Official Journal of
The American Radio
Relay League

QST

devoted entirely to

AMATEUR RADIO

February 1996

QST reviews:

- Kenwood TS-870S HF transceiver
- MFJ-9420 20-meter SSB transceiver
- JPS ANC-4 noise canceller

80-meter indoor antenna

Painless DSP

Plus...

- Sail with the crew of the *Illa Tiki*
- Browse the logs—and life—of W6VX
- The 1995 World Radiocommunication Conference

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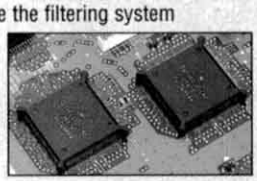
HF TREASURE

Intelligent Digital Enhanced Communications System

FREE Radio Control Program Software Included!

State-Of-The-Art IF-Stage DSP

Once again Kenwood defines the standard with next generation DSP. Utilizing dual digital signal processing chips, the TS-870S captures wave forms at the IF stage (including AGC circuit) in realtime to provide unmatched clarity, noise reduction and control over inbound or outbound signals. The DSP chips deliver a dynamic range of 144dB, enabling you to detect previously unheard signals and customize the filtering system through the menu interface. No other transceiver on the market gives you this much power and flexibility.



Digital Filters

Applying complex algorithms at the IF stage allows you to attain filtering that is unattainable with conventional analog circuits. For instance, you can shape the filter sharp enough to obtain over 100dB out of pass band attenuation with virtually no signal loss. Through the menu-driven interface on the front panel, you can apply standard filters or customize and store them for rapid and convenient access. And because it's all digital, there is no additional cost of optional filters!

Two Noise Reduction Methods

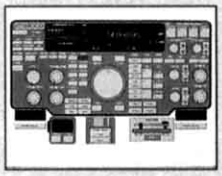
Choose from 2 methods of noise reduction: Line Enhancer Method (LEM) or Speech Processing/ Auto Correlation (SPAC). LEM allows you to custom-shape a filter curve around a target signal, essentially 'carving' it out of the background noise — a powerful tool in SSB operation. For tough CW conditions use the SPAC function, which employs a statistical correlation algorithm to pull weak signals out of the background.

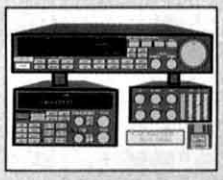
IF Digital Auto-Notch

Another benefit of IF-stage DSP is the ability to detect and eliminate broadcast carrier and continuous beat signals far more effectively than analog systems. It automatically tracks beat signal changes so you can 'set it and forget it'.

57.6 Kbps Computer Control

High speed computer control is available through a built-in RS-232C port and supplied Windows-compatible software called RCP (Radio Control Program). This enables access to most functions of the TS-870S including on/off, frequencies, bands, modes and more. It's also possible to "create" a customized screen radio, based on an original design or the included templates.





Built-In K1 LogiKey Keyer

Sophisticated CW operation is possible with the built-in K1 LogiKey electronic keyer with full or semi break-in, DSP-adjustable rise/fall times, and side tone monitor. A second keyer may also be connected to the TS-870S.

Easy-Access Menu System

Control all of the rig's functions through the menu-driven user interface on the front panel. It also incorporates a Quick Menu feature for rapid access to your most commonly used functions.

Dual Antenna and RX Out

Switch between 2 separate antenna systems from the front panel, plus attach an external receiver to the TS-870S for maximum antenna utilization.

Other Features

■ Beat cancel ■ Variable AGC ■ Selectable voice equalizer (SSB & AM) ■ Speech processor ■ Selectable transmit equalizer ■ 100 watts output on SSB, CW, FSK; 25 watts on AM ■ 100 kHz - 30 MHz general coverage receiver ■ Built-in automatic antenna tuner (TX & RX) ■ Dual VFO with 100 channel memories plus 5 channel quick memory ■ Full band scan, programmable band scan, group scan, memory scan with memory channel lock-out ■ Built-in tone encoder ■ High-quality 60-second digital recording unit option (DRU-3) ■ Voice Synthesizer unit option (VS-2) ■ Modifiable for MARS/CAP*

*Permits required for MARS and CAP use. Specifications guaranteed for Amateur bands only. Kenwood follows a policy of continuous advancement in development. For this reason, specifications may be changed without notice.

TS-870S

HF TRANSCEIVER

ISO 9002 Meets ISO Manufacturing Quality System

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95ARD-1347

Proven Winner

144MHz Single Band Operation

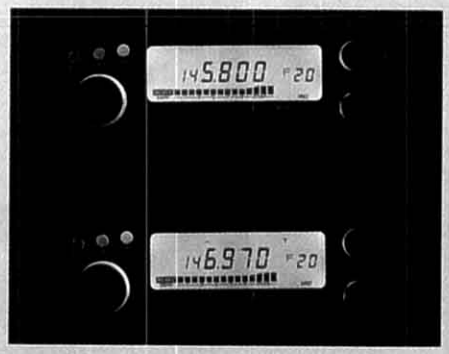
The smooth styling of Kenwood's TM-241A FM mobile transceiver — compact and easy to install — is complemented by rugged construction and up to 50 watts of RF power to get you through in adverse conditions. Reception performance is also first-class: intermodulation characteristics have been improved to cope with very strong signals.

Military Specifications*

To ensure that it can withstand the toughest assignments, the TM-241A has been engineered to meet US military standards 810C, 810D & 810E for shock and vibration resistance (*current K/K2 versions with serial #5080000 or later).

User-Friendly Design

The ergonomically designed control panel is easy to see as well as to operate: it features illuminated keys and an extra-large LCD with 4-step dimmer to suit various lighting conditions.



20 Multi-Function Memories Plus Call Channel

Facilitating mobile operation are 20 memory channels for storing frequency, CTCSS tones and on/off status, and REV data. Of these, 4 channels store, transmit and receive frequencies independently for odd split repeaters.

Multi-Scan Capability

Choose from several scan modes: full band scan, programmable band scan, and memory scan with memory channel lock-out. In addition to two scan stop modes — TO and CO — there is an intermittent priority alert scan.

Tone Alert System with Elapsed Time Indicator

When activated, this sounds for ten seconds and displays a bell symbol to alert you to an incoming signal. Both elapsed time and the number of calls are displayed.

Other Features

- Built-in CTCSS encoder and optional KQT-8 decoder
- Auto repeater offset
- Repeater reverse switch
- Multi-function microphone supplied
- DTSS for selective calling and page (with optional DTU-2)
- Time-out-timer
- Auto power-off with warning beeper
- Modifiable for MARS/CAP*

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TM-241A

2 METER MOBILE

ISO 9002 Meets ISO Manufacturing Quality System

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Encode/Decode & 2.5 Watts of Power!
BP-180 battery equipped models. Limited availability.*

*See your ICOM dealer for details!

IC-W31A/IC-Z1A FEATURES:

- BP 180 (7.2 V @ 600 mAh) = 2.5 W; BP 171 (4.8 V @ 700 mAh) = 1.3 W
- Slim profile • Tone scan
- Independent tuning knobs
- Multiple power-saver functions w/ battery voltage readout
- 180 mW audio output
- Accepts 4.5 – 16 V external power (13.5 V= 5 W max)
- UHF/UHF, VHF/VHF, or VHF/UHF band operation
- Simultaneous receive on both bands
- CTCSS encode/decode standar
- New HS-85 optional headset
- Auto repeater offset and memory
- Selectable DTMF auto dialing speed
- Adjustable power output (3 levels)
- Compatible with BC-79A drop-in charger (AD-51 req.)
- AM aircraft Rx • MARS/CAP modifiable

All features are operational in both the single unit and remote configuration (separation kit included)

IC-Z1A

WORLD'S FIRST REMOTEABLE CONTROL PANEL!

ICOM'S NEXT GENERATION TECHNOLOGY IN DUAL BAND HANDHELDS
The IC-W31A and IC-Z1A are both small, slim and jam-packed with features you wouldn't expect at such an affordable price.

IC-Z1A REMOVABLE REMOTE CONTROL PANEL IS A FIRST! – Better than a speaker-mic, the remoteable control panel provides a full functional display of all operating conditions (including bands and frequencies) and complete control of volume, operating modes, tuning, scan, band selection, ON/OFF, and PTT. The remote control panel comes standard with an extension cable and lapel clip.

IC-W31A TRADITIONAL SINGLE UNIT OPERATION –1/3 slimmer than its IC-Z1A cousin. Great looks match its outstanding performance.

ALPHANUMERIC MEMORY DISPLAY – Up to 6 characters for memory channel identification. 104 memories may be displayed by either the frequency or alpha name. An EEPROM prevents losing memory information if the battery runs down.

ALPHANUMERIC MESSAGE AND PAGING – Use the alpha display to transmit and receive up to 6 characters (using DTMF tones) as a simple message pager, acknowledgments, etc....

EASY TO USE BACKLIT KEYPAD – The keys are big, well-spaced and easy to use. For more information about the IC-W31A or the IC-Z1A, visit your local ICOM dealer, contact ICOM Technical Support in the HamNet forum on CompuServe© @ 75540,525 (Internet: 75540.525@compuserve.com) or call ICOM's brochure hotline: (206) 450-6088.

ICOM'S ON THE WEB!
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IC-W31A

ULTRA SLIM DESIGN, BIG PERFORMANCE

ICOM®
THE NEXT GENERATION

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ONLY $1,560.00! manufacturer's suggested retail price*

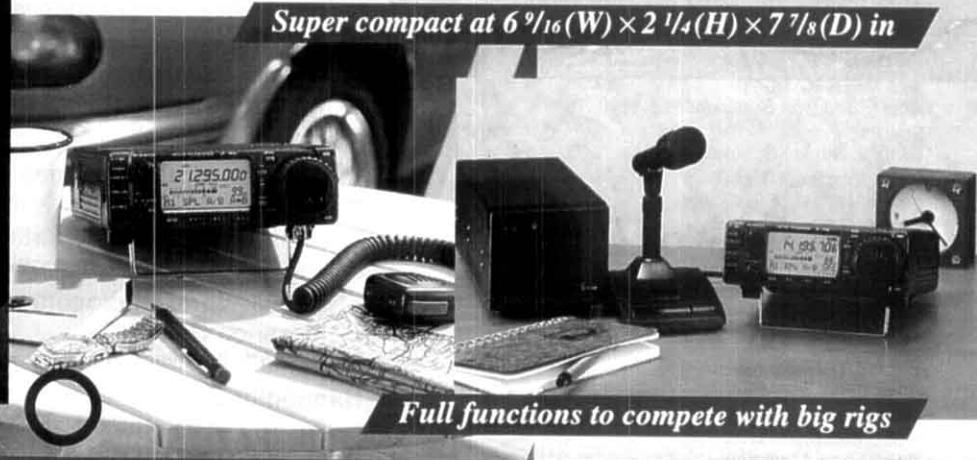
IC-706 : HF + 6M + 2M! : ALL MODES!

- Powerful 100 W from HF to 50 MHz and 10 W for 144 MHz
- 101 memory channels with dotmatrix display
- All mode including SSB, CW, RTTY, AM and FM.

The front panel photo is **Actual size.**

Detachable front panel mounts any where.

Super compact at 6 9/16(W) × 2 1/4(H) × 7 7/8(D) in



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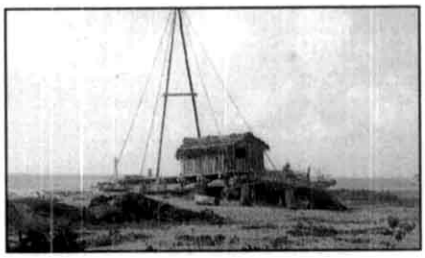
Technical



28
The *Illa Tiki* rests on Ecuadorian sands, waiting to cast off on its effort to sail to Hawaii. Amateur Radio was along for this historic adventure!

News and Features

New Ham Companion

Operating

Departments

Our Cover

Weather forecast: Snow—lots of it—and a high temperature of 10 . At least there's plenty of sunshine to bathe the solar panels at the Flat Top repeater site near Bozeman, Montana. Two amateur repeaters share the turf, along with a packet node and a commercial voice repeater. The Amateur repeaters run on four deep-cycle RV batteries that are fed directly from the panels. Neil Ramhorst, KL7JGS, captured this scene.

Membership in the ARRL, including a subscription to *QST*, is available to individuals at the following rates: $31 per year in the US and possessions, $44 elsewhere, payable in US funds. Age 65 and over, with proof of age, $25 US, $38 elsewhere. Licensed radio amateurs age 21 and under may qualify for special rates; write for application. Life Membership is also available. Membership and *QST* cannot be separated. Fifty percent of dues is allocated to *QST*, the balance for membership. Subscription rate for libraries and institutions: $31 per year postpaid in the US and possessions, $44 elsewhere. Single copies $5 in the US.

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AEA PC PakRatt for Windows 2.0™
Controls the entire family of AEA data controllers in the easy-to-use Microsoft Windows™ environment. Works with Windows '95, Windows 3.1, and Windows N/T. All popular modes are supported. Run two data controllers at once. Everything your AEA data controller can do, PC PakRatt for Windows makes easier. New features allow you to send and receive ANSI graphics in PACTOR and interface with Log Windows 2.0 or above for state-of-the-art logging and tracking. Individual windows for mailbox and QSO logging. Separate parameter settings for different modes and data controllers. Powerful and easy to use software.

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This is a DOS program terminal control program for all popular modes. Split screen makes working the modes easy. Works with IBM-compatibles and all AEA data controllers. On-screen help, full QSO logging, DOS gateway.

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This is AEA's newest control program for the newest Macintosh computers. Works with all AEA data controllers. Separate windows for each TNC's parameters, MailDrop, QSO logging, help, and many others. Lets you run two AEA TNCs at once, operating all the modes the TNC is capable of.

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AEA FAX III is a hardware and IBM-compatible software package that allows you to decode HF WeFax, RTTY, NAVTEX, and CW signals with your general coverage SSB or HF receiver. You don't need a data controller. WeFax images are received in gray-scale and can be enhanced with 256 false-color. These colorized images can be exported to GIF or PCX graphic files for use in other applications. In addition to the images, you'll be able to receive and decode Morse code, RTTY, and NAVTEX transmissions. A fax station database lets you store often used stations. AEA FAX III allows your computer to switch frequencies on your computer controlled receiver for unattended WeFax reception. AEA FAX III is easy to use right out of the box. Simply plug in the demodulator, install the software, and you are ready to receive highly detailed images.

DOS Money Saver!
AEA FAX III 900™
This is the software-only version of the AEA FAX III WeFax receiving system. If you have a new DSP-232 or PK-900 the hardware is built into your TNC and all you need is AEA FAX III 900 software for your computer. This software is less expensive than the regular AEA FAX III and has all the features mentioned above. AEA's DSP-232 and PK-900 were designed to give you added value with such items as AEA FAX III 900.

If you have Windows, get. . .
AEA WeFax 256™
This is the WeFax receiving program for those who have an AEA DSP-1232/2232 or the new DSP-232 and run Microsoft Windows™. WeFax pictures can be received from the NOAA HF WeFax Service or the NOAA APT Satellite Service. Received images can be colorized with the 256-color palette. Export images to BMP, GIF, PCX, TIF, or JPG image formats. Allows for unattended reception of WeFax transmissions.

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If you want Logging, get. . .
AEA Log Windows 3.0™
Logging, rig control, and DX cluster monitoring with award tracking and reporting, it's all here and much more! Works with Windows '95, Windows 3.1, and Windows N/T. Interfaces with PC PakRatt for Windows 2.0. It has its own Packet Cluster interface. Includes a database browser, transceiver control, antenna rotor control, QSL manager, and voice announcements of DX spots. Gives bearing & distance. Interfaces with SAM, Buckmaster, and QRZ. Switching to Log Windows is easy, you can use the LW Import program included. Award types: UC-CA, US country, DXCC mixed, phone, CW, FSK, bands, CQ mixed, SSB, FSK bands, WAS mixed, SSB, CW, FSK, and bands.

AEA ACARS Software

AEA ACARS™
ACARS stands for Aircraft Communications Addressing and Reporting System, and AEA ACARS is a hardware and IBM-compatible software package that lets you receive the digital communications used by airliners. With your PC, AEA ACARS, and your VHF AM (131.55 MHz) receiver, you will see aircraft status reports and other messages transmitted by aircraft in your area. There are two ways you can get AEA ACARS: 1) you can get the full AEA ACARS package, which includes a demodulator that plugs into your PC and software that you load onto your PC. 2) If you already own AEA FAX III, you can get the software-only version of AEA ACARS, called AEA ACARS 900. The same demodulator is used by both AEA FAX III and AEA ACARS. All you need to do is buy one of the programs and then the software for the other—this saves you money.

AEA ACARS 900™
This is a software-only version of ACARS for use with AEA's new DSP-232 and PK-900 and for those who already own AEA FAX III. The hardware is already built into the data controllers, so all you need is this special software.

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The Mode Warrior

The AEA DSP-232 Multi-Mode Data Controller

DSP 232 AEA MULTI-MODE

NEW

The AEA DSP-232

The DSP-232 multi-mode data controller—is *the* mode warrior. AEA engineered the first DSP data controllers nearly four years ago. AEA's PK-232MBX is the most popular data controller ever. Now, AEA has combined the power of Digital Signal Processing technology with affordability. We are proud to introduce the AEA DSP-232, our newest multi-mode data controller. It offers state-of-the-art DSP signal filtering, advanced modem performance, cutting-edge features, and an eye toward the future.

The Modes

Operate all the popular modes on two computer controlled radio ports. 9600 and 1200 bps VHF packet come standard. HF packet, PACTOR, AMTOR/SITOR, RTTY, CW, TDM, and NAVTEX—all standard. Plus, when new modes come out, like PACTOR II, this unit will handle them. Whatever your license class, the DSP-232 is your ultimate digital platform today and for years to come.

The Processor

At the heart of the DSP-232 is a high-speed Digital Signal Processor providing superior filtering. AEA data controllers are known for excellent filtering and shape-factor—the DSP-232 goes a step beyond. Noise is not a problem with the steep-skirts created by the analog to digital filters. Coupled with the memory ARQ, hardware HDLC, and DCD state machine, the DSP-232 is truly a warrior for all modes—battling through noise so you connect.

The MailDrop

Full PakMail™ MailDrop facilities for packet, PACTOR, and AMTOR are included. The DSP-232 comes standard with 18K (32K RAM) of dynamically allocated mailbox space and is expandable to a whopping 242K (256K RAM)! You even control what call signs have access to your mailbox.

The Future

Where other TNC manufacturers are spending money marketing their outdated hardware, AEA is developing innovative, new equipment. Look at the features. Look at the price. Look at all the AEA computer software available. You will see that the DSP-232 was designed to be a powerhouse for all skill and budget levels. As with other AEA data controllers, we've designed the new DSP-232 to handle whatever the future brings, making this your digital platform for the next decade.

This is the right machine for advanced digital users. A smart choice for beginners because it's loaded with features now and will grow as you do in the years to come. The tradition of the PK-232 continues with the new DSP-232.

Includes

The AEA DSP-232 comes with a detailed manual, two RX audio cables, one 2.1mm power cable, one 8-pin and one 5-pin DIN radio cable, one PC-comp. DB-9 male-to-female RS-232 serial cable, one wire loop-back jumper, one 5-pin DIN plug for FSK/AUX connections, and a limited one year warranty.

FEATURES

- Fast Digital Signal Processor (DSP)
- Upgradable for new operating modes
- 9600 & 1200 bps VHF/UHF packet
- PSK satellite modems built in
- 300 bps HF packet, PACTOR, AMTOR/SITOR (ARQ & FEC), RTTY (Baudot & ASCII), CW, TDM, NAVTEX
- Two switchable radio ports with rear-panel AFSK pots for both ports and another pot for 9600 bps packet
- 18K (32K RAM) PakMail™ Mailbox expandable to 242K (256K RAM)
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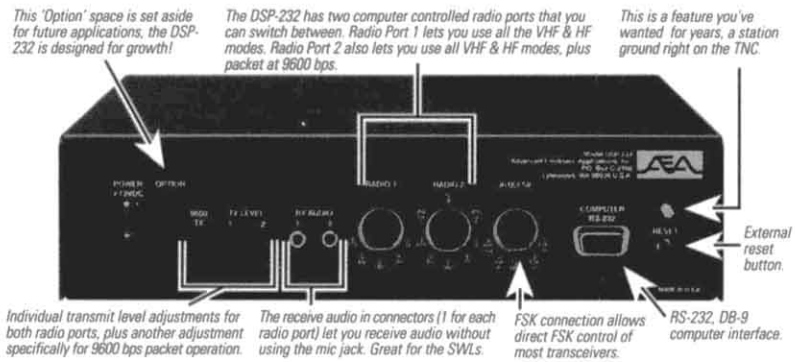
- SIAM™ automatically identifies HF signals & switches to them
- PACTOR memory ARQ
- Gateway firmware which works as a packet node and identifies TCP/IP, TheNet, and NETROM stations.
- DCD state machine for 9600 & 1200 bps packet
- PACTOR, AMTOR, & Packet MailDrop
- LED readout displays system status
- Up to 19,200 bps terminal baud rate
- Full-duplex Packet capability
- Optional AEA WeFax receiving software available for DOS & Windows™
- Optional AEA ACARS™ software
- Compatible with most all popular control programs including AEA's own PakRatt for Windows 2.0, PC PakRatt II for DOS, & MacRatt 3.0

You don't just buy the front of a data controller. . .

Why not just use a PCB data controller? Why not go for the smallest data controller? Take a look at the back of AEA's DSP-232 and you will see why. We have built our controllers to make life simpler for you. There are more input connections, more output connections, more external adjustments, and room for future growth and upgradability. PCB data controllers are difficult to work with. Small controllers don't provide proper connections and expandability. AEA engineered the DSP-232 to be compatible with the equipment you have now, to offer convenient adjusting, and to be upgradable for future applications.



Call AEA's 24-Hour Literature Line for more information on the DSP-232 at (800) 432-8873 or use CompuServe to download files at 76702,1013

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10, 12, 15, 17, 20, 30, 40 Meters

The "R" Factor

THOUSANDS OF HAMS EXPERIENCE IT EVERY DAY

Cushcraft R7 and R5 antennas are the most advanced verticals in the world. The difference is the "R" Factor! R means DXing and rag chewing are easier. R is louder signals. R also is easier assembly and installation. R is automatic band switching. R is a sleek appearance that looks good in the most demanding environment. R antennas eliminate the need for expensive towers and rotors. The R antennas do not use ground radials. R antennas have a proven track record. R antennas have gained the respect of the amateur community. Listen across the bands and you will hear R7 and R5 antennas perform better than any other antennas in their class. Hundreds of comments have been received recording their exceptional performance.

R antennas make selecting an antenna easy. If you want a small antenna that will give you clear, around the globe communications and quick installation, at a fair price, the R antenna is the right choice.

"I live in a congested suburban area. . .the R7 exceeds my expectations. Wyn H. McGee (ZL3DX)

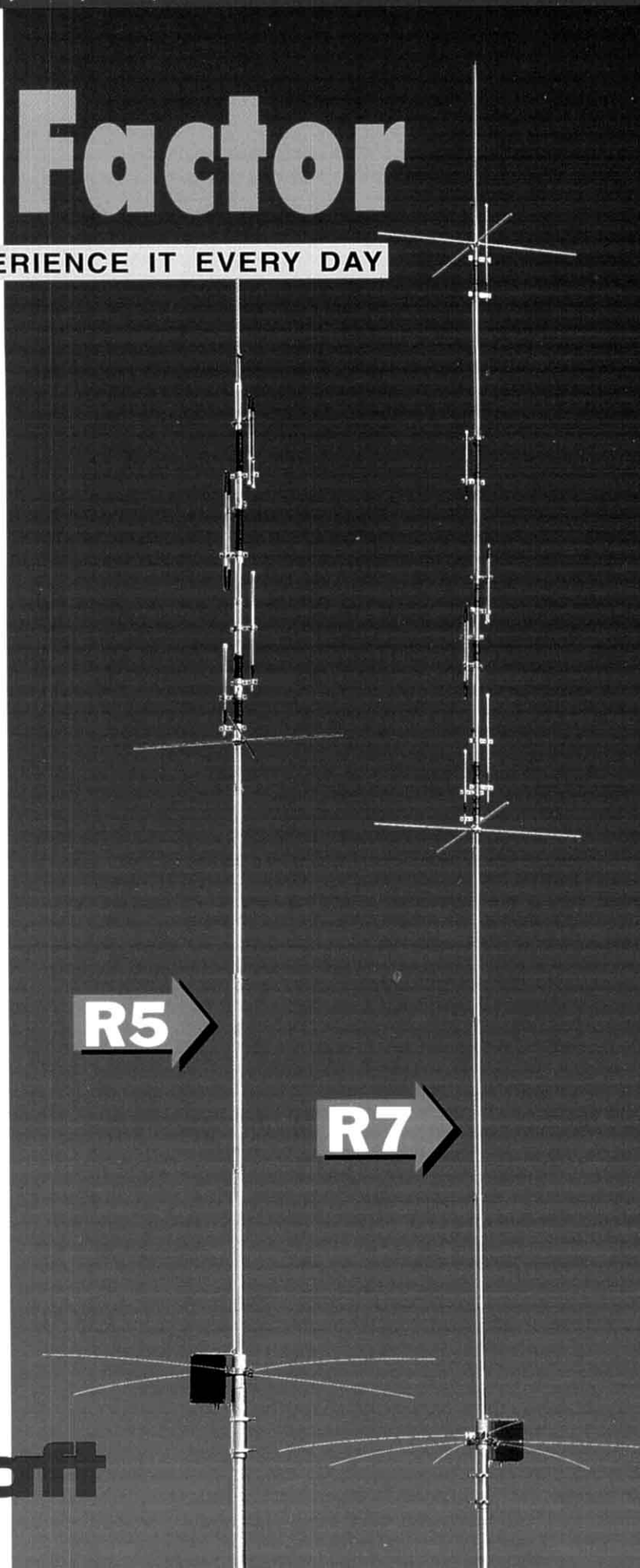
"I guess I would be understating the obvious - The R7 is fantastic. Also, it was very easy to assemble.
Robert L. Rose (KA2JUQ)

"Antenna is fabulous - SWR on all bands better than expected - I did not have to tune antenna at all."
Martin P. Miller (NN2C)

"Nothing would replace it on my limited spaced rented apartment balcony." Yuri Dzyuba (VE2XLT)

MODEL	R5	R7
Frequency, MHz	28, 24, 21, 18, 14	28, 24, 21, 18, 14, 10, 7
Electrical Wavelength	Halfwave	Halfwave
SWR 2:1 Bandwidth	10 m-2 MHz	10 m-2 MHz
	12 m-100 KHz	12 m-100 KHz
	15 m-450 KHz	15 m-450 KHz
	17 m-100 KHz	17 m-100 KHz
	20 m-350 KHz	20 m-150 KHz
		30 m-50 KHz
		40 m-75 KHz
Power Rating, Watts PEP	1800	1800
Radiation Angle, Degrees	16	16
Frequency Selection	Automatic	Automatic
Horizontal Rad. Pattern Deg.	360	360
Height, ft (m)	17 (5.2)	22.5 (6.9)
Mast Size Range, in	1.5-1.75	1.5-1.75
(cm)	(3.8-4.4)	(3.8-4.4)
Wind Load, ft2 (m2)	1.4 (.13)	2.25 (.21)
Weight, lb (kg)	8.7 (4)	12.3 (5.6)
49' Counterpoise Radials (Supplied)	4	7

AVAILABLE THROUGH DEALERS WORLDWIDE



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"It Seems to Us..."

Managing the Morse Issue

Paul Rinaldo's article on page 56 describing the 1995 ITU World Radiocommunication Conference, WRC-95, provides details of the news carried in DC Currents last month: the conferees did not accept New Zealand's proposal to eliminate the requirement that an amateur operator must demonstrate Morse code ability to be licensed to operate below 30 MHz. Instead, the entire Article of international rules that pertain specifically to the Amateur and Amateur-Satellite Services is on the provisional agenda for the WRC in 1999.

While 1999 may seem far away, in fact there is little time for amateurs to deal responsibly with the Morse issue and the other, possibly less controversial provisions of the Article.

The ITU acknowledges that the IARU is the representative of the interests of radio amateurs throughout the world. This recognition is not casually bestowed; it is the result of decades of patient effort by several generations of IARU officials who, while mostly volunteers, have dealt with ITU relations in a highly professional manner. Telecommunications administrations generally view their countries' IARU member-societies as the domestic representative of Amateur Radio.

Prior to WRC-95, the IARU member-societies reviewed the Morse requirement at regional conferences in three regions. In all three cases, there was overwhelming support for no change. These regional positions were consolidated in a resolution adopted by the IARU Administrative Council in 1994 and reproduced on page 106, November 1995 *QST*. While supporting no change, the resolution noted "that future advances in communications technology may influence perceptions of the relevance of this requirement"—in other words, the policy is subject to future review.

The future has a way of sneaking up on us, and in this case it is already here. Why? Because after WRC-99, it will be many years before there is again room on a WRC agenda for consideration of an internal Amateur Service rule. Also, most of the WRC-95 decisions do not come into force until June 1998, so it is reasonable to assume that WRC-99 decisions will not be effective until 2002. Even then, the Radio Regulations must be ratified by the Senate before they are binding on the US; ratification often takes even longer.

In short, any changes in the rules governing Amateur Radio internationally that we might wish, from now until well into the 21st century, must be made at WRC-99. Now is the time to consider the arguments, pro and con, on the Morse requirement and other issues.

The item on the WRC-99 provisional agenda reads simply, "consideration of Article **S25** concerning the Amateur and Amateur-Satellite Services." There is more in this Article than just the Morse HF requirement; it also contains the provisions for the so-called "banned country" list, international restrictions on third-party traffic, the basis for testing operational and technical qualifications of amateur operators, and general provisions regarding transmitter power, quality of emissions, and station identification. Special Amateur-Satellite Service rules protect other users in shared bands. What changes would we like to see in these provisions? What, if anything, ought to be added to the international regulations to make it easier for amateurs to operate while visiting other countries? What changes might others like to see that we may need to oppose? These are the questions the amateur community must now face, and must begin to answer through the mechanism of the IARU.

We know from long experience that our best chance of success lies in coordinating worldwide amateur positions, and selling those positions to national administrations. When a number of administrations propose the same thing to an ITU conference, the proposal stands an excellent chance of passage; when a variety of conflicting proposals is presented, it's anyone's guess what, if anything, eventually will be agreed. Most national proposals for WRC-99, including those of the US, will be developed during 1998. Thus, by the end of 1997—next year!—the IARU member-societies, including the ARRL, will have to know what we want our administrations to do on our behalf.

IARU President Richard Baldwin, W1RU, has named an ad-hoc committee on the Future of the Amateur Service (FASC), to function under the leadership of Vice President Michael Owen, VK3KI. Michael is an attorney with many years of experience in ITU affairs, including service on the Australian delegation to ITU conferences. The FASC is charged with "examining the international regulations governing the Amateur Service and the Amateur-Satellite Service (other than frequency allocations) with a view to formulating the changes, if any, that are desirable to properly reflect the objects, needs, obligations, and privileges of the Services for the next century, so that the Services remain viable and valuable, meaningful and relevant to both the community and to those licensed in the Services." At its meeting January 19-20, about the time you first read this editorial, the ARRL Board of Directors will be grappling with the parallel question of how to structure our domestic consideration of these issues. Membership input will be important in developing ARRL positions.

In the words of Dick Baldwin, "WRC-99 may result in the first sweeping changes in the Amateur regulations since 1927. It will enable the Amateur Services to consider whether the international regulations can be improved to reflect the changes that have occurred since 1927 to ensure that the Amateur Services remain strong and relevant. I do not believe that we should see this as a threat, rather an opportunity to enhance our future."—*David Sumner, K1ZZ*

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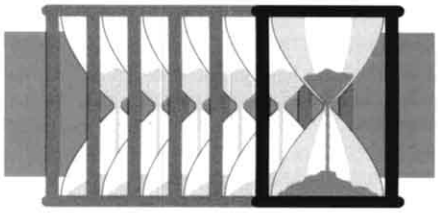

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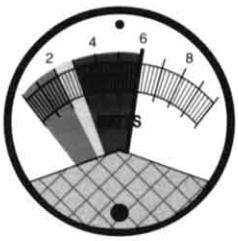

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Wyoming	Warren "Rev" Morton, WS7W, 1341 Trojan Dr, Casper, WY 82609 (307-235-2799)

Southeastern Division

Alabama	Tom Moore Jr, KL7Q, 216 Lee Rd 343, Salem, AL 36874 (334-745-0962); e-mail: **kl7q@bbs.k4ry.ampr.org**
Georgia	Dorothy "Dot" Fennell, KA4HHE, 24 Ridge Rd, Savannah, GA 31405 (912-234-5917)
Northern Florida	Rudy Hubbard, WA4PUP, PO Box 843, Milton, FL 32572-0843 (904-626-0620); e-mail: **71572.3727@compuserve.com**
Southern Florida	Robert (Rip) Van Winkle, AA4HT, 1413 Covey Cir S, Lakeland, FL 33809 (813-853-1400) packet: **aa4ht@wd8iby.#lkifl.fl.usa.na**
Puerto Rico	Guillermo Schwarz, KP4DDB, HC-03 Box 7526, Guaynabo, PR 0097 (809-720-8137)
Virgin Islands	Ronald Hall Sr, KP2N, PO Box 3987, St Thomas, VI 00803 (809-774-4740)

Southwestern Division

Arizona	Clifford Hauser, KD6XH, 8741 N Hollybrook Ave, Tucson, AZ 85742 (520-744-9095) packet: **kd6xh@wb7tls.az.usa.na**
Los Angeles	Phineas J. Icenbice Jr, W6BF, 19323 Halsted St, Northridge, CA 91324 (818-349-3186)
Orange	Joe H. Brown, W6UBQ, 5444 La Sierra, Riverside, CA 92505 (909-687-8394)
San Diego	Patrick Bunsold, WA6MHZ, 14291 Rios Canyon Rd, No 33, El Cajon, CA 92021 (619-561-0052); packet: **wa6mhz@wa6bgs.#soca.ca.usa.noam**
Santa Barbara	Robert Griffin, AB6YR, 1436 Johnson Ave, San Luis Obispo, CA 9340; e-mail: **ab6yr@aol.com**

West Gulf Division

North Texas	Robert Adler, NZ2T, 507 San Juan Dr, Southlake, TX 76092 (800-376-9933/817-329-0820); e-mail: **nz2t@aol.com**
Oklahoma	Joseph Lynch, N6CL, PO Box 73, Oklahoma City, OK 73101 (405-528-6625); e-mail **72124.2734@compuserve.com**
South Texas	Alan Cross, WA5UZB, 4714 Coltwood Dr, Spring, TX 77388 (713-350-0322)
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- **Separate** ALS-600PS power supply (included) can be placed conveniently out of the way and plugged into your nearest 120 VAC outlet -- no special wiring needed
- **Made in USA**
- **Enjoy** 600 Watts of *no tune* solid state power. Call your favorite dealer for your best price and order your ALS-600 with power supply today

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ALS-600PS power supply included with ALS-600 amplifier

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- **Includes prewired cable** to plug into ALS-600 amplifier
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Suggested Retail

- **Mobile** ***no tune*** **Solid State Amplifer** -- uses four rugged 2SC2879 high power linear RF power transistors
- **Instant bandswitching, no tuning, no warm up** -- just turn on and operate -- makes mobile QSOs safer
- **Very Compact** -- just 3½x9x15 inches -- fits in nearly any mobile installation; weighs only 7 pounds, that's less than some mobile HF transceivers
- **Extremely quiet** --quiet low speed, low volume fan stays off and silent until temperature rises
- **Output Power** -- 500 Watts PEP, 400 Watts CW
- **Continuous Coverage** -- 1.5 to 22 MHz; 10/12 Meters with easy-to-install optional kit, $29.95 plus s/h
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DC Currents

By Steve Mansfield, N1MZA
Manager, Legislative and Public Affairs

Just as radio waves aren't constrained by artificial boundaries, neither is ARRL's government relations effort. *DC Currents* covers behind-the-scenes activitiy you need to know about in Congress, at the FCC and other regulatory agencies, as well as at world-wide bodies such as the International Telecommunication Union.

On the Hill

- Snails gallop faster than the long-awaited Telecommunications reform bill introduced last spring. While a compromise version had been hammered out in a House/Senate conference as *QST* went to press, differences of opinion among the House majority party still threatened to derail final agreement on the bill. When House and Senate bills differ, a conference is called among members of both chambers to resolve the differences, and then identical bills are returned to the floor for a final vote. House and Senate Commerce Committee staff members were responsible for drafting compromise language on the points of difference, and the language was then submitted for approval to members of the conference. In this case, lengthy negotiations permitted opposition to mount organized, well-financed attacks on key items in the compromise bill. Sticking points included the entry of regional Bell companies into long distance services, removing price regulations for small cable TV services and expanding the number of TV and radio stations that one media company can own. Rules governing how local phone companies can provide video services have also generated considerable heat, as did debate over how to prevent pornography over the Internet and protect children from violence on television. Amateurs might be interested in noting that one related topic of discussion is reported to have been the possibility of increasing the statutory penalty for obscene language on the radio and by "telecommunication device" to $100,000 per occurrence! In all, there were nearly fifty major and minor points of disagreement between the two bills that needed to be ironed out.
- Spectrum provisions in the telecommunications bill have been largely noncontroversial. But that doesn't mean the potential for storm clouds has entirely passed. Even though the Budget Reconciliation Act was vetoed by the President, Congressional budget negotiators and the Administration were still looking at spectrum auction as a possible means of helping to balance the budget in seven years. One possible candidate continues to be the 6-MHz channels set aside for broadcasters to make the transition to high definition digital television. FCC Chairman Reed Hundt has championed the idea.
- In other significant news from the Hill, House Telecommunications and Finance Subcommittee Chairman Jack Fields (R-8th-Texas) has announced his intention not to seek re-election next year. Now speculation has begun on who might succeed Fields as chairman of one of the most influential and high profile committees on Capitol Hill. Prior to his announcement, Fields had frequently alluded to his desire to look at structural reforms for the Federal Communications Commission. Fields, a 44 year old who has served eight terms, said that he wants to return to his home town of Humble, Texas to spend more time with his family.
- During the 1995 Congressional session for the 104th Congress, ARRL's legislative effort made more than 225 office visits to Senators, Representatives and Committee staff to discuss Amateur Radio issues. Our primary objective was to ensure that Amateur Radio frequencies remain out of the spectrum auction arena, and to explain ARRL's other legislative positions. ARRL regularly represents Amateur Radio interests before decision makers in Congress, at FCC and other telecommunications policy bodies.

...If You're Moved to Write

♦ Do letters to Senators and Representatives actually make any difference? In a word, yup. In 1994 when ARRL members were pushing hard to get members of Congress lined up behind our joint resolution (H.J.Res. 199/S.J.Res. 90), Florida Congressman Porter Goss (R-14) balked because he misunderstood the bill to be just a "commemorative" pat on the back. That is, until he got a letter from a constituent, John Galloup, KD4FO explaining it. Goss wrote back: "Upon receiving your letter, my staff took another look at the resolution and concluded that [the resolution] goes beyond recognition for Amateur Radio and deserves my support." Goss promptly signed on as a cosponsor. If you're moved to pick up pen and write, remember that Congress gets a bumper crop of angry letters, but precious few with anything positive to say. Through the years, members of Congress from both parties have been friends of Amateur Radio. Maybe it's time to say "thanks!" before launching into any new demands or complaints.

Inside the FCC

♦ In response to the rising number of unresolved malicious interference complaints in Amateur Radio, the ARRL Executive Committee created an ad hoc committee to examine the issue of why the FCC has been unable to take effective enforcement actions in a handful of cases that plague the amateur community. The committee has recommended that ARRL seek possible long-term legislative remedies for the problem. As part of the continuing ARRL effort, Executive Vice President David Sumner, K1ZZ and General Counsel Chris Imlay, N3AKD, recently had what have been described as "productive" meetings with senior officials in FCC's Wireless Bureau and the Compliance and Information Bureau, following up earlier meetings by ARRL President Rod Stafford, KB6ZV. In addition, ARRL has begun rounding up support from several Congressmen from districts where amateurs are experiencing particularly intractable problems.

♦ ARRL has asked the FCC to relax federal regulations governing spread spectrum communications. The ARRL petition for rulemaking filed in December by General Counsel Imlay sought to relax the restrictions on spreading sequences and asked for more flexibility in spreading modulation. The petition also asked for automatic power control provisions to limit interference potential to narrow band modes. The use of the spread spectrum technique, which distributes information among several synchronized frequencies within a band at the transmitter end and reassembles the information at the receiver, was first approved for Amateur Radio in 1985. Among the reasons cited for permitting more experimentation with spread spectrum are reduced power density and reduction of interference to narrow band systems, improvement of communication under poor signal-to-noise conditions, improved communications in selective fading and multipath environments, and the ability to accommodate more communication channels simultaneously in the same spectrum.

In the States

- If good public policy advances in incremental steps, the state legislature in **California** has tried to put its best foot forward with the passage of A.B. 104, a bill that voids provisions of covenants prohibiting or restricting satellite television antennas less than a yard in diameter. No, it doesn't help hams who want to put up antennas in residential areas with so-called "CC&Rs" (codes, covenants and restrictions), but passage of A.B. 104 does suggest that some lawmakers are beginning to understand how these previously unassailable private CC&R contracts undermine the public benefit embodied in federal preemption of telecommunication matters.
- On the other coast, Governor Weld recently signed H-2782, making the PRB-1 style bill **Massachusetts** law. The bill says that "no zoning ordinances or by-law shall prohibit the construction or use of an antenna structure by a federally licensed amateur radio operator." It still permits regulation of location and height, but such restrictions must pass the "reasonable" test. The bill was written and filed by ARRL Volunteer Counsel Thomas Carrigan, WA1NVS. ARRL State Government Liaison Shawn O'Donnell, K3HI, ARRL Eastern Massachusetts Section Manager Phil Temples K9HI, Western Massachusetts Section Manager Dan Senie, N1JEB and many other Massachusetts hams worked hard in a well-organized four year lobbying effort to get H-2782 passed.

Retrenchments at the Agencies

- Federal budget cutters are already having an effect at the alphabet agencies. Watch for fairly substantial personnel cuts in Federal telecommunications management agencies. At the Federal Communications Commission, the cuts are likely to be mostly from field operations. While FCC Commissioner Reed Hundt originally predicted layoffs of up to 180 employees, rumor has it about 40 people are already targeted for pink slips. FCC is describing the layoffs as part of an agency "restructuring."
- At the National Telecommunications and Information Administration, the layoff situation is less clear. Reportedly hard hit will be NTIA's Office of Spectrum Management, with layoffs of as many as 45 people, or roughly 40% of the division, which handles international allocation issues. In spite of down-sizing, NTIA still faces extinction if Congress succeeds in eliminating the Department of Commerce.
- One early casualty of the budget cutting fever was Congress's own Office of Technology Assessment (OTA), established by Congress in 1972 as an "in house" consulting group on technical issues. OTA received no funding for 1996 and has officially ceased operations. OTA worked on a wide range of complex technical issues to help ensure that Congress was adequately informed as it made public policy in such areas as telecommunications, agriculture and medicine.
- New names at the Federal Communications Commission include Michael K. Hamra, appointed advisor to the Bureau Chief of the Wireless Telecommunications Bureau. A former Capitol Hill staffer, Hamra is leaving NTIA to assume his new position at FCC. Also appointed advisor to the Bureau Chief is David P. Wye, who worked for the now defunct Office of Technology Assessment, where he directed a study of wireless technologies and the National Information Infrastructure.

Congressional Helpers...

- Years ago, getting things done in Washington was largely a back room game of high pressure lobbying and influential contacts. But today, "grassroots" is increasingly the name of the game. When members of Congress get lots of letters on a subject, it demonstrates to them that there are voters out there who care. And in politics, the one thing more important than whom you know is *how many* you know. That's why organizations like ARRL, with our well-informed members, make particularly good grassroots organizations. Right now we're busy gathering names for our own grassroots network. Our goal? At least one ham letter writer in every Congressional District in the US, so that when we need a letter writing campaign, we'll have our network in place.

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The SCOUT™ Has Taken Tuning Your Receiver To a New Dimension

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The Scout's unique Memory Tune (Pat.Pend.) feature allows you to capture frequencies, log into memory and tune your AR8000/2700 at a later time. A distinctive double beep will inform you when the Scout has captured a new frequency, while a single beep indicates a frequency that has already been recorded. For discreet monitoring, a pager style vibrator will inform you of any hits the Scout captures.

The Scout will also Reaction Tune and Memory Tune Icom CI-V receivers: (R7000, R7100, and R9000) and (Pro 2005/6 equipped with OS456, Pro 2035 equipped with OS535). Download the Scout frequencies to a PC with the Scout Utility Disk and CX-12AR (optional), then compare them to the Spectum CD-ROM/PerCon FCC Database (optional).

Act Now!! Let the Scout Reaction Tune you into The World of Scanning

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Features

- Automatically tunes these receivers with Reaction Tune (Pat.Pend.) CI-V receivers (ICOM's R7000, R7100, and R9000), (Pro 2005/2006 equipped with OS456, Pro 2035 equipped with OS535) or AOR models (AR2700 and AR8000).
- Records and saves 400 unique frequencies
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- CX-12AR Computer Interface (optional)
- PC Utility Disk for downloading memory to PC
- Rapid charge NiCads with 10 hour discharge time
- Scout Spectrum CD-ROM/PerCon FCC database (optional)
- AC Adaptor/Charger
- DB 32 VHF/UHF mini-antenna shown with Scout (optional)
- Distinctive Beeper/Vibrator indicate frequency hits

At right: Scout shown with CLIPMATE™. A handy windshield mount for Scout, for quick access and visibility.

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EDSP RX/TX

All-Mode HF Transceiver FT-1000MP

The year was 1956. Electronic communication throughout the world was on the threshold of significant and remarkable change. Intrigued by the development of single-sideband radio theory, a young engineer and amateur radio experimenter painstakingly assembled an SSB transmitter. Word of his successful efforts spread quickly among his friends, and soon radio amateurs from all over the country were requesting transmitters just like it. Thus was born the first invention of JA1MP, founder of Yaesu. Though his key is now silent, in tribute to his leadership and exceptional contributions to the radio art, the FT-1000MP carries the memory of his call sign.

An HF Masterpiece, Combining the Best of Digital and RF design technology. The FT-1000MP.

Specifications

- EDSP (Enhanced Digital Signal Processing)
- Shuttle-jog Rapid Tuning Enhancement
- Directional Tuning Scale for CW/Digital mode and clarifier offset display
- Dual In-Band Receive w/ Separate S-Meters
- Selectable Antenna Jacks
- Collins SSB Mechanical Filter built-in, 500 Hz CW Collins filter plug-in, optional
- Selectable Cascaded Crystal and Mechanical IF Filtering (2nd and 3rd IF Filters)
- User-programmable Tuning Steps w/0.625 Hz High Resolution Low-Noise DDS Circuit
- Custom Feature Set-up via New Menu System
- Adjustable TX Output Power: 5-100W (5-25W AM)
- True Base Station: Both 100-117 or 200-234± VAC 10%, 50/60 Hz and 13.5 VDC Power Inputs

Blending digital and RF technology, the FT-1000MP features a Yaesu exclusive: Enhanced Digital Signal Processing (EDSP). Beginning on the receive side with Yaesu's industry-standard high-intercept front end design, the RF signal is then fed to the IF stages, where an impressive array of 8.2 MHz and 455 kHz IF filters (including a built-in Collins SSB Mechanical Filter) establish the tight shape factor so important in obtaining high dynamic range and low noise figure. Finally, the EDSP system provides specially-designed filter selections and response contours for maximum intelligence recovery.

Only with this combination of EDSP, independently selectable 8.2 MHz and 455 kHz IF filters, and a low-noise DDS local oscillator system can receiver performance without compromise be obtained. You can customize your FT-1000MP by choosing from 20 kHz, 500 Hz, and 250 Hz optional, cascaded IF filters, then zero in on weak signals using Yaesu's exclusive Shuttle-jog Rapid Tuning Enhancement and high-resolution (0625 Hz) DDS VFO. Without question, the FT-1000MP is the most technologically advanced HF rig today.

EDSP operates in both transmit *and* receive modes. On receive, the EDSP produces enhanced signal-to-noise ratio and significantly improved intelligence recovery during difficult situations involving noise and/or interference. The result of hundreds of hours of laboratory and real-world experimentation, EDSP's 4 preset random noise reduction protocols and 4 digital filtering selections are controlled by easy-to-use concentric controls on the front panel of the transceiver. High, low, and mid-range cuts for voice work are teamed with razor-sharp CW bandpass filters and an automatic notch filter which identifies and attenuates undesired carriers or heterodynes. Also operational in the transmit mode, EDSP provides 4 performance-enhancement pattern selections for different operating circumstances, ensuring best readability of *your* signal on the other end of the path.

Once again, Yaesu's engineers have reaffirmed the vision and dedication of JA1MP which began nearly 40 years ago. See the incomparable FT-1000MP today.

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All Mode HF Transceiver
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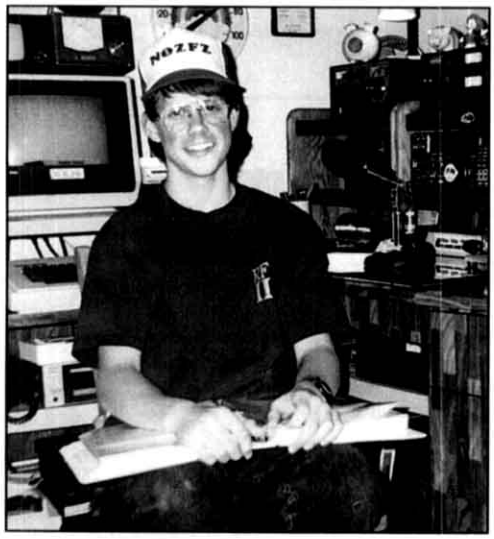
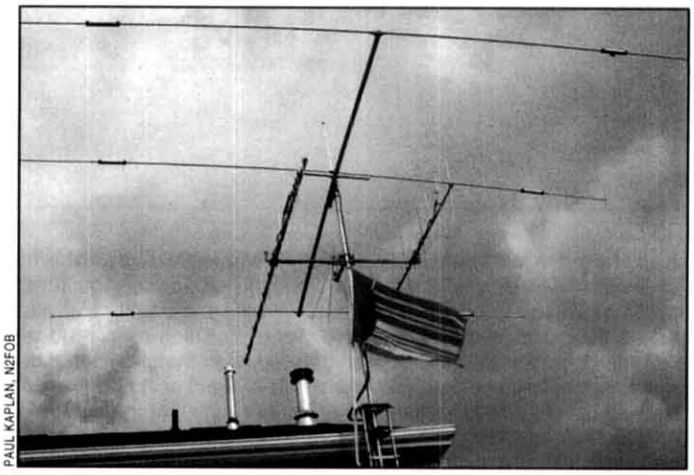
Welcome to another young ham—Jason, NØZFZ. Jason learned about ham radio through his great-grandfather, Von, NØEWB, and then he became interested in getting his own license. Jason asked for a Technician study guide for his next birthday and started reading. Young Jason had trouble understanding the material, but great-granddad Von came for a visit and helped explain things to him. Jason passed the Technician exam in October 1993, at age 11. In July 1994, he passed the 5-wpm Morse code element. By "studying and talking with other hams in town," Jason upgraded to Extra Class in January 1995, at age 13. Now he's helping his mom prepare for her license exam! Jason says, "I hope this information will inspire other young people to get their licenses and to upgrade, as I have. It's not an easy task, but it can be done. You will love the hobby and meet many great friends."



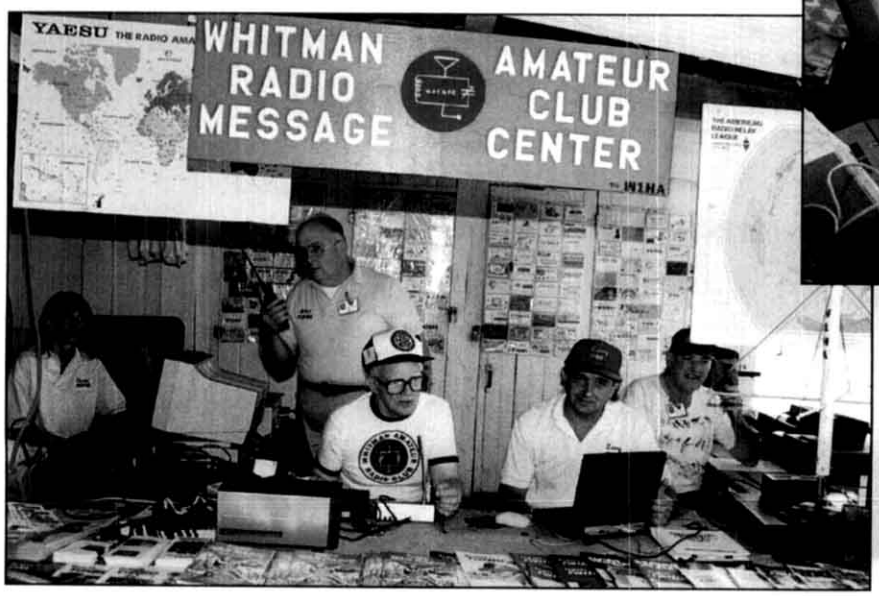


PAUL KAPLAN, N2FOB

Paul Kaplan, N2FOB, flies the ARRL flag from his tower. Paul applied to the Winslow Township (New Jersey) Zoning Board in May 1994 for a permit to erect his 35-foot tower and antennas. The Board subsequently turned down the request. Kaplan then filed suit, and the case was heard in January 1995. Judge Fratto noted that Congress has declared Amateur Radio to be a public benefit under Public Law 103-408, and noted that the zoning board had to make "reasonable accommodation" under PRB-1. He ordered the board to issue a permit to Paul, which was done, and the matter was closed when the Township issued a check to Paul in August 1995 for his out-of-pocket expenses.

Randy, AA2HR, and Carol, N2PNB, of the South Jersey Radio Association (below, right), are shown operating special-event station K2AA at the Chatsworth Cranberry Festival. SJRA called October 1995 their "special event month," with K2AA activated each weekend in a different public venue. One of the other weekend special events was Evesham Town-ship's "twinning" event with its sister city of Evesham, England, during which K2AA contacted GØERC, the station of the Evesham, England, Radio Club.

The Whitman Amateur Radio Club, WA1NPO, operated during the entire 10 days of the Marshfield (Massachusetts) Fair (below). Notice the eye-catching display with several operating positions demonstrating the various types of ham activities, and publications along the table for visitors to browse through.



Radio clubs present the good face of ham radio to the public

DX is Where You Find It

JIM LING, K6EXI

Jim, K6EXI, had a "Calibogie" whaler fishing boat built for him by International Marine and christened it *Rare DX*...

It all started in 1991, when Bill, KC6YOX, wanted to chat with his friend Dave, KC6YSO, on 6 meters. They couldn't make it via simplex, so their thoughts turned to a 6-meter repeater. Dave came up with a GE mobile radio and Bill modified it for repeater use. They asked their club, the Palomar ARC, for permission to put the repeater at the club's mountaintop site. Permission was granted, with the provision that they could use only one antenna. Bill checked and found that it would cost about $1800 for a commercially built duplexer. He found plans for a 2-meter duplexer in *The ARRL Antenna Book* and scaled the dimensions up for 6 meters. He salvaged some machined parts from an uncompleted 2-meter duplexer he located, and he secured a donation of copper tubing from a local business firm. The results? A duplexer with 100 dB of isolation at a cost of only $100 (its value as scrap copper is $240)—with a total of $450 invested in the 6-meter repeater, including the duplexer. Bill says that "When the repeater became operational, it was donated to the Palomar ARC for ARES use." The repeater operates on 52.18/.68 MHz with a CTCSS of 107.2 Hz, and is open to all. In the photo (l-r), Dave, KC6YSO; Bill, KC6YOX; and Art, KC6UQH, Palomar ARC president.

JOHN KUIVINEN, WB6IQS

ELIZABETH (BEEP-BOP) KOTANSKY

"Beep" and "Beep-Bop" are the pet names bestowed on Steve, KB2DLY, and his wife Elizabeth, respectively, by their first grandchild, Steve. Steve had been hearing the Morse code in Beep's shack all his life when he came up with these names at age 2. When Beep's 75th birthday rolled around last year, Beep-Bop made a special cake for him to enjoy with all five grandchildren (l-r): Brian, Keegan, Beep, Steve, Olivia and Cassia. Now, naturally, the whole family calls the senior members of the clan Beep and Beep-Bop!

ARRL Outgoing QSL Service Manager Joe, NJ1Q, reports that members sent Joe and his assistant, Fran, about 1,350,000 QSL cards during 1995. That's not bad for sunspot-minimum activity, but it is well down from the *2,900,000* cards the Service handled in 1991.

Joe reminds us that the fee for the Outgoing QSL Service remains at $3 per pound of cards (about 150 cards), or $1 for 10 or fewer cards. Joe and Fran picked out a couple of cards passing through that they thought were particularly nice, for us to share with our readers.

COURTESY BILL BARBEE, AA5ZR

Bill, AA5ZR, is pictured at the local Grenada Municipal Airport in Grenada, Mississippi, with a visiting Mooney whose tail number is N73DX. Alas, we checked with the FAA and learned that the aircraft is owned by an Ohio pilot who is *not* a ham!

Ham Radio Space News

The Southern Peninsula Amateur Radio Klub (SPARK) participated in the opening of the Virginia Air and Space Center in Hampton, Virginia, in April 1992, by setting up a special event station. A year later, a station was set up to demonstrate Amateur Radio satellite communication at the Center's first anniversary party. Later discussions with staff members at the Center led to approval of a permanent exhibit showing ham satellite communication. Tidewater Radio Conventions Inc, sponsor of the annual Virginia Beach Hamfest, donated $2000 for the project; the VASC Amateur Radio Group was formed, with representatives of 10 participating local clubs supporting the project with donations of funding and manpower. In late September 1995, the resulting exhibit (left) was opened, with a fully automated Amateur Radio satellite station (KE4ZXW), a display of antique radio equipment, and interactive displays for visitors. For information on visiting the Center, call 800-296-0800, or inquire via e-mail to **khinson@vasc.mus.va.us**.

Everyone has heard of "shuttle buses," but Tom, N3CXP, tells us of a different twist on the expression. In 1990, Tom was one of the local hams who helped the Allentown, Pennsylvania, schools with their scheduled SAREX contact with a space shuttle mission. Following the SAREX contact, local adults and students converted a school bus to the configuration shown. The photo below shows the shuttle bus during a visit to Washington to show off their handiwork to Pennsylvania's congressmen and senators. The shuttle bus has an operating multi-mode ham station (including satellite communication) near the cab area.

ARRL Radio Designer

Heavyweight RF CAD features without a heavyweight price

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- Model passive and small-signal linear circuits from audio to RF.
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- Simulate circuit performance in response to a steady-state time-domain signal using impulse, step, pulsed carrier or user-defined stimuli.
- Synthesize matching networks with Circles, an interactive Smith® Chart utility.
- Use manufacturer-supplied noise and S-parameter device data for highly realistic circuit simulations.

ARRL Radio Designer 1.5's 28 Circuit elements include

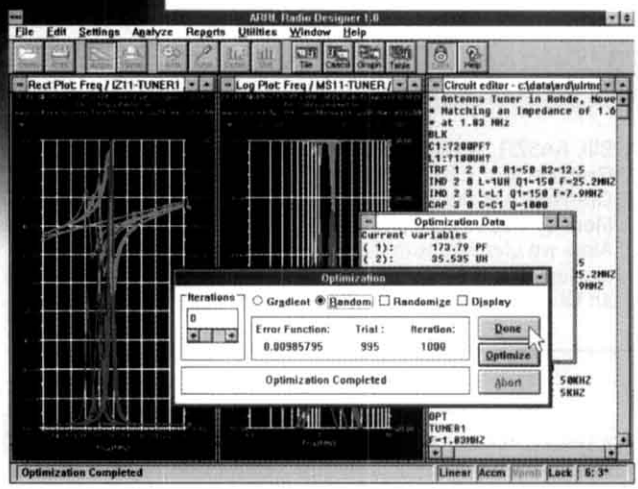
- **Active devices (bipolar and field-effect transistors, operational amplifier)**
- **"Black box" elements (two-terminal impedance specified by resistance and reactance; two-terminal one port specified by admittance, impedance or reflection coefficient; three-terminal two-port specified by admittance, impedance or S parameters)**
- **Controlled sources (current-controlled current, current-controlled voltage, voltage-controlled current, voltage-controlled voltage)**
- **Lossy capacitors, inductors, coaxial cables and transmission lines**
- **Transformers (ideal two- and three-winding types, specifiable in terms of turns ratio or impedance)**

Technical Specifications for *ARRL Radio Designer 1.5* Analysis:

Maximum number of nodes per circuit block*	**250**
Range of node-number values	**0 through 999**
Maximum number of ports per circuit block	**30**
Maximum number of frequency steps	**512**
Maximum number of statistical histograms	**20**

*** The number of circuit blocks allowed depends on their complexity; generally, 50 or more circuit blocks may be defined in a single *ARRL Radio Designer* netlist.**

ARRL Radio Designer is a derivative of Super-Compact®, an industry-standard linear circuit simulator by Compact Software of Paterson, New Jersey.



ARRL Radio Designer simulates and reports

- S, Y, Z, group delay and voltage probe parameters for *n*-port networks;
- Chain (ABCD), hybrid (H), inverse hybrid (G), gain, voltage gain, and stability parameters for two-port networks;
- Magnitude of reflection coefficient, phase of reflection coefficient, VSWR and return loss parameters for one-port networks;
- Gain, gain matching and noise parameters; and
- Complex S, Y, Z, H, G, chain (A), gain matching, noise matching and voltage probe parameters.

ARRL Radio Designer reports can be—

- Rectangular and polar graphs—onscreen and via any *Windows*™ compatible printer, in the colors, fonts and line weights you specify
- Tables—onscreen, in file form and via any *Windows*™ compatible printer

Minimum system requirements for *ARRL Radio Designer 1.5:*

- 386, 486 or Pentium™ IBM PC or 100% compatible (math coprocessor strongly recommended)
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- 3.5-inch, high-density floppy drive
- hard disk with at least 6 Mbytes of free space
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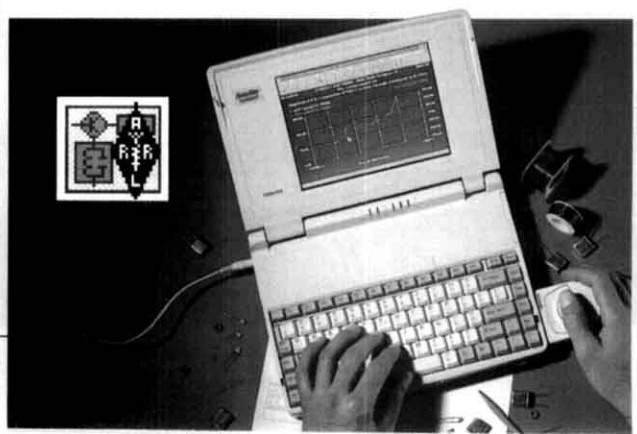

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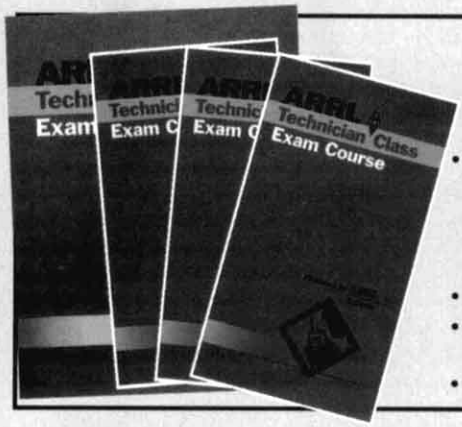

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IT'S NEVER TOO LATE . . .

♦ In January 1994, *QST* ran an article by long-time contributor, Rich Measures, AG6K, titled "The Nearly Perfect Amplifier." It was an incisive critique of HF amplifiers that may have stirred resentment among manufacturers, some of whose products are less than perfect.

In the September 1994 *QST* "Technical Correspondence" column, six "experts," some representing amplifier manufacturers, proceeded to discredit Rich's article, using such words and phrases as, "contrary to common sense," "misleading," "erroneous," "incorrect," and "inappropriate."

When Rich read these comments, he prepared a rebuttal to point out, among other things, the misquotes they used to prove themselves right. For reasons unknown, *QST* refused to print the rebuttal. Rich was hung out to dry before some 170,000+ readers. He resigned from the ARRL in January 1995.

Many months have passed, but as the old song goes, "It's never too late to say you're sorry." I think *QST* owes Rich Measures and the membership at large an apology for this journalistic lapse.

Let's get Rich back. He is too valuable a talent for us to lose.—*Jack Najork, W5FG, Duncanville, Texas.*

Rich Measures, AG6K, responds: Jack thinks that I am owed an apology. Well, no one owes me an apology. The people who matter, fellow amplifier builders, are aware of what happened. However, someone owes the membership an apology for allowing a moderately flawed critique to slip through, and for bending to advertiser pressure.

Looking at the situation with the benefit of hindsight, we regret that we did not do a more thorough job of editing out remarks of a personal nature that appeared in the Technical Correspondence piece. We should not have presented the opposing viewpoints in such a way that the contributors to the finished piece looked like a "lynch mob," as one reader put it. We could have done a better job of editing the piece to get the main points of disagreement across in less space.

Therefore, we agree with Jack that *QST* does owe Rich an apology for the handling of his article and the follow-up. We should have sent "The Nearly Perfect Amplifier" for technical review and dealt with any questions about its accuracy prior to publication, and we should have edited the Technical Correspondence piece more carefully.

However, Jack and Rich both imply that *QST* advertisers exert influence over the editorial content of the magazine, which is simply not true. Regular readers of *QST* Product Reviews and technical articles know that we do not hesitate to bite the hands that feed us if that is warranted.

We sent the article, along with the followup correspondence, for technical review by several ARRL Technical Advisors (TAs). These TAs are RF professionals who have no affiliation with any Amateur Radio manufacturer. Fred Telewski, WA7TZY, who helped coordinate the finished piece, has no connection to any Amateur Radio business. Only one of the correspondents quoted in the Technical Correspondence followup is employed by an Amateur Radio manufacturer.

The rebuttal that Rich provided was, in our view, repetitious of his articles that were previously published in *QST*. Readers who are interested in knowing more about his design philosophy have a wealth of material in print with which to work.—*Mark Wilson, AA2Z, Editor*

CAN HAM RADIO SURVIVE?

♦ Your editorial ("Thinking Strategically," It Seems to Us..., October 1995 *QST*, page 9) was a welcome breath of fresh air. As a communications professional and a 35-year ham, I know that only this kind of strategic assessment can make a place for Amateur Radio in the coming century.

However, you say that amateurs are unique in technical self-training, personal achievement, operational discipline and volunteerism. Not quite. Many Internet users are self-trained, as the term "browsing" suggests. Many also have greater personal achievement; competition and technical advancement are far more intensive in the computer environment. Amateur operational discipline is comparable to on-line forum discipline. Volunteerism is as visible on-line as it is on the air.

The differences you *didn't* cite are crucial. There are far more Internet users than amateurs, and Internet participation is growing much faster than the Amateur Radio population. Let's face it: Ham radio is no longer the primary hobby of personal communication.

Moreover, our technical innovation has virtually ceased. The telephone industry has been digitizing and compressing long-distance voice transmissions for at least a decade. The digital audio compact disk is the prevailing method of audio entertainment and distribution. Sony MiniDiscs and Phillips Digital Compact Cassettes compress audio digital streams ("bandwidth," in our terms) by about 80% without audible degradation. Codecs are now standard technology. DSS satellite systems are rapidly becoming popular among consumers. With advanced digital audio technology in almost every home, we "advanced" amateurs are still primarily using SSB and FM!

Our bright ray of hope is inherent in the nature of our technology. Wires stay put. Radio signals go everywhere. We are useful to the nation and the world because we can provide critical disaster communication better than anyone else. That advantage may not last long, though. As increasing numbers of people acquire portable cellular telephones, even that function may become superfluous. Ditto for the growing popularity of wireless LANs. It's not enough to say that we're trained communicators. A lot of nonhams use cellular extensively and are as proficient as any amateur. We need to do some hard thinking about how to stay ahead before it's too late.—*Marty Barrack, WA2ZKR, Burke, Virginia*

THE PRICE OF ADMISSION

♦ Over the past six years I've been noticing a steady increase in the admission price to hamfests. My home state hamfests, for example, often top the price list with an average admission of $7 per person. Imagine a parent and child shelling out $14 to walk through the door. And for what? To buy a couple of books and some used coax? I understand the need for clubs and other groups to raise funds, but they're rapidly approaching the point where the market can no longer afford the product! Some hams may decide that the better option is to simply stay home.—*Marc Roffman, WB2CUZ, Levittown, New York*

ABOLISH HF CW REQUIREMENT

♦ It's time to abolish the Morse code requirement for HF license privileges. I say this despite the fact that I spend at least 50% of my on-air time operating CW. I was raised in the vacuum tube and early transistor days of Amateur Radio, so the code has a special place in my heart. Today's technology, however, is leaving this amateur mode in the dust. With the explosion of the Internet, CW seems like a relic of the past—especially to youngsters.

MARS no longer uses CW, nor does the US Coast Guard and other armed services. Why not follow their lead? Let's say farewell to the code requirement and march into the 21st century. It's time to let go.—*Fred Mann, N5IVZ, McAllen, Texas*

THE JOYS OF AM DXING

♦ I really enjoyed Wayne Heinen's article, "AM Broadcast DXing" (November *QST*, page 62). I would like to offer a tip for those who may have newer transceivers with full-

coverage receive capability. They may find that these receivers are intentionally desensitized at MF frequencies to protect the front ends from strong local AM signals. My 1956 Admiral table radio with its internal loop antenna has picked up stations that I couldn't even hear on my Ten-Tec Paragon/G5RV setup. Vintage tube receivers or AM broadcast radios may provide better results—especially if your antenna installation is far from ideal.

Though the digital frequency readouts on the new rigs are nice when you're looking up stations via the National Radio Club log, it can be even more exciting to wait for the station IDs and get all the information *off the air* with a plain old dial-type radio. AM DXing is perfect for those days when you don't have enough energy left to concentrate on hamming, but you still want to "play radio."—*Ed Schumacher, WA9GQK, Berwyn, Illinois*

S9 + 60 CONTESTS?

♦ For more than 60 years I've enjoyed CW contests of all varieties. When contesting was in its infancy, a contester might call CQ and, after signing "K," would listen for replies. Is this still the practice today? I wonder.

My keyer is set to high speed for contests and, by actual measurement, it takes 1.25 seconds for me to send my short call sign. I use QSK and I hear most big-gun contesters repeating their CQ while I'm still sending my prefix! In short, they're devoting only 0.625 second to listening.

You're not going to hear weaker stations in that narrow time span. I guess only S9 + 60-dB calls are welcome and I don't always qualify. My thanks go to the stations (especially DX stations) who shun this practice and take a little more time *listening* after they make their calls.—*Jim McDonough, W3CY, Alexandria, Virginia.*

HAMS HELPING HAMS

♦ Last November, as my wife Barbara (KB7DRI) and I were driving home to La Grande, Oregon, from Portland, our little Dodge Colt blew its cooling system and I pulled over to the side of I-84. Grabbing my *ARRL Repeater Directory* from a suitcase, I set my mobile FM rig to the Hood River repeater and made a call.

Seconds later, Herb, WB7NDY, replied. I explained our predicament and asked if he had any suggestions. "I'll do better than 'suggest.' Stand by while I make some calls."

A few minutes passed before Herb reappeared. "Help is on the way," he announced. Another voice broke in and said, "I'm headed out now." That was Terry, KB7DRX, the owner of a local auto repair shop.

Terry confirmed our location and said it would take only a few minutes to reach us. Just as I was finishing with Terry, someone tapped on the driver's side window. It was Eric, KA7ETQ, a local Scoutmaster and a member of our church in La Grande. Eric overheard our conversations while in his company truck enroute to La Grande.

When Terry arrived, he replenished the radiator coolant, but we determined that the Colt was not driveable to La Grande. With our ham escort, we limped into Hood River where we located a trailer-transporter. Eric had his truck taillights rewired to accommodate the transporter, then took us all the rest of the way home (200 miles!) with our Colt in tow.

This is Amateur Radio at its best! —*Graham Hicks, W4PJS, La Grande, Oregon*

QSL ETIQUETTE

♦ I participated in the Hiram Percy Maxim 126th birthday celebration last September and enjoyed the activity. Within weeks my mailbox was stuffed with QSL cards, most requesting mine in return.

It was impressed upon me, very early in my ham career, that if I wanted someone else's QSL card I should pay the return postage. For domestic contacts, this means enclosing a self-addressed, stamped envelope.

Sadly, many cards I received from US amateurs included *nothing*. Do they think that my card isn't worth 32 cents and a return envelope? I checked a sampling of call signs and discovered that most of these thoughtless hams were not elderly operators on fixed incomes. Not only that, their own cards proudly listed their achievements such as DXCC, WAC and so on. These were not inexperienced hams! Even more surprising is the fact that two offenders were League appointees with ARRL-format QSLs!

I don't mean to be hard-nosed, but I doubt if these operators earned their awards by expecting others to pay the postage. Maybe it's time for an article on QSL etiquette in the pages of *QST*.—*Steve Licht, WF2S, Batavia, New York*

TOO MANY BELLS AND WHISTLES

♦ Is bigger always better? If it is possible, is it really *necessary*? Sometimes the lengths to which we go in the glorification of high technology seems a bit much. I refer to the multitude of so-called "features" now available in amateur rigs. In particular, the mushrooming number of bells and whistles one must accept in order to purchase a new H-T, HF transceiver, TNC and so on. Beyond that is the proliferation of minuscule controls, some less than half the diameter of a thumbtack.

Do hams feel conversant with *all* the features on their new electronic toys? Do they use all of them frequently? I doubt it. I just counted the number of pushbuttons and dials on one of the newer HF transceivers and found 57 different controls. Many serve more than one function!

Worse yet, if a new radio fails, most hams won't have a clue how to repair it. Ultraminiature surface-mount technology has made this task nearly impossible. The upshot is that new hams will never know the pleasure of fixing their own equipment—and we wind up paying a lot more for goodies we rarely use.—*Bob Giffin, K7JQR, Olympia, Washington*

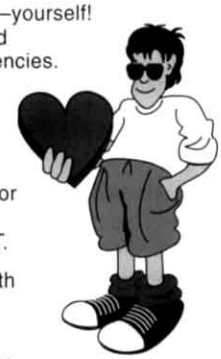
This Month in Amateur Radio

February may be the shortest month, even in a Leap Year, but it's long on reasons to spend time in your cozy ham shack or to head south to warmer climes check out a convention or two! Here's just a sample of what's in store for you this month:

Florida is a good place to be in February, especially if you're a ham! The Dade Radio Club's **Tropical Hamboree and ARRL Hamfest of the Americas** is a big event that attracts scores of our Latin American and Caribbean friends to Miami every year. This year it's **February 3 and 4**, and is also the ARRL Southern Florida Section Convention — see last month's *QST*, p 101, for details. This year, tours of the brand new National Hurricane Center, home of W4EHW, will be featured. Two weeks later, the **Orlando HamCation** and ARRL Florida State Convention will attract crowds of hams and their families to Disney's doorstep **February 16 to 18** — check it out on p 105, this issue.

The Jackson, Mississippi Amateur Radio Club is hosting the **Mississippi State convention** in—where else?—Jackson, Mississippi on the weekend of **February 3 and 4**. See the "Hamfest Calendar" on page 105 in this issue for details.

Check your CW copying speed against your most fearsome competitor—yourself! The **W1AW qualifying runs** take place on **February 3** at 0300 UTC and **February 24** at 2100 UTC on the usual Morse code transmission frequencies. If you live on the west coast and have difficulty hearing W1AW, try monitoring **W6OWP on 3.590 MHz** (W6ZRJ and AB6YR are alternates) on February 8 at 0500 UTC. See page 116 for the scoop on how to send in your results.



Be true to your school! If your elementary, middle, high school, college or university has a ham station, put it on the air during the **School Club Roundup, February 12 through 16.** See page 112 in last month's *QST*.

Who says hams aren't romantics? We'll be honoring Valentine's Day with special event stations in Tonawanda, New York, and—of course!—in Romance, Arkansas. See page 110.

There are several DX contests, but there's only one where US and Canadian hams are the object of everyone else's desires: the ARRL International DX Contest. Entry categories give everyone a chance to compete, from big gun to little pistol. If competition is not your thing, there's no better time to work on your quest for DXCC. The CW weekend kicks off Friday night, **February 16**, for 48 hours—dust off your keyer, or get your microphone ready for the phone weekend beginning **March 1**.

The moonlight will be just right on **February 17 and 18**. In addition to sparking romance, it will also draw moonbouncers onto the VHF/UHF bands. With several **moonbounce** "megastations" on the air, you'll be able to make contacts with a single Yagi antenna (eleven elements or more) and 150 W or so.

Despite the chill, Yankees know how to enjoy the winter months. The Committee for Amateur Radio and the Hamilton County ARPSC are kicking off the two-day **Great Lakes Division convention** in Cincinnati, Ohio on **February 24** in the spacious Cincinnati Gardens arena. See page 105.

EA3UM bounces signals off the moon with a 7-meter dish antenna! With "megastations" like this one taking up the slack, moonbounce is easier for the rest of us.

Another **new ARRL book** hits the streets this month! ***Your Mobile Companion***, by Roger Burch, WF4N, covers the many flavors of mobile operating, from motorcycle CW to aeronautical mobile. You'll also learn how to buy mobile gear (including transceivers and antennas) as well as how to install all these marvelous goodies in your car. There is even a helpful section on avoiding interference hassles. See your ARRL dealer or call the Publication Sales department at Headquarters to order your copy!

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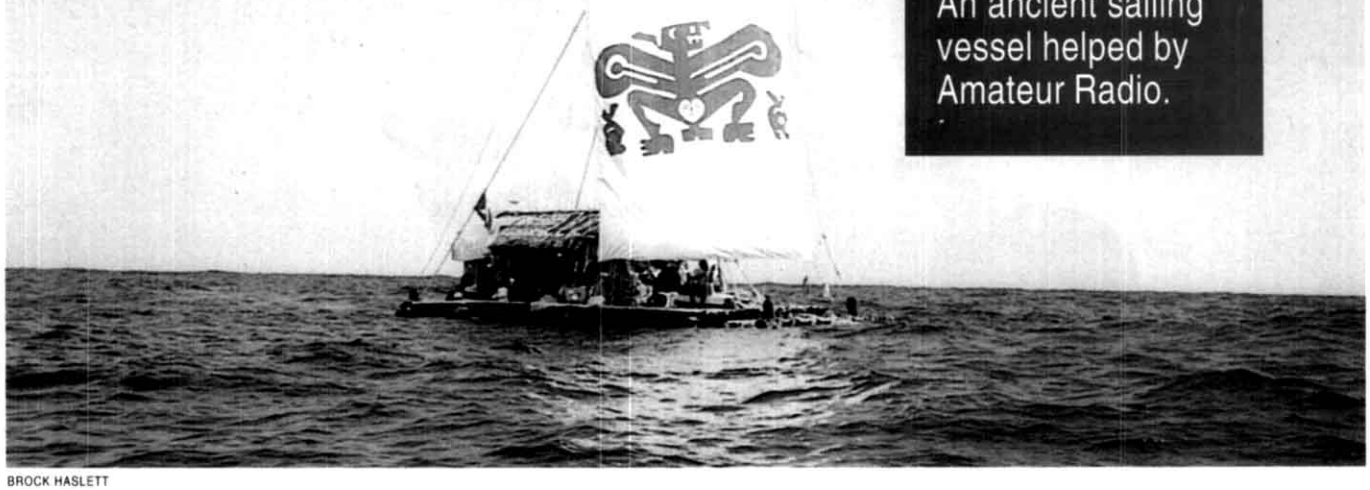
By John Haslett, KC5KHA

The *Illa Tiki* Expedition

An ancient sailing vessel helped by Amateur Radio.



BROCK HASLETT

I was in a deep sleep when the phone rang. While confused and somewhat agitated, I still managed to answer it. It was Dick Hoff, AA5NT, on the other end.

"I've looked over the outline of the expedition. What kind of radio are you going to use?"

"Uh.... That has been a thorn in my side from the word *go*," I truthfully replied. The fact of the matter was that I knew absolutely nothing about radio operation, and had no particular desire to learn. I was about to lead one of the most ambitious sea expeditions in the last decade, and it was clear that I would be forced to learn the mysteries of the radio world.

"Meet me at Texas Towers on Saturday and I'll get you started." I met Dick at the radio store and my worst fears were confirmed. I'd have to take tests and more tests, learn electronics jargon that sounded hopelessly complicated, and the most dreaded of all things—learn CW. I drove away from the shop thinking, "This is insane! I have a million other things that are more important to the project than learning about radio." Eight months later I sat in a bamboo hut, drifting off the coast of Panama, sweating over a Yaesu FT-900—and thanking the Lord I had become a ham.

"It's Prisoner Island" came the voice over the rig.

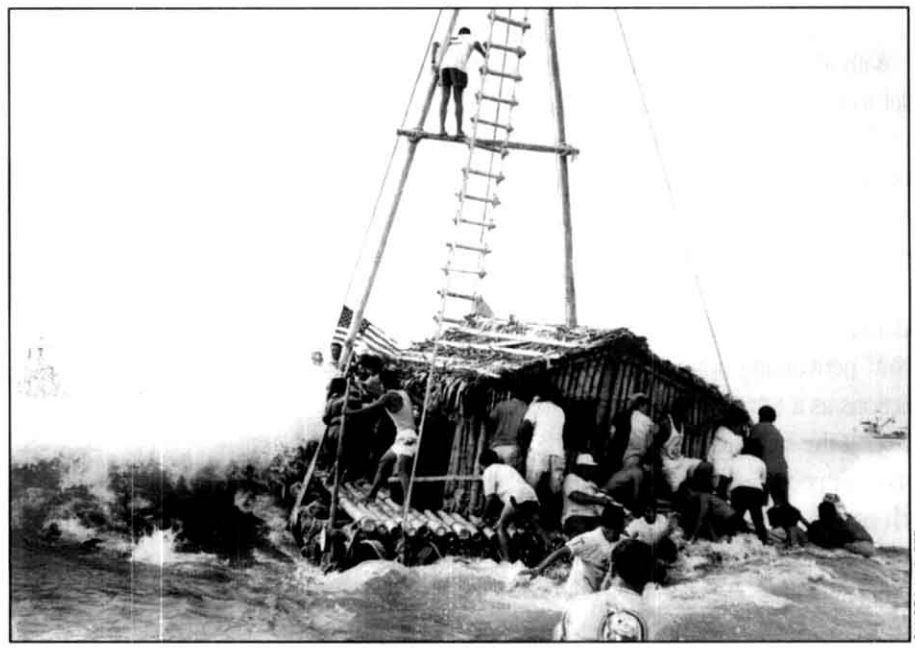
"W4SQG, this is KC5KHA/mm. I don't think I got that right; please say again"

"KC5KHA, the island on your horizon is the Isle of Coiba—a prison colony. According to my information, there is heavy piracy in the area and there have been several killings there recently. That would be the worst place to attempt a landing. QSL?"

"Roger, roger!"

At the time, I was speaking from one of the most unusual mobile stations in the world, the sailing raft *Illa Tiki*. The *Illa Tiki* had been constructed in Ecuador by my colleagues and me, in the hopes of voyaging to the Hawaiian Islands. We were, of course, following in the footsteps of the legendary adventurer Thor Heyerdahl, who had voyaged from Peru to Tahiti in the balsa raft *Kon Tiki* some 50 years earlier.

An unusual mobile station, indeed. Made of nine massive balsa logs tied together with almost a mile of hemp rope, the *Illa Tiki* is an exact replica of the sailing rafts that plied the coastal waters of Central and South America for centuries before the Spaniards arrived. On top of the main logs, hardwood crossbeams support a bamboo deck, an A-frame mast and the small hut that functioned as our home during the voyage. Using only machetes, wooden levers, and raw manpower, the villagers of



SANDRA HASLETT

Launching the *Illa Tiki*, a tricky and dangerous task, required about 300 people to force the 20-ton raft into the raging surf.

the tiny coastal community of Salango worked side by side with the five crew members to build the raft in the same manner that their forefathers had used 3000 years earlier.

In the end, not a single metal, plastic, or otherwise modern part was used in the composition of the raft. After six weeks of grueling work, and the force of 300 people pushing her, the 20-ton *Illa Tiki* was launched into the ocean for the first time on March 19, 1995.

Shortly after launch, I began installing the HF radio that would be our only link to the outside world. A single board, suspended by ropes from the thatched roof, acted as a table where the Yaesu FT-900 was placed, along with all my tools, spare parts and log book. The two 12-V batteries that powered the system were placed under the table and were kept charged by a combination of solar panels and bicycle-powered generators. Coax for the antenna ran through the thatch to the Hustler vertical antenna that was tied outside to the corner of the hut. Resonators for 10, 15, 17, 20 and 40 meters were carried on board the raft. A system of eight copper radials running from the antenna mount through the bamboo deck and into the water was used to form a counterpoise. Underneath the raft the radials were threaded in between the 1½-inch manila ropes holding the logs together and the logs themselves, to prevent various sea life from chewing on them. This particular task proved to be extremely difficult. The water in which we lay at the time was a "jellyfish soup," and the crew members installing the wires for the ground plane were continuously coming up to the surface with burns all over their bodies.

A few days after the radio system was up and running, the *Illa Tiki* was towed out to sea by the tanker *Everest* to begin her voyage. Problems immediately arose. The raft was more vulnerable to the movement of the currents than we had estimated, and the raft could not sail at an efficient angle into the wind. We were being pushed off course. Instead of sailing due west toward the favorable currents that would push us toward Hawaii, the raft was heading due north, directly toward Central America. The crew agreed that we would try a new course. We would run parallel to Central America until we were on the same latitude as Hawaii, then try to sail due west.

As we sailed north, several hundred miles off the jungle coast of Colombia, I began trying to make contact with Dick, AA5NT, our liaison to the States throughout the voyage. After searching the bands for a couple of hours, I stumbled across Owen Gander, GUØLAD/W4, operating from Pine Island, Florida. That was on the afternoon of April Fool's Day.

"Owen, can you get on the landline and call a ham in Dallas?"

"Roger that, KC5KHA. What is your location?"

"I'm about 400 miles off the coast of Colombia on a 35-foot balsa raft. Okay?"

"... Okay. I'll call him." (I think Owen was, at first, in a state of disbelief!)

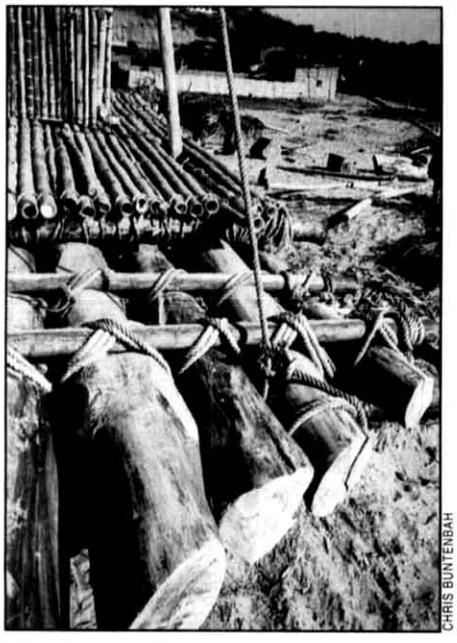
Soon I was contacting the US three times a week. It was a good thing, too. Six days after we started our schedules, the Ecuadorian press reported that the raft had been destroyed. It was an emotional scene at Dick's station the day after the report, as family members of the crew gathered and learned that we were, indeed, still alive. An hour or so later, aircraft from the Ecuadorian Navy—having been given our exact location—began making extremely low-level passes on the raft giving us thumbs-up signs.

The scheduled contacts from the raft were made on the Maritime Mobile Net. These contacts were always the highlight of the week for the crew, as we gathered eagerly around the radio table to speak to our loved ones. For a first-time ham and isolated mariner, the Maritime Mobile Net proved ideal. The net is run by some of the most responsible and professional radio operators I have ever had the pleasure of talking to. Net stations WA2CQK, Jim, and KA4BPR, Fletcher—both in Georgia—and W5HBI, Ray, in San Antonio, Texas, stand out in my mind.

Another treat for the crew was the ARRL's All-School Network. Through AA5NT and the ARRL, we began a series of contacts with various schools throughout the country, including KC5HQT, Heritage Middle School, Colleyville, Texas, and AA2NU, Blue Mountain Middle School, Montrose, New York.

During this time, we had a rapidly deteriorating medical situation on board the raft. Our Austrian colleague Hannes Kuhtreiber was developing unexplained sores on his hands and feet that became badly infected. Luckily we were able to turn to the net, and one of their regulars, Dr Earl Weston, W8BXO, gave us good medical advice.

The radio was one of the few comforts aboard the raft. The life we led on board was a bitter struggle. The original plan for food rationing was for us to take every other meal from the sea. However, during the first two weeks we were unable to catch enough fish, which caused our supply of rations to be consumed at an alarming



CHRIS BUNTENBAH

Balsa logs and hemp rope was all that was between us and the sea.

CHRIS BUNTENBAH

The raft's hut, with Hannes Kuhtreiber working on his research on migratory seabirds.

PAT NUGENT, KC5CMK

Discussing the ham radio aspects of the voyage (l-r): Chris Buntenbah; Alan Peacock, N5NTY; the author; and Dick Hoff, AA5NT. Dick's station was the *Illa Tiki*'s main radio contact, with Alan as the AA5NT backup operator when Dick had to be elsewhere at schedule times.

CHRIS BUNTENBAH

The author on the Azuero Peninsula of Panama, pictured just after he heard that the *Illa Tiki* could go no further on its first voyage.

rate—*three times* that which had been expected. Catching fish became a desperate fight for survival. Unable to attract squid that could be used as bait to catch dorados or tuna, we began making homemade lures and harpoons. Long battles were waged in the pitch black of night between hungry men and the incredibly powerful dorados. Many times these 30 to 40-pound predator fish would fight their way back into the water after we had them on board —despite the efforts of five spear-carrying, gaff-wielding ancient mariners. We learned that, in a fight between a man and a dorado, the dorado will win.

A second source of misery was the immense canvas sail. Wanting to use as much primitive technology as possible, we agreed not to use winches to handle the sail. That meant using only human strength to try to control an energy force strong enough to drag a 20-ton barge through the water. During times of even moderate wind, handling the sail could be extremely dangerous. Many times, men holding a line attached to the wind-filled sail were thrown through the air like dolls. Holding a corner of the canvas when the sail came loose and was out of control was the equivalent of having your hand caught in the bridle of a raging bull.

There were injuries almost daily, the worst incident happening to my brother Brock, who took a horrific blow to the head when a knot in one of the lines broke free. He is only now regaining the hearing in the ear that was hit by a seawater-soaked knot that weighed perhaps 10 pounds and which had swollen so tight as to feel like steel.

After 30 days at sea, the coast of Panama was sighted from our lookout post atop the 35-foot mast. At that point I decided to make anchorage in Panama so that modifications could be made to the *Illa Tiki* to make her more maneuverable under sail. Because we were far off our original course, we had no maps or charts of the area and were completely lost. That is when ham radio literally saved the expedition and possibly our lives.

From our position at sea we could not confirm if there were any safe anchorages or villages on the coast. Had we not been able to speak directly to the US on 20 meters, we would have landed on an island inhabited by prisoners, as described earlier. Thanks again to the Maritime Mobile Net, we were able to make safe anchorage on the Azuero Peninsula of Panama. But there was a greater problem lurking for us in Panama.

While moored in the Bay of Ciruelos, the giant balsa logs became infested with the *Teredo navalis* wood worm that has been the scourge of wooden ships throughout history. After a few weeks of being in the bay, the raft starting to float noticeably lower in the water—the *Teredo navalis* were rapidly consuming the soft balsa wood.

Again Amateur Radio would save the expedition. I asked Dick to set up a phone patch with Annie Biggs, the director and producer of the documentary film being made of the expedition. Annie put out word of our problem on the Internet, and soon we were given instructions on how to deal with *Teredo navalis*.

In order to kill the wood-eating mollusks, we would need to expose the raft to air for a continuous period of at least 24 hours. The only way to achieve this would be to beach the raft on the day of the highest tide of the month, and wait until the corresponding high-tide day the following month to push the raft back into the ocean. Unfortunately, all of these delays added up to the fact that we would have to sail the now-weakened raft right down "hurricane alley" during July—the high season.

To avoid a fatal disaster, I gave the order to beach the raft at the Bay of Ciruelos, remove all equipment, and wait until December to sail the raft back to Ecuador. The *Illa Tiki* will eventually become a permanent display in the Museo Salango—in Salango, the town where the raft was built—a museum dedicated to the ancient cultures that used these incredible rafts throughout the centuries. Immediately after my return to Ecuador, and the subsequent induction of the raft into Museo Salango, I will begin preparations for my second balsa voyage, on a similar raft—again with Hawaii as my destination.

When the *Illa Tiki* expedition is again under way, here's how to make contact with us. Monitor the Maritime Mobile Net on 14.300 MHz, Tuesdays and Thursdays at 1800 UTC. After making contact with Dick, I usually move to a clear frequency to give him my position and other important information. After the essentials are taken care of, I can usually handle about 20 minutes of QSOs. Occasionally, I will have to cut it short because of low battery power.

I would like to thank everyone who was there by our side on the bands. And, I am happy to report, after my initial reluctance to get a license I am now happy to be a ham for life—thanks to Dick, AA5NT!

I'd like to acknowledge some other hams important to the project. They included Bob McKinnie, AL7AQ, who designed the radio system; Alan Peacock, N5NTY, who took over for Dick, AA5NT, when Dick was out of town, and Chuck Lechner, WB2LMA, who served as Dick's back-up station.

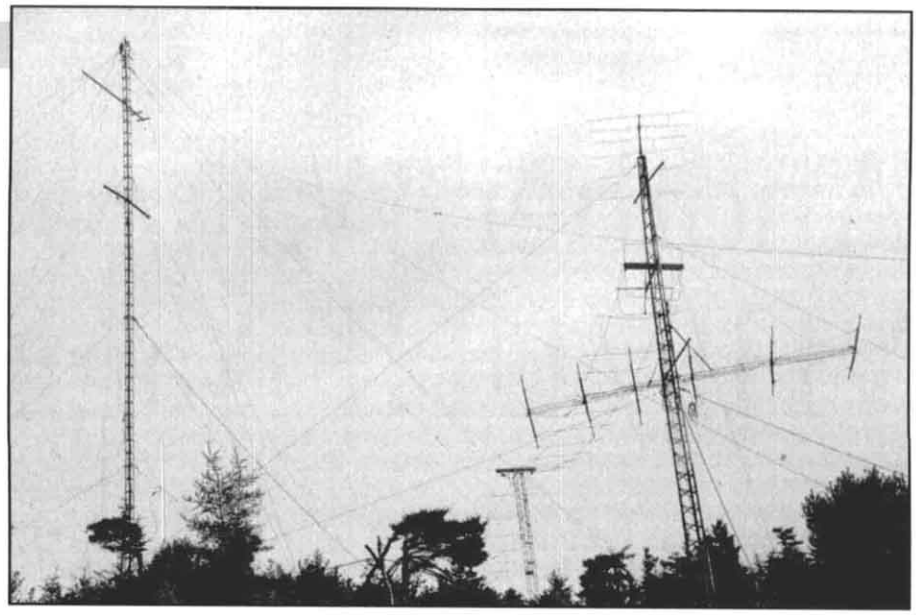
John Haslett, KC5KHA, 636 Northill, Richardson, TX 75080, e-mail: **process@iadfw.net**.

By James D. Cain, K1TN

VE1ZZ:

A "Ham's Ham"

A powerful station built through ingenuity and scrounging.



Some of Jack's towers and antennas. He has worked 264 DXCC countries on 160 meters.

Have you ever marveled at how VE1ZZ hears and works stations on 160 meters that you can't, and how Jack puts out a big signal on the HF bands? Fred Hopengarten, K1VR, did, and he visited Jack Leahy last September at his home outside Halifax, Nova Scotia, and got the straight scoop.

As the real estate people would say, "What a location!" Jack's house is surrounded by various gradual slopes, and bays and inlets of water. In directions ranging from eastward to southward, his antennas look downhill toward saltwater. To the northeast, it is just a mile to saltwater. And, for all intents and purposes, Nova Scotia might just as well be an island—from which you can almost see the White Cliffs of Dover.

Hopengarten calls VE1ZZ a "ham's ham," with a powerful station built through ingenuity and scrounging. Fred's favorite among the VE1ZZ HF Yagi antennas was a 15-meter beam with elements made of 0.850-in. cable television Hardline, with the Hardline tied and taped to thin logs (real wood) that Jack cut down to open up his backyard forest. "My other favorite," says Fred, "was a 6-meter, 23-element quagi (a quad driven element, quad reflector, and 21 linear directors), on a boom about 90 feet long. The boom is made of two ropes running toward Europe, supported at one end by a tower, in the middle by a tree, and at the far end by a tree."

Up the hill from the HF beams (all homemade) are wire arrays for 80 meters, along with "four square" vertical arrays for that band, made of very small TV towers. These towers are definitely not climbable; Jack erects them in one piece, with a 40-foot portable tower and pulleys.

Over the years Jack came upon a lot of scraps of TV Hardline, and he uses it everywhere. He lays out a scrap until it ends, then bends its end up toward the sky, grabs the next piece of Hardline scrap, and does the same. He then splices the two pieces of cable together with a stainless steel muffler clamp, wraps #14 wire several times around the two center conductors and solders the connections, and tops the splice with a plastic soda bottle. Jack even feeds his Beverage receiving antennas with these Hardline scraps.

The gray box pictured at the left contains a four-square system control. Note the Hardline splices, open-frame relays, and no coax connectors. Many of Jack's relays operate from 110 V, but will work on 24 to 30 volts. He uses what he can find, in the finest traditions of ham scrounging.

Does it work? Ask Peter Iovino, KA1BQ, who last year was participating in a contest operation from EA9IE in Northern Africa, struggling to hear North America on 160 meters. "Every now and again VE1ZZ would drop by and ask 'How are things going?'" Peter says it was as if a local had asked the question on 2 meters through the repeater!

Jack, 62, is retired from a job working on marine communication gear, so that he now has plenty of time to play with antennas and indulge his favorite hobby of ham radio.

Jim Cain, K1TN, PO Box 42, Andover, CT 06232. Photos are by Fred Hopengarten, K1VR.

Antenna control with open-frame relays and no coax connectors.

Jack's shack, with "Nova Scotia air conditioning."

Jack Leahy, VE1ZZ, and one of his Hardline splices.

By Brian Beezley, K6STI

Another Way to Stack VHF/UHF Yagis

An unusual stacking geometry maximizes array gain and minimizes side lobes.

Yagi-Uda arrays are wonderful antennas. Invented by Shintaro Uda in collaboration with Hidetsugu Yagi in the 1920s,[1] no other antenna yields so much benefit for so little complexity in so many practical applications.[2] Yagis are easy to design, offer significant gain over simple antennas and are capable of highly directional patterns.

One of the more attractive properties of a Yagi is that it's easy to obtain higher performance by simply increasing its boom length and adding some elements. (For optimum results, however, you need to readjust all the element lengths and spacings when you resize a design, but this is easy to do with a computer using automatic optimization algorithms.[3]) There's no limit to the increase in gain and pattern quality made possible by lengthening the boom—no theoretical limit, that is! Once your Yagi becomes so long that it's mechanically infeasible to further increase the boom length, what do you do? You stack multiple Yagis, of course!

Stacking refers to the simultaneous excitation of a number of similar antennas. The term comes from the appearance of antennas arrayed above one another in the vertical plane. You can stack Yagis vertically, horizontally, or even in depth. If you space the individual antennas properly, the overall gain increases 3 dB[4] each time you double the number of antennas in a free-space array.[5] So, when your Yagi becomes unmanageably long, you simply replicate it—and make your antenna unmanageably high and wide, too!

The Stacking Trade-Off

When you stack a pair of Yagis, not only does the gain increase, but the width of the forward lobe *decreases* in the stacking plane.[6] Figure 1 shows the E-plane pattern for an 8-element, 12-foot Yagi optimized for high performance at the low end of the 2-meter band.[7] This is the azimuth pattern when the Yagi is oriented for horizontal polarization. Figure 2 shows the pattern for a pair of these antennas stacked horizontally with 150 inches between the booms. This spacing maximizes forward gain for this particular design.

Figure 2 illustrates the fundamental design trade-off for stacked arrays. Although stacking increases the array's forward gain and narrows the main lobe, it also creates a pair of large side lobes just beyond the main lobe. In this particular case, the side lobes are down only 7.5 dB from the main lobe. The side lobe level is 2 to 3 dB greater than the response of a single Yagi in the same region. This makes the stacked pair more sensitive to noise and QRM just beyond boresight (off the axis of the main lobe). Even worse, the side lobes make it much more difficult to peak the array on a received signal, especially when it's fading.

You can obtain a better pattern by reducing the stacking distance and surrendering some forward gain. Figure 3 shows the azimuth pattern for the Yagis stacked 107 inches apart. The gain has dropped 0.36 dB, but the first side lobes are now down 15 dB from the main lobe. For most applications, this is a reasonable performance compromise. If you can tolerate less gain, you can

[1]Notes appear on page 34.

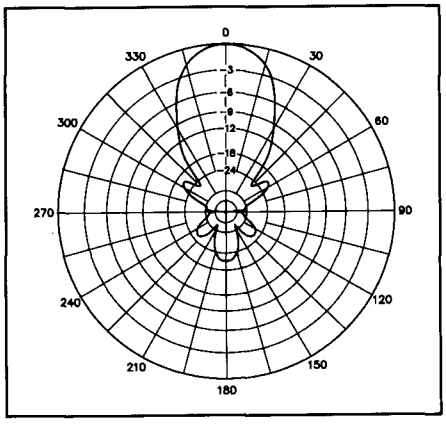


Figure 1—Free-space, E-plane pattern for an optimized, 8-element, 12-foot-boom, 2-meter Yagi. Freq: 144.2 MHz; 0 dB = 11.30 dBd

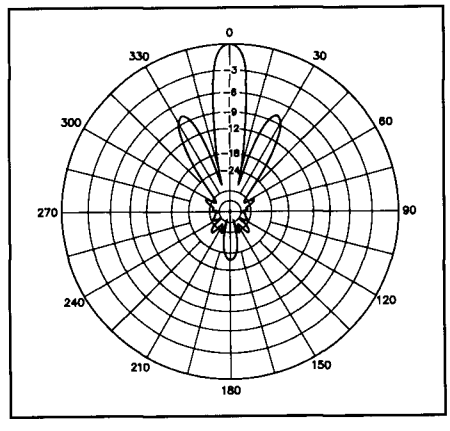


Figure 2—Free-space, E-plane pattern for a pair of 8-element Yagis stacked in the E-plane for maximum forward gain. Freq: 144.2 MHz; 0 dB = 14.38 dBd

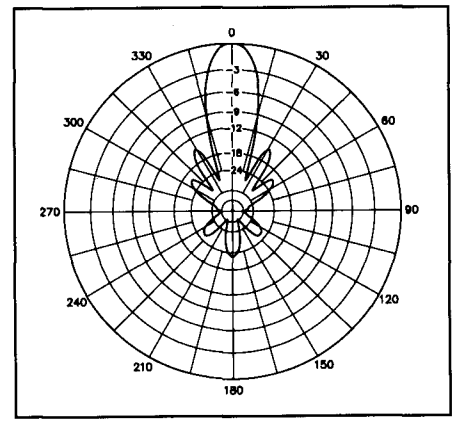


Figure 3—Free-space, E-plane pattern for a pair of 8-element Yagis stacked in the E-plane for reduced side lobes. Freq: 144.2 MHz; 0 dB = 14.02 dBd

drop the side lobes further by decreasing the stacking distance even more.

The Four-Stack

Many hams use a rectangular stack of four Yagis for serious weak-signal work on VHF/UHF (see Figure 4). This configuration uses two Yagis spaced horizontally with a second pair stacked directly above the first. Two vertical masts joined at their centers by a horizontal spreader support the array. This support structure is called an **H** frame. (For better stability, large arrays often use *two* horizontal spreaders displaced vertically).

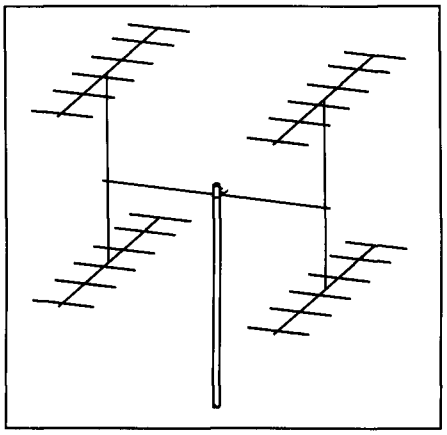


Figure 4—Stacking arrangement for a conventional Yagi four-stack.

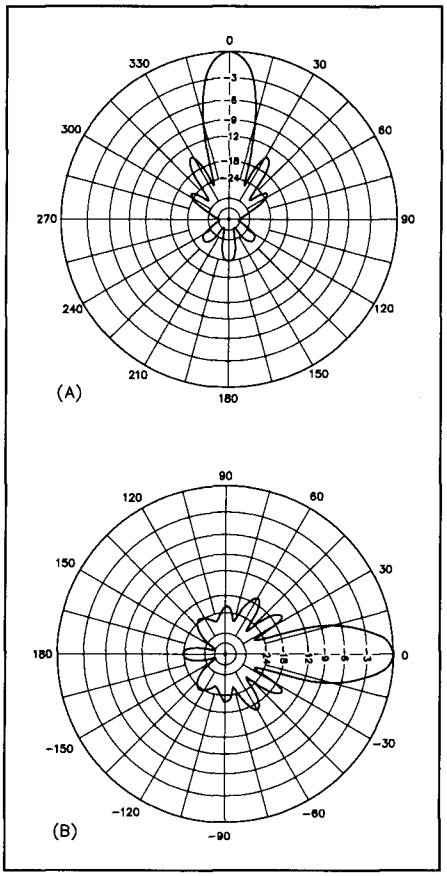


Figure 5—Free-space, E- and H-plane patterns (A and B, respectively) for a conventional Yagi four-stack. Array spacing is adjusted so that the first sidelobes in each plane are down about 15 dB from the main beam. Freq: 144.2 MHz; 0 dB = 16.84 dBd

The horizontal and vertical stacking distances most often are chosen to force the first side lobes in each plane to be 12 to 18 dB below the level of the main lobe. Figures 5A and 5B show the E and H-plane patterns for a four-stack using the Yagi of Figure 1, with the first side lobes down about 15 dB. The horizontal stacking distance is 107 inches and the vertical stacking distance is 99 inches.[8] This four-stack has 5.54-dB gain over a single antenna and reasonable E and H-plane patterns.

The Diamond Stack

The pattern of a stacked array can be factored into two components. The first component is called the *antenna factor* and is simply the pattern of a single array element—in this case, an individual Yagi. The second component is called the *array factor* and depends only on the stacking geometry, not on the individual antennas comprising the array. Without significant mutual-impedance interactions among individual array elements (the usual case at VHF/UHF), the pattern for the array as a whole is simply the product of the antenna factor and the array factor.

The array factor accounts for the undesirable side lobes of stacked Yagis. If you express the array geometry as a sequence of current magnitudes that correspond to the excitation of individual array elements, the array factor is simply the Fourier transform of the sequence. For the Yagi four-stack, the current sequence in either plane is 1-1. This notation indicates that the two Yagis are excited with equal current magnitudes. The Fourier transform of a uniform sequence like this is proportional to (sin x)/x, where x is related to the angle from boresight. The first peak in this function for $x > 0$ corresponds to the undesirable first side lobes in a Yagi four-stack.

Signal-processing experts will tell you that a uniform sequence like 1-1 yields just about the worst-possible Fourier side lobes.[9] The way to lower side lobe levels is to use a tapered sequence. For example, the Fourier transform of a 1-2-1 sequence is the transform of a 1-1 sequence squared. A side lobe that's down *n* dB for a 1-1 array is down 2*n* dB for a 1-2-1 array of the same spacing. The theoretical trade-off is that the width of the main lobe broadens when you taper a sequence. The practical trade-off for a 1-2-1 is that an additional Yagi is required and you have to figure out how to excite it with twice the current.

Or do you?

Take a Yagi four-stack and rotate it 45° so that the array looks like a diamond instead of a square—keep the Yagis horizontal. What's the sequence of excitation currents in the horizontal plane? From left to right, we have a single Yagi, then two, and finally one. All the Yagis are in phase, so the current contribution from the center Yagis is *twice* that of the end antennas. In the horizontal plane, the current sequence is 1-2-1, and we should expect much lower

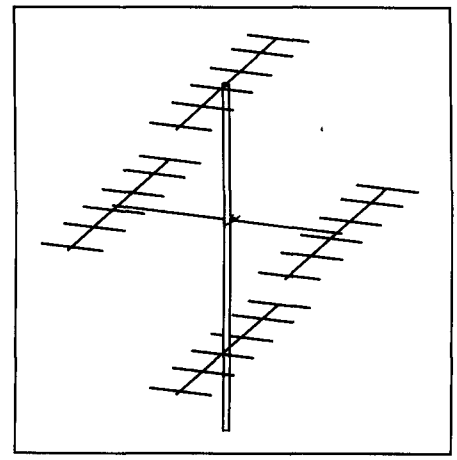


Figure 6—Arrangement of a diamond stack of four Yagis.

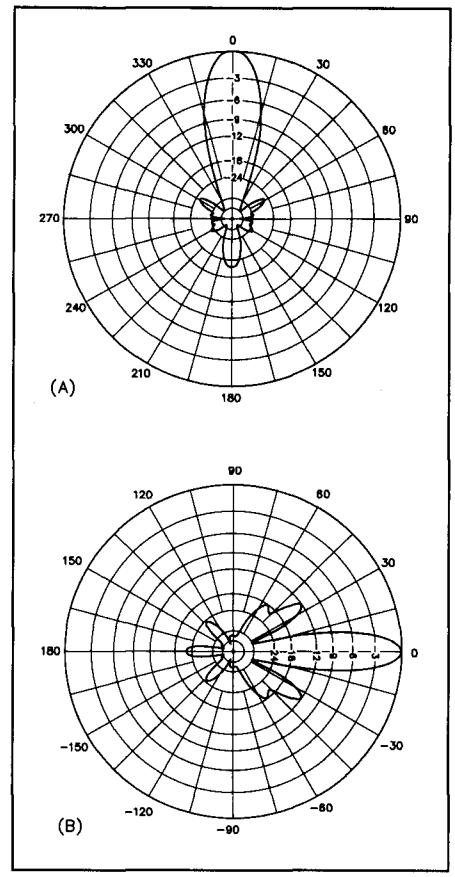


Figure 7—Free-space, E- and H-plane patterns (A and B, respectively) for a diamond stack of four Yagis. Array spacing is optimized for maximum forward gain. Freq: 144.2 MHz; 0 db = 17.60 dBd

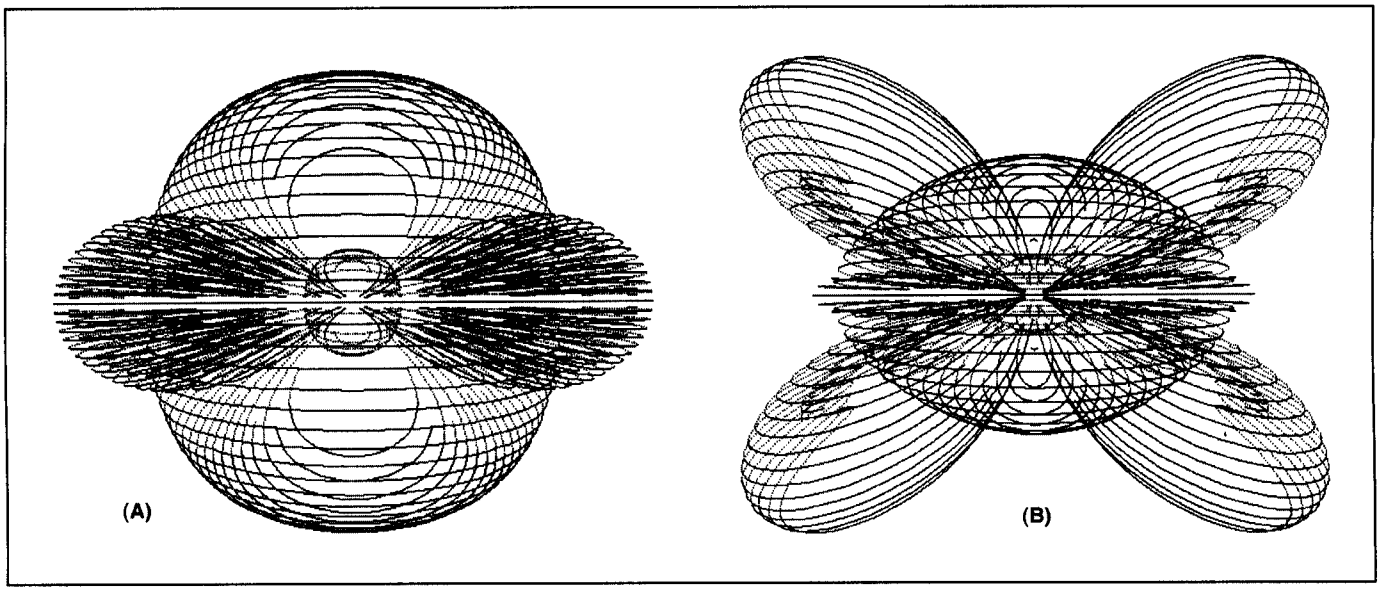


Figure 8—Head-on views of the 3-D patterns of a conventional Yagi four-stack (A) and a diamond stack (B) of the same antennas. Array spacing is the same as for Figures 5 and 7. The large, central blobs are the main beams, the small spheres are the back lobes, and the ovals are the first side lobes. Freq: 144.2 MHz; At A, peak = 16.84 dBd; at B, peak = 17.60 dBd

side lobes! The original side lobes are still there, of course, but they're pointing harmlessly up in the air and down at the ground instead of at the horizon.

