.65

The FCC has set the maximum fee for amateur license exams in 2000 at $6.66. The ARRL VEC and other volunteer examiner coordinators promptly set their fees at $6.65. The FCC sets a fee each October for the following year, based on the increase in the Consumer Price Index, or CPI, from September to September. The increase from 1998 to 1999 was 2.6%.

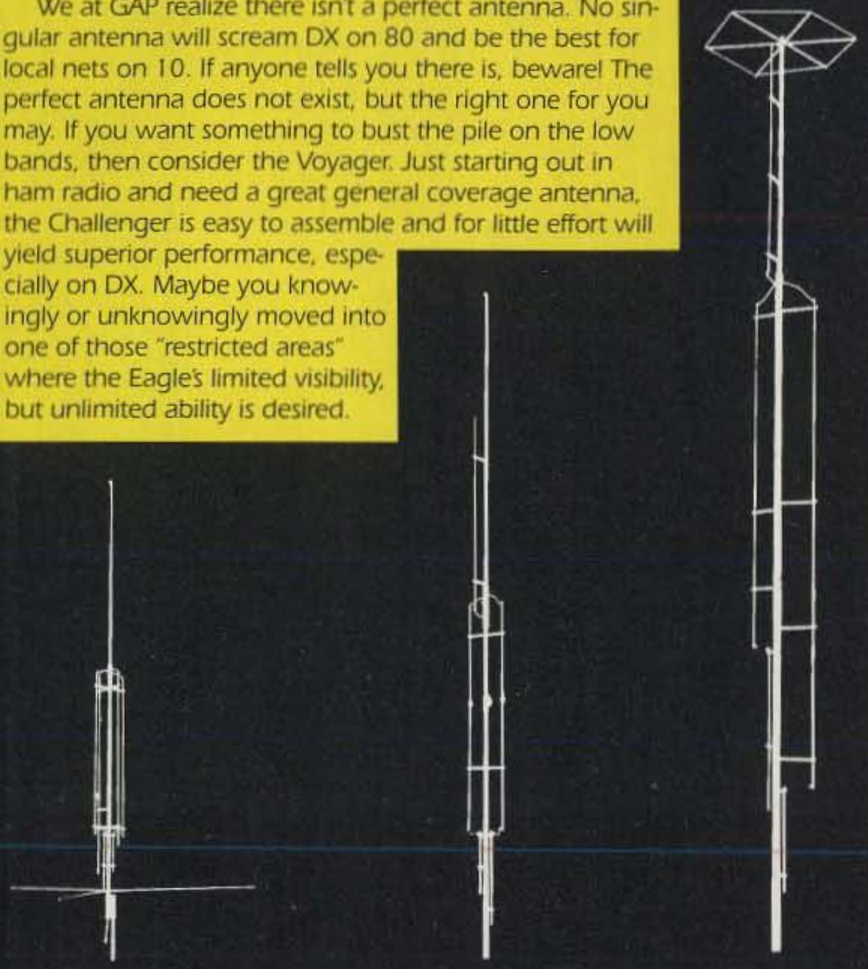
Vanity Call Website

Finally, the *ARRL Letter* reports that Michael Carroll, AA4BP, has set up a website devoted to vanity callsigns. Among other things, says the *Letter*, users may access a list of soon-to-be-available callsigns and may find out if someone has already applied for a particular call. The site may be accessed at <http://www.carroll-usa.com/vanity/>.

"Ham Radio News" will be a regular feature in *CQ* each month. Please send us your news items and "hot tips." You can reach our news desk directly via e-mail to <news@cq-amateur-radio.com>, or by postal mail to CQ Amateur Radio News, 25 Newbridge Rd., Hicksville, NY 11801. Always include contact information in case we need to ask you for more information.

GAP: The Perfect Antenna

We at GAP realize there isn't a perfect antenna. No singular antenna will scream DX on 80 and be the best for local nets on 10. If anyone tells you there is, beware! The perfect antenna does not exist, but the right one for you may. If you want something to bust the pile on the low bands, then consider the Voyager. Just starting out in ham radio and need a great general coverage antenna, the Challenger is easy to assemble and for little effort will yield superior performance, especially on DX. Maybe you knowingly or unknowingly moved into one of those "restricted areas" where the Eagle's limited visibility, but unlimited ability is desired.



Eagle DX | Challenger DX | Voyager DX

This chart helps you select the right GAP antenna. When comparing GAPs, bandwidth is not a concern. With few exceptions, a GAP yields continuous coverage under 2:1 for the **ENTIRE BAND**.

All antennas utilize a GAP elevated asymmetric feed. A major benefit is the virtual elimination of the earth loss, so more RF radiates into the air instead of the ground. This feed is why a GAP requires **NO RADIALS**. Just as elevating a GAP offers no significant improvement to its performance, adding radials won't either, making set up a breeze.

A GAP antenna has no traps, coils or transformers. This is important. The greatest sources of failure in multiband antennas are these devices. Perhaps you heard someone discuss a trap that had melted, arced or became full of water. Improvements to these inherent problems are the focus of the antenna manufacturer, while the basic design of the antenna remains unchanged. **GAP improved the trap by eliminating it!** Removing these devices means they don't have to be tuned and, more importantly, won't be detuned by the first ice or rain. The absence of these devices improves antenna reliability, stability and increases bandwidth.

Another major advantage to a GAP antenna is its NO tune feature. Screws are simply inserted into predrilled holes with a supplied nutdriver.

The secret is out and people in the know say:

CQ–"The GAP consistently outperformed base-fed antennas...and was quieter."

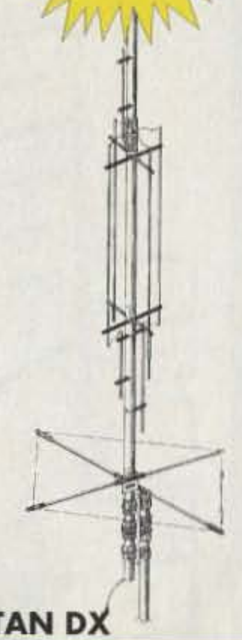
73–"This is a real DX antenna, much quieter than other verticals."

RF–"To say this antenna is effective would be a real understatement. Switching back and forth on 40m between another multiband HF vertical and the GAP, there was no comparison. Signals were always stronger on the GAP, sometimes by S units, not just DB's."

Worldradio – "These guys have solved the problem associated with verticals. That is, an awful lot of RF is wallowing around and dropping into the dirt instead of going outward bound. A half-wave vertical does need radials if it is end fed (at the bottom). But the same half-wave vertical does not (as much, hardly at all) if is fed in the center."

IEEE–"Near field and power density analyses show another advantage of this antenna (asymmetric vertical dipole): it decreases the power density close to the ground, and so avoids power dissipation in the soil below it. The input impedance is very stable and almost independent of ground conductivity. This antenna can operate with high radiation efficiency in the MF AM standard broadcast band, without the classical buried ground plane, so as to yield easier installation and maintenance."

Celebrating 10 Years 1989-1999



TITAN DX

This all purpose antenna is designed to operate 10m-80m, WARC bands included. It sits on a 1-1/4" pipe and can be mounted close to the ground or up on a roof. Its bandwidth and no tune feature make it an ideal antenna for the limited space environment as well as a terrific addition to the antenna farm.

MODEL	BANDS OF OPERATION											HT	WT	MOUNT	COUNTER-POISE	COST
	2m	6m	10m	12m	15m	17m	20m	30m	40m	80m	160m					
Challenger DX	■	■	■	■	■		■		■	■		31.5'	21 lbs	Drop In Ground Mount	3 Wires @ 25'	$279
Eagle DX			■	■	■	■	■		■			21.5'	19 lbs	1-1/4" pipe	80" Rigid	$289
Titan DX			■	■	■	■	■	■	■	■		25'	25 lbs	1-1/4" pipe	80" Rigid	$319
Voyager DX							■		■	■	■	45'	39 lbs	Hinged Base	3 Wires @ 57'	$399

GAP ANTENNA PRODUCTS INC.
99 N. Willow Street
Fellsmere, FL 32948

TO ORDER, CALL
(561) 571-9922

Come Visit Us At gapantenna.com

MasterCard VISA DISCOVER COD

Special HRO Holiday Discounts Off Our Already Low Prices!

HAM RADIO OUTLET

WORLDWIDE DISTRIBUTION

ANAHEIM, CA
(Near Disneyland)
933 N. Euclid St., 92801
(714) 533-7373
(800) 854-6046
Janet, KL7MF, Mgr.

BURBANK, CA
2492 W. Victory Bl., 91506
(818) 842-1786
(800) 854-6046
Eric, KA6IHT, Mgr.
Victory Blvd. at Buena Vista
1 mi. west I-5

OAKLAND, CA
2210 Livingston St., 94606
(510) 534-5757
(800) 854-6046
Mark, WI7YN, Mgr.
I-880 at 23rd Ave. ramp

SAN DIEGO, CA
5375 Kearny Villa Rd., 92123
(858) 560-4900
(800) 854-6046
Tom, KM6K, Mgr.
Hwy. 163 & Claremont Mesa

SUNNYVALE, CA
510 Lawrence Exp. #102
94086
(408) 736-9496
(800) 854-6046
Ken, K1ZKM, Mgr.
So. from Hwy. 101

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

PORTLAND, OR
11705 S.W. Pacific Hwy.
97223
(503) 598-0555
(800) 854-6046
Rich, KK7PL, Mgr.
Tigard-99W exit
from Hwy. 5 & 217

DENVER, CO
8400 E. Iliff Ave. #9, 80231
(303) 745-7373
(800) 444-9476
Joe, KDØGA, Mgr.

PHOENIX, AZ
1939 W. Dunlap Ave., 85021
(602) 242-3515
(800) 444-9476
Gary, N7GJ, Mgr.
1 mi. east of I-17

ATLANTA, GA
6071 Buford Hwy., 30340
(770) 263-0700
(800) 444-7927
Phil, N4DRO, Mgr.
Doraville, 1 mi. no. of I-285

WOODBRIDGE, VA
(Near Washington D.C.)
14803 Build America Dr.
22191
(703) 643-1063
(800) 444-4799
Mike, N4MDK, Mgr.
Exit 161, I-95, So. to US 1

SALEM, NH
(Near Boston)
224 N. Broadway, 03079
(603) 898-3750
(800) 444-0047
Chuck, KM4NZ, Mgr.
sales@hamradio.com
Exit 1, I-93;
28 mi. No. of Boston

YAESU

$10. HRO Coupon

FT-840

- 100W • 12V DC • DDS
- Gen. Cov. Rx, 100 mem.
- Optional Ext. Auto • Tuners Available

Call Now For Our Low Pricing!

$10. HRO Coupon

FT-1000MP HF Transceiver

- Enhanced Digital Signal Processing
- Dual RX
- Collins SSB filter built-in
- 100W, Power supply built-in

Call Now For Low Pricing!

$100. MFG. Coupon Thru 12/31 (FT-100)

$10. HRO Coupon

FT-100 HF/6M/2M/70CM Transceiver

- Compact Transceiver w/detachable front panel
- Rx 100kHz to 970mHz (cell blocked)
- Tx 100W 160-6M, 50w 2M, 20W 70CM
- Built-in DSP, Vox, CW keyer
- 300 Memories

NEW!

Call Now For Low Pricing!

Call For Winter Specials!

VX-5R

$5. HRO Coupon

50/2M/440HT

- Wideband RX, 6M-2M-440TX
- 5W output
- 220 mems, opt. barometer unit
- Alpha Numeric Display
- CTCSS/DCS built-in
- Li-Ion Battery

Call For Low Intro Price!

VX-1R

$5. HRO Coupon

2M/440 Sub-Mini HT

- 290 Memory Channels
- .5W output
- Receives 76-999mHz plus AM BCB (Cell Band Blocked)
- Lithium Ion Battery

Call Now For Your Low Price!

FT-50RD

2M/440mHz Compact HT

- DVR, Decode, Paging Built-in
- Alpha numeric display
- Wide Band receive
- Battery Saver
- 112 Memories
- Mil-Spec
- HiSpeed scanning

$5. HRO Coupon

Call For Your Low Pricing!

$10. HRO Coupon

FT-847

Ultimate Base Station, HF, VHF, UHF

- 100w HF/6M, 50w 2M/430 mHz
- DSP • Full Duplex Cross-band
- 1200/9600 Baud Packet Ready

Call for Low Price!

$10. HRO Coupon

FT-90R

2M/440 Mini Dualbander Transceiver

NEW!

- 50w 2m, 40w 440mHz
- Wide Rx • Detachable Front Panel
- Packet Ready 1200/9600 Baud
- Built-in CTCSS/DCS Encoder/Decoder
- Less than 4" wide!

Call for Your Intro. Low Price!

Free FM-1! Limited time only

$10. HRO Coupon

FT-920 HF+6M Transceiver

- 100w 160-6M, 12VDC
- Built-in DVR, CW Memory Keyer
- DSP, Auto-Notch • 99 Memories
- Computer controllable, CAT System

Call For Low Pricing!

$5. HRO Coupon

FT-8100R 2M/440 Mobile

NEW!

- Ultra Compact • 50w/35w 2m/440
- 110 memories • Wide Band RX
- Backlit mic • Remotable front panel w/op

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

COAST TO COAST FREE SHIPPING
UPS - Most Items Over $100
Rapid Deliveries From The Store Nearest To You!

CQ Interviews:

Riley Hollingsworth, K4ZDH
FCC Special Counsel for Amateur Radio

BY HAROLD ORT*, N2RLL

It sometimes seems as if Riley Hollingsworth, K4ZDH, has single-handedly brought the Federal Communications Commission back into the business of enforcing its own amateur radio rules. However, Hollingsworth says his work is part of a Commission-wide effort to put teeth back into FCC regulations. We are pleased to reintroduce "CQ Interviews" with N2RLL's chat with the FCC's Special Counsel for Amateur Radio, better known as "Riley the Enforcer." —W2VU

It's two hours before dawn in Arizona when the lights go on, revealing a new top-of-the-line amateur transceiver and linear amplifier. A large, floor-to-ceiling, in-wall bookshelf is home to years of magazines and books; the *ARRL Operating Manual* and several how-to antenna books are among the most prominent.

The operator, a middle-aged sales representative for a local newspaper, gets comfortable in the swivel chair, flicks on the rig and linear, and comes up on 14.313 with nearly 1.5 KW. Before long he's joined by several other "personalities," and they carry on with jamming and language you might expect from drill sergeants at a paramilitary boot camp. The "discussion" goes on for a couple of hours; no call letters are heard from most participants, and the conversation ranges from an exchange of racial jokes to long tirades about off-color subjects.

The early morning AM traffic and weather report finally alerts the operator that the real world beckons, and he wishes his fellow operators a good day. He quietly closes the door, leaving behind his well-appointed shack adorned with QSLs from all over the world, certificates, and his Extra class ham license—until the ritual-of-the-radio-damned is repeated the next day.

Maybe the problem operators are a reflection of society—those everyday pressures that drive some folks to behave as

The FCC's Riley Hollingsworth, K4ZDH, speaks at a forum at the Dayton Hamvention last year. (Photo via W2VU)

if they were the planet's sole inhabitants—or maybe it's because our hypothetical operator above was radio-deprived as a child or someone cut his coax in the '60s. Perhaps. But in reality, there's no one to blame except the operator who knows the rules, yet despite the rulebook—and worse yet, as an affront to good operators worldwide—thumbs his nose at the rest of us.

Like it or not, bad, discourteous, and renegade radio operators are here to stay, regardless of how much the FCC flexes its muscle. However, the biggest problem we've faced over the past 15 years or so is that the FCC has been nowhere in sight. But just when you thought it was safe to jam your fellow ham, they're baaack...

The good news that's getting rave reviews in the amateur community, as evidenced by standing-room-only crowds at his hamfest seminars, is that the FCC's Special Counsel for Amateur Radio, Riley Hollingsworth, K4ZDH, takes the matter of amateur radio very seriously. Just ask the 20 folks who received warning letters during August, September, and October, or the 10 former hams whose licenses were canceled because of their failure to appear for re-examination (under the rules, if you took the amateur exam from a volunteer examiner, the Commission can call you in for re-testing). Other recent FCC actions include:

- Called in 13 amateurs for re-testing.
- Inquired about apparent club callsign abuse in 10 cases.
- Issued modifications of licenses in five cases to suspend or restrict amateur operation.
- Opened inquiries into four amateur exam sessions.
- Issued three letters asking questions about alleged irregularities in the operation of certain ham stations.
- Notified two licensees that the FCC intends to designate their licenses for revocation hearing.
- Attempted to defuse a growing international incident over interference to a repeater in Mexico by hams in southern California.

(See this month's "Ham Radio News" section in CQ for more recent examples.)

Do The Crime, You Do The Time

At the Virginia Beach Hamfest last fall *CQ* talked with Hollingsworth about the FCC's return to amateur enforcement. Until very recently, he told us, the FCC had faced severe budget and personnel cutbacks, and with the explosion of commercial services—including pagers and cellular phones—the Commission had backed away from amateur radio enforcement for years. Hollingsworth, an amateur operator for 39 years, said, " . . . we had to focus on the commercial areas. In a matter of a very few years it grew to a multi-billion-dollar-a-year industry with little foreign competition. It was nobody's deliberate intention to let amateur radio go; we were overtaken by events with budget cutbacks. . . . " However, now there's a renewed interest in enforcement, not just on the amateur bands, but on CB as well, he emphasized.

Case in point: In October 1998 the ARRL sent a letter to the FCC complain-

c/o CQ magazine (Harold Ort, N2RLL, is Editor of CQ's sister magazine, Popular Communications.)
e-mail: <N2RLL@aol.com>

Personal Close-Up:

W. Riley Hollingsworth, K4ZDH
Special Counsel for Amateur Radio
FCC Enforcement Bureau

With 39 years in amateur radio behind him, Riley Hollingsworth, K4ZDH, joined the Enforcement Program of the FCC's Compliance and Information Bureau (formerly the Field Operations Bureau) as Legal Advisor for Enforcement in January 1998. He was placed in charge of coordinating enforcement in the Amateur Service after that program was transferred to the Compliance and Information Bureau (CIB) in October 1998. In November 1999 the CIB was renamed the Enforcement Bureau, and Hollingsworth received the title of Special Counsel for Amateur Radio.

Riley received a Master's degree in Political Science in 1970 from the University of South Carolina, and then earned a law degree at Wake Forest University Law School, where he was President of the Student Bar and a member of the Law Review. Prior to joining the Compliance and Information Bureau, Hollingsworth was an enforcement trial attorney, and later Deputy Chief of Licensing and Assistant Bureau Chief of the Wireless Telecommunications Bureau, all at the FCC.

In 1987 Hollingsworth managed the FCC 800 MHz Lottery Task Force in which new 800 MHz spectrum was assigned in 13 cities. He organized the FCC's program in which under-utilized radio channels in major cities were recovered for reassignment. This program withstood three challenges in the U.S. Court of Appeals.

Hollingsworth was awarded Vice President Gore's "Hammer Award" for Reinventing Government, in 1994. He participated as a Member of the Delegation from the U.S. State Department to Bucharest, Romania in 1992 to discuss radio licensing in the United States and opening foreign markets to American manufacturers. Riley also served as Co-Chairman of the FCC PCS Broadband and Narrowband Licensing Task Force in 1994.

Hollingsworth is currently a member of the Quarter Century Wireless Association and the Radio Club of America. He can be reached by mail: Riley Hollingsworth, Special Counsel for Amateur Radio, Federal Communications Commission, 1270 Fairfield Road, Gettysburg, PA 17325-7245.

ing about the Commission's inaction on a case in New York. This letter happened to come in after the FCC got a new Chairman, William Kennard, and Compliance and Information Bureau (CIB) Chief, Richard Lee. One of their main agendas was to enhance FCC enforcement and regain some respect for FCC enforcement. Hollingsworth said, "I know that Chairman Kennard wants the FCC to have the same respect as the Securities and Exchange Commission or the Federal Trade Commission, so the letter came in at the right time." Ironically, it was this catalyst that got enforcement, an area that had been neglected for over a decade, started again.

Within two weeks Kennard had the enforcement part of ham radio transferred to CIB along with some field personnel. "We've had wonderful cooperation from all the licensees and lots and lots of comments and some well-founded complaints. . . . it just seemed to fall into place," said Hollingsworth. Continuing, "we've found that amateurs are into many segments of communications—paging, cellular, and broadcasting—so it has raised the awareness across the board."

Complaint Central

Complaints about illegal operation have come to the FCC through a variety of means. "We'll take 'em any way we can get them," Hollingsworth emphasized, "but I prefer to get them by letter or e-mail. . . . certainly if anyone wants to call me we'll go over what we need. We'll take them from anybody and work on the problem. . . . Many complaints are about malicious interference, but I'm glad to see these operational problems seem to be tapering off."

I offered 3950 kHz as an example, with the intentional jamming and music playing, asking if the FCC was serious about tracking down these folks. Hollingsworth responded, "On 3950, when it comes to the Liberty Net, both sides are at fault; the net has been at fault and the jammers are certainly at fault. We had a recent case where an operator was cited for jamming and we rescinded that; certainly that's not an indication that we don't care about 3950, because 3950 has to be straightened out."

He continued, "We have warned operators that no matter what they're jamming, we're not going to tolerate jamming. It *can't* be tolerated because it degrades the whole band. . . . of course the Liberty Net [members] are partly at fault too, because I think in their own minds they think they own the frequency. We can't tolerate that. That net used to be a very outstanding net. They used to talk about technical issues and radio, some of the net members tell me. But I think they've dropped to the level of those who were jamming. The jammers kept jamming thinking we wouldn't do anything, but we are. . . . we've watched 3950 as a trouble spot and we won't tolerate anybody doing any jamming whether it's against the Liberty Net or anyone else."

Hollingsworth said it seems as if 80 percent of the FCC's amateur complaints concern 14313 and 3950, so they've got a lot of work ahead of them. He said, "There's an old expression in the South that you can lose the whole farm fighting for the outhouse. I'm trying to tell these people, let's forget about the First Amendment stuff on 3950 and what net you want to have; let's save this whole spectrum first and make sure we don't shoot ourselves in the foot, because if everybody starts fighting, we're going to lose the whole thing. We can't forget 97.1, the basis and purpose of amateur radio. It's a

Hollingsworth speaks to packed houses wherever he goes. (Photo via W2VU)

hobby *and* a service; it's not one or the other . . . "

Are You Part of the Solution?

The ham community has been *pleading* for enforcement for nearly ten years. Hollingsworth said, "I think we're doing it right and trying to get everybody to realize the decision they have to make: They've got to decide if they're going to be part of the problem or part of the solution." Everyone knows that the FCC could have come in like gangbusters. Hollingsworth continues, "We could have come in right off the bat and designated 20 or 30 licenses for revocation in the amateur service. We didn't do it that way. We tried to take a more clinical approach, because a lot of these people were out there operating the way they were or jamming because they saw the Commission as missing in action, and in their minds they weren't going to see the bands lost."

In some cases, a lot of long-time operators, fed up with the on-the-air antics, took charge. Hollingsworth leaned forward as he made the following point:

"Somebody who wasn't operating the way another operator thought he was supposed to be got jammed or he got on them about it. If somebody was jamming, he would jam the jammer, and it got very crazy. Frankly, if we had been doing our job, a lot of these long-time operators wouldn't have felt compelled to do this. I ask those operators who think we're doing the wrong thing or doing too much [enforcement] to just wait and give us more time, because I think we'll end up with a better service."

Hollingsworth said he has received five- to six-thousand messages for the Commission thanking it for getting back into enforcing the amateur service rules. Less than a half-dozen say the Commission should stay out of it.

Keeping It A Proud Service

"Just last week I was listening to the way a hurricane emergency traffic net was handled. I received only one complaint that entire week about malicious interference on ham bands that were handling traffic, and it was inadvertent interference. Just listening around the bands showed me that amateur radio is something to be proud of," Hollingsworth said. He added, "In Florida we had a Tampa newspaper reporter with earphones listening to the communications. . . . I would have been proud to have anybody hear it. There was a good bit of traffic being passed, and when there wasn't, the operators were having good QSOs and conversations, saying that if anyone needed the frequency to let them know. This is the way it's supposed to work. You'll never see that in the papers. . . . It doesn't get reported."

If you drive around in a neighborhood you haven't been in for a couple of months, you likely will see yet another cellular tower going up. The growth rate is phenomenal. That won't help when disaster strikes, though. Hollingsworth smiled broadly, clearly proud of the Amateur Service, and said, "You and I know that when you have a hurricane or any multi-jurisdictional disaster, cellular is often worthless and the first thing to go down, and the remaining ones are so jammed up you can't get access to them." He continued, "And the way public safety frequencies are allocated . . . so very often when there's a multi-jurisdictional disaster they can't talk to each other, so the first few hours or day or two of a disaster it's mass confusion. *However,* the amateur frequencies are shared, so very often it's the Amateur Service that helps them get things sorted out. The commercial services depend on too many parts of the infrastructure to operate."

Before heading off to another hamfest seminar, Hollingsworth made the point that we hams need to advertise ourselves more to the general public: "Any service that doesn't have an influx of young operators is going to have problems. There's so much to compete for their attention these days. I challenge all of you to bring one new person into the service and show him or her all the good things about it. . . . I can't think of another hobby that's fun and such a valuable public service at the same time." ■

On the Cover:

"Riley the Enforcer,"—the FCC's Special Counsel for Amateur Radio, Riley Hollingsworth, K4ZDH—poses outside the G & G Electronics booth at the Virginia Beach Hamfest fleamarket.

"My title originally was going to be Special Counsel for Amateur Radio Enforcement," Hollingsworth told us, "but then we realized that the initials would be SCARE." Uh, huh . . . and is there a problem with that?

Riley sat down recently for an interview with Harold Ort, N2RLL, editor of our sister magazine, *Popular Communications.* Harold's report on the ham-radio-related portions of the interview begins on page 13. His full interview will appear in the February issue of PopComm. (Cover photo by Harold Ort, N2RLL)

FT-1000MP
The radio of choice for world-class contest operators, the FT-1000MP provides 100 Watts of power, Enhanced DSP,™ Dual In-band Receive, Cascaded IF filters, General Coverage RX, and 160-10 M TX. (DC-only version also available.)

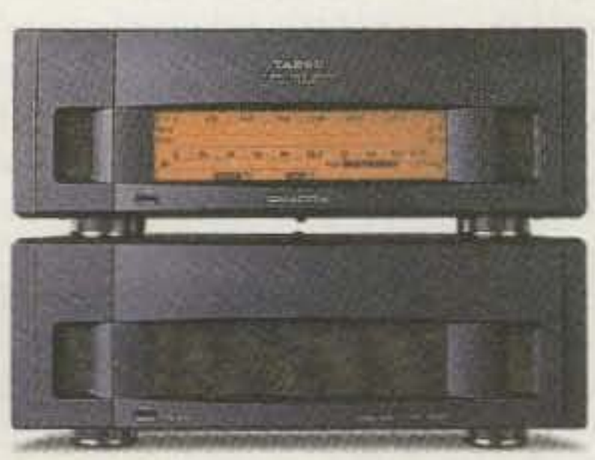
FT-920
The FT-920 HF/6M Transceiver is designed for today's active Ham. It features high-speed DSP in all modes, 127 memory channels, AFSK or FSK Digital operation, new-technology MOSFET PA finals, high-speed Automatic Antenna Tuner, and high-resolution LCD display.

FT-1000D
Truly an elite-class HF masterpiece, the 200 Watt FT-1000D provides Dual Receive (in-band or cross-band), Cascaded IF Filters, extraordinary Dynamic Range, DDS, high-speed Automatic Antenna Tuner, and 100 memory channels.

FT-100
This ultra-compact HF/VHF/UHF 100 Watt Transceiver provides SSB, CW, AM, FM and AFSK coverage of the HF, 6M, 2M and 70 CM bands. Features include 300 memory channels, built-in Electronic Memory Keyer, DSP, IF Shift, IF Noise Blanker, and CTCSS/DCS.

FT-840
Affordable yet feature filled, the FT-840 is an ideal traveling companion. It offers 160-10M TX with general coverage RX, 100 memory channels, DDS, CTCSS, Twin Band Stacking VFOs, and excellent receiver dynamic range.

FT-600
This compact 100 Watt HF Transceiver offers the utmost in operating simplicity. The MIL-STD rated FT-600 covers the 160-10M Amateur bands with General Coverage Receive, 100 memory channels, Direct Keypad Frequency Entry, and a front-mounted speaker.



VL-1000/VP-1000
The VL-1000 Quadra System is a Solid-State Linear Amplifier featuring four twin-MOSFET PA modules to produce 1000 Watts of clean power output on 160-15 Meters (500 Watts on 6M, modifiable for 12/10 meters). Included are an Automatic Antenna tuner, 2 Input and 4 Output Antenna Jacks, and extensive status displays on the multi-function LCD.

FT-847
The introduction of the FT-847 completely redefines base station operation by offering three radios in one–HF, VHF/UHF and Satellite. A full power multi-mode transceiver, the appropriately named Earth Station covers the HF, 50 MHz, 144 MHz and 430 MHz bands, and it includes crossband Full Duplex operating capability for satellite work. Its exceptional receiver performance is ready for all aspects of DX work thanks to the DSP filtering. And for local FM work both CTCSS and DCS encode/decode are built in. The FT-847 is an engineering breakthrough offering you the earth, the sky, and the moon in one compact package.

THE TASK MASTERS.

They're out there. Those elusive DX signals that can't poke through the QRM regardless of the late-night hours you put in trying to find them. But when a Yaesu HF enters the picture, weak signals suddenly jump into your headphones. Yaesu's High Frequency transceiver technology uniquely combines years of RF and AF design know-how with cutting edge advancements in IF filtering, noise reduction, and dynamic range. Whether you're on high bands or low, at home or away, the high frequency technology of Yaesu's task masters quickly fills up your log with contacts. Learn more about Yaesu products on the web at www.yaesu.com

YAESU **Choice of the world's top DX'ers.**

FT-8100R
The versatile FT-8100R Dual Band Mobile offers rugged RF design, 50 Watt (VHF)/35 Watt (UHF) power output, 310 memory channels, Dual Receive (VV/UU/VU), Enhanced Smart Search,™ CTCSS Encode, and a TX Time-Out Timer. (ADMS-2E programming software available.)

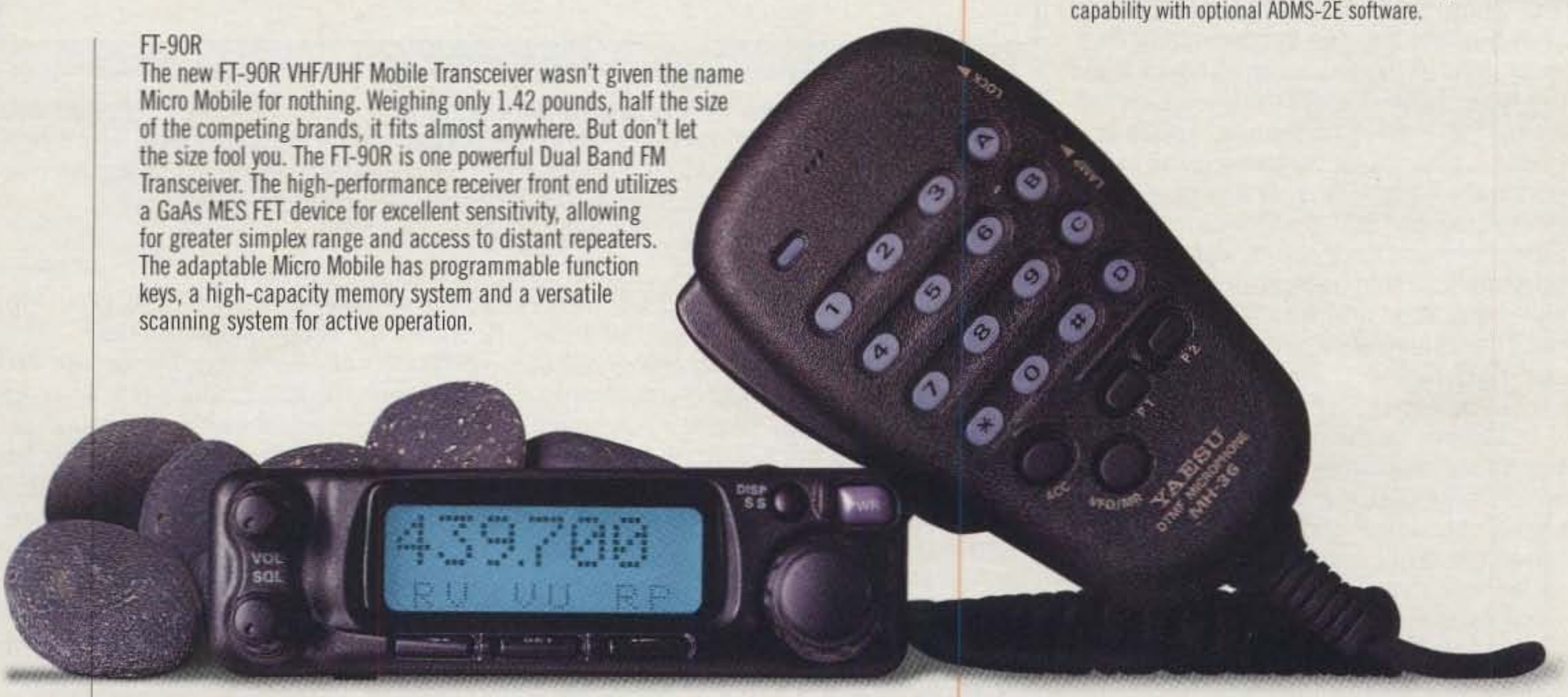
FT-100
This ultra-compact HF/VHF/UHF 100W Transceiver provides SSB, CW, AM, FM and AFSK coverage of the HF, 6M, 2M and 70 CM bands. Features include 300 memory channels, built-in Electronic Memory Keyer, DSP, IF Shift, IF Noise Blanker, and CTCSS/DCS.

FT-3000M
This 70W high-powered 2M FM Mobile provides extended UHF receiver coverage, AM Aircraft RX, and is MIL-STD approved. The FT-3000M features 81 memory channels, Smart Search,™ CTCSS/DCS, optional ADMS-2E programming software, and is 1200/9600 Baud Packet compatible.

FT-290RII
Ideal for base, vacation, or expedition use, this 25 Watt 144 MHz Multimode Transceiver is outstanding for emergency, travel, or weak-signal DX work. Optional battery pack allows over-the-shoulder portable use for search-and-rescue operation.

FT-2600M
This heavy-duty VHF FM Mobile is encased in a durable aluminum die-cast chassis/heatsink assembly, and manufactured to MIL-STD 810 requirements. Features include 60 Watt power output, 179 memory channels, direct keypad frequency entry from microphone, Alphanumeric memories, and PC programming capability with optional ADMS-2E software.

FT-90R
The new FT-90R VHF/UHF Mobile Transceiver wasn't given the name Micro Mobile for nothing. Weighing only 1.42 pounds, half the size of the competing brands, it fits almost anywhere. But don't let the size fool you. The FT-90R is one powerful Dual Band FM Transceiver. The high-performance receiver front end utilizes a GaAs MES FET device for excellent sensitivity, allowing for greater simplex range and access to distant repeaters. The adaptable Micro Mobile has programmable function keys, a high-capacity memory system and a versatile scanning system for active operation.



LITTLE BIG MOUTH.

Life is an adventure. So whether you're on expedition or vacation, you will probably encounter some rough going along the way. And when you do, you'll be glad that your mobile transceiver is a Yaesu. With units small enough to install almost anywhere and rugged enough to achieve military approval for shock and vibration, Yaesu is the obvious choice for dependability. Its exceptionally clear signal and wide dynamic range tame even the most crowded bands, and provide outstanding protection from intermodulation in urban areas. Learn more about Yaesu products on the web at www.yaesu.com

YAESU ...leading the way.

First used in the sky over Europe before World War I, these venerable "sky hooks" remain popular today, even when anchored securely to the ground.

End-Fed Antennas

BY LEW McCOY*, W1ICP

The end-fed Zepp has been a very popular antenna for many years. However, many newer hams don't realize just how excellent this multiband antenna can be. In this article I hope to show you how to use the end-fed Zepp. First, though, I would like to describe the Zepp's origins and give some very important general information about end feeding antennas.

History of the End-Fed Zepp

The Zepp antenna's name was derived from the fact that the zeppelin dirigibles, or airships as they also were known, used this type of antenna. Airships were invented by the French in the mid-1800s and became popular for commercial air transport in the early 1900s. The zeppelin was developed in 1900 by German inventor Ferdinand von Zeppelin. It was designated a "rigid" airship because a metal framework was used and was covered by fabric. There have also been semi-rigid and non-rigid airships, the latter commonly known as blimps.

In a zeppelin, the metal structure inside the vessel contained a gas-filled airbag which provided the lift for the airship. Usually two large engines with propellers drove the craft, many of which were lost to fire because highly flammable gases were used to lift them.

By 1918 the Germans had built a total of 67 zeppelins to be used in WW I. Only 16 survived the war, as they were relatively easy to shoot down. The business of manufacturing zeppelins prospered after WW I, and they were in use commercially until the 750 foot Hindenburg crashed and burned at Lakehurst, New Jersey in 1937. So how does all this relate to the Zepp antenna?

First, these airships began their careers before radio came into widespread use, so antennas became an "add-on" when radios were installed. The Germans decided on an end-fed, trailing antenna that could be tuned so the radio would operate on many different frequencies. I have not been able to track down the frequencies used, but it is safe to assume that they were the frequencies most commonly used in those early days of radio, probably just above our AM broadcast band.

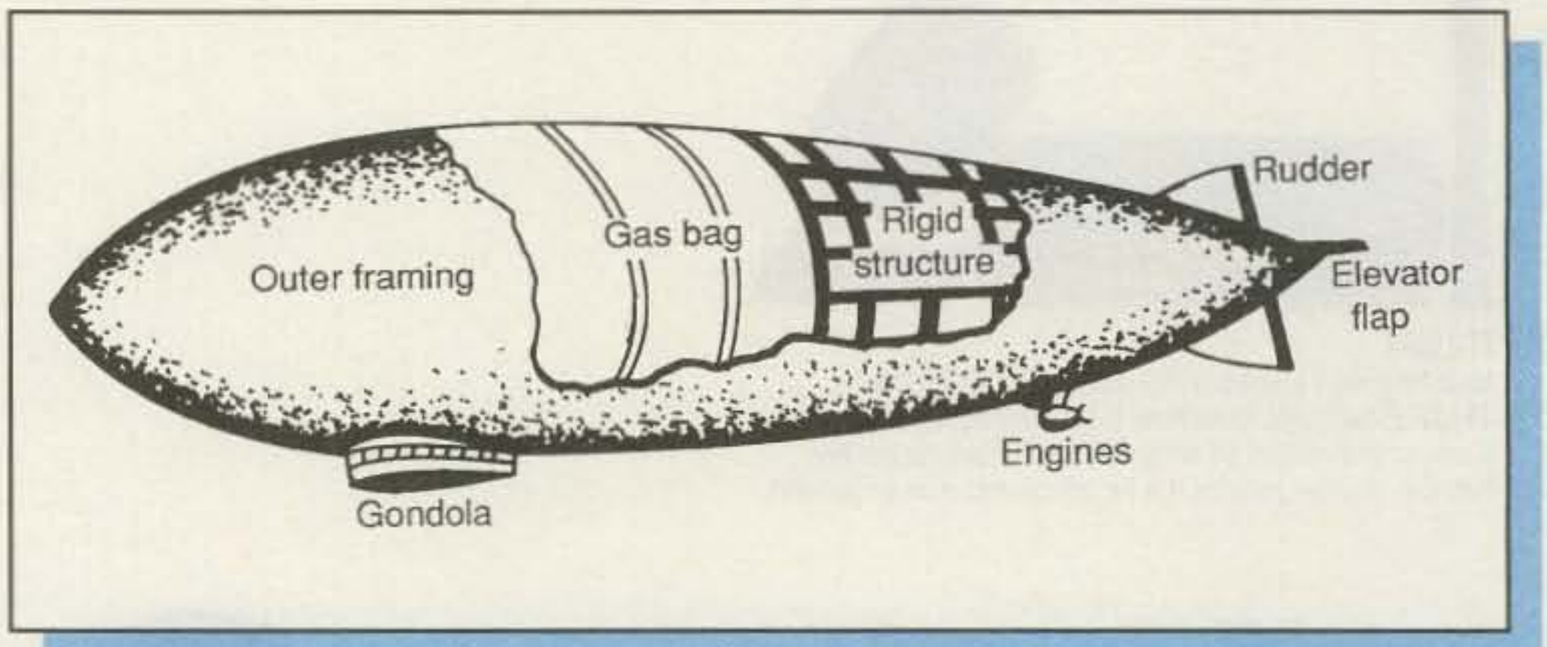


Fig. 1– A cutaway view of a zeppelin, on which Zepp antennas were first used and from which they got their name. For a number of years they were very popular for passenger and freight travel. Some of these ships were longer than a football stadium, so don't try to compare them to the much smaller blimps we see now.

One end of the Zepp was attached to the airship, and the other end trailed behind in the air. The Zepp antennas were a half-wavelength long, and the end that was attached to the airship was fed with open-wire feeders, resulting in a tuned antenna system.

Hams and the Zepp

The Zepp antenna became very popular with amateurs, perhaps because the fed end could be tied to a window or the roof of the house, near the shack, and the other end could be attached to a pole or tower. Fig. 1 is an example of this antenna. Of course, the beauty of this system is that only one support is needed, and that support is usually a tree or a utility pole. Fig. 2 shows the construction details.

Traditionally, end-fed Zepps are fed with open-wire line (usually No. 14 or 12 enamel-covered wire with the conductors spaced 2, 4, or 6 inches apart) or insulated 450 ohm "ladder line." You can use 300 ohm twin lead, but ladder line is preferred. There are many reasons why, and I'll touch on a few here.

These days hams worry themselves into a tizzy over standing-wave ratio (SWR). Coax is very popular as a feed line because it is simple to use, but the problem with coax is that it doesn't tolerate high SWR without serious loss and blowout problems (with high power). It is customary to match the 50 ohm coax impedance to the antenna's impedance to reduce the losses and power problems inherent in the use of coax, but this is not always an easy task. Fig. 3(A) shows a half-wavelength antenna, a dipole, which is fed at the center. The impedance of this antenna, depending on its height above the earth, is close to 50 ohms—at least close enough so that the dipole can be fed with the 50 ohm coax. However, with an end-fed half-

**Technical Representative, CQ, 8865 E. Baseline Rd. Space 1607, Mesa, AZ 85205 e-mail: <lewmccoy@uswest.net>*

AMERITRON . . . 800 Watts . . . $795

Ameritron gives you four 811A tubes, 800 watts and far better quality -- for less money -- than competitor's 3 tube 600 watt unit . . . Why settle for less power, less quality and pay more money?

AL-811H
$795
Suggested Retail

AL-811
$649
Suggested Retail

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.

Ameritron mounts the 811A tubes *vertically* -- not horizontally -- to prevent hot tube elements from sagging and shorting out. Others, using *potentially damaging horizontal mounting*, require special 811A tubes to retard sagging and shorting.

A *quiet*, powerful computer grade blower draws in plenty of cool air. It *pressurizes* the cabinet and efficiently cools your 811A tubes. Our air flow is so quiet, you'll hardly know it's there -- unlike noisy, poorly chosen blowers.

You also get efficient full size heavy duty tank coils, full height computer grade capacitors, heavy duty high silicon core power transformer, slug tuned input coils, operate/standby switch, transmit LED, ALC, dual meters, QSK compatibility with QSK-5 plus much more.

AL-811 has three 811A tubes and gives 600 Watts output for only $649.

Kilowatt Amplifier

AL-80B
$1299
Suggested Retail

Full kilowatt PEP output from a whisper quiet compact desktop linear. Only 8½x14x15½ inches. Plugs into nearest 120 VAC outlet. All bands 160-15 Meters, 1000 Watts out on SSB, 850 watts out on CW, genuine Amperex 3-500ZG tube has graphite plate, nearly 70% efficiency, inrush current protection, multi-voltage transformer.

Near Legal Limit™ Amp

AL-572
$1395
Suggested Retail

New class of *Near Legal Limit™* amplifier gives you 1300 Watt PEP SSB power output for *65%* of price of full legal limit amps! Four rugged *Svetlana* Russian 572B tubes. Instant 3-second warm-up. Plugs into 120 VAC. Compact 8½Hx15½Dx14½W. 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.

AMERITRON HF Linear Amps with Eimac™ 3CX800A7

AL-800H
$2395
Two tubes
1500 Watts plus

Suggested Retail

AL-800
$1695
Single tube
1250 Watts

AMERITRON's new 800/H amplifiers cover 160-15 Meters including WARC bands. The AL-800 has a single Eimac™ 3CX800A7 tube and produces 1250 Watts PEP. The AL-800H has two 3CX800A7s giving 1500 Watts plus.

Both amps have an adjustable slug tuned input circuit, grid protection, ALC control that is front panel adjustable, vernier reduction drives, heavy duty 32 pound grain oriented silicone steel core transformers and high capacitance computer grade filter capacitors.

These amplifiers have multi-voltage operation (14 user selectable AC line voltage from 90-140; 200-250 VAC), quiet pressurized ventilation systems, dual illuminated Cross-Needle meters that read peak forward and reflected power, SWR, high voltage, grid current and plate current.

Vernier reduction drives make tuning adjustments smooth and easy. Ameritron's exclusive *Step-Start Inrush Protection™* stops damage to your amplifier from inrush current. Ameritron amps feature an attractive Lexan front panel decal and superior, all metal construction -- it's built to last! Ultra compact desktop size is perfect for your operating station. 8½ x16½ x14¼".

AMERITRON no tune Solid State Amplifiers

Ameritron ALS-500M Mobile no tune Solid State Amp has 500W out, covers 1.5-22 MHz

ALS-500M
$799
Suggested Retail

Ideal Mobile amplifier -- uses 13.8 Vdc mobile electrical system, very compact 9½x9x15 in., extremely quiet, 500W output, 1.5-22 MHz coverage, instant bandswitching, no tuning, no warm up, no tubes, SWR protected.

Ameritron ALS-600 no tune Solid State base amp includes heavy duty power supply, 600 Watts out

ALS-600
$1299
Suggested Retail

No tuning, no fuss, no worries -- just turn it on and operate. *Includes* AC power supply, 600 W output, continuous 1.5-22 MHz coverage, instant bandswitching, *fully* SWR protected, extremely quiet, very compact. Amp is 6x9½x12 inches.

AMERITRON offers the best selection of legal limit amplifiers

AMERITRON's legal limit amplifiers use a super heavy duty Hypersil® power transformer capable of 2500 watts!

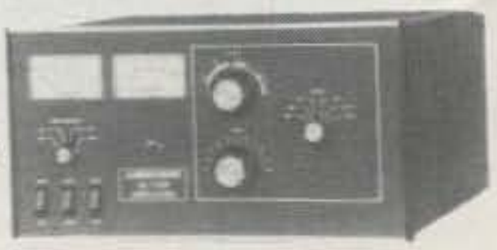
Ameritron's most powerful Linear

AL-1500
$2845
Suggested Retail

Ameritron's super powerful amplifier uses the herculean Eimac® 8877 ceramic tube. It's so powerful that 65 watts drive gives you the full legal output -- and it's just loafing because the power supply is capable of 2500 Watts PEP.

Ameritron's 3CX1200A7 linear Amp

AL-1200
$2395
Suggested Retail



Get ham radio's *toughest* tube with the Ameritron AL-1200 -- the Eimac 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.

Ameritron's dual 3-500 linear

AL-82
$2295
Suggested Retail

This linear gives you full legal output using a *pair* of 3-500s.

Most competing linears using 3-500s *can't* give you 1500 watts because their lightweight power supplies can't use these tubes to their full potential.

AMERITRON brings you the finest high power accessories!

RCS-8V Remote Coax Switch . . . $149

Replace 5 coax feedlines with a single coax. 1.2 SWR at 250 MHz. Cable to 450 MHz. 1kW at 30 MHz. **RCS-4, $139.**. 4 position remote HF switch.

ADL-1500 Dummy Load with oil . . . $59.95

Oil cooled 50 ohm dummy load handles 1500 W for 5 minutes. SWR under 1.2 up to 30 MHz. Low SWR to 400 MHz.

ICP-120/240-$79

Stops power-up inrush current and absorbs momentary high voltage spikes to your amplifier. ICP-120 for 110-120V, ICP-240 for 220-240 V.

ATR-15 Legal Limit Antenna Tuner . . . $399

Designed for legal limit amplifiers! Covers 1.8-30 MHz, peak reading SWR/Wattmeter, 6 pos. antenna switch, 1:1 or 4:1 balun.

ARB-700/702 amp-to-radio interface . . 39.95

Protects your costly transceiver from damage by *keying line transients*, steady state current and excessive voltages.

QSK-5 Pin Diode T/R Switch . . . $349

Self-contained, connects externally to most HF amps. Handles 2.5 KW PEP, 2 KW CW. Six times faster than vacuum relay. 6x4x9½ in.

TP-100 Tuning Pulser lets you safely tune your amplifier . . . $49.95

Pulse tuning lets you *safely* tune up your amplifier for full power output and best linearity. Keeps average power to low safe level to prevent overheating, tube damage, power supply stress and premature component failure.

ADL-2500 2500 Watt fan cooled dry dummy load . . . $199.95

Whisper quiet fan. Handles any legal limit amplifier -- 2500 Watts average power for 1 minute on, ten off. 300 Watts continuous. SWR below 1.25 to 30 MHz and SWR below 1.4 to 60 MHz.

Free Catalog: 800-713-3550

Call your favorite dealer for your best price!

AMERITRON®

. . . the world's high power leader

116 Willow Road, Starkville, MS 39759
TECH (601) 323-8211 • **FAX** (601) 323-6551
8 a.m. - 4:30 p.m. CST Monday - Friday
For high power amplifier components, call (601) -323-8211
Web Site . . . http://www.ameritron.com

CIRCLE 124 ON READER SERVICE CARD

wavelength antenna such as the Zepp shown in fig. 3(B), the impedance is somewhere around 4000 ohms, much more difficult to match to 50 ohm coax.

Open-wire or ladder line, on the other hand, doesn't have these problems. The extremely low-loss line can easily tolerate exceptionally high SWRs and power without any problems. To try to make this explanation simple, think about the following:

The end-fed half wave has a very high impedance, somewhere near 4000 ohms, at its end. At its center, the impedance is in the vicinity of 50 to 70 ohms. (You could easily use coax for center feed.) However, assume you end fed this antenna with coax. The SWR, as an example, could be 4000 (the feedpoint impedance) divided by 50 (the coax impedance), or an 80:1 SWR! The losses in the coax would be terrific. However, with the low-loss open-wire line, the 80:1 mismatch could be a piece of cake. You wouldn't have that kind of problem, though. The impedance of ladder line is on the order of 450 ohms, so you would end up with an SWR of only 10 to 1 or so. Using a Transmatch (antenna tuner) in the station provides you with a perfect match when properly adjusted. The Transmatch is really a transformer that transforms the unknown load to 50 ohms so that the transmitter works properly.

An important note: With an end-fed antenna using open-wire or ladder line, one side of the feed line is not connected to anything, while the other side is connected to the end of the antenna. The simplest explanation for this strange setup is simply that a feed line should be balanced, and if it is, one side of the line balances out the other side and no radiation from the line is able to take place. Because of this effect, only one side of the feeders is attached to the antenna. A balun isn't necessary to feed this type of antenna.

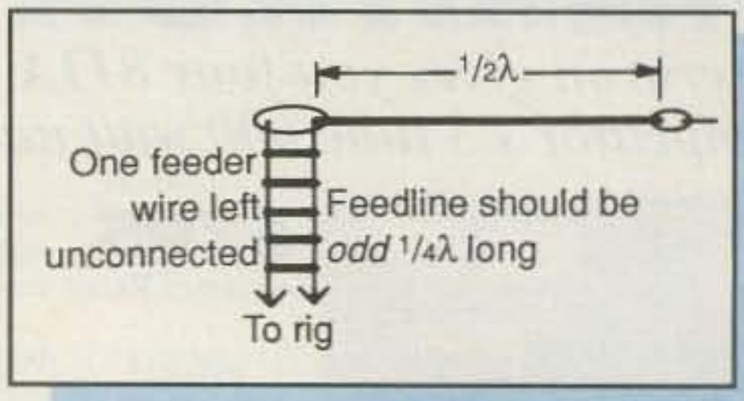


Fig. 2– The end-fed Zepp antenna is a half-wave long, although the antenna can be any length if a wide-range Transmatch is used. Note that the open-wire feed line or ladder line has only one feeder wire connected to the antenna. Normal feedline characteristics are that in a balanced line, such as twin lead, ladder line, or open-wire line, the field from one conductor cancels out the radiation from the other, or vice versa.

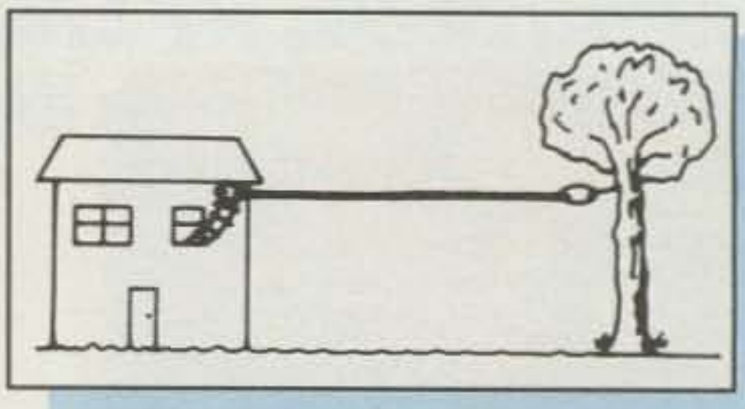


Fig. 3– A typical end-fed installation. A non-conducting line is used to hold the insulator to the house, while the other conductor is soldered to the end of the antenna. A tree or pole is used to support the other end.

Caution: High Voltage!

While this antenna looks simple—and it can be—if you have an incorrect feed-line length, you also have a mess of problems. Here's why: The ends of a half-wavelength antenna have the highest voltage of any point on the antenna. When the feed point is at the high-voltage point, you can run into serious problems, particularly if you use certain lengths of feed line (fig. 4). If a half wavelength of feed line is used on an antenna, the impedance at one end of the line will be repeated at the other end.

When a half-wave antenna such as the Zepp is end-fed, you are looking at a *very high* voltage point, and not just at the antenna. With a half-wavelength feed line that high voltage appears in the shack as well! This can create all kinds of problems. With RF floating around the shack, telephone interference, TVI, and many other types of interference can, and likely will, occur. The same applies to any multiple of a half wavelength. On the other hand, if you use a quarter wavelength of feed line, or odd multiples of a quarter wave, then the situation changes markedly, and the high voltage at the feed point is not repeated down in the shack. The simple solution here is to make the feed in odd multiples of a quarter wave, which would get rid of the high RF voltage problems.

But wait. Assume you make an end-fed 40 meter half-wave antenna, say, 60-plus feet long. With the open-wire type ladder line this is a multiband antenna. It will also work on 80 and all the higher bands with a good Transmatch. Keep in mind, however, that the feed-line length becomes critical. As you change bands, what is an odd quarter-wavelength line on 40 can become an even multiple of a half-wavelength—and thus a voltage-fed line—on other bands.

A simple answer that worked for me was to make several lengths of insulated ladder line that I simply coiled up and then used clip leads on the ends to attach these lengths to my 40 meter feed line. This, in effect, presents a different and more suit-

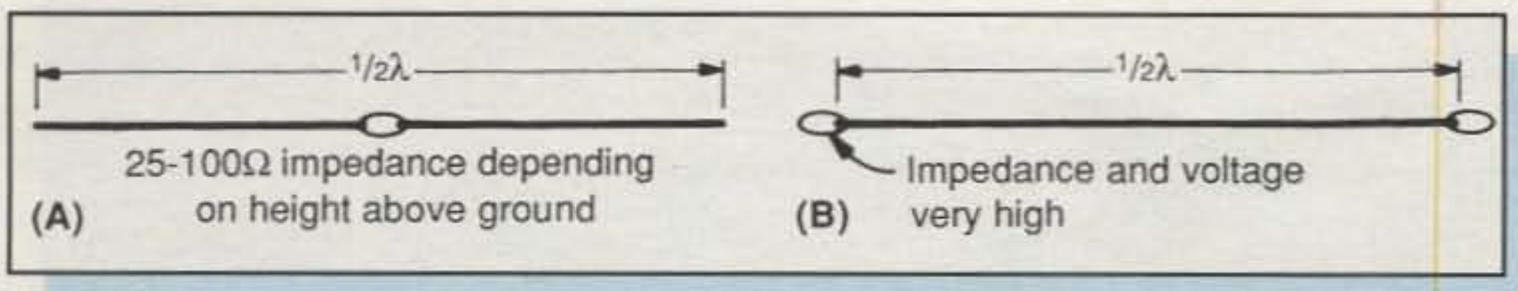


Fig. 4– At (A) is a normal center-fed dipole. At the feedpoint (the center) its impedance is anywhere from 25 to 100 ohms. Depending on its height above earth, the resistance and voltage are low at this point. At (B) is a Zepp antenna, also a half wave, the same length as at (A), but fed at the end. Keep in mind that this is a high-voltage feedpoint. (See text for ways to keep high voltage out of your shack.) Both the dipole and the Zepp have very similar radiation characteristics.

able matching load for troublesome bands. For example, a quarter-wave line at 40 meters is a little more than 33 feet (using the formula 234/f [MHz]). On 80 meters a quarter wavelength is about 60 feet. Therefore, I attach a 27 foot coil of ladder line to my 40 meter quarter-wave line when I want to operate on 80. By the way, the lengths don't have to be exact as long as they're near a quarter-wavelength long. I know some of the experts out there will say I am wrong about coiling up feedline lengths, but believe me, it works. I'll repeat this statement to drive it home: *Always use odd number multiples of a quarter wave of feed line with end feed.*

A couple of other points about end-fed antennas are in order here. It is useful to know that an end-fed antenna of half wavelength is just as good a performer as a center-fed half-wave antenna (and under many circumstances, it is better than an off-center-fed antenna).

Another time-worn trick used by amateurs with an end-fed Zepp is to tie the feeders together at the Transmatch end and feed the antenna as a random wire. If you're using a 40 meter half-wave antenna, such a feed might make the system a fairly good 80 meter antenna and will even work on 160. However, always remember the need to keep the feed line at an odd multiple of a quarter wavelength.

Random-Length End-Fed Antennas

Finally, let's discuss random-length end-fed wires, or if you insist, "long"-wire antennas. A long-wire antenna, just to keep the record and history correct, is customarily several wavelengths long.

For your most popular band, be sure to make your wire as close to an odd quarter wavelength as possible. I would assume that you are going to bring the end of the wire directly into the rig, or Transmatch. If you have to run it under a window, be sure to use insulation around the wire and keep the wire as much in the clear as possible. On many occasions I have brought my antenna line directly into my shack, but I have been careful to install the wires so that no one can get near the antenna. RF burns can be nasty.

An end-fed random wire needs to be counterbalanced with a grounding wire. Always try to make ground wires as short as possible. Most beginners never think about it, but let's look at an example.

Suppose you have your transceiver sitting on your operating table, and let's say that you are on the third or fourth floor. Your end-fed wire is 60 feet long, so your grounding wire should also be 60 feet long. Think about that statement for a minute. Your rig is actually center-feeding 120 feet of wire. This might make an excellent 80 meter antenna. The problem with grounding from a shack is that you never —and I mean never—really know where actual ground is. Just keep in mind that even numbers of half waves will end up as voltage feeds; odd-number lengths mean low voltage, and that's what you want in your shack.

How long should you make a random wire? The general answer is easy: Make it as long as possible, and you will start to experience gain in the direction of the wire. Put the wire as high as possible. Electric fence wire is still usually cheap and makes good long wires.

A friend of mine coined an expression which is absolutely true: Always put your antenna as high up as possible and make it as big as possible. If the darn thing stays up, it isn't big enough or high enough! Good luck!

James Alderman, KF5WT, set up a portable station at a Dallas trailer park and invited kids to experience the thrill of amateur radio. In addition to making about eight contacts, the kids enjoyed creating posters, coloring maps, and relaxing with cookies and punch.

Want to get young people interested in ham radio? One of the best ways is to let them get on the air and talk—especially to other kids. The Kid's Day event offers the perfect opportunity.

Kid's Day 2000

BY JEAN WOLFGANG*, WB3IOS
Educational Programs Coordinator
ARRL Field & Educational Service

Gather the paper and pencils (or boot up the computer). It's time for one of the first ham radio events of 2000. This event is different from others, though. Why? Because when you gather the paper and pencils, gather the kids, too! That's right. It's time to listen and laugh with the next generation of contesters, or just introduce young people to the excitement of ham radio! It's Kid's Day 2000, an operating event focused on getting kids talking to each other via ham radio. It was originated by the Boring Amateur Radio Club in Boring, Oregon, and is now co-sponsored by the ARRL.

Kid's Day provides young people with a perfect introduction to on-the-air competition, even though everyone who participates in this "contest" is a winner. Who knows? Some of us might learn a few contesting skills from them! Doug, Jim Setzler, K1SD's son, is a perfect example of what happens if you are persistent.

Jim says, "Doug usually likes to start off with some 'hunt and pounce' and then find a frequency to call CQ. This time he wanted to jump right into 'running' *(staying on one frequency and working station after station—ed.)*. He ran off about 30 stations

*c/o ARRL, 225 Main Street, Newington, CT 06111
e-mail: <wb3ios@arrl.org>

Kid's Day Rules

Purpose: Kid's Day is intended to encourage young people (licensed or not) to enjoy amateur radio. It can give them hands-on, on-the-air experience so they might develop an interest in pursuing a license in the future. It also is intended to give hams a chance to share their station with their children.

Date: January 1, 2000.

Time: 1800–2400Z, no limit on operating time.

Suggested Exchange: Name, age, location, and favorite color. You are encouraged to work the same station again if an operator has changed. Call "CQ Kid's Day."

Suggested Frequencies: 28350–28400 kHz, 21380–21400, 14270–14300 kHz, and 2 meter repeater frequencies with permission from your area repeater sponsor. Observe third-party traffic restrictions when making DX QSOs.

Reporting: Logs and/or comments may be posted on the Internet at <kids@contesting.com>. You may review these postings at <http://www.contesting.com/kids/>. Those without Internet access may forward comments to the Boring Amateur Radio Club.

Awards: All participants are eligible to receive a colorful certificate. (It becomes the child's personalized sales brochure on ham radio.) Send a 9 × 12 SASE to: Boring Amateur Radio Club, P.O. Box 1357; Boring, OR 97009. More details may be obtained at the web site <http://www.jzap.com/k7rat/>.

in the short time we had. Several times the QRM was really bad and I asked him if he wanted to find another, clearer frequency. No way! (The last Kid's Day Contest, someone took his run frequency from him and he was still smarting from it. He wasn't going to give up his frequency this time without a fight!) He hung in there and actually pulled them out rather well. The last contact made was also one of the toughest for him (and me) to copy. He finally got it right after just a few repeats. He was pretty happy (and surprised) that Australia called him in the contest!"

No children in the house? No problem! Invite a young neighbor and a parent, niece, nephew, grandchild, or even a group of scouts. If you live where the weather is still warm, invite the local kids to an afternoon of radio and food. The offering of food will almost always entice kids of any age! *(It's an unfortunate fact of life, but you should never have just one child alone with you, and parents should always be welcome.—ed.)*

Apparently, some of these kids have a real gift for operating. John, 5, and WØMU "worked 46 states in 2.5 hours. He talked; I logged. I think John worked 26 of those states!" I guess "mic fright" wasn't a problem in that radio shack! Since the exchange is easy (see rules), the kids seem to breeze right through it. They already know their name, age, location, and favorite color, so it's not a stumbling block.

The next six hours will be filled with surprises for you and the youngster sitting beside you. You may even get a chuckle if you hear a QSO similar to what Scott, K7ZO, heard: "You're not old; you're as young as my grandpa!"

Here are a few comments from the last Kid's Day. They should give you a good idea of what you are in for!

What a blast! I had 12 great kid QSOs in about 90 minutes of on-the-air time. The kids did a wonderful job, and I didn't hear any mic fright. Not sure who was more excited about talking to the FBI, the parents or kid operators. We will CU on the air this coming winter.—*Jay Chamberlain, AE4MK, Trustee K3FBI*

My daughter (3½) and I had a great time. I practiced the exchange with her a couple of times before going live, and she completed two QSOs before she became flustered. However, she was asking me the next day when she could talk on my radio again. There were a huge number of stations on 20 meters. Kid's Day is a terrific event, and I look forward to the next one!—*Rachel and Ken Hoover, N3YER*

What bedlam! If Sweepstakes or the CQ WW are the Daytona 500, this was "bumper cars" at Disney World! It wasn't unusual to hear four conversations simultaneously on a frequency, but everybody hung in there and didn't complain. The best laid plans . . . I discovered my own junior ops were playing in ball tournaments, so I drove past the local park [light bulb] and said, "Why not take the station to the kids instead of the other way around?" So I set up a Field Day vertical alongside the park shelter and fired up the 930. A few minutes later three kids and their parents showed up! None had ever seen ham radio, and they were mic shy. I'd made up a script to read with blanks to fill in name, age, and color. A challenge was a kindergartner who couldn't read but was a good "repeater." With low power and a clunky antenna, we got beat out in the pile-ups, but the kids didn't know enough to be bothered. They finally completed one or more QSOs, with proud parents in the background. Another kid who had a bit more radio savvy, with experience on 11 meters, showed up. I had to explain we don't use 10 codes on the ham bands; no problem. His QSO with a Massachusetts Scout group lasted half an hour, and he departed duly impressed. An outdoor Kid's Day in January won't fly in Illinois, but I'll do it again next June! Didn't even have to clean the shack, heh heh.—*Jim Funk, N9JF*

My first Kid's Day—Kevin, 10, was here about three hours, working a number of states. I would suggest, as it was a success and quite busy on 20 meters, expanding the frequencies. Twenty (which I hadn't been on in years, and won't again until next Kid's Day) is quite busy, but what better use of the bands is there than this?—*Mo Kittle, AD8T*

CQ Reviews:

The Alinco DJ-V5T(H) VHF/UHF Handheld Transceiver

BY HAROLD RUBIN*, N2MDD

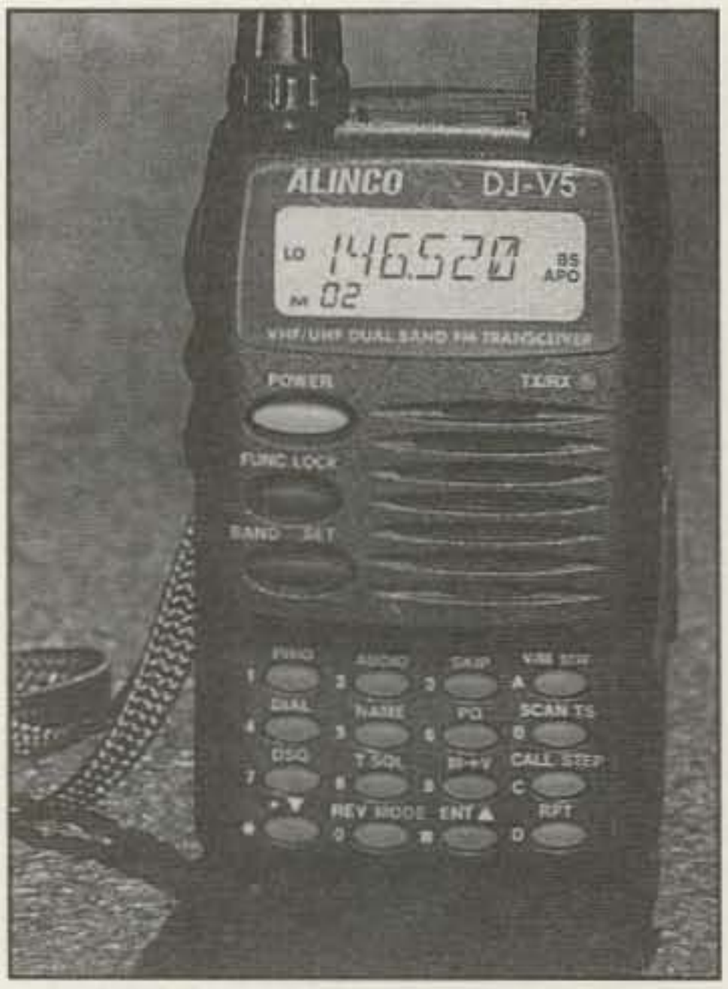
Yaesu, ICOM, Kenwood, and now Alinco. The race to be the best in the compact multiband HT market is still going strong. Just in time for the 1999 Dayton Hamvention Alinco introduced its rugged 2 meter/ 70 cm handheld transceiver, the DJ-V5T(H).

Alinco's latest entry measures a mere 2.28"W × 3.81"H × 1.58"D (2.0"D with the belt clip attached). The transmit range is 144–147.995 and 420–449.995 MHz. The receiver covers the transmit range plus FM broadcast, and it includes a true wideband FM capability, allowing you to listen to your favorite FM broadcast station while you are not transmitting (more on the receiver later). Unlike some other models on the market, the DJ-V5 does not sport the MIL SPEC 810 rating, but it's still a rugged little radio.

The unit ships with the supplied battery of choice (6.0 or 9.6 volt) with belt clip, a second belt clip, carrying strap, AC wall adapter/charger, and an SMA rubber duck antenna. I purchased the DJ-V5TH (S/N T000912) with the 9.6 volt pack.

When I first looked at this radio, I wondered what was unique that would make me want to use it over any of the other prime contenders. I turned on the rig and tuned it to the FM broadcast band to a station a friend of mine referred to as the "all Zeppelin" station. I could not believe my ears! I knew that Alinco had a focus on powerful audio in its HTs, as was evident in the very popular DJ-580T (I still have mine.), but I was amazed to hear the strong sound coming out of such a small speaker. The rig became even more appealing when I next tuned to a classical music station.

Transmit audio was also reminiscent of my DJ-580. Signal reports on low power (more on this in a moment) were solid, and for the signal-packed Dayton Hamvention, that's very good. The spec sheet boasts a full 5 watts of transmit power when using 13.8 volts. Unfortunately, transmit power levels are rather vague in the otherwise well-written owner's manual. In order to get a good idea as to the power levels achieved with the available Alinco batteries, you need to refer to the glossy, color sales brochure. Without the brochure and without measuring, all you know is that there are three transmit power levels: Hi, L1, and L2, L2 being the lowest. The actual values are 5, 1, and 0.5 watts with a 9.6 volt battery pack, and 2, 1, and 0.5 with the 6 volt pack. Either way, I still got in a full day of operating at the fleamarket (and then some) before I had to recharge the battery.



Compact design stops at the DJ-V5's physical dimensions. The display is large and well lit. The transmit and receive audio are strong and clear.

The DJ-V5 comes from good stock. The DJ-580 demonstrated Alinco is capable of producing a rugged, high-performance HT at a reasonable price.

Getting back to the receive capability of the DJ-V5, capability is the key word. Out of the box, the radio receives the 2 meter, 70 cm, and FM broadcast bands (76–107.9 WFM) quite well. That's it. You cannot even pick up standard NOAA weather frequencies with the default configuration. After we pointed out the problem, Alinco assured us that will be fixed in later production runs. Meanwhile, the only way to access the DJ-V5's full receive range (78–174 MHz, 380–512 MHz, and 800–999 MHz—minus cellular, of course) is by performing the MARS/CAP modification. This is quite simple: Just remove the knobs and antenna from the top of the radio, remove the battery pack, and unscrew the two screws on the back plate. Once inside, you'll see a lone blue wire sticking up from the circuit board. Cut it.

e-mail: <n2mdd@arrl.net>

Removing the NiCad battery pack on the DJ-V5 exposes the shielded compartment that houses its brains and brawn.

Nestled conveniently between the rotary dials and the SMA antenna connector, the speaker-mic connector accepts standard (Alinco, ICOM, Yaesu, Standard, Tandy) two-pin microphone and packet accessories.

Put the radio back together, do a reset, and you will have full frequency coverage.

Warning: This modification also expands the radio's transmit capability. Be very careful not to transmit on any frequency for which you are not licensed. The FCC has been coming down very hard lately on unlicensed transmissions.

Aside from the vague transmit power levels and the incomplete receive data (It doesn't tell you how to expand the range.), the supplied instruction manual does a good job of introducing the owner to his or her acquisition. I was able to identify quickly the basic features plus several advanced features of the radio. Packet wiring diagrams, schematics, and directions for radio cloning are also included. My edition of the manual included an errata sheet which corrects the directions for building a cloning cable. (Transmit data should be wired to the tip of the stereo connector, not the ring.)

When you first power-on the rig, you are greeted with the power source voltage (either the attached battery or the external DC source). The display then switches to the active frequency (i.e., 146.520), channel name (i.e,. CH 01), or memory name (i.e., SIMPLEX), depending on what you prefer. Audio squelch is controlled by pressing the monitor button on the side and turning the control knob on the top to either increase or decrease the level. Volume is controlled by an outer ring just below the control knob. I found it difficult to accidentally change the volume setting.

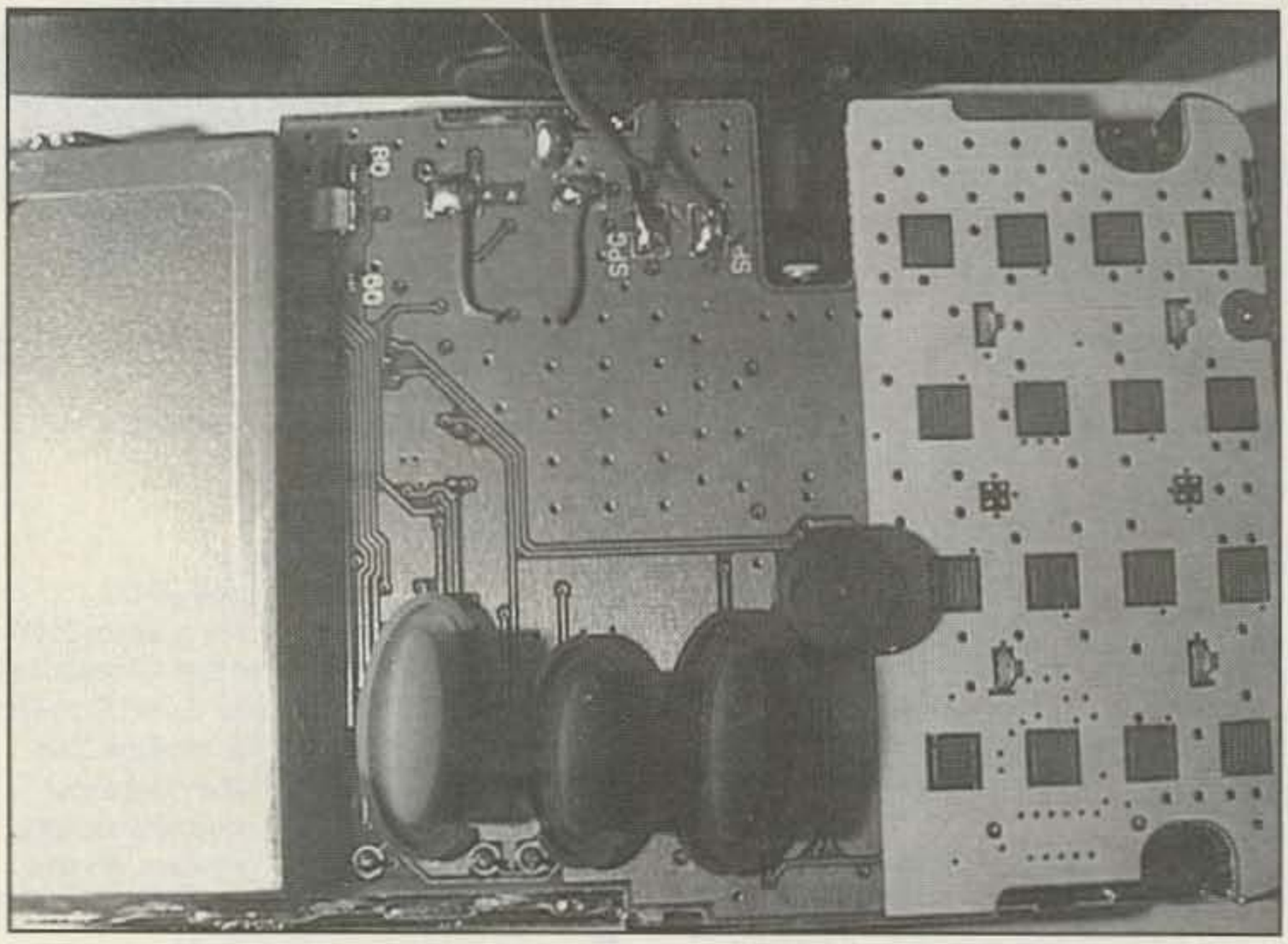
It is also easy to enable the keypad/control lock. Simply press and hold the FUNC/LOCK key, and all functions except PTT, LAMP, MONI (SQL), and POWER are disabled. Press and hold the FUNC/LOCK key to re-enable the other functions. If you are operating in low-light conditions, the backlight provides sufficient green light to illuminate the display and the buttons on the keypad. Function controls are not readable with the backlight. Unless the controls are locked, the backlight shuts off after 5 seconds.

The DJ-V5 can hold a bountiful 200 memories, plus two call-channel memories (one VHF and one UHF). Each memory can include repeater shift, transmit tone (PL), tone squelch (can be a tone different from transmit), DTMF squelch (DSQ), power level, and up to a 6-digit alphanumeric name. Memory scanning is

The DJ-V5 fits comfortably in the hand. A light squeeze on the PTT generates the RF signal reliably on target.

simple. Simply shift from VFO mode to memory, press and hold either the up or down arrows, and you're on your way. If you have stored in memory broadcast stations (or any frequency) that you want to exclude from the memory scanning, you can configure the radio to skip these frequencies. Frequency settings for any of the available transmit and/or receive bands can be stored in any memory location. You must be in VFO mode to change bands; however, you can enter any acceptable frequency at the keypad without having to first be in that band.

We're still not done. You can store up to five programmed scan ranges, if you like, for your auxiliary listening pleasure. DTMF with adjustable delay is available for repeater autopatch use, and the radio has 8 DTMF memories for auto-dialer operation. A split transmit function allows you to receive on one frequency in VFO mode and transmit on a different frequency stored in memory; this can be used for cross-band operation as well. (Note the DJ-V5 does not work as a cross-band repeater, but it will transmit on one band and receive on another. You thus



Interior of the DJ-V5 showing the wire sticking up from the circuit board that must be cut to access the DJ-V5's full receive range.

can use it to work satellites that support FM.) Several speaker-mic options are available for this radio, including a remote-function version (EMS-8). However, if you prefer, standard speaker-microphones work quite well with this rig.

Alinco provides several ways of increasing your operating/listening time. There are three battery-saver settings, selectable output power, and auto power off. The operating manual describes supply power requirements as ranging from 4–15 volts DC (rated at 13.8). This is also a radio that knows when to stop. The DJ-V5 will shut down if the input voltage is too high. It also senses when the transmitter is running too hot and will automatically switch to low power if this occurs.

The auto power off (APO) has four settings: OFF, 30, 60, and 90 minutes. If you feel so inclined, you can tune to your favorite repeater or FM broadcast station, set the timer, and just fall asleep. This is also a handy feature if you put the radio in your briefcase or bag, and you accidentally turn on the power; with the time-out timer set, you don't need to be too concerned about using up the battery.

I found the position of the POWER button acceptable. Although generally I am not a fan of power control buttons (I prefer a switch), I did not find myself accidentally turning the radio off and on. This is partially due to the fact that the button is not protruding from the face of the radio, and also because of the need to hold in the button for a few seconds to toggle the on/off setting.

Finally, I wouldn't attempt to go swimming with the DJ-V5, but I would not think twice about using it during a rainstorm at my local fleamarket or during an emergency situation/exercise. If you remove the battery pack from the back of the radio, you will be faced with a solid back plate. The buttons on the front all fit snugly against the face plate and provide a difficult barrier for foreign materials to penetrate. The Power, Function, and Band select buttons are also attached to a protective cap that fits over the condenser microphone.

The DJ-V5 not only features solid construction, it also knows what it means to be on frequency. As long as I had the resources of the Dayton Hamvention at my disposal, I stopped by the OptoElectronics booth and ran a couple of tests. When I hit the PTT on 146.52 MHz, the display on the available frequency counters read 146.520019. Works for me.

Every ham radio operator has different priorities when looking for a good dual-band HT. If you're looking for a rugged radio with solid transmit and receive audio, and a radio you can listen to while you're getting ready for work or going to bed, this is the one for you. ■

KB2YTN presents an inexpensive solution to what can be a rather costly battery problem.

Battery Replacement for the RadioShack HTX-202/404

BY GARY PALAMARA*, KB2YTN

Ever since I joined the amateur radio ranks I've been hearing old timers reminisce about the good old days of the hobby and the rigs that dominated their past. Names such as Drake, Collins, Hammarlund, and Heathkit are recalled with a slight tear in the voice. Today's amateur has many great rigs from which to choose, some of which will be classics in their own right some day. Rigs such as the Yaesu 1000D, ICOM 706, Kenwood 850, RadioShack HTX-202—*the Radio Shack HTX-202?* Yes, when you talk about "classic" radios, the RadioShack HTX-202 and its 70 cm brother, the HTX-404, fit the bill for classics of the hobby.