Now you can aggressively expand the spacing between Yagis to increase array gain. Figure 6 shows a diagram of the array. Figures 7A and 7B show the E and H-plane patterns for the stacking distances that maximize forward gain. The gain of the diamond array is 0.78 dB greater than that of a conventional four-stack, and the first side lobes have disappeared completely, leaving a second set of side lobes 26 dB down at 60° azimuth! The head-on, 3-D patterns in Figure 8 show the side lobe locations for conventional and diamond stacking.[10]

The Bad News

For terrestrial use, a diamond configuration of four Yagis significantly outperforms a traditional square. But when you physically examine the array, you'll begin to appreciate the construction difficulties.

For the 12-foot Yagi used as an example, the optimum boom spacing for the diamond array is 238 inches vertically and 151 inches horizontally. To support this array, you'll need a heavy-duty, 25-foot vertical mast that extends a few feet into your tower, and a beefy, 12.6-foot horizontal spreader. In contrast, the booms of a conventional four-stack are spaced only 8.5 feet vertically and 9 feet horizontally. By contemporary VHF/UHF standards, the Yagi I've used as a building block in this article has a short boom. The stacking distances must be even greater for longer Yagis with higher gain.

Furthermore, you'll need to use an insulated section for the last few feet of horizontal spreader to avoid detuning the left and right Yagis. For the same reason, you'll need to drop their feed lines vertically for some distance rather than running them up the boom and back along the spreader. If you're using short Yagis, consider mounting them at the rear of the boom. When mounted this way, run the feed lines back along the booms and spreaders. Although unbalanced, this support method removes extraneous conductors from the array near-field, does not require insulated spreaders and keeps the feed lines tied down.

Conclusion

If you're not daunted by the construction difficulties, a diamond configuration of four Yagis offers significant performance advantages for terrestrial work when compared with a conventional square array. Above 2 meters, the diamond configuration becomes much more manageable physically. Basically, it allows you to squeeze the maximum possible performance from four Yagis. As a final bonus, the distance between Yagis is greater in an optimized diamond configuration. This reduces any residual mutual interaction between the individual antennas.

Notes

[1]John Kraus, *Antennas* (New York: McGraw-Hill, 1988), second edition, pp 481 to 482.

[2]Actually, the number-one antenna of all time for simplicity, effectiveness, and practicality has got to be the ubiquitous whip. But if we restrict our attention to directional antennas, the Yagi gets my vote.

[3]Steve Powlishen, K1FO, has developed VHF/UHF Yagi-design families that require only a simple element-length correction as elements are added. See recent editions of *The ARRL Antenna Book* or *The ARRL Handbook*. (See the *ARRL Publications Catalog* elsewhere in this issue.—*Ed.*)

[4]When stacking small Yagis in the H plane, it's possible to obtain somewhat more than 3-dB gain due to favorable mutual-impedance interactions between the antennas. For example, you can get 3.8-dB stacking gain from a pair of two-element Yagis in free space if you stack and tune them just right.

[5]This stacking-gain formula also applies at VHF/UHF when the array is many wavelengths above ground. Unfortunately, it doesn't apply for HF Yagis at typical installation heights. The elevation patterns for HF Yagis at different heights aren't very similar and don't reinforce well. For more information, see "Stacked Yagi Arrays: Fact and Fiction" by Dave Pruett, K8CC, in *NCJ*, Jul/Aug 1991, pp 18-20.

[6]The pattern in the other plane remains unchanged unless mutual impedances between the antennas alter element currents.

[7]I optimized this antenna for maximum forward gain and a good E-plane pattern with *YO 6.5*. I used *AO 6.5* to optimize stacking distance for all stacked arrays in this article. (*YO* and *AO* are available from Brian Beezley, K6STI, 3532 Linda Vista Dr, San Marcos, CA 92069; tel 619-599-4962; each program is $60. See his ad elsewhere in this issue.—*Ed.*)

[8]For equal side lobe levels, the stacking distances must differ somewhat in the two planes because Yagis have different E and H-plane patterns.

[9]The only thing worse than a 1-1-1-1 sequence, for example, is a 1-0-0-1 sequence. This amounts to disconnecting your feed line from the innermost Yagis!

[10]Dick Knadle, K2RIW, built and used diamond stacks of Yagis in the late 1970s and described them at several VHF conferences, although he never published his designs.

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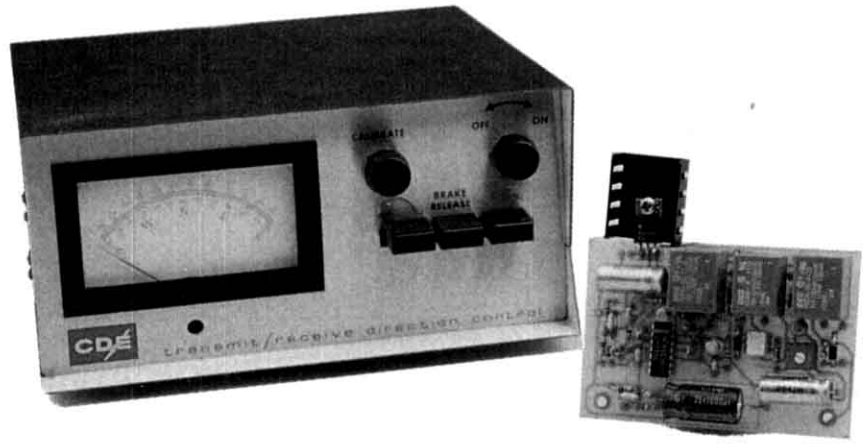
By Tony Brock-Fisher, K1KP

Build the Rotator Pal



By providing a preset-heading control for Hy-Gain rotators, this modification allows you to rotate your antenna without the need to keep your hand (or hands) on the rotator box controls. You simply move a **PRESET** knob to the desired heading, and the Rotator Pal does the rest! The Rotator Pal also adds a brake delay for those Hy-Gain rotators equipped with a brake. The brake delay works with automatic and manual rotation. The Rotator Pal has been tested with the T2X (Tailtwister), CD-44 and HAM-M rotators. It should be compatible with all the eight-wire rotators made by CDE and Telex/Hy-Gain.

What's in the Box?

The Hy-Gain rotator/control box is quite ingenious (see the upper section of Figure 1). To turn the antenna, a dual-winding, synchronous motor with gear reduction is used. One winding of the pair is fed through a capacitor (C2), which creates a current phase shift between the two windings. It's this phase shift that determines the direction of rotation and provides starting torque. S3, the brake switch (which exists even in control boxes for rotators that have no brake), supplies ac power to the primary of the transformer that powers the motor windings (and brake, if there is one).

LEDs CR6, CR7 and CR8[1] on the front panel are driven by the voltage supplied to the motor windings. (Some control boxes are not equipped with LEDs.) Unless activated, each switch shorts out its respective LED.

How It Works

Refer to Figure 1. The components in the upper part of the drawing are located in the control box and rotator. The rest of the circuitry is on the Rotator Pal PC board.[2] Two comparators, U31A and U31D, sense the voltage across the position-sensing potentiometer (R3) in the rotator. This voltage is compared to the voltage set by an added front-panel **PRESET** control (R39). Each comparator drives a relay (K33 and K32), each of which is wired in parallel with the direction switches (**CCW** and **CW**) of the rotator control box.

The control-box circuit is unusual in that it operates from a *floating* 13-V supply. This is because the wiper of the position-sensing pot (R3) in the rotator is grounded. Therefore, the Rotator Pal circuit is also powered from a floating supply, and its position-sensing input is connected to the control-box chassis ground.

Because R3's wiper is grounded, the position-sensing pot voltage and the rotator-motor current arrive at the shack on the same rotator-cable conductor. When the motor is running, a sizable ac component appears on the sense-pot voltage (caused by the ac current flowing through the resistance of the cable conductor). R31 and C31 in the Rotator Pal act as a low-pass filter to remove this ripple, which would otherwise cause buzzing and oscillation.

Hysteresis and Deadband

The considerations for well-behaved operational characteristics result in two circuit features: *hysteresis* and *deadband*. A deadband is provided so that some slight antenna movement doesn't result in the circuit acting to correct for the movement. Without a deadband, there's a high likelihood that the circuit will oscillate, turning the rotator back and forth as the antenna swings across the desired position. The deadband is a small window of rotation over which no action is taken by the Rotator Pal. The difference between the desired direction and the actual direction must be greater than the deadband before the circuit acts to move the antenna. The deadband is provided by D31 and D32, which offset the voltage representing the desired rotator position by a small amount, thus shifting the turn-on voltage for each comparator.

The second consideration for good behavior is hysteresis. This provides three aspects of good behavior. First, it prevents oscillations caused by the inductive kick of the relays coupling back into the inputs of the comparators. Second, it eliminates oscillations caused by antenna movement, by moving the turn-on point away from the turn-off point. Third, it compensates for the loss of aiming accuracy caused by the deadband. The deadband feature would result in the rotator stopping about 15° before the desired position is reached. The hysteresis shifts the turn-off point by about half the deadband, reducing the aiming error almost to zero. Hysteresis is provided in this circuit by the use of a small amount of positive feedback around the comparators. The output voltage at each direction relay is fed back to the input-voltage dividers by R36 and R44. The ratio of R36 to the impedance of the dividers determines the amount of hysteresis, and is chosen to be slightly less than the forward-voltage drop of the diodes.

Indicator LEDs

The normally closed contacts of the relays are wired in series with the common terminals of S4 and S5. This way, the switch or the relay can apply power to the motor windings and remove the short across the LED, allowing the indicator LED to light.

Brake Delay

The brake circuit must sense when any rotation is started, and turn on power to the brake circuit. When rotation has stopped, the brake circuit should continue to supply power to the brake for several seconds to allow the antenna to coast to a stop. The brake circuit takes advantage of the fact that voltage appears on both windings, independent of the direction of rotation. This means that either winding can be used as the source for a signal to turn on the brake current.

By shorting S3 in the control box, motor power is always available from the motor

[1]Notes appear on page 38.

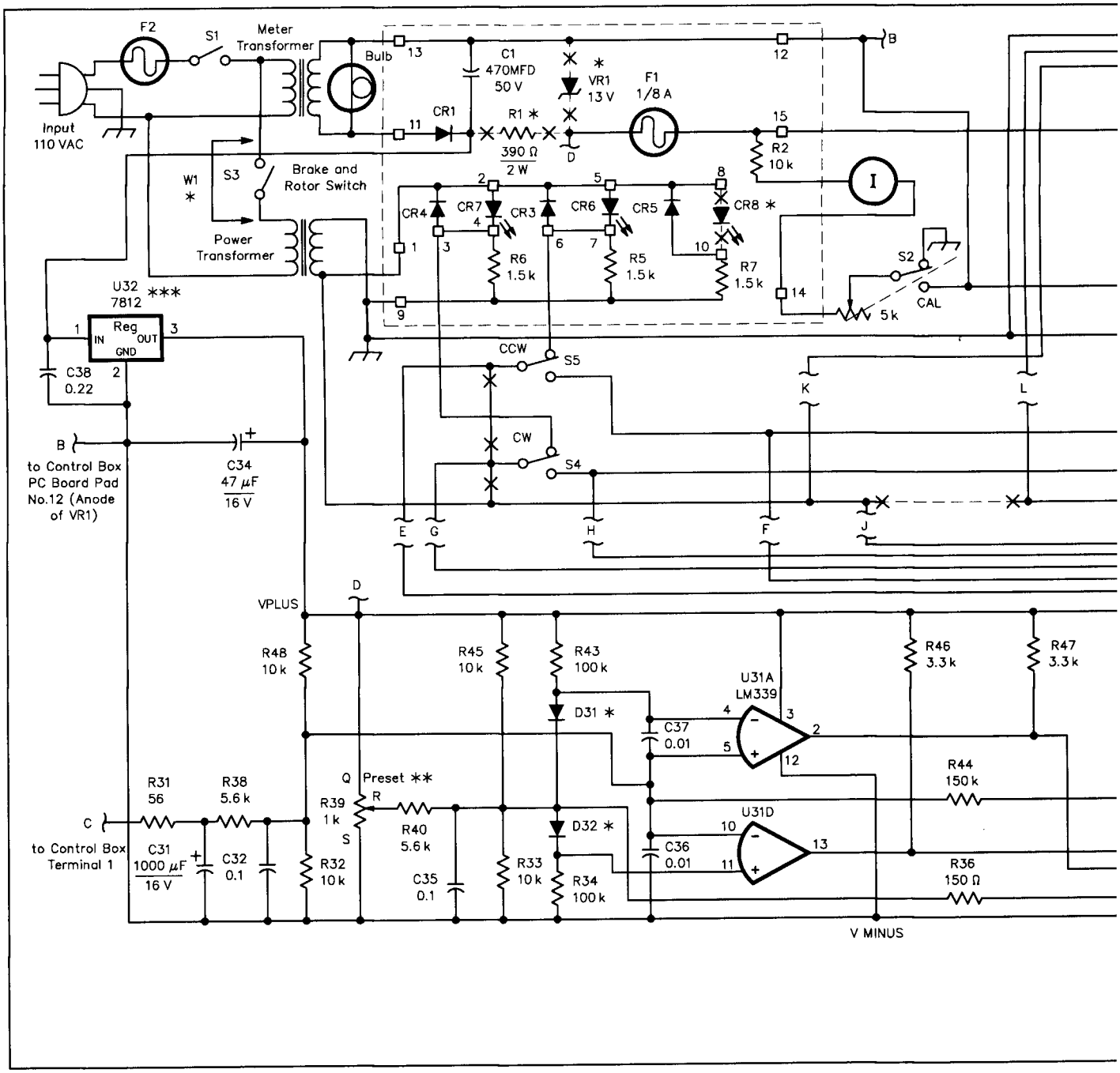
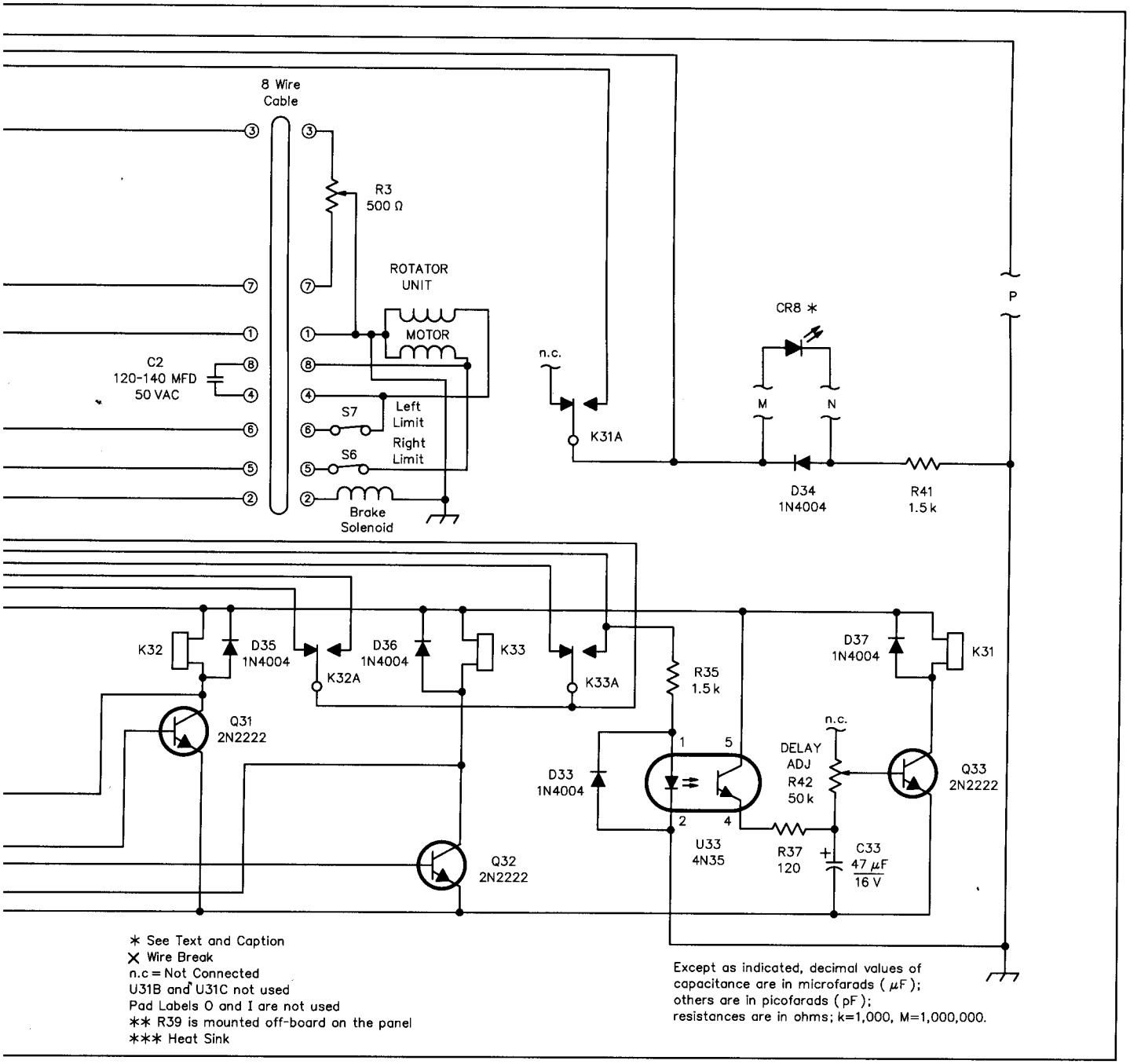


Figure 1—Schematic of a Hy-Gain T²X control box modified to accept the Rotator Pal circuit. The components at the top of the drawing are located in the control box. With the exception of U32 (see text), the rest of the circuit is on the Rotator Pal PC board. The *numbered* pads in the *control-box circuit* identify its PC-board connection points. *Alphabetic* labels in the *Rotator Pal circuit* identify pads on its PC board. Schematic part numbers for the Rotator Pal modification begin with the number 31 (ie, R31, U31, etc). The leads of CR8 are removed from the control-box PC board and relocated on the Rotator Pal PC board at pads M and N. Part numbers in parentheses are Radio Shack; equivalent parts can be substituted. Unless otherwise specified, resistors are 1/4-W, 5%-tolerance carbon-composition or film units.

C31—1000 µF, 16 V electrolytic (272-1047)
C33, C34—47 µF, 16 V electrolytic (272-1015)
D31, D32—1N5711 Schottky diode (Radiokit, PO Box 973, Pelham, NH 03076; tel 603-635-2235; fax: 603-635-2943; Telex: 887697) or use two 1N34A *germanium* diodes connected in series, for each of the two diodes (276-1123)
D33-D37—1N4004 (276-1103)
K31-K33—PC-board-mount, 12-V coil, SPDT relay (275-248a)
Q31-Q33—2N2222A or MPS2222A (276-2009)
R39—1 kΩ panel-mount potentiometer
R42—50-kΩ trimmer potentiometer
R_{TEST}—500-Ω pot used for calibration; see text
U31—LM339 quad comparator (276-1712); sections B and C not used
U32—7812, TO-220 case voltage regulator (276-1771) and heat sink (276-1363)
U33—4N35 optoisolator; Digi-Key 4N35QT-ND (available from Digi-Key Corp, 701 Brooks Ave S, Thief River Falls, MN 56701-0677; tel 1-800-344-4539, 218-681-6674; fax 218-681-3380).



transformer. The line from the transformer to the brake solenoid terminal is broken and run to the normally open contacts of K31. K31 now controls the current to the brake solenoid. An optoisolator (U33) senses when power is applied to the motor (manually, or automatically by a relay). The winding voltage causes U33 to allow C33 to charge through R37. This turns on Q33, which energizes K31 to supply power to the brake circuit. K31 stays energized as long as C33 is charged via U33. When the motor current turns off, U33 prevents C33 from charging. C33 then discharges through R42 and the base of Q33. This keeps Q33 turned on for the desired delay time.

Construction

A PC board is available.[2] The circuit board is mounted beneath the control-box chassis on two 3/4-inch-long #4-40 spacers. One spacer threads onto an existing screw (in lieu of a nut). The other spacer fits nicely in a hole in the chassis. The connections to the various points in the original control box are all made with convenient lengths of hook-up wire. If your rotator does not have a brake solenoid, you can omit the components associated with the brake circuit.

Control-Box Modifications

Before installing the Rotator Pal in your control box, some modifications must be made. The Zener-diode voltage regulator (VR1) in the meter circuit is removed and replaced by a three-terminal regulator, U32, on the Rotator Pal PC board. U32's needed because the extra load placed on the meter supply by the added circuitry causes VR1 to drop out of regulation, resulting in indicator errors and erratic operation of the Rotator Pal. (I suggest you install U32 even if you don't make the other changes/additions to the control box.)

Unsolder and remove R1 (390 Ω/2 W) from the control-box PC board behind the meter. Power is supplied to the Rotator Pal from the junction of CR1 and C1[3] on the control-box PC board. That junction is connected to pad A on the Rotator Pal PC board. The supply reference connection is made from pad 12 of the control-box board to pad B of the Rotator Pal PC board. Regulated 12 V is supplied to the meter and **POSITION** pot circuits of the control-box from pad D of the Rotator Pal PC board. Pad D connects to the junction of VR1 and F1 on the con-

trol-box board. Next, solder a short piece of hook-up wire between the normally open terminal of S3 (**BRAKE & ROTOR SWITCH**) and its toggle.

The following step has been found to eliminate RF susceptibility problems with the control box and I recommend it. Inside the box, solder one end of a 0.1-µF, 100-V ceramic capacitor to each terminal-strip lug (No. 2 through 8), attaching the other leads of each capacitor to terminal 1. Install a large ferrite bead on the control cable at the rear panel. Hold the bead in place by installing it between the screw terminals and the cable clamp. Now mount your circuit board in the control box.

Some rotator control boxes don't have LEDs, so those steps associated with rewiring the LEDs can be omitted. Locate terminal 2 of the 8-terminal strip on the rear panel of the control box. There should be three wires connected to terminal 2. Remove the three wires, connect them together to a length of hook-up wire and insulate the connection. Connect the other end of the wire to pad K on the Rotator Pal PC board. Connect pad L to terminal 2 of the 8-terminal strip.

Locate the wire that goes to the common terminals of S4 and S5. Remove this wire from the switches and solder it to the Rotator Pal PC-board pad J. Remove the jumper between the common terminals of S4 (**CW**) and S5 (**CCW**).

Unsolder the leads from the **BRAKE** LED at pads 8 and 10 of the control-box board, making sure to identify which lead is which. Connect the leads to pads M and N on the Rotator Pal board, being careful to observe the correct polarity. Connect the Rotator Pal PC board to the remaining control box points. Double-check your work.

Testing

First, disconnect your rotator from the control box. Apply power to the control box. **CAUTION!** Be extremely careful when working on the unit with line voltage applied!

Check the output of U32 by measuring the voltage across C34. You should measure close to 12 V. Note that the negative side of C34 is *not* connected to chassis ground—this is a floating supply. Turn off the control box and unplug it from the ac line.

To make room for installation of the **PRESET** control, R39, remove the **CALIBRATION** control knob, then remove the **CALIBRATION** control from the front panel. Insulate the control's lugs by wrapping them with electrical tape or heatshrink tubing. Replace the knob on the control. Turn on the control box, and set the calibration by pushing the control shaft, adjusting the **CALIBRATION** control so the meter needle is at the right-hand end of the scale. Push the knob again to return the meter to normal operation. Turn off the control box and place the **CALIBRATION** control inside the control box on top of the switch assembly. Make sure that the **CALIBRATION** control cannot accidentally short to anything. Turn off the control box.

Connect a 500-Ω pot (R_{TEST}) across terminals 3 and 7 of the control-box terminal strip. (This pot will simulate the position-indicating pot in the rotator.) Turn on the control box. Chances are that one of the direction lights will glow. Check for basic operation by setting the 500-Ω pot to its approximate center position, and turn the **PRESET** pot through its range. You should see one direction light come on when the **PRESET** pot is at one end of its range; then both lights go out. Then, as the control is advanced to the other end of its range, the other direction light comes on. You should also hear the relays clicking on and off. Check that when the 500-Ω pot is set to each end of its range, you can make both direction lights extinguish when you turn the **PRESET** pot to the corresponding extreme. Note that without the rotator connected, the brake circuit will only work properly for one direction of rotation. Center the 500-Ω pot. Adjust the **PRESET** pot so both direction lights are off. Slowly turn the **PRESET** pot towards one end until one direction light comes on. Then turn the **PRESET** pot back towards center. You should have to turn it a small—but noticeable—amount before the direction light goes out. This is a demonstration of the hysteresis working. Make sure there are no buzzing relays and that when the LEDs come on, they do so with full brightness. Any buzzing relays or dim lamps indicate the circuit is oscillating and something is wrong. Correct this situation before connecting the rotator.

If the brake-delay circuit is working properly, you should hear K33 drop out about four seconds after either direction lamps go out. You can adjust the delay with R42 as desired.

Operation

Operation is simple: Just set the **PRESET** knob to the desired direction. The appropriate direction LED should light, and the antenna should start turning. When the antenna's position matches that of the **PRESET** knob, the lamp should go out and the antenna stop turning. You'll notice that you have to turn the **PRESET** control a bit from its position to start the antenna moving—this is the hysteresis effect. For small movements of the antenna, you can move the PRESET far enough to get the antenna moving, then back to stop the antenna when it has moved a small amount. Or, you can still use the manual buttons on the front panel. The Rotator Pal won't position the antenna all the way to the limit switches because of the hysteresis. Again, you can use the manual switches to get the antenna all the way around to the limit if you need to. The brake delay circuit should keep the brake energized for a few seconds after rotation by either automatic or manual means.

Sticky Brakes

Rotators with a separate brake solenoid often have problems with sticking of the brake solenoid. If there's rotational force against the brake when it's activated, it sometimes doesn't retract. This is a very common problem. The solution is to activate the rotator in the opposite direction just long enough to allow the brake to release. Then—after allowing the rotator to slow down—commence rotation in the desired direction. Because of a sticking brake solenoid, you may notice that sometimes the rotator doesn't start turning when the Rotator Pal is set. If you spot this, you can usually start the rotator moving by pushing the rotation button for the opposite direction. This means that power will be applied to both motor windings at the same time. Don't worry; this won't harm the motor. It simply means that the starting capacitor is shorted out, and the motor stops trying to rotate. Often this releases the torque on the brake enough to allow it to retract. If this doesn't work, you'll have to use the **PRESET** knob to reverse the direction of rotation to get the brake to retract. Just remember not to change direction quickly—allow time for the antenna to coast to a stop. This eliminates large torque loads on the rotator and antenna system.

If the brake is stuck, Rotator Pal continues to attempt rotation. This may lead to overheating of the control-box transformer. However, the transformer is protected by a thermal cut-off switch that activates if the transformer overheats. When the transformer cools down, the cut-off switch closes and operation returns to normal. Knowing this, you should ensure the rotator is turning before taking your attention from the control box.

Enhancements

The voltage controlling the desired antenna direction can be generated in a number of ways. You can replace the potentiometer with switches and resistors or trim pots, which would allow you to instantly switch to any of a number of preset angles. The potentiometer can be replaced with a 12-position switch that selects taps on an equal-value-resistor ladder. Each switch position then provides a 30° rotation increment. (This is ideal for contesting.) Also, the steering voltage can be derived from a digital-to-analog converter, connected to a computer.

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Notes

[1]These are Hy-Gain's component identifiers. They've not been altered to conform to *QST* style in order to preserve familiarity with the rotator manual's schematic. Components added to the control box as part of the Rotator Pal modification begin with the number 31 (ie, U31, R31, C31, identify the first component of that series). U32 is added to the control box PC board.—*Ed.*

[2]A PC board for this project is available from FAR Circuits, 18N640 Field Ct, Dundee, IL 60118-9269, tel 708-836-9148 (voice and fax). Price: $6 plus $1.50 shipping for up to four boards. VISA and MasterCard accepted with a $3 service charge.

[3]Check the value of C1. In some control boxes, this capacitor value may be less than 470 µF (ours was 30 µF). If C1's value is significantly lower than 470 µF, replace it with a 470-µF unit *(Mike Tracy, KC1SX, ARRL Lab).*

By Dave Hershberger, W9GR

DSP— An Intuitive Approach

Learn how those new-generation digital signal processors can make your ham life easier!

Today's digital signal processors, such as my own DSP-3,[1,2] do a lot to enhance ham-radio operation. They remove both man-made and natural noise, and make operation more pleasant during difficult band conditions. DSP-based CW filters add razor-sharp selectivity to receivers that lack it, and they provide extra-narrow filtering (100 Hz or less) that is not generally available in analog IF filters. Custom band-pass filters are available for special modes such as SSTV and data communications. A few new functions keep things interesting: DTMF and CTCSS tone decoding.

The real strength of DSPs is their adaptive filtering capability, which makes automatic notch filtering and noise reduction a reality. DSPs frequently make it much more enjoyable to work stations with weak signals. Sometimes, when atmospheric noise disappears, DSP can seem like pure magic!

Well, it's not really magic. It's all done with digital technology, which is now inexpensive enough to bring some advanced signal-processing techniques to the radio amateur.

I promise not to use any equations or mathematics in this article. Equations and math are fine when you need to quantify or accurately model something, but I want to give you an intuitive understanding of what goes on in these wonderful DSP boxes. I will explain DSP with words, pictures and a little metaphorical hand waving.

DSP Chips

DSP is usually performed by specially developed microprocessors (DSP chips). These differ from general-purpose microprocessors in several ways: Most importantly, DSP chips can perform certain mathematical operations *very* quickly. They have *multipliers* that form the product of two 16-bit or larger numbers in *one* instruction cycle. (Even those general-purpose microprocessors that have "multiply" instructions take *many* instruction cycles to perform a multiplication.) DSP usually involves a lot of multiplication, which makes a fast multiplier necessary. DSP chips also quickly perform the repetitive *multiply, accumulate, and data shift* instruction sequence, which is common in DSP.

Although DSP technique has existed for several decades, *inexpensive* DSP has become a reality only recently. About a decade ago, first-generation DSP chips cost $200 each. Now, powerful DSP chips are available in the $5 to $20 range, even in small quantities. This makes them ideal candidates for low-cost amateur applications. Thanks to low-cost DSP chips, digital approaches to signal filtering and processing are now more than competitive with traditional analog methods.

DSP has several advantages over analog circuits. DSP units need no alignment or adjustments. They are free from drift or performance change with component aging and temperature variations and offer perfectly repeatable and predictable results. DSP allows easy implementation of complex signal-processing structures where analog component tolerances would be critical.

DSP also allows a filter to *change* itself, under its own control, in response to different conditions. This is the basis of adaptive filtering.

Differences between Analog and Digital Processing

In analog signal processing, a varying voltage or current represents a sound or a radio signal. We process that voltage or current using resistors, capacitors, inductors, amplifiers, mixers, crystal filters and other components. These circuits enable us to perform various signal-processing tasks such as band-pass, low-pass, and high-pass filtering, modulation, demodulation, frequency conversion, etc.

DSP first converts an analog waveform to a sequence of numbers called *samples*. From that point we perform similar signal-processing tasks, but our toolbox is different. We manipulate the numerical data with digital circuits such as multipliers, adders, barrel shifters, delays and other digital-logic operations. Then we convert the resulting numbers back to an analog waveform, which may drive a loudspeaker or headphones.

The digital domain offers many new operations that are difficult or impractical to implement with analog circuitry. Modern DSP chips can easily perform signal delays, multiplication, nonlinear processing, phase-linear filtering, time-varying, signal-dependent or adaptive filtering and more.

The DSP toolbox offers capabilities, economies and limitations. Don't expect to do straightforward receiver filtering at a high IF, such as 9 MHz, anytime soon. In addition to requiring a lot of DSP horsepower, it would also require a wide dynamic range analog-to-digital converter (with at least 16 bits of resolution). Such parts are not practical—at least not yet.

Therefore, DSP applications that exist today operate at AF or very low IFs (25 to 50 kHz). Even though we are restricted to mostly low frequencies, a mathematical principle called the *frequency shifting theorem* tells us that anything we do to achieve *audio* selectivity in a linear receiver (CW and SSB receivers are linear; FM is not) is equivalent to filtering or signal processing at RF or IF. Although A/D converters limit DSP dynamic range and AGC derived before the DSP may pump from signals removed by the filter, it is basically true that audio selectivity is

[1]Notes appear on page 42

equivalent to RF or IF selectivity for SSB and CW reception.

DSP CW Filters

Consequently, we can make DSP audio filters that are much sharper and narrower than the best crystal CW filters. We can design for phase linearity, too. This means that the time delay is equal across the passband, which reduces ringing and distortion of the CW envelope.

In DSP, we have no parts-tolerance problem. If a DSP instruction says, "multiply the present signal value by 23751," we know that the signal will be multiplied by exactly 23751, no more and no less. We can make highly selective filters without worries about accurate tuning, tracking and matching.

DSP easily performs time delays. We need only stuff signal samples into a memory, wait a while, and recall them. In analog circuits, a delay line requires a huge LC ladder structure with precise mutual coupling between the inductors.

A *transversal filter* can be designed for a phase-linear characteristic. This filter is very difficult to build with analog techniques, because it uses many delay lines or a single delay line with many taps. Because time delay and multiplication are easy in DSP, DSP transversal filters are common. In DSP, however, we call transversal filters *finite-impulse-response* (FIR) filters.

Figure 1 shows the frequency response and time delay curves of a typical (nonlinear phase) analog CW filter. This five-pole, elliptic, band-pass filter has a –3 dB bandwidth of 200 Hz and a –60 dB bandwidth of 350 Hz. Time delay is least at the center frequency, and it increases sharply as frequency approaches the passband edges.

Figure 1 also shows curves for a 100th-order FIR filter designed to the same specifications. The passband shape differs from that of the analog filter; but more importantly, the time delay is a *flat line*, constant with varying frequency.

The analog filter's phase distortion effectively delays the edges more than the bodies of the dots and dashes. Figure 2 shows keying envelopes filtered with the analog and phase-linear digital filters. Notice that the analog filter smears the keying transients by delaying them, while the digital filter distributes them equally before and after the edges and reduces their peak amplitudes (ringing).

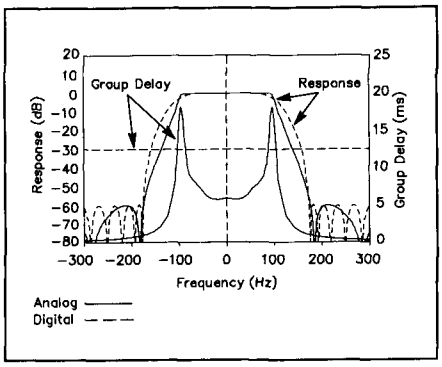

Figure 1—Response and group-delay curves for analog and digital (FIR) CW filters.

Ringing in CW Filters

There is a lot of misinformation on this subject. All band-pass filters ring; they *must* in order to work! There are two causes of ringing, however. The first is reduced bandwidth. All band-pass filters ring due to this mechanism. The second is nonlinear phase, also known as time delay distortion or phase distortion. Conventional analog filters incur this additional ringing due to phase distortion. Since a FIR filter is phase linear, there is no additional ringing from this mechanism. For a given bandwidth, a FIR filter rings less than a conventional analog filter, but it still rings. Many DSPs use FIR CW filters, so they present only minimal ringing.

FSK reception also benefits from phase-linear filters because phase distortion tends to smear adjacent bits so that they overlap in time.

Adaptive Filtering for Voice Signals

Perhaps the most wonderful benefit of DSP to Amateur Radio today is noise reduction. Many amateurs still have not heard a demonstration of DSP noise reduction. When they do, a common initial reaction is a dropped jaw and wide-open eyes.

DSP noise reduction removes most of the hiss from weak signals and makes such operation a lot more pleasant and less fatiguing. One ham told me that a few years ago he was calling CQ on one of the ham satellites. Even though he heard his signal loud and clear, nobody would answer him. Upon checking his equipment, he found that his DSP noise reducer was on. He switched it off and heard his signal fall into the noise! Apparently only he was listening to the satellite with DSP!

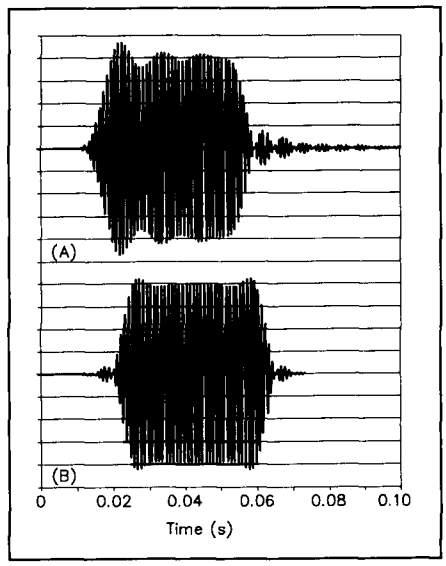

Figure 2—Analog filter phase distortion smears the edges of a CW pulse and increases ringing at A. At B, the result is much cleaner with a phase-linear (FIR) DSP filter.

Regardless of whether the noise reduction algorithm is the Widrow-Hoff Least Mean Square (LMS) algorithm,[3,4,5,6] or the Discrete Fourier Transform (DFT) based "spectral subtraction" algorithm,[7,8] DSP noise reduction works by finding the most significant spectral lines in a signal and then forming band-pass filters around the strongest energy concentrations. The particular algorithm only determines *how* this is accomplished. To understand adaptive noise reduction, it helps to think about filters in a different way.

Frequency-Domain Filtering

Conventional filters discriminate among signals on the basis of frequency. For example, a 2.4-kHz-wide crystal filter for SSB passes frequencies from 300 to 2700 Hz. It will reject an RF signal that produces a 4000-Hz tone or one in the opposite sideband because they are the wrong frequencies. Similarly, that filter would pass a 1000-Hz audio tone in the correct sideband. We might say that conventional filters operate in the *frequency domain*.

Autocorrelation Filtering

DSP noise-reduction filters and automatic notch filters operate by discriminating for or against a signal based on its degree of *autocorrelation*. We might call this kind of signal classification the *autocorrelation domain*.

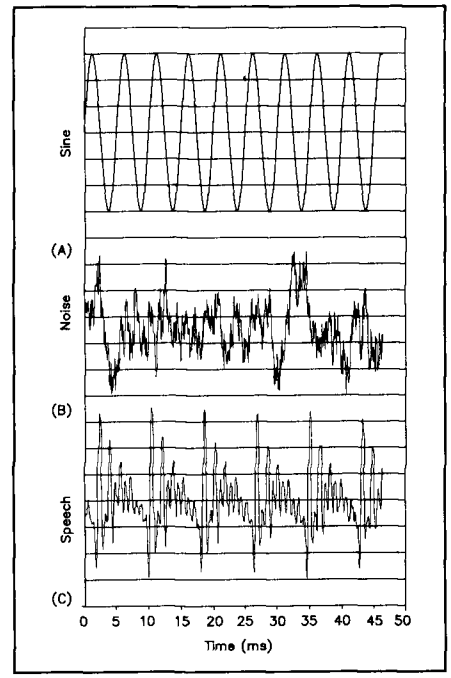

Figure 3—Time-domain displays of autocorrelation (see text) within common signals. Sine waves (A) are highly autocorrelated; noise (B) has no autocorrelation; speech (C) has partial autocorrelation.

What is "autocorrelation"? It has to do with the degree of repetitiveness of a signal. Refer to Figure 3 as we discuss three important signal groups.

Consider a sine wave (Figure 3A). A sine wave has the highest possible degree of autocorrelation because every cycle in the sine wave is *exactly the same* as the next cycle. A DSP filter that rejects signals with the highest degree of autocorrelation is an automatic notch filter, because interfering carriers appear as pure sine-wave audio tones.

At the other extreme are thermal and atmospheric noise, which sound like hiss. Figure 3B. also shows an example of band-limited noise. (That is, noise contained in some arbitrarily narrow band of frequencies.) There is no repetitive pattern in the noise. A DSP filter that rejects signals with no autocorrelation is a noise reducer.

What about speech signals? Figure 3C shows the diphthong[9] in the word "nine." Note that this speech waveform has a certain degree of repetitiveness. Each cycle is not exactly the same as its predecessors, but there is a lot of similarity. This is generally true of voice signals.

To summarize, pure sine waves have maximum autocorrelation; speech has some; background noise has none at all.

So a DSP filter that rejects signals with high autocorrelation and signals with zero autocorrelation is a simultaneous automatic notch and noise-reduction filter. This filter will allow semiautocorrelated speech signals to pass, while rejecting both noise and audio tones!

How do we filter signals based on their autocorrelation? The LMS algorithm provides a way to do this.

Any signal can be represented as either a time-domain signal, which you can observe on an oscilloscope, or as a frequency domain signal, which you can observe on a spectrum analyzer.

More repetitive signals show more of their energy in discrete spectral lines (frequency domain). For example, a pure 400-Hz sine wave has all of its energy concentrated in a 400-Hz spectral line. A nonrepetitive noise signal has its energy distributed throughout the spectrum, with no spectral energy concentrations. Speech is somewhere in between. It has a few strong spectral lines, and the rest of its energy is spread throughout the audio spectrum in weaker frequency components.

Figure 4 shows the spectrum of the diphthong in Figure 3C. There are several strong spectral lines in the frequencies below 1500 Hz, and a few more in the 2500 to 3000-Hz range.

Figure 4 also shows a possible adaptive-filter response. We can derive this response from the voice spectrum by looking for the most significant spectral lines, and forming band-pass filters around them.

If the voice signal also contains noise, the adaptive filter will reduce the noise in the stop bands. In this case, noise around 2000 Hz and above 3000 Hz would be reduced.

Noise that is very close to voice signal components is not significantly reduced *by the DSP*. But, due to a phenomenon known as "noise masking," another signal processor—the human brain—eliminates close-in noise components![10,11] Noise masking in the human auditory system makes the weaker of two closely spaced frequencies essentially inaudible.

So the DSP attenuates noise that is not close to the voice-signal frequency components. The ear-brain combination removes the remaining noise, which is close to the strong spectral lines.

As the voice signal spectrum changes from syllable to syllable, the adaptive filter response will follow it, continuously changing its shape with the input signal's variations.

Figure 5 represents common adaptive filters in the autocorrelation domain. The horizontal scale of this graph has noise to the far left, pure tones to the far right, and somewhat repetitive speech signals in the middle.

A DSP noise-reduction filter rejects signals with little or no autocorrelation, and passes everything else.

If the adaptive filter forms notches instead of passbands around the strongest spectral lines, it's an automatic notch filter. It rejects highly repetitive signals and allows everything else to pass.

An adaptive filter for speech provides simultaneous noise reduction and automatic notching. This filter rejects nonrepetitive noise and pure tones, but allows everything else (somewhat repetitive speech signals) to pass.

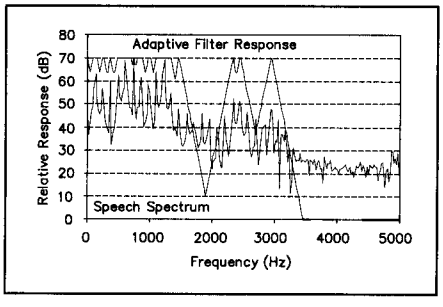

Figure 4—Adaptive filter response to a speech signal.

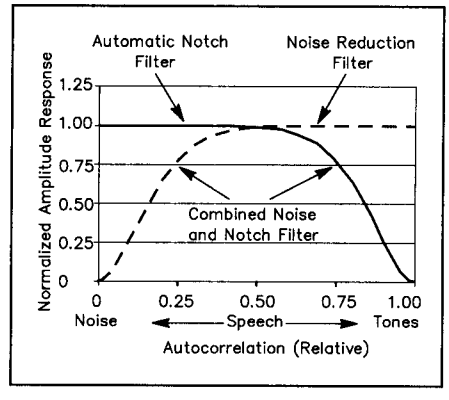

Figure 5—Response versus autocorrelation plots for noise-reduction and automatic notch filters. A speech filter applies both curves simultaneously to reduce white noise and carriers.

Spectral Subtraction

Spectral subtraction[7,8] is another way to reduce the noise in voice signals. This technique accomplishes much the same thing as the LMS algorithm, but in a different way.

Up to this point, all of the DSP algorithms we have discussed work by processing a series of numbers that represent the signal waveform as a function of *time*. Spectral subtraction, on the other hand, works by processing a series of numbers that represent the *frequency content* of our input signal.

To do this, DSPs use a relatively complex mathematical operation (called a *transform)* to change the signal representation from the *time domain* to the *frequency domain*.

For example, what comes out of an analog to digital converter is a series of numbers which represent the audio voltage in *time* increments at 0 µs, 100 µs, 200 µs, etc. The transformation operation yields a series of numbers that indicate signal energy in *frequency* increments at 300 Hz, 320 Hz, 340 Hz, etc, up through 3000 Hz or more.

A complementary inverse transform returns the frequency data to a time-domain signal. If we do the time-to-frequency transform and follow it immediately with the frequency-to-time (inverse) transform, we get our original signal back.

Spectral subtraction is a three-step process:

1. Transform signal to frequency domain
2. Process frequency domain data
3. Inverse transform back to time domain.

This process repeats for successive short segments (a fraction of a second) of audio.

Spectral subtraction relies on two assumptions:

1. Voice-frequency energy is concentrated in a small number of frequencies, and
2. Noise energy is uniformly distributed throughout the audio spectrum.

Spectral subtraction algorithms try to determine the "noise floor" of a signal. The process assumes that any frequency-domain value at or below the noise floor is noise and sets the energy at that frequency to zero. Conversely, it considers signals above the noise floor to be voice components and allows them to pass.

Figure 6A shows the spectrum of Figure 4, but with some noise added. The spectral-subtraction threshold is a horizontal line at

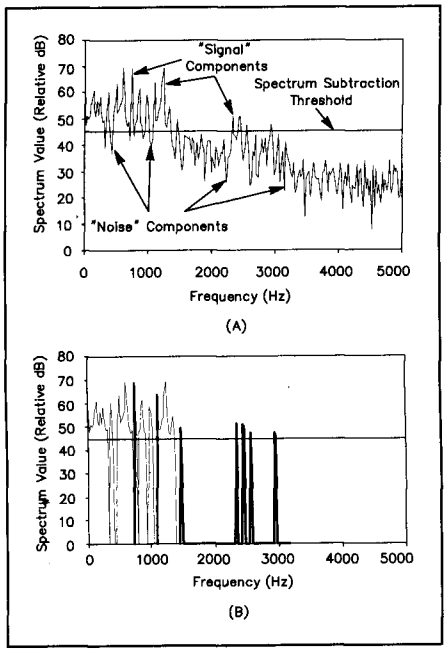

Figure 6—Spectral subtraction removes signal component frequencies with energy below some threshold (A). B shows the result.

+45 dB. We consider anything below this line to be "noise," and anything above it to be "signal." When signals below the threshold are set to zero, the spectrum of Figure 6B results.

Some amateur DSPs use spectral subtraction for noise reduction, but the algorithm has several disadvantages:

1. It takes a substantial amount of time to perform the forward and inverse transforms. The resulting delay through the DSP (a fraction of a second) can create an annoying "electrical backlash" condition. The delay makes it difficult to rapidly tune receivers, because the audio and dial position are not synchronized. The delay also makes very rapid contest exchanges impossible.

2. Spurious audio "tones" result when processing noisy signals in some implementations. These appear as seemingly random beeps at random frequencies. They are caused by the algorithm's imperfect ability to distinguish between signal and noise in the frequency domain.[12]

3. Spectral subtraction requires much more DSP computing power than the LMS algorithm.

All algorithms have their disadvantages; yet under some conditions, spectral subtraction may provide the best performance. The JPS NIR-12 DSP, for example, provides *both* spectral subtraction and LMS noise reduction (which JPS refers to as *adaptive peaking*). The user can choose the best noise reduction method for each situation.

To summarize, spectral subtraction allows concentrated spectral energy (speech) to pass, and rejects low-amplitude signals over a wide range of frequencies. Spectral subtraction does this by transforming the signal to the frequency domain, throwing away the smaller spectral-energy values, then performing the inverse transform to the time domain.

Different Kinds of Noise

What kind of noise can DSP remove best? DSP is most effective with noise that has a basically constant level (eg, hiss) rather than spiky noise (the kind conventional noise blankers remove). DSP noise reduction algorithms work best with moderate to weak noise; conventional noise blankers work best when noise is very strong. If the noise comes in bursts that remain at least 6 dB below the instantaneous signal strength, a DSP filter will probably help. When line noise is strong, a conventional noise blanker works better than DSP because it has access to the wideband RF signal prior to IF filtering.

Line noise can mean a lot of things. If the noise is strong 120-Hz impulses, DSP will not help much, but a conventional noise blanker will. When the noise is closer to white noise or a background "frying" noise (as opposed to a buzz), DSP will provide some relief.

Denoisers or Fixed-Frequency CW DSP Filters?

Although some amateurs use adaptive noise-reduction filters for CW work, nonadaptive CW filters are better in most applications. Remember that adaptive filters work by automatically forming little band-pass filters around the most significant spectral lines in the signal. For CW operation, the filter must create the band-pass filters with each dot and dash. Also, we have advance knowledge of the desired signal's spectrum, so we can design a fixed-frequency filter that is optimal and need not adapt itself. Furthermore, DSP fixed-frequency CW filters are phase linear, while adaptive filters formed by noise-reduction algorithms usually are not phase linear.

It makes sense to use adaptive noise-reduction filters for CW when tuning across the band; they provide a wide (SSB) bandwidth that passes more signals. When you want to hear only one signal, it is probably best to use dedicated CW filters.

Conclusion

Today, DSP provides a lot of value at low cost by reducing noise through advanced adaptive filtering algorithms. It also supplements IF selectivity with additional filters for a variety of modes. Additional functions—such as tone decoders—can be added where software space permits. The flexibility of general-purpose DSP chips allows designers to include a lot of functions in a single box.

As DSP hardware costs continue to fall and algorithm (software) development improves, DSPs will perform more and more functions in our radios. Multiple-bandwidth IF filtering, SSB generation, speech processing, passband tuning, FSK and FM generation and detection, fine tuning and bandwidth compression are all feasible as DSP functions.

Acknowledgments

Thanks and credit go to Dr Steven Reyer, WA9VNJ, who reviewed this article for gross oversimplifications and inaccuracies; Curt Holsopple, K9CH, for expunging incomprehensible "technobabble"; and to my wife Sandy Hershberger, N6SMF, for her support and insight.

Notes

[1]Glenn Swanson, KB1GW, "Product Review: Quantics W9GR DSP-3 Audio Filter," August 1995 *QST*, pp 73 to 75.

[2]Peter Bertini, K1ZJH, "Quarterly Review," Summer 1995 *Communications Quarterly*, pp 85 to 90.

[3]Steven Reyer, WA9VNJ, and Dave Hershberger, W9GR, "Using the LMS Algorithm for QRM and QRN Reduction," September 1992 *QEX*, pp 3 to 8.

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[5]Dave Hershberger, W9GR, "Low Cost Digital Signal Processing for the Radio Amateur," September 1992 *QST*, pp 43 to 51.

[6]Dave Hershberger, W9GR, "A Few Words about DSP," Summer 1995 *Communications Quarterly*, pp 80 to 84.

[7]S. Boll, "A Spectral Subtraction Algorithm for Suppression of Acoustic Noise in Speech," *IEEE Transactions on Acoustics, Speech, and Signal Processing*, Vol. ASSP-29, pp 113 to 120, April 1979.

[8]D. Hall, KF4KL, "Spectral Subtraction Eliminates Noise from Speech in Real Time," May 1995 *Personal Engineering*, pp 51 to 54.

[9]A dipthong is a gliding, monosyllabic speech sound.

[10]D. M. Green, *An Introduction to Hearing*, Lawrence Erlbaum Associates, Inc, Hillsdale, NJ, 1976.

[11]J. J. Zwislocki, "Masking: Experimental and Theoretical Aspects of Simultaneous, Forward, Backward, and Central Masking," in *The Handbook of Perception*, Volume IV, Academic, New York, 1978.

[12]R. Preuss, "A Frequency Domain Noise Cancelling Preprocessor for Narrowband Speech Communications Systems," *IEEE Transactions on Acoustics, Speech, and Signal Processing*, Volume ASSP-29, pp 212 to 215, April 1979.

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By Richard Q. Marris, G2BZQ

An In-Room, 80-Meter Transmitting Multiturn Loop Antenna

A little wood, some wire and a handful of components can make a directional antenna for indoor use where outdoor antennas are not permitted.

In the early 1970s, my employer asked that I move to the USA for a few years. I arrived armed with the correct passport visa plus an FCC permit to operate as G2BZQ/WØ.

On arrival in Minneapolis/St Paul, I found the people friendly and hospitable. The work was an interesting challenge with opportunities for travel throughout the US and Canada. Minnesota was delightful—with excellent fishing. Upon moving into my apartment, I had an unpleasant shock.

The "No Antennas Here" Syndrome

I soon learned that a dire punishment would descend on any resident who erected an antenna of any sort or was suspected of causing TVI. This meant that I must either forego transmitting or resign myself to an indoor antenna. The antenna design would be no easy matter, as 80-meter CW is my favorite band and mode.

In the end, the answer to an immediate problem became a continuing obsession that has spanned some 20 years. It has yielded an ongoing series of experimental designs for compact antennas that includes shortened-wire antennas, loops of various shapes and sizes and even experiments with ferrite-rod transmitting antennas (which have produced some interesting results).

The 80-Meter Spiral Miniloop

This loop incorporates an amalgam of the best technical features from many experiments, plus some new ideas. It offers a small, effective 30-inch-diameter indoor spiral loop that takes up very little domestic space. With a minor modification, the loop and support can be separated for vacation or portable operation. The construction permits future experiments or modifications.

The antenna is just 38×30 inches (HW). The 30-inch-diameter octagonal frame clips onto a vertical pole that mounts into a solid wooden base—see Figure 1. The loop-framework idea evolved over a decade. I have used it for loops with 18 to 48-inch diameters from VLF to VHF. A **TUNING/LOADING** meter and a neon "daisy chain" reference indicator make adjustment easy.

How It Works

This antenna is a low-power device; I use it with a 15-W (input) 80-meter CW transmitter. This power level serves the interests of domestic peace (no RFI) and RF safety. The antenna could be scaled up for more powerful transmitters, but it's better to use low power when the antenna is located so near the operator.[1]

Small loops like this one are essentially parallel-resonant circuits with one very long conductor—the loop. In order to reduce loss, small loops must have a very high circuit Q, which limits their bandwidth and multiplies the circulating current and voltage across the circuit. Even at 15 W, there are RF-burn and shock hazards at any exposed conductors in this antenna system. *Be careful!*

You can reduce RF-burn hazards by insulating or covering any exposed conductors. For example, place a plastic box over L2/C1 and cover L1's connections with electrician's tape. (The C1 end of L1 is a high-voltage point.)

Small antennas like this are not very efficient (about 1%), so it's important to maximize their limited efficiency by reducing losses wherever possible. This antenna does so by using a very short feed line, large stranded copper wire (not tinned; that adds loss) for L1, and a high-Q matching coil. (L2 has a large conductor, nearly equal length and diameter and wide turn spacing.)[2]

Figure 1 shows the loop circuit. The loop consists of a 5-turn, 30-inch-OD octagonal spiral loop, L1, which is series tuned by C1. Use heavy-duty wire for L1. We match the antenna circuit to the feed line by connecting the feed line center conductor to L2 at an appropriate spot. A simple **TUNING/LOADING** meter ensures that the loop is at resonance, with maximum radiation. This is confirmed by illumination of six small neon lamps (coupled to L1's innermost turn) that give a quick visual check after a frequency change.

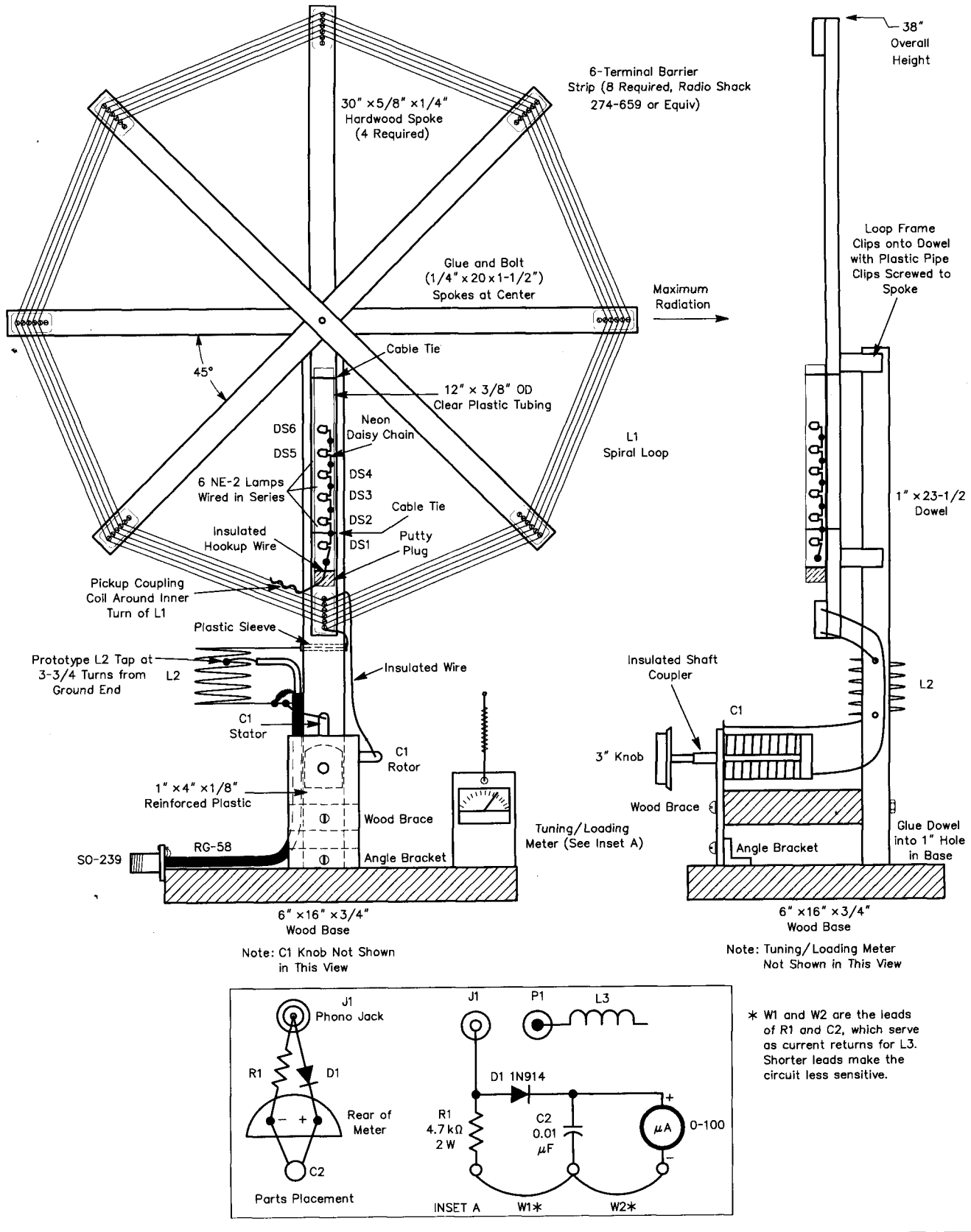
The loop radiation pattern is directional, with minimum radiation perpendicular to the plane of the loop. Maximum radiation is in the plane of the loop. Although theory says this loop should have a symmetrical radiation pattern, my loop exhibits a 2:1 front-to-back ratio, with the maximum radiation as indicated in Figure 1. The receive performance is quiet, with much lower QRN and QRM levels than with my end-fed slinky at 30 feet.

The usable transmit "bandwidth" of the prototype is just over 20 kHz. (I call "bandwidth" the frequency range over which *my* instruments detect no change in the level of radiated output. This is quite different from the common definition of bandwidth.)

Construction

Figure 1 shows most construction details for the antenna. Assemble the loop-

[1]Notes appear on page 45.



frame spokes as shown. Screw a 6-position, 2-A terminal block to the end of each spoke. These blocks are guides for the spaced coil winding. Clip the assembly to the vertical pole with two PVC standoff wall clips as used for 1-inch water pipes.

L1 consists of 5 turns (39 feet) of stranded (not tinned), insulated wire with a current rating of 6 A or more. Common lamp (zip) cord (#18 or larger) would be a good substitute. Begin with 20 feet of zip cord, separate the two conductors, solder

Figure 1—Construction details of the 80-meter indoor loop antenna.

C1—100-pF, 2-kV variable capacitor with ceramic end plates and silver-plated fins, eg Jackson C11

DS1 - DS6—NE2 (no resistor) neon lamps

J1—Panel-mount phono jack

L1—5-turn spiral loop made from one conductor of #18 AWG stranded copper lamp cord. For 15 W input, the wire should be rated at 6 A. Loop current increases as the square of the power increase: 30 W input (2 × power) produces 24 A (2 × 2 × current), etc. See text.

L2—6 turns of #14 AWG tinned copper wire, 2 inches in diameter, with turns spaced 1/4 inch apart. Place the coax center-conductor tap as described in the text. (It is 3 3/4 turns from ground end on the prototype.)

L3—About 10 inches of #16 AWG wire coiled by winding around a pencil.

Misc—4×3×1 1/2-inch plastic box for field-strength meter

P1—Phono plug

splice them and cover the splice with heat-shrink tubing or electrician's tape. Secure the wire at the outer hole of the bottom terminal block and proceed counter-clockwise through the terminal blocks, ending at the inside bottom terminal. Tighten one terminal-block screw on each loop turn to tightly hold the wire.

Make the matching coil, L2, as shown. Insulate the upper coil lead with a plastic sleeve, then drill holes through the 1-inch dowel and feed the coil leads through holes in the vertical pole. Connect the top lead of L2 to the outer end of the loop.

C1 is a 100-pF, 2-kV, small (approximately 2×1 1/4×1 1/4 inches) transmitting variable capacitor with ceramic end plates and silver-plated rotor and stator. I used a Jackson C11, but any similar capacitor will do. It is mounted on a 4×1-inch (HW) strip of reinforced plastic, which is fixed vertical to the base board with a small metal angle bracket and braced to the 1-inch dowel just beneath the capacitor. C1 has a shaft coupler, insulated shaft and 3-inch-diameter knob. The fixed plates are connected to the upper end of L2, and the rotor is connected to the lower end of L2 (ground).

An SO-239 jack is fitted to the back left-hand corner of the base board and connected to L2 by a length of RG-58 feed line. The RG-58 shield is soldered to the lower (ground) end of L2, and the inner conductor is tapped onto L2. The cable is fixed to the 1-inch dowel pole with cable ties.

Next, construct the neon lamp daisy chain as shown. Fix it to the bottom spoke of the loop frame with cable ties. The lead will be coupled to L1 later, during initial testing.

The **TUNING/LOADING** meter is fitted to the base board at the front right-hand corner, by means of a screw and spring washer. This lets it rotate to the best viewing angle. The circuit (Figure 1, inset) is self explanatory; it's housed in a 4×3×1 1/2-inch plastic box. Mount the meter and phono socket in the box lid. A coil of #16 wire, soldered into a phono plug, forms a short pickup antenna.

Setup, Tests and Operation

Connect the loop to the transceiver with a length of RG-58, not exceeding 6 feet. There is no ground connection at the loop, but my transmitter is grounded.

First, test the loop reception. Set your receiver to some test frequency (about 3550 kHz) and adjust C1 for resonance, as indicated by increased signal strength and noise. If the band is dead, use a pocket calculator near the loop as a noise source.

Set the transmitter to the same frequency, and adjust it while feeding a dummy antenna, if needed. Next, connect the loop to the transmitter. Place a field-strength meter (FSM) near the right-hand side of the loop and transmit; radiation should show on the FSM. Set C1 to midrange and adjust the tap on L2 for maximum field strength.

The **TUNING/LOADING** meter should also show a reading, but the meter sensitivity may need adjustment. To do so, lengthen or shorten the coiled antenna on the meter. Target a three-quarter-scale reading when the loop and transmitter are matched. If necessary, you can also adjust the meter sensitivity by experimenting with the value of R1.

The neon daisy chain provides a rapid radiation check. Couple a little RF to the neon chain by coiling the end of the PVC hook-up wire lead around the inner end of L1. On the prototype, a 3-turn coupling coil and 15-W transmitter light five of the six bulbs when the loop is fully loaded. As power is reduced, the lamps go out in sequence. When making a quick frequency change, quickly check that five lamps are still lit—if they're not, retune the loop. For lower power levels, increase the number of coupling turns until five of the six lamps are lit.

With a little practice, the loop is easy to use. You'll soon learn to rotate it slightly for maximum signal on receive and quickly adjust C1 for maximum field strength, as shown by the **TUNING/LOADING** meter and daisy chain.

For vacation or portable use, install small in-line connectors in the leads from L1 to L2 and C1. The loop frame can then be unclipped from the vertical pole and conveniently carried.

Summary

Your results with this little transmitting loop will, as with other antennas, depend on its location and height above ground, transmit power level and operating skill.

This setup won't compete with a kilowatt feeding a Yagi, but it's a good resource for the "no antennas here" syndrome faced by many frustrated hams.

Notes

[1]RF safety is a critical concern when hams operate close to their antennas. For more information, look in *The ARRL Antenna Book* (Chapter 1 in the 17th edition) or *The ARRL Handbook* (Chapter 9 in the 1995 and 1996 editions).

[2]For more information about small transmitting loops, see "Honey, I Shrunk the Antenna," in July 1993 *QST*, page 34. QST

New Products

AUTOMATIC CW IDENTIFIER FROM RACOM

◊ RACOM, of Cleveland, Ohio, introduces its model 700B automatic CW station identifier. Used in repeaters or base stations, the 700B can "remember" up to 50 Morse code letters, numbers, etc, and can be programmed with your personal computer.

Features: pulsed tone or pulsed carrier output; three timers; two system monitors and a test switch. List price: $74. Available from RACOM, 5504 State Rd, Cleveland, OH 44134; tel 216-351-1755, fax 216-351-0392.

HY-GAIN's DX77 "ADVANCED VERTICAL WINDOM": NO GROUND RADIALS REQUIRED

◊ What's 29 feet tall, features wide bandwidth on 40 to 10 meters, needs no radials, can handle a kilowatt of RF and needs no bandswitch? Hy-Gain's new DX77 vertical antenna, of course! Telex, the manufacturer, claims the DX77 has more than 50% greater bandwidth on 20 and 40 meters (compared to typical vertical designs) and features sturdy mechanical parts/design.

The new low-angle radiator has an easy-tilt mount, which makes tuning and initial setup a one-person job. The "vertical Windom" can be mounted on a pole, chimney, rooftop or deck, and comes with Telex's two-year limited antenna warranty.

Price: $419.95. For more information, contact Telex at 8601 E Cornhusker Hwy, Lincoln, NE 68505; tel 402-467-5321, fax 402-467-3279. QST

By Jim Murphy, AA0JG

A Father's Tale

"Dad, what repeater is this frequency in memory channel 5?"

"What Sarah? I was daydreaming for a minute." Daydreaming about a time not too long ago when memory channels and repeater frequencies were just so much mumbo-jumbo. And a time when my 10-year-old daughter Sarah knew nothing of repeater offsets, SWR and other techy terms.

"What's the bandwidth for an SSB signal?" I asked in my thoughts.... Thoughts that had jumped back almost a year, to a time when Sarah was heading for the test session where she would take her Technician written exam. "And what is the maximum power a Technician can use on the 23-cm band?" I continued, as if some last minute drilling would guarantee a passing grade.

I've been there before. Lots of times. Even Sarah has been there a few times. It really shouldn't be anything unfamiliar to either of us. But this time it seems to be a little more stressful—at least to me. She's so calm, though.

At the time, she was already licensed as a Novice. She had passed her written test for the Novice at an out-of-town session, and then, several months later, she took the 5-wpm code test at our local club's testing location. We concentrated on one test element at a time. First the Novice written, then the 5-wpm code, and now the Tech Plus written test.

Our study habits were perhaps different from those of other people. When I was studying for my first license and the ensuing upgrades, I had a copy of the current edition of *Now You're Talking!* from the ARRL, along with the other manuals and books, as they became necessary. *Now You're Talking!* took me through the Novice and Technician written elements and was a very good study guide. When Sarah began her studying, the Novice and Tech question pools had been changed and updated, but the book still had the same theory in it.

I found the current question pools on a commercial computer network and downloaded them to my computer at home. With a little editing and changing for margins and page breaks I had a workbook that could be used for studying the questions and answers. This however, didn't include any theory or explanation for the answers, and I believe such further explanation is important. If you can understand some of the theory behind a question you haven't directly studied, you still may be able to figure out the answer.

So Sarah's quest for a ham ticket began, covering the answer with a paper and reading the question, then explaining the question and associated topics in more detail. This was usually enough to make the question understandable and to make the answer appear reasonable. This, coupled with her observations of my ham operating, seemed to make the whole process coherent. When I couldn't explain something to her satisfaction, or needed a better explanation, we turned to the old *Now You're Talking!* to use as a reference.

Sarah took the Novice written and 5-wpm code tests in stride. When her ticket arrived in the mail, she began watching carefully for a 10-meter band opening to work some SSB stations. Of course, 10-meter openings nowadays are few and far between. Her CW operating never seemed to materialize.

"Here, Sarah. We can both use this H-T now."

Maybe that's why the Tech Plus ticket was so different. She could use voice on the local repeaters, she could talk to the rest of us and she could be on our local 2-meter net.

But I digress from my daydream of the testing session.

"Enough last-minute drilling. Quit acting like a father; we're entering the test site," I had told myself. This is the same location as our monthly ham club meetings, right here in our hometown. Sarah had been attending these meetings with me for some time now.

She should feel right at home in these familiar surroundings. The volunteer examiners are all from the club. We all know each other. No pressure here. Let her fill out her own Form 610. But I'll keep an eye on it just to be sure all the right blanks get filled in. She's so calm.

As Sarah turns in her paperwork to the VE, I find a cup of coffee and a comfortable place to sit. And to watch. I don't want to miss anything—as if there were going to be a lot of action. I wait while Sarah and other candidates quietly fill in answers, when suddenly panic hits me! Is the equivalent capacitance of two equal-value capacitors in parallel double or half of each one? Which way did I explain it to Sarah—did I make a terrible mistake? Maybe that question won't be on this test. "Relax," I tell myself. This is a fine time to start worrying about stuff like that. I hope the batteries in the calculator hold up. When were they changed? Oh brother! But Sarah is so calm.

She's getting up. She must be finished, but did she check it over? I wasn't watching. After handing in her test materials Sarah sits down with a book she brought. She's a voracious reader. And she's still calm.

I watch the VE closely now, trying to count his marks as he grades her test. Is he marking the wrong answers, or is he just keeping his place with the pencil? I can't tell. Oh, now I've lost track. How many would that make? Enough to pass? I know the local routine for the testing procedure well, because I'm a VE myself. But, since my daughter was involved at this session, I just stayed out of the way.

Still looking for some indication from my friends at the examiner's table, I try to make eye contact, but no one is paying attention to me. I wasn't this nervous at my first code test. Are they ignoring me? *Me*, the *father* of the test candidate?

Finally, they call Sarah's name. I force myself to stay in my chair. As I watch, she approaches the table. She's *still* calm, but I'm a wreck! A VE reaches out his hand to congratulate Sarah. I *knew* she would pass! Now I can congratulate Sarah myself with a big hug. Last week I bought a handie-talkie at a hamfest, just waiting for this moment. "Here, Sarah. We can both use this H-T now." The compact size is just right for her hand. She looks good with it.

"Dad? *Dad!*" as I come out of my daydream again I hear someone saying, "Do you have a book for the General exam?"

"Sure, Sarah. Right up here on the shelf. Here, let me get it for you."

Jim Murphy, AA0JG, 3256 Pole Line Rd, Cresco, IA 52136, e-mail: **J.Murphy64@genie.geis.com**. *Jim first became interested in Amateur Radio 30 years ago, and finally became licensed in 1991. Jim enjoys working CW and helping his other children become licensed—Paul, KB0SVI, is 12 years old, and 7-year-old Stephen is unlicensed at this time, but has been asking where the code tapes are.* QST

By Sarah Murphy, KBØNZR

Studying For My License

I am 11 years old, and I hold a General license. When I began studying for my license it was sortof tough because I wasn't very interested at the time. But I quickly became interested.

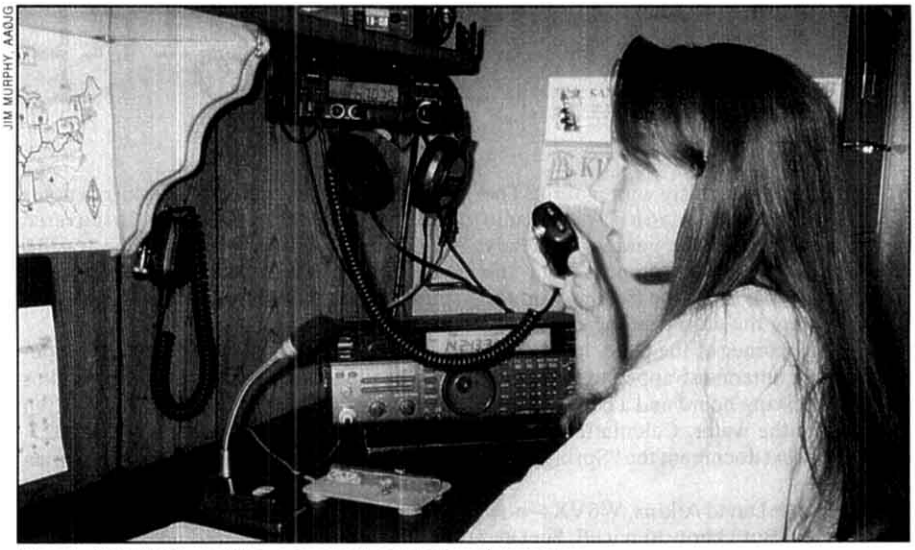
I started studying from a book my dad used. When there were questions or answers that I didn't understand, my dad, AAØJG, explained them to me. I knew a little about ham radio but not half as much as I needed to know. I thought one of the hard parts was about electricity. I thought I was terrible at it, but I got through it. Another thing I didn't like was remembering the frequencies a Novice could use. Whenever I got discouraged, I would just keep working on it until I got it.

One of my favorite parts was learning about E, I and R. I liked figuring the answers. After I passed the written test I began studying code. I thought that was a little harder. First I got a code tape and started practicing. After I got through the numbers, letters, and punctuation, there were paragraphs sent at different speeds. I was working at the speed of 5 to 7 wpm and I was remembering what the paragraphs said even though they were sent backward. It was time for me to quit with the tapes for a while, so I copied W1AW's code practice on the air . Another thing I worked on to practice for my code was a Morse code program on our computer.

After that I was ready to take the code test. I took it and passed. Code isn't one of my favorite things to practice, learn or use—yet.

About six months later I started practicing for the Technician Plus test. I took it and passed. I'm sure glad there wasn't another code test, though.

JIM MURPHY, AAØJG



Sarah, KBØNZR, making a contact on the local repeater.

The General test was a little harder than I thought it would be. And the General had to have another, higher-speed code test. I didn't have too much time to practice because the test was coming up. I practiced code three to four times a night building my speed.. I took both the code test and the written test and passed them both!

Here are some tips that I used for studying and taking a test:

1. Make up sayings and hints to remember difficult answers.
2. Don't *ever* give up.
3. Ask for help when you need it.
4. Ask questions if you don't understand something.
5. Take notes, for later study.
6. Take a calculator to the test for the E, I and R part.

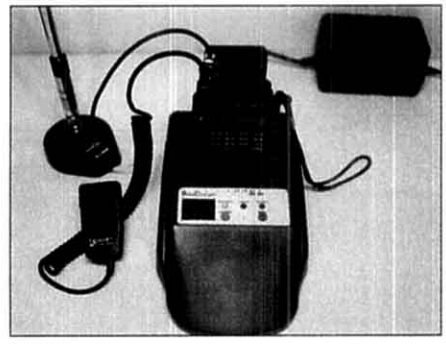
Sarah Murphy, KBØNZR, 3256 Pole Line Rd, Cresco, IA 52136. Sarah was licensed as a Novice in 1994, when she was 10 years old. She currently holds a General ticket and has begun studying the Advanced book. as well as working on her 20-wpm CW. QST

New Products

THE ROBOCHARGER UNIVERSAL CHARGER/BATTERY CONDITIONER

◊ Intelex announces its new battery charger/conditioner for hand-helds. In addition to charging and maintaining the charge state of your hand-held's battery, the Robocharger will also function as an ac power supply. You can use your rig *while* the battery charges. Add a mike, an external antenna and a Robocharger and you've got a VHF/UHF base station!

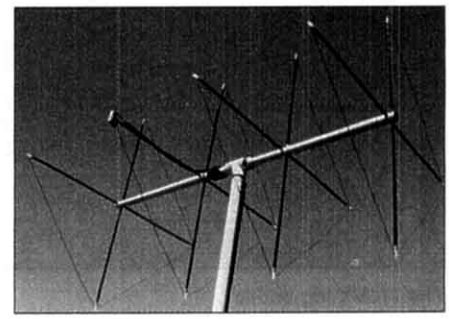
Price: $79.99 (basic model, functions only as a charger/conditioner); $99.99 (deluxe "base station" model). The Robocharger is available for a wide variety of hand-held rigs. For more information, contact Intelex at 129 West Eagle Rd, Suite 122, Havertown, PA 19083; tel 215-879-9419, fax 215-879-0137.



THE YELLOWJACKET: A 2-METER QUAD ANTENNA FROM CUBEX

◊ The four-element fiberglass quad is factory tuned to provide an SWR or 1.7:1 or less across the entire 2-meter band. There's nothing to adjust, and the beam, built along a 42-inch yellow fiberglass boom, can be assembled in the field with only pliers.

CUBEX, a 40-year veteran antenna manufacturer, has priced the Yellowjacket at $34.95, plus shipping and handling. For more information, contact CUBEX at 2671 Saturn St, Unit E, Brea, CA 92621; tel 714-577-9009, fax 714-577-9124. QST



By Harvey S. Laidman, N6HL

The W6VX Logs—An Autobiography

It's late, on a chilly winter night. The family is asleep and he's in the radio room behind the garage. A steady growl of static comes from the speaker as Dave rocks the big knob on the HRO, tapping the eraser on the empty log page. In the corner of the page, he draws a loaded whip antenna strapped to his swimming pool diving board and a counterpoise dragging in the water. Calculations, schematics and text document the "Springboard Antenna."

I never met David Atkins, W6VX—now a Silent Key. But I know him well, because I have read his logs. More than simple lists of numbers, letters and names, his logs contain the life story of a man deeply fascinated with the art and science of radio, and dedicated both to public service and to tenacious friendships. Dave was an inventor and tinkerer, an artist and skillful radioman. The log books were his diary—personal notes in the margins, sketches of projects nurtured and triumphantly completed. Like DaVinci's notebooks, these log books contain an autobiography—the story of a life in radio. In the following, I will share excerpts from the W6VX logs that gave me a rich and rewarding insight into Dave's life and times.

The 1920s

The earliest log, from Oakland, California, is dated December 1922. Margin notes tell that Howard Carter had just discovered King Tutankhamen's tomb. Dave was 16 years old. It was his practice to log everything he heard and to underline the stations he contacted.

The young boy slips the Brandes Superior headphones over his ears, and makes his first entry of the night—KFI, reporting on the Berkeley fire, September 17, 1923. Later that night, he hears his first Hawaiian station.

In 1925, Dave got on 40 meters, and a new world of DX showed up. The sadness of Uncle Will's funeral, on March 26 in Saratoga, was alleviated by the fact that the family Ford made the trip in a record 1 hour and 45 minutes!

The German rigid airship, *Graf Zeppelin*, made an adventurous trip around the world in 1929. Dave was on board once, helping his friends Hank Brown, W6HB, and Bill Eitel, W6UF, build and install an emergency transmitter for the airship. During a test, the three hams worked stations up and down the California coast on 40 meters.

The 1930s

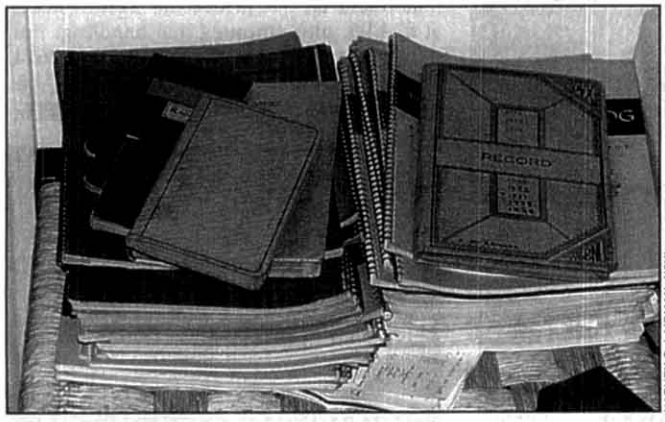
By 1932, Dave had moved to Piedmont, California. To make it easier to erect antennas, Dave noted that when he "stood under the northwest roof peak, the sewer pipe on the Nicholson's house is true North."

Dave built a superregenerative receiver for 5 meters, and scrambled up and down a ladder to aim his wire beam antenna. He made full-duplex contact with W6HB in San Francisco, who "...hooked [the] telephone into the speech amp through input transformer and...called his mother who read the [news]paper for a few minutes over the phone."

On April 29, Dave constructed a 20-meter transmitter, with a type 247 tube as the oscillator, a 247 tripler, a pair of 210s as drivers and a pair of 852s in the final. Testing the transmitter, Dave lost two 247s and a rectifier. By May 30, 1934, Dave had made contacts with all continents. On June 8, he celebrated his first "20M fone QSO." June 16: QRM—"... the (electric) bed pad broken loose again." On March 30, 1935, ZL2BN made his first 10-meter contact with Dave. Later, W6CAL says he believes that was the first New Zealand 'phone contact with the States on 10 meters.

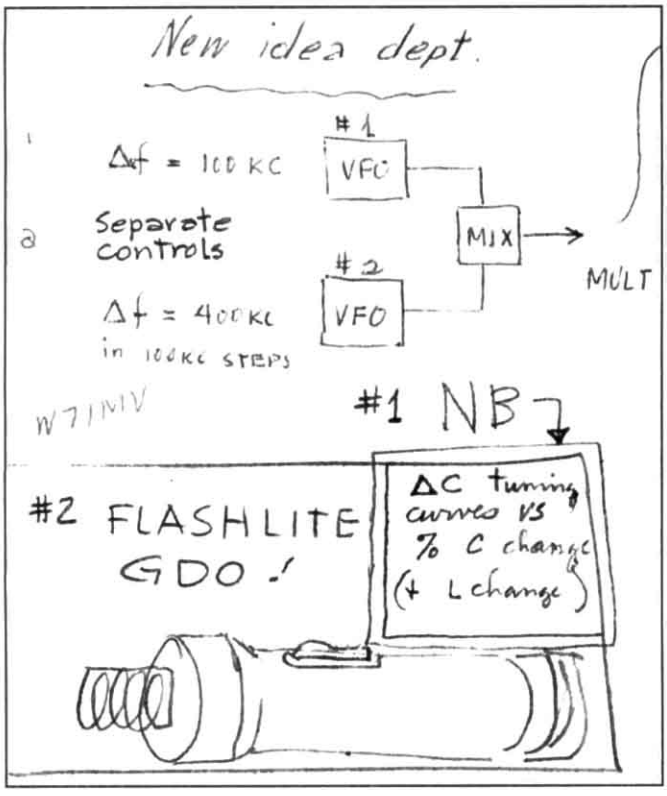
The September 1937 issue of *QST* carries an ad for the Atkins (W6VX) and Brown (W6HB) company (Figure 1), specializing in quality variable condensers.

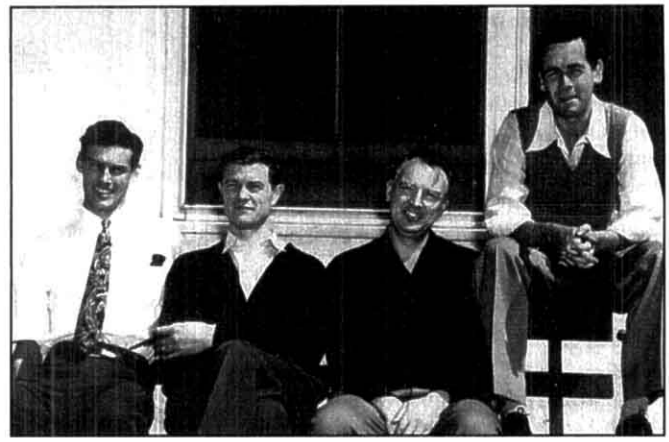
On July 13, 1938, Howard Hughes undertakes a transcanadian flight. The transcript of all communication between 11:15 PM to 1:30 AM is in Dave's log, and includes this passage: "...rocky WX rpt. Later data indicates stay at high altitude. Winds 40 to 45 NNW to NW at 12,000 ft. Winnipeg sure to remain CAVU (ceiling and



The W6VX log books.

Figure 1—Atkins and Brown ad from a 1937 *QST*.





Some of the 1940s Eitel-McCullough crew (l-r): John Woerner, W6ONQ, Head of R&D; Dave Atkins, W6VX, R&D; Hank Brown, W6HB, Head of Marketing; Bryant (Buck) Rogers, EIMAC Photo Lab. Woerner and Rogers, among others, later formed Penta Labs.

Figure 2—The "Flashlite GDO," May 1959.

visibility unlimited). Sending additional data Winnipeg to NY later. AR HW K."

The W6VX license is renewed on July 6, 1939. This year, Dave builds a 150-W 80-meter transmitter using an 852 tube. He logs the signals from the "Contender," 345 miles southwest of San Francisco, with the call sign KLRR on 8300 "KC"—with W6AM operating.

The 1940s

In 1940, the Atkins and Brown Company shut down and Hank Brown, W6HB, becomes the head of marketing at Eitel-McCullough. Dave Atkins joins the company, working in the research and development department with John Woerner, W6ONQ, and Rad Leonard, W6THN. Later, Rad Leonard and Bryant Rogers form Penta Labs, which manufactures power tubes. Dave Atkins stays with Eimac until the 1950s, when he moved to Los Angeles and went to work for ABC.

After the War

After the radio silence of World War II ends, the next log starts in November 1945, kept in an official *ARRL Amateur Radio Station Log*. Using high power on 10-meter CW, W6VX is cited for the second time by the FCC's Portland monitoring station for spurious emissions at half-frequency (14.005 Mc). The next day, he's off the air to rebuild his transmitter, changing the final amplifier from a pair of 100Ts to a pair of 4-125As.

Dave's license, issued September 15, 1950, is pasted in the log on that date.

Notes document the solar minimum of the early 1950s. Dave uses stations WFG and WWVH to gauge propagation. On February 20, 1953, the note: "7 Mc OPENS FOR FONE *WOTTA PILE-UP!*" (with hand-drawn italics). March 28, 1953: "FONE Opens on 21 Mc which is more than the band does."

As the solar flux rises, W6VX works all continents in one day, discusses Riesling wines with DJ1YJ, and complains that US stations are "59+60db" in the CQ World-Wide DX Contest. Dave sends a 4-125A tube to SM5AFI.

In January 1956, the Atkins take a cruise on the Cunard liner *Coronia* around the horn of Africa and westward, where he meets several DX operators he has worked over the years. He finally receives permission to operate an "ammiture" portable station at VQ9. These were the DXpedition years—Ted Henry is in the South Pacific operating at VR2BC, and Danny Weil, VP2VB, and Dick Spenceley, KV4AA, travel the world.

On October 7, 1957, Dave notes hearing the first orbiting satellite, *Sputnik*, on 20.005 "Mc." On November 13, 1958, Captain Kurt "Stay Put" Carlson, W2ZXM, visits the W6VX shack with his friend Stanley Vogel, W6QFE. Captain Carlson won world acclaim when he refused to abandon his freighter, the *Flying Enterprise*, as it foundered off the coast of Ireland. Among copious designs, diagrams and notes, Dave sketches a clever grid-dip oscillator built into a flashlight (Figure 2).

The 1960s

March 6, 1960: W6VX receives and delivers the following message:

From: K4SRA/MM USS Shangri-La

To: Naval Liaison ALUSNA

Urgently require hospitalization of man injured by explosion. Diverting to Valdivia, ETA 062010 Quebec. Request airlift and doctor to accompany helicopter. Airlift from carrier deck on landing. USS Shangri La

A QSL card with thanks from K4SRA/mm is pasted on the next page. Logbook number 8, covering the period of January 1961 to March 1964, as others before it, is filled with diagrams and drawings. On "26 March 1964," Dave invents the "GDO Linker" (Figure 3).

Starting in 1964, the logs are crammed with information on the public service activities of the 7.225-MHz West Coast Amateur Radio Service Net. Hurricane Hazel stranded several fishing ships, and Dave relayed messages to the Coast Guard until "...the radio operator suffered a broken leg in heavy seas & is out of service." This is documented by a clipping of a September 27, 1965, article from the Los Angeles *Herald-Examiner* that is pasted into the log.

There are records of many instances of health and welfare messages, downed airplanes, criminal pursuits, disabled vehicles, hurricanes and other natural disasters, with Dave's usually artistic handwriting replaced by hurried pencil scrawls and diagonal notes. There were comments on a trip to Europe, repairs to Dave's Porsche America coupe, and detailed documentation of the accuracy of a new Bulova Accutron wristwatch. Ray, W6MLZ, visited and played "When the

Moon Comes over the Mountain" on Dave's organ.

On July 4, 1969, the Trans-Pacific Yacht Race begins, with W6VX as a major communication link. Dave manages to locate a neurosurgeon aboard a yacht to treat a seriously fractured skull. Apollo 12 is launched on November 15, and Dave designs a linear amplifier from scratch, using a Penta Labs PL-172 ceramic tube and unusual toroidal tuned circuits.

The 1970s

Dave experiments with ionospheric propagation during the solar eclipse of March 7, 1970. In April, he sketches a transverter to be attached to a CB set to transmit and receive on 144 MHz. He records family illnesses and the passing of a friend.

On February 1, 1971, Dave has hernia surgery at St John's Hospital. There is a strong earthquake on February 9 that spills considerable water out of his swimming pool, and running commentary in the log reports on the quake.

In August 1971, Dave muses about the Moebius strip, and contemplates designs using the self-reversing strip as a noninductive resistor (Figure 4).

Across from the November 1 page, Dave comes up with the idea of using a magnet as a spring in a "sideswiper" paddle, and he makes detailed sketches. This principle, incorporated in the "Scotia" paddle, is used today in the Vibroplex Brass Racer series. Rad Leonard, W6THN, recalls: "Dave became very proficient with that sideswiper."

The paddle design continues to evolve through 1973. The "Diving Board Whip" becomes an 80-meter balloon-supported vertical, still using the swimming pool as a counterpoise. Massive solar flares occur during the summer of 1973. Dave traces the sun and its spots in his log book using binoculars to project the image on the page.

Israeli athletes are attacked at the Munich Olympic games. There is a daily schedule with G5BZ, and designs for an impedance bridge and a 40-meter ferrite direction-finder occupy Dave's thoughts. He also gets a new pair of glasses, and travels to Colombia at the end of 1973 to see a solar eclipse.

In March 1974, gasoline is 59.9 cents per gallon, and Dave's new Mazda RX2 is getting 17.2 miles per gallon. It's the time of the oil shortage, and there's a 45-minute wait to get to the pumps.

Dave designs a unique tank capacitor using a split disc. His interest in a 2-meter final coincides with the launch of Oscar 6. PY1MCC visits and leaves his picture pasted in the log. Dave travels to Russia in July 1974.

Oscar 7 is up. Close friend George, G5BZ, comes to visit in January 1975. In February, Dave puts up an end-fed folded quarter-wave antenna for 160 meters using—you guessed it—the swimming pool as a counterpoise. He constructs a breadboard transmitter using a UV211 tube and a polished Bakelite panel.

Radio station KIEV in Glendale, California, is one of the last broadcast stations to use a "flattop" horizontal antenna strung between iron towers, high atop a downtown hotel. W6VX notes: "The Chief Engineer, also a ham, allows Brian, K6STI, to use the antenna on 160 meters." Brian reports that he was allowed to use the antenna during the night, while the "daytimer" was off the air.

Clippings pasted into the 1976 log book concern a drought in southern California, sunspot predictions, the rising totals of Japanese hams and the possibility that the ARRL may move its Headquarters to the midwest!

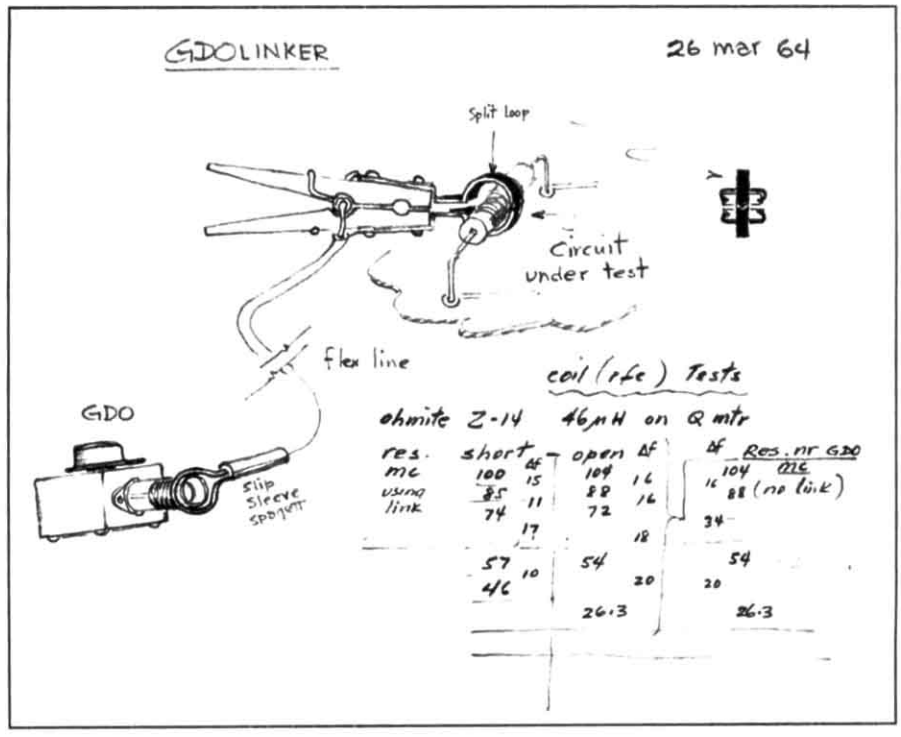


Figure 3—The "GDO Linker," March 1964.

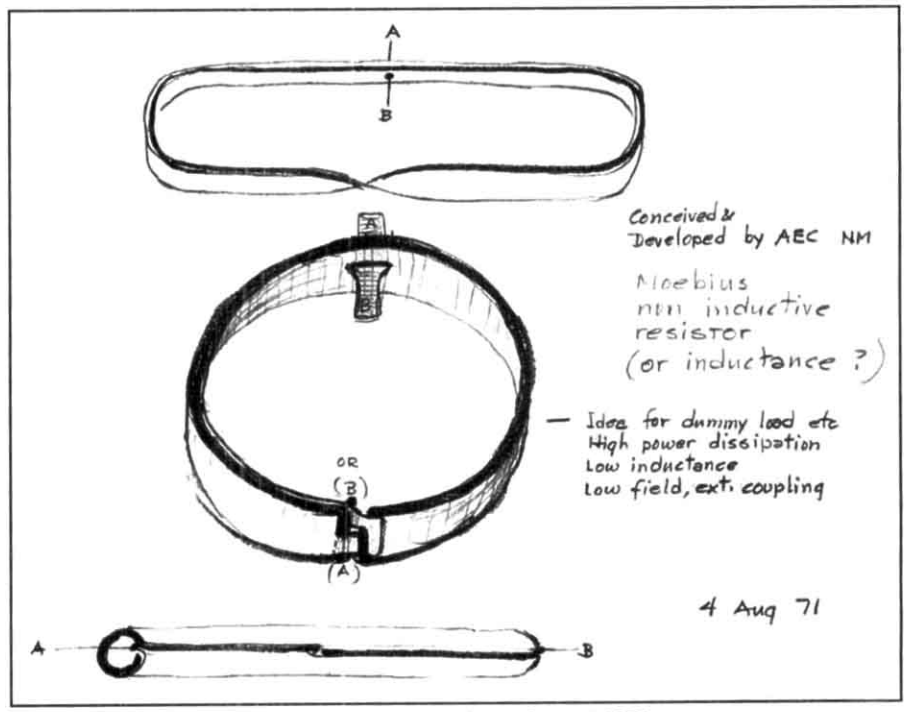


Figure 4—The Moebius strip noninductive resistor, August 1971.

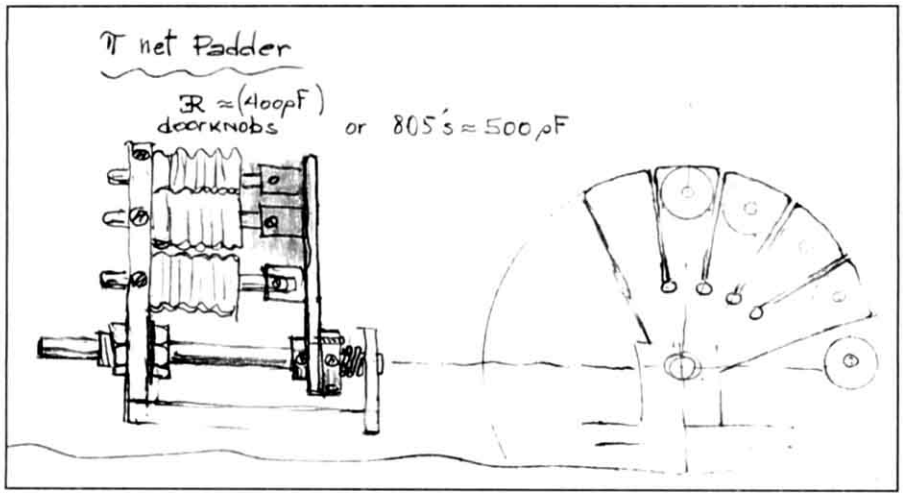


Figure 5—Switched capacitors, July 1990.

COURTESY OF CONSTANCE BLICK

Dave Atkins, W6VX.

Celebrating the country's bicentennial, Dave briefly uses "AC6VX," but concludes it's no "BIG DEAL." The February 6 earthquake in Guatemala is noted. Notes are consolidated into two magazine articles, and projects include a 20-meter full-wave loop antenna, various coaxial and ferrite baluns, a homemade oscilloscope, repairs to a noise bridge and plans for converting the HRO receiver to solid-state. NASA soft-lands on Mars and Dave visits G5BZ on June 23.

There is a letter from Senator Barry Goldwater, K7UGA, dated August 11, 1976, replying to a letter from Dave on the subject of CB operators intruding on the low end of 10 meters.

Dud Charman, G6CJ, is a guest at W6VX. Dave Atkins takes Dud to visit the *Queen Mary* and the famed "radio ranch" of W6AM. On June 16, Dud performs his "Aerial Circus.... A demonstration of miniature, table top antennas, operating at 3200 MHz ... duplicating the characteristics and performance of larger beams and antennas...."

OZ1VY visited and is a dinner guest on July 10, 1979. Skylab falls in Western Australia on July 12, gasoline is $2.25 a gallon in the United Kingdom and gold is $305 an ounce. Dave is still tracking his Accutron against WWV in October 1979.

The 1980s

The price of gold is soaring! Drawings fill the pages. The HRO solid-state project is completed on August 4, 1980. Dave and Constance Atkins travel to Manchester, Connecticut, in March of 1981 and Dave takes along a borrowed TS-820S. They have a memorable meal at Chez Pierre in Stafford Springs. On April 14, Dave notes: "Space Ship Columbia just landed at Edwards AFB 100% perfect... *Fantastique*." DK8EI writes in the log, "Have had fun to operate rig."

On June 19, 1981, W6VX contacts W6VF for the second time. The first time was 60 years earlier on 200 meters. On July 25, K6DDO visits, with SMØCCE in tow. The Falklands War starts in April 1982 and ends in June. The 10-MHz band opens in Europe and Japan. Dave keeps careful notes on that band's propagation and complains: "...old Congress sitting on US permission to OP on 30 meters." He notes a neat trick: "To wind...coax on toroidal cores, first wind it on a half-inch dowel and [screw the spiral] onto the core." Thirty meters finally opens for US hams on November 1, 1982.

In July 1983, Constance is in Santa Monica Hospital, but is home okay after two days. Dave sends articles to *Worldradio* and *Ham Radio*.

Dave and Constance travel to Palo Alto in May 1984 to celebrate Constance's class reunion. Dave experiments with antennas and matching sections. He draws a variable inductance using a ferrite core and develops the "Multi U" antenna for 10 meters. The PL-172 final loses cooling air circulation, killing Dave's last PL-172 tube.

The Wall Street Crash of October 19, 1987, is noted in the log. The Atkins travel on weekends with their children and grandchildren. Visitors' signatures fill the logs—particularly Dave's childhood friend, Hank Brown, W6HB. On February 25, 1989, Bill Eitel, W6UF dies; his obituary is pasted over a neat drawing of a 460-MHz dipole.

The logs show that Dave, now 83, is still as enthusiastic as he was in his teen years—on the air every day, and sketching a design for a UHF field-strength meter. He celebrates a visit from his daughter's family in large, red letters. In May 1989, he designs an SWR bridge that uses a current sensor made from circuit-board material. In June, he notes his 53rd wedding anniversary amid calculations for a unique 40-meter square antenna. Dave replaces his TS-820S with a new Ten-Tec Corsair II, and the TS-820S is sold on August 28.

SMØAQW visits, and they discuss chaos theory. Sadly, there are more and more entries regarding illness and Silent Keys. A note, made in festive green, highlights the arrival of the Atkins' first VCR.

On October 17, 1989, the Bay Area earthquake interrupted the World Series and collapsed the Nimitz Freeway. Dave notes that it happened during "Fire Prevention Week," and he handles health and welfare messages. The December 5, 1989, Los Angeles *Times* notes the passing of famed aerial photographer Clyde Sunderland. Dave adds "W6CBF" to the clipping.

The 1990s

Dave records the passing of his longtime friend, K6LV. Per, LA3FL, visits on March 6. Dave writes Ten-Tec, suggesting changes to the bandswitch and VFO in the Corsair. Constance falls and cuts her "4hd." Dave experiments with mechanically switched capacitances for pi networks (Figure 5). Among Dave's records of the passing of notable amateurs, he notes the demise of the Liquor Barn, a short-lived libation warehouse.

Dave's usually neat handwriting becomes a little wavery. For 40 years, Dave has kept up a faithful schedule, sometimes weekly, but mostly daily, with George, G5BZ. Logbook number 36 has "VI 1991" on the cover—and no ending date.

On June 9, 1991, Dave and Constance celebrate their 55th wedding anniversary. In August, Dave designs an antenna-matching network using a mechanically interconnected roller inductor and variable capacitor. He carefully calculates the change in frequency for each foot cut off his 40-meter dipole. The Oakland fire kills 19 in October.

In November, the wind snaps off half an element on the 15-meter beam and downs a 30-foot mast that was on the garage. With the help of his daughter, Dave—now 85 years old—dismantles the damaged beam

and selects a log periodic as his next antenna. In April 1992, Dave constructs the log periodic and puts it on the garage roof, ready to hoist up the mast. The final assembly is interrupted by the Los Angeles riots on April 29, but the antenna is up on May 1.

June 9, 1992, is Dave and Constance's 56th wedding anniversary. In the logs, the anniversary numbers have blossomed like sunflowers, with each number—from 50 to 56—bigger, more colorful and obviously more precious than the one before.

A July page notes G5BZ's hip surgery. Dave and Constance travel to Carmel, California. In August, Constance has serious surgery at Cedars-Sinai Hospital. For the first time, Dave refers to her as "Connie" instead of the breezy "C1." The gardener cuts the tower guy wires with his electric trimmer in September.

As the death notices compound, Dave traces a subtle "DAMN" in green highlighter dots and dashes. The subject of most of the contacts in the log is reminiscence about friends long gone, mutual memories that regain an earlier time. The log now reflects Dave's own race with destiny.

As 1992 ends, Dave is planning another trip to visit his friend George, G5BZ. He contacts his lifelong friend, Hank Brown, W6HB, on November 27.

Dave celebrates his 87th birthday in January 1993. There are no entries in February—the month Dave's wife and soulmate, Constance, passed away. From March on, the log is written in a very light touch, the pencil barely marking the paper. It seems to be fading out, as Dave continues to mourn his loss.

"90 F (in) Vegas," he notes—his last entry. That last page is scratched and dirty—it appears that, for a long time, it lay open and exposed. It was the ultimate unoccupied blank space, as was the empty space in his life that Constance no longer filled. No design that he could dream up could fill that emptiness.

Finally, the emptiness enveloped Dave as well. He was listed as a Silent Key in the June 1994 issue of *QST*.

But his logs live. They fluoresce with light and color. They cross the threshold of time and mortality and mark, for all to see, the exuberance of life, the gentility of art, the serendipity of curiosity, and the images of imagination of W6VX.

Harvey S. Laidman, N6HL, 4923 Encino Terrace, Encino, CA 91316, was first licensed as 12-year-old W8SLR in Ohio in 1954. He continues to be quite active, mostly in chasing DX on the HF bands.

Harvey thanks the following people who contributed to the telling of this story: Constance Buck ("C II"); Hank Brown, W6HB; John Woerner, W6ONQ, and his wife Jane; Rad Leonard, W6THN; George Bennett, G5BZ; Stanley Vogel, W6QFE; Dr David Morgan, K6DDO; Brian Beezley, K6STI; Harold (Skip) Bolnick, KJ6Y; and Roy (Ace) Ferren, K6RA.

Skip, KJ6Y, was called by Dave's daughter Constance to take down the W6VX antennas and help dispose of the station equipment after Dave passed away. Skip knew of Harvey's interest in historic things and passed the W6VX logs along to Harvey. Harvey is happy to report that the W6VX logs will be donated to the Western Heritage Museum in Omaha after he has finished studying them. Leo I. Meyerson, WØGFQ, is a driving force behind the Amateur Radio exhibits for the museum.

QST

New Products

CUSHCRAFT ASL-2010 SKYLOG LOG PERIODIC HF ANTENNA

◊ Big log-periodic beams: They're not just for embassies anymore! Cushcraft's ASL-2010 is a single beam antenna that covers 13.5 through 32 MHz—ham bands, shortwave bands, you name it, without switching antennas or tuners. It features a single feed line (balun included), uses no traps, and, according to Cushcraft, will loaf along at 1500 W.

The '2010 has 8 elements on an 18-foot-long boom (the longest element is 30 feet). All antenna parts are made from rugged 6063-T832 aluminum alloy, and all mounting hardware is stainless steel.

List price: $800. For more information, contact Cushcraft Corporation at Box 4680, Manchester, NH 03108; tel 603-627-7877, fax 603-627-1764, e-mail: **sales@cushcraft.com**.

JK MICROSYSTEMS' SINGLE BOARD DOS COMPUTER

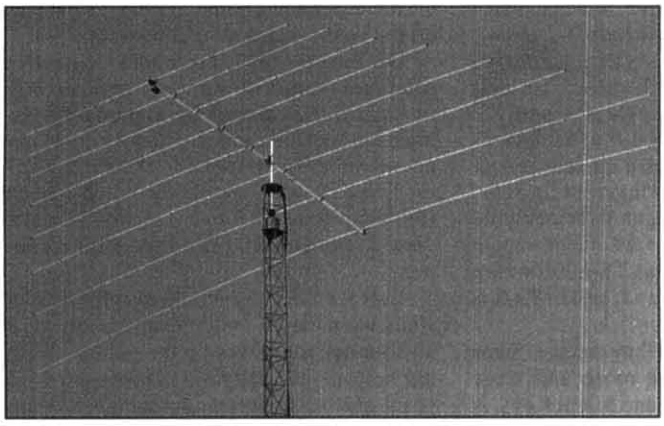
◊ How small can a DOS computer get these days? How about 4.2×3.6 inches? The Flashlite single-board DOS computer from JK Microsystems features an 8-MHz NEC V-25 CPU (a single-chip, 16-MHz processor that's compatible with Intel 8086/8088 architecture), 512k RAM, 128k flash RAM for program storage, two serial ports, two DMA channels, 24 parallel I/O lines and 5-V operation.

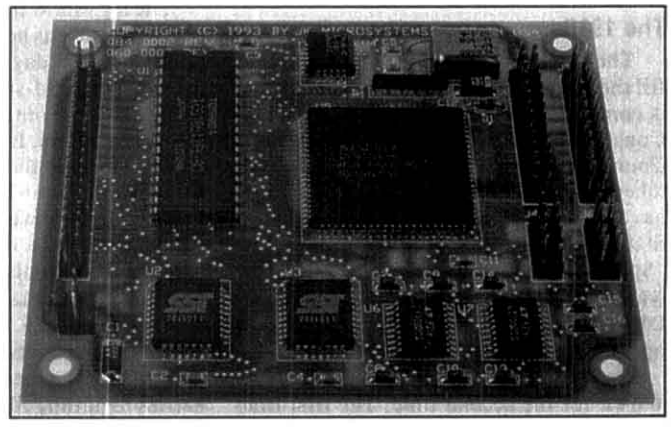
Programs can be developed on any full-size PC and downloaded to the Flashlite board for testing and implementation. The board comes with an X-modem uploader, a command interpreter and JK's DOS 3.3-compatible operating system for the V-25 CPU.

Designing systems using single-board computers isn't for the uninitiated, but several Flashlite systems have already been incorporated into repeater controllers and TCP/IP converters.

Price: $195 (quantity 1); $149 (quantity 100). For more information, contact Jim Stewart, KC6WXW, at JK Microsystems, 1275 Yuba Ave, San Pablo, CA 94806; tel 510-236-1151, e-mail: **jkmicro@dsp.com**.

QST





By Guenter Thoss, DF5OL

It's a Small World for Hams

Coincidence is a pseudonym that God adopts when he doesn't want to be recognized.—*Albert Schweitzer*

My trip on a container ship in 1993 pleased me so much that I decided to do something similar again. And so my cruise on container ship *Ipswich* started on October 7, 1994. Constructed in 1990, it is 535 feet long and 90 feet wide. It has a capacity of 22,500 gross tons, and can carry 1600 standard 20-foot containers.

The route for my cruise would be Hamburg, Rotterdam, La Spezia, Suez, Melbourne, Sydney, Auckland (later cancelled), Melbourne, Fremantle, Suez, La Spezia, Zeebruegge, Tilbury, and back to Hamburg.

I took a Kenwood TS-50 with an FP-757GX power supply, a 23-foot-long Kelemen trap dipole for 10, 15 and 20 meters (which was diagonally mounted between the second and the fifth decks) and an Annecke antenna tuner. I was soon on the air. And then my "coincidences" began.

When I joined the German maritime mobile net, Walter, DK2HK/mm, called me from his sailboat in Mallorca. Having heard my home QTH, he inquired whether I know his friend of many contacts, DK6AS. I sure do—he's my ophthalmologist and an enthusiastic DXer.

Bernd, DL7UUU, managing editor of a German ham magazine, had tried unsuccessfully to contact me on my previous trip. This time, he had a day off and no problem to get in touch with me. Klaus, DL4OBZ, had talked to me during my last trip. Now he was on vacation in Spain and contacted me, as EA7/DL4OBZ.

Without having arranged a sked, I spoke to Dieter, DF1OO, from my home town of Wolfsburg. Later, I had a chat with another Dieter, DL8TT, who had moved from Wolfsburg to southern Germany after his retirement and whose wife followed the contact with great interest.

One day I listened for some time to a ragchew in German. I couldn't decide whether the operators had a Bavarian or an Austrian accent, so I finally broke in. The accent was Bavarian all right, but they were a long way off—both lived in Brazil: Adi, PY7ZYV, near Recife, and Alfredo, PY2HY, in Sao Paulo. In the course of the chat it turned out that Adi—in Bavarian lederhosen—had accompanied a group of German hams who visited Brazil in 1992 on a tour of Recife. He even remembered some of their call signs—DG5DAM, DF1JL and DF2EB. So we discovered that we had met before—I had also been a member of that group!

A real ragchew developed with Wilfried, YB9AQR, on the Isle of Sumba, and Willi, YB9AWR, on the Isle of Flores. Wilfried had read my article on my previous radio cruise, and a short while ago I had met him in person during the Conveniat ham meeting in Germany.

After a QSO with an Indian station, John, W2JB, from New Jersey, called me and told me that my signal was quite strong there. I mentioned that I had lived in Ridgefield Park, New Jersey, for several months. John's home was just a mile away from where I had lived.

In the course of another contact, Nikos, SV9ANK, asked me to phone his friend Harry, VK3ABO, in Melbourne and convey his greetings. Harry is of Greek origin, but has lived in Australia for many years. When I did so, Harry invited me to visit him. I couldn't, because I didn't have enough time, but when we came back to Melbourne again (after Sydney), the ship stayed a little longer, so off I went to meet Harry. A streetcar took me to the suburb of Northcote in about an hour. The afternoon went by very fast with shop-talk in Harry's garden house, a combined radio/computer shack—Harry is a software man. His best ham friend in Germany is Fred, DJ3DJ, in Cremlingen, 12 miles away from my home town and well-known to me from our many contacts. Fred was stunned when I told him all about it after my return!

In a long ragchew, Denver, 4S7DA, informed me that he has had his license for many years. That caused me to ask him if he knew Gerd, DJ7GS, who had organized various ham training courses in Sri Lanka (Gerd and I had lived in the same house many years ago). The answer was "Yes," and then he asked, "Do you know Struppi?" Well, *everybody* knows Struppi, DJ3JW—I, for many years, and his wife sat next to me during Morse code training. A schedule was arranged for the next evening, when Struppi would be in Colombo. When that schedule time rolled around, we again made contact, and Struppi was loud and clear, although not quite like the repeater back home.

The captain of the *Ipswich* (center) with his two passengers (the author is on the right).

Another time I completed a contact with DL4HB, after which he called DL3HDB, a call sign that I thought sounded familiar. It was Hanfried, from Norderstedt, near Hamburg, who had acted as a harbor guide to a group of hams from out of town (including myself) in a sightseeing boat.

Don't we have a wonderful hobby? You can't find a nicer way to meet new friends and keep in touch with old friends!