Many of us who entered the amateur radio community in the last ten years or so were introduced to the hobby through the speaker of an HTX-202. The 202 is no longer sold by RadioShack and has been replaced by the new HTX-200 and HTX-400, a smaller lighter radio. However, thousands of the older 202s and 404s were sold and many are still in use. The 202 series is used in association with an amplifier to boost the rig's 5 watt output to a more respectable 30 to 40 watts.

My wife and I now own two 202s and two 404s. One of my 202 radios has graced the dashboard of my vehicle since I became an amateur. They fit the need of our everyday communications, as well as Field Day, hamfests, and the air shows we attend. They are simple to use and program and relatively immune to intermod. They seem to stand up to most of the abuse I've given them over the years, and the 202 series is also legendary for the outstanding audio characteristics.

Recently, I came across an HTX-404 at a local hamfest. The seller was asking $50. He stated that he didn't have a charging unit and the rechargeable NiCad pack was weak. Several local repeaters were programmed into the 404, and the received signals were strong. The transmit output, even with the reduced battery capacity and a rubber duck antenna, was enough to bring up several local repeaters. I received good audio reports in spite of not being DFQ. For $50 I could hardly go wrong.

Photo 1– Two completed HTX battery packs.

Upon arriving home, I wanted to check the condition of the battery pack. I put the pack on one of my chargers and waited. After 24 hours on the charger the voltage measured at the top of the battery pack

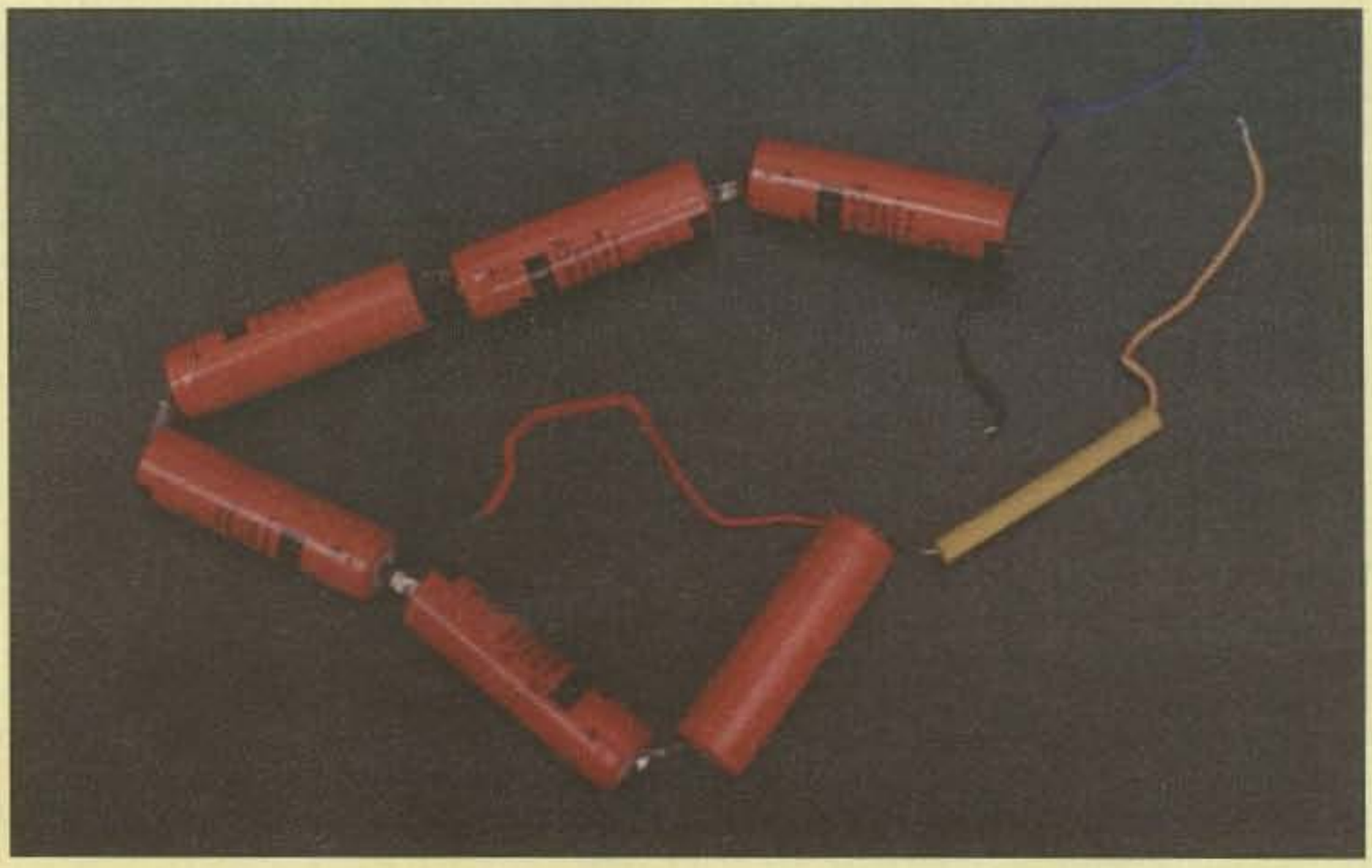


Photo 2– Six original 1.2 volt NiCad batteries in series with wires attached.

*28 Norse Drive, Howell, NJ 07731

Photo 3– Original HTX battery compartment.

was still low (5.6 volts). Once I began to transmit, the radio only worked for a short period and then failed. The battery pack was weak and needed to be replaced.

The replacement battery pack, Radio Shack #RSU 100020824, is still available at a cost of $39.99. It has to be special-ordered, since the HTX-202/404 series is no longer sold. There are also after-market sellers of these items listed in all the amateur magazines. As either an original replacement or an after-market unit, the cost is still considerable. I thought that there must be a better, easier way to deal with this problem.

Before joining the ranks of amateur radio, I was heavily into photography as a hobby. Most photographers have some sort of flash unit for picture taking. Thinking back over my photo career, I made extensive use of NiCad batteries for photo flash units. I built my own chargers and kept recharging batteries for years before they ultimately died of old age. The confidence gained from years of charging and recharging photocell batteries was all I needed to seek out an answer to the HTX-404 battery problem.

With a little investigating, I've come up with a less expensive solution to a rather costly problem (photo 1). Why replace the entire battery pack when you can replace the defective batteries at a fraction of the cost?

NiCad Basics

Prior to replacing the batteries, let's talk about some NiCad basics. Nickel cadmium batteries usually come in individual cells equivalent in size to the popular alkaline batteries. AAA, AA, C, D, and the 9 volt sizes all are available. NiCad batteries are not equivalent in voltage to alkaline batteries of the same physical size. The standard voltage unit for a single-cell NiCad battery is 1.2 volts as compared to the alkaline "equivalent," which is 1.5 volts. All batteries also carry a current rating, which will indicate how much current may safely be drawn from a fully charged battery. This current rating is usually in the form of milli amps per hour. This is a rating of how much current may be expected from a given battery for an hour of operation. A rating of 7.2 volts @ 600 ma/h means that the battery will deliver 7.2 volts @ 600 milliamps for one hour. Stated another way, the battery may also deliver 7.2 volts @ 1 milliamp for 600 hours. Either way, the capacity of the battery is the same. NiCad power sources are often arranged in packs of several individual cells, which will yield greater voltage or current capacity (photo 2).

When charging a NiCad battery, you must always observe the proper charging polarity. Even a short period of reverse voltage may totally destroy the battery. You must also provide at least double the battery voltage while charging. The double voltage will help break down the covalent bonds within the battery that cause the memory effect associated with NiCads. Also, the higher voltage will ensure a full charge. Don't worry about the higher voltage; the battery will only accept the voltage required to fully charge the battery. Measuring several of the charging units that came with my HTX radios, the open-circuit voltage of the chargers is in the range of 15 to 18 volts.

Perhaps the most important thing to know about charging NiCad batteries is to provide the correct charging voltage, at a *safe* current rate. NiCad batteries require only about one tenth of the rated discharge current to safely charge the battery. For example, the 202/404 battery pack, which is rated at 7.2 v @ 600 ma/h, requires only 60 milliamps to charge (photo 3). The charging time will take approximately 16 hours. Providing more current to a battery under charge will make the battery charge faster. However, faster charging may shorten the life of the cells. As the battery is charging, the molecules inside the battery are moving back and forth and creating friction. This friction is exhibited in the form of heat. Providing too much current during the charging cycle can "cook" the battery and make it totally unusable.

Photo 4– Align the new NiCad batteries, alternating plus and minus, into two sets of three batteries each and wrap with electrical tape.

Charging the Batteries

The circuit in fig. 1 provides a safe way to charge your HTX-202/404 battery pack. This is a very basic circuit. R-1 limits the

current drawn by the battery to a safe level of approximately 60 milliamps. R-2 and the LED are optional and may be omitted, but they provide assurance that the battery is connected and current is flowing. If you own several battery packs, you may add more 220 ohm resistors (one per battery pack) for each battery you want to charge. Make sure to select a transformer capable of supplying enough current and providing for a safety margin. Add up the total current drawn by all the batteries you want to charge and double the current for safety. For example, suppose you want to charge four 60 milliamp batteries; 60 milliamps times four is 240 milliamps. Radio Shack transformer #273-1366 is a 24 volt, 450 milliamp transformer. It will supply the voltage you need while providing a margin of current safety.

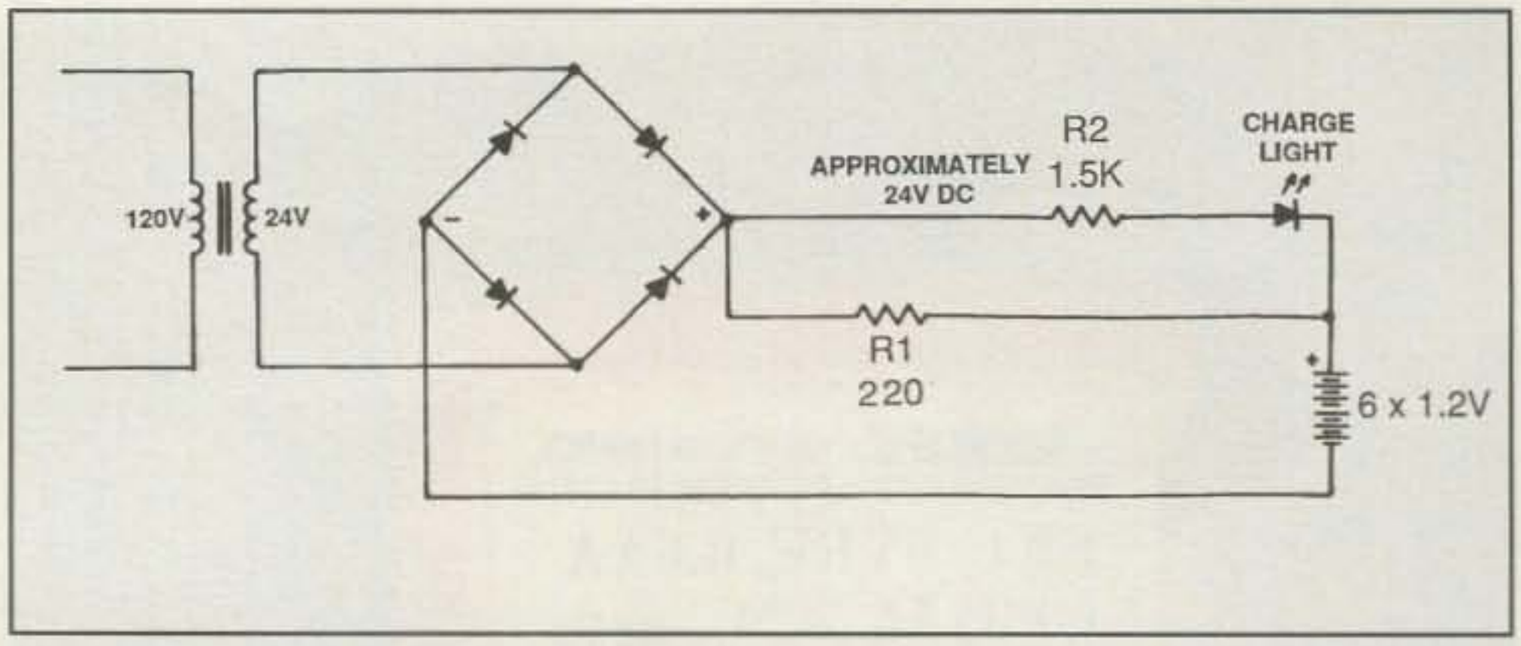


Fig. 1– The voltage on the left side of R1 is equal to the source voltage. The voltage on the right side of R1 is equal to the charge across the six-cell battery pack (7.2 volts). The current drawn by the battery is approximately 60 milliamps. The LED will only light when the battery is connected.

Replacement Batteries

Replacement batteries may be obtained from electronic parts suppliers such as All Electronics, Hosfelt, and Mouser. For this project I chose Mouser Electronics. Looking in the Mouser catalog, you will find that NiCads come in many versions. Some batteries look exactly like their alkaline "equivalents." Other batteries have tiny metal tabs on the ends for soldering. Some batteries are also prearranged into packs, and some batteries are only available as single cells. It can be confusing.

You have two real options for replacing the batteries in the HTXs. Mouser #573-60AAK3BP is a sealed set of three NiCad batteries in a presealed pack. You simply buy two of these three-cell packs, solder them in series, and install them into your battery pack, and you're done. Mouser #547-PS-AA-T is individual 1.2 volt cells with solder tabs. Using individual cells is a little extra work but has several advantages over the three-cell pack. In the future, if you have to replace just one battery in the pack, it will be much easier with individual cells. Individual batteries purchased in quantity are also cheaper than the three-cell battery pack. These batteries are exact replacements for the originals except that they have solder tabs for making the connections. Either option— individual cells or the three-cell pack—will electrically fit the bill for replacing your HTX batteries.

Inspecting the Battery Pack

Now let's visually inspect the battery pack. On the top of the pack is a metal slide which engages the bottom of the radio. Four Phillips screws hold this metal slide to the plastic battery case. In the center is a plastic island with another Phillips screw and the "+" symbol. This is the positive terminal for the battery compartment. The metal slide is the negative terminal.

Before performing any work on the battery pack, confirm that the voltage between the positive and negative terminals is low. A correctly charged battery should read 7.2 volts or greater. New batteries fresh off the charger may read above 8 volts. Remember, poor battery performance may be the result of a bad charger. Therefore, every effort should be made to charge the battery using a known to be accurate charger.

Turn the battery pack upside down. On the bottom of the pack are two screws with labels next to them for plus and minus. These screws serve two purposes: They hold the battery compartment together and also provide for drop-in charging of the entire pack. As far as I know, Radio Shack never made a drop-in charger for the 202/404 series. Perhaps the supplier of these units manufactured battery packs for several companies, including Radio Shack. Note also that the screws are located on one side of the split case. If you suspect that your batteries need to be replaced, you will have to open the battery pack for repair.

There are seven screws which hold the battery pack together. Only four screws need to be taken out in order to open the pack. On the top of the battery you need to remove only two of the four screws which hold the metal slide to the plastic case. Remove the two screws towards the "Front" of the battery pack, opposite the charging connection and charge light. Also remove the two screws on the bottom of the pack labeled plus and minus. With only these four screws removed, slide apart the two halves of the battery case.

Once the battery compartment is open, you will notice that there are four wires which lead from the battery pack to various connections in the case. Red and orange are the "+" connections. Black and blue are the "–" connections. The red and black lines go to the top charging circuit. The orange and blue lines attach to the two screws at the bottom of the case.

The entire battery pack actually is made up of six individual "AA" type cells in series. Each battery when fully charged has a voltage of just over 1.2 volts. The six new batteries in series will typically read 7.2 volts or higher.

With a pair of diagonal cutters, carefully clip the four wires, leaving a short stub of each colored wire on the solder connections. This will ensure correct rewiring when you have to solder the pack back together. After clipping the four wires, the sealed six-cell battery pack can be removed from the holder. With an Xacto

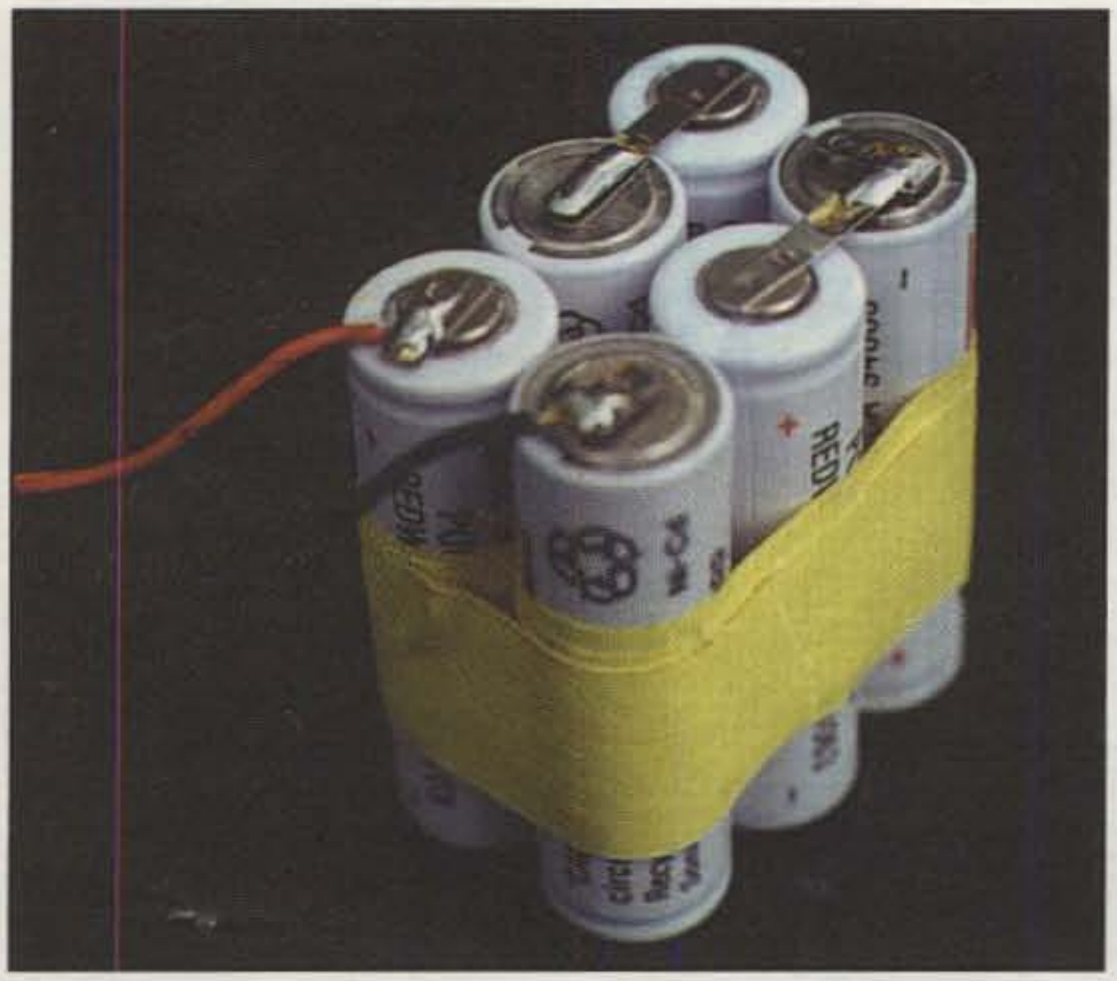


Photo 5– Place the two three-cell packs into a six-cell configuration and attach short pieces of red and black wires.

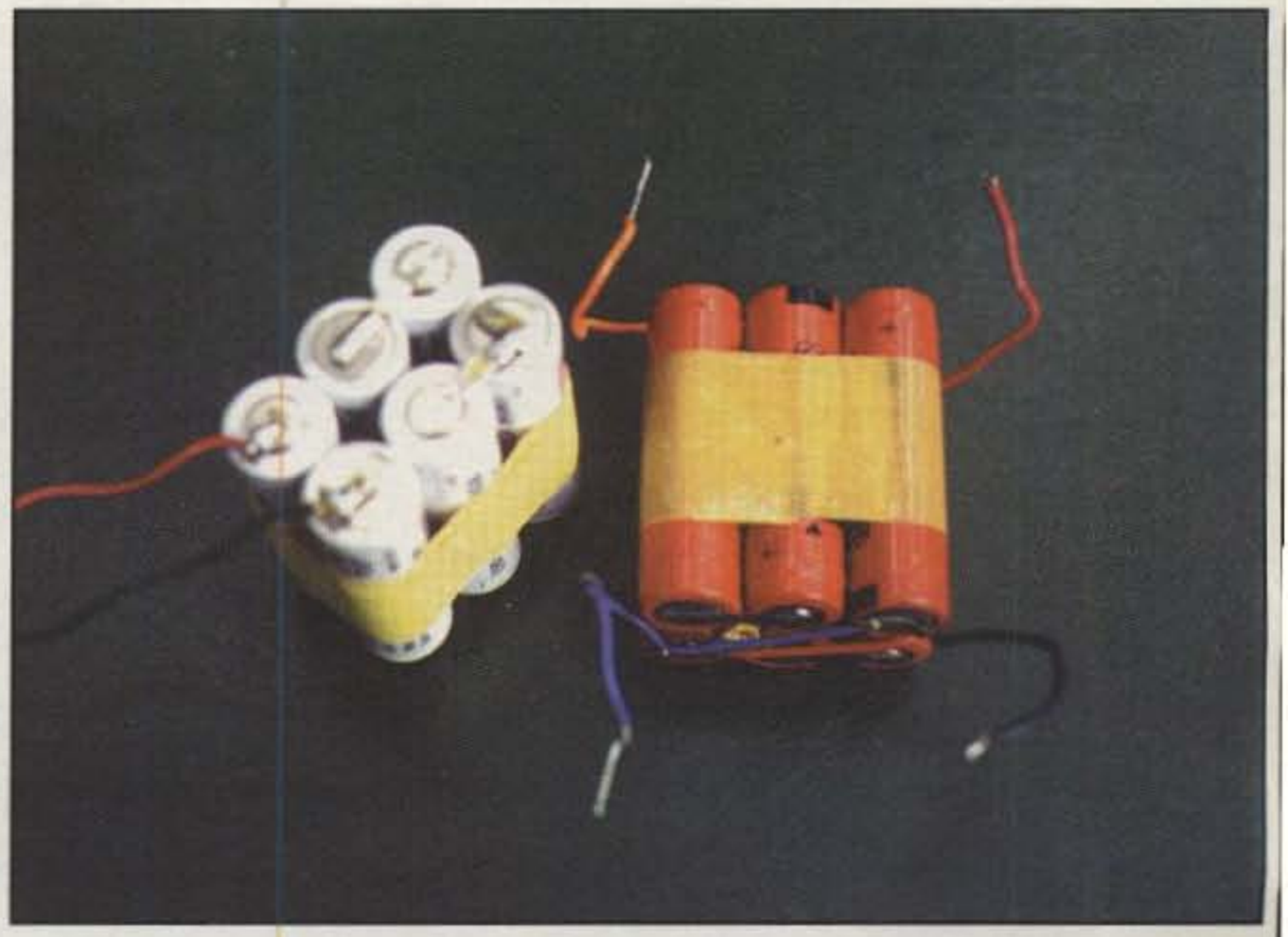


Photo 6– The new versus old battery configuration.

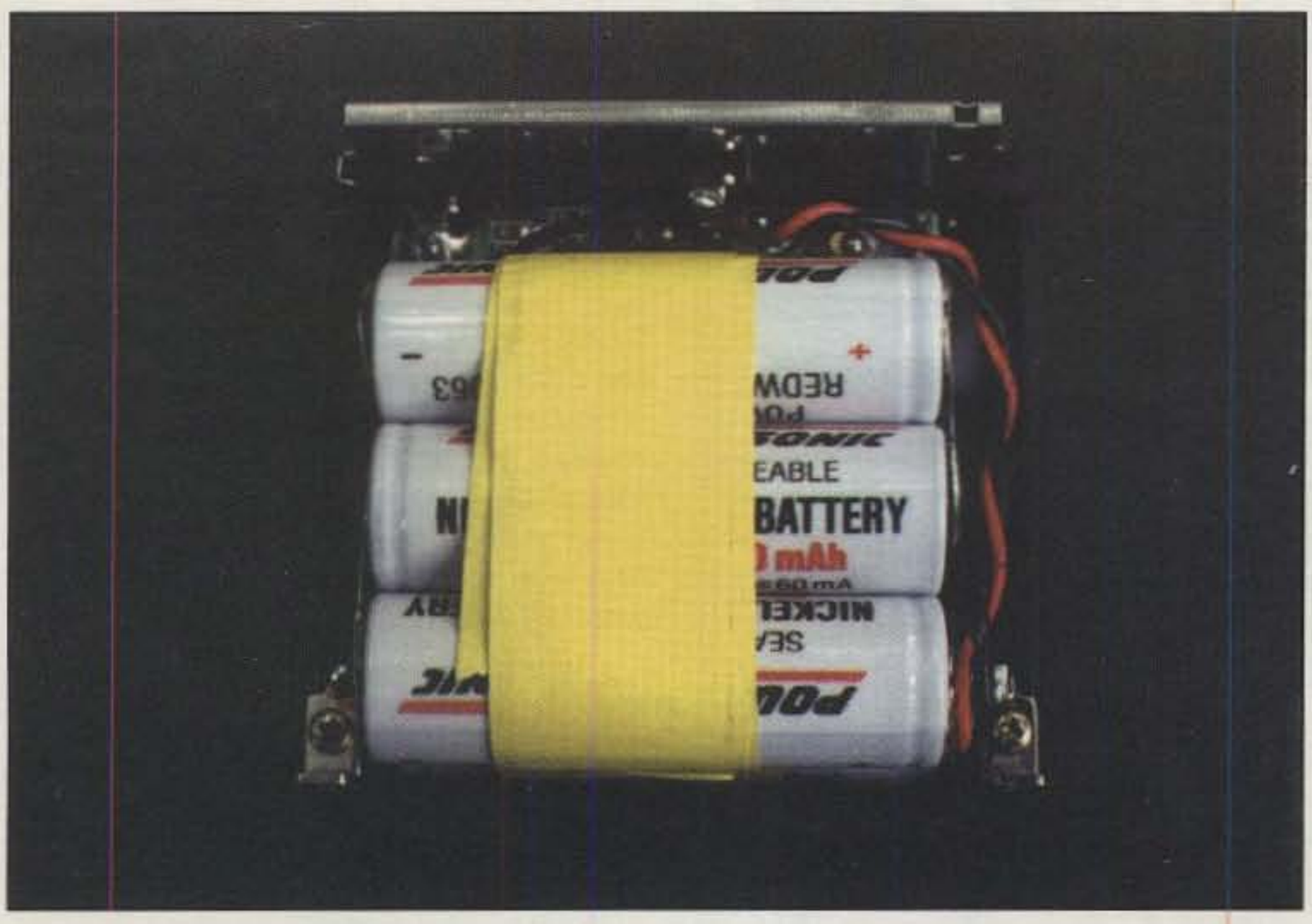


Photo 7– The new batteries re-installed in the battery pack.

knife remove the shrink-type wrap that surrounds the batteries. *Before removing the plastic tape which holds the six cells together, study the arrangement of the six-cell unit.* You may want to use the old batteries as a reference while you are *arranging the replacement cells.* Inspect the ends of the batteries for corrosion. Weak batteries will often exhibit corrosion on the battery connections. Again, since these batteries are in series, only one needs to be bad for the entire pack to malfunction.

With a voltmeter set for DC measure the voltage across each individual cell in the battery pack. With a poorly charged battery pack each cell may not read the textbook 1.2 volts. However, each cell should read some voltage. If you find a cell that reads zero volts, then that cell needs to be replaced.

If you have several battery packs, you may not want to replace all of the batteries at one time. If you find one or two bad cells, you can swap out just the bad cells and return the entire pack to a functional condition. I've done just that with several of my battery packs, and the old cells seem to take on a new life, at least for a while.

For the frugal among us, I am sure that some of you have been thinking, "Why would anyone replace all six batteries if only one or two are bad"? You have to consider the time and the costs involved. You need to judge whether your time is better spent talking on a HT or replacing batteries. Repackaging old cells will work, but for how long? Replacing all of the 1.2 volt cells at one time will make your battery pack "brand new" again. If you use your HT exclusively with battery power, this may be the most cost-effective way to go. Having several of the same battery packs I was able to match up six older cells and make one good pack out of the bunch. If you don't have several of the same packs, you may choose replacing all of the batteries at one time or replacing just the one or two cells which are at zero volts.

When reusing older batteries, make sure that a small portion of the metal tab used to electrically connect the cells together remains on the side of the good battery. You cannot solder to the battery itself, but you can solder to the metal tab. Using a diagonal cutter, cut the metal tab that ties two batteries together, leaving most of the metal on the side of the good battery. Overlap the metal tabs and solder the connections when reassembling the pack. One more note: When replacing your NiCad batteries, remember to discard the old cells in an appropriate manner. The last thing any of us needs is more toxic waste getting into the ground water. Recycle!

If you purchase new NiCad batteries, it is a good practice to check all of them for voltage prior to any soldering or assembly. If you happen to get a bad battery, it will be much easier to identify it prior to soldering the pack together. New NiCads may not read 1.2 volts before they are fully charged. Low voltage is okay, as long as each battery has *some*

voltage. A completely dead battery, zero volts, will forget how to charge. The battery will not know which end to make positive and which end to make negative. In the unlikely event that you purchase a new battery with zero volts, return it immediately. Once you have verified a voltage reading on each of the new batteries, you are ready to exchange the old batteries with new ones.

Repackaging the Batteries

Arrange the new batteries next to each other on the workbench, alternating the positive and negative ends of the batteries. Remember the batteries must be soldered in series, which means the positive end of one battery must mate with the negative end of the other battery.

Wrap three of the batteries at a time with electrical tape and solder the tabs (photo 4). After preparing two three-cell battery packs, arrange the three-cell sets as they were in the original pack. Wrap the six batteries with two turns of electrical tape, and solder the remaining tabs together (photo 5). Now measure the voltage across the entire pack. You generally will read something close to 7.2 volts. Solder a short piece of red wire to the positive end of the six-cell string.

If you are using a drop-in charger, some additional work is required. Locate and remove the orange wire from the original battery pack. You will notice that the orange wire has a small 1N4001 diode attached to the end. The diode is covered with a small piece of insulated tubing. Solder this part as it was in the original battery pack. The diode ensures that the battery pack cannot be reverse charged. Also, the diode prevents the battery pack from discharging through the two screws on the bottom of the battery housing. The screws are recessed, but if you happen to place the radio on top of a conducting surface, you may short the entire pack without the diode in place.

Now solder two black wires for the negative connection. Make sure that the red and orange wire(s) are on the positive end of the string and the black wire(s) are on the negative end of the battery pack (photo 6).

Carefully solder the red/orange and black wires to the original connections in the battery holder and double-check your work (photo 7). Once you are sure that all is wired correctly, you may place the batteries in the holder and slip the cover over the entire pack. Replace the four Phillips screws in the case. Now recheck the voltage at the negative and positive terminals on the top of the battery. If you rewired the two connections on the bottom of the battery pack, you should not get a voltage reading between the plus and minus screws if the 1N4001 diode was installed correctly.

Summary

If all checks out okay, you are ready to charge the battery pack. Do not attempt to use the battery pack prior to charging. Your new batteries with the original 60ma/h Radio Shack charger will take approximately 16 hours to charge completely. When you remove the new batteries after the first charge, don't be surprised if you read 8 volts or higher across the battery terminals. That's the sign of a great battery pack!

Finally, while this article was written for the HTX-202/404 series of radio, the same concepts apply to rechargeable battery packs from many other manufacturers. I replaced 12 batteries in two of my four HTX packs for the entire cost of $18 plus shipping. I then repackaged a third pack with the best of the leftover batteries. All things considered, I now have four great rechargeable packs for a fraction of the cost of replacing even one entire battery pack. ■

Reader Survey January 2000

We'd like to know more about you about who you are, where you live, what kind(s) of work you do, and of course, what kinds of amateur radio activities you enjoy. Why? To help us serve you better.

Each time we run one of these surveys, we'll ask a few different questions and ask you to indicate your answers by circling numbers on the Reader Service Card and returning it to us (we've already paid the postage). And, as a bit of an incentive, we'll pick one respondent every month and give that person a complimentary one-year subscription (or subscription extension) to *CQ*.

This month we'd like to start out with some questions about the merger of *CQ* and *CQ VHF* magazines.

Circle Reader Service #

1. This is the first combined issue of *CQ* and *CQ VHF* magazines. Please indicate whether you . . .

previously read CQ only	145
previously read CQ VHF only	146
previously read both magazines	147
previously read neither (this is my first issue)	148

2. Please indicate which choice best describes your current amateur radio operating activities (include MF activity under HF and UHF/microwave activity under VHF).

I am not currently a licensed ham	149
I am licensed but not currently active on the air	150
I operate exclusively HF	151
I operate mostly HF and a little VHF	152
I operate about half HF, half VHF	153
I operate mostly VHF and a little HF	154
I operate exclusively VHF	155

3. Please indicate the class of license you hold.

Not currently licensed	156
Novice	157
Technician	158
Technician Plus	159
General	160
Advanced	161
Extra	162

4. Please indicate how long you've been a ham radio operator.

Not currently licensed	163
One year or less	164
More than 1 year but less than 5 years	165
More than 5 years but less than 10 years	166
More than 10 years but less than 15 years	167
More than 15 years but less than 20 years	168
20 years or longer	169

Thank you for your responses. We'll have more questions for you next time.

CQ Showcase

Alinco Communications-Grade Switching Power Supply

Alinco USA has announced the DM-330MV, a compact (2.6 in. high and less than 7 in. wide and deep), lightweight (less than 5 lbs.) communications-grade switching power supply. It provides up to 30 amps continuous (32 amps peak) at 5 to 15 volts variable output. There is a user-selectable "memory" preset voltage along with a lighted meter that displays volts or current and a triple internal protection system against short circuits, overload, and over-temperature conditions. The unit has extensive filtering for quiet operation. And if the user should find pulse-noise present, Alinco has created a new Noise Offset Circuit (patent pending) so the noise can be moved to a different frequency. The multiple outlet terminals (binding post, auto-lighter, and snap-in terminals) make the DM-330MV usable for fixed, portable, and test-bench operations.

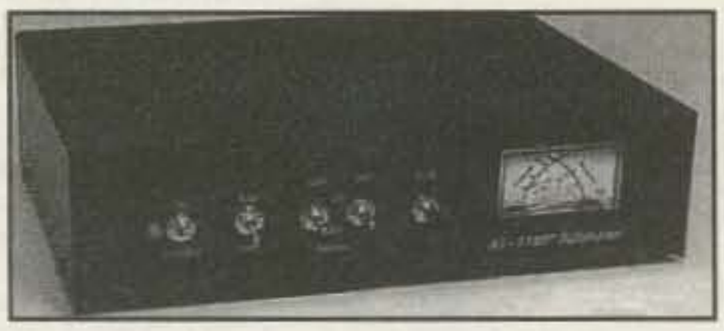
For more information, contact Alinco USA, 438 Amapola Ave., Suite 130, Torrance, CA 90501 (phone 310-618-8616; fax 310-618-8758). or circle number 101 on the reader service card.

Tri-Ex Towers From First Call

First Call Communications has been chosen as the national distributor for the Tri-Ex line of telescoping radio towers and mobile trailers. First Call specializes in telescoping towers in both the amateur and commercial markets. the president of First Call, Joel Kornreich, states that the company is committed to bringing back the popularity once enjoyed by Tri-Ex as the number one manufacturer of towers in the US. Also included in the Tri-Ex lineup will be the reintroduction of the Sky Needle series and the Tri-Ex mobile tower trailer units. For further information, contact Joel at 800-426-8693; e-mail: <firstcall@cyburban.com>; web: <www.firstcallcom.net>; or circle number 102 on the reader service card.

LDG Electronics AT-11MP Autotuner

The AT-11MP from LDG is a new autotuner that features a dual cross-needle



meter, providing forward/reflected power and SWR indications. In addition, an optional remote head is available to allow the tuner to be remotely mounted and still have control over the functions and visual indications of its status. The MP also features an interface for the ICOM IC-706 radio. While it will operate with any HF radio, The AT-11MP will use the built-in tune button on the IC-706 faceplate and will tune when pressed.

The unit operates 1.8 to 30 MHz at 5 to 150 watts continuous. The tuning circuit features a switched "L network" and is microprocessor controlled. Power requirements are 11 to 14 VDC with a current consumption of 15 to 500 ma (250 ma average). The unit will tune practically any coax feed antenna.

The AT-11MP is available assembled or in kit form: fully assembled and tested, $239; kit with enclosures, $199; kit without enclosures, $169. The optional Remote Head assembled and tested price is $39, and the kit price is $29. A balun impedance matching transformer is available to allow the tuner to tune end-fed, long wire, and random length antennas and it is priced at $25 in kit form or $30 assembled.

For more information, contact LDG Electronics, Inc., 1445 Parran Road, St. Leonard, MD 20685 (phone 410-586-2177; fax 410-586-8475; e-mail: <ldg@ldgelectronics.com>; web: <http://www.ldgelectronics.com>), or circle number 103 on the reader service card.

PRYME MMC-100 "Sun Visor" Microphone

The new MMC-100 "Sun Visor" microphone is a unidirectional clear-sounding electret microphone mounted on a flexible gooseneck. It secures to the sun visor of a car, in place for ham radio mobiling. The push-to-talk switch for the mic is located on an in-line box that can be mounted to the gear shift or arm rest.

The MMC-100 is sold without a microphone cable, but six different optional cables are available to support today's popular HF and VHF/UHF base station and mobile radios. The cables are plug and play, no soldering required. Cables are available for ICOM 8-pin, ICOM modular (RJ-45 style plug), Kenwood 8-pin (including compatible ADI and Alinco models), Kenwood modular (RJ-45 style plug), Yaesu 8-pin, and Yaesu modular (RJ-45 style plug) radios. For more information, contact Premier Communications Corp., 480 Apollo St. #E, Brea, CA 92821 (phone 714-257-0300; fax 714-257-0600; e-mail: <premier@adi-radio.com>; web: <http://www.adi-radio.com>), or circle number 104 on the reader service card.

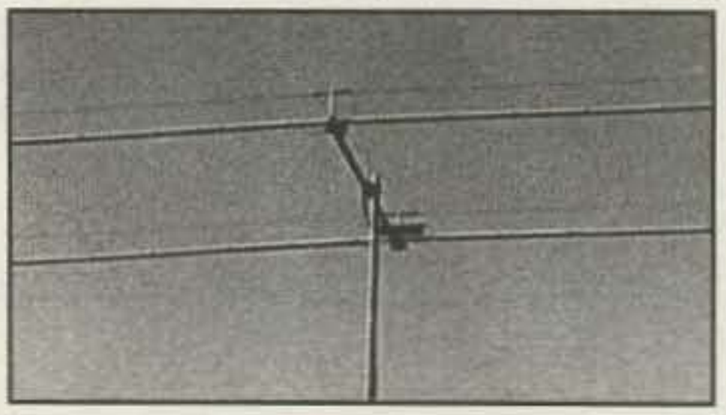
HamMall.com

Commerce Productions has announced the opening of HamMall.com, an Internet marketing company specializing in products and services of interest to amateur radio operators worldwide. In addition to the new equipment store, there is also a QSL manager List, a Call Wall to post your name and call, and a section to post your shack photo. HamMall will market for most manufacturers and publishers in the ham radio industry.

HamMall.com can be reached at P.O. Box 3487, Redmond, WA 98073, or online at <http://www.hammall.com>.

Giovannini D2T Very Wideband Antenna for Small Spaces

An Italian antenna manufacturer has introduced a small-footprint, wideband antenna that could be an ideal solution for hams with limited space for mounting



antennas. The Giovannini Antenna Systems Model D2T covers 1.5 to 200 MHz, at power levels up to 1 KW PEP. The D2T weighs 19 pounds and consists of two fiberglass elements, each 19.8 ft. long, mounted on a 6.6 ft. aluminum boom. SWR ranges between 1.1:1 and 2:1 over the entire bandwidth, with an average of 1.6:1.

Under 10 MHz, the D2T behaves like a Beverage antenna with considerable noise-reduction capabilities. Between 10 and 15 MHz, the D2T acts as a dipole, with directivity increasing along with frequency. Above 15 MHz, it becomes a 2-element beam, with gain increasing as frequency rises, until reaching a maximum gain of 6 dBd at about 30 MHz. On VHF, the antenna has a daisy-shaped radiation pattern.

The D2T is available to customers in the U.S. for $611, including shipping and handling (considerable discounts are available for retailers). For more information, contact Giovannini Elettromeccanica "Antenna Systems," via E. Mattel 9, 50039 Vicchio (Florence), Italy (phone 0039-055-844124; fax 0039-055-844797; e-mail: <giovannini@antenna.it>; on web: <http://www.antenna.it>.

Shortstop Cable Fault Finder From Jensen Tools

A new TDR is available for those who need to test for opens and shorts in all types of wire, including coax, two-wire shielded, twisted multi-pair, and AC wire. The ShortStop Cable Fault Finder will measure cable lebgth on spools, in the wall, and in the ground, as well as inject a tone onto the line for cable tracing. Adjustable VOP allows for more accurate readings. ShortStop is water resistant, input protected to 250 VAC and gives an audible indication of shorted wires and hazardous AC voltage. The unit includes four AA batteries and a clip lead adapter.

For more information and a copy of the company's catalog, contact Jensen Tools, 7815 S. 46th Street, Phoenix, AZ 85044 (800-426-1194 or 602-453-2671; fax 800-366-9662 or 602-438-1690; web: <http://www.jensentools.com>), or circle number 105 on the reader service card.

MFJ GrandMaster™ SWR/Power Meters

The MFJ GrandMaster™ SWR/Power Meters feature a large illuminated meter for ease of viewing, and a highly visible black and red meter scale on a bright white background to read SWR, forward, or reflected power. The meter lamp requires 13.8 VDC or 110 VAC with the MFJ-1312B ($12.95). A functional, simple front-panel layout lets the user select power ranges, bands, or make SWR readings intuitively. The units are housed in all-metal cabinets and measure 7 1/2"W × 3 1/8"H × 4 1/4"D. Models are as follows:

MFJ-870, HF; covers 1.6 to 60 MHz; 30, 300, 3000 watt power ranges; $134.95.

MFJ-872, HF/VHF; covers 1.8 to 200 MHz; 5, 20, 200 watts; $94.95.

MFJ-873, VHF/UHF; 125 to 525 MHz; 5, 20, 200 watts; $114.95.

MFJ-874, HF/VHF/UHF; 1.8 to 525 MHz; 5, 20, 200 watts; $169.95.

Each GrandMaster™ is covered by MFJ's "No Matter What™" one-year warranty. For more information, contact MFJ Enterprises, Inc., P.O. Box 494, Mississippi State, MS 39762 (phone 601-323-5869; fax 601-323-6551; <http://www.mfjenterprises.com>), or circle number 106 on the reader service card.

WeFax '99 Release 1 From Creative Services Software

WeFax '99 Release 1 is a new 32-bit Windows WeFax program for the Kantronics and AEA/Timewave TNCs. It allows the user to save the transmissions in .BMP (bitmap) format, print the transmission to any Windows printer, or e-mail via the internet. Other features include an automated scheduler which will allow the user to set times when he wants to receive faxes without having to be in front of a computer and a fax image manipulation window, where users can zoom, rotate, and flip the image.

WeFax '99 is written in robust C++ using the Microsoft Foundation Class library. It runs under Windows 95, 98, NT, and the soon to be released Windows 2000. For more information, contact Creative Services Software, 503 West State St. Suite 4, Muscle Shoals, AL 35661 (phone 256-381-6100; fax 256-381-6121), check their web site at <http://www.cssincorp.com>, or circle number 107 on the reader service card.

Most of us can always use another power supply. Here's one you can build from parts in your junk box.

A Junk-Box Power Supply For The Workbench

BY PAUL CARR*, N4PC

Regardless of the number of power supplies you have in your shack, you probably find yourself short by at least one. This is exactly the position in which I found myself. This situation, together with the fact that I am a natural hamfest browser and parts collector, provided the incentive I needed to solve my power-supply problem. I hope that you will find this rewarding reading and that you can glean some ideas to solve your own power-supply problem.

**97 West Point Road, Jacksonville, AL 36265*

Background

I have always been a person who spends a great amount of my allotted amateur radio time at the workbench, so this power supply was to fill the need for my projects. It needed to have an adjustable output from about 1 volt to 14.5 volts. As most of my projects are of the QRP type, two amps of current seemed to be adequate for my needs. Since this is an adjustable-voltage power supply, a voltmeter is a definite asset, and stiff regulation is required. Now that the parameters are clearly defined, on with the design.

Circuit Design

I can claim no originality for the circuit design. It came from *The National Semiconductor Corporation Linear Databook*. From my past experiments, I knew that the LM 317 was an excellent choice for

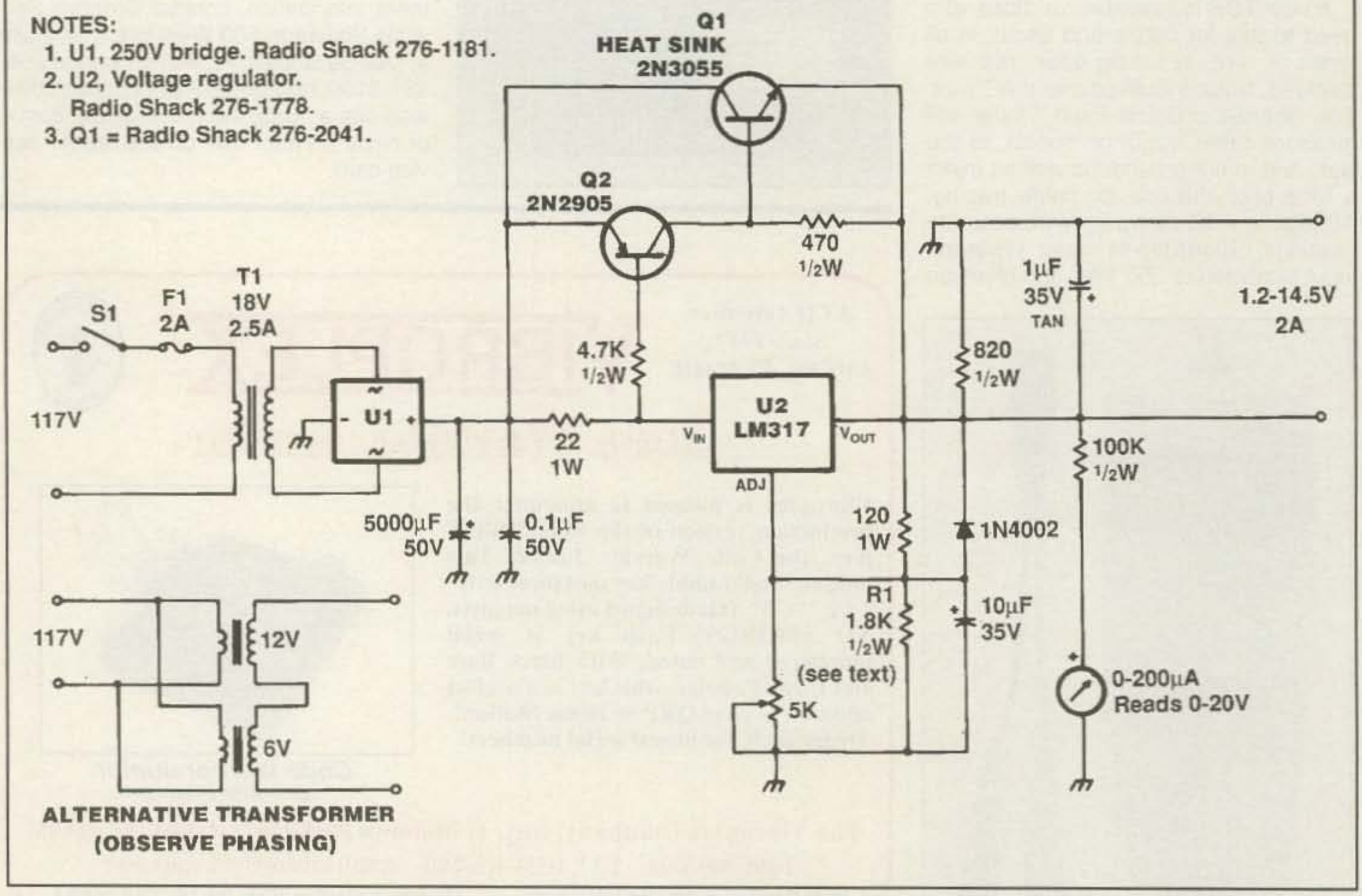


Fig. 1– Schematic of the junk-box power supply.

The junk-box power supply ready for its home on the workbench.

the heart of the regulation circuit. Since I needed more current than the LM 317 alone would supply, I found a circuit that employed a pass-transistor configuration. The only thing left to do was to design the voltage source and metering circuit.

At a hamfest I had found a transformer that was rated at 18 volts and 2.5 amps. I used a bridge rectifier and a capacitor to furnish the unregulated input voltage (about 25 volts for my supply) to the regulator circuit. Everything seemed to be in order, so on with the construction.

Construction Layout

I was fortunate to have an 8" × 6" × 3.5" minibox which provided an enclosure that would allow plenty of room for the components without crowding. I began the cabinet work by cutting the hole to mount the panel meter. That is the most difficult part of the entire project, and you may want to eliminate the meter; however, I think it is well worth the effort.

The On/Off switch is mounted at the lower left of the cabinet, and the voltage control is at the lower right. On the back there is a 2" × 3.5" heat sink for the 2N3055 pass transistor. There are also two five-way binding posts for the voltage output.

The remaining work inside is simple. Just place the parts so that no undue crowding occurs. I used a point-to-point wiring technique, and there is plenty of room inside for cooling.

Final Wiring and Testing

With power supplies, I have found it easier to begin at the AC voltage input and build toward the output. I wired the bridge rectifier and filter capacitor. I stopped for a preliminary voltage test and found that I had about 25 volts of DC across the filter. I then wired the pass transistors, the LM 317 voltage regulator, and the associated components. I carefully checked the wiring to assure myself that no solder bridges or wiring mistakes had crept in before I connected the supply voltage from the bridge rectifier/filter capacitor. After everything was verified, I applied power and checked the resulting regulated voltage. When I was satisfied that everything was correct, I made one more check and then installed the cover on the cabinet. Believe me, it is much easier to build than it is to write about!

How About Substitutions?

The one component that you may not be able to locate is the power transformer. As I said, this is one which I came across at a hamfest, but you can attain the same results if you use a 12 volt and a 6 volt transformer with their secondaries in series and their primaries in parallel. Be sure to observe a proper phase relationship when wiring the primaries. If the transformers have different current capabilities, restrict yourself to the lower current rating.

I have also specified a 1.8 K ohm resistor across the voltage control potentiometer. This was my preference because I wanted to restrict the output voltage to about 14.5 volts. If you want a higher output voltage, increase the value of this resistor. The choice is yours.

Afterthoughts

This article is presented to stimulate your thought processes and not for exact replication. I am sure the contents of your junk box are very different from mine, and you should explore the possibility of using the components you have available. There is one thing I am willing to say: I'll bet you could use another power supply! ■

Announcing:

The 43nd Annual CQ World-Wide WPX Contest

SSB: March 25–26, 2000
CW: May 27–28, 2000

Starts: 0000 GMT Saturday Ends: 2400 GMT Sunday

I. Contest Period: Only 36 hours of the 48 hour contest period permitted for Single Operator stations. **Off periods must be a minimum of 60 minutes in length and clearly marked in the log. Listening time counts as operating time**. Multi-Operator stations may operate the full 48 hours.

II. Objective: Object of the contest is for amateurs around the world to contact as many amateurs in other parts of the world as possible during the contest period.

III. Bands: The 1.8, 3.5, 7, 14, 21, and 28 MHz bands may be use. No WARC bands.

IV. Types of Competition (for all categories): All entrants must operate within the limits of their chosen category when performing any activity that could impact their submitted score. Transmitters and receivers must be located within a 500 meter diameter circle or within the property limits of the station licensee, whichever is greater. All antennas must be physically connected by wires to the transmitters and receivers used by the entrant. Only the entrant's callsign can be used to aid the entrant's score.

1. Single Operator (Single Band and All Band)

(a) Single operator stations are those at which one person performs all of the operating, logging, and spotting functions. **Only one transmitted signal is allowed at any time.**

(b) **Low Power:** Same as 1(a) except that **output power shall not exceed 100 watts.** Stations in this category will compete with other low power stations only.

(c) **QRP/p:** Same as 1(a) except that **output power shall not exceed 5 watts.** Stations in this category will compete with other QRP/p stations only.

(d) **Assisted:** Same as 1(a) except the **passive use (no self-spotting) of DX spotting nets or other forms of DX alerting are permitted.** Stations in this category will compete with other Assisted stations only.

(e) **Tribander/Single Element (TS):** Tribander (any type) with a single feedline from the transmitter to the antenna and single element (TS) category. During the contest, an entrant shall use only one (1) tribander for 10, 15, 20 meters and single-element antennas on 40, 80, and 160.

(f) **Band Restricted (BR):** An eligible entrant must hold a license restricting operation to less than the six (6) contest bands (160, 80, 40, 20, 15, 10) on both modes. Examples of such licenses are: Novice, Technician, 4 class license, etc. Since frequency privileges differ from country to country, competition is within one's own country.

(g) **Rookie (R):** An entrant in this category shall have been licensed as a radio amateur three (3) years or less.

2. Multi-Operator (All band operation only)

(a) **Single-Transmitter:** Only one transmitter and one band permitted during the same time period (defined as 10 minutes).

(b) **Multi-Transmitter:** No limit to transmitters, but only one signal and running station allowed per band. *Note:* All transmitters and receivers must be located within a 500 meter diameter area or within property limits of the station licensee, whichever is greater. **All operation must take place from the same operating site.**

V. Exchange: RS(T) report plus a progressive contact three-digit serial number starting with 001 for the first contact. (Continue to four digits if past 999.) Multi-operator multi-transmitter stations use separate serial numbers for each band.

VI. Points:

(a) Contacts between stations on different continents are worth three (3) points on 28, 21, and 14 MHz and six (6) points on 7, 3.5, and 1.8 MHz.

(b) Contacts between stations on the same continent, but different countries, are worth one (1) point on 28, 21, and 14 MHz and two (2) points on 7, 3.5, and 1.8 MHz. **Exception: For North American stations only—contacts between stations within the North American boundaries are worth two (2) points on 28, 21, and 14 MHz and four (4) points on 7, 3.5, and 1.8 MHz.**

(c) **Contacts between stations in the same country are worth 1 point regardless of band.**

VII. Multiplier: The multiplier is the number of "**valid**" prefixes worked. A PREFIX is counted only once regardless of the number of times the same prefix is worked.

(a) A PREFIX is the letter/numeral combination which forms the first part of the amateur call. Examples: N8, W8, WD8, HG1, HG19, KC2, OE2, OE25, etc. Any difference in the numbering, lettering, or order of same shall constitute a separate prefix. A station operating from a DXCC country different from that indicated by its callsign is required to sign portable. The portable prefix must be an authorized prefix of the country/call area of operation. In cases of portable operation, the portable designator will then become the prefix. Example: N8BJQ operating from Wake Island would sign N8BJQ/KH9 or N8BJQ/NH9. KH6XXX operating from Ohio must use an authorized prefix for the U.S. 8th district (W8, K8, etc.) Portable designators without numbers will be assigned a zero (0) after the second letter of the portable designator to form the prefix. Example: N8BJQ/PA would become PAØ. All calls without numbers will be assigned a zero (Ø) after the first two letters to form the prefix. Example: XEFTJW would count as XEØ. Maritime mobile, mobile, /A, /E, /J, /P, or interim license class identifiers do not count as prefixes.

(b) Special event, commemorative, and other unique prefix stations are encouraged to participate. Prefixes must be assigned by the licensing authority of the country of operation.

VII. Scoring:

1. Single Operator: (a) All Band score = total QSO points from all bands multiplied by the number of different prefixes worked (prefixes are counted only once). (b) Single band score = total QSO points on the band multiplied by the number of different prefixes worked.

2. Multi Operator: Scoring is the same as Single Operator, All Band.

3. A station may be worked once on each band for QSO point credit. **Prefix credit can be taken only once.**

IX. QRP/p Section: Single Operator only. Output power must not exceed 5 watts. **You must denote QRP/p on the summary sheet**

M² EXTRA, EXTRA, KLM GOES OUT OF BUSINESS !

M2 STEPS IN WITH CUSTOMER SUPPORT AND NEW TRIBANDER SERIES !

OUR COMMITMENT

At M2, we feel a strong connection with KLM customers. Mike Staal, K6MYC (M2's Owner/ Antenna Designer) Co-founded KLM in 1971 and fathered most of the KLM antennas that are still popular today.

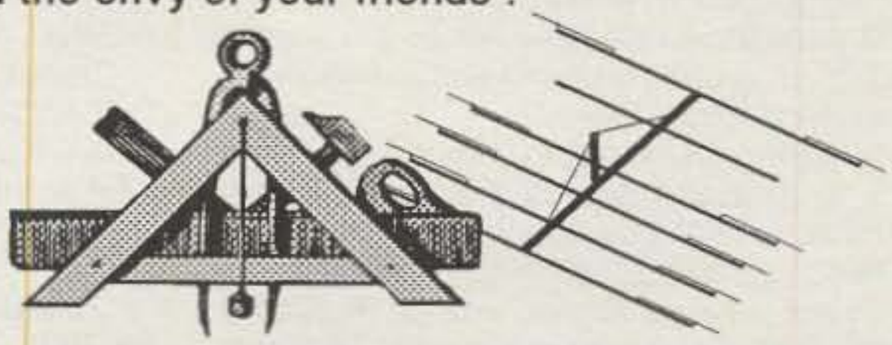
M2 has continued the same product philosophy using computers to optimize performance and strengthen the new designs mechanically.

We want to support KLM customers by providing replacement parts and support for KLM antennas whenever possible. At the same time we hope to help KLM customers make the transition to M2's line of stronger, more optimal designs.

So give us a call, fax or email and we will do our best to get you back on the air. You have a home at M2 !

NEW TRIBANDER SERIES

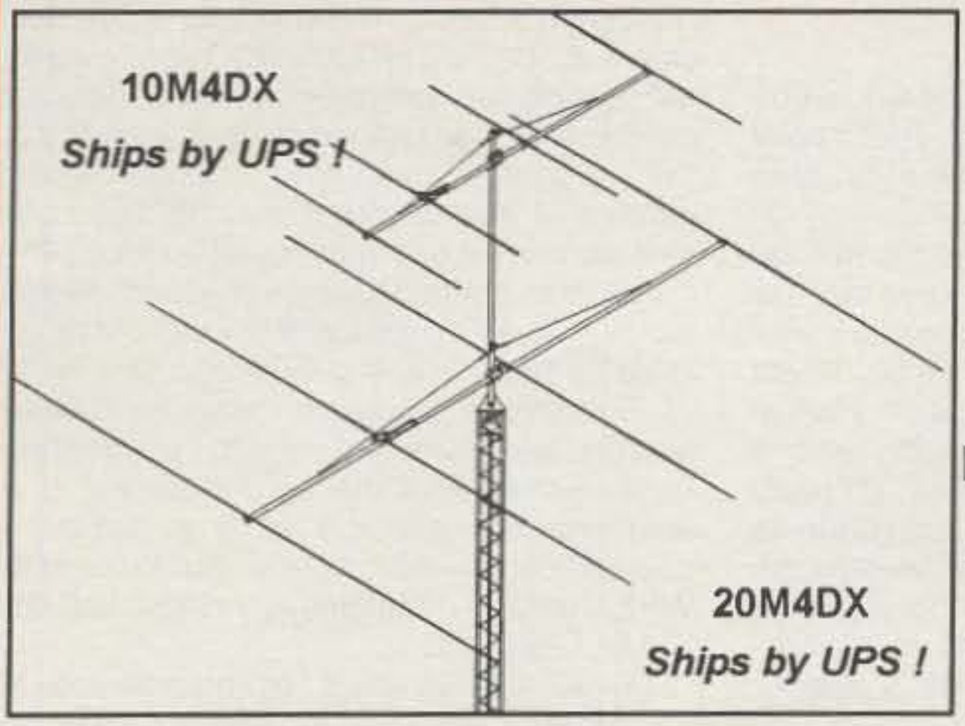
At M2's production facility, we are currently working on 3 Multiband designs that will make you the envy of your friends !



- **A small potent package sized like the KT-34A**
- **A medium sized smoker similar to the KT34XA**
- **A killer giant that will set new standards in tribander performance**

Watch for our future Ads for the actual details !

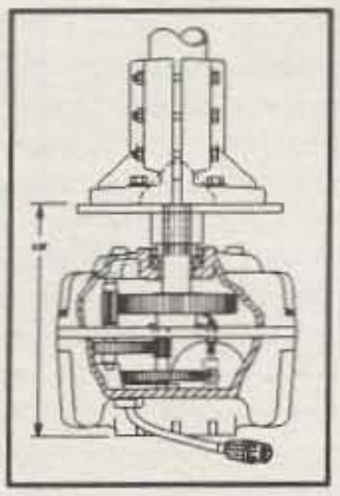
HF MONOBANDERS-DX SERIES



At M2 our DX Series of HF Monobanders are built from the latest computer optimization programs and designed mechanically from the best CNC parts known to the industry-to give you the most reliability and the best performance for you buck. Available from our Dealer Network and UPS Shippable !

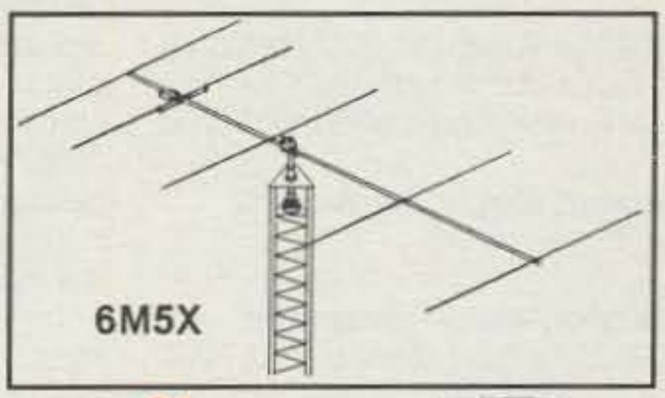
VHF/UHF/MICROWAVE YAGIS

At M2 we have combined the best new computer optimization programs and decades of VHF/UHF antenna design experience to maximize the overall performance of every 6M,2M,70CM and Microwave Yagi.



OR2800P ROTATOR

The OR2800P Azimuth Rotator is packed with performance and reliability....exactly what you would expect from M2. The controller has the Manual feature, plus 10 programmable presets, programmable ramped start / stop, 1/2 degree target accuracy. It has a RS232 port for complete computer control, tracking programs, etc.



Visit our website for all the goodies @ www.m2inc.com

Complete Catalog and Spec Sheets now available from our Website

MasterCard VISA DISC

7560 N. Del Mar Ave. Fresno, CA 97311 (559) 432-8873 Fax (559) 432-3059
E-Mail us at m2sales@aol.com Website www.m2inc.com

HIGH PERFORMANCE

SEE THE DIFFERENCE

and state the actual maximum output power used for all claimed contacts. Results will be listed in a separate QRP/p section and certificates will be awarded to each top-scoring QRP/p station in the order indicated in Section XI.

X. Low Power Section: Single Operator only. **Output power must not exceed 100 watts. You must indicate low power on the summary sheet and state the actual maximum output power used for all claimed contacts.** Results will be listed in a separate low power section and certificates will be awarded to each top-scoring low power station in the order indicated in Section XI.

XI Awards: Certificates will be awarded to the highest scoring station in each category listed under Section IV—

1. In every participating country
2. In each call area of the United States, Canada, Australia, and Asiatic Russia

All scores will be published. To be eligible for an award, a single operator station must show a minimum of 12 hours of operation and multi-operator stations must show a minimum of 24 hours of operation.

A single band log will be eligible for a single band award only. If a log contains more than one band, it will be judged as an all band entry unless specified otherwise.

In countries or sections where entries justify, second- and third-place awards will be made.

XII. Trophies, Plaques, and Donors:

SSB

Single Operator, All Band

WORLD – Stanley Cohen, WD8QDQ
USA – Atilano de Oms, PY5EG
EUROPE – Jim Hoffman, N5FA
SOUTH AMERICA – Ron Moorefield, W8ILC
OCEANIA – Phillip Fraizer, K6ZM Memorial
AFRICA – Peter Sprengel, PY5CC
*JAPAN – The DX Family Foundation
WORLD Low Power – Steve Bolia, N8BJQ
USA Low Power – Oklahoma DX Association
CANADA Low Power – Amateur Radio League of Alberta
WORLD QRP/p – Dayton Amateur Radio Association
USA QRP/p – Doug Zwiebel, KR2Q

Single Operator, Single Band

WORLD – John N. Reichert, N4RV
WORLD 28 MHz – Alan Dorhoffer, K2EEK Memorial
WORLD 7 MHz – William D. Johnson, KVØQ
WORLD 3.7 Low Power – Nilay & Berkin Aydogmus, TA3YJ & TA3J
OCEANIA - D. Craig Boyer, AH9B
USA 28 MHz Novice/Tech – Jon Engelhardt, KAØZFX
USA 21 MHz – Bernie Welch , W8IMZ Memorial
USA 3.7 MHz – Lance Johnson Digital Graphics
USA 14 MHz Low Power – Boomer Contest Club

Multi-Operator, Single Transmitter

USA – D. Craig Boyer, AH9B

Multi-Operator, Multi-Transmitter

NORTH AMERICA – Burt Curwen, KL7IRT Memorial
USA – Glenn Tracey, KC3EK

Contest Expedition

WORLD – Kansas City DX Club

CW

Single Operator, All Band

WORLD – Steve Bolia, N8BJQ
USA – Dennis Motschenbacher, K7BV
EUROPE – Ivo Pezer, 5B4ADA/9A3A
OCEANIA – Tom Morton, K6CT
CANADA – Radio Amateurs of Canada (RAC)
*JAPAN – The DX Family Foundation
WORLD LOW POWER – Steve Bolia, N8BJQ
USA LOW POWER – Ron Stark, KU7Y
CANADA LOW POWER – Amateur Radio League of Alberta
ZONE 3 High Power – Jim Pratt, N6IG

Single Operator, Single Band

WORLD – Pedro Piza, Sr., KP4ES Memorial
WORLD 7 MHz – William D. Johnson, KVØQ
WORLD 3.5 MHz – Lance Johnson Digital Graphics
OCEANIA – D. Craig Boyer, AH9B
USA – Kansas City DX Club
USA 28 MHz – Bernie Welch, W8IMZ Memorial
USA 21 MHz – Wayne Carroll, W4MPY

Multi-Operator, Single Transmitter

WORLD – Ron Blake, N4KE
USA – Austin Regal, N4WW

Multi-Operator, Multi-Transmitter

USA – Oklahoma DX Association

Contest Expedition

WORLD – Steve Bolia, N8BJQ

Combined SSB/CW

Single Operator, All Band

WORLD – Al Slater, G3FXB Memorial
EUROPE – Les Nouvelles DX Group
USA – D. Craig Boyer, AH9B

Club (SSB & CW)

WORLD – *CQ* Magazine
USA – Oklahoma DX Association

* *Donor is responsible for this trophy*

A station winning a World trophy will not be considered for a sub-area award. That trophy will be awarded to the runner-up for that area if the returns justify the award.

XIII. Club Competition: A trophy will be awarded each year to the club or group that has the highest aggregate scores from logs submitted by members. The club must be a local group and not a national organization. Participation is limited to members operating within a local geographical area **(exception: DXpeditions specially organized for operation in the contest and manned by members)**. Indicate your club affiliation on the summary sheet. To be eligible for an award, a minimum of three logs must be received from a club.

XIV. Log Instructions:

(a) All times must be in GMT. All breaks must be clearly marked. Single operator and multi-single logs must be submitted in chronological order. Multi-multi logs must be submitted chronologically by band.

(b) All sent and received exchanges are to be logged.

(c) Prefix multipliers should be entered only the FIRST TIME they are worked.

(d) Logs must be checked for duplicate contacts, correct QSO points, and prefix multipliers. Duplicate contacts must be clearly shown. Computerized logs must be checked for typing accuracy. Original logs may be requested if further cross-checking is required.

(e) **An alpha/numeric check list of claimed PREFIX multipliers must be submitted with your log.**

(f) Each entry must be accompanied by a Summary Sheet listing all scoring information, the category of competition, and the entrant's name and mailing address in BLOCK LETTERS. Also submit a signed declaration that all contest rules and regulations for amateur radio in the country of operation have been observed.

(g) Official log and summary sheets are available from *CQ* for an SASE with sufficient postage. If official forms are not available, you may make your own.

(h) Electronic submission of logs is encouraged. CT's *.BIN file or *.ALL file, TRLogs *.DAT file, NA's *.QDF are acceptable. Logs may also be submitted in the CABRILLO format. If you use the CABRILLO format, a separate summary sheet is required. An ASCII file containing all required information (time, band, call, sent exchange, rcvd exchange, QSO points and multipliers) is also acceptable. Logs must be in chronological order for single operator and multi-single stations and chronological by band for multi-multi stations. If you send a disk, please label the disk with your call. Please name log files with your call and extension (example: N8BJQ submits an electronic log using TRLog. The log should be labeled as N8BJQ.DAT and the summary file as N8BJQ. SUM).). **Disks or electronic files are required from all top-scoring stations and those which use a computer to prepare the logs.**

(i) Logs may be submitted via e-mail to <**N8BJQ@ERINET.COM**>. **Internet submissions require a summary sheet as well as the log file.** All logs received via e-mail will be confirmed via e-mail. A listing of logs received can be found on the CQ WPX website at <http://ourworld.compuserve.com/homepages/n8bjq>

XV. Disqualification: Violation of amateur radio regulations in the country of the contestant, or the rules of the contest, unsportsmanlike conduct, taking credit for excessive duplicate contacts, unverifiable QSOs or multipliers will be deemed sufficient cause for disqualification. An entrant whose log is deemed by the WPX Contest Committee to contain a large number of discrepancies may be disqualified as a participant operator or station for a period of one year. If within a five-year period the operator is disqualified a second time, he will be ineligible for any *CQ* contest awards for three years.

The use of non-amateur means such as telephones, telegrams, packet, etc., to solicit contacts or multipliers **during** the contest is unsportsmanlike and the entry is subject to disqualification. Actions and decisions of the WPX Contest Committee are official and final.

XIII. Deadline:

(a) All entries must be postmarked NO LATER than May 10, 2000 for the SSB section and July 10, 2000 for the CW section. E-mail logs are also subject to these deadlines. **Indicate SSB or CW on your envelope.** One extension of up to 30 days, for legitimate reasons, may be granted if requested from the contest director. Logs postmarked after the deadline, or extension deadline if granted, may be listed in the results, but will be ineligible for any awards.

All logs go to: CQ Magazine, WPX Contest, 25 Newbridge Road, Hicksville, NY 11801 USA. Questions pertaining to the WPX Contest can be sent to WPX Contest Director, Steve Bolia, N8BJQ, 7354 Thackery Road, Springfield, OH 45502 USA, or via e-mail to <N8BJQ @ERINET.COM>.

Please remember to send in early for WPX contest log and summary sheets.

The WPX Home Page: <http://ourworld.compuserve.com/homepages/n8bjq>.

800-882-1343 / 800-564-6516

Out of State **California**

ICOM

IC-756 HF + 6M Multi-Info Large LCD Display, 5-100 Watts, All Mode .....***SPECIAL!*** **$1979.95**

IC-746 HF+6M+2M-SPECIAL $1589.95
IC-706MKIIG HF+6M+2M Transceiver w/CTCSS encode/decode **$1399.95**
IC-706MKII HF+6M+2M Transceiver comes with UT-106 DSP (From ICOM) **$1099.95**
IC-2800H NEW 2M/440MHz **$559.95**
IC-2100H NEW 2M Mobile 55 Watts, Remote Control Mic...**SPECIAL $199.95**

IC-207H Dualband Mob., 45W/35W Detach. Front Panel.....**$339.95**

IC-T8AH 6M/2M/440MHz HT ...**$279.95**
IC-T81A Four Bands 6M/2M/440MHz/1.2GHz HT.....**$399.95**
IC-T2A NEW 2M/HT 6 Watts.....**$179.95**
IC-W32A 2M/440MHz HT 3/5W..**$309.95**
IC-R2 NEWAM, FM, WFM Receiver, .5-1300MHz, 400 Memories.....**$209.95**
IC-R10 .5MHz-1.3GHz HT Rec. .**$309.95**
IC-PCR 1000 5-1300MHz **$399.95**
IC-PCR 100 .1-1.3GHz **$219.95**
IC-R8500 .1MHz-2GHz Rec. **$1499.95**

KENWOOD

TS-870S HF Transceiver All Amateur Bands.....**$2269.95**
TS-60S 50MHz Transceiver, 90W Output **$879.95**
TS-50S 1.8-30MHz HF Transceiver Super compact.....**$799.95**

TS-570DG HF Transceiver,100W Auto Antenna Tuner, DSP.....**$1099.95**
TS-570SG HF with 6M.....**$1349.95**

$199.95

TM-261A 2M Mobile 50W

TM-G707A Dualband Mobile.....**$339.95**

TM-V7A FM,Dual Band, Detachable Front Panel

TM-V7A SPECIAL
$449.95 **list $719.95**

NEW!!! TH-D7A Data Communicator
TH-79AKSS Dualband HT.....$379.95
TH-G71A NEW, Dualband HT ...**$259.95**
FREE PB39 FROM KENWOOD
TH-22AT 2 Meter HT **$189.95**

JRC ***Call for JRC Radio***

YAESU

CLOSE-OUT SPECTACULAR

FT-10R/A16-41B
2 Meter Handheld
First Ham Handhelds with MIL-STD 810 Rating
5 Watts Output
Allpha-Numeric Display
High Speed Scanning
Battery Savers
Compact Design
99 Memories
Time-Out Timer
Read Amount of Battery
Programming Software Available

FT-10R/A16-41B
VHF, HT, 5 Watts with FNB-41 Battery Pack and NC-60B Charger, 16-Keypad, Encode
$119.95
List $349.95

FT-10R/A16D-41B
Same As Above, Plus Encode/Decode
$129.95
List $379.95

FT-10R/A16S-41B
Same As Above Plus Encode/Decode and Digital Recorder
$139.95
List $399.95

ALINCO

DX-70TH Compact, 100W, HF.....**$789.95**
DR-140T 2 M Mobile .....**CALL $$**
DR-150T 2M Mobile .....**CALL $$**
DR-605T 2M/440MHz Mobile.....**CALL $$**
DR-610T 2M/440MHz Mobile.....**CALL $$**
DJ-191TH 2M HT .....**CALL $$**

DJ-C1T/C4T
Credit Card size 2M or 440MHz HT
SPECIAL!.....**$89.95**

BARGAN BOX

AT-400 440 HT 5watts **$139.95**
AT-400 440MHz HTw/alkaline AA battery case **$119.95**

IC-BP173 9.6V 600ma Battery **$49.95**
IC-B157A 7.2V 900ma Battery. **$49.95**

ADI

AR-146 50W, 2 meter Mobile **$169.95**
AT-201HP 5W, 2M, HT ...**$145.95**
AT-600HP 5W, 2M/440HT **$259.95**
AT-400 440MHz HT **$199.95**
Limited Quantities

prices subject to change without notice

TIMEWAVE
MFJ
cushcraft
hy-gain *by Telex*
MAGELLAN
butternut
ASTRON CORPORATION
COMET
DIAMOND ANTENNA
TE SYSTEMS
GARMIN
PALOMAR
VIBROPLEX
DAIWA
NYE & Co.
HUSTLER
Force 12 *Antennas and Systems*
KANTRONICS
W & W
rfconcepts
KLM
PERIPHEX
M^2 Antennas
GAP
SGC

Larsen
MIRAGE
MAHA
BENCHER, INC.