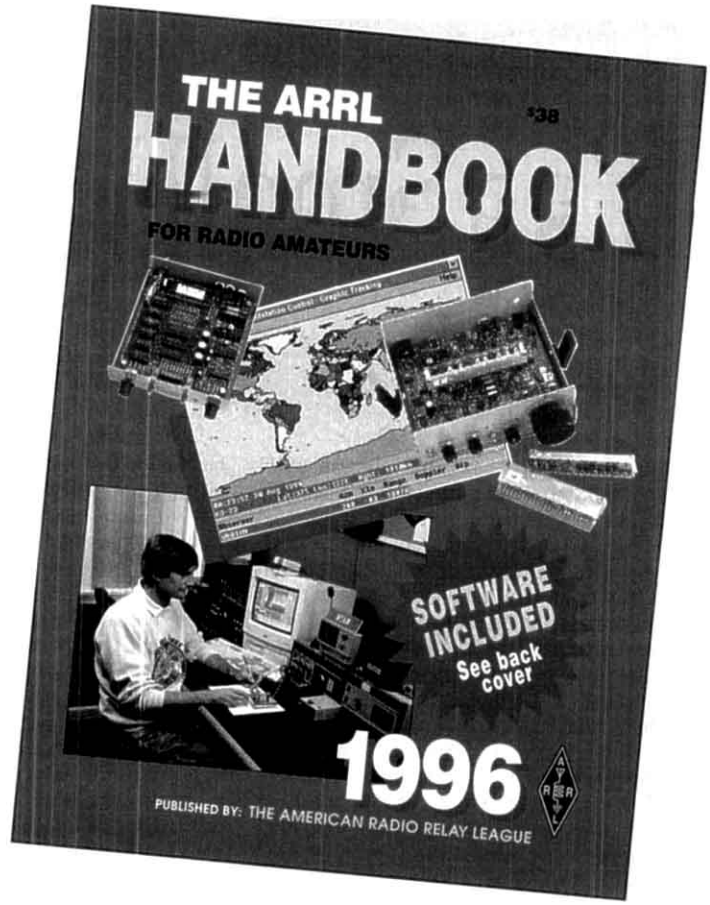
Guenter Thoss, DF5OL, Im Holze 13, 38444 Wolfsburg, Germany. Guenter was born in 1928, and studied languages at Heidelberg University. He worked for 33 years for Volkswagen, as the assistant to US advertising, public relations manager, and editor for foreign-language advertising and brochures.

Each Thursday the captain conducts what he calls a "pig weighing," to be sure his passengers are being well fed. QST

By Kirk Kleinschmidt, NTØZ

The 1996 *Handbook*—What's In it for You?

Just when you thought you didn't need another ham book...



Did I need the new 1996 *ARRL Handbook*? I wasn't sure. Thirty-eight dollars seemed like a lot of money. Of course, I had to admit that the *Handbook* is less expensive than most books its size. And it does include some neat software....

Well, okay—the book isn't a budget breaker, but it *would* occupy a lot of real estate on my shelves. Where would I put all my diet books?

Besides, the 1996 *Handbook* isn't casual reading material. I couldn't envision a time when I'd say, "Hey, I think I'm going to kick back, relax, and read about rectangular coordinates." After all, most hams only read the *Handbook* when they're researching, right? My old 1981 *Handbook* was still fine for that purpose.

Or so I thought.

Ring in the New Year

Wintertime is project time, and the new year called for a new project. I thought it would be great to try slow-scan TV (SSTV) using my personal computer. I grabbed my dog-eared 1981 *Handbook* and ... *nothing!* Personal computers as we know them today didn't even exist 15 years ago. If I wanted to do SSTV with my computer, I had to go back to the future, so to speak. It was time for a new *Handbook*.

As luck would have it, I struck gold with the 1996 *Handbook*, edited by Bob Schetgen, KU7G. Not only did it describe the PC-based SSTV system created by Ben Vester, K3BC, it gave me the software to run it!

As I browsed through the new *Handbook*, I quickly realized that a great deal had changed since 1981. Not only has the technology progressed (that's taken for granted), but the old *Handbook* style has given way to a "friendlier," easy-to-read approach. Yes, you can still find mind-bending discussions of advanced topics such as digital signal processing, but the editors have gone to great lengths to make everything comprehensible.

I bought my *Handbook* without blinking an eye. It seemed like a common sense thing to do. But I assume that you're more fiscally cautious. Before you dispense with a wad of cash equivalent to a meal for two people at a fairly good restaurant, you want to make sure you're doing the right thing. In other words, you're asking, "What's in the 1996 *Handbook* for *me*?"

New Projects

The 1996 *Handbook* is "project heavy." If you think that hams don't build their own gear anymore, you need to pick up a *Handbook*. In addition to the SSTV interface and software, you'll discover a clever little amplifier for 2 meters (page 13.46). You can build one of these in a single afternoon.

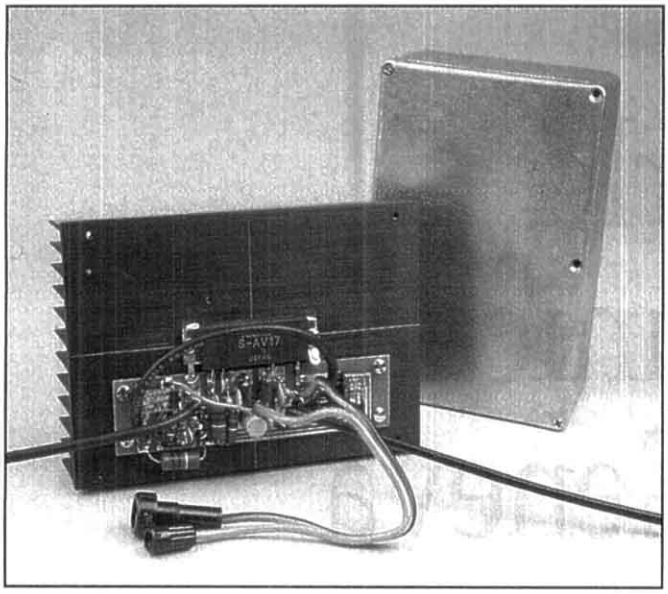
If you want to tackle HF "extreme" QRP, how about a ½-W CW transmitter designed around a CMOS buffer chip (page 17.100)? This tiny rig will work on 20, 15 or 10 meters. With only 16 parts to solder, you can throw it together while watching the evening news.

Have you ever thought of using your PC to measure voltages—or SWR? On page 22.35 you'll find a simple analog-to-digital converter designed by Paul Danzer, N1II. It's comprised of two chips and a handful of resistors and capacitors. Use it to turn your PC into a voltmeter, or connect it to a directional coupler and measure SWR. The software is included on the 1996 *Handbook* diskette.

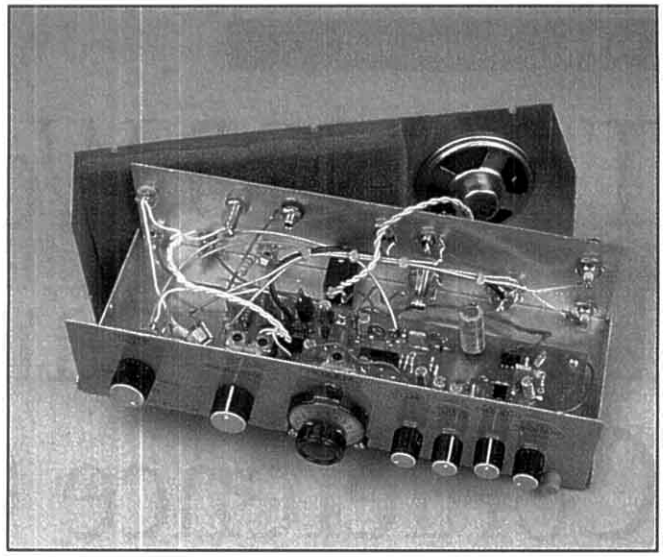
And while you're using your computer to gauge the outside world, you might as well use it to send and receive CW. On page 22.24 you'll see a description of a CW send/receive interface created by Ralph Taggart, WB8DQT. Of course, the software is on the disk!

If you're searching for a project with a bit more "meat," consider the 1750-meter transceiver on page 17.79. No, 1750 meters isn't a ham band, but an awful lot of hams hang out there. It's one of those little known corners of the radio spectrum where the heavy hand of government regulation rests lightly. As a result, it is an experimenter's delight.

This just nicks the surface of projects that are *new* in the 1996 *Handbook*. I haven't even mentioned the favorites that were carried over from the 1995 edition. There are enough projects between the covers to last a lifetime.



If your 2-meter H-T needs a boost, why not build your own 30 or 50-W amplifier? Just open your 1996 *Handbook* to page 13.46.



This transceiver will allow you to explore the depths of the 1750-meter "Lowfer" band.

"Hard" Information, Too

Sometimes you need pure information; not how-to details, but guideposts to point you in the right directions. I was interested in modifying a crystal-controlled 2-meter FM transmitter to function as a CW transmitter for use with the RS-10 and RS-15 satellites. Thanks to page 14.27 of the 1996 *Handbook*, I now have some tips on designing a variable crystal oscillator (VXO) that should do the job.

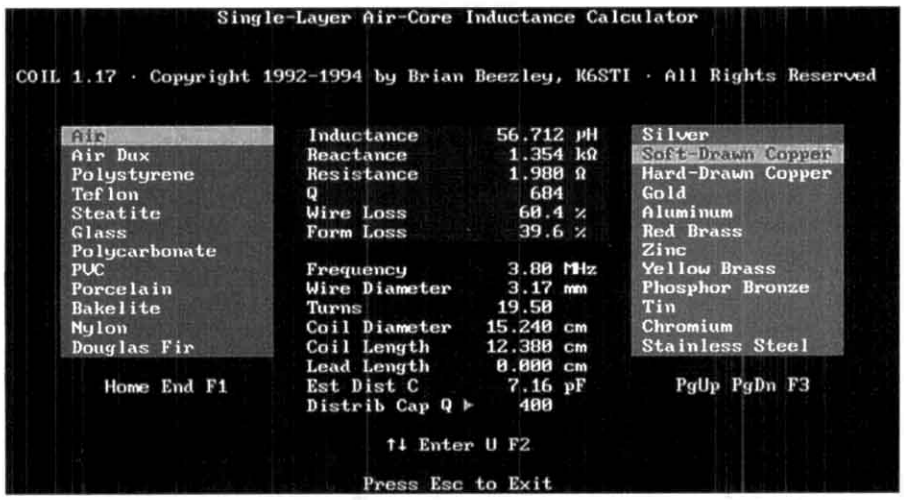
Digital signal processing (DSP) is a hot topic these days. Thankfully, the 1996 *Handbook* devotes an entire chapter (Chapter 18) to the subject. For example, on page 18.5 you can acquaint yourself with Fourier transforms, a mathematical technique for determining the frequency content of a signal. The chapter also includes a section on DSP hardware and development tools.

The material in the 1996 *Handbook* isn't always so "exotic." More often, it's practical, nuts-and-bolts information that you can use every day. During an e-mail "conversation" on the Internet, a ham asked about the effects of stray capacitance when designing L/C circuits for "real world" applications. ARRL Technical Advisor John Stanley, K4ERO, offered this reply:

"Stray capacitance of inductors (sometimes called *distributed capacitance*) is probably the single most important 'stray' in the components I work with. This can be estimated for a single-layer solenoid coil (the most common type) by assuming 1 pF of stray capacitance per centimeter of coil diameter. This holds pretty well for most form factors. Even better is to use the program *COIL* by K6STI, which is part of the software packaged with the 1996 *ARRL Handbook*. This will give you very accurate values for inductance, Q and capacitance in solenoids. In my opinion, this program alone is worth the price of the *Handbook* if you do lots of work with coils."

The 1996 *Handbook* disk also contains a clever *Windows* program called *TISFIND*. With *TISFIND* you can search the ARRL Technical Information Service database which contains addresses and contact information for more than 900 companies and organizations of interest to hams. Mike Tracy, KC1SX, Technical Information Service Coordinator, compiled the data and Jon Bloom, KE3Z, Senior Engineer, wrote the software.

The main menu screen of WB8DQT's CW send/receive program for PCs. You'll find the software on the disk inside the 1996 *Handbook*.



On the 1996 *Handbook* disk, you'll discover this handy piece of software called *COIL*.

Convinced?

The 1996 *Handbook* truly is one of the best investments you can make in your hobby. If you're active in Amateur Radio at all, you *will* reach for this book, and you'll be very glad it's there. As bodybuilders Hans and Franz used to say on *Saturday Night Live*, "Hear us now and believe us later..." Better yet, call your favorite dealer and get a copy of your own 1996 *Handbook*.

Kirk Kleinschmidt, NTØZ, 1010 Grove St, Little Falls, MN 56345

By Paul L. Rinaldo, W4RI

The 1995 World Radiocommunication Conference Geneva

The big battles at WRC-95 did not affect Amateur Radio. But wait until WRC-99...

The 1995 World Radiocommunication Conference (WRC-95) was held in Geneva, Switzerland, October 23 to November 18, primarily to do two things: (1) simplify the international Radio Regulations with benefit of the report of the Voluntary Group of Experts (VGE) and (2) consider limited additional allocations to the mobile-satellite service (MSS), particularly for use by low-Earth-orbit (LEO) satellites.

WRC-95 was the culmination of a two-year process. Its agenda was set at WRC-93, whose only purpose was to draft the agenda for WRC-95 and a preliminary one for WRC-97. Immediately after WRC-93, a meeting of the chairmen and vice chairmen of the ITU Radiocommunication study groups created several task groups specifically to study WRC-95 issues, and scheduled meetings for all the study groups, working parties and task groups for the following two years. Also thrown in were two Conference Preparatory Meetings (CPM-94 and CPM-95)—the first, a short organizational meeting; the second, to agree on a report for WRC-95.

Work began on WRC-95 in the United States early in 1994 and didn't stop until the conference was over. Those somewhat familiar with the process know that the principal US Government agencies involved are the Federal Communications Commission (FCC), the National Telecommunications and Information Administration (NTIA) and the Department of State. But that's simply the tip of the iceberg. Other agencies, such as the Department of Defense, the National Aeronautics and Space Administration, the Coast Guard, Federal Aviation Administration and Voice of America were involved to advance or protect their allocations. The private sector was also heavily involved, particularly companies seeking new MSS allocations or relief from some footnote restrictions in the Radio Regulations concerning the use of MSS bands allocated at WARC-92. Amateur Radio interests in the scores of US preparatory meetings were represented by the ARRL.

It was important for us not to miss any meetings, in order to head off any and all encroachments into the amateur bands. At first, the MSS proponents were looking for spectrum from 137 MHz on up, some for service links (from the user to the satellite) and for feeder links (between the satellites and their control stations). Study was divided into three parts—below 1 GHz (so-called *Little LEOs*), 1 to 3 GHz (*Big LEOs*), and feeder links for the Big LEOs above 3 GHz.

Now It Can Be Told

Yes, there were some proposals by LEO MSS proponents for amateur bands during the preparatory process. There was a proposal to reallocate the 420 to 423-MHz band to MSS. While the FCC requested public comment in its Notice of Inquiry (NOI), this band did not survive as a US proposal to WRC-95. (Canada and Mexico were also studying the same band, which is not a ham band in either country.) The ARRL strongly opposed this proposal in its comments to the FCC's NOI and in preparatory meetings, as it would have had a serious impact on amateur television. This is a band we share with the primary occupant, military radiolocation radar.

The 1240 to 1300-MHz band was also

studied by Big LEO proponents. This band was quickly found to be unavailable because of military, aviation and space sciences uses. The amateur and amateur-satellite services have secondary allocations in this band.

The 2300 to 2310-MHz and 2390 to 2450-MHz bands were also studied for possible MSS allocations. This was a very complex situation, because these bands were also part of another spectrum reallocation proceeding involving transfer of responsibility for these bands from NTIA (Government use) to the FCC (private sector use). The ARRL was heavily involved in these proceedings and was successful not only in retaining the use of 2390 to 2450 MHz, but having the Amateur Radio Service elevated to primary status in the bands 2390 to 2400 MHz and 2402 to 2417 MHz. Furthermore, we didn't lose our secondary allocations in the bands 2400 to 2402 MHz or 2417 to 2450 MHz. The jury is still out on the 2300 to 2310-MHz band, as the FCC will consider it later.

The Little LEO frequencies were the toughest. One spectrum management professional was quoted as saying, "If there were any frequencies available below 1 GHz, I would have already found them." The FCC came up with several candidate bands (including 420 to 423 MHz), to be studied in early 1995, but they were all short-lived because of opposition from incumbents in those bands. Those that the US finally proposed to WRC-95 were a result of a concentrated attempt to find about 6 MHz of bandwidth below 1 GHz. These proposals had no impact on us, and faced an uphill battle in Geneva.

Big LEOs

The US proposed to make some adjustments in the MSS allocations around 2 GHz— among other things, to achieve service link bands of 35 MHz in each direction (1990 to 2025-MHz uplink and 2165 to 2200-MHz downlink). It also sought feeder link allocations for Big LEOs from 5 to 30 GHz. None of these proposals had any impact on the amateur services.

NGSO FSS

Geostationary FSS television and telephone relay satellites have been around for years, and the FSS allocations and their accompanying conditions of use were created with those satellites in mind. Geostationary Orbit (GSO) satellites appear to stay in one place in the sky, as viewed from Earth, and they have specific target areas. Non-Geostationary Orbit (NGSO) satellite systems are constellations of satellites in low Earth or highly elliptical orbits and present a more complex interference-management problem.

Enter *Teledesic*. This is a proposed NGSO FSS system with a constellation of 840 operational satellites plus spares in low Earth orbit to provide wideband digital relay service throughout the world. The problems were that the system needed 500 MHz of bandwidth each way, and that NGSO FSS wasn't on the WRC-95 agenda. Nonetheless, it gained the full backing of the White House and Congress as exemplary new technology developed by American industry that could provide high-speed digital telecommunication to the entire world and could be advantageous to US trade. Very late in the WRC-95 game, it became the job of the US Delegation to get NGSO FSS added to the agenda and obtain 1 GHz of spectrum, worldwide.

US Proposals and Positions Regarding the Amateur Services

In the League's comments to the FCC's NOI for WRC-95, we asked that the Radio Regulations requirement for examination in Morse code be retained for licenses that grant operating privileges below 30 MHz. There had been information that a small group in New Zealand (*not* the large national society, NZART) had been campaigning its administration to seek elimination of this requirement. The New Zealand delegations to the VGE and CPM meetings had been trying to gain support with only minority support. It was learned that New Zealand intended to propose suppression of the requirement, Radio Regulation 2735, at WRC-95. New Zealand was aware that no IARU national society favored suppression of RR 2735. The League's position and that of the US delegation was to keep RR 2735 as it is.

It goes without saying that the League's main goal at WRC-95 was to preserve and protect our allocations.

The ARRL's comments to the FCC NOI included a request to place "international roaming" for amateurs on the WRC-99 agenda. International roaming is the idea of combining the features of the OAS International Amateur Radio Permit (IARP) and the CEPT T/R 61-01 European common license into one global system that would permit amateurs to operate in different countries without having to obtain licenses in those countries. The Commission accepted this idea in their WRC-99 report, but didn't propose any WRC-99 agenda items prior to WRC-95. Instead, the delegation decided to retain some flexibility and propose WRC-99 agenda items when the WRC-97 agenda became apparent.

It goes without saying that the League's main goal at WRC-95 was to preserve and protect our allocations. There were no specific proposals by any country to move other services into our bands. On the other hand, as at other conferences, some countries proposed to add their countries to footnotes for amateur bands, while others proposed to remove themselves. Nevertheless, a WRC is a conference with the power to reinterpret its agenda. Even if there are no proposals beforehand, each conference has an agenda item to make *consequential* changes—that is, a change in one band could prompt amendment of an adjacent band.

One of the League's long-range goals is to gain some modest amounts of spectrum, as detailed in our comments to the recent NTIA Spectrum Requirements inquiry. Among these are extensions of the small HF bands newly allocated to amateurs at WARC-79. A medium-range goal is to obtain a worldwide allocation 300 kHz wide around 7 MHz to end the present interregional sharing difficulties now the case at between 7100 and 7300 kHz. There was an attempt at WARC-92, as a consequence of a possible expansion of HF broadcasting just above 7 MHz, but the time was not right. The League's comments to the FCC WRC-95 NOI said we were still interested in 300 kHz at 7 MHz, but that we did not want to press for it until the time is right. We estimated that WRC-2001 might be the right time. Then again, our timing depends to some extent on when HF broadcasters get support for expansion below 10 MHz, and, more importantly, when there has been noticeable reduction of fixed and mobile services at HF.

What Happened at the WRC?

After the opening ceremony, at the first plenary, the chairman, Sami Al-Basheer of Saudi Arabia, took up the question of whether the US proposal for Teledesic's spectrum requirement could be considered, as it was not on the agenda. A subsidiary question, if it was to be dealt with, was what committee(s) or working groups of the WRC would handle it. The US delegation presented the NGSO FSS system as service that would benefit the entire world, particularly developing countries. It was also stressed that the recent reorganization of the ITU to provide WRCs every two years was supposed to permit rapid introduction of new technologies. The Teledesic matter wasn't really decided at the first plenary, but Al-Basheer proposed a series of steps to consider it during the conference. First, it would be debated in an Ad Hoc to the Plenary. Then it would come back to the plenary and, after approval, it would go to Committee 5 (allocations), and return to the plenary. It was a tangled web, for sure.

Well, it worked. NGSO FSS ran the maze the chairman had designed. Each step of the way was difficult and consumed much more time out of the meeting rooms than in. What Teledesic got for its effort was access to 1 GHz of spectrum—18.8 to 19.3 GHz (space-to-Earth) and 28.6 to

29.1 GHz (Earth-to-space). The US—with the support of the Arab countries, the Americas and developing countries—had pulled it off.

Why is this of interest to amateurs? It demonstrated that a well-financed initiative can get consideration at a WRC, even without being on the announced agenda. It not only got the needed spectrum—it dominated the conference. On the positive side, it demonstrates that the ITU can move quickly to make changes in its Radio Regulations to keep pace with new technologies. On the negative side, it shows the increasing need for services that use the radio spectrum to be prepared to defend their allocations—on short notice.

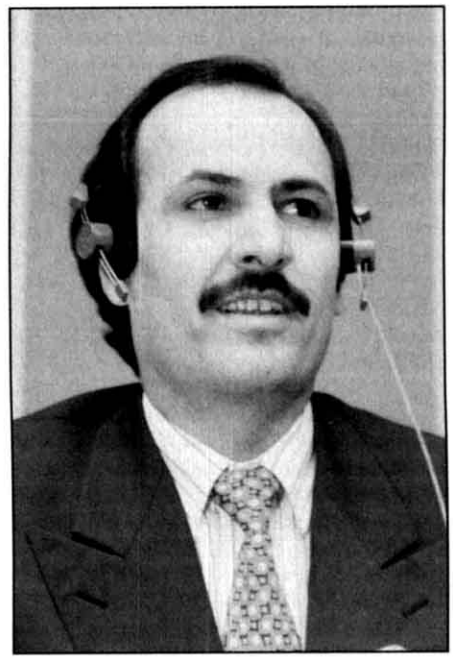
What About the MSS LEOs?

After all, they *were* on the agenda. The Little LEOs had a tough fight. The Working Group established for them met up until its last meeting without agreement. Countries in Regions 1 and 3 defeated MSS LEO use of the 216 to 218-MHz band out of concern for television broadcasting. A 401 to 404-MHz proposal was shot down to protect meteorological operations. There was strong opposition to the other proposals as well. As a last-ditch effort, an informal group was convened to try again and the group salvaged the bands 399.9 to 400.05 MHz, 455 to 456 MHz and 459 to 460 MHz, which was eventually approved in plenary. This was somewhat of a disappointment for the US, and particularly the Little LEO companies. However, US head of delegation Ambassador Brian Fontes put a different spin on it: "They did okay, if you look at it in context"; that is, it's difficult to find available frequencies below 1 GHz.

The Big LEOs got some, but not all, of the adjustments they asked for in their service link bands around 2 GHz. But their real gain was 300 MHz of bandwidth each way at 19.3 to 19.6 GHz (Earth-to-space) and 29.1 to 29.4 GHz (space-to-Earth) with a resolution (PLEN-4) that WRC-97 consider another 100 MHz each way, just above those allocations.

And About Amateur Issues?

The New Zealand delegation did, indeed, propose suppression of RR 2735, the provision that requires demonstration of competency in Morse code for amateurs seeking access to the bands below 30 MHz. Their spokesman stated that this requirement should not be in a treaty (the international Radio Regulations), but left to the individual countries. The IARU delegation submitted a document arguing that this matter should not be considered as it was not on the agenda, that the Morse code requirement should be retained, and at the very least, any such change would need a minimum of three years for the IARU to re-examine its policy, noting the three-year cycle of IARU regional conferences. Germany indicated some sympathy for suppression of RR 2735 but insisted it is not on the WRC-95 agenda. Other countries supported Germany's position. Only Denmark agreed with New Zealand that RR 2735 should be suppressed at WRC-95. To end the debate, New Zealand suggested that the matter be deferred to a subsequent WRC—possibly in 1999. That was accepted as a compromise at the committee level and the plenary ultimately adopted a preliminary agenda item for WRC-99, which reads: " ... consideration of Article S25 concerning the amateur and amateur-satellite services." Article S25 is the new designation for the old Article 32, which pertains to the amateur services; the "S" denotes "simplified" Radio Regulations.



WRC-95 Chairman Sami Al-Basheer

There was considerable discussion among the US, New Zealand, German and IARU delegates about how to word the Article S25 agenda item. The US and IARU delegations wanted to include, whatever the wording, consideration of amateur international roaming. After some consultation, the consensus was that Article S25 was broad enough to cover both the Morse code and roaming issues. Article S25 contains neither the service definitions for the amateur services nor frequency allocations.

The challenge for the policy makers of the IARU, its regional organizations, and national societies is how to prepare for this WRC-99 agenda item, which could be interpreted either narrowly or broadly. The IARU has already formed an international committee of experts to study the matter.

And About 7 MHz?

The HF broadcasters also got a preliminary agenda item for WRC-99, which reads: " ... examination of the adequacy of the frequency allocations for HF broadcasting from about 4 MHz to 10 MHz taking into account the planning procedures, if any, adopted by WRC-97 and the needs of other services." Depending on proposals from various administrations and how this agenda item is interpreted by the conference itself, this could either mean attacks on our 80 or 40-meter bands, or it could present an opportunity to achieve our long-sought 300 kHz worldwide around 7 MHz.

Future Work

The WRC-97 agenda just adopted by WRC-95 is loaded. An attempt to whittle down agenda items resulted in every one being classified as "urgent." There were many comments that WRC-97 could turn into another three-month conference like WARC-79, yet WRC-97 is scheduled to take only four weeks. The next and final approval step is the ITU Council, which meets annually and controls the purse strings. It seems they have three options: (1) simply approve the agenda and limit WRC-97 to four weeks, (2) leave the agenda alone and lengthen the meeting time, or (3) effect a compromise. The squeeze is that the Council is unlikely to find the additional money and will be reluctant to chop items that administrations consider urgent.

Meanwhile, the ITU Radiocommunication Study Groups, their Working Parties and Task Groups, and a newly formed "special committee" on regulatory and procedural matters have been tasked to complete 21 "urgent studies" called for by WRC-95 in preparation for WRC-97. Among them are sharing studies concerning the use of the bands below 1 GHz by the NGSO mobile-satellite service, flexible use of the MF and HF spectrum by fixed and some mobile services using block allocations for adaptive systems (eg, Automatic Link Establishment [ALE]), what to do about running out of call sign series, principles for allocation of frequency bands, etc. These studies are *in addition* to the ongoing work of the Study Groups and those leading to proposals by administrations for WRC-97. Two ongoing studies that could affect the amateur services at WRC-97 have to do with wind profiler radars and spurious emission levels.

The Message

The IARU, the ARRL, and its sister societies have a lot of work to do. This includes internal policy review, technical studies, and more participation in ITU and regional telecommunication meetings. WRC-97 will have nearly all the services preoccupied and probably leave little room for amateur issues. WRC-99, however, is destined to consider the Morse code issue and, we hope, international roaming.

Paul Rinaldo, W4RI, is Manager of Technical Relations at the ARRL's Washington office, 1233 20th Street, NW, Suite 204, Washington, DC 20036.

The Doctor is IN

Q Milo Lombard, KA8OID, asks, "I own an old Hallicrafters SR-400A transceiver. When I first turn it on, the output power in the TUNE mode is 30 W. If I try the TUNE mode 30 minutes later, the output drops to 10 W. The output level during normal operation never varies, however. What could cause this?"

A This problem is probably heat-related. It's possible that a resistor, or some other component in the **TUNE** circuit paths, is shifting in value during warm-up. Get a can of freeze mist and use it to cool the suspected components when the problem appears again. If you spray a resistor and find that the **TUNE**-mode power suddenly bounces back up to 30 W, you may have isolated the culprit.

Q Mike Oreskovic, VE3MPO, asks, "I have an ICOM SM-6 electret condenser microphone that I'd like to use with my TS-711 transceiver. I put together an adapter, but can't seem to get it to work. Any suggestions?"

A Assuming the adapter is wired correctly, the microphone output and/or impedance may be incorrect for use with a TS-711. An impedance-matching transformer may help, or you can use an audio preamp with the correct input and output impedance.

Bear in mind that condenser-type microphones also require a voltage source. If the mike isn't battery-powered, it might rely on the radio for its operating voltage. If the TS-711 doesn't supply the voltage at the mike connector, you'll have to inject it in some other way, possibly through your adapter.

Q William Watt, WA6HYC, asks, "When I compare the readings on my SWR meter to the calculated SWR, I see gross discrepancies. I know that my meter is accurate and the formula I'm using is:

$$SWR = \frac{P_F + P_R}{P_F - P_R}$$

Where P_F is the forward power and P_R is the reflected power. What gives?"

A The reason you're seeing such a big difference is because you're using the wrong formula to calculate SWR. There are two ways to go about it:

1. Solve for the reflection coefficient (ρ) using forward and reflected power, then calculate the SWR:

$$\rho = \sqrt{\frac{P_R}{P_F}} \text{ then.... } SWR = \frac{1+\rho}{1-\rho}$$

2. Or simply use forward and reflected power to solve for SWR in a single equation:

$$SWR = \frac{1+\sqrt{\frac{P_R}{P_F}}}{1-\sqrt{\frac{P_R}{P_F}}}$$

Q Alvin Zachariah, KB9LCO, asks, "Because of work commitments, my wife and I must live apart for the next three or four months. She will be in San Francisco while I'll be residing in Champaign, Illinois. I am licensed to the General class and my wife is a codeless Technician. What are our Amateur Radio communication options, especially considering her license class?"

A Your options are somewhat limited. Packet radio is probably your best bet. You can certainly use it to exchange short messages, if you don't mind the delays. If both you and your wife have access to Internet packet *gateways*, you may be able to enjoy some "live" keyboard-to-keyboard chats. You could do this by *telnetting* to each other, or by meeting on an *Internet Relay Chat* (IRC) channel, if available.

If you and your wife have room to set up the necessary antennas, consider the OSCAR 13 satellite. When it's in the proper position, this bird easily spans the entire United States—and then some! You may also be able to enjoy short conversations (about 10 minutes) through OSCAR 20, RS-10, or RS-15. All of these low-orbiting satellites have coverage sufficient to span the gap between your locations. See Figure 1.

Q Robert Beattie, KD4NFC, asks, "What is the best way to work 6 meters from a hardware standpoint? Do I have to invest in a tower and a beam antenna? How about an amplifier?"

A The "best" way to work 6 meters depends on what you hope to accomplish. If you want to fully exploit the long-range modes such as sporadic E, meteor scatter and aurora, a beam antenna atop a roof or tower is ideal. (Of course, you must make sure to feed the beam with low-loss coaxial cable.) The addition of an RF power amplifier (150 W or more) would also help—especially for meteor scatter and aurora.

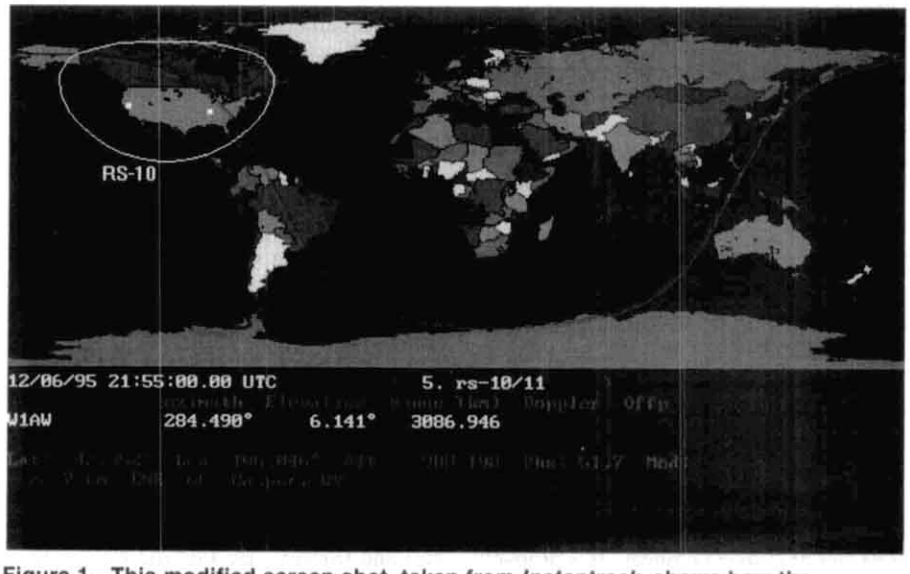


Figure 1—This modified screen shot, taken from *Instantrack*, shows how the *footprint* of the RS-10 satellite often covers most of the United States. The white blocks within the footprint represent the approximate locations of San Francisco, California and Champaign, Illinois. Properly equipped stations in both cities should be able to enjoy 10-minute conversations with each other through the bird.

Having said that, it is important to point out that many hams enjoy 6 meters with very modest stations. During last summer's spectacular sporadic-E openings, hams with 6-meter wire dipoles in their attics were getting in on the fun. Even mobile stations were able to participate. When the sunspot numbers start climbing near the end of this decade, you'll hear these same stations working the world.

So, if you can afford the beam, tower and amplifier, by all means go for it. You'll have an optimal 6-meter station that will give you a lifetime of enjoyment. But don't forgo the band just because you have to settle for something less.

Q Jaroslaw Perkowski, asks, "I am new to America and to FM repeater operating as it is practiced here. Do American repeater systems require tones for access, much like the 1750-Hz tones required for many European repeaters?"

A You'll be happy to discover that most 2-meter repeaters in the United States do not require access tones. You simply key your transmitter and start talking.

There are some repeaters that use *subaudible* tone-access systems. You'll hear these systems referred to as *CTCSS* (continuous tone-coded squelch system) or *PL* (Private Line, a Motorola Corporation trade name). Subaudible tone frequencies are too low for most people to hear, but the repeaters are equipped with special decoders that can detect them. These repeaters will not relay signals unless they are accompanied by the proper subaudible tones. Fortunately, most modern FM transceivers are equipped with subaudible tone generators.

You may occasionally encounter repeaters that require DTMF (*touchtone*) tones for access, but these are rare. Rarer still are repeaters that require operators to whistle at specific frequencies to get their attention.

Q Larry Mergen, NØIZZ asks, "I think I have a power line noise problem. However, the only times that I *don't* hear it is very early in the morning, or when it's raining. I can see its effects on my TV, and hear it as an S-8 signal on 20 meters. Can you explain this?"

A What you've described sounds like "classic" power-line noise. When it rains, the water often eliminates an arc that's formed somewhere on a power pole, temporarily causing the noise to disappear. During the morning hours, heavy dew serves the same purpose.

The interference you describe sounds pretty severe. FCC regulations require that the power company fix the problem if it is occurring on their equipment. I suggest that you talk to the power company service manager or system engineer. It is probably a bad insulator, transformer, or the like.

Actually, any loose hardware on the pole can cause the problem, even if it isn't connected to the lines. The strong electric field surrounding the lines can induce currents in nearby conductors. Any conductors that are not securely bonded together, or insulated from each other, can be the culprits.

Q Joseph Hubka, N7DZQ, asks, "What is the effect of using insulated wire for antennas instead of bare wire?"

A Insulated antenna wire exhibits some differences when compared to bare wire in the same application. For example, a dipole antenna made of insulated wire will be resonant at a lower frequency than its naked brother. Depending on the material and the thickness of the insulation, such an antenna could be 2 to 3% longer.

Q James Nichols, KQ4YC, asks, "I'm operating a VHF/HF packet gateway station. I've been asked to leave it on continuously, but what happens if, say, a codeless Technician licensee accesses the gateway when I'm not there?"

A It's perfectly legal for codeless Technicians to use your packet gateway to access the HF subbands specified in 97.221 (b), whether you're present or not. This is not a remote-base situation. Instead, your gateway is operating *automatically*. The distinction is important. Unlike a remote base, your gateway users cannot perform control-operator activities (such as changing frequencies). Instead, they simply connect on VHF and your station relays the data on the appropriate HF frequency. They're operating their stations legally and so are you.

Q Can I use a 50-Ω, 10-W wire-wound resistor as a 2-meter dummy load? It seems perfect for the job.

A No. While the dc resistance is correct, there is so much inductance that hardly any energy is absorbed by the resistor. In fact, such a resistor barely works at 160 meters (1.7:1 SWR). A much better choice is to use metal-oxide resistors. You can solder together a pair of 100-Ω resistors (Radio Shack no. 271-152) in parallel to make a nice 2-W dummy load that works fine, even at 2 meters.

Q Paul Coleman, N2OXQ, asks, "I'd like to operate my H-T from an external power supply such as one of those 'wall cubes.' I notice, however, that my H-T requires 13.8 V while the wall cubes only supply 12 V. Can I still use them?"

A If your H-T will operate on 13.8-V dc in your car, it should work fine with 12-V dc in your home. A 1.8-V difference is well within most tolerances. You can check with the manufacturer to be sure. Many H-Ts have battery voltage options for various output levels.

The real question with using a wall cube power supply concerns its current capabilities and filtering. Be sure the wall cube is rated for the load (your H-T). It must also provide sufficient filtering to keep the ac components at acceptably low levels. And make absolutely certain that you are not reversing the polarity when you connect it to your H-T. Doing so can cause permanent damage to the radio.

Q Alex Barthe, KC7MEX, asks, "I'm a relatively new ham who is frustrated by restrictive covenants—antenna restrictions to be exact. If I want to operate HF, I'm going to have to do it indoors and I'm considering a miniature loop antenna. What do you think?"

A Miniature loop antennas—either homebrewed or commercial—are favorites among housebound hams. They offer multiband coverage without occupying much space. The typical mini loop is only a few feet in diameter, so it fits neatly in a bedroom, den, living room, attic or wherever.

The downside of miniature loops is that their SWR bandwidth is extremely narrow. If you change frequency by as little as a few kilohertz, the SWR skyrockets. That's why the commercial loops (such as the one shown in Figure 2) use remote-controlled tuning capacitors. A tuning control—usually installed beside your radio—allows you to adjust the antenna in tiny steps. (You'll hear the signals and background noise rise sharply when you reach the point of resonance at your chosen frequency.) Retuning the loop every time you change frequency is a bit of a pain, but it's a small price to pay for the ability to operatewhen you otherwise couldn't.

Don't let their size fool you. Miniature loops work remarkably well. One ham here at Headquarters used a loop to work 65 countries in one weekend during a DX contest. If you go the loop route, try to get the antenna as high as possible. Attics are often great locations for mini loops. As with any indoor antenna installation, keep your output power down and keep RF safety and RFI concerns in mind. You can brush up on these topics by reading *The ARRL Handbook*.

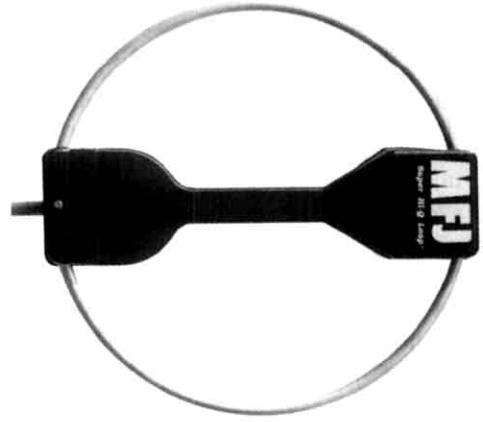


Figure 2—A miniature HF loop antenna manufactured by MFJ Enterprises. A similar version is offered by Advanced Electronic Applications (AEA). Check the advertising pages of *QST* for contact information.

Do you have a question or a problem? Ask the doctor! Send your questions (no telephone calls, please) to: "The Doctor," ARRL, 225 Main St, Newington, CT 06111. QST

Paula P. DiGennaro, KA8HQJ

Elementary Students "Adopt-a-Ham"

Use ham radio to make a difference in the lives of young students. All it takes is a little time.

I've been an Amateur Radio operator since 1979. Even so, I remain as enthusiastic as the day I passed my exam. Every time I turn on my radio there's a new surprise waiting.

Being a Technician Plus, I enjoy operating on 10 meters—contesting in particular. During several contests I've been asked to talk with students who are using the opportunity to listen to ham radio for the first time. I never pass up the chance! No matter where I am in the contest (even if my contact rate is sky-high), I spend whatever time is necessary to speak with the students and their teachers. After all, these kids are the future of our hobby.

Last February, Mike Fisher, N8XVF, a member of Upper Valley Amateur Radio Club, asked for volunteers to assist him in his *Adopt-A-Ham* program. I was thrilled at the prospect and quickly joined the effort, along with seven other club members.

Over the weeks that followed, Mike, a fourth-grade teacher at Parkwood Elementary School in Beavercreek, Ohio, finalized the program details. He received strong support from the school principal, Dr Ann-Olivia Westbeld. She agreed with Mike's idea of using Amateur Radio to help students develop their language skills. Through the use of radio, they could experience more complex adult dialogs *without* the intimidation of having the adult right in front of them. That sort of psychological "distance" is very important to a shy child.

During months of planning, Mike solicited support from members of Upper Valley Amateur Radio Club, obtained loaner equipment, and taught his students proper radio procedures. Obtaining the hardware proved to be harder than enlisting volunteers. Mike finally bought a Kenwood 2-meter FM transceiver and borrowed a power supply and a $^5/_8$-wavelength whip antenna from members of the club.

Once the operating schedules were determined, each ham volunteer was assigned to a group of four students. We were given biographical cards that listed the student's name, age, date of birth, brother's and sister's name, favorite classes, hobbies and so on. This information soon proved very useful!

The Conversations Begin

I was adopted by Erica Bull (age 9), Matthew Hogan (age 10), Joshua Bryant (age 9) and Michael Hills (age 10). We were scheduled to meet on 2 meters every Wednesday morning at 9 AM for 15 minutes over a period of six weeks. Of course, Mike was the control operator and supervised every session.

Parkwood Elementary School student Andrea Paoletti talks to her "adopted ham," as Ryan Jones awaits his turn at the microphone.

Our first contact was simply a brief introduction. During the second chat I talked about how our Dayton SKYWARN system functions, particularly from my vantage point as the net-control operator at the National Weather Service office. (Even before I volunteered for the Adopt-a-Ham program, the students were listening to me and several other SKYWARN net-control operators during severe weather.)

In the weeks that followed we talked about the Dayton Hamvention, Field Day and special-event stations. The Hamvention really piqued their interest! Several badgered their parents into allowing them to attend. Matthew asked his Dad to buy a radio at the convention on the promise that he would pass his license exam. His skeptical father declined, but he'll have to pay up soon—Matthew is now KC8ABE!

Meeting Face to Face

As we neared the end of the project, I wanted to meet my students. Mike agreed and invited me to lunch with the kids. This suggestion blossomed further when Mike asked me to speak to the entire class. Why not?

I prepared a one-hour class discussion around the 2-meter special-event station that my husband, Nelson, WB8VUU, and I operated at the Cincinnati "Tall Stacks" riverboat celebration in 1992. I included a number of photographs along with copies of our Tall Stacks QSL cards.

As I arrived at the school for my luncheon, I was greeted in the foyer by three smiling faces. (The fourth student, Michael, was not in school that day.) We were escorted to a special lunch area where we could privately talk and enjoy our food. The enthusiasm of the students was contagious. I gave each one a ham radio "goodie bag" containing Yaesu hats, some log books, a few lapel pins and our QSL cards. The hats went on immediately and all three proceeded to ask some very insightful questions about Amateur Radio!

Before I knew it, we were standing in front of the whole class. I launched into my presentation and the students seemed to eat it up. It was one of the shortest hours of my life! All too soon we were exchanging hugs and handshakes. My tenure as an "adopted" ham was at an end.

Next Year ... and Beyond?

What does Mike plan to do next year? "This was such a success that I hope to have three sessions," he explained. "I'd like to get more members of Upper Valley Amateur Radio Club involved. And I hope we can involve a class in Troy, Ohio, as well."

Of course, I've already volunteered for the sessions and my husband may take advantage of the same opportunity. In my first year I brought one child into our hobby and planted seeds of interest in many more. I can only guess what will happen next time.

The point of this tale is not to impress you with my volunteer efforts. My hope is that you'll use this example as yet another means of introducing Amateur Radio to children. If you're a teacher, consider setting up an Adopt-a-Ham program in your class. If you're not a teacher, at least be prepared to say "yes" when the call goes out for volunteers. You'll enjoy the experience and so will the kids. It's a small amount of time out of your life, and it could make a tremendous difference in theirs.

7136 Pineview Dr
Huber Heights, OH 45424-2556
Photo by the author

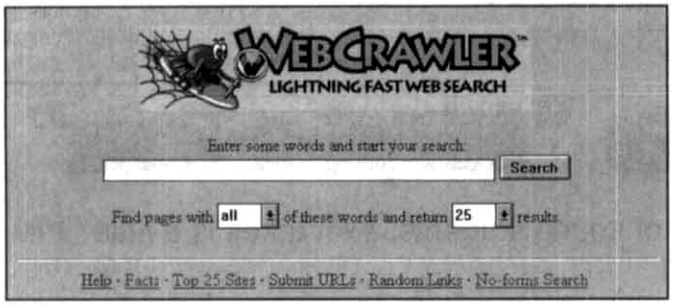


Figure 1—This Web crawler, maintained by America Online, is a fast, convenient way to search for information. Its URL is http://webcrawler.com/

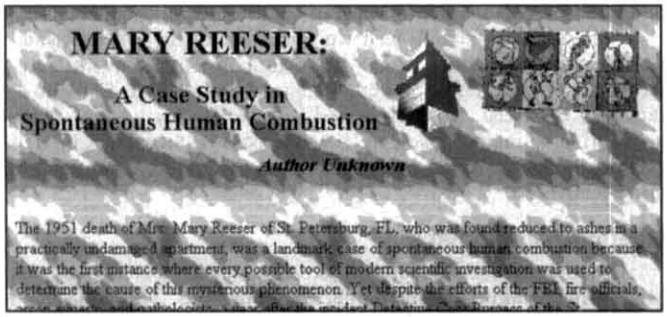
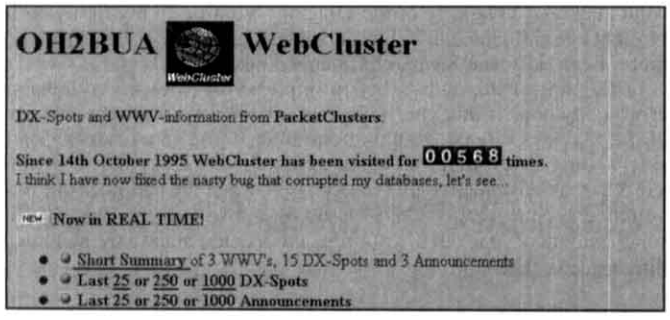


Figure 2—Ask and ye shall receive. I used the crawler to search for "spontaneous human combustion" and was directed to this page. Is there any topic that *isn't* on the Web?

http://www.arrl.org/
The ARRL Web page. Check out the latest W1AW bulletins, get a list of exams and hamfests in your area, and much more!



http://www.clinet.fi/~jukka/webcluster.html
Access the OH2BUA *WebCluster* in Finland and get DX information in real time.

Steve Ford, WB8IMY

Surf the Ham Webs!

There's a wealth of Amateur Radio information on the Internet that's yours for the taking!

Beware of the latest addiction afoot in the land: *Web surfing!* Ever since the World Wide Web made the Internet comprehensible to anyone, *everyone* with a computer has been jumping on line. Once you get your first glimpse of the power of the Web, it's easy to fall into its clutches.

The Internet used to be rather cryptic. To get from place to place you had to know the proper Unix-esque incantations. The simple act of interpreting the directory response from an Internet site caused catatonic episodes—otherwise known as *brain lock-ups*—in some individuals. (Electroshock therapy is often required to reset the wetware.)

The advent of the Web has swept that awkward side of cyberspace under the rug. In the place of "sockets," "gets," "sessions" and other phraseology, you have friendly, colorful screens (known as "pages") that even children understand. Information is literally at your fingertips. Just use your mouse to point your cursor and click.

And Web pages never stand alone. They're interlinked, one to the other, forming a global network so vast that it's almost beyond comprehension. Its structure mimics the human brain in many ways—and the implications are profound. I recently read a plot outline for a science fiction story based on the idea that the Internet could someday become self-aware, not unlike the infamous *SkyNet* in the movie, *Terminator 2*. Farfetched, you say? Maybe so, but spend just an hour on the Web and you'll understand how a fertile imagination could be led to that conclusion!

The Art of Surfing

To explore the information ocean that is the World Wide Web, you need all of the following:

- A computer, most often a PC or a Mac. Go for the gusto when it comes to speed, memory and so on.
- A browser. This is the software that allows you to "talk" to

http://www.westes.com/Ads/Ads.html
Buying or selling? This Web page is an electronic swap meet that never ends.

the Web and understand its responses. The two most popular browsers are *MOSAIC* and *NetScape*. Both are available from software retailers nationwide.

• A telephone modem—the faster the better. You'll be receiving an enormous amount of information, so you need to get it into your computer as rapidly as possible. A 9600-baud modem is considered the *minimum*, with 14.4 kbaud being the average at the moment. If you can get your hands on a 28.8-kbaud hotrod, so much the better.

• Access to the Internet. Local Internet providers are springing up like toadstools. For a monthly fee, often in the neighborhood of $30, they function as your gateways to cyberspace. Many of these providers offer high-speed data links at 28.8 kbaud and beyond.

In addition, virtually all of the on-line services such as CompuServe and America Online offer access to the Internet via the World Wide Web, and they encourage you to use it. Many even ply you by furnishing the necessary browser software. Web surfing through the on-line services tends to be a bit slow at times, but they're working hard to upgrade. (They know an emerging market when they see one!) A few services are even beginning to offer 28.8-kbaud connections in select cities.

Once you're connected to the Web, it's simply a matter of ricocheting through cyberspace, bouncing from page to page as you desire. If you want to go directly to a specific page, you can do so by entering its address in the form of the Uniform Resource Locator, or *URL*. A URL looks like this:

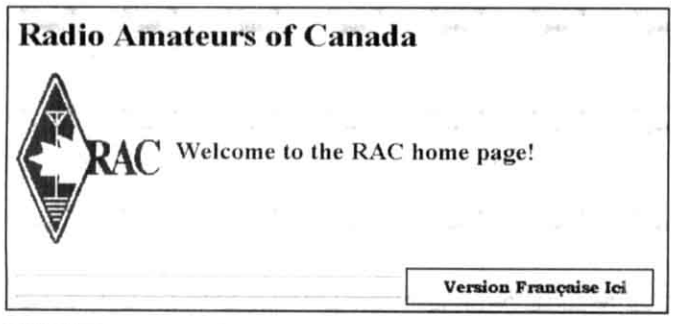
http://www.arrl.org/

This is the URL for the ARRL Web page. It's helpful to remember that all WEb page URLs begin with **http://.**

But what if you don't have a particular destination in mind? Perhaps you just want to find information on a specific topic? That's where the Web *crawlers* come into play. These crawlers are also known as "search engines," among other names. They're huge catalogs of URLs that are updated weekly or monthly. You just tell the crawler what you're looking for and it will try to find a match. Within seconds (or minutes if you have a s-l-o-w connection), the crawler reports all the pages that might have the information you need.

One of my favorite crawlers is supported by America Online (see Figure 1). The WebCrawler Project began as Brian Pinkerton's research project at the Department of Computer Science and Engineering at the University of Washington in Seattle before it made the move to AOL. You don't have to be an AOL subscriber to use it (I'm not). It's easy and quick. Just enter your word(s) and go!

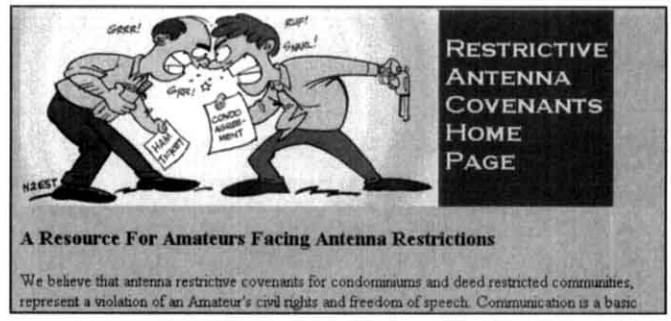
In an attempt to discover the true power of this crawler (and the Web itself), I thought I'd ask it to search for the most bizarre topic I could think of: spontaneous human combustion. That's the strange phenomena where certain unlucky individuals apparently burst into flame for no apparent reason. Surely no one would've created a Web page on such an obscure subject, right? Wrong—as you can see in Figure 2. (In case you're possessed with morbid



http://www.rac.ca/
The Radio Amateurs of Canada home page is available in English or French versions.

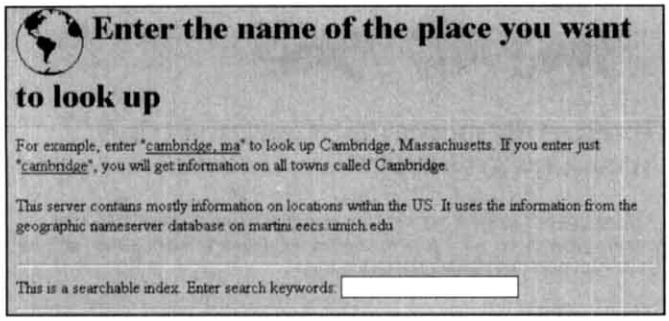
http://www.infoanalytic.com/ka9fox/cool_ham_links.html
KA9FOX's Web page contains extensive links to information of interest to DXers and contesters.

http://www.w2xo.pgh.pa.us/
W2XO operates this Web gateway between the Internet and the amateur packet radio network.



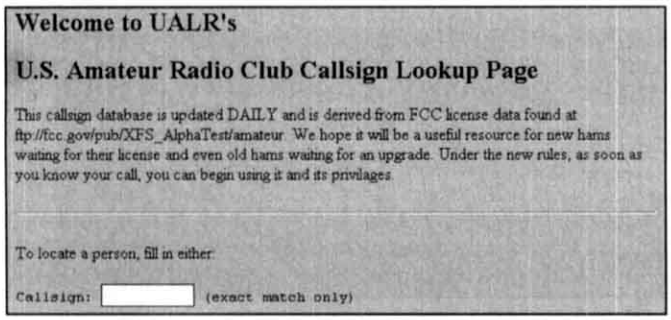
http://www.hamweb.com/~sjl/STONER/ANTENNA.html
Follow the saga of Don Stoner, W6TNS, as he battles his condo association for the right to erect an antenna. Learn what you can do if you're faced with a similar obstacle.

http://www.grfn.org/~ki8w/ki8w.html
The Bay Area DXers in Traverse City, Michigan, maintains this informative page. In addition to DX and contest information, you can view a weather radar map of the midwest and a weather satellite photo. (Its maps and photos are updated every couple of hours.)

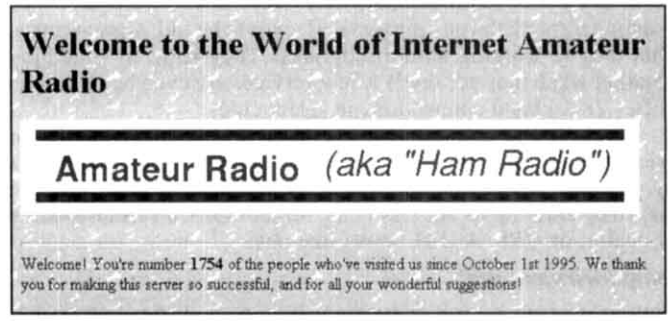


http://www.mit.edu:8001/geo
Need to find the latitude and longitude of a particular town? Just enter the name on this page and you'll receive all the relevant statistics.

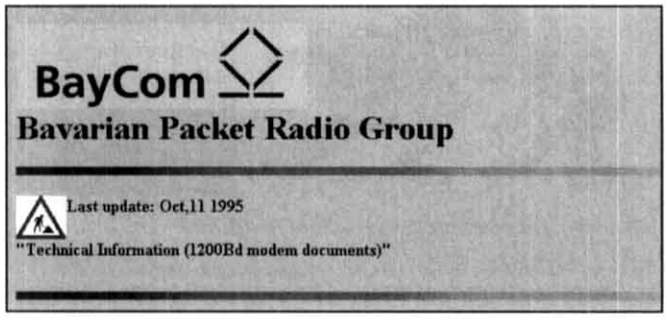
http://www.amsat.org/
Get the latest amateur satellite news and orbital elements on the AMSAT Web page.



http://www.ualr.edu/doc/hamualr/callsign.html
Finding the name and address behind the call sign is easy when you're on the Web!



http://www.acs.ncsu.edu:80/HamRadio/
Take a sample license exam or generate predictions for satellite passes over your home town!



http://www.baycom.de/
When you need information about the popular BayCom packet software systems, let the Web take you directly to the source in Germany.

curiosity, the URL for this gruesome page is **http://www.mindspring.com/~street/detour/shc.html**.)

Once you've reached a Web page, you can use it to jump to other pages (by clicking your mouse on underlined words, or on images), or just go back to the crawler and do another search. Are you beginning to understand the addictive quality? You can spend *hours* leaping from one page to another and searching on various subjects.

So What Does This Have to Do with Ham Radio?

The Amateur Radio aspects of the World Wide Web are growing at an explosive pace. Many ham organizations—including the ARRL—now have their own Web pages. So do ham dealers, clubs and even individuals. These Web pages are like overstuffed sandwiches: They're packed with nutritious information. Not only can you read text and view images, most pages allow you to download files and leave e-mail messages. Some pages even include *sound bites* that you can *hear* if you have the proper software and a sound card in your computer.

Tapping the Amateur Radio Web pages is like having a group of experts in your living room. You'll find Web pages devoted to almost every type of hamming. They're terrific places to gain new insights or to exchange information. A number of pages perform specific services, such as looking up call sign information.

The ham-radio portion of the Web universe is growing so quickly, I can't possibly list or showcase every available page. (If I neglected to mention your page, sorry. Perhaps another time.) Instead, I want to give you a brief taste of what exists in cyberspace by showing you a few pages that I've stumbled across during my browsing journeys.

As you rummage through the miniature Web gallery on these pages, keep in mind that URLs can change at any time. Let's say a club maintains a Web page with a local Internet provider. If the club decides to change providers for some reason, the URL for its Web page will change, too.

Ron Klimas, WZ1V, maintains a comprehensive list of every Amateur Radio–related Web page known to mankind. He does his best to keep the list current with changing URLs and the appearance of new pages. Simply connect to the following page ...

http://uhavax.hartford.edu/disk$userdata/faculty/newsvhf/www/ham-www.html

... then click on the name of the page you wish to explore.

See you in cyberspace!

Steve Ford is *QST*'s Managing Editor. You can reach him by e-mail: sford@arrl.org.

Bill Wright, G0FAH

Four Bands, Off Center

Every dipole must be center fed, right? Not necessarily. Here's a dipole that's fed *off center*, works on four bands, and doesn't require an antenna tuner.

Have you ever wondered why you're required to attach your feed line to the center of a dipole antenna? The middle is a good place for a half-wavelength antenna because the feed impedance is low, typically close to 50 Ω, when the antenna is cut to resonance at the operating frequency. This makes for a good match for 50-Ω coaxial cable, and a good match for your radio. But could you get a more versatile antenna by moving the feedpoint *away* from the middle?

Like many amateurs, I often ask other hams to describe the antennas they're using. Most of the time the answer is a wire antenna like the classic half-wavelength dipole. On occasion, however, some European amateurs tell me that they're operating with "FD3" antennas. Being more than a little unfamiliar with this design, I was eager to find out more.

After some research I learned that the FD3 is a single-wire antenna, with the feedpoint not in the middle, but *one third the way from one end.* It's coax fed with a 6:1 balun at the feedpoint. It actually resembles the Windom antenna with the single-wire feed that was popular in the early 1930s.

Studying the FD3 gave me an idea for the antenna shown in Figure 1. This off-center-fed dipole works on four bands: 40, 20, 15 and 10 meters. And, as a bonus, you don't need an antenna tuner! This antenna is similar to the 1950s Windom antenna that was fed with 300-Ω twinlead.

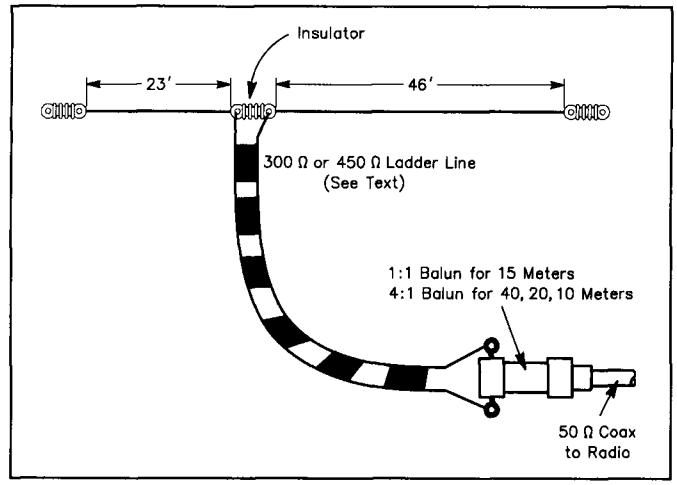


Figure 1—This off-center fed dipole offers four-band performance without an antenna tuner. Just cut the wires and the ladder line to the proper lengths. You'll need to swap baluns when you want to operate on 15 meters.

Construction

Imagine that you have 69 feet of #12 copper wire. If you were to cut this wire in two equal halves and feed it with 50-Ω coax, you'd probably find that it is resonant at the bottom end of the 40-meter band. (This depends, of course, on how high the antenna is above ground and so on.)

For your nonimaginary antenna, use 69 feet of bare copper wire, but *don't* cut it into equal halves. Instead, cut one length at 23 feet and the other at 46 feet. Rejoin the two sections with an insulator in between. This off-center feedpoint will have an impedance close to 300 Ω when you apply a 40-meter signal. This same feedpoint will also present a 300-Ω impedance on the 20 and 10-meter bands, at a typical height of 40 feet or more.

Connect ladder line, either the 300 or 450-Ω variety,[1] at the feedpoint. At our one-third feedpoint, the impedance will be very high on the 15-meter band. But if you make the ladder line a quarter wavelength long at 15 meters, it will transform the high impedance at the feedpoint down to a low impedance near your radio.

A quarter wavelength of 300-Ω ladder is about 10 feet for 21 MHz. This is probably going to be a little short to reach your radio. You can make it longer on one condition: The overall length must be an *odd* multiple of the 21-MHz ¼ wavelength. For best SWR on all four bands, I recommend either 55 or 111 feet of 450-Ω line (or 50 or 110 feet of 300-Ω line). One of these lengths should get the ladder line to your radio with room to spare.

Now that we have a low impedance at the end of the feeder, we use a 4:1 or 1:1 balun to make the transition to 50-Ω coax. Use a 4:1 balun for 40, 20 and 10 meters, and a 1:1 balun for 15 meters. At my station I have 4:1 and 1:1 baluns that I can plug in as required when I change to and from the 15-meter band. You can purchase 1:1 and 4:1 baluns from a number of *QST* advertisers.

Conclusion

How well does the off-center dipole work? I enjoy the convenience of hopping from one band to another without having to fiddle with a tuner. I found that changing the balun when moving to the 15-meter band wasn't all that cumbersome. By choosing the correct line length, the balun was right next to my radio. Best of all, the SWR never exceeded 2:1 on any of the four bands.

Not only is the antenna easy to use, it rewards me with plenty of contacts. Off center, yes, but *spot-on* performance!

[1]300-Ω ladder line is preferred for this design, but it isn't commonplace on your side of the Atlantic. Call around to several *QST* advertisers who specialize in wire and feed lines and you'll probably find it. If not, don't hesitate to use 450-Ω line.

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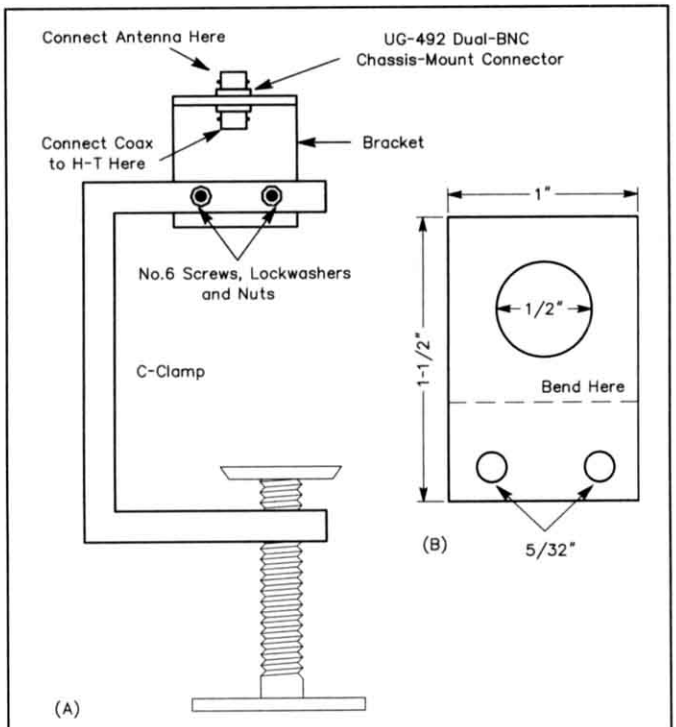
Build A Quickie H-T Antenna Mount

Here's a temporary antenna mount you can put together in less than one hour and use anywhere.

When operating portable, you often need to set up a simple antenna for your hand-held transceiver (H-T). We all know that a half-wavelength antenna works much better than the rubber dummy load that came with the radio. But walking around with a three-foot telescoping rod is rough on the H-T's antenna connector, your hand, and other people's eyes. Plus, you may need to get the antenna away from the H-T or other gear to avoid problems with nearby transceivers.

This easy-to-build temporary antenna mount uses a suitable clamp (spring clamp, **C** clamp, or even a pair of Vise-Grips) to hold a dual-BNC female chassis connector, sometimes called a UG-492 (see Figure 1A). The UG-492 resembles a double-female BNC adapter, except that it has a flange and a nut in the middle so that it can be attached to a metal panel. UG-492s are available from Ocean State Electronics, PO Box 1458, Westerly, RI 02891, tel 800-866-6626, as well as other suppliers.

Setting up and using the antenna mount is simple. Connect one end of a length of coax (with BNC plugs on both ends) to the underside of the dual-BNC connector. Connect the other end of the coax to your H-T. Your antenna of choice plugs in to the top side of the connector. Secure the clamp to a fixed object, such as a table or metal railing, and you're ready to go. I've even used the **C**-clamp version while operating railroad mobile, clamping the antenna to the curtain slide rail beneath the window of an Amtrak passenger car.



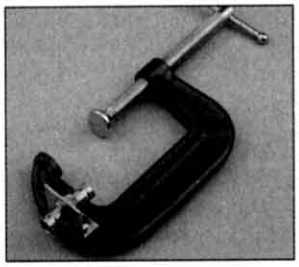


Figure 1—At A (not shown to scale), the quickie antenna mount shown with a common C clamp. The dual-BNC UG-492 chassis connector is installed on a small metal plate. This plate is, in turn, bolted onto the C clamp. B, a small piece of $^1/_{16}$-inch-thick aluminum is all you need to make the bracket for the dual-BNC connector.

Construction

At the heart of the quickie antenna clamp is a tiny metal bracket and a couple of well-placed holes. A drill press works nicely when you're constructing the bracket, but I've also had success with a hand-held electric drill and a tapered reamer (to bring the big hole to the right size). If you have access to the proper Greenlee hole punch, all the better. Just make sure to hold the metal in a vise or with a pair of pliers while drilling. That way, if it catches on the bit and starts spinning like a saw blade, it won't shred your fingers.

Start by cutting a piece of $^1/_{16}$-inch-thick aluminum into a rectangle 1 inch by 1.5 inches (see Figure 1B). Center punch and drill two $^5/_{32}$-inch mounting holes and a half-inch hole for the bulkhead connector. Look at your clamp and figure out where to mount the metal bracket. On some clamps, like **C** clamps, bend the bracket into an **L** shape. (Use a vise or a pair of Vise-Grips to do this.) For other clamp configurations, you can leave the bracket straight. Using the bracket as a template, mark your clamp and drill one or two $^5/_{32}$-inch holes through it. Mount the dual-BNC connector on the bracket, and attach the bracket to the clamp with #6 screws, lockwashers and nuts.

When using this mount, make sure that nobody can come into contact with the antenna when you are transmitting. If you'll be transmitting with more than 5 W, it's a good idea to keep people a couple of feet away from the antenna. Also, keep the antenna at least a quarter wavelength away from metal objects that could detune it.

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Dan Murphy, KA1SZP

Chain Saw Required?

With a little ingenuity, you *can* get there from here.

Planning a new station is a kind of organized daydreaming. In your mind's eye you see your equipment in an attractive setting, perfectly positioned for efficient, comfortable operating. Your idealized antenna farm is able to withstand gale force winds and covers every band with an SWR of 1.0:1. If wishes were horses, all hams would ride!

But wait a minute.

How are you going to fashion an entryway that will allow you to route coaxial cables between your antenna (ideal or otherwise) and your radio (dream rig or otherwise)? Will you have to drill monstrous holes in the siding/clapboard? Knock out a window? Open a door? Operate outside? Pick another hobby? Well, the answer is probably "all of the above"!

Fear not—where there is a will, there's a way. The enemies you confront are heat, cold, moisture and a too-rigid attitude. Attitude modifications are easiest. Just remember that no antenna installation is permanent. The urge to try something new comes upon most of us with astonishing regularity. Keep your entryway design—and your attitude—as flexible as possible. You're not building an entryway to outlast the pyramids.

Air has a funny way of migrating through even the smallest openings. Unless you enjoy heating or cooling the entire Earth (a generous thought, but really unnecessary), make your entryway as airtight as possible.

And while you're making it reasonably airtight, work on watertightness as well. You could come home to sopping-wet carpets someday! If nothing else, put a *drip loop* in your cable. A drip loop is nothing more than a small **U**-shaped loop in the coax that keeps rain from flowing into your home.

The Casement Window Entrance

If your shack is in the basement near a casement window, you can remove a glass pane and replace it with one of Plexiglas or plywood. The replacement should be the same size as the original glass and installed just as you would a new pane (with glazing, fasteners and so on). I'll suggest two options for the casement window challenge, but I am sure your imagination can come up with many more.

The preferred option is to drill a large hole and install a UG-363 bulkhead coaxial feedthrough connector (Figure 1) in the replacement pane (available from Ocean State Electronics, 800-866-6626). UG-363s work well from HF through 2 meters. You can improvise a feedthrough connector by soldering two SO-239s back to back and drilling the necessary holes for mounting them on the replacement pane. Whichever method you use, the feed lines from your antennas should end in PL-259 plugs and attach to the exterior connectors. Then, you can use short feedline jumpers between the *interior* connectors and your equipment. This arrangement also makes it easy to connect lightning-protection devices outside and ground them properly. Unused connectors may be covered with old plastic champagne corks. Remember to weather seal all exposed connectors, though.

The second option involves cutting a 2×3-inch opening in the replacement pane. A "trap door" larger than the opening is then attached to the *outside* of the pane (see Figure 2). Glue thick foam insulating material to the interior surface of the door where it meets the pane. The foam acts to seal around any cables you run through the opening. The door is fastened to the pane with a hinge on top and a long machine screw and nut on the bottom. The machine screw should be long enough to draw the bottom of the door snugly against the cables—but not too snugly! You must avoid pinching or crimping. By threading the cables through the door from the bottom, you'll automatically form a drip loop.

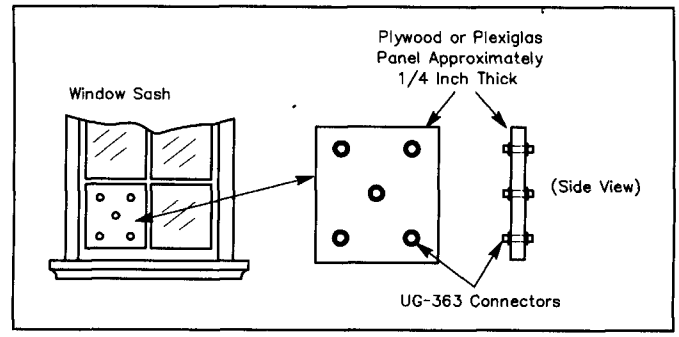

Figure 1—A piece of Plexiglas and a handful of UG-363 coaxial feedthrough connectors makes for a handy entryway. You can put one like this together in under an hour.

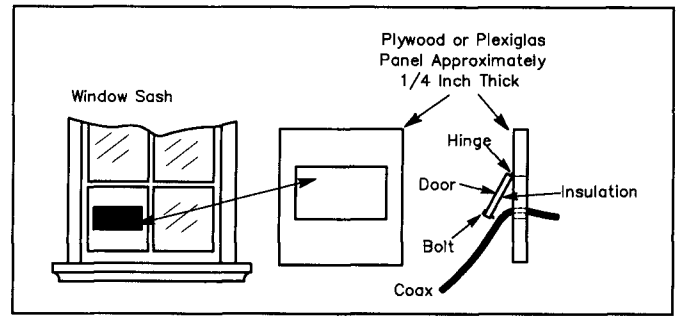

Figure 2—A somewhat less airtight approach uses a "trap door" replacement window pane to put the squeeze on your cables. You simply close the door onto the cables and tighten the bolt. The door should close just tight enough to allow the thick insulation to form a seal. Don't overdo it or you'll risk crimping the coax.

Apartment Dweller's Delight

For apartment dwellers, or anyone else who doesn't want to drill through a wall or window, you can make a simple "sandwich style" entrance using two pieces of lumber (see Figure 3). As you add or remove cables, you need only open the window, move the wood pieces, and then put them back in place. The sandwich-style design also allows you to change cables with the connectors attached.

Select two pieces of lumber that are as long as the sill and as deep as the thickness of the lower sash. The pieces should be

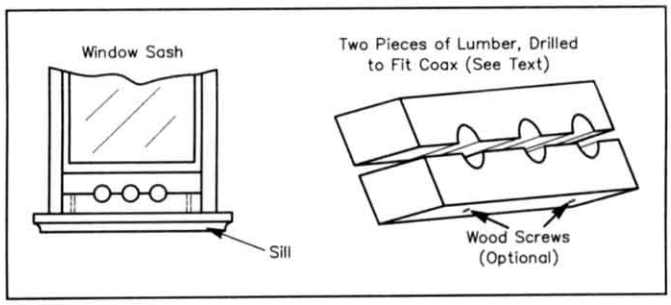

Figure 3—Any resemblance to Colonial-era "stocks" is purely coincidental! Rather than securing the arms and legs of criminals, this design makes a neat cable entrance for apartment dwellers.

relatively narrow, but not less than 1/2 inch in width. Nominal 1×2-inch pine boards have finished sizes of 3/4×1 1/2 inches and are easily obtained at most home centers. You simply cut the lengths to match the sill, then trim them slightly for a snug fit in the window channel.

Clamp the two pieces together tightly and drill holes of the appropriate diameter for the cables you're using (see Table 1). The holes should be centered at the junction of the two wood pieces. Don't forget flexibility! Drill more holes than you need to allow for new runs later. Just plug the unused holes with insulating material.

Place the bottom piece on the window sill (you can secure it with 1 1/2-inch flat-head wood screws, if you wish). Lay your cables in the slots and place the second piece on top. Slide the lower sash down to secure your entryway. Felt or insulating foam may be applied to horizontal surfaces to improve draft resistance. Don't forget to paint the lumber beforehand to prevent weathering (and to mask it from the eyes of your building maintenance manager!).

You'll have to reseal the joint where the upper and lower sashes meet. You can do this easily by stuffing foam insulation between them. The window lock may need alteration, or a built-up wood piece can be used to secure the window. As an alternative, a long screw, partially inserted into the upper sash close to the top of the lower sash can prevent either one from opening.

Table 1
Drill Bit Sizes and Corresponding Cable Diameters

Cable Type (inch)	*Diameter (inch)*	*Suggested Bit Diameter*
RG-58	0.195	13/64 or 7/32
RG-8X/RG-59	0.243	1/4 or 9/32
RG-8	0.405	13/32 or 7/16

But Sometimes You Must Drill

If you find yourself faced with the prospect of boring a hole in your home, make the job as clean as you can. I suggest a 2-inch opening to allow for several cables to pass together. Creating such a hole is certainly more difficult, but it's worthwhile in the long run. Sleeve the opening with a section of PVC pipe using flanges for neatness sake and to seal the exposed surfaces. Remember to size your opening to the *outside* dimension of the PVC pipe. After threading the cables through the pipe, plug it completely with insulating foam to reduce drafts and ward off curious varmints.

Consider All Opportunities

Before you reach for your drill, explore your home and consider every opportunity.

❑ In an older house, you may already have a useable opening (an old dryer vent, for instance).

❑ Check attic vents and eave overhangs. You may find a way to bring your cables in through either of these.

❑ Few attached garages are perfectly sealed. Inspect these garages carefully, especially the areas where they attach to the house. Sometimes a little modification can create a useable entryway.

With a little bit of thought and planning, you can make a cable entrance that will serve all of your present and future needs. Best of all, you can make it very neat and do little, if any, harm to the resale value of your home.

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New Products

HTMORSE FROM ELECTROSOFT

◊ *HTMORSE* turns any tabletop or laptop PC (IBM compatible) into a Morse code keyboard/Morse code generator for hand-helds. It's perfect for helping no-code Techs learn the code on the air. A single cable connects the computer's serial port and the hand-held's mike jack (schematic with Radio Shack part numbers included).

HTMORSE features: speeds from 5 to 100 wpm; adjustable dot/dash ratio; 10 memory buffers; selectable sidetone; and a random Morse code generator (practice for VE exams is built-in: *HTMORSE* simulates millions of unique Morse code conversations by drawing on a pool of common phrases).

Price: *HTMORSE*, $30; optional cable, $10. Both feature an "iron-clad" money-back guarantee. For more information, contact Electrosoft at PO Box 1462, Loveland, CO 80539; tel 970-663-4777.

By Kirk Kleinschmidt, NT0Z

On-Air Conversations: Go Beyond the Basics

If you're tired of "cookie cutter" contacts, why not jump out of your rut and say what you really mean? Here are some tips on turning boring, "by the book" QSOs into interesting—even educational—on-air *conversations*.

Ham Radio is extremely technical. Just ask anyone, and they'll tell you straightaway that our hobby has a lot to do with complicated doohickeys and thingamabobs. There are wires galore, and transistors, integrated circuits, the occasional big amplifier and digitally enhanced circuits of every type, to name just a few . . .

And don't forget the tests we're all required to pass to get our licenses! Although beginning hams no longer need to learn Morse code, we do need to bone up on radio and electronics theory—it's not a total walk in the park.

With all of the study, brainpower and red tape involved, you'd think that the whole mess is about technology, right? About knowing when 10 meters will be open to the Pacific, how grounded-grid linear amplifiers are tuned, or how digital signal processing helps dig out those weak DX signals.

Wrong!

That's the great irony about many technology-based hobbies (ham radio, computers, cruising the Internet, BBSing, etc). For the majority, the technology is simply a vehicle for an underlying, deeper reason for participating: Communicating with other people who share similar interests (people who often live outside the local area). After all, if they lived down the street, you could talk to them over coffee, during barbecues or while playing canasta!

To effectively participate, we need to learn about the technology involved—and certainly about operating procedures and protocols (that is, how to correctly communicate with others using whatever technology is involved). But once that's learned, we're still faced with simply talking to someone else. Having a conversation. Sharing something of ourselves. Learning something about the person on the other end of the mike, key or keyboard.

Sure, some of us become hams for primarily "technical" reasons. Some might love to build radios, or study the intricacies of VHF propagation from a scientific standpoint. But even "specialty hams" love to talk to other hams who *share* their particular interest. Just listen to two "homebrew-ing" hams talk about building *anything* and you'll be convinced.

So, despite the trappings of technology, it's all really about communicating. And to maximize your enjoyment of Amateur Radio, you need to be a good communicator. It's not difficult, but a refresher course can often help get the ball rolling!

Much like seeing a light at the end of a tunnel, every now and then you'll tune across a really interesting QSO. The participants are so caught up in whatever they're discussing, and the exchanges are so lively and natural, that the "mechanics" of ham radio are transcended ("back to you," "W9XYZ for ID," " QTH is . . .," etc). Why, it's almost as if they're having a *conversation!*

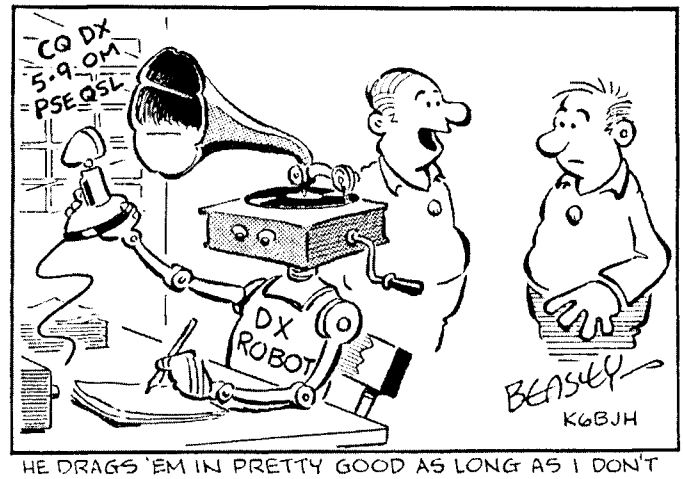
Most hams—whether they'll admit it or not—don't really care what kind of rig you have (they're talking to you, so it must be doing okay), what your weather is like (unless you're in a hurricane or something interesting), what brand of antenna you have, and so forth. Sure, they may find these things interesting, but what they really want to know is something about *you*. What makes you different, interesting or unique.

With only a little effort and a slight change in approach, interesting on-air conversations can be your norm. But before we discuss ways to have more fun talking with and learning about our fellow hams, let's review several (unfortunately) typical exchanges you could hear on the bands almost anywhere . . . and discuss what you can do to jazz them up.

Boring QSOs You've Heard . . . and What to do About Them!

❑ ***Robot DXing***. When it comes to wasting wonderful opportunities to exchange meaningful communication, the rapid-fire exchanges between "Robot DXers" immediately come to mind: Call sign, signal report, adios. QSL 100%. Look me up in the *Callbook*, buddy. Next . . . Over and over.

Amazingly, it took me 12 years to become bored with this. How



HE DRAGS 'EM IN PRETTY GOOD AS LONG AS I DON'T FORGET TO WIND HIM UP

long will it take you? (I'm not picking on "country hunters" and contesters, just hams who *never stop* contesting!)

Talking—and I mean really *talking*—with people in faraway lands is one of the most powerful incentives to become a ham operator. Why trade meaningful exchanges for QSL cards on the wall? When you're old and gray will you look lovingly through your QSL card collection and fondly say to yourself, "Yep, I remember when I talked to this particular guy in England . . . it was in the summer of 1985, and we talked for eight seconds. I think my signal report was five by nine."

It's not *always* possible to chat with DX operators. Band conditions can be poor, interference can be atrocious, your station may not have enough oomph, your respective Morse code speeds may be too far apart—or the ham on the other end may not even want to chat with you! Don't be offended—he may not feel that his English language skills are adequate for a ragchew, or he may not want to disappoint others who are waiting for a QSO. DXers the world over are afflicted with "Robot DX-itis," and if that's the case, forget chatting.

But what if the DX operator is interested in communicating beyond the basics—even if it's just for a minute or two to personalize each contact? Many DX ops leave telltale signs that they're interested

Tips for Better Communicating

Here are a few tips to "break the ice." Remember: Don't be shy! If necessary, just blurt something out. If your QSOs are stuck in a boring rut, dare to do something different. You'll enjoy Amateur Radio in an exciting new way.

❑ ***Families.*** If you can figure out whether your QSO partner has kids and/or grandkids, an invitation to talk about them often will be warmly received. Don't push too hard, though; some cultures regard family questions as more private than others.

❑ ***The Map/Atlas Gambit.*** There's no doubt about it: The handiest tool for budding ham radio conversationalists is a good map or atlas.

When you figure out where the other guy lives, check out his QTH on the map. That little blue squiggle might seem insignificant on your end, but your new friend might have been trout fishing there since he was a kid.

By simply asking about the local geography, at least two things will happen: (1) you'll learn a lot more about that little blue squiggle (or whatever it is), (2) you'll wake the ham on the other end to the fact that a real conversation is about to take place. Both are big steps in the right direction.

❑ ***Famous Places.*** If you or your QSO partner live in a "famous place," feel free to get a little conversational mileage out of it. If you're chatting with someone in Winterset, Iowa, try out your best John Wayne accent. It couldn't hurt, could it?

I've started many an interesting QSO by mentioning that I live in Little Falls, Minnesota, the boyhood home of Charles Lindbergh (and the stomping ground of Paul Bunyan and his blue ox Babe). You can, too.

❑ ***The Big Question.*** Asking people questions—on almost any topic—can often spice up an otherwise routine exchange. Be tactful, but ask away. Examples: "What do you do for a living?" "How about those Minnesota Vikings?" "Have you ever been to Japan?" You get the idea. To narrow down the range of possibilities, tailor your Big Question to what you already know about your QSO partner—or what you intuit or suspect.

❑ ***Hobbies.*** As hams, the one hobby we have in common is ham radio. But that's not all we have in common, and discovering other mutual hobbies will turn a by-the-numbers QSO into a real conversation.

❑ ***Nets.*** If you're shy about conversing with strangers, why not check into one or more of the many specialty nets out there? If everyone on frequency is crazy about ultralight airplanes—and you are, too—they're no longer strangers (and you're suddenly "one of the guys").

❑ ***Say Cheese!*** One of the most interesting and potentially rewarding ways to visually liven things up—usually with a "more established" QSO partner—is the Film Exchange. You each shoot a roll of film, choosing subjects that have meaning to your ham radio and personal lives, and then you exchange the undeveloped film or the printed pictures. When the exchange is complete, you hook up on the air to discuss the photos. This adds a visual element to the mix in a very personal way.

❑ ***IDs.*** As long as it's within reason, feel free to let other hams know a little bit about what you're up to. Instead of keying the repeater with "This is W9XYZ, listening," try "This is W9XYZ, on a round-the-world motorcycle trip, listening." Which do you think would garner more responses on a typical sleepy repeater?

Maybe the old-timer's CQ—"This is Bill, W9XYZ, calling CQ from the Louisiana bayou town of Swampy Creek"—heard regularly in decades past, has some merit. Don't use it while checking into an emergency net, and don't use it all the time, but you might give it a try on an uncrowded HF band just to see what happens.

❑ ***Delicate Subjects:*** One last word of advice: Be careful when discussing potentially controversial subjects such as politics, religion, sex, light beer, left-handed pitchers, etc. I'm not trying to step on your First Amendment rights, I'm merely suggesting that you be respectful and use common courtesy when bringing up certain topics. Amateur Radio is diverse, but it's also tolerant and accepting, and the best ham radio discussions build on a common ground of shared interests.

Regardless of which techniques you use (there are many more than those listed here), taking steps to make ham radio friends through better conversation will only increase your enjoyment of our hobby. You never know when you'll make a lifelong friend you would have otherwise overlooked because of a "cut and dried" QSO!

in (or might be coaxed into) conversing. If the pace of their QSOs is strictly rapid fire, you're probably out of luck, but if interesting tidbits creep in every so often, that op may be a talk-your-ear-off ham in disguise! When it's your turn to transmit, throw out a tidbit of your own to see if he takes the bait! If he's speaking English but you know something in his native language, slip in a greeting in that tongue—you may be suprised at the response!

If the DX station isn't interested in conversing, he'll acknowledge your tidbit and quickly move on—before you can blurt out some other interesting item that will only slow down his QSO rate. If this happens, it's no big deal. You simply have one more quick DX contact to put in your log. You'll likely have many more to keep it company.

If you have a "big signal," you can set the conversational tone of your DX QSOs. The rule of thumb for CQers is, if you're chatty, they'll be chatty. This works amazingly well, but you have to have the signal to back it up.

US hams can actually be at a disadvantage when it comes to blabbing with DX ops. There are so many American hams on the bands, DX stations are often deluged by waves of US ops calling them or replying to their QSOs. In fact, many DX ops think US hams only want a quick contact and a prize QSL card!

Don't get caught up in the details, though. Go ahead and see if the other op is interested in chatting. They're out there, and when you find one, you'll certainly have a more interesting contact—and you may even make a new friend you'll talk to regularly. That's how friendships are started.

❑ ***The Domestic Robot.*** The domestic variant of "Robot DX-itis" is just as boring (and, in fact, may stem from boredom itself!): Name, location, signal report, rig, antenna type, best wishes to you and your family, see-ya-later. Over and over. Painfully boring! Why bother turning on the rig? Are we taking a survey, or are we communicating?

❑ ***Repeaters.*** When it comes to being stuck in a rut, many repeater conversations aren't much better than their HF cousins, although some greater communication takes place occasionally—if only to convey street directions to inquisitive hams who are passing through town!

❑ ***Mode Considerations.*** Chatting on Morse code can be difficult—especially if you're used to "cookie cutter" QSOs. With a little practice, however, your code speed will increase, as will your appreciation and enjoyment of ham radio. Think about it. Conversing in Japanese would be challenging, too, unless you practiced a bit! Morse can help when language might otherwise be a barrier.

If your typing speed is slow, chatting on the digital modes may seem tough. Solution: *practice*! Every mode has its challenges and benefits, and it's possible to have meaningful comms on every one (certain moonbounce and weak-signal modes excepted). Don't get stuck in a rut.

Instead of propagating (and perpetrating!) limiting, unfulfilling conversations, why not enhance your communicating skills and expand your ham radio horizons? There are millions of interesting individuals out there disguised as ham operators! Dig deeper—you won't be disappointed!

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Edited by **Rick Lindquist, KX4V** • Assistant Technical Editor

Kenwood TS-870S MF/HF Transceiver

Reviewed by Larry Wolfgang, WR1B
Senior Assistant Technical Editor

With the introduction of the TS-870S, Kenwood helps usher in a new era in Amateur Radio equipment design. As do the latest offerings from ICOM and Yaesu, Kenwood's newest MF/HF transceiver includes digital signal processing (DSP) at IF, but with a difference. Kenwood's competitors take the belt-and-suspenders approach and couple crystal filters (both standard and optional) with DSP on their latest radios, but the TS-870S requires *no* additional crystal filters to supplement its DSP. It's the first radio in its class to make that claim.

To better understand how the TS-870S implements DSP at HF, see the sidebar "DSP in the Kenwood TS-870S."

Features

The TS-870S's attractive but no-nonsense front panel has the complement of controls you would expect on any full-featured HF rig. But, not all of this radio's goodies are obvious at first glance. The prominent main tuning knob has a soft-rubber grip that provides a comfortable feel and a handy finger depression to spin up or down the band. You can set the tuning steps to 5 or 10 kHz per revolution. The **FINE** tuning button divides this value by 10 when it is turned on, but you cannot display the 1 Hz units to go along with the fine tuning steps. With the small tuning steps, the radio sounds almost "analog" as you tune. None of that digital warbling as the VFO changes frequency!

Two groups of four controls apiece (some of them concentric) flank the tuning knob and give ready access to the most-used functions. Better yet, the knobs and associated pushbuttons are substantial enough for even the most fumble-fingered ops to get a grip on them.

To the left of the main tuning knob, one set of concentric controls adjusts the built-in electronic keyer speed and AGC attack speed. Turning the **AGC** knob fully counterclockwise turns off the AGC; there is no detent or other tactile response to let you know when the AGC is off, so you'll have to look on the display for the red AGC legend above the main frequency readout. Other concentric controls in this group set the speech processor and monitor volume levels, adjust CW, AM or FSK carrier level (or SSB output with the speech processor on), set VOX delay, and adjust microphone gain and power output level.

Convenient pushbuttons just above these knobs select the transmit metering function (options are ALC, SWR, compression level and output power) and activate the speech processor and monitor function.

The right-hand group of controls includes single-knob controls for **RIT/XIT** and **M.CH/VFO.CH** (to change the memory channel or VFO channel), plus concentric controls to set **AF** or **RF** level and **NB** (noise blanker) and **SQL** (squelch). A **CLEAR** pushbutton quickly zeros the incremental tuning. As you adjust the RIT, the main frequency display also changes to show the actual receive frequency.

The display window conveys plenty of information about the radio's operating status. Is the AGC on? How about the speech processor? The automatic antenna tuner? All these questions and more are easily answered at a glance. For example, one spot in the display window shows DSP filter high or low-frequency limits for phone modes, filter bandwidth for FSK and filter center frequency or bandwidth for CW. This information shares display space with RIT or XIT tuning increment data, as well as with the transmit frequency in split.

The left side of the display window is a digital LCD representation of an analog meter—complete with an arc. In receive, the top of the display is an S meter. In transmit, the same segments indicate output power. In receive, the lower portion of the display graphically indicates current filter bandwidth and relative frequency shift. This portion of the display lacks numbers, so you can't tell the *exact* filter settings. For that information, you'll have to look at the right side of the display window (and you may have to first turn the appropriate filter-select knob to activate the readout). In transmit, this same meter section displays SWR, ALC or speech compression level. Turning on the **P HOLD** menu selection holds peak readings on both bar graphs for about 2.5 seconds.

Most users liked the display window and its colorful legends. The bright, white main display numerals are about a half-inch high and easy to read. Red labels above the frequency display indicate active functions, such as **AGC**, **MONI**tor and speech **PROC**essor. Yellow labels below the frequency display indicate the active mode. One reviewer commented that the unlighted LED segments remain distractingly visible behind the display window lens. A darker display-window lens could lesser the effect.

The **ANT** button selects between two rear-panel antenna connectors. **ATT UP** and **DOWN** buttons select either 0, 6, 12 or 18 dB of receive attenuation. **AIP** (Advanced Intercept Point)—also available with the touch of a button—helps to reduce intermodulation distortion by throttling back the sensitivity. On a band crowded with strong signals, you'll likely want to leave **AIP** on.

Bottom Line

The first DSP transceiver without standard or optional narrow crystal IF filters, the TS-870S offers fine receive and transmit audio, noteworthy selectivity and comfortable controls. A snazzy computer-control program and interface are standard.

Getting Around with the '870S

The '870S has two VFOs plus 100

Table 1

Kenwood TS-870, serial no. 70500128

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
Frequency coverage: Receive, 100 kHz-30 MHz; transmit, 1.8-2; 3.5-4; 7-7.3; 10.1-10.15; 14-14.35; 18.068-18.168; 21-21.45; 24.89 -24.99; 28-29.7 MHz.	Receive, 30 kHz to 30 MHz; transmit, as specified
Modes of operation: USB/LSB, CW, AM, FM, FSK	As specified.
Power requirement: Receive, 2 A (no signal); transmit, 20.5 A (max).	Receive, 2 A (no signal); transmit, 16.5 A (max), tested at 13.8 V.
Receiver	*Receiver Dynamic Testing*
SSB/CW sensitivity, bandwidth not specified, 10 dB (S+N)/N: 100-500 kHz, ≤1 μV; 500 kHz-1.7 MHz, ≤4 μV; 1.7-24.5 MHz, ≤0.2 μV; 24.5-30 MHz, ≤0.13 μV.	Minimum discernible signal (noise floor), 400 Hz **WIDTH** and 700 Hz **SHIFT**: *Preamp off* / *Preamp on* 1.0 MHz: −108 dBm / −117 dBm 3.5 MHz: −131 dBm / −141 dBm 14 MHz: −129 dBm / −139 dBm
AM sensitivity, 10 dB (S+N)/N, bandwidth not specified: 100-500 kHz, ≤2 μV; 0.5-1.7 MHz, ≤32 μV; 1.7-30 MHz, ≤2 μV.	10 dB (S+N)/N, 1-kHz tone, 30% modulation, 6 kHz **WIDTH**: *Preamp off* / *Preamp on* 1.0 MHz: 35 μV (−76 dBm) / 11 μV (−86 dBm) 3.8 MHz: 2.3 μV (−100 dBm) / 0.7 μV (−110 dBm)
FM sensitivity, 12 dB SINAD: 28-30 MHz, ≤0.25 μV.	For 12 dB SINAD, 14-kHz bandwidth: *Preamp off* / *Preamp on* 29 MHz: 0.9 μV (−108 dBm) / 0.16 μV (−123 dBm)
Blocking dynamic range: Not specified.	Blocking dynamic range, 400 Hz **WIDTH**: *Preamp off* / *Preamp on* 1.0 MHz: 128 dB* / 124 dB 3.5 MHz: 127 dB* / 124 dB 14 MHz: 127 dB / 123 dB
Two-tone, third-order IMD dynamic range: Not specified.	Two-tone, third-order IMD dynamic range, 400 Hz **WIDTH**: *Preamp off* / *Preamp on* 1.0 MHz: 83 dB / 89 dB 3.5 MHz: 99 dB / 95 dB 14 MHz: 97 dB / 95 dB
Third-order input intercept: Not specified	*Preamp off* / *Preamp on* 1.0 MHz: +17 dBm / +17 dBm 3.5 MHz: +18 dBm / +2 dBm 14 MHz: +16 dBm / +4 dBm
Second-order intercept point: Not specified	Preamp off, +63 dBm; preamp on, +63 dBm.
FM adjacent channel rejection: Not specified	88 dB at 20 kHz channel spacing (29 MHz).
FM two-tone, third-order IMD dynamic range: Not specified	Preamp off, 84 dB; preamp on, 79 dB at 20 kHz channel spacing (29 MHz).
S-meter sensitivity: Not specified	S9 signal at 14 MHz: preamp off, 176 μV; preamp on, 50 μV.
Squelch sensitivity: Not specified	At threshold, preamp on: FM, 0.03 μV; SSB, 1.3 μV.
Receiver audio output: 1.5 W at 10% THD into 8 Ω.	2.4 W at 10% THD into 8 Ω.
IF/audio response: Not specified.	Range at −6 dB points, (band width): CW-N (400 Hz **WIDTH**, 700Hz **SHIFT**): 489-906 Hz (417 Hz); CW-W (1000 Hz **WIDTH**, 700 Hz **SHIFT**): 195-1203 Hz (1008 Hz); USB-W (**LO**=300 Hz, **HI**=3000 Hz): 230-2988 Hz (2758 Hz); USB-N (**LO**=400 Hz, **HI**=1800 Hz): 391-1804 Hz (1413 Hz); LSB-W (**LO**=300 Hz, **HI**=3000 Hz): 225-2967 Hz (2742 Hz); LSB-N (**LO**=400 Hz, **HI**=1800 Hz): 386-1798 Hz (1412 Hz).
Notch filter depth: 40 dB or more.	As specified.
Spurious and image rejection: 80 dB or better.	Preamp off, 98 dB; preamp on, 114 dB.
IF rejection: 80 dB or better.	Preamp off, 115 dB; preamp on, 124 dB*.
Transmitter	*Transmitter Dynamic Testing*
Power output: SSB, CW, FSK, FM, 100 W (max), 20 W or less (min), continuously adjustable. AM, 25 W (max), 20 W or less (min), continuously adjustable.	CW, typically 113 W (max), <1 W (min); SSB, 118 W (max); <1 W (min), varies slightly from band to band. AM, typically 24 W (max), <1 W (min). FM, typically 109 W (max), 9 W (min).
Spurious-signal and harmonic suppression: 60 dB or more.	<60 dBc on all amateur bands. Meets FCC requirements for spectral purity.
SSB carrier suppression: 50 dB or more.	As specified.
Undesired sideband suppression: 50 dB or more.	As specified.
Third-order intermodulation distortion (IMD) products: Not specified.	See Figure 1.
CW keyer speed range: 6-60 wpm.	As specified.
CW keying characteristics: Not specified.	See Figure 2.
Transmit-receive turnaround time (PTT release to 50% audio output): Not specified.	S9 signal, 14 ms.
Receive-transmit turnaround time ("tx delay"):	15 ms.
Composite transmitted noise: Not specified.	See Figure 3.

Size (height, width, depth): 4.7×13×13 inches; weight, ≈25 pounds.

Note: Dynamic range measurements were made at the ARRL Lab standard signal spacing of 20 kHz.

*Measurement was noise-limited at the value indicated.

Expanded Product Review Test Results Report Available

The ARRL Laboratory offers a 30-page test result report on the TS-870S that gives in-depth, detailed technical data on the transceiver's performance, outlines our test methods and helps you to interpret the numbers and graphs.

The report also includes spectral purity charts and receiver sensitivity figures for all bands, all CW keying waveforms (not just worst-case) and other facts to help you make an informed buying decision. The report even includes a summary of how this radio stacks up with similar, previously tested units.

Request the TS-870S Test Result Report from the ARRL Technical Department at $7.50 for ARRL members and $12.50 for nonmembers, postpaid.

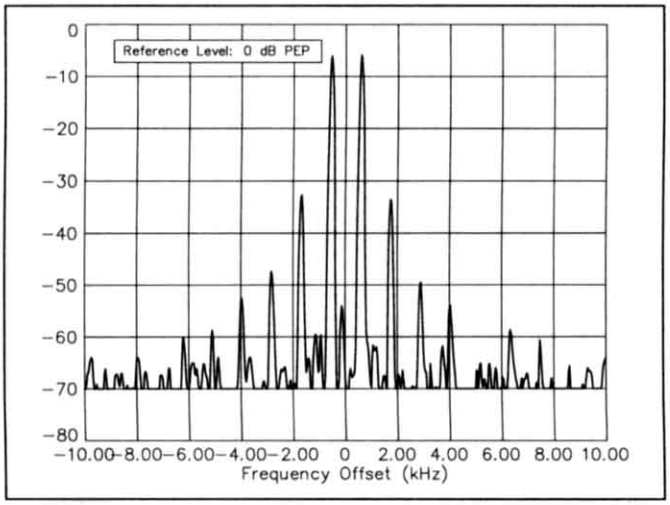

Figure 1—Worst-case spectral display of the TS-870S transmitter during two-tone intermodulation distortion (IMD) testing. The third-order product is approximately 32 dB below PEP output, and the fifth-order product is approximately 47 dB down. The transceiver was being operated at 100 W PEP output at 14.2 MHz.

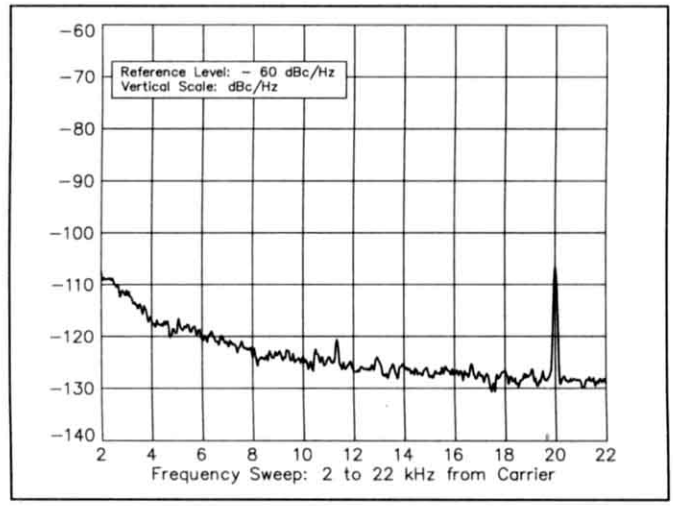

Figure 3—Worst-case spectral display of the TS-870S transmitter output during composite-noise testing. Power output is 100 W at 3.5 MHz. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 2 to 22 kHz from the carrier.

memory channels to make bandhopping and frequency swapping a breeze. Unlike its DSP competitors, the ICOM IC-775DSP or the Yaesu FT-1000MP, the Kenwood TS-870S does *not* have dual receive capability. You can transmit or receive on either VFO or a memory channel, however. Press the appropriate buttons in the RX and TX columns to the right of the **MODE** buttons to make a selection. A small LED lights in each active button. A single memory channel can store separate transmit and receive frequencies as well as mode information. The inability to store filter settings in any memory channel or band register was a common complaint from reviewers, however. It seems odd in a radio this sophisticated that you can't save a particular filter setting with a certain frequency, but the radio *does* remember what filter setting you used last with each mode.

UP and **DOWN** buttons let you switch bands in sequence or (with the **1MHZ** button activated) change frequency in 1-MHz steps instead. Additionally, a ten-key, multifunction keypad allows direct frequency entry, as well as storing memory data, selecting scan functions and controlling the memory keyer features. In VFO mode, you use the **M.CH/VFO.CH** control to make large frequency excursions within a band in steps of 1, 5 or 10 kHz (menu settable).

For split-frequency operation you simply select one VFO (or memory channel) for receive and the other VFO (or memory channel) for transmit. Or you can program a memory channel with both frequencies. If you select different VFOs or memory data for transmit and receive, you press and hold the **TF-SET** button and use the main tuning knob to set your transmit frequency.

One reviewer, who was used to the typical "split" button, found this a bit confusing. It does take getting used to. The right side of the display shows the transmit frequency and the word SPLIT in small red letters above it. There is *no* other indication. One contest group that used the radio liked the fact that the '870S displayed both receive and transmit frequencies but felt it was too easy to transmit on the wrong frequency.

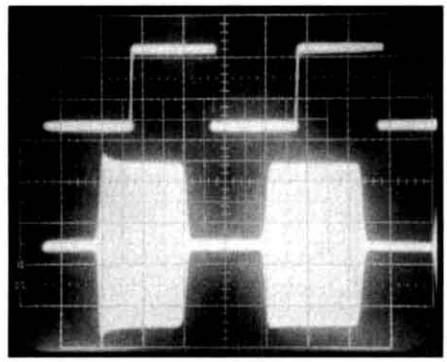

Figure 2—CW keying waveform for the TS-870S in the semi-break-in mode showing the first and second dits. The upper trace is the actual key closure; the lower trace is the RF envelope. Horizontal divisions are 10 ms. The transceiver was being operated at 100 W output at 14.2 MHz.

Would You Like a Menu?

As we've suggested, all the '870S's features are not obvious at first glance. They're "hidden" within a menu system that our review team found easy to use. The **MENU** button provides access to dozens of user-definable operating parameters, while the **M.CH/VFO.CH** button selects the appropriate menu item. Two identical menu banks (68 items each) let you define two completely different sets of operating conditions! This is useful for operators who want the radio to perform one way for contesting or DXing, but yet another for rag chewing or operating digital modes. Ham families using the same radio also might find the two menu banks helpful.

You'll want to have the manual at hand as you make your menu selections—at least at first—because the abbreviated word display can be a bit cryptic.

Among many other things, the menus let you set or adjust AGC release times for various modes, CW rise and decay times, CW pitch, speech processor frequency response, panel brightness and various DSP parameters.

DSP Goodies

Four pushbuttons along the upper right-hand side of the front panel access the radio's DSP functions: **AUTO NOTCH**, **BEAT CANCEL**, **N.R.** and **TX EQ**. The first three are adaptive filters that can identify various interfering signals or noise and modify their filtering characteristics based on the particular noise or interference. (You can switch between SPAC or Line Enhance using a menu selection.) Auto notch only works in SSB mode. This DSP filter identifies interfering tones in the receiver passband and attenuates them. Beat cancel works in both SSB and AM, and is *similar* to the auto notch filter, but can be more effective for some types of tones. Some reviewers lamented the lack of beat cancel or manual notch for CW. ARRL Lab tests found beat cancel was more effective against multiple heterodynes than auto notch, which only worked well against a single heterodyne.

The DSP noise reduction system operates in *any* mode and effectively reduces random background noise. It's a bit like an analog noise blanker (the TS-870S has one of those, too), but it seems more effective

than the typical noise blanker, which is best at combating pulse-type noise. Some reviewers were disappointed the noise reduction was not front-panel adjustable, as it is on competing transceivers as well as on many add-on DSP boxes. A menu choice lets you adjust the optimal correlation time for best reception using NR.

The **TX EQ** button lets you apply high-frequency boost, bass boost or comb filtering to your transmitted phone signal according to a menu setting. Other menu settings also let you tweak transmitted audio characteristics. In other words, you can tailor your transmitted audio characteristics to better match your voice, microphone frequency response and room acoustics. Reviewers got good audio signal reports during on-air testing. The transmitted audio did not seem distorted even with 10 dB of speech compression cranked in. As expected, the processor did add extra "punch" to the signal.

Now to the heart of the matter, the two small knobs—**LO/WIDTH** and **HI/SHIFT**—that adjust the DSP filter settings. For phone reception, the **LO/WIDTH** knob selects the low-frequency cutoff and the **HI/SHIFT** knob selects the high-frequency cutoff. On CW and FSK the **LO/WIDTH** knob selects the bandwidth, while the **HI/SHIFT** knob sets the IF shift in CW. But watch out! Using the menu, you can change CW pitch, or offset, and if you select a narrow filter bandwidth and adjust the IF shift, it's possible to move the received signal clean out of the passband! For example, if CW pitch is set to 500 Hz and the bandwidth is 100 Hz, with the IF shift at 700 Hz you won't be able to tune the received signal for zero beat.

All reviewers liked the ability to easily and quickly adjust DSP filter characteristics. Several commented on the operation of these controls. Both give positive tactile feedback—you can feel them "click" as you rotate them, each click representing another step in the DSP filtering. These steps seem optimal for SSB, but, at times, too large for other modes, where several reviewers longed for finer control. For example, you can select CW filter bandwidths of 1000, 600, 400, 200, 100 and even 50 Hz. (In FSK, available bandwidths are 1500, 1000, 500 or 250 Hz.) At times one bandwidth seemed too wide and the next one too narrow. While running RTTY, for example, I would have preferred a bandwidth somewhere *between* 500 and 250 Hz, especially while tuning for stations. CW operators expressed similar sentiments.

A peek at the Service Manual sheds some light on what happens inside the radio when you turn these knobs, and perhaps offers an explanation for the "digital" steps. The radio's microprocessor selects IF filter combinations based on the **LO/WIDTH** and **HI/SHIFT** settings. In addition, the microprocessor sends control signals to the PLL and DDS local oscillator circuits. By changing the LO frequency, the signal is shifted so the high and low-frequency edges of the combined filter response reduce the effective bandwidth. Kenwood calls this technique "slope tuning." Purely from an operating point of view, our reviewers would have preferred to have the filters continuously tunable, in an "analog" fashion. But, Kenwood's implementation virtually demands a limited number of digital steps.

You may have to "twiddle" the two knobs—and adjust the AGC time constant—to obtain the best performance. But, this design means that strong signals close to your desired receive frequency, especially on CW, may cause some blocking. Turning on **AIP** and adding some attenuation may help.

I didn't experience any interference that couldn't be acceptably reduced using the TS-870S's various adjustments. On the other hand, tests in the ARRL Lab confirmed that strong, close-in signals could produce troublesome IMD and degrade dynamic range in the TS-870S.

Our in-house receiver guru, Dave Newkirk, WJ1Z, asserts that Kenwood's filtering scheme produces "the best receive audio I've heard in an Amateur Radio product." One reason, Dave goes on to say, is that the TS-870S receiver has excellent immunity to in-passband IMD. Another reason, he says, is that the TS-870S's combination of linked variable-IF-bandwidth and DSP IF filtering "gives you maximal control over how much of an incoming signal the radio converts to audio: If you want, you can receive SSB with *no* detectable 'other side of zero beat' response and an audio passband that's flat from nearly 0 to beyond 6 kHz."

The TS-870S, Dave says, "lets you tailor your receive passband to match that of transmitted signals, and the resulting high-quality sound can be a revelation." Dave deplored the small size and poor audio fidelity of the built-in speaker. To take best advantage of the received audio quality, a good external speaker is a must.

Computer Control

Kenwood packages its *Radio Control Program* software with the TS-870S. This nifty *Windows* application lets you completely control the radio from your computer. A graphical representation of the radio is right there on the screen, and you can push its buttons and twiddle its knobs with your mouse or other pointing device. Clicking on the telegraph key graphic brings up a text screen where you enter text and click the key button to send it. You can even store and load text files with "canned" messages. It's that simple!

Using the computer-radio interconnection via the built-in RS-232 port, you can literally create your own user interface. Don't like the position of the main tuning knob? No problem. Just move it! Prefer a radio with a different shape or with customized controls? You've got it! You can design, display and operate the radio of your dreams.

It *is* fun to experiment with this software. The familiar *Windows* drag and drop editing, "radio button" controls and pull-down menus make the program easy to navigate. In addition, many contesters like to use contest software packages like *CT* or *NA* to run their stations. It's easy with the TS-870S: just connect a 9-pin modem cable and let your software do the rest.

CW Ops Only

CW ops will revel in the TS-870S's built-in, full-featured Logikey K-1 memory keyer, controlled from the front panel. The keyer was a favorite among the CW enthusiasts who tried the radio. (This is the CMOS Super Keyer II as seen in November, 1990, *QST* and featured in recent *ARRL Handbooks*.) It's a lot of fun to play with, and the Operator's Manual devotes six pages to it. The available speed range is about 6 to 60 wpm, settable in ranges referenced on 20 wpm. The keyer includes four message memories that can call each other and that can send automatic serial numbers for contesting.

Unless you're using an amplifier, it's best to turn off the loud, clacking amplifier switching/keying relay (a menu option). The **FULL/SEMI** button selects full (QSK) or semi-break-in CW operation.

Other Features

If you'd like, the TS-870S lets you program a set of "boundary" conditions for use with its automatic mode. In this case, as you tune the radio, say from the phone portion of the band into the frequency range used for digital modes and then into the CW region, the radio *automatically* selects the appropriate mode. You can set up to 19 such boundaries. Each mode change selects the last-used filter setting for that mode. You can't store particular filter settings with the boundaries, however.

The built-in automatic antenna tuner is supposed to match impedances between 20 and 150 Ω. The tuner certainly does a good job matching a resonant antenna beyond its "normal" bandwidth, but it won't work miracles. I found it helpful for matching my dipoles and triband Yagi over the entire band. Near band edges, where the SWR tends to climb, the tuner could provide a near perfect match.