310-390-8003
FAX 310-390-4393
http://www.juns.com
E-mail:juns@dxnet.com
HRS M-F 10 - 6, SAT 10- 5
5563 SEPULVEDA BLVD.
CULVER CITY, CA 90230
2.5 miles from LAX-N. on I-405
ESPANOL · KOREAN

Jun's Electronics

CIRCLE 180 ON READER SERVICE CARD

1999 CQ WW WPX CW High-Claimed Scores

UNITED STATES
SINGLE OPERATOR
ALL BAND

WW4T (W4AN)	8,177,990
NT1N	7,872,480
KQ2M	7,389,780
NE6N (N6RT)	6,874,281
NY4A	6,529,264
KX1A (W1WEF)	6,247,207
K3ZO	5,831,809
WC4E	5,743,474
N3BB	5,667,354
KT3Y	5,633,838
WV6C (N6IG)	5,583,876
WØUA	5,170,308
AJ1I (K5ZD)	5,090,191
KN7P (KL2A)	4,594,216
WK6LA (K6LA)	4,518,780
WØCG	4,192,074
AA3B	4,118,076
KC7V	4,014,010
WC1M	3,940,592
AA7A	3,717,776

28 MHz

N4BP	760,104
NN5AA (K5NA)	565,200
NE5D (K5RX)	387,477
*KN4Y	145,590
*K7WP	50,384

21 MHz

NU5A (K5GN)	4,518,193
WW4RR (K4WX)	3,829,960
N2IC/Ø	3,558,932
N8II	3,428,015
K6LL/7	3,252,932
NØNR	3,055,437
KS7O	2,626,875
NI3S/8	2,204,928
N6MU	2,187,221
N4PN	2,102,610

14 MHz

NA5B (W5AO)	2,480,940
W5FO	1,386,000
K5ZM	734,867
*AB2AP	456,808
*AB7RW	364,188

7 MHz

W3BGN	1,240,168
W4MYA	1,164,267
WX4CW (W4SO)	819,511
*WB2DVU	279,865
W6YJ	257,634

3.5 MHz

*W1MK	48,278
W8AEF	11,178

1.8 MHz

K4JYO	819

LOW POWER
SINGLE OPERATOR
ALL BAND

N3RS	3,543,858
WQ5L	3,315,610
W2TZ	3,287,565
N2BA	3,215,014
WO4O	2,692,952
K1VUT	2,682,140
K9QVB	2,465,385
WD4AHZ	1,922,940
WD5K	1,916,166
KN7Y	1,733,208

28 MHz

KN4Y	145,590
K7WP	50,384
KQ1V	41,280
W3NO	40,959
WD6DX	7,056

21 MHz

N4TZ	1,288,770
W9ILY	402,204
K7ON	401,253
N4IG	366,860
KW7R	241,860

14 MHz

AB2AP	456,808
AB7RW	364,188
W8UMR	193,536

7 MHz

WB2DVU	279,865
W3CP	186,559
AE1B	42,680
KU6T	19,140
K4WW	16,590

3.5 MHz

W1MK	48,278

DX
SINGLE OPERATOR
ALL BAND

CN8WW (DL6FBL)	13,338,213
WP2Z (N5TJ)	12,595,932
C4A (5B4ADA)	10,318,536
ED8PP (EA3KU)	10,204,040
JY9NX (JM1CAX)	8,758,484
P49V	8,390,976
AM8ZS (N6TJ)	7,729,977
YB1AQS	7,086,512
VE3EJ	7,007,288
HZ1AB (SMØCXU)	6,626,515
SP7GIQ	6,301,540
M6T (G4PIQ)	6,183,923
ZM1A (F2CW)	6,176,184
CN/DJ9RR	6,174,114
OK1RI	6,080,250
OHØZ (K7BV)	5,801,523
LY6M (LY1DS)	5,609,792
*VP5GA (N2GA)	5,526,936
Z32AU	5,509,044
LO1F (LU4FPZ)	5,334,498

28 MHz

5X1Z (SM7PKK)	4,743,492
5NØMSV	3,030,405
PP5BRV	2,455,720
OD5SB (OK1MU)	2,046,100
WP3A	1,990,885
SØU	835,376
*LU4FD	794,612
*LU9APM	607,990
EO7V (UR7VA)	598,416
OL5Y (OK1FUA)	577,656

21 MHz

A45XR	6,647,022
KH6ND	6,281,136
ZF1A (W5ASP)	5,401,600
9A3GW	5,198,622
*SU9ZZ	4,905,189
SP5GRM	4,104,205
ZT6Z (ZS6EZ)	3,750,500
VF6JY (VE5MX)	3,678,808
ZY2DX (PY2QE)	3,652,440
V73ZZ	3,553,924

14 MHz

SN2B (SP2FAX)	3,795,939
9A5W	3,662,106
HG3DX (HA3UU)	3,287,900
OH9DX	2,453,682
*9A7R	2,336,480
RZ6FA	2,240,994
HA3NU	2,236,185
SK3GW (SM5IMO)	2,195,820
*RJ6J (RA9JR)	2,185,690
LY2KW	2,109,040

7 MHz

9A9A	2,957,845
S57AL	1,958,396
LY2IJ	1,250,775
UT7IY	1,132,404
*S54A	1,121,736
DJ9DZ	1,064,712
SQ6Z (SP3RBR)	1,062,604
*OK2ZC	908,187
*S53F	811,938
*T91AAW	783,498

3.5 MHz

OK2RZ	831,836
UPØL	737,060
GUØWWW (5B4WN)	677,824
*C4ØM (5B4AFM)	395,038
UA9JLJ	341,548
OH2W	302,356
SP5GH	232,775
*S5ØD (S52RU)	231,035
HG3G	230,121
*9A3CY	206,052

1.8 MHz

4X4NJ	170,158
9A2AJ	140,298
VA1A (K3BU)	108,996
OM5NU	92,064
UR7QC	65,836
*UT1FA	56,146
LY2OU	43,875
OH3BU	22,204
*T94YT	18,170
*UR4III	9,438

LOW POWER
SINGLE OPERATOR
ALL BAND

VP5GA (N2GA)	5,526,936
PY2YU	3,868,833
YB2UU	3,598,560
XJ9DX	3,446,828
VE7SZ (VE7NTT)	3,386,773
VE3OI	2,994,064
T95A	2,937,330
VA3UZ	2,718,508
9A1O (9A5I)	2,641,950
HA1CW	2,471,720
EU1DX	2,334,069
RAØFF	2,266,538
PT1A (PY1NX)	2,254,014
CQ1A (ON5UM)	2,250,000
IKØYVV	2,151,025
LU7EE	2,145,088
S53EO	2,141,944
UY8IF	2,124,440
7M1MCT	2,099,010
EA7KN	2,049,754

28 MHz

LU4FD	794,612
LU9APM	607,990
9A6A	540,600
EA5DWS	395,928
VK4ICU	327,805
9A3VM	312,285
SV1DKR	306,222
Z31MM	304,056
JH9VSF	220,284
YV7QP	202,312

21 MHz

SU9ZZ	4,905,189
TA3D	3,494,813
CI7A (VE7SV)	2,729,540
YTØC (YU7CB)	2,079,506
EA8ASJ	1,871,352
UA4LL	1,860,550
JQ6NAW	1,721,760
9A3B	1,550,250
4Z5FW	1,503,280
Z31GX	1,376,830

14 MHz

9A7R	2,336,480
RJ6J (RA9JR)	2,185,690
S58AL	1,976,022
VK2APK	1,925,196
EV6M	1,847,937
T93Y	1,721,304
SN4PLJ	1,394,960
XV7SW	1,346,760
KP4AH	1,226,184
Z31CN	1,074,855

7 MHz

S54A	1,121,736
OK2ZC	908,187
S53F	811,938
T91AAW (T94IW)	783,498
SP2NA	749,434
F/OK1EE	697,109
YO2DFA	633,988
GØDEZ	601,215
OM4WW	488,312
DL4FN	445,176

3.5 MHz

C4ØM (5B4AFM)	395,038
S5ØD (S52RU)	231,035
9A3CY	206,052
SP7ELQ	204,848
HAØKHT (HAØIL)	202,016
4X3DIG	187,572
Z31JA	159,676
DL6KWN	118,604
UA6AKD	97,440
CT1AOZ	77,280

1.8 MHz

UT1FA	56,146
T94YT	18,170
UR4III	9,438
OK2ZV	9,394
VY2MGY/3	8,034

TRIBANDER/SINGLE ELEMENT
UNITED STATES
ALL BAND

N5NU	2,682,880
N1EU	2,530,164
N2CU	2,514,194
N8BJQ	2,428,040
ND5S	2,384,167
N2ED	2,185,529
K2SX	2,009,100
*WD4AHZ	1,922,940
*WD5K	1,916,166
N4VX (N2AV)	1,763,790

28 MHz

*KG5RM	5,916

21 MHz

K6LL/7	3,252,932
NI3S/8	2,204,928
*W9ILY	402,204
AK6R	230,175
*KGØUA	206,934

14 MHz

*K3VA	47,168

7 MHz

*K9CJ	15,340

DX
SINGLE OPERATOR
ALL BAND

JY9NX (JM1CAX)	8,758,484
Z32AU	5,509,044
UF3CWR	4,551,387
SØL (S59AA)	4,468,324
LY2BTA	4,398,604
LY8X (LY2BIL)	4,328,014
S53R	4,063,239
*PY2YU	3,868,833
VE2ZP	3,637,892
*XJ9DX	3,446,828

28 MHz

5X1Z (SM7PKK)	4,743,492

21 MHz

G5G (GØLII)	2,789,292
OE5OHO	278,528
*PAØRRS	100,425

ASSISTED
UNITED STATES
SINGLE OPERATOR
ALL BAND

W8AV	4,380,288
KW2O (K2LE)	4,005,480
W3PP	3,871,849
K5KG	3,809,421
KF3P (K3MM)	3,793,473
WØGJ (AAØBY)	3,409,056
WF2B (K2ONP)	2,526,582
N5JR	2,032,451
KC1F	1,441,083
KD6WW	1,440,768

DX

WP3R (DL2CC)	9,950,743
DK3GI	5,315,830
EA5FV	4,006,801
OL6X (OK1DIG)	3,915,570
S56A	2,889,175
IQ7A (IK7XIV)	2,312,500
JH3AIU	1,718,640
OE3I	1,598,400
OK1AXB	1,211,211
*UT2IO	1,119,076

MULTI-OPERATOR
SINGLE TRANSMITTER
UNITED STATES

K3WW	8,211,576
N4WW	7,757,724
AJ4Y	6,972,504
KM5G	5,798,010
WO8CC	5,324,560
NC7J	3,891,876
K6ZM	3,826,410
NR6R	3,283,484
NN5NN	3,171,300
WX6V	1,683,180

DX

CY9RF	14,431,912
E4/OK5DX	12,553,520
V26E	10,978,314
UA7A	10,422,076
HG1S	10,317,582
JY9QJ	9,659,790
TI1C	9,064,710
RD3Q	8,898,448
YL4U	7,891,938
9A7A	7,786,860
IR4T	7,613,718
RY9C	7,503,342
M5X	7,497,600
OE4A	7,227,570
RF9C	6,984,672
JA5BJC	6,747,555
OM5M	6,699,504
RN4LP	6,338,469
OH2U	6,197,824
DJ7AA	6,181,541

MULTI-OPERATOR
MULTI-TRANSMITTER
UNITED STATES

NQ4I	15,324,694
NR4M	12,906,455
KTØR	10,939,084
NZ5O	10,339,506
WM1K	8,557,146
KG6OK	8,134,974
WR3L	6,850,992

DX

HC8N	56,930,790
P3A	42,674,100
LT1F	22,857,468
RW2F	19,645,506
WL7E	18,671,136
S54W	18,353,491
HG5A	17,979,225
RM6A	15,204,986
HG6Y	14,979,843
EA4ML	13,002,444

QRP/p
UNITED STATES

KX1M	A	1,192,718
WO9S	A	951,237
N7IR	A	784,794
N1TM	A	605,340
W8QZA/6	A	466,095
WA6FGV	28	23,000
W7/JR1NKN	21	26,795
KA8NRC/T	21	15,392
KG5U	14	184,736
K2CS	14	40,690
KU7Y	7	37,968
W7DRA	3.5	1,392

DX

TI5N	A	1,612,800
ON6NR	A	1,290,550
LY2FE	A	1,177,500
SM3CCT	A	920,496
RW4UU	A	913,560
VE1ZJ	A	906,980
VE3KP	A	667,744
RZ6HX	A	582,820
VE6BF	A	570,240
S53MA	A	494,440
HA5BSW	28	139,160
LW7EIC	28	54,489
HAØGK	28	26,265
ES1CR	21	213,277
UR9MM	21	189,950
ATØU	21	99,484
OK2PYA	14	251,965
LU6HI	14	250,902
RA3FO	14	226,655
YZ7ED	7	125,538
JA2HUN	7	29,274
JA5CDL	7	10,670
SP4GFG	3.5	128,772
HA8LUH	3.5	89,998
EW6CU	3.5	83,490
UAØQGQ/UT	1.8	8,418

MFJ *Switching* Power Supplies

Power your HF transceiver, 2 meter/440 MHz mobile/base and accessories with these new 25 or 45 Amp MFJ MightyLite™ Switching Power Supplies!
No RF hash . . . Super lightweight . . . Super small . . . Volt/Amp Meters . . .

MFJ's new 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 in the palm of your 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.

MFJ's 25 Amp *MightyLite*™ weighs just 3.7 lbs. -- that's *5 times lighter* than an equivalent conventional power supply. MFJ's 45 Amp is even more dramatic -- *8 times lighter* and weighs just 5.5 pounds!

No RF hash!

These babies are clean . . . Your buddies won't hear *any* RF hash on your signal! *None* in your receiver either!

Some competing switching power supplies generate objectionable RF hash in your transmitted and received signal.

These super clean MFJ *MightyLites*™ meet all FCC Class B regulations.

Low Ripple . . . Highly Regulated

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.

Fully Protected

You won't burn up our power supplies!

No RF Hash!

← MFJ-4225MV
25 Amp
$149.95
plus s&h

MFJ-4245MV →
45 Amp
$199.95
plus s&h

No RF Hash!

They are fully protected with Over Voltage and Over Current protection circuits.

Worldwide Versatility

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.

***MightyLites*™ . . . Mighty Features**

Front-panel control lets you vary output from 9 to 15 Volts DC.

Front-panel has easy access five-way binding posts for heavy duty use and cigarette lighter socket for mobile accessories. MFJ-4245MV has two sets of quick-connects on the rear for accessories.

Brightly illuminated 3 inch meters let you monitor load voltage and current.

A whisper quiet internal fan efficiently cools your power supply for long life.

Two models to choose from . . .

MFJ-4225MV, $149.95. 25 Amps maximum or 22 Amps continuous. Weighs 3.7 pounds. Measures 5¾Wx4½Hx6D in.

MFJ-4245MV, $199.95. 45 Amps maximum or 40 Amps continuous. Weighs 5.5 pounds. Measures 7½Wx4¼Hx9D in.

NEW! 25 Amp *MightyLite*™

Super light, super compact switching power supply delivers 25 Amps maximum/22 Amps continuous at 13.8 Volts DC. Low ripple, highly regulated. *No RF Hash!* Five-way binding posts for high current. Quick connects for accessories. Over voltage/current protection. 110 or 220 VAC operation. Meets FCC Class B regs. 3.5 lbs. 5½Wx2½Hx10¾D in.

MFJ-4125
25 Amp
$109.95
plus s&h

MFJ 35/30 Amp Adjustable Regulated DC Power Supply

Massive 19.2 pound transformer . . . No RF hash . . . Adjustable 1 to 14 VDC . . .

MFJ-4035MV
$149.95
plus s&h

MFJ's heavy duty conventional power supply is excellent for powering HF or 2 Meter/440 MHz transceiver/accessories.

A massive 19.2 pound transformer makes this power supply super heavy duty! It delivers 35 amps maximum and 30 amps continuous without even flexing its muscles. Plugs into any 110 VAC wall outlet.

It's highly regulated with load regulation better than 1%. Ripple voltage is less than 30 mV. *No RF hash* -- it's super clean!

Fully protected -- has over voltage protection, fold back short circuit protection and over-temperature protection.

You get front panel adjustable voltage from 1 to 14 VDC with a convenient detent set at 13.8 VDC. A pair of front-panel meters let you monitor voltage and current.

Three sets of output terminals include a pair of heavy duty five-way binding posts for HF/VHF radios, two pairs of quick-connects for accessories and a covered cigarette lighter socket for mobile accessories.

A front-panel fuse holder makes fuse replacement easy. Whisper quiet fan speed increases as load current increases -- keeps components cool. 9½Wx6Hx9¾D inches.

MFJ *High Current* Multiple DC Power Outlets

Power two HF/VHF transceivers and six or more accessories from your 12 VDC power supply

MFJ-1118
$74.95
plus s&h

MFJ-1116
$49.95
plus s&h

MFJ-1112
$34.95
plus s&h

New!
MFJ-1117
$44.95
plus s&h

MFJ-1118, $74.95. This is MFJ's most versatile and highest current *Deluxe Multiple DC Power Outlet*. Lets you power two HF and/or VHF transceivers and six or more accessories from your transceiver's main 12 VDC supply.

Two pairs of super heavy duty 30 amp 5-way binding posts connect your transceivers. Each pair is fused and RF bypassed. Handles 35 Amps total.Six pairs of heavy duty, RF bypassed 5-way binding posts let you power your accessories. They handle 15 Amps total, are protected by a master fuse and have an ON/OFF switch with "ON" LED indicator.

Built-in 0-25 VDC voltmeter. Six feet super heavy duty eight gauge color-coded cable with ring tongue terminals. Binding posts are spaced for standard dual banana plugs. Heavy duty aluminum construction. 12½x2¾x2½ in.

MFJ-1116, $49.95. Similar to MFJ-1118. No 30 amp posts. Has "ON" LED and 0-25 VDC voltmeter. 15 amps total.

MFJ-1112, $34.95. Similar to MFJ-1116. No on/off switch, LED, meter, fuse.

NEW! **MFJ-1117, $54.95.** For powering four HF /VHF radios (two at 35 Amps each and two at 35 Amps combined) simultaneously. Tiny 8x2x3 inches.

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 direct 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

All are protected by MFJ's famous No Matter What™ one year limited warranty.

CIRCLE 127 ON READER SERVICE CARD

How many of us can say we've actually lived a childhood dream? N4CLT went to the South Pacific and did just that.

DXing from New Caledonia

BY HUBERT S. FEILD*, N4CLT

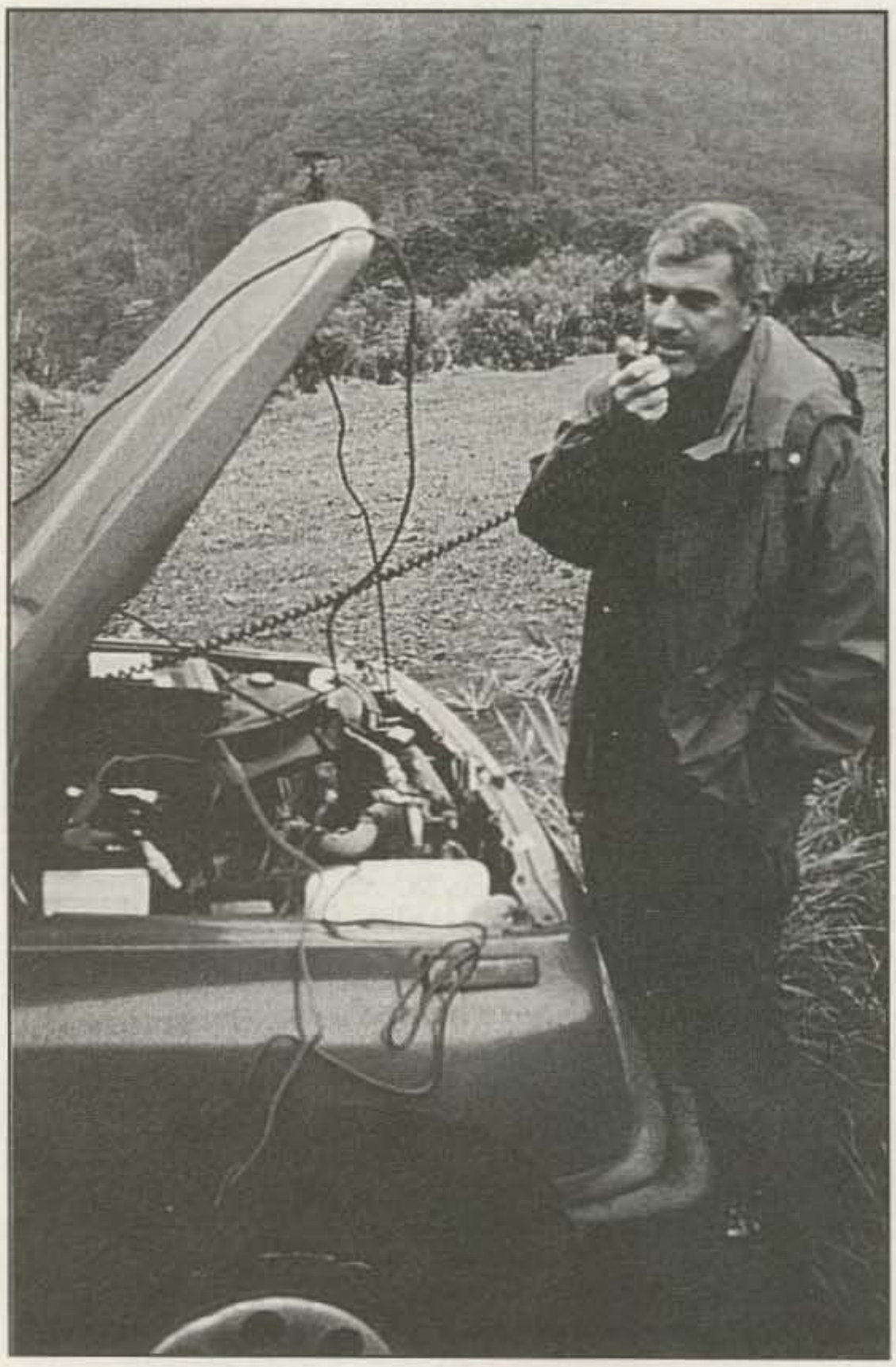
At age fifteen I first encountered the South Pacific by listening to Radio Australia and occasional VKs on a Zenith Transoceanic short-wave receiver my father had given me. Bill Alsup, now N6XMW (ex-WA5EGI); and I would sit spellbound in Jackson, Mississippi, listening for exotic callsigns emanating from areas such as the South Pacific. I often wondered what it was like to be a ham at these distant pinpoints on the globe. Some 40 years later, I had the opportunity to find out.

**1141 Knollwood Court, Auburn, Alabama 36830-6126*
e-mail: <feild@mindspring.com>

In April 1999 Taylor, KD4FNK, my son, invited me to visit him in New Caledonia, where he and Dr. Tim Brodribb of the University of Tasmania were conducting field research on tropical plants. I jumped at the invitation. I spent the next several months obtaining a passport, buying camping equipment, and making amateur radio preparations. In late July my journey began.

Radio Plans

One of my goals for the trip was to operate as a DX station from the tropical wilderness of New Caledonia. Initially, I completed



A QSO between N4CLT/FK and N6XMW.

Taking photosynthetic measurements of plants are Taylor Feild, KD4FNK, and Tim Brodribb (standing).

the necessary licensing forms for operating in New Caledonia, enclosed a copy of my FCC license, mailed my application, and then waited for my temporary operating ticket. Four weeks later I received what I had been waiting for—permission from the Office des Postes et Telecommunications to operate from New Caledonia as N4CLT/FK. Terrific! At last I was on my way.

Because of the necessity for my carrying the minimum amount of baggage, I planned to take my ICOM MKII 706 transceiver, a Hustler mobile mast with two resonators (for 15 and 20 meters), and a magnetic-mount base. Power would be obtained from the battery of the 4-wheel- drive research vehicle; an AC power source would not be available, as we would be camping in tents in a mountainous cloud forest.

Next I contacted N6XMW, a lifelong friend (we talk every Saturday on 20 meters), in Oakland, California, and asked if he wanted to relive some of our childhood dreams about the South Pacific. He was as excited about my trip as I was.

We used N6XMW's propagation-prediction computer software to identify which bands and times would be most suitable for contacts between Oakland and New Caledonia. (*N6XMW's propagation prediction software, "XMW Propagation Software," is available on a CD-ROM included in* The ARRL Antenna Compendium, Vol. 6, *ARRL: Newington, CT, 1999.)* Our analyses showed that 15 and 20 meters at 0300 and 0400 UTC would be best for our schedules. Joe, ZL2BIT, in New Plymouth, New Zealand, a CW sked buddy of N6XMW, was recruited to serve as a relay station in case N6XMW and I had difficulty making contact.

New Caledonia

Flying time from Atlanta to Noumea, the capital of New Caledonia, via San Francisco and Sydney, was roughly 23 hours. I approached Grand Terre, the largest of several New Caledonian islands surrounded by one of the world's largest reefs. It resembles a gleaming, sun-lit emerald sitting in a sea of blue turquoise. This French territory is a mountainous, oblong-shaped island about 1200 miles northeast of Sydney, Australia. Due to its isolation in the South Pacific and its unique evolutionary history, New Caledonia possesses some of the rarest, most unusual plants in the world.

Operating from New Caledonia

My first opportunity to operate was on Mt. Dzumac on the third day after my arrival. Because of the use of the research vehicle and the limited availability of gasoline, I operated N4CLT/FK for about 30 minutes every 2 to 3 days for 2 1/2 weeks. I operated on Mt. Dzumac at locations ranging from 2200 to 2600 feet above sea level. A diversity of pristine, tropical plants surrounded each location. The sunny, spring-like weather I experienced when landing in Noumea, however, belied what I was about to encounter during my first few days on the mountain. Although I had some expectations regarding the operating conditions, I underestimated the impact of high winds, cold, and pelting rain that would plague several days of operating outside the research vehicle.

In spite of the conditions, several CQs on the first day of operations brought responses from Jim, VK9NS, on Norfolk Island; Gene, AL7HX, in Alaska; and YN1XC in Nicaragua. The ICOM 706 performed flawlessly under the extremely wet conditions. On the eighth day of my stay, I was able to change my station location to Riviære Bleue, a national park about 600 feet above sea level. There the weather was much better, and signal reports from the location were generally good.

Most of our meals were cooked by KD4FNK and Tim, his colleague; the nightly camp cuisine of macaroni, cheese, and assorted vegetables under a steaming tomato sauce and baguettes was excellent. I served as chief dishwasher. We collected our water from the clear, cold mountain streams of southern New Caledonia. Water in the streams was so pure that filtration was unnecessary.

While I operated during the day and early evening, KD4FNK and Tim took hydraulic, fluorescence, and various photosynthetic measurements on primitive flowering plants that were growing in the cloud forest.

I operated for several periods during my 2 1/2 week stay. During that time I made roughly 30 SSB contacts. About half were on 15 meters and half on 20 meters. Most stations contacted were ZLs, JAs, and VKs. Other than N6XMW, I worked only five U.S. stations. Jan, KX2A, and Clint, W7SRC, were among the most distant U.S. stations reached.

Good band conditions generally prevailed throughout my visit to New Caledonia. I worked N6XMW on both 15 and 20 meters with signal reports for N4CLT/ FK ranging from 4/ 4 to 5/7. Better reports were received on the higher band. In addition, a significant difference in my reports occurred when I tried operating off the vehicle battery without running the engine. N6XMW noted that during the initial part of my transmissions my signal was strong, but it dropped suddenly to less than half its original strength. He suggested that I operate with the car engine running. After following his advice, N6XMW reported that my signal strength doubled when the engine was running. The voltage drop from the undersized battery in the Suzuki 4-wheel drive had an adverse impact on my signal. So much for trying to save fuel.

I left New Caledonia a bit wet, cold, and tired, but nonetheless I was exhilarated from knowing that I had briefly lived a childhood fantasy. I thank KD4FNK, Claire (my wife), and N6XMW for their encouragement and support of my trip. N6XMW thoughtfully tape-recorded each of our five QSOs. Also, I thank ZL2BIT for helping me establish initial contact with N6XMW. Now that I'm back, I marvel at being able to stay in touch with home from such a remote, exotic location—no Internet access available there! Now on to preparing the QSLs for those stations contacted who helped make a lifelong dream come true. ■

Tracking down interference sources can be a challenge for even the best RF detective. N6JF offers us not only some good clues, but also one solution to broadcast-related intermod on 2 meters.

2 Meters, Channel 2, and You

BY JIM FORD,* N6JF

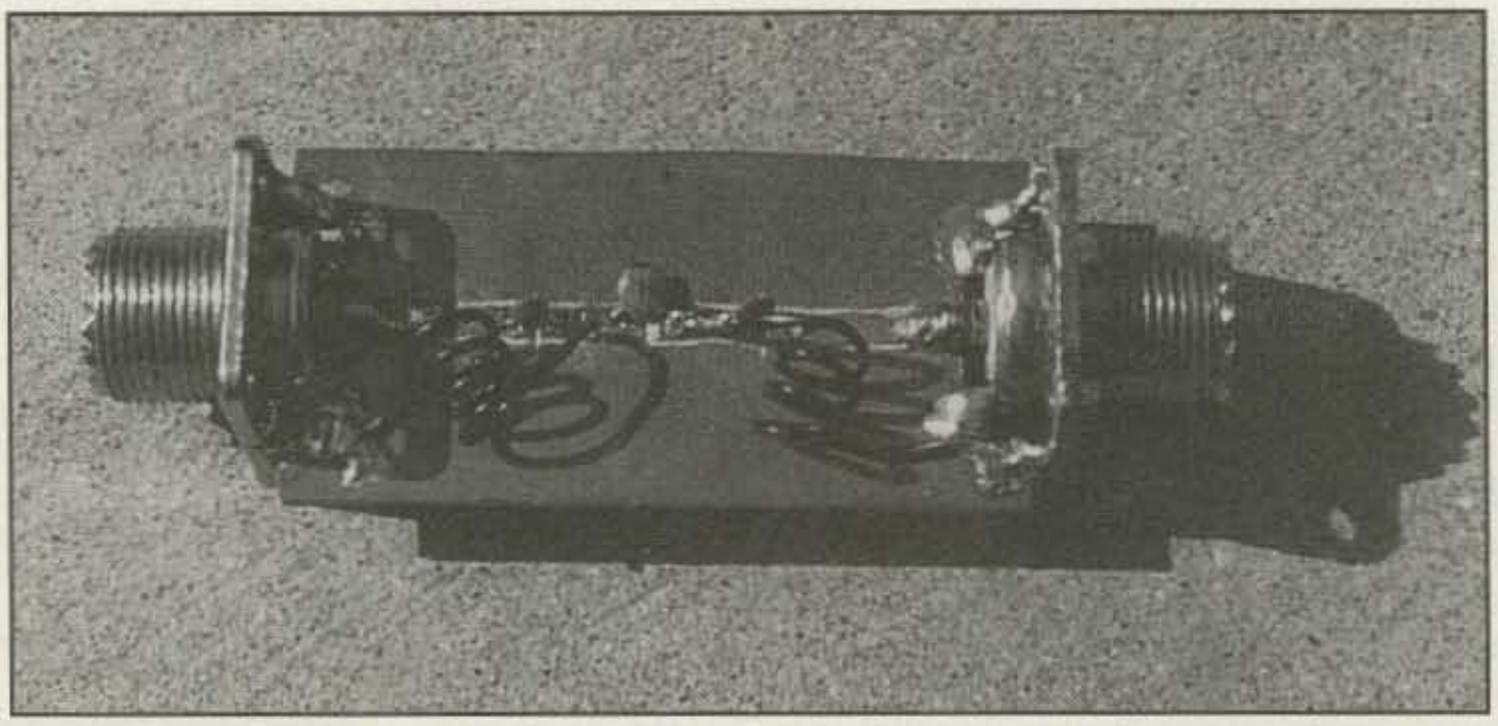
Is your 2 meter transceiver a victim of 2nd-order intermod? If you hear music on or about any of the frequencies listed in Table I, then you probably are affected. Read on to see what's happening and how you can deal with these problems.

Second-order intermod, or intermodulation distortion, is *not* what usually causes the most trouble in 2 meter transceivers and has not been much of a problem until now. Like the more common 3rd-order intermod, 2nd-order intermod is also an unintended mixing of at least two signals inside your receiver which generate other "phantom" interfering signals. Mathematically, 3rd-order intermod is 2F1 – F2 and 2F2 – F1, whereas 2nd-order is F1 + F2 and F1 – F2.

A couple of examples show the difference between 3rd and 2nd intermod and how channel 2 plays a part in 2nd-order intermod. If there are strong signals at 146.98 MHz (F1) and 146.42 MHz (F2), then (2 × 146.98 MHz) – 146.42 MHz = 147.54 MHz. So if you were listening on 147.54 MHz, then you could hear both signals at 146.98 MHz and 146.42 MHz.

Third-order intermod often sounds like two stations talking at the same time with the interference disappearing in mid-sentence, since only one signal has to go away to eliminate the interference. Notice that both signals were within the 2 meter band. This is why the 3rd-order intermod is often more troublesome, as filtering the signals causing the interference is not practical. The filters would also eliminate the signals you want to hear.

Not so with 2nd-order intermod. If you had a strong signal at 55.25 MHz (F1) and 92.3 MHz (F2), then F1 + F2 = 147.55 MHz. Now it happens that 55.25 MHz is the video carrier frequency of channel 2 and 92.3 MHz is an FM broadcast radio station. If you were listening to 147.54 MHz, then you would hear music, since the FM station deviation is quite wide. A TV station's bandwidth is 6 MHz wide, so mixing with other portions of the signal, including the sound carrier frequency of 59.75 MHz, is possible, but the video carrier is the most troublesome. Notice that both of the interfering signals are outside the 2 meter band and—in theory—should be eliminated by the RF filters in the front end of your receiver.



A 110 MHz high-pass filter contains just a few parts but can go a long way toward blocking TV and FM broadcast signals from mixing inside your 2 meter receiver.

What causes both problems and why is the 2nd-order intermod more of a problem now than in the past? Most of the time the problem is strong signals overloading an RF mixer stage that cannot handle these signals. Mixers that can handle strong signals are more expensive and are not incorporated into less costly radios. Mixer modification would certainly be major surgery to any existing radio. Even though stronger mixers would improve both 3rd and 2nd-order intermod, this is not an option for most of us. External filters seem to be the most practical solution to 2nd-order intermod, but more on this later.

The reason 2nd-order intermod is more of a problem now is because newer radios now have wide-band frequency receive coverage with no fixed tuned front-end filters. Wide-band receive is very nice, but comes with a price. Most of these radios have front-end pass-band filters which are tuned by varicap (variable capacitance) diodes that change capacitance depending on the receive frequency. This sounds good in theory, but there are problems with this in practice. Wide-band tunable filters often are a compromise design, but varicap tuned filters (called "tracking" filters) cause even greater compromises. The Q of a varicap diode is often the worst component in the filter, particularly when the DC control voltage on the diode needed for the low end of the tuning range is very low. In addition, the varicap diodes have been known to cause intermod by themselves. This varicap problem can be severe enough that premier receiver designer Ulrich Rohde, KA2WEU, said a state-of-the-art filter is tuned by an air variable capacitor rotated by a motor!

Is this 2nd-order intermod really a problem? In a word, yes. A couple of years ago several friends of mine had problems with some radios with the frequencies in the example. This was a severe problem when mobiling near the FM broadcast station. The problem was so bad it wiped out all but the strongest stations for over 20 miles. This problem seemed to diminish with newer radios, only to re-emerge now.

I recently purchased a very wide-band-receive dual-band radio. When I hooked it up to the base-station antenna, there was music on my favorite FM simplex fre-

*2415 College Dr., Costa Mesa, CA 92626
<n6jf@earthlink.net>

MFJ 1.8-170 MHz SWR Analyzer™

Reads complex impedance . . . Super easy-to-use

***New** MFJ-259B reads antenna SWR . . . Complex RF Impedance: Resistance(R) and Reactance(X) or Magnitude(Z) and Phase(degrees) . . . Coax cable loss(dB) . . . Coax cable length and Distance to fault . . . Return Loss . . . Reflection Coefficient . . . Inductance . . . Capacitance . . . Battery Voltage. LCD digital readout . . . covers 1.8-170 MHz . . . built-in frequency counter . . . side-by-side meters . . . Ni-Cad charger circuit . . . battery saver . . . low battery warning . . . smooth reduction drive tuning . . . and much more!*

The world's most popular SWR analyzer just got incredibly better and gives you more value than ever!

MFJ-259B gives you a complete picture of your antenna's performance. You can read antenna SWR and Complex Impedance from 1.8 to 170 MHz.

You can read Complex Impedance as series resistance and reactance (R+jX) or as magnitude (Z) and phase (degrees).

You can determine velocity factor, coax cable loss in dB, length of coax and distance to a short or open in feet.

You can read SWR, return loss and reflection coefficient at any frequency simultaneously at a single glance.

You can also read inductance in uH and capacitance in pF at RF frequencies.

Large easy-to-read two line LCD screen and side-by-side meters clearly display your information.

It has built-in frequency counter, Ni-Cad charger circuit, battery saver, low battery warning and smooth reduction drive tuning.

Super easy to use! Just set the bandswitch and tune the dial -- just like your transceiver. SWR and Complex Impedance are displayed instantly!

Here's what you can do

Find your antenna's true resonant frequency. Trim dipoles and verticals.

Adjust your Yagi, quad, loop and other antennas, change antenna spacing and height and watch SWR, resistance and reactance change instantly. You'll know exactly what to do by simply watching the display.

Perfectly tune critical HF mobile antennas in seconds for super DX -- without subjecting your transceiver to high SWR.

Measure your antenna's 2:1 SWR bandwidth on one band, or analyze multiband performance over the entire spectrum 1.8-170 MHz!

Check SWR outside the ham bands without violating FCC rules.

Take the guesswork out of building and adjusting matching networks and baluns.

Accurately measure distance to a short or open in a failed coax. Measure length of a roll of coax, coax loss, velocity factor and impedance.

Measure inductance and capacitance. Troubleshoot and measure resonant frequency and approximate Q of traps, stubs, transmission lines, RF chokes, tuned circuits and baluns.

Adjust your antenna tuner for a perfect 1:1 match without creating QRM.

And this is only the beginning! The

NEW

Call your favorite dealer for your best price!

MFJ-259B **$259.95**

MFJ-259B is a complete ham radio test station including -- frequency counter, RF signal generator, *SWR Analyzer*™, RF Resistance and Reactance Analyzer, Coax Analyzer, Capacitance and Inductance Meter and much more!

Call or write for ***Free Manual***

MFJ's comprehensive instruction manual is packed with useful applications -- all explained in simple language you can understand.

Take it anywhere

Fully portable, take it anywhere -- remote sites, up towers, on DX-peditions. It uses 10 AA or Ni-Cad batteries (not included) or 110 VAC with MFJ-1315, $14.95. Its rugged all metal cabinet is a compact 4x2x6¼ inches.

How good is the MFJ-259B?

MFJ *SWR Analyzers*™ work so good, many antenna manufacturers use them in their lab and on the production line -- saving thousands of dollars in instrumentation costs! Used worldwide by professionals everywhere.

More MFJ SWR Analyzers™

MFJ-249B, $229.95. Like MFJ-259B, but reads SWR, true impedance magnitude and frequency only on LCD. No meters.

MFJ-209, $139.95. Like MFJ-249B but reads SWR only on meter and has no LCD or frequency counter.

MFJ-219B, $99.95. UHF *SWR Analyzer*™ covers 420-450 MHz. Jack for external frequency counter. 7½x2½ x2¼ inches. Use two 9 volt batteries or 110 VAC with MFJ-1312B, $12.95. *Free* "N" to SO-239 adapter.

SWR Analyzer Accessories

Dip Meter Adapter

MFJ-66, $19.95. Plug a dip meter coupling coil into your MFJ *SWR Analyzer*™ and turn it into a sensitive and accurate bandswitched dip meter. Save time and take the guesswork out of winding coils and determining resonant frequency of tuned circuits and Q of coils. Set of two coils cover 1.8-170 MHz depending on your *SWR Analyzer*™.

Genuine MFJ Carrying Case

MFJ-29C, $24.95. Tote your MFJ-259B anywhere with this *genuine* MFJ custom carrying case. Has back pocket with security cover for carrying dip coils, adaptors and accessories.

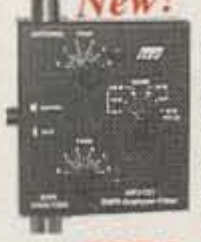
Made of special foam-filled fabric, the MFJ-29C cushions blows, deflects scrapes, and protects knobs, meters and displays from harm.

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 so you can use your MFJ *SWR Analyzer*™ without taking it out of your case. *Look for the MFJ logo for genuine authenticity!*

MFJ-99, $54.85. Accessory Package for MFJ-259/B/249/B/209. Includes *genuine* MFJ-29C carrying case, MFJ-66 dip meter adapter, MFJ-1315 110 VAC adapter. ***Save $5!***

New! Tunable Measurement Filter™



MFJ-731, $89.95. *Exclusive* MFJ tunable RF filter allows accurate SWR and impedance measurements 1.8 to 30 MHz in presence of strong RF fields. Has virtually no effect on measurements. Works with all SWR Analyzers.

MFJ *No Matter What*™ warranty

MFJ will repair or replace (at our option) your MFJ *SWR Analyzer*™ for one full year.

Free MFJ Catalog

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
(601) 323-5869; 8-4:30 CST, Mon.-Fri.
FAX: (601) 323-6551; **Add s/h**
Tech Help: (601) 323-0549

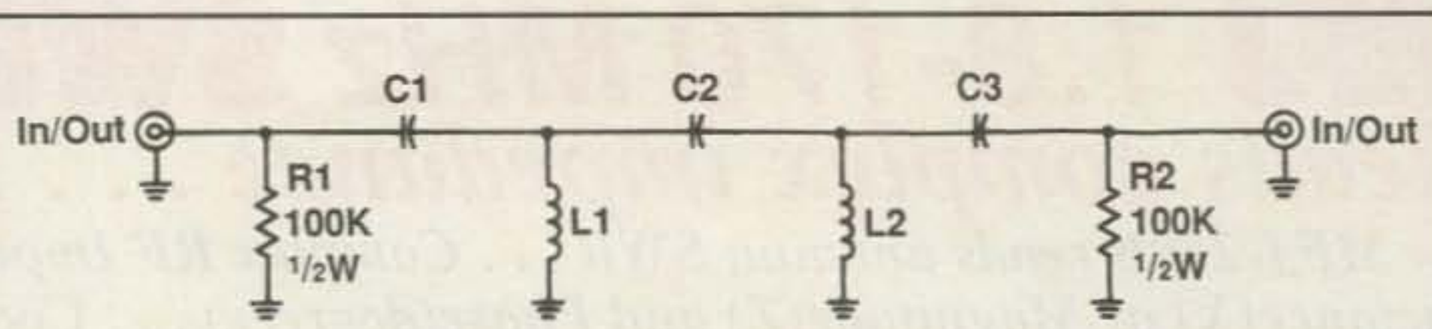
MFJ-224 **$159.95**

MFJ 2 Meter *FM SignalAnalyzer*™

Measure signal strength over 60 dB range, check and set FM deviation, measure antenna gain, beamwidth, front-to-back ratio, sidelobes, feedline loss in dB. Plot field strength patterns, position antennas, measure preamp gain, detect feedline faults, track down hidden transmitters, tune transmitters and filters. Plug in scope to analyze modulation wave forms, measure audio distortion, noise and instantaneous peak deviation. Covers 143.5 to 148.5 MHz. Headphone jack, battery check function. Uses 9V battery. 4x2½x6¼ in.

More hams use MFJ SWR Analyzers™ than any others in the world!

CIRCLE 64 ON READER SERVICE CARD



Parts List

110 MHz high-pass filter
C1,C3— 39 pF silver mica, disc, or chip capacitor
C2—18 pF silver mica, disc, or chip capacitor
L1, L2—55 nanoHenries, 4.5 turns of #18 wire .2 inches diameter, .5 inches long
R1, R2—100K 1/2 watt

Fig. 1– Schematic of the 110 MHz high-pass filter.

quency. Both the TV and FM broadcast stations causing the interference were 50 miles away! You're lucky if you live in an area of the country where there is no TV channel 2, but instead channel 3. The reason channel 3 and some of the other channels don't seem to be a problem is only due to the math. That is, the mixing products don't show up on 2 meters. It's a recipe for problems when both channel 2 and certain FM broadcast stations are strong.

There are a couple of solutions to this problem. External filters connected to the output of the radio are the most practical. There are three types of filters that should help: a band-pass, a notch, and a high-pass filter. A band-pass filter can cure a lot of problems, including paging interference, if you have one of the low-loss, Hi-Q types made by DCI and others as advertised in the ham magazines. There are also homebrew designs in *The ARRL Handbook* that should eliminate both channel 2 and FM broadcast interference. Some of the simpler filter designs shown in the handbook won't do much for paging interference (approximately 151.5 MHz) simply because the paging interference is too close to the cut-off frequency. The big problem with the band pass is it will eliminate 440 MHz and your extended frequency receive as well if you have a dual-band radio. The Hi-Q band-pass filters are also bigger than a dual-band radio and tend to have slightly higher insertion loss. In any case, there would have to be some way of bypassing the filter when it is not needed.

Another way would be to reject one of the interfering signals with a notch filter. Remember, even if you eliminate only one of the interfering signals, the product signal will go away. The easiest way to do this is with a T connector on the output connector of the radio with an open quarter-wave stub attached. The formula for that is 2951/F (MHz) × VF with an answer in inches. VF is the velocity factor of the coax cable. A good choice for the coax would be RG-213, because the velocity factor is well known at .66. Other coax cables can be used, but you must be sure of the velocity factor, since some may not be what you think. The length of an open stub piece of RG-213would be 35.25 inches for a null at the channel 2 video carrier of 55.25 MHz. A disadvantage of the stub filter is "suck out" at frequencies 3×, 5×, 7×, etc., of the design frequency with a slight SWR change at other frequencies. In addition, the bandwidth and depth of the notch might not be good enough to block out severe interference, and the null has to be set precisely.

A better approach to this problem, and the one highlighted here, is to install a high-pass filter in series with the antenna connector. A good choice for the cut-off frequency of the filter would be 110 MHz, just above the top end of the FM broadcast band. That way both the channel 2 and FM broadcast would be attenuated. This frequency also would not conflict with general-coverage receive of many of the dual-band radios that start their coverage just above this frequency.

I elected to design a five-section .01 dB Chebyshev filter. Although there are sharper roll-off filters, this filter has very good SWR. Also, a sharp cut-off filter should not be necessary because 2nd-order intermod is attenuated by 2 dB every time one of the signals is attenuated by 1 dB. Therefore, if the filter attenuates one signal by 10 dB, the product (actually sum or difference in this case) is attenuated by 20 dB. If both signals are attenuated, then there is additional reduction. Of course, the reverse holds true as well; when the interfering signals are increased by 1 dB, the product increases by 2 dB. The 3rd-order product, which again is the most common intermod, follows a similar rule, except they are reduced by 3 dB for every 1 dB decrease in the interfering signal.

I first built the high-pass filter in a small LMB box, but the SWR on the 440 MHz

Channel 2 Video Carrier (55.25 MHz) + FM Broadcast (MHz)

FM Station	2 meters – 75 kHz	2 meters Center	2 meters + 75 kHz
88.9	144.075	144.150	144.225
89.1	144.275	144.350	144.425
89.3	144.475	144.550	144.625
89.5	144.675	144.750	144.825
89.7	144.875	144.950	145.025
89.9	145.075	145.150	145.225
90.1	145.275	145.350	145.425
90.3	145.475	145.550	145.625
90.5	145.675	145.750	145.825
90.7	145.875	145.950	146.025
90.9	146.075	146.150	146.225
91.1	146.275	146.350	146.425
91.3	146.475	146.550	146.625
91.5	146.675	146.750	146.825
91.7	146.875	146.950	147.025
91.9	147.075	147.150	147.225
92.1	147.275	147.350	147.425
92.3	147.475	147.550	147.625
92.5	147.675	147.750	147.825
92.7	147.875	147.950	148.025

Table I– Second-order intermod may cause interference for up to 75 kHz on either side of the center frequency. The interference will be more intense closer to the center frequency.

band was a little high because of longer leads. I then just used a piece of PC board with .125 width traces cut for bridge mounting the series capacitors. The connectors on the end were soldered directly to the PC board.

The choice of connectors is optional. Some dual-band radios have N connectors and some have SO-239 (the common UHF connector). Certainly the N connector is a better match to 50 ohms, but if you have to use an expensive adapter, then maybe the SO-239 is okay. The capacitors I used were 50 V disc ceramic, although a silver mica or even chip capacitor would have been better. Toroid inductors also could have been used.

The high-pass filter exhibited .1 dB loss with 25 dB attenuation of channel 2. The actual cut-off frequency I achieved was lower than the 110 MHz design frequency, but was no issue, since the elimination of channel 2, low insertion loss, and good SWR were the real goals.

At first I started to figure out which component(s) made the frequency cut-off lower than anticipated, but I decided my goals had been met. It eliminated all of the music.

Not shown in the photo are R1 and R2, 100K 1/2 watt resistors which were added after the photo was taken. (They are, however, in the schematic.) Each resistor goes from the input/output to ground. I have found without a DC connection to ground, a static build-up is possible. It then can discharge into the front-end transistor and destroy it. This happened to me with this filter without the resistors on the mobile installation, so be sure to add these resistors.

Conclusion

Second-order intermod is not as common as 3rd-order intermod, but some of the newer VHF and VHF/UHF radios do experience this problem. This filter provides 25 dB attenuation of 55.25 MHz with low insertion loss and good SWR. This should be good enough to eliminate even severe 2nd-order interference. ■

Is your rig QRMing itself? If it uses a frequency synthesizer—as virtually all modern rigs do—chances are the answer is yes. The solution, says G3YWX, lies in better circuit design.

Phase Noise and Frequency Synthesizers

BY IAN POOLE*, G3YWX

Frequency synthesizers are used in virtually all new amateur receivers and transceivers these days. They offer several advantages over other techniques which can be used for generating local oscillator signals. For example, frequency synthesizers lend themselves to being controlled digitally, and this means they are ideal for use in conjunction with microprocessors to give the added flexibility to the equipment. In addition, they provide a relatively cheap method of manufacturing a very stable local oscillator that has very low levels of spurious signals.

Despite these and many other advantages, frequency synthesizers have disadvantages as well. The main one is the amount of phase noise that some designs produce. This continues to be the topic of a lot of discussion in the amateur magazines. In spite of this, comparatively little is written about the various mechanisms that cause phase noise and the ways in which it can be reduced.

What is Phase Noise?

First let's look at what phase noise is and how it affects the performance of transmitters and receivers.

The first point to note is that phase noise appears on all signals to some degree. Crystal oscillators are the best and possess the lowest levels. Variable-frequency oscillators (VFOs) are worse, but a poorly designed frequency synthesizer can be very bad. Even so, it should be noted that it is possible to achieve very low levels of noise using a well-designed synthesizer, although this can involve the use of complicated circuitry and result in added expense.

Essentially, phase noise can be thought of as short-term fluctuations in the phase of a signal. In fact, it is sometimes called *phase jitter*. It appears as phase modulation on the signal, and hence noise sidebands which spread out either side of the carrier are produced. For most signal sources this noise falls away as the frequency from the carrier increases (see fig. 1). However, for frequency synthesizers this is not totally true because of the way in which the synthesizer affects the noise produced in different places around the loop. The noise characteristics can look very similar to that shown in fig. 2.

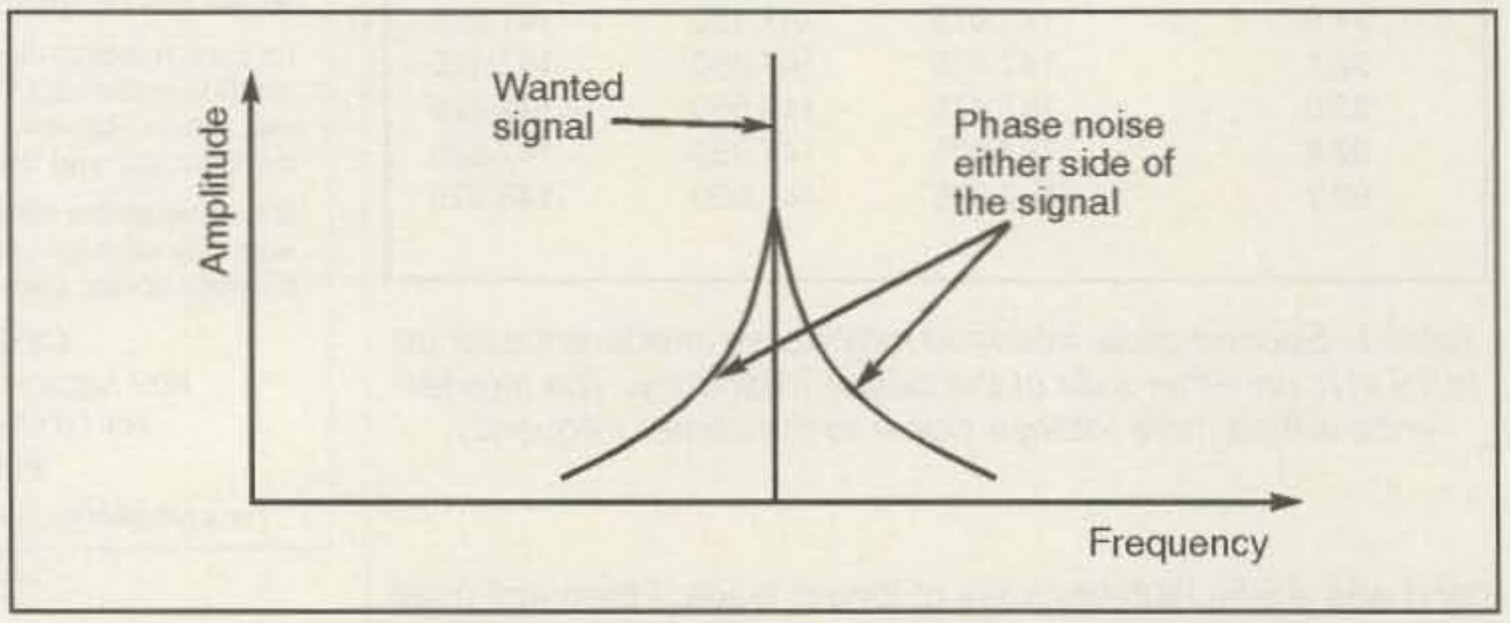


Fig. 1– Phase noise characteristic of a typical free-running oscillator.

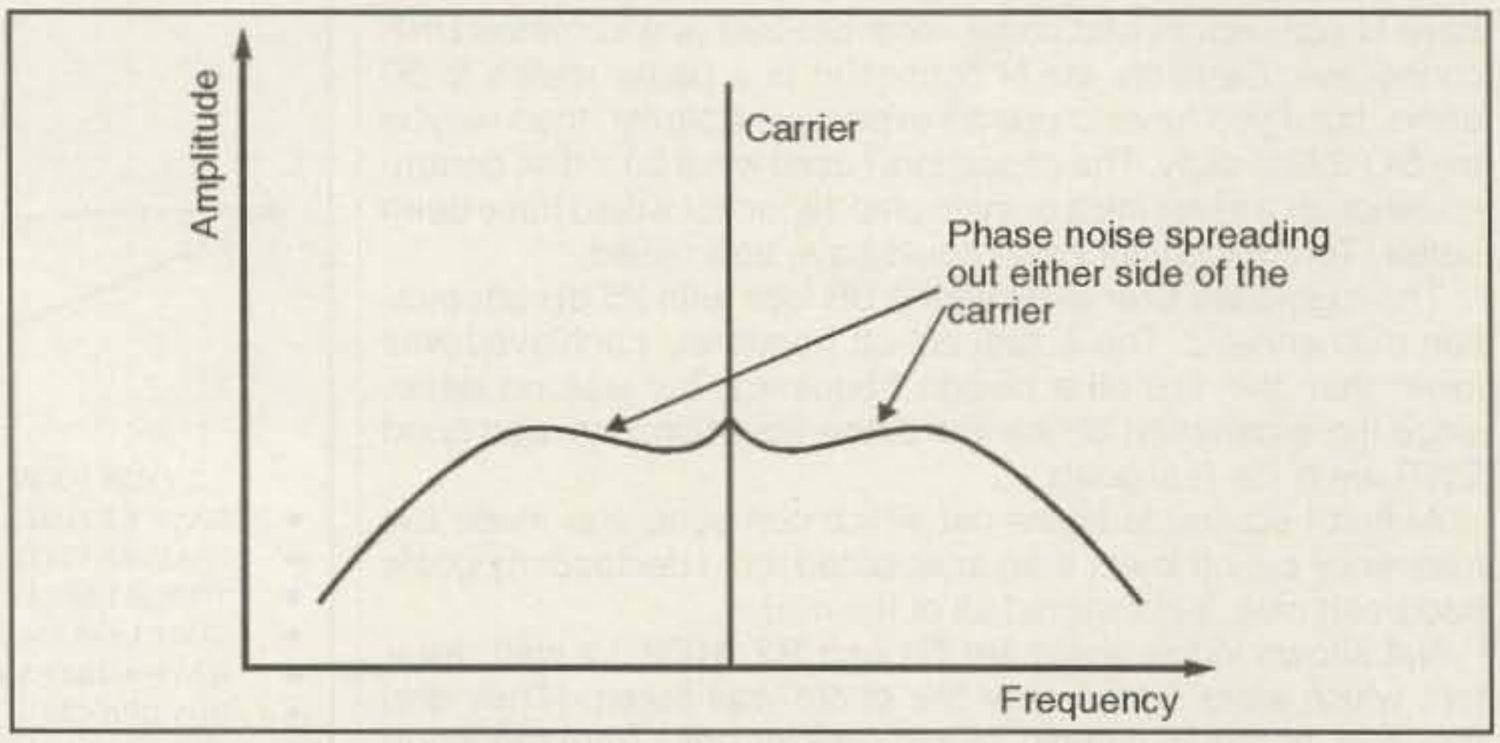


Fig. 2– Phase noise characteristic of a typical single-loop synthesizer.

When looking at phase noise, it is worth noting that amplitude noise is neglected. In most instances its effects are very much less than those of the phase noise and can be ignored.

As with many other parameters used in electronics as a whole, it is very useful to be able to quantify noise. Unfortunately, noise spreads over the whole radio spectrum, and the wider the bandwidth one looks at, the more noise will be seen. This

* *http://website.lineone.net/~ian_poole*

is unlike a carrier that occupies a single frequency. In order to measure noise, a certain bandwidth has to be specified. In addition, if the noise varies with frequency, its position has to be specified as well. In the case of phase noise, it is generally specified in a 1 Hz bandwidth and at a certain offset from the carrier. For example, a level of noise may be quoted as being 90 dB down on the carrier in a 1 Hz bandwidth at 10 kHz offset, or –90 dBc/Hz at 10 kHz.

The Effects of Phase Noise

Phase noise affects both transmitters and receivers, but in slightly different ways. As far as transmitters are concerned, the phase noise spreads out on either side of the main signal and will be radiated by the transmitter. This can cause interference, especially on single-sideband (SSB) transmitters where the noise is amplitude modulated by the sideband signal and is heard as splatter up and down the band. Everyone who operates on 2 meters SSB is very aware of this problem, particularly during contests when "wide" signals are very annoying if they mask out the weaker and more interesting signals.

In the case of receivers, the problem appears in a slightly different form. Phase noise spreads out on either side of the main local oscillator signal as shown in fig. 3. This has little or no effect if the receiver is tuned to a strong signal on a quiet band. However, if the receiver is tuned slightly off channel, then it still is possible for the incoming signal to mix with the noise from the oscillator and come within the receiver's IF bandwidth as shown in fig. 3. Normally, signals offset from the local oscillator by a frequency equal to the IF will fall within the IF passband. Similarly, if there is noise on the local oscillator and there is a frequency difference between a strong signal and the phase noise equal to the IF, then these signals will mix to create noise in the IF passband. This can mean that off-channel signals will still interfere with wanted signals regardless of the receiver's filter performance.

This process is known as *reciprocal mixing*, and it is very important when trying to listen to weak signals on a band where there are some very strong signals. For HF receivers, the test of their reciprocal mixing performance used to be 40 meters. Now the situation there is a little better. For VHF operators the ultimate test of a receiver's reciprocal mixing performance comes while listening to weak stations during a contest when there are a lot of very strong signals on the band.

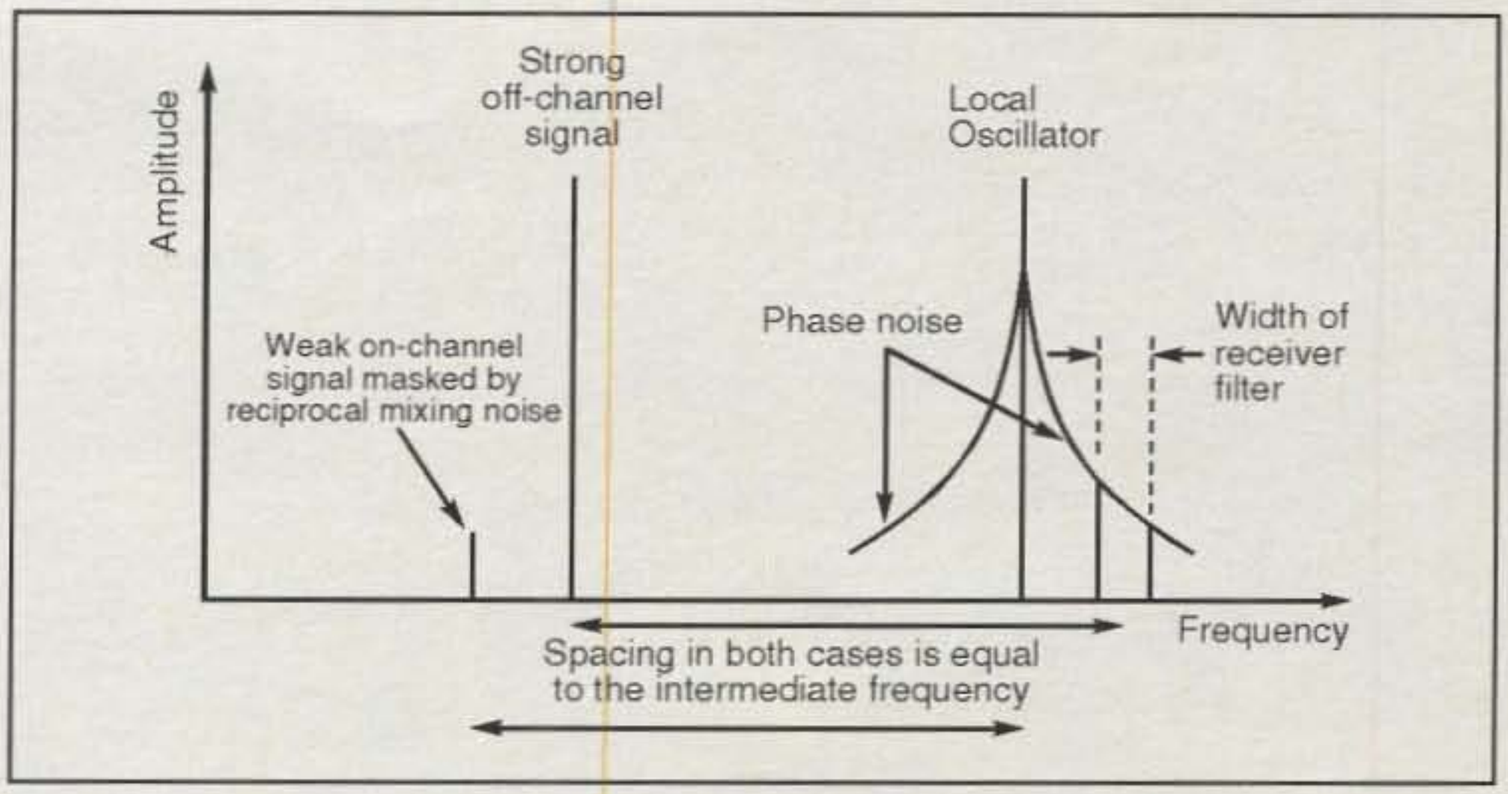


Fig. 3– Reciprocal mixing.

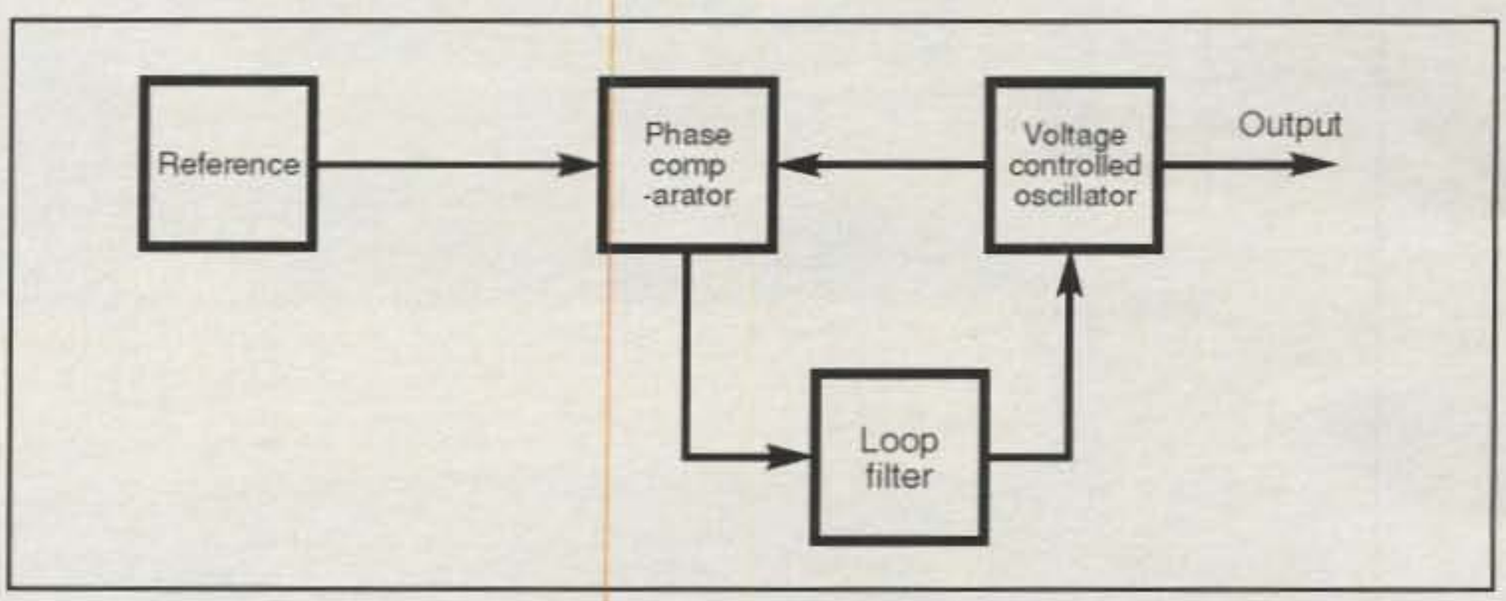


Fig. 4– A basic phase locked loop.

Basic Synthesizers

Most synthesizers used in amateur equipment today are based around a *phase locked loop* (PLL). Briefly, the loop consists of three main blocks: the *phase detector*, the *loop filter*, and the *voltage controlled oscillator* (VCO). A reference signal, from a crystal oscillator or other source, enters the phase detector along with the output from the voltage-controlled oscillator, and an error voltage proportional to the phase difference between the two signals is generated. This is applied to the control terminal of the VCO. It has the effect of trying to reduce the phase difference and hence the frequency difference between the two signals. Eventually, a point is reached when a steady phase difference exists between the two signals. As the phase difference is constant, this means that the signal from the VCO and the reference are on exactly the same frequency. This basic circuit enables the VCO to produce a signal on the same frequency as the reference.

In a frequency synthesizer, signals on a variety of frequencies are required. One way of achieving this is to place a programmable divider into the loop as shown in fig. 5. In this case the loop will fight to reduce the phase difference for the two signals at its input. Hence the frequency of the two signals at the input to the phase detector will be the same. With a divider set to a division ratio of *N*, the VCO must be operating at a frequency *N* times the phase comparison frequency—i.e., at *N* times the reference frequency. By changing the division ratio, the VCO frequency can be changed.

It can also be seen that the synthesizer steps in frequency increments equal to the phase comparator frequency. To have small steps, a low phase comparison frequency is required. In many amateur radio transceivers used for VHF a phase comparison frequency of 25 kHz is used, combined with large division ratios. Typically, a 2 meter transceiver with a 25 kHz step size operating between 144 and 148 MHz will require the division ratio to vary between 5670 and 5920.

The Loop and Phase Noise

Phase noise is generated at different points around the synthesizer loop. Depending on where it is generated, it will affect the output in different ways. For example, noise generated by the VCO will have a different effect than that generated by the phase detector. This illustrates that when designing the synthesizer, it is necessary to look at the noise performance of each circuit block in the loop so that the best noise performance is obtained.

One-Stop Shopping for HF

Factory-Direct for Big Savings!

$895

$139

PEGASUS

Combining the power of your PC with cutting-edge IF-DSP yields unmatched performance at this price. 34 built-in DSP filters on receive. Tailor the sound of your transmit audio with 18 different bandwidths! Installation is simple, no need to go inside your PC. Just load the software provided, connect to a serial port, and you're on the air! Runs on Windows 3.1, 95/98®. 100 watts out on all 9 HF bands and general coverage receive. Add optional model 302 remote tuning control for armchair operation. Download actual operating software from our website for a test drive.
Ship wt. 13 lbs.

OMNI VI *PLUS*

The finest ham band receiver in the world! You'll work the weakest signals under the worst band conditions, signals the competition can't even hear. Our unique crystal mixing makes it possible by eliminating phase noise as a performance factor. Even the most active contesters and DXers operate for hours on end with little or no listening fatigue. The power of DSP noise reduction makes signals "jump" out of the noise.
Ship wt. 25 lbs.

$2585

SCOUT

Have fun on HF without spending a fortune. Master every feature in minutes, no modern rig is as easy to use. Ideal for mobile, portable, or a 2nd rig in the shack. Everyone's favorite Field Day choice. Receiver performance runs circles around rigs at twice the price. Patented variable bandwidth "Jones" filter, 50 watts out, includes one band module of your choice, others only $29 each.
Ship wt. 9 lbs.

$549

Every TEN-TEC Transceiver and Amplifier includes our legendary, silky-smooth QSK!

Call 800-833-7373

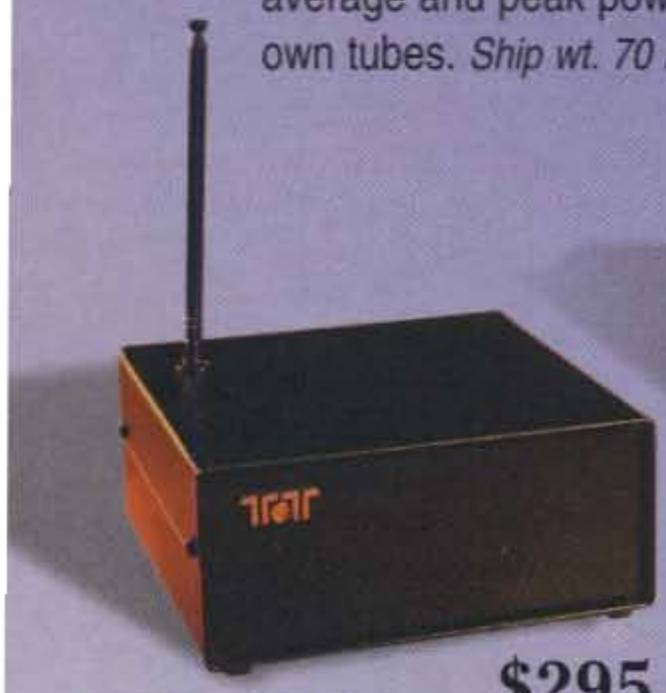
or visit us at www.tentec.com

CENTURION $1795

1300 watts PEP, 1000 watts CW from a pair of classic graphite 3-500Z's. Conservative design assures maximum tube and power supply life. Instant on, no warmup. Simultaneous metering of average and peak power. Only $1495 if you already own tubes. *Ship wt. 70 lbs.*

TITAN II $2990

Comfortably delivers 1500 watts output from single Svetlana 4CX1600B. Our unique L-Pi-L tank design assures cool operation, balanced Q, and excellent harmonic suppression. Built-in protective circuitry makes TITAN II virtually indestructible. 3 YEAR warranty. *Ship wt. 93 lbs.*



PC RADIO $295

Shortwave listening is only a mouse click away. General coverage from 100 kHz - 30 MHz. Connects to your PC via one serial port. Runs on Windows 3.1, 95/98®. Download the actual operating software from our website. *Ship wt. 5 lbs.*

HERCULES II $1395

Solid state, no tuning required! 50 - 70 watts provides 550 watts out, all modes. Use direct from 13.5 VDC battery for mobile or base operation or optional power supply. Model 9420, $749. *Ship wt. 25 lbs.*

HIGH POWER TUNER $395

Our superior "L" network utilizing heavy-duty, hand-built roller inductor. Matches up to 10.1 SWR at any phase angle. Handles 1500 watts with ease, even on 160 meters. *Ship wt. 14 lbs.*

Model 239 - 300 watt Dummy Load (1 lb.)	$ 27.95
Model 291 - 200 watt Antenna Tuner (4 lbs.)	$ 89.00
Model 701 - Hand Microphone (1 lb.)	$ 24.00
Model 705 - Desk Microphone (2 lbs.)	$ 79.95
Model 937 - 13.8 VDC 11 amp Power Supply (14 lbs.)	$ 79.00
Model 962 - Power Supply/Speaker Console (21 lbs.)	$275.00

Ship Wt. (lbs.)	<3	3-9	10-19	20-34	35-69	70-100
Continental U.S.	$6	$9	$15	$20	$31	$60
Alaska, Hawaii, Canada - Call Toll-Free for Quote						

*Customer pays shipping both ways.

NO-RISK 30-DAY MONEY-BACK GUARANTEE!*

You can reach us at:

1185 Dolly Parton Parkway
Sevierville, TN 37862
Sales Dept: 800-833-7373
Monday - Friday 9:00 - 5:30 EST
We accept VISA, Mastercard, and Discover

Office: (865) 453-7172
FAX: (865) 428-4483
Repair Dept.: (865) 428-0364 (8 - 4 EST)
Sales Dept. e-mail: sales@tentec.com

Call for Free T-Kit Catalog

Over 30 Budget-Priced Kits for Hams and SWL's

Ask about Club Fundraising or Club Quantity Discounts

TEN-TEC

MADE IN USA

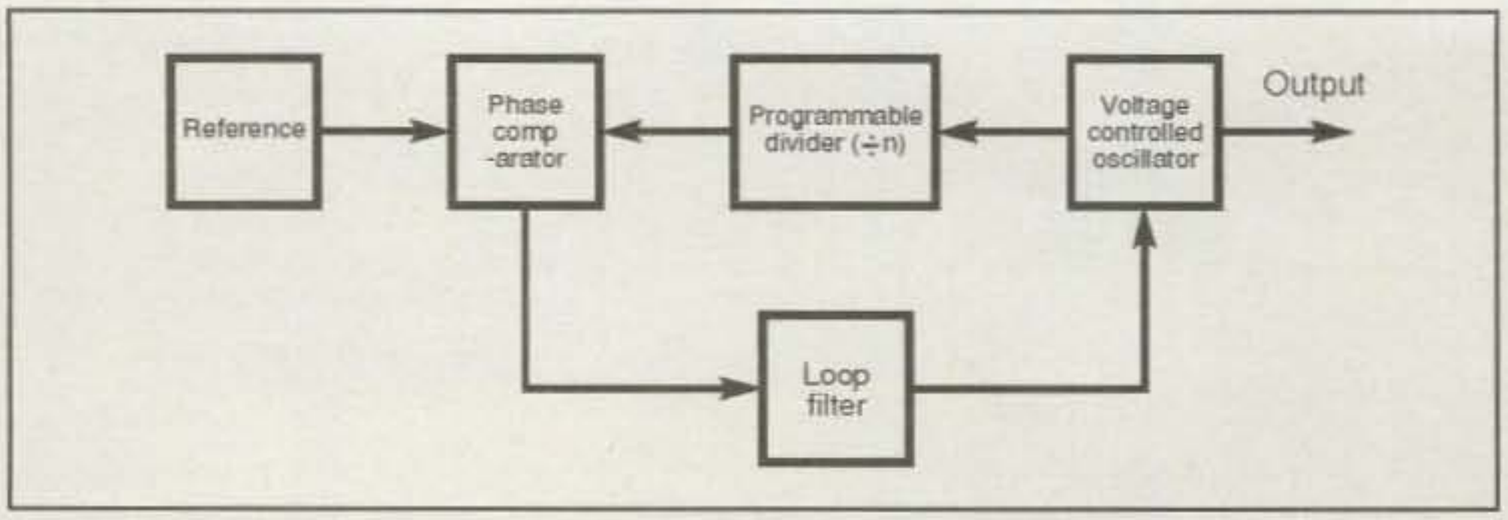


Fig. 5– Basic frequency synthesizer using a programmable divider in the loop.

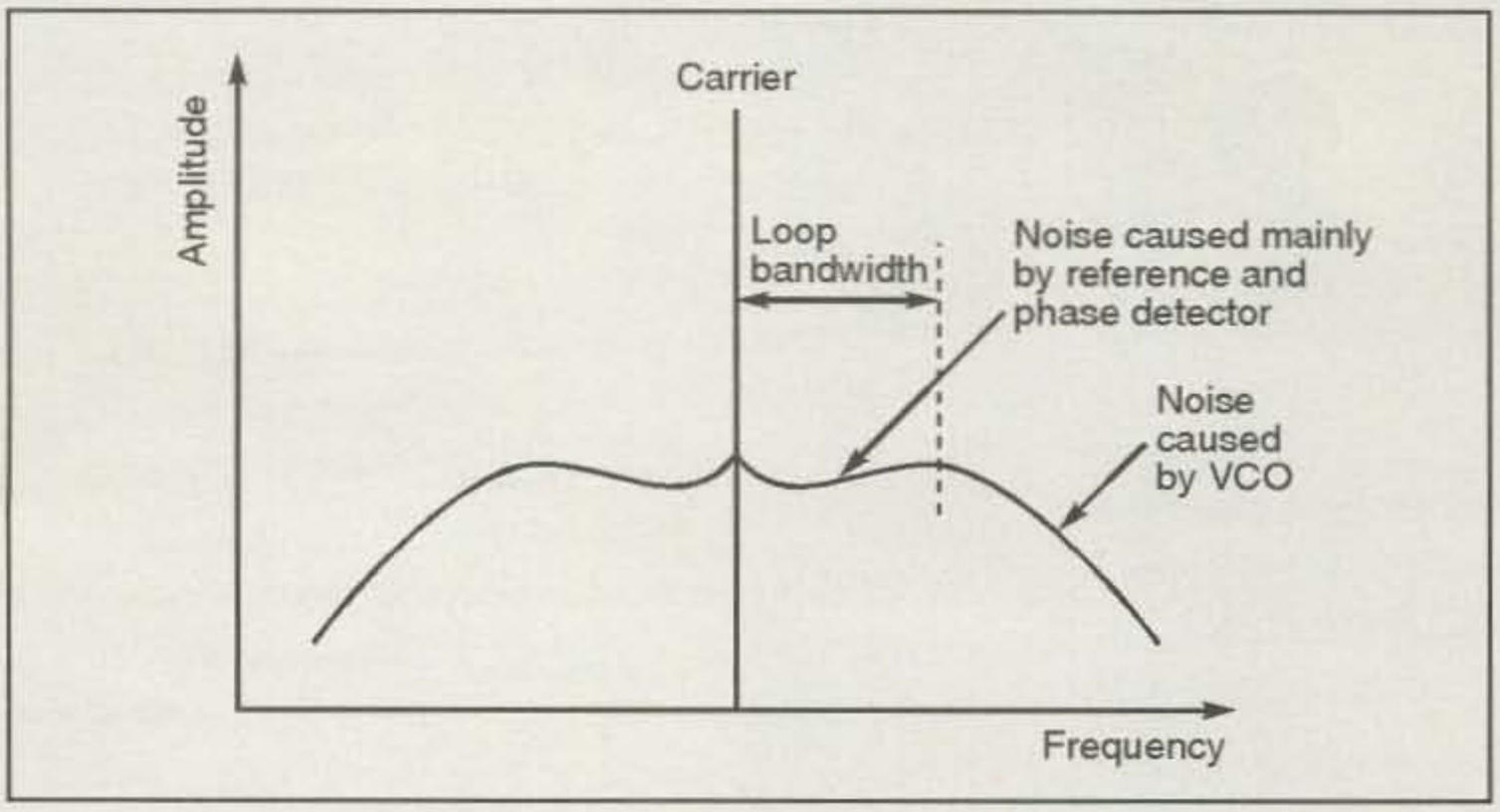


Fig. 6– Make-up of noise from a single-loop synthesizer.

Apart from ensuring that the noise from each part of the circuit is reduced to an absolute minimum, it is the loop filter that has the greatest effect on the final performance of the circuit. This is because it determines the break frequencies where noise from different parts of the circuit start to affect the output.

To see how this happens, take the example of noise from the VCO. Noise from the oscillator will be divided by the divider chain and will appear at the phase detector. Here it will appear as small perturbations in the phase of the signal emerging at the output of the phase detector. When it comes to the loop filter, only those frequencies which are below its cutoff point will appear at the control terminal of the VCO to correct or eliminate the noise. From this it can be seen that VCO noise within the loop bandwidth will be attenuated, but that which is outside the loop bandwidth will be left unchanged.

The situation is slightly different for noise generated by the reference. This enters the phase detector and again passes through it to the loop filter, where the components below the cutoff frequency are allowed through and appear on the control terminal of the VCO. Here they add noise to the output signal. It therefore can be seen that noise from the reference is added to the output signal within the loop bandwidth but is attenuated outside it.

Similar arguments can be applied to all the other circuit blocks within the loop. In practice, the only other block that normally has any major effect is the phase detector. Its noise affects the loop in exactly the same way as noise from the reference. The frequency divider creates some noise, but it is combined with that from the phase detector.

Fortunately, noise from the reference and phase detector is generally very low. However, as the loop effectively multiplies the frequency of the reference signal, it is also found that the level of phase noise is multiplied. In fact, the amount by which it is multiplied is simply 20 $\log_{10}$ N, where *N* is the division ratio of the divider. Therefore, a loop which has a divider set to 2 (and has a multiplication factor of 2) will multiply the noise of the reference and phase detector by 6 dB. The noise from the example above will be degraded much more: 20 $\log_{10}$ (5670) at 144 MHz—i.e., 75 dB!

Reducing Phase Noise

There are a number of ways of improving the noise performance of a synthesizer. The first can be seen from the example given above, and it is to reduce the division ratio within any loop. This can be achieved by designing a multi-loop synthesizer. There are a number of ways of designing multi-loop synthesizers; by doing this it is possible to ensure the division ratio in any loop is kept to reasonable limits.

Another guideline is to keep the loop bandwidth as wide as possible. The noise from the VCO rises towards the carrier. However, the loop cleans up the VCO noise inside the loop bandwidth. Therefore, if the loop bandwidth can be kept as wide as possible, the noise from the VCO will be minimized.

The performance of the VCO can also be improved. While general good design techniques must be observed to reduce the noise to a minimum, the Q of the tuned circuit within the oscillator has a major effect. By increasing the Q of this circuit, the performance can be improved greatly. This is often achieved only at the expense of the coverage of the oscillator.

Summary

The design of synthesizers is by no means an easy job. On one hand there are cost restraints which dictate that the circuitry has to be kept as simple as possible. On the other hand it would be nice to have a better synthesizer to reduce the levels of phase noise. However, with integrated circuits becoming more sophisticated, better, more economical circuits can be made. We can only hope that this means better-quality synthesizers and lower levels of phase noise. ■

Burghardt INC.
AMATEUR CENTER

Proud to be "AMERICA'S MOST RELIABLE AMATEUR RADIO DEALER"

Serving Amateur Radio Operators Since 1937

710 10th St SW - P.O. Box 73 - Watertown, SD 57201

WE WANT TO BE "YOUR" RADIO DEALER. Write for our Updated Used Equipment Listing or check our WEBSITE! (updated Daily)

KENWOOD

Communications Does It Again!! with top-of-the-line HF/VHF/UHF

IMPROVED DSP

Kenwood's New TS-570DG includes!

- *16 bit DSP technology on tx & rx*
- *Large LCD display*
- *Scrolling Menu system (46 types of functions)*
- *RS-232 computer port 57.6kbps w/software*
- *160-10 with Auto-tuner built-in*
- *World's FIRST CW AUTO TUNE*

CALL NOW FOR SPECIAL PRICING!

NOW IN STOCK

TM-V7A Dual Band Radio

144-148/440-450mHz standard

50/40 watt "COOL BLUE"

NEED SERVICE ON YOUR KENWOOD TCVR???

SINCE 1937 WE HAVE BEEN SERVING AMATEUR RADIO OPERATORS. ***KEEPING YOUR RADIO PERFORMING IS PART OF THAT.*** CALL US FOR YOUR SERVICE NEEDS OR EMAIL US (service@burghardt-amateur.com)

Technical & Info.

(605) 886-7314

FAX (605) 886-3444

(Internet Connections)

E-Mail
hamsales@burghardt-amateur.com

HOME PAGE
www.burghardt-amateur.com

HOURS: MON. - FRI. 8-5p.m.;
SAT. 9-1 p.m.
CLOSED SUNDAYS/HOLIDAYS

CALL or WRITE TODAY for our "TOP-DOLLAR" TRADE ALLOWANCE ON YOUR "GOOD and CLEAN" LATE MODEL HF, VHF, UHF, and Receiver EQUIPMENT.

DISCOVER NOVUS
VISA
MasterCard

73 from All the Gang

Stan	WØIT	Jim	WØMJY
Darrell	WDØGDF	Tim	WDØFKC
David	KAØJDN	Marty	KBØIOW
Pete	NØEDI	Chad	KCØDWY
Mike	KCØFTM	Lorie	Bookkeeping
Rochelle	Receptionist	Chad K.	Shipping

CALL OUR FRIENDLY AND KNOWLEDABLE SALES STAFF

TELEPHONE

1(800) 927-4261

CIRCLE 128 ON READER SERVICE CARD

You've probably heard of a J-pole antenna and maybe even used one. However, you might not really know how they work. KA4LBE takes us inside one.

The EZ-J J-pole Antenna

BY BENSON SMITH*, KA4LBE

The venerable J-pole may be the most widely identifiable amateur radio antenna around. Few hams, if any, are not familiar with the name "J-pole." This article will show you how it works and make it easy for you to design your own. Later we will look at how to increase the gain of a J-pole.

The J-pole, or simply the "J," has a few attributes that are attractive to amateurs: It has more gain than a quarter-wave ground plane; it is DC coupled, so it has low static noise; it is easy to build (easier for me than the ground plane); and it does not use radials, so its "foot print" is smaller than that of a ground plane.

The J-pole probably developed from the end-fed Zepp. They have a very similar design. Both employ a half-wave radiator section and a quarter-wave "stub" transformer for feeding the half-wave radiator's very high feed (radiation) resistance.

Fig. 1 shows the basic, or standard, half-wave J-pole. The basic J-pole has the following parts:

• The radiator, section "R," which is one-half electrical wave in length.

• Section "Q," which is a quarter electrical wave in length. It is shorted at the bottom end. It has spacing, "SP," between its two elements.

• The antenna is fed at points on "Q," shown as the two opposing points "F."

The total height of the J-pole is R plus Q. The electrical lengths of "R" and "Q" are determined by slightly different formulas. Section "Q" is actually a quarter-wave section of parallel transmission line, a shorted quarter-wave stub.

The secret of the operation of any J-pole lies in the operation of the quarter-wave stub, "Q." The radiator section, "R," has a very high radiation resistance, sometimes called *feed impedance*. Feed impedance actually covers other terms in addition to radiation resistance. Depending on the diameter of "R," this resistance can be over 1000 ohms! You cannot connect a feed line directly to it and achieve good results. In fact, a very high VSWR (SWR) might be the result!

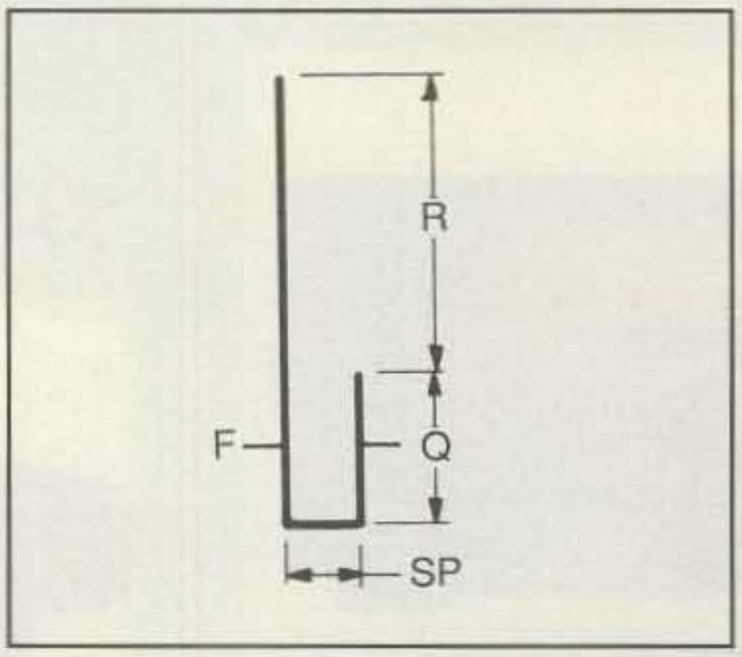


Fig. 1– The basic J-pole antenna. "R," the radiator, is one-half electrical wave in length. Section "Q" is a quarter electrical wave in length and is shorted at the bottom end; it has spacing "SP" between its two elements. The antenna is fed at points on "Q" shown here as the two opposing points "F."

The quarter-wave stub, "Q," acts as a transformer to match the feed line to the radiator. If the feed is 50 ohms and is connected at the top of the "Q" section, then the top point will be 50 ohms. If the radiator is also 50 ohms, a 1:1 VSWR will result. If the feed is connected at the midpoint of "Q," then the top point will be about 100 ohms, and if the radiator is 100 ohms, then the VSWR will be 1:1.

If the feed is moved an additional halfway down from the last point, which was the mid-position on "Q," then the top point impedance will appear as 200 ohms, and again, if this matches the radiator's resistance, then a VSWR of 1:1 will be measured.

The feed-point position will determine the ability to match radiator resistances from about 50 ohms, positioned at the top of "Q," to over 1000 ohms near the shorted bottom of "Q." To find this "match point," slide the connection up and down, stopping to measure and record the resulting VSWR as you go.

The dimension "SP" in J-poles built of 1/4 to 2 inch diameter conductors typically will be between 1/2 inch to about 2 inches. See photo A, which shows the finished "EZ-J."

J-poles commonly (but not necessarily) are built of continuous material. That is, the "Q" and the radiator section are

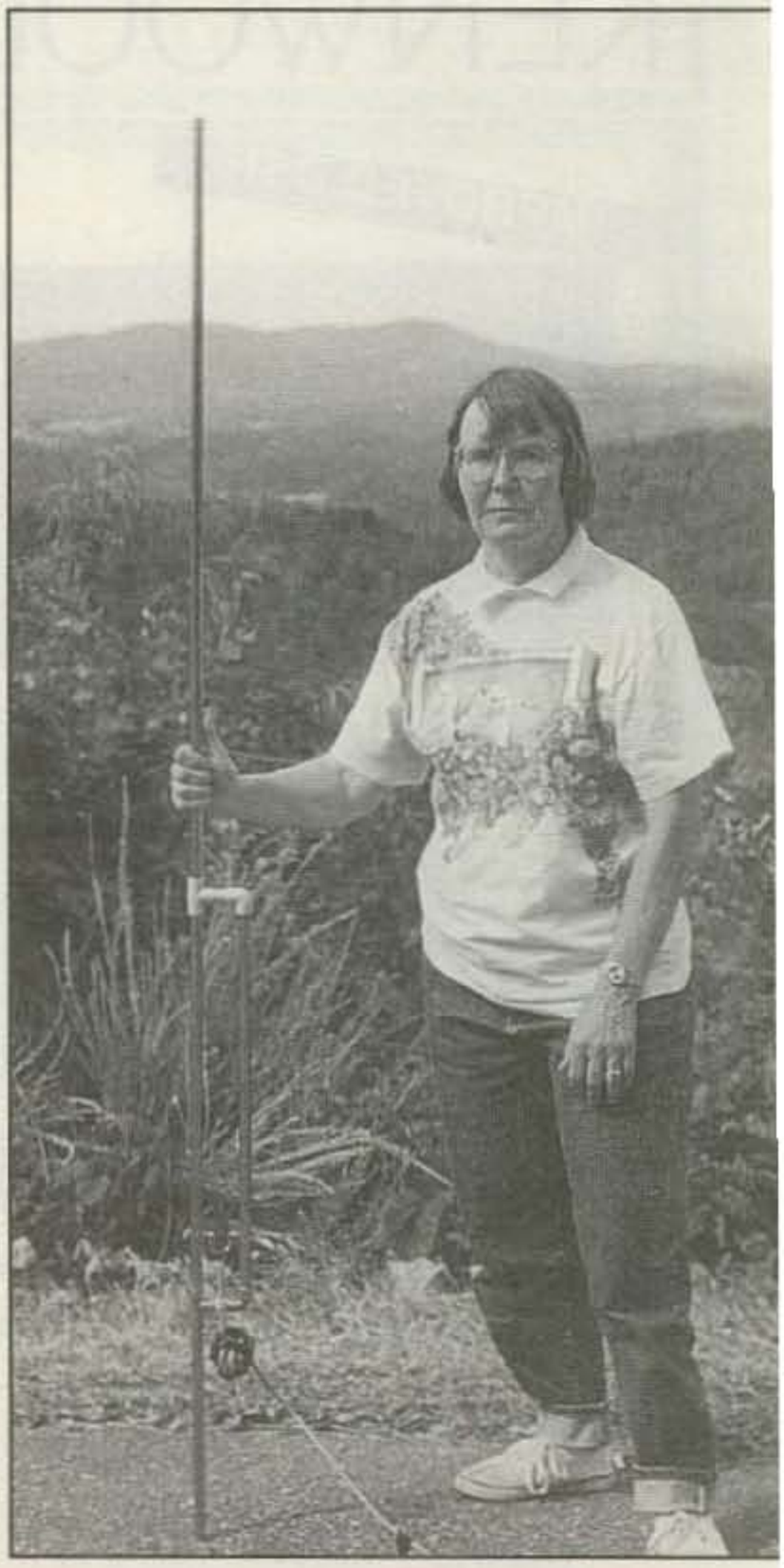


Photo A– Here is Lois, KA4LBD, holding the finished EZ-J.

*1324 Sunset Park Dr., Seymour, TN 37865

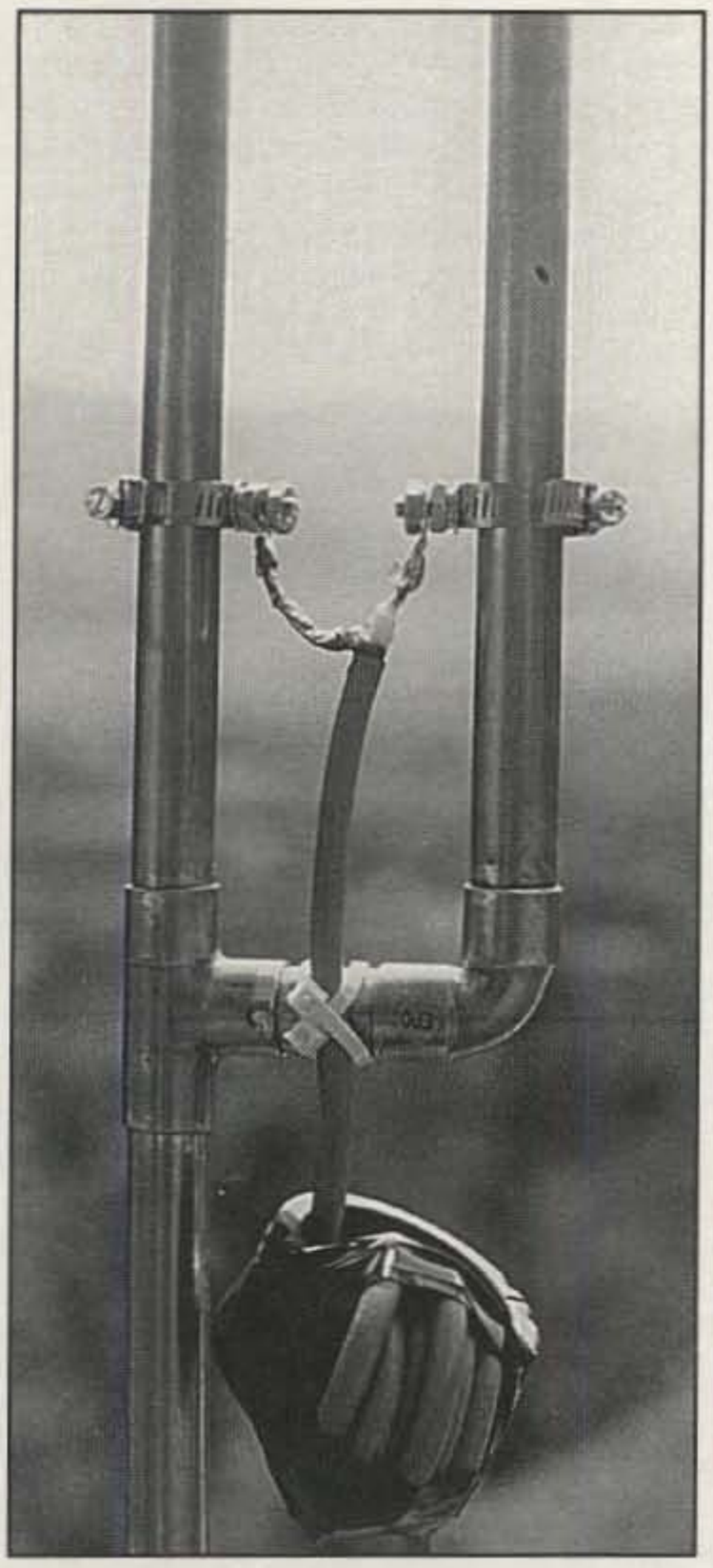


Photo B– Feed method of the EZ-J.

made of the same conductor material. For example, if 1/2 inch thin-wall copper pipe is used, *both* sections are made of it. There is no physical break from the "Q" section's top to the bottom of the radiator.

The standard J-pole is a half-wave antenna. Therefore, it is a resonant antenna. It cannot use added radials. Being a half-wave antenna, the standard J-pole, when properly matched, has a gain and field pattern similar to a vertically mounted dipole.

We have been assuming coax is used for the feed line. Parallel line may also be used if the radiator resistance is greater than that of the line impedance.

Another parameter of a J-pole that can be confusing is that the J-pole is a balanced-feed antenna. It is a bit important to feed the J-pole using a balanced feed. If coax is used, a 1:1 balun should be added. The simplest method is to make a coil of the feed line very close to and below the bottom crossover (shorted end) of the "Q." Ferrite beads could also be used. A good rule of thumb is to design this coil to have an inductive reactance of about ten times the coax impedance. This coil, acting as an RF choke, will also reduce the

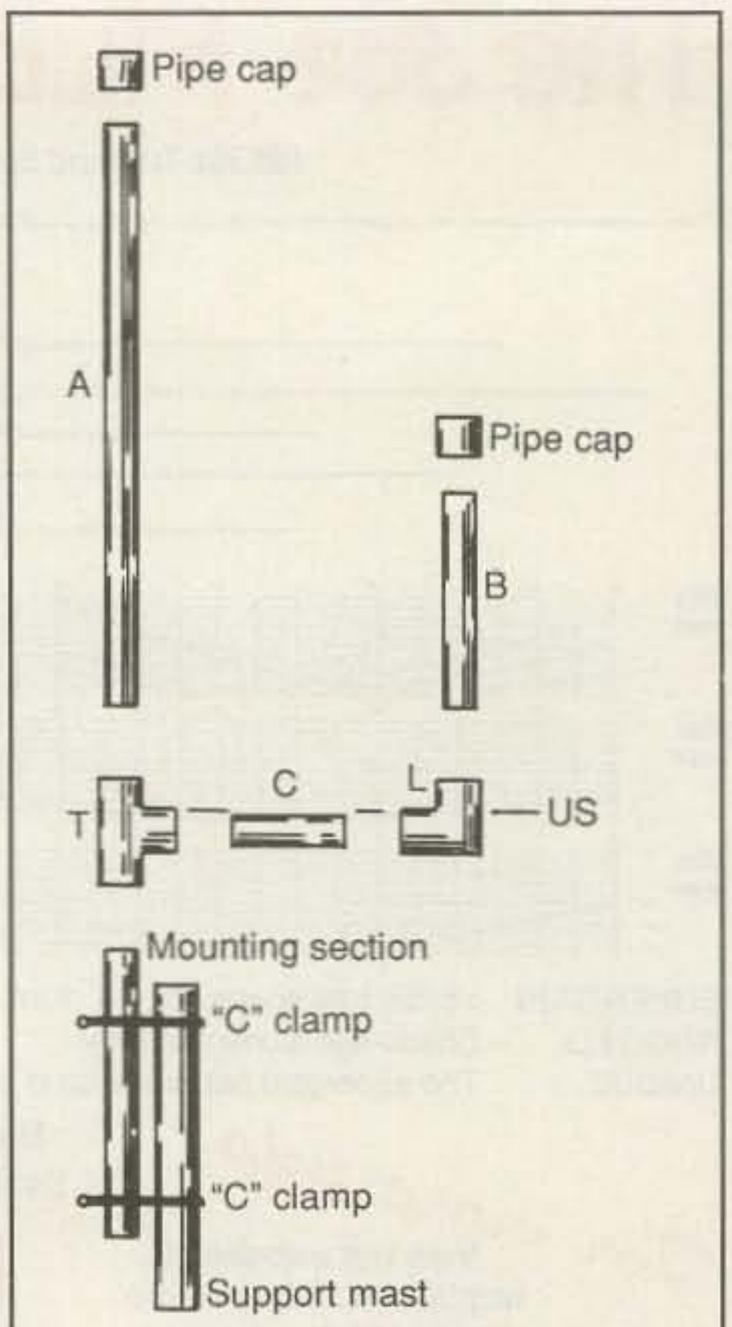


Fig. 2– If desired, the J-pole can be isolated from a support mast using PVC pipe below the "Tee."

level of RF current which might couple to the coax shield.

Since the feed is then balanced, the connection of the coax can be made with the center to the longer or shorter element and the shield to whichever element was not used for the center. The length and dress of the feed should be short and balanced and the coax should pass by the center of the crossover (shorted end) of the stub ("Q") and held firmly in place, both during measurements and final use (see photo B).

The stub ("Q") adds very little to the antenna field because the fields from the two vertical stub members, being out of phase and in very close proximity, cancel. There is only a tiny bit of radiation from the stub.

It is possible to mount the J-pole by using a continuous mast so that the antenna is grounded electrically. If desired, the J-pole can be isolated from a support mast using PVC pipe below the "Tee" (see fig. 2). Now let's design a J-pole.

Designing a J-pole

We will use 1/2 inch thin-wall copper pipe for this example. Other material, such as aluminum pipe, could be used.

1. The first step is to determine the operating frequency. Give a bit of consideration to this selection. If the J-pole is to be used on 2 meter FM, you might consider using the center point between transmit and receive frequencies.

2. The radiator section length will be determined by:

$$R \text{ (inches)} = [(492/F) \times K] \times 12 \qquad \text{eq. 1}$$

In equation 1, "F" is the operating frequency in MHz and "K" is a correction factor based on the radiator diameter to wavelength. The "K" factor can be determined by referring to *The ARRL Antenna Book,* Chapter 2. The outside diameter of our sample of 1/2 inch pipe is 0.625 inch. We will design our J-pole for operation centered on 146.5 MHz. The "free space" wavelength is found by:

$$L_{fs} \text{ (inches)} = [984/146.5] \times 12 \qquad \text{eq. 2}$$
$$= 80.6 \text{ inches}$$

Since our pipe has an outside diameter of 0.625 inch, the L_{fs}/dia. is:

$$L/D = 80.6/0.625$$
$$= 128.96$$
$$\sim 130$$

In the chart in Chapter 2 of *The ARRL Antenna Book* the "K" factor is about 0.96. By inserting appropriate values in equation 1, we find:

$$R \text{ (inches)} = [(492/146.5) \times 0.96] \times 12$$
$$= 38.688326$$
$$\sim 38.70$$

3. The quarter-wave stub, section "Q," length can be calculated using:

$$Q \text{ (inches)} = [(246/F) \times V_f] \times 12 \qquad \text{eq. 3}$$

In equation 3 we find the term "V_f" which refers to the velocity of propagation of the RF signal traveling on a parallel feed line. Our "Q" section is a section of such line. It is an "open line," since it will have only a very small insulator touching it. We will use a V_f value of 0.98 since it is "open line." By inserting these values in equation 3 we find:

$$Q \text{ (inches)} = [(246 / 146.5) \times 0.98] \times 12$$
$$= 19.747165$$
$$\sim 19.75$$

4. The long side of the J-pole is the sum of lengths "R" and "Q," or:

$$A = \text{Long Side} = 38.7 + 19.75$$
$$= 58.45 \text{ inches in length}$$

5. The short side is simply the length of "Q," or 19.75 inches. All dimensions are

to be measured from the upper surface ("US") of the cross member of "Q."

6. For our parameters, the distance, "SP," between inner surfaces of "Q" will be about 1 to 1.5 inches. By use of a 1/2 inch copper elbow, "Tee," and two end caps, we can now make our J-pole.

The junction of the long side to the cross member (bottom of "Q") is to be made using a "Tee" connector. A short vertical piece could then be added to the bottom opening to provide a mounting point for the antenna.

It is convenient to use stainless hose clamps for feed-point connections. These clamps are used in automobile applications and are available in auto parts stores.

Assembling the J-pole

Material used is 1/2 inch thin-wall copper pipe and dedicated accessories. A 10 foot piece will provide all pipe parts plus the mounting section. In addition, you will need one 1/2 inch copper Tee fitting, a 1/2 inch copper 90 degree elbow, and two 1/2 inch copper-pipe caps. Cut the following pipe pieces:

A = 58.45 inches = R + Q
B = 19.75 inches = Q
C = 1.25 inches

The remaining piece can be used for the mounting.

Temporarily assemble all parts (do not solder yet). Slip caps on and measure the uprights. They should be trimmed to "A" and "B" dimensions. Disassemble and clean all ends then flux joints and assemble, soldering carefully. Finally, attach the remaining pipe for mounting.

Attach the feed coax to a set of stainless hose clamps. Add the RF choke-balun to the feed line and slide the clamps over the "Q" section areas.

Use stainless "C" clamps to mount the antenna to a vertical support, such as a mast or section of PVC pipe. Mount the J-pole away from any grounds or interference and check the VSWR. Slide the clamps up or down and repeat measurement. Continue to slide the clamps (by small increments) in the direction of reduced VSWR. When tuning is completed, thoroughly clean the entire antenna, removing flux and dirt. Add a bit of anti-oxidant between the hose clamps and the pipe. Finally, give the J-pole a thin coat of clear acrylic spray paint.

As with any antenna or mast installation, be *extremely careful*, especially when working around power lines.

In the next installment we will learn how to increase the gain of our J-pole. ■

Go Mobile, get there with → COMET!

Build your own antenna mounting system with the lip mounts and cable assemblies below.

Choose a Lip Mount

RS-730
Multi-adjustable heavy duty lip mount, up to 70" antenna

RS-720 • RS-720 NMO
Multi-adjustable lip mount, up to 60" antenna RS-720 NMO accepts an NMO mount

RS-520
Multi-adjustable lip mount, up to 45" antenna

Choose a Cable Assembly

3D5M Standard low loss cable assembly. Gold plated SO-239/ PL-259 connectors. 17' length

3D4M Same as 3D5M, but 13.5' length

CK-3M5 Deluxe cable assembly 17' length including 17" of RG-188A/U for easy entry from a lip mount without causing water leak, wind noise or coax damage

CK-3M Deluxe cable assembly same as CK-3M5, but 9'9" total length

Create an antenna mounting system just for your vehicle!

Attach the chosen mount to the trunk, door, hood, hatch or rear door of your car, van or SUV. Any lip 1/4" or less in thickness will do. Tighten the setscrews and adjust the mount to vertical. **Installation takes only a few minutes.**

NO HOLES TO DRILL!

Additional available mounting assemblies with cable included!

CQ-5M
Deluxe "Quick-Disconnect" trunk lip mount with CK-3M5 cable included. With a flip of a lever, the antenna and coax are easily removed and stored in the trunk for car washes, theft prevention or any reason.

GR-5M
Deluxe stainless steel trunk lip mount with CK-3M5 deluxe cable included. Fully adjustable.

A

B

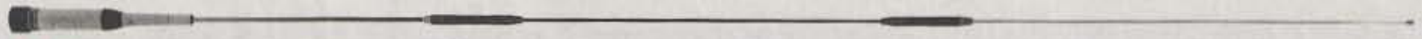
C

COMET™

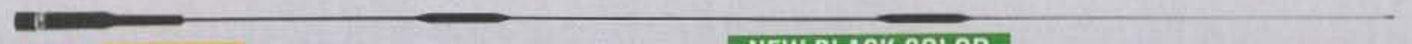
NCG COMPANY

1275 N. Grove Street • Anaheim • California 92806
(714) 630-4541 • (800) 962-2611
Fax: (714) 630-7024 • www.cometantenna.com

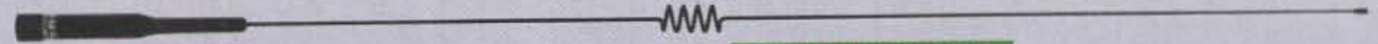
CIRCLE 100 ON READER SERVICE CARD



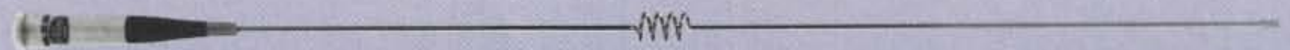
SB-15 • Tri-band 52/146/446MHz w/fold-over
Gain & Wave: 52MHz 0dBi 1/4 wave • 146MHz 4.5 dBi 6/8 wave • 446MHz 7.2dBi 5/8 wave x 3 • Length: 58" • Conn: PL-259 • Max Pwr: 120W



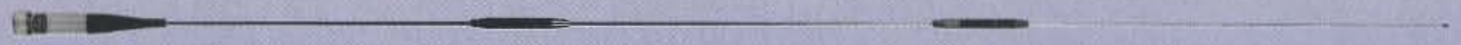
SBB-7 **SBB-7NMO** • Dual-band 146/446MHz w/fold-over **NEW BLACK COLOR**
Gain & Wave: 146MHz 4.5dBi 6/8 wave • 446MHz 7.2dBi 5/8 wave x 3 • Length: 58" • Conn: SBB-7 PL-259/SBB-7NMO NMO • Max Pwr: 70W



SBB-5 **SBB-5NMO** • Dual-band 146/446MHz w/fold-over **NEW BLACK COLOR**
Gain & Wave: 146MHz 2.5dBi1/2 wave • 446MHz 5.5dBi 5/8 wave x 2 • Length: 39" • Conn: SBB-5 PL-259/SBB-5NMO NMO • Max Pwr: 120W



THEFT **Z750** • Dual-band 146/446MHz w/fold-over • Includes COMET exclusive theft-resistant lock!
Gain & Wave: 146MHz 2.15dBi 1/2 wave • 446MHz 5.5dBi 5/8 wave x 2 • Length: 39" • Conn: Gold-plated PL-259 • Max Pwr: 200W



THEFT **Z780** • Dual-band 146/446MHz w/fold-over • Includes COMET exclusive theft-resistant lock!
146MHz 6/8 wave 4.5dBi • 446MHz 5/8 wave x 3 7.2dBi • Length: 62" • Conn: Gold-plated PL-259 • Max Pwr: 150W

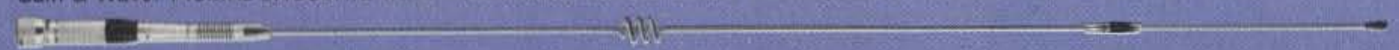
B-20 **B-20NMO** • Dual-band 146/446MHz w/fold-over
Gain & Wave: 146MHz 2.15dBi 1/2 wave • 446MHz 5.0dBi 5/8 wave x 2 • Length: 30" •
Conn: B-10 PL-259/B-20NMO NMO • Max Pwr: 50W

B-10 **B-10NMO** • Dual-band 146/446MHz cellular look-a-like •
Gain & Wave: 146MHz 0dBi 1/4 wave • 446MHz 2.15dBi 1/2 wave • Length: 12" •
Conn: B-10 PL-259/B-10NMO NMO • Max Pwr: 50W

- The **CA-UHV** is a 6M/2M/70cm triband antenna. Add 2-3 of the stock or optional coils for 5-6 band operation.
- HF-70cm all in one economical easy to mount antenna.
- Fold-over hinge built in.
- Select the correct duplexer or triplexer for your specific radio (s).
- CF-706A, CF-530, CFX-514N (Ask your dealer)

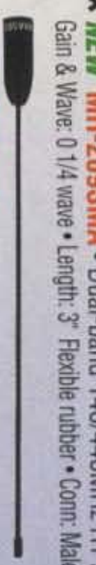
NEW** **CA-UHV** • HF/6M/2M/70cm Mobile Antenna40/*20/*17/15/10/6/2M/70cm ***40M Thru 70cm!
Gain & Wave: HF-6M 1/4 wave • 2M 3.4dBi 5/8 wave • 70cm 2.15dBi 1/2 wave • VSWR: HF 1.6:1 or less • 6M-70cm 1.5:1 or less • Length: 6'2" •
Max Pwr: HF 120W SSB • 6M 200W SSB/100W FM • 2M/70cm 100W FM • *L-14 Optional 20M coil • *L-18 Optional 17M coil

***NEW** **MSG-1000C** • Dual-band 146/446MHz w/spring whip and fold-over
Gain & Wave: 146MHz 2.15dBi1/2 wave • 446MHz 5.5dBi 5/8 wave x 2 • Length: 39" • Conn: PL-259 • Max Pwr: 120W



***NEW** **MSG-1100C** • Dual-band 146/446MHz w/spring whip and fold-over
Gain & Wave: 146MHz 3.5dBi1/2 wave • 446MHz 6.0dBi 5/8 wave x 2 • Length: 43" • Conn: PL-259 • Max Pwr: 150W

***NEW** **MH-209SMA** • Dual-band 146/446MHz HT Antenna w/SMA Conn
Gain & Wave: 0 1/4 wave • Length: 3" Flexible rubber • Conn: Male SMA • Max Pwr: 5W



NEW **SMA-503** • Dual-band 146/446MHz HT Antenna w/SMA Conn
Length: 8.75" • Conn: Male SMA • Max Pwr: 10W

***NEW** **MH-510** • Tri-band 52/146/446MHz HT Antenna w/SMA Conn
Gain: 0/0/ 3.2dBi • Length: 20.75" • Conn: Male SMA • Max Pwr: 10W

Go Mobile, get there with COMET!

NEW MSG SERIES*

Performance and Durability! Designed with a spring in the whip to absorb impacts.

For a complete catalog of NCG/COMET Antenna products call or visit your local dealer. Or contact NCG Company at **800/962-2611**. Use NCG/COMET products, and enjoy amateur radio to it's fullest!

NCG COMPANY

COMET™

*NCG Product

1275 N. Grove Street • Anaheim • California 92806
(714) 630-4541 • (800) 962-2611
Fax: (714) 630-7024 • www.cometantenna.com

NCG COMPANY

CIRCLE 131 ON READER SERVICE CARD

Q&A

Questions and Answers About Ham Radio

Editor's Note: "Q&A" was a regular feature of CQ VHF, which has now been transferred to CQ as a result of the merger of the two magazines. Some of the questions here refer to articles that ran in past issues of CQ VHF. We'll do our best to provide thumbnail sketches of those articles for the benefit of CQ readers who may not have seen them.

Q: I got my Technician class license in 1979 which included the code test. What are the changes to my operating privileges now and those proposed?

Jesse Giammarino, N1ASP
Via e-mail

A: *Your 1979 Technician class license is what's called a Tech-Plus license today (actually, plus a little more than that, but one thing at a time). You have all amateur privileges above 50 MHz plus HF Novice privileges, which include code segments on 80, 40, and 15 meters, and voice privileges on 10 meters, between 28.300 and 28.500 MHz (and 10 meters is super-hot right now!), with a power limit of 200 watts on HF.*

Now for the plus-plus: Since you got your license before the Technician and General class theory exams were split into Elements 3A and 3B, you also have full credit for the General Class theory. Pass a 13 wpm code test and you have a General. (You need to show a copy of your pre-1987 Technician license.)

As for what's proposed, the FCC didn't really make a specific proposal regarding code speed, but rather asked the amateur community for input. There were many different proposals, but the majority seemed to include reducing the code speed requirement for General to 5 wpm. If this becomes part of the FCC's eventual decision, then you should automatically have a General lass license.

Q: I am a new ham (KD7GRQ) looking for product reviews your magazine has already printed about 2m/70cm mobile radios. I thought since you provide this web site, I'd be able to tap into past articles on the web.

Either I don't know how to use your web site (which might be the case), or your web site does not provide that function. I trust writers/hams reviewing products to weed out undesirable radios (just like they do in *Popular Photography)* and go into operational info to help us hams find the gear we need or want. If I had known that I would have been getting my license so quickly (less than two months from the time I knew classes were being held), I could have been subscribing to your magazine months ago to learn about the radio reviews, and by the time I needed a radio, know which one I wanted. Please e-mail me back and tell me how I can tap into past product reviews.

David Neely, KD7GRQ
Via e-mail

A: *Equipment reviews are an important part of the "mix" here at CQ. For a variety of reasons, though, we have not posted any full articles from our magazines on our websites, although we are planning to post the equipment reviews that ran in CQ VHF. We do post our annual indices (although I'm not sure if 1999 is up yet), so your best bet would be to use the search engine on our sites to look up the reviews in which you're interested, and then order the specific back issues in which they appear.*

The following question was directed to CQ VHF "Digital Data Link" Editor Don Rotolo, N2IRZ:

Q: I was browsing through some back issues of *CQ VHF*, and read your article "Electronics in the Great Outdoors" (April 1999). In photo C on page 52 the grounding system from the feedlines is shown. Is the feedline pictured the type used by CATV companies? If that's the case, could you fill me in on your experiences using that type of cable, connector types, etc.?

Bruce Tobias, WB9WOZ
Pres., Northern Illinois APRS Network

N2IRZ replies:

A: Sorry, but the hardline in that photo is genuine 50 ohm stuff—quite costly when purchased, but I was given some big pieces a few years ago, sadly without connectors. I managed to find some connectors and had to make some others.

The hardline used for CATV is 75 ohms, as you likely know. I have played with that in the past, with good luck. One way to use it is to buy (or make) some 50 to 70 ohm transitions; these were sold for many years, but they are frequency-dependent— one band at a time.

Another way to use it is simply to ignore the impedance. After all, 75 ohms is not such a bad mismatch. You might end up losing a dB to that, but gaining 3 or 4 for the length of a run versus 9913 or RG-8. On VHF and UHF, the rig probably will not care about a 1.5:1 VSWR. Making connectors is more an exercise in plumbing and ingenuity than anything else. Mating copper plumbing pipe with aluminum isn't difficult; you cannot solder, but friction-fits with slit copper tubing and hose clamps is effective, as are screw-on brass fittings.

I would pay a visit to the local cable company one day, and ask if you can speak with their chief engineer. Explain to him or her that you are a ham, and would appreciate being able to get a piece of the thickest hardline they have, something they might have left over, or even something used. (Don't ask for more than 100 feet unless you're pretty sure they'll give it to you.) They might ask you to give them a few dollars for it, to recover the scrap value, but more likely than not, it's too much trouble to take your check. (Maybe offer to buy pizzas for the crew!)

The following question was directed to CQ VHF "Antennas, etc." Editor Kent Britain, WA5VJB, regarding his series on "Cheap Yagis" for VHF/UHF use:

Q: Hello, Mr. Britain. I enjoyed your articles in *CQ VHF* some months ago and now am about to start construction of the 2m antenna, preferably 6 elements. In the photos, the 6-element Yagi is not end mounted. Where should I locate the clamp on the boom? Does its exact location matter? Will the mast interfere with the function? You don't mention what you used for materials and I'm finding $^{3}/_{16}$" aluminum rods a bit hard to find as well as the copper/brass $^{1}/_{8}$" rod for the driven element. I can find $^{13}/_{64}$" brass rod in 12' lengths at $5.06 each so that's not too bad. If I use it, how will the increased driven element diameter affect its dimensions? I'm looking forward to building the antenna.

Martin Orloski, N1WST
Saint Albans, Maine

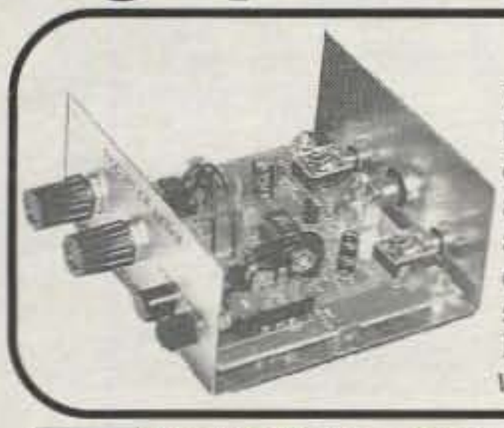
WA5VJB replies:

A: There certainly have been many interesting/creative/weird ways the antennas have been mounted thus far. If you are mounting the antenna horizontally, I'd beef up the boom a bit where I put the clamp, and mount the clamp near the center-of-gravity or balance point of the antenna. Vertically polarized gets more complex, but I've talked about several mounting techniques in my columns.On 2 meters you could go to $^{1}/_{2}$" material before I'd even think twice about recalculating element diameter vs. lengths, so no problem there. The diameter will affect the driven element a bit, but there is an easy tweak. Make the element an inch or so too long and trim it down for lowest SWR. On my test antennas, I have some tubing that will telescope over the element and I just move it in an out for best SWR. When I find the best point, I solder it in place.

Do *you* have a question about any aspect of ham radio? We'll do our best to give you a clear, concise answer, or if it's not a question that has just one easy answer, we'll invite readers to offer their solutions. Send your questions to: Q&A, *CQ* magazine, 25 Newbridge Rd., Hicksville, NY 11801; or via e-mail to <q&a@cq-amateur-radio.com>. Sorry, but we can't answer everything individually. Those questions with broad interest will be considered for publication.

VECTRONICS® kits

High-performance electronic kits . . . fun to build and use!



Full featured CW Keyer Kit, $24.95!

VEC-201K, the best electronic keyer bargain in ham radio! Send beautiful sounding Morse Code. Self-completing dot-dashes and dot-dash memory forgive timing errors -- makes sending CW easy and accurate. Front panel volume/speed (3-65 wpm) controls. Weight adjusts 25-75%. Sidetone (300 -1000Hz) has LM386 audio amp for external speaker/phones. Select Iambic A or B, fully automatic or semi-auto "bug" mode. Tune mode for tuning rig. RF proof. Sleep Mode battery saver. Use 9V battery. 1¾x4x3½ in. *Simple skill level.*

VEC-201K shown in optional case (vinyl cover top not shown). VEC-201KC, $14.95

Crystal radio set Kit lets you relive the experience of early radio pioneers. This baby really works! Wind your own inductor, wire up the earliest radio circuit without soldering a thing and listen to the magic of radio that needs no power. Put up an antenna, connect a ground. Stations come in amazingly loud and clear. Includes antenna wire, sensitive earphone. 1¾x5x6½ in. *Simple skill level.* Order **VEC-121K, $19.95.**

Aircraft Receiver Kit tunes entire voice aircraft band 118-136 MHz. Picks up air traffic 100 miles away. Track progress of incoming/outgoing traffic in your area, gain advanced weather information, and discover how the National Air Traffic System really works. Great way to learn about aviation. Use 9V battery. Drives external speaker/phones. 1¾x4x3½ in. *Intermediate skill level.* Order **VEC-131K, $29.95.**

20/30/40/80 Meter Receiver Kits give high performance! Covers entire band or tailor to cover desired portion. Copy CW/SSB/AM. NE602/ 612 mixer-oscillator, LM386 high gain audio amplifier. 1¾x4¾x5¼ in. *Moderate skill level.* Order **VEC-1120K** (20 Meters),**VEC-1130K**(30 Meters),**VEC-1140K** (40 Meters), **VEC-1180K** (80 Meters), **$29.95 ea.**

20/30/40/80 Meter QRP CW transmitter Kits have variable crystal oscillator tuning, front panel switch selects 1 of 2 crystals. 1 crystal included. Transmit and Receive switch. Connect receiver. 1¾x4x3½ in. *Intermediate skill level.* Order **VEC-1220K** (20 Meters), **VEC-1230K** (30 Meters), **VEC-1240K** (40 Meters), **VEC-1280K** (80 Meters), **$29.95 ea.**

Tunable SSB/CW Audio Filter Kit has sharp *four* pole peak and notch filters. Zero in with frequency control & adjust bandwidth for best response. Tune frequency from 300-3000 Hz. Notch is an outstanding 50 dB. 1 Watt amplifier. Speaker/Phone jacks. 12 VDC at 300 mA. 1¾x4¾x5¼ in. *Intermediate skill level.* Order **VEC-841K, $34.95.**

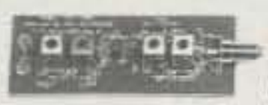
***Vectronics Comprehensive Soldering Course* and Kit** is the best home study soldering course available! Includes theory, quizzes, PC board, tools, safety, techniques and materials. Get professional soldering skills and a fun blinking LED project. Gets you ready for "through-hole" PC board assembly and repair. *Simple skill level.* Order **VEC-1500K, $29.95.** New!

Super CW filter/amplifier Kit has powerful 1 watt audio amplifier to drive speaker. 8 poles active IC filtering uses cascaded low-Q stages. 3 bandwidths: 80,110, 180 Hz. Center frequency: 750 Hz. Up to 15 dB. Use 9-18VDC, 300 mA max. 1¾x4 x3½ in. *Simple skill level.* Order **VEC-821K, $29.95.**

Super SSB Audio Filter Kit improves readability with 8 poles, optimizes audio bandwidth, reduces SSB splatter, low, hi-pitched interference, hiss, static crashes, background noise. Use 9V battery. 1¾x4x 3½ in. *Simple skill level.* Order **VEC-830K, $19.95.**

144/220/440 MHz Low-Noise Preamp Kits soup up your antenna system. Helps pull in weak signals. Works wonders for scanner or ham-band receiver. Gives great low-noise performance and immunity from damaging electrostatic discharge. 1x1½ in. *Simple skill level.* Order **VEC-1402K** (144 MHz),**VEC-1422K** (220 MHz), **VEC-1444K** (440 MHz), **$17.95.**

CW Memory Keyer Kit stores 512 characters in four 128 character non-volatile EEPROM message memories. *Carry on entire QSOs by just pressing memory message buttons.* True sinewave sidetone with soft rise and fall time eliminates harsh keyclicks. Has all features of VEC-201K CW Keyer Kit. 1¾x 6¼x5¼ in. *Simple skill level.* Order **VEC-221K, $69.95.**



High-performance 2 Meter Preamp Kit pulls weak signals out of noise. Solves three reception problems -- boosts signals using a 1-dB noise figure microwave transistor, provides razor-sharp bandpass filtering, eliminates unwanted electrical noises with built-in balun. Uses 9-14 volts DC. Tiny 1½x3x1 in. fits in any size box. *Intermediate skill level.* Order **VEC-1402DK, $59.95.**

2/6/10 Meter FM Receiver Kits let you tune into the world of ham radio. Catch all the action! Each covers the entire FM sub-band and runs off your 9 volt battery. Plug in speaker or headphones for loud clear reception. 1¾x4x3½ in. *Intermediate skill level.* Order **VEC-1002K** (2 Meters), **VEC-1006K** (6 Meters), **VEC-1010K** (10 Meters), **$34.95 each.**

2 Meter Monitor Kit receives 144-148 MHz. Low noise, high gain RF preamp gives you excellent 0.1 uV sensitivity. Air variable tuning capacitor has 8:1 reduction. Dual conversion superhet provides selectivity and stability. Automatically eliminates squelch tails. Built-in speaker, squelch, tone, volume controls. 19¼ in. telescopic whip. 9V battery. 2x4¼x4 in. *Intermediate skill level.* Order **VEC-104K, $79.95.**

5 Watt 2 Meter FM transmitter Kit lets you transmit voice and data -- AFSK data (up to 1200 baud) and FSK data (up to 9600 baud). Jumper select reactance or direct FM modulators. Reliable Motorola NBFM transmitter IC and PA transistor. Crystal controlled (x8 frequency multiplication). -60 dBc spurs and harmonics. Use 12-14 VDC, 1.5 amps. 5-pin DIN microphone jack. 1¾x4¾x5¼ in. *Difficult skill level.* Order **VEC-1202K, $99.95.**

Ni-Cad/Ni-MH Battery Charger Kit safely quick charges expensive batteries -- no overcharging -- many in less than an hour. HTs, cell phones, camcorders, lap top computers. Handles 1 to 12 cells. Charging status LEDs. Discharge before charge function reconditions batteries. Also removes memory effect. Runs on 12-15 VDC. 1¾x4¾x5¼ inches. *Moderate skill level.* Order **VEC-412K, $49.95.**

Shortwave Converter Kit converts AM or AM/FM radios to shortwave receivers at a push of a button. Choose two 1 MHz bands between 3 and 22 MHz. Popular 13, 16, 19, 25, 31, 41, 49 and 60 Meters international broadcast bands. On/off bypass, NE-602/612 mixer-oscillator IC and tuned input circuit. Use 9 V battery. 1¾x4x3½ in. *Intermediate skill level.* Order **VEC-101K, $27.95.**

Shortwave Receiver Kit lets you listen to the world! Covers 75/80, 49, 40, 30, 31, 20, 25, 22, 19, 17, 16, 15 and 13 Meter bands. Explore AM, SSB, CW, WWV, RTTY and Packet signals. Vernier reduction drive, smooth regeneration control, RF stage. *Includes all metal cabinet.* 2 earphone jacks. Use 9V battery. 2½x7x6 in. *Intermediate skill level.* **VEC-102K, $59.95.**

QRP Transceiver Kits for 80/40/30/20 Meters

Great introduction to QRP, the hottest and fastest growing activities in ham radio. With this tiny *transceiver*, you'll discover what thousands of QRP enthusiasts already know -- you don't need a $1000 radio to get on the air and communicate worldwide. All it takes is some simple circuitry using less energy than a pen-light bulb! You get VXO frequency control, broad-banded transmitter circuitry, solid one Watt plus output, shaped keying, .3 uV sensitivity, direct conversion receiver. Includes crystal for popular QRP calling frequency. 1¾x4¾x5¼ in. *Intermediate skill level.* Order **VEC-1380K** (80 Meters), **VEC-1340K** (40 Meters), **VEC-1330K** (30 Meters), **VEC-1320K** (20 Meters) **$59.95 each.**

Super CW Audio Filter Kit gives you three bandwidths: 80, 110, 180 Hz. Eight poles gives super steep skirts with no ringing. Pull CW QSOs out of terrible QRM! Plugs into phone jack to drive phones. QRM down 60 dB one octave from center frequency (750 Hz) for 80 Hz bandwidth. Improves S/N ratio 15 dB. Use 9V battery. 1¾x4x 3½ in. *Simple skill level.* Order **VEC-820K, $19.95.**

AM Radio Transmitter Kit lets you set up your own AM station and broadcast crystal clear programming from your studio with *you* as the disc jockey or talk show host. Play music from CD player, tape deck or other source. Choose clear frequency from 530-1750 KHz. Standard line level or microphone input. Easy CD, tape deck or mike mixers connect. Audio level adjustment. 1¾x4x3½ inches. *Simple skill level.* Order **VEC-1290K, $29.95.**

The *GIANT* Book of Electronic Projects, Volume I.

Project book includes 19 exciting kits on this page. Has building tips, complete parts lists, parts placement and PC board layouts, test and alignment, operating instructions, in case of difficulty, theory and specs, schematics, cabinet layout and much, much more. Great school project book or gift for your favorite ham.

Order VEC-1901, $19.95.

Inspect and download our manuals from:

http://www.vectronics.com

Vectronics kits feature a professional quality epoxy glass PC board with solder mask and component legend, simple step-by-step instructions and highest quality components.

All metal cases for most kits, $14.95. Add "C" for case to model #. Example: "VEC-201KC". Has knobs, hardware, rubber feet and brushed aluminum-looking front panel decal.

Order Toll-Free 800-363-2922

• **Fax**: (601) 323-6551 • **Tech**: (601) 323-5800
VECTRONICS, 300 Industrial Park Road, Starkville, MS 39759 USA • ***Add $6 s/h***

WE'VE REINVENTED THE POWER SUPPLY!

Alinco introduces the Communications Grade Switching Power Supply

DM-330MV

The Alinco DM-330MV is a breakthrough design in compact, lightweight power supply technology. This Communications Grade unit provides up to 30 amps continuous, (32 amps peak), 5 to 15 volts variable output through front and rear panel terminals and weighs less than 5 pounds! There's also a user-selectable "memory" pre-set voltage, a lighted meter that displays volts or current and a triple internal protection system.

Forget what you may know about other switching power supplies; the Alinco DM-330MV is filtered for quiet operation. However, if you should find pulse-noise present, Alinco has created a Noise Offset Circuit (patent pending) so that you can move the noise to a different frequency!

The multiple outlet terminals (binding post, auto-lighter and snap in terminals) make the DM-330MV perfect for fixed, portable and test bench operations. Perhaps the best news is that it's available at a very attractive Alinco price!

- **5 ~ 15 VDC Variable output**
- **Noise Offset Circuit™**
- **Ripple less than 15mV p-p**
- **Rear panel binding posts (32 A)**
- **Two sets of snap-in terminals (5 A each)**
- **Customer-defined output "memory"**
- **Up to 30 amps continuous, 32 amps peak**
- **Large illuminated Volt/Amp meter**
- **Weighs less than 5 pounds (2 kg approx.)**
- **Front panel cigar outlet (10 A)**
- **Front panel voltage adjust**
- **Memory, power and protection indicators**
- **Triple circuit protection: Short circuit, over temperature, current limiting**

For reliable station power, come to the experts!

CIRCLE 123 ON READER SERVICE CARD

Be sure to check out the DM-340MV Full-Sized Regulated Power supply!

- **30 A continuous, 35 A peak**
- **0 ~ 15 VDC output**
- **3 sets of output terminals**
- **Volt & Amp meters**
- **Reliable circuit protection**
- **Front panel fuse**

Simple ▪ Clean ▪ Dependable

ALINCO

AMATEUR RADIO'S VALUE LEADER℠

U.S.A. Alinco Branch: 438 Amapola Ave. • Suite 130 • Torrance, CA 90501
Phone: (310) 618-8616 • Fax: (310) 618-8758 • Internet: http: //www.alinco.com

AWESOME TWOSOME!

The only thing better than a new radio from Alinco is TWO new radios from Alinco! Check out these exciting new products from Amateur Radio's Value Leader™

NEW!

DJ-V5T VHF+UHF Compact HT

- Alphanumeric Display, up to 6 characters
- 200 memory channels plus two call channels
- Full VHF + UHF Amateur Band Coverage
- Expandable Receive Range, (76 ~ 999 MHz*) includes Wide FM capability
- Up to 6 watts output, 3 output settings
- CTCSS Encode+decode, DTMF squelch and 4 different European Tone Bursts
- Accepts up to 13.8 VDC direct input
- 4 scan modes, 5 programmable scan banks
- Input voltage display with over voltage warning
- MARS/CAP capability
- Autodial memories
- Automatic high temperature protection feature
- Standard high-power 700 mAh Ni-Cd battery pack EBP-45N
- SMA antenna connector
- Eight different tuning steps
- Wire cloning capability
- Wide choice of accessories
- Audio output control (high/low)
- Split-band operation capability

·Cellular blocked.

CIRCLE 174 ON READER SERVICE CARD

NEW!

DJ-195T 2 Meter HT

- Alphanumeric display
- 40 memory channels
- 5 watt output with standard battery
- CTCSS encode+decode and DCS
- 13.8 VDC direct input
- Direct frequency input
- S-meter
- Autodialer
- Cable Cloning
- Additional features, including theft alarm!

Ask your dealer about the wide choice of accessories for your Alinco radio. There's a large selection of speaker mics, batteries, chargers, DC input cables and more!

Simple ▪ Clean ▪ Dependable

ALINCO®

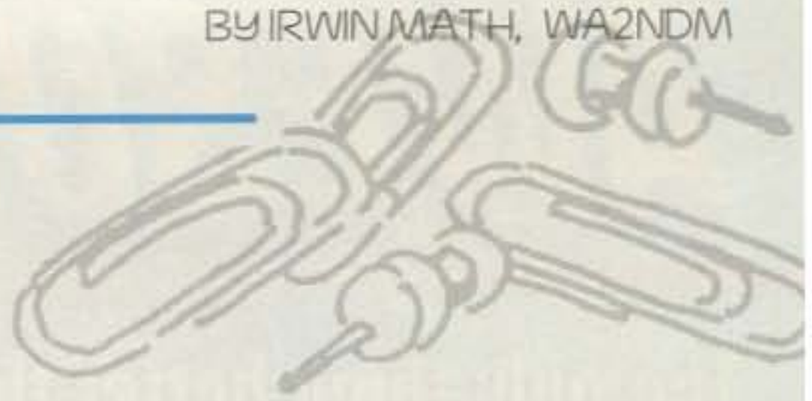
AMATEUR RADIO'S VALUE LEADER℠

U.S.A. Alinco Branch: 438 Amapola Ave. • Suite 130 • Torrance, CA 90501
Phone: (310) 618-8616 • Fax: (310) 618-8758 • Internet: http: //www.alinco.com

Math's Notes

What's New And How To Use It

BY IRWIN MATH, WA2NDM



Food for Thought

First, as always, a very happy and healthy New Year to all readers of this column, and especially to those who have been able to bear with me for more than the past quarter century. I sincerely thank you for your continued support of this column and hope to share the many exciting new developments (as well as my thoughts) that most certainly will occur as time marches on.

I find it hard to believe that we are now in the year that the science-fiction authors of the stories I read as a youngster called "the distant future." As I indicated last month, although we cannot really predict where our technology will take us in the months and years to come, rest assured it truly will be amazing. It is my hope, however, that the experimenter and "inventor" segment of the amateur radio fraternity will continue to make the same sort of technical contributions that were made in the early part of the 20th century.

Although at first glance it may seem an almost impossible task to develop anything technologically significant today without a high degree of expertise in solid-state physics, consider what was known in the early 1900s relative to what was developed at that time. The analogy is really the same, since those future developments were just as "impossible" to predict at that point in time. In fact, our modern technological base is infinitely more broad than the oatmeal-box coil forms, cat's whiskers, and Model T spark coils of the 1900s. Therefore, in theory at least, an individual should be able to develop (or "invent") much more sophisticated devices.

Remember, the human mind has not yet been replaced with artificial intelligence, and a plethora of components that could not even be imagined in 1900 is routinely available. All of the necessary "ingredients" are there. It is up to us to take advantage of this. It's fun to dream about the role we might have in the future, though, so let's take a moment and try to identify some possible starting points.

Artificial intelligence has brought us to the point where a computerized operator answers most of our telephone directory-assistance questions using both voice recognition and synthesis techniques. You can even buy a software package that lets you dictate letters in many of the popular word-processor formats, as well as have written documents read back to you. Does this mean that with a little bit of additional processing we will be able to have "intelligent" conversations with our machines? Will the computers of the science-fiction movies become reality in the next few years? Watch out! It could—and I believe it will—happen! For the experimenters in our midst it's really only clever software; you probably have the computing power and the microphone/speaker I/Os in your possession already. I don't really think you need the equivalent of a Bell Labs to make a significant contribution. It would be interesting to come home and ask the computer, "What's on 20 meters?" (and get an accurate verbal answer to boot) wouldn't it?

Cellular telephone technology has shown us just how reliably an 800–900 MHz line-of-sight full-duplex HT can operate. Can amateurs develop similar computer/RF links that can evolve into the next generation of "intelligent" repeaters? Will you someday be able to either simply speak someone's call or call "CQ [some country]" into a microphone and be connected directly to the person or at least to a group within the selected country no matter where on Earth that might be?

Do other frequencies, including those readily available to amateurs, exist that can give similar (or even better) results than in the 800 MHz area? Less than 100 years ago anything above 1–2 MHz was considered a wasteland. Today the spectrum from 100 GHz to light (and then beyond) is virtually unknown, so there is plenty of virgin territory for experimentation. How does one operate at 250, 500 or 1000 GHz? The amateurs of the past didn't ask how to push the technology into the "short waves"; they just experimented and eventually figured out how to do it. Sometimes the fact that they did not have an extensive technical education (that "proved" that something like short waves were useless) was actually a blessing.

Try something. You might be surprised! And don't be afraid of the ultra-low frequencies either. The military has been communicating with submarines under the ocean, on the opposite side of the Earth, at frequencies well below 200 kHz for years.

In the same light (forgive the pun), how about optical communications? Consider the advantages of very narrow beamwidths (less than a fraction of a degree). You could make an optical beam antenna with a front-to-back ratio of better than 100 dB using mirrors, or reflections, or who knows what! Sure, the laser diodes that might be used for optical transmitters today can only put out milliwatts. However, why limit yourself to a laser when you can get a 1000 watt projector lamp, connect your newly designed external optical modulator which works directly on the beam from the lamp (Well, you have to do something clever.), connect your lens- or mirror-based optical "antenna," and come up with an optical kilowatt! Why not? Perhaps you can start a new chapter in what amateur radio (or should we rename it "Amateur Wireless") communications will become.

Then there is the whole world of modulation techniques. We now know of and routinely use AM, FM, SSB, spread spectrum, and a wide range of digital pulse rate/width/position encoding methods of all kinds. What else is lurking around the corner? At a recent trade show we saw a start-up company transmitting signals by some sort of pulse method using modulated harmonics of a single frequency. They claimed long range with high peak power but very little average power. Their pulse method also assured a high degree of immunity to interference. Possibly you may find the next mode. Remember, when AM was king, E. H. Armstrong (in a lab that was a joke compared to what exists today in even a modest experimenter's shack) developed FM! And the list goes on.

You should notice that all of the above does not really require any large-scale expenditure for exotic equipment. It does, however, require a significant investment in brain power.

If you are fortunate enough to have a modest budget, the possibilities extend even further. By way of example, Thomas Edison was able to manufacture light bulbs with the type of vacuum pump that could be found in any high school physics lab today and could easily have made simple vacuum tubes well before Lee De Forrest if he only had realized what they would be capable of.

While you might have a hard time making transistors or integrated circuits in your shack, galena crystals, which were our first elementary semiconductors, made pretty good detectors of low-frequency RF at the dawn of radio. Do similar devices exist today to detect "what ever"? I'll bet that in the year 2100 there will be many who look back and say, "Gee, why didn't I think of that?"

If you read about the work of Heinrich Hertz in turn-of-the-century scientific jour-

c/o CQ magazine

nals, you will see that he actually generated and demonstrated many of the characteristics of 150 MHz VHF RF before the word "radio" was even coined—and that was done using a spark coil plus some well-machined mechanical components! There were no synthesizers, MOSFETs, duplexers, or for that matter anything at that time that even looked like an RF component at any frequency.

Remember when we spoke about generating microwave signals with a doorbell buzzer and a surplus cavity in a column last year? Very elementary, true, but it worked. Could you generate and detect crude "futuristic signals" by some similar technique? I'll bet you could!

I have a lot of faith in human ingenuity. I also believe that the basis of most, if not all, future technology exists today and that it is well within the capabilities of the technically inclined individual to play a significant role in the development of some of that technology. It is really only a matter of state of mind. To paraphrase an old Chinese proverb, "If you want to develop something badly enough, be careful. You may find that you can!" If you want the entire amateur radio experience to continue into the 21st century, you might find that you have to convince the FCC and the powers that be that there is a valid reason why it should continue.

73, Irwin, WA2NDM

Packet User's Notebook

BY BUCK ROGERS, K4ABT

Connecting You And Packet Radio In The Real World

Communications and Technology in the New Millennium

Here we are entering a new millennium with the most advanced technologies ever witnessed by mankind. What a great time to be alive!

I was born in the mid-1930s, and since that time I have witnessed some of the greatest achievements ever bestowed upon our world. I enjoyed the applications of the vacuum tube. Then in 1949 I witnessed the birth of true "solid state"—the transistor! I also enjoyed being one of the first users of the Raytheon CK722 PNP transistor. In *Popular Electronics* I had read about this new device and how it would revolutionize the world of "telephony." Were they kidding? Okay, so it did make great strides in the telephone industry. That, however, was only the beginning.

I picked enough cotton in one week so I would have sufficient money to buy one of these devices (in those days they were commonly called the "three legged firecracker"). After reading all the material that came in the box with the CK-722, and then reading every publication I could find at Southeastern Radio Parts (the device vendor), I became the neighborhood guru of transistor know-how. As a matter of fact, I built so many projects with that single CK-722 that I finally bent the (three) small wire leads enough times so they broke off. I then carefully soldered them back onto the tiny "sprig" that remained. In those days this was a difficult task using an "American Beauty" soldering iron. To get a picture of the size and heat generated by this monster soldering device, it could have doubled as a branding iron for our herd of cattle.

The Beginning of My Career In Communications

Following the fun I had with the transistor, I next witnessed the advent of "integrated circuits." Actually, the first title bestowed on the combination of transistors, resistors, and capacitors was "packaged circuits."

Television had made its entry into the world of communications, and with the manufacture of the television set came a need for compact components. In those days the TV had a 5, 7, or 9 inch (round) picture tube with a box surrounding it that was large enough to house a family of four (not including the in-laws). To reduce the size of some component clusters' build-outs, the manufacturers (Zenith, if my recollection is correct) put several resistors, capacitors, and diodes onto a small, vertically mounted, 8-pin/wire package and dipped it into some hard material that resembled "brick." They called it a "PC," or packaged circuit. It conserved space on the large metal chassis simply because it stood in a vertical position above the chassis. Somehow I feel the packaged circuit must have given the design engineer an idea for the printed circuit board.

Then came the introduction of real integrated circuits—many transistors, as in several transistors, diodes, resistors, and capacitors combined into one "versa-catalyst" (heat resistant and a hard solid) compound to form an IC. Later several companies, including one large developer in Texas, would come up with a new technique to reduce the same component package by using a technique called "thin film" technology.

Then Came the Space Age

With the space age and space exploration a part of our lives, electronics had to be compressed in size and weight even more. At first it was called "micro circuitry." Then came a further reduction in integrated circuitry and design.

Someone had to come up with a new acronym. Thus, the SSI, or small-scale integration, era was born. Next came "greater . . . miniaturization" (Isn't that a contradiction in terms?), which was called MSI, or medium-scale integration. Finally came the last of the series, LSI, or "large-scale integration," and of course the present-day use of hardware and software integration.

Past, Present, and Future

Having examined some history relating to electronics and communications with a glimpse of the past and with a quick peak at the present, I would hardly be a real "Buck Rogers" if I ended here without providing the readers of my column with a glimpse of the future!

Where are we headed? Well, we are certain to see a few glitches in the transition to the year 2000 (Y2K). However, I do not think it will be the horrible, frightening experience many have prophesied! There have been enough doomsday predictions to last another 1000 years! Let's talk about the better world we can look forward to in communications and technology in the first decade of the new millennium.

The Future of Digital Communications

Somehow I feel that I'm a part of the technology that has given us the beginnings of a "wireless society." Digital, or packet, radio is where we are, and packet is actually on the upswing. Packet will soon be the only medium we use to converse between computers. How did that happen?

All communications in today's world will soon be "packet" based. Even voice communications now primarily are based on very-high-speed packetized digital information. There is no way to refute this as the standard, for error-free communication has been etched in stone. The added concept of digital signal processing (DSP) will support my last statement.

All two-way communication packets—whether on the Internet, radio, or video—have one common factor, and that is "FEC." Forward error correction is the basis of all error-free digital communications, whether data, voice, or video. Without FEC we would have "streaming" data. In turn, there would be dropped bits and then bytes, and much to our regret, the total breakdown and loss of all data. To keep every packet of data intact, there is a Boolean strip in the header of each and every packet, whether 128 bytes or 56 kilobytes long, that performs the checksum handshake between the originating terminal and the destination terminal.

Taking off from this, in decades to come we then will find a means of implementing "teleportation" of a sort.

Oh, boy. Buck has flipped out now! Well, not quite. If we think about it for a moment, we know that every *deoxyribonucleic acid* (DNA) is encoded with a special code that makes it different from every other DNA. This special coding gives each single-core, dual-helix DNA a personality all its own. Using an FEC Boolean strip or header attached to each DNA that comprises a given parcel of matter, we just might have the first glimpse of another great quantum leap into the future—teleportation!

Milestones to Come

Here are a few things I feel will be milestones in the new millennium.

Humanity has reached the point where each of us soon will have an embedded code in our body (tissue) that can be read by an external device. This device will decipher the individual's recorded data—i.e., blood type, Social Security number,

115 Luenburg Drive, Evington, VA 24550
e-mail: K4ABT@PacketRadio.com

SAVE BIG ON ANTENNAS, TOWERS & CABLE

TELESCOPING ALUMINUM TUBING

DRAWN 6063-T832

.375	$.60/ft	1.250"	$1.40/ft
.500"	$.70/ft	1.375"	$1.55/ft
.625"	$.80/ft	1.500"	$1.75/ft
.750"	$.90/ft	1.625"	$2.00/ft
.875"	$1.00/ft	1.750"	$2.25/ft
1.000"	$1.10/ft	1.875"	$2.50/ft
1.125"	$1.25/ft	2.000"	$2.75/ft
		2.125"	$3.00/ft

In 6' or 12' lengths, 6' lengths ship UPS. Call for 3/16"& 1/4" rod, bar stock, and extruded tubing.

CUSHCRAFT ANTENNAS

X7/X9	$569/819
XM240	$599
R6000/R7000	$269/369
A50-3S/5S/6S	$89/139/219
AR2/ARX2B	$45/65
AR270/AR270B	$69/99
ARX270U/ARX270N	$219/219
13B2/17B2/26B2	$119/199/329
719B/729B	$115/179
A270-6S/A270-10S	$59/79

Please call for more Cushcraft items

FORCE 12–MULTIBAND

C3	10/12/15/17/20m, 7el	$519
C3S	10/12/15/17/20m, 6 el	$459
C3SS	10/12/15/17/20m, 6 el	$449
C4	10/12/15/17/20/40m, 8 el	$660
C4S	10/12/15/17/20/40m, 7 el	$569
C4SXL	10/12/15/17/20/40m, 8 el	$839
C4XL	10/12/15/17/20/40m, 9 el	$929
C19XR	10/15/20m, 11 el	$849
C31XR	10/15/20m, 14 el	$1119
C36XR	10/15/20/40m 13 el	$1449

Please call for more Force 12 items

US TOWER

MA40/MA550	$659/1055
MA770/MA850	$2359/3649
TMM433SS/HD	$1139/1379
TMM541SS	$1499
TX438/TX455	$1069/1319
TX472/TX489	$2649/4599
HDX538/HDX555	$1379/1919
HDX572	$4139

Please call for help selecting a US Tower for your needs. Shipped factory direct to save you money!

BENCHER / BUTTERNUT

Skyhawk, Triband Beam	$769
HF2V, 2 Band Vertical	$199
HF5B, 5 Band Minibeam	$429
HF6VX, 6 Band Vertical	$269
HF9VX, 9 Band Vertical	$329
A1712, 12/17m Kit	$54
CPK, Counterpoise Kit	$119
RMKII, Roof Mount Kit	$139
STRII, Roof Radial Kit	$109
TBR160S, 160m Kit	$109

More Bencher/Butternut–call

M2 VHF/UHF ANTENNAS

144–148 MHz

2M4/7/9	$80/99/109
2M12/2M5WL	$145/179
2M5-440XP, 2m/70cm	$149

420–450 MHz

420-450-5/420-450-11	$119/84
432-9WL/432-13WL	$159/209
440-18/440-21ATV	$109/129

Satellite Antennas

2MCP14/2MCP22	$155/209
436CP30/436CP42UG	$209/249

FORCE 12–MONOBAND

EF410	10m, 4 element	$249
EF415	15m, 4 element	$379
EF420	20m, 4 element	$499
EF240	40m, 2 element	$539
MAG810	10m, 8 element	$619
MAG615	15m, 6element	$719
MAG520	20m, 5 element	$869
MAG620	20m, 6 element	$1119
MAG340	40m, 3 element	$899
MAG280B	80m, 2 element	$1829

Please call for more Force 12 items

ROHN TOWER

25G/45G/55G	$79/179/229
AS25G/AS455G	$39/89
GA25GD/45/55	$68/89/115
GAR30/GAS604	$35/24
SB25G/45/55	$39/89/109
TB3/TB4	$85/99
HBX32/HBX40	$349/439
HBX48/HBX56	$589/699
HDBX40/HDBX48	$549/699
BXB5/6/7/8	$39/49/59/59

Please call for more Rohn prices

COMET ANTENNAS

GP15, 6m/2m/70cm Vertical	$149
GP6, 2m/70cm Vertical	$149
GP9, 2m/70cm Vertical	$179
B10NMO, 2m/70cm Mobile	$36
B20NMO, 2m/70cm Mobile	$49
SBB2NMO, 2m/70cm Mobile	$39
SBB5NMO, 2m/70cm Mobile	$49
SBB7NMO, 2m/70cm Mobile	$75
Z750, 2m/70cm Mobile	$55
Z780, 2m/70cm Mobile	$69

Much more Comet in stock–call

M2 ANTENNAS

50–54 MHz

6M5/6M7	$189/269
6M2WLC/6M2.5WLC	$399/529

10/12/15/17/20m HF

10M4DX, 4 El. 10m	$379
12M4DX, 4 El. 12m	$379
15M4DX, 4 El. 15m	$419
17M3DX, 3 El. 17m	$379
20M4DX, 4 El. 20m	$499

More M2 models in stock–please call

GLEN MARTIN ENGINEERING

Hazer Elevators for 25G

H2, Aluminum Hazer, 12 sq ft	$359
H3, Aluminum Hazer, 8 sq ft	$269
H4, HD Steel Hazer, 16 sq ft	$339

Aluminum Roof Towers

RT424, 4 Foot, 6 sq ft	$159
RT832, 8 Foot, 8 sq ft	$229
RT936, 9 Foot, 18 sq ft	$389
RT1832, 17 Foot, 12 sq ft	$499

Please call for Glen Martin info

UNIVERSAL ALUMINUM TOWERS

4-40'/50'/60'	$519/739/1049
7-50'/60'/70'	$939/1369/1789
9-40'/50'/60'	$729/1049/1469
12-30'/40'	$559/869
15-40'/50'	$969/1399
23-30'/40'	$859/1289
35-30'/40'	$979/1509

Bold in part number shows wind-load capacity. Please call for more Universal models. All are shipped factory direct to save you money!

DIAMOND ANTENNAS

D130J/DPGH62	$79/139
F22A/F23A	$89/119
NR72BNMO/NR73BNMO	$39/54
NR770HBNMO/NR770RA	$55/49
X200A/X300A	$129/159
X500HNA/700HNA	$229/369
X510MA/510NA	$189/189
X50A/V2000A	$99/149
CR627B/SG2000HD	$99/79
SG7500NMO/SG7900A	$75/112

More Diamond antennas in stock

MFJ ANTENNAS

259B Antenna Analyzer	$219
1798, 80–2m Vertical	$239
1796, 40/20/15/10/6/2m Vert.	$179
1793, 80/40/20m Vertical	$159
1792, 80/40m Vertical	$145
1788, 40–15m Loop	$399
1786, 30–10m Loop	$349
1780, 14–30 MHz Loop	$229
1768, 2m/70cm Beam	$65
1762, 3 Element 6m Beam	$65

Big MFJ inventory–please call

COAX CABLE

RG-213/U, (#8267 Equiv.)	$.36/ft
RG-8X, Mini RG-8 Foam	$.19/ft
RG-213/U Jumpers	Please Call
RG-8X Jumpers	Please Call

Please call for more coax/connectors

TIMES MICROWAVE LMR® COAX

LMR-400	$.59/ft
LMR-400 Ultraflex	$.89/ft
LMR-600	$1.19/ft
LMR600 Ultraflex	$1.95/ft

TOWER HARDWARE

3/8"EE / EJ Turnbuckle	$10/11
1/2"x9"EE / EJ Turnbuckle	$15/16
1/2"x12"EE / EJ Turnbuckle	$17/18
3/16" / 1/4" Preformed Grips	$4/5

Please call for more hardware items

HIGH CARBON STEEL MASTS

5 FTx .12" / .18"	$35/59
10 FT x .12" / .18"	$65/110
15 FT x .12" / 17 FT x .18"	$95/180
20 FT x .12" / .18	$120/199
12 FT x .25" / 24 FT x .25"	$189/359

GAP ANTENNAS

Challenger DX	$259
Challenger Counterpoise	$25
Challenger Guy Kit	$14
Eagle DX	$269
Eagle Guy Kit	$22
Titan DX	$299
Titan Guy Kit	$22
Voyager DX	$389
Voyager Counterpoise	$49
Voyager Guy Kit	$38

LAKEVIEW HAMSTICKS

9106	6m	9115	15m
9110	10m	9117	17m
9112	12m	9120	20m
9130	30m		
9140	40m		
9175	75m		

All handle 600W, 7' approximate length, 2:1 typical VSWR ... $24.95

HUSTLER ANTENNAS

4BTV/5BTV/6BTV	$129/169/189
G6-270R, 2m/70cm Vertical	$149
G6-144B/G7-144B	$109/159

Hustler Resonators in stock–call

ANTENNA ROTATORS

M2 OR-2800P	$1095
Yaesu G-450A	$239
Yaesu G-800S/SDX	$319/399
Yaesu G-1000SDX	$479
Yaesu G-2800SDX	$1069
Yaesu G-550/G-5500	$289/499

ROTATOR CABLE

R51(#20)/R52 (#18)	$.22/.32/ft
R61 (#20)/R62 (#18)	$.28/32/ft.
R81/82/83/84	$.25/.39/.52/.85/ft

PHILYSTRAN GUY CABLE

HPTG1200I	$.39/ft
HPTG2100I	$.52/ft
PLP2738 Big Grip (2100)	$5.50
HPTG4000I	$.79/ft
PLP2739 Big Grip (4000)	$7.65
HPTG6700I	$1.15/ft
PLP2755 Big Grip (6700)	$10.95
HPTG11200	$1.55/ft
PLP2558 Big Grip (11200)	$16.50

Please call for more info or help selecting the Phillystran size you need.

WEEKDAY HOURS:
9AM–5PM CST

SATURDAY HOURS:
9AM–1PM CST

CREDIT CARDS:
M/C, VISA, DISCOVER

TEXAS TOWERS

A Division of Texas RF Distributors, Inc. • 1108 Summit Avenue, Suite #4 • Plano, TX 75074

(800) 272-3467

LOCAL CALLS:
(972) 422-7306

EMAIL ADDRESS:
sales@texastowers.com

INTERNET ADDRESS:
www.texastowers.com

date of birth, and information pertaining to medical condition. It is also common knowledge in many circles, and especially in the government "archives," that pertinent information about each person's life is recorded, making the individual's life style no longer "sanctuaried." There are also rumors that every living being over the age of 12 has 6000 bytes (approximately two full, tightly spaced pages) of information stored in a mountain vault somewhere in Utah. According to a recent newscast, these records are now accessible on the Internet.

Yes, this somehow leaves me with a feeling of having my privacy invaded. At the same time, I think privacy went away when the United States Marine Corps assigned me a "serial number" in the early 1950s and when the Social Security Administration assigned me a Social Security number.

Now for the Good Stuff

At present, computers use an on-board hard drive with the executable and data-storage base on them. I think this no longer will be the case early in the first decade of this new millennium.

As programs grow and expand in size, even the present-day 20 and 30 gigabyte hard drives will be too small. Therefore, our program and/or OS (operating system) will come from the Internet. In some cases, it will be the server operated by our ISP, and in many cases, it will come from distant servers with gillions of gigabytes of program storage space.

Television, radio, and every other conceivable kind of entertainment will come into our homes via only one wire/fiber connection.

The utility companies will join forces and combine a large, single, coaxial (in most cases) and underground cable that consists of an integrated wire and a "kevlar™" graded fiber bundle. The wire will be large enough to supply 120 and 240 volts AC at up to 200 amperes of power service to our home(s). In the same cable entry there will be fiber-optic connections with opto-couplers for a T-1 level Internet connection, television, radio, and related video entertainment distribution.

I didn't forget the telephone, either! The telephone will no longer be connected to a wire line or twisted pair. The telephone device (such as it will be) is about to become as close to you as the ballpoint pen in your shirt pocket. Not only will the telephone in the home, or on your person, be wireless, it will cost you less than ever before because your long-distance calls will not be a separate charge. They will be part of the basic phone-call rate plan. The so-called "package deal" that offers you 1000 minutes for $50 will go away. In its place, the competitive rate structure will yield to a new basic phone payment plan of $50 a month with your "local" calling area being *anywhere in the world!* The discount rate for your "personal" phone will go a step further to provide the user with an even better rate by being able to pay the phone service charges annually rather than monthly. By making this personalized phone service available in this way, the phone service provider (PSP) will benefit by having an easier method of bookkeeping, and in the case of the annual pay discount structure, fewer billing periods.

By building new home access lines with fiber-optic links, and improving the code used to compress the data and digital binaries into the present-day bandwidth, our wireless combination handheld computer/phones will accommodate secure, full-color televideo phone conversions.

Even the postal service will resort to use of the Internet. No, hardcopy mailings will not go away, but Internet SPAM will! The spammers will reach a point where their unruly practices are unlawful. Having the "spammers" lose their foothold on the Internet (junk mail), the postal service will realize a new feature that will be adapted to the use of integrated Internet hardcopy mail. This will give the postal service one of the greatest opportunities since Ben Franklin.

We will be able to send printed mail in one of two ways—as facsimile (fax), or as a document that we've composed with our local computer and word-processing software. The letter or post will be complete with any inserted color photos and illustrations. In the second way we can compose the letter or document and forward it to a central postal service office, where it will be committed to hardcopy, enclosed in an envelope, and delivered to the office or home of the intended recipient. Money transfer(s) and pseudo banking will also become a postal service enticement.

Remember earlier in this column I mentioned that we will have that embedded code in our body? That code will open the door for personal identification purposes. I see the government losing control of the coding process, and the postal service becoming the "keeper of the keys," so-to-speak. Even if, or when, the code is ever "compromised," the postal service can change or otherwise restructure the embedded code. *Only* the postal service will have access to the primary coding of every individual in the world. Please note that I did not say the *US* postal service! When the update comes, the embedded code can be updated to include a high-resolution color photo of the individual bearing the embedded code.

Only two numbers will matter: our individual Social Security number and our

personal IP address. Now I'm going to muddy the waters with a bit of dirt. I'm suggesting that we link these two numbers by having one reference the other. By so doing, we will have only one number. Thus we will have reached, might we say, "prophecy fulfilled."

HAM—Help All Mankind

As I close this month's "Packet User's Notebook," I visualize more than just the text I've committed to print here. For now, though, let's not lose sight of the fact that we as amateur radio operators must maintain our sense of responsibility for the safety and comfort of mankind during and following any disasters, be they hurricanes, tornadoes, or even another New Madrid earthquake.

We as hams must always be ready to rally to a call for help at a moment's notice. We are amateur radio operators *always,* and we don't have to have a repeater or a single assigned frequency on which to operate. We are not restricted to only one frequency, and we can communicate simplex. We did it in the beginning, as did the friends of Hiram Percy Maxim, W1AW, and those who paved the way for what we have today. At the same time, I wonder if Hiram envisioned the ARRL sitting on those precious 100 kHz wide digital/data channels while amateur radio operators turned to the wire-line-based Internet for high-speed communications. At 219 to 220 MHz we have the already approved frequencies that would enable hams to have their own "wireless" Internet with coast-to-coast data speeds that would allow faster communications than the wire-line, ISP-based Internet.

These ten 100 kHz wide channels (219 to 220 MHz) were approved more than five years ago, and to date the ARRL has not moved to coordinate them or allow others to do so. While we're remembering, let's also think about what it would be like to have a 64,000 byte digital data network exclusively for hams.

Just at the Berlin Wall came down, so have many other walls. As a matter of interest, and in defense of the Internet, the "net" has begun to change the way we look at one another, and not just here in the US, but worldwide. The Internet has given us the tools to breech that gap and open the world of communications so that all mankind can see how others live. Communications is our most powerful means of removing oppression, dictatorships, and tyranny.

When power lines are down, however, when phone lines are severed, when fiber optics are broken, when towers have fallen and public-service repeaters are dead, the ham is there to do just what the name implies: HAM—Help All Mankind.

In Closing

In 1972 I delivered a keynote address to a graduating class of engineers and students. The speech contained many of the predictions that I envisioned over the next 28 years, from that night, May 14, 1972, through the year 2000. This was my closing statement:

"In closing, I only hope that the future of electronics and communications will remain secure in the hands of those of you who enter into industry or government, by sharing the wholesome respect for the key role it plays in our democratic society . . .

"Technological advance may be sociological retrogression, and each must be weighed in terms of its impact upon our free society. . . . If it fails the test of compatibility on the full flow of freedom, then it should be relegated back to the laboratories with the nerve gasses and DDT."

May you all have a great new year, and more important, have a very safe and prosperous "New Millennium."

73 de BucK4ABT
e-mail: <k4abt@PacketRadio.com>
Visit: <www.PacketRadio.com>

Public Service

BY BOB JOSUWEIT, WA3PZO

Public Service and Emergency Communications

Hams Provide Key Help During Weather Emergencies

Happy New Year! We've either just experienced the first emergency of the new year or we're remembering the disasters of the past. Whether it was that bug named Y2K, three hurricanes in the east, or an earthquake in the western United States, around the world amateur radio operators are ready to spring into action at a moment's notice to serve in the public interest.

For our former *CQ VHF* readers we're ready to continue the adventure into the world of amateur radio public service with the inclusion of operations below 30 MHz. To our *CQ* readers, welcome to one of the most fascinating aspects of amateur radio.

Last year in *CQ VHF* we covered operations under adverse conditions such as a severe winter along the Great Lakes, the record heat of the southwest, the collapse of our communications infrastructure in the east, and during wartime in the Balkans, even when it wasn't in our best interest. This month we continue to explore the world of amateur radio operators serving in the public interest.

By monitoring local emergency channels, Bob Duran, N3ZRR, saw a need for hams to help report road closures and other information while local officials were taking care of emergency communications. (Photo via N3ZRR)

Hector Shakes, Rattles, and Rolls

Nearly 10 years after the San Francisco Bay area earthquake, a 7.1 earthquake struck near Barstow, California on October 17th last year. At the time very little damage was being reported by the news media. In fact, many Los Angeles area amateur radio operators thought that the earthquake was a non-event. The Hector Mine earthquake did cause one group of hams to spring into action, though.

Following established procedures, the Hospital Disaster Support Communications System (HDSCS) activated, as it does any time the ground shakes in Orange County. For one hospital the crisis brought on by the earthquake was made less stressful because hams were prepared and acted quickly. According to Joe Moell, KØOV, "Minutes count when hospitals need help. This ARES group doesn't wait for calls from health-care facilities or governmental agencies. Instead, HDSCS immediately checks on the hospitals, gathers status, and provides it to Orange County Emergency Medical Service Agency. If hospital phones or other communications links fail or are overloaded, ham responders discover it and are in position to provide immediate backup."

The HDSCS Net was on the air within five minutes after the quake struck. Thirty-eight members quickly began to assess the condition of the county's 34 hospitals. In addition, one went to the radio room at the county Emergency Operations Center. Usually RACES does not activate immediately in these situations, so HDSCS sends its own operator to the EOC.

Members provided the first status reports within 10 minutes. The status of all 34 medical centers was determined within 75 minutes. At Los Alamitos Hospital, Dennis Kidder, WA6NIA, and Phil Glumm, KD6TJT, discovered that commercial power had failed. The hospital was using its generator, but that didn't power some important diagnostic equipment. The facility was forced to close its Emergency Department to incoming patients. HDSCS members remained at the hospital for six hours to provide backup communications.