Another feature reviewers found especially useful was the "quick memory." Say you're not having any luck trying to break the DX pileup and want to come back a bit later to try again. Just hit the **M.IN** button. You can store up to five frequencies this way. To recall them, hit the **MR** button. Turn the **M.CH/VFO.CH** knob to step through the five quick memory channels. Data move through these channels in a first-in/first-out fashion, so when you store a sixth frequency the first one is pushed out of the register and lost.

Using menu selections, you can repro-

DSP in the Kenwood TS-870S

Like the rest of the current crop of DSP-equipped amateur MF/HF transceivers, the TS-870S performs digital signal processing at a low IF, about 11.3 kHz in this case. On receive, the signal is first mixed to 73.05 MHz and passed through the 15-kHz-wide "roofing" filter, then shifted down to 8.83 MHz to pass through a 3 or 6-kHz filter (or through *no* filter in FM). The signal is then shifted to 455 kHz, where it passes through a 3, 6 or 15-kHz filter. Finally, the signal is mixed down to 11.3 kHz and applied to the DSP's analog-to-digital converter.

The various oscillators that set the mixing frequencies are all digitally controlled, and that turns out to be important. The TS-870S uses a time-honored technique to achieve adjustable bandwidth and IF shift by varying these oscillator frequencies so that one side of the receiver passband is set by the 8.83-MHz filter and the *other* side by the 455-kHz filter. The resulting band-limited signal then is demodulated by the DSP. It is also bandpass *filtered* by the DSP, and the DSP generates the AGC voltage. Since both the oscillators used for mixing and the DSP unit are digitally controllable, the TS-870S can adjust the analog passband and the digital passband in tandem.

Consider what this means. If the TS-870S relied only on DSP to narrow the receiver's passband, signals outside the DSP filter but inside the analog passband would pound away at the IF circuitry, possibly causing gain compression (blocking) and/or IMD generation. On the other hand, if the TS-870S relied only on the analog filters to set the passband, strong-signal performance wouldn't be as bad, but you wouldn't have the advantage of the "brick-wall" shape of a DSP filter's frequency response. But the TS-870S uses *both* kinds of filtering. That means the receiver's ultimate passband is set by the DSP filters, but signals outside the DSP filter passband are attenuated by the analog filters.

The results of this tradeoff are particularly noticeable in CW. To achieve a typical CW passband of 400 or 600 Hz, the analog filters are shifted so that their passbands overlap only by the desired amount. But *between* the filters, in the mix down to 455 kHz, a full 3-kHz-wide swath of signals—the signals that pass through the 8.83-MHz filter—is present. This means that signals within this 3-kHz-wide band, but outside of the desired passband, may cause blocking or generate IMD. (For an explanation of this effect, see "Putting Variable-Bandwidth Tuning Back into Late-Model ICOM IC-751A Transceivers," Hints and Kinks, April, 1991, *QST*.) We found this to be the case with the TS-870S. For example, blocking dynamic range degrades by 10 dB or so when a signal appears *inside* the 8.83-MHz filter, as compared to the same signal appearing *outside* that filter. Older, non-DSP Kenwood designs allowed for inclusion of narrow crystal filters—typically 500-Hz-wide—in the IF stages. These created a narrow passband with a good shape factor, which simply isn't the case when using one IF to set the high edge of the passband and the other IF to set the low edge. The DSP in the TS-870S takes care of the shape factor, but the lack of a narrow crystal filter means that a wide-bandwidth signal is always present in the 8.83-MHz IF stages, no matter what **LO/SHIFT** or **HI/WIDTH** settings you use.

The radio uses two Motorola DSP56002 DSP chips, which represent a lot of processing capability. This allows the demodulation and filtering functions to be combined with adaptive filters for noise reduction and automatic notching.

In transmit, the TS-870S uses the DSP system to generate the modulated signal, which is then mixed up to the output frequency through several stages. The DSP also processes the transmitted audio, including speech compression and VOX, and generates the CW sidetone and the radio's various control beeps, a nice economy of circuitry. (Why *not* use the DSP instead of building a beep oscillator?)

The TS-870S does a good job of integrating DSP technology into an HF transceiver. While any technology can be improved, the scheme used by Kenwood takes good advantage of the possibilities of digital signal processing. If provision were made for optional 500-Hz crystal filters, the combination of analog and DSP performance would be nearly ideal.—*Jon Bloom, KE3Z*

gram four front-panel buttons (**ENTER, TF-SET, 1MHz** and **FINE**) to handle other functions you might find more useful. Or, you can disable them altogether if you want.

The TS-870S Instruction Manual is 100-plus pages chock full of clearly written and easy-to-understand information and operating tips. It even includes a brief DSP tutorial. Plenty of diagrams help you identify various controls and connections. Schematic diagrams are on two 23×32 inch folded sheets, and there's a smaller block diagram.

No one on the review team even mentioned cooling fan noise with the TS-870. Indeed, it's hard to tell when it's running.

The "Dark" Side

There's nothing particularly remarkable about the radio's rear panel, except a lack of clutter. There are two antenna jacks, plus connections for a keyer paddle, a straight key or external keying device, external speaker, amplifier connections, accessory connector for a multimode communications processor (MCP) for RTTY, packet and other digital modes and a 9-pin RS-232 computer interface connector. I was glad to see a ground lug with a wing nut and washers rather than a "push-in terminal" for a solid wire that some radios *call* a ground connection. A phono jack provides the 8.83-MHz IF signal for connection to a station monitor.

Fortunately, Kenwood supplies the 13-pin DIN plug accessory connector for an MCP, since it would no doubt be difficult to find one otherwise. Soldering connections to this plug is no picnic, however. The spacing between pins is one-tenth of an inch, so solder bridges and stray wire strand problems happen easily.

You'd think the phono jack labeled **EXT RX ANT** is for an external receive antenna, but you'd be wrong! This jack lets you connect a second *receiver* to the '870S. Kenwood concedes that connecting a separate receive antenna to the TS-870S, such as a Beverage for 80 or 160 meters, is not possible without internal modifications.

The TS-870S does *not* have a built in AC power supply. It needs 13.8 V dc at 20.5 A. If you don't already own a suitable supply, add *that* cost to the price of the radio!

The Complete Radio?

I have yet to find the "perfect radio" at a price I could afford. We could consider the TS-870S to be the "*complete* radio," however. Except for the required power supply, the TS-870S is ready to go as it comes out of the box. It doesn't need additional IF filters, an external audio DSP unit or an external memory keyer. Available matching accessories fall under the heading of *nice* to have rather than *need* to have.

Perhaps Dave Newkirk summed it up best: "Nits aside, the TS-870S is a great beginning for something new in Amateur Radio: Radios with *IF* DSP that do *IF filtering*—IF DSP that's teamed with AGC performance that needs no apology and that produces the stellar receive audio today's best analog designs can only approximate."

Thanks to these hams who contributed operating impressions and comments for this review: Rick Lindquist, KX4V; Dave Newkirk, WJ1Z; Glenn Swanson, KB1GW; Jon Bloom, KE3Z; Mike Gruber, WA1SVF; Tom Frenaye, K1KI (and his contest team) and Emil Pocock, W3EP.

Manufacturer's suggested retail prices: TS-870S, $3199.95, MC-90 desktop microphone, $269.95; PS-52 heavy-duty power supply, $309.95, SP-31 external speaker, $99.95. *Manufacturer*: Kenwood Communications Corp, P.O. Box 22745, Long Beach, CA 90801-5745, tel 310-639-5300.

MFJ-9420 20-Meter SSB Travel Radio

Reviewed by Steve Ford, WB8IMY
Managing Editor

I used to think that operating SSB on the HF bands with only 10 W was a fool's game. As far as I was concerned, low-power hamming was strictly the province of CW lovers. After all, the ability of a CW signal to be heard under virtually any condition makes it an ideal mode for low-power. Attempting the same thing with an SSB signal (with its highly variable audio characteristics and broad-as-a-barn bandwidth), seemed like a grand waste of time.

It's funny how we carry certain assumptions for years without really putting them to the test. I was due for a wake-up call—in the form of the MFJ-9420 transceiver.

Back to Basics

It's difficult to find an SSB transceiver that's more basic than the MFJ-9420. The tiny radio features only four controls: **VFO**, **POWER ON/OFF**, **VOLUME**, and **TUNE ON/OFF**. (The **TUNE ON/OFF** button lets you put out a reduced-power carrier for an external antenna tuner.) A five-pin DIN-type microphone connector, a backlighted analog S meter and two LEDs round out the collection. That's it! On the rear panel you find an SO-239 antenna jack, dc power connector, microphone level control and—if you install the MFJ-415 CW adapter—a button to enable CW operating and a key jack. An internal speaker graces the top of the cabinet.

The MFJ-9420 receiver is a single-conversion superheterodyne. A four-pole bandpass filter at the input functions as an effective preselector for 20-meter signals. The active mixer stage converts the signals to the 10-MHz IF. From there, a crystal ladder filter sets the IF bandwidth before the signals are applied to a single-chip IF amplifier. Another IC acts as the product detector, and its output drives yet another chip which functions as an audio preamp and filter. AGC is audio-derived and can be adjusted internally. The final audio amp drives the speaker directly, providing plenty of room-filling volume, although the output as measured by the ARRL Lab fell a tad short of the specified 1 W or so.

In the transmitter, a microphone speech amplifier drives a balanced modulator, and a filter then removes the lower sideband and carrier. (The MFJ-9420 operates in upper sideband *only*.) After undergoing a healthy amount of dynamic compression (more about this later), the USB signal is routed to the transmitter mixer. RF predriver, driver and final output stages follow.

The MFJ-9420 is designed to generate about 10 W "average speech" output. My unit cranked out approximately 8 W. This is not QRP by strict definition (5 W PEP or less). Sticklers can crank down the microphone level to achieve true QRP. That's just what I did during the 1995 November Sweepstakes—with interesting results. (See the sidebar, "Phone Sweepstakes 1995—The 30-Minute Sprint.")

Power requirements are simple: 12 V at 2 A. I used a Radio Shack regulated dc supply and it didn't even break a sweat. You could also use a rechargeable gel-cell battery.

Bottom Line

Impressive performance in an economical, go-anywhere low-power transceiver that's loads of fun to use.

MFJ-415 CW Adapter

Unwilling to explore 20 meters with one hand behind my back, I decided to add the MFJ-415 CW adapter. The adapter is a small L-shaped circuit board that installs atop the primary transceiver board. Installation is straightforward and takes less than a half-hour. You secure the board on standoff posts and mate two small connectors.

The adapter expands frequency coverage down to 14.0 MHz simply by adding capacitance to the VFO tank circuit. When you key the transceiver, the adapter unbalances the balanced modulator, resulting in a carrier on the desired frequency. Nothing too complicated about that. The keying delay and sidetone volume are adjustable through potentiometers on the adapter board. These pots are *not* accessible without removing the cover, however.

As you might suspect, the adapter is a bit of a compromise. The offset is fixed at roughly 700 Hz at the factory. To change it, you need a frequency counter or a general-coverage receiver. The 700-Hz offset was fine for me, but it might be unacceptable to other operators. IF bandwidth is the same as for SSB.

The MFJ-415 adapter does *not* provide full break-in (QSK). In addition, keying was somewhat harsh. The roughness was noticeable but, in my opinion, not objectionable. However, a CW purist might cringe at every dit and dah. Also, we discovered during

Table 2
MFJ-9420 "Travel Radio" 20-Meter SSB Transceiver

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
Frequency coverage: Receive, 14.150-14.350 MHz, SSB; 14.0-14.100, CW; transmit, not specified.	Receive and transmit, 14.153-14.344 MHz, SSB; 14.0-14.145 MHz, CW.
Modes of operation: USB and CW (with CW adapter)	As specified.
Power requirement: Receive, 100 mA (typical max); transmit, 2.2 A (max) at 13.8 V.	Receive, 109 mA; transmit 1.8 A, tested at 13.8 V.
Receiver	*Receiver Dynamic Testing*
SSB/CW sensitivity (bandwidth not specified, 12 dB S/N): <0.5 μV (–113 dBm).	Minimum discernible signal 0.6 μV (–131 dBm).
Blocking dynamic range: Not specified.	103 dB.
Two-tone, third-order IMD dynamic range:	82 dB.
Third-order intercept point: Not specified.	–8 dBm.
Second-order intercept point:	+77 dBm.
S-meter sensitivity: Not specified.	S9 signal, 115 μV.
Receiver audio output: >1 W at 10% THD into 8 Ω.	0.6 W at 10% THD into 8 Ω.
Spurious and image rejection: Not specified.	IF rejection 55 dB; image rejection 99 dB.
Transmitter	*Transmitter Dynamic Testing*
Power output: CW, 8-10 W; SSB, 10 W PEP.	CW and SSB, ≈8 W.
Spurious-signal and harmonic suppression: Not specified.	45 dB. Meets FCC requirements for spectral purity.
SSB carrier suppression: Not specified.	≈40 dB.
Undesired sideband suppression: Not specified	46 dB.
Third-order intermodulation distortion products: Not specified.	See Figure 4
CW keying characteristics: Not specified.	See Figure 5
Transmit-receive turnaround time (PTT release to 50% audio output): Not specified.	S9 signal, ≈78 ms.
Receive-transmit turnaround time ("tx delay"):	≈18 ms.
Composite transmitted noise: Not specified	See Figure 6
Size (height, width, depth): 2.5×6.5×6 inches; weight, ≈2 lb.	

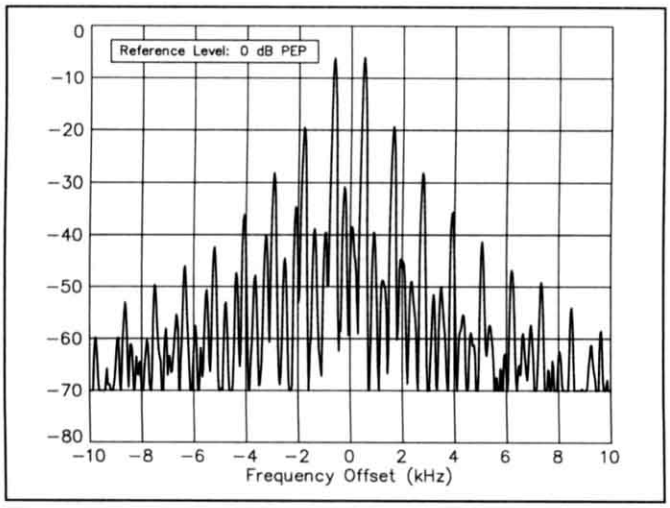

Figure 4—Spectral display of the MFJ-9420 transmitter during two-tone intermodulation distortion (IMD) testing. Third-order product is approximately 19 dB below PEP output, and the fifth-order product is approximately 28 dB down. The transceiver was being operated at approximately 8 W PEP output at 14.2 MHz.

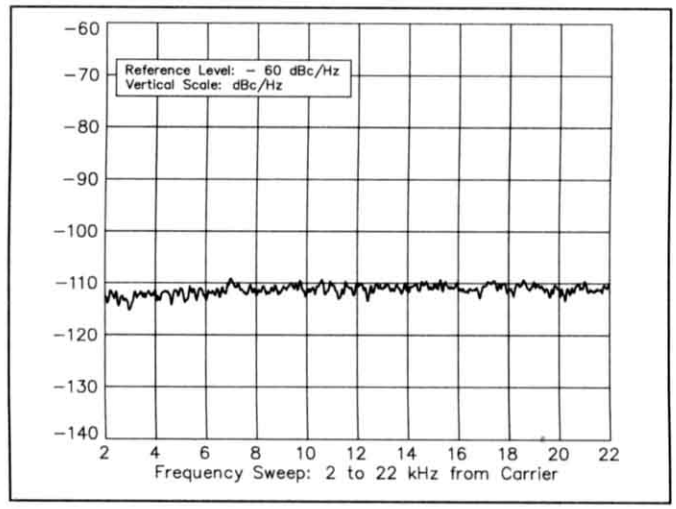

Figure 6—Spectral display of the MFJ-9420 transmitter output during composite-noise testing. Power output is approximately 8 W at 14.2 MHz. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 2 to 22 kHz from the carrier.

ARRL Lab tests that even a high resistance (1 MΩ or so) across the key terminals would key the transmitter, possibly posing a problem for some keyers.

The point to keep in mind is that the MFJ-415 adapter adds value to the 9420 transceiver by almost doubling the frequency coverage and adding a second mode. The casual operator—the person this transceiver was designed for—will probably be willing to forgive the adapter's faults in view of its benefits.

On The Air

They call the MFJ-9420 a "travel radio," so I decided to get into the spirit of the design. (No, I didn't pack it into a suitcase, although I *could* have, with plenty of room to spare.) I cut a wire dipole antenna and center fed it with RG-58 coax. One end of the dipole was about 40 feet up in a backyard maple tree. The opposite end was anchored to the roof of my tool shed, about 8 feet off the ground. I was careful to trim the antenna for a 1:1 SWR, because the 9420 design does *not* include foldback circuitry to protect the RF output transistor, an MRF-477 that MFJ describes as "bullet-proof" (MFJ says it "tolerates a 3:1 VSWR and accidental feedline shorts or opens"). Besides, at such low power levels you can't afford to waste power in the feed line.

The MFJ-9420 occupied a place of honor on our guest room night stand. I assumed that it would end up in a similar location in a hotel, fishing cabin or wherever. My first surprise came when I stretched out on the bed and switched on the radio. I expected muddy audio and a few signals here and there. Not so! The 9420's receiver was remarkably sensitive and selective. I spent considerable time listening to everything from DX pileups to traffic nets. The VFO is touchy, so you must tune very slowly. If you become too eager, you'll find yourself zipping through a dozen signals in one twist of the knob.

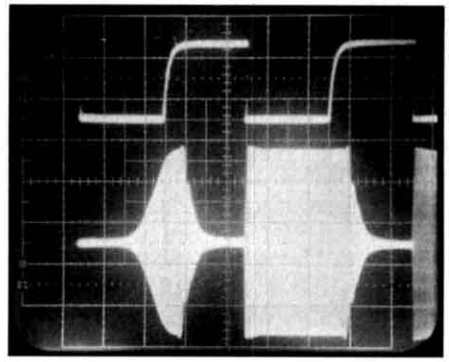

Figure 5—CW keying waveform for the MFJ-9420 in the semi-break-in mode showing the first and second dits. The upper trace is the actual key closure; the lower trace is the RF envelope. Horizontal divisions are 10 ms. The transceiver was being operated at approximately 8 W output at 14.2 MHz. Note the significant shortening and slower rise time of the first dit.

Receive audio was abundant, but that advantage soon turned into a curse. If the MFJ-9420 is truly a go-anywhere rig, how do you prevent your fellow travelers from being inundated by a symphony of signals? (I often have a sleeping toddler in the next room. If I awaken her, it's my duty to get her back to sleep.) The obvious answer was headphones, but I quickly discovered that the 9420 lacks a headphone jack! I grabbed a jack from my junk box and improvised, eventually creating a pig-tail assembly that protruded from the back panel. (I couldn't bring myself to drill a hole in a new radio.)

After assuming a comfortable position on the guest bed once again, I began searching for phone contacts. I answered a CQ from a ham in Scotland who gave me a 56 report. Impressive! When I told him what I was running, I could hear the astonishment in his voice. As I once had, he simply had taken it on faith that operating sideband QRP was next to impossible.

Part of the secret of the 9420's success is the hefty amount of speech processing it uses. By watching the output meter, I could tell that my average power level was barely fluctuating. I asked the fellow how I sounded, and he simply described the audio as "punchy." At least it didn't sound as though the rig was trying to suck the room into the microphone along with my voice!

I enjoyed similar conversations (and signal reports) with other hams in the US, South America and Europe. As long as the band remained stable and interfering stations kept their distance, I could talk as long as I liked. Generally speaking, I was able to work any station I could receive at moderate strength (S5 or greater on the 9420's meter). I even managed to bag some of the weaker ones, but with difficulty.

CW operating with the MFJ-9420 takes a little practice. You need time to perfect your zero-beating skills, for example. You don't have the luxury of an RIT control to assist. And don't forget that the offset is adjustable only by recalibrating the adapter. You also must acclimate yourself to the clattering relay. Hams accustomed to silent T/R switching may find themselves distracted at first. But after a few minutes on the air, I hardly noticed the noise.

Running CW with the 9420 was every bit as enjoyable as operating phone. During one Sunday afternoon I prowled up and down the band making contact after contact. I even managed to fight my way through a small pileup and work a station in Morocco. The only annoyance was the inability to narrow the receive bandwidth. An audio filter would be a big help.

Phone Sweepstakes 1995—The 30-Minute Sprint

If you're going to put a new transceiver through a baptism of pure hellfire, the ARRL November Sweepstakes is the best time to do it. This contest draws a tidal wave of phone and CW operators on two separate weekends. Unfortunately, family activities knocked me out of the CW slugfest (another operator easily worked a half dozen or so stations with the 9420, however), and I could only spare a half hour for the phone brawl. If I was going to properly abuse the MFJ-9420—figuratively speaking—it would have to be within the first 30 minutes of the contest.

I jumped in with both feet at 2100 UTC, starting at 14.150 MHz and working my way up. I began hunting and pouncing on the strongest stations, and this strategy paid off right away. The big guns didn't always answer my first call, but I usually attracted their attention by my third or fourth appeal.

Despite the RF pandemonium, everyone seemed to copy me well. The 9420's receiver also did an adequate job of distilling relative order from chaos. A number of stations expressed amazement when I told them I was QRP (Using the microphone gain control, I had reduced the output to slightly less than 5 W PEP—*true* QRP.) One fellow in Minnesota thought I was pulling his leg: "You're kicking my meter up to S 9. You *can't* be running QRP with just a dipole!"

I doubt that I was pushing many receiver meters beyond S 5, but my signal was strong enough that I rarely had to repeat an exchange. I shut down at 2130 UTC with 32 contacts in the log—slightly more than one contact per minute. Not bad for a radio that you can hold in one hand!—*WB8IMY*

Conclusion

The MFJ-9420 is a terrific little transceiver for casual 20-meter operating. With a small power supply or rechargeable battery pack, you can take it anywhere. Although it's promoted as a travel radio, the 9420 is fine for home use—especially for a low-profile station. (It also was a pleasure to work 20-meter phone without tearing up my TV and telephones!)

You won't bust many DX pileups with the 9420 nor win any contests, but you *will* work more stations than you might imagine—and have a heck of a good time while you're at it. (I wonder if anyone has earned their phone DXCC with this radio? Hmmm...)

If you're at all inclined to operate CW, the MFJ-415 adapter is worth the additional cost. Even with the adapter, the MFJ-9420 is still within most hams' budgets. In fact, the MFJ-9420 could be an excellent starter radio for new hams licensed at General class or higher—as long as they understand the nature of QRP operating and have realistic expectations.

As I've already mentioned, a headphone jack would be a welcome addition. For CW operating, an external audio filter also would substantially enhance the performance. Nitpicking aside, the MFJ-9420 is a fun radio that has more than a few surprises in store for jaded hams such as myself! *Manufacturer*: MFJ Enterprises, PO Box 494, Mississippi State, MS 39762, tel 800-647-1800. Suggested list prices: MFJ-9420 transceiver, $229.95; MFJ-415 CW adapter, $39.95.

JPS ANC-4 Antenna Noise Canceller

Reviewed by Emil Pocock, W3EP, ARRL Technical Advisor

Voodoo electronics! That was my first reaction after hearing the JPS ANC-4 completely eliminate loud computer hash in the middle of 40 meters. It is also remarkably effective in reducing the radio-frequency interference generated by nearby power lines, electric motors, televisions and many home electronic devices.

Typical noise blankers and limiters often are ineffective in dealing with many of these problems. Even when they do reduce interference from pulse-type radio sources, noise blankers create another difficulty. Strong adjacent signals can trigger the automatic gain control, effectively reducing the receiver's dynamic range. The ANC-4 avoids this problem by removing many types of local noise *before* the offending signals enter the receiver. Desired signals previously buried in the noise magically stand out in a much-quieter receiver passband when using the ANC-4!

Description

The ANC-4 is enclosed in a rather weighty two-piece black steel box. It easily installs between the station antenna and receiver or transceiver. A short, collapsible whip—which mounts through a hole on top of the unit—serves as a built-in noise-sensing antenna. On the rear apron are UHF connectors for **MAIN ANTENNA** and **RADIO** (receiver or transceiver), a phono jack for an optional (ie, external) wire **NOISE ANTENNA**, and a coaxial dc power jack. Any 12-V source delivering up to 150 mA will do. JPS can supply a 120-V ac adapter. The adjustable **NOISE PHASE** and **NOISE GAIN** controls are on the front panel, along with **PHASE RANGE** and **FREQUENCY RANGE** pushbuttons. The ANC-4 has a built-in RF-sensing relay, so it can be used with a transceiver.

The ANC-4 is designed to reduce only

Bottom Line

The ANC-4 is remarkable in reducing local RF noise on a wide range of frequencies and modes. To defeat local noise *before* it reaches your transceiver's antenna jack, the ANC-4 is hard to beat.

Table 3
JPS ANC-4 Antenna Noise Canceller

Manufacturers Claimed Specifications	*Measured in the ARRL Lab*
Operating frequency range: 100 kHz to 80 MHz.	As specified.
Noise cancellation: 40 dB or greater typical.	As specified.
Signal loss from main antenna: 6 dB.	As specified.
Maximum RF input to main antenna: 3 V rms.	As specified.
Maximum RF transmit power through unit: 150 W PEP.	As specified. Tested at 14 MHz for approximately 5 mins.
Time to switch to bypass when transmit RF is detected: 7 ms typical.	6 ms.
Time to return to receive when transmit RF is removed: 500 ms typical.	≈600 ms. (JPS new includes a resistor to cut hang time to 7 ms, if desired.)
Power requirements: 11 to 16 V dc at 150 mA.	75 mA at 13.8 V.
Size (height, width, depth): 1.7×6×4.3 inches. Weight: 2 lb.	

locally generated RF noise and does little to reduce noise from distant sources, including static. The unit performs its magic by comparing two signal sources. The first, originating primarily via the main antenna, contains the desired signals plus the unwanted RF noise. The second, arriving via the noise-sensing antenna, consists mostly of the undesired RF noise, which is amplified and passed through an adjustable phase-shift network. You set the **NOISE GAIN** control so noise from the noise antenna just equals noise from the main antenna. Then, you adjust the phase-shift network with the **NOISE PHASE** control until the two noise sources are 180° out of phase. The two signals enter a hybrid combiner, where the noise components cancel each other. The desired signal—coming almost exclusively from the main antenna—passes through the combiner with some loss but is otherwise unaffected.

Performance

Adjusting the **NOISE PHASE** and **NOISE GAIN** controls to achieve complete noise cancellation was sometimes tricky, especially above 15 MHz. The two controls interact to some extent, but the general idea is to increase the **NOISE GAIN** until some perceptible change is noted, then to vary the **NOISE PHASE** knob until you null the noise. Changing the frequency and phase range switches sometimes helped, but there was no way to know in advance what settings would achieve optimal results. Once found, further adjustment was not needed while tuning as much as several hundred kilohertz from the initial frequency.

The ANC-4 did a remarkable job of eliminating the simultaneous noise from my computer, television, and telephone answering machine, which are scattered about the house. I brought my especially noisy computer down to the shack, as if for contest logging or to run a packet station. The ANC-4 had no trouble knocking out all traces of the S9 noise on any band. Below 10 MHz, the insertion loss was hardly perceptible. However, at 50 MHz—where CW or SSB signals might be very weak—the insertion loss *was* noticeable. Even so, being able to take out 50 dB of local noise generally justified the one S-unit or so loss of signal strength.

The top-mounted whip prevent you from putting the unit below a shelf or other overhang. I found a wire noise antenna much more flexible, since its length and placement often made all the difference to good performance, especially at higher frequencies. I eventually settled on a 10-foot wire stretched across the ceiling in the basement shack as optimal for 28 and 50 MHz, but the noise antenna size and placement will vary with circumstances. The ANC-4 works best when the noise antenna is close to the noise source. Lab tests showed the unit especially needed a strong noise signal above 30 MHz to effectively cancel it. So, if the problem is a furnace blower, it may help to place the antenna near the furnace and connect it to the ANC-4 via coaxial cable. Its effectiveness against power line noise may be increased by placing several feet of noise antenna parallel to some house wiring or even laying the noise antenna on the ground beneath the errant power lines. The ANC-4 also can be used in a mobile setup. In that case, the manual suggests routing a wire noise antenna into the engine compartment to insure good pickup of offending ignition and alternator noise.

Other Uses

The ANC-4 also can serve as an "active antenna." In that mode, no antenna is connected to the main antenna jack. Instead, the top-mounted whip (or a short wire) serves as the main receiving antenna, and the **NOISE GAIN** control adjusts the amplification of the received signals. With some experimentation, the ANC-4 also can be used for diversity reception. You connect a second antenna of opposite polarization or separated by several wavelengths from the main to the noise antenna jack. Then, you adjust the controls to combine signals from both antennas so they are in phase. The ANC-4 also can be used to create a receiving antenna system with a high front-to-back ratio. Such a system requires a second antenna that's similar to the main one, but separated from it by at least half a wavelength. In this case, you use the **NOISE PHASE** adjustment to null signals arriving from the unwanted direction.

The controls and noise antenna placement can be critical, but once you find optimal operating conditions, the unit generally requires no further adjustment within a given amateur band. Its use does not affect the dynamic range or other performance features of the main receiver. Thanks to Charles Michaels, W7XC, and Rick Lindquist, KX4V, for contributing to this review.

Manufacturers suggested retail price: $175. *Manufacturer*: JPS Communications, PO Box 97757, Raleigh, NC 27624; tel, 919-790-1048; fax, 919-790-1456.

SOLICITATION FOR PRODUCT REVIEW EQUIPMENT BIDS

[In order to present the most objective reviews, ARRL purchases equipment off the shelf from dealers. ARRL receives no remuneration from anyone involved with the sale or manufacture of items presented in the Product Review or New Products columns.—*Ed.*]

The ARRL-purchased Product Review equipment listed below is for sale to the highest bidder. Prices quoted are minimum acceptable bids, and are discounted from the purchase prices. All equipment is sold without warranty.

Alinco DX-70T MF/HF/VHF transceiver (see Product Review, December 1995 *QST*). Minimum bid: $759.

ICOM IC-775DSP MF/HF transceiver with optional filters FL-222, FL-223 and FL-102 (sold as a package only; see Product Review, January 1996 *QST*). Minimum bid: $2855.

MFJ-411 Pocket Morse Tutor (see Product Review, December 1995 *QST*). Minimum bid: $50.

morsix Codeman mt-5 Morse code trainer (see Product Review, December 1995 *QST*). Minimum bid: $102.

Sealed bids must be submitted by mail and must be postmarked on or before March 1, 1995. Bids postmarked after the closing date will not be considered. Bids will be opened seven days after the closing postmark date. In the case of equal high bids, the high bid bearing the earliest postmark will be declared the successful bidder.

In your bid, clearly identify the item you are bidding on, using the manufacturer's name and model number, or other identification number, if specified. Each item requires a separate bid and envelope. Shipping charges will be paid by ARRL. Please include a daytime telephone number. The successful bidder will be advised by telephone with a confirmation by mail. No other notifications will be made, and no information will be given to anyone other than successful bidders regarding final price or identity of the successful bidder. If you include a self-addressed, stamped postcard with your bid and you are not the high bidder on that item, we will return the postcard to you when the unit has been shipped to the successful bidder.

Please send bids to Bob Boucher, Product Review Bids, ARRL, 225 Main St, Newington, CT 06111-1494. QST

QEX:

The ARRL Experimenter's Exchange

The December 1995 issue of *QEX* includes:

The 9-cm band has lots of promise for amateurs, but you'll need a good preamp, such as the "PHEMT Preamp for 9 cm," by Rainer Bertelsmeier, DJ9BV.

Think the commercial manufacturers of amateur gear have a corner on making transceivers with direct digital synthesis, microprocessor control and good performance? Not so, as Tim Ahrens, WA5VQK and Rand Gray, W1GXN, show in, "A Microprocessor Controlled Multiband Transceiver."

Cheap microwave dishes! That's what those new direct-satellite TV systems have, and they look perfect for 10-GHz work, too. But how to illuminate them? In "More on Parabolic Dish Antennas," Paul Wade, N1BWT, shows how to do it. He also has some useful tips on other feed systems and on using sun noise for system measurements.

Take a look at our annual index, appearing in this issue. It *has* been an exciting year! —*KE3Z, email:* **jbloom@arrl.org**

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Hints & Kinks

Edited by **Bob Schetgen, KU7G** • Assistant Technical Editor

RADIO SAFETY FOR JUMP STARTS

◊ Remember to disconnect amateur radios and amplifiers before connecting jumpers to boost a weak car battery! My battery was at 9.46 V when it died and would no longer start my car. I connected jumper cables to the car and the battery in my truck, which was at 13.9 V with the motor running. The result was weird, unintelligible figures in the display of my ham transceiver. [Automotive equipment is designed to withstand 60-V transients that may occur when changing a dead battery. A transient from connecting the cables is the likely culprit.—*Ed.*]

It almost scared the daylights out of me when I saw that, but resetting to the default frequency cleared the display, and I could breathe again—and reprogram the TW-4100A.—*J. B. Guillaume, N5CPE, Rougon, Louisiana*

VOICE-ACTIVATED TRANSMITTER CONTROL FOR A VHF MOBILE TRANSCEIVER

◊ Today's amateur, who operates mobile in urban or suburban environments, frequently needs both hands on the steering wheel. It's inconvenient, and sometimes dangerous, to use a hand-held microphone while driving. Two solutions are a VOX control circuit or VOX incorporated in a microphone headset. Unfortunately, most VHF mobile rigs do not allow for this feature. Here is a solution to the problem. Although this article describes adapting the VOX system only to a Yaesu 5200 VHF transceiver, the approach should work easily with other VHF units.

In general, VOX headsets are designed to operate with hand-held radios; they are therefore small and lightweight. They require 5 V dc, which is usually supplied by the transceiver. Most have two connectors for the transceiver: one for receive audio, the other for transmitter control (PTT), transmit audio and operating power. The transmit plug, which provides three functions, is usually a stereo (two-circuit, three-contact) variety. One circuit carries dc power; the other carries transmit audio and PTT. The PTT is usually a voltage from 0.1 V dc to less than 2.0 V dc. The transmit audio rides along on the PTT voltage.

The foundation for this VOX adaptation is the Alinco Model EME-10K VOX unit. Alinco supplies this model for use with various Alinco hand-held transceivers. Other VOX headsets should work as well. For example, I found that the ICOM Model HS-51 pinouts are identical to those of the Alinco unit.

Table 1
Mobile VOX Connections

	Yaesu 5200 Pinouts (8-Pin DIN Jack)		*Alinco 10K Pinouts (2-circuit, 2.5-mm Plug)*
TX Audio In	Pin 8	TX Audio Out	Connector tip
PTT	Pin 6	PTT	Connector tip
Power, (+5 V)	Pin 2	Power (+5 V)	Middle sleeve
Ground	Pin 7	Ground	Inner sleeve

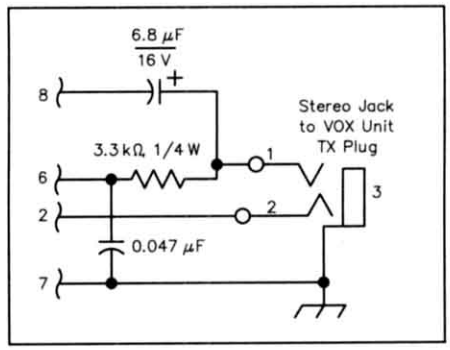


Figure 1—An adapter circuit permits an Alinco VOX headset to work with a Yaesu mobile VHF transceiver. Similar arrangements may work with other headsets and radios. See text for more information. The two-circuit, 2.5-mm jack is Mouser Electronics (tel 800-346-6873) part number 161-3307. The remaining parts are from Radio Shack.

An adapter cable with two added components mates the Alinco VOX headset to the Yaesu 5200. Table 1 and Figure 1 give the details of the adapter. The capacitors and the resistor are mounted inside the 8-pin DIN plug and associated cable. The receive-audio components of the headset are not used. (Check the laws in your area about driving while wearing a headset.) The microphone gain adjustment and position allow for operation with the transceiver speaker. *Temp Titus, W4HZV, Leesburg, Virginia*

DRILL IC-HOLE PATTERNS EASILY

◊ When you make a PC board in your home shop, how often do you find the little holes in the centers of the IC pads didn't etch? Without those small holes to guide it, your drill bit may wander. The result is often misaligned holes that make IC insertion difficult.

I've devised a way to be sure my hole pattern is correct every time. A simple home-built jig made of clear Lucite or Plexiglas is the answer.[1] Start with a piece of 0.1-inch-on-center Vector board to use as a pattern. Since you can't see through the Vector board, it is very difficult to use as a guide to drill IC pads. I place a piece of 0.125-inch Plexiglas under the opaque vector board and tape the two pieces together securely. (Most Plexiglas comes with sticky-backed paper on it to keep the material from being scratched while you are working with it. If the piece you have has the paper on it, leave it on while you do your drilling.)

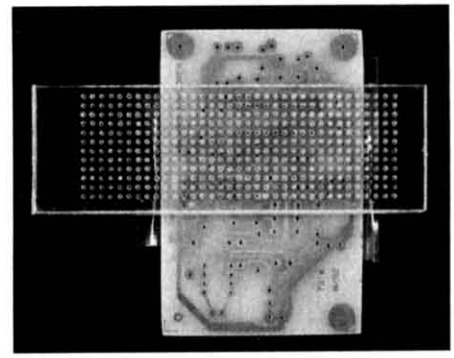


Figure 2—The IC-hole pattern template.

Start drilling a few square inches of the pattern on the Vector board through the Plexiglas with a #65 drill. The Plexiglas jig will last long enough to drill several boards. They do wear out after prolonged use, so you may want to make several jigs at once. I size mine about 1 1/2×4 inches. (See Figure 2.) There is no reason you couldn't make a drill guide for a complete PC board, especially if you must make several boards exactly alike. You will be surprised how easily ICs, sockets, and other connectors fit into a prototype board drilled using this fine little jig.—*David W. Martin, WA6TYJ, Paso Robles, California*

CURE REPEATER AUDIO FEEDBACK IN THE YAESU FT-470

◊ When using the Yaesu FT-470 dual-band hand-held in cross-band repeat (CBR) mode, audio acoustically couples from the speaker

[1]Here are some sources for plastic: Cadillac Plastic (call 810-583-1200 and ask for a local office). US Plastic Corp, 1390 Neubrecht Rd, Lima, OH 45801; tel 800-537-9724, fax 419-228-5034.

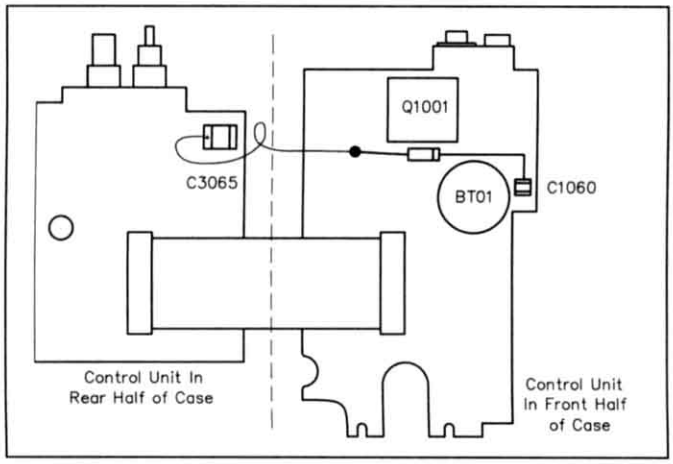


Figure 3—Diode installation to inhibit FT-470 receive audio when transmitting.

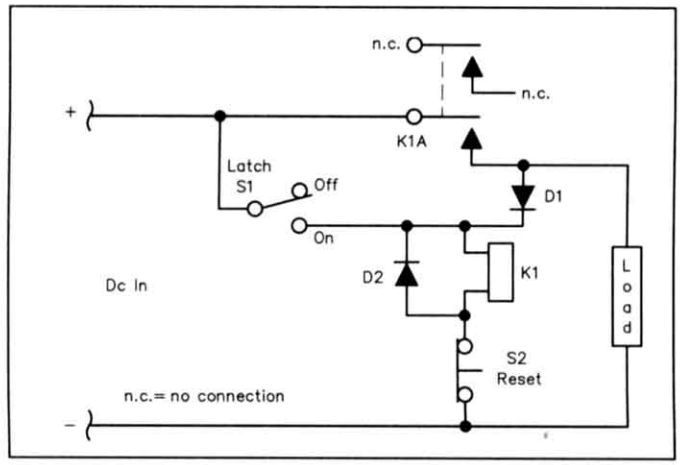


Figure 4—D1 steers load current away from the actuating components in this refined, home-built latching relay.

to the mic. Although this is fine for some modes of CBR, a feedback path exists when using the FT-470 with a dual-band mobile radio that is set up for access-assist operation.[2] In this mode of CBR, the mobile radio takes the transmitted signal from the FT-470 and sends it to the repeater, while the FT-470 receives the repeater signal directly. Because the FT-470 receiver is active while transmitting, feedback results. Solutions include using an earphone, disabling the FT-470 subband receiver or reducing the volume while transmitting. These solutions require accessories or operating controls in addition to the PTT switch. It is better to modify the radio so as to disable the receiver audio when transmitting, thus breaking the feedback path. We can accomplish this by adding a single diode (1N5817) to the FT-470 between the audio amplifier and PTT switch. C3065 on the IF board and C1060 on the Control board are convenient hookup points.[3] (See Figure 3.)—*Wally Erikson, WBØLPB, Eden Prairie, Minnesota*

BUILD REFINED SELF-LATCHING RELAYS

◊ In several of my designs, I have had occasion to use a circuit that causes a relay to self-latch. A typical circuit (see Figure 4) takes coil-holding voltage from the load side of the relay contacts, once the relay has closed them. S1 may then be released.

In a dc application, the addition of D1 considerably improves this circuit. With a short circuit in place of D1, the load current passes through S1's contacts from the instant S1 closes until the relay contacts close (milliseconds later) and deliver power to the load, or loads.

By adding D1, with an appropriate PIV rating, you can use a much smaller switch or actuating contact at S1. D1 blocks delivery of any power to the load via the actuating switch, yet permits current to reach the relay coil. Reset switch S2 (normally closed) sees only the coil current, and thus can also have a low current rating. D2 shorts any transients generated when the coil field collapses.

Although SCRs inherently self latch, relays are still useful to control circuits with multiple loads at different voltage levels. —*A. W. Edwards, K5CN, Corpus Christi, Texas*

CPU RESET CURES KENWOOD RADIO MEMORY PROBLEMS

◊ I've owned a TM-631 for a few years and have enjoyed operating it. This radio has a five-year lithium battery to power the memory. After two years, however, my radio started to experience amnesia: It operated correctly except that the memory would reset itself every day or two. In my experience, this typically indicates that the lithium battery needs replacement. It seemed logical to me that either the age of my battery was greater than five years, or it was defective. Changing the battery did not correct my situation, however.

To me, Kenwood's operating manual was not clear that resetting the CPU (depress the **MR** key when turning on the radio) prior to battery replacement may eliminate unusual memory problems. Maybe it's obvious to most casual observers, but I considered resetting the CPU a catastrophic measure—done only when the radio is completely useless to the operator.

After much head scratching, I decided to reset the CPU. To my surprise it worked! Since then, I've met other hams with the same problem. They were lost until I suggested resetting the CPU. If your Kenwood radio exhibits memory problems, try resetting the CPU before you consider replacing the lithium battery.—*Tom Vincent, N2AYF, Buena Park, California*

[2] Figure 6 of "Crossband-Repeater Operation," (March 1993 *QST*, p 45) shows this kind of system.

[3] The required part and step-by-step instructions are available from Wally Erikson, WBØLPB, (12115 Chesholm Ln, Eden Prairie, MN 55347) for $1 and an SASE.

Feedback

◊ Two of the telephone numbers that were listed in the table on page 73 of the article, "Airborne Amateur Television" (*QST*, November 1995) are incorrect. The telephone for Micro Video Products is not in service, and we have not been able to determine their new number. The telephone number for Super-Circuits has been changed to 512-260-0333.

◊ Please refer to "The Four-Way DFer," *QST*, November 1995 pp 29-35. In the caption for Figure 2, delete the references to R34, R36, R37 and R46. The correct value for R46 is 1 kΩ as shown in the schematic.

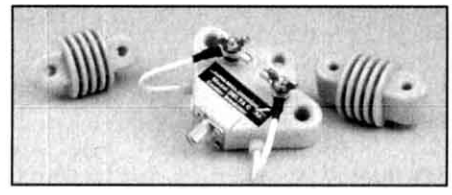
New Products

DELTA-C ANTENNA HARDWARE KIT FROM ALPHA DELTA

◊ Want to build wire antennas that rival the quality of factory-made models? Alpha Delta's new Delta-C hardware kit may be just the ticket. Each kit contains one Delta-C center insulator; one SEP Arc-Plug static-electricity discharge unit (mounted inside the back of the center insulator); and two Delta-CIN end insulators.

All components are made from high-performance UV- and RF-resistant material and feature stainless-steel mounting/connecting hardware.

Price: $29.95. Alpha Delta products are available from your local Amateur Radio dealer or from Alpha Delta Communications, PO Box 620, Manchester, KY 40962; tel 606-598-2029, fax 606-598-4413.



Technical Correspondence

Edited by ***Paul Pagel, N1FB*** • *Associate Technical Editor*

DIRECT-CONVERSION RECEIVER NOISE FIGURE

By Rick Campbell, KK7B
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Michigan Technological University
1400 Townsend Dr, Houghton, MI 49931
email **rlcampbe@mtu.edu**

◊ The noise figure of a receiver may be calculated using the "noise figure of cascaded stages" formula. The formula states that the early stages of a receiver must have a low noise figure and enough gain to override the noise contributions of the following stages. The R1 "High-Performance Direct-Conversion Receiver"[1] was designed for maximum close-in dynamic range. One of the design rules for close-in dynamic range is to keep the gain at a minimum before the high selectivity elements. The gain before the main filter element is thus a compromise between lowest noise figure and best close-in dynamic range.

Over the years, I developed a simple test for adequate noise figure and gain in the first audio preamp of a direct-conversion (D-C) receiver. If the receiver noise output increased when the local oscillator (LO) was turned on, then the noise from the mixer was greater than the noise of the audio stages in the receiver. The R1 and R2 receivers were designed using this test. The noise figure of a lossy mixer followed by a low-noise amplifier is approximately the mixer loss plus the amplifier noise figure.[2] For the R1 and R2, the mixer loss is about 6 dB, the diplexer loss is about 2 dB and the audio preamp noise figure is about 5 dB, so the total noise figure should be about 13 dB. This assumes that the audio preamp has enough gain to override the noise contributions of the following audio stages.

When the prototype R1 and R2 receivers were measured, they had disappointing 18 to 20-dB noise figures, even though they had adequate audio-preamp gain and noise figure according to the test described earlier. One possible source of noise had been neglected in the R1 and R2 design: excess mixer noise. Excess mixer noise is usually neglected in diode-mixer engineering at HF. A review of the professional literature produced several references to 1/f noise in Schottky diodes, including several curves showing audio-noise levels sufficient to produce the results obtained with the R1 and R2. To look for evidence of 1/f noise, the prototype receivers were connected to an HP 3582A audio-spectrum analyzer. The LO was turned on and off to enable and disable the mixer diodes. Figure 1 is typical of the plots obtained. The change in noise spectrum is clear. The receiver noise figure is apparently dominated by mixer-diode 1/f noise, and there was nothing to be gained by reducing the noise figure of the audio preamplifier or adjusting the audio gain distribution. The R1 article was published at this time.

Dissent

Hundreds of R1 receivers were built around the world after the August 1992 *QST* article appeared. Wes Hayward, W7ZOI, built one (using ugly construction, of course!) and compared it with previous mixer-only D-C receivers used at his location. His "calibrated ears" told him that the preamp gain was low, so he modified the audio-preamp design for more gain, and noted an improvement in sensitivity. He then supported his on-the-air observations with measurements and communicated his findings to me. Maybe 1/f noise was not a fundamental limitation after all...

More Measurements

The first step was to duplicate Hayward's results. The preamp modification was added to the original R1 prototype; careful measurements revealed a noise figure of 13.5 dB. The next step was to find the flaw in the 1/f noise analysis and measurements. A second set of measurements was made using the experimental setup in Figure 2. This time, instead of merely turning off the LO to disable the mixer diodes, the audio preamp was switched between the mixer IF port and a 49.9-Ω metal-film resistor. The original R1 displays little change in the receiver-output spectrum when the preamp is switched between the mixer and resistor. After Hayward's modification, a small increase in noise output occurs with the mixer connected, but the additional noise is flat across the receiver bandpass. A typical

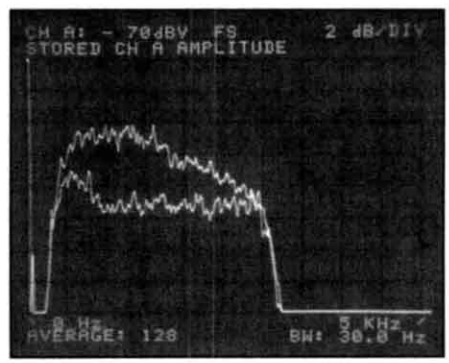


Figure 1—R1 audio-output spectrum with the receiver input connected to a 50-Ω resistor. The vertical divisions are 2 dB and the horizontal scale ranges from 0 to 5 kHz. The upper trace is with the LO on and the lower trace is with the LO off. Note the difference in the spectrum shape.

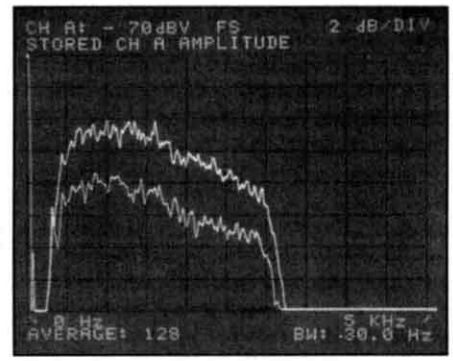


Figure 3—R1 audio output spectrum using the test setup of Figure 2. The vertical divisions are 2 dB and the horizontal scale ranges from 0 to 5 kHz. The upper trace is with the mixer connected and the lower trace is with the 49.9-Ω metal-film resistor connected. There is no difference is spectrum shape.

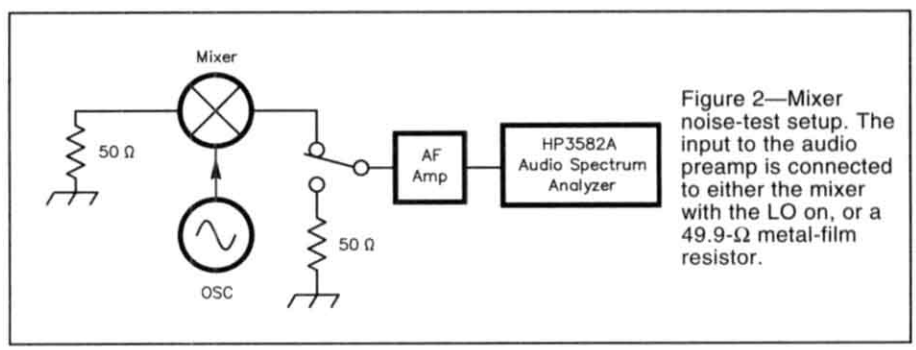


Figure 2—Mixer noise-test setup. The input to the audio preamp is connected to either the mixer with the LO on, or a 49.9-Ω metal-film resistor.

[1]Notes appear on page 84.

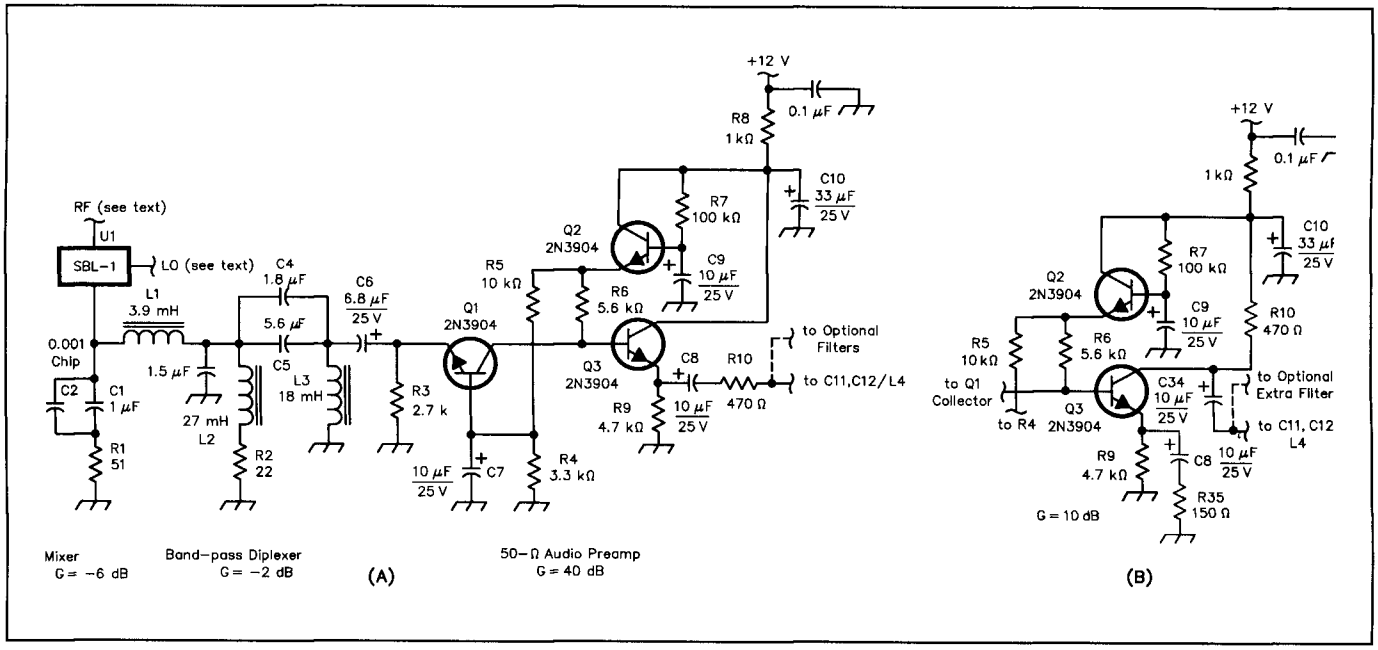


Figure 4—At A, the original R1 and R2 input-stage circuit. When the LO is off, the mixer IF port is an open circuit at audio frequencies. At B, the R1 input-stage schematic showing the modifications made by Wes Hayward, W7ZOI. This modification is included on all R1 circuit boards and kits sold by Kanga US.

output spectrum for the new measurements (Figure 3) shows no evidence of 1/f noise.

The error in the first set of measurements may be seen by looking at Figure 4A, the schematic of the R1 input stage. The grounded-base, low-noise audio preamp is connected to the mixer through a diplexer network. When the mixer has LO drive, the mixer IF port has an impedance of about 50 Ω. When the LO is off, the diodes are off, and the IF port is an open circuit. Turning the LO on and off thus has the effect of dramatically altering the impedance of the network connected to the input of the low-noise preamp. A detailed analysis isn't needed to see the result—simply recall that the gain of a grounded-base amplifier is approximately the ratio of the output impedance to the input impedance. Turning off the mixer diodes lowers the gain of the preamp and changes the noise spectrum by modifying the frequency response of the input network. For the R1 and R2 input networks, the difference in spectrum shape has nearly a 1/f response over much of the passband. Not only were the original measurements misleading, but the "simple test for adequate gain and noise figure" is meaningless for this particular D-C receiver topology.

Improving the Noise Figure of the R1

The mixer loss in the R1 is about 6 dB. The diplexer has a loss of a little more than 2 dB. The audio preamp has a noise figure of about 5 dB and a gain of 40 dB. The audio preamp drives the resistive filter-matching network, the low-pass filter and the filter termination/volume control. It's easy to lose much of the preamp gain before arriving at the input to the first LM387 section. The LM387 has a noise figure of about 13 dB when driven by a source with an impedance of 500 Ω. A large increase in preamp gain will improve the noise figure of the R1, but greatly reduces the close-in dynamic range. Most of the noise figure improvement can be obtained with a 10-dB increase in preamp gain.

The Hayward modification is shown in Figure 4B. It's been incorporated in all of the R1 boards sold by Kanga US, and is easily added to earlier R1 PC boards as a "flying mod." The 5 or 6-dB improvement in R1 noise figure is worthwhile on 40 and 30-meter rigs without RF preamps. For rigs with preamps, and for 80 and 160-m rigs used with full-size antennas, the improved sensitivity is probably not needed and the slight reduction in close-in dynamic range might be noticed.

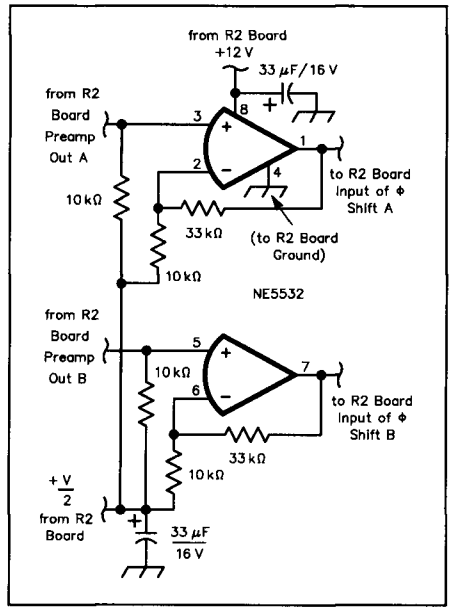


Figure 5—Audio amplifier stage added to the R2 board between the preamps and audio-phase-shift networks.

Improving the Noise Figure of the R2

In the R2, the outputs of the two preamps drive the audio-phase-shift network. The noise figure can be improved simply by using low-noise op-amps for the audio-phase-shift network and increasing the gain of the op-amp summer before the main selectivity filter. This option has not been explored in detail, but a 3 or 4-dB improvement in R2 noise figure has been noted simply by replacing the originally specified NE5514 quad op amps with TL074 low-noise op amps. (There are probably better choices, as the output drive capability of the TL074 is poor.) After changing to low-noise op amps, the gain can be adjusted by changing the feedback resistor in the op-amp summer at the outputs of the audio-phase-shift network.

Another option is to add a low-noise dual op amp between the grounded-base preamps and the phase-shift network. An NE5532 mounted on a small scrap of unetched PC board is a good choice. All of the power supply, ground, input and output connections are available on the R2 PC board near the input to the audio-phase-shift network. A 14-MHz R2 with the added dual preamp shown in Figure 5 has a measured 14-dB noise figure.

The miniR2 Input Circuit

The miniR2 has a different design and

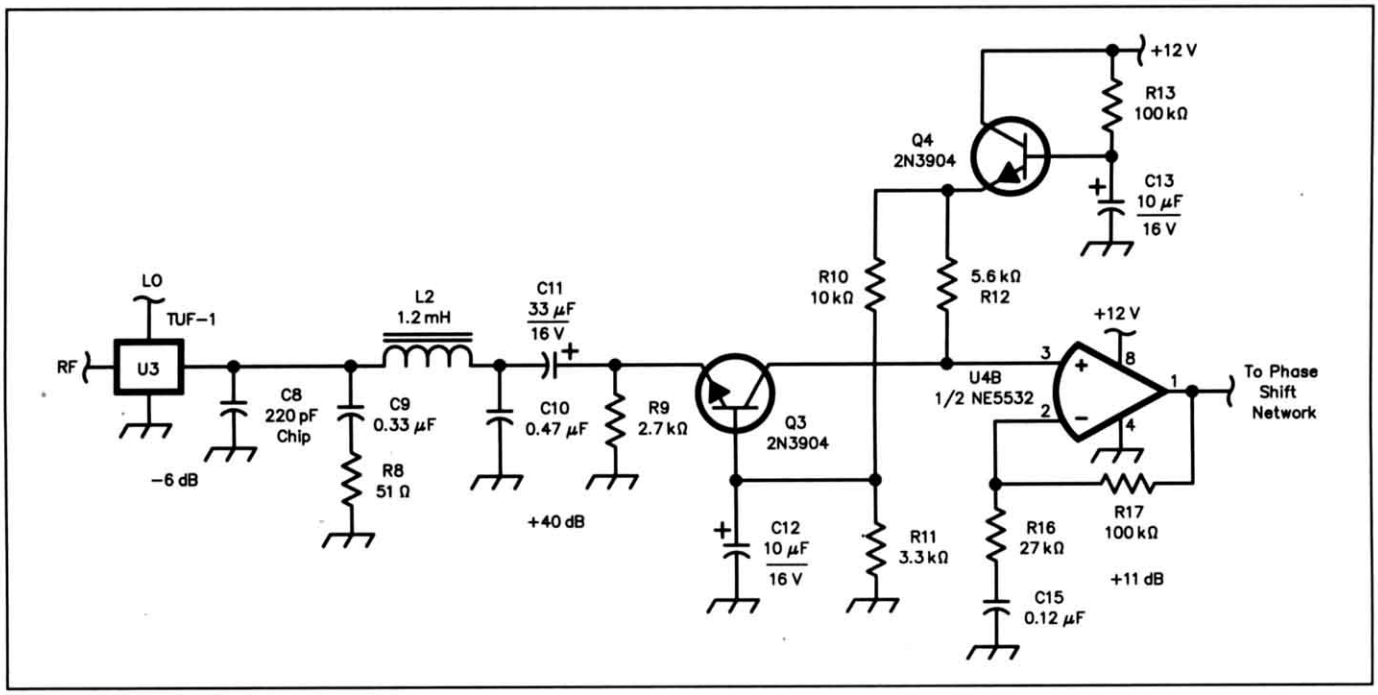


Figure 6—Audio preamplifier used in the miniR2. The overall gain of 50 dB is a reasonable compromise between close-in dynamic range and noise figure.

application emphasis than the R1 and R2. The R1 and R2 were designed for maximum close-in dynamic range. After they were introduced, many builders (including me) expressed the desire for a simpler image-reject version that didn't require hand-matched diplexer components. Other desirable qualities were reduced parts count, smaller size, reduced current drain and lower cost. The miniR2 was optimized subject to these constraints. To meet the size, cost, parts count and off-the-shelf parts requirements, the diplexers were simplified. Although they look deceptively like the version used by Roy Lewallen in his "optimized" transceiver,[3] the diplexers were actually designed to have repeatable phase and amplitude matching across the audio passband using 10%-tolerance components.

To reduce the size and current drain, the audio power-output stage was eliminated. The miniR2 drives headphones or an external powered speaker. Finally, to reduce the size, the mixers were changed to the TUF package and the low-pass filter was reduced from a 7th order to a 5th order filter.

The preamps for the miniR2 use the circuit shown in Figure 6. An NE5532 low-noise op-amp stage replaces the emitter-follower used in the original R1 and the R2. The preamp gain is set by the feedback resistor, and can be easily altered for the best compromise between noise figure and close-in dynamic range. The simplification of the diplexer network results in lower loss before the audio preamp, which reduces the system noise figure. The measured noise figure of several miniR2 receivers is about 11 dB. The improved noise figure of the miniR2 results in improved dynamic range using the ARRL Lab's standard signal spacing of 20 kHz. With standard level mixers and SSB bandwidth, the measured two-tone third-order dynamic range of a miniR2 on 14 MHz is about 96 dB. This is in the same ballpark as the best commercial receivers measured at ARRL labs.

Notes

[1]Rick Campbell, KK7B, "High Performance Direct Conversion Receivers," *QST*, Aug 1992, pp 19-28

[2]Richard Campbell, KK7B, "Low-Noise Receiver Analysis," *Proceedings of Microwave Update '91*, ARRL publication number 147, ISBN: 0-87259-370-3, pp 1-13.

[3]Roy Lewallen, W7EL, "An Optimized QRP Transceiver," *QST*, Aug 1980, pp 14-19.

[4]The R1, R2 and miniR2 boards and kits are available from Kanga US, 3521 Spring Lake Dr, Findlay, OH 45840, tel 419-423-5643; e-mail: **kanga@bright.net.**

Letters for this column may be sent to Technical Correspondence, ARRL, 225 Main St, Newington, CT 06111, or via e-mail to **ppagel@arrl.org.** Please include your name, call sign, complete mailing address, daytime telephone number and e-mail address on all correspondence. Whether praising or criticizing a work, please send the author(s) a copy of your comments. The publishers of *QST* assume no responsibility for statements made herein by correspondents.

QST

New Products

HIGH-PERFORMANCE T/R SWITCHES FROM ADVANCED RF DESIGN

◊ If you're a VHF/UHF high-power op who's looking to configure split transmitter/receiver setups, or you need to switch a receive preamp in and out of a high-power coaxial line, consider Advanced RF's new TCX series of fast, RF-sensed, PIN-diode T/R switches.

Each switch features the following: switching times of less than 15 microseconds (a thousand times faster than a typical coaxial relay)–no sequencer required; greater than 60 dB of isolation; 0.3 dB insertion loss; sensitive RF sensing–switching occurs with as little as 4 mW of drive; PIN diode design–no mechanical relays.

Models are available for 144, 222, 440, 900 and 1200 MHz, with versions for 200 W, 500 W and 1500 W of transmitter output. The TCX series is perfect for full-break-in CW, EME, satellite and general DX operation. Use model TCXSW02 for split tranceive/receive operation; model TCXSW03 for preamp bypass systems; and TCXSW04 for preamp bypass/remote linear-amplifier operation.

For pricing and full specs, contact Advanced RF Design at 39 Maple Stream Rd, East Windsor, NJ 08520; tel 800-669-2733, fax 609-448-6689. QST

Prepared by the ARRL Laboratory Staff

You've Got Questions? Here's How to Find the Answers!

This month's column features Mike Tracy, KC1SX, ARRL Technical Information Service (TIS) coordinator. TIS is one of the many valuable benefits that League members enjoy. Mike prepares information packages, maintains the ARRL's Internet e-mail Info-Server, and helps members find technical information.

Q: I just got my license in the mail yesterday and I have a million questions! Can you help me?

A: The best place to start looking for answers is right in your own shack. If you make an investment in a few "general-coverage" books, you'll create a reference library that can put most of the answers right at your fingertips.

Q: But I'd rather spend money on gear. Can I buy the books later?

A: I'm not suggesting that you spend a bundle at once! If you build your home reference library slowly, you'll have a better chance to become familiar with the books you purchase. A gradual investment will allow you to build up a substantial collection of books without depleting your bank account.

Although there is a great temptation to buy a lot of gear for your shack when you start out, try to resist the urge. If you take the time to thoroughly enjoy each new purchase, you'll derive more pleasure out of your new hobby. The same principle applies to learning and building your bookshelf.

Q: So where do I start?

A: There are a number of places (including the ARRL) that offer good introductory and advanced books about all of the popular aspects of hamming. They're terrific resources for information on proper operating techniques, antennas, feed lines, station installation, grounding, kit building, homebrewing and the fine art of equipment shopping.

Start by purchasing books that you're likely to use often. If you already know what kind of operating you are interested in, pick up a book or two about it (such as one of the ARRL *Companion* series) and you'll feel much more confident when it comes time to get on the air.

The ARRL Operating Manual will provide you with all kinds of information about the countless ways hams communicate. If you overhear someone on a repeater or at the local club meeting discussing "working the RS-12 satellite" or "last night's traffic net," simply look in your handy *Operating Manual* to learn all the details.

Q: Where do I find information on what radio to buy?

A: The best source for information on new radios and equipment is right here in the pages of *QST*. Every year you'll find dozens of Product Reviews of transceivers, antennas, tuners and station accessories. These reviews give you the hard facts as well as hands-on operating impressions.

You can obtain an electronic copy of the list of Product Reviews published in *QST* from the ARRL *Hiram* BBS and Internet sites, which I will tell you about a little later on (individual Product Reviews are only available as reprints).

If you're hunting "preowned" gear, check out *The Radio Buyer's Sourcebook* and *The Radio Buyer's Sourcebook, Volume 2*. These books contain collections of *QST* Product Reviews, as well as other worthwhile information. They're considered the "bibles" of the used-equipment market.

Q: I want to know more about setting up my shack. How do I install a proper grounding system? What kind of accessories do I need?

A: The answers to these questions and many more can be found in a general technical reference, such as *The ARRL Handbook*. This book has been a staple of the ham community for decades. It is also a respected reference in the professional communications world.

The *Handbook* was extensively revised in 1995 and features a wealth of new material including chapters on operating, circuit theory, antennas, equipment, construction, RFI and troubleshooting, just to name a few. Each chapter is nearly a book in its own right! Most chapters have construction projects, too.

Although the size of this book may seem daunting at first, keep in mind that the *Handbook* is not something that you should sit down and read cover to cover. It is a reference that you'll come back to time and time again.

Q: What if I want to do something out of the ordinary? For example, let's say I want to set up a solar-powered station. Where can I find the equipment?

A: These types of specialized questions are more common than you might think. Fortunately, the best resource for hard-to-find information is in the *Handbook*'s References chapter. And in the new 1996 *Handbook* there's something special: software!

One of the programs included on the 1996 *Handbook* diskette is a *Windows* program called, *TIS FIND*. This software was prepared by the Technical Information Service as a way of expanding on the *Handbook*'s References chapter. *TIS FIND* is a database of companies, individuals and organizations who can help you find the things you need to enjoy your hobby to the fullest. In addition to the software, the References chapter has names and addresses for companies that offer all kinds of products and services.

The 1996 *Handbook* diskette includes other useful software. Nearly every program mentioned in the book is on the disk, including software for a neat slow-scan TV interface!

Q: A friend of mine bought the 1996 *Handbook*, but he doesn't have a computer system. Since he can't use *TIS FIND*, is there another comprehensive supplier list available?

A: Tell him to pick up a copy of the *Amateur Radio Mail Order Catalog and Resource Directory*. It's an extensive list of companies and products related to ham radio, all arranged nicely in book form. The book is available from your favorite dealer or directly from ARRL Headquarters (see the *ARRL Publications Catalog* in this issue).

Q: My boss asked me to locate a company that sells 10,000-W power-line filters. Where can I buy one of those?

A: The Technical Information Service is limited to finding answers for questions about Amateur Radio. We *do* get questions like yours from time to time, however. A good resource for this type of material is the *EEM* buyers guide, published by Hearst Business Publishing (645 Stewart Ave, Garden City, NY 11530, tel 516-227-1300).

One source of technical help that's often overlooked is your local library. In addition to having a selection of electronics books (if they don't have ARRL books, perhaps you can convince them to buy a few!), they'll have a reference section that may include buyers guides and a copy of the *Thomas Register*. The *Thomas Register* lists the addresses and telephone numbers of companies doing business in the United States. Most librarians are willing to research their materials to answer your questions, although you might get some unexpected answers to technical questions!

Q: Let's get back to my station. What's the best reference for antennas that I can put up quickly?

A: By far the most popular ham topics are antennas—which is why there are so many books written about them! The best book to start your collection is a broad-topic text such

as *The ARRL Antenna Book*. When it comes to antennas, *The ARRL Antenna Book* picks up where the *Handbook* leaves off. It has chapters on antenna theory, propagation and nearly every type of antenna design you could imagine.

As with the *Handbook*, the *Antenna Book* is not something you'll sit down and read cover to cover. When propagation conditions are poor, the information in this book can change frustration into enjoyment as you discover new ways to beat the odds.

Q: I bought an older transceiver at a hamfest last week. How can I find out if there have been any articles published about it?

A: You need information that's a little more specific than what you'd find in a book. Although this means that you'll have to dig a little deeper, you should still be able to find the answers close at hand.

Amateur Radio is nearly 100 years old. What this means for technical questions is that (for the most part) there really isn't anything new under the sun. Chances are, no matter what your topic of interest is, there has been a magazine article or two (or two dozen!) published about it. You simply have to know where to look.

Fortunately, you can often find a collection of older ham magazines either at your local club or at the local library. An annual index of articles appears in each December issue of *QST* and other ham magazines. By searching these indexes, you can usually find what you're looking for.

Q: I have a computer in my shack and I'd rather not spend several hours looking through December *QST*s. Are there any indexes on disk that I can use?

A: Owning a computer will certainly make the task of finding articles much easier! The *QST* December indexes from 1977 through 1992 were converted into ASCII files (with a search program) by Don Shipley, WB2PKG (see September 1992 *QST*, page 55, for details). This program is available via the ARRL *Hiram* BBS (860-594-0306) as *QSTSEARC.ZIP*. It is also available on the Internet via FTP to **oak.oakland.edu** in the directory **/pub3/hamradio/arrl/bbs/programs**.

Another computer index tool that you can use is *From Beverages through Oscar* by Didah Publishing (PO Box 7368, Nashua, NH 03060). Although this program covers mostly technical articles, it does have listings for a number of other periodicals in addition to *QST*.

Q: I found the articles I was looking for, but now I have some questions about them. Can you help me answer them?

A: If you have a specific question about a magazine article (or book chapter), the author is the best person to contact since he or she would have the original project or notes for the article. Write the author a friendly letter and pose your questions. (As a courtesy, always include an SASE!) Most authors will send you a prompt reply. If you offer feedback to the article, try to be positive, even if you disagree with the author.

Q: I'm still not sure if I understand my HF rig's tuning procedure as described in its manual. Can you tell me who can help?

A: An often-overlooked source of technical help is the talent closest to you. The experience of veteran hams in your area can give you a real boost. You may even find that several of these local folks have encountered and solved the same kinds of problems you're having!

If you haven't yet joined a club in your area and you need to find one, we can help. Just send an SASE to ARRL Headquarters for a list of ARRL Affiliated Clubs in your state.

Q: I tried contacting the nearest club, but they're a repeater group and can't help me. Is there anyone else I can turn to?

A: Certainly! As an ARRL member, you also have access to the vast resources of the ARRL Field Organization. Nearly every League section has a Technical Coordinator (TC) and one or more Technical Specialists (TS). These volunteers can offer hands-on assistance and personal advice for technical questions about antennas, station installation, interference problems or other questions that require personal attention. Your ARRL Section Manager, listed on page 8 of *QST*, can refer you to your nearby TC or TS.

Q: My Grandpa, who has been a ham since the early '30s, told me about a neat *QST* article that helped him when he first started out. He doesn't remember the title and he isn't sure what issue it appeared in, but he does remember some of the details of the article. Can you help me locate it?

A: Of course! ARRL Headquarters can do article research and answer technical questions, too. Our friendly Technical Information Service staff can help you locate older *QST* articles, or research technical topics.

The TIS staff can even help explain the details of complex technical issues and provide photocopies of out-of-print *QST* or *QEX* articles when you can't find them at your club or library. You can contact the ARRL Technical Information Service by Internet e-mail (**tis@arrl.org**), telephone (860-594-0214) or letter.

In addition, TIS has information packages and bibliographies to answer many technical questions. TIS information packages are available electronically via the ARRL BBS, Internet FTP (at the site mentioned previously), and from our Internet e-mail Information Server (Info-Server).

The Info-Server sends text files as e-mail messages in response to commands it receives. To use it, send an e-mail message to **info@arrl.org** with the word HELP on a line by itself in your message text (the Subject line is ignored). Add a line with the word QUIT at the end of your message. The Info-Server will respond within minutes or hours, depending on the level of network activity.

These information packages are also available by mail from the ARRL Technical Department Secretary, 225 Main St, Newington, CT 06111. There is a modest fee for each package requested by mail ($2 for ARRL members and $4 for nonmembers, postpaid). QST

New Products

MFJ's DUAL-BAND "FLEXIBLE-DUCK" ANTENNAS

◊ MFJ unveils a trio of flexible antennas for your dual-band or 2-meter hand-held. The top of the line, the dual-band MFJ-1717, measures a big 15 3/4 inches—a full half-wavelength on 440 MHz (almost a quarter-wavelength on 2 meters)!

At 8 3/4 inches, the dual-band MFJ-1716 is a quarter-wavelength on 440 MHz and a loaded 1/4-wave on 2 meters. The MFJ-1718, the shortest of the bunch, is a 4 1/4-inch high-Q helically wound "duckie" for 2 meters. To complement their RF performance, MFJ designed its new rubber-coated antennas to be physically tough, as well—so flex away!

Prices: MFJ-1717, $19.95; MFJ-1716, $16.95; MFJ-1718, $12.95. For more information, contact your local Amateur Radio product dealer or MFJ Enterprises, PO Box 494, Mississippi State, MS 39762; tel 800-647-1800, fax 601-323-6551.

DIP METER ADAPTER FOR MFJ SWR ANALYZERS

◊ With MFJ's MFJ-66 Dip Meter Adapter, if you own an MFJ SWR Analyzer, you also own an accurate—and convenient—grid" dip meter. With the '66 and an MFJ SWR Analyzer, you can save time and eliminate guesswork when winding coils, determining a tuned circuit's resonant frequency, measuring capacitance and coaxial cable velocity factors, etc. Two "plug-in" coils cover 1.8 to 170 MHz (depending on the model of your MFJ SWR Analyzer).

Price: $19.95. For more information, contact your local Amateur Radio product dealer or MFJ Enterprises, PO Box 494, Mississippi State, MS 39762; tel 800-647-1800, fax 601-323-6551. QST

Edited by **Rick Lindquist, KX4V** • Assistant Technical Editor

FCC Vanity Call Sign Form 610V is Ready; FCC is Not

With vanity call sign application FCC Form 610V now available, many hams are eagerly waiting for the FCC to open the filing gates to accept completed forms. That won't happen until the Commission acts on four additional Petitions for Reconsideration and until computer software has been installed and checked out to handle the expected avalanche of applications.

Gate 1 will allow individuals or clubs to apply for a previously held call sign, or for individuals to seek a call sign once held by a deceased close relative. Gate 1A will allow clubs that held a station license call sign on or before March 24, 1995, to request the call sign of a deceased former member), with the consent of a close relative. Subsequently, Extra class licensees and club-station trustees will get to file under Gate 2, Advanced class licensees and club-station trustees under Gate 3 and all other licensees and club-station trustees under Gate 4. Individual or club applicants vacating their current call signs and seeking a new call sign will get the first available of their 25 choices.

In its Memorandum Opinion and Order of two months ago in PR Docket 93-305, the FCC made several changes to the program as originally adopted. Applicants in the 48 contiguous states will be allowed to request a call sign from any of the 10 call districts, but not from available call signs corresponding to Alaska, the Caribbean insular areas, and Hawaii and the Pacific insular areas.

Once the FCC starts accepting them, completed applications—including the $30 fee for a 10-year license—won't go to Gettysburg or to any FCC field offices, but to the FCC's bank contractor in Pittsburgh, Pennsylvania. That's because the Commission is using Mellon Bank there as a fiscal agent to collect the fees, something it's not set up to do in Gettysburg. Completed Form 610V applications will go to a post office box in Pittsburgh, but the FCC also has made provisions for courier or hand delivery of applications. See Exam Info, on page 104 of this issue, for more details on Form 610V.

Wyoming Teen is Hiram Percy Maxim Award Winner

Beth Harris, KJ7FC, a 15-year-old Amateur Extra Class licensee from Cheyenne, Wyoming, is the 1995 ARRL Hiram Percy Maxim Award winner. Beth got her Novice ticket just two years ago and advanced to Extra Class in a little more than a year. The Cheyenne East High School sophomore is active on the air and in several student organizations—including the Amateur Radio and French clubs—and is a member of the SHY-WY Amateur Radio Club in Cheyenne. She's also an honor student.

In his nomination letter, Wyoming Section Manager Warren G. "Rev" Morton, WS7W, called Beth "a very gifted young lady" and said he was "impressed not only with her intelligence but also her ability to communicate easily with her peers and with any adult." Paul M. Crips, KI7TS, a communication technology instructor at Cheyenne's Carey Junior High School was among those recommending Beth for the nomination. He said Beth "has a true love of life, learning and exploration. With young operators like Beth, Amateur Radio will always have its rightful place as a national resource."

Renae B. Humburg, Superintendent of Schools for Laramie County School District Number One, also recommended Beth for the annual award, calling her "a role model" for other students. Among other achievements, Beth was cited for her public

PAUL CRIPS, KI7TS

Beth Harris accepts the Hiram Percy Maxim Award check and plaque from Wyoming SM Warren G. "Rev" Morton, WS7W.

Maxim Memorial Award Nominations Open

It's time again for section managers to make their nominations for the Hiram Percy Maxim Memorial Award. Section managers may submit more than one name. The deadline is March 31, 1996. The Maxim award goes annually to a licensed radio amateur under age 21 whose accomplishments and contributions are most exemplary within the framework of Amateur Radio activities. Criteria include—but are not limited to—the candidate's participation or leadership in local or national organizational affairs, technical achievement, operating record, recruitment and training of new amateurs and public relations activities.

In keeping with the tradition of the award, established in 1936, section managers make the formal nominations based on recommendations. Supporting information, including endorsements by ARRL affiliated clubs and elected or appointed League officials, should be submitted with the nomination. Nominations should thoroughly document the individual's Amateur Radio achievements and contributions during the previous calendar year. Additional information concerning the nominee's character should be as complete as possible.

The idea behind the Maxim Memorial Award is to provide a tangible reward to deserving young amateurs who contribute their time, skills and energies daily through their commitment to Amateur Radio. As models for their peers—and an inspiration to us all—these fine young people are highly visible boosters of Amateur Radio awareness. We must continue to recognize and encourage their hard work and contributions at every opportunity.

An award panel reviews the nominations and selects a winner. The prize is $1000, an engraved plaque, and travel and accommodations for the winner to attend the formal award presentation at an ARRL convention. For more information, contact Rick Palm, K1CE, Field Services Manager, at ARRL Headquarters.—*Rick Palm, K1CE*

demonstrations of Amateur Radio throughout Wyoming, her tenure as president of her junior high school ham radio club and for introducing several of her classmates to the hobby.

Beth was honored at a pizza luncheon (her choice) November 15 attended by her parents; school officials; Morton; former Wyoming SM Steve Cochrane, WA7H; ARRL Public Information Officer Wilson Sellner, WB7RRZ; and ARRL Rocky Mountain Division Director Marshall Quiat, AGØX.

NEW SERVICES ENVISIONED FOR 2300-2310 MHz

An October report by the National Telecommunications and Information Administration (NTIA), "Land Mobile Spectrum Planning Options," suggests a new use for the band 2300-2310 MHz, now allocated to the Amateur Service on a secondary basis. The report states that the band "has potential for new, non-Federal radiolocation, fixed and *mobile* [emphasis supplied] communication technologies..." The report also notes that constraints are necessary to protect NASA's Deep Space Network and Planetary Radar operations in an adjacent band. A table in the report describes a possible future use of the band as "Wide Area Land Mobile."

In its February 1995 "Spectrum Reallocation Final Report," NTIA listed several constraints that would apply to new non-Federal use of the 2300-2310 MHz band. These include no airborne or space-to-Earth links; commercial applications limited to less than 1 W of power; unwanted emission levels below 2300 MHz attenuated at least 70 dB relative to the unmodulated carrier; and no operation at Ft Irwin, California.

The 2300-2310 MHz band is expected to be the subject of an FCC allocation proceeding as a follow-on to ET Docket No. 94-32, which dealt with 2390-2400 and 2402-2417 MHz.

RATCLIFF NAMED IARU AMSAT FREQUENCY COORDINATOR

Graham Ratcliff, VK5AGR, is the new IARU AMSAT Frequency Coordinator (IAFC). IARU Satellite Adviser Hans van de Groenendaal, ZS5AKV, made the appointment from among a number of nominations by international AMSAT groups. In naming Ratcliff, van de Groenendaal cited Ratcliff's long association with the Amateur Satellite program and his excellent performance as a ground command station controller for AMSAT OSCAR 13. His primary job as an IARU volunteer will be to coordinate frequencies and emissions of planned amateur satellites with existing and other planned amateur satellites. Ratcliff replaces Bruce Lockhart, SMØTER, who was appointed last winter but resigned last summer citing conflicting personal and business commitments.

Ratcliff is a medical technologist at a hospital in Adelaide, where he's also responsible for all computing in his department. Ratcliff has been involved in Amateur Radio satellite activities since he got his first ham license in 1978. His e-mail address is: **gratclif@wattle.itd.adelaide.edu.au**. His mailing address is: 9 Homer Rd, Clarence Park, South Australia 5034. *—IARU*

TOWER FALL INJURES MISSOURI AMATEUR

On December 4, while hanging Christmas lights on his Amateur Radio tower, Charlie Boyd, KEØAH, an ARRL life member in Louisiana, Missouri, slipped and fell about 30 feet to the ground. He suffered several fractures of his elbow, wrist, and leg, underwent several hours of surgery and spent a short time in intensive care. Although he struck a guy wire with his face and injured an eye on the way down, doctors were able to save his sight. He is net control for the Missouri Weather Net and was just appointed an ARRL assistant director. Boyd was wearing his safety belt, but he is not sure whether it was snapped. While this reads like a horror story, the good news is that KEØAH should be back on his feet soon. The lesson here is to *never* take chances while on a tower. It just may be your last one!*—Lew Gordon, K4VX*

W1AW CODE PRACTICE A HIT IN SLOVAK REPUBLIC

Paul Taylor, WB2GIN, brought back more than memories from his recent visit to a hamfest in Strbske Pleso in the Tatra Mountains of the Slovak Republic. He also carried a message of gratitude to the ARRL for the W1AW code practice transmissions.

He reports that the bottom rung of the Slovak Republic licensing ladder is a no-code VHF license. "To upgrade, you need the Morse code," explained Taylor, who also holds the Slovak Republic call sign OM9AAK, which he said stands for "all-American kid." Taylor first visited the small hamfest in 1994 at the invitation of Frantisek Kiss, OM1WX. Now, he said, he's in demand because "people like to practice their English."

Taylor said the two-day hamfest, held in a hotel in Strbske Pleso, attracted perhaps 100 hams. "They push the tables back and put a flea market there," he said. Ironically, the door prize is a *real* ham—a small roast pig—and not the new transceiver you'd expect in the US.

PHILIP RAND, W1DBM, SK; WAS PIONEER IN FIGHTING TVI

Philip S. Rand, W1DBM, died November 17, 1995, in Lebanon, New Hampshire, at age 89, following a brief illness. The Newtonville, Massachusetts, native was a 1929 graduate of Harvard University. He was an electronics engineer for the Remington Rand Corporation in the late 1940s, when Amateur Radio faced the crisis of interference to early VHF television sets. Rand worked with the ARRL to de-

Commerce Secretary Visits W4EHW at National Hurricane Center

US Secretary of Commerce Ron Brown was at the National Hurricane Center in Miami as forecasters tracked Hurricane Opal last October. Brown made a special point of stopping by at the center's ham radio station, W4EHW (which uses the phonetics "**E**arly **H**urricane **W**arning") during his visit. Also on hand were representatives from Yaesu, which donated all new equipment for the station, on the campus of Florida International University. W4EHW includes gear for HF, VHF/UHF and APRS and packet. During 1995, volunteers manned the station for eight hurricanes. Volunteers at the center gather data for forecasters tracking hurricanes in the Atlantic and western Pacific. Tours of W4EHW will be given during the ARRL convention at the Tropical Hamboree in Miami February 3-4, 1996.*—Rich Vahan, N4PBF*

Secretary Ron Brown, seated, at W4EHW. Standing (l-r) are Rich Vahan, N4PBF; Carlos Chajin and Kevin Karamanos of Yaesu; and Joe Schmidt, W4NKJ.

velop TVI-suppression techniques for channels 2 through 6. He developed new shielding methods for ham transmitters while George Grammer, W1DF, then ARRL's technical editor, designed high-pass filters for the primitive TV sets. In those days, Rand lived in Redding Ridge, Connecticut, and also worked closely with League staff member Lew McCoy, W1ICP (now retired), who called Rand "my tutor in TV interference."

In addition to being a pioneer in TVI prevention, Rand served as ARRL New England Division director in 1955 and 1956. Last October, he received the President's Award from the Quarter Century Wireless Association. His career as a *QST* author spanned 50 years—from "A Shack on Wheels" in 1933 to "The Beeper, An Audible Frequency Readout for the Blind Amateur" in 1983. Survivors include his wife of 59 years, Louise, and three daughters.

FRANK C. JONES, W6AJF, SK; DESIGNED FIRST AC/DC RADIO.

Internationally known radio communications engineer Frank C. Jones, W6AJF, died November 5 in Sonoma, California, at age 91. A prolific writer and radio experimenter, Jones had been a ham most of his life and was active until a few years ago, according to a close friend, Robert Townsend, K6OHE. Among his many inventions, he is credited with designing and building the first ac/dc radio, according to the *Sonoma Index-Tribune*. Jones also wrote *Amateur Radiotelephony*, *The Ultra-High Frequency Handbook* and *VHF for the Radio Amateur*, among other titles. He leaves his wife of 70 years, Edith.—*Brad Wyatt, K6WR*

CHARLES KING DAVIS, W4GZ, SK; AMONG OLDEST US HAMS

One of the oldest hams in the US, Charles King Davis, W4GZ, of Fulton, Kentucky, died November 30, at age 92. Davis was first licensed in 1920 as 9GG and remained active up until a couple of weeks before he passed away. Davis was the subject of a Stray in the November 1994 issue of *QST*, which discussed how several of his friends helped him set up his ham gear and a couple of antennas at the Haws Nursing Home where Davis lived. Davis spent many years in Hickman, Kentucky. He first got interested in ham radio in 1915, when, as a 12-year-old passenger on a steamship, he was fascinated by the wireless room. —*Jerrald Chandler, K4WOT*

AMATEUR RADIO PIONEER EARLE CADWELL TURNS 100

Earle M. Cadwell, N2EC, a New Britain, Connecticut, native who now lives in Millbrook, New York, turned 100 on November 26. Cadwell received the sixth ham radio license issued in the United States, was a marine radio operator during World War I and was a radioman aboard a dirigible, according to a feature about his cen-

Behind the Diamond: Educational Programs Coordinator Glenn Swanson, KB1GW

If I needed just one word to describe Glenn Swanson, it would be *enthusiastic*, and especially about Amateur Radio, the hobby that turned into a calling for him. Glenn's one of those rare folks who actually looks forward to going to work each day. You know the type. Like the golfer turned pro, Glenn feels that working at HQ is on the same "par." Glenn, 41, says that after he got his license, he always wondered what it would be like to work at HQ. Now that he's been aboard for three years, he still considers it "an absolute blast!"

First licensed as a Novice in 1987 as KA1IWH, Glenn credits Peter Budnik, KB1HY, now a coworker, for getting him involved in radio: "Peter is my best friend, and he was really into CB. I became involved, too. Later, when Peter decided to take an Amateur Radio licensing class, it was natural that I'd go along with my buddy and take the class too!"

Glenn says he and Peter "climbed the licensing ladder together," from Novice to General. "And here we are years later, both Advanced Class and both working at ARRL HQ—in the *same* department!"

Glenn's work experience has given him a background in electronics. Right out of high school, he got a job at a plant that turned out 16-mm motion picture projectors, among other products. He moved on to a job at a nearby school system where he maintained audio-visual equipment, including some of the same film projectors he helped build at his first job. Later jobs involved installing and servicing communication gear for businesses throughout southern New England. Glenn also provided audio-visual support for an Executive Communications Center at a life insurance trade association in central Connecticut.

Several years ago, Glenn moved to the Richmond, Virginia, area to take yet another audio-visual job, this time at a state-run university in Richmond. He and his wife Lynn (she's also from New England) were married in Virginia in 1989. Glenn says he made a lot of good friends in Virginia via Amateur Radio, and they still keep in touch. Ultimately, Glenn's and Lynn's "Yankee roots" brought them back to "home and family" in Connecticut.

When Glenn came to the ARRL in January 1993, he was Assistant to the Manager in the ARRL/VEC. After two years under the tutelage of Bart Jahnke, KB9NM, Glenn moved to his present position, working with Rosalie White, WA1STO, and the rest of the gang in the Educational Activities Department (EAD). In his role as Educational Programs Coordinator, Glenn is involved with programs such as the Shuttle Amateur Radio EXperiment (SAREX), the Boy Scouts' Jamboree on the Air (JOTA), and the ARRL Instructor of the Year awards. Glenn also is responsible for the yearly publication of the *Proceedings of the National Educational Workshop*, and he works with EAD's educational advisors and ARRL-registered instructors and teachers. And if that weren't enough, he also pitches in to help both prospective and new hams by answering EAD's 800-32-NEWHAM hotline.

In his "spare" time, Glenn has been a frequent contributor to *QST* as a product reviewer and feature writer. Active in both local and regional contest clubs, Glenn is never at a loss for something to do, from pitching in with a contest effort, working on his 45-foot fold-over tower and wire antennas, or completing "honey-do's" around the house.

Glenn enjoys casual contesting from his home in Avon, Connecticut, but says he's really looking forward to the day when he can buy enough hilltop land ("with a slope toward Europe, of course!") to put up at least one tall tower. Fortunately, his wife, who's not a ham, "understands my love affair with ham radio and supports me when it comes to future home-site plans."—*Rick Lindquist, KX4V*

tennial celebration in the *Voice/Ledger* of Millbrook. A 1924 graduate of Rensselaer Polytechnic Institute with a degree in mechanical engineering, Cadwell worked for the New York Telephone Company, then became a consulting engineer at an age when most people retire. He gave up consulting work just a few years ago.

Cadwell's hearing and sight are failing, but Margaret Herrick, N2XJC, reports he still can read Morse code tapped into his hand. Cadwell also got a mention on the birthdays list on the ABC Television program "Good Morning, America."—*Margaret Herrick, N2XJC*

HAM RADIO COLUMNIST GOING STRONG AFTER 23 YEARS

Ham radio newspaper columnists are *not* extinct, reports Vivian E. Douglas, WA2PUU, now in her 23rd year of writing her Ham Radio column in the *Syracuse* (New York) *Herald American STARS* magazine. Her chatty and informative column is a regular feature in the four-page hobby section of the Sunday magazine, where she shares space with columns about bridge, bird-watching, genealogy, stamp collecting and pets. Vivian concedes that if she's not the last of a dying breed, she's at least *among* the last of the ham radio columnists.

Recent topics in Vivian's column run the gamut from training sessions and new licensees to "the art of collecting QSL cards" and a feature about Ed Little, W2PHQ, when he marked 60 years as a League member last year. She includes information that won't fit in her column (which she says has shrunk over the years) on the paper's NewsLine, a telephone call-in service. In her spare time, Vivian serves in several ARRL leadership positions in her section, including assistant section manager, section emergency coordinator and section traffic manager. Fellow ham radio journalists can write her at 213 Monticello Dr S, Syracuse, NY 13205.

Briefs

• **Five schools have been selected** for participation in SAREX during space shuttle flight STS-76, tentatively set to launch March 21 for a nine-day mission. The schools are Artesia (New Mexico) Public School; Troy (New Mexico) Middle School; S. J. Davis Middle School, San Antonio, Texas; Bethlehem Central Senior High School, Delmar, New York; and The University of Colorado College of Engineering and Applied Science in Colorado Springs.

• **Nominations are now being sought** for the 1996 awards to be presented at the ARRL Atlantic Division Convention, including Amateur of the Year. The nomination deadline is April 1, 1996. The convention is held in association with the Rochester, New York, Hamfest, May 31 to June 2, 1996. The awards are commemorated by handsome plaques to be presented at the hamfest banquet. Amateur of the Year nominees should be outstanding, all-round amateurs from the Atlantic Division with a strong record of service to the Amateur Radio community. An award for lifetime service to ham radio, the Grand Ole Ham, is open to Atlantic Division members, male or female, who have been licensed at least 30 years or are at least 50 years old. The Atlantic Division's Technical Achievement Award may be presented to an individual or a group. For more information, contact the Rochester Hamfest, 300 White Spruce Blvd, Rochester, NY 14623, or call 800-724-8515 or 716-424-7184.

• **The FCC *Interference Handbook*** now is available on the Internet. The 22-page booklet, available from the Compliance and Information Bureau via the FCC's World Wide Web home page, includes the same information and illustrations contained in the hard copy edition, *Interference to Home Electronic Entertainment Equipment Handbook*. It discusses equipment installation, identifying interference sources, curing interference problems, and filters. It also includes a list of home electronic equipment manufacturers and telephone numbers. Pictures illustrate different TV interference problems, including radio transmitter interference. The *Interference Handbook* is at **http://www.fcc.gov/Bureaus/Compliance/WWW/tvibook.html**.

• **The DOVE-OSCAR 17** satellite 2-meter downlink failed December 3, but the AMSAT control team doesn't know what went wrong. While it's not clear if the problem resulted from a computer crash aboard the spacecraft, the control team will reload the software to see if that fixes it. The satellite's S-band transmitter is on, and the permanent onboard backup software is working. DOVE-OSCAR 17 is used for educational and research purposes.

• **As a result of ongoing negotiations** between the Radio Society of Great Britain (RSGB) and that country's Radiocommunications Agency, the RSGB's Licensing Advisory Committee reports that a very low frequency allocation is closer to reality. The Radio Communications Agency in Great Britain has agreed to a frequency around 73 kHz. Discussions continue on the actual terms of licensing.—*RSGB Press Bulletin*

• **The Southeastern VHF Society** has been formed to promote weak-signal modes and experimentation on the VHF, UHF and microwave bands, and to sponsor and conduct an annual technical, educational and operating conference. Dues are $20. Contact Neal Sulmeyer, AE6E, Treasurer, Southeastern VHF Society, 412 Stockwood Dr, Woodstock, GA 30188, or via e-mail: **humecon@crl.com**.—*Tad Danley, NZ3I*

SECTION MANAGER ELECTION NOTICE

To all ARRL members in the Illinois, Indiana, Maine, Northern Florida, Oregon, Santa Clara Valley, Vermont and Wisconsin Sections. You are hereby solicited for nominating petitions pursuant to an election for section manager (SM). Incumbents are listed on page 12 of this issue.

To be valid, a petition must contain the signatures of five or more full ARRL members residing in the section concerned. Photocopied signatures are *not* acceptable. No petition is valid without at least five signatures, and it is advisable to have a few more than five signatures on each petition. Petition forms (FSD-129) are available on request from ARRL Headquarters but are not required. We suggest the following format:

(Place and Date)

Field Services Manager, ARRL
225 Main St
Newington, CT 06111

We, the undersigned full members of the ___ ARRL section of the ___ division, hereby nominate ___ as candidate for section manager for this section for the next two-year term of office.

(Signature__ Call Sign__ City__ ZIP__)

Any candidate for the office of section manager must be a resident of the section, a licensed amateur of Technician class or higher and a full member of the League for a continuous term of at least two years immediately preceding receipt of a petition for nomination. Petitions must be received at Headquarters by 4 PM Eastern Time on March 8, 1996. Whenever more than one member is nominated in a single section, ballots will be mailed on or before April 1, 1996, to full members of record as of the closing date for nominations. Returns will be counted May 21, 1996.

Section managers elected as a result of the above procedure will take office July 1, 1996. If only one valid petition is received from a section, that nominee shall be declared elected without opposition for a two-year term beginning July 1, 1996.

If no petitions are received from a section by the specified closing date, such section will be resolicited in the July 1996 issue of *QST*. A section manager elected through the resolicitation will serve a term of 18 months. Vacancies in any section manager's office between elections are filled by the Field Services Manager. You are urged to take the initiative and file a nomination petition immediately.—*Rick Palm, K1CE, Field Services Manager*

REPEAT NOMINATING SOLICITATION

Since no petitions were received for the Alaska and Western Massachusetts section managers' election by the September 8, 1995, deadline, nominating petitions are herewith resolicited. See above for details on how to nominate. QST

Edited by **Bill Kennamer, K5FUV** • DXCC Manager

8Q7—The Maldives

Rudi Klos, DK7PE, provides a further report on his recent 8Q7CW operation.

About 40 hams visit the Maldives annually, so the 8Q7 prefix is not a rarity, at least above 10 MHz. However, on 80 meters these islands are very rare, even for Europeans. On 160 meters, only a few stations (the "big guns") have ever worked 8Q7.

At the Dayton Hamvention last April, I was approached several times about the possibility of activating the Maldives on 160 meters. Apparently no 8Q7 station had been heard in North America on the Top Band. I decided to break this dry spell, despite the obvious challenges!

A Difficult Route

Look at any globe and you'll quickly see that the Maldives are located on exactly the opposite side of the Earth from North America. This extreme distance, as well as the fact that the path crosses the highly attenuating polar region, makes contact over this path extremely difficult on 160 meters...but not impossible.

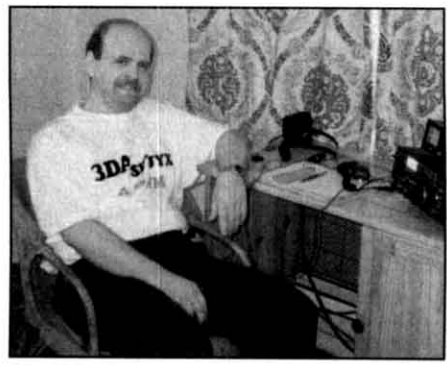
Gray Line in September

In my opinion, the most favorable time for a contact between North America and the Maldives is the equinox phase of equal day/night length at the end of March or the end of September. During those days, dawn at the Maldives and dusk in the USA and Canada occur at pretty much the same time. The path would therefore run entirely via the North Pole across the dawn/dusk zone (gray line). In fact, I was able to detect some US and Canadian call fragments in the noise before dawn in the Maldives for several days.

Struggling with a Fickle Band

During the night of September 29 and 30, extraordinary propagation prevailed. At 2231 UTC, I called CQ on 1.828 MHz. I expected responses from Europe since contacts in that direction had been possible throughout most of the night. What I got was a huge pileup of American stations (considering the customary US power output, the local electrical utilities must have enjoyed windfall profits!). Because the noise level was relativity low, I was able to work a total of 28 stations before calling it quits.

Only a relativity small area—a "spot," if you will—offered good signals at any given time. The spot seemed to have a radius of about 250 kilometers with stations in this area being distinctively stronger than the others. The spot seemed to race erratically over the eastern part of the North American continent. Often, the effect of the spot was present from a few seconds up to a maximum of several minutes from the same location. If a QSO did not take place within this short interval, it did not pay to "lock in" on a particular call sign. Other stations came to the fore, whereas stations that had been well readable dropped into silence.



3DA/SP2JYX, Adam Ksobiech, during his 1994 operation. More than five thousand QSOs were made on the 20,17,15,12, and 10 meter bands between October 5 and 13. Equipment used was an IC-751A transceiver and an SB-200 amplifier, along with a TH3JR tribander antenna and 12- and 17-meter dipoles.

During my struggle with the fickle band conditions, I also observed the sky with much interest. When it turned steel blue, I could assume that the maximum signal strength had been reached. After an extremely short dawn phase, the sun rose and signal strength decreased drastically. Noise on the band again increased and the phenomenon was gone for the next 24 hours, or even the next several days.

Receiving Antennas

During the week of September 25 to October 2, a total of 2400 contacts were made on 30/40 meters, 80 meters, and 160 meters. Of these, 38 160-meter QSOs were made with the US and Canada. Of course, it would have been possible to improve upon this result with a better receiving antenna, but my resources were limited. At least during one night I was able to come up with a kind of long-wire receiving antenna. However, it only had a length of 50 meters. Even though it probably would have functioned well enough, it was located very close to a huge transformer substation. As a result, it collected all of the "garbage" that my quarter-wavelength transmitting sloper had to contend with.

As another alternative, I experimented with a receiving loop antenna. Results were only marginal, however, so I returned to using the transmitting antenna exclusively. If you've been able to make the comparison between an ordinary dipole antenna and a quiet Beverage, you'll appreciate the struggle I had by using the sloper.

A Very Special QSO

My 160-meter contacts from the Maldives included a special QSO with Bob Eshleman, W4DR. Bob has been an active DXer for decades and has worked almost everything. Although our contact was brief, Bob followed up with a letter: "Rudi, thanks for the contact of a lifetime! Country #265 and my first Zone 22 on 160 meters in 45 years of DXing..."

(Translation of Rudi's report was provided by Hans Meurer, W2TO.)

GIBRALTAR NEWS

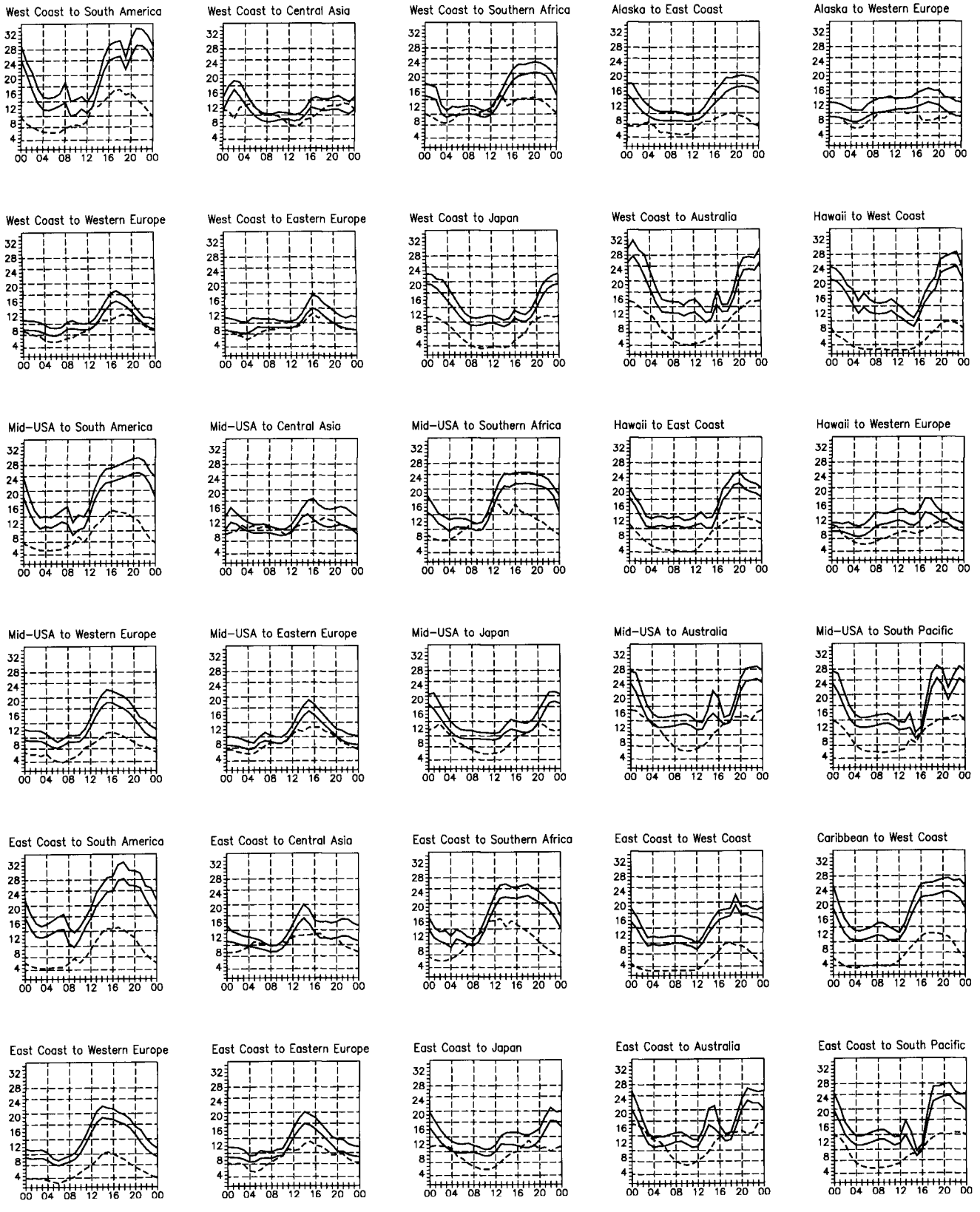
From Robin Phillips, ZB2JK, Secretary of the Gibraltar Amateur Radio Society, comes the following news:

The Gibraltar Amateur Radio Society would like to make a sincere apology, without reservation or excuse, regarding unanswered inquiries and unanswered applications for ZB2 awards. All applications and inquiries have now been dealt with, and awards applied for are now in the post. If awards applied for since 1993 are not received (by now), would applicants please inquire by post. Cost of postage both ways will be borne by us.

Would all amateurs please note that the ZB2 call is permitted only *on* the Rock of Gibraltar. There are no provisions for use outside the area specified in the license. The ZB2 call is being pirated, and so all QSL cards received from stations *not* in Gibraltar must be treated as suspect. Legitimate licensees are reminded that operating away from Gibraltar necessitates application for a reciprocal license in the usual way.

Visiting amateurs will be allowed to operate for the duration of their stay on production of their original license to the General Post Office on their arrival, using ZB2/home call format.

Any inquiries may be made to Gibraltar Amateur Radio Society, Robin P. Phillips ZB2JK Secretary, G.A.R.S., PO Box 292, Gibraltar.



When are the bands open? These charts, generated using IONCAP, show probabilities for average HF propagation from February 16 to March 15, 1996, for the paths indicated. The horizontal axes show Coordinated Universal Time (UTC), and the vertical axes frequency in MHz. On 10% of the days of this period, the highest frequencies propagated will be at least as high as the upper curves, and on 50% of the days they will be at least as high as the lower solid-line curves. The broken lines show the lowest usable frequency (LUF) for a 1500-W CW transmitter. For SSB or a lower transmitter power, the LUF will be somewhat higher than the curves indicate. See October 1994 *QST*, pp 27-30, and February 1995 *QST*, pp 34-36, for more details. The predictions for this period assume an observed 2800-MHz solar flux value of 75.

DX Century Club Awards

*Edited by **Bill Kennamer, K5FUV** • DXCC Manager*

The ARRL DXCC is awarded to amateurs who submit written confirmation for contacts with 100 or more countries on the *ARRL DXCC Countries List*. The totals shown below are exact credits given to DXCC members from October 1 through October 31, 1995. There were 327 current countries at that time. The DXCC rules and application forms are contained in the *ARRL DXCC Countries List*, available for $2 from Publication Sales.

NEW MEMBERS

Mixed

DF9LB/117
DL4YE/142
DL5IAH/103
EW2CR/265
G3RSD/102
GM0FET/122
I1PP/296
I0JBL/320
IK1QLD/116
IK1RLI/270
IK2MMF/296
IK2OBS/229
IK2UKW/106
IK4AUY/104
IK4SDY/109
IK6BSM/219
IK6GZM/321
IK8DYD/103
IK8PLK/299
IK0CNA/182
IS0JMA/227
IV3ZCX/104
JH0MJY/126
JK1OTP/162
JN1MKU/260
JR7AGI/232
PA0NRA/204
SP6TGC/110
VE3QAA/212
XE1AAG/126
XE1KK/250
ZP6SC/111
ZS4Y/217
N2ZAQ/101
K3WWP/100
N3IUT/107
N4MIR/104
N4TD/231
WB4PJW/147
KA5DAV/105
KK5EP/126
NY5B/175
WD5DBW/188
AB6KE/106
KO6OV/108
KJ7GU/110
K7CV/177
KB9EWK/106
N9LCR/110
K0UXQ/104

Phone

EW2CR/149
I1MRH/129
I2EZD/313
I2VGW/109
I4ACO/119
I4JUB/322
I4YEL/110
I7JFQ/112
I8USE/111
I0JBL/319
IK1NLZ/110
IK1RGL/110
IK1RLI/270
IK2FOE/110
IK2IWU/118
IK2QPO/110
IK2QPR/110
IK2RXV/102
IK2SGC/278
IK4AUY/104
IK4CWP/119
IK4GNH/146
IK4HLQ/107
IK4PNE/110
IK4QJH/110
IK4RQF/110
IK4RSD/105
IK4SWZ/110
IK5EKB/116
IK7WUJ/111
IK8HJE/311
IK8NIM/210
IK8PLK/299
IS0JMA/227
IY4FGM/108
JA1MVO/109
JH0MJY/125
JK1OTP/120
JN6MIC/107
JR7AGI/192
LU8FVS/107
OD5NH/119
OZ7DN/295
VK4LW/106
XE1JPP/168
XE1KK/250
ZP6SC/110
ZS4Y/217
6Y5NR/223
N1JAC/181
N2UHD/102
WB2NUW/197
AA3HA/230
N4TD/230
KJ5KQ/261
KN6TN/104
KI7BP/142
K7CV/173
AA0LG/205

CW

DL4FDM/119
EW2CR/205
G3HQX/111
I4LCK/313
IK2MMF/286
IK2VJF/105
IK4QJH/105
IK4WMG/110
IK0HBN/110
IN3FHE/108
JA8ALB/118
JK1OTP/129
JR7AGI/135
VE3QAA/179
VE3VHB/120
N1JAC/159
N2KOF/100
AA3HA/121
AD4AA/117
N4MIR/103
NU5V/125

RTTY

IS0QDV/100
JA8ALB/200
OZ7DN/119
N1JAC/105
K2PF/108

Satellite

JF2MBF/108
XE1KK/100

160 Meters

OZ1BTE/110

80 Meters

EW2CR/101
IK1RLI/108
JA2KSI/105
JH6CDI/119
JN1MKU/121
OZ7DN/101
VE3VHB/101
W5KFT/156
WA7IHN/103

40 Meters

EW2CR/105
IK1RLI/110
IK4HPU/113
JH6CDI/121
JN1MKU/125
SM0BNK/105
VE3VHB/125
ZP5CGL/127
AD4KW/101
KB5OHT/130
NU5V/100
W5KFT/173

10 Meters

EW2CR/112
IK1RLI/109
IK6BOB/170
JA8ALB/117
JH6CDI/127
JN1MKU/121
SM0BNK/115
VE3VHB/101
ZP5CGL/116
ZP5HSB/147
ZS4Y/102
KA1OEO/102
N1JAC/121
WB4RFZ/307
K5BQJ/109
NU5V/101
W5KFT/169
KI7BP/136
K7CV/126
WA7IHN/110

6 Meters

IK8DYD/103

NEW HONOR ROLL MEMBERS

Mixed

326

I2YDX/345
AB9E/336

318

IK7JTF/323

Phone

326

JA2KSI/337

325

VK3AKK/327

324

I8IGS/331

323

I2YDX/342

322

IK1HJS/327

321

AB9E/330

320

IK2HTW/324
NX0I/326

319

N5FTR/323

318

I2RKI/320
IK7JTF/323

CW

325

AB9E/335

318

JH6CDI/319

5BDXCC

W5KFT
JH6CDI
IK2ILH
EW2CR
JA2KSI
JA7MA
VK6VS
AD4KW
JN1MKU
I4LCK
IK1RLI
VK3AKK
WF2Y
WG9L

160 Meters

OZ1BTE

17 Meters

W5KFT
I4LCK
W8ZSD
DL4MCF
EA5BY
SM5CZK
S57A
CT1BH
JF2MBF
WB2DND

12 Meters

W5KFT
I4LCK
DL4MCF
S57A
CT1BH
JF2MBF
WB2DND

6 Meters

S57A

ENDORSEMENTS

Mixed

DJ1UR/305
ES1AR/369
F3RG/310
F5XX/265
F9DK/206
FS5PL/244
G3HQX/190
G3KYF/347
G4SFO/202
G0MFO/297
HB9FAI/200
I1APQ/347
I1PME/251
I2ZZZ/345
I4EFE/162
I6VYV/332
IK1ADH/312
IK1HJS/329
IK2FEO/300
IK2IGX/316
IK2VJF/180
IK4HPU/195
IK0IHA/307
IK0NGI/271
IK0QBI/253
IS0QDV/304
IT9AZS/321
IV3JWR/315
JA1BK/365
JA5BSQ/336
JA6RIL/333
JA7MFL/325
JF2MBF/330
JH1LMG/330
JH1XUP/299
JH6TYD/257
JH8UGL/205
JR0AMD/300
KP4TB/270
LA4WJ/296
LA9XGA/228
LU4MEE/331
LX1MU/223
OE2SCM/293
OH2BC/360
ON6CR/159
OZ7DN/313
SM0BNK/283
SM0EBP/202
S57KV/227
VE3ETB/325
VE3VHB/342
VE3WHE/317
VE3ZTH/240
VK2FH/336
VK3AKK/327
XE1AMS/321
XE1RHZ/316
XE1ZLW/328
ZP5MAL/212
ZP6CC/183
ZS6YQ/361
4X1KP/329
4X4RE/320
KA1CLV/305
KA1MJR/159
KD1IA/221
KT1T/125
K1DC/306
K1UO/337
K1VMI/196
NY1L/322
N1FOJ/263
N1JAC/219
N1QY/300
WZ1R/311
W1ETV/339
W1EYT/327
W1JEL/327
W1UC/338
KA2ANF/300
KA2WEI/218
KX2A/273
K2PF/296
N2AUK/217
N2GBH/320
N2KOF/184
N2LDV/209
N2LEB/197
WA2CJT/268
WA2CNV/207
WB2NUW/228
WB2ZTH/288
WS2U/171
W2GC/369
AA3BG/187
AA3HA/238
AA3JI/159
KD3UY/213
K3NL/351
AD4AA/194
AD4KW/317
KA4IKH/161
KA4VZO/314
KC4FW/296
KJ4KB/277
KO4PY/238
KR4QQ/157
K4JEX/337
AA5LF/152
AB5YG/193
KA5OER/259
KB5IXI/172
KB5OHT/263
KF5EA/329
K5BQJ/142
K5VV/293
NU5V/228
N5NXH/313
WG5G/322
WQ5H/207
WR5I/240
WY5Q/327
W5OXA/285
W5RUK/315
W5THT/123
W5YM/295
KI6T/365
KN6EL/318
K6AXC/338
K6BIA/324
K6QS/327
N6HVZ/303
N6RFM/265
WA6GIN/301
WB6JMS/314
WJ6O/334
W6YHM/322
AB7BB/258
KE7CR/226
KV7L/337
K7CVL/330
WA7HRR/279
W7AEP/332
AB8Y/336
K8BL/328
WB8HIW/328
KB9MI/285
WB9PTN/315
W9GIL/373
W9NTU/308
W9RN/339
NX0I/331
WA0ACI/155
W0GKL/365

Phone

DL9GU/219
DL9HC/254
EA3KB/307
ES1AR/357
F6FYD/260
G0MFO/268
I1APQ/347
I2YWR/309
I4FAF/330
I4ZXO/228
I5JHW/331
I6QFH/331
I6VYV/332
I7SCA/355
IK2ANI/327
IK2IGX/316
IK4HLU/156
IK4HPU/195
IK4IYC/320
IK4LAI/320
IK4NZD/194
IK4UNI/169
IK6BOB/330
IK6HSM/327
IK0IHA/296
IK0NGI/266
IK0QBI/251
IT9GCQ/335
JA1BK/364
JA3GM/339
JA6RIL/319
JF2MBF/328
JH6TYD/177
JH8UGL/142
KP4TB/270
LA4WJ/203
LA9XGA/132
LU4MEE/328
OE2SCM/292
PS7AB/274
SM4TIY/162
SM0BNK/244
SM0EBP/198
UA4RZ/332
VE3VHB/280
VE3WHE/317
VK6VS/308
XE1AMS/321
XE1RHZ/316
XE1ZLW/328
YV3BKC/266
ZP5CGL/236
ZP5HSB/242
ZP5MAL/212
ZP6CC/183
ZS6YQ/359
4X1KP/201
4X4RE/187
KA1CLV/281
KD1IA/214
K1UO/337
N1FOJ/263
N1QY/153
W1EED/316
W1EYT/135
W1UC/216
KA2WEI/217
K2PF/266
N2AUK/217
N2GBH/316
N2KOF/167
N2LDV/209
N2LEB/197
WA2CNV/207
WB2ZTH/287
K3CI/320
K3NL/265
N3NPG/151
WB3ECU/142
AD4KW/317
KA4VZO/311
KC4FW/294
KJ4KB/174
KO4PY/162
KQ4KS/162
KR4QQ/154
K4NQR/213
N4/OA4OS/150
AA5LF/147
AB5YG/129
KA5OER/259
KB5IXI/129
KB5OHT/176
NY5B/165
W5OXA/285
KD6ZM/260
K6AXC/338
K6BIA/149
K6FM/317
K6IIS/205
N6HVZ/303
WA6GIN/300
W6YHM/286
AB7BB/236
KV7L/331
W7AEP/332
AB8Y/334
K8BL/318
WD8JKV/244
KB9MI/283
WB9PTN/296
W9RZW/280
W0GKL/364

CW

EA7BR/240
F6IIA/212
FS5PL/164
G3KYF/282
G4SFO/185
G0MFO/263
I2YWR/281
I8IGS/213
IK1HJS/269
IK6BOB/317
IK0PRG/210
JA1BK/336
JA3GM/334
JF2MBF/303
JH1XUP/153
JH2AYB/275
JH6TYD/188
JH8UGL/184
LA4WJ/286
LA9XGA/218
LX1MU/223
OZ1BTE/322
PA3BWQ/178
SM0BNK/221
SP5GH/299
UA4RZ/242
VA3NO/305
KA1CLV/297
K1UO/291
K1VMI/196
N1QY/300
WZ1R/280
W1UC/297
K2PF/283
K3NL/180
KJ4KB/240
KO4PY/214
AA5TN/232
AB5YG/145
KB5OHT/216
KF5EA/291
N5NXH/300
WB5TKO/143
WY5Q/317
W5MUG/258
KI6T/281
KN6EL/302
WJ6O/173
W6YHM/304
AB8Y/330
K8BL/310
K9RN/273
NX0I/310

RTTY

EA7BR/150
I1JQJ/281
I2YWR/180
JF2MBF/209
JH2AYB/133
4X1KP/129
KF5EA/235

Satellite

JH2AYB/222

160 Meters

JF1NZW/125
SP5GH/125
NX0I/132

80 Meters

G0MFO/118
I1JQJ/217
JA8ALB/131
JF2MBF/169
JH2AYB/131
ON4ACG/240
OZ1BTE/282
SP3GEM/314
SP5GH/202
KA1CLV/112
K1DC/194
N1QY/138
K4JEX/261
KV7L/123
K8BL/134

40 Meters

I1JQJ/301
JA2KSI/245
JA8ALB/135
JF2MBF/198
JH2AYB/178
LA4WJ/139
LA9XGA/133
OZ1BTE/314
SP5GH/211
KA1CLV/157
K1DC/176
N1QY/222
WZ1R/227
K2PF/169
W2FR/303
KO4PY/135
W5RUK/127
KV7L/129
K8BL/196

10 Meters

G0MFO/220
I1JQJ/312
IK2ANI/161
JA2KSI/320
JF2MBF/223
JH2AYB/128
LA4WJ/173
OZ7DN/186
VA3NO/132
VE3WHE/177
XE1KK/125
KA1CLV/242
N1QY/226
WZ1R/204
K2PF/217
N2AUK/139
WB2ZTH/135
KA4VZO/164
KA5OER/129
WD8JKV/176

6 Meters

I0AMU/121

QST

Strays

I would like to get in touch with...

◊ Anyone who can help with information about building and operating an HF amplifier using the 4-1000A tube. Graeme Johnstone, ZL3NP, 2/28 New Brighton Rd, Shirley, Christchurch 8006, New Zealand.

◊ Hams who would correspond with Tom, OK2PTE, and Peter—two students at the Technical University of Ostrava, Czech Republic—to help them start communicating via packet radio. Tomas Bubela, CP 223, CS-75612 Horni Lidec, Czech Republic; e-mail, **L94008@vsb .cz**.

◊ Anyone who is experimenting with earthquake detection using active or passive RF transmissions. James L. Richey, WA4URR, 4402 Roundhill Rd, Alexandria, VA 22310.

Public Service

*Edited by **Rick Palm, K1CE** • Field Services Manager*

A Community Warning System—Amateur Radio's Role

By Jerry Boyd, KG6LF
Chief Of Police/
Director of Emergency Preparedness
City Of Martinez, California

In 1993, a hazardous materials release from a railroad tank car in Richmond, California, affected the residents of four populous counties in the San Francisco Bay region. While the release, which led more than 20,000 people to seek medical attention, occurred in Contra Costa County, the hazardous materials plumes spread into nearby Alameda, Napa and Solano counties as well.

In addition to the tens of thousands of people who actually experienced physical effects from the chemical release, hundreds of thousands were affected emotionally and psychologically. As the media reported the incident, people dozens and dozens of miles away jammed 911 lines with questions: What is it? Will it reach us? Is it deadly? What do I do? What about our children? The elderly? Those with breathing difficulties?

Contra Costa County's Health Services Department had in place prior to this incident a computerized telephone notification system (Community Alert Network — "CAN").

However, it does have limitations, not the least of which is that it can make fewer than 150 telephone notifications per minute. This, during an event which was literally affecting 25,000 people each minute, proved inadequate.

Following the Richmond incident, County officials, and citizen/industry groups met to critique the overall response to the event. One issue of paramount importance at their discussions was the need to enhance community warning and notification.

The result was the creation of the Community Warning System (CWS). Contra Costa County's Community Warning System is the first of its type in California and one of only three in the entire United States. The Community Warning System uses advanced technology to alert and notify the public in the event of a chemical accident, or any incident, natural or manmade, which requires that the public be notified quickly.

The alert portion of the system consists of sirens in the county's industrial corridor, emergency alert receivers for schools, hospitals, convalescent centers and other sensitive receptors such as day care and senior centers. The system also includes pagers to alert emergency response personnel. The sirens are similar to the air raid warning sirens of the Korean War era. These, however, emit only one tone, calling for one and only one type of response.

When the siren system is activated, residents have been trained to "shelter in place" and immediately turn on their television or radio for additional information as to what action, if any, they need to take to protect themselves. Plans are being made by the trustees of several of the county's Amateur Radio repeaters to provide for lawful rebroadcast of warning messages. The Community Warning System messages will be received and stored on the repeater's digital voice recorders. Once received, whenever the repeater would otherwise identify with its call sign the emergency notification message would also be broadcast.

The Amateur's Role

Early on, it became clear that Amateur Radio could, and should, have some role to play, not just in the warning phase but in what follows. The 50 private companies that contributed financially to the development and installation of the system (some $4.5 million) were encouraged to provide some funding to install Amateur Radio antennas, feed lines and equipment at certain key receptors (schools, hospitals, day care centers, etc). Those school districts in close proximity to the petrochemical zone have benefited from that funding and Amateur Radio antennas, etc, are being installed in a number of school sites. It helps, of course, that the project administrator for the Community Warning System is an active radio amateur. The purpose of installing amateur equipment in sensitive receptors is to facilitate communications between individual schools and school district headquarters, should a major event occur during the times these facilities are occupied. Antennas are also scheduled for installation at area hospitals, day care and convalescent centers. Frequencies to be used in an emergency by each type of "sensitive receptor" are predetermined and consistent with the county's RACES/ARES General Plan.

Another outgrowth of the effort to integrate Amateur Radio into the warning response plan has been the recruitment and training of new Amateur Radio operators. The ARRL affiliated Mount Diablo Amateur Radio Club, the largest Amateur Radio club in the area, with well over 600 members, has sponsored training classes for teachers and staff members from several of the school districts in the target area. Many teachers have earned their amateur tickets and have been trained to serve as operators from those sensitive receptors at which antennas and equipment have already been installed. Now, when and if a siren sounds, not only will people be warned in a timely manner, but a network of Amateur Radio operators will quickly come online to help coordinate an appropriate response to the event.

The Community Warning System concept was, during its planning stages, formally presented to the County Board of Supervisors and the city councils of each of the 18 independent cities in the county. The county's police chiefs and fire chiefs associations, as well as the Emergency Medical Services Advisory Board, also received detailed information as to how the system would function. Since Amateur Radio serves as a part of the warning system and as a significant part of the response system, government bodies and professional organizations once again were exposed to mention of the Amateur Radio resource. In one instance this contributed to a city electing not to pursue an antenna ordinance that would have had a detrimental effect on the amateurs' ability to perform as part of the overall Community Warning System.

With increasing concerns nationwide about the risks posed by industries using and producing hazardous chemicals, it is likely that systems such as Contra Costa County's Community Warning System will be established elsewhere in our country. When that happens, Amateur Radio has an opportunity, as happened here, to become an integral part of the overall system. It is highly recommended that such an opportunity be seized, and perhaps more importantly, that we prepare for it in advance.

Mistaken identity

In one of the photographs that appeared in the December 1995 column ("HF Joins VHF on the Great Circus Train"), we identified Joe Novak, W8TVT, as the operating partner of Frank Huges, WD8IIR. Nice picture, but wrong caption. Frank was actually sharing the photo with Jerry Gorrell, W8WFN. *QST* regrets the error.

Field Organization Reports November 1995

Section Emergency Coordinator Reports

There are 39,626 ARES members accounted for in SEC records. The following section emergency coordinators reported: AL, CO, EWA, IN, KY, MDC, ME, MI, MN, NFL, NH, NLI, NTX, NV, OH, SD, SDG, SFL, TN, VA, WMA, WVA.

National Traffic System

Net	Sess	Tfc	Avg	Rate	% Rep	% Rep to Area
Cycle 2						
Area Nets						
EAN	30	908	30.27	0.815	94.4	
CAN	30	832	27.73	0.907	95.5	
PAN*	60	338	5.63	0.340	92.2	
Region Nets						
1RN	60	551	9.18	0.658	98.0	100.0
2RN	60	304	5.06	0.474	98.0	100.0
3RN	30	100	3.30	0.280	90.0	86.7
4RN						100.0
RN5	60	696	11.60	0.521	94.0	100.0
RN6	31	71	2.29	0.930	71.0	93.3
RN7	60	368	6.13	0.380	76.3	98.3
8RN	60	476	7.93	0.509	100.0	96.7
9RN	60	177	2.95	0.270	87.0	86.6
TEN	60	912	15.20	1.030	79.0	100.0
TWN	60	234	3.90	0.418	86.0	85.5
ECN						

RN6 Digital mailbox traffic: 98

Cycle 3						
Area Net						
EAN	30	171	5.70	0.411	80.0	
Region Nets						
1RN	30	74	2.47	0.322	92.9	96.6
2RN	29	90	3.10	0.375	93.1	93.3
3RN	22	22	1.00	0.180	48.9	86.6
4RN						70.0
8RN						96.6
ECN						50.0
Cycle 4						
Area Nets						
EAN	30	1050	35.00	1.231	94.2	
CAN	30	624	20.80	1.018	100.0	
PAN	30	465	15.50	0.598	94.4	
Region Nets						
1RN	60	260	4.30	0.378	92.4	100.0
2RN	55	173	3.14	0.410	97.0	100.0
3RN	54	144	2.60	0.280	82.8	100.0
4RN	60	708	11.80	0.661	99.6	100.0
RN5						100.0
RN6	60	181	3.01	0.300	68.0	98.6
RN7	60	308	5.13	0.448	87.0	100.0
8RN	53	345	6.51	0.415	82.0	100.0
9RN	60	229	3.81	0.610	95.0	100.0
TEN	60	262	4.37	0.396	64.2	100.0
TWN						80.0
ECN	40	33	0.82	0.130		80.0
ARN	30	43	1.43	0.047		80.0

*PAN operates both cycles 1 and 2.

ARRL Section Traffic Managers reporting: AL, AR, AZ, CO, CT, EMA, ENY, EPA, EWA, GA, IA, ID, IL, IN, KY, LA, MDC, MI, MN, MS, NC, NFL, NLI, NNJ, NTX, OH, OK, OR, ORG, PR, RI, SB, SC, SD, SDG, SF, SFL, SNJ, STX, SV, TN, VA, VT, WI, WMA, WNY, WTX, WV, WWA.

Transcontinental Corps

Area	Successful Functions	% Successful	TCC Function Traffic	Total Traffic
Cycle 2				
TCC Eastern				
TCC Central	85	94.00	297	371
TCC Pacific	114	89.17	120	261
Cycle 3				
TCC Eastern	26	100.00	n/a	48
Cycle 4				
TCC Eastern	96	92.31	259	801
TCC Central	51	79.70	181	383
TCC Pacific	103	86.00	329	670
Summary	250	86.00	769	1934

NTS *APLink* Total: 7507

TCC Roster

Eastern Area, Cycle 3: W2FR, Director. N1OTC W2FR W3OKN K8TPF KA8WNO.

Eastern Area, Cycle 4: W2FR, Director. W1EFW W1FYR KF1L KT1Q KW1U N1OTC W1NJM W1UD W2CS W2FR KA2GJV N2JAW N2XJ W2GKZ W2RQ KA2VZX N3DRM W3PQ AA4AT K4SCL K4WJR K4ZK KB4N KO4BJ N4GHI N4SS W4UQ N6ANQ AA8AN K8TPF KA8WNO W8PMJ WB8YDZ WD8V WØUCE VE3AWE.

Central Area, Cycle 2: NØFBW, Director. W4CKS W5CTZ KG5GE W5JDF N5KKI W5KLV K5MXQ W5QFU K5UPN KE5ZV WØFE WBØWNJ.

Central Area, Cycle 4: K5GM, Director. K5GM WB5J W5JDF KA5NNG K5RG W5TFB KB5W WD8LDY N9CKC W9FC K9PUI WA9QCF WØGRW NØSM.

Pacific Area, Cycle 2: KT6A, Director. WB6DOB AB6EU N6GIW K6UYK KF7AG W7TGU K7VVC KA7YYR.

Pacific Area, Cycle 4: W7GB, Director. W6EOT N6LUY WF6O W6VZT AB6YR NR7E WA7EES KA7EKL W7EP W7GB W7GHT KB7GZU NN7H W7LG W7VSE W7ZIW KØEZ KØTER WØMHS/7 KØTER VE7CTW.

NTS *APLink* stations: KK4CQ KQ4ET W1FYR N2JAW WX4J AD4DO W4KAU, N1NNM, KD4OBQ W5YQZ N9ANL NØFBW

Public Service Honor Roll

This listing is to recognize amateurs whose public service performance during the month indicated qualifies for 70 or more total points in the following 8 categories (as reported to their Section Managers). Please note the maximum points for each category: 1) Checking into a public service net, using any mode, 1 point each; maximum 60. 2) Performing as Net Control Station (NCS) for a public service net, using any mode, 3 points each; maximum 24. 3) Performing assigned liaison between public service nets, 3 points each; maximum 24. 4) Delivering a formal message to a third party, 1 point each; no limit. 5) Originating a formal message from a third party, 1 point each; no limit. 6) Serving as an ARRL field appointee or Section Manager, 10 points each appointment; maximum 30. 7) Participating in a communications network for a public service event, 10 points each event; no limit. 8) Providing and maintaining an automated digital system that handles ARRL radiogram-formatted messages; 30 points. Stations that qualify for PSHR 12 consecutive months, or 18 out of a 24-month period, will be awarded a certificate from HQ upon written notification of qualifying months to the Public Service Branch at HQ.

1701 KE4PAP
1548 KF4ABM
1444 KAØARP
987 NM1K
830 NZ2T
429 KB6ECH
321 K4SCL
295 KE4LPD
278 AB6EU
277 WØOYH
275 KE4DNO
264 KA2ZNZ
251 KA4FZI
243 KF2VL
242 KB7JQM
236 WB2UVB
233 W7TVA
231 N3PDK
226 WX8Y
225 KC4RNF
219 N5IKN
217 KØBXF
215 N3PGG
197 WA1TBY WX4H
192 K5DPG
191 N2WFN
190 N2FET
189 KB2EPU WAØSXR
188 W2HOB
187 N3SQW
183 K9DHR KR4MU
181 K2UL N5NAV AA2CX
179 KK9AS KC4TFF
178 KL7Q W2MTA
177 W7WAT AB5JY
176 KB2KLH WD8LDY
175 KA2CQX W9YCV
172 AD4DO W7ZIW
170 WB6DOB KG7LS KD4GR KK1A
169 KB2RTZ WA9VND K9FHI KO6RZ KA2GJV
168 KQ4ET
165 KF1L
164 WX4J N2AKZ N4GHI N2ULY
163 N1OTC WA7EES KA4HHE
160 K4IWW NR2F WØNBT
159 WA8HED
158 WA2YBM WB5GLV
157 KA9KLZ W9CBE
156 NY2V
155 K4BGZ
154 KE4EC N2ZRC
153 KI7UN WE2G KA5TTO
152 NX1A N1HYF
151 KB5RUG W3YVQ
150 K2DN K2BCL
148 KF2YC KE4LWN K5MXQ AC4LM
147 AD4BL KA4LRM WA2UKX
146 WB1CHU KE2JX WD5GKH KD7ME
145 KA1GWE KT1Q AA4HT KE4KET
144 KFØTK W7KDB
143 N2OPJ WA8AHV
142 KP4DJ N7UQW KT6A
140 W1EFW W5RZV WA4EIC KA1JXH N3DRM N8FPN AA2XR
139 K3GHH WB1SGK WA4NDA KFØFI WB9TUS NY1H
138 W4AET W2PTZ KD4TOK W7GB N9BDL
137 N2GJ
136 KC4ZHF
135 WA1FNM WF6O AF2K
134 N2YHK KF2ER
133 N1SGL N2XJ WAØTFC KC3Y KA2YZM WB2ZIE N2LTC
132 WA4QXT N4GNL NØMEA N8RBE N2WGF W7GHT
131 KB4OLY K4RBR
130 NZØM
129 N7UOF KD8HB W4ZBA
128 K6AGD WB4DVZ WB2ZCM KF2KN N2OWN WDØGUF K1TPK
127 NØJL W7AZU KG2D
126 K5TF N1DHT ND2S
125 N7THH AA9HN K2GNZ
124 N4PNE K4MTX
123 AA2SV WBØLES WA1CSO KB2ETY
122 KI4YV KO4BJ WD4EKA WD4DSS WBØWNJ W9UMH WJ3K K7GXZ
121 K3JL WNØY WØNO NR9K W4DGH
120 W7VSE N2YJZ W2OD
KA7TTY WA3UNX
119 W6IVV AAØOM N8FWA N4YYQ
118 N7CPP AA2MH KA7AID KC7CGK N4JAQ W3OKN W4CKS WB2QIX
117 NØALH KE4AZL WB4TVY
116 N1FLO WB2YAZ
115 N5OUJ W4BNY
114 KE4ESV W4PIM
113 KA1WCD WB2VUK W2MTO N2VQA N2SU N4GMU
112 WØOTF N3OHH KB9ENO N4TRX W2FR
111 N2TQN
110 KJ9J K3ORW
109 W5CTZ WA5FXQ AB6YR WA8SSI AAG9G KD4KT N2SSS
108 AD4KA WØMZI K7BDU N9KHD AA2NX N2TOY
107 W4OGG WB5YDD W1JTH KB5VXB KC5OZT
106 WB5CKX KB2QPU WA8DHB W5AYX
105 N6GIW N2XLY
103 KC6ZEC KE6HLV
102 K8LEN KE3OX
101 KE4OOW KN6VV KK6NQ
100 KD4ITI KB1AF WB2OJR KB5UCQ WBØZNY KC4YGB KB2UQZ
99 N9MN N1IST WD9HII KB8ROA
98 N5WSW KE3FL WR8F
KD4FUN KR4TF N4ZNO
97 K4AIF N2UHD KB2OPJ KA2DBD
96 KC6VVT KC4VNO
95 KE1CN WD9FLJ
94 N6FWG WB2IJH
93 N2LTK N3NNH
92 N2RPI KD6MHE KE4MNS KD4TQN N2DLN
91 N1LAH N1LRT N8XCT KC5GNI
90 N4JTG K5WOD KØPIZ KB2ETO
89 N4AA KD4PWK K4VIA KD4JMV N2JRS
88 N2JBA KB4MON KK5BE
87 WA4GLS NØUOD W4XI
86 N2SXO WB2IIV WB8KQJ WY3K KA9FVX NB2D
85 KC6SKK KB2SDW KE6KMD
84 N5XJS
WDØHXR K8ZJU AB5RV KJ5VL
83 W2AZ W2CC KB4WBY
82 KD1LE K8SH W4QAT
81 KC5JEE KA1VEC
80 WB8BGY
79 N1SHF KC5MVB WB4UHC
78 N5JUU WA3FYZ WA4TVS
77 N4RBX KN4OH
76 KA1VAX KC4ZSV
KA4UIV
74 WU4C WB2CZW WA3WRT N2YGN N2ZMZ AA2ED
73 KB2TFS KD5GM KK5ST AA4AT
72 N1TDF N2ZMI KB2GEK N7MPS N2VDK
71 N1LKJ KB2VSR WØYMB KC5NEZ
70 N2HMX N2AYK N2OFB KD1DS KC5AJN KB4CAU W4NTI

Brass Pounders League

The BPL is open to all amateurs in the US, Canada and US possessions who report to their SMs a total of 500 points or a sum of 100 or more origination and delivery points for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in standard ARRL radiogram format.

Call	Orig	Rcvd	Sent	Dlvd	Total
KE4PAP	1572	48	1636	48	3304
N2JAW	485	295	1420	215	3045
KF4AMB	51	1451	70	1541	3023
KAØARP	1352	201	1362	4	2919
W9AYK	0	1542	33	1072	2657
W3CUL	694	650	1175	64	2583
WX4H	7	1072	1038	22	2139
NM1K	867	345	1003	6	1904
N3PGG	44	569	957	13	1583
K4FQU	9	646	623	7	1285
K4DOR	308	233	541	0	1082
W3VR	315	301	410	30	1056
KT6A	7	497	453	7	964
KE4DNO	102	339	404	35	880
K4SCL	138	285	398	45	866
N4SS	2	427	427	8	864
WA9VND	3	427	368	48	846
KB6ECH	401	15	418	10	844
NZ2T	611	214	815	31	830
NØBQP	30	437	56	294	817
N5IKN	0	392	80	312	784
WBØWNJ	0	173	573	4	750
WB9JSW	0	431	32	282	725
KT1Q	0	343	369	7	719
KA2VZX	0	446	245	16	707
N4GHI	4	393	278	22	697
NØJUS	29	330	0	286	645
K1UGM	0	296	295	0	591
AA4HT	0	311	254	7	572
NR2F	10	200	340	12	562
NØZO	0	266	277	5	548
KQ4ET	2	261	254	8	525
KA1VEC	10	243	257	11	521
KF1L	2	246	261	5	514
WA1TBY	6	263	230	13	512
AB6EU	63	163	213	63	512
WD8LDY	3	249	251	5	508
W5KLV	2	229	263	10	504
N1OTC	1	232	270	4	502
WØLVI	25	266	76	134	501

BPL for 100 or more originations plus deliveries: WA4PUP 242, KE4LPD 127, KA4FZI 123, KB5VXB 122, K5GBN 118, KB7JQM 118, KA2ZNZ 116, KF5A 116, WA5OUV 100.

Independent Nets

Net Name	Sess	Tfc	Check-ins
BEARS of Manchester	30	397	463
Central Gulf Coast Hurricane Net	30	55	2125
Empire Slow Speed Net	30	255	478
Green Mountain Net	28	28	844
Hit and Bounce Net	30	453	698
Hit and Bounce Slow Net	30	159	345
IMRA	26	530	1362
Michigan Wolverine Net	30	43	1109
Midwest RTTY Net	30	158	428
Mission Trail Net	30	54	963
NYSPTEN	30	51	427
Sunbelt Service Net	28	37	2355
75 Meter ISSBN	30	172	1117
7290 Net	46	476	3735
September, 1995, report for Hit and Bounce Net	30	304	638

The World Above 50 MHz

Edited by **Emil Pocock, W3EP***

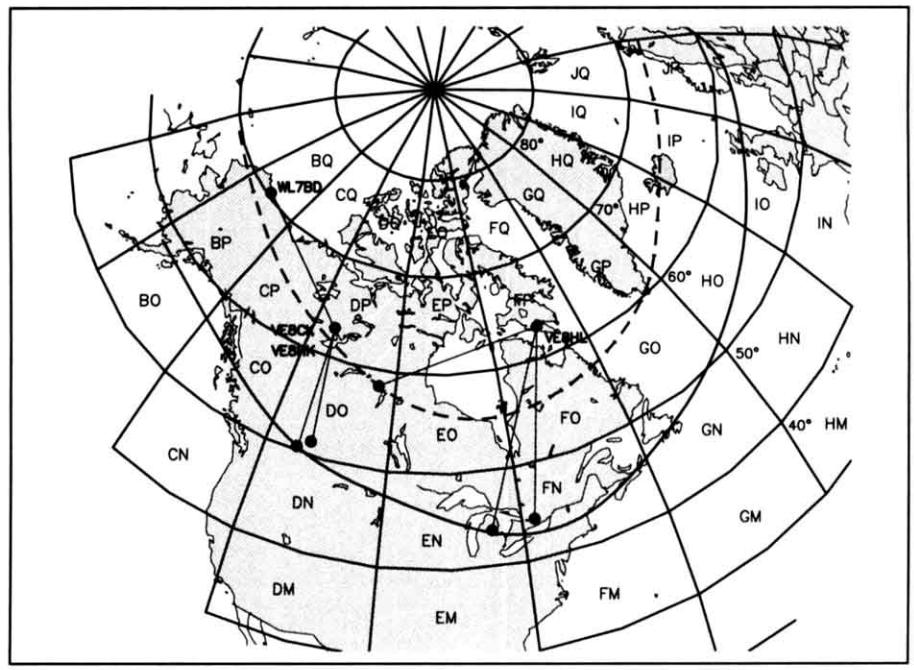
Two Meters Across the Arctic

Two-meter FM contacts across the Arctic using low power and simple antennas seems fantastic, yet the number of reports over the past few years suggests that these contacts were not flukes. Last month's column on auroral-zone propagation only hinted at the possibilities for auroral-E propagation in the far north. It seems likely that late afternoon and evening contacts on 50 and 144 MHz across the auroral zone might be much more common that previously supposed.

What will it take to investigate the possibilities further? Not much! The contacts of VE8CK and VE8HL have already demonstrated that ordinary 2-meter FM gear is quite sufficient to make contacts of 1000 km and longer, either direct or through repeaters. Several of these contacts have extended into the northern tier of the United States, suggesting some interesting possibilities even for stations on the edges of the auroral zone.

There are several hundred 2-meter repeaters in the auroral zone that would provide an excellent means to monitor propagation. Professional studies suggest that the most likely hours for auroral-E propagation are 1800 to 0200 local time. Unlike temperate-zone sporadic E, auroral E exhibits little seasonal variation. During unusual geomagnetic disturbances, auroral E may extend further south and beyond the usual confines of the auroral zone. Optimal distances for auroral-E propagation appear to be in the 1000 to 2000-km range. Paths that cross the center of the auroral zone (the dotted line on the map) may be more common than others. Using this information, stations within and adjacent to the auroral zone can consult *The ARRL Repeater Directory* to find likely Canadian repeaters and monitor them for DX contacts.

Favorable conditions are much more likely at 50 MHz, perhaps even as common as summertime sporadic E further south. There are only four 6-meter repeaters in Canada that are outside Ontario, according to the latest *ARRL Repeater Directory*, but active 6-meter SSB stations may find that regular schedules might yield some interesting results. The four Canadian 6-meter beacons (listed in January's column) might also prove valuable. VE8BY (FP53) on 50.047 MHz (but temporarily off the air at press time) is optimally placed for stations from Newfoundland through central Manitoba. VE2TWO (FO13) on 50.088 MHz is probably too far south to be optimal, but is about the right distance for stations in New England through the Great Lakes region.



The peak of the auroral zone, where aurora could be seen on nearly 100% of clear nights, is shown by the dotted line. The solid line, which can be considered the southern limit of the ordinary auroral zone, indicates where aurora can be seen on an average of 20% of the clear nights. The straight lines show paths of some 144-MHz FM contacts reported during the last five years. (Thanks to Michael Owen, W9IP, for generating the original map on his *Nova* program.)

ON THE BANDS

Sporadic E continues its surprising ways. After an unusual amount of 6-meter activity in October, the band was open for at least seven days during November. There was also an exciting tropo opening across the Gulf of Mexico late in the month. Scattered meteor and TE contacts rounded out November's activities. Not bad for the slow season! Dates and times are UTC, as usual.

Six-Meter Sporadic E

"Sounds like summertime, everyone on 50.125" was the reaction of Herb Spoonts, W3IWU, to the opening on November 21. Widespread contacts took place from around 1750 to 0000 and included much of the eastern two-thirds of the country. Additional stations reported contacts through the nation's midsection earlier in the day, from 0130 to 0300. This was not an isolated sporadic E event, as more than a dozen 6-meter operators reported openings on November 5, 16, 18, 20, 25, and 26 as well. The openings of the 26th also lasted several hours (from 0030 to 0430, at least), primarily linking the midwest to the western states. None of the openings were extraordinary by summertime standards, but they were welcome enough for a usually slow period and they further bolster the impression that 1995 was an unusual year for sporadic E.

Gulf Tropo

Tropospheric ducting events across the Gulf of Mexico have become so common that they are hardly newsworthy any more, but the events of November 26 and 27 did have some unusual features. For openers, several stations reported ducting at 50 MHz—rare enough anywhere—and as high as 1296 MHz. The longer contacts were in the 1500 to 1900-km range between Texas and Florida, and some welcome DX stations enlivened the action. Special event station CO1OTA in the rare grid EL72 was handing out contacts on 50, 144, and 432 MHz, while XE2OR in DL98 was an appreciated addition in many logs on 144 and 432 MHz.

Oscar Morales, CO2OJ, and several Euro-

This Month

February 17-18	Good EME Conditions

*Send reports to Emil Pocock, Box 100, Lebanon, CT 06249. Leave voice messages at 860-642-4347 or fax 860-594-0259.

pean VHFers operated with the CO1OTA expedition to Jutia Key. The Cubans set up their antennas near the top of a lighthouse, about 150 feet above sea level. They made several dozen contacts on 144 MHz as far north as K4KAE (FM02) and west to XE2OR. On 432 MHz, CO1OTA made it to WB5LUA (EM13) at nearly 1700 km. They made over 100 50-MHz contacts in 47 grids, both on tropo and sporadic E. Equipment problems prevented any completions on 1296 MHz.

Stations all along the west coast of Florida were also having an easy time making it into Texas on 144 through 1296 MHz. Bob Smith, WD4MGB (EL87), made a number of unusual contacts, including 50-MHz tropo contacts with WA5UUD (EL49), CO1OTA, and XE2OR. Bob also completed with XE2OR on 432-MHz FM! The distance was about 1770 km. John Cembruch, WB4JEM (EL89), worked as far as XE2OR on 144 MHz and to W3XO/5 (EM00) on 144, 432, and 1296 MHz with just 10 W. John suggests sending CO1OTA VHF QSLs to CT1ESO, PO Box 207, 8900 Ursa, Portugal; and cards for XE2OR to W5OZI.

The opening extended along the Georgia and South Carolina coasts on the eastern side. Andy Blackburn, WD4AFY (EM92), found conditions excellent after 0400 on the 27th. Among Andy's longest contacts were W3XO/5 on 144, 222, and 432 MHz, around 1700 km. Steve Swatloski, KI5GF (EL09), worked a long string of stations on 144 and 432 MHz all the way from EL72 north to FM03. Steve's contacts with KR4QQ (FM03) on 144 MHz and K4KAE (FM02) on 432 MHz were in the 1900-km range, the longest reported of the opening.

Leonids Meteor Shower

The Leonids is an overlooked meteor shower that may be perking up in anticipation of a possible great storm in 1998 or 1999. Ken Ramirez, KP4XS (EM84), observed many long burns on 50 MHz during the morning of November 25, making random contacts easy. Jack Nyiri, AB4CR (EM39), made six of seven scheduled contacts, including WB4JEM on 222 MHz. Many 144-MHz bursts lasted for 15 seconds. Ted Goldthorpe, WA4VCC (EM94), reported a 90-second burst on 144 MHz during a schedule with VE3URS (FN15). Ron Klimas, WZ1V (FN31), even made a 144-MHz contact with KP4XS without a schedule. This shower is worth watching in the coming years.

Transequatorial Reports

Six-meter operators in Japan and Brazil observed 50-MHz F-layer propagation via transequatorial field-aligned irregularities (TE) on November 3, 4, 6, 7, and 8. PY2OU reported working Venezuela and hearing the V44K beacon on November 4, 6, 7, and 8. Japanese stations worked New Zealand on November 3 and eastern Australia on November 7 and 8. The F layer is a source of continuing amazement, even in the depths of the solar cycle.

VE3ONT Beset with Problems

Peter Shilton (VE3VD) and Michael Owen (W9IP) report that plans to put VE3ONT on 50 through 1296 MHz during the two weekends of the ARRL EME contest faced unexpected setbacks. Power to the 150-foot Algonquin dish went out two hours before the contest began on October 7, knocking out planned 144-MHz operations. The group got the 50 and 1296-MHz gear in place for the next day when power was restored, but the results were disappointing. Aurora limited VE3ONT to 34 QSOs on 1296 MHz. Operation on 50 MHz was curtailed because of its interference to the 1296 station, resulting in contacts only with OH2BC, W5FF, WA4NJP, and W6JKV. The second weekend had to be canceled altogether so that a scientific team from the University of Western Ontario could use the dish for an observation of a solar disturbance. The VE3ONT team regrets any disappointments, but do not be surprised to find the group trying it again next year.

VHF/UHF/MICROWAVE NEWS

FM, Satellites, and Packet

Some of you have asked from time to time why "The World Above 50 MHz" rarely deals with issues relating to FM, repeaters, packet, and satellite activities. The main reason is that *QST* has covered these topics for some time in other columns! Jay Mabey, NUØX, writes the "FM and Repeaters" column. "Amateur Satellite Communications" is handled by Steve Ford, WB8IMY. Stan Horzepa, WA1LOU, writes the "Packet Perspective" column. If you have thoughts or topics for discussion in those areas, the columnists welcome your input. Direct your correspondence to them at their mail or e-mail addresses. In addition, the New Ham Companion often includes articles and features designed to help the new VHF/UHF operators. Altogether, *QST* carries a wide range of regular VHF features and technical articles each month. Did you read the August, October, and November "Packet Perspective" columns, which discussed using packet for meteor scatter contacts? This innovative use of a new transmission mode has a lot of potential for the serious VHF operator.

Central States VHF Conference

The 30th annual conference of the Central States VHF Society is set for July 26 through 28 at the Thunderbird Hotel and Convention Center in Bloomington, Minnesota. Conference organizer Paul Husby, WØUC, recommends making hotel reservations (tel 800-328-1931) as early as possible. Contact Paul at 1462 Midway Pkwy, St Paul, MN 55108, for more information.

International EME Conference

The 1996 EME Conference will be held in Bowie, Maryland, from August 15 to 18, according to the September/October *VHF EME Report*. A variety of technical talks, slide shows, and presentations are being organized now. For more information about participating and attending this gala international event, contact Willie Mank, W1ZX, 7620 Bensville Rd, Waldorf, MD 20603, or e-mail: **mank@media.mediacen.navy.mil**.

Southeast VHF Society

The newly organized Southeastern VHF Society joins the growing list of regional VHF organizations around the country. Led by President Steve Adams (WS4F), Dick Hanson (N4HSM), and Bob Striegl (KA2DRH), the society is planning its first annual conference for the spring of 1997 and a newsletter, to be edited by Ron Hooper (AB4RU). Dues are $20. For more information about joining, contact society Treasurer Neal Sulmeyer, AE6E/4, 412 Stockwood Dr, Woodstock, GA 30188.

THOSE STANDINGS BOXES

Recent changes in *QST* have affected the World Above 50 MHz by limiting the column to an average of fewer than three pages per issue. Some months (like February) allow only two pages. As a consequence, the schedule for the standings boxes must be revised in order to make best use of available column space. The new schedule will be as follows:

Standings Box	*Month Published*	*Deadline for Updates*
Microwave	January	November 1
EME	March	January 1
DX Records	April	January 1
144 MHz	June	April 1
222 MHz	August	June 1
432 MHz	October	August 1
50 MHz	December	October 1

The standings boxes remain one of the most popular features of "The World Above 50 MHz," but they are also the most troublesome part of the column. You may have noticed that many of the top stations in 6-meter countries, EME initial contacts, and other standings are missing. If you are among the unlisted, please update your totals—everyone is interested in keeping track of how the leaders are doing. EME standings should reflect *only* EME contacts, including total states and grids worked. Combined EME and terrestrial totals can be included in the regular standings boxes. All standings box totals should reflect contacts made from only one location, as defined by the VUCC rules. Some stations, especially in the 6-meter box, may still be counting combining country, state, and grid totals from multiple locations.

To be listed, simply send your totals at least every two years. Reporting forms make the job easier and will be supplied with an SASE, but any clear format is acceptable. Every reasonable effort is made to reduce errors, but mistakes and omissions have dogged the standings boxes since they first appeared more than 50 years ago. Apologies to WA8WZQ and N6XQ, whose outstanding microwave accomplishments were inadvertently left out of the January issue. If anyone else suspects their listings are wrong for any reason, please send a correction right away.

33 cm (902-928 MHz)					
WA8WZQ	MI	14	2	32	1523
N6XQ	CA	2	2	7	4060
23 cm (1240-1300 MHz)					
WA8WZQ	MI	18	2	48	1523
XE2/N6XQ		3	2	8	4142
13 cm (2300-2310, 2390-2450 MHz)					
WA8WZQ	MI	12	—	23	1523
XE2/N6XQ		1	1	5	508
9 cm (3300-3500 MHz)					
WA8WZQ	MI	10	—	11	695
XE2/N6XQ		1	1	1	986
5 cm (5650-5925 MHz)					
WA8WZQ	MI	10	—	13	695
XE2/N6XQ		1	1	1	986
3 cm (10-10.5 GHz)					
XE2/N6XQ		1	2	10	1123
12.5 mm (24-24.25 GHz)					
N6XQ		1	1	5	175

W5FF Continues to Lead 6-Meter VUCC

Fred Fish, W5FF, who has made contacts with all 484 grids in the continental US, has 850 grids confirmed on 50 MHz as of mid-November. Fred should have been included in the December 6-meter box with 128 DXCC countries and 50 states worked as well. The published 50-MHz VUCC totals as of September 29 (prior to Fred's latest endorsement) show five stations with 700 or more grids: W5FF (825), K1TOL (800), WD5K (750), K8WKZ (725), and W5OZI (700). Another 11 stations have at least 600 grids. Congratulations all around to some remarkable operating persistence. QST

By Jennifer Hagy, N1TDY

Announcing the Fifth Annual Philip J. McGan Memorial Silver Antenna Award

Nominations for the fifth annual Philip J. McGan Memorial Silver Antenna Award are open. The award's namesake, journalist Philip J. McGan, WA2MBQ (SK), applied his communication talents avocationally to promote Amateur Radio to the general public. McGan was the first chairman of the ARRL's Public Relations Committee, which helped reinvigorate the League's commitment to public relations. He also served as public information coordinator for the New Hampshire Section.

Because Phil's premature passing prevented him from seeing the fruits of this labor of love, his many friends in the New Hampshire Amateur Radio Association (NHARA) joined with the ARRL Board of Directors to pay lasting tribute to Phil's memory with the creation of the Philip J. McGan Memorial Silver Antenna Award. The ARRL and the NHARA join in giving this annual award to a ham who best exemplifies Phil McGan's volunteer public relations efforts on behalf of Amateur Radio. A committee of volunteers knowledgeable about Amateur Radio public relations picks the winner, subject to approval by the ARRL Board of Directors.

Call for 1996 Nominations

1. The award is given only to an individual (not a group). The nominee must be a full ARRL member in good standing at the time of nomination, must not be compensated for any public relations work involving Amateur Radio (including payment for articles) and may not be a current League officer, director, vice director or paid staff member or be a member of the current selection committee.

2. The winner of the Philip J. McGan Memorial Silver Antenna Award will demonstrate volunteer public relations success on behalf of Amateur Radio at the local, state or national level, and will live up to the high standards of achievement that Philip J. McGan exemplified.

3. Anyone may make a nomination. Nominations must be on an official entry form, available from ARRL. The nomination will include a written summary whenever possible.

4. Nominations must be received by ARRL, Newington, Connecticut, by 5 PM on May 31, 1996. We cannot accept nominations arriving after the deadline or without an entry form.

5. A committee of Amateur Radio operators knowledgeable about public relations screens eligible nominations and forwards its recommendation to the Volunteer Resources Committee of the ARRL Board of Directors. The Board makes the final determination at its July meeting, and notifies the winner shortly after that.

6. To obtain an entry form, call ARRL 860-594-0328 or e-mail to **jhagy@arrl.org** or to MCI mail at **519-3279**. Ask for an official Philip J. McGan Memorial Silver Antenna Award entry form.

7. Return the completed entry form and supporting materials to Philip J. McGan Memorial Silver Antenna Award, c/o Jennifer Hagy, N1TDY, ARRL, 225 Main St, Newington, CT 06111.

Jennifer Hagy, N1TDY, Media Relations Assistant, ARRL QST

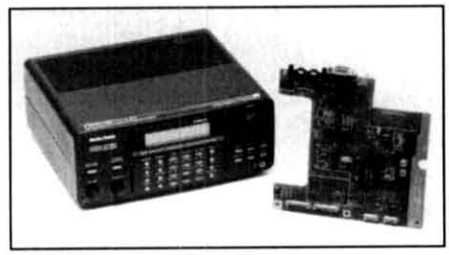
Public relations versus public service

Confusion sometimes exists about the distinction between "public relations" and "public service." In the past, some Philip J. McGan Memorial Silver Antenna Award candidates have been nominated for their *public service* activities, such as emergency communication, net leadership and other activities that—while helping maintain a positive public image of Amateur Radio—don't fit the definition of "public relations." Public Relations activities for which the McGan Award is given include efforts specifically directed at casting Amateur Radio in a positive light before the public, typically via the news media. This may include traditional methods like news releases; or nontraditional methods, such as the weekly radio show hosted by 1994 McGan Award winner Len Winkler, KB7LPW. So, if you're considering nominating someone in your area for the 1996 award, please ask yourself if your candidate's work fits the *public relations* criteria.

New Products

OPTOSCAN535 COMPUTER CONTROL INTERFACE FOR RADIO SHACK PRO-2035 SCANNERS

◊ The '535 computer interface from Optoelectronics puts your PRO-2035 into computer-controlled high gear! It not only adds computer control (with its simplified control scheme)—it greatly increases the radio's scanning speed, as well (the manufacturer claims that a PRO-2035 with an OptoScan535 interface is the fastest computer-controlled scanner available).



With a '535, even when you're away from home your scanner can search for new, active frequencies and store them into its memory.

Features: Built-in CTCSS, DCS and DTMF tone decoding; two built-in CI-V interface converter jacks (eliminating the need for an external converter); supported by *Probe*, *Scanstar*, *Scancat*, *Scanner Ware for Windows*, *Radio Manager for Windows*, *Wave* (Macintosh) and other scanning software packages.

List price: $299. For more information, contact Optoelectronics at 5821 NE 14th Ave, Ft Lauderdale, FL 33334; tel 305-771-2050, fax 305-771-2052. QST

TELECOM 95—A Huge Success in Geneva

By Larry E. Price, W4RA, and Paul Rinaldo, W4RI

Imagine the Dayton Hamvention lasting for *ten* days instead of three. Now imagine 188,000 visitors and a display space six times as great. Wow!

That describes the event known as *TELECOM*, which is held in Geneva, Switzerland, every four years. It is sponsored by the International Telecommunication Union (ITU), which is also headquartered in Geneva. TELECOM is the world's largest trade exhibition of telecommunication equipment manufacturers and vendors.

At TELECOM 95 there were 1050 exhibitors from 52 different countries. The word "booth" doesn't quite do justice to the displays staged by companies such as Microsoft, IBM, AT&T and Motorola—to name only a few firms from the US. Large companies often spend more than $10 million each to make an appearance at TELECOM. The cost of exhibit rental is approximately $500 *per square meter*, and that is just for the bare floor space. You still have to construct your own display, arrange for telephone installation, and complete all the other tasks that turn a static collection of wood and metal into a high-tech attention-getter!

Many of the exhibits were elaborate multi-story affairs with live demonstrations of all kinds of new technology, including Virtual Reality, live worldwide video conferencing, and—you name it. If the technology exists (or might exist soon), someone was promoting it at TELECOM 95!

Amateur Radio at TELECOM

TELECOM attracts a number of visitors who are high-level policy and decision-making officials from ministries of communications around the world. So, in order to help spread the word about the Amateur Radio and Amateur Satellite services, the IARU (International Amateur Radio Union) sponsored a small booth.

The IARU exhibit was quite attractive, although far less expensive than the exhibits constructed by the major manufacturers. Hams, being hams, know how to be frugal! With the help of the CERN Radio Club, a club comprised of employees of the European scientific nuclear research center near Geneva, a booth was put together similar to the one used at TELECOM 91.

In addition, cooperation from amateurs employed by the ITU, and members of the International Amateur Radio Club (IARC), was instrumental in getting the display materials shipped to Geneva.

An international team of radio amateurs was assembled to staff the booth during the 10 long days that the exhibition was open to the public: Tafa Diop, 6W1KI, from Senegal; Abdi Razak Al-Shahwarzi, A41JT, of Oman; Vincent Magrou, F5JFT, from France (these first three are members of the Region 1 IARU Executive Committee); Pedro Seidemann, YV5BPG, from Venezuela (the Region 2 IARU Secretary); Hans Ehlers, DF5UG, of the DARC; and Frode Weierud, LA2RL, of the CERN.

Paul Rinaldo, W4RI, Manager of Technical Relations for ARRL, was project manager for the IARU display. Paul brought together the many elements, both human and material, required to mount a successful effort on behalf of IARU.

The IARU exhibit contained a working packet radio station. The packet station was connected to a local node, HB9IAC, on 70 cm. The exhibit also featured a personal computer loaned by CERN, which had a dial-up PPP connection to the Internet, and a static display of a Microsat that was furnished by AMSAT-NA.

We also displayed sample books indicative of the wide range of Amateur Radio publishing activities, including both the RSGB and ARRL *Handbooks*. Attracting quite a bit of interest were the copies of a new official ITU publication, *Excerpts from the Amateur and Amateur Satellite Service Regulations*, published by the ITU in cooperation with the IARU. The publication is available in any of the three ITU working languages—English, French and Spanish. You can order excerpts of ITU radiocommunication texts concerning the amateur service and the amateur satellite service directly from ARRL Headquarters at a cost of $20 (catalog number 5404). It is also available from the ITU in Geneva for 28 Swiss francs.

Naturally, the IARU booth served as a gathering point for many radio amateurs who were either visiting or working at TELECOM. Several hundred signed our guest book and enjoyed chats about the state of ham radio. Of course, our primary purpose for being at TELECOM was to make contact with governmental officials (Ministers of Communication, especially) and discuss the benefits of having a strong amateur service in their respective countries. Support for amateur frequency allocations at future World Radiocommunication Conferences (WRCs) is somewhat dependent on how well these officials understand the role of Amateur Radio. This is especially true for nations that do not have a long history of public service by amateurs.

The Internet: A Major TELECOM Topic

One of the most interesting aspects of TELECOM 95 was the two-day Internet Forum. The forum featured top-flight speakers such as Jim Clark, president of Netscape Communications, and Vincent Cerf, presently with MCI and a real pioneer of the Internet. While delivering his opening remarks, Dr Pekka Tarjanne, Secretary-General of ITU, observed that only four years earlier, at TELECOM 91, the word "Internet" was hardly mentioned. Now it is embraced as a principal player in the telecommunications world. Many of the hams who stopped by the IARU booth commented favorably on the amateur-related Web pages that were visible on our PC screen. Don't forget that CERN was the birthplace of the World Wide Web, which has all but replaced gopher as a cyberspace search mechanism.

Was it all worth the time, the expense, the standing in line for buses, and the lunches of cold sandwiches wrapped in plastic? You bet! IARU has already submitted an application for space at TELECOM 99 to be held in Geneva in October 1999. It is promised to be "even bigger and better." We truly hope the IARU booth will be there—in a bigger and better version, too!

A Team Effort

Special thanks for a successful TELECOM exhibit are due, in no small part, to the work of the CERN radio club. CERN is a scientific establishment that performs research on behalf of the European nations. Among the CERN contributions known to the general public is the World Wide Web (WWW), now the standard for surfing in cyberspace!

The team leaders from CERN were Fritz Sconczo, OE6FOG/F6IMS, and Claudia Wulz, F5NYQ. They were assisted by LA2RL, F5SWE, F1SAC, F8RU and many others. Hotel arrangements, always difficult during TELECOM, were made possible by Gerald Lander, HB9AJU.

The ITU gang, including Philippe Capitaine, HB9RKG, and Attila, HB9IAJ/OM1AM, were also quite helpful.—*Larry E. Price, W4RA, ARRL International Vice President, and Paul Rinaldo, W4RI, ARRL Manager of Technical Relations*

Edited by **Steve Ford, WB8IMY** • Managing Editor

FO-20 Replacement to be Launched This Year

The Japanese Fuji-OSCAR 20 satellite has provided nearly six years of service to the amateur community, but its days are numbered. The packet BBS failed quite a while ago and the SSB/CW transponder is on the way out. Radiation is causing gradual deterioration of the gallium arsenide solar cells and, as a result, power-generating capacity is decreasing. The exact date of the bird's demise is anyone's guess, although some at the Japan Amateur Radio League (JARL) predict that it may "go dark" this year.

If you've enjoyed FO-20, fear not. A robust replacement is on the way in the form of a satellite named *JAS-2*.

JAS-2 is presently scheduled for launch in either August or September board a NASDA (National Space Development Agency of Japan) H-2 rocket blasting off from the Tanegashima Space Center.

JAS-2 is quite similar to FO-20, both in appearance and function (Figure 1). Like FO-20, JAS-2 features a linear transponder for SSB and CW communication. The uplink passband is 145.90 to 146.00 MHz with a downlink passband from 435.80 to 435.90 MHz—just like FO-20. The linear transponder on FO-20 has been a grossly underused resource. Those who *have* used it, love it, but they're few in number. Perhaps this will change with JAS-2.

If you've missed FO-20's easy-to-use BBS, you'll be pleased to hear that it will return on JAS-2. Its function will be almost identical to a "standard" packet BBS. You won't need special software to access it. Unlike FO-20, however, the JAS-2 BBS has the ability to operate at 1200 or 9600 baud. Twelve-hundred-baud operation will use a PSK (phase-shift keying) downlink signal, so you'll need a PSK modem/TNC to decode the data. The 9600-baud mode will use FM FSK on the downlink.

At this point the designers are considering a rotating schedule for the satellite. For example:

Linear transponder —> 1200-baud BBS —> Linear transponder —> 9600-baud BBS

Of course, the schedule details will be published when the bird is ready for general operation. JAS-2 will also feature a "digitalker" somewhat similar to the unit presently in use on DOVE-OSCAR 17. It will be used occasionally to broadcast satellite bulletins and other messages of interest.

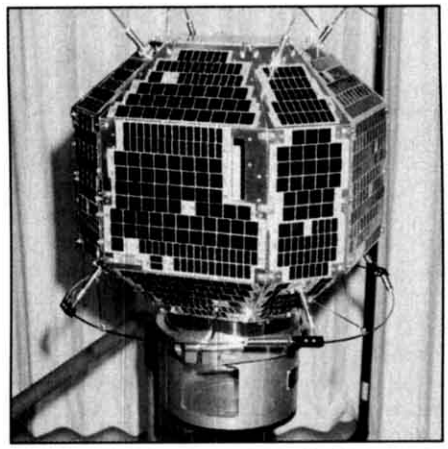
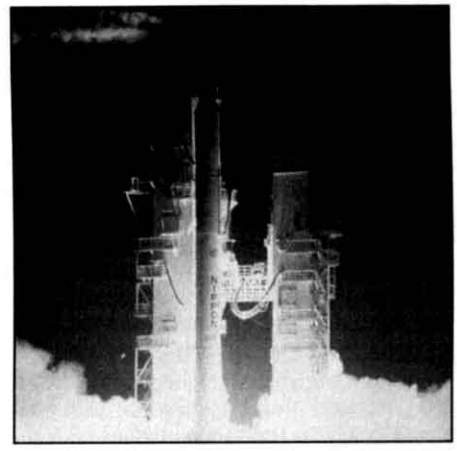


Figure 1—JAS-2 is ready to fly this summer. This 50-kg "basketball" (actually, a 26-sided polyhedron) is the welcome replacement for the dying FO-20 satellite.



An H-1 rocket carries Fuji-OSCAR 20 into orbit in 1990. Its successor, the H-2, will lift the JAS-2 satellite into space this year.

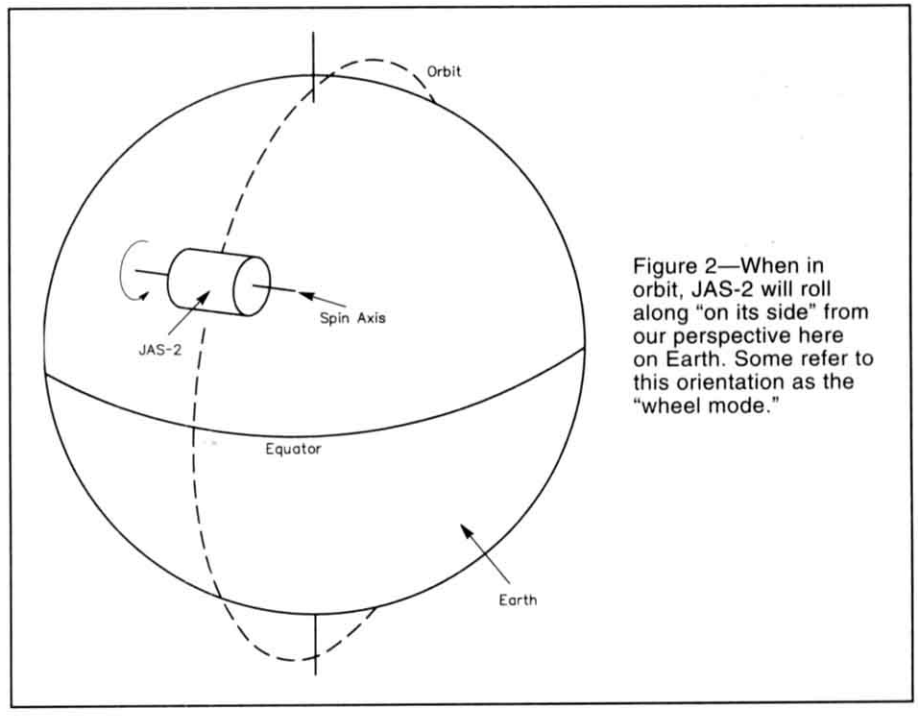


Figure 2—When in orbit, JAS-2 will roll along "on its side" from our perspective here on Earth. Some refer to this orientation as the "wheel mode."

The anticipated orbit of JAS-2 will be polar with an apogee of 1500 km and a perigee of 800 km. This should offer a wide, continent-spanning footprint! The satellite's spin axis will be maintained *perpendicular* to the orbital plane. This is the so-called "wheel mode," named for fact that the bird looks like a wheel rolling through its orbit. Strange as it appears (see Figure 2), the wheel mode provides even sunlight exposure to the solar cells.

Keep an eye on W1AW and AMSAT bulletins as the launch date approaches!

QST

Stan Horzepa, WA1LOU*

HF Throughput Truths

Mike Bernock, KB1PZ, Bob Levreault, W1IMM, and Ken Wickwire, KB1JY, recently completed the first phase of a program to gather and analyze a large amount of on-air throughput measurements in the packet, AMTOR, PACTOR and G-TOR modes. Their goal is to put various claims about HF digital throughput in perspective, and to give hams a sound basis with which to assess claims for the more advanced systems such as CLOVER, PACTOR II and automatic link establishment (ALE).

Mode	Average Throughput	Standard Deviation Throughput	Maximum Throughput	Sample Size
G-TOR	24.0	10.5	44.1	240
PACTOR	17.6	5.6	25.1	230
AMTOR	5.2	1.1	6.3	140
Packet	3.1	2.6	10.0	56

How It's Done

The automated measurements are being gathered with a program written in *C* for the Macintosh operating system. All participating stations use Kantronics KAM multimode processors equipped to run packet and the three TOR modes. The receiving KAMs have their ARQBBSs enabled and are waiting in the TOR STANDBY or command mode (for packet measurements).

The program instructs the local (sending) KAM to connect to a receiving KAM in each of the modes in turn. After each connect is complete and the appropriate confirmations and handshakes are received, an ASCII text file of specified size is uploaded to the receiving KAM mailbox.

Experiments suggest that the optimum file size, considering protocol overhead, for highest throughput and minimum test time is around 2,000 to 3,000 characters. Most of the transfers have used file sizes in that range.

The program logs the link and file transfer times and calculates the throughput in characters per second. The time-tagged logging file is later analyzed off-line with a separate program that calculates various statistics, such as the mean and standard deviation of the link, the transfer times, the throughput, and so on for each mode. The off-line program can also break down the statistics by call sign (and, thus, path length), file size, etc.

The transfer time is defined as the time between the start of the transfer and the receipt of the "Message Saved" prompt from the receiving BBS. Because there are a few seconds used to send the "Message Saved" notification, the measured throughputs are slightly pessimistic. This is a small price to pay for totally automatic measurements.

80 and 40 Meter Tests

The first test phase involves near-vertical-incidence skywave (NVIS) paths from 50 to 200 km long, between stations in Massachusetts, New Hampshire and Maine at all times of the day. NVIS paths are characterized by lots of multipath, strong D-layer absorption at midday, and high noise and interference at night. Therefore, the NVIS measurements may represent a lower bound on throughput performance in the TOR and packet modes. The measurements were run on the 80 and 40 meter bands.

So far, the test team has performed over 200 transfers in PACTOR and G-TOR, over 100 in AMTOR and over 50 in packet. For the packet transfers, they had to adjust several parameters (such as paclen, maxframe and hbaud) to achieve transfer. For example, they usually lower the baud rate to 100 or 150 baud to get files through on NVIS channels using packet.

Although they have not kept track of numbers of failed transfers, AMTOR—and especially packet—often fail to get files through before time-out when conditions are difficult. Roughly speaking, packet transfers have failed about half the time and AMTOR transfers somewhere around 20 to 25% of the time.

Preliminary Results

The table shows some preliminary findings, with all NVIS paths and all file sizes lumped together. The throughputs are all in characters per second. Huffman compression was used for almost all the PACTOR transfers. ("Standard Deviation" is a measure of statistical spread. "Maximum Throughput" is the maximum throughput observed so far in the NVIS tests.)

The relationship between the G-TOR and PACTOR average throughputs hides the fact that PACTOR sometimes did better than G-TOR, especially when the signal-to-noise ratios were low. It's also interesting to note that AMTOR would occasionally top the other TOR modes when it came to establishing links under poor conditions. Even so, file transfers were not guaranteed in those cases.

You'll notice the relatively large standard deviation of the G-TOR throughput. This is probably a reflection of the fact that G-TOR has a much wider choice of possibilities for automatically adjusting itself to changing channel conditions than the other modes.

The team will publish a more detailed breakdown of their data in the future. So, tune in later for more throughput truths.

9600 in '96

Have you made plans to move up to 9600 in 1996 yet? Or have you already made the jump to 9600?

This year, I plan to devote a lot of space in this column about upgrading to 9600. If you have any interesting experiences, good or bad, about your move to 9600, pass them along to me so we can share them with other "Packet Perspective" readers.

Geminids Packet Meteor Scatter Test Results

As you read this, I am wading through the results of the December Geminids packet meteor scatter test (see December *QST*, page 100). If you have not sent in your data yet, get them to me as soon as possible so that your participation will be reflected in the final results to be published in the April "Packet Perspective." QST

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CompuServe: 70645, 247

ARES—Change is Inevitable!

By John T. Litz, WA6IQZ/4

A recent article raised the question, "Is the traditional role of the Amateur Radio Emergency Service (ARES) dying?" (see Op-Ed, *QST*, Sep 1995, p 115). It explained why this would be a tragedy to Amateur Radio and how we need to come together to prevent the demise of ARES. I believe we must recognize the changing role of Amateur Radio in emergency service communications, examine the traditional role of ARES and accept the fact that a "rebirth" just might be appropriate.

My 16 years of emergency communications experience began as an ARES member while I was in high school. That experience led me into a career in public safety communications. I am now director of a countywide 911 system and the Deputy Emergency Manager of the White County (Georgia) Emergency Management Agency. Over the years, I have seen tremendous changes in the communications industry and in public safety communications technology. My experience tells me that the "traditional" role of ARES also must change if it is to survive and grow.

Communication is no longer the "weak link" in the public safety chain, as it may have been 15 years ago. Many urban and rural public safety agencies now have sophisticated communication systems to meet day-to-day and emergency communications needs. Cellular telephone technology allows emergency management field commanders direct and immediate access to the "information superhighway." The communications industry welcomed and embraced digital technology even faster than we hams did. Did we miss the boat? Not at all. But we must realize technology has eliminated many of the more "traditional" ARES functions. If we want to stay in the game, ARES leaders now must work more closely with our "user" agencies and offer our services in more "nontraditional" roles.

Our rural Georgia community experienced two natural disasters in less than 18 months—the 1994 Palm Sunday tornado outbreak and, more recently, our October 5, 1995, brush with Hurricane Opal. In both of these events, we used ham radio and ARES to supplement and assist recovery efforts, but not in the traditional "communicator" role. Today, the value of an Amateur Radio operator as a volunteer is much greater than "have radio, will travel!"

In the Palm Sunday Tornado, ARES wasn't activated until "day two," when recovery operations were well under way. How come so late? The county's new VHF communications system effectively handled law enforcement, fire, rescue and emergency management communications. (Also, the local Amateur Radio community lacked an effective organizational structure to interface with county emergency management.) When placed into service, hams *did* supplement communications, yes, but they also assisted local officials with shelter operations, damage assessment, supply and personnel transportation and other "noncommunications" functions. Had these "noncommunications" needs been met by the involved agencies, ham radio's role in emergency relief operations would have been extremely limited. Communicating wasn't our big problem. Having "professionals" that we could count on was.

During Hurricane Opal, Amateur Radio "staff" were called into the emergency operations center (EOC) the day before the storm to help monitor the storm's progress via various 75-meter phone nets and to assist the Emergency Management Agency staff with a planned response. We found the "live" reports from coastal hams to be an excellent source of information. During the storm, the public safety communications network handled most emergency response communications. But, when the operation shifted to the recovery phase, our ARES team was ready to roll in various capacities. These included not only communications, but damage-assessment response, sheltering, transportation, and logistical support.

Hams stand above the rest of the volunteer corps in their ability to think and function in technical and operational matters. I have found that I can take most ham radio operators and, with minimal training, plug them directly into support of my public safety team. I also can rely on hams to understand logistics and to function "professionally." During the Palm Sunday tornadoes, I used one of our hams to videotape much of the devastation. It took 10 seconds to explain what I wanted and how to work the camera, and the end product was outstanding. Could I have done that with just any "volunteer"? I don't think so. The ham radio operator had the unique combination of knowledge, skill and ability to get the job done.

I have heard many hams advocate "free agency." As a ham, I agree, but as a public safety professional, I think you need to be much more realistic. If you have the time, plug into several organizations and give freely to all of them. But remember your limits. Stretched too thin, you are worthless. As a professional charged with the responsibility to protect life and property, I value more the volunteers that I can regularly count on to be there.

In our agency, we maintain a list of all our volunteers' knowledge, skills and abilities—not just their ham radio qualifications. If I need HF operators, the no-code Tech can't help me there, but his skill at digital networking might be invaluable at an incident where information security is important. In return, Emergency Management Agency membership offers our ham operators an avenue of specialized emergency management training, such as advanced first aid, computers, and hazard-mitigation courses, which the ARES program alone could not tap into.

Your ability and skill as a volunteer are tremendously valuable to the agencies you serve. Volunteers may support the legally tasked agency, but in an emergency the agency has the ultimate responsibility. If ARES members aren't looked upon as part of that team, they won't be called out. It's that simple. We have got to have faith in hams' ability to be part of the solution—with similar reliability as our paid professional staff. I look upon our volunteers as unpaid professional staff, and I expect them to respond and act accordingly. Each has a professional ID card and standard operating procedures (SOPs) to guide their conduct.

We hams need to get the word out that we are a group of professional, motivated volunteers who already understand the discipline involved in public safety work. You've done something most other volunteers have not. You've "earned" your right to use the airwaves by getting your license. We should demonstrate and promote our ability to be part of the public safety team above our ability to communicate. Once we do that, we open tremendous doors of opportunity to work with public safety in all kinds of situations.

Remember: We're all here to serve the public. When the chips are down, the bottom line is to effectively get the job done. Let's worry less about who made the call or whether we got to use our portable radio, and focus more on what really matters—being safe, saving lives and protecting each other.

John T. Litz, White County 911 System, 1241 Helen Hwy, Suite 160, Cleveland, GA 30528

QST Op-Ed Policy

1) Contributions may be up to two-thirds of a *QST* page in length (approximately 900 words).

2) No payment will be made to contributors.

3) Any factual assertions must be supported by references, which do not necessarily have to be included in the body of the article to be published.

4) Articles containing statements that could be construed as libel or slander will not be accepted.

5) The subject matter chosen must be of general interest to radio amateurs, and must be discussed in a way that will be understandable to a significant portion of the membership.

6) With the exception that the article need not be consistent with League policy, the article will be subject to the usual editorial review prior to acceptance.

7) No guarantee can be made that an accepted article will be published by a certain date, or indeed, that it will be published at all; however, only articles that we intend to publish will be accepted, and any article we have decided against publishing will be returned promptly.

8) Send your contributions to ARRL Op-Ed, 225 Main St, Newington, CT 06111 QST

Edited by **Jay Mabey, NUØX** • *Editor,* The ARRL Repeater Directory

Band Plans and Misunderstandings

One of the great appeals of Amateur Radio is its astonishing diversity. We have many modes of communication—from FM to television—throughout our bands. This diversity is even more remarkable when you consider that we do a pretty good job of staying out of each other's ways—most of the time.

Keeping everyone separated is a daunting task. That's why the ARRL developed *band plans*. They organize all amateur bands (not just 2 meters) with the ultimate goal of providing a portion of spectrum for each of the interests we hams enjoy. You'll see these band plans printed in publications such as *The ARRL Operating Manual* and *The ARRL Repeater Directory*.

Agreements—*Not* Laws

Band plans are not legally binding in any fashion. They're a kind of social contract that most hams agree to follow. We agree because we fear the alternative—*chaos*.

Would you hold a door open for a stranger with an armload of packages? I hope so, even though there is no law that compels you to do it. If you let the door swing shut in his face, you won't be arrested or fined. However, anyone witnessing the incident will instantly decide that you're a jerk, and rightfully so! You've broken the social contract of behavior that most of us agree to obey.

The same is true of band plans. The FCC will not, for example, stop you from engaging in an FM simplex conversation smack in the middle of the weak-signal portion of 2 meters. But you'd be committing a gross violation of the band plans that the majority of hams observe. Not only will your fellow hams label you a fool, they're likely to tell you so!

Flexibility is the Key

If there is any problem with the ARRL VHF/UHF band plans, it's their one-size-fits-all nature. Fortunately, band plans are meant to be flexible. They're *recommendations*, not rigid edicts transmitted from Mount Olympus, or Newington, Connecticut. If the established plan doesn't meet amateurs' needs in a particular area, there is nothing to stop local coordination groups from fashioning their own plans, as long as they fit within the general framework. The "local option" applies most often in the repeater subbands. For example, certain frequencies may be designated for repeaters, or for simplex activity, depending on the local need.

Some hams erroneously perceive that the ARRL takes a dictatorial stance when it comes to band planning. Some even believe that planning decisions are made by Headquarters staff, which is not true.

It's easy to see how such misperceptions are born. All takes is an unfortunate error that gets propagated through the ham population. One such incident happened recently. The League published a book titled *Practical Packet Radio* by Stan Horzepa, WA1LOU. In one chapter of the first printing of this otherwise excellent reference, we published a list of VHF and UHF *packet* frequencies. Thanks to human error and an overzealous word processor, the list includes FM simplex *voice* frequencies (such as 146.52 MHz).

Errors are a part of the human condition and will always be with us. But this error will cause a certain amount of distress. You can bet that someone will start operating packet on 146.52 MHz or some other inappropriate frequency, and, when they're confronted by angry FM voice operators, will say, "The ARRL said I could do it! Look, it's right here in this League book!" Ouch!

If you confront someone using who is FM voice frequencies for packet, patiently acquaint them with the philosophy of band planning. If they cite *Practical Packet Radio* in their defense, tell them about the error and send them a photocopy of this article.

VHF/UHF BAND PLAN SUMMARIES

The 6-Meter Band

50.00—50.10	CW/Beacons
50.06-50.08	Beacon subband
50.10—50.30	SSB/CW
50.10—50.125	DX window
50.125	SSB calling frequency
50.30—50.60	All modes
50.60—50.80	Nonvoice communications
50.62	Digital (packet) calling frequency
50.80—51.00	Radio control
51.00—51.10	Pacific DX window
51.12—51.48	Repeater inputs (19 channels)
51.12—51.18	Digital repeater inputs
51.50—51.60	Simplex
51.62—51.98	Repeater outputs (19 channels)
51.62—51.68	Digital repeater outputs
52.00—52.48	Repeater inputs (52.02, 52.04 FM simplex)
52.50—52.98	Repeater outputs
52.525	National FM simplex calling frequency
52.54	Secondary FM simplex
53.00—53.48	Repeater inputs
53.00	Remote base FM simplex
53.1 .2 .3 .4 .5 .6 .7 .8	Radio remote control
53.54—53.98	Repeater Outputs (53.52, 53.90 FM simplex)

The 2-Meter Band

144.00—144.05	Moonbounce and weak signal CW
144.05—144.10	General CW and weak signals
144.10—144.20	Moonbounce and weak signal SSB
144.20	National SSB calling frequency
144.20—144.275	General SSB operation
144.275—144.30	Beacons
144.30—144.50	Satellites
144.50—144.60	Linear translator inputs
144.60—144.90	FM repeater inputs
144.90—145.10	Weak signal and FM simplex (packet)
145.10—145.20	Linear translator outputs
145.20—145.50	FM repeater outputs
145.50—145.80	Miscellaneous and experimental modes
145.80—146.00	Satellites
146.01—146.37	Repeater inputs
146.40—146.58	Simplex (some repeaters-local option)
146.52	National FM simplex calling frequency
146.61—147.39	Repeater outputs
147.42—147.57	Simplex (some repeaters-local option)
147.60—147.99	Repeater inputs

The 1.25-Meter Band

219—220	Digital links (Point-to-point message forwarding only)
222.00—222.15	Weak signal modes
222.0—222.025	Moonbounce
222.05—222.06	Beacons
222.10	SSB/CW calling frequency
222.10—222.15	SSB/CW
222.15—222.25	General operation, CW/SSB, etc (some repeater inputs-local option)
222.25—223.38	Repeater inputs
223.40-223.52	Simplex
223.50	National FM simplex calling frequency
223.52—223.64	Digital, packet
223.64—223.70	Links, control
223.71—223.85	Simplex, packet, repeater outputs (local option)
223.85—224.98	Repeater outputs

The 70-Centimeter Band

420.00—426.00	ATV repeater or simplex
426.00—432.00	ATV simplex
430.05—430.95	Packet
432.00—432.07	Moonbounce
432.07—432.10	Weak-signal CW
432.10	SSB/CW calling frequency
432.10—432.30	Mixed-mode and weak-signal work
432.30—432.40	Beacons
432.40—433.00	Mixed-mode and weak-signal work
433.00—435.00	Auxiliary/repeater links
435.00—438.00	Satellites
438.00—444.00	ATV repeater input
441.00—441.075	Packet
442.00—445.00	Repeater inputs and outputs (local option)
445.00—447.00	Shared by auxiliary and control links, repeaters, packet and voice simplex (local option)
446.00	National FM simplex calling frequency
447.00-450.00	Repeater inputs and outputs (local option)

QST

Edited by **Bart J. Jahnke, KB9NM** • ARRL/VEC Manager

FCC Releases Vanity Call Sign Application Form 610-V

Although the vanity call sign issue isn't an exam issue *per se*, volunteer examiners will receive questions about the form, so we are addressing its availability and use in this month's column.

FCC Form 610-V is the form necessary for use by amateurs when applying for a vanity call sign. A vanity call sign is one not sequentially issued by the FCC, but instead is specified by applicants who currently possess a currently valid station call sign. Form 610-V was made available to the public by the FCC in the first week of December 1995.

The FCC has not yet announced any of its application-gate opening dates, so *do not* send your Form 610-V to the FCC yet!

Form 610-V Availability

Although the FCC was not able to distribute hard copies of the form to the public until late in December 1995, they sent camera-ready copies to the ARRL/VEC, the W5YI Group, and perhaps others, so the forms could be duplicated and distributed by the VECs. The FCC actually provided camera-ready copy for *three* important pieces of information for the vanity program—the Form 610-V, Form 1070V and FCC Vanity Fact Sheet PR 5000 #206V.

The FCC also began at that time making Form 610-V available from their "fax-on-demand" system and via their Internet and World Wide Web electronic sites. To obtain Form 610-V via fax, from your fax machine you need to call 1-202-418-0177 (enter form number 006108). You can also obtain other FCC forms from this service (eg, Form 610 is form number 000610). To obtain the forms from FCC via the Internet or World Wide Web, use the following URLs (note that they are case-sensitive): **ftp://ftp.fcc.gov/pub/Forms/Form610V/** or **http://www.fcc.gov/Forms/Form610V**.

From the very first FCC announcement in early 1995, in which they released their new rules for the vanity call sign program, requests for Form 610-V were very heavy. Early on, recognizing the FCC's delay in providing the form, ARRL began accepting SASEs. Over our nearly 10 months of waiting for the form, the SASE requests amassed to nearly 9000!

Having finally received the form on December 4, the ARRL/VEC duplicated a supply of the forms to fulfill the requests, and on December 7, all 9000 were mailed. Persons wanting to obtain a Form 610-V information packet can request it from the ARRL, Form 610-V Request, 225 Main St, Newington CT 06111 (include 32 cents postage for each packet requested).

Completing Form 610-V

Completing Form 610-V need not be a complicated process. To begin, you need only five things to complete your application and to be ready to file it—the Form 610-V, a copy of your current FCC license, a check or money order for $30 (these are the common payment methods—see Form 1070V for additional options), an envelope/postage and a pen.

First, review the two pages of instructions and the vanity application fact sheet (PR 5000 #206V). Then, complete Form 610-V Section 1, item 1 (that's your name [last, first, middle initial] or club name), item 2 (your date of birth if applying for an individual vanity call sign, not a club vanity call sign) and item 3 (your mailing address—street address, city, state, zip or zip+4). Next, in item 5, write in the amount, $30.

Now we are starting to get into the *really important stuff*. In item 6, enter your current FCC-issued call sign (you must have a call sign before you can apply for a vanity call sign). For the next boxes, 7A to 7F, you must check one (and only one) box and write in applicable information where necessary.

Box 7A: If you are applying to receive your formerly held call sign, check this box and write in your former call sign (if you were previously WN1ABC, you cannot write in anything other than WN1ABC. You cannot drop the "N" and request W1ABC.

Box 7B: If you are the close relative of a deceased amateur, check this box and write in that deceased relative's call sign and your relationship to the deceased.

Box 7C: If you are the trustee of a club that formerly held a call sign that the club would like to get back, check this box and write in the former call sign.

Box 7D: If your club held a club station call sign on or before March 24, 1995, your club can seek the call sign of a deceased former member of your club. You must obtain the express written consent from the deceased amateur's family. Write in the deceased former member's call sign.

Box 7E: If you applying in gate 2, 3, or 4, according to your license class, check this box and complete your list of 25 preferred call-sign choices in Section 2 on the top of the back of Form 610-V (you are not *required* to include 25 choices, you may include as many as 25 or as few as you wish the FCC to consider; if none of your choices is available, you will revert to your present call sign). List your first choice as number 1, and then your remaining choices in your order of preference in numbers 2 through 25.

Box 7F: Same as Box 7E, but check this box if you are applying as a club trustee for a club station vanity call sign. Complete Section 2 as described above.

Item 8: Attach a copy of your current amateur operator/primary station license or, if you checked one of boxes 7C, 7D or 7F, attach a copy of the current club station license here.

Section 2, item 9: As before, if you checked boxes 7E or 7F, enter your 25 call-sign choices in order of your preference here.

Section 3, items 10 through 12, are to be completed by *all* applicants. You must sign and date your application and include your daytime telephone number!

Preparing your Form 610-V Envelope for Submission

Once you've completed your Form 610-V, double-check to be sure that you have completed *all* applicable items, and that you have checked the appropriate box of items 7A through 7F and provided any additional information), and make sure you've attached a copy of your current station license or your club's current station license (item 8). Then make out your check or money order, payable to "FCC" for $30 (US currency). Other fee payment methods are available; see Form 1070V for details.

Once you have all these pieces together, place them (form, license copy [attached to the form] and check) in an envelope and address the envelope (even if you will be sending the package by courier or carrying it by hand) to Federal Communications Commission, Amateur Vanity Call Sign Requests, PO Box 358924, Pittsburgh, PA 15251-5924.

If you will be hand-delivering your package or if you will be sending it via express or courier service (place your envelope as described above into the courier's packaging) and hand-carry or address it to Federal Communications Commission, c/o Mellon Bank, 525 William Penn Way, 27th Floor, Room 153-2713, Pittsburgh, PA 15259, Attn: Wholesale Lockbox Shift Supervisor.

You *may not* ship, send, mail or hand-carry your application until your appropriate application gate date has arrived. At this time, none of the gate opening dates are known. We don't expect to know what those dates will be until sometime in early 1996. Once a gate opens, it will remain open. The gates will be announced one at a time, and will open one at a time. QST

Coming Conventions

*Edited by **Gail Iannone** • Convention Program Manager*

MISSISSIPPI STATE CONVENTION

February 3-4, 1996, Jackson

The Mississippi State Convention, sponsored by the Jackson ARC, will be held at the Wahabi Shrine Temple, W Frontage Rd, Elton Rd Exit from I-55 S. Doors open for dealer setup Fri 4-8 PM, Sat 6-8:30 AM; public 8 AM to 4 PM, Sun 8 AM to 2 PM. Features include giant electronics flea market, computers, seminars, forums, workshops, ARRL activities, VE sess (Sun 8 AM, walk-ins), free parking, refreshments. Talk-in on 146.76. Admission is $5, under 12 free. Tables are $20 (dealers) and $15 (swap). Make checks payable to JARC Hamfest, 117 Beechtree Ln, Florence, MS 39073. Contact Travis Cliett, AB5ZE at 601-359-3413 (days), 601-939-9236 (eves); or Ken Johnston, KG5YV, 601-924-6253.

FLORIDA STATE CONVENTION

February 16-18, 1996, Orlando

The Florida State Convention (50th Anniversary Orlando HamCation and Computer Show), sponsored by the Orlando ARC, will be held at the Central FL Fairgrounds, Rte 50, 3 mi W of I-4. Doors open for setup Fri 9 AM to 5 PM; public Fri 5-9 PM (swap and tailgate), Sat 9 AM to 5 PM, Sun 9 AM to 4 PM. Features include 150 commercial exhibits, 450 swap tables, largest tailgate area in FL ($15 per space for 3 days), RV overnight parking ($16), forums (NASA, ARRL, AMSAT, NOAA, MARS), DX presentations (China Radio Conference and trip to Tibet by WA3YVN, DXpedition to Heard Island and Vietnam by K5VT, and DXpedition to Turks and Caicos Islands by NX4N). Talk-in on 146.76. Admission is $6 in advance and $8 at the door. Tables are $25 for 3 days. Send check for tickets and tables to Orlando HamCation, PO Box 547811, Orlando, FL 32854. Contact Ken Christenson at 407-291-2465; or e-mail, **KD4JQR@aol.com**.

GREAT LAKES DIVISION CONVENTION

February 24-25, 1996, Cincinnati, OH

The Great Lakes Division Convention, sponsored by the Committee for Amateur Radio and Hamilton County ARPSC, will be held at the Cincinnati Gardens Exhibition Ctr, Seymour Ave at Langdon Farm Rd, I-75 to Paddock Rd, E to Seymour Ave (Rte 561), E to Gardens. Doors open 8:30 AM to 5 PM. Features include flea market, commercial vendors, ARRL booth, forums (ARRL and others), VE sess (Sat AM). Talk-in on 145.37, 145.19, 224.06, 443.65. Admission is $6 in advance and $8 at the door. Contact Stan Cohen, WD8QDQ, 2301 Royal Oak Ct, Cincinnati, OH 45237; 513-531-1011.

1996
February 3-4
Southern Florida Section, Miami
(See January *QST* for details)
March 23-24
Oklahoma Section, Tulsa
March 30-31
Maryland State, Timonium
September 13-15, Peoria, IL
ARRL NATIONAL CONVENTION

NEBRASKA STATE CONVENTION

March 8-10, 1996, Norfolk

The Nebraska State Convention, sponsored by the Elkhorn Valley ARC, will be held at the Northeast Community College, 801 E Benjamin Ave, 1 1/2 mi E of Hwy 81. Doors open Fri 5-8 PM, Sat 8 AM to 5 PM, Sun 8 AM to noon. Features include flea market, forums (ARRL, NASA, Internet, ATV, LEOS), banquet (Sat 6 PM), VE sess (Fri 6 PM, Sat 7:30 AM), Wouff Hong ceremony, free parking. Talk-in on 146.73. Admission is $4 in advance and $5 at the door. Contact Bob Sheckler, NØTCW, 509 Nebraska St, Wayne, NE 68787; 402-375-4746.

Attention Hamfest and Convention Sponsors:

ARRL HQ maintains a date register of scheduled events that may assist you in picking a suitable date for your event. You're encouraged to register your event with HQ as far in advance as your planning permits. Hamfest and convention approval procedures for ARRL sanction are separate and distinct from the date register. Registering dates with ARRL HQ doesn't constitute League sanction, nor does it guarantee there will not be a conflict with another established event in the same area.

We at ARRL HQ are not able to approve dates for sanctioned hamfests and conventions. For hamfests, this must be done by your division director. For conventions, approval must be made by your director and by the executive committee. Application forms can be obtained by writing to or calling the ARRL convention program manager, tel 860-594-0262.

Note: Sponsors of large gatherings should check with League HQ for an advisory on possible date conflicts before contracting for meeting space. Dates may be recorded at ARRL HQ for up to two years in advance.

The ARRL National Convention is Playing in Peoria!

Join thousands of hams and many League officials from across the country at the 1996 ARRL National Convention to be held at the Peoria (Illinois) Civic Center, September 13-15. The event is sponsored by the Peoria Area Amateur Radio Club. Don't miss it! For convention information, call **(309) 692-FEST**. See you there!

QST

Hamfest Calendar

*Edited by **Gail Iannone** • Convention Program Manager*

Attention: The deadline for receipt of items for this column is the **1st of the second month preceding publication date.** For example, your information must arrive at HQ by **February 1** to be listed in the **April** issue. Hamfest information is accurate as of our deadline; contact sponsor for possible late changes. For those who send in items for Hamfest Calendar and Coming Conventions: Postal regulations prohibit mention in *QST* of prizes or any kind of games of chance such as raffles or bingo.

(Abbreviations: *Spr* = Sponsor, *TI* = Talk-in frequency, *Adm* = Admission.)

Arizona (Phoenix)—Feb 5, 7 PM. *Spr:* West Valley ARC. St Clement of Rome Catholic Church Social Hall, 15800 Del Webb Blvd, Sun City, 1/2 mi S of Bell Rd on W side of Del Webb. AR equipment auction (club keeps 10% commission from seller). *TI:* 147.3. Paul Playford, W8AEF, 18021 N Hyacinth Dr, Sun City West, AZ 85375-5349; 602-546-2119.

†ARRL Hamfest

†**Arizona (Scottsdale)—Mar 9,** 6 AM to 3 PM. *Spr:* Scottsdale ARC. Scottsdale Community College. Forums (ARRL, ARES), VE sess. *TI:* 147.18. Ron Reynolds, N7WTF, 2514 E Turney Ave, Phoenix, AZ 85016; 602-240-0473.

British Columbia (Vancouver)—Feb 25; sellers 9 AM, buyers 10 AM to 2 PM. *Spr:* Burnaby ARC. Westminster Armouries, 6th St at Queens. Flea market, parking, refreshments. *TI:* 145.35, 442.85. *Adm:* sellers $12 per table, buyers $3. Contact the club net Mon nights at 8 PM local time on 145.35 or write to Box 72012, 4429 Kingsway, Burnaby, BC V5H 4P9, Canada.

California (Livermore)—Feb 4, 7 AM to noon. *Spr:* Livermore ARK. Las Positas College (because of college security concerns, buyers and sellers must stay off property until 7 AM the day of swap). Swapmeet held in open parking lot rain or shine. *TI:* 147.045 (94.8 Hz) from the W, 145.35 (100 Hz) from the E. Noel Anklam, KC6QZK, 474 Humboldt Way, Livermore, CA 94550; 510-447-3857 eves.

Connecticut (Bristol)—Mar 10 (snow date Mar 17); dealer setup 7 AM, public 9 AM to 1 PM. *Spr:* Insurance City Repeater Club. Bristol Eastern High School, King St, Rte 229. Flea market, dealers, used ham, computer, and electronic equipment, VE sess (10 AM, prereg only), handicapped accessible, parking, refreshments. *TI:* 146.88, 224.8 (77 Hz). *Adm:* $4. Tables: before Mar 2 $10 (adv res only, Pete Brunelli, 358 Andrews St, Southington, CT 06489, 860-620-0176), after Mar 2 $15. Send SASE to ICRC, PO Box 165, Pleasant Valley, CT 06063.

†**Florida (Brooksville)—Feb 24,** 8 AM. *Spr:* Hernando County ARA. Hernando County Fairgrounds, 2 mi S of Brooksville on US Hwy 41. Tailgating ($5), vendors (must have adm ticket), programs, free parking. *TI:* 146.715. *Adm:* adv $4, door $5. Tables: $10. Send SASE and check payable to HCARA to Glenn Brown, AC4QH, 31188 Park Ridge Dr, Brooksville, FL 34602; 904-799-6755 after 7 PM.

†**Florida (Crystal River)—Jan 20;** vendor setup Fri 3-5 PM, Sat 7-8 AM, public 8:30 AM to 3 PM. *Spr:* Sky High ARC. National Guard Armory, just off US Rte 19, turn E at traffic light, S of the Crystal River Airport on W Seven Rivers Dr. RV parking, refreshments, free parking, tailgating ($8), exhibitors (must purchase adm tickets when table reservations

are made), computers. *TI:* 146.955. *Adm:* adv $4 until Jan 1, door $5. Tables: $15 (8-ft; first-come, first-served). Chad Johnson, W3IKO, 904-746-1299.

Florida (Orlando)—Feb 16-18, Florida State Convention. See Coming Conventions.

Georgia (Comer)—Mar 2, 9 AM to 3 PM. *Spr:* NE GA Bubba Net. Madison County Fairgrounds, 1/2 mi S of Comer on Hwy 22. Flea market, dealers, VE sess, camping (Fri eve, hookups $6), refreshments. *TI:* 147.3. Dan Daniel, AE4HS, 152 Windfall Dr, Winterville, GA 30683; 706-742-2777.

†**Georgia (Dalton)—Feb 24;** set up Fri 3-9 PM, Sat 6:30 AM, public 8 AM to 3 PM. *Spr:* Dalton ARC. N GA Fairgrounds, downtown Dalton on Legion Dr. ARES and MARS forums. *TI:* 145.23. *Adm:* $5. Harold Jones, N4OTC, 706-673-2291 (after 6 PM); James Jordan, K4FLG, 706-278-0630 (after 6 PM); or write Dalton ARC, PO Box 143, Dalton, GA 30722-0143.

†**Illinois (Rock Island)—Feb 18;** set up Sat noon to 6 PM. Sun 6 AM, public 7:30 AM to 3:30 PM. *Spr:* Davenport Radio Amateur Club. QCCA Expo Center, 2621 4th Ave. Flea market, commercial exhibits, refreshments, free parking, handicapped accessible, VE sess (prereg preferred, send SASE to Roger Franke, K9AYK, 2506 E 29th Ct, Davenport, IA 52803; walk-ins accepted, must show photo ID and one other form of ID, original current license and any CSCE forms, make check or money order for current fee payable to ARRL/VEC). *TI:* 146.88, 146.64. *Adm:* adv $5, door $6, under 14 free. Tables: $12 (commercial booths $20; to guarantee table and booth space, reservations must be received by Jan 10; send SASE to Kent Williams, K9UQI, with check payable to Davenport RAC, 4245 10th St, East Moline, IL 61244). Don Schneider, WDØAMA, 518 W Locust St, Davenport, IA 52803-2898; 319-333-6223 days, 319-388-0108 eves; fax 319-333-6218, or e-mail, **dschneir @saunix.sau.edu.**

†**Illinois (Sterling)—Mar 24;** set up Sat 6-9 PM, Sun 6:30 AM, public 7:30 AM. *Spr:* Sterling-Rock Falls ARS. Sterling HS Field House, 1608 4th Ave. Flea market, radio and electronic items, computers, dummy load to test equipment, VE sess (walk-ins only, bring original and copy of current license and photo ID), free parking, areas for self-contained campers and mobile homes, refreshments. *TI:* 146.85. *Adm:* adv $3, door $4. Tables: $5 w/o elec, $6 w/elec, bring cord (first table, $6; additional, $5), Lloyd Sherman, KB9APW, PO Box 521, Sterling, IL 61081-0521; 815-336-2434.

†**Kansas (Colby)—Mar 9;** set up 6 AM, public 8 AM to 2 PM. *Spr:* Trojan ARC. Colby National Guard Armory on K-25 (I-70 Exit 53, 2 mi N). National Weather Service, ARRL, and KS Packet Group forums, VE sess (12:30 PM, walk-ins encouraged), refreshments. Early bird get-together Fri 6 PM at Sirloin Stockade. *TI:* 146.82. *Adm:* $2. Tables: $5. TARC, Box DX, Colby, KS 67701-0983.

†**Louisiana (Lafayette)—Mar 8-10;** Fri 5-7 PM, Sat 8 AM to 4 PM, Sun 8 AM to noon. *Spr:* Acadiana ARA. Holiday Inn Holidome, E Service Rd off I-49, just S of I-10; take Exit 103-A off I-10, then first left, cross over S of I-10 to E Service Rd, go S on E Service Rd to Holiday Inn Holidome. AMSAT, MARS, ARRL forums, VE sess, Louisiana Council Meeting, low band DXing, packet communication. *TI:* 147.03, 146.82, 145.33, 147.21. *Adm:* adv $3, door $4. Nolen Griffith, K5ARH, 123 Normandy Rd, Lafayette, LA 70503; 318-989-9039.

Massachusetts (Braintree)—Mar 3; set up 8 AM, public 9:30 AM to 2 PM. *Spr:* South Shore ARC. DAV 29 Hall, Liberty St; Rte 3 to Exit 17, go E .4 mi to light, turn right onto Middle St, go straight 1.3 mi (as you go under expressway, Middle St becomes Liberty St, hall on left). Flea market, VE sess (prereg only), ample parking in parking lot only, refreshments. *TI:* 146.67. *Adm:* $2. Tables: 8-ft $12 (before Feb 20), $15 (on day of sale). Make check or money order payable to South Shore ARC before Feb 20 and mail to William Morgan, 25 Helena Rd, Boston, MA 02122.

†**Massachusetts (Marlborough)—Feb 17,** 10 AM to 2 PM. *Spr:* Algonquin ARC. Marlborough Middle School, Bolton St; Rte 20 toward Marlborough, Rte 85 N, at 2nd light take a right and then first left. Flea market. *TI:* 146.61. *Adm:* $2. Tables: adv $12 (before Feb 10), door $15. Ann Weldon, KA1PON, PO Box 258, Marlborough, MA 01752; 508-481-4988 before 9 PM.

†**Michigan (Dearborn)—Feb 25,** 8 AM to 3 PM. *Spr:* Livonia ARC. Dearborn Civic Center, 15801 Michigan Ave, SW corner of Michigan Ave and Greenfield Rd. Swap-n-Shop, SKYWARN, RACES, VE sess (prereg only), computers, electronic test equipment, parking. *TI:* 145.35, 146.52. *Adm:* adv $4 with table reservation, door $5. Tables: $15 (plus adv $4 adm). Send 4×9 SASE to Neil Coffin, WA8GWL, c/o LARC, PO Box 2111, Livonia, MI 48151; 313-261-5486.

Michigan (Southfield)—Jan 21, 8 AM to 3 PM. *Spr:* Southfield HS Technology Dept, Southfield HS, 24675 Lahser Rd. Swap and Shop, computers, software, electronic parts and equipment. *Adm:* $5. Tables: 8-ft $17. Gerald Kocsis, 810-746-8853.

Michigan (Traverse City)—Feb 17, 8 AM to noon. *Spr:* Cherryland ARC. Immaculate Conception Middle School, 720 2nd St. Swap-n-Shop, VE sess. *TI:* 146.86. *Adm:* $5. Tables: $8. Chuck, W8SGR, 616-946-5312, or Joe, W8TVT, 616-947-8555.

Mississippi (Jackson)—Feb 3-4, Mississippi State Convention. See Coming Conventions.

Nebraska (Norfolk)—Mar 8-10, Nebraska State Convention. See Coming Conventions.

New Jersey (Absecon)—Mar 2; sellers 7 AM, public 9 AM. *Spr:* Shore Points ARC. Holy Spirit HS, Rte 9, 3/4 mi S of Rte 30. Flea market, tailgating ($5, weather permitting), free parking, refreshments. *TI:* 146.985. *Adm:* $5 (nonham spouses and children free). Tables: $7 per 8-ft section (in heated indoor selling area with ac; reservations accepted). Shore Points ARC, PO Box 142, Absecon, NJ 08201.

New York (Freeport)—Feb 25, 9 AM to 4 PM. *Spr:* Long Island Mobile ARC. Freeport Armory, 63 Babylon Tpke, Meadowbrook Pkwy to Exit 7. Dealers, vendors, computers, VHF tune-up clinic, free parking, refreshments. *TI:* 146.85. *Adm:* $6 (children and sweethearts free). Tables: $25 (includes 1 adm, adv reservations only). Jay, N2FP, 516-735-0557, or George, N2LSK, 516-286-7562; LIMARC 24-Hour Hotline 516-349-0843.

†**New York (Goshen)—Feb 17;** 9 AM to 3 PM. *Spr:* Orange County ARC. John S Burke High School, Rte 17 to Exit 122A (Fletcher St), follow signs. Vendors, tailgating, refreshments, ARES forum, VE sess (9-11 AM, Novice and Tech only; 11 AM to 2 PM, open to all; prereg advised). *TI:* 146.76 (100 Hz). *Adm:* $3, under 10 free. Steve Voorman, KB2TRG, 2215 Rte 94, Salisbury Mills, NY 12577-5407; 914-496-8710.

New York (Horseheads)—Feb 17. *Spr:* Rookies ARA. New York State Armory, 128 Colonial Dr. Jack Slocum, WB2FXK, 410 Shelbourne St, Horseheads, NY 14845; 607-739-4866.

†**North Carolina (Charlotte)—Mar 9-10;** Sat 9 AM to 5 PM, Sun 9 AM to 2 PM. *Spr:* Mecklenburg ARS. Merchandise Mart, 2500 E Independence Blvd, Rte 74 E. Forums, VE sess. *TI:* 145.29. *Adm:* adv $6, door $8. Mary Hunt, KA4EXP, 3213 Bridgemere Terr, Matthews, NC 28105; 704-841-HAMS or 704-845-9429.

†**North Carolina (Elkin)—Feb 18,** 8 AM to 4 PM. *Sprs:* Briarpatch ARC and Foothills ARC. Elkin National Guard Armory, 1 mi N of Elkin on US Rte 21. *TI:* 145.37. *Adm:* $5. Dave Nicholson, N4VMB, PO Box 162, Cana, VA 24317; 703-755-4669.

†**North Dakota (Bismarck)—Mar 2,** 8 AM to 4 PM. *Spr:* Central Dakota ARC. Radisson Inn, 800 S 3rd St. Forums, VE sess. *TI:* 146.85. *Adm:* adv $5, door $6. Tim Rasset, NØSDB, 4109 38th Ave NW, Mandan, ND 58554; 701-663-6620.

Ohio (Cincinnati)—Feb 24-25, Great Lakes Division Convention. See Coming Conventions.

†**Ohio (Conneaut)—Mar 10.** *Spr:* Conneaut ARC. Conneaut Human Resources Center, 2 blocks N of the junction of Rtes 7 and 20; Exit 241 off I-90. VE sess. *TI:* 147.39. *Adm:* adv $4, door $5. Jack Marttila, KA8TUU, PO Box 661, Conneaut, OH 44030; 216-593-3353.

†**Ohio (Cuyahoga Falls)—Feb 25,** 7 AM to 3 PM. *Spr:* Cuyahoga Falls ARC. Emidio & Sons, 48 Bath Rd, OH State Rte 8 and E Bath Rd, approx 6 mi S of OH Tpke. Hamfest/Computer Show, flea market. *TI:* 147.27. *Adm:* adv $4, door $5. Tables: $8 (adv only). Carl Hervol, N8JLQ, 11192 Cottingham Cir, Uniontown, OH 44685; 216-497-7047.

Ohio (Lorain)—Feb 4; vendor setup 7 AM, public 8 AM to 2 PM. *Spr:* Northern Ohio ARS. Gargus Hall, 1969 N Ridge Rd (N Ridge Rd is the extension of Rte 254, aka Detroit Rd, W of Rte 57). *Adm:* $4. Tables: 6-ft $8, 8-ft $10 (does not include adm). Stan Zupan, AA8IN, 216-933-4261 before 9:30 PM.

†**Ohio (Mansfield)—Feb 11,** 7 AM to 4 PM. *Sprs:* Intercity ARC and Mansfield Amateur Emergency Rptr. Richland County Fairgrounds, from US Rte 30 exit on Trimble Rd N, follow signs to far W side of Fairgrounds. Hamfest/Computer Show, flea market. *TI:* 146.94. *Adm:* adv $4, door $5. Tables: adv $9, door $12. Send SASE to Pat Ackerman, N8YOB, 63 N Illinois Ave, Mansfield, OH 44905; 419-589-7133 after 6 PM EST (adv ticket/table orders must be received and paid by Feb 1).

†**Oregon (Rickreal)—Feb 17;** set up Fri 6-9 PM, Sat 7 AM, public 9 AM to 4 PM. *Sprs:* Salem Rptr Assn and OR Coast Emergency Rptr. Polk County Fairgrounds, W on Hwy 22 from Salem to Rickreal, left at traffic light onto Hwy 99W, 1/4 mi to Fairgrounds. Flea market, exhibits, dealers, self-contained RV spaces, ARRL forum, VE sess, ARES meetings, handicapped accessible, refreshments. *TI:* 146.86. *Adm:* adv $6, door $7. Evan Burroughs, N7IFJ, 503-585-5924.

†**Pennsylvania (Latrobe)—Feb 11,** 8 AM to 3 PM. *Spr:* Chestnut Ridge ARC. Latrobe American Legion, 1811 Ligonier St, Rte 30 to Rte 982 N, follow signs. Hamfest/Computer Show, refreshments. *TI:* 145.15. *Adm:* $2. Tables: $10. Chris Weiss, K3JDU, 412-537-6068; or Carol Demosky, N3UVA, 412-539-1552.

†**Pennsylvania (Pittsburgh)—Feb 25,** 8 AM to 3 PM. *Spr:* South Hills ARC. Castle Shannon VFD Memorial Hall, Rte 51 to Rte 88 (Library Rd), 1 1/4 mi to VFD. Hamfest/Computer Show, flea market, vendors, handicapped accessible, free parking, refreshments. *TI:* 146.955, 146.46. *Adm:* $3, under 11 free with adult. Tables: vendors $15 (includes electricity), flea market $10 (no electricity). Steve Lane, N3RNY, PO Box 11626, Pittsburgh, PA 15228; 412-341-1043.

†**Texas (Smithville)—Feb 17.** *Spr:* Bastrop County ARC. Riverbend Park, N of TX Hwy 71 at Colorado River, just N of Smithville. VE sess. *TI:* 145.35, 443.75. *Adm:* $1. Charlie Claiborne, N5JWP, PO Box 556, Smithville, TX 78957; 512-237-3817.

†**Texas (Victoria)—Mar 9,** 8 AM to 3 PM. *Spr:* Victoria ARC. KC Hall, 3610 N Ben Wilson. *TI:* 145.13 (103.5 Hz), 145.19 (103.5 Hz). *Adm:* adv $4, door $5. Robert Whitaker, KI5PG, 121 S Main, Suite 205, Victoria, TX 77901; 512-518-8045.

Vermont (Milton)—Feb 24, 8 AM to 3 PM. *Spr:* Radio Amateurs of Northern VT. Milton High School, Rte 7, Milton Village, 5 mi N of I-89, Exit 17. Flea market, auction, dealers, forums, exhibits, book sales, refreshments, VE sess (9 AM and 2 PM), commercial radio exams (2 PM). *TI:* 145.15. *Adm:* $3, under 18 free. Tables: available while they last (call ahead for large setups). Mitch Stern, WB2JSJ, 802-879-6589.

†**Virginia (Vienna)—Feb 25,** 7:30 AM to 3 PM. *Spr:* Vienna Wireless Society. Vienna Community Center, 120 Cherry St. VE sess (Sat 9 AM, same location), flea market, vendors, tailgating, parking and free shuttle bus at Vienna Metro station southside. *TI:* 146.685. *Adm:* $5. Paul Wilkins, AB4CY, 703-560-2779.

†**Washington (Puyallup)—Mar 9;** set up Fri 2-8 PM, public Sat 9 AM to 3 PM. *Spr:* Mike and Key ARC. Western Washington Fairgrounds Pavilion. Club info, VE sess. *TI:* 146.82 (103.5 Hz). *Adm:* $5, under 16 free. Michael Dinkelman, WA7UVJ, 637 2nd Ave S, Kent, WA 98032-6137; 206-854-4031.

West Virginia (Fayetteville)—Feb 25, 9 AM. *Spr:* Plateau ARA. Fayetteville High School, take Laurel Creek Rd Exit off US Rte 19, go 2 blocks E. Amateur radio demos, VE sess, commercial dealers, refreshments. *TI:* 146.79. *Adm:* $5. Tables: $7 and $5. Mark Skaggs, N8UYN, PO Box 135, Victor, WV 25938, 304-658-5789; or Mike Vargo, WB8WKO, 211 Kelly Ave, Mt Hope, WV 25880, 304-877-5460.

Silent Keys

Edited by ***Kathy Capodicasa, N1GZO***

It is with deep regret that we record the passing of these amateurs:

W1ALB, Raymond Legro, Sarasota, FL
W1DBM, Phillip S. Rand, Haverhill, NH
W1DT, Barton G. Albert, Swansea, MA
KA1EMI, Margaret M. Morriseey, South Yarmouth, MA
W1FSF, William A. Bottomley Jr, Glastonbury, CT
K1JAP, Frederick E. Jones, Portland, ME
K1LFH, Norman A. Cucuel, Bristol, CT
N1TED, Robert J. Barickman, Waitsfield, VT
KB2AYE, Joseph A. Castaldi, Waretown, NJ
WA2CUJ, Irwin C. Cohen, Jupiter, FL
W2CUS, William E. Wackenhuth, Roseland, NJ
WB2EID, Lindus L. Caulum, Zephyrhills, FL
W2ELM, Walter R. Emrich Jr, Staten Island, NY
W2NZT, John A. Graham, Belleville, NJ
W2OPW, Eugene C. Howe, Ballston Spa, NY
N2QVZ, Murray S. Miron, Syracuse, NY
WB2WHI, Elizabeth Widmann, Crawfordville, FL
N2ZBN, Francis M. Flynn, Mastic, NY
N3ALJ, Henry J. Soracco, Pittsburgh, PA
N3CZ, Carlton Zellars, Philadelphia, PA
N3DPA, Solomon Davidowitz, Gettysburg, PA
*W3FQB, G. F. Montgomery, Washington, DC
N3HPU, Arnold D. Cohen, Levittown, PA
WA3IFC, Luther T. Bissey, State College, PA
W3KJY, Howard C. McClelland, Pittsburgh, PA
N3NOM, Herbert R. Smith, McKees Rocks, PA
KA3NYU, William E. Young, Langhorne, PA
K3RCU, Arthur Guido Sr, Baltimore, MD
*W3RLR, Joseph Mullan, Baltimore, MD
KI4BG, Carl W. Hines, Wilson, NC
KK4BN, John L. Mitchell, Augusta, GA
W4BRV, D. W. Maness, Nashville, TN
W4CEL, Clement Murray, Columbia, SC
*N4FFP, Charles N. Kaeff, Bellevue, KY
*WD4FTK, John C. Murray Sr, Yorktown, VA
W4FTM, Morris F. McLain, Concord, NC
KB4GY, Russell Mariz, Beaufort, SC
W4GZ, Charles K. Davis, Fulton, KY
N4IBF, Roger C. Frith, Nashville, TN
K4KSS, Richard W. Steffel, Wooster, OH
K4LR, Charles W. McDowell, Birmingham, AL
W4MLV, Angelo J. Misenti, Phoenix, AZ
WD4MVQ, Elisabeth K. Konieczny, Lexington, TN
KC4QS, Truman Sims, Clearwater, FL
WA4TDD, Geraldine R. Grantges, Belleair Beach, FL
KE4TIC, Kenneth Schweikert, Stuart, FL
W4TXZ, Elisha W. Winfrey III, Newport News, VA
WA4WHB, James E. Marino Jr, Apex, NC
WB4YGI, Robert N. Olson, Milton, FL
N5CLR, James C. Washburn, Midland, TX
N5ELH, Shirley E. Lucht, Hobbs, NM
WB5GWU, William R. Bell, Monticello, AR
W5HQ, Henry F. Binz, Corpus Christi, TX
W5III, Joseph Bonnett, Dallas, TX
NZ5J, William G. Jackson, Seguin, TX
WB5LNV, Claude C. Fogle, Dallas, TX
W5MOX, Roy H. Self, Roy, NM
W5PSP, Sankston S. Tunnell, Artesia, NM
W5RJL, George A. Lupey, Luling, LA
WF5R, Alexander F. Norcross, Long Beach, MS
KD5SL, Shelton McAnelly, Baton Rouge, LA
W6AJF, Frank C. Jones, Sonoma, CA
KE6FXY, Clare Bishop, Hesperia, CA
K6GH, Douglas A. Lane, Seattle, WA
WA6KDD, Magnus K. Stromberg, Modesto, CA
KE6NAQ, Bill Harding, San Diego, CA
W6NNV, Norman F. Wasson, Arcadia, CA
K6NX, George C. Anderson, Whittier, CA
W6RKR, Harvey I. Lawrence, Scotts Valley, CA
N6RSW, Brian M. Perkin, Santa Clara, CA
W6UID, Del Alumbaugh Jr, Menifee, CA
KZ6U, James D. Young, Riverside, CA
W6WPK, James L. Coleman, San Juan Capistrano, CA
W6ZYA, Paul M. Reinhardt, San Jose, CA
WB6ZYA, Medill J. Bienenfeld, Los Angeles, CA
W7DTP, Hubert F. Hoover, Spokane, WA
W7ETK, Walter L. King, Phoenix, AZ
W7IGK, Harold W. Toedtemeier, Salem, OR
W7IHO, William R. Eidenschink, Lincoln City, OR
W7JZQ, Earl K. Moore, Comanche, TX
W7KA, L. M. Dunlap, Edmonds, WA
W7KYN, Thomas E. Thorpe Sr, Prescott, AZ
W7LFR, Robert W. LeClerc, Seattle, WA
W7LIN, Nelson A. Maxwell, Beaverton, OR
W7NDC, Fred L. Thomas, Tigard, OR
KD7NF, S. A. Belland, Medford, OR
W7OC, Kenneth R. Straight, Spokane, WA
W7QQ, Christian L. Engleman, Washougal, WA
WB7TIB, Melvin L. Zyph, Chattaroy, WA
KM7T, Michael G. Strahon, Eugene, OR
KA7WFB, Donald Churchill, Nehalem, OR
KE8CI, Craig V. Moore, Belpre, OH
K8DEC, John C. Steadman, Jacobsburg, OH
WA8EBS, Eila D. Russell, Fairview Park, OH
NY8E, Edward McCann, Cincinnati, OH
KE8GR, Victor R. Pearson, Mesa, AZ
WD8JAI, Frank W. Yarbrough, Cincinnati, OH
W8KXK, Norman J. Treadwell, North Ridgeville, OH
W8LSF, Robert J. Kolb, Jupiter, FL
KE8NZ, John D. McGeorge, Canton, OH
WA8OZF, Kurt H. Kammann, Shelby Township, MI
W8PH, Douglas H. Horner, West Carrollton, OH
KD8QB, Bernard L. Chandler, Rose City, MI
W8QOM, Anna E. Strawway, West Branch, MI
WD8QVD, Heinz P. Gronemeier, Clarkston, MI
W8RTL, Donald F. Hinton, Xenia, OH
W9ASX, Glen E. Rogers, Lafayette, IN
K9DZS, John E. Niemeyer, Seymour, IN
KB9EAV, Rene L. Petit, De Pere, WI
W9EGG, Clarence R. Rogness, Evanston, IL
W9EPT, Donald L. Smith, South Bend, IN
K9HOF, Eugene F. Molitor, Aurora, IL
WD9HZB, Jewell D. Carr, Wilmington, IL
WB9JDX, Dallas K. Brown, Borden, IN
KB9KCL, Charles Prescott, Tomah, WI
WB9QDR, Frank L. Hirt, Santa Claus, IN
W9SNF, Neil G. Barry, Crown Point, IN
K9TBZ, John Drabik, Burbank, IL
W9VSR, Edwin E. Spurr, East Moline, IL
NØCJN, Richard H. Carpenter, Cumming, GA
WØDOK, Phillip G. Dawson, Kansas City, MO
WAØDRX, Joseph D. Brown, Iowa City, IA
WDØFFO, Samuel H. Adams, Bloomington, MN
NØGCA, Charles W. Armstrong, Poplar Bluff, MO
WØGX, Leo W. Knaust, Normandy, MO
KØIVU, Lester E. Messersmith, Cambridge, NE
*WØIWV, Arthur L. Robertson, Arvada, CO
NØLLY, Harold G. Drybread, Topeka, KS
WØPUR, Clifford De Jong, Pella, IA
*WØSOJ, John E. Hyde, Naples, FL
WØWIT, Paul M. Kersten Md, Nokomis, FL
G3CDK, R. I. Clews, Surry, Great Britain
G3TSN, D. Newbould, West Yorks, Great Britain
VO1DR, Harold O. Trainor, Harbour Grace, Nfld Canada
VE3XK, Bertram Morgan, Sudbury, ON Canada

*Life Member, ARRL

**Charter Life Member, ARRL

Note: Silent Key reports must confirm the death by one of the following means: a letter or note from a family member, a copy of a newspaper obituary notice, a copy of the death certificate, or a letter from the family lawyer or the executor. Please be sure to include the amateur's name, address and call sign. Allow several months for the listing to appear in this column.