Hospital officials were unsuccessful in contacting the Edison Company by telephone, so Kidder contacted Rosie Falcon, N3IVO, at the EOC for assistance. Information was given to county officials, who then were able to make contact with the power company and initiate a high-priority response.

"This event was reminiscent of the Landers earthquake of 1994," said Moell. "During the immediate HDSCS response to that temblor, Gary Holoubek, WB6GCT, was first to arrive at Buena Park Hospital, where both commercial and generator power had failed, plunging the entire facility into darkness. The problem of overloaded Edison phone lines was overcome in that case when another ham spotted an Edison truck and gave the message to its driver, who called it in on his mobile radio."

"Portability, flexibility, and speed are the keys to successful response to hospital emergencies," said April Moell, WA6OPS, Coordinator of HDSCS. "If we had not checked on our supported hospitals within the first hour, we would not have been aware of problems and been able to help. In disaster and potential disaster situations, hospitals must be a *first* thought of hams, not just an afterthought."

The United States Geological Survey predicts there is a 70% chance of a 7.0-plus earthquake in the San Francisco Bay area in the next 30 years. Dave Larton, N6JQJ, the California Auxiliary Communications Service Training Officer, commented that many of the current amateur radio operators weren't even licensed when the last quake hit 10 years ago.

Trained Communicators Useful in Floyd's Wake

As we reported last month in *CQ VHF*, Hurricane Floyd dumped a large amount of rain on the Carolinas, Virginia, Maryland, Pennsylvania, New Jersey, and Connecticut, resulting in widespread flooding and communication failures. As always, amateur radio operators were ready and responded. Here are some additional Floyd reports.

In the Jacksonville, Florida area hams were planning a response to a possible direct hit by Floyd. This category 4 storm was aiming directly for the coast. Longtime hurricane watchers indicated that the Jacksonville area had been subject to sustained hurricane-force winds only once since the Civil War.

As one of the largest peacetime evacuations began, the American Red Cross opened 25 shelters in 7 Florida counties. ARES members staffed most of these shelters, which housed thousands of people. For two days the W4IJJ repeater hosted a net supporting 14 Red Cross shelters in Duval County. Communication was also maintained with the State Emergency Operations Center in Tallahassee. Additional shelter communications were established in Nassau, Clay, Putnam, and St. Johns counties, as well as in the Red Cross headquarters in Daytona Beach.

c/o CQ magazine
e-mail: <wa3pzo@cq-amateur-radio.com>

Guilford County, North Carolina ARES Emergency Coordinator (EC) Jon Matlock, KE4IAM, operated from a shelter at Carver Elementary School in Pinetops, North Carolina supplying communications to the local and state EOCs. APRS proved to be a useful tool for shelter communications.

"One thing that stands out in my mind and that made the whole trip worthwhile was a call I got from the EOC late one evening," said Matlock. It was a message for a shelter resident: "Text is you are a grandmother. Mother and son doing fine!" According to Matlock, "Being able to pass that message to a woman who had been there for more than a week was worth the trip down. If not for amateur radio, she would not have known for days. That's what it's all about." (Photo via Bill Boyes, KB1G)

Fortunately, the storm took a turn to the north and never hit the Florida coast. By the end of the second day, all nets were secured and Hurricane Floyd had picked out its next target.

North Carolina Hams Help the Red Cross

North Carolina was particularly hard hit by the rain from Hurricane Floyd. Creeks and streams overflowed. Whole towns along the coast and waterways had to be evacuated. In a nut shell, just about everything east of Raleigh in the state sustained damage. Patrick J. Dougherty, KC6ZCV, an Assistant Communications Officer with the Disaster Services Administration of the American Red Cross said, "All the Red Cross functions—Mass Care, which includes shelters and feeding, damage assessment teams, Service centers, and Family service teams to name a few—needed communications support . . . " According to Dougherty, 32,295 families in North Carolina were affected. Just under 14,000 people were housed in 51 shelters. He said 1,305,656 meals and snacks were served to those affected in the disaster area.

Dougherty continues the story: "As you know, no large relief operation can be coordinated without telecommunications. We have coordinated/installed/ and trained volunteers in the use and installation of land lines, local and long-distance service, creating internal phone (contact) directories, cellular phones, Nextel equipment, cellular equipment, VHF low base, UHF handhelds, UHF base, UHF mobile, pagers, low earth orbit satellite terminals (Iridium), amateur radio, and fax equipment. We have kept track of over 800 non-expendable pieces of communications equipment across the state.

"This was such a large operation that radio communications played a large role," according to Dougherty, "because of the damage done to the telecommunications infrastructure of the communities affected."

"About two days prior to my leaving, I started conducting research for possible repeater sites. Naturally, I contacted the amateur radio community, who has contacts in the area of operation. The Virginia ARES/RACES group recommended we contact Danny Hampton, K4ITL, in Raleigh, NC. Danny had a UHF repeater and had access to a tower at the 1400 foot elevation level just outside of Smithfield, NC. He offered to program our UHF frequencies into the repeater. Of course we accepted his offer. He added a 100 watt amplifier, tuned duplexers for us, and installed a high dB gain commercial antenna for us. The repeater had a 60 mile radius from its location.

"I was dispatched out of Falls Church, VA with a special four-wheel drive vehicle. This was a Pathfinder equipped with cellular phone, AMSC voice satellite unit, two UHF repeaters, two duplexers, one cross-band system from VHF Lo to UHF, one autopatch system, two 300 watt power inverters, 100 Vertex UHF handheld radios, 50 Vertex UHF mobiles, one programming kit, and 500 ft. of RG213.

"I arrived in the evening and made contact with some of the Red Cross team that was at the headquarters. They included Col. John Macinnes (Ret.); Cindy Hughes, KC6OPI, Assistant Officer; Mike Katz, KD6TFP, Resource (equipment) Management; Bob Devarney, WE1U, Radio Installation; Stan Weir, KBØSHB, Radio Installation; Dick Merrill, KB8CFD, Telephone Installation; and Larry Writeman, Telephone Installation.

"Over the next five days we set up programming in the old Burlington House located in Smithfield. We programmed handheld radios and mobile radio equipment. We made portable base stations and had tripods ready with antenna masts. This equipment was then deployed to the field by the radio installation team.

"They installed equipment in staff cars, rental trucks, Red Cross trucks, even tractor trailers. They trained volunteers how to operate the equipment and set up a tactical callsign system for operation. We had a local volunteer operate as net control and identify every half hour until Bob and Mike made a Morse code identifier. We identified as ARC DIS OPS and our callsign. We even set up VHF base stations in field kitchens located through out the state.

"The amateur radio community in Virginia and North Carolina came together and assisted us and the communities affected. This was a very rewarding experience for me, one that I won't forget."

PA Hams Study Reducing Communication Overload

Many Pennsylvania hams were starting their morning commute to work. It had been raining all night, but it certainly was nothing to worry about. Even your author was at work at 7 AM, less than 10 miles from the affected area, and not overly concerned about the rest of the day. However, by 9 AM widespread reports of street flood-

A Shelter Operator's Story

Clayton Bennett, KA4NHW, was assigned to the Bayside High School, Special Needs Shelter, in Palm Bay, Florida. He tells his story in the Platinum Coast Amateur Radio Society Newsletter.

Wearing my BEARS shirt with RACES and ARES badges displayed, I checked in with Norm, the shelter manager, on Monday afternoon. He told me the shelter residents would be in the gymnasium area and it was specially constructed for a hurricane shelter. He also said the school had generator power backup.

Norm introduced me to the shift supervisor and several staff workers. Most of them worked for the county library services and knew my wife, who also works for the county library system. I told them who I was, what my duties were, and how we were going to pass information by ham radio for the net control.

I told him I wanted to do a site survey for the location of the ham radio operator station. He showed me two locations where I could set up. I couldn't hit the repeater with a handheld radio from either one. I could hit the repeater inside the gym with the HT. I asked him if I could set up in the open area by the staff where they were checking in patients, and he said yes. I told him I would be back the next morning.

I got my personal things together and antennas on my house were taken down. Tuesday morning I boarded up my windows and secured everything. I went to the shelter at around 11 AM and set up the radio. I used a magnet-mount 5/8 whip mounted on a construction cart located inside the gym area. My radio position was located around the corner, and I could hit the repeater full quieting.

I went back home, got my family, and arrived back at the shelter at around 1:45 PM. I entered the net and was all set up. I met with the Palm Bay police officer on duty and told him who I was and also showed him my Palm Bay Police DCS badge. By morning the threat of the storm had past and the shelter was closed down.

For my radio equipment I had the following:

- Kenwood 241 two meter main radio
- Kenwood 221 two meter backup radio
- ADI AT-600 dual-band handheld radio for listening when I was walking in the area.
- Scanner
- Three ea. 12V 38 amp deep-cycle batteries
- 12V D-cell battery pack for HT radio
- 12V 10 amp charger
- Power cables with 20 amp Molex connector (PCARS power connector) and 25 amp alligator clip to connect to batteries
- 5/8 mag-mount 2 meter antenna
- 1/4 mag-mount 2 meter antenna
- 1/4 mag-mount dual-band antenna
- 2 meter Ringo antenna
- 10 ft. mast for Ringo antenna
- Two 100 ft. rolls of coax cable
- Various types of coax adapters
- Tool bag
- Rope
- Three flashlights and extra batteries
- One ea.12V fluorescent light
- Three ea. 120V clip-on lights
- One ea. 100 ft. 12g. ext. cord
- Three ea. 50 ft. 14g. ext. cords
- Several pads of paper, lots of pens and pencils
- DCS Emergency Manual
- "Amateur Radio Communications" sign
- Amateur Radio Operator's license
- Card table
- Folding chair
- Raincoat
- Clothes for three days
- Personal hygiene items and medicine
- Ice chest with drinks and food for two days
- Military cot, sleeping bag, blanket, pillow

ing began to be received. In anticipation of deteriorating conditions, Montgomery County Skywarn Coordinator Bob Duran, N3ZRR, activated the net at 9:15 AM.

"At this point, the activity was comparable to a normally heavy rainstorm," according to Duran. However, as he monitored local police activity on his scanners, "It became immediately apparent in the voices of field officers and dispatchers that the worst was yet to come.

"By 10 AM requests were increasing for updated info concerning which roads were still open and which were impassible. Radio traffic was becoming steady, and by 10:30 dispatchers began filtering reports to priority traffic. Street flooding, downed lines, and wind damage began to take a back seat to 'accidents with injuries.' Skywarn spotter call volume increased with conditions—rainfall, wind, and flooding reports. Attempts to phone in major flooding or downed lines to the County EOC were met with the same, citing call overload. Monitoring the other frequencies confirmed this as a widespread pattern. And cellular companies were asking patrons to only report injurious situations, accidents, etc. Within a half-mile of my home, later that afternoon, one helicopter and three water rescues were underway at the same time. Nearby Norristown called in a Coast Guard helicopter for a river rescue as well."

How does all this affect Skywarn and R.A.C.E.S.?

"It dramatically changed the nature of what we do," Duran said. "Clearly, incident reporting or the reporting of weather conditions became useless when severe weather was widespread. There was simply too much going on. And as noted above, we weren't the only ones. Municipalities had their hands full as well. However, they were becoming impaired as well by the lack of updated information on open vs. impassible roads for emergency vehicles, etc.

"Throughout the day, I had been informally logging this info for our own Spotters and RACES members, if needed. Then it occurred to me that in the future RACES and Skywarn could assume this role and provide a valuable service to our County EOC or municipalities. This, of course, in addition to the forwarding 911 traffic received via VHF and HF call-ins."

In conclusion, Duran suggested that any and all Skywarn, RACES, and ARES organizations devise a separate game plan for "wide area/high-traffic volume" conditions.

"Clearly, police, fire, and rescue personnel desperately need current info when all hell breaks loose," said Duran. "But this experience has taught us that existing dispatchers and EOCs are simply too busy with life-and-death and serious injury matters."

In retrospect, our RACES, Skywarn, ARES, and amateur radio operators in general can provide a useful service in assuming these and other similar responsibilities during such events. Locally, I am recommending that we man the EOC during such conditions, whereby we can work in unison with emergency personnel to stay on top of a truly challenging ordeal.

Amateur Radio Makes a Difference

Skip Voros, WD9HAS, Executive Director, Milwaukee Area SKYWARN Association, Inc., reported on the National Weather Service (NWS) service assessment during the May 3, 1999 Oklahoma-Southern Kansas tornado outbreak (48 dead, 70 tornadoes, damage at $1 billion plus). These service assessments (usually several months in the making) take a very detailed look at how the NWS responds before, during, and after a major weather disaster. With regard to amateur radio, a paragraph entitled "Internal and External Coordination" noted the following:

"The Norman National Weather Service Forecast Office's strong partnership with the amateur radio community in central and western Oklahoma proved very valuable on May 3rd. Amateur radio information played a crucial role in the warning process and in subsequent follow-up information (Severe Weather Statements and Local Storm Reports). Seventy-five severe-event reports were received via the amateur radio network. The office's amateur radios were of even greater importance that night since its phone service was often interrupted for several hours (6:30 PM until at least midnight).

"Amateur radio repeaters helped keep the Norman National Weather Service Forecast Office in contact with spotters and Emergency Operations Centers (EOCs) throughout the far-reaching counties in its County Warning Area. This was critical for these outlying communities because local TV coverage was focused on the Oklahoma City metropolitan area F5 tornado.

"National Weather Service Office Wichita has developed a strong working relationship with the SKYWARN program and has expanded it within the amateur radio community. This partnership resulted in the prompt and accurate communication of tornado and damage reports throughout the event."

Also in that report, and not related to amateur radio, but which would easily affect unprepared amateur radio net control stations, Emergency Managers, and storm spotters, was the surprise finding that "When National Weather Service Office Wichita began receiving detailed damage locations of the tornado (i.e., street addresses), personnel were not readily equipped to identify the location, since they did not have a local city map. The only map of Wichita was in the Yellow Pages of a phone directory."

A Final Note . . .

Many of these reports would not be possible without your input. I want to thank the North Florida Amateur Radio Society for their information. And remember that we are not limited to VHF operations in this column. Drop us a note and let us know how your group is serving in the public interest. 73, Bob, WA3PZO

World Of Ideas

BY DAVE INGRAM, K4TWJ

A Look At The World Around Us

Classics Forever: Another Romp Down Memory Lane

Hearty greetings and celebrations, friends. What better way to kick off the year 2000 than with a light-hearted look back at our glamorous past, when radio was young and simple. Thus, this month's column features another "Classics Special" complete with build-a-copy details of some easy-to-brew rigs you can enjoy displaying and occasionally using on the air today. It's golden-age nostalgia at its best, and it also reflects my famous adage of "the operator rather than the rig makes the difference." We have some exciting ground to cover, so settle back and start thinking about homebrewing a simple one-tube transmitter and restoring an old-time receiver just for fun.

The calendar pages have been flipping backwards, and they are now stopping at around the mid-1930s. Listen carefully and you even can hear original St. Louis jazz and big band music of the era emanating from the family's all-wave receiver. Oh happy days!

Photo A– This smart-looking Tri-Tet transmitter (left) and its mating receiver (right) were made by Arnold Sayre, W8WVM, and both units are absolute showpieces. The transmitter's tuning capacitors are mounted on metal spacers and graced with home-brew dials behind vintage knobs. The meter in the center adds symmetrical balance to the layout. (Photo courtesy W8WVM)

Tri-Tet from '36

A while back Paul Messer, KB4TTT, gave me a copy of the legendary *Jones Radio Handbook*, and I have gone bonkers building simple rigs from it. As you may know, Frank Jones was a big name in old-time radio, and his handbooks were printed by the Pacific Radio Publishing Company. This same company published the *Pacific Radio News*, which became *Radio* and was later sold, moved from California to New York, and its name changed to today's *CQ*. The *Jones Handbook* and its featured rigs, such as the Tri-Tet from '36, are thus true pieces of amateur radio's proud history. Tri-Tet oscillators, which let you operate on two bands with one crystal (at the fundamental frequency and second harmonic), were very popular in the 1930s and '40s.

Upon first entering the 1930s, we find wood frames and bases rather than metal chassis. Tri-Tet oscillator circuits are just coming into vogue, and the hefty little 59 tube is a favorite low-power "valve" used in home-built transmitters. The Tri-Tet's big attraction is its ability to work two bands with only one crystal—and do so without loss of efficiency or output power like frequency doublers of previous times. The 59 tube is a classic-looking gem with a 2.5 volt filament and a quite interesting idiosyncrasy. When operating at the fundamental frequency (rather than the second harmonic) of its associated crystal, it tends to produce two dips in plate current at resonance. Think back and you will recall old timers talking about such tubes and circuits. Yes, they were real. So which dip is correct and how do you tune up a 59 tube transmitter? Just add a wattmeter, hot wire an RF ammeter or SWR bridge between the transmitter and antenna, and then tune for the most pronounced dip in plate current while noticing that this setting also coincides with maximum output. You knew that, however, right?

Ready to quick-assemble your own 59-tube Tri-Tet transmitter? Great! It's easy-

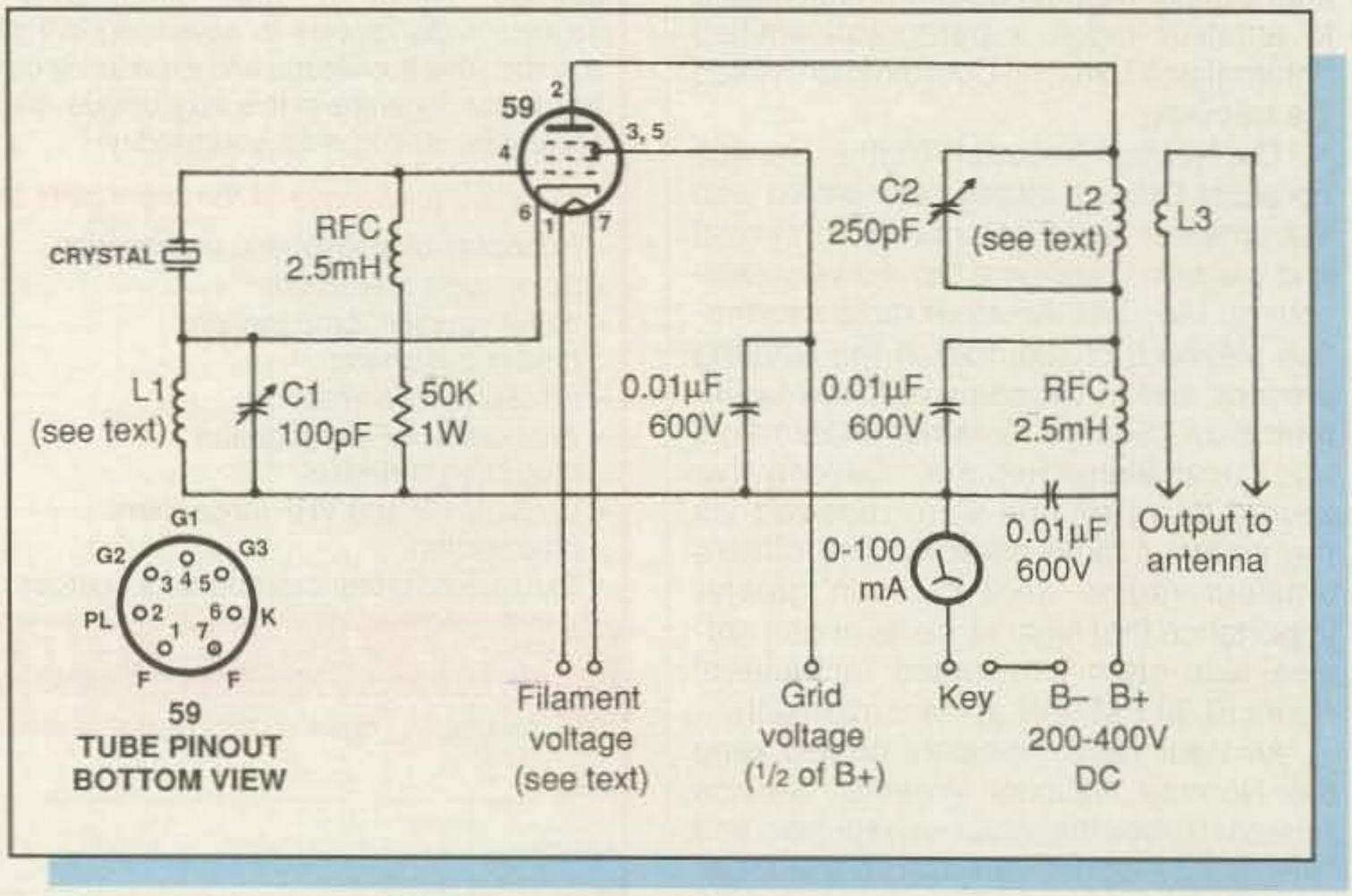


Fig. 1– Circuit diagram of the Tri-Tet from 1936. This little transmitter uses a single type 59 tube, which was popular before the classic 6L6 captured its thunder.

4941 Scenic View Drive, Birmingham, AL 35210

C-31 XR *The Magnum Tribander that has no equal Anything else is just an antenna*

> Based on our proven C-3, multi-monoband, no trap design
> Highest gain, superior patterns, stepped gain for stacking.
> Wide-spaced 3el 20 & 4el 15, 7el on 10 mtrs, all full size
> Single feedline OR individual feedlines, your choice
> 5KW, 100 mph standard, 31' tapered boom
> Less than 100 in/lbs mast torque @ 70 mph
> 30" open space for side mounting
> Fast, "plug and play" assembly

INTRODUCTORY PRICE $998 (reg $1,175)

The **C-31XR** is truly the next generation in tribanders; designed for maximum performance on 20-15-10 mtrs, plus strength, ease of assembly, low mast torque, side mounting and stacking. The **C-31XR** is 3 monoband Yagis overlaid on the same boom. There is a wide spaced 3el 20, a wide spaced 4el 15 and 7 elements for 10 mtrs. The gain target to beat was our own **C-3**, which was shown to have the most gain across 20 & 15 mtrs according to independent testing by K7LXC and NØAX. We did it! The **C-31XR** exceeds the C-3 by 1.4dB on 20, 1.5 on 15 and 3dB on 10 mtrs. F/B and side nulls are exactly what you would expect; excellent. There is nothing better than the **C-31XR**.

Specifications: 31' boom, 14 elements, 85lbs, 10.5sqft, 100mph, 5KW, single feedline, no traps, all elements full size

CONGRATULATIONS!

6Y2A set a new Multi-Multi CW World Record using all Force 12 antennas, primarily verticals. This is especially impressive, as it is from a 2-point country, with 18,000 QSO's (on CW!!).
P40E (Jose, CT1BOH) operating from P43P's QTH (Jacob) used all Force 12 antennas, too, to set a new Single Op CW World Record. These are all Force 12 Yagis, an EF-180B rotatable 80 and C-4XL. More and more top stations are putting up Force 12 antennas.

Force 12 Inc. is now the exclusive manufacturer and dealer for Tri-Ex Amateur Towers
call us for the finest crank-up, free standing and guyed towers

Call or write for a comprehensive brochure on the **Force 12** product line. The brochure includes true specifications and explanations of terms. For the best $10.00 you will ever spend ($12.50) w/postage), ask for the book entitled, **ARRAY OF LIGHT (Straight talk about Antennas and Related Information).** These 76 pages are a compilation of practical subjects, questions and answers, installation tips, operating helps and data on antenna design including a section on traps.

Force 12 - Proudly brings you the future. Electrically and mechanically superior. If it's riveted, it's a Force 12! There are more than 60 antennas to meet your needs and your dreams!

Force 12
Antennas and Towers

Order line: **800.248.1985,** Technical **805.227.1680,** FAX **805.227.1684**
Force 12 East: **Natan Huffman, W6XR (607) 275-9747**

Internet: force12e@lightlink.com www.force12inc.com

Why imagine the ultimate when you can have it?

FORCE 12, Inc.
P.O. Box 1349, Paso Robles, CA 93447

CIRCLE 22 ON READER SERVICE CARD

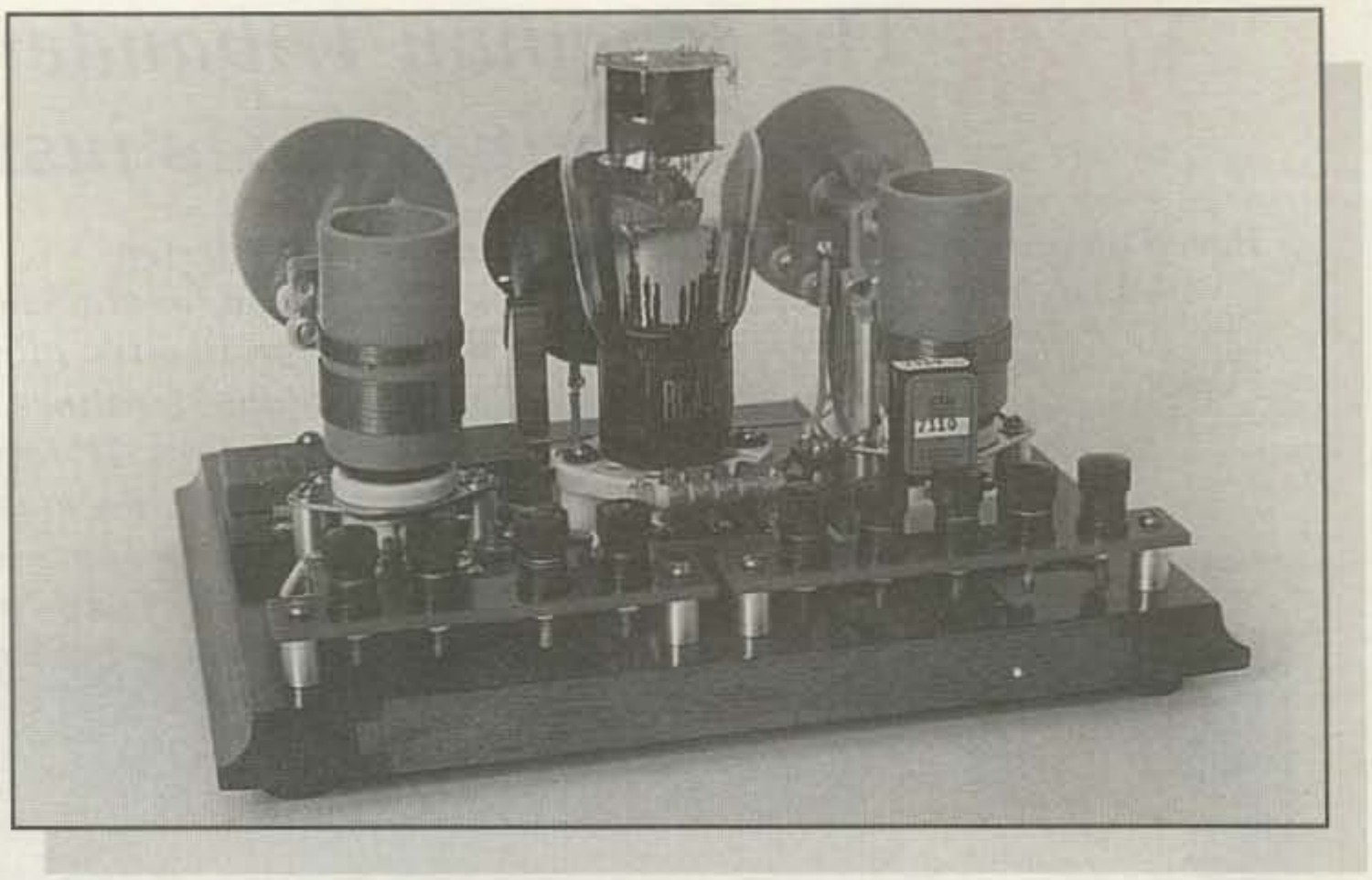


Photo B– Rear view of the W8WVM Tri-Tet transmitter reveals more spacers used for mounting the tube socket, coil and crystal sockets, plus binding posts on phenolic strip. Every component was meticulously cleaned and polished before installation. (Photo by W8WVM)

to-follow circuit diagram is shown in fig. 1, and an authentic replica you can use as a parts placement guide is shown in photos A and B. This Tri-Tet transmitter (and its accompanying two- tube receiver), incidentally, was made by our good friend Arnold Sayre, W8WVM, and it is truly a work of art. Notice the brilliantly glazed wood base, clever use of metal spacers, and homemade dials behind the plate and cathode tuning capacitor's knobs. Now answer truthfully, gang. Who could resist curling up with a rig like this on a cold winter's night. Allow three minutes to resume normal breathing, and then read on as we delve into circuit specifics.

Since a type 59 tube has a 2.5 volt filament, a low-value resistor or rheostat should be included in series with its 3 volt battery or power supply to drop 0.5 volt. A 5 to 20 ohm, 10 or 20 watt "slider adjustable" resistor should work fine. Preset it to its highest resistance, and then carefully lower the value until approximately 2.25 volts is measured at the tube's pin. (In this case of a difficult-to-find tube, less rather than more voltage is best.) If your power supply does not include adjustable

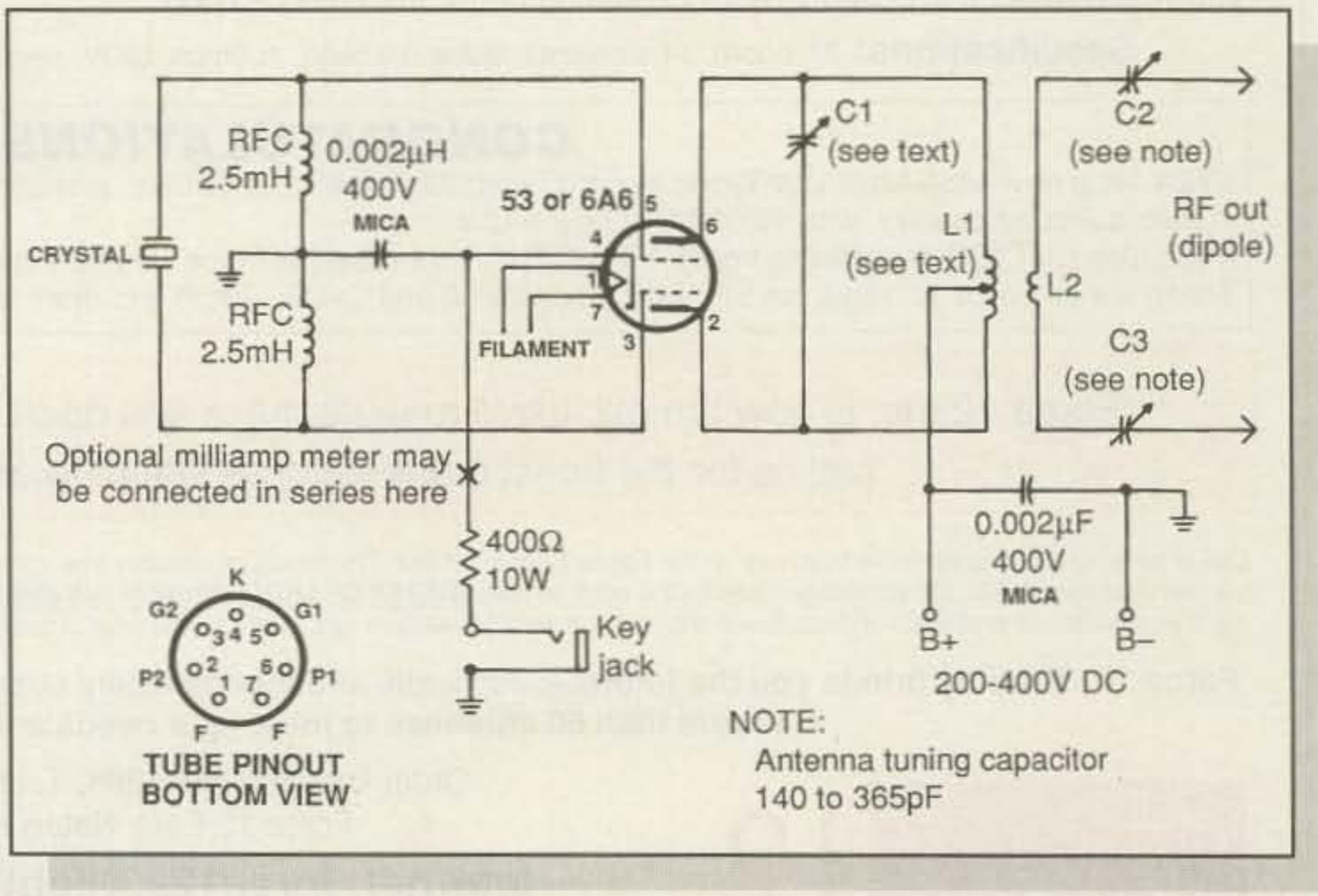


Fig. 2– Circuit diagram of a one-tube push-pull transmitter from the 1936 Jones Radio Handbook. *Rig is easy to build, looks great, and works like a champ.*

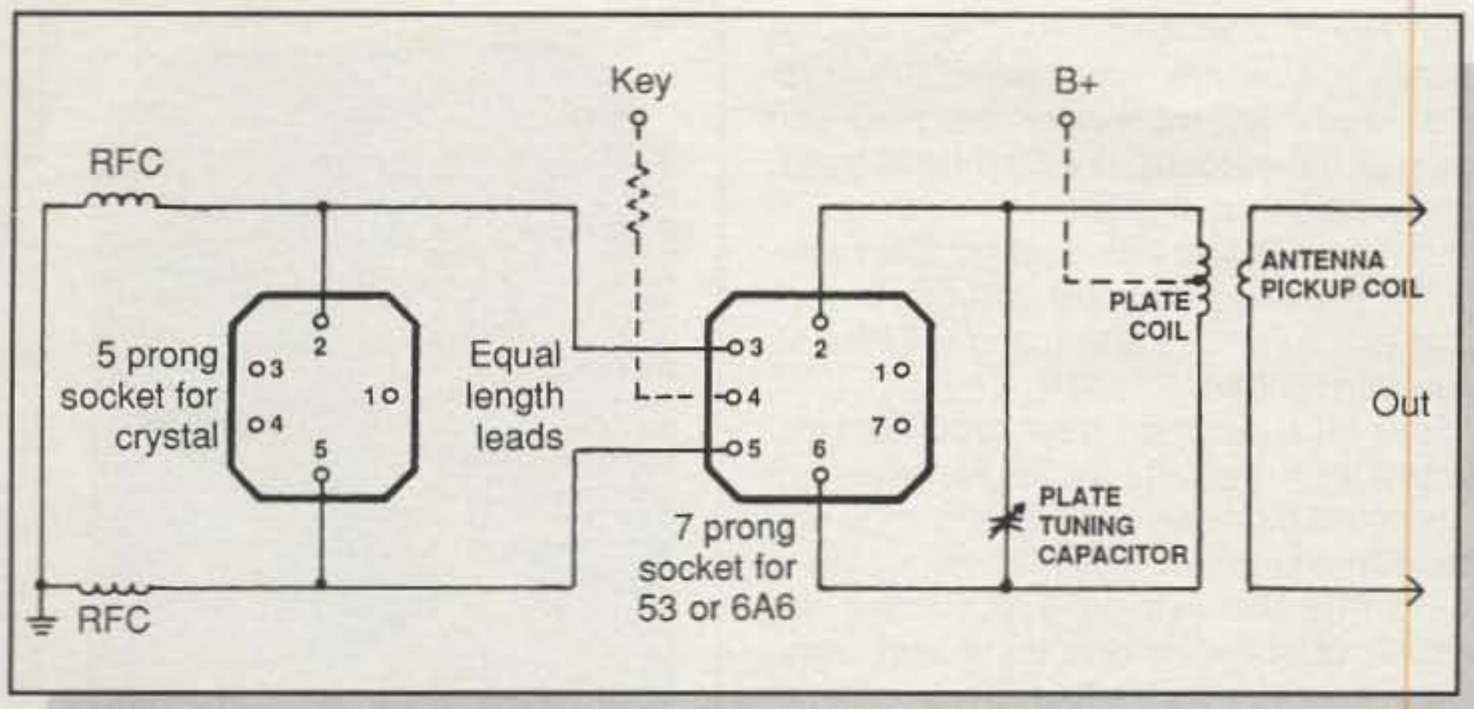


Fig. 3– Physical layout of the main components in a one-tube push-pull transmitter.

high-voltage outputs, another off-base (no pun intended!) slider resistor should be included to set screen grid voltage. Typically, it should be set at about half of the B+ voltage. More on that later.

Since the 59 draws a mild amount of grid current, older-style FT-243 cased crystals are recommended in this transmitter. These crystals often are found in hamfest fleamarkets, or you can order one on your desired frequency directly from Jan Crystals at 1-800-JAN XTAL. Just ask for "a plain ham band crystal with the least expensive frequency tolerance and 30 or 32 pFd series or parallel load capacitance."

Now referring to fig. 1, cathode coil L1 is wound on a 1 1/2 inch diameter form made by gluing a hamfest-obtained 4-pin plug to a 2 1/2 inch tall section of plastic tubing. A pill bottle or original-era plug-in coil form can, naturally, be substituted here. The coil is wound with number 22 enamel coated copper wire and consists of 30 turns for 80 meters, 20 turns for 40 meters, or 15 turns for 20 meters. Plate coil L2 and L3 are wound on a similar 1 1/2 inch diameter by 2 1/2 inch tall form using No. 20 or 22 enamel-coated wire. L2 consists of 14 turns for 80 meters, 12 turns for 40 meters, or 6 turns for 20 meters. L3 is positioned 1/4 inch above L2 (note left coil in photo 3), and consists of 10 turns for 80 meters, or 6 turns for 40 or 20 meters.

Choice of a meter for this transmitter—as with its knobs, tube sockets, etc.—will depend on what you can find at hamfest sales tables. A 100 ma meter connected in series with the B– or key lead is ideal.

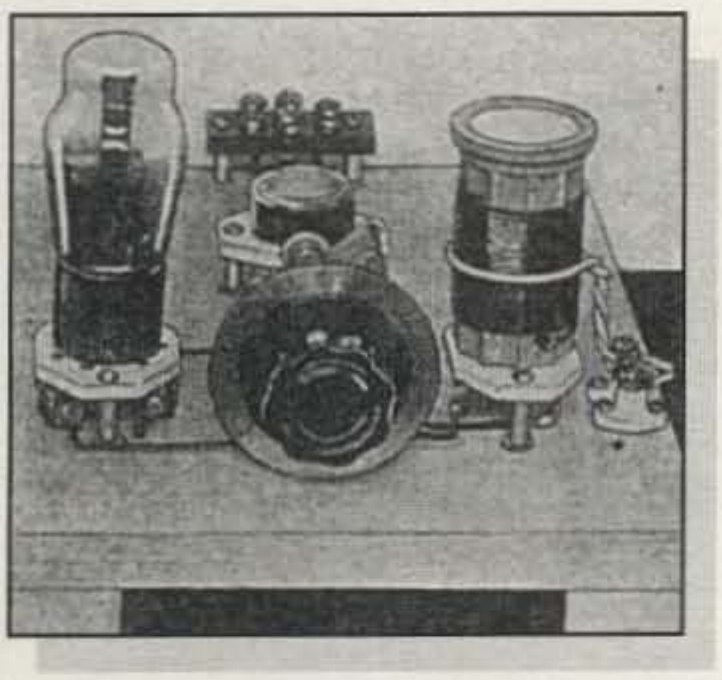


Fig. 4– A view of the push-pull transmitter as shown in the Jones '36 Handbook. *A plug-in coil appears in the picture, but the text describes a larger diameter open-air coil. Similar variations are noted throughout handbook. Evidently Jones liked humor or mystery.*

Alternately, an RF ammeter can be series-connected in an antenna lead. In that case, output power is calculated using the formula $I^2 \times R = P$, or antenna current squared times resistance of antenna equals watts. As an example, .5 A × .5 A = .25 × 50 ohms, or 12.5 watts. Likewise, 1 A × 1 A = 1 A × 50 ohms, or 50 watts. With respect to antennas, I suggest using a dipole specifically cut for your band of operation. This will minimize radiation of harmonics while ensuring that you radiate a good communications-worthy signal.

Transmitter tune-up and operation begins by applying plate voltage, then closing the key and tuning-plate capacitor C2 for minimum current, or the most pronounced dip. As previously mentioned, this will coincide with maximum or near-maximum output power.

Next, and while monitoring the rig's signal on a modern receiver/transceiver, adjust cathode coil L1 for the best keying and most stable-sounding signal. Re-dip C2, and then experimentally vary screen grid voltage until the transmitter's signal takes on a real glitz and glamour sound. Re-tweak C1 and C2, and then hit the air with a superb-sounding 1936-style signal that everyone will admire!

Push-Pull One-Tuber

Another captivating and easy-to-brew transmitter from the 1930s is the little 10

watt push-pull oscillator shown in figs. 2, 3, and 4. Yes, push-pull circuits usually employ two tubes and are used in amplifiers rather than oscillators—especially crystal oscillators—but that's what makes this gem from the *Jones Handbook* unique. Build one and show it to your friends. They will be green with envy. Use it on the air and enjoy some real golden-age nostalgia.

"So how can a single tube operate push-pull?" you ask. Simple: It has twin control grids and plates and a common cathode. It thus is comparable to two identical tubes in one envelope. The tube is a type 53 with a 2.5 volt filament and a plate potential of 200 to 400 volts. Incidentally, if you prefer an easier-to-power tube, a 6 volt filament 6A6 may be substituted for the 53 tube.

Jones's original 53 Push-Puller was laid out, or mounted, on an 11" × 15" × 3/4" pine board, but it was noticeably larger than necessary. A smaller and more fancy decoupage plaque works as well or better and adds a special touch of class. The transmitter's circuit diagram is shown in fig. 2, so let's begin by discussing some of its finer points.

This little transmitter also draws a mild amount of grid current, so use a big-time FT-243 rather than a wimpy HC-6 type crystal for frequency control. After—I repeat, *after*—you confirm the completed rig is operating properly, you can wire a 5 microHenry coil and 140 pFd variable capacitor in series with one of the crystal's leads for frequency warping (an optional "dink" idea). If a 53 tube is used, also consider adding an off-board 5 to 20 ohm, 10 to 20 watt slider-adjustable resistor for reducing filament voltage from 3 volts to 2.5 volts as discussed with the 59 tube transmitter.

Now let's focus on tank circuit details. Plate coil L1 is a hefty, large-diameter item supported by three short board-mounted standoff insulators. Yes, I know a plug-in coil form is shown in fig. 4, but Jones had a habit of showing one thing and using something else in his handbook—a form of unusual humor, I guess. The plate coil is wound with No. 14 bare wire (with turns spaced to avoid shorting) or enamel-coated copper wire (if you scrape clean the ends and center tap). The original coil was 2 3/4 inches in diameter, with turns spaced or stretched to yield a total length of 5 inches. The 80 meter coil was 37 turns, and the 40 meter coil was 22 turns.

A 100 pFd or 140 pFd variable capacitor is fine for C1. If only 40 meter (or 30 meter) operation is planned, a 75 pFd capacitor can be substituted for C1. Although 1/8 inch larger than specified, a green Comet® cleanser can makes a convenient/temporary form for winding L1. Tuning capacitor C1 easily can compensate for the slight difference in inductance. Antenna pickup coil L2 is wound over the middle of L1. It is made of insulated doorbell wire or No. 18 or 20 hookup wire. Approximately 16 turns are used for 80 meters, and 10 turns are used for 40 or 30 meters. The 140 or 365 pFd antenna tuning capacitors are optional. If only one variable capacitor is available, connect it in parallel with (or "across") L2. This same idea also can be applied to our previously featured 59 rig.

Tune-up and operation of the push-puller is a cinch. Just apply high voltage, close the key, and then tune C1 for minimum plate current, maximum output power. Next slowly increase loading with the antenna tuning capacitor(s) until you approach the point where additional loading does not increase output, but only uses more ma of current (same procedure used with pi-networks). Check signal quality on a communications receiver you know is good, and decrease loading if the signal sounds unstable or "warbly." Then hit the airwaves with a real glow-in-the-dark ham rig!

What About Receivers?

By the mid-1930s many amateurs were mating homebrewed transmitters with commercially produced receivers rather than building their complete station "from scratch"—a trend that continued to rise in popularity during future decades. Genuine "communications grade" receivers were a mite expensive, though, so home-entertainment-type "all wave" (550 kHz to 18 MHz) radios such as the cathedral-case General Electric shown in fig. 5 became popular.

Fig. 5– Looking at all-wave home-entertainment radios such as this cathedral-case GE helps us understand how SWLing and amateur radio became so popular during eras past. Manufacturers also offer circuit diagrams for adding homebrewed BFOs to radios (see discussion in text).

How could such AM radios without a BFO be used for CW reception? First, some manufacturers (such as GE) offered free details for homebrewing an external signal generator set to their radio's IF frequency. An operator just placed the generator near the radio, and bingo: BFO action. Second, amateurs interested in experimenting could synthesize a BFO by connecting a .05 mFd, 400 volt capacitor between one of the speaker's wires and the volume control. It was crude, but it worked, and the ideas still work today. Remember them if you find an irresistible all-wave radio at a garage sale or you shift a little AM radio's tuning enough to cover the low CW end of 160 meters. You could be set for more real nostalgic fun than anyone could imagine!

Hot Tip!

If you are restoring a classic receiver or transmitter for present-day operation, you know the most challenging aspect is finding accurate circuit information and alignment instructions on that gear.

Well, friends, I recently discovered the perfect solution to this dilemma, and it's W7FG's Vintage Manuals service. W7FG really does them up right with superb-quality copying, heavy-stock covers, and

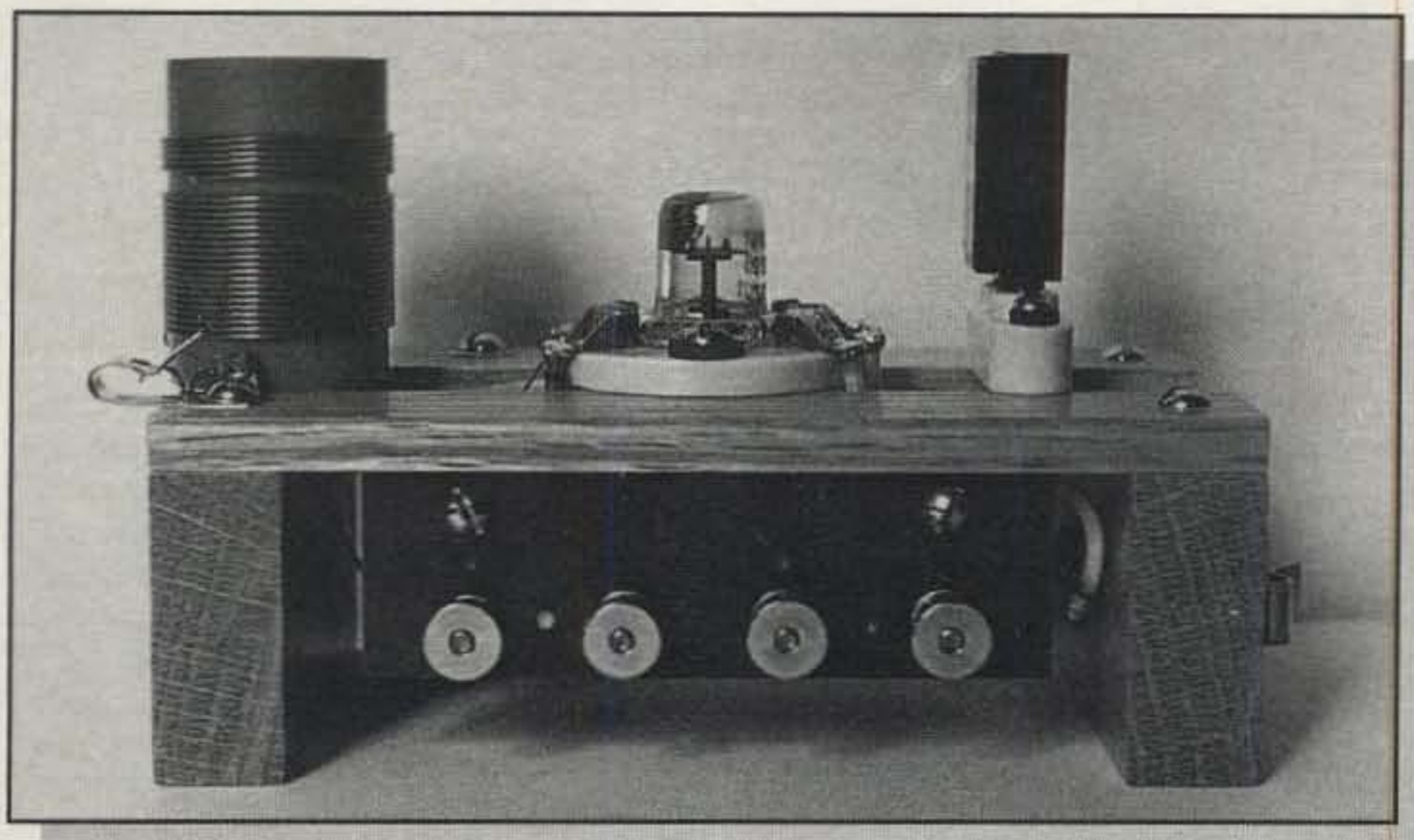


Photo C– This milliwatting masterpiece was also homebrewed by W8WVM, and it works as great as it looks. The little gem uses a 955 tube and was originally featured in this column in March 1990.

"lay flat" spiral binding. He has over 5500 manuals covering all types of ham gear, antennas, test equipment, and military radios in his collection.

Prices of manuals are fair and square, and delivery is quick. Check it out! You can contact W7FG Vintage Manuals at 402731 West 2155 Drive, Bartlesville, OK 74006 (telephone 1-800-807-6146) or via <http://www.w7fg.com>.

Wrap Up

Once again the closing wire approaches, so let's conclude with two final views of neat little rigs readers homebrewed from inspiration in past columns. First is the Arnold Sayre, W8WVM, version of our 500 milliwatt transmitter described in March 1990 *CQ* (photo C). Second is the Quent, K5TVC, rendition of our Taylor-tube replica rig featured in November 1998 *CQ* (photo D). Marvelous, aren't they? Now get busy homebrewing your own "replica of yesteryear" station and let's QSO on 30 meters one weeknight. Amateur radio is terrific, and I look forward to hearing you enjoying it to the max on the air! May the force of good signals always be with you!

73, Dave, K4TWJ

Photo D– This 1935 replica transmitter was made by Quent, K5TVC, after he read about it in our November 1998 column. The rig uses a Taylor TZ20 tube, Johnson ceramic socket, and Weston meter. Beautiful, isn't it? (Photo via K5TVC)

The Digital Dipole

BY KARL T. THURBER, JR., W8FX

From Software Through Antennas For The Shack

Happy Year 2000!

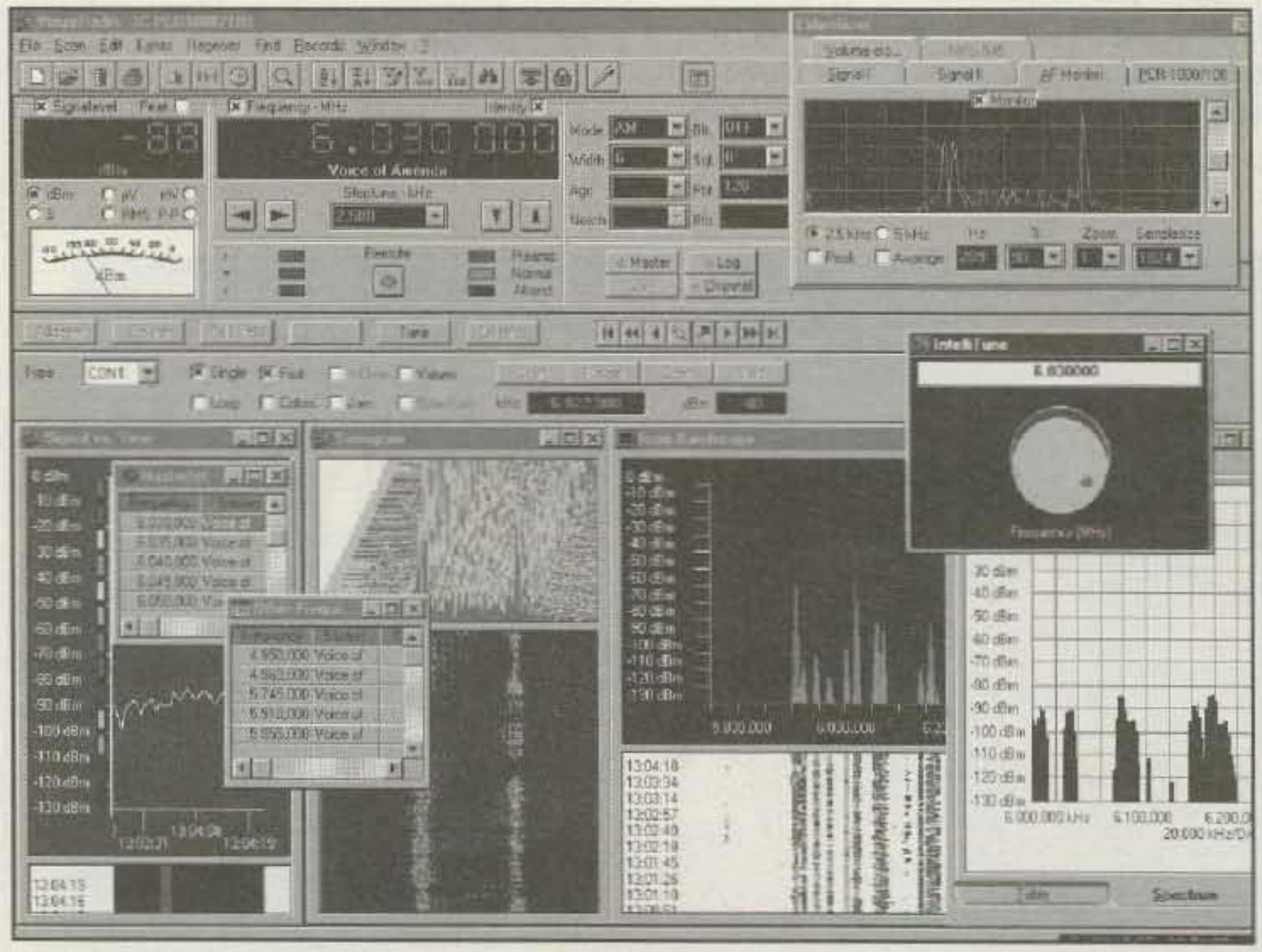
Happy New Year and Happy New Century! I'm writing this column well in advance, with some concern as to just how the "Y2K transition" to the new century will fare. Like most readers, I'm worried not only about the big picture of how our country (and the rest of the world) handles the transition, but also about the "homier" picture of just how my own household's PCs, amateur radio gear, VCRs, answering machines, telephones, and appliances will work in the brand new century.

Looking further downstream, where do I think amateur radio and technology in general are headed in the coming era? Well, I think that our whole lives, and not just our amateur radio hobby, will be on an ever-faster technology-based track. This high-tech track especially will emphasize computers and communications-based electronics. One thing is certain: Rapidly accelerating and increasingly pervasive technological developments will require every one of us to change our familiar ways of doing many things, including the ways in which we enjoy our hobbies. Some of these changes may be inconvenient and unwelcome, while others may be exciting and challenging.

I will also point out that most humans, myself included, are very poor predictors of the future, especially a future more than a year or two away. It's very difficult to forecast what this future holds, since one's view is necessarily limited by one's mindset and view of the present. Unexpected events may occur along lines we could never have anticipated, throwing off the best of predictions. Even professional "futurists" have a tough time of it.

So, perhaps all we really can do is stay flexible in all aspects of our lives—hobbies such as amateur radio included—and sort of roll with the punches thrown at us in the coming era. You can, however, be assured that if you love change, you'll love the future. If not, then good luck!

289 Poplar Drive, Millbrook, AL 36054-1674



VisualRadio is for professional quality radio monitoring, including control of computer-ready radios, RF and spectrum display analysis, and database management. The software works with a wide variety of AOR, ICOM, JRD-NRD, Kenwood, Optoelectronics, Yaesu, WinRadio, and other manufacturers' units.

That having being said, and assuming all is reasonably well on the millennial front, in this very first month of the year 2000 we'll continue with our customary formula of antenna, software, and book notes. Stay with us.

Antenna Notes

W7FG True Ladder Line. Many of us are familiar with "W7FG Vintage Manuals," a firm that offers more than 5000 manuals, from some 350 manufacturers, for radios, hi-fi equipment, test gear, amplifiers, transmitters, and more. Over the years the manuals supplier has established a good reputation for the ability to furnish you with just about any manual you might need to operate, service, or repair almost any kind of electronic equipment. You can obtain a free, 30-page catalog by mail, or you can check out the firm's website (see below) to find what you need.

Now W7FG also offers low-loss "True Ladder Line," both the ladder line itself and center-fed wire antennas with ladder-line feeders. The high-quality line is constructed of 16-gauge, 26-strand, 100-percent copper wire with lightweight, low-wind-loading spreaders. The line has a nominal impedance of 600 ohms and is available in a minimum assembled length of 50 ft. for $23; 100 ft. is $40. You also can obtain a 100 ft. kit for $32.

Also available from W7FG are several classic center-fed wire antennas with ladder line, to offer good multiband HF performance. The W7FG antennas boast no splices; they are of "one conductor from equipment to far-end antenna insulator." The skyhooks include center and end insulators.

Several antennas are available, including models for 160–10 meters (240 ft. in length), 80–10 meters (125 ft.), and 40–10 meters (65 ft.). Each of the antennas is available with 50 ft. of assembled ladder line, or 100 ft. of either assembled or unassembled ladder line. Antenna prices range from $41 to $74, depending on the band and ladder-line configuration.

To digress for a moment, why use centerfed wire antennas and ladder line for multiband HF operation, anyway? Most amateurs probably would agree that the simplest, least troublesome, least expensive "all-band" HF antennas are balanced centerfed types using open-wire, parallel-conductor feed line to the antenna center. The length of such antennas and the feedline are not critical, and the antennas can offer a good match to modern HF transmitters and transceivers with low-impedance coax output if fed through a wide-range antenna tuner or transmatch.

For more information, contact W7FG Vintage Manuals, 402731 W. 2155 Dr., Bartlesville, OK 74006 (1-800-807-6146; e-mail: <w7fg@w7fg.com>; web: <http:// www.w7fg.com>). You can view or download the W7FG catalog from the website.

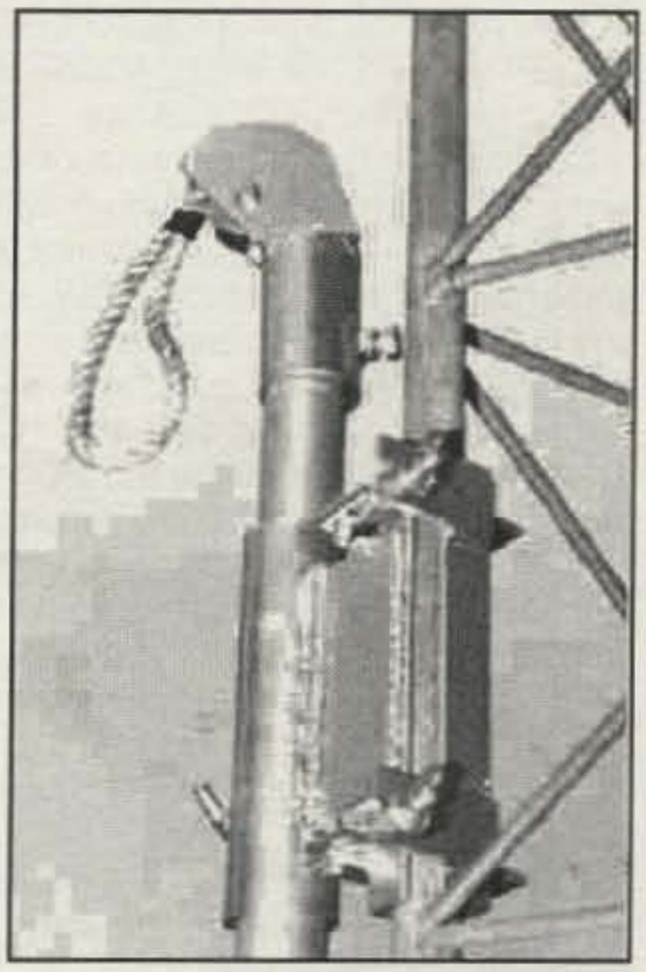
BC Matcher™. Successfully feeding a short, loaded vertical antenna with coaxial cable can be something of an "iffy" proposition due to the typically very low base impedance the antenna presents. For best results, you should take measures to correct the resultant antenna-to-coax mismatch. (These and related problems are discussed in *The ARRL Antenna Book*, Chapter 16, "Mobile and Maritime Antennas.")

You can contrive a match by juggling the antenna mast and coil or resonant frequency, thereby lowering the "Q" (quality factor) and/or incorporating the feedline as part of the antenna system. However, in doing so you may produce dysfunctional results such as loss of power, degraded performance, and the like.

Wade Williams, WØBC, of the Sale Safe Company, has introduced a handy variable matching device for overcoming these problems, one which mounts at or near the bottom of the antenna mast. The easy-to-install device is intended to match popular antennas, including the Bug Catcher, Hustler, Hamstick®, and others. The matching device handles 500+ watts and is $43.50 including shipping.

For more information and a flyer explaining the unit's theory of operation, contact Sale Safe Co., 8720 Fairway, Leawood, KS 66206 (1-800-479-0889; e-mail: <w0bc@qni.com>).

IIX Equipment, Ltd. is well-known for its steel gin-pole kits. Three models are offered. They are for stamped open-leg towers, towers using legs of tubing, and towers with close-spaced "W" bracing. The IIX catalog has good descriptions, sketches, and photos of the gin poles, with details showing how they're safely used.



IIX Equipment, Ltd. Update. Serving the amateur and commercial radio markets for more than 16 years, IIX Equipment, Ltd., manufactures fine-quality welded steel products to solve the problems associated with radio tower and antenna erection, as well as the mounting of communication equipment in vehicles. Heavy steel construction and hot dipped galvanizing characterize the company's tower accessories. We last profiled the firm and its products in 1995.

The firm's latest catalog also is replete with antenna and tower hardware. Included are heavy-duty goodies such as standoff brackets, building mounts, bolt-on mast climbing steps, rotor mounts and rotating antenna mounts, roof "quad pods," multiple tower antenna mounts, mast adapters and couplers, beam mount and boom-mast plates, and a variety of mobile equipment mounts.

IIX Equipment Ltd. also offers three steel gin-pole kits. These are for stamped open-leg towers, towers using legs of tubing, and towers with close-spaced "W" bracing. The kits range from about $200 to $220. The IIX catalog has good descriptions, sketches, and photos of the gin poles, with details showing how they're safely used.

Contact IIX Equipment, Ltd., P.O. Box 9, Oak Lawn, IL 60454 (708-423-0605; e-mail: <iix@interaccess.com>; web: <http: //www5.interaccess.com/iixeqpt>).

Soft Stuff

VisualRadio. Cord Schuette of Computer International offers a variety of monitoring and analysis software tools for radio receivers, transceivers, and scanners. Perhaps the most interesting of these products to radio amateurs and SWLs is VisualRadio. This product was created by Liedtke GmbH, a well-established European company, for professional-quality radio monitoring, including control of computer-ready radios, RF and spectrum display analysis, and database management.

The program works with a wide variety of AOR, ICOM, JRD-NRD, Kenwood, Optoelectronics, WinRadio, Yaesu, and other radios. A VisualRadio Plus version is for use with the Optoelectronics Scout radio or the AOR SDU-5000 series Spectrum Display Units.

Some of VisualRadio's key features include point-and-click receiver tuning; RF and AF spectrum analysis; timer-controlled scanning; recording of signals in Windows® WAV file format; support of two radios; data import from other databases, including popular scanner and shortwave broadcast database CD-

ROMs; and extensive computer control of most radio functions. VisualRadio is $140, while VisualRadio Plus is $250. Upgrades from previous versions also are available.

Computer International also offers RadioCom, which combines computer-assisted tuning with digital signal processing (DSP) capabilities. RadioCom lets you tune and decode digital and analog signals (including CW, FAX, RTTY, and SSTV) from any high-quality transceiver or receiver, to significantly improve sound readability and quality. The software works in conjunction with your PC's communications port and sound card. The receiver's signal goes directly to the PC for DSP processing, without the need for any hardware interface. The receive-only version is $180, while a receive/transmit version is $250. You can download demos of both VisualRadio and RadioCom from the firm's website.

For more information, contact Computer International, 207 South US-27, St. Johns, MI 48879 (phone 517-224-1791; e-mail: <computer@email.mintcity.com>; on web: <http://computer-international.virtualave.net>).

CyberCWContest and CyberDX-CW. Are you a DXer or contester, but one who doesn't have the equipment, antennas, time, or patience to participate and score high in your favorite on-the-air pursuits? If so, you may be interested in two new simulation products from Bill Beggs, N5RR, of B&B Cyber Software. These programs are CyberCW Contest and CyberDX-CW.

CyberCWContest is a "cyberspace simulation" of amateur radio contesting. The software generates a simulated radio environment, where you can tune the HF contest bands and actually hear computer-generated station activity. With it, you attempt to work as many stations as you can in as many different countries and zones on one or more amateur bands in a given time period using Morse code (CW). You either identify and answer DX stations or you call CQ and respond to stations that call.

The probability of your hearing a given station, or the station hearing you, is essentially dependent upon a number of factors that attempt to approximate "real world" conditions. These include time of day, noise and QRM level, band, propagation conditions, activity, timing, and several other factors.

Features include the ability to operate on any of the six normal HF contest bands, 160–10 meters; a keyboard CW mode; an SDU-type display; parameter change by mouse or keyboard; automatic logging and score-keeping; multiple log files; online help; web-based high-score listings; and more. Software disks and a printed manual are $54 plus shipping.

CyberDX-CW is a software simulation of an amateur radio station monitoring the world in search of DXCC. Here you attempt to work all of the world's countries using CW. The countries are the same as those defined by the ARRL DXCC program. A virtual awards program has been started for the softwaré program.

The software generates a simulated radio environment, where you can tune all of the HF bands and hear computer-generated station activity. You identify and answer DX stations. The probability of your hearing a given station, or the station hearing you, is essentially dependent upon a number of factors similar to those in CyberCWContest. CW speed is dependent on where in the band you're tuned: higher speed stations are found in the lower portion of each band, as in the real world.

Advanced features are included, such as a keyboard key mode; preprogrammed Morse sequences; support for all WARC bands; an SDU-type display; easily changed CW pitch, sidetone frequencies, and other program defaults; a DX Cluster feature, which simulates real-world cluster activity; various listings of worked and needed countries and prefixes; multiple log files; and more. Software disks and a printed manual are $54 plus shipping.

Download versions of, and updates for, both programs are available from the firm's website. Contact B&B Cyber Software, 10649 Goosehaven Drive, Lafayette, CO 80026 (phone 303-666-5252; e-mail: <info@bbcyber.com>; web: <http://bbcyber.com>).

From the Bookshelf

Artsci Publishing Update. Under the proprietorship of Bill Smith, N6MQS, Artsci Publications—"where art and science work for you"—has been producing books and manuals for the amateur radio community since 1989. The firm focuses on providing straightforward instructions and drawings to make complicated aspects of the hobby simple to understand. Other products, including hardware and software, also are offered, but the publications are at the heart of the business.

Artsci offers several reference pubs for the radio amateur, SWL, and scanner buff. Among others, these include *Amateur HamBook*, a $14.95 compendium with numerous charts, tables, and construction plans; and *Lost Users Manuals*, a $19.95 reference with condensed VHF/ UHF mobile, handheld, and scanner radio programming and operating instructions. Also offered are the $9.95 *Repeater MapBook*, which contains locations of many hundreds of open repeaters, and *Radio/Tech Modifications*, in two $19.95 editions which together provide practically all known mods for ICOM, Kenwood, Azden, TenTec, Heathkit, Uniden, Radio Shack, and other receiver, transceiver, and scanner manufacturers.

For more information, contact Artsci, Inc., P.O. Box 1428, Burbank, CA 91507 (phone 818-843-4080; e-mail: <books@artscipub.com>; on the web: <http://www. artscipub.com>).

"Comfortable Computing" Booklet. Is your PC ergonometrically integrated with your radio hamshack? And do you employ good work habits when using your PC? "Comfortable Computing" is a new, 16-page booklet from the Center for Office Technology (COT). It provides a number of tips and guidelines regarding good PC work habits is for both individual users and businesses.

The booklet is designed to help you determine your computer work-station arrangement and work practices that are best for you. The booklet also addresses potential discomforts experienced by some computer users, and it explains how to develop good work habits that might let you alleviate such discomforts.

Subjects the booklet covers include chair adjustments; organizing a work area; using keyboards, pointing devices, and document holders; controlling lighting and glare; taking breaks and exercise; and vision care. The booklet has an "office ergonomics checklist" and an appendix with additional resources.

The booklet is $4; bulk rates are available. Contact Center for Office Technology, 301 N. Fairfax Street, Suite 102, Alexandria, VA 22314 (703-684-7760; e-mail: <CtrOfTek@erols.com>; on the web: <http://www.cot.org/comfort.html>).

Short Bursts

Cord Control Kits from Get Organized. Do you need help with your jumbled wiring? Get Organized offers a line of what it calls "wire management" products to provide "solutions for all your messy cords, cables, and wires." Get Organized is dedicated to the development of such products for the home, office, and professional audio and video industries. I use their products and have had excellent results with them.

The firm offers practical solutions to the universal problem most of us are confronted with—the endless rats' nests of cords and wires. The easy-to-use Cord Control Kits and accessories can transform the appearance of any hamshack, office, PC workstation, workbench, or entertainment center by systematically labeling, bundling and concealing all electronic equipment cords and wires.

At the core of the Cord Control Kits is the Superflex slit-plastic tubing, which works together with reusable beaded cable ties to secure and conceal all types of wiring. The full-length slit lets

the cords enter and exit the tube at any point so all you see is the last couple of inches of cord. Safely bundled inside the tubing, all cords remain accessible but out of sight.

Each kit contains color-coded labels for the cord ends and jacks. With the labels you easily can hook up or reconnect complicated equipment cabling simply by matching colors. The cable ties bundle up any cords that are left outside the tube.

Recently, the firm introduced the "Just Right" Cord Control Kit. This assortment is good for bundling, labeling, and securing the cords and cables behind a moderately large PC work station, operating position, or home entertainment center. The new, 8 ft., $15.95 kit was created because for some applications the Superflex tube in the standard kit was too small, and the tube in the big tube kit was too big. The 1 1/4 in. diameter Superflex tube holds up to 40 percent more cords than the standard kit.

The cord control kits range in price from $12.95 for the standard 6 ft. kit, to extra-long and "big tube" versions at $18.95. Inexpensive accessories also are offered, including reusable cable ties with self-adhesive mounts ($3.95), color-coded labels ($2.95), and "Go Speedwraps" for quickly bundling cables ($4.95). Internet orders are shipped postpaid.

Contact Get Organized, 328 Canham Rd., Scotts Valley, CA 95066 (831-438-0259; e-mail: <getorg@scruznet.com>; web: <http://www.getorg.com>).

Ghosts from a Previous Callsign Holder? Some time ago, Brian Cooke, W8BPC, e-mailed to tell me that he had seen a 1956 Michigan callsign license plate bearing my callsign, W8FX. Brian saw the plate in a restaurant in Howell, Michigan. I've never been to Howell, never lived in Michigan, and never had a Michigan plate on my car. So what was going on with this "sighting"?

It's not too hard to figure out, since my W8FX callsign is a reissued one. It's a call I picked largely because it would have a nice "ring" on CW, having been eligible for one of the 1×2 "old-timer" callsigns in the mid-1970s when the FCC opened them up to Extras. (I had first been licensed as KN2IKZ in 1954, with many different calls to follow—K2IKZ, W7DZW, KL7HID, and W8LYF—as I followed an Air Force career with lots of travel.)

Anyway, the previous W8FX holder was the late Ralph Thetreau, a prominent and public-spirited Michigan amateur, and a long-time ARRL and Old Old Timers Club (OOTC) member. Ralph also had donated a large tower for ARRL's Connecticut headquarters station, W1AW. This generous act resulted in a plaque being set at the base of the W1AW tower that sports "my" callsign. Ralph was quite well known in the radio amateur community, so when I attended some major hamfests in the late 1970s and early 1980s, people saw my callsign nametag and wondered if they indeed were seeing a ghost or a reincarnation of some sort.

In any case, I've never figured out just why the W8FX plate ended up in the Michigan restaurant. However, I did learn that there's some risk in acquiring a reissued callsign, particularly if the previous holder was prominent in amateur circles!

Wrap-Up

That's all for this time, gang. Next time, more "Digital Dipole" topics of current interest. See you then.

Overheard: When you really come down to it, where you came *from* isn't quite as important as where you're *headed.*

73, Karl, W8FX

Contesting

BY JOHN DORR, K1AR

News/Views Of On-The-Air Competition

Contesting for a New Millennium

January's Contest Tip of the Month

It may seem like a small thing to some of you, but when operating in the multi-operator category in a phone contest, take the time to reprogram your voice keyer when changing operators. In last year's CQ WW, K3IXD encountered tremendous QRM while calling a multiplier and almost didn't complete the QSO because the voice answering him was different from the CQ voice, making him think he was working someone else. This is another situation where having a "unique" is not helpful and may cost you QSOs! *(tnx K3IXD)*

It's hard to believe, but the year 2000 is finally upon us! We've all reacted differently to the challenge of the millennium. For some, it's just another day in our busy lives. Others have built underground shelters stocked with supplies and gold bullion. For you lucky Y2K technical types, the challenge is nearly over. Yes, our clocks, coffee makers, VCRs, and lawnmowers are still working. Also, thanks to the hard efforts of the Y2K community, our bank accounts, utilities, airlines, and governments are still functioning.

Speaking of functioning, so is contesting as we enter this next phase of our hobby. That is the theme of this month's commentary: What's in store for contesting as we enter the new millennium?

There are a Few Realities

Before I embark on the challenge of writing an inspiring dissertation about the future of contesting, let's acknowledge some of issues that are testing our staying power.

The unfortunate reality of today's climate is that contesting, and amateur radio in general, continues to lack a meaningful infusion of new enthusiasts. In contest circles, that manifests itself in the average age creeping up, the obvious lack of young operators actively participating in contest events and multi-operator circles, and so on. Furthermore, the cost of entry into the world of competitive contesting has been a major impediment for adults, not to mention for financially-challenged teenagers.Then there is the competition from life's other attractions. In youthful terms, that is defined as the Internet and video games. For adults, it's the ability to pick up a cell phone and be able to call a business associate in Sydney, Australia from New York while eating sushi at your favorite Japanese restaurant. In other words, the draw of worldwide communications provided by ham radio just "ain't what it used to be."

So do we simply fold up our tents and accept the inevitable, or is there another view? Read on and you'll get a perspective I hope you can support.

2 Mitchell Pond Road, Windham, NH 03087
e-mail: <K1AR@contesting.com>

Calendar of Events

Dec. 18	OK/OM DX RTTY Contest
Dec. 18-19	Stew Perry Contest
Dec. 18-19	Croatian CW Contest
Dec. 19	RAC Canada Winter Contest
Jan. 1	ARRL Straight Key Nite
Jan. 1	Kid's Day Operating Event
Jan. 1-2	The Millennium PSK31 Contest
Jan. 7-9	Japan Int. CW DX Contest, 160–40m
Jan. 8-9	ARRL RTTY Round-Up
Jan. 8-9	North American CW QSO Party
Jan. 15-16	North American SSB QSO Party
Jan. 15-16	Mich. QRP Club 2000 CW Contest
Jan. 16	HA DX Contest
Jan. 22-24	ARRL Jan. VHF Sweepstakes
Jan. 28-30	**CQ WW 160 Meter CW Contest**
Jan. 29-30	REF CW Contest
Jan. 29-30	UBA SSB DX Contest
Feb. 6	North American SSB Sprint
Feb. 12-13	World-Wide RTTY WPX Contest
Feb. 12-13	Dutch PACC Contest
Feb. 13	North American CW Sprint
Feb. 19-20	ARRL Intern. CW DX Contest
Feb. 25-27	**CQ WW 160 Meter SSB Contest**
Mar. 4-5	ARRL Intern. SSB DX Contest
Mar. 25-26	**CQ WW WPX SSB Contest**

Is the Glass Half Full Or Half Empty?

If you're a charter member of the "sky is falling" club, the timing is probably right for you to sell your radios while you can still command a few pennies for them. However, there's reason for optimism, and that's going to be my focus for the rest of this month's column.

Did you operate in the 1999 CQ WW DX SSB Contest? Even if you're not a contester, did you listen to the action? If you did, you had to marvel at the activity. While this is a subject for a separate column, like it or not, 10 meters was fully occupied for an entire megahertz from 28200 to 29200! World high multi-multi stations were claiming 20,000+ QSOs; world-class single operators tallied results as high as 10,000+ contacts. Even this old reporter made his highest QSO total ever from a domestic location with nearly 4200 QSOs. If contesting is nearing extinction, you'd never know it by that weekend. And for those who have rightful concerns over the intrusiveness of the contest activity we experienced that weekend, I think ham radio was well served by our demonstration of activity and interest in radio communications in general.

Another factor to consider is that contesting is not just the big guns beating up each other on 20 meter SSB in a DX competition. The reality is that there are scores of other contests that can appeal to the interests of many hams, whether they enjoy domestic operating (or their stations are better suited for that kind of operating), VHF, or specialty modes such as RTTY, AMTOR, PACTOR, etc. I encourage you to check out the annual calendar of contest events that I've assembled for this month (Table I) and consider participating in a few of them.

Finally, there are the intangible benefits. Maybe I'm a dying breed of competitor, but I have to admit that I enjoy contesting for a number of irreplaceable reasons: (1) The thrill of the competition; (2) the thrill simply of working interesting hams and places; and (3) the camaraderie that comes from it all. Let's close with some thoughts on each of those topics.

The Thrill of the Competition. A wonderful attribute of contesting is that it allows for competition at whatever level you choose to define. The range can be from winning at the world-class level to beating your personal score from last year. It can mean exceeding a million points for the first time, to working 100 countries on a single band. If anything exists in spades in our culture today, it's competition. It's a significant component in the makeup of our personalities, and contesting can and does feed off of that. That's an attribute that will most certainly drive the future of contesting into the next millennium in a positive way.

The Thrill of Working Interesting People and Places. Okay, I'll admit another one this month: I still enjoy getting on the air and talking to far-away places. That's an aspect of ham radio that first attracted me to the hobby 30 years ago and is one which still interests me to this day. In the spirit of combining hi-tech and ham radio, at the moment I have a TELNET session running in the background on my laptop connected to one of the Finnish DX spotting networks. And yes, while I was typing just a few minutes ago, someone spotted R1ANZ in Antarctica on 40 meters. Did I keep typing? Nope. I ran downstairs and worked him. Maybe I'm unique, but that element of the chase pro-

vided by ham radio in general and contesting in particular cannot be replaced with cell phones and e-mail. It's an element of contest operating that will never go away and will continue to drive the existence of contesting in the future *(Standby, readers: ZA1Z on 18077.)*

Contest Camaraderie. Whether it's the Dayton Hamvention™ or your local club, the social aspect of contesting has driven and will continue to drive interest into the future. Let's face it: As contesters we're like fishermen when we socially interact. The conversation ranges from how we bagged the big one to why the big one got away. Many of my contest friends have become my lifelong friends, not just to talk about contesting and ham radio, but to discuss career and life's issues in general. Without that aspect of contesting, my ham radio experience would be dramatically diminished.

Closing Comments

That's it for this month. I think the future of contesting, while facing major challenges, is still bright. Propagation is back in a big way, promising a great start to the new millennium for contest operation. Make 2000 your operating year, however you choose to define that!

As always, I need to receive your contest calendar submissions for the April issue no later than February 1st.

73, John, K1AR

Kid's Day Operating Event

1800Z to 2400Z Sat., Jan. 1

Sponsored by the Boring Amateur Radio Club, the Kid's Day Operating Event is intended to encourage activity by younger people (licensed or not) using amateur radio. The goal is to give unlicensed young people some hands-on, on-the-air experience so they might develop an interest in pursuing a license. It is also intended to give hams a chance to share their station with their children.

Exchange: Name, age, location, and favorite color. You are encouraged to work the same station again if either operator has changed. Call "CQ KIDS DAY."

Frequencies: 28350–28400 kHz, 14270–14300 kHz and 2 meter repeater frequencies with permission from your area repeater sponsor. Observe third-party traffic restrictions when making DX QSOs.

Logs, comments, and funny stories may be posted via the Internet to <kids@contesting.com>. You may review these by visiting <http://www.contesting.com/kids/> with your web browser. All verified participants will receive a colorful certificate. Send an SASE to BARC, P.O. Box 1357, Boring, OR 97009. More details may be obtained from the Boring ARC or at <http://www.jzap.com/k7rat/>.

ARRL RTTY Roundup

1800Z Sat. to 2400Z Sun., Jan. 1–2

This is the 12th annual all-digital contest sponsored by the ARRL. Any station may work any other station worldwide. You may operate more than one digital mode, but QSOs and multipliers are counted once only regardless of modes used.

Operation is limited to 24 hours out of the 30-hour contest period. Two rest periods must be taken in two separate blocks of time and clearly marked in the log.

Modes: Baudot, RTTY, ASCII, AMTOR, and packet (attended operation, only).

Bands: 3.5–30 MHz on those frequencies recommended for digital operation (no 10, 18, or 24 MHz).