Many hams have remembered a Silent Key with a memorial contribution to the ARRL Foundation. Should you wish to make a contribution in a friend or relative's memory, you might designate it for an existing youth scholarship, the Jesse A. Bieberman Meritorious Membership Fund or for the Victor C. Clark Youth Incentive Program Fund or for the General Fund. Contributions to the Foundation are tax-deductible to the extent permitted under current tax law. Our address is: The ARRL Foundation, Inc, 225 Main St, Newington, CT 06111. QST

75, 50 and 25 Years Ago

February 1921

◊ Sending code as she gazes at a photo of her beloved, the woman ham in H. R. Hick's cover painting seems not to need the services of Cupid, who nonetheless takes aim from just below the *Q* in *QST*. Editorials discuss, among other things: how lucky we are to have generally useful amateur privileges ("consider Canada with its 50 meters, Britain with its 10 watts and restricted aerials, France with its ban on everything except meteorological information, Germany with its absolute 'verboten'"); "false calls vs. bum fists"; and holding off on transmitting for "about seven minutes" twice each day, just ahead of noon and 10 PM, while NAA, Arlington, VA, transmits its time signals.

L. M. Clausing's "I.C.W. from Sixty-Cycle Current"—a method of generating interrupted (broad, modulated) continuous waves through mechanical rectification of a vacuum-tube oscillator's plate supply—leads the issue's features. We also investigate "2ZM's Radiophone and C.W. Transmitter" (L. Spangenberg) and "An Electrolytic Rectifier for C.W." (lead and aluminum strips in eight jars of 20 Mule Team Borax electrolyte, by P. J. Furlong, 1FF). The Old Man provides humor in the form of "Rotten S.O.L." (out of luck, that is, if we "stay-at-homes" missed out on the Midwest Convention in St Louis); Who's Who in Amateur Wireless fetes Frank Conrad, 8XK—the man behind station KDKA, Pittsburgh—as "an example for the amateur."

February 1946

◊ The cover photo shows the finely machined acorn-tube oscillator featured in the issue's lead article, "Tuned Circuit Design for U.H.F," by Maurice Apstein, W2QI, and Moe Joffe, W2BNY. The editorials cover "These Bands" ("Have you ever thought of our bands as having personalities?") and "War Surplus." We read of the "ARRL Band-Warming Party"— the "first postwar world-wide QSO contest"—scheduled for February 22-25 and March 1-4.

Following Apstein and Joffe, Byron Goodman, W1JPE, builds "A 28-Mc. Receiver/Converter"; Sidney T. Fisher puts "divided-wave amplification" to work in "A New Linear Amplifier Circuit"; William R. Foley, K4FEC, gets down to "Forecasting Long-Distance Transmission" ("using predicted-MUF charts for determining DX frequencies and times"); W. W. Smith, W6BCX, increases sideband power without overmodulation with "Premodulation Speech Clipping and Filtering"; and E. P. Tilton, W1HDQ, assembles "A Non-Radiating Superregenerative Receiver for Two Meters." The issue's essay-ad from the National Company details how the basic (and famous) HRO receiver varied in name and design through the war.

February 1971

◊ The cover: "It's not a psychologist's maze, it's a die photo showing the works of a monolithic integrated circuit." Editorials discuss "The *Service* Headquarters" ("if you have a problem, or a project, drop us a line; it's dollars to doughnuts we can be of help") and the misinformation that seems to be surfacing as "Industry Pessimism."

A legendary controversy gets top billing in the issue's lead feature, "Quad *vs* Triband Yagi" by John H. Parrott Jr, W4FRU. Doug DeMaw, W1CER, provides "Quick-and-Easy Portable-Mobile Reception" by modulating a mediumwave oscillator with audio from simple 80- and 2-meter detectors. "New Ideas for the 2-Meter Kilowatt" pour in from the lab benches of Thomas F. McMullen Jr, W1QVF, and Edward P. Tilton, W1HDQ. Norman D. Pos, WA6KGP, explores "Integrated Circuit Flip-Flops." William J. Hall, K1RPB, presents Part 1 of "The ATR-166: A Homemade Transceiver for the 160- through 6-Meter Bands," as Chuck Daily, WN7PDT, puts up "A 15-Meter Beam 'On a Budget' in Beginner and Novice. Recent Equipment examines Heathkit's SB-102 HF transceiver. Richard Hammell, W2FCR, provides photographic evidence of what happens when "Lightning Strikes!"

Remember the *Pueblo*? Ralph (K1SCQ) McClintock's "A Ham in the People's Paradise" recounts the experiences he had while imprisoned in North Korea with his *USS Pueblo* crewmates.—*David Newkirk, WJ1Z* QST

Contest Corral

*Edited by **Warren C. Stankiewicz, NF1J** • Assistant Contest Manager*

ARRL International DX Contest time is here. Remember that the CW deadline has changed! The deadline for CW is now March 19 (30 days after the end of the contest), not 30 days after the end of the phone contest (which is April 2). Is your club taking part in the ARRL Affiliated Club Competition? If so, make sure that your list of club members eligible for the DX Contest (along with what class your club is entering) has been submitted, and that your paperwork with the Club Branch at HQ is up to date. If you're looking for a record to break, the new *ARRL Contest Yearbook* has, for the first time, all the official records of the ARRL Contest Program. Pick up your copy today!

Feedback: In the September VHF QSO Party, WBØGGM was multioperator, not single operator. This makes them the Multioperator leaders for the Minnesota Section and Dakota Division, and in ninth place overall; WAØBWE becomes the single operator section and division leader; and WRØG is tenth place overall in the single ops. In addition, AA7VT's rover score was 3,958, not 39,588. This makes WA8NJR the overall winner, and moves AA7VT from first to third in the West Coast Region box.

Qualifying Runs

February W1AW runs are set for 10 PM EST on Friday, February 2, and at 4 PM EST on Saturday, February 24. The West Coast Qualifying Run will be on Wednesday, February 7, at 9 PM PST. Check the W1AW Schedule for details.

Jan 28-Feb 28

CTARL World Wide 10-Meter FM Contest, sponsored by CTARL, from 0000Z Jan 28 to 2400Z Feb 28. 10 meter FM only, 100 W output max. Single operator and multi-single. OM stations exchange RS and age; YLs send RS and 00. Score 1 pt/QSO in own call area; 2 pts/QSO in different call area; and 3 pts/QSO w/DX stations. Multipliers are prefixes. Final score is QSO pts × mults. Awards. Send logs by May 31 to 10 FM Net Taiwan, POB 104-51, Taipei, Taiwan, ROC.

February

3-5

Classic Radio Exchange, from 1900Z Feb 4 to 0400Z Feb 5. Object is to restore and operate equipment at least 10 years old. Exchange name, RS(T), QTH, and receiver and transmitter type (homebrew, send amp tube or transistor). CW—60 kHz up; phone—3.880 7.290 14.280 21.380 28.320; Novice/Tech—20 kHz up. Final score is QSOs × no. of different receivers and transmitters worked per band/mode and states/provinces/DXCC countries worked per band/mode × total years old of all receivers and transmitters used that made at least 3 QSOs (×2 if transceiver). If gear is homebrew, count as 25 unless older. Awards. Send logs to Jim Hanlon, W8KGI/5, POB 581, Sandia Park, NM 87047.

North American Sprint, phone, sponsored by *NCJ*, 0000-0400Z Feb 4 (local date, Feb 3); CW is 0000-0400Z Feb 11, local time Feb 10. Sprints are separate. 80, 40, 20 meters only. North American stations work everyone; others work NA stations only. Exchange other station's call, your call, serial no., name, and state/province/DXCC country. 3.540 3.850 7.040 7.225 14.040 14.275. Work stations once per band. QSY rule: Stations calling CQ, QRZ, etc, may only work one station in response to that call; they must then move at least 1 kHz before working another station or 5 kHz before soliciting another call. Once you are required to QSY, you may not make a new QSO on the previous frequency until you have made a contact at least 1 kHz or 5 kHz (as required) away. Team competition. Awards. Electronic entries accepted. Send CW logs to Tree Tyree, N6TR, 15125 SE Bartell Rd, Boring, OR 97009 (e-mail, **tree@cmicro.com**); phone logs go to Rick Niswander, POB 3778, Greenville, NC 27836 (e-mail, **aoniswan@ecuvm.cis.ecu.edu**) no later than 30 days after the end of the contest.

Northern New England QSO Party, sponsored by the QSO Parties of the States of Maine, New Hampshire and Vermont. This party runs concurrent with those individual state QSO parties, and entry in any one of the parties enters you in this one automatically.

Maine QSO Party, sponsored by the Portland AWA, from 0000Z Feb 3 to 2400Z Feb 4, work any 24 hours, off times must be 6 hours min. Work stations once per band and mode. No repeater/digipeater QSOs. Single op, multi-op, large club (>50), small club, low power (<150 W), QRP (<10 W), mobile. Send RS(T) and QTH (county for ME stations; others send state/province/DXCC country). CW—35 kHz up, and 25 kHz up in the Novice segments; phone—25 kHz in the General segments and 28.300-28.500; VHF—50.200 144.200 146.55. Score 1 pt/phone, 2 pts/CW or digital, and 5 pts/10 pts for phone/CW or digital QSO with club stations NS1Z, K1GUP, KD1HH, WA1WPR, AA1KC, W1TLC, N1JBD, N1BUG, W1KVI, WA1URS. Final score is QSO points × ME counties worked (max 16); ME stations multiply by ME counties/states/provinces/DXCC countries. Awards. Send logs postmarked by Mar 31 to Portland AWA, POB 1605, Portland ME 04104.

New Hampshire QSO Party, sponsored by NHARA, from 0000Z Feb 3 to 2400Z Feb 4. Work 24 hours, off times must be 6 hours min. Work stations once per band/mode. No repeater/digipeater QSOs. Single op, multi-op, large club (>50), small club, low power (<150 W), QRP (< 10 W), mobile. Send RS(T) and QTH (county for NH stations, state/province/DXCC country for others). CW—30 kHz up; Novice/Tech—30 kHz up; phone—25 kHz up in the General segments and 28.300-28.500; VHF—50.200 144.200 146.55. Score 1 pt/phone, 2 pts/CW or digital, and 5 pts/10pts per phone/CW or digital QSO with club stations WB1CAG K1BKE KB1BRO W1WQM N1KLP WW1G KB1BTW W1ET W1GUA KC1XG W1WA. Final score is QSO points × NH counties worked (10 max); NH stations use NH counties/states/provinces/DXCC countries. Send logs by Mar 31 to North Country ARC, Richard C Force, WB1ASL, 12 Cottage St, Lancaster, NH 03584-1903.

Vermont QSO Party, sponsored by the Central Vermont ARC, from 0000Z Feb 3 to 2400Z Feb 4. Work 24 hours, off times must be 6 hours min. Work stations once per band/mode. Single op, multi-op, large club (>50), small club, low power (<150 W), QRP (< 10 W), mobile. Send RS(T) and QTH (county for VT stations, state/province/DXCC country for others). CW—40 kHz up; Novice/Tech—20 kHz up; phone—25 kHz up in the General segments and 28.300-28.500. Score 1 pt/phone, 2 pts/CW or digital, and 5 pts/10 pts per phone/CW or digital QSO with club stations KB1BQI K1UFL KB1BRN W1KOO W1BD WB1FPT KB1BQH KB1BSB WA1WLM KB1BRI KB1BPR KB1BPX KB1BSP W1FN WB1GQR. CW—40 kHz up. Final score is QSO points × VT counties worked (14); VT stations use VT counties/states/provinces/DXCC countries. Awards. Send logs by Mar 1 to Barry Driscoll, KE1BV, Central Vermont ARC/VT QSO Party, POB 674, Montpelier, VT 05601.

10-12

IDRA World Wide RTTY WPX Contest, sponsored by the *Digital Journal*, from 0000Z Feb 10 to 2400Z Feb 11. Single op one signal, high/low (<150 W) power, all band; single op single band; multi-single (10 min rule); multi-multi. Single ops operate 30 hours max; multis operate full 48. 80-10 meters, except the 30, 17 and 12-meter bands. Use of spotting nets or *PacketCluster* is allowed for all classes. Exchange RST and serial no. starting w/ 001. Score 1 pt/QSO w/own country, 2 pts/QSO w/ own continent, and 3 pts/QSO w/different continents. QSOs on 3.5 and 7 MHz are worth double; ie, 2, 4 or 6 pts, respectively. Multipliers are prefixes; final score is QSO points × mults. Awards. Send logs postmarked by 30 days to Jay Townsend, WS7I, POB 644, Spokane WA 99210-0644, or e-mail to **jayt@comtch.iea.com**.

North American Sprint, CW, see Feb 3-5 listing.

NW QRP Club Winter Sprint, sponsored by the NW QRP Club, 1800-2300Z Feb 11. Work stations once per band/mode. Exchange RS(T), state/province/DXCC country and NWQ no. (non-members send power output). Score 5 pts/3 pts per QSO w/ NWQ member on CW/phone; 3 pts/1 pt per QSO with non-members. Multiply final score by 3 if <1 W used. Awards. Send logs by Feb 29 to Stan Yarema, KG7ME, 3457 12th W, Seattle, WA 98119.

PACC Contest, sponsored by the Vereniging voor Experimenteel Radio-Onderzoek in Nederland, 1200Z Feb 10 to 1200Z Feb 11. Single op or multiop. Send RS(T) and serial no, PA/PB/PI stations also send province. Score 1 pt/QSO, work PA/PB/PI stations only, once per band regardless of mode. Final score is QSOs × provinces worked (max 12 per band). Awards. Send log by Mar 31 to Frank E. van Dijk, PA3BFM, Middellaan 24, NL-3721 PH Bilthoven, The Netherlands.

RSGB 1.8 MHz Contest, sponsored by RSGB, 2100Z Feb 10 to 0100Z Feb 11. CW only, use 1820-1870 kHz. Single op only. Overseas stations work UK only. Exchange RST; UK stations will send RST and county code. Score 3 pts/QSO and a bonus of 5 pts/QSO for each new UK county worked. Awards. Send logs (postmarked within 16 days) to RSGB HF Contest Committee, c/o S V Knowles, G3UFY, 77 Bensham Manor Rd, Thornton Heath, Surrey CR7 7AF, England.

YL-OM Contest, phone, sponsored by the YLRL, from 1400Z Feb 10 until 0200Z Feb 12 (CW is 1400Z Feb 24 until 0200Z Feb 26). YLs work OMs and vice versa. Exchange RS(T), serial no., and section/province/DXCC country. Work stations once per band. Phone—3.960 7.240 14.250 21.380 28.410; CW—3.540 7.040 14.040 21.120 28.180. Final score is QSO pts × sections/provinces/DXCC countries worked/band × 1.5 if <100 W (CW) or 200 W PEP (phone) is used. All participants must use <750 W on CW and <1500 W PEP on phone. Awards. Send logs to Carol Hugentober, K8DHK, 4441 Andreas Ave, Cincinnati, OH 45211.

12-16

School Club Roundup, see Jan *QST*, p 112.

17-18

ARRL International DX Contest, CW, see Dec *QST*, p 105.

23-26

CQ WW 160-Meter DX Contest, phone, see Jan *QST*, p 105.

CZEBRIT QRP Contest, sponsored by the OK and G QRP Clubs, from 1600Z Feb 24 to 2400Z Feb 26. CW only, must use <5 W output. Exchange RST, serial no., and power. 3.560 7.030 14.060 21.060 28.060. Score 5pts/QSO w/OM, OK or G stations and 3 pts/QSO w/other European stations. If you contact 2 or more European countries, multiply final score × 2. Awards. Send logs to G QRP Club, c/o A D Taylor, G8PG, 37 Pickerill Rd, Greasby, Merseyside L49 3ND, England.

North Carolina QSO Party, sponsored by the Alamance ARC, from 0000Z Feb 24 to 2400Z Feb 25. NC stations work everyone, others work NC stations only. Work stations once per band and mode. Work mobiles again as they change coun-

ties. Exchange RS(T) and NC county, state, province, or DXCC country. Score 1 pt/SSB QSO, 2 pt/CW QSO, 5 pts/Novice/Tech QSO. NC stations multiply QSO points × NC counties/states/provinces/DXCC countries; others × NC counties worked (max 100). Add 25 bonus pts for working both Cherokee and Dare counties. Awards. Send logs by Mar 22 to NC QSO Party, c/o Alamance ARC, K4EG, Box 3064, Burlington, NC 27215.

REF French Contest, phone, see January *QST* p 105.

RSGB 7 MHz Contest, sponsored by the RSGB, from 1500Z Feb 24 to 0900Z Feb 25. CW only. 7.000-7.030. Single operator and multioperator. Exchange RST and serial no. UK stations also exchange three-letter county code. Non-UK stations work only UK stations, and vice versa. North American stations score 15 points/QSO. Multipliers are UK counties. Final score is QSO points × multipliers. Awards. Send logs postmarked within 16 days to RSGB HF Contest Committee, c/o SV Knowles, G3UFY, 77 Bensham Manor Rd, Thornton Heath, Surrey CR7 7AF, England.

UBA Contest, CW, see January *QST*, pp 105-106.

Winter QRP QSO Party, sponsored by the Colorado QRP Club, from 2200Z Feb 25 to 0400Z Feb 26. Single band, multiband, and Novice/Tech. QRP only. Exchange RS(T), state/province/DXCC country, first name and CQC no. or power output. CW—1.825 3.560 3.710 7.040 7.110 14.040 21.060 21.110 28.060 28.110; phone—1.910 3.985 7.285 14.285 21.385 28.385. Score 6 pts/4 pts/CW QSO with member/non-member; score 3 pts/2 pts/phone QSO w/member/non-member. Final score is QSO pts × states/provinces/DXCC countries × number of first names worked, one/letter of the alphabet, 26 max. Awards. Send logs to Jim Pope, KGØPP, POB 31575, Aurora, CO 80041-0575.

YL-OM Contest, CW, see Feb 10-12 listing.

March Events

2-3	**ARRL International DX Contest, phone**
2-3	European EME Contest, 144 and 1296-MHz portion
9-10	Cadiz Silver Cup Contest
10-11	Wisconsin QSO Party
12-13	CLARA and Family HF Contest
16-17	Bermuda Contest
16-17	Russian DX Contest
23-24	European EME Contest, 432, 2304-MHz-and-up portion
30-31	CQ WW WPX Contest, phone.

24-March 3

FISTS Novice Roundup, sponsored by FISTS, 1600Z Feb 24 to 2400Z Mar 3. Novice/Tech stations work everyone; others work Novice/Tech stations only. Exchange RS(T), state/province/DXCC country, and FISTS no. (if member) or power output. Novices and Techs must sign /N or /T. Work stations one per band. Score 1 pt/phone, 2 pts/packet, and 3 pts/CW QSO. Add 1 pt/QSO w/FISTS member. Multipliers are states/provinces/DXCC countries. Final score is QSO pts × multipliers. Send logs by Apr 9 to Peter Kozup, K8OUA, 5115 N Park Ave, Warren OH 44481.

Contest Announcements: Items for this column can be sent on a MS-DOS disk in ASCII format, via modem (860-594-0306), via fax (860-594-0259), via Internet (to **contest@arrl.org**), or in letter form. Submissions must be received no later than the 1st of the second month preceding the publication date; ie, a contest in **May** would have to be received by **Mar 1.**

QST

VHF/UHF Century Club Awards

The ARRL VUCC numbered certificate is awarded to amateurs who submit written confirmations for contacts with the minimum number of Maidenhead grid-square locators (indicated in *italics*) for each band listing. The numbers after call signs refer to endorsements. The totals shown are current as of November 30, 1995. A self-addressed, stamped envelope (SASE) will bring you the rules and application forms.

Compiled By Bill Moore, NC1L Century Club Supervisor

50 MHz

100

758	WB8K
759	K5RHR
760	N5VVB
761	KC5KBD
762	KD4HKL
763	N2QHS
764	N9KUW
765	WA9BOW
766	WQ5Y
767	KQ4PI
768	WDØEMY
769	KA5PVB
G4SEU	250
VE3SXE	275
NØLL	675
KØTLM	575
KSØF	450
NØIGZ	300
W1WHL	375
W3TFA	225
WA4GLV	125
KB4CSE	425
W4DR	650
WB4DBB	575
WA5NFC	150
WB5IGF	375
K5RHR	125
N5VVB	150
W5RCI	350
KB6NAN	250
W6YLL	250
WN6W	300
WB8YFE	575
NQ8A	200
WA9BOW	300
WA9PWP	275

144 MHz

100

509	SM6UMO
510	KD4UPF
511	G4SEU
512	WA6HXD
513	KQ4PI
514	N5TML
515	KGØTQ
KSØF	175
KØDAS	150
WZ1V	250
WB5IGF	275

222 MHz

50

86	KB4CSE
87	WA1HYN
88	NS4W
89	WB5IGF
90	AA4H
KØDAS	80
W5RCI	100

432 MHz

50

250	NA4I
251	N8EDQ
252	WZ8T
KØTLM	110
KØDAS	90
N5FAC	60
W5RCI	210
WB5IGF	80

902 MHz

25

21	WB5IGF

1296 MHz

25

122	KH6CP/1
123	KØDAS
124	NU7Z
W5RCI	60

2.3 GHz

10

55	WB5IGF

3.4 GHz

5

47	WB5IGF

5.7 GHz

5

29	WB5IGF

10 GHz

5

87	K1FWF
88	N1RWM
89	KH6CP/1
KH6CP/1	10
K6KLY	15

Satellite

100

47	KE4SCY
48	K1CLN
49	K9HF
50	N8ULU
51	AA9LC
TI5RLI	250
KE4CSY	250
K5RHR	200
KD6WW	225
N7SFI	175

QST

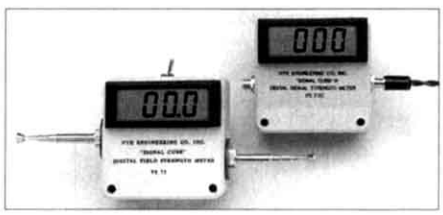
New Products

NYE ENGINEERING's FS73C DIGITAL "S" METER

◊ Adding to the capabilities of its older brother, the FS73 digital field-strength meter, the FS73C is a digital signal-strength meter that connects to your radio's RF or IF section. The unit can be powered by an internal 9-V battery, or from your receiver.

The original FS73 is a calibrated field-strength meter that receives signals via two built-in telescoping antennas. The new FS73C uses your radio to receive signals and provide selectivity, resulting in improved accuracy when displaying "received signal strength." Both versions are housed in the same compact, rugged enclosures.

Price: each unit costs $169 plus $5 s/h. For more information, contact Nye Engineering at 4020 Galt Ocean Dr, Suite 606, Fort Lauderdale, FL 33308; tel 305-566-3997, fax 305-484-3376.

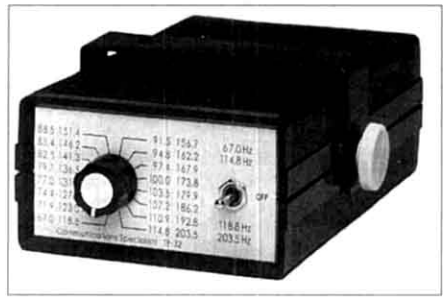


TE-32 MULTI-TONE ENCODER FROM COMMUNICATIONS SPECIALISTS

◊ The TE-32 is the newest variation of Communications Specialists' model SS-32P tone encoder. Any EIA CTCSS tone from 67 to 203.5 Hz can be selected via a front-panel rotary switch. Users can access repeaters that require CTCSS tones even if their radios do not have internal tone encoders.

The TE-32 is housed in a rugged 5.25×3.3×1.7-inch plastic case and is supplied with a mounting bracket and a shielded cable. Use it in your car or in your shack.

Price: $49.95; comes with CS's "no hassle" 1-year warranty. For more information, contact Communications Specialists at 426 W Taft Ave, Orange, CA 92665; tel 800-854-0547, fax 714-974-3420.



Strays

FORTUNE COOKIE WISDOM

◊ Tom Delker, WB4ZSA, was taken out to dinner by his daughter Katy, KC5JXE. They went to a Chinese restaurant. When Tom opened his fortune cookie at the end of the meal, it said, quite appropriately: Enjoy the pleasure of two-way communication for now.

Special Events

Edited by ***Warren C. Staniewicz, NF1J*** *• Assistant Contest Manager*

Sun Prairie, Wisconsin: Four Lakes ARC. W9JZ, 1500Z **Feb 2**-2400Z **Feb 3**, Groundhog Day. 3.850 7.225 14.225 28.400. Certificate. Jake Kitzinger, KE9XZ, 3181 Siggelkow Rd, McFarland, WI 53558.

Punxsutawney, PA: Punxsutawney ARC. **Feb 3**, Groundhog Day. Lower General 40 & 20-meter phone. Certificate. Ken Fetterman, N3VFN, RD 6 Box 70, Punxsutawney, PA 15767.

Fort Myers, FL: Fort Myers ARC. W4LX, 1500-2100Z **Feb 9-11**, Edison Festival of Light Parade. Certificate. FMARC, POB 061183, Fort Myers, FL 33906.

Decatur, IL: Cenois ARC. K9HGX, 1400-2300Z **Feb 10**, Abraham Lincoln's Birthday. Lower 25 kHz General subbands, 28.485. Certificate. Cenois ARC, POB 4595, Decatur, IL 62525.

Tonawanda, NY: ARA of the Tonawandas. W2SEX, 1200-2200Z **Feb 10**, Valentine's Day. 3.940 7.045 7.290 14.045 14.290 146.55. QSL. ARATS, POB 430, North Tonawanda, NY 14120.

Fargo, ND: Red River ARC. KØZWG, 1400-2300Z **Feb 10**, Handi-Ham project at 38th Kiwanis Pancake Carnival. Lower 25 kHz of General 20 and 15 meters. QSL. Jim Mowery, KØZWG, Horizons Manor, 2500 Broadway, No. 710, Fargo, ND 58102.

Edison, NJ: Metuchen RC. K2YNT, 1600-2100Z **Feb 10**, Birthday of Thomas Alva Edison. 7.230 7.250 14.280 14.305. Certificate. David Kanitra, WB2AZE, 74 Port Reading Ave, Woodbridge, NJ 07095.

Stratford, CT: Stratford ARC. W1ORS, 1700Z **Feb 10 to** 2400Z **Feb 16**, club's 50th anniversary. Lower 25 kHz General 160-15 meters and 6 meters. Certificate. May Blakley, WA1EHK, 17 Coram Rd 4F, Shelton, CT 06484.

Romance, AR: Metropolitan ARC. N5RLJ, 1500-2100Z **Feb 11**, Valentine's Day. General 40, 20, 15 meters phone. Certificate. David Flake, N5RLJ, POB 4248, North Little Rock, AR 72190.

Oklahoma City, OK: Handicap Information Net. KA5ENU, 2000Z **Feb 12**, 27th anniversary. Jackolyn Olsen, KA5ENY, 911 Kenilworth Rd, Oklahoma City, OK 73114.

Savannah, GA: ARC of Savannah. W4HBB, 2200Z **Feb 12** to 0500Z **Feb 16**, 262nd anniversary of the founding of Savannah. 7.245 14.245 21.345 28.345. Certificate. ARCS, POB 13342, Savannah, GA 31419.

Show Low, AZ: Kachina ARC. WA7GWG, 1500-2300Z **Feb 14**, Arizona's 84th birthday. 7.130 7.235 14.240 21.350 28.350. Certificate. Kachina ARC, POB 2996, Show Low, AZ 85901.

Roseville, MI: L'Anse Creuse ARC. KB8YUV, 1500-2100Z **Feb 17**, Macomb Mall public demonstration. General 80-10 meters. Diane Scalzi, WI8K, 21621 Briarcliff, St Clair Shores, MI 48082.

Alexandria, VA: Mount Vernon ARC. N4BV, 1600-2200Z **Feb 17-18**, George Washington's Birthday. Lower General 80-15 meters and Novice 10 meters. Certificate. MVARC, POB 7234, Alexandria VA 22307.

Certificates and QSL cards: To obtain a certificate from any of the special-event stations offering them, send your QSO information along with a 9×12-inch self-addressed, stamped envelope to address listed in the announcement. To receive a special event QSL card (when offered), be sure to include a self-addressed, stamped business envelope along with your QSL card and QSO information.

Special Events Announcements: For items to be listed in this column, you must use the ARRL Special Events Listing Form. Copies of this form are available via Internet (info@arrl.org), the ARRL BBS (860-594-0306), or for a SASE (send to Special Requests, ARRL, 225 Main St, Newington, CT 06111, and write "Special Requests Form" in the lower left-hand corner.) Entries must be received by ARRL HQ no later than the 1st of the second month preceding the publication date; ie, a special event listing for **May** *QST* would have to be received by **Mar 1**. Entries may be sent on an MS-DOS floppy disk in ASCII format; fax at 860-594-0259; via modem (860-594-0306); via Internet (to contest @arrl.org); or in letter form.

QST

New Books

THE NEW SHORTWAVE PROPAGATION HANDBOOK

By George Jacobs, W3ASK; Theodore J. Cohen, N4XX; and Robert B. Rose, K6GKU
Editor: Gail M. Schieber

Published by CQ Communications, Inc, 76 N Broadway, Hicksville, NY 11801. First Edition, 1995, softcover, 8½ by 11 inches, 192 pages. B&W illus. $19.95 plus S&H. ISBN 0-943016-11-8

Reviewed by Jerry Hall, K1TD
ARRL Assoc Technical Editor, Retired
e-mail: jerhall@cris.com

If you have an interest in DXing, solar activity, sunspot cycles or the study of radiowave propagation—or if you simply wonder what amateur bands will be open to where, and when—then *The NEW Shortwave Propagation Handbook* could be the greatest book to come along in recent years. As Cycle 22 winds down and sunspot activity is minimal, this volume's appearance is especially timely. If you're an Amateur Radio veteran, you also realize that chasing DX these days is a whole different ball game than it was a few years ago. This book tells you why and explains how to deal with today's propagation conditions.

No mere rehash of its predecessor, *The Shortwave Propagation Handbook* (First Edition 1979, Second Edition 1982), this handbook is a brand-new publication from stem to stern. Oh, yes, it does draw information and ideas from the older publications, but the entire book has been freshly written. In particular, it reflects new insights gained from the vast knowledge obtained in recent years through satellite observations and ground-based stations using advanced ionospheric-sounding techniques. Much of the new information comes by way of the knowledge and experience of the book's third author, Bob Rose, K6GKU. As you may recall, Bob authored "*MINIMUF*: A Simplified MUF-Prediction Program for Microcomputers" in *QST* for December, 1982. *MINIMUF* was the first program ever that gave hams the power to make propagation predictions using a personal computer.

Because of its striking wrap-around cover—an artist's airbrush drawing of a solar prominence in brilliant red-oranges and yellows on a jet-black background—*The NEW Shortwave Propagation Handbook* is easy to spot in a book display. From its attention-grabbing cover through its seven chapters to the final page of the index, the book is chock full of excellent information. A dedication reflects on 100 years of shortwave radio. Brief biographies of the authors follow a preface and acknowledgments.

Chapter titles aptly describe their contents. They include: Principles of Ionospheric Propagation, Sunspots and the Sunspot Cycle, Sunspot Cycle Predictions, Do-It-Yourself Propagation Predictions and Master Propagation Charts, Ionospheric Forecasts, HF Propagation Prediction Programs, and Unusual HF and VHF Ionospheric Propagation.

The New Shortwave Propagation Handbook contains a wealth of information and data and deals with essentially every known mode of radio-wave propagation: E-region, F-region, daytime, nighttime, scatter modes, aurora, spread-F, gray-line and more. This handbook is one you'll want to read from cover to cover to glean all the information you can. But once read, instead of gathering dust on your bookshelf, it will continue to serve as a valuable reference book to help you determine what bands to use—and when—to communicate with various parts of the world. If your Amateur Radio interests involve HF or VHF DX propagation, you'll want to keep this book handy in your hamshack.

Results, Tenth IARU HF World Championship

By **Billy Lunt, KR1R**
Contest Manager
and
Warren C. Stankiewicz, NF1J
Assistant Contest Manager

24 hours of contest propagation just like the "good old days"!

Wow! This year's IARU contest was not what any of us expected. It was incredible! July never brings great conditions, and around this point of the sunspot cycle, they're usually even worse. Not this year! We had—great, wonderful, incredible, unbelievable (take your pick of adjectives here)—propagation. Who would have expected to run Europeans on 15 meters in July? Or to make as many contacts as they did on 10 meters? Heck, we didn't have conditions like these in the DX Contest back last winter! We may not even know what happened, but to tell the truth, who cares! The bands were great, and we made the most of it! It wound up being a hot contest for a hot weekend!

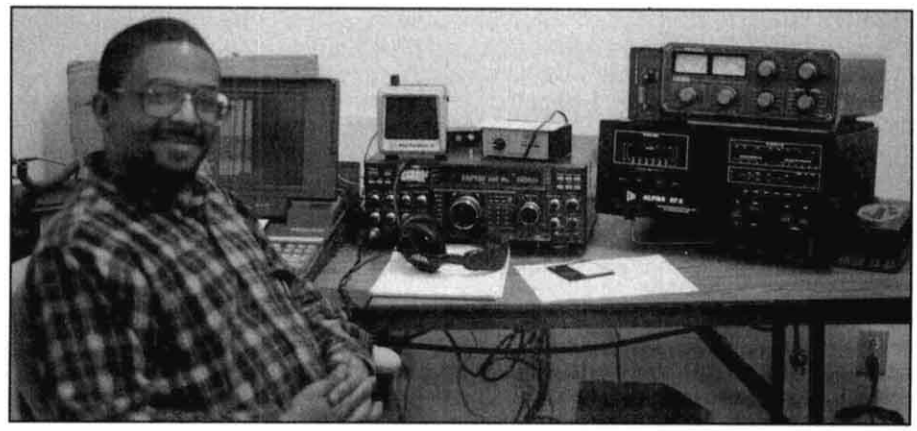
Participation was up nearly 10% this year, and that sure helped. Either a lot of folks stumbled onto the contest by accident, or operating events like these are attracting more and more people. We heard from a lot of "first-timers" this year. Is it the shorter time period that makes the difference? Does summer bring a different crop of contesters? Comments were favorable (with a lot less complaints!) about the operators and the operating.

Twenty meters being open during the entire contest was a major attraction, but the big propagation story has to be the 15 and 10-meter bands. Were they open where you are? More importantly, did you remember to check them, or did you just write them off as unusable? Most of the top European folks were able to rack up anywhere from 200 to 400 QSOs on 10 meters, and totals of 600 to 1000 QSOs on 15 meters were not uncommon.

Admittedly, it wasn't as good here in the US and Canada—but you should have been able to make at least 50 QSOs or so on 10, if you were lucky; and some folks had QSO totals on 15 meters in excess of 300. If you were running with the pack on 20 and 40 and didn't think to check 10 or 15, you should know better by now! It's experiences like these that differentiate between the top contesters and the rest of us. Who would have known you'd be able to work folks on those bands? *They* sure knew!

Another thing that sure helped boost scores were all those IARU HQ stations on the air this year. You should have been able to log a handful—after all, 27 of them were active, and 22 submitted logs. The Hungarian crew at MRASZ kept their long-standing win streak intact, easily topping anyone (and anything) the other societies could throw at them. The "We Try Harder" competition for number 2 took a twist this year, though. Perennial runners-up DAØHQ found themselves slipping to fifth, with the Slovaks at OM5HQ, the Ukrainian operation at EM5HQ, and the Romanian ARF's YRØA all putting forth excellent efforts. ARRL's Headquarters station, W1AW, also did extremely well this year, making the most QSOs but finishing eighth, with 6.8 million points. For a blow-by-blow description, check out the sidebar, "The Way to Win at W1AW." Our thanks to our IARU sister-societies everywhere for helping to make this contest successful. It sure pays now to do a little multiplier hunting for the HQ folks.

Speaking of winning streaks, we saw another long-standing one broken in the Mixed Mode category: Rad, YU1RL, went to EA9IE and stopped Gyozo, HAØMM, in his tracks! Just when you thought you could win with 2 million points, he comes in and makes almost 3 million! Henry, YT1AD, wasn't too



John, WB2K, may not have a lot of awards mounted on the wall, but he sure nailed down the top spot in the W/VE phone-only competition.

Top World Scores

Mixed Mode

Call	Score
EA9IE (YU1RL,op)	2,911,184
HAØMM	1,977,150
YT1AD	1,970,724
UT5UGR	1,765,752
TM1C (GØJFX,op at F6CTT)	1,669,920
UA3RAR	1,598,625
KF3P	1,500,736
S53R	1,305,103
LY6M (LY1DS,op)	1,272,154
OH6WZ	1,239,249

Phone Only

Call	Score
UT5DK	1,462,344
OH1EH	1,416,524
OH6LNI	1,104,752
5NØMVE	846,264
EMØF (UXØFF,op)	834,677
DL8PC	826,619
LY1DT	759,744
5NØGC	755,760
S59L	742,350
WB2K	729,904

CW Only

Call	Score
HAØDU	1,877,533
RZ9U (RZ9UA,op)	1,506,557
S59AA	1,374,206
C47W (5B4WN,op)	1,356,516
YT5ØBB (YT1BB,op)	1,223,586
N2IC/Ø	1,203,734
P4ØZ	1,198,392
OH1NOR	1,120,560
SLØCB (SMØTXT,op)	1,098,165
W1WEF	1,070,388

Multioperator

Call	Score
UU5J	2,702,612
RS3A	1,965,816
IR4T	1,937,796
RY6Y	1,790,712
RK9XWH	1,481,385
RU3A	1,466,630
RWØA	1,400,352
WXØX	1,379,856
HG5M	1,359,299
RU9D	1,272,556

Top W/VE Scores

Mixed Mode

Call	Score
KF3P	1,500,736
KFØH	932,252
AA4NC	919,512
KØIJL (AAØBY,op)	676,021
KZ1M	577,729
WZ4F	558,688
WX9E (at KS9B)	518,122
N9AG	513,472
K3WW	507,756
N5EA	411,152

Phone Only

Call	Score
WB2K	729,904
WS1A	602,030
W3BGN	526,560
K4VUD	489,375
WA7FOE	486,552
VE6JY	473,434
N4UH	380,256
KB4WQO	370,364
WB2NQT	365,960
K6SVL	296,055

CW Only

Call	Score
N2IC/Ø	1,203,734
W1WEF	1,070,388
K3ZO	1,006,934
WXØB (NM5M,op)	790,400
K4PQL	724,196
K7SV	633,879
N6TR	618,288
K2SX/1	601,735
K8GL	586,034
AA4NU (KØEJ,op)	578,816

Multioperator

Call	Score
WXØX	1,379,856
KN2T	1,148,904
N3BB	1,059,122
W5WMU	1,010,316
K9SD	798,187
NCØP	669,123
KA4RRU	605,665
WT2Q	602,426
WØAIH	580,152
N3KZ	520,884

IARU Headquarters Stations

HG95HQ (HA1s FF,WD,YA,HA2RX,HA4YD,HA5s AWH, BGG,BSW,BWW,CQA,FM,GF,IW,KS,LN,MK,ML,NG, OM,TI,UA,WE,YLN,ZD,HG5s CCC,CNC,HA6s DX,FQ, GK,IAB,ND,NF,NL,NQ,NY,OB,OI,OQ,OY,PN,PX,BA,VH, WI,WP,WQ,WX,ZS,ZV,HG6IPQ,HA7s JES,PO,RY,VB, HA8s IB,IE,HA9AX,ops)	9,287,492	9348	314
OM5HQ (OM3s JW,KAG,KAP,KCM,KFF,KII,KZY,RJB, RKA,RMM,ops)	8,095,005	8517	305
EM5HQ (US1s IDX,ITU,UT2s IA,ID,II,IJ,IM,IO,IV, UR3IKY,UR5IFZ,UT5IZO,US8ISC,UT8s IA,IM, UX8IX,US-1-602,-603,-700,ops)	8,052,860	7904	274
YRØA (YO2s ADQ,ARA,AVM,BBT,BEO,BP,CBF,DFA, GL,YO3s APJ,BWK,CDN,FF,FRI,FU,FWC,ATW, HW,NF,SI,XF,YO4s ATW,HW,NF,SI,XF,YO5s CUQ, DMB,TE,YO6s AWR,FUE,YO7UP,YO8s AXP,BAM, BIG,CT,EQ,WW,ops)	7,918,772	7659	284
DAØHQ (DL1s ASA,AUZ,AWI,DTL,EMY,DK2OY, DL2s EBY,HTO,MEH,OBF,DL3s APO,DXX,OI,RMA, DL4s MM,RDJ,DL5s ANT,AOM,ATD,AXX,XU,DK6WL, DL6MYL,DF7RX,DJ7AA, DL7s UTA,VNF,VOA, DL8s HWA,MVG,DL9AWI,ops)	7,258,828	9233	292
S5ØHQ (S5Øs A,R,S51s AY,IX,OI,ZO,S52ZO,S56A, S57s AL,O,W,S58s A,AB,FA,S59A,ops)	7,022,966	7789	298
SPØHQ (SP2s EBG,FWC,SP3s ASN,GEM,HLM,RBI, RBR,SP5s BYY,INQ,JTM,SP6s CZ,HEQ,HFZ,VGP, XRZ,SP7GIQ,SP8NR,SP9s EIJ,IUM,ops)	6,882,645	7305	295
W1AW (K1s CC,KI,TO,ZZ,W1s OD,RM,AA2Z,K5FUV, N6BV,ops)	6,839,532	9745	252
LZ7A (LZ1s GL,LF,MC,PJ,ZD,LZ2s JE,UU,ZF,LZ3s FN, FM,GU,LZ4s AX,ZF,ops)	3,440,310	4872	246
ER7A (ER1s AP,DA,M,OO,ER3s AL,DX,ED,KS,OO,ZZ, ER5s AA,AL,DX,OK,WU,ops)	1,478,750	2782	169
YUØHQ (YU7s AV,BJ,GO,GW,NF,NW,YZ7UN, 4N7DW,ops)	1,214,748	2396	153
IY2ARI (I2MQP,IK2VJF,ops)	1,031,240	2000	145
SK3HQ (SM3s CER,DMP,RAB, ops)	821,548	1627	143
LT4E (LU2BDG,LU4AHV,LU6BEG,LU8AQE,ops)	683,410	1139	130
GB5HQ (G1AOF,G3TRU,G4WSE,G0s DBE,IEQ,KXL, PZO,STU,WAB,ops)	647,946	1495	142
8J3XHQ (JA3s MAU,SVG,JF3EIG,JG3RPL,JH3HOA, JI3s ERV,XOM,JJ3WPF,JP3s DZA,TEN,JQ3HDD,ops)	325,668	1313	84
4V1ØØRC (HH2s B,JO,JR,ops)	239,946	2758	87
LXØRL (LX1s KQ,TI,ops)	204,972	706	87
LY1RMD (LY1DC,op)	189,288	735	99
XJ7RAC (VE7SBQ,op)	129,356	452	73
HB9A (HB9DDZ,op)	74,998	372	77
Z3ØRSM (+ops)	33,762	662	51

far behind HAØMM in the race for second, either, falling just 7k short. Whew! It's pretty obvious to us that one way to ensure a good score is to be in one of those locales with a direct shot to Europe.

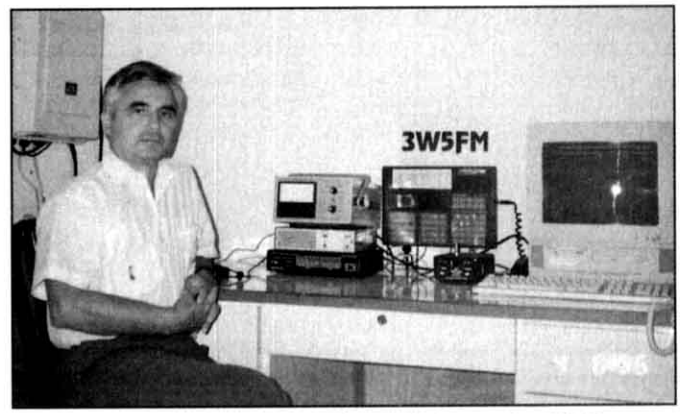
These folks weren't the only ones to turn in great scores. Tyler, KF3P, came out of nowhere to win the US mixed mode, and John, WB2K, jumped up a couple of spots to win on phone. Steve, N2IC/Ø, had the best of both worlds: not only were the bands (especially 20) open to Asia, but he was able to work Europeans, too! That was enough for first place W/VE on CW!

So, are you feeling lucky? Out for blood? Or just looking for a good excuse to get out of the hot July sun? Whichever way you feel, the next IARU HF World Championship is only a couple of months away—July 13-14. Why, it'll be here before you know it. In fact, the IARU records are now available in the new *ARRL Contest Yearbook*. What better way to motivate yourself to get on the air?

SOAPBOX

I wasn't able to work the entire contest, but did enjoy picking here and there. I also found that the conditions from this area weren't too bad for this part of the sunspot cycle (KL7Y). This was our team's first effort from Alaska, but we'll be in there during the next contest (KL7/DF4ZY). The band conditions were not that great, but still enjoyable. There certainly was a dearth of Western European stations. Thank goodness there were a lot of Russian stations on the air to fill the gaps. This was a great contest, though (VE3CWE). This was my first IARU contest and I had so much fun that I will be back for the next one (VE9ZL). I was able to make about the same amount of contacts as last year. The bands did not seem as active as they were last year. It certainly seemed good to see all of the Headquarters stations on the air (N4TQO). I am 14 years old and I have been a ham for one year. These were the best band conditions I've ever operated in. I'm looking forward to participating in the contest next year (AC6NS). I only had a few hours to participate in the contest but hope to put an honest effort in next year (K7OX). This was a limited operation for me due to a busy schedule, but I still had a lot of fun (N6TR). This is an excellent contest for those that have a modest station and I wish I had had more time to operate (N7ENU). The propagation was just good enough to let you know that the stations were out there, but not good enough to copy them well. The multipliers just were not there, and again this year there were very few Central and South American stations heard (N5EA). It certainly was a hot contest, as it was 93° in the shack. My air conditioner bit the dust on Friday evening before the contest and I didn't get back on line until late Saturday afternoon, but the contest was already 10 hours old by that point (N5NMX). This is a fantastic contest and the rules are terrific. The propagation conditions were excellent and I'll be back for the next contest (N3BB). The only thing that I have ever done is CW ragchewing. This was my first contest and I found it a great deal of fun—I'll be back for next year's (KGØKR). The contest was superb and it seems that summertime conditions during the sunspot cycle minimum were excellent (K7SV). This is one of my favorite contests and I had a lot of fun (NZ5O). I worked with only 100 W, and, considering the sunspot cycle, I was very satisfied with the responses that I received—especially since this was only my second contest (KB8QO). This was a great time and a great contest, and 20 meters was still the workhorse, as usual. Any one who misses this contest is missing a summer classic (K8GL). I find that when the conditions are right this contest is more fun than any other. Conditions were more than right, they were superb on all bands for the entire period. Thanks to the Russians and Europeans for their usual good showing (N9AG). This was my first IARU contest and it positively will not be my last (N9XBM). This was my first attempt at this contest and it took a while to realize that the multipliers are more important than the contacts. I never thought I'd work that many stations from my own zone and in between the DX stations. There were good band openings and strong signals, but not like the big sunspot days. I look forward to a bigger score next year, somehow (KJ9C). This was a great contest, considering that the band conditions were not very good. There was lots of activity (AA9BJ). This was my first contest and I found it really exciting and fun to operate. I plan to enter it again next year (XE2CWW). It was a great pleasure—I enjoyed a very good time in this contest and appreciated being able to participate (XE2Z). The conditions this year were again excellent and the only problem that I had was with my 160-meter dipole just before the contest (OH6NIO). I tuned up and down the bands looking for a VK or ZL on several bands but without any luck. There was a great opening on 20 meters to W6 in the morning here and this allowed me to better my scores over the past couple of years (OZ5EV). This was my first time operating in the contest because of my busy schedule and I enjoyed the time that I operated CW (OH6YF). This is one of the most pleasant contests of the year, and it was a pleasure to work all six bands (SM4BTF). This was an excellent contest and I enjoyed it very much. I look forward to next year's (UA1PAC). My time was limited, but I was able to make a few contacts and make a few people happy with the points from my area. I will be back next year and hope to do better (PA3AEB). This is my very best contest effort of the year and I enjoyed it very much (F5JBR). There seemed to be quite a bit of activity on the bands. I would like to have a stacked array, but you have to do the best with what you have. I enjoyed the contest except around 0500Z, when the pain really set in (GØLII). This was my first contest alone and I enjoyed it very much (PA3EXI). This has always been a very pleasant contest (ON5CZ). There was lots of activity, plenty of big signals and lots of fun in this contest (PA3DWJ). This year the contest was a real summer sizzler, it was 30° C outside and 40° C inside the

Mario, 5B4WN, operating C47W, should have been an easy Zone 39 multiplier!



Need Vietnam? Nickolai, 3W5FM, handed out a few QSOs.

shack. The propagation was excellent on 20 meters and held in there all night long. I know that I will be back next year to try and break my previous record (DL3KDV). This was a great contest but I was handicapped by a visit by my mother-in-law (DL7ANQ). I really enjoy low-power contesting, and so did my neighbors (S57U). I really enjoyed the contest and especially working 15 meters (SO5TW). This was a most enjoyable contest and I was able to work my first Americans on 40 meters with only 15 W (SP2WDW). This was an excellent contest and I enjoyed it very much (SP9MDY). I am 15 years old and visually impaired. I enjoyed the CW part of the contest (SQ9BZK). This was a very exciting contest, but I found 10 and 15 lacking during most of the time (YO5BQ). This was my 18th IARU contest and it was just as exciting as the first one that I entered (YU7SF). Murphy hit twice during the contest, I had to repair the amplifier and lost nearly an hour in the process. Despite the problems, I had fun. There was a great opening to the West Coast on Sunday morning (LY6M). This was an exciting contest and the activity was better than last year (UT5UGR). This was a superb contest. We didn't sleep for 24 hours. There was great activity from the USA and Europe but we didn't hear anything from Japan (RS3A). This was my first contest after serving my required time in the Army. I enjoyed being a civilian, but I especially enjoyed the contest (UA4AVN). There was strong QRN on Saturday night and it left me with a low score on 40 meters. The only ones that I could work were the big guns, but I was compensated by an excellent opening on 10 meters (EA3EJI). The propagation was not too good to this part of the world, but I still enjoyed the contest and I know I will be back (7K2DOD). I found the conditions on 40 and 20 meters to be excellent. It was great to work many fine USA stations. I tried using the computer to key the rig, but it was very hard to get used to (JHØGHZ). I only had a few hours to enjoy the contest from the field, but it was fun under these conditions (JI3KDH/3). I used only a 6-foot-long, 10-foot-high whip antenna. Even though my station was a weak one, there were many stations that heard me and it made for an exciting contest for me (JL7PVR/1). The propagation was just barely good on 20 meters, which I enjoyed even though I only operated during the last half hour of the contest. It was the signals from W1AW that piqued my interest to join the contest (JF1SQC).

Feedback—1994 IARU HF World Championship

See February 1995 *QST*, pp 100-104.

WB2K's score was 820,068. This made him the Eastern Pennsylvania CW leader, as well as fourth place W/VE and seventh place overall. WX9E was left out of the results for Illinois. His line score was 35,640-204-60-A.

The Way To Win At W1AW

Well, not exactly. This year's ARRL effort was a bit different than those of the past—rather than trying to deal with the limited resources (and limited space) at W1AW, this year the show went on the road—to the superstation of Tom, K1KI. Tom says, "Our basic goal was to put more QSOs into the W1AW log than in previous years, and we sure met our goals! Conditions were much better than we expected—it's hard to believe we made nearly 10,000 QSOs in 24 hours."

So they may not have won, but they sure had one whale of a time! Without any further ado, here's a band-by-band (and blow-by-blow) description of what it was like, through Tom's eyes:

"We didn't spend enough time on 160. We timeshared this band with 80 CW, and the rates were better on 80. We heard several European HQ stations we couldn't work because of QRM. Our last European QSO was at 0415Z with TM1C (shortly after their sunrise).

"We worked our first European on 80 at 2330Z, and our last at 0445Z. It was pretty noisy all night. We worked KL7Y at 0830Z. We were able to keep USA runs going all day long—it was sort of like Sweepstakes!

"On 40, the band was open to Europe from 2115 to 0604Z. We worked a couple of JAs, but conditions were not so good—we stole the SSB amplifier for 80 CW Saturday evening. 5W1AU QSYed from 20 to 15 to 40 for us, but he had no key and the SSB QSO through the broadcast QRM was difficult, especially for a dedicated CW operator!

"We didn't work our first European on 20 meters until QSO number 48, but they were there for almost 24 hours. The USA runs were longer and louder, however. The JA run Sunday morning was just like the good old days! After working an HL, we asked if there was a DU on frequency, and DU1SSG called in.

"On 15 meters, the Europeans were weak most of the day, but they kept calling. We must have worked enough W4 QSOs for the Worked All W4 Award. After 0600Z (2 AM, local time!) the VKs faded, and the Europeans came back in through the end of the contest. We worked a few JAs and got ready for a big JA run that ended with just six JA QSOs.

"I'm certain that we qualified for the Worked Almost All Newcomers Award on 10 meters. There seemed to be an endless list of KE4xxx QSOs, but it was actually only 50 (plus two KF4xxx stations). Midnight brought a pipeline into W9 and we sent people from 20 and 15 to 10. We even found KH6, FO, and VK! The rate dropped below 20 at 0645Z, so we got some sleep and started up at 1000Z with some more European stations.

"Our rate for the entire contest was 409; our best hour (1447Z to 1547Z) had 707 QSOs, and our best minute was 1538Z, when we made 19. We didn't get much help from packet, but it all adds up. We also found out that there are limits as to how many amplifiers (six at 1400 W) can run off my two 220-V circuits. We popped the breakers three times.

"Out of the 9821 QSOs (including duplicates), we worked 6689 unique call signs. Nothing beats working people who say that they've been a ham for 40, 45, 50 or more years and never worked W1AW before. It was really fun! We can do better next time!"

Here's the number one Multioperator team at UU5J: (l-r, sitting) UU5JR, UU5JQ, UB7-067-2; (l-r, standing) UU3JD, UU2JZ, and UU4JDF.

If S50HQ was one of your multipliers, you surely must have worked one of these ops: (l-r, first row) S58A, S51ZP, S55T, S52ZW, S51IX, S56A; (l-r, second row) S59A, S57W, S51OI; (l-r, third row) S51DB, S50A, S52EZ, S58AB; (l-r, back row) S51RS, S57O, S50R, S51AY, S58FA.

Scores

Scores are listed by ITU zone and then by country, ARRL section or Canadian province within the zone. Line scores indicate call sign, final score, QSOs, multipliers and entry class (A = single operator, mixed mode, B = single operator, phone only; C = single operator, CW only; D = multioperator, single transmitter).

Zone 1

Alaska

KL7Y	216,039	601	101	A
KL7FAP	2,223	39	19	A
WL7CMK	39,292	279	38	B
KL7/DF4ZY (+NL7DU,DL8WEM)	151,689	657	59	D

Zone 2

Alberta

VE6FR	69,168	320	66	A
VE6JY	473,434	844	139	B
VE6BF	213,213	627	91	C

British Columbia

VE7QO	109,986	394	69	A
XJ7CFD	113,152	550	64	B
VE7JMN	96,748	381	76	B
VE7TLK	55,500	303	60	B
VE7XO	35,896	171	56	B

Zone 3

Manitoba

VE4YU	29,640	168	52	A

Zone 4

Quebec

VE2AWR	60,705	411	45	A
VE2FFE	612	36	6	C
NØTT/VE2 (+WØHW)	177,912	716	76	D

Ontario

VE3CWE	50,337	223	63	A
VA3WTO	223,223	719	91	B
VE3STT	2,520	48	18	B
VE3ZIS	6	6	3	B
VE3KP	283,318	791	98	C
VE3NBE	10,108	85	38	C
VE3XO (+VE3s MV, WHE)	464,578	901	134	D
XJ3AT (+NET)	304,759	903	91	D
VA3NR (+NET)	28,985	175	55	D

Zone 6

W6

East Bay

KG6LF	53,380	470	34	B
KI6OY	5,500	68	25	B

Los Angeles

KJ6HO	118,224	508	72	A
KU6T	53,314	268	61	A
KC6X	40,863	179	53	A
K6SVL	296,055	1035	81	B
KM6YX	242,648	792	98	B
NA2D	11,515	105	35	B
N6IBP	20,633	112	47	C
N6GL	20,102	151	38	C
N6IC	14,840	107	40	C
W6SX	176	16	4	C
N6MI (+K5TTE)	181,487	597	97	D

Orange

KE6UP	15,457	117	41	B

Santa Barbara

W6TKF	54,191	327	47	A
WA6FGV	63,085	381	55	C
KN6WV	18,447	133	42	C
AD6J	9,960	94	30	C
W6BKY	6,762	121	23	C

Santa Clara Valley

N6IP	292,675	707	115	A
AB6YL	100,659	354	87	A
AC6NS	4,576	72	22	A
N4TQO (at AG6D)	496,016	1090	116	C
N6NM	57,200	278	65	C
N6NF	6,204	101	22	C

San Diego

KD6QK	39,600	266	45	B
N6KI	331,674	881	106	C
AA6EE	7,964	100	22	C
KE6MWA (+KE6MWB)	36,912	257	48	D

San Francisco

W6BIP	41,552	176	53	C
KA6SGT	469	27	7	C

San Joaquin Valley

KC6CEX	161,315	485	77	A
WC6U	116,348	479	68	C
KB6HRB (AA6AH,KB6QNP,KC6UCN, KD6HMN,ops)	46,620	240	63	D

Sacramento Valley

N6JM	840	20	15	A

W7

Arizona

N7JXS	42,924	271	49	A
KI7MN	192	11	2	B
W7YS	23,134	128	43	C
K7OX	5,415	107	15	C

Eastern Washington

KW1K	60,900	315	60	A
NØDH	290,835	761	115	C

Idaho

AA7UN	115,640	588	70	B

Montana

N9ITX	43,780	333	44	B
K7ABV	40,843	217	32	B

Nevada

AB7BS (+KC7BNH)	243,179	737	97	D

Oregon

W7YAQ	349,338	719	134	A
N6TR	618,288	1200	132	C
AI7B	174,720	570	78	C
W7LNG	51,116	238	52	C
AA7KF	22,044	135	44	C
AA7FL	17,748	105	36	C
N7ENU	15,295	121	35	C

Utah

WA6HXE	21,935	137	41	B
W7HS	29,760	172	40	C
K6XO (+AB7GM,KI7WX,WØMHS)	316,110	1171	82	D

Western Washington

N7LOX	23,008	221	32	A
WA7FOE	486,552	1310	114	B
AA7RW	51,322	267	67	B
N6HR	208,000	580	100	C
NN7L	205,205	783	65	C
WA7UVJ	102,432	450	66	C
KI7OT	59,649	289	59	C

Zone 7

W5

Arkansas

AC5BR	41,268	240	57	A
AB5SE	49,560	250	60	B
K5GOE	8,358	61	42	B
N5XYN	26,145	199	45	C

Louisiana

NZ5O	195,700	587	100	B
N5OZB	168,960	624	88	B
KJ5KQ	33,920	118	80	B
AB5HD	2,415	55	15	C
W5WMU (+WU3V,KC5OAM,N5SYF, W5MEG,N8RR)	1,010,316	1646	177	D

Mississippi

WA5OYU	121,129	415	89	B
N5QDE	59,292	206	81	B

North Texas

WB5B	249,193	707	97	A
KS1G	171,276	571	84	A
AA5UO	209,475	623	105	B
W5PLN	141,703	425	101	B
WD4FRX	11,900	108	35	B
W5RNF	9,380	104	35	B
WXØB (NM5M,op)	790,400	1426	152	C
N6ZZ	530,140	1129	130	C
W5FO	77,616	484	42	C

Oklahoma

NW5H	39,005	433	29	B
N5RXF	28,728	224	42	B
WV5S	372,294	884	117	C
W5UDA	368,781	837	119	C

South Texas

N5EA	411,152	1009	112	A
N5NMX	216,040	608	110	A
WA1PRY	10,114	111	26	A
WA5IYX	33,915	191	57	B
KC5HFI	344	40	4	B
K5ZTY	10,050	132	25	C
W5NR	6,072	81	22	C
KJ5CR	60	4	3	C
N3BB (+AA5RB)	1,059,122	1940	157	D
WQ5Y (+NZ5V)	124,120	327	107	D
KC5HTX (+KC5AMA)	5,436	70	18	D

West Texas

AB5WB	19,980	180	37	A

W9

Illinois

NEØP/9	15,402	185	34	C
K9SD (KC9AL,WW9L,KAØGGI, KWØA,ops)	798,187	1297	169	D

WØ

Colorado

N2IC/Ø	1,203,734	1766	173	C

Iowa

KFØH	932,252	1719	148	A
WØPPF	10,266	100	29	B
KØOAM	106,622	340	89	C
KK9W	90,045	407	69	C
NCØP (+ops)	669,123	1541	131	D

Kansas

KØVGB	141,610	425	98	A
WBØYJT	17,358	134	33	A
WIØR	61,983	281	71	C
AAØYA	57,070	290	65	C

Minnesota

KØIJL (AAØBY,op)	676,021	1463	127	A
KFØVB	77,404	338	74	B
KFØT	118,800	475	80	C
WAØBNX	7,008	65	32	C

Missouri

NSØB	119,364	360	98	A
AAØNB	25,695	205	45	A
WXØX (WX3N,K4VX,AG9A,ops)	1,379,856	1924	204	D

North Dakota

WBØO	312,906	714	121	C

Nebraska

KGØKR	10,478	114	31	C

Zone 8

W1

Connecticut

KE1BU	70,752	324	66	A
KD1TM	72,996	281	84	B
W1INF (KB1GW,op)	68,476	510	53	B
N1QVE	18,309	106	51	B
KE1AU	3,886	50	29	B
K8CH	3,171	59	21	B
N1OFO	6	6	1	B
W1WEF	1,070,388	1775	153	C
K2SX/1	601,735	1123	151	C
W1BIH	140,026	327	108	C
N1OPZ (+NET)	4,872	58	28	D

Eastern Massachusetts

KB2R (at K1KP)	405,288	1030	117	A
N1HOQ	191,805	597	95	B
K1VUT	538,607	1145	127	C
K1JKS	293,265	871	115	C
W1MK	121,524	401	76	C
KD1VQ (+KA1ZAK,KE1CN,N1s UFF, UJV)	137,544	535	88	D
W1FM (+N1SOH)	21,949	147	47	D

Maine

KA1GTR	156,312	459	104	B

New Hampshire

KA1FMR	25,200	180	50	A
WS1A	602,030	1309	130	B
AG1C	71,680	322	56	B
WC1M	123,840	522	86	C
AA1HJ	109,446	408	87	C
AE1D	13,962	128	39	C
KB1AXF	11,214	101	42	C
N1SNB	3,825	76	15	C

Rhode Island

K1PLX	165,680	553	109	B
WA1MKS	13,579	105	37	B
N9LYE	616	48	7	B

Vermont

N1PBT	116,616	610	86	B
K1CLN	49,560	266	59	B

Western Massachusetts

KZ1M	577,729	1043	137	A
AA1EY	111,398	330	109	B
WE1B	49,236	260	66	C
WT2Q (+KB1W,KY1H,NU1P,WM1K)	602,426	1246	139	D

W2

Eastern New York

KB2HUN	47,824	300	61	B
N2BZP	270	37	10	C

NYC-Long Island

K2LE	250,155	589	109	A
WB2AYQ	19,150	122	50	B
KA2HMJ	148,070	622	65	C
N2LSK (+KA2GWM,KF2ER,N2NSM)	152,789	583	91	D

Northern New Jersey

N2MZH	160,632	584	97	A
W1GD	107,378	305	106	A
W2LRO	9,006	91	38	A
WB2K	729,904	1342	152	B
K3FNW	123,552	332	108	B
N2INN	19,650	107	50	B
N2VYU	12,882	115	38	B
WV2X	1,944	32	18	C

Southern New Jersey

K2PS	282,942	718	99	A
WB2DIN	68,634	277	82	A
W5KI	5,216	67	32	A
AB2E	523,192	1055	136	C
W2GTN	1,584	37	16	C
KN2T (+KD2I,KN2L,N2ORM)	1,148,904	1834	162	D

Western New York

AE2T	97,040	394	80	A
AA2GS	66,518	223	82	A
N2UHI	552	31	8	A
AA2BA	34,626	205	58	B
AA2VZ	6,399	75	27	B
N2LQQ	4,914	75	26	B
KW2J	141,912	591	73	C
W2OMV	76,807	267	89	C
N2PEB	45,724	208	71	C
WA2RZJ	42,240	203	66	C

W3

Delaware

NY3C	21,408	196	48	A
WN3K	436,506	1059	114	C

Eastern Pennsylvania

K3WW	507,756	1056	131	A
W3BGN	526,560	1175	120	B
N3MLV	185,136	431	114	B
N3BDA	41,480	192	61	B
WA3YTI	480	17	12	B
AA3B	459,655	1409	145	C
KL7HIR	176,035	553	109	C
N3CZB	106	25	2	C
N3KZ (WI2s E,N,ops)	520,884	1299	126	D
KB3TS (+KE3RR)	124,558	359	98	D
NN3Q (+NET)	66,000	278	60	D

Maryland-DC

KF3P	1,500,736	2223	179	A
K3IXD	77,436	308	81	B
K3ZO	1,006,934	1667	158	C
AA3HM	141,592	469	88	C
W3CPB	47,302	228	67	C
N5OKR/3 (+NET)	235,635	537	115	D

Western Pennsylvania

KB3AFT	38,979	285	61	A
W3YEY	74,760	256	84	B
WBØIWG	52	5	4	B
K3WWP	22,905	275	45	C
NB4J	12,296	126	29	C
AA3GM	1,106	41	14	C
N3QDL (+NET)	1,029	107	7	D
K3UA (+W3FSB)	960	20	16	D

W4

Alabama

WZ4F	558,688	1650	104	A
KS4AW	2,831	57	19	B
KK4SM	119,295	397	99	C
KS4YT (+KB4FAI)	79,296	654	48	D

Georgia

KN4QV	80,278	363	82	A
KQ4HC	240,142	718	119	B
KD3GC	26,884	257	52	B
KB4GID	394,680	1008	130	C
K4BAI	170,841	649	93	C
AC4PQ	2,304	34	24	C

Kentucky

KB4WQO	370,364	1066	106	B
KI4DC	145,704	556	78	B
K2YJL	1,400	93	8	B
N4XM	225,680	692	104	C

North Carolina

AA4NC	919,512	1638	162	A
N4UH	380,256	821	136	B
KC4YM	77,074	340	89	B
K4PQL	724,196	1310	151	C
WN4BBJ	38,628	252	58	C

Northern Florida

AD4RE	50,962	204	83	A
K4VUD	489,375	1125	145	B

South Carolina

KC4UN	12,240	100	34	A
W4JKC	116,100	440	90	C

Southern Florida

N4BP	207,128	800	68	C

Tennessee

WA6KUI/4	219,333	733	113	A
KS2X	21,700	172	50	B
AA4NU (KØEJ,op)	578,816	1442	117	C
NA4K	242,865	631	105	C
K4LTA	188,694	680	99	C
KO4EW	117,231	511	79	C

Virginia

WA4JUK	47,336	254	61	A
N4OT	20,480	100	80	A
WB2NQT	365,960	844	140	B
N4MM	119,780	342	106	B
KO4IQ	2,556	142	18	B
K7SV	633,879	1109	153	C
K4FPF	126,336	402	96	C
W3GOI	61,299	350	49	C
W4XD	46,308	263	68	C
KA4RRU (+K3TLX,KJ4VG)	605,665	1309	145	D

W5

Mississippi

KB5IXI	5,775	75	21	A

W8

Michigan

KG8PE	89,551	399	77	A
WB8BUQ	45,016	208	68	A
K8CV	23,520	182	49	A
N8LIQ	26,500	137	53	B
KB8QO	12,160	107	38	B
K8GL	586,034	1141	142	C
AA8AV	383,940	1013	108	C

Ohio

N9AG	513,472	1178	142	A
AA8OT	171,392	520	103	A
W8UPH	45,630	268	65	A
K8NZ	28,656	127	160	A
N8LXS	384,087	1053	103	C
N8BJQ	116,952	495	88	C
KF8TM	85,041	271	99	C
WT8P	45,450	320	50	C
N8AA	38,304	200	56	C
AA8SM	18,396	137	36	C
NF8R (+KA8O)	457,940	1082	140	D

West Virginia

K8OQL	89,544	378	82	C
WG8T	28,500	203	57	C
AA8RT (+KG8KV)	31,700	256	50	D

W9

Illinois

WX9E (at KS9B)	518,122	1269	121	A
NA1R	307,375	779	125	C
K9MMS	222,432	720	112	C
N4OGW	151,618	569	86	C
N9YIQ	16,380	250	30	C
AA9KH	7,548	88	34	C

Indiana

W9RE	157,388	550	98	A
N9XBM	78,677	502	56	A
AA9AQ	294,912	839	128	B
KBØC	102,980	298	95	B
KO9Y	259,160	676	110	C
KJ9C	54,924	123	69	C
WBØOLA	43,835	273	55	C
KX8D (N9s DHN,WHG,ops)	167,580	566	105	D

Wisconsin

NØBSH	373,198	1001	122	C
AA9BJ	74,028	404	62	C
W9HE	55,728	220	72	C
WØAIH (+K9ZVZ,N9CIQ,AAØSE,AIØY, NØAXL)	580,152	1396	138	D

Zone 9

New Brunswick

VE9ZL	39,984	311	49	B
VE9ST	386,229	1045	93	C

Zone 10

Mexico

XE3LMV	82,895	449	59	B
XE2CWW	60,836	274	67	B
XE2Z	56,674	370	43	B
XE1CCB	58,412	514	34	C

Zone 11

Panama

HP1AC	35,776	177	64	C

Grenada

J37LK	1,708	122	14	B

Puerto Rico

WP4LNY	216	14	4	B
KP4YS	63,744	359	48	C

Aruba

P40Z	1,198,392	1786	138	C

Costa Rica

TI7DBS	27,132	219	53	B
TI4/AA7JM	25,000	150	50	C

Turks and Caicos Islands

VP5J (KF8UM,op)	437,992	1188	106	B

Cayman Islands

ZF2AH	15,408	204	24	A

Zone 12

Chile

CE8EIO	30,858	188	37	B
CE8SFG	4,488	50	22	B

Ecuador

HD2RG	253,368	598	91	B
HC3AP	9,557	119	19	B
HC1/KE4EWI	6,344	56	26	B
HC1NWW	4,070	53	22	B

Colombia

HK3JJH	158,356	536	61	B

Peru

OA4EI	124,872	327	88	B

Venezuela

YV1DRK	31,812	124	66	B
YV4EYA	3,718	37	26	B
YV1OB	6,405	67	21	C

Zone 13

Brazil

PY7OJ	14,040	87	40	C
PP7CW	10,820	106	42	C

Zone 14

Chile

CE5BPE	1,170	17	15	B

Argentina

LU8HSO	64,538	228	61	A
LU1AEE	9,510	81	30	A
L5F (LU1FNH,op)	640	80	10	A
L37N (LU2NI,op)	254,944	490	124	B
LU2QC	158,598	490	66	B
LU8ADX	147,050	380	85	B
LU2DW	130,392	1571	83	B
L3HL	37,877	187	49	B
LU5E (LU5EWO,op)	31,703	137	49	B
LU2DKN	28,548	116	61	B
LU2ANN	22,231	111	47	B
LU8HLI	1,254	278	58	B
LS7EE (LU7EE,op)	183,700	412	100	C
LU1EWL	159,720	397	88	C
LW2DRF	560	22	16	C

Zone 15

Brazil

PY1EDB	37,996	190	41	C
PY2NZR	15,840	106	30	C
PQØMM (PP5s JR,UA,PU5FBS,PY2NY, ops)	778,776	1134	148	D

Zone 16

Argentina

LV1V (LU1s VV,VK,LU2VD,LU4VZ, LU5VC,LU9VY,ops)	741,980	1346	115	D

Zone 17

Iceland

WJ2O/TF	441,600	1370	100	A

Zone 18

Norway

LA4BN	52,972	233	76	B
LA1PHA	4,000	47	32	B
LA2AD	882	27	14	B
LA4LJA	812	29	14	B
LA5MT	136,846	403	106	C
LA2HFA	32,538	162	66	C
LA5FBA (+LA2HYA,LA6ZFA,LA8UU)	82,315	297	101	D

Aland Islands

OH2VZ/OHØ	15,224	112	44	C

Finland

OH6WZ	1,239,249	1829	187	A
OH6NIO	1,227,786	1924	161	A
OH3KCB	63,630	331	70	A
OH6SU	57,031	179	107	A
OH1EH	1,416,524	2118	173	B
OH6LNI	1,104,752	1756	176	B
OH5PA	3,240	80	15	B
OH1NOR	1,120,560	1706	174	C
OH8LAE	565,288	1067	152	C
OH6YF	548,100	1114	135	C
OH6AG (OH6KZP,op)	238,140	655	108	C
OH9NUC	31,872	214	48	C
OH2YL	31,304	165	55	C
OH3NM	3,408	40	24	C
OH3KOH	2,034	32	18	C
OH3NE (OH1KAG,OH3s LQK,MMH, ops)	651,867	1309	151	D

Denmark

OZ5EV	228,375	457	145	B
OZ5MJ	147,018	400	107	B
OZ8T	2,520	43	24	B
OZ1KWG	33,344	181	64	C
OZ5UR	378	12	7	C

Sweden

SMØBDS	83,444	307	92	A
SM6CZU	1,272	31	24	A
SM5ARL	198,720	1472	135	B
SM3LIV	137,994	408	109	B
SMØTTV	85,981	391	71	B
SM7RZF	62,160	260	74	B
SM7HSP	58,240	266	70	B
SM4BTF	22,800	136	60	B
SM6AHU	2,898	53	18	B
SLØCB (SMØTXT,op)	1,098,165	1735	179	C
SKØWJ (SMØTHN,op)	623,199	1473	129	C
SMØDZH	100,919	360	91	C
SM5AJV	64,086	308	66	C
SM5RE	40,896	207	64	C
SM6SHF	3,840	52	32	C
SKØUX (SMØs JHF,KCO,TOX,ops)	1,089,003	1937	163	D
SK5EW (SM5s FUG,IMO,ops)	60,580	318	52	D

Zone 19

European Russia

U1BA	26,070	181	55	B
UE1A (RV1AC,op)	790,720	1555	140	C
RW1AN	646,737	1014	161	C
RZ1AYX (RV1AQ,RX1AW,RW6HJV/1, ops)	498,960	1123	135	D

Zone 20

European Russia

UA1PAC	20,915	145	47	A

Asiatic Russia

RA9XF	90,525	289	75	B
RK9XYW	39,468	214	44	B
UA9XC	254,900	589	100	C
UA9XS	247,248	537	102	C
RA9XU	14,534	128	26	C
RK9XWH (UA9s XFY,XJV,XMC,ops)	1,481,385	1765	183	D

Zone 21

Asiatic Russia

UA9KDZ	12,375	120	25	C

Zone 23

Asiatic Russia

UAØQBR	111,680	411	64	C

Zone 25

European Russia

RKØQXY	34,522	205	51	C

Zone 26

Asiatic Russia

UAØKCL	66,170	254	16	C

Zone 27

Ireland

EI1DD	40,680	353	40	A
EI4VTC/P	113,804	425	92	C
EI/G4BUO	58,460	244	79	C

France

TM1C (GØJFX,op at F6CTT)	1,669,920	2378	168	A
F5ADH	1,638	29	18	B
F5PRH	563,323	666	239	C
TM9C (F5IN,op)	343,896	1036	89	C
F6BQY	270,940	655	124	C
F5NQL	129,536	444	88	C
F5RAB	112,104	334	108	C
F5JBR	87,058	268	79	C
F5TNI	17,954	110	47	C
TM8A (F5s OZF,RXL,SSG,EA2KL,ops)	473,796	1180	123	D

England

GØDEZ	219,915	521	135	A
GØVYH	167,462	591	74	A
GØVSN	248,882	614	107	B
GØLII	277,495	657	127	C
G3ESF	209,440	492	119	C
G6QQ	29,100	155	66	C

Northern Ireland

GIØSAP	41,760	308	30	C

Scotland

GM3CFS	177,858	116	123	A

Wales

GWØAJI	25,190	173	55	B

Belgium

ON7NQ	75,670	231	94	A
ON7SS	19,451	133	53	A
ON5GQ	350,901	789	127	B
ON4MA	215,800	595	104	B
ON4ATW	169,386	615	74	B
ON6CR	76,533	273	97	B
ON5PJ	28,112	174	56	B
ON5CZ	8,675	89	31	B
ON4XG	93,700	265	100	C
ON4NL	41,912	210	62	C
ON4RU	25,628	172	43	C
ON6TJ	24,388	149	52	C
OT5V (ON4s ALL,AYM,BCP,ON6KZ, KB2RRV,ops)	1,162,720	1829	160	D
ON6AH (+ON4GO,ON5OO,ON6s QR, VL)	893,760	1515	152	D
OT5K (ON4s AGX,BCJ,KB,ON,ON5s DI, GK,SY,ON6CX,ON7XT,ON9CGB,ops)	498,432	1156	118	D

Netherlands

PI4ZLD (PA3EOB,op)	44,880	210	68	A
PAØYN	36,500	57	43	A
PAØIJM	318,816	930	96	B
PA3GAB	60,240	247	80	B
PA2ALF	40,690	220	65	B
PA3DWJ	16,104	118	44	B
PA3AEB	8,052	86	33	B
PAØQX	5,200	68	20	B
PA3EXI	2,166	44	19	B
PA3GNO	56,240	217	80	C
PAØJR	32,838	145	78	C
PA3BTH	15,244	110	37	C
PA3BEJ	6,541	75	31	C

Zone 28

4UØITU (DL1XAQ, DJ2XS, ops)	395,698	1141	106	D

Croatia

9A4RU	209,664	555	126	A
9A3ZG	91,000	362	100	A
9A3SM	87,548	312	86	A
9A5I	81,345	341	85	A
9A1CEI	27,869	333	29	A
9A2TX	34,200	302	45	B
9A2AJ	296,664	2104	141	C
9A2WJ	15,192	194	64	C
9A2A (9A2FM, 9A4FM,ops)	65,436	380	57	D

Fed. Rep. of Germany

DL3KDV	975,371	1517	179	A
DJØFX (OE2VEL,op)	936,144	1332	198	A
DL8HCO	76,196	356	86	A
DL1MIE	71,910	287	90	A
DL2AYI	71,640	344	90	A
DL9GMN	39,934	220	82	A
DL3BRA	37,812	212	69	A
DL9MWG	14,924	126	41	A
DL6SDW	13,740	97	60	A
DL5AUJ	440	16	11	A
DL7URH	180	16	9	A
DL8PC	826,619	1245	193	B
DL8OBQ	191,278	537	118	B
DF7YU	128,631	627	53	B
DL6KY	108,756	369	114	B
DL8SDC	49,236	282	66	B
DL2SEU	49,210	211	74	B
DF5BX	45,401	259	83	B
DL5FCV	26,740	203	70	B
DLØSWL (DL2FJ,op)	24,360	156	70	B
DL4KCC	15,370	109	53	B
DL1HSR	11,136	115	58	B
DL6MTG	5,600	68	40	B
DL8URJ	5,510	67	38	B
DL7UKE	4,250	58	25	B
DL3WB	3,828	60	29	B
DL3HWW	1,919	45	19	B
DL4VBS	1,121	27	19	B
DL1JPL	738	38	9	B
DJ1VQ	715	31	11	B
DLØHRO (DL3KUD,op)	299,585	727	143	C
DL6KVA	268,320	554	156	C
DL3JAN	232,883	611	133	C
DL6BBT	223,836	552	138	C
DL9RR	211,068	552	123	C
DL2NWK	196,321	431	137	C
DL7BQ	179,124	457	132	C
DAØTJM (DL9GFB,op)	176,276	581	127	C
DL1TH	142,027	431	109	C
DL4SZB	110,999	365	101	C
DLØTD (T94DX,op)	108,498	349	107	C
DL4JYT	93,400	316	100	C
DL5KUD	87,860	276	115	C
DL3AWJ	79,887	270	93	C
DL5SVB	77,193	336	87	C
DL1ARJ	69,485	324	65	C
DL1DQY	69,050	343	50	C
DL1ZQ	56,950	670	85	C
DL7VOX	54,372	235	92	C
DL3BZZ	54,115	225	79	C
DL6JRA	54,036	261	76	C
DL7ANQ	51,828	242	84	C
DL2ZAV	49,385	251	85	C
DL1GHX	43,180	205	68	C
DJ5GG	42,975	219	75	C
OL8MKW	41,625	255	75	C
DL5LRA	39,846	153	87	C
DL3HSC	36,162	211	63	C
DL4FDM	30,178	175	79	C
DL3HRA	25,970	371	70	C
DL1EV	22,950	96	85	C
DK7FP	22,792	127	56	C
DL9YP	18,778	170	41	C
DL3KWF	16,912	120	56	C
DF3QN	15,675	123	55	C
DL1OO	15,400	308	50	C
DL3HXS	9,537	74	51	C
DL2DRZ	5,632	48	44	C
DL/WD4AHZ	4,380	80	30	C
DL3KWR	2,880	54	20	C
DJ2YE	2,552	50	22	C
DL9GMC	2,100	37	20	C
DL2YAK	1,410	32	15	C
DL5FCO	312	18	12	C
DLØGVM (DL1SWG,DL4s SUA,SVA, DK7XS,ops)	568,008	1123	168	D
DLØDR (DG1IU,DF2IX,DL5s IAI,IAM, DB6IR,DK7IH,DK9IP,ops)	473,286	979	142	D
DLØMBG (DK1AOB,DL8s AUA,AYI,ops)	449,242	978	146	D
DLØWEM (DK8BS,DJ9CN,ops)	253,752	516	194	D
DLØWMD (DL1KVA,DL3KUW,DL6KWN, DL9GRO,ops)	93,936	400	103	D
DL6RDE (+NET)	64,600	266	40	D

Hungary

HAØMM	1,977,150	2378	245	A
HA7RC	96,354	315	106	B
HAØDU	1,877,533	2299	233	C
HA3OD	236,313	649	121	C
HA4FV	10,802	265	22	C
HG5M (HA1ZU,HA5s BBC,BVD,EH, MY,WA,ops)	1,359,299	2057	193	D
HG750K (HA1s XO,ZN,ZZ,ops)	303,702	971	98	D

Switzerland

HB9IBA	13,356	183	36	C

Italy

IK3SCB	61,676	287	68	A
IK4WMG	30,282	210	49	A
IØKHP	18,550	143	50	A
IKØXBX	11,140	115	40	A
IR4R (IK4ALM,op)	512,958	1142	141	B
IRØC (IKØAZG,op)	451,328	982	128	B
IO4A (IK4PVR,op)	433,698	898	129	B
IK1HSS	371,309	787	157	B
IR4B (IK4AUY,op)	325,120	818	128	B
IR5R (I5JHW,op)	213,920	608	112	B
IR4QJH	185,380	563	124	B
IK6GPZ	151,848	520	76	B
IK2VOV	135,324	429	84	B
IV3FSG	92,988	293	108	B
IK6SNR	57,690	316	45	B
IK3XNQ	47,182	233	62	B
IK6RFQ	23,698	209	34	B
IT9AJP	13,536	90	48	B
IKØCHU	8,480	86	40	B
IV3GCP	2,163	37	21	B
IN3KTT	2,090	74	11	B
IT9CWJ	1,746	37	18	B
IK2MJD	1,248	27	13	B
IØZUT	280,000	710	125	C
IKØSHF	224,534	616	131	C
IK5TSS	169,904	402	148	C
IT9ORA	27,612	179	52	C
IKØDWJ	26,585	135	65	C
IKØADY	12,685	105	43	C
IT9GXE	2,793	55	21	C
IKØHBN	593	211	26	C
IR4T (IK2s HOG,QEI,I4s JMY,UFH,YSS, IK4IEE,ops)	1,937,796	2507	204	D
IK2VUE (+IK2XYI)	574,104	1373	152	D
II2K (I2GXS,IK2s BUF,SGF,UCK,ops)	556,614	1218	153	D
IU8E (IK8s EPC,TEO,ops)	340,704	1018	117	D
IO2L (I2OKW,IK2s PIG,XYU,YYE,ops)	309,810	777	138	D

Sardinia

ISØOMH	92,796	565	76	C

Bulgaria

LZ3YY	272,060	927	122	A
LZ1VA	114,597	326	48	A
LZ2FM	26,460	164	63	A
LZ2KGA (LZ2NZ,op)	2,848	38	32	A
LZ4BU	38,880	230	72	B
LZ1DM	27,666	193	58	B
LZ5QZ	2,184	38	21	B
LZ1BJ	195,597	691	103	C
LZ2VP	63,414	355	78	C
LZ1QZ	26,492	239	37	C
LZ1CW	20,700	690	30	C
LZ2TW	11,816	107	56	C
LZ1ZJ	7,002	130	18	C
LZ1FJ	2,951	69	13	C
LZ2NB	2,431	76	33	C

Austria

OE1KYW	55,722	321	74	A
OE1GOA	1,600	44	20	A
OE8Q (OE8SKQ,op)	10,329	107	33	C

Czech Republic

OK1MD	458,749	951	167	A
OK1KZ	194,928	564	124	A
OK1IR	90,075	425	75	A
OK1DXI	24,026	182	41	A
OK1DSA	5,037	111	23	A
OK1UHZ	6,150	137	25	B
OK2BDI	386,939	713	167	C
OK1VD	319,358	648	142	C
OK1FPS	247,368	606	132	C
OK1DRQ	245,490	598	147	C
OK2QX	175,001	421	139	C
OK1FHI	129,092	404	118	C
OK1FKV	127,983	439	111	C
OK1GS	94,863	242	103	C
OK2BWJ	44,784	266	72	C
OK2BND	31,666	169	71	C
OK1DMS	5,496	79	24	C

Slovak Republic

OM3CDZ	120,900	444	93	A
OM3TA	108,640	406	97	A
OM6MO	102,973	409	89	A
OM2SM	59,724	303	63	A
OM1AF	128,029	433	103	C
OM3IF	56,052	219	81	C
OM7AT	55,050	303	75	C
OM3CAB	49,392	319	63	C
OM5KM	30,476	135	76	C
OM3CDN	17,215	137	55	C
OM3TUM	3,383	50	12	C

Slovenia

S53R	1,305,103	1731	191	A
S59L	742,350	1386	147	B
S51DX	685,584	1312	162	B
S51WV	34,526	262	61	B
S59AA	1,374,206	1889	202	C
S50D (S57AD,op)	772,422	1476	159	C
S53MJ	175,670	576	110	C
S57U	158,326	559	86	C
S51NU	109,368	318	98	C
S54A	89,100	301	108	C
S58MU	81,270	325	90	C

Poland

SP2QCH	256,230	770	130	A
SP5ELA	235,587	659	121	A
SP6CIK	129,800	458	100	A
SP3IOE	126,046	444	107	A
SO5TW (K3TW,op)	34,528	266	52	A
SP6KEP (SP-23022,op)	328,152	800	132	B
SN9K (SP9LJD,op)	276,727	943	121	B
SP9XCN	269,698	684	143	B
SP7SEW	162,936	497	124	B
SP8OON	93,600	342	100	B
SP6MLX	82,058	316	89	B
SP1HJK	66,906	326	81	B
SP9VEJ	58,859	331	71	B
SP6FBD	37,115	251	65	B
SP6DVP	25,593	157	57	B
SP6FJ	20,832	152	56	B
SP8OOB	17,108	156	52	B
SP6SOX	16,044	128	57	B
SP5BB	13,216	179	32	B
SP3ZJA	2,678	49	26	B
SP2FOV	328,640	760	130	C
SP9KRT	238,524	586	143	C
SP2WDW	219,125	639	125	C
SP1AEN	197,750	544	113	C
3Z4EAK	119,392	483	82	C
SP2UKB	106,106	351	106	C
SP5CNA	99,231	309	93	C
SP5DIR	79,636	301	86	C
SP3PFR	76,014	296	82	C
SP7NMW	62,764	282	71	C
SP8BAB	37,324	222	43	C
SP7BYM	35,700	178	70	C
SP3FZN	35,283	138	57	C
SP3FAR	32,453	115	83	C
SP6SYF	27,324	159	54	C
SP5CGN	26,277	147	57	C
SP6CXH	18,235	172	35	C
SP2AHD	14,950	139	46	C
SP4GFG	14,768	134	52	C
SP9KZ	13,423	124	31	C
SP9MDY	8,224	103	32	C
SP8LZC	1,806	61	14	C
SQ9BZK	671	37	11	C
SP2KJF/4	342	22	9	C
SP8KEA	20	4	4	C
SP3PLD (SP3s BBZ,CB,FLR,IBM,ops)	366,576	780	168	D

Greece

SV2AEL	26,078	178	59	A
SV2BFN	86,602	333	106	B

Dodecanese

SV5/DL9GTI	2,363	47	17	C

Bosnia-Herzegovina

T94EU	124,630	404	103	A
T94NF	23,923	251	47	A

Romania

YO5BQ	67,670	362	67	A
YO2QY	22,230	138	45	A
YO3RU	187,579	597	127	B
YO7DAA	87,932	399	89	B
YO2LFP	86,102	471	76	B
YO4RDN	55,890	342	81	B
YO3AIL	48,057	187	83	B
YO4RIU	43,588	289	68	B
YO7ARY	20,466	160	54	B
YO2LIM	16,502	214	42	B
YO6XB	696	42	12	B
YO8KAN	275,906	637	142	C
YO8FR	176,953	517	119	C
YO3AAQ	45,162	206	78	C
YO5DAS	23,430	160	55	C
YO2ARV	12,462	98	31	C
YO4AAC	8,820	108	35	C
YO3KWA (YO3s GEK,GHC,ops)	159,318	579	106	D

Yugoslavia

YT1AD	1,970,724	2458	203	A
YU5ØRO	1,792	115	9	A
YU5ØKN	63,753	339	79	B
4N1N (YZ1MB,op)	13,608	248	42	B
YT5ØBB (YT1BB,op)	1,223,586	1974	182	C
YZ7V (YT7AO,op)	702,693	1218	163	C
YZ1AU	523,450	1144	145	C
YU7LS	337,587	743	131	C
YU1JU	192,510	582	115	C
YU7SF	105,339	337	111	C
YU1GN	59,925	239	85	C
YU1NU	28,126	237	41	C
YU7KM	25,800	155	60	C
YU5ØRA (YU1RA,op)	5,307	81	11	C

Macedonia

Z3ØM (Z31GX,op)	688,296	1789	136	B
Z32BU	218,790	729	99	B
Z32JA	123,250	565	85	C
Z32DR	4,662	75	22	C

Albania

ZA/OK5DX	1,019,133	1839	153	C

Zone 29

Azerbaijan

4K9W	20,801	226	61	C

Moldova

ER2WD	34,030	260	41	B
ER1OA	148,390	467	95	C

Belarus

EU1DQ	206,415	539	135	A
EW6TU	161,868	652	94	A
EU8MA	59,126	394	47	B
EU1MM	918,340	1534	170	C
EW2AA	45,678	232	46	C
EW4XA (EU4EU, EU4-001,-002,ops)	166,440	558	114	D

Lithuania

LY6M (LY1DS,op)	1,272,154	1731	226	A
LY2IJ	1,162,060	1712	194	A
LY2LA	325,625	879	125	A
LY1DT	759,744	1488	144	B
LY3BH	577,656	1253	142	B
LY2OU	293,410	799	122	B
LY1FW	212,810	620	130	B
LY3NJ	55,809	281	81	B
LY2AO	674,847	1164	167	C
LY1BA	539,736	989	172	C
LY2MW	537,251	1042	169	C
LY2PAQ	246,152	682	116	C
LY3MR (LY1s FF,FR,LY3NFW,ops)	745,542	1437	100	D

Kaliningrad

RA2FAD	1,215	45	15	B

European Russia

UA3RAR	1,598,625	1781	225	A
RN3QO	330,250	821	125	A
RX3AQL	131,026	1337	98	A
RK3SWX (UA3S-952,op)	82,916	417	63	A
RA6ABK	50,912	200	86	A
RU6BV	39,292	272	47	A
RU4SS	71,258	329	82	B
RK3FT	46,450	285	50	B
RA1QEA	29,786	196	53	B
RU3WT	19,140	147	55	B
UA3RCO	18,480	148	40	B
UA4AVN	14,352	202	52	B
UA4YJE	6,265	71	35	B
UA6XJA	111	41	19	B
UA6XT	96	6	6	B
RA3XO	501,984	944	166	C
RV3LA	234,813	715	87	C
RW3GU	233,750	598	125	C
RU1AO	183,735	476	135	C
RA4HRL	125,345	442	99	C
RA3PP	111,815	403	95	C
RN6AI	65,280	259	85	C
UA4YJ	62,040	293	73	C
UA3DGA	52,140	254	79	C
UA4ANZ	39,196	120	82	C
UA3YKG	33,891	155	29	C
UA3LDU	25,956	148	63	C
RX3DTN	24,568	252	37	C
UA4SS	22,048	181	53	C
RA3VY	19,640	179	40	C
RS3A (RZ3BW,RAØAX.ER2CQ,ops)	1,965,816	2366	228	D
RY6Y (RA6s AU,AX,RV6AGG,RX6BA, UA6YN,UA6-101-350,ops)	1,790,712	2486	231	D
RU3A (RA3s AUM,AUU,RK3DT,RU3FM, RV6HY/3,UA6XGL/3,ops)	1,466,630	2054	199	D
RU4L (RW4LW,UA4LL, UA4-169-459,ops)	741,710	1279	170	D
RK3EWW (,RA3EA,RZ3s EC,EM, UA3EKG,R3E-1,-4,UA3-147-543,ops)	732,796	1364	167	D

Ukraine

UT5UGR	1,765,752	2183	236	A
UUØJ (UUØJZ,op)	700,400	1378	170	A
UX6VA	238,720	629	128	A
US3IZ	196,298	560	122	A
UY5TE	92,070	394	93	A
UX1RX	82,650	334	75	A
UX1LA	74,906	324	67	A
UX1HW	33,226	280	74	A
UT8IT	8,745	99	33	A
UT1ZZ	7,532	83	28	A
UT5DK	1,462,344	2269	156	B
EMØF (UXØFF,op)	834,677	1420	179	B
UX4UA	252,648	666	78	B
UR5DDX	157,352	541	104	B
UR5WHT	65,772	316	81	B
UX2VZ	59,444	273	77	B
UT1HT	13,455	210	12	B
UT3HD	12,862	137	59	B
UR5EAT	873,816	1495	184	C
UR8QX	754,290	1328	153	C
UY1I (UT3IQ,op)	583,947	1136	161	C
UX3FW	402,116	865	148	C
UT7ND	317,086	645	142	C
UT7ZT	226,944	550	128	C
UX2MF	202,740	525	124	C
UX5EF	152,378	433	65	C
UR3MP	116,296	457	91	C
UR5BCJ	88,722	297	106	C
UR3PDM	67,868	250	76	C
UR4IZA	67,200	345	64	C
UY2ZZ	40,174	267	53	C
UT3FM	36,087	157	69	C
UU2JA	33,856	152	92	C
UX5VK	1,666	30	17	C
UU5J (UU1JA,UU2s JQ,JX,JZ,UU3JD, UU4JDF,UU5JR,UUØJX,ops)	2,702,612	2976	257	D
US4IWU (URØIQ,UXØIY,ops)	184,736	629	92	D

Latvia

YL2DZ	24,026	206	41	A
YL2GN	39,819	360	39	C

Zone 30

Turkmenistan

EZ8BO	12,684	107	28	C

European Russia

UA4WGU	1,203,840	1816	190	A
RA4HUQ	4,233	99	20	C
RK4WWA (RW4WA,UA4WA,ops)	755,596	1382	172	D

Asiatic Russia

RA9CMO	237,420	847	60	A
RW9QA	19,649	114	401	A
RW9AB	225,982	465	103	B
UA9AOL	107,360	294	88	C
RV9WB	29,492	100	73	C
RU9D (RW9DX,RX9DR,UA9CSS,ops)	1,272,556	1706	166	D

Uzbekistan

UK7R	93,732	308	73	C

Kazakhstan

UN7BY	588,280	925	140	C

Zone 31

Asiatic Russia

RZ9OO	473,375	849	125	B
UA9URZ	56,198	346	86	B
RZ9U (RZ9UA,op)	1,506,557	1569	221	C
RZ9OZ	207,230	558	85	C
RZ9HG	200,816	522	88	C
RW9OWW (UA9OO,UA9s 145-590, 145-591,ops)	39,996	198	44	D

Zone 32

Asiatic Russia

RWØA (RVØs AM,AR,AX,UA3DPX, UAØs AGI,ANW,I2VXJ,ops)	1,400,352	1754	174	D

Zone 33

Asiatic Russia

UAØJB	570,920	995	140	C

Zone 34

Asiatic Russia

RAØFU	271,425	688	105	A
RSØF	14,448	130	28	C
UAØLS	5,442	57	26	C

RZØLWA (RAØLSO,RWØLMF, UAØLHT,ops) 44,838 236 53 D

Zone 36

Madeira Islands

CQ3B (CT3EE, op) 657,597 1245 109 B

Azores

CU3FQ 167,172 833 95 B
CU3AV 54,050 371 50 B

Canary Islands

EA8DXD 3,088 52 22 B

Zone 37

Spain

EA7DPU 245,300 667 110 A
EA2CR 11,211 102 37 A
EA1UX 328,605 1008 95 B
EA5GRC 233,649 615 117 B
EA3BOX 187,999 531 107 B
EA3GHQ 179,280 457 120 B
EA3ELZ 76,349 269 91 B
EA1FBU 67,575 305 51 B
EA1EB 64,296 276 76 B
EA5EYJ 59,616 260 69 B
EA1FDG 47,160 353 40 B
EA5EIL 37,764 291 42 B
EA1OB 37,084 153 73 B
EC3CIL 34,112 434 26 B
EA1BEZ 31,500 191 60 B
EA1OT 6,180 76 30 B
EA3AMV 3,948 68 21 B
EC5ACZ 2,190 68 10 B
EA1BLF 1,092 26 14 B
EA1DLN 1,092 26 14 B
EA3GIW 720 26 12 B
EA3AJW 61,245 297 45 C
EA7FZ 44,320 190 80 C
EA5DLT 12,920 116 34 C
EA7AAW 1,349 33 19 C
EA3EJI (+NET) 156,816 432 121 D

Balearic Islands

EA6ACF 13,638 271 33 B
EA6ACZ 11,172 120 42 B
EA6JN 3,444 50 21 B
EA6ZS 7,192 76 29 C

Ceuta and Melilla

EA9IE (YU1RL,op) 2,911,184 2888 212 A

Zone 39

Israel

4Z4TA 129,516 308 86 A
4Z5FW 8,330 98 17 A
4X1VF 4,471 52 17 C

Cyprus

C47W (5B4WN,op) 1,356,516 1948 147 C

Lebanon

OK1EE/OD5 893,500 1506 125 C

Turkey

TA2ZW 1,147,248 1761 144 A

Iraq

YI9CW (SP5AHC,op) 157,868 566 61 C

Zone 41

India

VU2TLO 155,308 432 82 C

Zone 44

Taiwan

BV2FG 184,955 657 71 A
BV2FI 88,320 338 44 B

China

BY1BY (BG1s JX,MK,BZ1DCH, ops) 20,492 122 47 B

South Korea

HL5AP 47,412 283 54 C
HLØK (DS1AII,DS2AFP,HL1s LME,ODG, HL2IDN,ops) 40,876 289 44 D

Hong Kong

VS6BG 58,351 271 59 C

Zone 45

Japan

JH5FXP 667,464 1080 137 A
JA2JNA 195,920 376 124 A
JR4GPA 154,584 705 72 A
JA7KBR 76,610 219 94 A
JL3SBE 72,542 266 83 A
JA1BUI 69,342 221 78 A
JK2VOC 65,412 264 69 A
JA6IP 17,700 99 50 A
JE9LLO 6,510 53 30 A
JQ1NGT 6,160 84 22 A
JA1AB 6,120 61 24 A
JG1RDV 3,850 71 25 A
JA4HIX 2,413 33 19 A
JH5ZCP (JR5JAQ,op) 384,356 844 106 B
JH4RHF 95,628 298 78 B
JHØHON 82,144 56 30 B
JH1UUT 49,600 255 64 B
7K2DOD 21,504 110 48 B
JH6FHJ 18,960 115 48 B
JA7BEW 14,792 59 32 B
JR7WAB 11,491 200 26 B
JR9NVB 8,954 66 37 B
JR1MRG 6,358 49 34 B
JE1UFF 2,982 38 21 B
JA2GHP 2,592 40 18 B
JR7LVK 2,460 43 20 B
JA1STY 1,652 34 14 B
JA9KUG 1,456 22 16 B
JA2BEY 1,157 23 13 B
JA1DY 456 16 6 B
JH2WHS 324 48 6 B
JG1GCO 189 7 7 B
JA1JLP 45 13 2 B
JA1IDY 407,365 702 113 C
JR7OMD/2 247,044 510 119 C
JA9CWJ 217,251 489 101 C
JP6JKK 191,961 652 77 C
JS1OYN 117,924 322 93 C
JF3IUC 101,288 291 88 C
JHØGHZ 85,374 248 81 C
JM1NKT 61,364 250 58 C
JA5APU 59,472 328 42 C
JA3ARM 57,836 207 76 C
JF3GKE 53,370 294 45 C
JA1WYQ 47,064 157 74 C
JR2BNF/1 29,971 153 43 C
JH6TYD 25,152 131 48 C
JA1QN 22,425 141 39 C
JA1KI 19,844 109 44 C
JA7COI 17,646 121 34 C
JH1DYV 17,064 112 36 C
JA2SWF 11,715 81 33 C
JA8SPZ 11,322 78 37 C
JA6CM 10,140 74 30 C
JI3KDH/3 9,342 88 27 C
JA2MOG 8,512 66 32 C
JR9FJY 7,920 60 33 C
JO2CKU 5,346 68 27 C
JA2GTW 4,599 51 21 C
JA2QVP 3,717 45 21 C
JA1XEM 3,655 55 17 C
JA7DNO 2,912 40 16 C
JL7PVR/1 1,290 29 10 C
JF1SQC 1,280 20 16 C
JA8AJE 1,269 35 9 C
JJ2KFF 1,248 24 13 C
JA1AAT 931 22 7 C
JH1JGZ 891 25 11 C
JA3AVO 711 17 9 C
JA3BCT 204 8 5 C
JA7YAA (JE1AMC,JF1s CKX,SXL, JG7PSJ, JRØSPG,ops) 763,147 1417 119 D
JAØYAK (JF1USQ,JI7TDR,JM7SGO, JEØETP,JFØESV,ops) 220,920 651 84 D

Zone 46

Nigeria

5NØMVE 846,264 1208 148 B
5NØGC 755,760 1134 141 B

Zone 49

Vietnam

3W5FM 8,096 156 16 A

Zone 50

Philippines

DU1SSR 36,405 179 45 B
OHØXX/DU1 11,085 152 14 C
4G2X (DU2s AYL,BBH,RK,DY2BRL, 4F2s IR,MD,ops) 353,632 850 86 D

Zone 52

Angola

D2TT (ON6TT,op) 448,440 980 95 B

Zone 54

Indonesia

YB2CPO 37,640 201 40 B
YC1JZF 9,020 86 22 B
YBØASI (AA4U,op) 138,498 363 82 C

Zone 55

Australia

VK4TT 35,061 229 31 C
VK4MZ (+VK4EMM) 572,314 907 134 D

Zone 57

South Africa

ZS9F (ZS6YA,op) 95,976 282 86 B
ZS6CAX 19,395 101 45 C
ZS6AJS 6,386 54 31 C

Zone 59

Australia

VK5GN 201,572 467 92 A
VK2VM 14,820 86 38 A
VK2ARJ 66,261 357 39 B
VK2APK 344,080 644 115 C

Zone 60

New Zealand

ZL2AGY 243,360 628 80 C

Zone 61

Hawaii

KH6FKG 90,650 500 37 B
WH6CQH 56,940 302 39 B
WH6PK 20,590 150 29 B

Zone 63

French Polynesia

FO5IW 482,963 1029 97 B

Zone 65

Marshall Islands

V73CO (KE6TDY,op) 6,400 64 20 C

Checklogs

4S7WP, DH5DAK, DJØMAQ, DLØMWG, DLØSH, DL2AKF, DL2DWA, DL2HUM, DL3HTR, DL3NEO, DL4AMA, DL5AMF, EA1AKP, EA5JC/EA1, EA8BXQ, EC7FAB, HA3GN, JRØBAT, JR1XKU, KL7UR, LA4OGA, LA7CL, LA8CE, LA8LA, LZ1KVF, LZ1VQ, LZ2UA, LZ2UA, NØXCF, NG3K, OH2KQ, OK2SNX, OM4JD, PAØTV, PA3CNI, PA3FYF, PY3CJI, RV3VF, SMØCSX, SMØGKF, SMØNJO, SP1GZT, SP2HHX, SP2LNW, SP3NGB, SP4TJS, SP5KDK, SP6DMJ, SP6LK, SP7VCA, SP7VCK, SP9HOF, SV2YC, UAØYAY, UA1QBE, UA3WCN, UN7EAT, UN9PQ, WD4FJP, XE1LM (XE1PE, op), YO5QCA, YO9HH, YV2FEQ.

QST

W1AW schedule

Pacific	Mtn	Cent	East	Sun	Mon	Tue	Wed	Thu	Fri	Sat
6 am	7 am	8 am	9 am			Fast Code	Slow Code	Fast Code	Slow Code	
7 am	8 am	9 am	10 am			Code Bulletin				
8 am	9 am	10 am	11 am			Teleprinter Bulletin				
9 am	10 am	11 am	noon							
10 am	11 am	noon	1 pm			**Visiting Operator Time**				
11 am	noon	1 pm	2 pm							
noon	1 pm	2 pm	3 pm							
1 pm	2 pm	3 pm	4 pm	Slow Code	Fast Code	Slow Code	Fast Code	Slow Code	Fast Code	Slow Code
2 pm	3 pm	4 pm	5 pm	Code Bulletin						
3 pm	4 pm	5 pm	6 pm	Teleprinter Bulletin						
4 pm	5 pm	6 pm	7 pm	Fast Code	Slow Code	Fast Code	Slow Code	Fast Code	Slow Code	Fast Code
5 pm	6 pm	7 pm	8 pm	Code Bulletin						
6 pm	7 pm	8 pm	9 pm	Teleprinter Bulletin						
6^{45} pm	7^{45} pm	8^{45} pm	9^{45} pm	Voice Bulletin						
7 pm	8 pm	9 pm	10 pm	Slow Code	Fast Code	Slow Code	Fast Code	Slow Code	Fast Code	Slow Code
8 pm	9 pm	10 pm	11 pm	Code Bulletin						
9 pm	10 pm	11 pm	Mdnte	Teleprinter Bulletin						
9^{45} pm	10^{45} pm	11^{45} pm	12^{45} am	Voice Bulletin						

W1AW's schedule is at the same local time throughout the year. The schedule according to your local time will change if your local time does not have seasonal adjustments that are made at the same time as North American time changes between standard time and daylight time. From the first Sunday in April to the last Sunday in October, UTC = Eastern Time + 4 hours. For the rest of the year, UTC = Eastern Time + 5 hours.

❑ ***Morse code transmissions:***

Frequencies are 1.818, 3.5815, 7.0475, 14.0475, 18.0975, 21.0675, 28.0675 and 147.555 MHz.

Slow Code = practice sent at 5, 7½, 10, 13 and 15 wpm.

Fast Code = practice sent at 35, 30, 25, 20, 15, 13 and 10 wpm.

Code practice text is from the pages of *QST*. The source is given at the beginning of each practice session and alternate speeds within each session. For example, "Text is from July 1992 *QST*, pages 9 and 81," indicates that the plain text is from the article on page 9 and mixed number/letter groups are from page 81.

Code bulletins are sent at 18 wpm.

W1AW qualifying runs are sent on the same frequencies as the Morse code transmissions. West Coast qualifying runs are transmitted on approximately 3.590 MHz by W6OWP, with W6ZRJ and AB6YR as alternates. At the beginning of each code practice session, the schedule for the next qualifying run is presented. Underline one minute of the highest speed you copied, certify that your copy was made without aid, and send it to ARRL for grading. Please include your name, call sign (if any) and complete mailing address. Send a 9×12-inch SASE for a certificate, or a business-size SASE for an endorsement.

❑ ***Teleprinter transmissions:***

Frequencies are 3.625, 7.095, 14.095, 18.1025, 21.095, 28.095 and 147.555 MHz.

Bulletins are sent at 45.45-baud Baudot and 100-baud AMTOR, FEC Mode B. 110-baud ASCII will be sent only as time allows.

On Tuesdays and Saturdays at 6:30 PM Eastern Time, Keplerian elements for many amateur satellites are sent on the regular teleprinter frequencies.

❑ ***Voice transmissions:***

Frequencies are 1.855, 3.99, 7.29, 14.29, 18.16, 21.39, 28.59 and 147.555 MHz.

❑ ***Miscellanea:***

On Fridays, UTC, a DX bulletin replaces the regular bulletins.

W1AW is open to visitors during normal operating hours: from 1 PM until 1 AM on Mondays, 9 AM until 1 AM Tuesday through Friday, from 1 PM to 1 AM on Saturdays, and from 3:30 PM to 1 AM on Sundays. FCC licensed amateurs may operate the station from 1 to 4 PM Monday through Saturday. Be sure to bring your current FCC amateur license or a photocopy.

In a communication emergency, monitor W1AW for special bulletins as follows: voice on the hour, teleprinter at 15 minutes past the hour, and CW on the half hour.

Headquarters and W1AW are closed on New Year's Day, President's Day, Good Friday, Memorial Day, Independence Day, Labor Day, Thanksgiving and the following Friday, and Christmas Day.

Section News

*Edited by **Steve Ewald, WV1X** • Assistant Field Services Manager*

The ARRL Field Organization Forum

Field Organization Abbreviations	
ACC	Affiliated Club Coordinator
ARES	Amateur Radio Emergency Service
ASM	Assistant Section Manager
BM	Bulletin Manager
BPL	Brass Pounders League
DEC	District Emergency Coordinator
EC	Emergency Coordinator
LGL	Local Government Liaison
NCS	Net Control Station
NM	Net Manager
NTS	National Traffic System
OBS	Official Bulletin Station
OES	Official Emergency Station
ORS	Official Relay Station
OO	Official Observer
OOC	Official Observer Coordinator
PBBS	Packet Bulletin Board Station
PIC	Public Information Coordinator
PIO	Public Information Officer
PSHR	Public Service Honor Roll
SGL	State Government Liaison
SEC	Section Emergency Coordinator
SM	Section Manager
STM	Section Traffic Manager
TCC	Transcontinental Corps
TA	Technical Advisor
TC	Technical Coordinator
TS	Technical Specialist
VC	Volunteer Counsel
VCE	Volunteer Consulting Engineer
VE	Volunteer Examiner

ATLANTIC DIVISION

DELAWARE: SM, Randall Carlson, WBØJJX—I hope everyone had a pleasant and safe holiday season. It may not have the prestige of the Boston Marathon nor the numbers of the New York City Marathon,but this did not seem to deter the spirit of the over 500 runners who participated in the Delaware Marathon/10k run on Dec 10. Many thanks to the twelve amateurs who braved the sub-zero wind chill factor to watch over the event. Several medical treatment cases once again demonstrated the value of Amateur Radio in events of this type. Thanks to N3FRO for providing the communications planning for the event. IF you are an incomming president, please take a minute to fill the 1996 ARRL affiliated club report forum, and bring your club records up to date. Traffic (Nov): DEPN: QNI 26 QTC 0 in 4 sess. K3JL 35, WBØJJX 5. 73, Randall.

EASTERN PENNSYLVANIA: SM, Bob Stanhope, KB3YS @N3KDS— ASMs: exec WA3PZO @WB3JOE, W3ZXV @N3ACL, WB3FPL @WB3FYL, K3DCU & N3KDS. ACC: N3IGA @N3DPU. BM: KD3OA @KD3OA. OOC: WN3V. PIC: WB3DCL @N3ACL. SGL: WA3IAO @WA3TSW. SEC: WB3FPL @WB3FYL. STM: WK3KOD @KB3QW. TS: WB2LGJ @WB3JOE. You win with people...1990-1996...When you are the section manager, you must fill the job titles listed above with qualified leaders. My job is to insure that the ARRL members in my section are provided the services vital to the continued excellence the service deserves. This is very difficult, especially when most are recruited by reputation alone. When I became Section Manager in 1990, Eastern Pennsylvania was in a re-building mode. This wasn't the fault of the previous section manager, WT3P, as Kay recognized this need and started the process. In fact, her entire staff was filled with terrific appointments that she made, many are still with me today! Fortunately, I started out with a lot of talent. Then disaster struck. On Easter Sunday, 11 days in office, the section bulletin/traffic manager, Tom Teel, KB3UD, suddenly died. As a rookie section manager, I suddenly had my first crisis and had to fill 2 staff positions. Carter Craigie, KD3AO, stepped into the traffic manager job as an "interim appointment" only to do a spectacular job with the National Traffic System for over 3 years. Chris Tobias, KD3OA, was appointed bulletin manager, and he too has served EPA splendidly right from the start and is still there every day for 6 years preparing ARRL and section news bulletins. Today, Harry Thomas, W3KOD, is in his third year and has a staff of 4 net managers and 24 relay station appointments who handle over 15,000 NTS messages each year. Chris' staff of 11 bulletin stations distribute the news of Amateur Radio throughout EPA via packet, regional nets and club newsletters. Another holdover, Steve White, WA3IAO, has been the section's government liaison. Steve, as an attorney, has kept an eye on legislative events in Harrisburg and Washington that may have effect on Amateur Radio, either directly or indirectly for 8 years. He's worked with dozens of amateurs on antenna ordinances, and written opinions on state and local law that effects the hobby. Some to advise the League as a volunteer council. he's worked with the governor's office to gain the recognition you deserve for the volunteer service that you all provide the people of Pennsylvania in what has become the governor's proclamation designating the last week of June as "Amateur Radio Week in the Commonwealth." Today, he serves both Eastern and Western Pennsylvania sections. All this without a staff. Donna Reinart, N3HMD, joined EPA in June 1990 as the affiliated club coordinator until just recently. She quickly brought the section's records up to date. In the process, she reactivated "lost clubs" that became inactive and fell through the paperwork cracks into obscurity. She also helped bring 4 special service clubs on board. Recently, John Holmes, N3IGA, has taken over this position and has 3 new clubs in the works and 2 established clubs that he's attempting to qualify as special service clubs. Donna and John perform a thankless tiring job in a paperwork jungle. Without them, I would have been forever lost. Continued next month.

MARYLAND/DC: SM: Bill Howard WB3V @ KA3RFE 410-551-6775 (wjh@ideas.com)—ACC: Tony Young, WA3YLO 301-262 1917. ASM: Jerry Gavin, NU3D @ KA3RFE 410-761-1423. ASM/RACES Coord: Al Nollmeyer, W3YVQ. ASM/Youth: Cynthia Mann, KA3ZNQ 410-647-0005. ASM/Youth: Brian Davids, KA3WWI 410-647-2956. BM: Bill Dillon, WA3SCW @ WA3SCW 410-787-1580. SEC: Mike Carr, WA1QAA 410-799-0403. STM: Bruce Fleming N3EGF @ K3HKI 301-863-6582 (76136.2017 @compuserve.com). TC: Bob Bruninga, WB4APR 410-553-6021 (bruninga@greatlakes.nada.navy.mil) MDC Section, World Wide Web site URL: http://www.seas.gwu.edu/student/hanir/mdc/ DC ARES Web site URL: http://www.seas.gwu.edu/student/hanir/dcares.html Please remind your clubs to fill out and return the 1996 ARRL annual club report form. If the club hasn't received one, you can get one from HQ or from our ACC WA3YLO. EC reports: ALLE - N3ISA reports 45 members and 4 net sessions. GARR - N3KAT reports 17 members and 3 nets and a SET critique. BALT - N3IVO reports 47 members and welcomesN3VEJ as an asst. EC - working with NWS and the Salvation Army. WASH and Western Region - NF3X reports 150 members, one public service event, 9 net sessions and 1 SKYWARN call-up. Thanks to all who support ARES and please continue your outstanding level of work. The AARC and MMARC entered into a joint venture to place a wide-coverage 440 ARES repeater on-the-air in Annapolis. Many clubs have inquired about starting PBBS operations. Often they only need that special someone to head up the effort. Maybe that someone is you! Widows assistance and scholarships are two of the many difficult jobs handled by our local Foundation for Amateur Radio. Please give them your club's support. Also the many unsung heroes of TMARC deserve your applause for the monumental and thankless task of repeater coordination. They too deserve our club's support. Oh, by the way - how are your plans for Field Day coming along? 73 Bill. With the nets: NET/NET MGR/QND/QTC/QNI: MSN/KC3Y/30/45/314, MEPN/K3ORW/30/83/653, MPTN/VACANT///, MDD/WJ3K/49/151/213, MDD TOP BRASS, W3YVQ/123, N3DE/96, WJ3K/106, BTN/AA3LN/30/51/268, SMN/KE3OX/4/3/49, DCTN/KQ3X/30/23/117, *Tfc*: K3GHH 162, N3DE 101, W3YVQ 86, WJ3K 85, KC3Y 62, K3ORW 51, WA3WRT 42, KE3OX 32, N3EGF 29, WA3FYZ 24, N3HYM 18, WI3A 16, KE3FL 14, W3DQI 10, W3FZT 9, K3NNI 9, WA1QAA 7, WA3GYW 6, W3ZNW 3, KJ3E 2, N3WCM 2. PSHR: W3YVQ 151, K3GHH 139, KC3Y 133, WJ3K 122, K3ORW 110, KE3OX 102, KE3FL 98, WA3FYZ 78, WA3WRT 74, WI3A 66.

NORTHERN NEW YORK: SM, George Veraldo, WB2BAU—ASM: KD2AJ. ASM: AA2JH. BM: KA2JXI. OOC: N2MXR. TC: N2JKG. ACC: WZ2T. PIC: N2SZK. SGL: WN2F. STM: WA2SPL. SEC: WA2JPM. On Nov 18, the first LO meeting was held in Tupper Lake, and it was agreed that public safety communications would be one of our main priorities in the new NNY Section. We are looking forward to a renewed working relationship with county EMOs, state EMOs and served agencies. Clinton and Essex counties have had excellent results with the auxiliary communications concept of integrating RACES with ARES, NTS, MARS, CAP and REACT resources under the coordination of emergency management when public safety is involved. This procedure will first direct resources to emergency communications needs and then health and welfare. Where applicable, we are encouraging the implementation of this concept throughout the section. For further info on the ACS/RACES concept, please contact our SGL/RACES coordinator Darry Roberts, WN2F@WN2F.#NNY.NY.USA.NA; Phone 518-293-6680 or WB2BAU, George Veraldo, phone 315-353-2167.

SOUTHERN NEW JERSEY: SM: Bruce Eichmann, KE2OP (@K2AA)—ASM: W2OB, KA2YKN, WB2LOO, WA2CVJ, K2GA, N2OO. SEC: W2HOB STM: WB2UVB.ACC: K2IXE. TC: W2EKB.SGL: K2GA. BM: N2XEZ. OOC: K2RCG. PIC: N2YAJ. TS: K2JF, W2PAU, AB2Y, WB2MNF, KD3HN. 1996 is well under way. The new 610V "Vanity Call Sign" Applications are out and many of us are anxiously awaiting the announcement for the gate openings. Good luck to those of you who will be applicants in this program. It was my pleasure to issue a certificate of appreciation to Toni Bull, N2CYL, for her service to Amateur Radio with the Southern Counties Amateur Radio Club (SCARA). Toni was also the prime organizer of the Amateur Radio communications at the Miss America Pageants in Atlantic City over the past several years. Thanks, Toni, for all your hard work. This is just a reminder that the Atlantic Division cabinet meeting will be held in the SNJ Section this year. As host for this mtg, I will be inviting the section club presidents and SNJ staff officials to attend the Saturday meeting. The time and place are still pending. Please let know your concerns for discussion at this meeting. Until next month, 73. *Tfc*: WB2UVB 188, AA2SV 139, W2HOB-4 126, K2UL 121, KB2RTZ 74, W2AZ 71, N2WFN 39, KA2CQX 16, N2FET 11, N2SXO 8, KB2TFS 6, N2ZMI 5, KB2VSR 2.

WESTERN NEW YORK: SM, William Thompson, W2MTA (@WF2A)—Nov 11 WNY/WPA "Exercise PC" by ARES and NTS operators was a good learning experience—well done to all participants under direction of SEC N2EH and STM KA2GJV. Club Officers: Jefferson RAC N2RZO KA2GHO KB2TYX N2ZMS WB2LCE KB2QGD VE3HPF. Orleans KE2XT N2YMB KZ2R KA2BC N2CWG; STARS KE2VW KB2OUT WA2TVT KB2ESM N2TEZ AA2AC. Club News: Welcome N2YTS and new affiliate Black Fly ARC, Essex County; John Bonar, NA2C, great LARC legend, was remembered in LARC Ham-of-Year search; WNYDXA contest plaque winners are WB2WPM-low power, WB2RAJ-high power, GRAM reminds us that ARRL memberships are available thru affiliated club discounts of $2 on renewals and $5 for new members. As 1995 closes out, only 41 clubs have filed 1995 Annual Reports; eleven remain due from those filed in 1994. Sixteen other clubs are on the inactive list (Auburn, Brockport, Buffalo, Five-County, Jefferson, Kodak, Margaretville, Oswegatchie RIT RVHFG, Schoharie SIAR, SUARC U of Roch. Unatego Xerox.) Appointments: (OES) KG2DI, N2SSS. PSHR: K2BCL WA4BNY AA2CX KG2D KA2DBD N2DLN K2UN AA2ED KB2ETO W2FR WI2G KA2GJV WB2IJH N2JAW N2JS AF2K KB2KOJ KF1L N2LTC W2MTA KB2QIX ND2S N2SSS KB2TIY N2TOY WA2UKX N2ULY UQZ NY2V N2VDK KF2VL K2YAI KA2ZNZ. BPL (Nov): N2JAW KF1L KA2ZNZ. DATALINK! K2DN S1, KA2GJV R109/S71, N2JAW R902/S590, W2MTA R44, NY2V R9/S10. Recent History Recipients of BPL medallions: AA2CX K2GXT KA2GJV KA2UBD KA2ZNZ KF1L N2EIA N2JAW N2LTC W2AET W2FR W2MTA WA2FJJ WA2HSB (SK) WB2IDS WB2IJH WB2OWO. There were many Silent Keys this month—we all shall miss them: AK2O K2PPK KC6TFI W2OZR WA2FLT WB2FCS WB2NLU. *Denotes National Traffic System nets, listed below.

Net	QNI	QSP	QND	Net	QNI	QSP	QND
Early Bird Net-FM	469	000	220	WDN/E*-FM	485	141	30
SI Rooster-10/70	1028	057	30	NYS/E*-CW-3677	415	160	31
NY RACES-SSB	074	007	04	WEST-FM/SSB	957	941	28
NY RACES-CW	023	004	04	Lewis Co ARES-FM	027	000	04
Carrier Net-SSB	839	069	26	OMEN ARES-FM	030	001	02
NYS/M*-CW-3677	280	161	29	Q Net-FM-325/925	TBD		
Clearing House-SSB	267	137	30	Jefferson RC-10/70	753	059	30
WDN/M*-FM	426	097	30	Oneonta ARC-25/85	047	001	04
NY Phone*-SSB	313	277	30	TIGARDS-FM-16/76	022	003	04
NYPON*-SSB-3913	365	304	30	BRVSN-FM-055/655	295	005	30
ESS-CW-3590	478	255	30	CNYTN*-FM	321	055	30
NYSPT&EN-SSB	427	051	30	OCTEN/L*-FM-34/94	484	133	30
OCTEN/E*-FM28/88	1224	218	30	WDNL/L*-FM	423	063	32
STAR*-FM-13/73	351	024	30	NYS/L*-CW-3677	225	115	30

Tfc (Nov): N2JAW 304, KF1L 514, K2BCL 417, AA2CX 399, KA2ZNZ 391, N2LTC 347, W2MTA 337, KF2VL 316, KA2GJV 298, WI2G 268, WB2IJH 223, N2ULY 163, AF2K 149, K2YAI 144, ND2S 142, W2FR 139, KB2TIY 135, NY2V W4BNY 119, WB2QIX 114, KG2D 87, N2DLN 60,KA2DBD 59, N2JRS 44, K2DN 40, KB2UQZ 37, N2TOY 36, N2VDK 32, KB2KOJ 26, N2SSS 17, KB2ETO 16, AA2ED 12, KA2SJG 10, WA2UKX 4. Here's wishing for the new Northern New York Section of the League a continued success in the Field Organization's public service efforts. 73.

WESTERN PENNSYLVANIA: SM, Bernie Fuller, N3EFN (@WA3ZCA)—ASM (East): NR3T (@W3SYY). ASM (Pkt): KC3ET (@KC3ET). ASM (ARES): N3FQQ (@W3SYY). SEC: N3LLR (@N3LLR). STM: WN3F (@KA3JSD). TC/OOC: AA3HP. BM: KC3ET. ACC: AK3J. PIC: N3EFN. You have been appointed the club Public Information Officer; now what do you do? In these days of commercial interest in our frequencies, a good public information program is essential if we are to keep our story in front of the public...we can't expect support if our potential supporters are not aware that we exist and provide valuable public services.

Continued on page 124.

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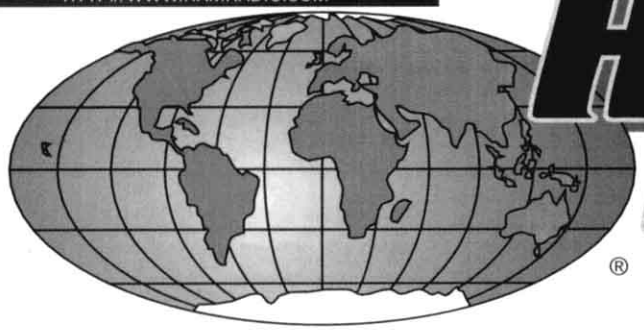

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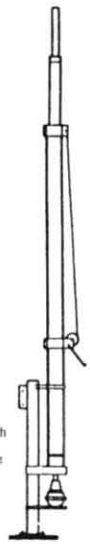

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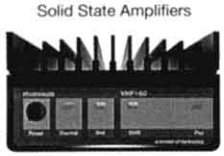
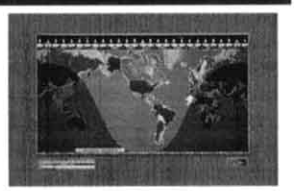


Contemporary design, quality and a 1 year warranty on parts and labor. 1 year on the RF Final transistors. Most amplifiers have GaAsFET receive pre-amps and high SWR shutdown protection

GEOCHRON

Global Time Indicator



• Detailed illuminated map shows time, time zone, sun position and day of the week at a glance for any place in the world. Continuously moving - areas of day and night change as you watch.• Mounts easily on wall. • Size: 34 1/2" x 22 1/2".

Reg $1295. ***SALE $999.95***

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IC-Z1A

2 M/ 440 MHz

100 Alphanumeric Memories, Backlit Keypad, Tone Scan, Expanded Receive with no Modification. Now with 2.5 W and Encode/Decode.

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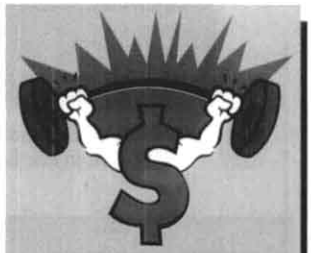

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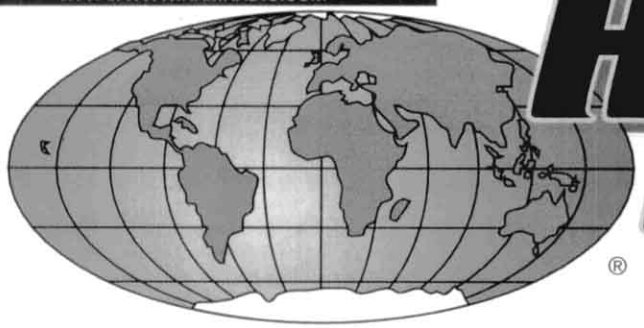

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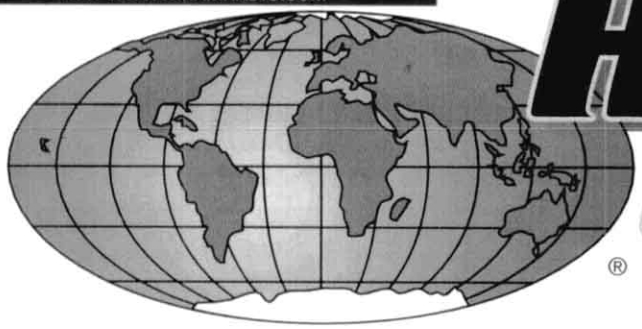

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108 db Dynamic Range, Optional DSP

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Compact FM Mobile Transceivers

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New Deluxe Model!

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5W Optional, DTSS Built-In
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240 Mem.
w/optional mem. unit
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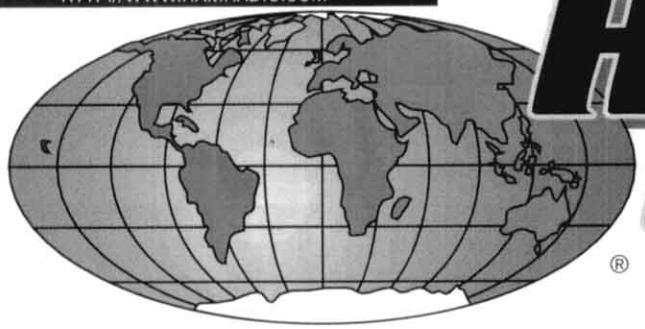

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- CTCSS Enc/Dec Standard

C1208DA
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- CTCSS Built In
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C5068's Now In Stock!

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130-170 Rx
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C228A
2M & 220MHz
2.5W

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2M & 440MHz
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2.5W

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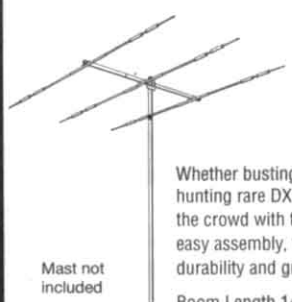


A3S

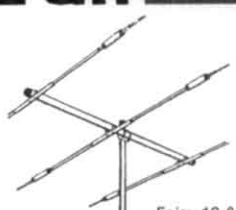
DX that stands out from the crowd. With stainless steel hardware
10, 15, 20 METERS

Mast not included

Whether busting pile-ups, rag chewing or hunting rare DX, the A3S stands out from the crowd with the perfect combination of easy assembly, the right size, rugged durability and great performance.

Boom Length 14 ft.
Weight 27 lbs.
Wind Surface Area - 4.36 ft.

REG. $445. ***SALE $329.95***



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New 12 & 17 Meters
DUO-BANDER

*Optional A103 30 Meter Add-on
REG. $140. ***SALE $109.95***

Enjoy 12 & 17 meter bands with full performance beam. Easy-to-use kit adds 30 meters. Mount on lightweight tower/rotator or use with existing tribander. A3WS has all aluminum construction w/stainless hardware.

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Boom Length: 14 feet • Weight: 22 lbs.
Turning Radius: 14.4 ft. • Wind Area: 4.1 sq.ft.

R5

14, 18, 21,24,28 MHz Half Wave Vertical

Broadband impedance matching network/ all 5 bands
Fully automatic frequency selection
Four 48" long counterpoise rods/ excellent isolation
No radials required

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7,10,14,18, 21,24,28 MHz
7 Band Half Wave Vertical

NEW!

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New Dual Band Ringo

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70 CM (435-450 MHz)
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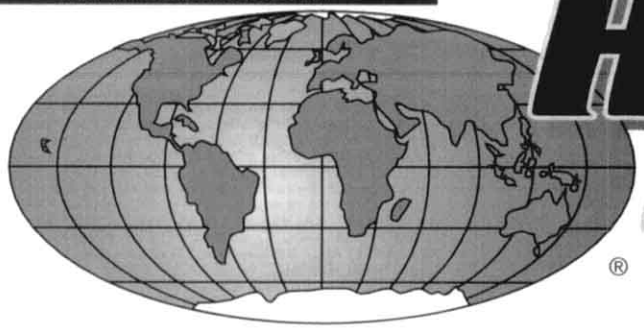

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Most organizations tend to talk a good game at their meetings, and all of the members know what a great job the group is doing. Where these organizations fail is in not informing others outside of the group of their activities. Amateur Radio clubs are no exception...in short, we spend too much time talking to ourselves! Here are a few hints on spreading the word: *Establish and maintain liaison with local news media, and keep them informed on a regular basis of your club's activities. * Establish a speakers bureau and offer its services to local schools, service clubs and public service agencies. * Produce a quality club brochure and widely distribute it to govt officials, news media, public service agencies, and during your club's annual shopping mall demonstration station (you do have one of those, don't you?). These are just a few ideas...hold a brainstorming session at your next club meeting...you will be amazed at the number of great ideas that will surface. SPREAD THE WORD!! CLUB ELECTIONS: These hams have accepted the responsibilities that go with the privileges of club membership, have you? Butler Cty ARA: AA3EB-pres, KA3NTA-vp, N3VUZ-vp, N3RMT-secty, N3GXQ-treas, WA3BVQ, K3AMK, W3DMB, WB3BFC-dirs; McKean Cty ARC: N3NSK-pres, KD3OI-vp, N3LLR-secty/treas; North Hills ARC: N3DOK-chr of BOD, WA3TYRF-pres, K3QK-vp, KB3ANK-secty, N3DOS-treas, KB3ANI-trustee, N3LXJ, NM3P, KB3ANH, W3TAM, N3OIA-dirs; Radio Assn of Erie: N3BZL-pres, N3PYH-vp, KB3AOL-secty, KB3ALT-treas. Steel City ARC: W3IOH-pres, AA3GQ-vp, AK3J-treas, KC3YE-rec. secty, W3UUH-corr. secty; Triple A ARA: K3NPX-pres, N3PCZ-vp, N3IAL-2nd vp, N3RXB-secty, N3TSQ-treas, N2VQJ-ch.engineer, KC3TN-trustee. 73, Bernie, N3EFN SM-WPA.

CENTRAL DIVISION

ILLINOIS: SM, Bruce Boston, KD9UL—SEC: W9QBH. SGL: WA9AQN. ACC: AA9KL. BM: K9EUI. STM: K9CNP. PIC: N9EWA. TC: N9RF. OOC: KB9FBI. The new officers of the Kishwaukee ARC are pres N9MZQ, vp NEØP, sec N9UJQ, trea WA9TXW. The newsletter of the Hamfesters ARC "Hamgab" reports their new officers are pres KB9CYL and vp WM9T. The new slate for the Starved Rock Radio Club are pres N9OUT, vp KC9NL, sec KF9NZ, trea N9DRU. Best wishes to all the new officers. The Peoria Area ARC, host of the 1996 ARRL National Convention, reports attendance at last year's Peoria Superfest reached nearly 5,000. Amateurs in the Peoria area who are tackling the Worked All States award can contact N9HHU to have cards verified. Technical coordinator N9RF and technical specialist W9OES passed along word that information on electromagnetic hazards may be available from your power utility. Members of the Prime club participated in a mock disaster Oct 30. A part of the simulated earthquake, club members assisted by relaying communications between drill coordinators and local agencies. Farther north, Kishwaukee ARC members provided assistance during a disaster drill in Rockford and Cherry Valley. KARC members also helped with the annual Crop Walk held at Northern Illinois University. Over 150 walkers participated. According to the Macoupin County ARC newsletter, this year's Jamboree on the Air was a success. The team worked several scout stations on HF and packet. Members of the Fox River Radio League also participated in the JOTA event. Some of the scout leaders had so much fun they are studying for their license exams. Is your club ARRL affiliated? At last count, 66 clubs in the Illinois Section had joined the ranks, but of this number only a dozen hold the distinction of being an ARRL Special Service Club. If your group is already affiliated with the League and is actively working to promote and strengthen the hobby, your club may be ready to join the select few that have made it to the top. To learn more about becoming a Special Service Club, contact ARRL headquarters for information and application forms.

Net	*Freq*	*Time (local)*
ISN	3.905	1800 daily
ILN	3.665	1830 & 2200 daily
ITN	3.680	1900 daily
CTN	147.090+	2100 daily
ILARES	3.905	1630 1st & 3rd Sunday
IEN	3.940	0900 Sunday
ILPN	3.855	1645 M-F; 0830 Sunday
NCPN	3.912	0700 M-S
NCPN	7.270	1215 M-S

Tfc (Oct): K9CNP 159. (Nov) D9RN de K9DHR 177 w/484 check-ins, section represented 63% by W9HLX, NS9F, W9ZZU. W9HLX 143, K9CNP 98, WA9SLT 42, W9VEY memorial net de K9AXS 7 w/178 check-ins, WA9RUM 6, N9JF, N9OZM 1.

INDIANA: SM, Peggy Coulter, W9JUJ—SEC: K9ZBM. ASEC: WA9ZCE. STM: AA9HN. OOC: KA9RNY. SGL: WA9VQO. PIC: KK9G. TC: KF9IQ. BM: WB9AHJ. Sympathy extended to the families and friends of Silent Keys 11/19, Allen T. Goff, K9CCP, Muncie; 11/28, Larry D. Nuckols, KA9JLK, Portland. They will be missed. I would like to congratulate all new club officers who took the responsibility to run your club. Members help them out whenever you can. Good volunteers are hard to find and much needed everywhere. There is a CW net at 0200 UTC (9 PM EST) on 40 meters 7.1405 MHz. Net control is Henry, KA9ZNN, in Fort Wayne. Net speed is 1-10 wpm. Want practice, check in. Early reminder, IRCC will hold their spring meeting second Sunday in April, due to the first being Easter. Mark your calendar and join the group. Meeting will be in Indianapolis, place to be announced later. Contact SM to find out where. The Fall Festival Foliage Parade at Martinsville had communications furnished by KB9GAL, N9UPM, KA9ZZR, KA9JQR, WK9G, KA9NPY, W9SWC, KA9NYS, KA9UVA, N9TEJ, W9ZSK and N9JPX. They were afraid they would have repeater problems but WB9PGW got the regular remote repaired and reinstalled and all went well. News was very short this month. Don't forget to send me items that would be of interest. NM's ITN/W9UMH, QIN/WB9TUS, ICN/AA9HN, WN/WA9OHX, VHF/AA9HN, BBS/WJ9U.

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Power Curve -- typical BD-35 output power for your HT input							
Watts Out (2 Meters)	*30*	*40*	*45*	*45+*	*45+*	*45+*	*45+*
Watts Out (440 MHz)	*16*	*26*	*32*	*35*	*35+*	*35+*	*35+*
Watts In	*1*	*2*	*3*	*4*	*5*	*6*	*7*

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AN-24-G, $39.95, Sleek Glass Mount

160 Watts on 2 Meters

B-5016-G

B-5016-G, $299, for 25 to 55 watt mobile/base -- 160 watts out for 50 in. *Low-noise* GaAsFET preamp, automatic T/R, all modes FM/SSB /CW. **B-2516-G, $299,** for 10 to 35 watt mobile/base -- 160 watts out for 30 in.

B-1016-G

B-1016-G, $379, *dual purpose* handheld *or* mobile /base amplifier -- 160 watts out for 10 in. **B-108-G, $299,** 80 watts out for 10 in. B-1016-G, B-108-G for 0.2-15 watt transceivers.

35 watts for 2 Meter Handhelds

B-34-G

B-34-G, $99, boosts your 2 Meter handheld to 35 watts. All modes: FM, SSB, CW. 18 dB GaAsFET preamp. Includes mobile bracket. Reverse polarity protection. **B-34, $79,** 35 watts out. FM only. No preamp or mobile bracket.

Low noise GaAsFET Preamps

KP-1

KP-2

High gain *ultra low noise* GaAsFET preamps for receiving weak signals. Selectable gain prevents receiver intermod. 15 to 22 dB gain. Less than 0.8 dB noise figure. Automatic RF switching up to 160 watts. **Choose** *In-Shack* model or *Mast-Mount* (includes remote control) model to reduce loss. Rugged die-cast enclosure.

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220-225	KP-1/220	KP-2/220
430-450	KP-1/440	KP-2/440

70 cm Amplifiers (420-450 MHz)

D-3010-N

D-3010-N, $365 --100 W out/30 in. For 5 to 45 watt *mobile/base*. **D-1010- N, $395,** 100 W out/10 in. *Dual purpose* -- for handhelds *or* mobile/base. **D-26-N, $269,** 60 W out/2 in, for *handhelds*.

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ITN	3910	1330/2130/2300	2206	511	1244	60
QIN	3656	1430/0000	359	155	913	57
ICN	3705	2315	147	68	640	29
IWN	3910	1310	2107	–	300	30
IWN VHF Bloomington			417	–	450	30
IWN VHF Kokomo			659	–	150	30
IWN VHF Northeast			927	–	600	30
Hoosier VHF nets (14 nets)			1823	429	2617	85

D9RN had 60 sessions with 177 QTC.IN was represented 95 % by K9GBR, W9UEM, KA9MSR, WD9HII, and KA9DIG. 9RN had 60 sessions with 229 QTC.IN was represented 97 % by WB9TUS, KO9D, WA9QCF, K9PUI, KJ9J, W9FC, AA9HN, N9HZ, and WB9UYU Packet BBS reports: N5AAA/5306 and KB9AVO/ 592. *Tfc*: W9FC 169, W9UEM 148, WB9TUS 139, W9UMH 123, KJ9J 108, WB9QPA 93, AA9HN 79, K9GBR 69, KO9D 66, W9JUJ 52, WA9OHX 51, WA9QCF 51, K9PUI 34, WD9HII 30, N9HZ 28, K9RPZ 24, K9SBW 19, N9GAF 19, WB9AHJ 19, W9CSJ 18, WA6OIZ 15, KA9DIG 14, K9DIY 13, W9EHY 10, KB9WI 8, K9FIV 7, N9JAI 7, NZ9S 6, AB9A 5, K9ILK 5, WB9NCE 5, K9OUP 5, W9YB 4, N6CXB 3.

WISCONSIN: SM, Richard R. Regent, K9GDF—ASM: K9FHI. STM: KA9KLZ. SEC: WB9SMM. ACC: K9FHI. SGL: W9RYA. OOC: N6JSX. PIC: K9ZZ. BM: WB9JSW. TC: K9GDF. Red Cross Repeater Association Auction, February 27 starts 7 PM at American Legion Post, 634 Water Street, in Eau Claire; contact KA9OMC for details. If you would like to be an ARRL Volunteer Examiner, please phone 800-927-7583. It's time to appoint a Field Day committee and arrange for a site! Club activity suggestions: hold seminar on good operating techniques, OSCAR, packet or other specialty operating modes; explorer scout demonstration meeting, Valentine's Day message center. Four lakes ARC has renewed as a SSC. New Green Fox ARC officers: pres AA9LY, vp N9GVY, treas N9TS, secy WB9ZBS. Exams: February 3, Racine and Oak Creek; February 10, Madison; February 17, Milwaukee; February 21 West Allis; February 24, Tomahawk and Wauwatosa. Sorry to report Silent Keys W9DND and N9NXR. Drop me a note if you would like a free list of Wisconsin's 111 radio clubs or 127 nets. Thought of the month: Teamwork is the fuel that allows common people to attain uncommon results.

Net	Freq	Time (local)	Mgr
BWN	3985	1800	W9AYK
BEN	3985	1200	KE9VU
WSBN	3985	1730	K9UTQ
WSSN	3645	1830	N9BDL
WIN/E	3662	1900	WB9ICH
WIN/L	3662	2200	W9NGP
NWTN	3494	1830	NS9Q

Tfc: W9AYK 2657, WB9JSW 725, K9FHI 305, W9CBE 216, K9DHR 131, N9BDL 120, KA9KLZ 108, N9CKC 99, KB9UE 95, W9YCV 90, K9RTB 71, N9KHD 70, KE9VU 64, AG9G 57, KA9FVX 44, W9IHW 40, W9UW 40, W9NGT 38, K9JPS 37, NS9Q 34, KB9ENO 33, K9UTQ 33, N9BCX 31, K9GU 31, KA9BHL 30, KG9B 29, WB9ICH 28, W9ODV 24, N9JIY 7, W9PVD 1.

DAKOTA DIVISION

MINNESOTA: SM, Randy Wendel, NØFKU—As of January 1 we have a new ARES Section Emergency Coordinator. Gary Peterson, NØZOD, 500 Lyndale Ave, Spring Valley MN 55975, phone/fax 507-346-7615. Please write this info down. Gary brings emergency related experience with him, not to mention a great desire to work closely with all ARES people in our section/state. All current ARES DECs and ECs have been notified, and I urge any ARRL members who are interested in becoming an EC for their respective county, to contact Gary on what is involved. We'd like to hear from you. Gary joined us almost a year ago as DEC/South East MN and EC/Fillmore County. Nicollet County ARES (Jan Holte-NØJFL EC) participated in an emergency tornado scenario meeting in St. Peter in early Nov. Also OES Jack Maus, WØMBD, reported St.Cloud RACES folks helped in a similar event in late Oct. McLeod Co ARES EC Roger Vacek activated a simulated emerg net on the new Hutchinson 147.375 repeater in late Oct that is also host to a weekly ARES net on Wednesdays. DEC Doug Brown, N9DXS, of Hutchinson reports his wife, Lynn, is tech licensed as KBØTTJ. 9:00 PM. Last month I neglected to mention the 33's club in Twin Cities who also mails me their club newsletter. Their club member Jean Girardot, NØVEF, volunteers on a medical-aid trip to Honduras this February. Welcome new ARRL MN members: N9IWK, N5GNB, KBØBQX, KBØQXN, KBØSRB, KBØTRY, KØKGS, KA9HLN, NØJYC, KBØTAN, KBØPCI, KEØWH, KBØTYS, KBØTRI, NØATQ, KBØLTX, KBØTZB, KBØTWA, KBØUBF, KBØAYK, WØDCL, KBØTAL, KBØTUQ, KFØYO, KBØTUU, KBØUBU, KBØPYO, KAØETZ, KBØMPU, KBØQEG. Congrats to David Royer, KBØJBD, who recently achieved Eagle Scout. Ed-KBØOKX reports Faribault has a ham club once again, and Mike Jandro, NØMXX, says they have also met with local emergency folks on providing supplemental communications. 73 from your SM, NØFKU. *Tfc*: KAØARP 2919, WBØWNJ 750, WAØTFC 92, WØNO 171, KBØAII 120, KFØFI 117, NØUJK 110, WDØGUF 81, W3FAF 71, NØALH 65, WØGRW 63, KN9U 56, KØPIZ 55, NØJP 21, WDØHXR 20, KAØATT 18, KØWPK 17, KØOGI 9.

NORTH DAKOTA: SM, Bill Kurtti, WCØM— Bismarck Hamfest Mar 2, Radisson Inn. Sorry to hear that NØZKF is a Silent Key. Merle was active in the Ashley area. Also, KAØTBY, is a Silent Key. Pat will always be remembered for his work with the Ham Station at the Rollag Thrashers Reunion Grounds. We are all glad to hear that WØLHS is making solid progress in his recovery after a double knee replacement surgery. Also my new ham neighbor is KC6MVG who is retired from his job as an ocean ship captain and has had his share of health problems with 2 major surgeries in the last 6 weeks. He is recovering fast and hopes to get his station in full operation by next summer. In Bismarck-Mandan area, the BBS WØZRT has been moved to a remote location that gives much better coverage to the local area, but problems with the user port have prevented

OWNERS SAY IT BEST

It's one thing for us to say the OMNI-VI has the finest amateur receiver in the world, it's quite another to hear it from your fellow hams. So take a look in our mail bag – here are just a few of the letters we receive from active DXers and Contesters. OMNI-VI owners say it best!

"The OMNI-VI has finally ended my search!"

"I have owned 18 different HF rigs including most high end models from your three competitors. I used each intensively, many side by side. I pick 2 to retain, then purchase another to run more comparisons - my personal quest to find the 'ultimate' rig. With high hopes, I purchased and then sold when each did not quite deliver. I thought I might be looking for something that did not exist. The OMNI-VI has finally ended my search! If there were a word that defined better than superb, I would use it for the OMNI's receiver. It is a serious operator's rig - not a fashion designer's creation with little substance beneath the veneer."

— Gregory Buhyoff, KN4FR

"Performance to cost ratio makes this radio a best buy."

"In my 40+ years of hamming, I have owned and operated most equipment that has been built. I am still a very active DXer. To say I am pleased with my OMNI-VI would be a wild understatement. Quietness, selectivity and dynamic range is the best I have seen. Performance to cost ratio makes this radio a best buy."

—Ralph Napolitano, W9LKJ

"For the first time I am not bothered by strong adjacent stations."

"I dreamed for many years of having this type of performance and you have done it. For the first time I am not bothered by strong adjacent stations. Recently I was listening to a very weak station on 40 and only discovered after tuning up in frequency a little that an 80 dB over 9 was only 1.5 KHz away [we'll forgive Tom's enthusiasm, that's a BIG signal]. *I was so impressed that I nearly jumped up and shouted. Thanks for such great performance."*

— Tom Jednacz, KA2G

"It truly does pull in the weak ones."

"I have to say I am pretty picky and spent considerable time making up my mind. My observation is that the OMNI-VI is 20% better than the competition which I had for 10 years. Easy to operate and the receiver is all I hoped it would be. It truly does pull in the weak ones and in this down spiraling sunspot cycle being able to hear them is the competitive edge. The filtering exceeds my expectations. I now realize there is a stateside company that hams can still rely on. TEN-TEC staff have been extremely kind; a cheerful and helpful voice is just a phone call away."

— Tommy Farr, WJ60.

"Nothing I have tried comes close to the receiver performance of the OMNI-VI."

"I spent several years being disappointed by the available transceivers. I like to work DX, contests, and most especially weak signal DX on the low bands. From the Mid-West there is no more demanding situation than 40 meters at contest time, each 1 KHz away, and trying to work the weak Europeans. On my OMNI, the Europeans are crystal clear and although very weak a pleasure to work. On the competitions' transceivers they are indistinct and confusing in the noise. Nothing I have tried comes close to the receiver performance of the OMNI-VI."

— Bill Maxson, N4AR

Would I buy it again? I sure would!

"You may be interested in my response to a letter from a ham who saw my station pictured in QST. He asks if the OMNI-VI performs as well as advertisements say and, further, would I buy it again? 'I sure would! I have used TEN-TEC for 25 years and consider it tops. OMNI-VI is the best in a long line of transceivers. You just can't beat their service.' I know from personal experience."

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TEN-TEC

the 2nd port from going into operation as of this date. Grand Forks hams operated a portable station for the Cub Scouts Jamboree on the Air even though Murphy did his best to make the event challenging. HF nets sess/QNI/QTC/mgr: Goose River 4/68/0; DATA 25/592/8; Wx nets 48/919/41; VHF nets: North 40: 4/19; Mon-Dak 3/8; SW-Belles 4/17.

SOUTH DAKOTA: SM, R.L. Cory, WØYMB—Plans are being made to have the Dakota Division Convention at the same time and place as the Midwest Division Convention at South Sioux City, NE. The host organization will be the 3900 Club. The 1997 Dakota Division convention will be held at Bismarck, ND. Aberdeen ARC has been working on west link at Bowdle. The antenna is up, and at the time of this writing a few problems are being worked out. Their packet computer has been upgraded to a 386. On Sept 26, Aberdeen ARES assisted with a missing man hunt. Person was found and was OK. A closed repeater has been installed at Rapid City on 449.825 444.825 at Watertown. The LARK QSL card contest was won by AAØNE. Their new call sign was put on the air for the first time at a demonstration involving the Boy Scout Jamboree and their simulated emergency test. Denny, KFØHL, has access to several data bases via the Internet and may be able to help if you need a call sign not listed in any of the books you have. NØMEA reports the NE S Dakota SKYWARN net activity has improved from its yearly low with 293 pieces of traffic in October. Clear Lake ARC has now become an ARRL affiliated club. November traffic: 872.

DELTA DIVISION

ARKANSAS: SM, George Mitchell, KI5BV—I hope everyone is well into the new year and looking forward to an exciting year in the section. This is going to be a year of growth and excitement. With the help of the new hams and the "old timers" working together, the section will grow like never before. Let's all adopt this year as "The Year of Growth Through Teamwork." To all of the club presidents, if you haven't already done so, please send me a copy of your club officers for 1996. As of this writing, I am still looking for somebody to fill the ASM position for the North Central section of the state. If you are interested or know of someone who would make a good ASM, please drop me a line or give me a call. Congratulations to the ADXA on having a very successful DX Convention in December. Guest speaker for the occasion was Bill Kennamer, K5FUV. Bill works at the DX desk at ARRL Headquarters and gave an excellent presentation on his recent trip to Burma. ADXA president Rick Harris, AI5P, presented Bill with an "Arkansas Traveler" certificate signed by Governor Tucker. Kennamer presented Lennie Mendel, K5OVC, with a certificate from Dave Sumner, K1ZZ, for 50 years as a continuous member of the ARRL. Congratulations Lennie, keep up the good work. Due to timing considerations for getting this article to the League for publication, I failed to congratulate Joel Harrison, WB5IGF, upon his reelection as Delta Division director. *Tfc*: W5QFU 73, W5RIT 69, AA5LT 33, WØQIZ 18, WA5QMQ 8, W5LZQ 8, W5HDN 7, KA5MGL 6, WB5YLI 6, K5BOC 5.

LOUISIANA: SM, Lionel A "Al" Oubre, K5DPG— ASM: KB5CX. ACC: KA5IJU. BM: K5ARH. TC: KE5FZ. SEC: KA5YDJ. OOC: WB5CXJ. PRC KB5QVI, NM LEN KI5TI The Thibodaux ARC awarded its Ham of the Year to WA5LIS. Congratulations to Wade for his work on behalf of Amateur Radio. Wade is also Training Officer for LA Army MARS. It is with great regret that I announce the resignation of KG5GE as STM/NM LTN due to health reasons. Chuck has served us well for over two and a half years. Thanks, Chuck, from all of us. We are looking for volunteers to fill both positions. Interest is building for a section CW net to be re-established. If anyone is interested in either of the above please contact me. Contrary to what some people think, CW is still the most effective method of communicating under adverse conditions. Especially during these winter months, when propagation is poor, traffic can be passed on CW when it is impossible on voice or digital modes. Until we can get a LA CW net going try one of our neighboring section CW nets. Upcoming hamfests are: Lafayette March 8-10, Baton Rouge May 3-4. NET REPORTS for November 1995: LTN QNI 323 QTC 85 in 31 sessions. LEN QNI 77 QTC 2 in 4 Sessions. DRN5 586 messages in 62 sessions, LA Represented 97% by KG5GE, K5WOD, KD5UY, WB5CDX, WA5WBZ, K5IQZ and K5DPG. PSHR: K5DPG 192, K5WOD 90, WB5CXK 106. *Tfc*: K5DPG 96, K5WOD 15, WB5CXK 8.

MISSISSIPPI: SM, "Ernie," W5OXA— ASM: KJ5RC. ASM: K5VV. SEC: N5ZDF. STM: KB5W. OOC: WA5TMC. BM: W5EPW. PIC: AA5SP. SGL: KB5ZKK. TC: N4KMH. ACC: K5VXV. Have you ever thought about sending a radiogram to a fellow ham, friend, or a relative. It is easy to do and they sure do get a big charge out of someone calling with a happy birthday or some other ARRL numbered message. The MSPN meets 365 nights a year to take your traffic. With so many special occasions every year, radiograms are a very special way for you to express your feeling to others. I would like to welcome the Southwest Mississippi ARC to the ranks of the other ARRL affiliated clubs in the state. I hope that your club will use all of the ARRL programs available to your members. Good luck. I would like to have more reports from the field appointees so that we can get more information in our state newsletter. CLUBS, share your activities with others via the new letter. Net Reports: MDXA Net (147.375) 4 sess; Magnolia Net (38625 kHz) 30 sess :1071 QNI; 8 QTC; Laurel ARC (2 mtr net 146.60) 4 sess, QNI. MSPN (3862 kHz) 30 sess; 2566 QNI; 61 QTC Miss. Slow Net (3688 kHz) 22 Sess, 194 QNI, 7 QTC. CARES (147.730) 5 Sess, 77 QNI, 0 QTC, 2 EMGR.USAGE. DRN5 (7280 kHz) 60 SESSIONS;696 QTC; MISS.REP.100% by W5OXA, N5XGI, W5HKW, W5JDF,AND NS5M.

TENNESSEE: SM, O.D. Keaton, WA4GLS—ASM: WB4DYJ. PIC: W4TYU. SEC: WD4EKA. STM: WA4HKU. ACC: WA4GLS. OOC: N4PUQ. TC: KB4LJV. According to the TN CW Net Bulletin, the monthly averages for the first 10 months of '95 are: 22 sessions, 180 QNI, and QTC 23; TN Slow Net for Oct was 21 sessions, QNI 98 and QTC 2, good start. The TN also contained lots of good operational information traffic handling. Thanks to Maury Co EC Tom Hughes, KM4ES, for the timely accounts of ARES published in MARC news. BARC elected WD4EKA-pres, WA4IHJ-vp, W4WRJ-sec, N4PXF-treas for 1996. New ARES/RACES net now open in the Jackson area on

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A kit building tradition started with the dawn of ham radio in the 1920s, peaked in the 1960s and nearly vanished when HEATHKIT™ discontinued ham products in the 1980s. Many of you continue to encourage us to revive the tradition.

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(sorry, FCC rules forbid sales of add-on power amp)

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No need to buy a complete transceiver to discover the fun of 6 meters. T-Kit offers two transverters to choose from. **Model 1209** converts your 2 meter handheld or mobile rig to 6. All features and modes on your 2 meter rig immediately available on 6 (FM SSB CW). Tune 144-148 MHz to work 50-54 MHz. **Model 1208** converts any modern HF rig with 20 meters to 6. Tune 14-14.35 MHz to work 50-50.35 MHz.

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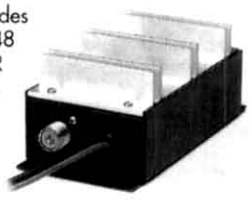

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Connectors for both HF and VHF let you leave meter in line with BOTH rigs. Front panel switch between HF and 2 meters. Measure power or SWR on 20 or 200 watt ranges. 1.8-30 MHz and 144-148 MHz.

1202.....kit.....$49*
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145.230 repeater on S at 10:00 AM; numerous upgrades have or will be made on the repeater to make it compatible to the emergency needs of the community. The Zero Beat announces QCWA net change to 146.76 repeater at 9:00 PM on Sun. The CATS MEOW announces the "After Supper Net" on 28.450 at 8:00 PM on T, F & S. All hams are invited to join in; CATS members: KE4FVT, KE4CTO, WD5NGB, AA4TA KE4YTZ, KD4RGT, NX7T, N4GXE, KA4GKX, KE4HEH, N4LAE, KD4SZU, KD4RUP, K4VM, KE4KBQ, KE4NEO, KB2MFS, KE4SSLR, WD4SKU, KD4NCI, KE4QHI, N4ROC, KC4VPE, WD4IFI, KA8RTS, KE4UJK, KE4TYI, KB4JAY, KF4L & KF4BDY assisted the Kennessee Bicycle Club, Inc with its 6th "Labor Day Century Bicycle Tour." RACK had only three public service events this time KD4FBT, KE4OHN & KB4EBA worked the Artfest 5K; KF4AHW, KD6FBT, KB9EBA, KB4OHN & KC4YDR worked the Walktoberfest; KF4AHW, KB9EBA, KE4OTZ & KE4WFM worked the Twilight Run for the Pumpkins. UCARS connection has a good set of directions on how to use the media to foster Amateur Radio. I saw this in the Feedline: "If you don't like what you hear on the air, help us gather evidence to hand to the FCC. Better, teach a newcomer 'the right way' so we can all have more fun." Very well said, don't you think? DRN-5 rpt 696 mess, 60 sess, TN rep 78% by W4MLL, WA4MCC, K4TKR & W4OGG. Net sess/QTC/QNI: TMPN 30/53/2764; TEMPN 22/23/753; TEPN 25/56/2673. *Tfc:* WA4FMR 127, W4OGG 72, WB4DYJ 46, N4LA 36, KA5KDB 34, WA4HKU 25, WA4GLS 22, WA4GZZ 9, W4PSN 6, KI4V 6, N4ZXM 4, W4IKK 4, WD4EKA 3.

GREAT LAKES DIVISION

KENTUCKY: SM, Steve Morgan, WB4NHO @ KK4XE—SEC: Paul Mitchell, N4DUE @N4DUE. ASM: Tom Lykins, WD4RWU. ACC: John Embry, KR4KL @ W4CN. STM: John Farler, K4AVX @KB4FHU. SGL: Ron Landrum, KM4DX. PIC: Steve McCallum, K4URX. I welcome a new field service appointee, ASM, Allison Zettwoch, KD4CKP, from Louisville, KY. Allison brings national recognition to the section in her efforts in working with young people in this great hobby. She is appointed as a youth advisor to the section. Also, welcome two new affiliated clubs to the section, Louisville Red Cross ARC and the Leslie County ARS. Don McNamara, N8CRB, is President. My congratulations go to Paul Kern, AD4NM, as the new President of the Louisville ARTS club. Also, it was a pleasure to meet the members of the Lincoln Trail ARC during their December meeting. I attended the PAK meeting held Nov. 11 and there is strong will to continue with the 440 backbone. What is your club doing to help establish this goal? I congratulate KC4ZSV for qualifying in PSHR the last 12 months. A note that the KTN will be meeting regularly at 2200Z.

UTCSection Net	*Freq*	*Time/UTC*	*QNI*	*QTC*	*Sess*	*NM*
KRN	3.960 MHz	1230	1041	24	22	N4AFP
MKPN	3.960 MHz	1330	2004	105	30	WD4RWU
KTN	3.960 MHz	2200	1420	60	30	WD4RWU
KYN	3.600 MHz	0100	182	51	30	K4AVX
Christian Co ARES					33	KF4BDY
Laurel Co			183	8	4	KD4MWH
Madison Co			164	9	9	KD4PWK

Tfc: : N4GNL 72, K4AVX 62, KC4ZSV 19, KD4PWK 12, N4GD 10, KF4BDY 7, WB4ZDU 7, WA4HLW 3.

MICHIGAN: SM, Dale R. Williams, WA8EFK @WB8ZPN. ASMs: Skip Wallace, WD8KQC. Larry Camp, WB8R, Keith Allen, N8QNA, and Dick Mondro, WA4FQT @WB8ZPN. ACC: Mike Pearsall, KA8YNJ. OOC:. Joe Haefner, WD8PSX. PIC: Greg Ozimek, WB8FNQ. SEC: Doug Burke, WB8CFV @ WA8URE. SGL: Ed Hude, WA8QJE. STM: Dale Cryderman, KA9EIZ @W8EHH. TC: Dave Smith, W8YZ. VHF NM: Mike Karmol, N8KUF @WB8ZPN. Congratulations to the Motor City ARC, winner of the 1995 Ivory J. Olinghouse FD Award. The award is given to the MI club with the highest percentile score each Field Day. Club elections in the news: Gladwin AARC elects pres KA8KIY, vp KA8RGT, treas KB8UAK, secy AA8RO. With a large number of club elections this time of year, I am reminded of the need to share the load among the members of an organization. Far too often a few sparkplugs carry a group to its successes, and often find themselves defaulted to the same position year after year. It's not fair to them and not fair to the club. Leadership changes are needed on a regular basis to infuse new ideas into an organization. So what if "it" (that new idea) has been tried before. The people are now different, technology has changed, the group is a different size and outside influences have also changed. Give those new folks a chance at leadership or take a chance at it yourself. The really important items for any new leadership team are (1): to carefully plan and (2): set a good example of participation. We all really learned from examples, good and bad, and as we all know, subtle influences can and will chart the course for an organization. Good news from the L'Anse Creuse ARC's youth group, the L'Anse Creuse Junior Radio Amateurs, as they enjoyed a fall sailing trip and some kit building projects. Does your club have a youth activities chairperson? Contact ASM Keith Allen, N8QNA, for more details on how to set up a program. Just an advance reminder with the Dayton Hamvention schedule change to May 17-19, many local swaps may adjust their schedules. MI ARRL affiliated clubs should keep an eye on the QRV bulletin for those swap dates, and any club considering a change should supply the information to ACC Mike Pearsall, KA8YNJ, as soon as possible. Mike's address this winter season is 36722 Kay Ave, Zephyrhills, FL 33541. October net reports:

Net	*Freq*	*Time/Date*	*QNI*	*Tfc*	*Sess*	*NM*
QMN	3663	6 PM Dy	234	45	49	WB8SYA
MiTN	3952	7 PM Dy	540	161	30	KA9EIZ
UPN	3921	5 PM Dy	1752	47	34	WA8DHB
GLETN	3932	9 PM Dy	705	42	30	WB6OFO
MACS	3953	11 AM M-Sa	361	61	30	K8OCP
SEMTN	145.33	10:15 PM Dy	363	80	30	WI8K
WSSN	3935	7 PM Dy	738	43	30	K8GOU
VHF nets (combined)			632	20	33	N8KUF

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Hams complain about today's cars having precious little space for gear. The SCOUT is the smallest HF rig in the industry (excluding QRP) measuring only 2.5" x 7.25" x 9.75" and runs directly off the 12 VDC car battery. If the SCOUT won't fit your car, nothing will. The optional noise blanker reduces ignition noise from both your car and the one that just drove by.

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Business travelers and vacationing hams typically set up a briefcase or small travel bag to include the 5 lb SCOUT, wire or whip antenna and lightweight power supply like our Model 938 switcher (its only 3 lbs!). It is surprising how many hikers and cyclists take along their SCOUT using some clever battery arrangement.

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The SCOUT is the most economical way to get started in ham radio. Consider the choice a new ham must make just to test his interest in HF: (1) Spend nearly $1000 or more on a new rig, (2) buy a used radio and take a chance on its condition, or (3) invest in a SCOUT at $549 with a one year factory warranty and our legendary TEN-TEC support.

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- "SYNCHRO-LOCK" software keeps VFO virtually drift free regardless of temperature variation.
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- Receive Offset Tuning
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$29* Each additional band module

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297	Noise Blanker	$19.50
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938	Tiny Switching Supply (Only 3 lbs.!)	$95.00
700C	Hand Mike	$39.95
607	Weighed Key Paddle	$39.00
291	Antenna Tuner	$89.00

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Everyone is encouraged to report their station activities. Your HF nets reports and PSHR reports go to our STM. VHF reports to our VHF NM, and traffic totals too our SM, all before the 8th of each month. *Tfc* (Nov): KA9EIZ 255, N8FPN 138, WX8Y 134, AA8OL 102, K8GXV 74, AA8PI 64, WA8DHB 38, K3UWO 34, K8UPE 27, K8OCP 26, WA8EFK 21, WR8F 20, NN8OSC 17, K8ZJU 15, W8YIQ 14, N8KUF 12, NJ8R 12, N8JGS 10, KI8Q 6, KA8LAR 5, WB8BGY 4, W8YZ 4. Thanks for your prompt reporting.

OHIO: SM, David Kersten, N8AUH @NO8M (see p.12)—ASM: John Haungs, WA8STX @KC8TW 513-563-7373. ASM (Packet): Steve Wolf, NO8M @NO8M. SEC: Larry Solak, WD8MPV 216-274-8240. STM: Joyce Judy, KD8HB @W8CQK. ACC: Joanne Solak, KJ3O/8. BM: John Schlueter, W8WYH @W8BI. TC: John Fakan, KB8MU. SGL: Paul Krugh, N2NS @W8CQK. PIC: Joe Phillips, K8QOE. OOC: Paul LaFollette, Jr. WB8ONA @W8CQK. A few recent elections have provided clubs with new officers for the coming year: Greater Cincinnati elected KW8X, pres; K8JE and K8DHK, first & second vp's; WA9IRS, Rec Secty & W8MFT, corr secty; WA8STX, treas. Twenty Over Nine ARC N8LNE, pres; WA8UQR, vp; N8VPQ, secty; WD8NAC, treas. Congratulations as you take on leadership of your respective clubs, and remember, Joanne, our Ohio affiliated club coordinator, is always ready and willing to help affiliated and special service clubs with questions, league supplies and she'll gladly help non-ARRL clubs to become ARRL affiliated. Joanne and husband Larry, WD8MPV, are frequent speakers at club meetings, when requested with adequate lead time to properly schedule. Also, other section leadership folks are available to attend meetings and present ARRL programs. I must remind all that adequate advance notification is required for meeting participation as well as hamfest attendance: Attendance is not automatic....If you wish ARRL representation, let us know. Contact me, N8AUH, or Larry, WD8MPV, or Joanne, KJ3O. Be sure to note that the Dayton Hamvention has changed dates in 1996: May 17-19, in Dayton, of course. Hamfests coming up soon, include: IARC/Mansfield, Feb 11; Great Lakes Division Conv. (Cincinnati), Feb 24-25; Cuyahoga Falls ARC, Feb 25; Hamfest Assoc of Cleveland (Berea), March 3, Toledo MRA, March 17. I keep the hamfest list for Ohio Section updated on the packet network. If you don't see yours listed, send me a flier or message so the list is as complete/correct as possible. Bob Johnson, K3RC/8, maintains the listing of Amateur Radio exams throughout Ohio: This list is available in Ohio Section Journal and on the packet network, too. Net and station activity reports for November 1995 follow:

Net	*QNI*	*QTC*	*Sess*	*Times*	*Freq*	*NM*	*QTR*
BN Early	174	123	30	1845	WD8KFN	371	
BN Late	169	100	30	2200	3.577	NY8V	379
BNR	112	15	30	1800	3.605	W8LDQ	695
OSN	168	65	30	1810	3.708	WB8KQJ	594
OSSBN	1635	725	90	1030	3.9725	KF8DO	2639
				& 1615, 1845	3.9725	KF8DO	
OSSN	146	68	30	M-F 0645	3.577	WB8FSV	617
				S-Sn 0800	3.577	WB8FSV	
Ohio Section ARES Net				Sn 1700	3.875	WD8MPV	
Subtotal	2404	1096	240				5295

Tfc: KD8HB 427, W8PMJ 387, N8IXF 359, K8DHD 228, N8IIP 227, N8RBE 218, NS8C 217, WD8KFN 216, WA8HED 183, N8FWA 171, KA8HBN 168, KF8DO 136, WA8SSI 130, W8PBX 122, KD9K 106, KA8MPD 95, N8AUH 88, WA8EYQ 82, WB8KQJ 66, N8LSG 65, N8TNV 65, W8RG 55, N8TFD 49, KB8RGY 47, KB8ROA 46, N8CWT 44, WD8QXT 41, W8LDU 39, W8JLW 39, N8HJB 34, WD8KBW 32, N8UEO 30, N8CW 29, NY8V 28, N8XCT 26, W8LDQ 25, KI8O 25, AA8DK 25, KB8RUL 19, KA8YIT 19, WB8KWC 18, K8IOW 18, N8VVZ 18, KB8VBU 17, N8VET 16, N8IVX 16, KB8TIA 16, N8GOB 14, KD8XL 14, K3RC 14, WD8IKC 13, WD8JYE 13, W8GDQ 11, KB8RDM 10, N2NS 10, KA8GOV 8, WA8STX 8, KB8LVX 7, KB8SBK 7, WA8JLE 7, W8KB 6, N8XXR 6, WB8KWD 6, WB8KWD 6, KB8JYV 4, KF8FE 4, WB8DPZ 4, KA8OQF 1, KB8AST (PBBS) 1.

HUDSON DIVISION

EASTERN NEW YORK: SM: Paul Vydareny, WB2VUK—STM: Tom Cody, WE2G. SEC: Tony Pazzola, WB2BEJ. ACC: Millie Feeny, KV2A. SGL: Phil Bradway, KB2HQ. PIC & BM: Steve Anderman, WA3RKB. OOC: Hal Post, AK2E. ASM/Information: Andrew Schmidt, N2FTR. ASM/Education: Richard Sandell, WK6R; ASM/Interclub Relations: Tom Raffaelli, WB2NHC. Net Reports (November 1995) Checkins/Traffic passed: AESN: 32/1 CDN: 487/107 CGESN: 34/0 ESS: 478/255 HVN: 456/163 NYP: 313/277 NYPON: 365/304 NYS/E: 415/157 NYS/L: 225/115 NYS/M: 280/161 SDN: 405/114. Club News: Orange County ARC had a Family Night dinner/meeting/election Dec. 3rd. Their hamfest will be Feb. 17th. Mt. Beacon reports a successful hamfest Nov. 5th. WZ2D, N2XQG and N2OKA discussed packet aspects on Dec. 11th at Saratoga RACES. They welcome new member N2IUE. WA2DHF discussed the latest at ARRL and FCC at Crystal Radio Club's Dec. 6th meeting. Schenectady ARA's Dec. 4th meeting heard K2LJH discuss design, manufacture and operation of VHF/UHF gear from a manufacturer's perspective. They also heard from George Chapek on packet operations coupled with GPS. They report Silent Keys KA2OHT K2QNU W2NC. Troy ARA teamed up with NWS for a winter weather clinic. Albany ARA held elections Dec. 8th and report that WA2YBM, public service coordinator is stepping down Jan 1st after 18 years service. Thanks for a job well done, Jack! Westchester ARA held its annual dinner on Jan 18th. Westchester ECA had a presentation by K2KJI on the latest equipment. November PSHR: KB2EPU WA2YBM WE2G KF2YC N2YHK WB2ZCM N2YJZ WB2YAZ WB2VUK KB2QPU N2JBA WB2IIV. Nov *Tfc*: KF2YC 328, KB2EPU 174, WA2YBM 102, N2YHK 92, K2LYE 75, N2AWI 75, N2JNG 68, WE2G 63, WB2YAZ 59, N2JBA 48, KB2QPU 39, N2YGK 39, N2YJZ 35, WB2VUK 27, WB2ZCM 27, WB2IIV 24, W2CJO 19, N2SBC 12, K2HNW 4.

NEW YORK CITY/LONG ISLAND: SM: Rick Ramhap, N2GQR (Internet rramhap@i-2000.com)—ASM, Emerg. Svcs.: WF2T. ASM, Technical: WB2WAK. ACC: N2IMF.

MFJ *tunable* DSP *filter*

NEW

. . . Tunable "brick wall" bandpass, lowpass, highpass, notch, SSB, CW filters . . . programmable pre-set filters . . . automatic multiple notch filter eliminates heterodynes . . . adaptive noise reduction reduces noise and QRN . . . for Voice, CW, Data . . .

MFJ's ***tunable*** **super DSP filter automatically eliminates heterodynes, reduces noise and interference** ***simultaneously*** **on SSB, AM, CW, packet, AMTOR, PACTOR, RTTY, SSTV, WeFAX, FAX, weak signal VHF, EME, satellite -- nearly any mode.**

Only MFJ gives you
tunable and programmable "brick wall" DSP filters
MFJ-784B
$249.95
Patent pending

You get MFJ's tunable FIR linear phase filters that minimize ringing, prevent data errors and have "brick wall" filter response with up to 57 dB attenuation just 75 Hz away.

Only **MFJ gives you 5** ***tunable*** **DSP filters. You can** ***tune*** **each lowpass, highpass, notch, and bandpass filter including optimized SSB and CW filters. You can** ***vary*** **the bandwidth to pinpoint and eliminate interference.**

Only **MFJ gives you 5** ***factory*** **pre-set filters and 10** ***programmable*** **pre-set filters that you can customize. Instantly remove QRM with the turn of a switch!**

You get MFJ's ***automatic notch*** **filter that searches for and eliminates** ***multiple*** **heterodynes.**

You also get MFJ's advanced ***adaptive noise reduction.*** **It silences background noise and QRN so much that SSB signals sound like local FM.**

The ***automatic*** **notch and** ***adaptive*** **noise reduction can be used with** ***all*** **relevant tunable pre-set filters.**

Automatic gain control **(AGC) keeps audio level constant during signal fade.**

Automatic notch filter

MFJ's automatic notch filter searches for and eliminates multiple heterodynes in milli-seconds. It's so fast, that even *interfering* CW and RTTY signals can also be eliminated.

With up to 50 dB attenuation, you'll copy stations otherwise masked by heterodynes.

Voice signals aren't degraded because the notch is extremely narrow.

Turn on *automatic* notch and you'll never hear unwanted heterodynes of tuner-uppers.

You can *selectively* remove unwanted tones using the two *manually tunable* notch filters --an MFJ exclusive. Knock out unwanted CW stations while you're on CW.

Adaptive Noise Reduction

Turning on noise reduction silences background noise. It reduces fatigue and makes noisy signals readable.

Noise reduction works in all filter modes and on all random noise -- white noise, static, impulse, ignition noise, power line noise, hiss.

The LMS algorithm gives you up to 20 dB of noise reduction. Noise reduction is adjustable to prevent signal distortion.

Tunable highpass/lowpass filters

For Voice and Data, nothing beats MFJ's exclusive *tunable* highpass/lowpass FIR linear phase "brick wall" filters.

You can tune the lower cutoff frequency 200 to 2200 Hz and the upper cutoff frequency 1400 to 3400 Hz. This lets you create *custom* filters for Voice, Data and other modes.

Signals just 75 Hz away literally disappear -- they are reduced 57 dB!

NEW MFJ-784B Features

- Tunable *Spotting Tone*™ -- an *MFJ invention* -- accurately tunes even the narrowest CW filter
- MFJ's exclusive *Adaptive Tuning*™ -- Center frequency tuning automatically becomes finer as you narrow bandwidth -- makes extremely narrow filters easy-to-use
- Improved automatic notch with *variable* aggressiveness
- New quieter audio amplifier gives you *full* 2½ Watts output
- Speaker ON/OFF button, phones always active
- Accurate easy-to-use input level indicator
- *Filter Talk*™ function sends precise filter settings in Morse code
- Filter automatically bypasses during transmit for monitoring CW sidetone, voice or data by sensing PTT line
- Improved manual notch in the CW mode
- Manual notch and automatic notch can be used simultaneously
- Noise reduction,automatic notch and tunable manual notch can be used in Memory mode
- Adjustable line level output
- More Mark-Space frequencies and baud rates for data filters
- Improved self-test for all digital circuitry, switches and controls

Unlike other filters, speech is not distorted by unequal time delay.

When signals are weak, you can improve copy by removing noisy high and low speech frequencies that contain little information.

On crowded HF bands, you can "slice-off" overlapping SSB signals to improve copy.

You can highpass filter out hum, pulses, rasp and other irritating low frequency noise.

Tunable bandpass filters

Narrow band signals like CW and RTTY jump out of QRM when you switch in MFJ's *exclusive* tunable FIR bandpass filters.

You can tune the center frequency from 300 to 3400 Hz, and vary the bandwidth from 30 Hz to 2100 Hz -- from super-tight CW filters to wide razor-sharp Data filters.

As you narrow the bandwidth, interfering signals drop out, because, just 60 Hz away, they're down by over 47 dB.

You can use narrower bandwidths to fight tough QRM because these linear phase filters don't distort signals with unequal time delays.

Even with the narrowest 30 Hz bandwidth, you'll never have a problem with ringing.

One position gives you two tunable filters you can use together. For example, tune one to mark, one to space and set the bandwidth tight for an incredibly sharp RTTY filter.

15 *pre-set* filters -- use factory set or program your own

You can select from fifteen convenient *pre-set* filters. Use them for SSB, AM, CW, packet, AMTOR, PACTOR, RTTY, SSTV, WeFAX, FAX or any mode you can think of.

If you don't like our pre-set filters, you can program your own -- *an MFJ exclusive!* Save center frequency/ bandwidth, lowpass/highpass cutoffs, auto/manual notch, noise reduction -- all filter settings -- in 10 *programmable* filters.

Only MFJ gives you the best of both worlds -- *tunable* filters to eliminate nearly any QRM and fast convenient *pre-set* filters customized for any mode.

Plus more . . .

A push-button bypasses your filter -- lets you hear the *entire* unfiltered signal.

2½ watt amplifier, volume control, input level control, speaker jack, PTT sense line, line level output. 9½x2½x6 inches.

Plugs between your transceiver or receiver and external speaker or headphones. Use 12 VDC or 110 VAC with MFJ-1315, $14.95.

MFJ-780, $99.95, "brick wall" DSP data filter. Plugs inside MFJ-1278B or MFJ-1278 Multimode Data Controller.

No Matter What ™ guarantee

You get MFJ's famous one year No Matter What™ unconditional guarantee. That means we will repair or replace (at our option) your MFJ-784B no matter what for a full year

Call your dealer for your *best* price

Automatically eliminate heterodynes, reduce noise and QRM on Voice, CW and Data. Call your favorite dealer for your best price and order your MFJ *tunable* DSP filter today!

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Nearest Dealer/Orders: 800-647-1800
Technical Help: 800-647-TECH (8324)

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SEC: WF2T. STM: KA2VZX. OOC: N2JIX, PIC: KA2JMA. TC: W2QUV. BM: KC2FD. SGL: N2FF. VE Sess: Grumman ARC (W5YI), 2nd Tue 5 PM, Grumman Rec Ctr, Plant 28, 950 S Oyster Bay Rd, Hicksville, Bob Wexelbaum, W2ILP, 516-499-2214; LIMARC, 2nd Sat 9 AM, NY Inst of Tech, 400 Bldg, Rm 409, Northern Blvd, Old Westbury, Al Bender, W2QZ, 516-623-6449; Suffolk Co VE Team, 2nd Sat 9 AM, Suffolk Co Comm College, Islip Arts Bldg, Rm 104, Selden, George Sintchak, WA2VNV, 516-751-0265; Gallups Island RA, 3rd Sat at 1 PM, USMMA, Bowditch Hall, Steamboat Rd, Kings Point, Les Rauber, AA2FJ, 516-922-0947; Great South Bay ARC, 4th Sun, 12 PM, Babylon Town Hall, ARES/RACES Rm, 200 E Sunrise Hwy, N Lindenhurst, Tom Carrubba, KA2DFO, 516-422-9684; Suffolk Co VHF/UHF Assn, 2nd Fri 7 PM (W5YI) & 4th Sat 10 AM (ARRL), H. Acampora Rec Ctr, 39 Montauk Hwy, Blue Point, Leonard Buonauito, KE2LE, 516-224-7114; Islip ARES, 1st Sat 9 AM, Islip Town Hall Annex, 401 Main St, Islip, Addison Levi, 516-234-0589. Hellenic ARA, 4th Tues, 6:30 PM, Pontion Society, 31-25 23rd Av, Astoria, George Anastasiadis, KF2PG, 516-937-0775; Larkfield ARC, 3rd Sat, 9 AM, Huntington Town Hall, 100 Main St., Huntington, Joe Coffield, W2DDZ, 516-266-3192. Report changes to testing schedules to N2GQR. The following are traffic/ARES nets in and around the section:

Net	Freq	Time Day	NM
Big Apple VHF	146.430/R	2000 Dy	KB2KLH
Nassau Co ARES	146.805/R	2030 We	WA2WKV
Nassau Co VHF	147.330/R	1930 M-F	KF2ER
Nassau Co VHF	146.805/R	1930 Sa-Su	KF2ER
NYC ARES	147.270/R	2000 Mo	WB2DWC
Suffolk Co ARES	145.330/R	2100 Mo	WB2FXN
Suffolk Co VHF	145.210/R	2000 Dy	WB2ZIE

From the mailbag, a quick roundup of club activities in the Section: Great South Bay ARC bid for a blind auction. Radio Central ARC heard from Fred Winter, N2XOU, concerning his 1995 SAREX experiment involvement. RCARC has also established a WWW presence on the Internet. A recent meeting featured a presentation on "Getting Started in Contesting." Sam Streger, WA2UXY, was recently featured at Suffolk Co. ARC, discussing battery recharging. Kings Co. ARC was visited by Hudson Director Steve Mendelsohn, WA2DHF. For those of you new to Amateur Radio, this represents a small sampling of the active clubs in the area. I think you'll find the area's clubs to be valuable resources. Nov '95 NTS stats not available as of this writing, more next month. ARES DEC Reports rec'd from Nassau, NYC and Suffolk.

NORTHERN NEW JERSEY: SM Richard S. Moseson, NW2L (@WA2SNA), e-mail: NW2L@aol.com /—ASMs: Education/KB2WI, Volunteer Counsel/N2IOB, Youth/N2MCV, SE/KY2S, SW/KE2HG, NW/NW2S. ACC: WA2QYX. BM: K2ULR. OO/AAC: KA2BZS. PIC: (Vacant). SEC: N2DSY. STM: WB2FTX. TC: WG2W. Lots of traffic news to report this month, so much, in fact, that it'll take up the whole column. But even if you're not sure what "traffic" is all about, read on anyway. We'll start out with a basic introduction to ham radio "traffic-handling." Let's start at the very beginning: What is "traffic"? In ham radio, it doesn't mean cars on the highway; it means messages, generally formal written messages that are "passed," "handled" or otherwise sent and received on a "net," an organized on-the-air meeting for a specific purpose. ARRL traffic nets are organized nationwide into the National Traffic System, or NTS. NTS nets in each ARRL section are coordinated by a section traffic manager (STM), appointed by the section manager (SM), and by net managers (NMs). Individual net meetings (or "sessions") are run by Net Control Stations (NCSs), who are appointed by the NM. Now — here's the NTS news from NNJ: We have two new NMs as of Jan 1. Jan O'Hara, WA2OPY, is taking the reins of NJM, the New Jersey Morning Net. Many thanks to Carl Felt, N2XJ, for serving as interim NM for the past several months. And, NJN/L (New Jersey Net/Late) NM Matt Grossman, WA2PCS, is being succeeded by Ray Czyzewski, WA2SEI. NJ Traffic Handling Awards were presented at the annual NJ Traffic Confab held 12/2 at Trenton St. College. AA2SV, Willie, was named Outstanding Traffic Handler; Kate, N2ZKJ, won the Outstanding Newcomere award and John, N2OWN, received the VHF award. Congrats to all. At the confab, STM WB2FTX spoke on digital traffic modes. He operates the NTS NNJ packet node and an APLINK node for out-of-area traffic. Net Activity for Nov(CJTN #s are lower than usual due to repeater problems. If you can't find CJTN on 147.12, try 145.485 (Tnx WB2FTX):

Net	Mgr	Freq	Time	Sess	QNI	QTC
NJM	N2XJ	3695	1000	30	227	85
NJPN	W2CC	3950	1800	34	355	63
NJSN	AA2HJ	3715	1830	30	168	34
NJN/E	AG2R	3695	1900	30	226	96
NJN/L	WA2PCS	3695	2200	30	143	32
CJTN	W2OD	147.120	2000	30	338	53
NJTTTN	N2SU	223.880	2100	30	211	38
NJVN/E	KF2KN	146.895	1930	30	588	78
NJVN/L	W2PTZ	146.490	2230	30	352	58

Nov. Traffic (Call/Tfc.Pts./PSHR Points): KE2JX/ 141/146, N2XJ//104/133, N2OPJ/100/143, W2MTO/ 95/113, KF2KN/ 62/128, N2VQA/50/110, W2OD/49/120, N2OWN/41/128, N2QAE/36/30 W2PTZ/35/138, N2SU/28/110, N2VRC/24/12, N2GJ/21/137, W2CC/21/83, N2OFB/19/70, N2UHD/18/93, N2RPI/17/92, KB2OPJ/15/97, KB2TKC/8/- ,WB2CZW/4/74. 73 de NW2L.

MIDWEST DIVISION

IOWA: SM, Jim Lasley, NØJL @KEØBX— ASM: NØLDD. SEC: NAØR. STM: KØCNM @KØCNM. OOC: NØLOH. ACC: WØFZO @ NFØN. BM: KØIIR @WAØRJT. SGL: WRØG. TC: WØDIA. PIC: WØZPM. FMARC has a new communication trailer and many thanks to NØMXD, their newest life member. At least one newsletter editor admits to missing his deadline learning Windows 95. Don't worry, KAØENY, I won't mention your name. Sorry to note the loss of WØFGC, WAØEKC and KAØTHA. DMRAA had "Operation Santa Claus" going again this year, and has for 46

MFJ TNCs for VHF/HF Packet

MFJ-1270C super TAPR TNC clone has a world wide reputation as the most reliable packet TNC in the world! Thousands used as digipeaters, nodes, BBS and in all kinds of commerical applications working 24 hours a day -- many work for years without a single failure . . .

Now GPS Compatible

- *ROM expands to 512K*
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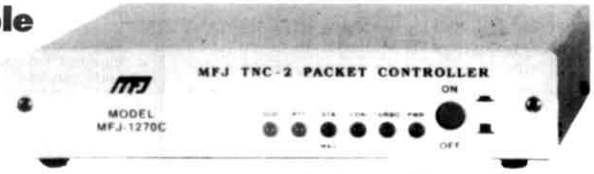
- *Built-in monitor amplifier*
- *Front panel ON/OFF switch*
- *Enhanced DCD circuit for HF*
- *Supports 19,200 baud terminals*
- *Memory Expands to 64K, 128K or 512K*



MFJ-1270C **$119.95**

The MFJ-1270C *super* TAPR TNC clone has a world wide reputation as *the most reliable TNC in the world!*

Thousands are dedicated as digipeaters, nodes, BBS and used in all kinds of commercial applications working 24 hours a day -- many work for years without a single failure.

The Most for Your Money

The most reliable TNC in the world gives you the most for your money. See for yourself . . .

Fully TAPR TNC-2 Compatible

You get full TAPR TNC-2 compatibility -- *all* software and hardware designed for the TAPR TNC-2 standard works without modification. You get NETROM, theNET, X1J and Rose Switch compatibility that turns your MFJ-1270C into a Layer Three and Four networking node.

VHF *and* HF operation.

You get high performance VHF *and* HF modems as standard equipment -- for double fun.

You get a true DCD circuit that dramatically reduces sensitivity to noise and dramatically increases completed QSOs.

FREE AC Power Supply

You get a *free* 110 VAC power suppy at no extra cost. With other brands, the AC power supply could cost you an extra $20.95.

New *enhanced* Personal Mailbox

The *enhanced* Easy Mail™ personal mailbox lets you use a dedicated call-sign for your mailbox. Your mailbox can stay on while you operate packet. It will also auto forward or reverse forward mail to and from other BBSs. A *check mail* LED blinks when you have mail. More features: remote sysop access, sysop paging, mailbox C-text, chat mode and many other features not available in other TNCs. The mailbox memory is expandable to 32K, 128K and 512K.

WeFAX gives you Weather Maps

You get a WeFAX mode that lets you print full fledged weather maps from your HF radio to screen or printer or save to disk using an MFJ Starter Pack.

Plug-in Modem - - 2400 or 9600 Baud

You can add MFJ's optional *internal* 2400 baud or 9600 baud modem just by *plugging it in* and making a few simple connections.

KISS interface and MFJ Host Mode

You get a KISS interface that lets you run TCP/IP and MYSYS and MFJ's Host Mode that makes it easy to write efficient application programs.

MFJ *Anti-Collision*™ Technology

You get MFJ's *Anti-Collision*™ technology that prevents packet collisions and improves performance on busy channels.

Plus more . . .

You also get 32K RAM, IC sockets for easy service, 256K ROM, speaker jack, lithium battery backup, RS-232 *and* TTL serial ports, radio cable (you have to add a connector for *your* radio), Fast-Start™ Manual plus much more. Use 12 VDC or 110 VAC. 9½x1½x7½ in.

One Year *Unconditional* Guarantee

You get MFJ's famous *No Matter What*™ one year *unconditional* guarantee.

Enjoy Packet for a long, long time

If you want a TNC that'll work 24 hours a day without failure -- *one that has more features than any other* -- get the ultra reliable MFJ-1270C today and enjoy packet for a long, long time.

2400 Baud *Turbo*™ TNC

MFJ-1270CT, $209.95. Has all the features of the MFJ-1270C plus built-in fast 2400 baud modem. Operate 300, 1200 and 2400 baud packet with the MFJ-1270CT. Radio modification is *not* necessary when operating 2400 baud packet.

MFJ 9600 Baud *TurboPlus*™ TNC

MFJ-1270CQ **$229.95**

Has all the features of the MFJ-1270C, *the most reliable TNC in the world,* plus built-in 9600 baud G3RUH compatible modem. Operate 300, 1200 and 9600 baud.

TNC ACCESSORIES

MFJ Starter Packs

An MFJ Starter Pack, $24.95, gets you on the air instantly. You get interface cable, software on disk and instructions -- just plug it all in and start enjoying packet. Order **MFJ-1284** for IBM or compatibles, **MFJ-1282** for Commodore 64/128, **MFJ-1287** for Macintosh or **MFJ-1290** for Amiga.

2400 and 9600 Baud Modems

MFJ-2400, $89.95, operates 300, 1200 and 2400 baud packet and works with any radio. **MFJ-9600B,** $109.95, G3RUH compatible 9600 baud modem. Not all radios compatible with 9600 baud. Both plug into MFJ TNCs for easy installation.

Mailbox Memory

For MFJ-1270C/1276. Plugs into RAM socket for extra *mailbox* memory. **MFJ-45A** (32K), $14.95, **MFJ-45B**(128K), $29.95, **MFJ-45C** (512K), $159.95.

Real Time Clock

MFJ-43, $29.95, ends re-setting TNC clock everytime you turn it on. Maintains correct time even when TNC is off. Plugs into RAM socket. Works with MFJ TNCs and TAPR TNC clones.

FM Deviation Meter

MFJ-52, $29.95, plug this board into your TNC configured as TheNet X-1J Node and users can check their transceiver packet FM deviation. Requires X-1J or later nodeware. See *CQ Magazine*, Nov. 1993.

Firmware Upgrade

For older MFJ TNCs. **MFJ-40C**, $19.95, gives you enhanced mailbox and supports mailbox up to 512K. ***And now you also get GPS compatibility.***

Mailbox Memory Expansion Board

For older MFJ TNCs. **MFJ-47A**, $49.95, 32K RAM; **MFJ-47B**, $69.95, 128K RAM; **MFJ-47C**, $239.95, 512K RAM. Complete with firmware.

MFJ's new TNC/Mic Switch

Switch between your TNC or Mic by pushing a button!

MFJ-1272B/M **$39.95**

Switch between your microphone and TNC by pushing a button!

You won't have to unplug your microphone and plug in your TNC *everytime* you want to work packet or other digital modes.

Just plug these pre-wired cables into your rig's microphone connector and into your TNC and you're ready to go -- no more hard-to-find connectors and wiring up cables.

Works with HF, VHF and UHF radios with 8 pin mic connectors -- including Kenwood, ICOM, Yaesu, Alinco and others. *For radios with 8-pin RJ-45 modular telephone jack, select the new "M" models.*

Plug-in jumpers let you quickly set-up for virtually any radio. Factory set for Kenwood and Alinco. Includes easy-to-follow instructions. Has audio-in and speaker jacks. 3¼x1¼x4 inches.

MFJ-1272B/1272M, $39.95, for MFJ TNC/multimodes,TAPR TNC-2 clones.
MFJ-1272BX/1272MX, $39.95, for PK-232.
MFJ-1272BYV/1272MYV, $39.95, for KAM VHF/KPC3.
MFJ-1272BYH/1272MYH, $39.95, for KAM HF Port.

Pre-wired Radio-to-TNC cables . . . $14.95

TNC Type / Radios	All MFJ TNCs/ PK900/PK96/ PK12/PacCom/ other TNC-2 compatibles	KAM VHF[5]/ KAM HF[5]/ KPC3[5]/ KPC9612[5]	PK-232	PK-88
Icom[1]/Yaesu/ Alinco/Radio Shack HTs	MFJ-5024	MFJ-5024YV	MFJ-5024X	MFJ-5024Z
Kenwood[2] HTs	MFJ-5026	MFJ-5026YV	MFJ-5026X	MFJ-5026Z
Yaesu 8-pin	MFJ-5080	MFJ-5080YV MFJ-5080YH	MFJ-5080X	MFJ-5080Z
Icom[3] 8-pin	MFJ-5084	MFJ-5084YV MFJ-5084YH	MFJ-5084X	MFJ-5084Z
Kenwood/Alinco 8-pin	MFJ-5086	MFJ-5086YV MFJ-5086YH	MFJ-5086X	MFJ-5086Z
Yaesu 8-pin modular	MFJ-5080M	MFJ-5080MYV	MFJ-5080MX	MFJ-5080MZ
Icom[4] 8-pin modular	MFJ-5084M	MFJ-5084MYV	MFJ-5084MX	MFJ-5084MZ
Kenwood 8-pin modular	MFJ-5086	MFJ-5086MYV	MFJ-5086MX	MFJ-5086MZ
Radio Shack 8-pin modular	MFJ-5088M	MFJ-5088MYV	MFJ-5088MX	MFJ-5088MZ

1. does not include IC-W2A
2. does not include 2500
4. does not include IC-100H, IC-2700H
5. YV for KAM VHF port, YH for KAM
6. YV for KP9612 1200 baud port
7. YH models for KPC9612 9600 baud port

PACKET *plus* PACTOR TNC

You get all the features of the MFJ-1270C HF/VHF TNC plus . . . PACTOR . . . precision HF tuning indicator. . . extra 32K mailbox memory . . .

MFJ-1276 **$159.95**

PACTOR combines the best of Packet and AMTOR for HF. You get excellent weak signal operation, error correction, faster baud rate, data compression and full 8-bit word transmissions.

A 20 LED bargraph makes HF tuning easy. Just tune your radio to center a single LED and you're precisely tuned in to within 10 Hz -- and it shows you which way to tune!

You also get an extra 32K of memory for your enhanced *Easy Mail*™ packet mailbox.

MFJ-1276T, $249.95, same as MFJ-1276 but includes fast 2400 baud modem. Lets you operate 300, 1200, and 2400 baud packet.

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years! DMRAA is also in the process of updating their repeaters and controller. Appreciate the MARS info in the "Static Sheet" since I don't hear much about those operations. Did Calhoun Co. get their 'big box' up? I hear the repeater is running. We await further developments. Clinton had a club meeting presentation on APRS. That should have been good. CVARC learned some valuable things in their SET, did you? I made it to Cresco for their Christmas dinner. Met several friends, had lots of good food, and spoke very briefly (I'm learning!). Make note that the Hamboree this year in Sioux City is also the Midwest Division Convention and also the Dakota Division Convention. First time ever for two divisions to hold their conventions together. I'm glad we can be a part of history. Shari and I hope you had a very Merry Christmas and a Happy New Year. Make a resolution to report monthly on the appointments you hold, pick up a new appointment, and join your local club. Newsletters were received from IAILARC, FMARC, SEITS, SARA, OARC, DMRAA, Calhoun Co ARC, Clinton ARC, CVARC. *Tfc*: WØSS 169, KAØADF 105, NØJL 57, NRØE 43, KØCNM 33, KEØWO 10. (Oct) KAØADF 64, NRØE 31.

KANSAS: SM, Gary C. Bliss, NZØM— SEC: WDØDMV. STM: WØOYH. ACC/OOC: KØBXF. SGL: AAØGL. This is my first report as SM. Bear with me and I hope they get better. I want to thank Bob, KØBXF, for his 30+ years as our SM. He will retain his ACC/OOC position. All affiliated club, Special Service Club and official observer reports and business needs to be sent directly to him. SEC, WDØDMV, is needing reports from the DECs. The DECs are needing reports from the ECs. If we all work together, we can form an exceptional ARES and RACES organization in Kansas. There are a few appointments open, so if you would like to serve the ARRL Field Organization, contact me and we will check on what is open in your area. Please keep me informed about what is happening in your Amateur Radio club, and the best way to do that is to put me on your list for the newsletter. I have received several newsletters from around the state, and I want to thank those clubs for sending them. If you would like everyone to know how your packet BBS is doing, send your reports to WØOYH or NZØM. I received only three packet BBS reports. They are NØOBM 40/809/12 861, NXØR 40/779/2 821, NØUJQ 15/315/3-333. Net reports for October are as follows: Net/QNI/QTC. KSBN 1418/176. KPN 329/38. KMWN illness nr.KWN illness nr.CSTN 1696/130. QKS 267/107. QKS-SS 12/4. *Tfc*: KFØTK 416, WØOYH 414, AAØOM 399, KØBXF 212, NZØM 182, WØNBT 174, WBØZNY 94, WAØSXR 91, WAØOZP 54, WØFT 51, KXØI 24, NBØZ 14, NØLL 4.

MISSOURI: SM, Roger Volk, KØGOB—I hope that this is old news to everyone in the section, but just in case you did not hear, Charles, KEØAH, the net manager for the MEOW net fell some 45 feet from his tower while putting up Christmas lights. On the way down, he hit a guy wire and his inverted V for 160. He broke several limbs but was treated and released from the hospital in just a few days. He won't do any climbing for a while. Charles had his climbing belt on and exactly what happened was not available at this time. Send him a QSL card to wish him a speedy recovery. The results of the Midwest Division election for director are in, and Lew, K4VX, has been reelected to a second term. Thanks to all who supported my candidacy. I ask everyone in the section to support our director, as I will, so that we present a united front to the outside interests that want to reduce our frequencies and otherwise restrict our operating options. If you do not know the difference between operating HF and being the only signal on the band, just ask the members of the Monsanto ARC about the installation of tier Mosley PRO 67B at 70'. What a signal! Wish I had one at my station. It seems that I write something about the Kimberling City RC almost every month. This month is no different. They just received their 14th award for community service. This time it came from the Branson Tri-Lakes Humane Society. Their professional looking newsletter can also serve as a model for other clubs. A note to pres Jim, NQØG, will get you all of the details on how its done. Nets: MOSSB 30/722/66 KØPIM; MEOW 30/?/? KEØAH; STLRPTR 4/133/3 KØWEX; PAULREVERE 4/434/0 NØIWA; HAMBUTCHERS 22/729/27 KØDSQ; SWMOSKYWAR 5/210/5 KEØPQ; WAARCI 4/123/0 WEØG; MON1&2 60/253/44 WØOUD; HARC 5/155/0 NØYLF; WJACKCOARES 4/31/0 KØUAA; SPARC 4/61/0 WØENW; AUDRAINARES 5/69/5 WBØSEN; 3393 4/60/0 WAØUUC; PLATTECOARS 4/47/0 WAØUUC. *Tfc*: N3PGG 1583, WØOTF 43, WAØYJX 12.

NEBRASKA: SM, Bill McCollum, KEØXQ—ASMs: WØKVM, KFØZJ, WBØULH, WYØF & WBØYWO. There is one appointment this month and that is Bill, WBØYWO, ASM for DX & Contesting. He has also been appointed as DXCC Field Representative. The Midwest Division Director has approved a joint Midwest and Dakota Division Convention to be held at the Marina Inn, S. Sioux City, NE, May 31 & June 1, 1996. Plans are being made for a "Section Managers" meeting at the convention. Contact WØFZO for more information. The Pine Ridge ARC recently celebrated its' 42nd anniversary as a club. The Plattsmouth ARC is getting a jump on the severe weather season. It held a WX Spotter Training Session on Feb. 6. The club also celebrated its' 1st anniversary. The AK-SAR-BEN ARC will be providing communications for the first Nebraska State Winter Games to be held in Omaha this month. Be sure to let me and the ARRL know of any changes in your clubs' officers. During the winter months, Dave WØNRW, Meteorologist In Charge of the NWS in Valley often checks into the Nebraska Storm Net for snowfall totals. WØIRZ Memorial Net: QNI 114, 4 sessions and QTC 2. WNE Net: QNI 2112, 26 sessions and QTC 109. Midlands ARES Net: QNI 330, 4 sessions and QTC 1. *Tfc*: KAØVNV 75, KEØXQ 47, WØAP 38, WDØBFO 4, WJØZ 2, NØWJX 2, KBØIWC 2, WAØSAQ 2. PSHR: KAØVNV 226.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Betsey Doane, K1EIC— Schedule of Tfc Nets: Net Name, Freq, Time, Days, NM: CT. Phone Net, 3.965, 1800 M-Sa., 1000 Su., N1DIO; CT. Net, 3.640, 1900 & 2200, daily, N1AEH; Western CT. Net, 147.18/R, 2030, daily, KA1GWE; RASON Tfc Net, 146.73/R, 2100, daily, WA1FCA; BEARS of Manchester Net, 145.11/R, 2115, daily, NM1K; Nutmeg VHF Tfc Net, 146.88/R, 2130, daily, K1HEJ. CT was privileged for the second time this year to

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No need to remove your handheld from your belt to talk or monitor calls. Clip it near your ears so you can easily hear every call with the volume turned down.

First-rate electret mic element and full size speaker gives superb audio on transmit *and* recieve. Earphone jack, PTT, lightweight retractable cord. Gray. 1¼x2x3 in.

MFJ-284 fits Icom, Yaesu, Radio Shack, Standard; **MFJ-286** fits Kenwood.

MFJ-284 or MFJ-286
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These **tiny** *MFJ Speaker/Mics are so small and so lightweight you'll forget they're there -- until you get a call.*

Excellent audio from electret mic element and speaker. Has swiveling lapel /pocket clip, PTT button with transmit LED, earphone jack, lightweight retractable cord. Available with L or regular connector. *Tiny* 2x1¼x¼ in.

Order MFJ-285/MFJ-285L for ICOM, Yaesu, Alinco; **MFJ-287/MFJ-287L** for Radio Shack, Standard, Kenwood; **MFJ-283** for split plug Alinco; **MFJ-285W** for IC-W2A.

MFJ-283, MFJ-285, MFJ-285L, MFJ-285W, MFJ-287 or MFJ-287L
$24.95

L Connector also available - order L model.

MFJ Artificial RF Ground

MFJ-931
$79.95

Creates artifical RF ground that eliminates or reduces RF hot spots, RF feedback, TVI/RFI, weak signals caused by poor RF grounding.

Greatly improves your signal if you're using a random wire or longwire antenna with an ineffective ground.

Electrically places a far away RF ground directly at your rig by tuning out reactance of connecting wire.

20 Meter CW Transceiver

MFJ-9020
$189.95

Throw this *tiny* MFJ 20 Meter CW Transceiver in a corner of your briefcase and enjoy DXing and ragchewing wherever you go. You get a high performance superhet receiver, crystal filter, RIT, AGC, vernier tuning, sidetone, speaker, up to 5 watts output, semi/full break-in, much more. *Free* manual. See *free* MFJ catalog for 40, 30, 17, 15 Meter versions, keyer, audio filter, power pack, tuner, antennas.

Super *Active* Antenna

**``World Radio TV Handbook''** says MFJ-1024 is a ``first rate easy-to- operate active antenna...quiet...excellent dynamic range...good gain... low noise...broad frequency coverage... excellent choice."

Mount it outdoors away from electrical noise for maximum signal, minimum noise. Covers 50 KHz - 30 MHz.

Receives strong, clear signals from all over the world. 20 dB attenuator, gain control, ON LED. Switch two receivers and aux. or active antenna. 6x3x5 in. Remote has 54 inch whip, 50 ft. coax. 3x2x4 in. 12 VDC or 110 VAC with MFJ-1312, $12.95.

$129.95 MFJ-1024

Cross-Needle SWR Meter

MFJ-815B
$69.95

Peak/ average Cross-Needle SWR/ Wattmeter. Shows SWR, forward/ reflected power in 2000/500 & 200/50 watt ranges. 1.8-60 MHz.

Mechanical zero. SO-239 connectors. Lamp uses 12 VDC or 110 VAC with MFJ-1312, $12.95.

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MFJ Coax Antenna Switches

$39.95 MFJ-1701 **$21.95** MFJ-1702B **$59.95** MFJ-1704

Select any of several antennas from your operating desk with these MFJ Coax Switches. They feature mounting holes and automatic grounding of unused terminals. One year *unconditional* guarantee.

MFJ-1701, $39.95. 6 position antenna switch. SO-239 connectors. 50-75 ohm loads. 2 KW PEP, 1 KW CW. 10x3x1½ in. DC-60 MHz.

MFJ-1702B, $21.95. 2 positions plus new Center Ground. 2.5 KW PEP, 1 KW CW. Insertion loss below .2 dB. 50 dB isolation at 450 MHz. 50 ohm. 3x2x2 in. *MFJ-1702BN, $31.95, N connectors, DC-1.1 GHz.*

MFJ-1704, $59.95. 4 position cavity switch with lightning/surge protection. Center ground. 2.5 KW PEP, 1 KW CW. 50 dB isolation at 500 MHz. 50 ohm. 6¼x4¼x1¼ in. *MFJ-1704N, $69.95, N connectors.*

Dry Dummy Loads for HF/VHF/UHF

MFJ has a full line of dummy loads to suit your needs. Use for tuning to reduce needless (and illegal) QRM and save your finals.

$29.95 MFJ-260C **$59.95** MFJ-264

MFJ-260C, $29.95. VHF/HF. Air cooled, non-inductive 50 ohm resistor. SO-239 connector. 300 Watts for 30 seconds, derating curve. SWR less than 1.3:1 to 30 MHz, 1.5:1 to 650 MHz. 2½x2½x7 in. *MFJ-260CN, $34.95, N connectors.*

MFJ-264, $59.95. Versatile UHF/VHF/HF 1.5 KW load. Low SWR to 650 MHz, usable to 750 MHz. 100 watts/10 minutes, 1500 watts/10 seconds. SWR is 1.1:1 to 30 MHz, below 1.3:1 to 650 MHz. 3x3x7 in. *MFJ-264N, $69.95, N connector. MFJ-5803, $4.95, 3 ft. coax/ PL-259.*

MFJ Low Pass Filter

Suppress TVI, RFI, telephone and other interference by reducing unwanted harmonics going to your antenna. 9 poles, MFJ's exclusive *Teflon® Dielectric Technology™* capacitors, hi-Q inductors, ground plane shielding, RF tight cabinet gives excellent TVI/ RFI protection. Full legal power 1.8-30 MHz. Mounting tabs.

MFJ-704
$39.95

Full Color FAX

Use your computer and transceiver to receive, display and transmit *brilliant full color* news photos and incredible WeFAX weather maps with all 16 gray levels. Also receive/transmit RTTY, ASCII and CW.

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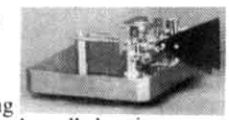
Animate weather maps. Display 10 global pictures simultaneously. Zoom any part of picture or map. Manager lists over 900 FAX stations. Automatic picture capture and save.

MFJ Iambic Paddles

MFJ Deluxe Iambic Paddles feature a full range of adjustments in tension and contact spacing, self-adjusting nylon and steel needle bearings, contact points that almost never need cleaning, precision machined frame and non-skid feet on heavy chrome base. For all electronic CW keyers.



MFJ-564
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MFJ/Bencher Keyer

The best of all CW worlds --a compact MFJ Keyer that fits right on the Bencher iambic paddle!

MFJ-422C
$134.95

Iambic keying, speed (8-50 wpm), weight, tone, volume controls. Automatic keyer or semi-automatic ("bug")/tune mode. RF proof. 4⅛x2⅝x5½ in.

MFJ-422CX, $79.95, keyer only for mounting on your Bencher or MFJ paddle.

12/24 Hour LCD Clocks

$19.95 MFJ-108B **$24.95** MFJ-112

MFJ-108B dual clock has separate UTC and local time displays. Huge 5/8 inch LCD digits are easy-to -see. Brushed aluminum frame.

MFJ-112 shows hour/minute/ second, day, month, date, year at any QTH on *world map*. 12 or 24 hour display. Daylight saving time feature.

VHF SWR/Wattmeter

MFJ-812B
$29.95

Covers 2 Meters and 220 MHz. 30 and 300 Watt scales. Relative field strength 1-250 MHz, SWR above 14 MHz. 4½x2¼x3 in.

Code Practice Oscillator

MFJ-557
$24.95

MFJ-557 Deluxe Code Practice Oscillator has a Morse key and oscillator unit mounted together on a heavy steel base so it stays put on your table. Portable. 9-volt battery or 110 VAC with MFJ-1305, $12.95.

Earphone jack for private practice, tone and volume controls for a wide range of sound. Speaker. Adjustable key. Can be hooked to transmitter. Sturdy. 8½x2¼x3¾ in.

MFJ Multiple DC Outlet

MFJ-1118
$69.95

Use your rig's 12 VDC power supply to power two HF/VHF rigs and six or more accessories with this MFJ *high current* multiple DC outlet.

2 pairs of 30 amp 5-way binding posts separately fused for rigs. 6 switched, fused pairs for accessories. DC voltmeter, "on" LED, RF bypassed, 6 ft. of 8 guage power cable. See *free* MFJ catalog for more DC outlets.

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have one of its clubs participate in a SAREX contact. The Greater Norwalk ARC hosted a direct contact with the Astronaut Ken Cameron on the Atlantis. I was present for this contact and I must tell you that even after some 37 years in the hobby, that experience was truly one of the most memorable in my life! If any of you ever gets the chance to watch young children talk to astronauts in space, try not to miss the opportunity because those moments will truly be special for you. Some of you witnessed the previous contact with the Plymouth Center School so you know how exciting this experience can be! The GNARC contact took place on November 14 at the Bedford Middle School in Westport with youngsters from the Bedford Middle School, Columbus Magnet School in Norwalk, Western Middle School in Greenwich, Coleytown Middle School in Westport and the Saxe Middle School in New Canaan. Any project of this kind demands an incredible amount of teamwork for that GNARC is to be congratulated. The project was led by president Ed, W9KTH, Ray, WB1U, control op and teacher Laurie, N1INM, Tim, N2GIG, Bill, WA2TQI, and Rich, KA1OF. The students received answers from Mr. Cameron to twenty questions in about 8 minutes that I understand tied the record! The audio was just as clear as many of you are used to on 2 meter FM. GNARC showed a video that they produced under the direction of Phil, KA1YIQ, and Brent, N1RRD, describing the Club and the SAREX program. The professional quality of this video is something you can all be proud of as amateur operators. The PR that resulted from this contact once again showed that we as a group are creative and true experimenters. GNARC is presently developing a web page on the internet. A gallery of pictures can be downloaded at the following address: http://www.geopages.com/TheTropics/1148/sarexgal.htm. Net/sess/QNI/QTC: CN 57/208/86; CPN 30/211/76; WCN 30/467/155; NVTN 30/366/74; RTN 30/243/64. *Tfc:* NM1K 1904, KA1VEC 521, KA1GWE 343, WA4QXT 239, W1EFW 216, N1NYJ 101, KD1YV 36, N1BOW 33, K1HEJ 28, KE1AI 27, KD1UK 14, N2LTK 12, N1SFE 8, AA1NQ 7, W1GPS 4.

EASTERN MASSACHUSETTS: SM, Phil Temples, K9HI—ASMs: WA1IDA, AA1FS, KE1BG, N1GTB, N1UGA. ACC: KC1VS. BM: N1IST. OOC:(pending). PIC: N1PBA. SEC: K3XL. SGL: K3HI. STM: WA1TBY. TC: W3EVE. EMA ARRL: voice, 617 926-5986. Packet: K9HI@WA1PHY. Packet bulletins: ARRL@EMABBS. E-mail: phil@temples.com. mailing list: ema-arrl@netcom.com. Worldwide Web: http://www.temples.com/arrl. I want to thank all the EMA ARRL staff for making 1995 a very successful and productive year. VICTORY AT LAST! H-2782 is now MA law! Gov. William Weld signed the bill just before Tnxsgiving, completing a three-year process started by ARRL VC WA1NVS. For a detailed summary of the effects of the new Chapter 225, contact SGL K3HI or your SM. I want to thank outgoing ASM WY1Z for his efforts this past year. Club presidents: wanna make your SM happy in '96? Please recommend to me club candidates for OBS, ORS, EC, LGL, PIO and TS. Nashoba Valley ARC was chosen to handle QSLs for the upcoming STS-76 space shuttle mission! Take a "tip" from the Wareham ARC—WARC holds regular fund-raising events. Members staff a local Burger King restaurant in exchange for a portion of the proceeds. A recent event netted over $50 with 11 members participating. Barnstable ARC's WA1ECF recently accredited by ARRL as an HF Awards Manager. Invest in ham radio: invite a new ham to your shack and help him/her make a contact on a new band or mode! Congrats to new ARRL life member WA3RPG of Newton. Winter is here and that means Nor'easters and snow. Are you ready to assist your community in time of need? Some sure-fire media hits: What are hams doing with your local library, senior center or Rotary group? What's going on in your schools? Teachers and students may be doing some newsworthy things with ham radio! Have you checked out the new EMA ARRL Web page recently? It's stocked with lots of good resources. Framingham ARA will co-sponsor the 1996 Mass. QSO Party. They're looking for help from at least one more radio club. Is your club interested? Boston ARC coordinated another successful message fair at the Boston First Night festivities. SKYWARN activity is increasing. At this writing, a series of coordination meetings with NWS and ARES leaders is in the works. Also, EMA ARES is being reorganized. Stay tuned for further developments. Colonial Wireless and Acton-Boxboro ARC held a joint tour of FEMA in Maynard hosted by W1OJ. Happy birthday to the Minuteman Repeater Association—in operation for 25 years! I'll see members of the South Eastern Mass. ARA on Feb. 8. 73, K9HI. Tfc: K1UGM 591, WA1TBY 512, N1OTC 502, KA1WCD 155, KB1AF 126, N1FLO 110, WB1CHU 94, WA1FNM 94, WA1GDJ 92, K1BZD 90, N1LKJ 74, N1SGL 63, KD1LE 54, N1LRT 48, K8SH 48, N1TDF 46, N1LAH 43, N1SHF 41, N1AJJ 37, WA1LPM 36, N1IST 33, KE1CN 30, KA1YLC 24, N1IWR 22, KA1VAX 20, N1PNN 16, N1SGK 14, KA1BBU 13, KD1NQ 6, KB1EB 3, WA1PHY 2.

MAINE: SM, Michelle Mann, WM1C—ASMs: WA1YNZ & KA1TKS. STM: KA1ODT. BM: W1JTH. TC: NS1Z. SEC: KA1LPW. OOC: W3EZ. SGL: WA1N. ACC: NX1A. PIC: KD1OW. Asst. Dirs. W1KX, KA1TKS. Regret to report Silent keys W1MN, N1MIQ, KA1DDA, and K1TXJ. They will all be missed. Are you ready for the 1996 hamfest season? It starts off March 1 and 2 with the Andy Hamfest at the Ramada Conference Center in Lewiston. Time is 5:30 PM Friday evening, and 8 AM Saturday morning. This year promises to be a BIG event with forums, demonstrations, exams, speakers, things for non-hams to do, etc. See you there! The next one is Portland, April 13, USM gym in Portland. I'm certain that one will be a success as usual, too. I'm sure everyone learned a lot at the packet users' seminar Dec 9. Hopefully they'll do another one sometime. Maine's packet system seems to be expanding daily! Need the statewide exam schedule? Send an SASE to Phil, W1JTH, and you'll get one. We'll also try to have them available at hamfests. Have you been helping out with SKYWARN this winter? The weather service appreciates our help. *Tfc* (Nov): NX1A 195, N1NFK 97, W1JTH 87, WM1C 79, AF1L 77, W1CE 58, N1HYF 49, W1KX 37, KA2ZKM 28, WA1WPR 22, WA1YNZ 21, WA1URS 7. 73, Michelle.

NEW HAMPSHIRE: SM, Al Shuman, N1FIK (@WA1WOK) Internet (ashuman@mv.mv.com) 603-487-3333. ASMs: WB1ASL, W1NH, WA1ALM, N1FIL, NA1E, N3CLZ. OOC: KB4N. TC: W1JY. PIC: AA1EX. ACC: N1OEZ. SGL: W1HSB. STM: WA1JVV BM: KH6GR. Pleased to announce

MFJ *HF/VHF* SWR Analyzer™ with RF Resistance Meter

Read your antenna SWR from 1.8-170 MHz . . . 10-digit LCD frequency counter . . . RF Resistance Meter™ . . . smooth reduction-drive tuning . . . simple-to-use . . .

MFJ-259 **$229.95**

If you work with antennas, MFJ's revolutionary new *SWR Analyzer*™ is the best investment you'll ever make! Now you can diagnose a wide range of antenna problems instantly with one easy-to-use instrument.

What the MFJ-259 Does

The MFJ-259 gives you a complete picture of your antenna's performance anywhere between 1.8 and 170 MHz -- you can even check SWR outside the ham bands without violating FCC rules. Set the bandswitch and tune the dial--just like your transceiver. SWR is displayed instantly!

RF Resistance Meter™

Does 2:1 SWR mean 25 ohms or 100 ohms? *The new MFJ-259 tells you at a glance!*

Now you can measure RF resistance up to 500 ohms at minimum SWR -- instantly -- on MFJ's *exclusive* side-by-side RF Resistance and SWR Meters!

Take the guesswork out of building matching networks and baluns for your antennas.

Watch the effects of spacing on radiation resistance as you adjust your antenna.

Here's What You Can Do . . .

Find your antenna's true resonant frequency from the shack.

Tune the antennas on your tower and watch SWR change instantly as you make each adjustment. You'll know exactly what to do by simply watching the display.

Tune critical HF mobile antennas in seconds -- without subjecting your transceiver to high SWR.

Measure your antenna's 2:1 SWR bandwidth on a single band, or analyze multiband performance over the entire spectrum from1.8 to 170 MHz!

Measure inductance, capacitance, resonant frequency of tuned circuits, transmission line velocity factor/impedance/loss.Test RF chokes, transformers, baluns.

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

And this is only the beginning! The MFJ-259 is really *four* test instruments in one: an accurate RF signal generator, a high resolution 170 MHz frequency counter, *RF Resistance Meter*™ and an *SWR Analyzer*™.

Free Manual

MFJ comprehensive 18 page instruction manual is packed with useful applications -- all explained in simple language you can understand! **For** free manual write or call MFJ.

Take It Anywhere

The MFJ-259 is fully portable, powered internally by 8 AA batteries or 110 VAC with MFJ-1312B, $12.95. It's in a rugged all metal cabinet that's a compact 4x2½x6¾ inches. Take it to remote sites, up towers, on DX-peditions -- anywhere your antennas are located.

For rough service, pick up a convenient **MFJ-29B**, $24.95, padded carrying pouch to keep your MFJ-259 close at hand and looking like new.

How Good is the MFJ-259?

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! Professional installers and technicians use them worldwide.

Get More by Paying Less

With the MFJ-259, you get full 1.8 to 170 MHz coverage, simple operation, instantaneous readings, a high accuracy frequency counter and MFJ's exclusive *RF Resistance Meter*™-- all for a low $229.95.

1.8-170 MHz *SWR Analyzers*™

MFJ-249 **$209.95**

MFJ-249 *HF/VHF SWR Analyzer*™ has all the features of MFJ-259 but less RF resistance meter. Includes 1.8-170 MHz *continuous* coverage, 10-digit LCD frequency counter and smooth vernier tuning.

MFJ-209 **$109.95**

MFJ-209 *HF/VHF SWR Analyzer*™ is same as MFJ-259 without LCD frequency counter and RF resistance meter. Has jack for external frequency counter. MFJ-249/MFJ-209 are 4x2½x6¾ inches and uses 8 AA cells or 110 VAC with MFJ-1312B, $12.95.

Carrying Pouch with Window

MFJ-29B **$24.95**

Tote your MFJ-259/249/209 *SWR Analyzer*™ anywhere with this custom Carrying Pouch.

Made with a special foam-filled fabric, it cushions blows, deflects scrapes, and protects knobs, meters and displays from harm.

Clear protective frequency display window and cutouts for knobs let you use it without taking it out of pouch. Fully-adjustable webbed fabric carrying strap has snap hooks on both ends. Wear around waist or over shoulder.

Keep your analyzer safe and looking new!

MFJ-29, $19.95, no window or cutouts.

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.

With a dip meter you'll save time and take the guesswork out of winding coils, measuring inductance and capacitance, measuring velocity factor and electrical lengths of coax. Determine resonant frequency of tuned circuits and measure Q of coils. Set of two coils cover 1.8-170 MHz depending on your *MFJ SWR Analyzer*™.

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10-160M *SWR Analyzer*™

MFJ-207 **$79.95**

If you're an HF man, this compact MFJ-207 *HF SWR Analyzer*™ will help you build 10-160 Meters antennas that'll make working DX almost routine.

Just plug in your coax to find the SWR of any HF antenna on any ham band 10-160 Meters. Has jack for external frequency counter. 7½x2½x2¼ inches.

2 Meter *SWR Analyzer*™

MFJ-208 **$79.95**

MFJ-208 2 Meter *VHF SWR Analyzer*™ finds the SWR of any antenna from 138-156 MHz. Jack for external frequency counter. 7½x2½x2¼ inches.

For Commercial VHF Radio

Same as MFJ-208 but for commercial VHF. **MFJ-217**, $79.95, covers 30-50 MHz and **MFJ-218**, $79.95, covers 150-170 MHz.

440 MHz *SWR Analyzer*™

MFJ-219 **$99.95**

Read SWR of any antenna 420 to 450 MHz -- just plug coax of your antenna into SO-239 connector, set frequency and read SWR. Uses microwave integrated circuits and microstrip technology. Jack for external frequency counter. 7½x2½x2¼ in.

MFJ-219N, $99.95, sames as MFJ-219 but with "N" connector.

MFJ-219/218/217/208/207/203 uses 9 volt battery or 110 VAC with MFJ-1312B, $12.95.

Bandswitch Dip Meter™

MFJ-203 **$99.95**

The MFJ-203 is a sensitive *Bandswitched Dip Meter*™ that covers all ham bands from 160-10 Meters. There are no plug-in tuning coils to keep up with or break.

Has detachable coupling coil, dual FET oscillator, op-amp meter amplifier and jack for external frequency counter. 7½x2½x2¼ in.

MFJ Antenna Bridge

MFJ-204B **$79.95**

Great for determining feedpoint resistance of antennas and for designing impedance matching networks. Measure RF resistance up to 500 ohm. Covers all ham bands 160-10 Meters. Built-in resistance bridge, null meter, tunable oscillator-driver, frequency counter jack. 7½x2½x2¼ inches. Use 9 volt battery or 110 VAC with MFJ-1312, $12.95.