Categories: Single operator, multi-band, (1) less than 150 watts output, (2) 150 watts or more; multi-operator, single transmitter, all band.

Exchange: Signal report and QTH. State for the U.S., province for Canada. DX will send a serial QSO number.

Scoring: One point per QSO. A station may be worked once per band for QSO credit.

Multiplier: Each US state (48), each VE province (12), and each DXCC country, counted only once, not once per band. (KH6 and KL7 are countries; VO1/VO2 counts as one VE province.)

Entries with 200 or more contacts must submit a duplicate QSO check sheet.

Awards: Certificates to the top single operator, both low and high power, and multi-operator scorers in each ARRL/RAC section and each DXCC country. Novice/Tech entrants with at least 50 QSOs will also receive a certificate.

Contest forms are available from the ARRL for an SASE and two units of first-class postage and are recommended. Entries must be postmarked no later than 30 days after the end of the contest. Mail your entry to: ARRL RTTY Roundup, 225 Main St., Newington, CT 06111 USA. E-mail logs to <RTTYRU@arrl.org>. These logs must be in ASCII format. The log data file and the summary sheet must consist of the callsign and the extension (i.e., xxxx.log and xxxx.sum).

Japan Int'l DX CW Contest (Low Band)

2200Z Fri. to 2200Z Sun., Jan. 7–9

Sponsored by *Five-Nine* magazine, the object is for amateurs around the world to work as many JA stations in as many JA prefectures as possible.The maximum operating period is 30 hours (except for JAs, who can use the full 48-hour period) with off periods longer than 60 minutes.

Year 2000 Contest Calendar

January	1	ARRL Straight Key Nite
	7–9	Japan Int'l DX Contest – 160-40 meters
	8–9	North America CW QSO Party
	8–9	ARRL RTTY Round-Up
	15–16	North America SSB QSO Party
	16	HA DX Contest
	22–24	ARRL January VHF Sweepstakes
	28–30	CQ 160M CW Contest
	29–30	REF CW Contest
February	6	North American SSB Sprint Contest
	12–13	World-Wide RTTY WPX Contest
	12–13	Dutch PACC Contest
	13	North American CW Sprint Contest
	19– 20	ARRL International DX Contest CW
	25–27	CQ 160-Meter SSB Contest
	26–27	REF SSB Contest
	26–27	UBA DX CW Contest
March	4–5	ARRL International DX Contest Phone
	11–12	RSGB Commonwealth CW Contest
	12–13	Wisconsin QSO Party
	18–20	Bermuda Contest
	18–20	BARTG Spring RTTY Contest
	18–20	Russian DX Contest
	25–27	CQ WW WPX SSB Contest
April	1–2	SP DX Contest
	1–2	EA RTTY Contest
	15–16	YU DX Contest
	15–16	Michigan QSO Party
	22–23	Helvetia DX Contest
	22–23	Florida QSO Party
May	6–7	ARI International DX Contest
	13–14	CQ-M International DX Contest
	27–28	CQ WW WPX CW Contest
June	10–12	ARRL June VHF QSO Party
	17	Kid's Day Operating Event
	17–19	All Asian CW DX Contest
	24–25	ARRL Field Day
July	1	RAC Canada Day Contest
	8–9	IARU HF World Championship
	15–17	North American RTTY QSO Party
	22–24	RSGB Islands On The Air Contest
August	5–6	ARRL UHF Contest
	5–6	North American QSO Party
	6	YO DX HF Contest
	12–13	Worked All Europe CW DX Contest
	12–13	Maryland-DC QSO Party
	19– 20	ARRL 10 GHz and Up Cumulative Contest
	19–20	North American SSB QSO Party
	19–21	NJ QSO Party
	26–27	Ohio QSO Party
September	2–3	All Asian SSB DX Contest
	3	North American CW Sprint Contest
	9–10	Worked All Europe SSB DX Contest
	10	North American SSB Sprint Contest
	9–11	ARRL September VHF QSO Party
	16–17	Scandinavian Activity CW Contest
	16–17	Washington Salmon Run
	16–17	ARRL 10 GHz and Up Cumulative Contest
	17–19	Tennessee QSO Party
	23–24	CQ/RJ World-Wide RTTY DX Contest
	23–24	Scandinavian Activity SSB Contest
October	7–8	California QSO Party
	7–8	VL/ZL Oceania SSB Contest
	7–8	Pennsylvania QSO Party
	14–15	VK/ZL Oceania CW Contest
	28–29	CQ WW SSB DX Contest
November	4–6	ARRL November Sweepstakes CW
	11–12	WAE RTTY Contest
	11–12	OK/OM DX CW Contest
	18–19	LZ DX Contest
	18–20	ARRL November SweepstakesPhone
	25–26	CQ WW CW DX Contest
December	1–3	ARRL 160 Meter Contest
	9–10	ARRL 10 Meter Contest
	16	OK DX RTTY Contest
	16–17	Croatian CW Contest
	17	RAC Canada Winter Contest

Table I– Year 2000 Contest Calendar. (Some dates may change pending updated contest announcements from sponsors).

This is the low-band edition (others to follow in subsequent months), and operation is limited to 160–40 meters, exclusively.

Classes: Single operator high power/low power, all band/single band; multi-operator; and maritime mobile.

Exchange: JA-RST and prefecture number (1–50); others send RST and CQ Zone.

Scoring: 160 meters 4 points, 80 meters 2 points, 40 meters 1 point per QSO. Multipliers are total prefectures worked per band (DXCC countries for JA). Final score is total QSO points times multiplier.

Awards: Plaques and awards will be sent to the winners in each class around the world. A special contest award will be offered to anyone working all Japanese prefectures during the contest period.

All logs must be postmarked no later than February 28th and should be sent to: JIDX LFCW Contest, c/o *Five-Nine* magazine, P.O. Box 59, Kamata, Tokyo, 144 Japan. E-mail log submissions will be judged with the time stamp of the e-mail and should be sent to <jidx-log@ne.nal.go.jp>. Contest results will be sent to anyone including one IRC and an SAE.

1998 North American QSO Party

CW: 1800Z Sat. to 0600Z Sun., Jan. 8-9
SSB: 1800Z Sat. to 0600Z Sun., Jan. 15-16

The object of this one is to work as many North American stations (and/or other stations if you are in North America) as possible during the contest period. North American stations are defined by the rules of the CQ WW DX Contests with the addition of KH6.

Classes: Single operator and multi-operator, two transmitters. Multi-operator stations must keep a separate log for each transmitter and must have at least 10 minutes between band changes. Use of helpers or spotting nets by single operator entrants is not permitted. Single operator entrants may only have one transmitted signal at a time. Output power must be limited to 150 watts for eligible entries. Multi-operator stations may operate for the entire 12-hour period. Single operator stations may operate 10 out of 12 hours. Off times must be at least 30 minutes in length and clearly marked in the log.

Mode: CW only in CW parties. Phone only in phone parties.

Bands: 160–10 meters only (no WARC bands). You may work a station once per band. Suggested frequencies are 1815, 3535, 7035, 14035, 21035, and 28035 (20 kHz up from band edge for Novice) on CW; and 1865, 3850, 7225, 14250, 21300, and 28450 on phone. Try 10 meters at 1900Z and 2000Z, 15 meters at 1930Z and 2030Z, and 160 meters at 0430Z and 0530Z.

Exchange: Operator name and station location (state, province, or country).

Scoring: Multiply total valid contacts by the sum of multipliers worked on each band. Multipliers are states (including KH6 and KL7), Canadian call areas (VE1–VE8, VO1, VO2, VY1, and VY2) and other North American countries. Do not count

USA, Canada, KH6, or KL7 as countries. Non-North American countries do not count as multipliers, but may be worked for QSO credit.

Team Competition: Team competition is limited to a maximum of five single operator stations (two minimum) as a single entry unit. *Pre-contest Requirement:* To qualify as a team entry, you must register the name, callsign of each operator, and callsign of the station operated should the operator be a guest at a station other than his own (e.g., N4RJ op. by W4AN). Teams must be registered with the contest director before the contest.

Penalties: For each unmarked duplicate QSO you lose that contact plus an additional three contacts; for each QSO for which you are not in the other station's log, you lose that QSO plus an additional one contact; and for each QSO for which the log data is incorrectly copied in any respect, you lose that contact. Entries with score reductions greater than 5% will be disqualified.

Awards: A total of five trophies will be awarded for the high score in each of the following categories: Single Operator CW and Phone, Multi-Operator CW and Phone, and Single Operator Combined score. Certificates of merit will be awarded to the highest scoring entrant with at least 200 QSOs from each state, province, and North American country.

Send CW North American QSO Party entries to Bob Selbrede, K6ZZ, 6200 Natoma Ave., Mojave, CA 93501. All SSB logs go to: Bruce Horn, WA7BNM, 4225 Farmdale Ave., Studio City, CA 91604. Entries must be postmarked no later than 30 days after the party to be eligible for awards. E-mail log submissions *must be* in ASCII text format and must include your summary sheet and complete log. Name your files with your callsign (i.e., yourcall.SUM and yourcall.LOG). Do not send any binary format logs (i.e., yourcall.BIN or yourcall.QDF). NAQP CW logs should be sent to <k6zz@ccis.com> and NAQP SSB logs to <bhorn@hornucopia.com>.

HA DX Contest

0000Z to 2400Z Sun., Jan. 16

Sponsored by the Hungarian Radioamateur Society, this is one of several very popular eastern European national contests. The contest is CW only and stations may be only worked once per band.

Classes: Single op, single band; single op, all band; multi-op, single transmitter; multi-op, multi-transmitter; and SWL.

Exchange: RST plus serial number (599001). HA stations will also send a two-letter code corresponding to their county. The possible codes are: BA, BE, BP, BN, BO, CS, FE, GY, HA, HE, KO, NO, PE, SA, SO, SZ, TO, VA, VE, ZA.

Scoring: Count 6 points per HA QSO and 3 points for non-HA QSOs on other continents. Final score is total QSO points times sum of HA counties worked per band.

Entries are due six weeks after the contest and should be sent to: Hungarian DX Club, Box 79, Paks, H-7031 Hungary.

ARRL VHF Sweepstakes

1900Z Sat. to 0400Z Mon., Jan 22–24

This is the 53rd ARRL January VHF Sweepstakes. ARRL Headquarters recommends that you use the official log forms, which will help make your log keeping and scoring much easier. A large SASE to Newington will get you the necessary forms. Complete rules can be found on ARRL's web site at <www.arrl.org>. They are a bit complicated, so look them over carefully.

CQ WW 160 Meter Contest

CW: Jan. 28–30 SSB: Feb. 25–27
2200Z Friday to 1600Z Sunday

Complete rules were published in the November issue. The following is a brief overview.

Exchange: RS(T) and QTH. State for U.S., areas for Canada, country abbreviation for DX.

Scoring: Contacts with stations in own country 2 points, other countries in same continent 5 points, and with other continents 10 points.

Multiplier: Each U.S. state (48), Canadian area (13), and DX country. (ARRL and WAE country lists and WAC boundaries are the standards.) Note that Washington, D.C. is now a multiplier (same as a state).

Awards: Certificates to the top-scoring stations in each U.S. state, Canadian area, and DX country will be awarded as well as an assortment of plaques for U.S. and world winners.

Penalties: Three contacts will be deleted for each duplicate that has not been removed.

Disqualification: Taking credit for excessive duplicate contacts, and the usual assortment of rules violations and unsportsmanlike conduct.

Mailing deadline for logs is February 30th for CW entries and March 27th for the SSB section.

Logs should be sent directly to: CQ 160 Meter Contest, David Thompson, K4JRB, 4166 Mill Stone Ct., Norcross, GA 30092 or via e-mail to <cq160@contesting.com> with the usual e-mail log guidelines. *Indicate CW or SSB on the envelope.*

1999 REF Contest

CW: 0600Z Sat. to 1800Z Sun., Jan. 29–30
SSB: 0600Z Sat. to 1800Z Sun., Feb. 26–27

The Reseau des Emetteurs Francais (REF) invites radio amateurs from around the world to participate in the REF Contest, the object of which is to establish as many QSOs as possible between radio amateurs around the world and French stations. French stations are defined as (1) stations from France and Corsica, (2) French military stations in Germany, and (3) overseas territories and departments (i.e., FG, FH, FJ, FK, FM, FO, FP, FR, FS, FT, FW, FY). Operation is on 80–10 meters only (no WARC bands).

Classes: Single operator, all band and single band; multi-single; and SWL.

Exchange: RS(T) and serial number. French stations give RS(T) and department number. Overseas territories use RS(T) and prefix.

Scoring: Credit one point for QSOs within the same continent and three points for QSOs with another continent. All QSOs with "French speaking countries" stations are worth 5 points (C3, CN, D6, HB, HH, HI, J2, LX, OD, ON, TJ, TL, TN, TP2CE, TR, TT, TU, TY, TZ, VE2, XT, YJ, 3A, 3V, 3X, 4U1ITU, 5R, 5T, 5U, 5V, 6W, 7X). Multipliers are French departments, military stations, and territories per band. A special multiplier may be taken for working F6REF/00 per band.

Awards will be sent to the first-place single and multi-operator winner of each country. All logs must be received before March 15 (CW) and April 15 (SSB). Send entries to: Reseau des Emetteurs Francais, REF Contest, BP 2129, 37071 Tours, Cedex, France.

U.B.A. Contest

Phone
1300Z Sat. to 1300Z Sun., Jan. 29–30
CW
1300Z Sat. to 1300Z Sun., Feb. 26–27

This one is sponsored by the Belgium Amateur Radio Union (U.B.A.) and is any station working any other worldwide. Numerous operating awards are available, and contest QSOs may be credited towards these awards.

Classes: Five categories—Single operator, all band/single band; multi-operator/single transmitter; QRP 5 watts; and SWL. In all categories *only one* transceiver (or receiver) is allowed at any time during the contest. Only one transmitted signal is permitted at any time during the contest, so *no* multiplier station permitted. The use of DX Cluster facilities is permitted for all categories.

Frequencies: CW—3500–3560, 7000–7035, 1400–14060, 21000–21060, 28000–28060 kHz. SSB—3600–3650, 3700–3800, 7040–7100, 14125–14300, 21175–21350, 28400–28700 kHz. Note that ON stations are only allowed 1830 to 1850 kHz on 160. It is mandatory to respect the IARU Region I band plan and the IARU Region I contest preferred frequencies.

Exchange: RS(T) and consecutive serial number. Belgian stations also give their province abbreviation.

Multipliers: All Belgian provinces, prefixes—ON4–9, DA1–2, and European Community countries. A QSO with a Belgian station can give you two multipliers—province and prefix.

Scoring: QSOs with ON count 10 points. European QSOs count 3 points. All others are 1 point. Final score is total QSO points times total multipliers.

Awards: There are several awards available, including trophies and certificates to the high scorers in each operating class. Note that the 12th European Union Trophy will be awarded to the highest scoring EU member station from both the CW and SSB Class B competition.

Send your final results no later than 30 days after each contest mode to: UBAHF Contest Committee, Carine Ramon, ON7LX, Bruggesteenweg 77, B-8755 Ruiselede, Belgium. Logs via e-mail are accepted at <ON7TK-ON7LX@village.uunet.be>. A confirmation will be sent when the log arrives. ■

The RF Applications VFD RF Power/VSWR Meter

VHF VERSION now available

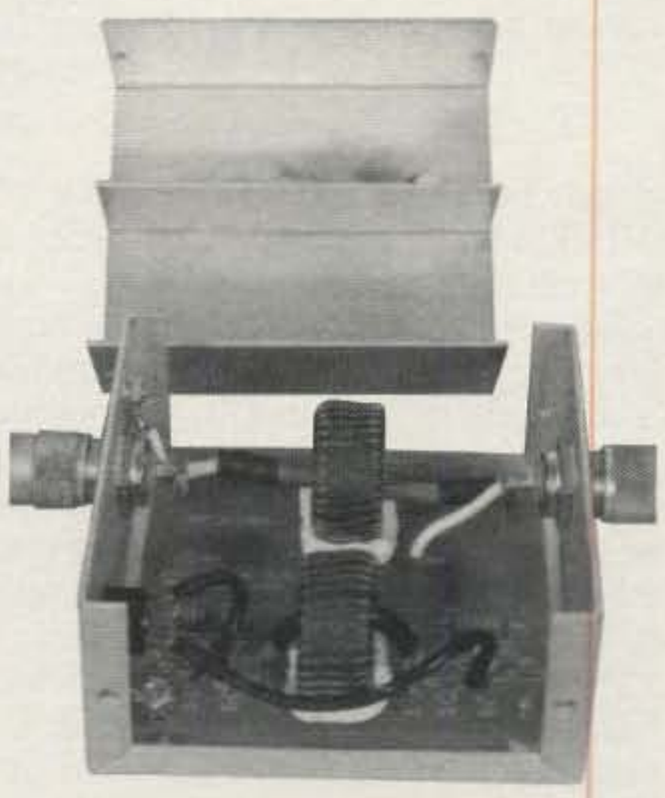
The ONLY Wattmeter for the Serious Operator

EXCITING NEW TECHNOLOGY

RF Applications, Inc. VFD Series Wattmeters represent breakthroughs in microprocessor, display and software technology. These units feature a 2 line by 16 character vacuum fluorescent display, tuning and operate modes, and a settable VSWR alarm limit. With our VFD External Relay Option, you can use this instrument to interrupt your transmit control circuitry to protect your valuable station equipment in high VSWR conditions (wrong antenna, bad cable, ice, etc.).

We can even *personalize* your wattmeter with your callsign (11 characters maximum). The Vanity Option is supplied as a separate chip (you keep the original), so your VFD can still be used by someone else!

Housed in a compact (5.75" by 3.0" by 2.0") enclosure, the VFD Series Wattmeters offer many features you cannot find anywhere else. The VFD Wattmeters use our "battle proven" remote sensor design being used around the world today. All this at a price you can afford.



ALARM INDICATION

You can set the VFD to tell you if your VSWR has exceeded a preset limit. A bright red LED tells you if you have exceeded 1.5:1, 2.0:1, 2.5:1 or 3.0:1 (the default). If you have installed the optional relay, you can disable your amplifier to prevent damage to your system.

THE BEST SENSOR

The VFD uses our P-3000-D sensor. Insertion loss and VSWR are minimal, and the sensor uses large cores that will not saturate, even above 1.5 kW. Network analyzer plots of the sensor's performance are available on request.

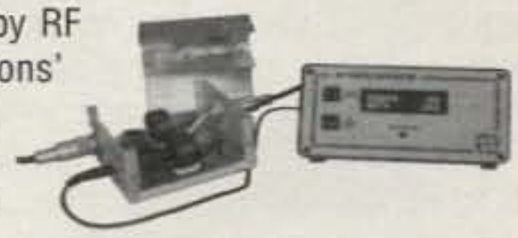
The VFD gives you a real time peak and hold display of your actual power and VSWR *every time you transmit*. This means that you'll always know that your system (exciter, amplifier, feed lines, antennas, etc.) are operating the way you intend them to. Tuning an amplifier has never been easier because the VFD's 65 element bar graph gives you better resolution than a meter. In addition, you can select a quick update for the displayed power (Tune Mode).

IS IT ACCURATE?

The VFD uses sophisticated technology that achieves remarkable accuracy in a low cost package. Compare it with your Bird™ or other accurate meter. You'll be amazed at this unit's performance.

WHAT YOU GET

The VFD is shipped with a display unit, the P-3000-D sensor and a 12 VDC power cable. This product is covered by RF Applications' standard two year warranty.



KEY SPECIFICATIONS

Frequency range:
1.8 to 30 MHz (60 MHz with recalibration)

Power:
5 - 2,955 watts (VSWR accuracy suffers below 20 watts)

Nominal impedance: 50 ohms

Accuracy:
Better than ±10% of the displayed reading

Operating power:
12 VDC at 130 mA average, 200 mA max

Connectors: SO-239 (2)

Signal cable length: 62" (24.4 cm)

Shipping weight: 3 pounds

COST AND OPTIONS

The VFD sells for $249.00, and the following options are available:

Vanity Option ($20.00)—You can special order a replacement chip for your VFD that can contain up to 11 characters of your choosing.

VSWR Alarm Relay Option ($20.00)—This option adds a reed relay output to the VFD that you can use to inhibit a radio or amplifier when your preset VSWR limit is exceeded.

Power Monitor Option ($35.00)—The Power Monitor Option allows your VFD to monitor your transmitted power and gives you relay contacts to let you know that you are applying RF to an antenna.

All options are available factory direct only.

OUR CUSTOMERS SAY

"This one is a keeper. Easy on the amp, and easy on the QRM."

--WXOB

"Best station accessory value since computer logging."

--W3LPL

"Best wattmeter I own."

--W4AN

Founded in 1992, RF Applications has products installed and operating around the world.

RF Applications, Inc.
7345 Production Drive
Mentor, OH 44060 USA

+1 440.974.1961 Voice
+1 440.974.9506 Fax
1.800.423.7252 Orders

http://www.rfapps.com
sales@rfapps.com

VISA MasterCard DISCOVER

CIRCLE 74 ON READER SERVICE CARD

Antennas

BY ARNIE CORO, CO2KK

Connecting Your Station To The World

1... 2 ... 3... 4... TEN + —Five low-cost Antennas for Y2 MAX Year!

Arnie Coro, CO2KK, is well-known to hams and shortwave listeners the world over. Besides being very active on the amateur bands, Arnie is the host of two programs on Radio Havana, including "DXers Unlimited," a weekly program about DXing and hobby radio. He was a regular contributor to CQ VHF, *and we're very pleased to have him join our roster of Contributing Editors at* CQ. *—W2VU*

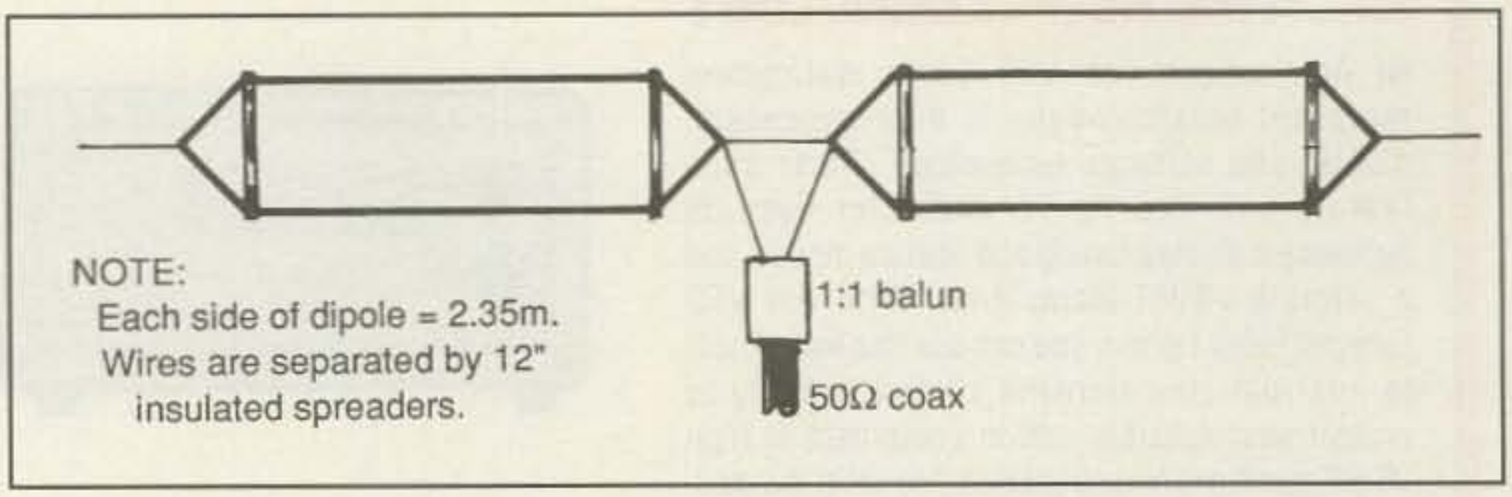


Fig. 1– The Fat Dipole for 10 meters has a bandwidth greater than 3 MHz, making it usable across the entire 10 meter band. With an antenna tuner, it will work on 12 meters as well.

Ten meters! One-point-seven megahertz of radio frequency spectrum assigned to amateur radio, giving you the opportunity to work DX using low power and simple antennas now that solar Cycle 23 is racing towards its peak, which is widely expected to be sometime during the year 2000.

Due to the very low ionospheric absorption prevalent at the upper end of the HF band near 30 MHz, a simple antenna with an appropriate low takeoff angle and a low- power rig are all you will need to see your number of countries worked on 10 go past the 100 mark in a few weeks during solar maximum years.

Antennas for 10 meters need not be expensive or difficult to homebrew, as these 4+ simple projects will demonstrate.

No. 1: "The Hacksaw Special"

Shopping around for a CB quarter-wave ground-plane vertical is not too difficult. There certainly are many different commercially built 1/4-wave antennas for the 27 MHz band which use aluminum pipe or tubing for the radiating element, and three or four dropping wires for the radials that form the ground plane. The fastest and perhaps one of the most inexpensive 10 meter band antennas that is capable of producing the low takeoff angle radiation required for working DX is precisely a converted 11 meter CB antenna.

Try to find the highest possible quality antenna to start with, and proceed to resonate the vertical radiator to the part of the 10 meter band you plan to operate most of the time. A good center frequency to cut the antenna to is 28.5 MHz, which should give reasonably low SWR from the low end of the band up to around 29 MHz. If you plan to operate on 10 FM, then the radiator should be resonated to around 29.2, which still will give acceptable SWR down to 28.5, allowing SSB DX to be worked, too. (You're cutting to 1/4 wavelength here, so use the formula 234/f [MHz] to find the dimension for your center frequency of choice).

Do not use steel whips for this project. They are too thin, and thus their bandwidth is much more limited. CB antennas with telescoping elements are the best, as they can be resonated by changing the overall length with just loosening a small clamp, adjusting the upper section, and retightening the clamp.

A more typical "conversion" will need a hacksaw and some elbow grease. Once you have decided on which part of the band to tune your antenna, proceed to measure the 1/4 wavelength plus about 5 percent, and do a first trial cut.

Install the antenna as high and in the clear as possible, placing the four radials at an angle of between 30 and 45 degrees. Use the highest possible quality 50 ohm coaxial cable (more on this later) and run an SWR test at the projected center frequency. A well-done sweep, starting at the low end of the band and going all the way to 29.7 MHz, will give you a very good idea of what the next step should be.

Work slowly, and by all means avoid the 1:1 SWR syndrome. You will not achieve a "perfect" match and you don't need to. Your converted CB 1/4-wave vertical should show an SWR of around 1.2:1 to 1.4:1 at resonance, and that's all you will really need when running rigs in the 100 watts or less class.

Next make the radials using No. 12 or No. 14 bare copper wire. They should be cut about 5 percent longer than the radiating element (see formulas in Table I).

As with all vertical antenna systems, it's always a good idea to provide some kind of static discharge path to ground. You

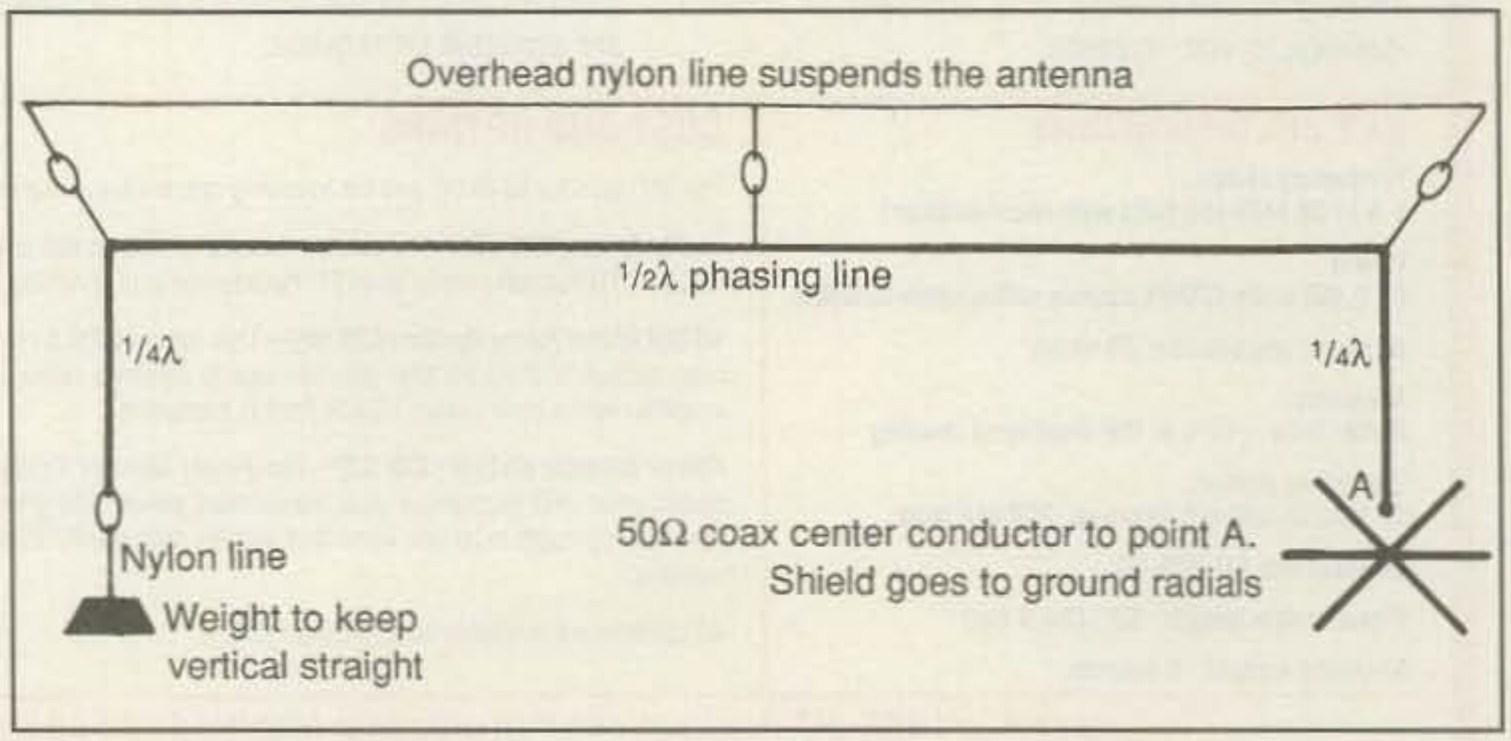


Fig. 2– The Half-Square Antenna Array. Note: This is the RIGHT way to feed a half square. Other methods you may have seen, including those using an LC tuning network, will not work well—and neither will the antenna. Feed it this way and you should get excellent results.

Antenna Data

Hacksaw Special

Use the standard formula to calculate the length of the 0.25 radiating element—that is, 234/f(MHz) = length in feet, or 71.5/f(MHz) = length in meters.
You will want to make the first "cut" a little longer, and carefully check the antenna's resonant frequency until the lowest SWR is obtained.
The typical converted CB 1/4-wave vertical with drooping radials will show an SWR of 1.5:1 or lower at resonance.
Remember that the radials must be 5 percent longer than the radiating element.

Broadband Fat Dipole

Minimum antenna height above ground or roof = 3 meters (approx. 10 ft.)
Overall length of the antenna = 5 meters (approx. 16 1/2 ft.)
Spacing between upper and lower wires forming the dipole = 30 cm (1 ft.)
Wire used = No. 14 or No. 12 (may be PVC insulated or bare copper)
Use a 1:1 balun to feed this dipole.
The points where the wires join should be soldered with a heavy-duty soldering iron or a blowtorch.

Half-Square Array

Vertical elements of the antenna (2) use the formula 278/f (MHz) = length of the element in feet.
For the typical 28.5 MHz center frequency, the antenna's vertical elements are 2.97 meters (approx. 9 3/4 ft.)
Horizontal element of the antenna (1) use the formula 447/f (MHz) = length in feet.
For the typical 28.5 MHz center frequency the antenna's horizontal element will be 5.1 meters (approx. 15.6 ft.)
Feed impedance when antenna is about 3 meters (10 ft.) from the ground typically will provide a very good match to a 50 ohm transmission line when the Half Square Array is fed at one of the corners using the decoupling method explained in the main text.
This antenna can be installed as a "sloper" providing both horizontal and vertical polarized waves, but the lower end must be at least 3 meters (about 10 ft.) from the ground.

EMGP (Electromagnetic Ground Plane)

First the ground system or counterpoise: Use no less than 16 quarter-wave radials, and if possible use a wire mesh of about 1/8-wavelength radius soldered to the bottom of the vertical part of the antenna.
Here are the dimensions for the 28 MHz EMGP:
Vertical part = 1/12 of a wavelength = 85 cm (approx. 33 1/2 in.)
Horizontal part = 1/6 of a wavelength = 1.7 meters (approx. 67 in.) (This will need fine adjustment to resonance.)
Gamma match element length = 47 cm (approx. 18 1/2 inches) (It will also need fine adjustment, so start with about 55 cm and move the matching point until lowest SWR is obtained.
Separation between the gamma match and the radiator = 5 cm (approx. 2 in.)

BFD (Broadband Fan Dipole Antenna)

Note that this antenna requires the use of a 4:1 balun and an antenna tuner.
The 5 elements on each side of the dipole are all of the same size—that is, 3 meters (approx. 10 ft.) long, and they are separated at their ends in such a way that the antenna is 1.5 meters (approx. 60 in.). This gives a radiating element that has a 2:1 ratio of length to width.
The two coaxial cables used for the pararell shielded transmission line are of 75 ohms impedance, and their shields are tied together at the antenna end, but left floating.
At the connection to the 4:1 balun, the two cables' shields are also connected together, and then connected with a low-impedance braid to the station's ground.

Table I– Data for the 10 meter antennas described in the text.

can do this by building a simple spark gap at the base of the antenna, or by using one of the popular "coaxial gas-tube surge protectors" properly installed with an adequate grounding system.

No. 2: The Fat Dipole

Another low-cost, highly effective, broadbanded antenna for 10 meters is the so-called *Fat Dipole*, which I will recommend to those of you who enjoy both working CW at the low end and chatting via NBFM repeaters at the high end of 10. Instead of having to install *two* antennas, building a Fat Dipole (fig. 1) will let your rig work at a comfortably low SWR at both ends of the band.

Use No. 12 or No. 14 copper wire, 2.5 m (8 ft., 1 1/2 in.) on each side. Electricians' PVC insulated wire used for home installations is a good low-cost choice, and in this case the slightly different velocity factor shown by insulated wire as compared with bare copper will not make a difference in the antenna's resonant frequency of performance. Follow closely the dimensions shown in the graph, but again, this is not a critical antenna at all. The wires should be spaced 30 cm (12 in.) apart using spreaders made from fiberglass rod or PVC pipe.

Feed your Fat Dipole with 50 ohm low-loss cable, and as always, make sure that connections between the downlead and the antenna are not only properly soldered, but also are properly *sealed against humidity*. There is nothing more annoying than seeing how an otherwise perfectly working antenna starts to show a progressive increase in SWR due to poor protection against the weather. As many of you know too well, once a length of coaxial cable spoils due to water seeping between the braid and the center conductor's insulation, there is no choice but to send it to the local recycling facility.

The Fat Dipole will show a very reasonably low SWR from 28.0 MHz up to 29.7 MHz, and a good way to install it is by making it slope at an angle between 20 and 45 degrees. A sloping Fat Dipole will provide an excellent "mix"of vertical and horizontal polarization, so it will work well both with local CW and SSB stations that use horizontal antennas and NBFM stations using verticals. For DX signals there is not much difference at all, as Faraday rotation will make the polarization of the waves reaching your receiver change quite a bit during a QSO. The antenna will work best if its lowest point is at least 3 m (10 ft.) above the roof or ground. There are many possible geometries for the Fat Dipole, but the one shown here has proven to work very well and is the easiest to build of them all!

No. 3: The Half-Square Array

Now we are talking not about a single-element 0 dBd or even less gain antenna. The *half-square array* is a low-cost approach that can be built using wire elements and Dacron or other insulating material ropes (fig. 2). It's a nice antenna for portable work, too, as it goes up in just a few minutes. Among the advantages of the half-square array is that it is a *self-completing* antenna system, which means in technojargon that it does not need a ground plane to operate properly.

A half-square array for 10 meters uses about the same space as a conventional half-wave horizontal dipole, but it provides two distinct advantages: (1) it has no less than 3 and up to 4 dB gain over the dipole; and (2) it radiates a vertically-polarized, low take-off angle wave. Number 2 here is very important if you are really going to get involved in working DX on 10 during Y2 MAX.

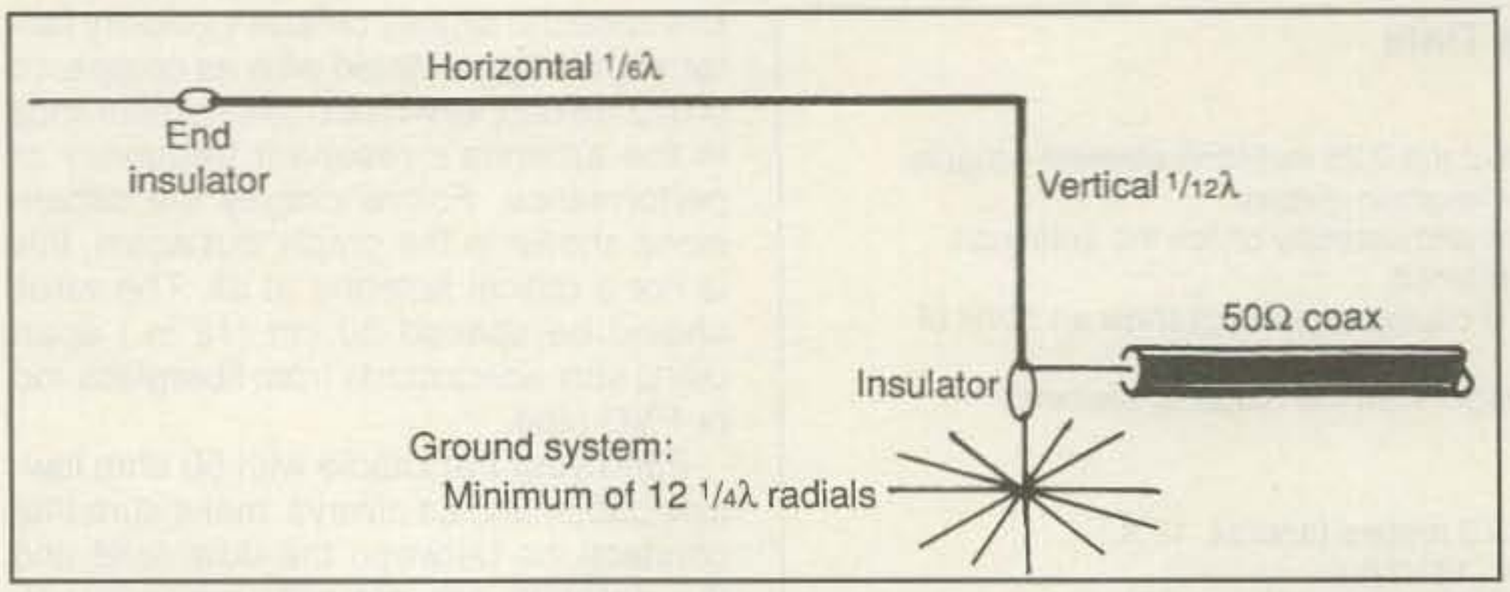


Fig. 3– The low-profile Electromagnetic Ground Plane (EMGP) antenna. Note that the ground plane is essential and the length of the horizontal portion will need to carefully be tuned to resonance.

Why Ten?

Propagation gurus are forecasting the solar maximum to occur around the middle of this year (2000). The peak solar flux will make Cycle 23 somewhat similar to previous Cycle 22 or a little less. Solar flux figures above 150 units are needed to keep 10 meters going, and they are expected to be available for extended periods from the last quarter of 1999 all the way up to year 2002 or a bit further.

That's why building a low-cost 10 meter antenna for your station can be such a highly rewarding project, and the more we radio amateurs make good use of 10 meters the less chance there will be of intruders and illegal stations setting foot in our widest HF band of them all.

Here's an important note: Many people feed half-square arrays the *wrong* way, and that has led to many complaints of poor performance not only for this antenna, but also for its close relative, the *Bobtail Curtain.* Therefore, pay close attention to the instructions in fig. 2 for feeding your half square, and use an appropriate system for decoupling the 50 ohm coaxial line from the antenna elements.

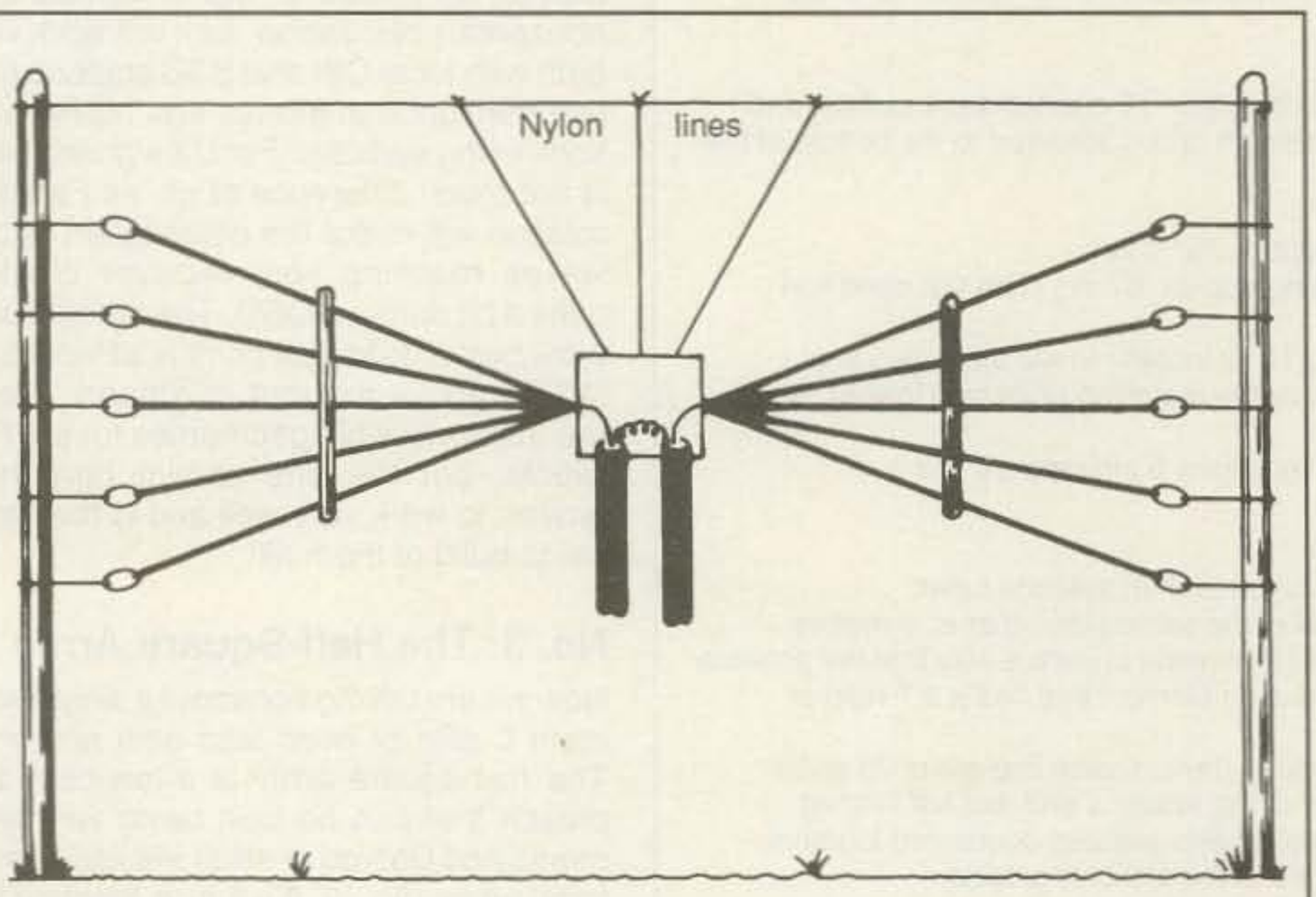
There are two approaches to decoupling: One is by using an adequate length of ferrite rings which are placed one next to the other for no less than 30 cm, or about 12 in. This is perhaps nice, but it is also expensive. The poor man's approach is to wind some 6 to 8 turns of the coaxial cable right next to the feedpoint, using a 100 mm or 4 in. PVC pipe as a coil form.

Antenna elements are made from No. 12 bare copper wire, and here I do recommend bare and not insulated wire, as dimensions for 1/4-wave resonance do change when using insulated wire due to the difference in the velocity factor.

As you can see, the half-square array (in this low-cost version) hangs from insulated ropes, but there is no objection to using self-supporting vertical elements made of aluminum tubing and insulated-form ground using conventional ceramic or polymer insulators.

Install your half square as high as possible, and if you have enough space, two of these antennas and a switching device will give you 360-degree coverage. If only one half-square can go up, then try to place it so that the maximum radiation, which is broadside to the vertical elements, favors those areas you need to work most.

You can make *fat vertical elements* (see the Fat Dipole) if you need an antenna with wider bandwidth, but DXers usually cut their arrays for the lower part of the band, centered around 28.3 or 28.4 to work both CW and SSB DX. If you ever need to work FM at the high end, a simple antenna tuner will bring the SWR down to keep those finals cool.



NOTES:
1. The shields af the two coax lines are joined at the feedpoint and left floating, not connected to the antenna element.
2. The rectangle is made of aluminum angle and serves as support for the two coax cables and the antenna elements.
3. Coax inner conductor is connected to the 5 wires forming the fan dipole.

Fig. 4– The Broadband Fan Dipole (BFD) Antenna System. This unique antenna system uses two coax feedlines, with the shields joined together at both ends. In the shack they're tied to ground, and at the antenna they're connected to each other but to nothing else. The center conductor of each cable attaches to one set of five 3 meter long wires that make up the fan dipole. The antenna works on 15, 12, 10, and 6 meters.

No. 4: The Low-Profile EMGP

"No space for an antenna here!" "Can operate HF in the car, but at home it's only handie-talkie territory. . . ." Ever heard those comments? If they sound familiar, here is the answer to make them null and void: It's the *EMGP*, or *electromagnetic ground-plane*, low-profile antenna (fig. 3). This one does need a full set of radials, or better yet, a ground mesh of no less than 1/8 of a wavelength around the feedpoint. But as you all well know, ground radials or even copper-wire mesh can easily be buried or just placed over a rooftop.

The EMGP's total vertical length is less than one meter, actually just 84 cm (33 1/2 in.) at 28 MHz. The amazing fact about this low-profile vertical is that when properly installed and tuned it makes 10 meter

operation possible at locations where no other antenna will go unnoticed.

For the EMGP I recommend using 4 mm copper wire, or even 6 mm refrigeration-type copper tubing. Keep in mind that this antenna has a low feedpoint impedance that can be somewhere between 8 and 12 ohms, so all connections should be really well soldered, and the ground-plane system is essential. A wire mesh of no less than two meters diameter centered at the base of the antenna is ideal, but some 20 or 30 quarter-wave radials will work well, too. I tested a combination of a 1/8-wavelength diameter wire mesh *plus* twelve 1/4-wave radials and the antenna matched very well, providing some nice contacts during last spring's first 10 meter openings.

This is a "hands-on" antenna. It requires careful tuning using appropriate instruments—essentially a high-quality SWR meter and my favorite cable attachment when working with single-band antennas, which is a length of high-quality 50 ohm coaxial cable cut to exactly one full electrical wavelength, taking into account the velocity factor of the cable. I attach the SWR meter to the transceiver's output with a very short length of cable, and then connect the antenna via the one wavelength cable, thus avoiding some of the typical problems that occur when measuring SWR close to the antenna's feedpoint and using a random length of cable.

Adjust the EMGP's gamma feed to minimum SWR at your preferred operating frequency, and run an SWR-versus-frequency sweep. You soon will realize that this is *not* a broadband antenna system! However, I'm sure you will agree with me that for an antenna less than 90 cm high (that's a bit less than 3 ft.) and providing low takeoff angle vertically polarized radiation, there is not much more to ask for!

Finally, the Plus (+)

Four easy-to-build, low-cost antennas for 10 meters gave this article its name. However, I couldn't resist adding the *BFD* antenna. The *Broadband Fan Dipole* (fig. 4) is not only an easy-to-build, nice-looking skywire, it also will let you operate on 15, 12, of course on 10, and even on 6 meters!

The BFD does require the use of an antenna tuner and a 4:1 balun, but it provides a nice broadband system covering 20 to 60 MHz, or a 3:1 frequency range.

It is easy to build following the illustration. All ten elements are the same length —3 m (9 ft., 9 in.) each, made from No. 14 wire. For this antenna it's okay to use PVC-insulated household electrical wire, which is inexpensive and plentiful. The two coaxial lines' shields of braids are connected together at the top (antenna end) and left floating. At the tuner's end they are also connected together, but they are then connected to the station's ground. I use an air-core 4:1 balun and a simple PI network antenna tuner that someday may be the basis for an article for *CQ,* too. Please note: To be most effective, the lowest element of this antenna should be at least 3 m (10 ft.) above the ground or roof.

73, Arnie, CO2KK

First Time? Ask For Help!

If this is your first antenna project, try to get advice from other local amateurs. You will want to install the coaxial cable connectors properly, something that requires a heavy-duty soldering iron, patience, and some practical experience. Connections between the feedline and the antenna must be both mechanically and electrically well done, and you will need to learn how to properly seal the coaxial cables from the weather. Special silicone compounds and elastic tapes used by cable TV technicians are ideal for weatherizing your antenna systems. Do remember that once water makes its way into the coaxial cable, there is no choice but to send it to recycling!

A side benefit to asking other hams for help: You just might make some new friends!

Beginner's Corner

BY PETER O'DELL, WB2D

For the Newcomer to VHF

Simple Wire Antennas for HF

Welcome to "Beginner's Corner." My goal in this column is to give the newcomer simple information that can be put to use immediately. I'll keep theory and jargon to a minimum, as we confront common problems the newcomer faces. Ham radio is more than a license or "owning" a callsign; it's more than a bunch of dry formulas and techniques found in *The ARRL Handbook;* and it's fun—it has always been for me, anyway. It's okay to laugh as you read this column, as from time to time I'll be telling you about dumb mistakes I made.

In keeping with the editorial theme of this January 2000 issue, I would like to look forward to what the new year and new millennium will bring for newcomers to amateur radio. For starters, it's going to be much easier to get a ham license that allows significant HF phone privileges. (You don't have to call a 1-900 number to figure out that one.) This, of course, has its positive and negative aspects. On the one hand, the bands are going to be more crowded. Ham radio has a long tradition of courtesy and common sense, and surely those virtues will be called upon in the months and years to come. Technology may come to our aid here by developing some new modulation system that frees up bandwidth, but that's down the road.

In the meantime, non-voice modes requiring little bandwidth may become more popular. It would be ironic if CW became the mode of choice not because it is required (or at least any significant proficiency with it), but because narrow bandwidth and relative lack of crowding make it more attractive. Who knows? Once it's not being forced upon the new ham, it may be a lot easier to fall in love with it. Time will tell.

*123 NW 13th Street, Suite 313, Boca Raton, FL 33432
e-mail: <wb2d@cq-amateur-radio.com>

Simple Wire Antennas For HF

Getting started on HF is pretty easy these days. Virtually everyone buys or borrows a rig; home construction is left to those stalwart souls who take great joy in such pursuits. Most people, I suspect, buy their antennas, too. That's a shame. Wire antennas are easy to assemble and inexpensive—and they perform well.

The simplest resonant antenna is the dipole, which is a 1/2 wavelength of wire fed in the middle, usually with 50 ohm coax. You can install this antenna in almost any configuration. When this antenna is installed so that the radiator is parallel to the surface of the earth, it is a dipole. Position it so that the center connector is the highest point above the ground and the legs slope down in different directions, and it's called an *inverted-Vee*. Orient it so that the radiator slopes down toward the earth from one end to the other, and it's called a *sloper*. Although it's not commonly done, you can also install it perpendicular to the surface of the earth as a *vertical*. (We'll take a look at vertical antennas in a future column.)

Most books and articles imply that the legs of the dipole have to run in a straight line. Well, they don't. Is it "better" if they run in a straight line? Sure. However, it's not necessary. I've had both indoor and outdoor antennas where space limitations forced me to bend the legs. I still made contacts. The radiation pattern may have been skewed a bit (so what?). Or maybe the SWR curve changed some. The point is that it still worked. If you have the space to make the legs go in a straight line, then do it. If not, then bend it.

How long should the dipole be? The magic formula is 468/f, where f is the frequency in MHz. The exact length of the antenna is probably never going to be exactly equal to that formula, and that's the fun of playing with antennas. Nothing ever works quite the way the formulas predict. This formula is a good place to start, though. Why? Because all sorts of things influence the exact length of a dipole, including soil conductivity, nearby objects, the size of the wire, and the characteristics of the insulating material on the wire (if any). For all anyone knows, the alignment of Jupiter's moons may have a subtle impact on the SWR curve of an 80 meter dipole.

Suppose you want to cut a dipole for 3920 kHz. That comes out to a few inches less than 120 feet using the formula. Is that going to put the minimum SWR of the antenna at 3920? Maybe, but maybe not. Go ahead and cut it for this length. Then put it up and test the SWR at several spots throughout the band (I usually use 50 kHz

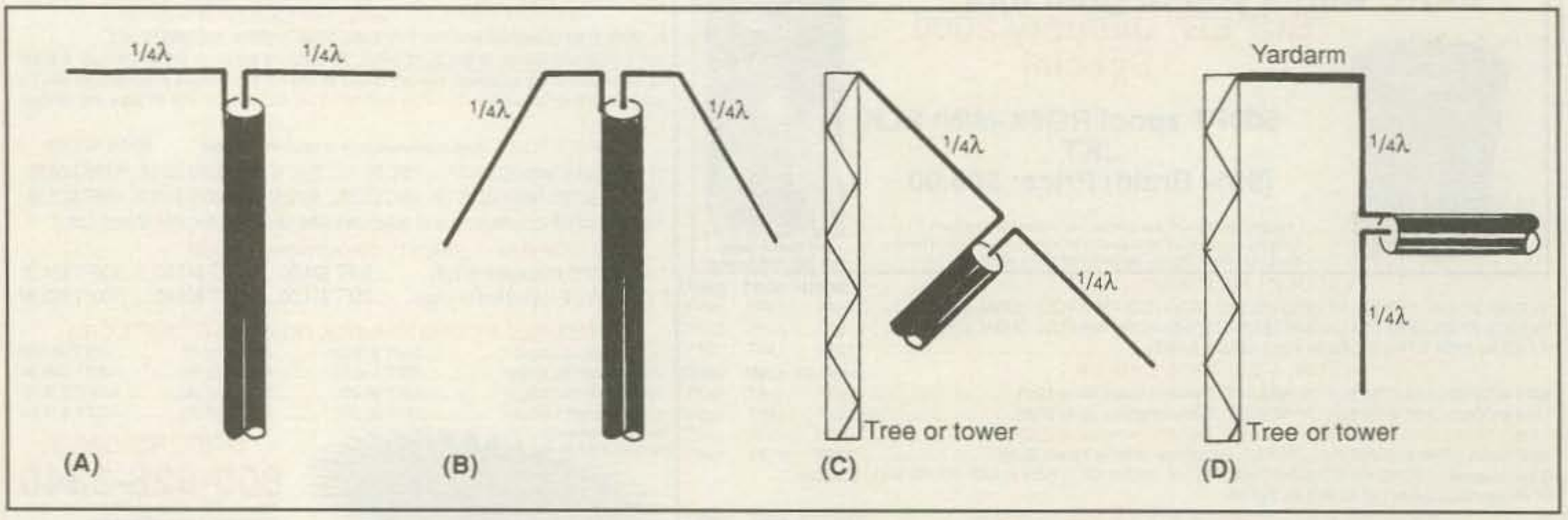


Fig. 1– The half-wave resonant antenna in its various configurations. (A) With the elements parallel to the earth, it is a dipole. (B) Slant the legs down from the center connector, and it becomes an inverted-Vee. (C) Anchor the end of one leg to a tall object and slope the whole antenna down and you have a sloper. (D) Hang the antenna from a tall object by the end of one leg, and it becomes a half-wave vertical.

increments until I zero in on minimum area.). If the minimum SWR is at a frequency that is higher than the intended one (3920 kHz in this example), then you need to make the legs a little longer. If it's at a lower frequency, then the legs should be shortened.

"Oh, no!" you shout. "I'll just buy it precut and assembled." Guess what? You still have the same problem if you buy a commercial wire antenna. I usually use #14 or #12 stranded copper wire for antennas. (Incidentally, #14 is the smallest size wire to use for antennas that is okayed by the National Electrical Code. Use something smaller, and the antenna police will come and carry you away.) The ends are attached to ceramic insulators by looping the ends through the insulator and soldering. What a pain to unsolder and resolder each time you want to adjust the length an inch or two.

After a few hours wasted with the propane torch and lineman's pliers, I finally figured out an easy way to handle this situation. I deliberately cut the leg about a foot shorter than what I expect the final length to be. For instance, with the above example, I would cut both legs to exactly 59 feet. Then I would assemble the insulators and solder the wire. However, I would also add a 15 inch "tuner" piece of wire to each leg. After attaching the rope to the insulator, I would loosely twist the "tuner" around the rope. Next I would raise the antenna to position and check the SWR.

Suppose the minimum SWR now occurs at 3860 kHz. I know I have to trim each leg, but how much? I can just guess, or I can do a little math and get real close on the next cut. If I multiply 120.5 (the actual length of the antenna) by 3.86 (actual resonant frequency), I get 465.13. Now if I use this figure instead of 468, I can calculate the exact length of an 80 meter dipole for my particular installation. Thus, 465.13 divided by 3.92 comes out to 118 feet 8 inches. That means I have to trim 1 foot 10 inches off the overall length, or 11 inches off each leg.

It is a simple matter to lower each leg and using a pair of cutters to clip 11 inches off each "tuner" section. No unsoldering. No mess. Five minutes and it's done —until the wire stretches! Sure, copper wire will stretch, and some alloys worse than others. However, it takes a while, and besides, it's strong and resilient. When I lived up north, I checked the SWR curve on my wire antennas each spring after the last ice storm. Once a year is probably enough for almost any installation.

You will need some sort of rope or nonconductive line to attach to the insulators to hold the antenna in place. I use nylon because of its availability and strength. Also, it tends to hold up well over a period of time (usually two or three years before noticeable deterioration). Nylon does stretch somewhat. Polyester rope is about 10% weaker than nylon, but it stretches very little. You will find it sold under brand names such as Dacron® or Terylene®. Polypropylene is the least costly of the synthetic ropes, but it is probably the least desirable for anything other than a temporary installation. Although it's strong and very lightweight, it deteriorates rapidly in sunlight. I used it once or twice on 80 meter dipoles. In each case there was noticeable deterioration after only a few months, and I had to replace it. Nylon will cost a little more, but it will last a lot longer. Cotton rope is okay, but it stretches a lot. Also, some varieties have a steel wire in the center to add strength. Obviously, you want to avoid this.

Finally, there are two major concerns with the center insulator: weatherproofing and mechanical stability. If the inside of the coaxial cable is exposed to the elements, you soon will have water inside the coax. At that point, the line will start to act like a big resistor. You probably will have a low SWR, but you won't work very many stations—about the same as what you would get trying to use your dummy load as your antenna!

I've seen a lot of solutions over the years, but my favorite has been to solder the center conductor of the coax to one leg and the braid to the other. I then fashioned a mold out of an ordinary tuna can by cutting slits for each leg and the coax. Also, I added an eye bolt for attaching a line. After putting the connection point inside the mold, I sealed it around the slits with tape. I then filled the mold with a resin product that is used to repair fiberglass boats. It sets in short order, and it's strong and waterproof. One such antenna I made like this lasted for over 15 years. This is just one technique. *The ARRL Handbook* shows examples of numerous other methods.

Finally, keep in mind that coax is heavy. Suppose you have a dipole elevated 50 or 60 feet with the coax dropping straight down to the ground. That's a lot of weight putting a lot of stress on the center connector. Add a little ice, and . . .

Next time we will continue with other simple antennas for the beginner.

Peter O'Dell, WB2D, was first licensed in 1963 and holds an Amateur Extra class license (since 1977). He holds WAS and DXCC, among other awards. Over the years he has participated in most phases of amateur radio. He was on the staff of both the ARRL and CQ Communications for several years. At the ARRL, he was deeply involved in promoting W5LFL's historic first ham radio operation from the Space Shuttle. Currently he lives in south Florida, where he owns and operates the Success Easy NLP Hypnosis Center.

Call for Photos and Stories

We'd like to hear from you about your experiences as a newcomer. If you have questions, we'll try to incorporate them into future columns. If you have photos (color prints or slides okay) of your station or antennas, please send them along and we'll publish the best ones. If you have a solution to a common problem that new hams experience, we'd like to hear about it so we can pass it along. You can contact me at <wb2d@cq-amateur-radio.com> or Peter O'Dell, WB2D, Beginner's Corner, 123 NW 13th St., Suite 313, Boca Raton, FL 33432.

Looking Ahead in CQ

Here are some of the articles that we're working on for upcoming issues of *CQ:*

- "The Grid Dip Oscillator," by K8WPI
- "A Weathernode Paging System," by KC5RTH
- "Unusual Propagation," by WB2AMU
- "Build Your Own Laser Station," by GM4RJX

Plus...
- "A Tale of Three Continents," by K5MAT
- "A Vacation DXpedition to Bermuda," by WB2AMU/VP9
- "The Why and How of CW," by W6BNB
- "Wilderness Ham Shack," by WA6NGH

Authors wanted! If you've got a ham radio story to tell, we'd like to hear about it and consider sharing it with our readers. If you'd like to write for *CQ*, please send a request for writers' guidelines, along with a self-addressed, stamped envelope (SASE), to: *CQ* Writers' Guidelines, 25 Newbridge Rd., Hicksville, NY 11801. We plan to have an online version available soon on our website <http://www.cq-amateur-radio.com>.

VHF Plus

BY JOE LYNCH, N6CL

All About The World Above HF

The Future—Band By Band

As a way of starting off this new year, the last of the 20th century millennium, *CQ* Editor Rich Moseson, W2VU, has asked us columnists to reflect on what the future might hold for us. As I reflect on this assignment, I find myself in the dual role of prophet and chaplain.

Over the next two or three columns I will be looking at our spectrum band by band, starting with 50 MHz and ending with light. For each band I will be the prophet, telling what I foresee for the future, and the chaplain, encouraging us to make the best of what I see.

50 MHz

For 50 MHz I foresee continued exploration of the phenomenon of propagation. Our forefathers envisioned 50 MHz as a place where propagation is just enough of a challenge for us to continue to explore it. It is far enough removed from 10 meters so as to not be affected by *F2* propagation nearly as often as 10, but also it is not high enough in frequency so as never to be affected by it.

This past sunspot cycle afforded us a lot of opportunity to experience F2 propagation with fantastic results. It produced the first DXCCs ever in the history of the 50 MHz band, partly because of the propagation and partly because of the increased activity in more different countries, the latter often being fueled by the former. This increased activity made it possible for many of us to come close to attaining DXCC. Yet as the *F2* propagation waned, those of us perilously close to the magic number 100 started to scramble to see how else we could make those last few contacts to reach the goal.

For a while EME (Earth-Moon-Earth) was the answer. However, that interest quickly waned as more and more of us found out just how much of an investment it took to make those precious few contacts. Many of us found that the cost per QSO, whether monetary or time, was way beyond our means. This form of propagation has all but died out for the time being on this band.

I predict, though, that at the tail end of this next sunspot cycle there will be a resurgence of interest in EME communications on 50 MHz. Perhaps it may gather more enthusiasm than was witnessed in this past cycle. If it does, it mainly will be due to advances in technology that make the present barriers less formidable.

P.O. Box 73, Oklahoma City, OK 73101
(phone 918-627-6625; fax 918-835-9785)
e-mail: <n6cl@cq-amateur-radio.com>

VHF Plus Calendar

Jan. 2	Poor EME conditions.
Jan. 4	*Quads* shower predicted peak.
Jan. 6	New Moon, lowest declination and apogee.
Jan. 9	Poor EME conditions.
Jan. 14	First quarter Moon.
Jan. 16	Moderate EME conditions.
Jan. 20	Full Moon, near highest declination and perigee.
Jan. 22–24	ARRL VHF Sweepstakes.
Jan. 23	Excellent EME conditions.
Jan. 28	Last quarter moon.
Jan. 30	Very poor EME conditions.

• *EME conditions courtesy W5LUU*

Regarding *F2* propagation, we were spoiled by the last sunspot cycle. Unfortunately, the prognosticators seem to feel that we will reach the peak of this cycle sometime this spring and that the peak will be much lower than the last one. They also say that we may experience some of the good times we had during the last cycle, but only for about a year to a year and a half, and then it will be down hill all over again.

Encroachments from outside interests are not as likely. Four MHz on the edge of the North American VHF television allocation has always been problematic and that will not change significantly. Therefore, 50 MHz will continue to be less likely to hold any appeal to outside interests in the U.S. Overseas, however, is a much different story, as governments of various countries continue to view their hams' interest in 50 MHz with a great deal of reluctance. Without a sustained sunspot-driven interest in the band by us hams, countries that have little ham radio activity will continue to be reluctant to allocate permission for their hams to operate on this band. This in turn also will keep the number of new DXCC holders and the increase in country totals down.

Sporadic-*E* propagation will continue to be a mainstay for the band. Because so many new HF radios are equipped with the VHF bands of 50 MHz and sometimes 144 MHz, some of us will venture onto this band out of curiosity. Arriving at the right time when sporadic-*E* is in progress will cause some operators to want to stick around. However, without some education about this band's peculiar propagation modes, the casual visitor will not be interested in sticking around.

Challenges to the band will also include potential realignment of interests causing shifts in the need of spectrum. However, this is not too much of a threat on this band, as each interest's territory is pretty well defined already.

Another challenge to the band is the calling frequency. At present, proposed realignments of the DX window will continue to influence how we operate in that part of the band. With good ideas there comes opposition. As of this writing, how to protect DX on the band from interference from populated areas of the world is still being sorted out. Furthermore, the perennial question of who is DX to whom and when continues to make for problems on the use of this portion of the band.

The close proximity to our TV channel 2 here in North America will continue to be a challenge for us—something that your editor is experiencing first-hand. With a channel 2 in operation here in Tulsa, Oklahoma, my new QTH for a few years, I am very reluctant to install an antenna for this band and operate with it for fear that I will hear about my operations from my next-door neighbors.

Speaking of antennas, neighborhood antenna restrictions will somewhat stunt the growth of this band, as well as all of amateur radio, as more and more neighborhoods impose such restrictions on its residents.

For those of us who are diehard operators of 50 MHz, we will continue to have both challenges and opportunities. It will be up to us to meet these challenges by education and promotion of operating on the band.

144 MHz

Our next highest allocation in the VHF+ spectrum is 144 MHz. This band will continue to provide exciting propagation opportunities for the weak-signal VHF operator. Sporadic-E, meteor scatter, tropo, FAI, and EME all will provide opportunities to make contacts on this band.

Speaking of terrestrial propagation, there continues to be off and on interest in completing a transatlantic QSO via North America and Europe. I predict that this will occur during the next decade. A few years ago a Canadian and a Briton

worked very diligently, with one of them hearing a burst from the other, but that was the extent of the effort spread out over several days. However, I believe that with advances in technology will come the ability to hear weaker and weaker signals to a point where a viable QSO will result from some future effort between hams in North America and Europe.

I also believe that the tropo records in the Pacific between the islands and the U.S. mainland will be stretched out beyond Hawaii. Someone will make the effort to go to an island other than the state of Hawaii and break the record, thereby giving west coast operators a new country on this band. Additionally, because of advances in technology, I believe that a tropo QSO between Australia and New Zealand may take place on this band.

Speaking of threats to the band, this band unfortunately continues to be under siege both from within and without. The Low Earth Orbiting (LEO) satellite business in the past has eyed this band with interest. To date we have been able to keep them at bay. However, while they have not made much noise recently, they have not completely gone away.

Our biggest threat, therefore, seems to be from within. Lack of activity on the weak-signal allocation of the band has opened it to encroachment by operators of other modes, in particular FM. While proposals to put up electronic legal fences to keep such encroachments out have been put forward, controversy has surrounded such proposals. At present, probably because of the controversy, nothing is being done to legislate such electronic fences. The argument in support of increased population of the space by weak-signal operators seems to be the less-intrusive solution. However, as with 50 MHz, here again education is paramount.

Perhaps one of the better growth areas in this band will be EME communications. As more and more of us become acquainted with this mode and technological advances make it easier to operate on EME, our curiosity will increase interest in operating on this mode. The CW near-requirement for operating on this mode will provide some barrier, but only to the extent that we discover ways to use computers to copy and interpret that weak CW signal.

Speaking of CW, another potential growth area will be high-speed meteor-scatter operation. It is via this operation that the CW barrier has been most pierced by the use of computers.

As the Phase 3D satellite finally becomes operational, increased interest in satellite communications will take place. The narrow spectrum allocated to satellite operations will have to be used responsibly by both the satellite users and those who operate on nearby frequencies with other modes.

Lack of responsible use of the calling frequency will continue to plague us. If we continue to congregate on the calling frequency and engage in local QSOs, we will continue to miss out on openings. I cannot recall how many times I have heard distant stations on meteor scatter coming through over or on top of local stations rag chewing on the local calling frequency.

Another threat from within is the potential use of spread spectrum. Weak-signal operators, particularly EME, feel especially threatened because of the potential increase of the noise floor caused by the use of spread spectrum.

This mode also has tremendous possibilities. It has been my contention that the present way of allocating authorization for repeater operation on this band is at best counterproductive and wasteful. Our friends in the cell-phone business have shown us how to set up micro repeaters all over the place to provide fairly reliable phone service on their frequency spectrums. We need to take a serious, major look at just how we are using this mode of operation on the band with an eye toward better frequency management, thereby making better use of our skimpy resources on this band. Hopefully, the com-

ing years will bring developments in technology that will force us to do so. As with 50 MHz, as new operators discover 144 MHz, education will play a key role in both retention and responsible use of the band.

222 MHz

Because of the controversies surrounding the 222 MHz band, most of us in the weak-signal arena have shied away from it in recent years. Furthermore, because of its close proximity to TV channel 13, operators in communities where a channel 13 exists have been reluctant to operate on this band. In addition, because manufacturers of HF-VHF radios have skipped this band due to its lack of popularity, exploration of this band has been all but thwarted.

This band is rich with propagation challenges, though. Principally, tropo is the best mode of propagation. Even so, meteor scatter, aurora, EME, and rare sporadic-*E* openings provide additional opportunities for communicating on this band.

While at present there appears to be little threat to this band from outside interests, spectrum territorial wars within geographic areas of high population will continue to be a threat to weak-signal operation despite any further FCC intervention by way of regulations.

Again, population of the band will be the best form of protection of spectrum. And again, education as to the potential of the band will be the best way of populating it.

432 MHz

The 432 MHz band will continue to be challenged both from within and without. Again, outside interests such as LEOs see this band as having potential for their use. Within the band, territorial interests will press on adjacent interests to create friction. Also, as with 144 MHz, with the success of the Phase 3D satellite increase in satellite operation will continue.

For the weak-signal operator, the various modes of propagation—tropo, occasional meteor scatter, and aurora—will continue to keep us interested. In particular, interest in EME will continue to grow. It is most likely that the first couple of DXCCs will come within the next five years. Once this barrier has been pierced, interest will continue to increase as advances in technology also continue to strip away entry barriers.

With the advent of commercial HDTV, amateur television can go in either direction. Certainly, the spectrum is not wide enough to accommodate HDTV. However, as the old goes out, equipment will become less expensive and more readily available, thereby becoming of interest to hams. It is entirely possible that interest in ATV will enjoy an upward spike.

This increased interest may be problematic, as frequencies used by ATV are near frequencies used by satellite operation. Again, with the potential success of Phase 3D, satellite operation may enjoy an upward spike as well.

902 MHz

This band, unfortunately, is what I have to refer to as the garbage band of amateur radio. With so many interests vying for space within this band, any worthwhile amateur radio communication will continue to suffer. While it supports tropo and EME communications, interference from other users of this band will continue to plague amateur radio operation. I see no real amateur radio progress coming out of this band under present circumstances.

Next month I will give my observations and predictions for the other microwave bands. Should you have your own predictions, please let me know via the e-mail address at the beginning of this column.

ARRL VHF Sweepstakes

This annual winter classic takes place 22–24 January, beginning at 1800 UTC on the 22nd and ending at 0300 UTC on the 24th. Exchange is your grid square. Presently, this is the only VHF contest that features club competition.

The complete rules appeared in the December 1999 issue of *QST*. Rules, plus log/summary sheets, are also available electronically from the League from several different sources, including their bulletin board (860-594-0306), and their home page (http://www.arrl.org) via the World Wide Web. As always, mail or electronically file your log with the League.

Derwin King, W5LUU, predicts that this weekend should prove to be excellent for EME communications. Try something different. Some very intriguing grid locators could show up in logs this way.

The *Quadrantids*

The *Quadrantids*, or *Quads*, is a brief, but very active meteor shower. The expected peak is around 0740 UTC on 4 January. The actual peak can occur ±3 hours of the predicted peak. The best paths are north to south. Long-duration meteors can be expected about one or more hours after the predicted peak. As always, look to 3818 or 3843 kHz in the evening hours and to the VHF reflector on the Internet for opportunities for skeds.

And Finally . . .

It's time to start thinking about those New Year's resolutions. How many new grids on which band are you going to work? How many new states? Is WAS (Worked All States) in sight on any of the bands? How many new countries on 6 or 2 meters? High on your list should be: How many new hams will you help get licensed?

According to Fred Maia, W5YI, who tracks these things, we are stagnant in our growth. We must increase the number of hams so that we can mount an offense and keep our ham bands. This force must be united! If we fight among ourselves, we lose the big battles. Therefore, I reiterate that it is absolutely necessary that each one of us brings others into the hobby. And we must start with the young people.

Working with youth in my ministry confirms for me the absolute necessity of getting new, young recruits. Once we do, we must keep them for all of their lives, which means that they become our replacements. Our seniors did a wonderful job of recruiting us. However, we are woefully falling down on the job.

My conclusion: When making your New Year's resolution list, make sure that it includes Elmer duties at your local ham radio club at the very least. You will be glad you did, and so will the rest of us in the hobby. Until next month . . .

73, Joe, N6CL

How It Works

Theory 'n Practice

BY DAVE INGRAM, K4TWJ

An Introduction to Meters, Multipliers, and Shunts

Those of you who have followed this column to *CQ* from its former home in *CQ VHF* will recall that we recently discussed the basics of AC/DC circuits and oscillator stages used in amateur radio equipment. This month we continue along that same path with a straightforward, "keep it simple" look at meters and metering circuits. These electronic measuring devices are used to tell us what's happening in a particular unit, circuit, or rig. They typically are employed in transceivers, linear amplifiers, antenna analyzers, wattmeters, volt/ohm meters, and many more types of equipment. Knowing "How They Work" allows us to use meters to their full potential in an endless number of applications.

Whether you need to replace a panel meter on an older model classic rig, want to adapt a "fleamarket find" meter to a homebrew project, or are just curious about meters in general, read on! In this introduction to meters we will hold the complexities to the simplest level possible, and we also will apply to meters some of our recently acquired knowledge of series and parallel circuits. This approach will give you the ability to mix and match various meters and needs both now and later. The study promises to be informative, so settle back with a good reading light and a note pad and let's get started!

Types of Meters

The subject of meters is quite extensive, so let's begin by separating the little critters into specific types and categories.

First, there are single or stand-alone meters designed for direct mounting on panels of electronic equipment (photo A). Some folks also call these items "meter movements." They are made by companies such as Simpson and B & K, are designed to measure various ranges of AC and DC voltage and current, and are sold through electronic-parts supply outlets nationwide. A *panel meter's* internal mechanism is often made up of fine wire for measuring low levels of voltage and current, and one or two resistors may be included with the meter to extend its overall range. This technique will be explained more under "Multipliers" and "Shunts."

Another type of meter is the familiar *volt/ohm meter (VOM)*, or *multimeter* test instrument. Here, range-extending circuitry plus related switches, test lead sockets, and the meter's movement all are contained in one easy-to-carry case. These meters presently are available in both analog ("actual dial or scale" types as exemplified in photo B) and digital types (they have a numerical readout) as shown in photo C.

Recently another type of meter (which actually could be called a meter's display) also has evolved and become quite popular. It's the *multipurpose LCD panel*. An easily recognized example of this item is the backlit frequency and signal level/power output display on new-style solid-state transceivers. In this case, the voltage or current to be monitored is converted to a pre-established range (such as 0 to 1 ma), switch-selected, and displayed bargraph style. Since LCD readouts do not contain moving mechanical parts as do regular panel meters, they are less prone to wearing out and will probably become the main meter of the new millennium.

If we step back and look at meters from a slightly different angle, we also see that they can be separated into two general design types: *analog* and *digital*. What's the difference? An *analog meter* has a pointer that moves across its dial to indicate a measured level. A simplified sketch of this meter's mechanism is illustrated in fig. 1. When current is passed through the meter (via its positive and negative terminals), the fine coil of wire on its movable armature becomes a tiny electromagnet. Small permanent magnets on each side oppose the movable armature's/electromagnet's resultant field, causing the armature to move and swing its pointer upscale. How far the pointer moves depends on the strength of the armature's field, which in turn depends on the amount of current passing through the meter's terminals. That is the "story in a nutshell," or in a meter's case, so to speak.

As previously mentioned, *digital meters* are available in LCD panel-mount versions, are integrated into test instruments, and also are included in frequency readouts on transceivers. Fig. 2 is a simplified block diagram of a digital volt meter (DVM), and its concept of operation follows.

First, incoming voltage is directed to a comparator or analog-to-digital converter where it is changed to a digital quantity or count comparable to its level. The resultant, or processed, count is then directed to a seven-segment/numerical encoder or to a bargraph encoder. The encoder's output then drives its associated display to

Photo A– Classic analog-type panel meter such as would be mounted on a high-power linear amplifier, SWR bridge, etc. This particular meter measures RF amps. By connecting it between a transmitter or amplifier's output and an antenna, and applying the formula of antenna current squared times resistance of antenna, it will indicate output power from one watt to approximately 450 watts.

Photo B– An example of a traditional analog-scale volt/ohm meter (VOM) is the famous Simpson model 260. Center switch selects/connects various internal multiplier and shunt resistors required to read different voltage and current ranges. This particular VOM is special, as it was "handed down" to me from my father. He designed the original burnout-proof 260, and this was his prototype.

4941 Scenic View Drive, Birmingham, AL 35210

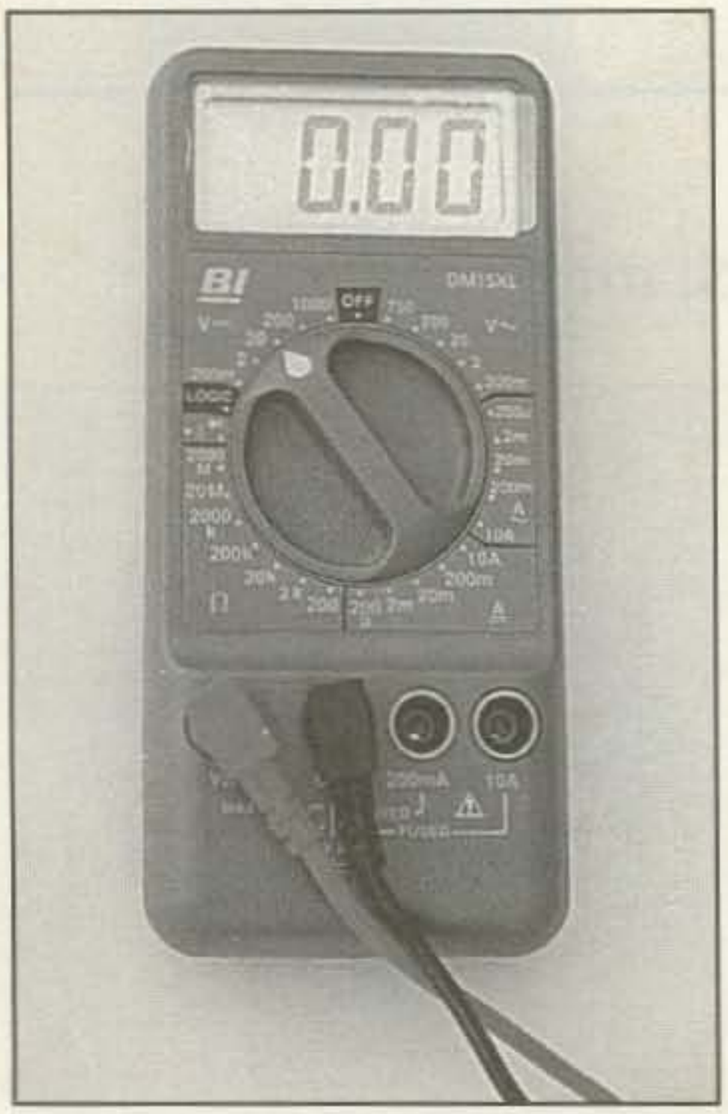


Photo C– A typical digital volt/ohm meter. This one has a center switch that selects/connects various internal resistors to read different ranges. Item is made by Beckman Industrial Corp. and costs less than $50.

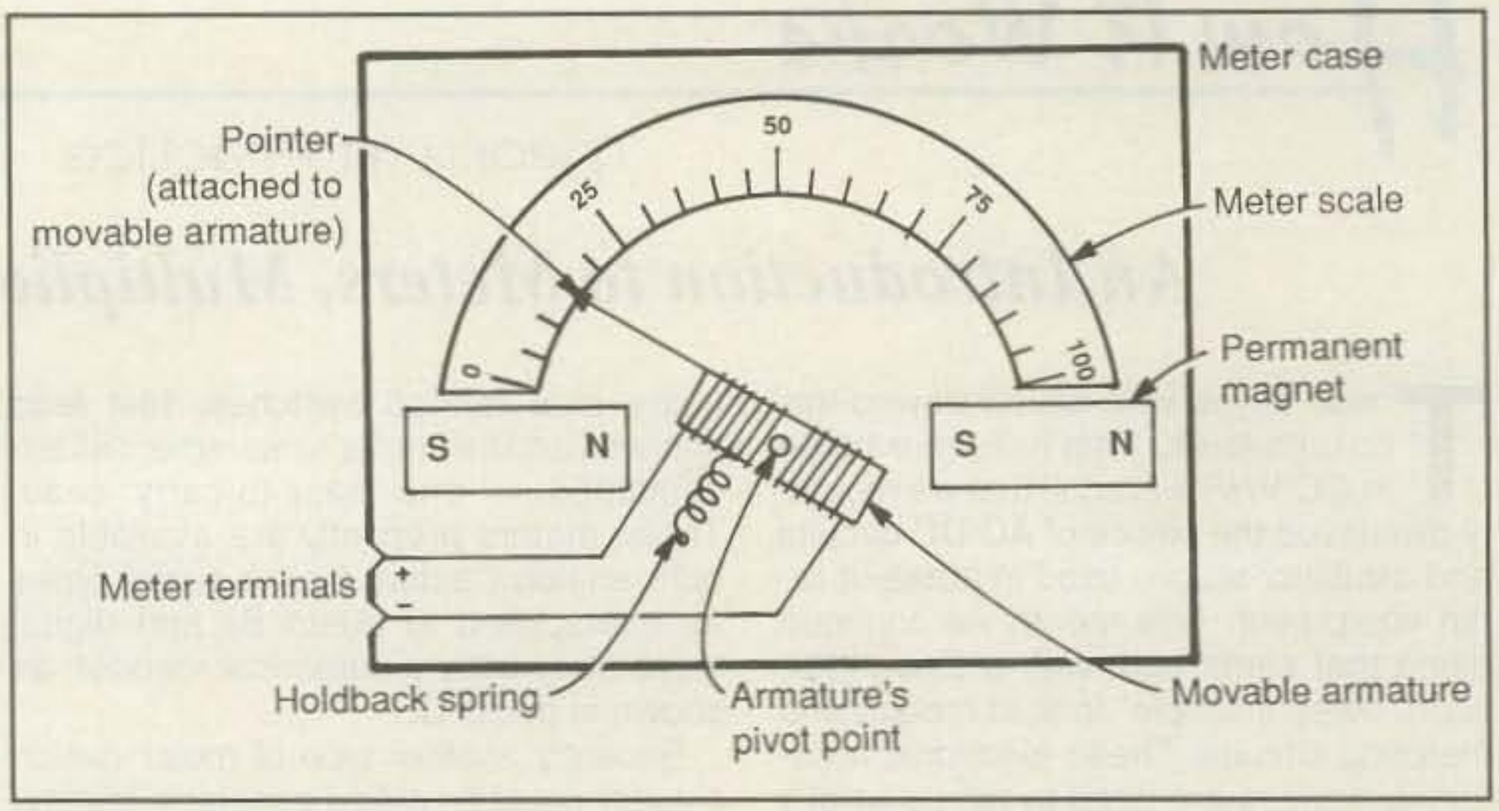


Fig. 1– Simplified or "table napkin" sketch of a meter mechanism and its parts. (Explanation in text.)

yield a visible indication of the measured voltage or current. Neat, eh?

Ranges of Meters

Meters can be purchased or adapted to measure or "read" every imaginable range from microamps to kilovolts—and more. How is this accomplished? In the case of very small measurements, meter sensitivity is maximized by using ultra-fine wire on moving armatures or by precise-level amplifying circuits for digital readouts. More often, however, meter sensitivity is reduced (rather than increased) through the use of multiplier and shunt resistors so larger (rather than smaller) quantities can be measured. The key to selection and connection of a resistor here involves use of Ohm's Law and basic series and parallel circuit parameters—and that brings us to our next topics of discussion. Stay with me. I'll keep this technical explanation simple.

Voltage Multipliers for Meters

Probably the most common type and range of meter in general use today is the 0 to 1 ma or simply the 1 ma full-scale analog panel meter. I say that because a 1 ma meter can be adapted to fit a large number of applications.

Let's assume we have such a 0 to 1 ma meter and wish to use it for monitoring the output of a 0 to 50 volt DC power supply. We begin adapting it by first using a VOM to measure the meter's internal resistance (resistance of its armature's coil). Let's say it measures 82 ohms and sketch our steps for extending its range with a multiplier resistor (fig. 3). Since we now know two of the meter's three variables, we apply Ohm's Law as follows. First, .001 amp × 82 ohms = .082 volt drop across the meter. This leaves 50 volts (total) – .082 volt (meter), or 49.918 volts to be dropped across the multiplier resistor.

Now think back to our previous "basic electronics" columns. Since voltage divides but current stays the same in components of a series circuit, .001 amp flows through both the meter and the multiplier resistor. Thus, 49.918 volts divided by .001 amp = 49,918 ohms. How large should the resistor be in size? Volts times amps = watts, so (rounded off) 50 volts × .001 amp = .050 watt. A 1/2 watt resistor therefore is fine, but 49,918 ohm resistors are unusual. Personally, I would purchase a 47,000 ,1 watt resistor and then use a round file to cut a "U" in the middle of its body (an old engineer's trick; just trust me). I would stop every so often and check the resistor's value with my VOM. Before filing halfway through the resistor, its value will rise—to 48,000, then 49,000, then 49,918 ohms. I would then recalibrate the meter's face (.5 ma = 25 v, etc.), quick-seal the resistor with a spray of Krylon® clear plastic, and bingo! One custom 50 volt meter with multiplier resistor emerges!

As another example, let's say we want the previous 0 to 1 ma meter to read 1000 volts full scale (in this case, .5 ma will be comparable to 500 volts). The meter's resistance is still 82 ohms, so its voltage drop is still .082 volts. Now 1000 – .082 leaves 999.918 volts at .001 amp to drop across the multiplier resistor. Thus, 999.918 volts divided by .001 amp = 999.918 ohms. Here I would purchase an 820 ohm resistor and file it as I previously discussed until "hitting" 999.918 ohms. Bingo! Another custom multiplier resistor and another "replacement" meter goes into action.

Always Think Safety!

Meters and metering circuits are, by their general nature of application, typically located in areas of potentially dangerous voltage and/or current. Never take chances or dink with metering circuits in any equipment if you are unsure of your technical expertise or simply feel uncomfortable doing so. *You could be killed.* Always exercise the utmost caution around voltage and current. Always keep one hand in your pocket or behind you when probing in metering circuits. Never work on equipment when you are home alone, sleepy, or have shaky hands. Listen to the voice of experience here, friends. Even when you know exactly what you are doing, a hand can slip (yeow!). Never wear jewelry when checking voltage or current levels. Voltage can jump or arc (So will you if you are "bit"!), and current burns (a wedding ring can pass enough current to become super hot and sever a finger). We want you to be a good, smart radio amateur, and we also want you to stay happy, healthy, alive, and reading *CQ!*

Current Shunts for Meters

Our "general purpose" 1 ma meter can also be employed to measure high levels of current. In this case, we use a parallel, or "shunt," resistor to divert excess current around the meter (fig. 4). If we wish to read 200 ma full scale, for example, 199 ma must go through the shunt, so only 1 ma will be left to go through the meter. How can we do this?

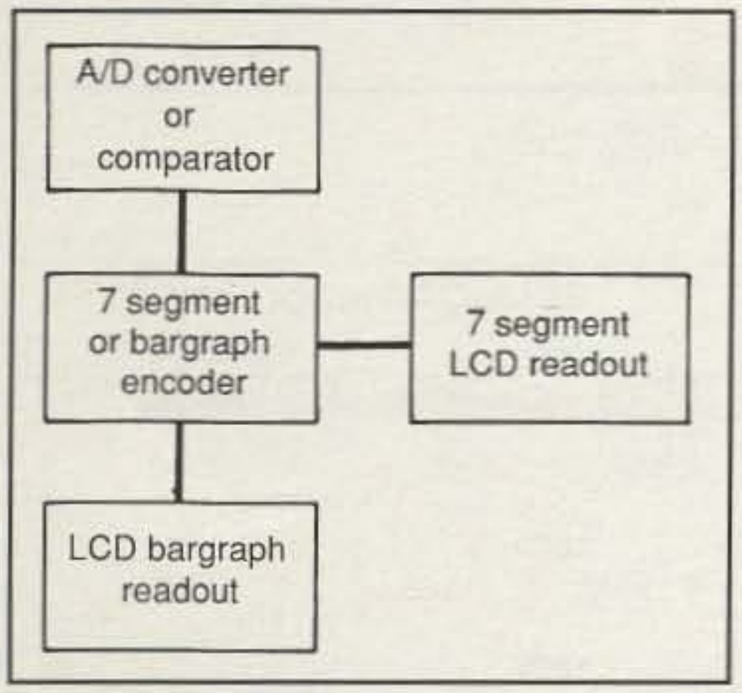


Fig. 2– A simplified block diagram of "front end" electronics in a digital volt meter. Similar circuit arrangements are also found in amateur gear such as transceivers and linear amplifiers.

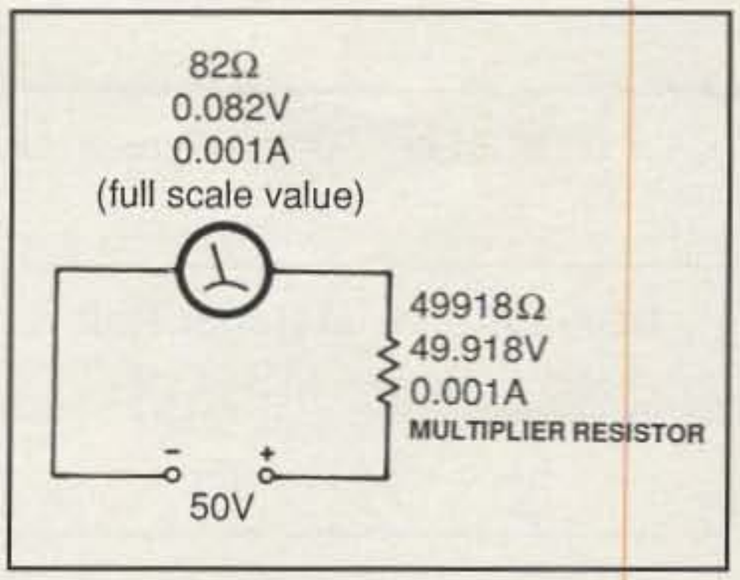


Fig. 3– Outline of how a multiplier resistor is used with a panel meter to extend its range and permit measuring medium to high voltage levels. (Discussion in text.)

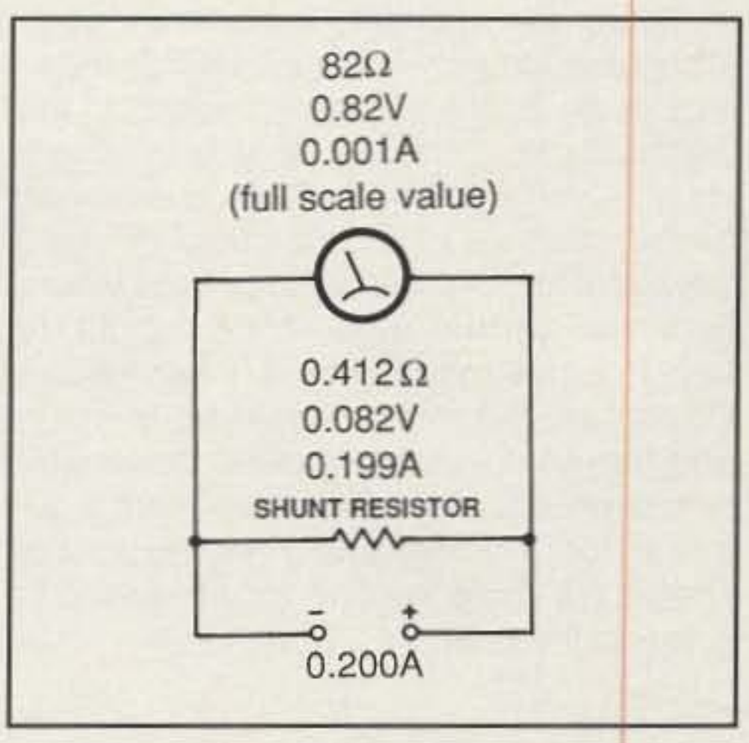


Fig. 4– Illustration of how a shunt resistor is connected with a panel meter to read medium to high current level. (Discussion in text.)

Here's the key: Current always takes the path of least resistance. Assuming the meter's internal resistance is 82 ohms as previously discussed, its voltage drop is .001 amp × 82 ohms, or .082 volt. Again, we remember from past studies that current divides while voltage stays the same in a parallel circuit. Thus, .082 volt divided by .199 amp = .412 ohm. We could use a "fraction of an ohm" resistor here and file it to the exact value as previously discussed. A more convenient solution, however, is to use a few inches of nichrome wire to "make" the resistor. Nichrome wire is used to make electric-heater elements. It is available in precise "multiples of an ohm per foot" lengths from electronic parts suppliers nationwide.

As a second example, let's use that same 1 ma meter to measure 500 ma of current. The meter's resistance is still 82 ohms, and it still drops .082 volt. Now 499 ma at .082 volt must pass through the shunt resistor, so .082 ÷ .499 = .1643 ohm resistance for the shunt. Once again, we use nichrome wire to "make" a shunt resistor, and we have a custom meter.

Closing Notes

In reflecting back on meters, multipliers, and shunts, I would say the main points to remember are voltage divides in a series circuit, current divides in a parallel circuit, and Ohm's Law lets you calculate unknown values. Determining resistances for multiplier and shunt resistors is easy if you work in steps.

First determine all three variables for one component such as the meter. How? Look at its face and read its full-scale value (current or voltage). Then measure its internal resistance with your ohmmeter and calculate its current or voltage requirement. Next subtract the meter's requirement from the full/applied value to be read. Insert that "do not apply to meter" value and the circuit's "same in all components" value (current if series, voltage if parallel) into Ohm's Law to determine the value of added resistance. Finally, double check your metering circuit by comparing its readings with a known to be accurate meter and add a note or mathematical correction factor to readings as (if) required. When adapting panel meters, some folks like to remove the indicating/calibrated scale, reverse it, and add their own custom scale on the flip side. The choice is yours. Just use your imagination and creativity!

We obviously could continue many more pages on meters and metering circuits, but we've reached the closing wire for this month's column. I thus will bow out for now and encourage you to stay tuned as we continue to explain circuits and head toward a point where everything can be "brought together" and used to describe how modern amateur radio transceivers and accessories work.

73, Dave, K4TWJ

Awards

BY TED MELINOSKY, K1BV

News Of Certificate And Award Collecting

This column marks the beginning of my third year of acting as *CQ*'s Awards and USA-CA columnist. This is also my first column to be published in the year 2000, and it's a really neat time to make predictions.

My first one is a pretty safe bet. I predict that towards the middle to end of the year some lucky county hunter will earn USA-CA 3076 number 1000! I promise that this number is not going to be held for any special person or cause. It will be issued in strict numerical sequence. If there are two applications to be processed on the same day, it's the one that ends up on the top of the pile. I wonder who it will be? Start your scheming!

Longer term, I predict that the Internet will continue to challenge amateur radio. The influence of the Internet probably will gain strength in the 2000s as computers and communications evolve and broadband connectivity becomes commonplace. Amateur radio will survive, I believe, although it won't look exactly like it does today. The basic thrill of communicating without wires is very strong.

65 Glebe Road, Spofford, NH 03462-4411
e-mail: <k1bv@cq-amateur-radio.com>

USA-CA Special Honor Roll

Nick E. Nicholson, W7TSM
USA-CA All Counties #984
September 30, 1999

How would a successful blending of amateur radio and the Internet affect award hunting?

My predictions: You would be able to e-mail a certified list of contacts to the sponsor. The verification (GCR) would be performed by your witnesses independently e-mailing the sponsor. It would be commonplace to apply for most awards via e-mail or by a WWW page script, and the certificate would be sent to you overnight via an electronic file. Perhaps a universal format such as PDF files could be used as a print file. A copy could printed whenever you got the urge—for example, to take to a club meeting for a brag session. Of course, the award would be in color, and the print from your 3000 dpi printer would be dazzling and more than adequate for framing and hanging in the shack. No more waiting for an award to come in the mail!

USA-CA Honor Roll

500
DJ6VM.....3095
W7TSM.....3096
WB5P.....3097

1000
W7TSM.....1528

1500
W7TSM.....1273

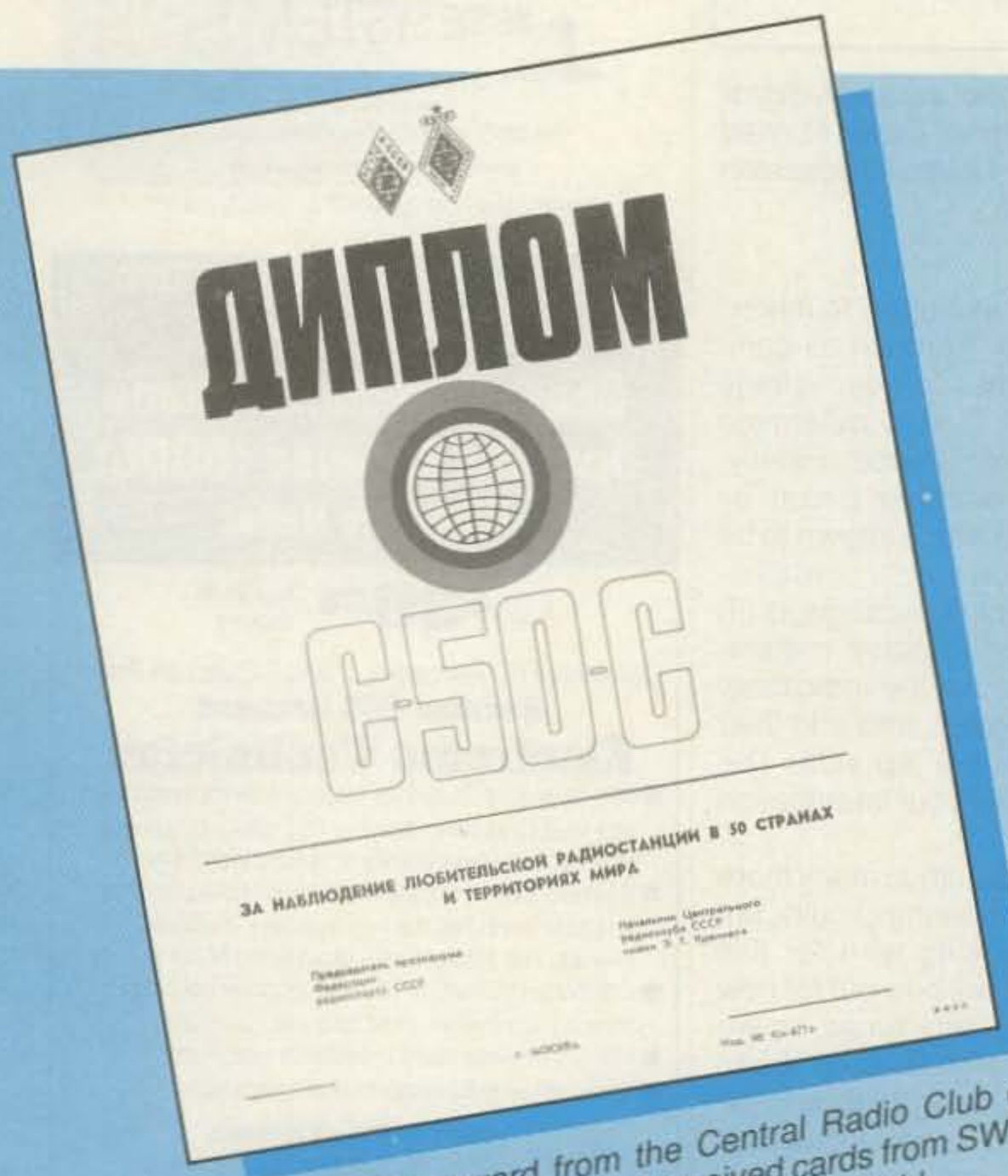
2000
W7TSM.....1173

2500
W7TSM.....1098

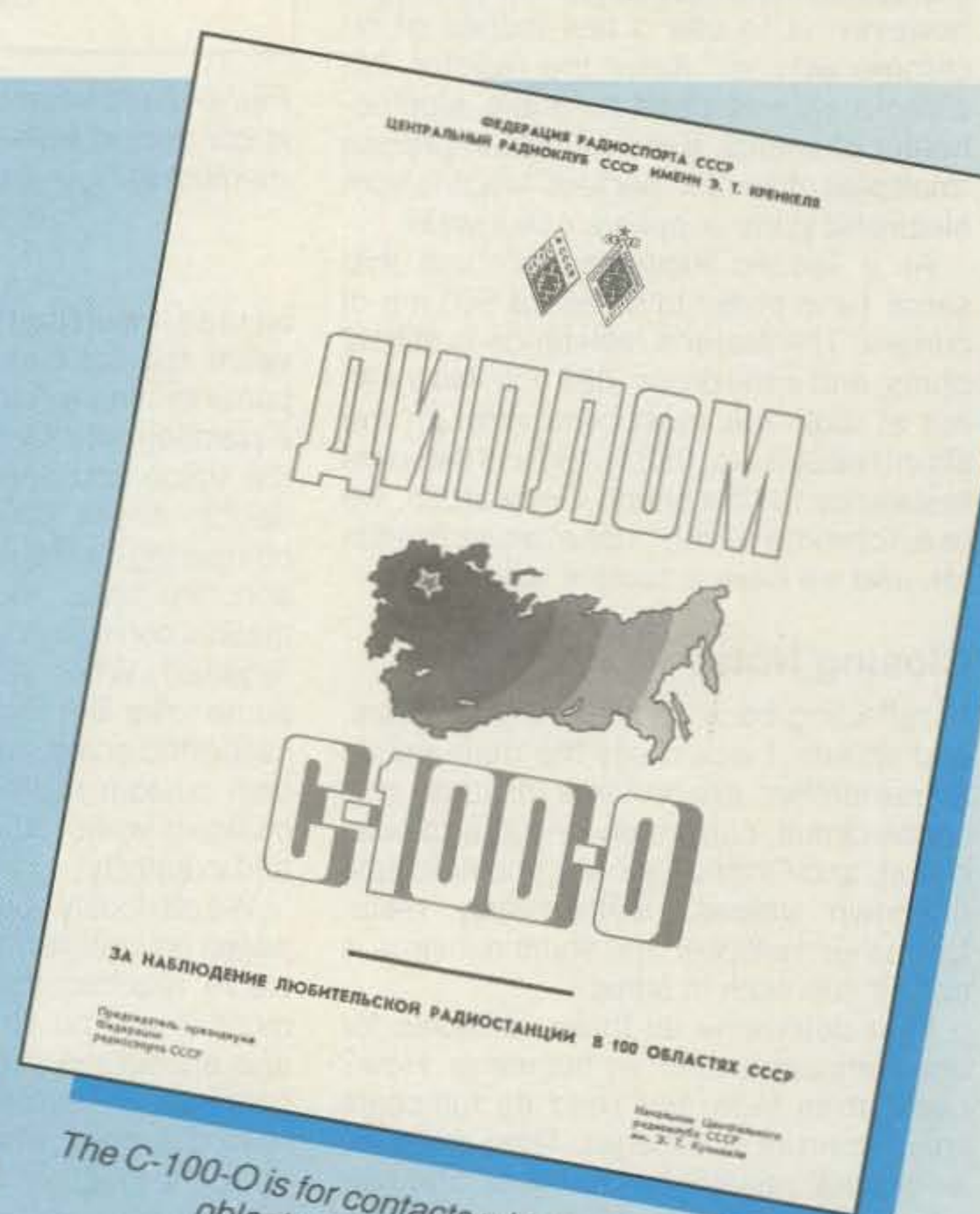
3000
W7TSM.....1001
KD9ZP.....1002

The total number of counties for credit for the United States of America Counties Award is 3076. The basic award fee for subscribers is $4.00. For nonsubscribers it is $10.00. To qualify for the special subscriber rate, please send a recent *CQ* mailing label with your application. Initial application may be submitted in the USA-CA Record Book, which may be obtained from *CQ* Magazine, 25 Newbridge Road, Hicksville, NY 11801 USA for $2.50, or by a PC-printed computer listing which is in alphabetical order by state and county within the state. To be eligible for the USA-CA Award, applicants must comply with the rules of the program as set forth in the revised USA-CA Rules and Program dated March 1, 1997. A complete copy of the rules may be obtained by sending an SASE to Ted Melinosky, K1BV, 65 Glebe Road, Spofford, NH 03462-4411 USA. DX stations must include extra postage for airmail reply.

How about costs? Well, with no printing, postage, or envelope charges, I suspect that the majority of awards would be free. Sponsoring groups who use money from awards for expeditions or charitable



The C-50-C award from the Central Radio Club of Russia is issued for having received cards from SWLs in 50 different countries of the world.



The C-100-O is for contacts with Russian SWLs in 100 oblasts on any two amateur bands.

works, etc., could collect the fee, via your cash authorization from your electronic banking service, which would be usable in any world currency.

In the future award chasing will continue to be one of the many interesting aspects of amateur radio which will evolve with the new modes of communication. And who knows? Perhaps the following award, which has been unclaimed since 1929, will be earned in the first years of the 21st century.

ARRL's Elser-Mathes Cup

This award is to be issued to the first licensed amateur making an Earth-to-Mars two-way contact. Established in 1929, a time when DX records were routinely being broken, this award has not yet been claimed! There is no charge, and somewhat more than a GCR list is needed. Apply to ARRL, 225 Main St., Newington, CT. 06111. *(Hartford Courant—1988)*

Russian Awards

This continues the series on the Central Radio Club of Russia and its series of interesting awards that we began in the November 1999 issue.

General Requirements: The awards are available to all licensed radio amateurs and SWLs worldwide. All contacts should be made from the same country according to the official "P-150-C" countries lis. (send SASE for list). All of the contacts should have been verified with QSL cards that are in your possession. All of the awards are issued for QSOs on any band or mode as specified below under the requirements for each individual listing. Send GCR list certified by a national society awards manager or two other licensed amateurs. Fee for each award is 10 IRCs (or USA dollar equivalent). Send to: Box 88, Moscow, Russia.

C-50-C (listened to by 50 countries). Here's a way to put those SWL cards you receive to good purpose! This award is available for having received cards from SWLs in 50 different countries (territories) of the world using the P-150-C award (similar to DXCC list).

C-100-O (listened to by 100 oblasts). This award is issued for having received QSL cards from Russian SWLs in 50 + 50 different oblasts (regions) of Russia on any two amateur bands. Reception reports received since 1 January 1957 are valid for this award.

Cosmos–RS Award. This award, as well as Cosmos–UHF, was introduced to commemorate the first manned space flight by the famous Soviet cosmonaut Yuri Gagarin, honored as a "Hero of the Soviet Union." The award is issued for verified QSOs made via amateur radio satellites and is available in three classes:

1. For QSOs with 100 different amateur radio stations via satellites.
2. For 200 stations via satellites.
3. For 300 stations via satellites.

Contacts made on or after 7 May 1962 may be used.

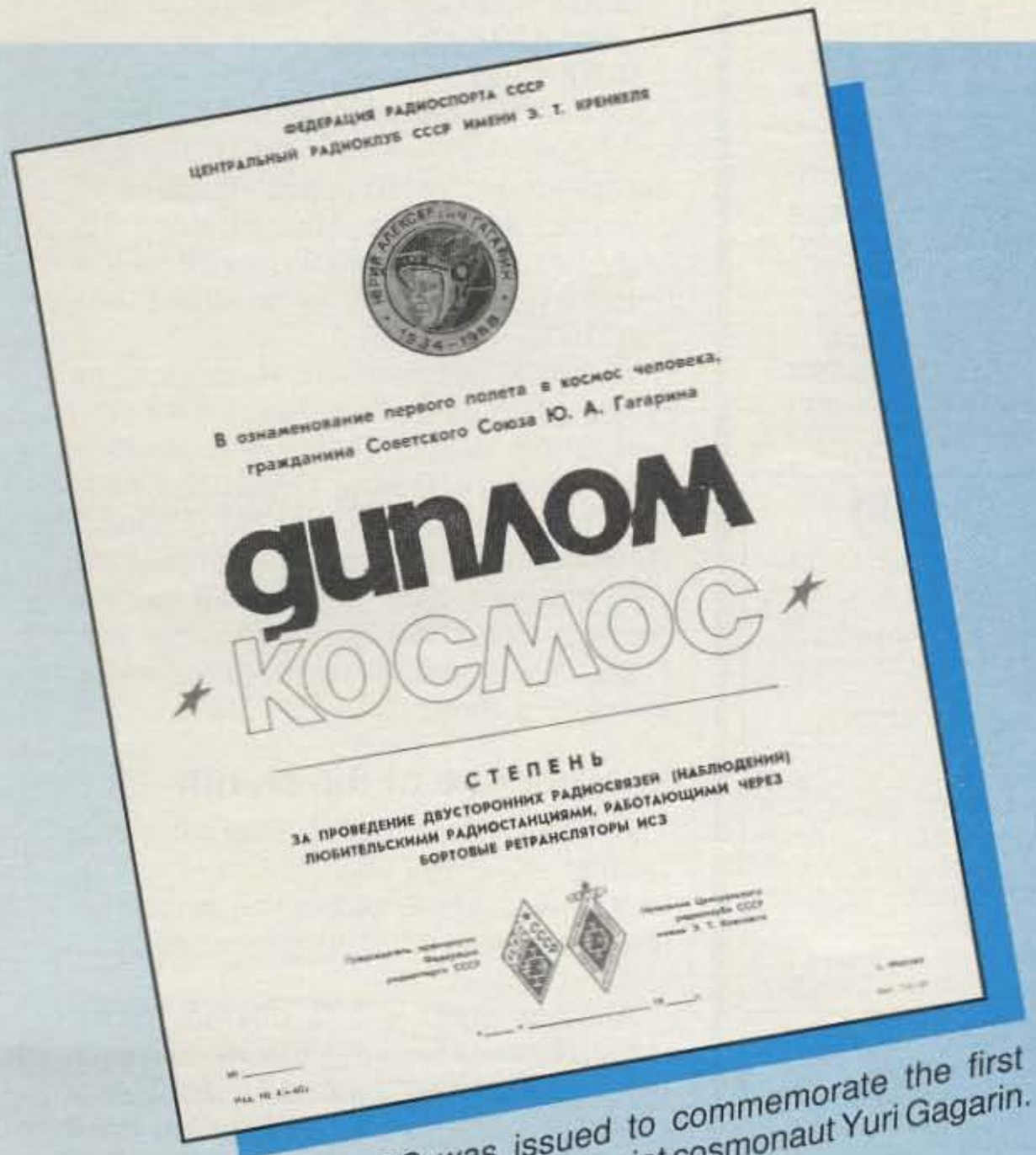
The *Cosmos-UHF* is issued for contacting 100 different amateur stations on UHF bands. For this award, contacts must have been made since 1 May 1984.

P-6-K Award (worked six continents). Similar to the IARU WAC award with minor differences, this award is issued for one QSO with each of the continents, three QSOs with the European part of Russia, and three QSOs with the Asian part of Russia. There are three classes of this award:

1. QSOs made on the 1.8 or 3.5 MHz band.
2. QSOs made on the 7 MHz band.
3. QSOs made on any band or bands.

Verified QSOs made on or after 7 May 1963 may be used.

P-10-P Award. Work amateur stations in the 10 different callsign regions of the former USSR. (1 through Ø). Verified QSOs made between 1 January 1958 and 4 April 1984 are valid for the award. While I generally would not provide the rules for an award when the contacts are at least 16 years old, I do this because (1) most middle-age active DXers have a real stack of Russian cards dating this far back, (2) this is a excellent souvenir of the old USSR, and (3) the physical size of the cer-



Cosmos–RS was issued to commemorate the first manned space flight by Soviet cosmonaut Yuri Gagarin.

The P-6-K award for QSOs with six continents and three QSOs with the European part and three QSOs with the Asian part of Russia.

The Russia award is issued for QSOs with 50 oblasts of Russia.

tificate is a massive (11" × 17"). Bring this one to your next club meeting!

Russia Award. This award is issued for QSOs with 50 different regions (oblasts) of Russia. It is available in three classes:

1. QSOs on the 1.8 or 3.5 MHz band.
2. QSOs on the 7 MHz band.
3. QSOs on any combination of bands.

QSOs must have been made on or after 12 June 1992.

U-DX-Club Award. This award is issued for QSOs with different stations which hold membership in the U-DX-Club. European and Asian applicants need 15 contacts, Africa and America need 10, and Australia and Oceania need 5. QSOs must have been made on or after 1 January 1988.

W-100-R (worked 100 Russian radio amateurs). The award is issued for verified QSOs with 100 different amateur radio stations of Russia. QSOs must have been made since 12 June 1992. A special version of this award with an endorsement "100 years of radio" is offered if the 100 contacts were made during calendar year 1995. This is another large-format award measuring some 12" × 15".

Internet Site of the Month

The Central Radio Club Internet site is located at: <http://www.mai.ru/~crc>. All of the rules presented in this article are there plus other interesting information on radio in Russia.

Another great site is offered by the Dutch National Society VERON. The society's very popular awards series is described in both Dutch and English. Point your browser at: <http:// www.qsl.net/pb7cw/veron.html>. 73, Ted, K1BV

Amateur Television

BY ED MANUEL, N5EM

All About Ham TV

Sound and Light

Welcome to Y2K. I hope that your New Year's transition was bug free. Since I'm writing this column in November, I have yet to experience the New Year. I'd welcome you to the new millennium, but I'm sure that you know by now that the new millennium doesn't actually start until January 1, 2001. So much for Y2K. Let's get on with ATV-2K.

Like any other area of amateur radio, it is not difficult or complicated to get started in amateur television. I've talked about this in previous columns in *CQ VHF*. The first step is to get reception going. Depending on the amateur television activity in your area, this may be as simple as attaching an antenna to your cable-ready television or VCR.

After deciding that you really want to start having fun like you are seeing on your TV, you need to assemble the pieces necessary to transmit. For many, this includes a transmitter that matches the local activity or repeater system and some source of video, often an existing camcorder or old second-hand camera. Perhaps you also have a video card in your personal computer that allows you to output video. This enables you to use your PC for other areas such as computer-generated slides, photos, video clips, etc.

At this point, you are becoming an experienced ATVer. Now you are ready to start thinking in terms of the details and fine points. I'd like to discuss some of these topics this month.

4734 Shetland Lane, Houston, TX 77027
e-mail: <n5em@cq-amateur-radio.com>

Most of us began our on-the-air video experience with a camera that may have had a built-in microphone. That seemed really easy. You just plugged the right cables into the right jacks and away you went. You probably even found it worked pretty well. (I began in this same fashion. I put the camera on the shelf right on top of the transmitter about a foot in front of my nose. It worked just fine. Sometimes I felt I needed a wider angle on the lens, but I could only push it back so far before it fell on the floor!) The nice thing about this arrangement is that you could pick up the camera and point it at your workbench or table in order to show someone an interesting item in the shack. Of course, you probably used this hand-held arrangement to take fellow ATVers on a live tour of your shack.

At some point, you may have decided that this operation lacked something. I finally put my camera on a tripod across the room to get a better viewing angle. This allowed a better viewing perspective for the observer. Now I could get up and go behind the camera and do a much better tour of the shack without hearing complaints about making the viewer seasick as the camera moved around in my hands.

Soon after this new arrangement, I began to receive comments about my audio. The microphone on the camera that worked so well 12 inches from my nose now was around 6 to 10 feet from where I sat in the shack. It was picking up every sound in the shack from squeaking chairs to equipment fans. My room wasn't designed for good acoustics, either. Those walls and ceiling caused a lot of ambiance that did not sound particularly good on the air. Clearly some improvements were in order.

At first I used a separate hand-held microphone plugged into the transmitter. That worked very well. Had I taken the next step and mounted it on a real microphone stand, it would have proved a workable solution when I was sitting at the operating position. Unfortunately, the cord limited mobility around the shack. When behind the camera, the camera-mounted microphone still sounded best. That provided a good argument for some type of mixer or switch to manage audio sources. I found such an item at the local RadioShack. The solution worked just fine for a while, but the need to mix or switch required constant attention. That's fine if you have a producer in your shack as in a real broadcast studio. Most of us have to settle for doing it ourselves.

Once again, I found the solution in the RadioShack flyer. One local ATVer noticed that RadioShack had their wireless microphone on sale. I'd never thought about going wireless, assuming that that was too expensive. That myth was quickly dispelled when I found that I could buy one for around $40. I took the plunge and bought a small wireless microphone. It had a small transmitter unit about the size of a deck of cards and a small microphone that clips onto a collar or lapel. Since you put the microphone in a good place to pick up your voice and it is attached to you, your audio is now stable. Once set, the level is constant and the ambient pickup

Watch for sales on wireless microphones. They let you move around while talking without being "off-mic." If you get more than one, make sure they're on different frequencies.

An audio mixer will let you control multiplew microphones and other sound sources. Look for one with both mic-level and line-level inputs.

is greatly reduced. Now I was free to move around the shack at will. Audio reports changed from gentle complaints to constant compliments.

I was so pleased that I bought a second wireless microphone the next time I found them on sale. Be careful to buy your second microphone on a different channel so that they can be used simultaneously. Why would you want to have two microphones on at the same time? Wire that guest in your shack for sound! Now both of you can be on-screen and chat live with great audio on-the-air. Hey, it works for "Good Morning America"!

For that second microphone you will need a small audio mixer to sum the signals into a single feed for your transmitter. You either can buy a small mixer like the one I mentioned earlier, or you can build one. A microphone mixer is an incredibly simple device. It consists, in its simplest form, of a couple of potentiometers and a couple of resistors. That method introduces loss into the system, so generally it is better to use a circuit with enough gain to overcome any losses.

The wireless microphones I am discussing provide "line" output. This is an amplified output that typically provides 1 volt into a 1000 ohm load. This is very different from a conventional microphone that has an extremely tiny signal output. You must know what your audio input is and appropriately match it. For example, the PC Electronics 70 cm transmitters have a microphone level input. You can connect directly to this input with a microphone without needing any amplification. If you happen to have a high-level (line) output (for example, a wireless microphone receiver or VCR), you would need to attenuate this properly to avoid overdriving your transmitter. On the other hand, the HF Technologies transmitters have a line-level input. A microphone will not drive this input, and a microphone preamplifier or mixer with line-level output is required.

So now you may have a desk microphone or one mounted on a boom at your operating position, a wireless microphone, and the built-in microphones on some of your cameras. What we have learned is that, like tools, you need the right microphone at the right place for each job. And, like tools, you can't have enough microphones!

Let's go back to that starter camera you purchased at a pawnshop for $25 (You *do* look at the pawnshops for bargain video equipment, don't you?). If it is an older camera with a tube or vidicon, it probably needs a good bit of light for proper operation. Outside in the sunshine it will work just great. However, inside your shack with the 100 watt bulb in the ceiling fixture everything seems just a bit flat. Also, you may notice that things seem a bit yellow if you are critical. This is normal, of course. Incandescent bulbs have light output that tends to be yellow. This is measured by comparison to a hot body (no, not that kind of hot body). At certain temperatures hot objects radiate different color light. The color of daylight is the white type of light that we think of as normal. By comparison, incandescent light is yellow. Fluorescent light is green. As you watch other ATVers, you will notice this difference from camera to camera and shack to shack. Now this is not necessarily a serious problem. Most folks won't notice or comment about the color temperature of your lighting. As we mentioned earlier, though, you are beginning to think about the finer points. For an ATVer, light is certainly one of the important areas.

One common problem for the new ATVer is the measurement of light sensitivity and light output. Cameras respond to light and are specified by the number of lux required for operation. A lux is "a unit of illumination, equivalent to .0929 foot-candle and equal to the illumination produced by a luminous flux of one lumen falling perpendicularly on a surface one meter square" (*The Random House College Dictionary*, copyright 1972, Random House, Inc.). Did you get that? If you have an older vidicon camera, you may have a light sensitivity of 10 lux. If you have a newer camcorder, you may well have a light sensitivity of 1 or 0.5 lux.

My Sony camcorder is specified as zero lux! Does that mean it works without needing light? Well, not exactly. Because many CCD imaging sensors are sensitive to infrared light, the camera literally can see in the dark by illuminating the subject with the built-in infrared LED. I actually operated my shack on the air one evening in total darkness just playing with the camera in its zero lux mode. Operating in the dark is interesting but not particularly practical. For most operation we need light—the visible kind!

Light output is specified in foot-candles, or more often in lumens. A lumen is "the unit of luminous flux, equal to the luminous flux emitted in a unit solid angle by a point source of one-candle intensity" (*The Random House College Dictionary*, copyright 1972, Random House, Inc.). So how many lumens do you need to have enough light for that 10 lux camera? That's easy. You need enough lights so you can see well and have good color with it! You could spend a few hours calculating the amount of light falling on your subject at a certain distance from a light source of so many lumens to equal the amount of lux your camera requires. Personally, I'd just buy a couple of lights and play with them until it looks good on the air. That's the empirical approach.

Again, going back to our bargain camera, your first need probably will be to add more light to your shack. Often this lighting is switched from the operating position, so it is only on when you actually are transmitting. For older cameras, enough light may mean 400 to 600 watts. Since that creates a lot of heat when on, it certainly argues for only having it on when you are transmitting. It also argues for a newer, more light-sensitive camera! Frequently it is the budget that dictates the equipment we have to use. In the finest tradition of amateur radio, use what you have and learn how to get the most out of it.

When picking out some supplemental lighting, I'd recommend that you consider the newer quartz-halogen low-voltage devices. These are small, have high light output, and are easy to deploy. I prefer small track-light units that are mounted on the ceiling and pre-aimed at your subject areas. These quartz-halogen lights very nearly equate to the color temperature of daylight and work very well for older cameras. These are the same types of bulbs found in camera-mounted lights used in low-light portable environments. One word of caution is in order. I have been told that the use of light dimmers to control the output of quartz lights causes the color temperature to change. I plan to do some experiments in my new studio (currently under construction) to confirm this. My plan is to have several track-light bars and switch the tracks on and off, adding light as needed rather than using dimmers on the tracks. I'd be interested in the results of experiments readers may have conducted in this area.

My photography hobby was replaced largely by ham radio many years ago. Oh, I still take pictures, but some of those neat tools we used to have in the camera bag are gone. Specifically, I regret letting my old light meter get away. I'm seriously considering buying a light meter to be able to deal more carefully with illumination in the studio. Just like voltage, power, current, resistance, capacitance, and inductance, the parameters of the ATVer include light and sound. As we begin to get deeper and deeper into the creative process these topics need more and more attention. I'd very much enjoy reading a feature article on lighting for the ATVer. Is any reader out there up to the challenge?

That's it for this time. Step back from your operation and spend a few minutes evaluating some of the finer points in your shack/studio. Maybe Y2K is the year it all comes together for you and ATV. Above all, have fun as you learn and operate.

73, Ed, N5EM

Washington Readout

Regulatory News In The World Of Amateur Radio

BY FREDERICK O. MAIA, W5YI

Amateur Spread-Spectrum Rules Relaxed

The future of amateur radio lies with innovative digital systems. That means widespread use of computers, satellites, high-tech emissions— even access to the Internet over amateur radio spectrum.

The FCC has amended the Part 97 Rules to provide for greater use of spread- spectrum (SS) transmissions in the Amateur Service. This change will allow radio amateurs to experiment with additional SS emission types and to develop new innovations and products. It will also permit the use of spread-spectrum technologies currently used in consumer and commercial products.

In a nutshell, here are the new rules:

1. Remove the limitation that amateur stations transmit SS emission types using only frequency hopping and direct-sequence spreading techniques.

2. Require that amateur stations use automatic transmitter power control to limit transmitter power to the minimum necessary to maintain communications.

3. Remove now-unnecessary record keeping and station identification requirements that apply only to stations transmitting SS emissions.

What is Spread Spectrum?

Spread Spectrum is a modulation technique that distributes the energy of the transmitted signal in little bits over a segment of spectrum that is much larger than would be needed for a "traditional" modulation scheme. This results in the power density of the transmitted signal being very low, and the duration of a transmission on any frequency in the frequency segment being but a fraction of a second, at any point of bandwidth the SS emission occupies.

This technique also allows reuse of the bandwidth in the available frequency segment that the SS emission occupies, thereby allowing multiple stations transmitting SS and non-SS systems to use the segment of spectrum simultaneously.

While SS modulation techniques have been known for over 60 years, until the last 20 years their use primarily has been to obscure military communications.

Amateurs Experiment with SS

Over 18 years ago, *Special Temporary Authority* to experiment with SS transmissions was granted to 25 amateur radio stations affiliated with the Amateur Radio Research and Development Corporation (AMRAD). These experiments involved on-the-air evaluation of different spreading rates, frequency ranges, and interference to stations transmitting other emission types.

On the basis of these tests, amateur radio stations were authorized to transmit SS emissions using two spreading techniques—frequency hopping and direct sequence—on the ham bands above 420 MHz on a secondary basis after June 1, 1986. Detailed records had to be kept, and the rules prohibited SS transmissions from being made to obscure the meaning of any communication.

On March 3, 1997 the Commission released a Notice of Proposed Rulemaking to examine whether hams should be permitted to transmit SS signals using additional spreading sequences. The decision was announced last fall.

National Volunteer Examiner Coordinator, P.O. Box 565101, Dallas, TX 75356-5101 (telephone 817-461-6443)
e-mail: <w5yi@cq-amateur-radio.com>

Automatic Power Control

The ARRL had asked in its Petition for Rulemaking that each SS transmitter be required to incorporate a device to automatically limit its power to that actually necessary to carry out the communications. The FCC stated, "After review of the record, we conclude that the automatic power control requirement proposed in the Notice should be adopted. . . . such a requirement is reasonable in mixed-mode frequency bands until sharing protocols are sufficiently developed to satisfy users that stations can avoid inter-mode interference. Further, we believe that power limits are a reasonable trade-off between the wideband characteristics of SS emissions and the ability and flexibility to use various spreading codes."

The FCC declined, however, to adopt the League's suggestion that the power level of the SS emission be limited to 1 watt. "We are concerned that reducing the authorized maximum power for SS emissions to the level suggested by the ARRL could adversely affect SS experimentation in the Amateur Service and would effectively reduce amateur stations transmitting SS emissions to the status of Part 15 devices." Part 15 devices are low- power RF equipment used by the unlicensed public.

Station Record Keeping And Identification

The FCC said, "The basis for the station record-keeping requirement was a concern that the Commission and amateur radio licensees could not monitor readily SS emissions, and therefore ciphers or other prohibited messages could be transmitted by stations using SS emissions. To date, we are not aware of any instances of improper messages being transmitted by amateur stations, and the record in this proceeding does not indicate to the contrary.

"We agree that this requirement no longer serves a useful purpose and that eliminating it is a logical outgrowth of our proposal to remove restrictions on the spreading techniques that amateur radio stations may transmit. We see no regulatory purpose being served by requiring amateur radio stations that transmit SS emissions to keep different records than amateur radio stations transmitting any other emission type."

SS Emissions and Interference

A number of commenters expressed the concern that if a significant number of additional stations start transmitting spread-spectrum emissions, interference to ongoing modes of Amateur Service communications will increase.

The FCC agreed with the ARRL. "Section 97.311(b) will require that a station transmitting SS emissions must not cause harmful interference to stations employing other authorized emissions, and must accept all interference caused by stations employing other authorized emissions. This rule change clarifies that stations transmitting SS emissions will remain, as they are now, secondary to other stations on the frequency bands they are authorized to transmit on.

"We also note that interference between amateur radio stations is already addressed generally by Section 97.101(d), which

prohibits operators from willfully or maliciously interfering with or causing interference to any radio communication or signal.

"A hallmark of the Amateur Radio Service has been that all frequencies are shared. The expectation of any station that it can operate in a totally interference-free environment thus is unreasonable."

Stations transmitting SS may not exceed a power level of 100 watts under any circumstances. If more than 1 watt is used, automatic transmitter control shall limit output power to that which is required for the communication. The new rules are now in effect.

Shared Ham Spectrum Allocated to ITS

Radio amateurs have access to the 5 cm band between 5.650 and 5.925 GHz on a secondary basis. This band is also shared with several other radio services. On October 21st the FCC followed through on its 1998 proposal to allocate 75 MHz of 5 GHz range spectrum to the mobile service for futuristic Dedicated Short Range Communications (DSRC) systems operating in the Intelligent Transportation System (ITS) radio service.

ITS, a national initiative of the U.S. Department of Transportation, refers to various transportation systems which apply emerging information technologies to address and alleviate traffic congestion problems. In 1991 the Transportation Department was authorized by Congress to develop a program for smart transportation systems.

The FCC allocation culminates many years of work initiated by the department's *Federal Highway Administration*. Specifically, the commissioners voted unanimously to allocate 75 MHz of spectrum between 5850 and 5925 MHz to DSRC, which is defined as a broad assortment of short-range, line-of-sight wireless communications links between vehicles traveling at highway speeds and roadside systems, such as at toll booths, intersections, or on the open highway.

DSRC and ITS

DSRC applications will include real-time travelers' alerts, expanded automatic toll collection, information services to mass-transit drivers en-route and riders (such as ice and freeze warnings), intersection collision avoidance, emergency dispatch services, transit or emergency vehicle signal priority (which allows a bus, police car, fire truck, or ambulance to command a green light approaching an intersection), and electronic parking payments. The capability even exists to make "wireless credit cards" a reality. Parking-lot charges, gas fill-ups, or even fast-food from drive- through restaurants could all be billed to the same card.

DSRC will also process commercial- vehicle clearance and electronic safety inspections with roadside facilities at highway speeds instead of requiring trucks to pull off the highway. Also, Motorola and Microsoft are both interested in providing wireless onboard computers and applications to commercial and private vehicles. The possibilities are endless.

Using advanced surveillance systems, ITS can detect the early stages of a traffic bottleneck, and traffic can then be directed to other routes to relieve the congestion and to provide faster and more efficient routes for travelers.

New technologies enable this type of surveillance and guidance response to occur in real time, and therefore, allow potential congestion situations to be addressed *before* they develop into serious traffic jams.

The allocation means that U.S. auto makers can begin installing transponders as original equipment on cars. Deploying ITS not only enhances safety, it also reduces the need for new urban highways by as much as 35 percent.

The Commission said that the spectral environment and propagation characteristics of the 5.9 GHz band are appropriate for short-range DSRC applications and would enable sufficient signal coverage and considerable frequency reuse. They believe that DSRC operations, government radar operations, and Earth-to-space (Fixed Satellite Service) operations should be able to share the spectrum on a co-primary basis subject to coordination. The FCC also noted that frequency and geographic separation should enable DSRC operations to share the spectrum with secondary Amateur Radio Service operations.

The Amateur 5 cm Band

In addition to being the 5 cm ham band, a portion of the 5.650 to 5.925 GHz band is also allocated to ISM (Industrial, Scientific, and Medical) devices. Until further notice, amateurs may continue to use the 5 cm band on the condition that they not cause harmful interference to FSS, military radar, or ITS operations. The Amateur Service is not protected from interference generated by the co-primary users of the band or from interference from ISM devices operating at 5.8 GHz.

The Notice requested comment on the spectrum-sharing potential of DSRC operations in this band. ITS proponents generally supported the allocation of 75 MHz of spectrum at 5.85–5.925 GHz for use by DSRC-based ITS services. On the other hand, the American Radio Relay League argued that the Commission " . . . had not adequately considered alternative spectrum above 40 GHz that is relatively available and could be used for short-range communications."

The FCC disagreed, saying, " . . . the propagation characteristics of millimeter- wave spectrum could not accommodate DSRC applications [since communications] tend to be sharply attenuated by the atmosphere, foliage, and other objects."

It is also the League's belief that the DSRC allocation would substantially reduce the value of the 5.9 GHz band to the Amateur Radio Service.

The FCC said, "We are sympathetic with ARRL's concerns that an ITS allocation at 5.9 GHz could impact Amateur Service use in the 5.650–5.925 GHz band. We note, however, that the Amateur Service is afforded secondary status in these bands and that, as the NPRM pointed out, this secondary Amateur Service allocation covers 275 MHz of spectrum in the 5.650–5.925 GHz band.

"We also note that the amateurs historically have been able to design and modify their systems to avoid or minimize interference given the flexibility in selecting transmitting channels that Part 97 affords Amateur Service stations. The record indicates that Amateur Service use of the 5.85–5.925 GHz band is primarily for point-to-point networks. We believe that spectrum sharing between the Amateur Service point-to-point links and DSRC operations is viable.

"The DSRC applications will generally operate over relatively short distances and will use directional antennas. While DSRC operations along the path of a higher power Amateur Service point-to-point link may experience interference, we conclude that these occurrences would be infrequent and interference could be mitigated by using alternative frequencies, shielding, informal coordination, or by other means. Therefore, we find that DSRC operations in the 5.85–5.925 GHz band are unlikely to receive significant interference from or cause interference to amateur operations."

The ARRL suggested that coordination between the Amateur Radio Service and DSRC operations would promote spectrum sharing in the 5.85–5.925 GHz band. The FCC disagreed: "Given that amateur operations are secondary in this spectrum range, are not extensively deployed, and considering the availability of remedies if interference should occur, we do not anticipate that a formal coordination procedure will be necessary. However, the Commission may revisit this matter in the future as DSRC operations develop and more experience is gained with sharing this spectrum.

"We encourage any ITS entities wishing to use the 5.85–5.925 GHz band to informally notify the ARRL or the local amateur service community of its intended operation. In this regard, we note that in many areas of the country amateur radio operators have established clubs which can disseminate information locally, that bulletin boards devoted to specialized interests in amateur radio are available on the Internet, and that databases of amateur

radio operators and their locations also are readily available on the Internet."

5 cm Spectrum Allocated

The Commission said that the record in this proceeding overwhelmingly supports the allocation of spectrum for DSRC-based ITS applications to increase traveler safety, reduce fuel consumption and pollution, and continue to advance the nation's economy.

The FCC established the peak transmit DSRC output power at 750 mw with up to 16 dBi in antenna gain. If transmitting antennas of directional gain greater than 16 dBi are used, the peak transmit output power must be reduced by the amount in dB that the directional gain of the antenna exceeds 16 dBi—i.e., the device's maximum EIRP shall not exceed 30 watts EIRP. However, the peak transmitter output power may be increased to account for any line losses due to long transmission cables between the transmitter and the DSRC device's antenna, provided the EIRP does not exceed 30 watts.

The next step involves how to "channelize" the spectrum and how to assign the ITS licenses. The Commission is deferring this to a later proceeding because standards addressing such matters are still under development by the Department of Transportation. Once such standards are developed, the Commission will take whatever action is necessary to implement the standards related to DSRC use. "We expect that will happen sometime early next year," the FCC said.

UK—A Different Idea for 5 cm!

Great Britain has abandoned their Power Line Telecommunications (PLT) project which would have distributed high-speed data over electrical power lines. This was indeed good news for UK radio amateurs, since it means less interference to the HF spectrum.

Now a new initiative is underway involving the use of RadioLANs (RLANs). Radio Local Area Networks are short-range, high data rate, mobile or nomadic equipment operating in the 5 cm frequency range—5.150–5.875 GHz. RLANs are defined as high-bandwidth (capacity), two-way data communications networks using radio as the medium of transmission rather than optical fiber or copper cable and operating over a limited geographic area.

UK telecom regulators have announced the start of a two month "consultation period" which could lead to limited amateur radio access to the Internet for British amateurs by the turn of the year. The consultation proceeding, which is similar to the FCC's Notice of Inquiry, requests information from the public.

At a recent telecommunications presentation, the British Radiocommunications Agency (RA) spoke about the important role amateur radio had played in the past in encouraging young people to pursue a career in radio engineering. Also mentioned was the decline of amateur radio worldwide and the need to make amateur radio an attractive pursuit for young people.

"Linking amateur radio to the Internet would be an important step forward. It is hoped, subject to licensing considerations, that limited access—perhaps via the Repeater Network—would be in operation by Christmas." It was stressed that this would just be the start. The Radio Society of Great Britain, the UK national ham organization, said the amateur community would be consulted fully to ensure the best possible use was made of this initiative. More details on the project are to be released by the RA shortly.

The closing date for the consultation is Friday, January 28, 2000. Keep in mind that this is a UK initiative which (so far, anyway) is not being considered in the U.S. However, Internet access via the ham bands is interesting, and many British amateurs welcome the idea. Others, however, are fiercely opposed to it, since it has the capability of greatly impacting amateur conduct on the ham bands— especially if the general (unlicensed) public is also permitted to operate on the same 5 cm spectrum.

73, Fred, W5YI

BY CHOD HARRIS, VP2ML

News Of Communication Around The World

When is a Contact Not a Contact?

CQ DX Editor Chod Harris, VP2ML, suffered a serious heart attack in late October. He is recovering well, but will be unable to write his column for at least a couple of months. We're working on lining up a substitute columnist to fill in, but for this month we're repeating a "golden oldie" from Chod, along with a report from Contest Editor John Dorr, K1AR, on DX conditions during the 1999 SSB weekend of the CQ World-Wide DX Contest, and a look at the future of DXing by Editor Rich Moseson, W2VU.

Only a handful of DXers hold a valid QSL card from North Korea.

Recently I had the following exchange with a station I hope was XQØX, on San Felix Island.

XQØX (?): "QRZ Twos only."
WB2CHO: "Whiskey Bravo Two Charlie Hotel Oscar."
XQØX (?): "Charlie Hotel Oscar, 59."
WB2CHO: "Whiskey Bravo Two Charlie Hotel Oscar, QSL. You're also 59."
XQØX (?): "QSL. QRZ Twos only."

Did I work that station? He never repeated my complete call, nor did he acknowledge my prefix. I couldn't hear the other twos calling; my beam has a good null to the side. There may have been another 2CHO calling at about the same time. Is this a valid QSO? (On another matter, that station never did send his callsign during the 25 minutes I listened to him. However, he was on 14236 kHz, spoke with a Spanish accent, and was very popular with DXers. This information, plus a PacketCluster DX spot, suggests to me that I worked XQØX.)

What is the definition of a valid QSO for DX purposes? The generally accepted definition is that a QSO is a mutually acknowledged exchange of information between two stations. There are two parts of this definition. First, the two stations must exchange some piece of information. This is often their callsigns, but may be a signal report, or as in some contests, some location information, name, age, etc. In the above case, XQØX (I hope) and I exchanged signal reports.

The second part of the definition of a valid QSO is the mutual acknowledgement of the exchanged information. This is most often done through use of the Q-signal "QSL," which means "I acknowledge receipt." In the above exchange both XQØX (?) and I acknowledged each other's signal reports by saying "QSL." Thus, this contact met the definition of a valid QSO. I will put San Felix into the "worked, not confirmed" category and send CE3ESS a QSL card.

Although this contact meets the generally accepted definition of a valid QSO, I won't know about the most important consideration (for me) of whether the QSO was valid until I receive my QSL card back from CE3ESS. Then I will know that not only did I exchange some information with the DX station, and we mutually acknowledged that exchange, but also that I am *in the log.*

This is the real proof of a valid contact: the DX station's log shows my callsign at about the right time, on the right band. Even if I had met the other requirements for a contact, if that contact did not appear in XQØX's log, it is *not* a valid contact.

Since XQØX did not give my entire callsign, nor acknowledge my prefix, I don't know that I'm "in the log." However, instead of an insurance contact (which might cheat another DXer out of a San Felix contact altogether), I logged the next five stations XQØX worked. Then in the unlikely event that my QSL card comes back marked "not in log," I can go back to CE3ESS and explain that I heard my suffix, repeated my prefix (without acknowledgement), and logged the following five stations after my contact. This should allow CE3ESS to find my contact in the log.

The requirement that a contact is not valid unless it is "in the log" is an important one to DXers shooting for *CQ*'s 5 Band Worked All Zones Award. This requirement is used to maintain the award's high standards. In most cases, an unaltered QSL card is proof of a valid contact. However, there are cases in which a QSL card is not enough. Should the information on a QSL card not "ring true," the WAZ award manager may write to the DX station in question to ask if the reputed contact was indeed "in the log." Only if the contact is "in the log" of the DX station is the QSL card considered proof of a valid contact for the 5 Band WAZ Award.

Unfortunately for award managers, many DX stations and QSL managers are careless about distributing blank QSL cards. I have several hundred blank QSLs, representing more than 120 DXCC countries, that have been sent to me unsolicited. An unscrupulous DXer might take advantage of such a blank QSL to "verify" a contact. Here is one example where an unaltered QSL card is *not* proof of a valid QSO; the real proof lies in the log of the DX station.

Honest DXers should applaud this high standard for the 5 Band WAZ Award. The award is probably the single most difficult award to earn in DX, and those who have earned it should be grateful that less-than-honest DXers cannot claim that they have

P.O. Box 50, Fulton, CA 95439
e-mail: <chod@compuserve.com>

ASTRON CORPORATION
9 Autry Irvine, CA 92618
(949) 458-7277 • (949) 458-0826

E151765 c E151765 LISTED 2F29

...POWER ON WITH ASTRON

SWITCHING POWER SUPPLIES...

MODEL SS-10TK

MODEL SS-12IF

SPECIAL FEATURES:

- HIGH EFFICIENCY SWITCHING TECHNOLOGY SPECIFICALLY FILTERED FOR USE WITH COMMUNICATIONS EQUIPMENT, FOR ALL FREQUENCIES INCLUDING HF
- HEAVY DUTY DESIGN
- LOW PROFILE, LIGHT WEIGHT PACKAGE
- EMI FILTER
- MEETS FCC CLASS B

PROTECTION FEATURES:

- CURRENT LIMITING
- OVERVOLTAGE PROTECTION
- FUSE PROTECTION.
- OVER TEMPERATURE SHUTDOWN

SPECIFICATIONS:

INPUT VOLTAGE: 115 VAC 50/60HZ OR 220 VAC 50/60HZ SWITCH SELECTABLE

OUTPUT VOLTAGE: 13.8VDC

AVAILABLE WITH THE FOLLOWING APPROVALS: UL, CUL, CE, TUV.

MODEL SS-18

DESKTOP SWITCHING POWER SUPPLIES

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SS-10	7	10	1⅛ x 6 x 9	3.2
SS-12	10	12	1⅛ x 6 x 9	3.4
SS-18	15	18	1⅛ x 6 x 9	3.6
SS-25	20	25	2⅛ x 7 x 9⅛	4.2
SS-30	25	30	3¼ x 7 x 9⅛	5.0

MODEL SS-25M

DESKTOP SWITCHING POWER SUPPLIES WITH VOLT AND AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SS-25M*	20	25	2⅛ x 7 x 9⅛	4.2
SS-30M*	25	30	3¼ x 7 x 9⅛	5.0

MODEL SRM-30

RACKMOUNT SWITCHING POWER SUPPLIES

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25	20	25	3½ x 19 x 9⅛	6.5
SRM-30	25	30	3½ x 19 x 9⅛	7.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M	20	25	3½ x 19 x 9⅛	6.5
SRM-30M	25	30	3½ x 19 x 9⅛	7.0

MODEL SRM-30M-2

2 ea SWITCHING POWER SUPPLIES ON ONE RACK PANEL

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25-2	20	25	3½ x 19 x 9⅛	10.5
SRM-30-2	25	30	3½ x 19 x 9⅛	11.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M-2	20	25	3½ x 19 x 9⅛	10.5
SRM-30M-2	25	30	3½ x 19 x 9⅛	11.0

MODEL SS-12SM/GTX

MODEL SS-10EFJ-98

CUSTOM POWER SUPPLIES FOR RADIOS BELOW

EF JOHNSON AVENGER GX-MC41
EF JOHNSON AVENGER GX-MC42
EF JOHNSON GT-ML81
EF JOHNSON GT-ML83
EF JOHNSON 9800 SERIES
GE MARC SERIES
GE MONOGRAM SERIES & MAXON SM-4000 SERIES
ICOM IC-F11020 & IC-F2020
KENWOOD TK760, 762, 840, 860, 940, 941
KENWOOD TK760H, 762H
MOTOROLA LOW POWER SM50, SM120, & GTX
MOTOROLA HIGH POWER SM50, SM120, & GTX
MOTOROLA RADIUS & GM 300
MOTOROLA RADIUS & GM 300
MOTOROLA RADIUS & GM 300
UNIDEN SMH1525, SMU4525
VERTEX — FTL-1011, FT-1011, FT-2011, FT-7011

NEW SWITCHING MODELS

SS-10GX, SS-12GX
SS-18GX
SS-12EFJ
SS-18EFJ
SS-10-EFJ-98, SS-12-EFJ-98, SS-18-EFJ-98
SS-12MC
SS-10MG, SS-12MG
SS-101F, SS-121F
SS-10TK
SS-12TK OR SS-18TK
SS-10SM/GTX
SS-10SM/GTX, SS-12SM/GTX, SS-18SM/GTX
SS-10RA
SS-12RA
SS-18RA
SS-10SMU, SS-12SMU, SS-18SMU
SS-10V, SS-12V, SS-18V

CIRCLE 134 ON READER SERVICE CARD

*ICS – Intermittent Communication Service

"earned" 5 Band WAZ. The very high standards of the DXCC program helped propel that award program to the forefront of DX. DXers everywhere should appreciate that 5 Band WAZ has an even higher standard than DXCC.

Chod, WB2CHO/VP2ML

CQ WW Conditions Prime for DXing!

By John Dorr, K1AR

If there was any debate about the status of our solar cycle and the availability of workable HF DX, the 1999 CQ WW SSB contest should have put that to bed. Whether it was in volume of stations worked (over 20,000 QSOs by the larger multi-operator stations) or numbers of countries (Many operations worked nearly 200 countries on a single band in 48 hours!), the results were staggering. In one of the first times in recent memory, 10 meters had wall-to-wall signals for nearly a full MHz of bandwidth, making it sound like the old days of crowded 20 meter conditions. At times all continents could be heard simultaneously, making DX pickings a real thrill.

If you were an East Coast contester, you were able to enjoy wide-open Asian/Pacific openings at the beginning of the contest to places such as 9M6, BY, VK8, V63, and many others. And imagine having VK5GN tell you that you were causing him QRM at 1300Z while you had a contest run going to Europe!

Finally, there was the matter of zones. Many stations claimed 40 zones on several bands over the weekend. For those of you who are 5B WAZ enthusiasts, you can only begin to imagine what it means to work WAZ on three of the required five bands in just one weekend. I would add that it's no less thrilling when 5A1A calls you on 20 meters to learn that he's not even a new zone (zone 34) in the contest!

So, friends, if you haven't dusted off that old transceiver in a few months, don't miss out on a ham radio event. DXing is alive and kicking!

21st Century DX

By Rich Moseson, W2VU

What does the future hold for DX and DXing? Well, for starters it's likely that there will be many more DXers here in the U.S., assuming that the FCC's license restructuring decision provides easier access to broad HF privileges for Technician and Tech-Plus amateurs. This, of course, will aggravate a situation recently brought to light by a reader who wrote to complain that there just isn't enough

CQ DX Awards Program

SSB

2290 ..... KD5AIJ
2291 ..... K5VUU
2292 ..... KØOZ

CW

996 ..... YT1MP

SSB Endorsements

320 ..... KZ2P/331
320 ..... VE3XN/331
320 ..... DU9RG/331
320 ..... WB4UBD/330
320 ..... DL6KG/326
320 ..... VE4ACY/325
320 ..... YZ7AA/321
300 ..... LU3HBO/301
300 ..... LU5DV/300
275 ..... KØOZ/291
275 ..... KA5OER/275
200 ..... N4RXL/205
200 ..... KD5AIJ/217

CW Endorsements

320 ..... K4IQJ/328
320 ..... WØJLC/327
320 ..... WB4UBD/324
320 ..... N4CH/324
300 ..... PY4WS/302

RTTY Endorsements

320 ..... WB4UBD/320
275 ..... W4EEU/284

The basic award fee for subscribers to *CQ* is $4. For non-subscribers, it is $10. In order to qualify for the reduced subscriber rate, please enclose your latest *CQ* mailing label with your application. Endorsement stickers are $1.00 each plus SASE. Updates not involving the issuance of a sticker are free. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business-size, No. 10, self-addressed, stamped envelope to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. Currently we recognize 331 active countries. Please make all checks payable to the award manager.

The WPX Program

SSB

2719 ..... KI5QA
2720 ..... IK8OZP
2721 ..... HK3LGO
2722 ..... JA8TEZ
2723 ..... KU6J
2724 ..... KB5VNM
2725 ..... W9IAL
2726 ..... F5UTE

CW

3022 ..... KU6J

Mixed

1841 ..... CT1EWX
1842 ..... JL3TEM
1843 ..... KU6J
1844 ..... JA9AVU

CW: 350 KU6J. 400 KU6J. 600 WA2VQV. 650 4XØ/G3WQU. 800 K6UXO. 1200 AI6Z. 1250 KT2C.
SSB: 350 IK8OZP, EA6BE, HJ3PXA, W9IAL, KU6J, UA3LIU. 400 HJ3PXA, W9IAL, KU6J, F5UTE, UA3LIU. 450 HJ3PXA, W9IAL, KU6J, F5UTE, UA3LIU. 500 HJ3PXA, N3TA, W9IAL, KU6J, F5UTE, UA3LIU. 550 W9IAL, F5UTE. 600 W9IAL, F5UTE. 1000 AI6Z. 1150 K9GWH. 1550 LU5DV. 1600 JR4NUN, LU5DV. 3700 I2PJA.
MIXED: 450 CT1EWX, JL3TEM, KU6J. 500 N3TA, JL3TEM, KU6J. 550 W9BOK, JL3TEM, KU6J.650 JL3TEM, KU6J. 700 JL3TEM, KU6J. 750 KU6J. 800 K6UXO. 850 RW3AX. 900 RW3AX. 1150 K9GWH. 1200 VE6FR. 1250 VE6FR. 1300 VE6FR. 1500 ON4CAS, AI6Z. 1550 JA6GWU. 1600 AA1KS, JA6GWU. 1800 JN3SAC. 1850 JN3SAC. 3700 I2PJA. 4150 W1CU. 4200 W1CU. 4250 W1CU. 4300 W1CU.

10 meters: K9GWH
15 meters: US7MM, JL3TEM
20 meters: WA2VQV, US7MM
40 meters: EA5YU, JL3TEM, US7MM, K6UXO
80 meters: EA5YU, DL6UAA, US7MM
160 meters: US7MM

Asia: JL3TEM, KU6J, US7MM
Africa: AI6Z, US7MM
No. America: KU6J, RW3AX, US7MM
So. America: US7MM
Europe: JL3TEM, KU6J, US7MM
Oceania: JL3TEM, I3ZSX, KU6J, US7MM

Award of Excellence Holders: K6JG, N4MM, W4CRW, K5UR, K2VV, VE3XN, DL1MD, DJ7CX, DL3RK, WB4SIJ, DL7AA, ON4QX, 9A2AA, OK3EA, OK1MP, N4NO, ZL3GQ, W4BQY, IØJX, WA1JMP KØJN, W4VQ, KF2O, W8CNL, W1JR, F9RM, W5UR, CT1FL, W8RSW, WA4QMQ, W8ILC, VE7DP, K9BG, W1CU, G4BUE, N3ED, LU3YL/W4, NN4Q, KA3A, VE7WJ, VE7IG, N2AC, W9NUF, N4NX, SMØDJZ, DK5AD, WD9IIC, W3ARK, LA7JO, VK4SS, I8YRK, SMØAJU, N5TV, W6OUL, WB8ZRL, WA8YM, SM6DHU, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, DK4SY, UR2QD, ABØP, FM5WD, I2DMK, SM6CST, VE1NG, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, HA8XX, K7LJ, SM3EVR, K2SHZ, UP1BZZ, EA7OH,, K2POF, DJ4XA, IT9TQH, K2POA, N6JV, W2HG, ONL-4003, W5AWT, KB0G, NB9CSA, F6BVB, YU7SF, DF1SD, K7CU, I1PO, K9LNJ, YBØTK, K9QFR, 9A2NA, W4UW, NXØI, WB4RUA, I6DQE, I1EEW, I8RFD, I3CRW, VE3MC, NE4F, KC8PG, F1HWB, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, KC7EM, YU1AB, IK2ILH, DEØDAQ, I1WXY, LU1DOW, N1IR, IV4GME, VE9RJ, WX3N, HB9AUT, KC6X, N6IBP, W5ODD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, WØULU, K9XR, JAØSU, I5ZJK, I2EOW, IK2MRZ, KS4S, KA1CLV, KZ1R, CT4UW, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, OE1EMN, W9IL, S53EO, DF7GK, I7PXV, S57J, EA8BM, DL1EY, KØDEQ, KU0A, DJ1YH, OE6CLD, VR2UW, 9A9R, UAØFZ, DJ3JSW, HB9BIN, N1KC, SM5DAC, RW9SG, WA3GNW, S51U, W4MS, I2EAY, RAØFU, CT4NH.

Award of Excellence with 160 meter Endorsement: K6JG, N4MM, W4CR2, N5UR, VE3XN, DL3RK, OK1MP, N4NO, W4BQY, W4VQ, KF2O, W8CNL, W1JR, W5UR, W8RSW, W8ILC, G4BUE, LU3YL/W4, NN4Q, VE7WJ, VE7IG, W9NUF N4NX, SMØDJZ, DK3AD, W3ARK, LA7JO, SMØAJU, N5TV, W6OUL, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, UR1QD, AB9O, FM5WD, SM6CST, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, K7LJ, SM3EVR, UP1BZZ, K2POF, IT9TQH, N8JV, ONL-4003, W5AWT, KBØG, F6BVB, YU7SF, DF1SD, K7CU, I1POR, YBØTK, K9QFR, W4UW, NXØI, WB4RUA, I1EEW, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, YU1AB, IK4GME, WX3N, WBØDD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, K9XR, JAØSU, I5ZJK, I2EOW, KS4S, KA5CLV, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, S53EO, S57J, DL1EY, KØDE1, DJ1YH, OE6CLE, HB9BIN, N1KC, SM5DAC, S51U, RAØFU, UAØFZ, CT4NH, W1CU.

Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage if airmail desired) to "CQ WPX Awards," P.O. Box 593, Clovis, NM 88101 USA.

CQ DX Honor Roll

The CQ DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more ACTIVE countries. With few exceptions, the ARRL DXCC Countries List is used as the country standard. The CQ DX Award currently recognizes 331 countries. Honor Roll listing is automatic when an application is received and approved for 275 or more active countries. Deleted countries do not count and all totals are adjusted as deletions occur. To remain on the CQ DX Honor Roll, annual updates are required. All updates must be accompanied by an SASE if confirmation of total is required. The fee for endorsement sticker s is $1.00 each plus SASE. Please make checks payable to the awards manager, Billy F. Williams. All updates should be mailed to P.O. Box 9673, Jacksonville, FL 32208.

CW

K2TQC 331	N4MM 330	K4IQJ 328	WØJLC 327	W4LI 325	ON4QX 321	LA7JO 316	OH3NM 310	KØHQW 299
K2FL 331	G4BWP 330	W1WAI 328	NC9T 326	K3JGJ 325	KA5TQF 321	N5HB 316	VE9RJ 309	K9FYZ 297
K6JG 331	EA2IA 330	W2FXA 327	IT9TQH 326	K1HDO 325	K9QVB 321	K4JLD 316	9A2AJ 309	LU3DSI 295
N4JF 331	W7OM 330	WØIZ 327	4N7ZZ 326	W8XD 324	HA5DA 321	K8JJC 315	HB9DDZ 307	WG7A 295
K9BWQ 331	KZ4V 329	K8PV 327	DJ2PJ 326	DL3DXX 324	K6CU 321	AA2X 314	WG5G/QRPp 307	G4MVA 294
K2ENT 331	WØHZ 329	W4QB 327	NC9T 326	N6AR 324	IT9ZGY 320	NØFW 314	W7IIT 305	F6HMJ 292
K6LEB 331	K4CEB 329	F3AT 327	VE7CNE 326	IT9VDQ 324	HA5NK 319	N1HN 313	CT1YH 305	KB8O 292
N7FU 331	W4OEL 329	I1JQJ 327	K9IW 325	N4CH 324	K2JF 318	K9DDO 312	KE5PO 304	DJ1YH 288
K3UA 331	N7RO 329	W7CNL 327	I5XIM 325	WB4UBD 324	VE7DX 318	W3II 312	G2FFO 303	YU7FW 286
YU1HA 331	K2JLA 329	I4LCK 327	WA8DXA 325	K8LJG 324	N6AV 318	W4UW 312	IKØADY 302	EA3BHK 282
K9MM 331	K4CN 329	N5FG 327	N5FW 325	W6SR 323	VE7DX 318	K1VHS 311	PY4WS 302	YC2OK 280
WA4IUM 331	K6GJ 329	I4EAT 327	IK2ILH 325	IT9QDS 323	I2EOW 318	WA8YTM 311	N4OT 301	EA2CIN 278
K1MEM (SK) 330	PAØXPQ 328	DL8CM 327	9A2AA 325	K5UO 322	YU1AB 317	N6AW 311	W6YQ 300	KF8UN 276
K2OWE 330	F3TH 328	SM6CST 327	OK1MP 325	N4AH 322	G3KMQ 317	K1FK 311	KH6CF 300	I3ZSX 276
W2UE 330	WB5MTV 328	N4KG 327	KA7T 325	KUØS 322	K7JS 317	OZ5UR 310	YV5ANT 299	G3DPX 275
W6DN 330								

SSB

K4MZU 331	EA4DO 330	K1HDO 328	KB4HU 325	IT9ZGY 324	KF8VW 320	CT1AHU 316	EA5OL 305	VK3IR 289
K2TQC 331	ZL3NS 330	VE7DX 327	KC4MJ 325	K6LEB 324	G4ADD 320	W6NW 315	WB2AQC 305	KF7VC 288
K2FL 331	OE3WWB 330	AA6BB 327	CX2CB 325	IK1GPG 324	I4WZK 320	KV2S 315	K6CF 304	OK1AWZ 287
EA2IA 331	XE1VIC 330	SM6CST 327	W9SS 325	K3JGJ 324	I4SAT 320	WA9RCQ 315	KC4FW 304	IK2DUW 287
W6EUF 331	K9FYZ 330	W3GG 327	W4EEE 325	IØSGF 324	W7ULC 320	N3ARK 315	EA5GMB 304	EA5GMB 287
K2JLA 331	XE1AE 330	I4EAT 327	KE4VU 325	VE4AT 323	EA3EQT 320	K7TCL 315	EA3CWK 303	TU2QW 286
K6JG 331	VK4LC 330	OZ3SK 327	WA4WTG 325	K4JDJ 323	KØFP 320	I4CSP 315	EA3BT 303	KK4TR 286
K6GJ 331	WB4UBD 330	CX4HS 327	WD8PUG 325	KA5TTC 323	KE3A 320	WB8ZRV 314	YC2OK 303	NM5O 285
K2ENT 331	K3UA 330	IT9TQH 327	W2CC 325	KB2MY 323	N4CSF 320	NØAMI 313	WB2NQT 303	EA1AYN 285
N4JF 331	K9BWQ 330	IT9TGO 327	PT2TF 325	EA3BKI 323	NI5D 320	OH5KL 313	CT1YH 302	VE7HAM 285
VE1YX 331	VE3MRS 330	WD8MGQ 327	KM2P 325	W2FGY 323	N4HK 320	WDØDMN 313	W5GZI 302	IK2HBX 284
K5TVC 331	N4CH 330	I1EEW 327	N5FW 325	KC8EU 323	DL3DXX 320	K9YY 313	N5QDE 302	F5RRS 284
K6YRA 331	KØKG 330	IØZV 327	K9HDZ 325	K6BZ 323	AE5DX 320	W9IL 313	KD4YT 302	KE6CF 283
YU1AB 331	WØYDB 330	SV1ADG 327	WA3HUP 325	YV5CWO 323	KA5TQF 320	W1LQQ 313	RA2YA 301	K7HG 283
W7OM 331	WA4IUM 330	DL8CM 327	YV1CLM 325	I8KCI 323	KB1HC 320	KD5ZD 312	N3RX 301	K7ZM 282
K4MQG 331	YV1KZ 330	KE4VU 327	N6AW 325	VE4ROY 323	XE1MD 319	N5HB 312	LU3HBO 301	WN6J 281
VE3MR 331	YV1AJ 330	I1JQJ 327	ZP5JCY 325	CE7ZK 322	KB1JU 319	IN3ANE 311	YT7TY 300	CP2DL 281
K7LAY 331	W4NKI 330	K9PP 327	WB3DNA 325	LU7HJM 322	PY2DBU 319	F1OZF 311	W5OXA 300	YU1TR 280
IK1GPG 331	W7FP 329	W4UNP 327	KE5PO 325	K5NP 322	IØSGF 319	EI6FR 311	K3LC 300	KN4RI 280
K5OVC 331	N5FG 329	CT1EEB 327	TI2CC 325	KB8O 322	WA4DAN 319	YZ7AA 311	WA4ZZ 300	WD9ACQ 280
DJ9ZB 331	WS9V 329	W9OKL 327	YV5IVB 325	K8YVI 322	KI3L 319	GM4XLU 311	WZ3E 300	OA4EI 280
NØFW 331	ZL1AGO 329	F9RM 327	KD8IW 325	W2FKF 322	KF8UN 319	KA5RNH 310	LU5DV 300	KK5UY 280
KZ2P 331	I8KCI 329	KX5V 327	N2VW 325	WW1N 322	F6BFI 319	I2MQP 310	YV4VN 299	WØIKD 279
K1UO 331	4Z4DX 329	N4KG 326	KF7SH 325	K9HQM 322	N6RJY 319	HA6NF 310	K6GFJ 299	EA3CWT 278
OZ5EV 331	DL9OH 329	VE2GHZ 326	IKØIOL 325	KC5P 322	ON5KL 319	KF7RU 310	KJ9N 298	LU5EWO 278
W6BCQ 331	K4CN 329	W4QB 326	YU1HA 325	W3AZD 322	CT1EEN 319	AB4IQ 310	SV3AQR 296	EA3CWT 278
YV5IVB 331	W4UW 329	W2FXA 326	YV5AIP 325	W8AXI 321	KF5AR 318	W4WX 310	KB5WQ 295	VE2DRN 277
K7JS 331	W8ZET 329	K8PV 326	K9IW 325	W6MFC 321	I8IYW 318	EA5RJ 309	SV1RK 295	9A9R 277
DU9RG 331	K8CSG 329	NC9T 326	WA4JTI 325	EA8TE 321	WA8YTM 318	EA5KY 308	4X6DK 295	K3LC 277
VE3XN 331	OE2EGL 329	K5UO 326	W8KS 325	XE1CI 321	CE1YI 318	EA3CB 308	YT1AT 294	VE2DRN 277
K9MM 330	K4JLD 329	W6SR 326	VE4ACY 325	LZ1HA 321	K4JDJ 318	EA3BHK 307	IT9VDQ 293	KC6AWX 276
N4MM 330	PAØXPQ 328	W4LI 326	VE3GMT 325	WA5HWB 321	ZL1BOQ 318	VE3CKP 307	KJ5LJ 293	SV2CWY 276
PY4OY 330	VE2WY 328	OE7SEL 326	VE7WJ 324	TI2JJP 321	K9QVB 318	WR5Y 306	W6WL 291	W6UPI 276
XE1L 330	VE2PJ 328	DL6KG 326	AI8S 324	YZ7AA 321	W9IL 317	N6AV 306	YB1RED 291	VE2AJT 275
I4LCK 330	W2JZK 328	W5RUK 326	N6AR 324	TI2HP 320	WA6DTG 317	TI2TEB 306	DJ2UU 291	US1IDX 275
W7BOK 330	I2EOW 328	9A2AA 325	AC7DX 324	OA4QV 320	EA1JG 317	VE3DLR 306	KØOZ 291	Z31JA 275
4N7ZZ 330	LA7JO 328	KA3HXO 325	KØHQW 324	OE6CLD 320	N5HSF 316	W3YEY 306	WA3KKO 290	F5NBX 275
IK8CNT 330	YV1JV 328	I2QMU 325	K2JF 324	W5XQ 320	K6RO 316	XE1MDX 305	OE7KWT 290	KA5OER 275
W6DN 330	KZ4V 328	OK1MP 325	I8LEL 324	LU1JDL 320	WS9V 316	DK5WQ 305	IK2PZG 289	
N7RO 330	WDØBNC 328	WB3CQN 325						

RTTY

K2ENT 327	W2JGR 316	K3UA 304	G4BWP 287	W4EEU 284	W4QB 280	YC2OK 280	KE5PO 274	PAØXPQ 272
WB4UBD 320	NI4H 305	I1JQJ 289	EA5FKI 284					

rare DX to go around! There may, however, be more space in which to pursue those too-rare DX stations. It's possible that hams will see more and larger HF allocations as current commercial and government HF users continue their migration to satellite-based systems for long-range communications.

Amateurs will make more use of satellites for DXing as well. The long-delayed Phase 3D satellite, once safely in orbit and operating, will permit excellent DX for long periods without depending on the sunspot cycle. This will also be an increasingly popular option for DXers with limited antenna space, as the VHF, UHF, and microwave bands used by P3D will permit the use of small, portable, antennas.

Back on HF, continuing improvements in receiver design and digital signal processing (DSP) circuits will make it easier to dig out signals from stations that are not only rare, but weak, perhaps helping to alleviate the shortage of rare stations noted by our correspondent. Actually, his major point was that he felt it would be wiser to take the money currently invested in high-end DXpeditions and instead channel it to training and equipping full-time residents of these rare locations to get licensed and on the air—establishing a permanent on-the-air presence in these places rather than the one-shot of a DXpedition. This debate will no doubt continue in the future as well.

The DX crystal ball also shows that it won't be long before some method of electronic QSLing is developed that's secure enough to permit electronic-QSL credit for operating awards, perhaps some variation on the public-key/private-key approach used in commercial transactions to assure that both the buyer and the seller are who they claim to be.

Finally, DXing will continue to be the magnet that draws new people into ham radio. DX is magic, plain and simple. Look ma, no wires! Our responsibility as hams, and especially as DXers, is to share the excitement of making those far-off contacts, to share the magic, and to cast the spell of ham radio DX over a new generation of amateurs.

Our Readers Say

The *CQ VHF – CQ* Merger

Editor, *CQ:*

I just read the news about the merge. I am somewhat disappointed but optimistic that you will continue your great coverage of VHF and above articles. I have enjoyed *CQ VHF* since its debut, wishing it was bi-weekly instead of monthly. I have especially enjoyed the articles on basic theory and antenna construction. Please don't abandon your format of VHF and try to turn us into a bunch of contesters requiring mega buck stations and acres of antenna farm. I enjoy meaningful conversation with amateurs of like interests and am sure many will share this style of operation. Please remember that many of us have no interest in contesting.

Bryan McGhee, KA9WMZ

Editor, *CQ:*

The latest edition of the *ARRL Letter* described how *CQ* and *CQ VHF* would be combined starting with the January 2000 issue. Change is inevitable. However, please continue to publish articles aimed at the beginning ham. The instructive format of *CQ VHF* has really been appreciated. Keep up the good work.

Jim, KF4ZYL

Editor, *CQ:*

I am really pleased that both these magazines will merge. I am a subscriber of *CQ VHF*, but I also wanted *CQ*. Could not justify the expense of both. I really think you will create the best (by far) magazine about ham radio in the USA!

Dick, W5AK

Bryan, Jim, and Dick: Many thanks for your kind words about CQ VHF. *We have no intention of trying to force anyone to do or be anything. We do plan to share the great diversity of our entire hobby—HF and VHF alike—with all of our readers. It is our goal to bring together the best that both magazines had to offer in the past, for the benefit of all amateurs.*

Editor, *CQ:*

The following is a letter for *CQ VHF* magazine: I am primarily interested in HF CW, satellite communication, and HF QRP. I do read your magazine occasionally and have found it generally helpful insofar as containing much practical information. I was leafing through the November issue and decided to buy it after seeing an article by Dave Ingram, K4TWJ, on oscillators. This was, as usual, very informative. Reading further, I encountered the article by Lew Ozimek, N2OZ, regarding binary and hexadecimal numbers. I thought it was outstanding. He explained the basics of these numbers in a most lucid fashion. This man must be a teacher, or should be! Best wishes for the future of an excellent publication.

Brooks Klostermyer, MD, KE4UMW

Brooks: Thank you, on behalf of Dave and Lew. Their contributions to our magazines are innumerable. Brooks, you represent the growing majority of hams today—interested and active on both HF and VHF. The recognition of this trend was the leading factor behind our decision to merge CQ VHF *into* CQ. *We hope you will enjoy having one magazine that addresses all of your ham radio interests.*

Words to Live By

This letter was addressed to "Beginner's Corner" columnist Peter O'Dell, WB2D:

Mr. O'Dell, I just thought that I would drop you a short note about your article that appeared in the October 1999 issue of *CQ VHF* ("The People Side of Ham Radio"). "Words to live by" is how I would sum it up. In fact, your article reminded me of a wonderful poem that a friend sent me a few years ago entitled, "The Greatest Things in Life I Learned in Kindergarten." It is based on some simple rules, such as saying "thank you" when someone has done something for you; "I'm sorry" if you hurt someone's feelings; and my wife's favorite—"If you took it, put it back where you found it." Well, this Friday evening, I will finally write my Basic Amateur Exam. If I can hold on to the message that you stressed in your article, it might help me be a more considerate operator, and who knows? Maybe, just maybe, we might have more of those good days ahead. Keep up the good work. We need to be reminded!

Francis Pitre
New Brunswick, Canada

WB2D responds: Thank you for the kind words. I'm glad that they were meaningful for you, but then I doubt that you needed to be reminded of such things. Good luck on your exam. Our hobby needs more people like you.—73, Peter

Not on My Band!

Editor, *CQ:*

I am puzzled why Mr. Riley Hollingsworth decided only to take away HF operating privileges from K4OKA based on inappropriate conduct on the air as described in an ARRL newsbrief. (*The FCC alleged in July that John A. Abernethy, K4OKA, had engaged in deliberate interference on 80 meters, and suspended his HF operating privileges for 6 months.—ed.)* I hope that K4OKA doesn't think that his same behavior is condoned on VHF/UHF but not on HF.

John W. Thomas, KB9KPT

John: It has been common practice in recent months for the FCC to take action short of suspending all operating privileges for certain infractions. Generally speaking, if an interference problem occurred on HF, then the offender's HF operating privileges were suspended for a certain length of time. Likewise, in cases of VHF interference (such as QRMing a repeater), the Commission has suspended the offenders' VHF privileges. In neither case is it a suggestion that behavior that is inappropriate on one part of the ham spectrum is okay on another.

Share Your Skills

Editor, *CQ:*

I read with much interest your editorial in the November issue of *CQ VHF* ("We Do This Stuff at Work Every Day..." encouraging hams in high-tech careers to apply their knowledge and skills to ham radio). It sure hit home with a BANG with me. Let me explain why.

I have just retired from 40 years as an electrical/electronics technician. I spent 15 years in the U.S. Air Force, first in electronic countermeasures equipment repair, then ground radio equipment repair, and finally in precision measurement equipment (test equipment) repair. After leaving the Air Force, I spent the last 27 years in electrical/electronic/instrumentation equipment repair in heavy civilian industry.

My retirement is on a disability for heart disease. That simply means I cannot do the heavy industrial work anymore and I cannot climb towers like I used to, but it does not mean I cannot work at my workbench in the shack on ham radio projects. It has provided me with the opportunity to begin much-needed work towards modernizing my shack.

I have been a licensed ham radio operator for 27 years. I am currently licensed as an Extra Class with the callsign ND9R. I am an educated, experienced ham radio operator. Most important, I am available and willing to follow your advice to begin working towards advancing technology for ham radio use.

My problem is probably the same as for many others in my situation. How do we make contact with other hams to begin this much needed work? I live in a small Midwestern community, so I do not have the opportunity for contact with those who currently work in the communications industry, or others who might also be interested in advancing technology for ham radio use. Where do these people meet? Do

Books, Videos, Calendars, Cards!

Visit Our Web Site www.cq-amateur-radio.com

33 Simple Weekend Projects

by Dave Ingram, K4TWJ

Do-it-yourself electronics projects from the most basic to the fairly sophisticated. You'll find: station accessories for VHF FMing, working OSCAR satellites, fun on HF, trying CW, building simple antennas, even a complete working HF station you can build for$100. Also includes practical tips and techniques on how to create your own electronic projects.

Order No. 33PROJ.... $15.95

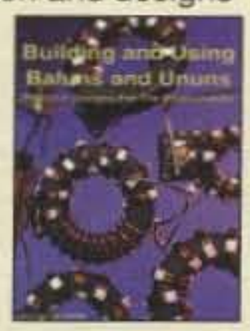
Amateur Radio Equipment Buyer's Guide

This 144-page book is your single source for detailed information on practically every piece of Amateur Radio equipment and accessory item currently offered for sale in the USA complete with specs and prices. Also includes the most comprehensive directory of Ham product manufacturers and dealers in the USA.

Order No. EBG..... $15.95

Building and Using Baluns and Ununs

by Jerry Sevick, W2FMI



This volume is the source for the latest information and designs on transmission line transformer theory. Discover new applications for dipoles, yagis, log periodics, beverages, antenna tuners, and countless other examples.

Order No. BALUN . . . $19.95

The Vertical Antenna Handbook

by *Paul Lee, N6PL*

Learn basic theory and practice of the vertical antenna. Discover easy-to-build construction projects.

Order No. VAH..... $9.95

The NEW Shortwave Propagation Handbook

by W3ASK, N4XX & K6GKU

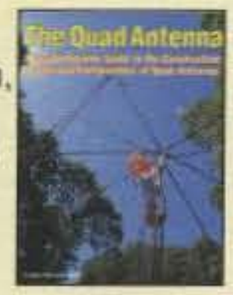
A comprehensive source of HF propagation principles, sunspots, ionospheric predictions, with photography, charts and tables galore!

Order No. SWP $19.95

The Quad Antenna

by Bob Haviland, W4MB

Second Printing



An authoritative book on the design, construction, characteristics and applications of quad antennas.

Order No. QUAD $15.95

Keys, Keys, Keys

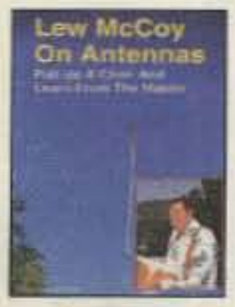
by Dave Ingram, K4TWJ

You'll enjoy nostalgia with this visual celebration of amateur radio's favorite accessory. This book is full of pictures and historical insight.

Order No. KEYS $9.95

McCoy on Antennas

by Lew McCoy, W1ICP



Unlike many technical publications, Lew prsents his invaluable antenna information in a casual, non-intimidating way for anyone!

Order No. MCCOY..... $15.95

W6SAI HF Antenna Handbook

by Bill Orr, W6SAI

Inexpensive, practical antenna projects that work! Guides you through the building of wire, loop, Yagi and vertical antennas.

Order No. HFANT..... $19.95

Getting Started Videos - "How-To," Tips, Techniques & More!

Ham Radio Horizons: The Video . . *Order No. VHOR*
Getting Started in VHF . . *Order No. VVHF*
Getting Started in Ham Radio . . *Order No. VHR*
Getting Started in DXing . . *Order No. VDX*
Getting Started in Packet Radio . . *Order No. VPAC*
Getting Started in Amateur Satellites . . *Order No. VSAT*
Getting Started in Contesting . . *Order No. VCON*

Only $19.95 each
Buy more and save!
Buy 2 or 3 for $17.95; Buy 4 to 6 for $15.95
Buy all 7 for your Club for only $99.95

Fax us at 516-681-2926
Call us toll free at 1-800-853-9797

1999/2000 Calendars

$9.95

Fifteen month calendars January 2000 through March 2001

Please specify Amateur Radio or Classic Radio Calendar

CQ Award Pins

If you've earned any of CQ's Awards, you can also display the corresponding CQ Award pin. Available for WAZ, 5 Band WAZ, 160 Meter WAZ, CQ DX, CQ DX Honor Roll, WPX, WPX Honor Roll, and USA-CA awards. **ONLY $5.00 EACH.**

Playing Cards

Top quality, plastic coated playing cards.
ONLY $9.95 per deck

FREE SHIPPING on orders over $50*

Name _____ Callsign _____

Strreet Address _____

City _____ State _____ Zip _____

Qty	Item #	Description	Price	Total Price
U.S. and possessions - add $4 shipping/handling. *FREE S/H on orders $50 and over. Foreign - shipping/handling charges are calculated by order weight & destination. *A $4 credit will be applied for Foreign orders over $50.			Shipping/Handling	
			Total	

Method of payment ☐ Check ☐ Money Order ☐ Visa ☐ MasterCard ☐ Discover ☐ American Express

Credit Card No._____ **Expiration date**_____

CQ Communications, Inc., 25 Newbridge Rd., Hicksville, NY 11801/516-681-2922; Fax 516-681-2926

they meet "on-the-air"? What information can you share with me to get me started?

L. Wayne Mollohan, ND9R

Wayne: First of all, thank you for your willingness to share your knowledge and experience with others. Your best bets for making contact with other hams who share your interest and enthusiasm are the following (in no particular order): (a) through the pages of this magazine—write an article about an idea, a project, etc.; (b) on the air and at club meetings—talk directly with your fellow hams, discuss your ideas, and do some brainstorming; (c) through the ARRL's Technology Task Force and Technology Working Group. One of the topics these groups have been discussing is how to share the many excellent ideas and proposals submitted so far. As of this writing no final plans were in place, but they may be by the time you read this. Check out the TTF/TWG area on the ARRL website; (d) on the Internet. There are countless newsgroups and e-mail reflectors devoted to virtually any ham radio interest you can think of. Find the one(s) that best match your interests, ignore the inevitable off-topic "flames," and dive right in.

Second Thoughts

Editor, *CQ*:

As a new ham (Tech-Plus, KG4CPO), I and my 14-year-old son, KG4CPN, have been amazed at the controversy that seems to surround this hobby. We initially used 2 meters locally and met a lot of fine people. Then I purchased an HF rig, and what a difference a few megahertz made. The Novice/Tech-Plus CW bands were great. I have made many contacts on CW the past few months and have even come to enjoy CW more than SSB or 2 meters. Several things have happened to change my mind about my choice of hobbies, though.

I listed our home e-mail address on the QRZ database. Within 24 hours I received a signal report via e-mail from a "ham" in Connecticut who also advertised his sexually explicit web page. Both of my boys received the same e-mail on their laptops. I have since then removed the e-mail address from the database.

I downloaded an SSTV program to monitor what was on the air, just to see if we would be interested in SSTV. While demonstrating it to my family on 14.230, we received a photo of a nude lady. Needless to say, this did not reinforce my wife's feeling about ham radio.

While at a local hamfest, a fellow ham gave my son about 30 copies of old *CQ* magazines. It was a nice gesture, one we appreciated very much. As we read through them together we couldn't help noticing the passionate controversy that seems to be in ham radio. There were numerous letters on "No-Code" and how it was going to turn ham radio into a CB-style environment. What is the big deal? Just because you had to learn the code does not mean everyone's interest is that way. My son's interests are in digital communications; however, he worked hard on CW so that he could gain his HF privileges. I also am taking the 13 wpm test and have already passed the General exam.

As we tune around the bands, just to listen and learn, we have heard many hams passionately discussing and sometimes outright arguing with each other on the air. Most of the arguments seemed to be centered around the code requirement and alleged jamming. This is supposed to be fun, people. How can you go through life fighting over a hobby and whether someone does not have to learn Morse code?

In addition, the language used on the air is inappropriate, especially on 20 meters and 80 meters. I realize the FCC has limited resources, so we must do our part also. I will break off any contact I feel is not in the true spirit of ham radio traditions.

As for the code requirements: Drop the code requirement altogether, or at least reduce full HF privileges to 5 wpm. Let's get some kids into the hobby or it will die when all the old men who staunchly defend their "rights" to keep the unwashed masses away die. We, my sons and I, will try to keep on in the hobby. The day I received KG4CPO was the fruition of a lifelong dream. Now I am afraid it may become a nightmare.

Bill Christiansen, KG4CPO

Tnx, XYL

Editor, *CQ*:

I have been a ham for many years (off and on) and I have observed that some hams run into difficulty explaining to their wives why a large antenna is not unsightly, why the shack needs some space in the house, and so forth. I am very fortunate. My wife is very understanding of my hobby, and even expresses concern that I have enough time to enjoy it. She found out one evening that the wife was referred to as the XYL. Since I had put my ham callsign on my vehicle license plate, she thought that "XYL" was an excellent complement. Of course, my ham friends all know what the plate means, but we do have to do a lot of explaining to the less enlightened. She even told me that one day a truck driver tapped out the classic "shave and a haircut" QSO ending with his horn when he passed her. It took her a few seconds, but she recognized the significance and knew he was another ham. Nice touch!

I have shared this story with other hams on the air, and they are always impressed that my wife takes an interest in our hobby, even though she is not a ham.

Joe Kolmer, WN9BDN
(with Liz Tulman, XYL)

Announcements

• **Ham Radio University 2000** – This event will take place in Babylon, New York, at the Babylon Town Hall Annex on January 23 and will include technical forums on all aspects of amateur radio: license restructuring, antennas, DXing, contesting, purchasing equipment, packet FLEXNET, ARES, APRS, satellite communications, QRP, YL issues, and more. For a complete list see <http://www.arrlhudson.org/nli/hru2000.htm>. In addition, there will be information booths for the ARRL, QCWA, and a tune-up clinic and DXCC/WAS card checking. Hours are 9 AM to 3 PM; donation $2.00 (spouses and children under 12 free). For more information contact Phil Lewis, N2MUN at <lewisp@hazeltine.com> or telephone 516-226-0698. Talk-in on 146.685, 136.5 PL.

• **Dayton ARA Scholarships** – The Dayton Amateur Radio Association is accepting applications for scholarships. The scholarships are open to graduating high school seniors who have an Amateur FCC license of Novice or higher. Awards up to $2000 each are presented. Applications may be requested by sending an SASE to DARA Scholarships, 45 Cinnamon Ct., Springboro, OH 45066. Applications must be postmarked no later than June 1, 2000.

• **OK, Oklahoma City VE Exams** – VE exams are held at 9 AM on the third Saturday of each month at the Southern Temple Baptist Church, 1821 So. High Street, Oklahoma City, OK. For more information, contact Audie, NG5B, 405-799-9916. Talk-in on 146.76.

• **The following Special Events will take place in Jan.:**

W4W, from Blue Ridge Mountain Millennium, Piney Creek, North Carolina; Tri-State ARC; Dec. 22 through January 4 on 3.978 (0000Z), 7.278 (1200Z), 14.278 (1500Z), 18.138 (1800Z), 21.378 (2100Z). QSL with SASE to W4UU, P.O. Box 4, Piney Creek, NC 28663.

K8DF, from Clarksburg, West Virginia, celebrating the birthday of General Stonewall Jackson; Stonewall Jackson ARA; 1400–2200Z January 22; on 7.240, 14.280, and 28.480 MHz ±. For certificate send SASE to Stonewall Jackson ARA, P.O. Box 752, Clarksburg, WV 26302.

• **The following hamfests are slated for Jan.:**

Jan. 8, **Northern Colorado ARC Superfest,** Larimer County Fairgrounds, **Loveland, Colorado**. For tables contact Michael Robinson, N7MR, 970-225-7501, or <michael@frii.com>; more information <www.info2000.net/~ncarc>. Talk-in 145.115 (– offset, 100 Hz) or 146.52. (Exams)

Jan. 8, **WARAC Swapfest**, Waukesha County Expo Center Forum, **Waukesha, Wisconsin**. West Allis Radio Amateur Club. Contact Phil, W9NAW, 414-425-3649. (Exams)

Jan. 9, **South Bend Hamfest & Computer Expo**, Century Center, **South Bend, Indiana**. Contact Denny, KA9WNR, Mon.–Fri. 7–10 PM, 219-291-0252. Talk-in 145.290.

Jan. 15, **Northwest Missouri Winter Hamfest**, Ramada Inn, **St. Joseph, Missouri**. Contact Dick Merrill, KCØAMY, P.O. Box 1533, St. Joseph, MO 64502 (816-279-2304). (Exams)

Jan. 16, **Metro 70cm Network Computer and Electronic Fleamarket**, Lincoln High School, **Yonkers, New York**. Contact Otto Supliski, WB2SLQ, 914-969-1053. Talk-in 440.425 PL 156.7, 146.910 PL 114.

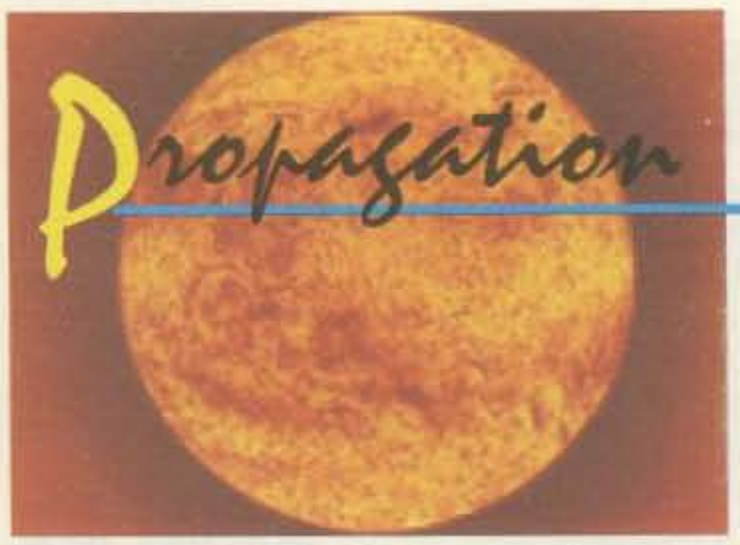
Jan. 16, **Hazel Park ARC Swap & Shop**, Hazel Park High School, **Hazel Park, Michigan**. Contact HPARC, P.O. Box 368, Hazel Park, MI 48030. Talk-in 146.64–.

Jan. 16, **Richmond Frostfest 2000**, The Showplace, **Richmond, Virginia**. Call 804-739-2269 ext. FEST; <http://frostfest.rats.net>. Talk-in 146.88. (Handicapped accessible.)

Jan. 22, **Gallatin Hamfest**, Gallatin Civic Center, **Gallatin, Tennessee**. For more info telephone 615-451-0213, web <www.rogerg.com/scara>, e-mail: <hamfest@rogerg.com>. Talk-in 147.240+ (114.8 PL), 444.350+ (107.2 PL). (Exams)

Jan. 30, **Tusco ARC Hamfest**, Ohio National Guard Armory, **Dover, Ohio**. Contact Billy Harper, KB8CQG, P.O. Box 80407, Canton, OH 44708 (phone 330-484-4634; e-mail: <bharper@neo.rr.com>). Talk-in 146.730–.

Jan. 30, **MMARC Post Holiday Hamfest**, Odenton Volunteer Fire Dept. Hall, **Odenton, Maryland**. Contact Bill Hampton, N3WGM, 7609 McGowan Ave., Glen Burnie, MD 21060 (telephone 410-766-2199; e-mail: <diamond@space4less.com>; web: <www.space4less.com/usr/mmarc>). Talk-in 146.205/805. (Preregister for exams with NU3D, 410-761-1423)



BY GEORGE JACOBS, W3ASK

The Science Of Predicting Radio Conditions

1999 CQ WW DX SSB Conditions Best in 8 Years!

The geomagnetic field was mostly stable throughout the world, with some brief unsettled periods in polar and auroral regions. Table I shows the worldwide Kp index of geomagnetic activity for both contest days.

The ionosphere was generally stable throughout both days, with what appears to be outstanding conditions on 10, 15, and 20 meters. Observers reported close correlation with the predictions contained in the October "Propagation" column, including the expected good early-evening openings to the Far East on 10 meters.

Several seasoned contest participants confirmed that the 1999 SSB contest weekend was, by far, the best observed on the higher bands in at least eight years, and that several records are expected to be broken. Forty meter openings were also reported to be as good as, if not better than, those of the past eight years.

Conditions on 80 and 160 meters generally peak during years of *low* sunspot count. They were not expected to be at their best during this year's contest because of the higher absorption associated with the increasing sunspot numbers. This was confirmed, with reports of generally good but weaker and noisier openings on 80 meters than during previous years. Early reports on 160 meter conditions indicate decreased DX openings, with weaker and noisier signals than were observed during previous years when sunspot activity was much lower.

Table II shows general ratings of propagation conditions observed both days in various geographical areas of the world. Geomagnetic and ionospheric conditions were mainly Low Normal in polar and auroral latitudes. Brief periods of minor radio storminess were noted between 08 and 11 UT on October 30 and between 16 and 20 UT on the 31st, with some signal degradation. In middle latitudes conditions were mainly High Normal with brief periods of Low Normal. Conditions were generally High Normal in low latitudes, and they varied between High and Above Normal in equatorial latitudes.

Sunspot Cycle 23 Progress

The Royal Observatory of Belgium, the world's official keeper of sunspot records, reports a monthly mean sunspot number of 71 for September 1999. The high for the month was 113 reached on September 15th. A low of 29 was recorded on September 26 and 27. September's mean value results in a smoothed running sunspot number of 84 centered on March 1999. This is approximately the same level as observed the previous month. A smoothed sunspot level of approximately 112 is forecast for January 2000.

Canada's Dominion Radio Astrophysical Observatory in Penticton, B.C. reports a corresponding mean 10.7 cm solar flux level of 136 for September 1999. This results in a smoothed level of 144 centered on March 1999. A level on the order of 146 is forecast for January 2000.

Peak in Cycle 23 Expected in 2000

Mother Nature is expected to celebrate the beginning of a new century and a new millennium with a peak outburst of sunspots. Sunspot Cycle 23, which began during May 1996, has been rising slowly towards a peak since then. To date, it is a much slower and considerably less intense cycle than had originally been predicted by the world's experts. Perhaps Mother Nature slowed down the cycle so that the new century could be greeted with the once in an eleven-year sunspot cycle peak.

Most solar scientists now expect Cycle 23 to peak sometime during the year 2000, probably by early summer, with a maximum sunspot count on the order of 115. A few experts are calling for a somewhat more intense peak, on the order of 125 or

Planetary Kp Index	UT 00-03	03-06	06-09	09-12	12-15	15-18	18-21	21-24
Oct. 30	1	1	1	2	3	2	2	2
Oct. 31	2	2	3	3	3	3	2	3

Table I– Worldwide geomagnetic indices (planetary Kp) reported every three hours during the SSB Contest weekend of October 30–31. Levels 1 to 3 indicate stable conditions with 1 exceptionally quiet, 2 quiet, and 3 quiet to unsettled.

LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for January 2000

Propagation Index	Expected Signal Quality (4)	(3)	(2)	(1)
Above Normal: 8, 10, 23-26	A	A	B	C
High Normal: 5, 9, 16-17 20-21	A	B	C	C-D
Low Normal: 2-4,6, 11, 14-15 18-19, 22, 27, 30-31	B	C-B	C-D	D-E
Below Normal: 1, 7, 13, 28-29	C	C-D	D-E	E
Disturbed: 12	C-D	D	E	E

Where expected signal quality is:

A—Excellent opening, exceptionally strong, steady signals greater than S9.

B—Good opening, moderately strong signals varying between S6 and S9+, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S9, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S6, with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find the *propagation index* associated with the particular path opening from the Propagation Charts appearing on the following pages.

2. With the *propagation index*, use the above table to find the expected signal quality associated with the path opening for any given day of the month. For example, an opening shown in the Propagation Charts with a *propagation index* of 3 will be fair to poor (C-D) on Jan. 1st, fair to good (C-B) from the 2nd through the 4th, good (B) on the 5th, fair to good (C-B) on the 6th, etc.

Extensive geomagnetic, solar, and ionospheric data evaluated by early November confirm that conditions during the CQ World-Wide DX SSB Contest weekend of October 30–31 were generally as predicted. They were the best to have occurred in the past eight years. The 1999 SSB Contest is very likely to see several new records established.

During the SSB weekend good, generally stable HF propagation conditions were observed. A solar flux count of 169 and a corresponding daily sunspot number of 146 were reported for October 30, dropping slightly to a flux of 160 and a sunspot count of 129 on the 30th.

There were no significant solar flares reported during the contest weekend.

11307 Clara Street, Silver Spring, MD 20902
e-mail: <george@gjainc.com>

Geographical Area	October 30	October 31
Polar	Low Normal*	Low Normal*
Auroral	Low Normal*	Low Normal*
Middle Latitude	High/Low Normal	High/Low Normal
Low Latitude	High Normal	High Normal
Equatorial	Above/High Normal	Above/High Normal
10.7 cm Radio Flux	169	160
Daily Sunspot Number	146	129
WW Geomagnetic Ap Index	7	10
WW Geomagnetic Kp Index	1.8	2.6

** Brief periods of minor radio storminess reported between 08–11 UT on Oct.. 30 and 16–20 UT on the 31st.*

Table II– Summary of HF propagation conditions based on reports made jointly by USAF and NOAA during the CQ WW DX SSB Contest weekend of October 30–31 and upon initial reports from contest participants.

more. This portends even better propagation on the HF bands than was observed during 1999, the level of which happens only once in approximately every eleven years.

Radio amateurs and other users of the HF spectrum should certainly look to the new year as one for unusually good propagation conditions. What a great way to celebrate the new century!

HF Propagation Conditions—The Best May Now Be At Hand

Here is a thumb-nail sketch of propagation conditions expected during 2000 on each amateur band between 6 and 160 meters.

6 meters: Increased *F2*-layer ionospheric DX openings to many areas of the world are expected during the daylight hours of 2000, particularly during the winter and equinox months. Improved short-skip openings are expected during the sporadic-*E* summer season.

10 meters: This should be a great year for 10 meters. Expect an increasing number of DX openings for longer periods of time during the daylight hours, especially during the equinox and winter months. DX openings to many areas of the world should also be possible during the summer months, sometimes lasting well into the early evening hours. Expect improved short-skip openings during the summer sporadic-*E* season.

12 meters: Should behave very much like the 10 meter band, but open somewhat more frequently to more areas of the world and remain open for an hour or two longer.

15 meters: This very likely may be the optimum DX band in 2000 for worldwide openings during the daylight hours of all seasons. Expect the band to remain open well into the evening hours, particularly during the summer months.

17 meters: Should behave much like 15 meters, but open more often, and remain open for DX an hour or two longer.

20 meters: Always a great band, it is in its prime during peak solar activity. Excellent conditions are expected on this band during the hours of daylight, with worldwide DX openings possible throughout the year. DX conditions on this band tend to peak for a few hours after local sunrise and again during the sunset period. During the summer months expect this band to remain open for DX well past midnight, and often throughout the entire period of darkness. In the winter months of 2000 increased nighttime DX openings are also expected. Twenty meters may well edge out 15 meters as the best all-around DX band during the new year.

30, 40, 80 and 160 meters: These are basically nighttime DX bands. Exceptionally good worldwide DX should continue on 30 and 40 meters from about two hours before sunset to approximately two hours after sunrise during all seasons. DX openings on 80 and 160 meters should peak during the hours of darkness during the equinox and winter months. Expect somewhat weaker and noisier signals, which are associated with increased sunspot activity on these bands.

A Look into the Future

With the start of a new century, the game of the day seems to be forecasting the future. However, if these were the last days of the 19th century, who in 1899 ever could have imagined the progress made in communications, transportation, medicine, science, etc., in the 20th century?

With this in mind, I will risk a brief look only into the *first* decade, and only in the field I know best—communications.

The main "buzz word" in describing the future of communications today is *convergence*. Data, audio, and video communication, information, and entertainment in digitized form are converging rapidly toward the same end point, often referred to as "the box." While the experts might differ as to what the box of the future eventually will look like, many support Bill Gates' concept that the ultimate box will

be a future version of the household PC.

Presently through the Internet we have available a greater amount of knowledge and information than has ever been previously stored in a single library. We can communicate worldwide with e-mail; we can watch movies and video, listen to music and the radio, speak with and see our friends, and process our digitized photos with our PC. However, this is only the beginning!

As rapid as convergence has been towards "the box" concept in this past decade, I predict that in the next decade it will pale by comparison with the technological progress in developing a well-designed, consumer-friendly "box" as the future home center for data, audio and video communication, information, and entertainment. A popular phrase during the new century may well be "I'll be seeing you on the box!"

Amateur radio is well known for the many contributions it has made to the development of communications, providing vital assistance during countless emergencies, and to society itself through its personalized nature. I will leave it to others to theorize the future role of amateur radio in a world of boxes. On a positive note, I point out that the importance of HF communications is its ability to span oceans, bridge continents, and cross frontiers freely, directly, and instantaneously, without an intermediate "gatekeeper." This cannot be duplicated by the box concept, which requires Internet providers and a wire, cable, or wireless provider as gatekeepers, with associated fees. The ionosphere is free!

Despite the explosive advancement in developing the box concept that is expected during the first decade of the new century, the world will continue freely to be the domain of the amateur HF bands.

January Conditions

It should be a toss-up among 10, 12, and 15 meters for DX propagation honors during the daylight hours. These bands should open to most areas of the world, often with very strong signals. Ten meters may have a slight edge before noon, with 12 and 15 meters being somewhat better after noon and becoming the optimum DX bands during the late afternoon hours. Short-skip openings between distances of approximately 1200 and 2300 miles should be excellent on 10 meters during most of the daylight hours. Excellent short-skip openings are also expected on 12,15, and 17 meters from shortly after sunrise through the early evening hours for distances between 1000 and 2300 miles.

Excellent propagation conditions are expected on 20 meters for both DX and short-skip openings almost around the clock. DX conditions should peak during

HOW TO USE THE SHORT-SKIP CHARTS

1. In the Short-Skip Chart, the predicted times of openings can be found under the appropriate distance column of a particular meter band (10 through 160 meters) as shown in the left-hand column of the chart. For the Alaska and Hawaii Charts the predicted times of openings are found under the appropriate meter band column (10 through 80 meters) for a particular geographical region of the continental USA as shown in the left-hand column of the charts. An * indicates the best time to listen for 80 meter openings.

2. The propagation index is the number that appears in ( ) after the time of each predicted opening. On the Short-Skip Chart, where two numerals are shown within a single set of parentheses, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. The index indicates the number of days during the month on which the opening is expected to take place, as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual dates on which an opening with a specific propagation index is likely to occur, and the signal quality that can be expected.

3. Times shown in the charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 AM; 13 is 1 PM, etc. In the Short-Skip Chart appropriate *standard* time is used at the path midpoint. For example on a circuit between Maine and Florida, the time shown would be EST, on a circuit between New York and Texas, the time at the midpoint would be CST, etc. Times shown in the Hawaii Chart are in HST. To convert to standard time in other USA time zones add 2 hours in the PST zone; 3 hours in the MST zone; 4 hours in the CST zone; and 5 hours in the EST zone. Add 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 14 or 2 PM in Los Angeles; 17 or 5 PM in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *standard* time in other areas of the USA subtract 8 hours in the PST zone; 7 hours in the MST zone; 6 hours in the CST zone; and 5 hours in the EST zone. For example, at 20 GMT it is 15 or 3 PM in New York City.

4. The Short-Skip Chart is based upon a transmitted power of 75 watts CW or 300 watts PEP on sideband; the Alaska and Hawaii Charts are based upon a transmitter power of 250 watts CW or 1 KW PEP on sideband. A dipole antenna a quarter-wavelength above ground is assumed for 160 and 80 meters, a half-wave above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 dB gain above these reference levels, the *propagation index* will increase by one level; for each 10 dB loss, it will lower by one level.

5. Propagation data contained in the charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado 80302.

CQ Short-Skip Propagation Chart
January & February 2000
Local Standard Time At
Path Mid-Point (24-Hour Time)

Band	*Distance From Transmitter (Miles)*			
(Meters)	*50-250*	*250-750*	*750-1300*	*1300-2300*
10	Nil	Nil	07-08 (0-1) 08-09 (0-2) 09-10 (0-3) 10-12 (0-4) 12-15 (0-3) 15-17 (0-2) 17-18 (0-1)	07-08 (1) 08-09 (2-3) 09-10 (3-4) 10-12 (4) 12-15 (3-4) 15-16 (2-4) 16-17 (2-4) 17-18 (1-3) 18-19(0-3) 19-20(1-2) 20-21(0-1)
15	Nil	07-08 (0-1) 08-10 (0-2) 10-15 (0-3) 15-17 (0-2) 17-18(0-1)	06-07 (0-1) 07-08 (1-3) 08-10 (2-4) 10-15 (3-4) 15-17 (2-4) 17-18 (1-4) 18-19 (0-3) 19-21 (0-1)	06-07 (1) 07-08 (3-2) 08-18 (4) 18-19 (3) 19-21 (1-3) 21-23 (0-1)
20	09-11 (1-2) 11-14 (1-3) 14-15 (1-2) 15-17(0-1)	06-07 (0-2) 07-09 (0-3) 09-11 (2-4) 11-14 (3-4) 14-15 (2-4) 15-17 (1-4) 17-19 (0-3) 19-20 (0-2) 20-06 (0-1)	06-07 (2-3) 07-08 (3) 08-09 (3-4) 09-17 (4) 17-19 (3-4) 19-20 (2-4) 20-21 (1-4) 21-23 (1-3) 23-02 (1-2) 02-06 (1)	06-07 (3-2) 07-08 (3) 08-12 (4) 12-14 (4-3) 14-21 (4) 21-23 (3-4) 23-01 (2-3) 01-04 (1-2) 04-06 (1)
40	07-08 (0-2) 08-09 (1-3) 09-10 (2-4) 10-19 (4) 19-21 (2-3) 21-00 (1-2) 00-07 (0-1)	07-08 (2-3) 08-09 (3) 09-11 (4-3) 11-15 (4-2) 15-19 (4) 21-00 (2-4) 00-02 (1-3) 02-06 (1-2) 06-07 (1-3)	07-08 (3) 08-09 (3-2) 09-11 (3-1) 15-17 (4-2) 17-18 (4-3) 18-00 (4) 00-02 (3-4) 02-06 (2-4) 06-07 (3-4)	07-08 (3-1) 08-15 (1-0) 15-17 (2-1) 17-18 (3) 18-06 (4) 06-07 (4-3)
80	07-08 (2-4) 08-10 (4) 10-15 (4-3) 15-00 (4) 00-04 (3-4) 04-07 (2-3)	07-08 (4-3) 08-09 (4-2) 09-10 (4-1) 10-15 (3-1) 15-16 (4-1) 16-18 (4-2) 18-04 (4) 04-07 (3-4)	07-08 (3-1) 08-09 (2-0) 09-16 (1-0) 16-18 (2-1) 18-20 (4-3) 20-06 (4) 06-07 (4-3)	07-08 (1-0) 08-16 (0) 16-18 (1-0) 18-20 (3-2) 20-04 (4) 04-06 (4-3) 06-07 (3-1)
160	09-17 (1-0) 17-19 (3-2) 19-06 (4) 06-08 (3) 08-09 (2-1)	17-18 (2-1) 18-19 (2) 19-21 (4-3) 21-05 (4) 05-06 (3) 06-07 (3-2) 07-08 (3-1) 08-09 (1-0)	17-18 (1-0) 18-19 (2-1) 19-21 (3-2) 21-03 (4-3) 03-05 (4) 05-06 (3-2) 06-07 (2-1) 07-08 (1-0)	18-19 (1-0) 19-21 (2-1) 21-03 (3) 03-05 (4-2) 05-06 (2-1) 06-07 (1-0)

ALASKA
November & December 2000
Openings Given in GMT#

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern USA	17-18 (1) 18-20 (2) 20-22 (3) 22-00 (2) 00-01 (1)	15-16 (1) 16-17 (2) 17-21 (3) 21-23 (4) 23-00 (3) 00-01 (2) 01-02 (1)	12-16 (1) 16-18 (2) 18-21 (1) 21-23 (2) 23-02 (3) 02-03 (2) 03-05 (1)	06-12 (1) 07-11 (1)*
Central USA	17-18 (1) 18-20 (2) 20-00 (3) 00-01 (2) 01-02 (1)	15-16 (1) 16-17 (2) 17-20 (3) 20-23 (4) 23-01 (3) 01-02 (2) 02-03 (1)	12-16 (1) 16-18 (2) 18-20 (1) 20-22 (2) 22-00 (3) 00-02 (4) 02-03 (3) 03-04 (2) 04-06 (1)	06-08 (1) 08-13 (2) 13-14 (1) 07-12 (1)*
Western USA	18-19 (1) 19-20 (2) 20-21 (3) 21-23 (4) 23-00 (3) 00-01 (2) 01-02 (1)	16-17 (1) 17-18 (2) 18-20 (3) 20-01 (4) 01-02 (3) 02-03 (2) 03-04 (1)	12-16 (1) 16-18 (2) 18-22 (3) 22-02 (4) 02-04 (3) 04-05 (2) 05-07 (1)	04-05 (1) 05-06 (2) 06-14 (3) 14-15 (2) 15-16 (1) 05-10 (1)* 10-14 (2)* 14-15 (1)*

HAWAII
November & December 2000
Openings Given in
Hawaiian Standard Time#

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern USA	07-08 (1) 08-09 (2) 09-13 (4) 13-14 (3) 14-15 (2) 15-16 (1)	06-07 (1) 07-09 (4) 09-12 (3) 12-15 (4) 15-17 (3) 17-18 (2) 18-19 (1)	12-14 (2) 14-17 (4) 17-21 (3) 21-00 (2) 00-06 (1) 06-08 (3) 08-09 (2) 09-12 (1)	17-18 (1) 18-20 (2) 20-02 (3) 02-03 (2) 03-04 (1) 19-20 (1)* 20-01 (2)* 01-03 (1)*
Central USA	07-08 (1) 08-09 (2) 09-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	06-07 (1) 07-09 (4) 09-13 (3) 13-17 (4) 17-19 (3) 19-20 (2) 20-21 (1)	08-13 (2) 13-14 (3) 14-20 (4) 20-00 (3) 00-02 (2) 02-05 (1) 05-06 (2) 06-08 (3)	17-18 (1) 18-20 (2) 20-21 (3) 21-01 (4) 01-03 (3) 03-04 (2) 04-06 (1) 19-20 (1)* 20-22 (2)* 22-01 (3)* 01-03 (2)* 03-05 (1)*
Western USA	07-08 (1) 08-09 (2) 09-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	06-07 (1) 07-08 (2) 08-12 (3) 12-18 (4) 18-20 (3) 20-21 (2)	08-10 (4) 10-15 (3) 15-22 (4) 22-01 (3) 01-04 (2) 04-06 (1)	17-18 (1) 18-19 (2) 19-20 (3) 20-03 (4) 03-05 (3) 05-06 (2)

Western USA	21-22 (1)	06-08 (3)	06-07 (1) 19-20 (1)* 20-21 (2)* 21-04 (3)* 04-05 (2)* 05-06 (1)*

#See explanation in "How To Use Short-Skip Charts" in the box at the beginning of this column.
* Indicates best time to listen for 80 meter openings. Openings on 160 meters are also likely to occur during those times when 80 meter openings are shown with a propagation index of (2) or higher.
Check for 6 meter openings at times when the 10 meter forecast rating is shown as (4).
For 12 meter openings interpolate between 10 and 15 meter openings.
For 17 meter openings interpolate between 15 and 20 meter openings.
For 30 meter openings interpolate between 40 and 20 meter openings.
Note: The Alaska and Hawaii Propagation Charts are intended for distances *greater* than 1300 miles. For shorter distances use the preceding Short-Skip Chart.

a window of an hour or two following sunrise, and again during the late afternoon and early evening hours. On many days the band should remain open well past midnight. Short-skip openings between approximately 1300 and 2300 miles should be possible from just after sunrise to as late as midnight. Shorter distance openings should also be possible from mid-morning to mid-afternoon.

The optimum band for DX conditions during the hours of darkness should be 40 meters. Openings to most areas of the world are forecast from shortly before sundown, through the hours of darkness, and until shortly after sunrise. Signal levels may be exceptionally strong at times. During the daylight hours short-skip conditions should be optimum for openings between approximately 100 and 600 miles. Skip will lengthen during the late afternoon, and by nightfall short-skip conditions should be optimum for openings between 800 and 2300 miles.

Atmospheric noise levels are expected to be at seasonally minimum levels in the northern hemisphere during January. This should result in peak conditions on both the 80 and 160 meter bands. Expect some good openings to many parts of the world on 80 meters during the hours of darkness and the sunrise period. Short-skip openings between distances of 50 and 250 miles should be optimum on 80 meters during the daylight hours. During the later afternoon and early evening hours short-skip openings should increase to between 250 and 1500 miles, and by nightfall openings up to and beyond 2300 miles should be possible.

Expect some DX openings on the 160 meter band during the hours of darkness. Openings towards Europe and the east should peak at about midnight.

Openings towards the South Pacific and in a generally southerly direction may be possible just prior to daybreak. Short-skip openings up to 1300 miles should be possible during the hours of darkness, and frequently the skip will extend out as far as 2300 miles. During the daylight hours, intense solar absorption will severely limit openings, although some may be possible at times up to 150 miles or so.

Short-Skip Charts

This month's column contains a Short-Skip Propagation Chart for use in the continental United States for distances between 50 and 2300 miles. Prediction charts centered on Hawaii and Alaska are also included. These charts are valid through February 2000. See last month's column for DX Propagation Charts for use during January.

VHF Ionospheric Openings

Solar activity is expected to be near peak intensity during January. This should result in some good DX openings on 6 meters to many areas of the world. Look for peak conditions towards Europe and Africa an hour or two before noon and towards the Caribbean area and Central and South America from an hour or two before, to about an hour or two after, noon. Look for possible 6 meter openings towards the Pacific, Australasia, and possibly the Far East during the later afternoon hours. Trans-continental openings should be possible beginning at about noon. Chances are best for 6 meter openings on those days expected to be High or Above Normal. (See the Last-Minute Forecast at the beginning of this column.)

Chances for meteor-scatter VHF openings should be pretty good between January 2nd and 4th, coincident with the occurrence of the *Quadrantids* meteor shower. This is expected to be a major shower, which should peak on January 3rd with a count of approximately 40 meteors an hour.

Some auroral-type openings should be possible during January. Fairly widespread auroral activity can occur during the month when HF conditions are Below Normal or Disturbed. Check the Last-Minute Forecast for appropriate dates.

Not many trans-equatorial (TE) openings are expected this month, since a seasonal slump usually occurs during January. Some infrequent openings may be possible, however, between southern tier states and countries well south of the equator in this hemisphere. The best time to check for TE openings on 6 meters is between 7 and 10 PM local time.

Propagation conditions on the HF bands should be off to a good start during January, and they are expected to remain at an exceptionally high level throughout the New Year.

Welcome to the new decade, the new year, the new century, and the new millennium. As the ancient Romans would say, "Salut MM."

73, George, W3ASK

Ham Shop

Advertising Rates: Non-commercial ads are 20 cents per word including abbreviations and addresses. Commercial and organization ads are $1.00 per word. Boldface words are $1.50 each (specify which words). Minimum charge $2.00. No ad will be printed unless accompanied by full remittance. All ads must be typewritten double-spaced.
Closing Date: The 10th day in the third month preceding date of publication (example: Jan. 10th for the March issue). Because the advertisers and equipment contained in Ham Shop have not been investigated, the Publisher of *CQ* cannot vouch for the merchandise listed therein. The publisher reserves the right to reject any advertisement. Direct all correspondence and ad copy to: CQ Ham Shop, 25 Newbridge Road, Hicksville, NY 11801.

CB-TO-10M CONVERSIONS: Frequency modifications, FM, books, plans, kits, high-performance CB accessories. Catalog $3. CBCI, Box 1898A, Monterey, CA 93942. <www.cbcintl.com>

FOREIGN AIRMAIL POSTAGE for successful QSLing! Many countries, monthly bargains, plus **EUROPEAN NESTING AIRMAIL ENVELOPES!** We offer **QSLs, EYEBALL CARDS, QSL ALBUMS, Wall Hangers.** Bill Plum, 12 Glenn Road, Flemington, NJ 08822-3322 (weekdays: 908-788-1020; fax: 908-782-2612).

QSLs FOR DX STATIONS: Our new "International Division" was established to handle QSL needs of DX hams. We understand the problems of packaging, shipping, and dealing with the customs problems. You can trust us to deliver a quality QSL, usually much cheaper than you can find locally. Write, call, or FAX for free samples and ordering information. "The QSL Man—W4MPY," 682 Mount Pleasant Road, Monetta, SC 29105 USA. Phone or FAX 803-685-7117.

"QRZ DX"—since 1979: Available as an **Adobe PDF file** each Wednesday or by regular mail. Your best source for weekly DX information. Send #10 SASE for sample/rates. **"The DX Magazine"—since 1989:** Bimonthly – Full of DXpedition reports, QSL Information, Awards, DX news, technical articles, and more. Send $2.00 for sample/rates. DX Publishing, Inc., P.O. Box DX, Leicester, NC 28748-0249. Phone/FAX: 704-683-0709; e-mail: <DX@dxpub.com>; WEB PAGE: <http://www.dxpub.com>.

CALLBOOK 2000 CD-ROM: $38.95 POSTPAID. All ARRL items discounted. <AA6EE@amsat.org>, 760-789-3674. D. Heise, 16832 Whirlwind/C1, Ramona, CA 92065. **<http://www.radiodan.com/aa6ee/>**

LEARN CODE BY HYPNOSIS: http://www.qth.com/cweasy/ or 1-800-425-2552.

CERTIFICATE for proven contacts with all ten American districts. SASE to W6DDB, 45527 Third Street East, Lancaster, CA 93535-1802.

TOWER HARDWARE, SAFETY EQUIPMENT, weatherproofing, T-shirts, and **MORE**. Champion Radio Products, telephone 888-883-3104, or <www.championradio.com>.

ALUMINUM CHASSIS-CABINET KITS, UHF and VHF Antenna Parts. K3IWK, 5120 Harmony Grove Rd, Dover, PA 17315-3016; <www.flash.net/~k3iwk>.

AMERICAN HAM GEAR manufactured between 1930 & 1980 needed to illustrate *CQ* book and calendar projects. Photography can be done at your location. Contact Joe Veras, N4QB, P.O. Box 1041, Birmingham, AL 35201. Tel: 205-967-2384 days, 205-967-0639 evenings and weekends.

<www.seaqmaui.com>

HALLICRAFTERS Service Manuals. Amateur and SWL Write for prices. Specify Model Numbers desired. Ardco Electronics, P.O. Box 95, Dept. C, Berwyn, IL 60402.

FREE IBM DISK CATALOG! Ham Radio, Shareware, and CD-ROMs. MOM 'N POP'S SOFTWARE, P.O. Box 15003-HE, Springhill, FL 34609-0111 (phone 1-352-688-9108; e-mail: <momnpop@webcombo.net>; website: <www.momnpopsware.com>).

TRYLON SELF-SUPPORTING TOWERS: Steel towers available up to 96 ft. Terrific value and reliability. The popular T-500 72-footer will take 45 square feet of antennas at 70 mph and is only $1825.00. <www.championradio.com> or 888-833-3104 for more info.

Get Ready For The

ORLANDO HamCation

Amateur Radio & Computer Show

2000

February 11, 12 & 13

AT THE CENTRAL FLORIDA FAIRGROUNDS
4603 West Colonial Drive Orlando, Florida

ARRL North Florida Section Convention ● 150 Commercial Exhibits
Over 400 Swap Tables ● Largest Tailgate Area In Florida
Testing On Saturday ● QSL Card Verification ● Free Parking
RV Camping On Premises ($16 per night) ● Fox Hunt
Guest Friendly Central Florida Atmosphere ● Theme Parks Nearby
Great Food On Premises ● Courtesy Talk-In On 146.76 (Backup Talk-In On 145.11)

Fri. 5 pm to 9 pm (commercial 2, swap tables & tail-gating) Sat. 9 am to 5 pm Sun. 9 am to 3 pm

Commercial Exhibits	Quentin Jones KU4WD	407-859-7115	qjones@mpinet.net
Swap Tables	Ron Ruebush KE4WBI	407-847-0650	
RV Reservations	Bob Cumming W2BZY	407-333-0690	W2BZY@mpinet.net
General Chairman	Ken Christenson KD4JQR	407-291-2465	KD4JQR@juno.com
Tailgating	Donna Ronco KF4YUF	407-823-7425	
e-mail:	ae4nj@web-cycat.com		

Orlando Amateur Radio Club

The Orlando HamCation is a registered service mark of the Orlando Amateur Radio Club. Honor System ATM on premises

Celebrate the year 2000 in Orlando at one of the great hamfests. Orlando has the best theme parks on earth to round out your visit. It's a great vacation for the ham and their families.

See the latest equipment. Find swap table bargains. See the largest tailgating area in the Southeast. There's base stations, mobile rigs, HT's, amps, antennas, call-letter hats, T-shirts, eye-ball QSO's, QSL cards, computers, food, fun and sun. It's ham heaven.

Make your plans now for the 2000 Orlando HamCation.

Advanced tickets: **$7.00**
Tickets at the gate: **$9.00**

Three day swap tables $35 advanced. ($45 at the gate.)
Three day tailgating $25 advanced. ($35 at the gate)
Swap table & tailgating participants are required to purchase an admission ticket.

For current information, please visit our web site:
www.oarc.org/hamcat.html

or write: **HamCation**
P.O. Box 547811
Orlando, FL 32854-7811

NEW CD-ROM release for 1999, for the PC with the PicturePacket (LITE) program ready to install on your Windows 95, 98, or NT based PC. The CD also contains many of K4ABT's articles, PacketRadio Handbooks, and hundreds of TNC to transceiver drawings, transceiver modifications (both 9600 baud and some commercial radio conversions), TNC to node conversions, and text file radio modifications. Some documents are in MSWord format. Here is a library of files and drawings from 15 years of the "Packet User's Notebook." Most drawings are in GIF and JPG formats. All orders are shipped PRIORITY, FIRST-CLASS MAIL within 24 hours of received order. Send check or MO ($20.00 US) payable to Buck Rogers, K4ABT, 115 Luenburg Drive, Evington, VA 24550.

KNOW FIRST! Ham radio fanatics—you need THE W5YI REPORT, a twice-monthly award-winning Hot Insider Newsletter Acclaimed best! Confidential facts, ideas, insights, nationwide news, technology, predictions, alerts. Quoted coast-to-coast! We print what you don't get elsewhere! $19.50 annually to new subscribers! Money-back guarantee! FREE sample for S.A.S.E. (two stamps). W5YI, P.O. Box 565101, Dallas, Texas 75356.

W7FG Vintage Manuals and Ladder Line: Most manuals in stock. SASE for catalog. 600 ohm Ladder Line. Visa/MasterCard accepted. **402731 W. 2155 Dr.**, Bartlesville, OK 74006 (918-333-3754 or 800-807-6146) **<http://www.w7fg.com>**

FREE Ham Gospel Tracts, SASE. KW3A, 265 West Ave., Springfield, PA 19064.

HAM RADIO REPAIR, quality workmanship. All Brands, Fast Service. Affordable Electronics, 7110 E. Thomas Rd., Scottsdale, AZ 85251 (480-970-0963). <hamservice@aol.com>

ANTENNA HARDWARE – S.S. "U" bolts, Aluminum Saddles, Element and Boom Plates, S.S. Hose Clamps. Write for list to HARBACH ELECTRONICS – WA4DRU, 2318 S. Country Club Road, Melbourne, FL 32901-5809 (http://www.harbach.com).

WORK RARE CW DX? CW CONTESTS? Contest Code is the answer. Powerful hypnosis audio tapes teach you to copy High Speed (30/40 WPM) or Ultra High Speed (50/60 WPM). Subliminals speed you along! 20 min/day for 30 days yields results. Each tape $15.95 ppd US. $3.00 shipping/handling. Specify 30/40 or 50/60 tape. Amex/VISA/ MC Order now! Call 1-800-425-2552, Alternative Arts.

WANTED: Older model bugs, unusual bugs, and miniature hand keys. State price, condition. Dave Ingram, K4TWJ, 4941 Scenic View Drive, Birmingham, AL 35210.

FOR SALE: CQ/Ham Radio/QST/73 magazines and binders. SASE brings data sheet. W6DDB, 45527 Third Street East, Lancaster, CA 93535-1802.

FREE HAM RADIO GOSPEL TRACTS: Christian youth leaders needed for out-reach areas. Membership is free. Send #10 SASE with call letters for details. Ray Bohmer, W1REZ, P.O. Box 8, Harmony, ME 04942.

P49V's ARUBA COTTAGE FOR RENT with 2 bedrooms, rig, and antennas. For info write Carl Cook, 2191 Empire Ave., Brentwood, CA 94513.

HamMall.Com : Largest Web site dedicated to the sale of all types of amateur radio equipment. Check out the QSL Manager's Listing, add your call to the Call Wall, or get technical assistance. Find us at: <www.hammall.com>.

IMRA-International Mission Radio Assn. helps missioners—equipment loaned; weekday net, 14.280 MHz, 1:00–3:00 PM Eastern. Sr. Noreen Perelli, KE2LT, 2755 Woodhull Ave., Bronx, NY 10469.

RADIOAMADORES BRASILEIROS, compre ICOM, Kenwood no Brasil. Tel/Fax: +19-875-6174 ou <www.bestway.com.br/radiohaus>.

Advertiser's Index

(continued on page 131)

WANTED: HAM EQUIPMENT AND RELATED ITEMS. Donate your excess gear—new, old, in any condition—to the Radio Club of Junior High School 22, the Nation's only full time non-profit organization working to get Ham Radio into schools around the country as a teaching tool using our EDUCOM—Education Thru Communication—program. Send your radio to school. Your donated material will be picked up ANYWHERE or shipping arranged, and this means a tax deduction to the full extent of the law for you as we are an IRS 501(c)(3) charity in our 18th year of service. It is always easier to donate and usually more financially rewarding, BUT MOST IMPORTANT your gift will mean a whole new world of educational opportunity for children nationwide. Radios you can write off; kids you can't. Make 1999 the year to help a child and yourself. Write, phone, or FAX the WB2JKJ "22 Crew" today: The RC of JHS 22, P.O. Box 1052, New York, NY 10002. Twenty-four hours call 516-674-4072; fax 516-674-9600; or e-mail <wb2jkj@juno. com>. Join us on the WB2JKJ Classroom Net, 7.238 MHz, 1200–1330 UTC daily and 21.395 MHz from 1400 to 2000 UTC.

Statement of Ownership, Management and Circulation, October 1, 1999. CQ Amateur Radio, 25 Newbridge Road., Hicksville, NY 11801. Publication #007-893X. Issued monthly, subscription price $27.95 per year (12 issues). Publisher: Richard A. Ross; Editor: Richard S. Moseson; owned by CQ Communications, Inc. Stockholder: Richard A. Ross. Circulation (Average of Preceding 12 Months): Net Press Run 58,604, Sales Through Dealers and News Agents 17,882, Mail Subscriptions 27,694, Total Paid 45,576, Free Distribution 371, Total Distribution 45,947, Copies Not Distributed 400, Returns from News Agents 12,.257, Total 58,604. Circulation (single issue nearest filing date): 53,963, Sales Through Dealers and News Agents 15,573, Mail Subscriptions 26,821, Total Paid 42,394, Free Distribution 331, Total Distribution 42,725 Copies Not Distributed 500, Returns from News Agents10,738, Total 53,963 s/Richard A. Ross, Publisher.

FOR SALE: **Transmission Line Transformers** (Baluns and Ununs). Due to QTH downsizing, I have to dispose of the many transformers used in my study of these broadband and highly efficient matching transformers. A suggested price is $20, covering labor, packaging, and shipping. Oldest transformers will be shipped first. They will include a short personal note on the particular experiment. Please, no special requests.Most transformers are uncased. Jerry Sevick, W2FMI, 32 Granville Way, Basking Ridge, NJ 07920 (908-766-6122). **Note:** These are one of a kind, for experimental use only.

ASTRON Power Supply, brand new w/warranty, RS20M $99, RS35M $145, RS50M $209, RS70M $249. Call for other models, AVT 626-286-0118 <www.aventrade.com>.

ATTENTION SB-200 & SB-220 OWNERS: Restore and up-grade your tired old amplifier with our parts and kits. Power supply boards, soft keys, soft starts, new fans & motors, many more items. Write for details—**Please specify the model**. Harbach Electronics—WA4DRU, 2318 S. Country Club Rd., Melbourne, FL 32901-5809 (http://www.harbach.com).

TRIBANDER COMPARISON REPORT: Find out the real lowdown on HF antenna performance. K7LXC and NØAX test the KT34XA, TH7, TH11, C-3, Skyhawk, and more. Over 60 pages. $15 plus $3.00 s/h. <www.championradio.com> or 888-833-3104.

PHASED ARRAY NETWORKS by COMTEK SYSTEMS deliver gain and front to back. Call 704-542-4808; fax 704-542-9652. COMTEK SYSTEMS, P.O. Box 470565, Charlotte, NC 28247.

QSL CARDS Many styles. Top quality. Order Risk Free. Plastic cardholders, T-shirts, Personalized caps, mugs, shirts. Other ham shack extras. Information and samples: **Rusprint 1-800-962-5783; 913-491-6689; or fax 913-491-3732.**

FREE GUIDE "THE TEN MOST COMMON TOWER BUILDING MISTAKES": Written by well-known tower expert Steve Morris, K7LXC, this guide will help you avoid dangerous mistakes. TOWER TECH, Box 572, Woodinville, WA 98072; e-mail <UpTheTower@aol.com> or call 800-TOWERS8 or on the web: <www.championradio.com>.

WANTED: (1) Vibroplex Deluxe Semiautomatic keyer in WW II battleship gray. (2) J-36 military keys by Vibroplex, Bunnell, Lionel, etc. (3) Coast Guard, Navy RM, or MM Radio Officer's speed key in carrying case—for private collection by senior Coast Guard officer. Also other straight keys/bugs/keyers with naval history and incomplete/broken bugs for restoration parts. <wb4rhb@arrl.net>

GROUND IT Ham Station Grounding Accessories. **J. Martin Systems**, 35 Hilltop Ave., Stamford, CT 06907. Voicemail/Fax 203-461-8768; web: http://**www.jmsystem.com**

WANTED: Collins, Drake, 3-500Z Amplifiers, bad, good. Price list :$1.00, SASE. Joe Bedlovies, P.O.Box 139, Stratford, CT 06615.

FOR SALE: Ten-Tec Omni C Power Supply, Ten-Tec Remote VFO 243, Ten-Tec Keyer KR-20A, Ten-Tec 580 Delta w/ps, Heath HW-18 w/ps, Hammarlund Receiver HQ-170A, Hallicrafter Receiver SX-130. W4LQI, telephone 1-606-265-3545.

DRAKE TR4C $350, Kenwood TS-530S $450. K1BW, 413-538-7861.

VP5 – Be DX: Newly constructed 2BR/2BA villa with rig and antennas overlooking north coast of beautiful Middle Caicos. Telephone 904-282-0158, or e-mail <islands@southeast.net>.

OVER 2500 DIFFERENT DX AWARDS from 122 DXCC countries listed. K1BV DX Awards Directory. Put your QSLs to work for you! $21 postpaid. Ted Melinosky, 65 Glebe Road, Spofford, NH 03462-4411. <http://top.monad.net/~k1bv>.

HEARD ISLAND commemorative T-shirts, same shirt as team is wearing on QSL card. Proceeds benefit VKØIR DXpedition. Personal checks on U.S. banks okay. Please no credit cards. Sizes remaining: large, extra-large. 100% cotton, U.S. made. $20 Priority Mail stateside, $25 DX Air Mail, postage included. Tom Anderson, WW5L, 3505 Cliffwood Drive, Bedford, Texas 76021-2043 (phone 817-498-2820; e-mail <WW5L@gte.net>).

SX88 Hallicrafters receiver wanted. Jim, W6OU, 714-528-5652.

RAINBOW AMATEUR RADIO Association, the gay/lesbian club. Active weekly HF nets, monthly newsletter, e-mail reflector, web page: <www.rara.org>. Privacy respected. E-mail: <rara@qsl.net>, or P.O. Box 191, Dept. A, Chesterland, OH 44026-0191.

RF TRANSISTORS & TUBES: SD1446, 2SC1969, MRF454, MRF455, MRF422, 2SC2290, 2SB754, 2SC2312, 2SC2166, SAV17, MRF448, MRF151G, 3-500ZG, 3CX3000A7, 3CX400A7/8874, 4CX250B, 572B. WESTGATE 800-213-4563.

WEATHER SATELLITE and MIR/Shuttle 2M antennas. Woodhouse Communication, P.O. Box 73, Plainwell, MI 49080. Voice 616-226-8873; fax 616-226-9073; e-mail <www.view2earth.com>.

KK7TV COMMUNICATIONS: *See our display ad.*

GREAT CIRCLE MAPS computer generated for your exact QTH, $20 ppd worldwide. Printouts $12 ppd. SASE for info. Bill Johnston, K5ZI, Box 640, Organ, NM 88052 (505-382-7804).

Join the LAMBDA AMATEUR RADIO CLUB (LARC) since 1975, the only open and visible public-service oriented ham club for gay and lesbian hams. Monthly newsletter, HF skeds, internet listserv and IRC, ham-fest meetings, chapters, DXpeditions. Write LARC, P.O. Box 56069, Philadelphia, PA 19130-6069 or e-mail <lambda-arc@geocities.com>; <http://www.geocities.com/WestHollywood/1686>.

19" RACKMOUNT PC CHASSIS <www.cti-texas.com>.

CALLSIGN BRASS BUCKLES and Custom Ham Products. <www.TheMaineStore.com>

The famous copper **J-POLE** antenna for 2 meters. KF6TSS 5/8 wave version. $29.95. <http://home.earthlink.net/~drduggee/jpole.htm> or toll-free 1-888-881-5670.

FOR SALE/TRADE: Original ALLIED Knight-Kit manuals—Ocean Hopper, Space Spanner, SpanMaster, SpanMaster II, StarRoamer, StarRoamer II, Transistor DXer, Crystal Set, R-55, R-55A, R-100A, R-195, AX-190, SX-190, A-2525, A-2516, A-2517, A-2518, T-50, T-60, T-150, T-150A, T-175, TR-106, TR-108, C-11, C-100, C-560, LC-1, P-2, KG-620, KG-625, KG-650, KG-653, KG-670, KG-686, KG-687, KG-688, KG-690, KG-696, G-30, V-44, V-107, X-10, RFz-bridge; LAFAYETTE manuals— LSG-10, HE-10/KT-200, TE-18, TE-57, HE-20T, HE-25 ("Voyager"), TE-27, HE-45B, HA-50, HE-55, HE-56, TM-59A, HE-61A, HA-63A, HE-71, HE-74, HE-89, HA-90, KT-116, KT-135 ("Explor-Air"), HA-144, HA-146, KT-208, HA-230/KT-340, HA-250, HA-350, KT-390 ("Starflite"), HA-410, HA-450, HA-460, HA-500, HA-600, HA-600A, HA-650, HA-700, HA-750, HA-800, HA-1200. WANTED: Any manuals for Hallicrafters, Hammarlund, National, Globe/WRL, Heathkit, Johnson, Multi-Elmac, Gonset, EICO, B&W, RME, Conar, B&K, Harvey-Wells, Morrow, Mosley, Drake, Regency, Ameco, Clegg, Genave, Utica, Polycomm, Pierson, Archer/Realistic, RCA, Simpson, Triplett, Superior, Swan, Howard, Echophone, Millen, McMurdo Silver, Raco, Precision, and others. NI4Q, P.O. Box 690098, Orlando, FL 32869-0098; phone 407-351-5536; e-mail: <ni4q@juno.com>.

WORLD RADIO TEAM CHAMPIONSHIP WRTC-2000 Call for Contributions

The WRTC-2000 will be held in the city of Bled, Slovenia from July 5 to July 11, 2000. Amateurs worldwide are invited to come to Slovenia to experience an adventure of a lifetime. Previous WRTC events (1990 and 1996) brought together hundreds of amateurs and their families. It is expected that WRTC-2000 will attract close to a 1000 contesters from all over the world.

Whether you can attend WRTC-2000 or not, your financial contribution will help assist the funding of this great contesting event. Carl Cook, AI6V (P49V), has been asked by the Slovenian Contest Club to solicit contributions and act as WRTC-2000 Treasurer/Non-Europe. A donation in excess of $250 may be submitted via a direct contribution to the: Northern California DX Foundation, a non-profit organization, and addressed to: Bruce Butler, W6OSP, 4220 Chardonnay Ct., Napa, CA 94513 USA. Contributions under $250 should be sent to: Carl Cook, AI6V/P49V, 2191 Empire Ave., Brentwood, CA 94513 USA. A contribution of any magnitude will be greatly appreciated.

If you would like to contact the fund-raising drive, please send an e-mail to: <ai6v@ aol.com>. For more information on WRTC-2000, point your browser at <http://wrtc2000. bit.si>. Thank you for your support.

73, Carl Cook, AI6V/P49V

Advertiser's Index *(cont'd)*

It's easy to advertise in CQ.
Let me know what I can do to help.
Arnie Sposato, N2IQO
(516) 681-2922 or FAX (516) 681-2926
e-mail:arniecq@aol.com

HF ENTHUSIASM

Yaesu, Choice of the World's top DX'ers

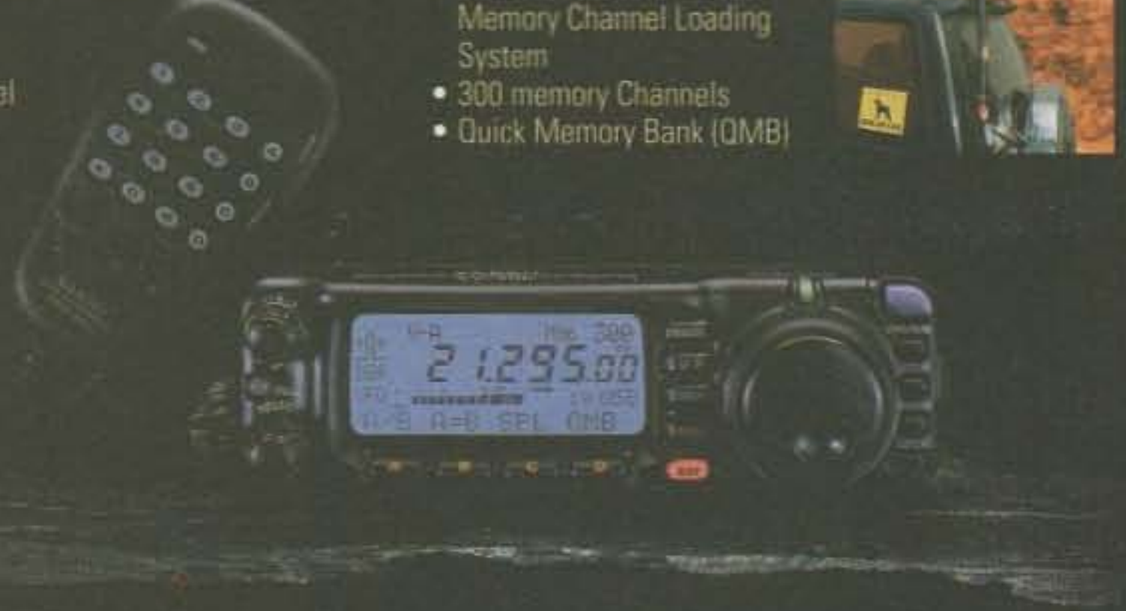
MICRO MOBILE FT-100

Over 40 years of experience in HF transceiver design has firmly established Yaesu as the choice of the world's top DX'ers. The knowledge that produced unequaled RF technology and design that is found in the State of the Art FT-1000MP can also be found in the miniature FT-100. The FT-100 while small in size 6.3" × 2.1" × 8.1"(160 W × 54 H × 205 D mm :w/o knob) is large in features and performance. This is accomplished by using the most advanced manufacturing techniques and component mounting technology. High Dynamic range RF front-end technology and Advanced Digital technology such as DSP sets a new standard of receiver performance for miniature HF transceivers. The single piece die cast frame, dual cooling fan system and revolutionary RF high power design technique keeps the FT-100 running cool and smooth in the most adverse operating environments. (TX Power output=100W HF, 50W VHF/20W UHF) The TX Equalizer offers crisp, clear and clean TX audio reproduction that until now was only found in top of the line HF base stations. The optional ATAS-100 (active tuning antenna system) ushers in a new age of mobile and field day operation (from HF to UHF frequencies). Add the optional ATBK-100 base kit (Good for limited space, simple setup.) and you've got a base station that ranks among the best in the world.

Features

- Frequency coverage:
  RX : 100 kHz-961 MHz (cellular blocked)
  TX : 160-6 m/144-148 MHz/430-450 MHz
- Power output : 100 W (160-6 m), 50 W (144 MHz), 20 W (430 MHz)
- DSP Bandpass Filter, Notch Filter, Noise Reduction, and Equalizer
- IF Noise Blanker
- SSB, CW, AM, FM, AFSK, Packet (1200/9600 bps) operation
- Detachable Front Panel
- Two Antenna Jacks (HF/50 and 144/430)
- IF Shift
- VOX
- Dual VFOs
- Available IF bandwidths of 6 kHz, 2.4 kHz, 500 Hz, and 300 Hz (6 kHz, 500 Hz, 300 Hz filters optional)
- Built-in Electronic Memory Keyer
- Speech Processor
- Built-in CTCSS and DCS for FM operation
- Automatic Repeater Shift and Auto-Range Transponder System
- Smart Search™ Automatic Memory Channel Loading System
- 300 memory Channels
- Quick Memory Bank (QMB)

- Bright LCD with multi-function display
- Optional FC-20 External Antenna Tuner
- Compatible with ATAS-100 Active-Tuning Antenna System. Add the optional ATBK-100 base kit



MICRO MOBILE SERIES

FT-100

Ultra-Compact HF/VHF/UHF Transceiver

YAESU
Choice of the World's top DX'ers

For the latest news, hottest products:
Visit us on the Internet! http://www.yaesu.com

Specifications subject to change without notice. Specifications guaranteed only within Amateur bands.Some accessories and/or options are standard in certain areas. Check with your local Yaesu dealer for specific details.

FT-50RD
This durable, multi-featured 5 Watt Dual Bander is manufactured to rigid MIL-810 standards. Featuring wideband frequency coverage,* CTCSS/DCS operation, Dual Watch, 112 memory channels, and Digital Voice Storage.

FT-51R
This full-featured 5 Watt Dual-Band Handheld includes dual receive, 120 memory channels (80 if Alphanumeric), Auto Tone Search, Spectra Scope, and V/V, U/U and V/U operation.

VX-1R
The pocket-sized VX-1R is small in size only. Featuring Smart Search,™ DCS/CTCSS, Dual Watch, ARTS,™ wide-band coverage (76–999* MHz plus AM BC). The VX-1R provides 291 memory channels, and puts out ½ Watt (1 Watt w/optional E-DC-15 DC Adapter).

* Cellular Blocked

VX-5R
Although Yaesu's newest Tri-Band Handheld Transceiver is the world's smallest, it offers the performance of a full-size unit. The VX-5R operates on the 50 MHz, 144 MHz and 430 MHz bands with 5 Watts of power output, along with ultra-wide receive coverage of the VHF and UHF spectrum, plus AM medium- and short-wave broadcast reception. The VX-5R is military rated, so its durable, lightweight design allows you to take it anywhere. It is equally suited to walking through the concrete jungle as it is to forging the raging rivers of a real one. Along with a temperature display, the optional barometer pressure sensor unit gives a read-out of barometric pressure and altitude.

FT-11R
This compact 2M Handheld features 150 memory channels (75 if Alphanumeric), 10-memory DTMF Autodialer, Automatic Battery Saver (TX/RX), backlit Keypad, and are available in 1.5 Watt and 5 Watt versions.

FT-411E
The affordable FT-411E is compact and durable. This 5 Watt VHF FM Handheld features a die-cast case, 40 memory channels, 10 DTMF memories, built-in VOX, CTCSS, and multiple scan modes.

FT-23/33R
These ultra-compact, 5 Watt VHF FM Handhelds feature rugged die-cast aluminum cases, 10 memory channels, optional CTCSS, and multiple scan modes. The FT-23R (2M) and the FT-33R (222 MHz) are easy to operate, and give outstanding performance.

FT-10/40R
These single-band handhelds are manufactured to MIL STD 810 specifications, featuring either 30 or 99 memories, CTCSS/DCS operation, Dual Watch, and are available in 2.5 Watt or 5 Watt versions, with four keypad options.

VR-500
This miniature Handheld Receiver provides FM, AM, SSB and CW reception on 100 kHz–1300 MHz, with 1091 memory channels, Smart Search,™ versatile Dot Matrix display, Band Scope, and Dual Watch.

TOUGH GUYS.

When you're small, you get picked on. Isn't that how it goes? Well not in Yaesu territory, because not only do we design compact handhelds for efficiency, but we give these clever little guys plenty of muscle. Yaesu handheld transceivers have earned the bragging rights for being the smallest handhelds with the most durable water resistant casings ever created. And packed inside the brawn are engineering accomplishments in performance that are unmatched in the industry. Our high-tech handheld transceivers provide clean power output on the VHF and UHF bands and offer revolutionary features that allows these tough guys to continually outperform the competition. Learn more about Yaesu products on the web at www.yaesu.com

YAESU ...leading the way.

POCKET PERFORMANCE
Take it everywhere! The IC-Q7A is small enough to slip in a pocket, yet big enough for easy operation.

IC-Q7A On-the-Spot savings. No coupons, no paperwork, no waiting! Limited time offer. See your authorized ICOM dealer for details.

SAVE $25

ON THE PERFECT STOCKING STUFFER

IC-Q7A

Small Size, Big Sound

- 2 Meter/440MHz
- 100 mW Audio Output
- 30 to 1300 MHz Rx (cellular blocked)
- 200 Memory Channels
- CTCSS Encode/Decode
- Auto Repeater
- RIT Function
- Includes 2-"AA" Ni-Cds and Charger, or use "AA" Alkalines
- Meets MIL STD 810 C/D/E

SAVE $30*

IC-T22A
Shirt pocket small, 2 meter operation.

SAVE $40*

IC-T7H
Dual bands at a single band price.

IC-W32A
Advanced dual band. The best.

IC-T81A
World's first and only quad band ham HT.

SAVE $70* AND GET A FREE ALKALINE CASE

IC-T8A
3 bands in one hand. An exceptional value.

IC-T2H
Super rugged, easy to use 2 meter handheld.

ISO 9001 SGS

ICOM Connect 2000

MIL STD 810 C/D/E VIBRATION

All ICOM amateur HTs meet MIL SPEC 810 C/D/E for shock and vibration (IC-T81A test pending).

ICOM®

www.icomamerica.com