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the appointment of Tom Mangles, WA1JVV, as STM. Tom, an accomplished traffic handler, is a 25 year ARRL member with the dedication to continue to build the NTS and ORS programs in NH. Tom succeeds Rich, KB4N, who's dedication to the STM and OOC positions has been outstanding. Rich will continue as OOC. Coming this first weekend in Feb. is the "Great Northern New England QSO Party". VT, ME and NH will jointly hold their QSO parties with identical rules. The contest will begin 0000Z (7 PM) Friday and end 2400Z (7 PM) Sunday. Stations may work a max. of 24 hrs. with each station down time a min of a 6 hrs. Full rules send a SASE to Rich, WB1ASL, 12 Cottage Street Lancaster, NH 03584. If you are ordering software include a disc. NARC presented me with their coveted 8 Ball award for my ability to rank the #1 Field Day Station (24A) in the world, 11th in NH. Their rank was determined by the competition's scoring rules. I retaliated by giving them a "Special" FD plaque noting their 11th place accomplishment. I'm glad I am a member of the club! Keep warm. 73 Al.

RHODE ISLAND: SM, Rick Fairweather, K1KYI @KA1RCI.RI—ASM: N1JFY. ACC: AA1CE. STM: WA1CSO. SEC: N1FKI. OOC: WA1ZFS. TC: KA1EGY. BM: KA1BNO. SGL: NN1K. Providence Radio Assn's entry level classes were a great success with 4 new Techs and 2 Tech + licenses earned. N1RHS, WA1UWU, W1EYH, and K1DS were the instructors. They will continue with code classes so the Techs will be able to upgrade and enjoy HF privileges. N1AKO recently upgraded the W1OP operating positions at the club house with new antenna switching and direction control arrangements and N1BBM is designing a new switching panel. New officers at the Newport County RC are pres: N1QMG, vp: N1NEZ, treasurer: W1IIC, recording sec: N1QAA, corres. sec: N1NMI, New exec committee members N1NMI and N1NFB. It was nice to see so many new hams at the Ocean State Amateur Radio Group meeting in November. KC1RI who has been active in the club for many years as an officer and a board member was nominated and elected to life membership in the organization...congratulations Judy! South Coast Wireless Society has a special event station set up at the Dutch Inn in Galilee in December. Their newsletter had an interesting article about SSTV by KB1LN.. *Tfc*: KA1JXH 112, K1TPK 79, WA1CSO 74, K1KYI 9. PSHR: KA1JXH 140, K1TPK 128, WA1CSO 123.

VERMONT: SM, Justin Barton, WA1ITZ—My apologies to Karen Stetson, WA1SQO, BM, for overlooking Linda Robinson, KB1BMO's appointment as OBS. Milton Hamfest, Saturday, February 24, 1996 8:00 AM at Milton High School. CVARC 160 meter Net Mondays at 8:00 PM-David Hale, KD1KB, NM. New officers at RANV: pres. Clifford Lang, N1RYS; v. pres./Treas. Cyrus Freeman, WBØDEN; secty. Don Skidmore, N1QKH. Bob DeVarney, WE1U, speaker at RANV. Mitch Stern, WB2JSJ, giving CW classes on Thursday nights. Cavern's VET session led by Team Liaison Bob DeForge, K1HKI, was attended by 21 candidates that included 8 year old Carl Grosser, KA1BMC, who passed 20 wpm and his mother Marie, KB1AYE, who passed her 13 wpm. Participating VEs: Tom Girardi, WA1YNU; Tom Phillips, WX1N; Justin Barton, WA1ITZ; Barry Driscoll, KE1BV; Gordon MacArthur, N1EQO and Bob McCorkle, WB1AJG. Mitch Stern, WB2JSJ, scheduled to work with Ron Gauthier, N1LDT, SEC and Steve Hogan, N1OLC, SKYWARN, NWS to create linking of repeaters for statewide emergencies. Have a great NEW Year!

NORTHWESTERN DIVISION

ALASKA: SM, Larry Flanagan, NL7XG—ASM: Mike Dolph, KL7JBV; Bob Kreiser, WL7GK; Norm Snyder, KL7RS. The Fairbanks Arctic Club has been busy expanding its 2 M network all along the highway system in the interior. The newest is the repeater in Cantwell and the rumored expansion to include the Nenana repeater. Several homesteads out on the Kantishna will appreciate that. This is my next to last report, and to the best of my knowledge no one has been nominated for the SM position. It is hoped that someone will step forward to take the lead here. This being written in December, will not appear until February 1996 *QST*, so a belated Merry Christmas and Seasons Greetings to all. Alaska Nets (all times local Alaska):

AK Pacific Net	0830	14292 kHz
Snipers Net	1800	3920 kHz
Bush Net	2000	7087 kHz
Motley Group	2100	3933 kHz

EASTERN WASHINGTON: SM, Kyle Pugh, KA7CSP—ASM: KC7FJ. SEC: WA5ZAY. STM: W7GB. OOC: KB7HDX. SGL: WB7UEU. TC: N7TOF. Current Section Field Organization Appointed ORS's are: Don Calbick, W7GB, Moses Lake; Harvey Marsh, K7GXZ, and Earl Hawley, W7LBK, both Spokane. OBS's are: W7LBK, and Warren Triebwasser, W7YEM, Spokane. The Section ARES districts have been restructured to conform to the state fire districts. Jim Nadeau, W7DLB, is the new EC for Klickitat Co. and Don Allen, KG7XY, is now DEC for S. Central. Jim Mattes, N7TOF, is new DEC for SE. Pat Dockery, NQ7M, NE DEC, and Dee Foster, W7HES, Spokane, both had bypass surgery and are recovering OK. ASM Kurt Kromholtz, KC7FJ, in Spokane suffered a very severe stroke and we want Kurt and XYL Sharon, N7LLJ, to know of our concern and we convey our best regards. STM Don, W7GB, reports a fair amount of Thanksgiving tfc on the nets, and the transition to early times for the WARTS and WSN nets went smoothly. *Tfc*: W7GB 343, K7GXZ 229, KK7T 91, KA7EKL 82, W6UVP 18, KA7CSP 11. PSHR: W7GB 138, W6UVP 68.

IDAHO: SM, Don Clower, KA7T—ASM: K7REX. ASM: KB7UIM. STM: W7GHT. SEC: KI7EP. OOC: N7GHV. ACC: KC7HHK. Well I have joined the new age and have an internet address. It is cwdxer@aol.com. W7GHT our STM also has an internet address and it is w7ght@lewiston.com. I attended the Voice of Idaho ARC meeting last month and it was my pleasure to present them with their Special Service Club Certificate. The VOI have become extremely active in community activities and are a good example of an amateur organization that is doing all of the right things. My congratulations to the officers and the members of the VOI for their accomplishments. *Tfc*: W7GHT 206, WB7VYH 169, N7MPS 56, KB7GZU 72. PSHR: W7KDB 144, W7GHT 132, N7MPS 72. OOR: KA7T 25/0. 73's Don

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However, if you make the investment, you'll get the finest 3 KW antenna tuner money can buy.

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You get two *massive* 250 pf transmitting variable capacitors with detailed logging scales. They can handle *amps* of RF current and withstand 6000 RF volts because the plates are smoothed and polished and have extra wide spacing.

Precision Roller Inductor

A precision roller inductor, 3 digit turns counter and spinner knob gives you *exact* inductance control for absolute minimum SWR.

Ball bearings on steel shafts give you a velvet smooth vernier feel and long term durability.

You won't have arcing problems with this roller inductor. Firm springs put high pressure on a plated contact wheel for excellent electrical contact.

Wide, low inductance straps are used for high currents and a new core minimizes RF loss.

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MFJ-989C

Cross-Needle Meter

You get a lighted *peak* and average reading Cross-Needle SWR/Wattmeter with 200 and 2000 watt ranges. Its new directional coupler gives you accurate readings from 1.8 to 30 MHz.

Super Heavy Duty Balun

You get a super heavy duty current balun for balanced lines. It has two giant 2½ inch powder iron toroid cores and is wound with *Teflon®* wire connected to high voltage ceramic feedthru insulators. It lets you operate high power into balanced feedlines without core saturation or voltage breakdown.

Ceramic Antenna Switch

A two wafer 6 position *ceramic* antenna switch with extra large contacts gives you trouble free switching.

Plus much, much more

You also get a 300 watt dummy load, full one year *unconditional* guarantee, flip stand, all aluminum cabinet, tough baked on paint, locking compound on all nuts and bolts. 3 KW PEP. 10¾x4½x15 in.

Don't settle for less, get yours today!

More hams use MFJ tuners than all other tuners in the world! Why settle for an imitation when you can have the real thing?

MFJ's *deluxe* 300 Watt Tuner

MFJ-949E **$139.95**

More hams use the MFJ-949E than any other antenna tuner in the world!

Why? Because you get proven reliability, the ability to match just about anything and a one year *unconditional* guarantee.

You get a lighted *peak* and average reading Cross-Needle SWR/wattmeter, antenna switch, 4:1 balun for balanced lines, 1.8-30 MHz coverage and a *full size* dummy load that easily handles 300 watts of abusive tune-up power.

New 8 position antenna switch lets you pre-tune into dummy load to minimize QRM.

The inductor switch is designed for high RF voltages and currents--it's not a *plastic* switch made for small signals and wired with *tiny* gauge wire.

Each MFJ-949E cabinet is chemically treated and has a new tough scratch-proof *vinyl* cladding -- not paint that can scratch or chip off. You won't find a tougher, longer lasting finish anywhere.

MFJ's *versatile* 1.5 KW Tuner

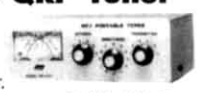
MFJ-962C **$249.95**

Use your barefoot rig now and have the capacity to add a 1.5 KW PEP amplifier later! Lighted Cross-Needle SWR/Wattmeter. 6 position antenna switch, *Teflon®* wound balun, ceramic feedthru insulators for balanced lines. 1.8-30 MHz. 10¾x4½x14⅞ in.

MFJ's *portable/QRP* Tuner

Tunes coax, balanced lines, random wire 1.8-30 MHz. Cross-Needle Meter. SWR, 30/*300 or 6 watt QRP* ranges. 6x6½x2½ in.

MFJ-971 **$89.95**



MFJ's *super value* Tuner

MFJ-941E **$109.95**

The new MFJ-941E gives you a 300 watt PEP tuner with *lighted* Cross-Needle Meter. Covers 1.8-30 MHz.

Antenna switch selects 2 coax lines (direct or thru tuner), random wire, balanced line or external dummy load. 4:1 balun. 1000 volt capacitors.

2 Knob *Differential-T*™ Tuner

MFJ-986 **$299.95**

The MFJ-986 Differential-T™ 2 knob tuner uses a differential capacitor to make tuning foolproof and easier than ever. It ends constant re-tuning with broadband coverage and gives you minimum SWR at only one best setting. 3 KW PEP. 1.8-30 MHz.

Roller inductor makes tuning smooth and easy. Turns counter lets you quickly re-tune to frequency.

Lighted Cross-Needle Meter reads SWR/forward /reflected/*peak*/average power in 2 ranges. Current balun reduces feedline radiation and forces equal currents into unbalanced antennas.

MFJ's *mobile* Tuner

MFJ-945D **$99.95**

Don't leave home without this mobile tuner! Let the MFJ-945D extend your antenna bandwidth so you don't have to stop, go outside and adjust your mobile whip.

Small 8x2x6 inches uses little room. Lighted Cross-Needle SWR/Wattmeter with lamp switch. 1.8-30 MHz. 300 watts PEP. **Mobile mount,** MFJ-20, $4.95.

MFJ's *6 Meter* Tuners

The MFJ-906 has lighted cross-needle SWR/Wattmeter, bypass switch. Handles 100W FM, 200W SSB. For coax fed antennas. MFJ- 903, same as MFJ-906, less SWR/Wattmeter, bypass switch.

MFJ-903 **$49.95**

MFJ-906 **$79.95**

MFJ's *smallest* Versa Tuner

The MFJ-901B is our smallest --5x2x6 inches --(and most afford- able) 200 watt PEP tuner -- when both your space and your budget is limited. Great for matching solid state rigs to linear amps.

MFJ-901B **$69.95**

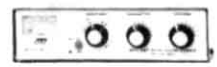
MFJ's *random* wire Tuner

Operate all bands anywhere with any transceiver with the MFJ-16010. It lets you turn a random wire into a transmitting antenna. 1.8-30 MHz. 200 watts PEP. Ultra small 2x3x4 inches.

MFJ-16010 **$39.95**

MFJ's *VHF or UHF* Tuners

MFJ-921 or MFJ-924 **$69.95**



MFJ-921 covers 2 Meters/220 MHz. **MFJ-924** covers 440 MHz. SWR/Wattmeter. 8x2½x3 in. Simple 2-knob tuning for mobile or base.

MFJ's *artificial* RF Ground

Creates artificial RF ground. Elimi- nates or reduces RF hot spots, RF feedback, TVI/RFI, weak signals caused by poor RF grounding. Also electrically places a far away RF ground directly at your rig by tuning out reactance of connecting wire.

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Sess	Qni	Qtc	Mgr	
Farm	30	2172	106	W7RKI
Nwtn	30	1351	44	N7LMA
Idacd	22	737	60	K7UBC
Imn	30	219	108	WB7VYH

MONTANA: SM, Darrell Thomas, N7KOR—Some members of the Gallatin Ham Radio Club in Bozeman were called upon in late November to put their talents in transmitter hunting to practical use. A private aircraft had gone down in the mountains northwest of Bozeman and the emergency locator transmitter was activated. The amateurs were called upon by local authorities to help locate the signal. They were able to get a triangle grid on the signal and plot a suspected location. Using the coordinates provided, an Air Force helicopter located the crash site the next morning. It was unfortunate that there were no survivors in this incident, but had there been the ability to locate the signal and lead rescue personnel to the site would have been invaluable. Perhaps a good New Years Resolution for all of us would be to invite some of the many new Technician Class hams to our shacks and offering our assistance in upgrading their licenses. The no-code license has been a very popular entry for many to the hobby but we should all encourage them to upgrade and enjoy the hobby more. This could also be a club project. *Tfc*: KA7YYR 199. PSHR 122. Net/QNI/QTC/NM; MSN/96/0/ KF7R; MTN/1998/152/ N7AIK; IMN/219/108 WB7VYH.

OREGON: SM, Randy Stimson, KZ7T—ASM: W7FBP, ASM: KF7KE. ASM: KG7OK. ASM: WA7EES. STM: W7VSE. SEC: WB7NML. PIO: KC7YN. SGL: KA7KSK. ACC: AA7OA. STC: N7HMV. OOC: NB7J. I was reading the local newspaper, *The Oregonian*, and noticed a great article on ham radio. It was not just ham radio but the youths in ham radio. Portland ARC started a youth net some time ago and it is going well. I really like to see this kind of publicity so that non-hams know what ham radio is all about. I sure wish we could get more of it so when these antenna ordinance come, they would be a little more understanding. I would like to welcome the new emergency coordinators. They are Gary, N7ZHG, for Umatilla and Morrow counties and Stephen Keys (I didn't get the call sign) for Curry County. Lew, WB7NML, the SEC, will be attending the planning session for QUAKEX-96. It will be April 14-17 1996. I will keep you informed on it. The Umpqua Valley ARC has new officers they are president Lyle, W6OFF, 1st vp Russ, KB7NVV, 2nd VP Ed, W5PII, secretary James, AB7NC, and treasurer Helen, KB7YYH. Radio Amateurs of the Gorge have new officers they are, president Mike, KA7ZNI, vp Dave, N7PJS, and Lori, KB7OM, secretary and treasurer. *Tfc*: (P)= Packet N7UOF 271, W7WAT 156, WA7EES 147, W7VSE 146, KI7UN 112, K6AGD 82, KC7CGK 70, N7THH 64, K7NLM 34, W7ODG 34, N7YFS 21, KA7AID 27, N7UQW 16.(Sept). WA7EES 320.

WESTERN WASHINGTON: SM, Harry Lewis, W7JWJ—Every 5 years or so Western Washington has a 100-year flood. When the first drops of rain begin to moisten the ground radio amateurs magically appear to help their neighbors charge the batteries in their cellular phones when the power is out, make coffee at the nearest shelter and loan that hand-made quilt from grandma to a family that has watched their home float down the river. Assisting in damage assessment is no problem. Some of these individuals may be identified by the antennas sprouting from their automobiles. Others may have a small trailer and rowboat in tow. If one were to glance into the rowboat one might see a dozen sandbags, a five gallon can of gasoline and several jugs of fresh water and an old *QST* magazine. On occasion any of these amateurs may provide vital radio communication. Special Kudos to the Hams of Snohomish, Skagit & Mason Ctys. - Reporting via SEC Herb our District 1 DEC Ron, KE7KR, comments from Kitsap Cty: "During the past few months I have been attempting to check in to various ARES Nets surrounding Kitsap Cty. I have found a growing trend of either ignoring or forgetting 'visitors.' It is my personal feeling that we are going to hurt ourselves by not being attentive to newcomers. I feel we should take the extra few minutes to recognize newcomers and welcome them to ARES." Ron, KØBQ, reports from Mason Cty that as the Skokomish valley flooded the DES computerized early warning system was used and should be credited with averting life threatening situations due to the floodwaters. A lost mushroom picker was the object of a Mason Cty SAR mission with KC7HYJ moving out the commvan to assist along with N7ZNN. KG7OA opened a support net on the repeater. WB7PJM is the new Cty RO. A release of toxic fumes during the Haz-Mat incident at Boeing resulted in activation of the Medical Services team as requested by Auburn EOC. *Tfc*: KB7JQM 359, KD7ME 329, W7ZIW 274, W7LG 172, KG7LS 143, K7BDU 117, W7AZU 89, KA7TTY 32, W7GHQ 28, KA7RSZ 24, K7SUQ 18, KB7UXK 18, KJ7AU 11, K7CLL 7, N7DIP 6. KD7ME STM net rprt: (Ckins, Sess, Tfc, Mgr, Ln) NTN 6334/60/582/W7TVA/RN7; WARTS 2767/30/275/W7GB/RN7; WSN 738/60/261/ W7ZIW /RN7; NWSSB 398/27/32; CCAIN 128/4/5/K7SUQ/ WARTS; PSTS 1054/63/39/KA7TTY/ WARTS-WSN. Packet HFBBS N6EQZ 86 tfc.

PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W6RGG—ASMs: W6ZF, WB3FCV. SEC: KG6LF. DECs: N4OGL, W6CPO. STM: K6APW. OOC: Vacant. TS: KF6NY. The Alameda County Emgy Svcs (ACES) Net is held Tuesdays at 8 PM on 147.240, 444.200 (107.2), 147.120, 224.740, 441.125 (100.0) & 145.43 (100.0). All are linked for the net, and those interested in Emgy Comms are invited to check in. Check out the EB WWW Page at http://www.portal.com/~pdarrl/ebs.html. Welcome to new Section Emergency Coordinator, KG6LF. Jerry is a welcome addition to the EC Team, and can be reached at jboyd@ctobbs.com. I wish to thank out-going OOC, AA6DL, for his efforts on our behalf. Dick leaves some big shoes to fill, and will be missed. EBARC members KE6NMJ, KG6FR, KB6WC, KD6SXH, W6THD, WB6DOB, KD6JCT, and AC6PU helped Richmond celebrate its' 90th birthday by manning a Special Event Station from their new club station. BARC bid a fond farewell to KE6IA, who has moved north, and can now be found on the air as KJ7OQ. Good luck, Dave. HRC members KB6JOX, N6MQQ & N6MON hosted a group of

10 Bands -- 1 MFJ Antenna!

Full size performance . . . No ground or radials

Operate 10 bands: 75/80, 40, 30, 20, 17, 15, 12, 10, 6 and 2 Meters with one antenna

Separate full size radiators . . . End loading . . . Elevated top feed . . . Low Radiation Angle . . . Very wide bandwidth . . . Highest performance no ground vertical ever . . .

Operate 10 bands -- 75/80, 40, 30, 20, 17, 15, 12, 10, 6 and 2 Meters -- with this MFJ-1798 vertical antenna and get *full size performance* with no ground or radials!

Full size performance gives you high efficiency for more power radiated. The result? Stronger signals and more Q-5 QSOs.

Full size performance also gives you exceptionally wide bandwidths so you can use more of your hard earned frequencies.

Full size performance is achieved by using separate full size radiators for 2 through 20 Meters and highly efficient end loading for 30, 40 and 75 /80 Meters.

You get very low radiation angle for exciting DX, automatic bandswitching, omni-directional coverage, low SWR and it handles 1500 watts PEP SSB.

MFJ's unique *Elevated Top Feed*™ elevates the feedpoint *all the way to the top* of the antenna. It puts the maximum radiation point high up in the clear where it does the most good -- your signal gets out even if you're ground mounted.

It's easy to tune because adjusting one band has minimum effect on the resonant frequency of other bands.

Self-supporting and just 20 feet tall, the MFJ-1798 mounts easily from ground level to tower top -- on small lots, backyards, apartments, condos, roof tops, tower mounts.

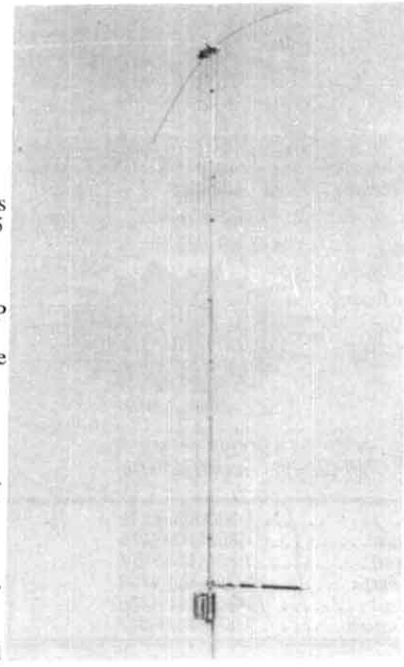
Separate *Full Size* Radiators

***Separate** full size* quarter wave radiators are used on 20, 17, 15, 12, 10 and 2 Meters. On 6 Meters, the 17 Meter radiator becomes a 3/4 wave radiator.

The active radiator works as a stub to decouple everything beyond it. *In phase* antenna current flows in all parallel radiators.

This forms a very large equivalent radiator and gives you incredible bandwidths.

These radiator stubs provide automatic bandswitching -- there is absolutely *no loss* due to loading coils or traps.



MFJ-1798

$269.95

End Loading

On 30, 40, 75/80 Meters, end loading -- the most efficient form of loading -- gives you highly efficient performance, excellent bandwidth, low angle radiation and automatic bandswitching.

MFJ's unique *Frequency Adaptive L-Network*™ provides automatic impedance matching for lowest SWR on these low bands.

Tuning to your favorite part of these bands is simple and is done at the *bottom* of the antenna.

No Ground or Radials Needed

You don't need a ground or radials because an effective counterpoise that's 12 feet across gives you *excellent* ground isolation.

You can mount it from ground level to roof top and get awesome performance.

No Feedline Radiation to Waste Power

The feedline is decoupled and isolated from the antenna with MFJ's exclusive *AirCore*™ high power current balun. It's wound with Teflon® coax and *can't* saturate, no matter how high your power.

Built to Last

Incredibly strong solid fiberglass rod and large diameter 6061 T-6 aircraft strength aluminum tubing is used in the main structure.

Efficient high-Q coils are wound on tough *low loss* fiberglass forms using highly weather resistant Teflon® covered wire.

Teflon® is registered trademark of Dupont

MFJ *Super Hi-Q Loop*™

MFJ-1786

$299.95

MFJ's *tiny* 36 inch diameter *high efficiency* loop antenna lets you operate 10 to 30 MHz *continuously* -- including the WARC bands!

It's ideal where space is limited -- apartments, small lots, mobile homes, attics, motor homes.

Enjoy both DX and local contacts when you mount it vertically. You get *both* low angle radiation for excellent DX *and* high angle radiation for local close-in contacts. Handles 150 watts.

Super easy-to-use! Only MFJ-1786 *Super* Remote Control has *Auto Band Selection*™. It auto-tunes to your desired band, then beeps to let you know. No control cable is needed.

Fast/slow tune push buttons and built-in two range *Cross-Needle* SWR/Wattmeter lets you quickly tune to your exact frequency.

All *welded* construction, no mechanical joints, welded butterfly capacitor with no rotating contacts, large 1.050 inch diameter *round* radiator -- not a lossy thin flat-strip -- gives you highest possible efficiency.

Each plate in MFJ's *superb* tuning capacitor is welded for low loss and *polished* to prevent high voltage arcing. It's welded to the radiator, has nylon bearing, anti-backlash mechanism, limit switches and a continuous *no-step* DC motor for *smooth precision* tuning.

A heavy duty 1/8 inch thick ABS plastic housing with ultraviolet inhibitors protects it.

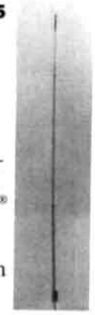
MFJ-1782, $269.95. Same as MFJ-1786 but remote control has only fast/slow tune buttons.

Super 80/40M Vertical

MFJ-1792

$159.95

Designed as a *high performance* antenna for 80 and 40 Meters, the MFJ-1792 features a *full size* quarter wave radiator for 40 Meters - - that's a full 33 feet of ruthless radiating power.



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High strength 6061-T6 aluminum tubing, super strong solid fiberglass insulator, *Frequency Adaptive L-Network*™, heavy duty *swing* mount. Handles 1500 watts PEP. Requires guying and radials, counterpoises or ground screen.

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No, it's not a fan -- it's a high efficiency portable loop antenna that's about the same size and shape as a 2x2 foot box fan, complete with carrying handle.

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Webelos Scouts at their club station for JOTA. NCCC is still looking for hosts and stations to support the World Radiosport Team Competition in July 1996. Fifty-two two-man teams from around the world will operate this event from stations in the Bay Area. Info from W6OAT at 651 Handley Trail, Redwood City, CA 94062, or e-mail epps@netcom.com. *Tfc* (Nov): WB6DOB/456, WB6ETY/41, WB6UZX/33. PSHR: WB6DOB. Tfc nets: NCN1/3630/7PM; NCN2-SLOW SESSION/3705/9PM; NCN-VHF/145.21/8:30PM; RN6/3655/7:45PM & 9:30PM; PAN/3651/7052/8:30PM. Your check-ins are always welcome.

NEVADA: SM, Bill Smith, W4HMV (emial: w4mhv@accessnv.com)— ASM: KG7IY. TC: NW7O. SEC: N7JEH. ACC: N7FPP. OOC: W7KLH. PIC: WW7E. Yours truly got to meet the members of the Nellis Radio Amateur Club at Nellis AFB—as usual, a friendly and very active group. The NRAC meets the third Thursday of each month at 7 PM; the club will be starting a novice/no-code technician class on Jan 29; for details on class and meetings, contact Rosie, N7RIR at 652-7178 during work hours. The Nellis club has a repeater on-base on 147.060 MHz. Glad to report that Bob, KG7IY, is recuperating and is getting back to speed. Also very pleased to report that the Las Vegas Packet Users Group is now an ARRL affiliated club! Congratulations to LVPUG members! Congratulations also to Doris, KJ7RF, of Pahrump. She upgraded to Extra on December 2. Reno area is suffering a big loss from the move of Jim, KI7GH, and Teresa, N7TSE, to Idaho. They have been genuine sparkplugs in Reno-area activities and Jim had been the president of SIERA. The November issue of WADG's "The Printed Circuit" has a great article, complete with photos of that group's October expedition to Steamboat Hill to install antenna and coax for the 147.30 machine. I sent welcome letters to 20 new hams in November—seems like there is a group of new hams up in Dayton—any Hamvention-West plans in the works?

PACIFIC: SM, Bob Schneider, AH6J— I hope everyone had a joyful Holiday season. I realize by the time you read this it will be in 1996, but it is written before Christmas. Yesterday was the Honolulu Marathon and I have no word on the support EARC gave the race. It is usually one of their big events of the year. I went to the WHARS picnic & election & had a great time. WHARS officers for 1996 are: president, Victor Limacher, NH6LR; veep, Dennis Carvalho, KH2M; secretary, Jim Russell, WH6BA & treasurer, Dewey Proietti, NH6M. Directors are: Jack Murphy, WB9IME; Ted Leaf, WH6VO; and John Gardner, K6RER. I hope to make one more visit around the state before my term expires in April. BIARC officers for 1996 are: president, John Gager, NH6XM; veep Ken Wages, WH6CQH; secretary, Lori Miner, WH6CVH & treasurer, Joyce Carlson, WH6BIR. Directors are: Kenny Bell, KH6AFQ; Bill Carlson, AH6GN and Harry Nishiyama, KH6FKG. Reminder: The ARES section net will be meeting EVERY Wednesday at 1930(W) on 3905 kHz.

SACRAMENTO VALLEY: SM, Jettie Hill, W6RFF—Section staff: STM: WA6WJZ. ACC: KB6COH. OOC: AB6GQ. TC: WB6RBE. PIC: WA6OWH. BM: WB5FIX. SGL: N6IG. SEC: WD9EKX. DECs: K7KEH, AB6OP, WA6SLA. I am making a schedule of visits to clubs during the year. If your club has a month you would like me to visit your club, please let me know. Last years sked was a mess because of the wild winter and spring wx. Amador Cty ARC members helped out with communications during a simulated disaster drill in their county. El Dorado Cty ARC raised $250 at their "white elephant" sale and Sierra Foothills ARC raised $500+ at theirs. This is always a good fund raiser. Yuba-Sutter ARC provided comm for Christmas parade. Also, SFARC worked at the Roseville Holiday parade. Always a good public service activity. W6SUN gave a presentation on quads to the Shasta Cascades ARS. Tehama Cty ARC working on ways to keep the club alive and solvent. WA6ULL runs a swap on K6IS 144.590 after North Hills' Thur 8 PM Net. Yolo ARS held their annual "Dessert Potluck" in Davis. Sounds like my kind of event. Now is the time to volunteer for one of your club's committees. The new club officers can use your help. Put something back into the club and Amateur Radio. Also, promote ARRL as your help is needed to protect our frequencies from the auctioneer's gavel. ARRL is our voice to Congress, FCC and International Radio Union. New club members: GEARS: WD6BUN, KE6ETO, KE6YGT, KE6YYY; SFARC: KA6LNC, WD6DSN, WA6RWS; Yolo ARS: W6QVB, KE6SSK, KE6MBL, KE6TOS, KD6TNA, W6CPE, KE6VQO, WA6TFO.

SAN FRANCISCO: SM, Tom Orman, KD6VWD—ASM: N6KM. SEC: WB6TMS. STM: AB6EU. OOC: KD6HQ. PIC: N6BWS. TC: N1AL. Sorry to report the following Silent Keys—Frank Jones, W6AJF, Honorary Life President of Valley of the Moon ARC, KB6WUW, KE6CDD, N1IEA, WA6UBX, WD6AMA. Please welcome our new SM: KD6VWD. New time for VHF session of Northern California Net is 1930 local (145.21 MHz) every day of the year. Sonoma County RA 1996 officers—pres: KK6VY, vp: K6ZWB, sec: KD6CJR, treas: KJ6LF. Mendocino County ARS had good 1995 and is looking forward to a lot of fun during 1996. Willits ARS reports K6WC operated from The Great Wall of China. Members and guests of San Francisco ARC enjoyed a real fun holiday dinner, complete with many gifts and a very special Technical Net. Amateur Communications Society Ham of the Year 1995 is KD6DTG. Remember that Field Day is June 22-23, 1996. Plan now for Pacificon in Concord, Oct 18-20, 1996. Corrected Oct—PSHR: AB6EU 398, N6FWG 116. *Tfc*: AB6EU 670, N6FWG 156, KK1A 8. Nov—PSHR: AB6EU 278, KK1A 170, N6FWG 94. *Tfc*: AB6EU 512, N6FWG 196, KK1A 160. This column was written by W6VV, who wishes to thank all of you for your support during his time as SM.

SAN JOAQUIN VALLEY: SM, Mike Siegel, KI6PR—Looks like we made it through another holiday season; even the roads were in pretty good shape for most of the season. Down in Kern County, the Kern County-Central Valley ARC and the Kern River Valley clubs both ran very successful Road & Weather Nets on their for their respective repeater systems for the duration of the season. A special congratulaitons to all the folks at the Clovis Amateur Radio Pioneers (CARP). I recently had the opportunity to present the CARP-ers with certificates not only for League Affiliation, but also for becoming a Special Service Club. Both awards are unique, and CARP has earned both in less than

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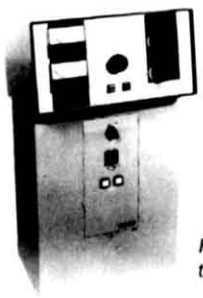

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Yaesu	Astron	Maxrad	MFJ	Tekk	Much More

a year. Not bad for "just a bunch of kids"! Speaking of awards, I also recently had the opportunity to present Madera County ARC a certificate for 25 years' affiliation with the League - Well Done! And thanks for the years of service. Ten Meters is not dead! The Fresno/Madera (FresMad) 10 Meter Net meets Saundays at 5 pm on 28.495. All are welcome. Are band reviews making a comeback? Recently, Turlock ARC, Tulare County ARC, and Castle ARC have been involved in communications for local band reviews. They're a change from marathons & races, and much more interesting than a regular parade. After many years of service, WA6ZLO is stepping down as editor of Stanislaus ARA's READOUT newsletter. Bob's efforts won SARA many national awards in the past; the READOUT is now being handled by N6KMR; I wish him much success with it.

SANTA CLARA VALLEY: SM, Kit Blanke, WA6PWW—ASMs: WB6W, KA6S. SEC: KE6EPM. STM: KE6EPN. BM:(tbd). TC:(tbd). ACC:(tbd). PIO:(tbd). OOC: KB6FPW. Welcome to our new SEC, Fred Fowler, KE6EPM. The list above does look like a typo with consecutive calls for the SEC and STM (Dave Gilsan) but it's no mistake! Seems they both took their exams at about the same time, but in different places! Dave and Fred will work very closely to build an integrated ARES/RACES and NTS team that will be ready to provide emergency communications for served agencies and the general public via the technology that is available in the mid-1990's. We are still looking for other section level staff appointments, those with a tbd above. If you are interested or know of someone who would do a good job, give Kit, WA6PWW (KIT6PWW@AOL.COM) a call. The Lockheed-Martin ARC heard Steve, KA6S, on the trials and tribulations of T-hunting. Steve also gave away some of my best "fox" tricks...The San Bruno Civil Defense Radio Club is planning "Certified Disaster Worker" classes for next year. They meet the first Monday of each month at 7:30 PM in the basement of the San Bruno City Hall. They also have a weekly club net at 7:30 PM every Monday night on 146.43 simplex and 224.06- (WA6NMO)....The Millbrae Amateur Radio Club meets the first Thursday of the month, 6:45PM in the meeting room of the main library, behind the police department. Their club net is every Thursday (except meeting night) at 7:30 PM on 146.49 simplex and 224.06-...The North Peninsula Electronics Club net is on 146.86- every Monday night at 7:30 PM. Check the net for meeting date, time and place...The Santa Cruz County ARC meets at 7:30 PM the third Friday of each month (except December) in the education building of Dominical Hospital, 1515 Soquel St. Santa Cruz...SCCARA meets the second Monday of the month at the United Way Building 1922 the Alameda in San Jose...Local T-hunts are - (most start at 5 PM) 1st Sat. in Fremont (talkin WA6PWW 147.015 +PL136.5), 2nd Sat. in Pleasanton (talkin AD6X 147.12+), 4th Sat. in Redwood City (talkin WA6PWW 147.015 +PL136.5) call Rich KN6FW 510-462-1476 for more details...ARRL License Class HOTLINE 408-456-0702,ARRL exam info 408-984-8353, Sunnyvale VEC exam info (408) 255-9000. 73 de WB6W (asm).

ROANOKE DIVISION

NORTH CAROLINA: SM, W. Reed Whitten, AB4W. ASMs: AB4S, KE4ML, KC4ACE. SEC: WB4SGA. STM: K4IWW. ASTM: W4EAT. ACC: WC4T. TC: KM4OX. SGL: KI4AN. OOC: W4ZRA. PIC: KN4AQ. BM: KA4CAC. An old operating event is being revived. The North Carolina QSO PARTY, a weekend operating event/contest, sponsored by the Alamance Amateur Radio Club, K4EG, is scheduled for 0000Z Feb 24. Stations outside NC try to work all counties so we need LOTS of participation from stations in our section. Details, county list, and logging program info. will be available on local BBS and our Section WWW home page http://ncarrl.wilmington.net/>. Event schedules, bulletins, and emergency information is also available on the home page. Considering the record number of hurricanes this year we were fortunate that only two affected us. Hurricane Opal brought flooding to western NC and Felix caused significant ARES activation in coastal NC. Em. Mgt. officials praised our efforts during both events. A reminder - use LOCAL TIME on messages sent within North Carolina during emergencies! Dick Orander, KD4ISC, is our new Raleigh (RAH) SKYWARN EC. He replaces Jerry Stuckle, AI0K, whose dedicated service for over 11 years had a great influence on the growth of SKYWARN throughout North Carolina and beyond. Amateurs and NWS personnel have expressed great appreciation for his efforts! Bernie Nobles, WA4MOK, is now Area A DEC, replacing Bob Richardson, KR4TW. Thanks to Bob for serving and to Bernie for volunteering. Mary Harper, AD4HC, joins KE4FCW as an Asst. DEC for Area D. The Quarterly DEC meeting on Dec 10 in Raleigh was well attended. My thanks to all the volunteers who make our section Field Organization work so well!! Briarpatch & Foothills ARCs' Elkin Hamfest Feb 18; Mecklenburg ARS Charlotte Hamfest with ARES & NTS meetings Mar 9-10. *Tfc* (Nov): KO4BJ 407, KI4YV 173, N4WZH 165, K4IWW 157, N4AA 150, AE4EC 111, AC4DV 110, W4BJD 97, W4EAT 97, K4CWZ 92, N4BJX 86, AB4W 78, K4AIF 73, WB4HRR 61, KR4LS 49, KE4JWL 34, N9MN 33, K4YJB 31, KS4WH 30, KD4ITI 29, WD4MRD 28, WA4SRD 26, KE4AHC 24, W4IRE 20, KE4JHJ 19, KE4YHR 18, N4JTG 18, N4NTO 18, AA4YW 17, KE4WMI 17, K4DDY 16, N4SHE 15, KE4ZFP 14, NT4K 11, W4DYW 11, KE4YHR 10, WB1HGO 10, KE4WCW 8, KE4KFZ 8, KE4NDB 7, KE4TYJ 7, KR4ZJ 7, KA4KTU 6, KT4CD 6, K4MPJ 3, KD4UAI 3, KE4ZMW 1 [AR]

SOUTH CAROLINA: SM, Mike Epstein, KD1DS (mepstein@carol.net) —STM: W4DRF. ASMs: W4DRF, KQ4OU, KD4RAP, KE4OOW. SEC: K8AFP. PIC: KA4LRM. OOC: W4NTO. BM: KQ4OU. AIRS: W4DRF. SGL: K8AFP. ACC: KE4OOW. I received an interesting pamphlet from Morse 2000 Outreach. Called "MORSEIs," the newsletter promotes the use of Morse code in the rehabilitation and education of disabled persons. With limited movement and sensory limits, a person can use Morse code to control a computer. "Research and clinical experience are indicating that the fast rate of entry and low level of physical exertion inherent in Morse code can make it a viable, competitive method of microprocessor control for many disabled persons." One of their goals is to "expand global Morse literacy and awareness for potential users and the general public." WB4TBF and KD4RSM had QSOs with STS-74 astronauts.

KD4SFF, Al, in Greenville, made a mobile contact and went on to get excellent TV coverage of the contact. Congratulations to all in Greenwood for putting on another excellent hamfest. And congratulations to KE4OOW on the announcement that Myrtle Beach will host next year's Section Convention. *Tfc* (Nov) (keep up the good work): N4PNE 196, KE4SCC 109, K3LM 102, KE4OOW 73, KA4LRM 69, W4DRF 52, KD4WUU 31, KT4FP 20, K4VIA 20, KA4SLQ 16, KA4UIV 13,W4NCN 12, WA4HNA 9, KQ4SY 8, AC4IP 7, KD1DS 6, AA4IX 6, K4GDL 5,KD4FRO 3, K8DZH 2, WA4EIV 2.

VIRGINIA: SM, Ted Dingler, N4KSO— STM: N4GHI @WA3TAI. SEC: N4SCK. OOC: W8IRT. TC: N4UA @WA4RTS. BM: W3ATQ. AAC: KA4YUY. SGL: W4UMC. PIC: NØRDQ. As of this date, there have been no changes in the section leadership. Continue sending your PSHR reports to N4SCK. If you have any questions concerning the section, be sure and give me a call at 800-646-5798. This number is to make it easier for you to get your questions answered. I have had this 800 number for over a year. It brings in calls from other sections. The year is off to another good start. Have you been making headway on your goals? If you need help in getting started, get involved in your local club. If you don't know the contact person in your area, give me a call. I have a list of affiliated and Special Service clubs in the section. Clubs, be sure to submit your annual reports. Congrats also to KM4QE, KE4PHH, KE4CHJ and KC4WCH for leading the Western Tidewater Radio Assn in their 1st year. This club is already seeing affiliation with ARRL. This is a great way to start. Are you interested in volunteering your services to the section? Let me know what your interests are, and we'll try to find you a spot. Till next time. 73.

Net	*QTC*	*QNI*	*QND*	*NM*
VTN	257	224	257	K4BGZ
VSBN	205	441	528	KD4TZN
VNE	135	276	127	N4GHI
VNL	54	164	277	WD4MIS
VLN	126	177	437	N3PDK
NVTN	147	375	391	N4DCC
STARES	237	664	1138	KD4JMA
SVEN	5	541	12	N8ODZ

Tfc: KE4PAP 3304, KF4AMB 3023, K4DOR 1082, KK4NN 812, N4GHI 697, KQ4ET 525, N4TRX 345, KR4MU 319, N3PDK 288, K4MTX 263, AA4GL 259, WD4MIS 241, KE4KET 217, K4BGZ 213, KE4HFX 206, N6ANQ 169, KD4FUN 140, WA8AHV 90, KN4OH 73, W4UQ 62, N4ABM 60, KE4MNS 58, AA4AT 57, KR4AY 53, WB4FLT 51, KE4AZL 49, KD4TZN 42, KR4TF 37, N4DCC 36, KE4EF 36, KC4YGB 35, KD4JMA 33, K4YVX 30, W4ZYT 22, K4MLC 21, NØRDQ 19, K4IX 19, KB4CAU 19, KE4NYY 18, WB4KIT 15, KD4BI 15, KE4DRB 15, KN4US 13, KS4IG 12, WB4UHC 10, KF4ACM 10, W4JLS 8, W4TZC 7, W3ATQ 7, KD4UFS 4, KS4OJ 4, KE4RBO 2, K4JM 2, KC4JGC 2, W4HU 2, KE4UDX 2, KE4DRA 2, KC4OAG 2, N4FNT 2, KE4GEG 1.

WEST VIRGINIA: SM, O.N. (Olie) Rinehart, WD8V— ASM: N8FXH. STM: W8KBM. SEC: K8QEW. ACC: WD8MKS. SGL: K8BS. TC: K8LG. PIC: KB8QKY. Just at presstime, we discovered that FCC has issued the 610-V and 1070-V forms needed for vanity call signs. Forms are available but time frame on gates is not, so you cannot submit your forms to FCC. Important note: they will go through Mellon Bank, not the FCC office direct. I have a limited supply printed from file downloaded from FCC on Internet. That (Internet) is the next subject. There has been a home page and network set up for section managers, so I am enjoying a close association with the SMs around the country. No concern about propagation, wx or band conditions! Is the new technology a benefit or a threat to "Ham Radio"? We will use it wisely and see. Hey, you remember WD8LDY! Dave is now STM of NTX section, traffic flowing. My phone is listed on the SM list near the front of *QST*. If you need me but can't catch me on one of the nets, via packet or UHF, call collect. I work for YOU and ARRL! WVFN STA 1429, TRF 179 N8OYY; WVMDN STA 824 TRF 96, N8UGK, WVN-E STA 234, TRF 181 W8IMX, WVN-L STA 185, TRF 46 W8IMX, HILBLY STA 115, TRF 6 W8YP, ARES/RACES SES 52 STA 1427 TRF 81 K8QEW. *Tfc*: KA8WNO 447, N8IXF 359, WD8V 348, W8YP 162, WD8DHC 152, W8IMX 108, K8QEW 95, W8JWX 86, NN8OYY 82, K8KFJ 67, W8FZP 32, KG8GW 29, N8FXH 20.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Tim Armagost, WBØTUB—SEC: Rich Ferguson, KAØDXM. STM: Mike Stansberry, KØTER. ACC: Ron Deutsch, NKØP. PIC: Warren Williams, NØPBY. OOC: Karen Schultz, KAØCDN & Glenn Schultz, WØIJR. SGL: Mark Baker, KGØPA. TC: Bob Armstrong, WA4SVJ. BM: Stan Morris, NØJOQ. Mike, KØTER, is looking into resurrecting the Colo. Wyo. Slow speed net. The net is done at about 5 words per minute so that new hams can get into traffic handling. If you are interested, talk to Mike on the Sunday morning net, 8 AM on 3925 or 8:30 on the Colorado Connection. Lots of nets you may check into for your enjoyment: EOSS, 147.225 Tuesday 8 PM; Pikes Peak FM association, 147.97, 9 PM Sunday; RMRL, 146.94 8:30 PM Monday; YL net 145.31, 8:15 PM Monday plus many more! Don't forget the Ham Exam hot line at 303-360-7293...everything you wanted to know about where to test and when. Watch for the new RF Light bulbs made by GE. We hope they don't talk to our radio equipment! The new for 610V form is out...that is the one to request your vanity call with. The form is here but the FCC isn't taking the application yet. Watch for the window to open the end of the 1st quarter of 96 (my prediction only!). Get involved! Lots of new hams coming into the hobby but volunteers and involvement isn't keeping pace. Remember, joining the ARRL isn't a "magazine subscription", it is belonging to the national organization, supporting ALL Amateur Radio activities, the place to get answers to your ham related questions and the place to find like-minded individuals to enhance your enjoyment of the hobby...PLUS a great magazine! The new format of *QST* sure looks nice! *Tfc*: NTS traffic totals: KØTER 58, NØUOD 38. Colorado Amateur Weather Net (CAWN) totals: NØBQP 817, NØJUS 645, WØLVI 501, WØKEV 486,

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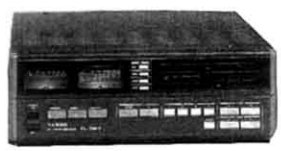

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NØFCR 411, KCØVL 309, WØWPD 264, WØACH 248, KDØWT 186, AAØZR 174, KGØAO 131, KØYFK 116.73, Tim, WBØTUB.

NEW MEXICO: SM, Joe T. Knight, W5PDY—ASM: K5BIS & N5OQJ. SEC: K6YEJ. STM: ND5T. NMs: WA5UNO & WB5ZME. TC: W8GY. ACC: N5OQJ. New Mexico Roadrunner Net meets daily, 3939 @ 0100 UTC, handled 104 msgs with 1119 checkins. New Mexico Breakfast Club meets daily, 3939 @6:30 AM, handled 144 msgs with 973 checkins. Yucca 2-mtr Net 78/18 handled 15 msgs with 621 checkins. Caravan Club 2-mtr Net, 66/06 handled 8 msgs with 100 checkins. SCAT Net, 66/06 handled 15 msgs with 680 checkins. Four Corners Net handled 34 msgs with 404 checkins. GARS Net handled 13 msgs with 75 checkins. THIS IS WINTER?? Wow, what a beautiful fall!! We may be looking for the warmth in Jan Had a nice hamfest at Socorro with a nice crowd and lots of activity along with the Festival of Cranes and an excellent VE session. Congrats to all the new hams! Also had a nice visit with the Valencia ARS last week, and we hope they will soon be an ARRL club. The Northern NM Club will be having their Christmas party next week, followed by the ABQ ARC Christmas dinner at Bella Vista and many other clubs will be having their Christmas dinner parties in the next two weeks. Wish I could attend them all! Congrats to Beth Harris, KJ7FC, a 15-year old Extra Class in Cheyenne, WY, for winning the Hiram Percy Maxim Award & $1000 cash. So very sorry to note the passing of so many Silent Keys. They are: K5RHW, W5VIJ, WB5CSO & KA5FSB. They will all certainly be missed. Vy best 73. Joe, W5PDY.

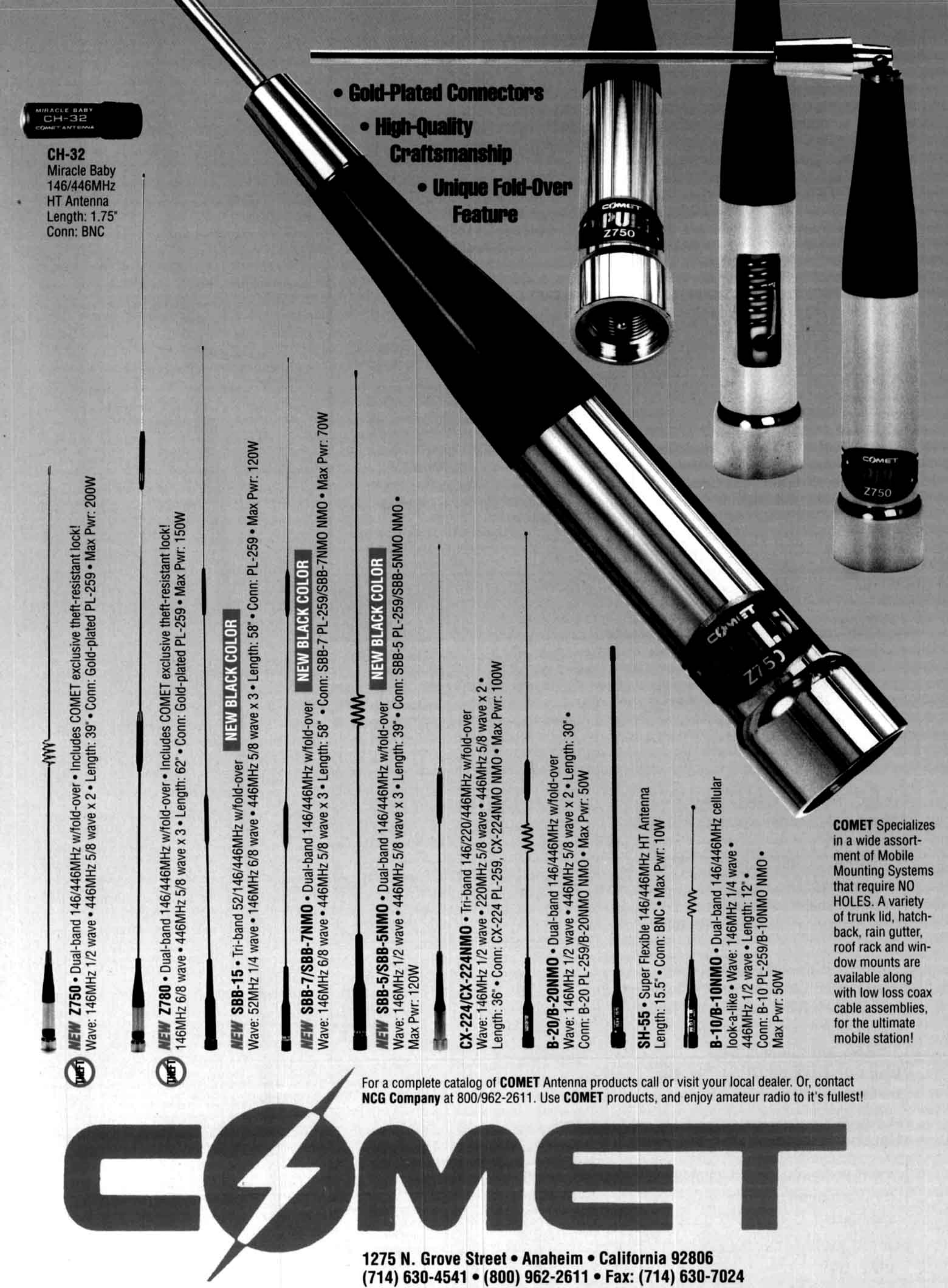
UTAH: SM, Jim Rudnicki, NZ7T— Greetings once again. On 12/5 I attended the Utah County ARES meeting. Boy what a busy group! They are active in all types of public service events, SAR callouts, and lots and lots of training. Their net meets every Tuesday night at 2100 hours on 147.34+ repeater. With around 160 members, they are a wonderful organization. Congrats to Doug Nielson, N7PPW (EC) for a fine job. The 1995 Utah County ARES Member of the Year is Deniece Ricks; KJ7QW. Licensed only two years, Deniece had the highest participation in all of the ARES activities this year. She is the packet radio training coordinator, and has also been instrumental in establishing EOC's in American Fork, and soon in Lehi City. Congrats Deniece! Davis County ARC 1996 officers: president-Mel Parkes, N5UVP, vp- Gary Smith; KC7IHZ, treas.- Colleene Jameson; N7XLP, secty- Suzie Squires; KC7CBR. UARC 1996 officers; president- Bruce Bergen; KI7OM, exec. vp- Cindy Peters; KB7OUT, vp- Gordon Smith; K7HFV, sec- Gary Openshaw; KC7AWU, treasurer- Chuck Johnson; WA7JOS. Be sure to meet your League officers at the VHF Society Swap Meet this month. Also, don't forget to make your WIMU reservations. It's only a few months away! Contact Duane Anderson; KJ7HO (801)-288-1859 for more info. *Tfc*: WA7MEL: 120. 73 de NZ7T.

WYOMING: SM, Rev Morton, WS7W—The Wyoming State Hamfest is set for May 25-26 at the Holiday Inn in Cheyenne. Steve, WA7H, and the Chy-Wy Group are working hard to bring us another great hamfest. Please support our only state hamfest and make your reservations early. At the hamfest banquet, I will present the ARRL Ham of the Year for Wyoming. If you have a ham in your community who should be nominated, please do so. How could I have forgotten to congratulate the Cedar Mountain ARC for winning the Wyoming Club Field Day trophy. This is the first year for such an award and I look forward to seeing the names of all the ARRL affiliated clubs on "The Cup" in the years to come. However, the folks in the Cody area may be tough to beat after enjoying the fruits of their labor. With the new year comes the time to renew your H.E.R.C. membership if you have not done so already. Membership is $15.00 for an individual and $20.00 for a family, and your checks should be made out to the "H.E.R.C." System. It goes without saying that 1995 was a tough year for the system, and we need your membership more than ever. Thanks and 73, Rev, WS7W.

SOUTHEASTERN DIVISION

ALABAMA: SM Tom Moore KL7Q — My thanks and appreciation to all who attended the Alabama Section Meeting in Clanton on Jan 20th. Check the February issue of the Alabama Section News (ASN) for happenings at that meeting. Many thanks to Jim Smiley, KE4CAP, for accepting the tremendous job of Section public information coordinator and editor/publisher of the ASN. His first issue, January, got him off to a great start! All Clubs, Newsletter editors and writers please send a copy of your newsletters and articles to Jim at 117 Talltimber Rd, Alabaster, AL 35007, e-mail ke4cap@scott.net, packet ke4cap@w4cue.#bhm.al.usa.noam or ke4cap@k4ry.#cenal.al.usa.noam (I will auto fwd to him) or ph 205-664-3647. Articles for the ASN need to be to Jim by the 20th of the month. The packet version will be published the last week of the month and the published version will be mailed by the first week of the month. Please keep sending me a copy of your newsletter - how else do I know what's going on around the State? There are many section appointments available. Contact me for details. February 19-23 is severe weather awareness week. Are you and your club's emergency response teams ready? Now is the time to check out your plans and procedures for response to severe weather. Many thanks to Brian Peters WD4EPR of the NWS for all the SKYWARN training classes he has given around the State the past year or so. He has really had a tough travel schedule. Congrats to the Greenville folks for putting on yet another great little hamfest last month. Had a great time there! *Tfc*: KC4TFF 346, W4CKS 285, KC4RNF 179, KL7Q 136, W4ZBA 100, W4DGH 78, W4PIM 72, KC4VNO 67, AC4LM 54, KD4TQN 43, N4YYQ 42, N4ZNO 30, W4XI 24, KD4KT 23, WB4TVY 22, W4NTI 19, W4QAT 17, KD4FZF 6, KS4MN 3.

GEORGIA: SM, Dot Fennel, KA4HHE 912-234-5917—ASM: Dick Walker, N4YPG. ASM: Jim Altman, N4UCK. SEC: Charles Calmbacher, AD4JU. ASEC: Dale Culp, W1BPP. STM: Ed Butorajac, KM4QQ. SGL: Charles Griffin, WB4UVW. TC: Bob Reeves, WB4DVZ. ACC: Cheryl Waters; KB4TJO. OOC/Digital: Tom Mills, KM4DY. PIC: Tom Howell, AD4TA. BM: Mark Eversoll, KQ4WT-Internet Mark@Armstrong.EDU. Hurricane season ended Nov 30th. There were 18 named storms. Eleven of them were hurricanes that left 121 dead & $7.7 billion dollars in destruction.



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Wave: 146MHz 6/8 wave • 446MHz 5/8 wave x 3 • Length: 58" • Conn: SBB-7 PL-259/SBB-7NMO NMO • Max Pwr: 70W
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NEW SBB-5/SBB-5NMO • Dual-band 146/446MHz w/fold-over
Wave: 146MHz 1/2 wave • 446MHz 5/8 wave x 3 • Length: 39" • Conn: SBB-5 PL-259/SBB-5NMO NMO •
Max Pwr: 120W
CX-224/CX-224NMO • Tri-band 146/220/446MHz w/fold-over
Wave: 146MHz 1/2 wave • 220MHz 5/8 wave • 446MHz 5/8 wave x 2 •
Length: 36" • Conn: CX-224 PL-259, CX-224NMO NMO • Max Pwr: 100W
B-20/B-20NMO • Dual-band 146/446MHz w/fold-over
Wave: 146MHz 1/2 wave • 446MHz 5/8 wave x 2 • Length: 30" •
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In the US, $5 billion dollars in damage and 36 people lost their lives. Fourteen Georgians died in Opal. The number of storms unmatched since 1933- 62 years ago. What can we expect in 1996? It's expected to be the same as 1995 due to the climate factors such as the high-level winds blowing out of Africa. SET report deadline January 31, 1996. Hope you made it. Amateurs have really been busy with public service activities providing communication for many organizations. Chatham Co ARES with Arthritits Foundation for the Jingle Bell Run and Reindeer Walk; Dublin hams working with the Dublin Lions Club and cub scouts in Lauren's County; Macon ARES group with the Macon Christmas parade, receiving a nice write-up in local paper. (The Macon officials were really impressed when the ambulance was on site before the local officials were able to make contact. Great work! Thomasville ARC working the Spaghetti 100 Bike Race and the Old South parade. Get your newsletters to me or send a piece of traffic telling me what's going on in your club. We'd like to recognize your group, and any of your members receiving special recognition. Tom Howell, AD4TA (PIC) and DEC GEMA, was recently honored by Georgia Gov Zell Miller for helping a family contact a relative in the Virgin Islands in the aftermath of Hurricane Luis on Sept 5 and 6. Howell was notified of his honor by Gary McConnell, Director of GEMA. Thanks to all the amateurs that provided excellent communications during the hurricane season. Our sympathy and prayers go out to the families of our Silent keys: KK4GQ, AD4NQ, K4VYX and KE4QHA. *Tfc*: W4AET 142, K5TF 133, KA4HHE 109, WD4DSS 75, WB4GGS 67, AD4KA 61, WU4C 59, KM4DY 34, K4VHC 33, N4UZ 25, N5XUJ 20, WB4DVZ 18, K4BAI 12, N4DOM 9, K4LDI 4.

NORTHERN FLORIDA: SM, Rudy Hubbard WA4PUP—ASM: N4ADI. BM: N4GMU. OOC: WB4GHU. SEC: W4MLE. SGL: KC4N. STM: WX4J. TC: W0RAO. PACKET: N4GMU. STM reports BPL for Nov as WX4H, KE4DNO, N4SS, NR2F, NØZO, and WA4PUP. PSHR -KE4DNO, WX4H, AD4DO, WX4J, NR4F, AD4BL, WA4NDA, KD4TOK, KB4OLY, WA4JAQ, N4GMU, K4AJV, WA4EYU, KC4FL. All stations should report their activity to the STM and the EC/DECs to the SEC. Those changing addresses and call signs should report them to ARRL HQ. EC appointments are vacant in several NFL counties, W Pasco, Marion, Hernando, Calhoun, Bay, Franklin, and Levy. All nominations should be directed to the SEC. Only the SM/SEC can make the appointments. The ARES group in E Pan Dist continues to gain strength and members. It now has its own repeater operating as KD4TOK/r. A squall line in early Nov left a trail of destruction in the W Pan (Tallahassee, Gainesville, as well as areas near Ga border. TLH WX office recorded sustained winds above 100 miles per hour. K4LDR, and KD4FG, Citrus are putting out a good newsletter to members. All Club newsletters sent to the SM will be greatly appreciated. The 1997 Jax Amateur Radio and Computer show is to be billed as American Radio Relay League National Convention. Each person attending will receive a permanent personalized credential as a keepsake of this once in a lifetime event. Congrats to The Range newly elected officers, pres.N4KWC, vp KE4QYC, treas. KI4ZL, sec.KE4IOR, dirs. KF4AAF and KD4UJK. All Clubs have been contacted to recommend to the SM someone for PIO. This appointment can be a valuable asset to the Club. The FI DEM will hold another annual meeting of ARES officials sometime in March at TLH. Keep tuned to 3950 ARES Net for more information. *Tfc*: WX4H 2139, KE4DNO 80, N4SS 864, NR2F 562, NØZO 548, WA4PUP 489, WA4NDA 245, WC4D 205, AA4FG 169, KB4OLY 149, KE4PRB 145, AD4DO 104, WD4IIO 100, AD4BL 92, K4AJV 81, WA4EYU 80, W1UKR 69, KF4OWG 69, WX4J 64, KE4LOJ 58, W4KIX 54, N4EDH 48, KD4TOK 48, KB4DCR 45, KF4CCT 42, AD4QH 35, N4JAQ 32, KC4FL 28, KF4BBN 23, KJ4HS 20, KB4T 20, KF4AFZ 19, KT4AAZ 19, KF4SP 17, N4GMU 16, KE4BEF 15, KE4OAV 14, KD4ORV 12, KE4LTS 9, KF4EJV 8, KE4MBY 8, W8IM 2, WB2IMO 6, KJ4UW 6, KM4WC 6, KS4XX 6, KF4BQF 6, KD4JBO 4, KF4BXT 3, AA4ZJ 3, KF4BYA 3, AA4WJ 1.

PUERTO RICO: SM, Guillermo Schwarz, KP4DDB—BM: KP4ECL. SGL: KP4PQ. ACC: KP4QI. TS: KP4RF. TM: WP4IIW. PIC: WP4LTF. The FRA net frequencies are 146.93 MHz Wed at 8 PM and 7225 kHz Sunday at 10 AM. A great cw net is PRN, meets daily 7 PM on 3710 kHz. Our appreciation and recognition goes to Ramon, KP4GE, and Gabriel, KP4BJD, for their outstanding work during the hurricane season using the digital modes. Some great ideas have been presented and we need to work with them before next storm season. QRV? PR DX Club has been having very interesting meetings every second Tuesday of the month. Last months of the year were busy for many new contesters. We will surely see their calls published with the great results. Congratulations to the contester gang for their great scores in the CW WW DX CW 1994: NP4Z, WP4IIW, KP4TQ, KP4DDE, WP4/AA3BG, and KP4VA (op: KP4TK). QRU de KP4DDB.

SOUTHERN FLORIDA: SM, Robert "Rip" Van Winkle, AA4HT 941-853-1400—ASM: K4ZK 407-334-7418. ASM: KA4FZI 941-574-3467. ASM: WB9SHT 407-336-5608. STM: WV5Z 407-496-5257. SEC: W4SS 407-967-1477. Asst SECs: WB2WPA 941-775-2397, KD4GR 305-748-0775. TC: KI4T 305-791-4275. BM: WA4EIC 941-543-4853. PIC: WA4ATF 813-733-9441. OOC: WB4GHU 941-647-1415. ACC: NY1H 813-541-2895. SGL: KC4N 904-385-5924. Pkt Mgr: KB4VOL 407-546-2532. Great to see so many folks at the Tampa Hamfest. The forums were excellent and very informative. Several ARES groups had exhibits set up that were quite impressive. Congratulations to the Peace River Repeater Association on becoming affiliated with the ARRL. KD8AQ, Hillsborough Co EC, reports that a county-wide mass casualty drill was held, with approximately 35 amateurs participating. Several neighboring counties also participated in the very successful drill. It was very sad news to learn that Bob Konkel, N8DEK, had become a Silent key. In addition to being an ARRL PIO in Sarasota Co, Bob was the SERCuit Newsletter editor, an ARES member, and a member of the board of directors of the Sarasota Emergency Radio Club. Bob was an active ham and a good friend to those who knew him. Ron, WD4HAZ, reports that Amateur Radio in Sarasota received some very nice publicity recently. During Hurricane Luis, a local cable news channel ran a piece about Amateur Radio's involvement and included interviews with Deputy

Director of Emergency Management, Bill Quigley, K4QHN, and Ron. Broward County ARES/RACES members were recently recognized for their assistance in the search in August for Owen Betty, Jr. Several members of the family, including Owen Betty, Sr, and representatives from the Broward Co Sheriff's office, Lauderhill and Sunrise Police Departments were also present at the meeting. Owen Betty, Sr. expressed his sincere appreciation to all who participated in the search. Chuck, W4ORA, ARRL Act Dir SE Div, who originally organized the search, presented certificates to the Betty family, the law enforcement representatives, and the amateurs who participated. Thirty-three of forty BBSs submitted their reports to KB4VOL this month and the NTS total increased considerably. The total NTS traffic handled by the BBSs jumped up to 2556 from the 464 handled last month. The SYSOPs are to be congratulated for the fine job they do and the many hours they put in to keep their BBS up and running smoothly. Just a reminder that nominations for the ARRL instructor of the Year awards are due to your section manager by January 31, 1996. If you need additional information, please contact me or refer back to recent bulletins issued by ARRL. Mort, WA2STA, sent a note advising me of ham radio classes that the West Palm Beach ARC is starting on Jan 15. In addition to Novice and Tech Plus, they will also be holding classes for those that would like to upgrade to General. If you know of anyone that might be interested in that area, they can contact WA2STA at 407-433-4031. Don't forget the ARRL Information Net each Sunday morning at 7:30 AM on 3940 kHz. 73 de AA4HT. Tfc: W3CUL 2583, K4FQU 1285, W3VR 1056, K4SCL 866, WA9VND 846, KB6ECH 844, AA4HT 572, KB4WBY 433, W7AMM 430, AB4XK 379, KA4FZI 333, KC4ZHF 314, KA2YZM 304, WV5Z 282, N4RHJ 255, W4DL 253, WA4EIC 176, KD4HGU AA4BN 137, KE4LWN 119, AE4DI 112, KD4GR 111, KD4JMV 110, WB4PAM 109, N4RBX 109, KE4ESV 103, K4RBR 77, K2GNZ 74, WT4F 58, NY1H 50, K9EHP 45, KB4MON 32, KE4UOF 26, WB4GCK 25, KE4RSN 25, W1KAM 16, KE4RWI 15, KB4KAW 14, KF4DKY 13, K4GVI 12, W4WYR 11, K4OVC 6, W4OMI 6, K4ENA 4, W3IJR 4, K8DGV 3.

VIRGIN ISLANDS: SM, Ron Hall, KP2N—ASM: KV4JC. SEC: NP2B. STM: NP2E. TC: NP2R. PIO: WP2K. SGL: NP2I. NM: VP2VI. With extra hours worked after Hurricane Marilyn plus all that insurance money coming in some new ham rigs are appearing in the islands. NP2W is sporting a TM-433 mobile and Standard small dual-bander HT. NP2L is building a satellite station and also assisting WP2O in trying to align his Ku band satellite dish. ARES nets on all islands continue to grow and there is a lot of interest in ham classes. St. Thomas/St. John ARES net report for Nov. was QNI 53, sessions 4. NCS was NP2DJ. NP2DZ has enlarged his battery bank and is looking for more solar panels plus a wind generator. KP2A has a new 180' free standing tower in place. The 146.630 repeater has returned to the air since going down during Marilyn. NP2Y reports that the 10M 29.66 repeater should be on by spring. Hope to see a few of the ex islanders at the Miami Hamfest. 73 de paradise de KP2N.

SOUTHWESTERN DIVISION

ARIZONA: SM, Clifford E. Hauser, KD6XH— Congratulations to the new officers and board members of the many clubs. Please support these people because they will shape the club and state activities for the coming year. The Kachina ARC in Show reported that their Labor Day weekend was spent supporting the "20th Three Flags International Motorcycle Rally" sponsored by the Southern California Motorcycle Association. A 24-hour operation was conducted using people in a three (3) hour shift schedule. The southern Arizona ARC's supported the "Tour de Tucson" bike ride with over 70 operators. These are examples of amateurs supporting community functions. If you need information on club activities, please call. Ron Boan, AK6Y, is the section emergency coordinator. He is responsible for all emergency coordination and activities within Arizona. There are many district emergency coordinators who work with local officials planning emergency communications in the event of a local disaster. These people are the behind-the-scenes workers who will only be needed under difficult situations (i.e. forest fires, floods, etc). Repeater frequency coordination within Arizona is done by the Amateur Radio Council of Arizona. This work is done by "volunteers" and is very time consuming. So if you apply for a repeater frequency pair, please be patient. They work as fast as possible; sometimes under duress. Please provide all ARRL volunteers your support when they need it. I do enjoy reading about your club activities. Just a quick reminder that ARRL provides both the incoming and outgoing QSL service for free. Contact me or the ARRL headquarters if additional information about this free service is needed. The Scottsdale ARC will be the sponsoring club for the 1996 Southwestern Division Convention located in Mesa on October 11-13, 1996. Ham Radio and More, sponsored by Len Winkler, is going strong and now is carried worldwide. Don't forget the spring hamfest at Scottsdale community college on 09 March 1996. I can be contacted by packet radio here in Tucson. My packet address is KD6XH @WB7TLS.AZ.USA.NA. 73, Clifford E. Hauser, KD6XH. Net QNI/QTC/Sess: ATEN 744/122/30; ADNN 312/478/30; ADNN (Oct) 546/269/30. *Tfc*: K7VCC 375, W7EP 169, WB6OTS 89, W7OIF 45.

LOS ANGELES: SM, Phineas J. Icenbice, Jr., W6BF—It is very important to learn to work with volunteers and W6LPJ, Archie Willis, gave us a quote that is well worth its weight in gold. "NEVER ACCEPT A JOB AS A VOLUNTEER THAT YOUR WIFE CANNOT DO WELL". One of the latest radio systems innovations for Amateur Radio licensees is a system for automatically reporting radio positions and displaying them on a computer video screen. This system employs a low cost ($75 to $300) GPS receiver and radio interface to an Amateur Radio transceiver. This system is referred to as "APRS". Automatic Position (or Packet) Reporting System. According to Pat Bunsold, WA6MHZ, there are about two dozen or more systems operating in the San Diego area at the present time. Pat is the ARRL section manager in San Diego and has been instrumental in promoting the system for emergency service. This system allows many stations to exchange data just like voice users would on a voice net. Any station can insert information into the network and each station on the packet network can receive

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and log it. The APRS network operation solves the real time tracking problems. The computer display is in color and rather spectacular with the capability of displaying various selected MAP sizes. Special events and emergency situations need real time communications and information about the location of emergency vehicles, weather damage, key assets and other real time management data. All of these good things are provided by this unique packet reporting system. Most of us realize that working together is synergetic and efficient but Burk, W6LZN, has reported from his Masonic paper "Agricultural Notes" issue #97 that geese have a lesson for all of us. Geese fly in a "V" formation, for a very good reason. As each bird flaps its wings, it creates an "uplift" for the bird following. By flying in a "V" formation the whole flock adds 71% more flying range than if each bird flew alone. Furthermore, when the lead goose gets tired it rotates back into the formation and allows another goose to lead from the point position. (The lesson is; it may pay to take turns doing the difficult job.) Oh, yes the geese also honk at each other to keep an orderly "V" flying formation. Lee Trevino once told me that the difficult golf shots got easier when you practice eight hours every day for five years. His wife also told him that he must have been vaccinated with a photograph needle. If you have trouble speaking into a microphone maybe you should consider being vaccinated. If you have trouble with the code, you need a different needle! Just as in Lee's case, your spouse may supply the needle, asked for or not! The Westside ARC, conducted their 53rd annual DEAD BAND HEAVY WEIGHT contest in November. The exchange is a signal report and your weight. The signal exchange must take place on the Novice portion of the 10 meter band. This award is called the prestigious 31 FLAVOR AWARD! Hank, W6SX sent in a traffic total of 63! We have an excellent, free BBS configured and operated by our ACC Joe Cira, KB6AXK, on 818-584-1952. This ARRL bulletin board (BBS) has had 610 users with an average of about 255 calls per month. This ARRL BBS has all of the latest ARRL HQ bulletins available to you free on a local phone number. Joe has a total of 5,700 files, if you can't find what you want let Joe know and he will make every effort to put it on this BBS if at all possible. 73 de W6BF Phineas

ORANGE: SM, Joe H. Brown, W6UBQ—ASMs: Riv Co-Bob, W6LKN 909/686-3823; Org Co-Art, W6XD 714/556-4396. SB Co-Ken, WA6ZEF 909/983-1272. Membership/Recruiting- Orville, K6LEF 909/737-2388. Section News/PIC: Gwyn, KE6JOF 909/685-7441. SEC: Fred, KA6IXY 909/674-1731. ASM INYO Co-Nancy, KE6TSH. Orange RACES reports, "Fog, Frustration, Flat tires, Fun!" — and more, all experienced by both hunters and hikers alike as they celebrated their 50th monthly T-hunt. Keep up those good Amateur Radio practice sessions! And, from the Morongo Basin ARC we hear that their ARES/RACES members and other hams provided communications support for the Sheriff's Dept. Search and Rescue Annual Soggy Dry Lake Desert Run last October. Too many hams to mention in their column, that really goes to show the level of their support. Great participation—great job! STM N6GIW reports for Nov 95 PSHR: KO6RZ 168, WF6P 135, N6GIW 105, SCNV 30, Sess QNI 344, QTC 190; BBS Tfc: WF6O 193; Indv Tfc: KO6RZ 468, N6GIW 281, KC6SKK 147, ADØA 145, N6HIW 71, KO6EYI 52, WF6O 45, W6RE 30, KD6BWH 29, KA6TND 28, KE6SBJ 28, KC6YRH 26, KC6SFP 20, N6OKS 4. Vy 73 W6UBQ.

SAN DIEGO: SM, Patrick Bunsold, WA6MHZ 619-561-0052—ASM: Rich Medhurst, KD6BFO. ASM/MARS: Harry Hodges, WA6YOO. ASM for Youth: Frank Forrester, KI6YG. SEC: Pat Ryan, KC6VVT. ACC/PIC: Tuck Miller, KC6ZEC. STM: Warren Dilley, KT6A. SGL: Mark Carroll, KB6OSP. Attention ELKS! The El Cajon ELKS ARC Post 1812 meets every 1st Wed at 1115 AM at the Lodge at 1400 E. Washington, El Cajon. Join them for a great lunch and meeting! Visitors and guests welcome! Ed Andress W6KUT is new entrant into the San Diego DX Club's Hall of Fame at the Christmas party Dec 1st. Palomar ARC had a mini convention with many exhibitors! Tuck, KC6ZEC, is new prez of ARC of El Cajon! More space available now at ARCEC Swapmeet 1st & 3rd Sats (6 AM) at Santee Drive-in. Come enjoy the bargains & meet your fellow Hams! ARES NET is 7 PM Sundays on 146.265 Lyons Rptr. North Shores ARC had an APRS demo by Bob KI6MP and TC/OOC Del N6JZE. Specia TNX to Tom KM6K and HRO Crew for support of San Diego Ham Community! Computerized yet? A 486 today costs 1/4 of what it did last year! Tune in APRS activity on 145.790 in SDGO. ARES DECs North: Dennis, K7DCG, South: Pat KA6PSG, East: Rich N6NKJ, Central: Al W6WYN. Tfc: SDCTN: Sess 29, QNI 187, QTC 162. ARESP: Sess ?, QNI ??, QTC ?; ARESN: Sess 4, QNI 16, QTC 1. Tfc: KT6A 964, KC6ZEC 137 (Oct 81), KE6TOQ 58, KC6VVT 44, KE6MTT 40, KE6KNN 28, KD6YJB 14. WA6IIK PSHR: KT6A 142, KC6ZEC 103, (Oct 101). MY Packet: RATBBS (WA6MHZ) or PBBS WA6MHZ-10 on 145.01;on SoCal Packetcluster or Via WA6MHZ @WA6BGS.#SOCA. E-mail Internet adr: pbunsol@CATI.CSUFresno.EDU.

SANTA BARBARA: SM, Jennifer Roe, AA6MX—ASM: ACT: Chuck McDonald, WA6VEP. BM: Howard Coleman, N6VDV. OOC: Mike Baugh, W8AKF. STM: Robert Griffin, AB6YR. PIC: Jeff Reinhardt, KM6II. SEC: Jennifer Roe, AA6MX. Silent Keys: Condolences & sympathy to the friends & family of Frank Robinson, KE6BGD (VCARC), and Dale Auth, N6BUY (EC for SLO_ECC). Clubs: Congrats to the Leisure Village ARC, our newest Affiliated Club. Welcome to new club president Bill Allen, N6XD (Ventura County ARC). PARC joined in the Ventura Street Fair on 12/4/95 helping with lost children patrol & a PR booth operating 2 meters & HF. Weather: N6VDV & KE6JQP are developing a pilot program for automatically reporting weather conditions via packet to the US Weather Bureau. ARES: Congrats to Ed Reiten, AC6HR, returning president for the SLO_ECC. On 11/29 36 ops provided backup/overload communications for the SLO County Emergency Response Exercise. HF & packet were used in the exercise; the standby VHF was never used. Vandenberg Symposium: Ventura, South Santa Barbara County, Lompoc, Santa Maria, & San Luis Obispo County ARES members participated in the Vandenberg Emergency Symposium held mid-November. ARES was represented at every symposium held on Saturday. On Sunday, ARES participated with other emergency organizations in a drill held at the base. VE

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INFORMED SOURCES

The ***ARRL Letter*** provides news of interest to active, organizationally minded radio amateurs faster than it can be disseminated by QST. We strive to be fast, accurate and readable in our reporting. Available to ARRL members only. Twice monthly. 24 issues by first class mail to the US, Canada and Mexico: $19.50. Elsewhere by airmail: $31.

QEX, the ARRL Experimenter's Exchange, provides a medium for the exchange of ideas and information between Amateur Radio experimenters in order to document advanced technical work and support efforts to advance the state of the Amateur Radio art. Monthly. For 12 issues to ARRL members: US, $15; Canada, Mexico and US by first class mail $28; Elsewhere by airmail $48 or surface mail $20. Non-members add $12 to these rates.

NCJ, the National Contest Journal, features articles by top contesters, letters, hints, statistics, scores, NA Sprint and QSO Parties. Big gun or small, ***NCJ*** provides a valuable source of information on the active world of competitive radio. Bimonthly. For 6 issues (one year): US, $12; US, Canada and Mexico by first class mail, $20; elsewhere by surface mail $22; airmail $30.

THE AMERICAN RADIO RELAY LEAGUE
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Sessions Happenings: 2/3, Estero ARC; 2/10 Santa Maria, Camarillo. Traffic Report: AB6YR 118, KM6RZ 50, KN6VV 9, KC6JLW 8, KO6SX 5, KK6NQ 4, WA6DQK 2.

WEST GULF DIVISION

NORTH TEXAS: SM, Bob Adler, NZ2T (800-376-9933, Pkt NZ2T@NZ2T.#DFW.TX, E-mail NZ2T@aol.com).—ASMs: W5GPO, W5IWE, KG5SC, WD5IVD, KF5BL, KB5LES, WB7NPH, N5UQA, KB5YAM, N5WOY, KJ5AE, K5RE, KA5TTO, K5LP, K5SXK, K5ZSB, K5MXQ, KK5NA, KK5QA, KJ5GE, ACC: W5SOQ, STM: WD8LDY, SEC: K5UPN, PIC: WW5L, SGL: N5GAR, TC: KJ5BA, OOC: WB5UDA, BM: WO5H. We regret the loss of the services of AC5Z, who has served with distinction as our ASM in the Southeastern part of the section. We wish Bert well in his future activities. Congratulations to KA5TTO, new DFW Late manager and to N5NAV, manager of TTN for 1996. Monthly spotlight this month shines on Dan Griswold, KC5GMR. Dan's leadership and his warm and kind disposition provided the net with a leadership role model that everyone could feel comfortable in emulating. I understand that Dan will be leaving us upon graduation, but we're glad that we had this chance to get to know this gentlemen. Kudos to KF9AS on her receiving the BPL medallion at the DFW holiday party. Also, that same evening the net named their "traffic handler of the year," who this year is KC5GNI. FB. If you'd like to bring someone special to my attention for this segment, please drop me a line or call me. A few days prior to this article being written, I had the privilege of moderating a joint section meeting that was held in Austin. We would like to thank Hal, W5MDL, for his hospitality, expertise, and wit. We enjoyed the meeting and look forward to more of the same in the future. Committees were formed to coordinate digital activities in NTS throughout the state, a statewide public service coordinating committee, a few special interest matters were attended to as well. One goal is a statewide SET with all the trimmings ready to go next fall. We regret to report the passing of two fine amateurs: Truman Goodman, W5AIR, and Ed Price, KG5GO. Both were active in a variety of activities, and both will be missed by their many friends and their respective families. Nominations for North Texas Amateur of the Year are open. Please submit your nominations to me prior to March 31. Nominations should be 250 words or less with a second supporting nomination of 100 words or less. Welcome new field organization member K5CW. Thanks to Bill, KF5BL, for the following report on upgrades and new licensees for month of November: Tech: C Earl, D Lang, R Forsyth, R Parvin R McCarthy R Rheinfield. Tech (+) KC5MTN, KC5QQV, KC5RHV. Advanced KC5LRZ. Extra KC5EPZ. Thanks to the fine job done by Ft Worth/AB5QU, Longview/N5RQC, Irving/KF5BL, and Anna/KA5TTO VE teams in administering these exams. If you upgraded in November, and do not see your callsign here, it is because it was not reported for publication by the VE team leader where your took our exam. Please remember the weekly ARES net each Monday night on 3783 at 7:30 PM with Joe, K5UPN. For those who are able, I host a weekly net on 145.19 (PL 110.9) each Wednesday at 7:15 PM. November traffic nets (Net/Mgr/QNI/QTC) DFWE/KC5GMR/530/188, DFWL/KE4LPD/394/156, DTTN/509/116, TTN/N5UAP/959/137, TEX/WD8LDY/342/163, TSN/K5UPN/152/69, NTXD/KB5GLV12/1662. DRN5 report from WB5YDD, NTX 100% by W5AYX, KF5BL, K5MXQ, W5VMP, K5UPN, NZ2T, KD5RC and WD8LDY. *Tfc*: BPL: NZ2T, WD8LDY, KE4LPD/100 originations. KB5GLV 289, KF9AS 210, K5MXQ 193, W5AYX 139, KF5BL 110, KJ5GE 95, KA5TTO 67, KC5OZT 72, KC5GNI 59, KK5ST 58, WB5BKM 53, KC5GMR 44, KC5MVB 41, AC5CR 33, W5VMP 25, KK5BE 20, KJ5VL 20, WA5EZT 18, KC5EIV 18, W5CMX 15, KC5NEZ 12, KB5YAM 4, N8QVT 1.

OKLAHOMA: SM, Joe Lynch, N6CL— I regret to report that Raymond Selby, K5LLK, became a Silent key on October 26. Ray was a charter member of the Wheatstraw ARC and will be very much missed by all the Wheatstrawers. I always enjoyed hearing Ray's friendly, gravely voice on the radio. Somehow, the airwaves will not be the same. OKDXA has rejoined the Central Oklahoma Radio Amateurs Association (CORA), thereby using CORA's newsletter as its media outlet for the club. If your club is principally located within the central Oklahoma area, you might consider affiliating with CORA. The consolidated news contained within the "Collector and Emitter" along with the excellent tidbits of information produced by its Editor, Harold Miller, KB1ZQ, and Circulation Manager, Linda Miller, N1LPS, are always a delight to read. If you are not a member of an affiliated club, you still can subscribe to the newsletter. Drop Linda a note at PO Box 95942, Oklahoma City, OK 73143-5942 and she will send you the information. Dave Land, KD5FX, reported that the QSL card for his contact with TK5EL was hand delivered to his door by the manager Reinhard Maute, DF4TD. Dave says that Reinhard does a lot of traveling and enjoys surprising hams with his personal delivery style. Dave added that Reinhard spent the better part of a morning looking for a ham in Claremore but could not find his address. Oh, well, I guess that card will just have to go via the bureau. As I am writing this column, it's finals time here at SMU. I have really enjoyed going back to school. However, at the moment, I have one more final to take. So, I better put a "final" touch on this report and e-mail it to the League. Until next month...73 de Joe, N6CL.

SOUTH TEXAS: SM, Alan Cross, WA5UZB—The new year has arrived and with it opportunities. I want to remind you of duties and responsibilities to yourself, your community, and your service. Many club and organizations use the new year to install new officers and plan yearly activities. All outgoing presidents and staff should meet with incoming presidents to guarantee that club paperwork is handled in a correct and timely manner. For example, has your club's ARRL yearly affiliation paperwork been completed and sent in? If you have a VE team, have they planned the yearly test sessions and let HQ know that schedule (and passed that information on to your newsletter editor and newsletter editors of other clubs). Have you sent "thank you" letters to the folks that rent you the facilities in that you meet? For you new presidents, talk with folks in your club so that you won't be caught short in your paperwork duties. Has your activity chairman listed what the plans for the new year? Remember that the Section has a number of well-qualified persons that will come and speak to your club and HQ has a profusion of resources that you can call upon (such as a great video library). What about club activities? Everyone plans for FD, but how about other contests to pique the interest of local hams; such as using the 10-meter contest with the newer hams for fun and a wintertime activity; the 160-meter contest to show folks that there is life on the top band (!) and what it takes to operate with a lot of patience; or the RTTY contest to demonstrate a new mode to amateurs who aren't knowledgeable in digital modes. I know that your organization is planning on at least one test of emergency communications preparedness; but are you planning on the once-a-year ARRL sponsored SET? Or the unplanned "real" emergency or disaster? Your club's public information officer and community liaison should always be included so that your fine activities are known in the community. Remember to invite the media to your meetings and your events. Those involved in recruiting should have a good year. Plenty of new hams are being generated by the efforts of your VE team. Use them as volunteers to help your club grow. This year, look beyond your club and your community. Is your club "right" for everyone in the amateur community? If not, perhaps the community needs another club. If so, help them get organized and started on the right track! Look at getting additional volunteers for the work that needs to be done, and the work that could be done. It's still a fun hobby and a great service. Let's see how much more we can do this year. And finally, thank you one and all, for what you do as an individual to better your community and our nation. *Tfc*: W5KLV 504, N5NAV 328, W5YQZ 161, W5CTZ 107, WB5YDD 102, WA5FXQ 82, KK5QT 59, WD5GKH 54, KB5UCQ 52, W5ZIN 49, KB5SYP 48, KB5RUG 46, KB5GST 44, N5WSW 32, W5RZV 31, KD5GM 22, N5OUJ 12, KG5CX 10, N5JUU 9, W5SJA 6, KC5JEE 4, N5XJS 3.

WEST TEXAS: SM, Milly Wise, W5OVH—Seasons Greetings to everyone from West Texas. From the West Texas ARC "relay", the officers are for 1996 are Jerry Naylor, KB5THR pres., Mark Ingram, KI5ER v-pres., Thomas McCain, KC5ETW, secretary, Les Blacock, N5KOA treas., Mike Glen, WD5EGS Director...Congratulations to all newly elected officers.. Wish to thank all the people who helped with the Odessa Hamfest and also the other hamfests that are held. It takes a lot of work and effort by all who put on hamfests or conventions. Having participated in all different capacities in many different hamfests and conventions, I feel I am well qualified to give a special thanks for the work well done. Get well wishes go to Ray Hudson, KF5LZ who is recovering from surgery. The Kilowatt bulletin from San Angelo reports that seventeen people turned out to help with the adopt-a-highway cleanup and the club held a special event station starting Nov. 30th. Let us all start planning to attend the St. Patrick's Day Hamfest in Midland on March 15 and 16. I will be there and also it is not too early to plan to attend the Abilene Convention or Hamfest. As I learn about dates and months and times of different hamfests we'll let everyone know. Sorry to report I just got word that the XYL of a very active and well known ham in West Texas has passed away, Carolyn McNutt, XYL of Trevor, W5KBP. 73, Milly.

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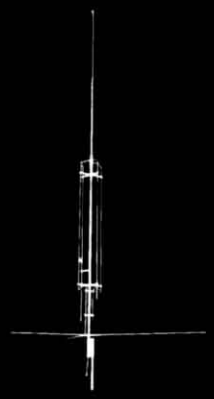
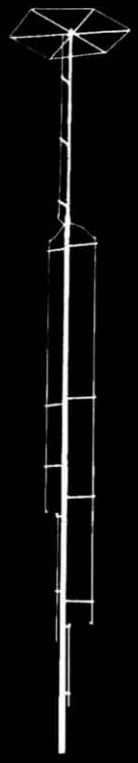
We at GAP realize there isn't a perfect antenna. No singular antenna will scream DX on 80 and be the best for local nets on 10. If anyone tells you there is, beware! The perfect antenna does not exist, but the right one for you may. If you want something to bust the pile on the low bands, then consider 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."

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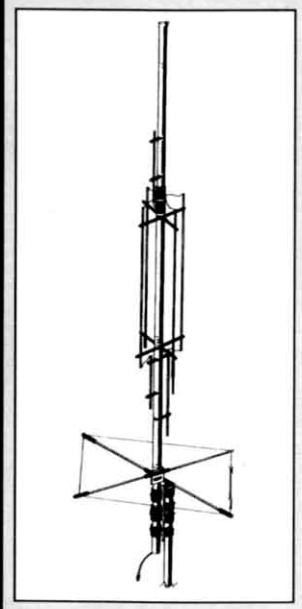

This all purpose antenna is designed to operate 10m-80m, WARC bands included. It sits on a 1-1/4" pipe and can be mounted close to the ground or up on a roof. Its bandwidth and no tune feature make it an ideal antenna for the limited space environment as well as a terrific addition to the antenna farm.

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Eagle DX			■	■	■	■	■		■			21.5'	19 lbs	1-1/4" pipe	80" Rigid	$269
Titan DX (Just Released)			■	■	■	■	■	■	■	■		25'	25 lbs	1-1/4" pipe	80" Rigid	$289
Voyager DX							■		■	■	■	45'	39 lbs	Hinged Base	3 Wires @ 57'	$399

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- Rx expands 130 - 170 MHz by keypad control
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- VFO/Memory Scan
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- Backlit LCD Display and DTMF Pad
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- Multi Function DTMF Microphone
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- Memory/Band Scan
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- Auto Power Off
- Dual Frequency Watch
- 4 Step Display Dimmer
- Frequency Lock
- 16 Digit DTMF Decode and Display
- Dual Tone Squelch System Paging
- Time Out Timer (Adjustable)
- Selectable Frequency Steps
- S - Meter Squelch

AR - 446 : 430 - 450 MHz

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- RX expands 425 - 475 MHz

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Voltage (VDC)	3-15	13.8	1-15	1-15	13.8
Current (ICS)	12	14	30	40	5.2
Current (cont.)	9.2	12	24	32	4.2
Ripple(max.)	3mV	3mV	3mV	3mV	3mV
Regulation	1%	1%	1%	1%	2%
Cooling Fan	NO	NO	NO	YES	NO
Size(inch.)	5x4x9	5x4x9	7x6x9	11x5.5x9	6x3x9
Weight (lbs.)	11	11	18	22	6
Meter	YES	NO	YES	YES	YES

Daiwa Switching Power Supply

Compact, Lightweight, Highly Efficient, 40amp supply Auto Switching - 100-117V or 220-240V Input.70 - 132V or 140-264V; crossbar protection.

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Isolation	60 dB 600MHz	50dB 1 GHz	60dB 300 MHz
Conn.	SO239	N	N

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- Famous Cross Needle Meters -

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CN410M - Mobile 3.5-150MHz • **CN460M** - Mobile 140-450MHz • **CN465M** - Mobile 140-450MHz

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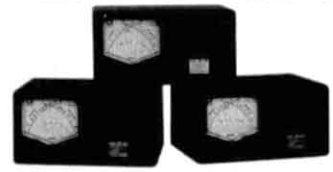

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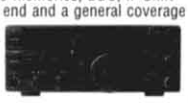
FT-840 $100
This new transceiver delivers the fun and performance you're looking for while staying on a budget! It has 100 watt output, 100 memories, DDS, IF Shift FET front end and a general coverage receiver, all for a low price.



FT-736R
Satellite and all-mode 2m/70cm work gets exciting with this full-feature transceiver. Linked tuning, 12 unlink memories, 100 memories, and 2 optional modules offers band extensions for 6m, 220MHz, or 1.2 GHz operation.

FT-530
The newest member of the dual band family. This hand-held sports auto tone search, 82 memory channels, automatic power off, built-in VOX, dual in-band receive feature, built-in cross band repeat function and much more. $70

FT-10
New, small and versitile. With Mil-spec and lots of audio.

FT-1000MP
Features E.D.S.P. on Tx & Rx, Collins• Filter, shuttle-jog tuning, dual Rx & more to make this feature packed transceiver "The most technologically advanced HF rig today" See the CD-ROM for an active demo.

FT-8500
Control in the palm of your hand is yours with the FS-10 smart controler mic combo. This new large & uncluttered omni glow display features "Spectra analyzer & menu programming. Removeable/remote front panel CTCSS encode, messaging, TOT, APO, 110 memories, A/N memory & much more. MIL-STD 810/C rating. $30

FT-2500M
This new 2 meter mobile borrows its ruggedness from the FT-2400H while adding great new features such as advance track tuning, time out timer, A.P.O., 9600 bps option, 31 memories, the new "omni-glow" LCD display and more! $30

FT-11R/31 $30
This new HT packs the features you want in a small size. It features a new alphanumeric display, super small profile, new square "D" battery design, lit keypad, AM air craft receive, DSQ & CTCSS encode.

FT-2200H $40
This compact, full-featured mobile comes with 49 memories, 10 DTMF autodial memories, A.R.S., CTCSS encode, digital squelch and lighted keypad are standard features.

FT-51R $30
This new H.T. is the world's smallest dual bander. FET output, back lit keypad, V+V, U+U and U+V operating modes, *Spectrascope*™, CTCSS encode, DTMF paging, 120 memories, cloning, and much more.

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DR-610
This dual band mobile offers channel scope, 120 mem's, LITZ alert & multi color display panel to create user friendly fun.

DJ-G5T
Here's a dual band H.T. to the Max. Channel scope, 160 mem's, DTMF, RF att. V/V-U/U, TOT, APO & 20 more features add up to fun & function. More is better.

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160 meters through 6 meters with a removable face plate make this mobile ready for your vacation fun *NOW!* Dual VFO's, 100 memories, wide band receive provide long lasting performance.

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TRAP DIPOLES

Model	Bands	Traps	Length	Price
D-314	12/17/30	4	37'	$89.95
D-42	10/15/20/40	2	55'	74.95
D-52	10/15/20/40/80	2	105'	79.95
D-56	10/15/20/40/80	6	82'	125.95
D-68	10/15/20/40/80/160	8	146'	162.95

SINGLE BAND DIPOLES

Model	Band	Length	Kit Form Price	Assembled Price
D-10	10	16'	$18.95	$23.95
D-15	15	22'	18.95	23.95
D-20	20	33'	19.95	24.95
D-40	40	66'	24.95	28.95
D-80	80/75	130'	29.95	33.95
D-160	160	260'	41.95	45.95

Includes instructions, Deluxe Center Connector, 14 ga. Stranded Antenna Wire and End Insulators. Coax Fed.

LIMITED SPACE DIPOLES

- Reduces overall length over 40%! • Coax Fed.
- Shorteners* are enclosed, sealed, weatherproof and lightweight.
- Complete with Deluxe Center Connector, 14 ga. Stranded Antenna Wire, End Insulators, and Assembly Instructions.
- Use as inverted "V", or flat-top. • Excellent for all class amateurs.

Model	Band	Length	Price
LS-40K	40	38'	$48.95
LS-80K	80/75	69'	54.95
LS-160K	160	100'	56.95

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- Features "Double Protection".
- Utilizes a hermetically sealed gas filled discharge element.
- Easy to install in coax line.
- 2 arresting stages.
- Restores itself after each surge.
- Diverts transients to a safe ground, away from your equipment.
- Unit has standard UHF (SO-239) receptacles.

"2 Year Guarantee"

Model LA-250 (handles 250 watts)	$32.95
Model LA-2000 (handles 2000 watts)	34.95

ALL TRAP ANTENNAS are Ready to Use - Coax Fed - Factory Assembled - Commercial Quality - Handles 600 Watts - Comes complete with: Deluxe Traps, Deluxe Center Connector, 14 ga. Stranded Antenna Wire and End Insulators. Automatic Band Switching - Tuner usually never required - For All Transmitters, Receivers, & Transceivers - For All Class Amateurs - One Feedline works All Bands - Instructions included.

● Any single band, or Trap antenna with PB-1 Balun instead of Deluxe Center Connector; Add $10.00 to antenna price. (For PB-1-C – Add $12.00)

ALL BAND – LIMITED SPACE ANTENNA

- Works ALL Bands 160 thru 10 Meters
- Sealed, weatherproof lightweight shorteners utilize NO rust terminals
- Perfect match for your Antenna Tuner with balanced line output
- Handles Full Power
- Works with all transmitters, transceivers receivers, etc.
- Completely Factory Assembled – Ready to Install! – NO adjustments necessary
- Only 70 feet overall length!
- Perfect for ALL classes of Amateurs
- Install as Flat-top, Sloper, Inverted "V", or almost any configuration
- Shorteners provide full 135 feet electrical length, with only 70 feet physical length
- Utilizes Heavy 14 gauge stranded wire
- INCLUDES 100 ft. of 450Ω Feedline

MODEL AS-2 – $49.95

★ ★ ★ ★ ★ ★ **COMBO SPECIAL – #AS-2-SP** ★ ★ ★ ★ ★ ★
AS-2 – ALL BAND Antenna with popular MFJ-949E Ant. Tuner only $179.95!
And get a 18' RG-8X Interconnect cable **FREE!!**

COAX CABLE: (Includes PL-259 connector on each end)

Type	Length	With Antenna Purchase	Seperately
RG-58	50'	$12.00	$13.95
RG-58	90'	17.00	19.95
RG-8/213	50'	27.95	31.95
RG-8/213	100'	44.95	48.95
RG-8X	50'	14.95	18.95
RG-8X	100'	22.95	26.95

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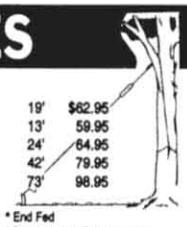
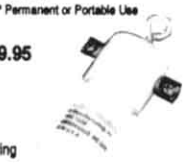
VS-312	12/17/30	2	19'	$62.95
VS-32	10/15/20	2	13'	59.95
VS-42	10/15/20/40	2	24'	64.95
VS-53	10/15/20/40/80	3	42'	79.95
VS-64	10/15/20/40/80/160	4	73'	98.95



* Can be used without radials
* Feedline can be buried if desired
* End Fed
* Permanent or Portable Use

"PRO-BALUN" PB-1 – $19.95



- 1:1 For Dipoles, Beams & Slopers
- Handles Full Legal Power
- Broadband 3 to 35 Mhz.
- Lightweight, Sealed & Waterproof
- Deluxe connectors require NO soldering
- NO jumper wires
- Minimizes coax & harmonic radiation
- Accepts standard PL-259 connector

2" x 6.5"

"PRO-BALUN" PB-1-C – $21.95

"Current Type" 1:1 Ratio - 3KW – 1.5 to 55 Mhz.

"PRO-BALUN" PB-4, 4:1 Ratio – $21.95

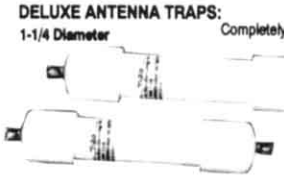
DELUXE CENTER CONNECTOR

- NO RUST Brass Terminals
- NO Jumper Wires Used
- NO Soldering
- With SO-239 Receptacle
- Handles Full Power
- Completely Sealed & Weatherproof
- Easy Element Adjustments
- Commercial Quality

CE-1
$8.95

DELUXE ANTENNA TRAPS:

1-1/4 Diameter



Completely sealed & weatherproof
Solid brass terminals
Handles 600 watts
NO jumpers
NO soldering
Instructions included

T-10, T-12, T-15, T-17, T-20 – $20.95 EACH
T-30, T-40, T-80 – $21.95 EACH

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LM-354	$1,865	$1,300
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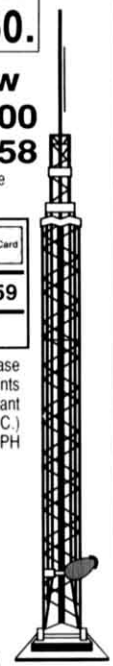

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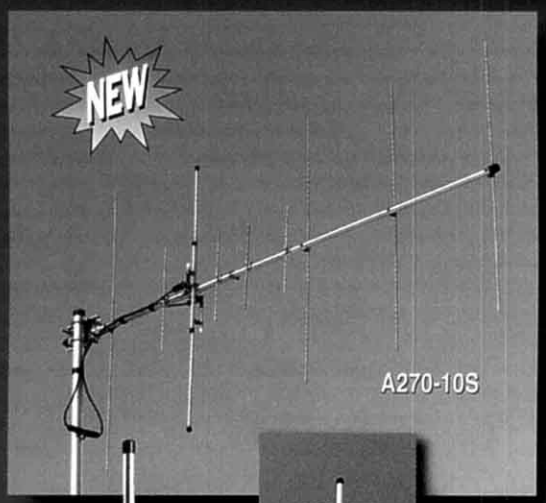

NEW A270-10S

Increase your range on 2 meters and 70 cm with this new Cushcraft dual band Yagi. Make more solid contacts on FM and eliminate many disconnects and retries on packet by focusing your transmit and receive power. The latest computer-aided design and long-life stainless steel hardware make this antenna the right choice for improving your station's performance.

A DUAL BAND FOR ANY APPLICATION

Cushcraft's full line of American made dual band antennas offers a solution for every need. The ARX-270 fiberglass is an excellent choice for those demanding requirements for long-range communications or repeater applications. Now you can run your 2 meter and 70 cm repeaters into the same antenna. AR-270B is designed for high performance at a moderate price and all in a package that is less than 8 feet tall. The AR-270 for compact spaces provides excellent coverage and easily fits every budget. Cushcraft AR-270 and AR-270B feature all aluminum construction. All models have stainless steel hardware and are guaranteed to withstand winds up to 80 mph. Our CS-270M is a sophisticated dual band mobile which is designed for high performance and all weather durability.

MODEL	A270-10S	
Frequency, MHz	144-148	430-450
No. Elements	5	5
SWR 1.2:1 Typical		
2:1 Bandwidth, MHz	≥4	≥10
Power Rating, Watts PEP	350	350
Boom Length, ft (m)	6.17 (1.9)	
Longest Element, in (cm)	40.3 (102.4)	
Turning Radius, ft (m)	6 (1.8)	
Mast Size Range, in (cm)	1.25-2 (3.2-5.1)	
Wind Load, ft^2 (m^2)	.725 (.07)	
Weight, lb (kg)	1.8 (.81)	

MODEL	AR-270		AR-270B		ARX-270U/N	
Frequency, MHz	144-148 / 430-450		144-148 / 430-450		144-148 / 430-450	
SWR 1.2:1 Typical						
2:1 Bandwidth, MHz	>4	>15	>4	>15	>4	>20
Power, Watts FM	250	250	250	250	200	200
Height, ft, (m)	3.75 (1.13)		7.7 (2.3)		16.5 (5)	
Mast Size Range, in	1.25-2 (3.2-5.1)		1.25-2 (3.2-5.1)		1.25-2 (3.2-5.1)	
Radial Length, in (cm)	6.75 (17.1)		20 (51)		20.5 (52.1)	
Wind Load, ft2 (m2)	0.27 (0.03)		0.47 (0.044)		0.95 (0.088)	
Weight, lb (kg)	2 (0.9)		2.4 (1.09)		5 (2.3)	
Construction style	High strength aluminum		High strength aluminum		Fiberglass enclosure	

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TS-450S/AT • w/tuner..... **CALL**
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TM-241A • 2m FM transceiver .....**CALL**
TM-331A • 25w 220 xcvr w/TTP mic **CALL**
TM-441A • 35w 440 xcvr w/TTP mic..**CALL**

TM-251A • 2m FM xcvr w/9600b ...**CALL**
TM-451A • 440MHz FM 9600b .... **CALL**

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TH-28A • 2.5W 2m HT/batt/cgr/TTP.. **CALL**
TH-48A • 2W 440 HT/batt/cgr/TTP.. **CALL**
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FT-1000D *Deluxe* • dual bandpass filter • temp. compensated xtal osc. • 2.4kHz & 2KHz SSB filters, 500Hz CW crystal filter.
New! **FT-1000MP & FT-1000MP/DC** Features include E.D.S.P on transmit & receive, Collins mechanical SSB filter, shuttle jog tuning, dual receive, menu system.

FT-990 HF Transceiver • tx: 160–10m • **rx:** 100kHZ–30MHz • 90 memories • SCAF • FSP • DDS • high speed antenna tuner w/memories • AC power supply • 12¾"w x 4½"h x 11½"d. **FT-990DC** is DC version

FT-840 HF Transceiver • tx: 160-10m Ham Bands • **rx:** 100kHz-30MHz • 100W •100 memories • Twin band stacking VFOs • optional FM • automatic repeater offset • CTCSS encode • 9⅞"w x 3⅜"w x 9½"d.

FT-8500 Dual Band Mobile • Compact with new Spectra-Analyzer and FS-10 Smart Controller mic. 50/35W, 5½"w x 1⅜"h x 6 ¼ "d, 2.4 lbs. **FT-8500/MH-39** features MH-39 standard TTP mic.

FREE YSK-900 Remote Kit! with FT-900 FT-900/AT FT-900/CAT *Limited Time*

FT-900/AT HF Transceiver • tx: 160–10m • **rx:** 100kHz–30MHz • 100W • 100 memories • built-in antenna tuner • front subpanel optionally mounts separately from the main body • CTCSS encode with repeater offset • twin stacking VFOS.
FT-900 • no built-in antenna tuner.
New! **FT-900/CAT** • features a Collins mechanical filter for superior IF performance.

FT-736R Multi-Mode U/V Full Duplex Base 2m: 144-148MHz; **70cm:** 430-450MHz • opt. modules for 50, 220MHz & 1.2 GHz • 100 memories • full duplex crossband • inverted tracking • 25W–144, 220 & 440MHz, 10W–50 & 1.2GHz • built-in AC supply/13.5 V DC • 5⅛"h x 14½"w x 11½"d.

FT-5200/6200 Dual Band Mobiles
32 memories • CTCSS encode • dual receive • built-in duplexer • cross band repeat • remote capability • 5½"w x 1⅜"h x 6"d.
FT-5200 • 2M/440MHz (50/35w).
FT-6200 • 440MHz/1.2GHz (35/10w)
FT-5100 • Like FT-5200 w/o remote feature.

FT-2200/7200 Mobiles
50 memories • DTMF page/coded squelch • backlit DTMF mic • 5½"w x 1½"h x 6¼"d.
FT-2200 • 2m with 110-180MHz rx (50w).
FT-7200 • 440MHz (35w)

FT-7400H Mobile (left) • 440MHz (35w) • 31 memories • alpha display • track tuning • CTCSS encode • backlit DTMF microphone • 6½"w x 1⅝"h x 7"d, 3.3 lbs.
FT-2500M 2m Mobile (top) • 50w • 31 memories • CTCSS encode • scan • backlit DTMF mic • 6"w x 1⅛"h x 7"d.
FT-912RH Mobile (right) • 1.2GHz

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FT-40R • 440MHz HT
FT-41R • 440MHz HT Coupon
FT-51R • 2w 2m/440 HT Coupon
FT-51R/HP • 5w 2m/440 Coupon
FT-411E • 2.5w 2 meter FM HT
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DR-150T 2m Mobile 50W • **tx**:144-148MHz **rx:** 108-174MHz AM, FM + 440-450MHz FM • two VFOs • frequency entry from microphone • 100 memories • channel scope • 3 scan modes • 9600bps ready • tone encoder • DTMF encoder • auto dialer • cloning • DSQ • 5⅛"w x 2"h x 7"d, 3¾ lbs.

DR-600TB 2m/440MHz Twin Band Mobile 45/35W • **rx** 118-174MHz (incl. AM) + 410-470 MHz • 40 memories • scan • full duplex cross band • remote from any DTMF capable 2m or 70cm unit • separate VHF/UHF outputs • separate controls for each band • CTCSS & DTMF encode • 5⅛"w x 2"h x 7"d.

DR-610T 2m/440MHz Dual Band Mobile 50/35W • 144-148MHz tx, 108-174MHz AM, FM rx; 420-470 MHz tx, 438-450 MHz rx • 2 VFOs • 120 memories • channel scope • 4 scan modes • 9600 bps ready • CTCSS encoder • built-in duplexer40 • Priority • DSQ • 5⅛"w x 1⅝"h x 6½"d.

DX-70T HF Transceiver HF plus 6-meter coverage • 100W output from 1.8-30MHz • 10W on 6m • dual VFOs • 100 memory channels • built-in RF preamplifier • noise blanker • full QSK CW operation • detachable control head • 2¼"h x 7"w x 8⅜"d

DR-M06T 6 meter FM Mobile Find exciting communications on the 50MHz band! • 50 to 54MHz coverage • 100 memory channels • 10/1W output • Programmable offset, built-in • 50 tone encoder with decoder optional • DTMF microphone • 5½"w x1½"h x 4½"d.

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DJ-580T 2m/440MHz Twin Band HT 2W std. • extended receive: 130-173 & 420-480MHz • 43 memories • 4⅜"h x 2⅛"w x 1½"d..... **CLOSEOUT $373.95**

DJ-F1T 2m Mini HT • 2.5W • 130-174MHz + 118-136MHz rx • scan • autodial • back-lit keypad, 40 memories • call channel • CTCSS • DTMF encode • DSQ page • 4⅜"h x 2⅛"w x 1½"d, 14 oz ..... **CLOSEOUT $188.95**

DJ-F1T/HP • Same as DJ-1FT but 5W 12V battery..... **CLOSEOUT $208.95**

DJ-180T 2m HT • extended receive: 130-174 MHz • 2.0W; 5W with optional 12V battery pack • Illuminated LCD display • 16 digit DTMF pad • 10 memories • 5½"h x 2⅜"w x 1⅜"d.

DJ-180TH • Same as DJ-180T, but 5W battery pack is standard

DJ-191T 2m HT • 1.5W standard • extended receive: 135-174MHz.• Large LCD backlit display • 40 memories + 1 call memory channel • 50 tone CTCSS encoder • DTMF squelch encoder and decoder • 16 digit DTMF pad • 9 auto-dialer memory channels • DSQ • cloning capability • battery saver • auto power-off • 2¼"w x 6"h x 1⅛"d. **DJ-191T** is 5W.

DJ-G1T 2m HT • 2m transmit/receive + 440MHz and AM airband receive • channel scope shows signal strength of 7 frequencies simultaneously • 80 memories • Crossband semi-duplex operation • DSQ paging • various scanning modes • 4½"h x 1⅛"w x 1½"d.

DJ-582T VHF/UHF HT • Extended receive: 130-174 & 420-470 MHz • same standard features as the popular DJ-580T + bigger bold keypad buttons • easier to grasp control knobs • faster scan speed • channels display • Tx LED • super low battery consumption • 2¼"w x 5½"h x 1¼"d.

DJ-582TH same as DJ-582T, but 5W battery pack is standard.

DJ-480T UHF HT Similar design, and offers a simple program as found in the DJ-180T.

DJ-G5TH Dual Band HT Covers 2m and 440MHz transmit, 108-174MHz AM, FM and 438-450 MHz FM receive • airband receive without modifications • 5W output on both bands • 80 memories plus 20 autodialer memories • multiple scanning functions • cross band repeat • channel scope • cloning • CTCSS tone encode/decode • 5½"h x 2¼"w x 1¼"d. DJ-G5TY is 2W.

ALINCO Data Radio CLOSEOUTS

DR-1200T Features optimum packet on 2-meters 25W • 1200/2400 baud • 14 programmable memories • 4 scan modes • programmable .CTCSS encode/decode • voice transmission with optional. microphone • 5½"w x 2"h x 6¾"d. **$199.95**

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The MINI STATION 2.3 is a very portable 2.3 Amp-Hr gel cell hangs from your belt or shoulder and will power your HT for days/weeks using your cigarette power cord. Great for cellular phones, laptops even spotlights! It comes complete with carrying pouch with a belt loop that buckles, removable shoulder strap, and auto shutoff wall charger. **Order before Jan 31 and receive a FREE DC CHARGER CABLE at no extra cost (a $10.00 value).**

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PC600	600 Watts	1000 Watts	3	14.2" x 6.3" x 2.6"	$244.95
PC1000	1000 Watts	2000 Watts	2	12.5" x 9.5" x 3.0"	$374.95
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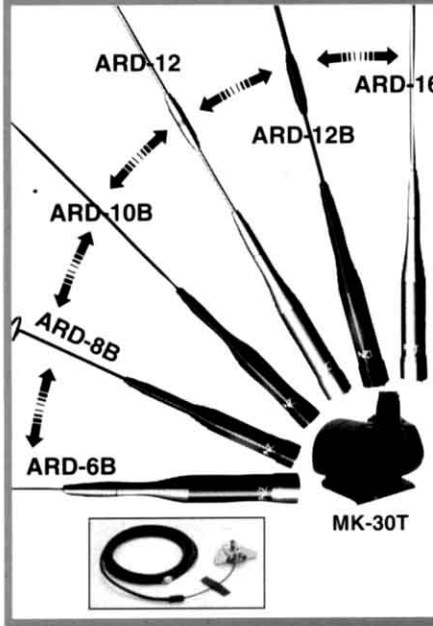

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ARD6/6B	26.5″	2m:1/2λ /70cm:2-5/8λ	100w
ARD10/10B	34.4″	2m:1/2λ /70cm:2-5/8λ	120w
ARD12/12B	48.2″	2m:5/8λ /70cm:2-5/8λ	150w
ARD16/16B	64.8″	2m:5/8λ /70cm:3-5/8λ	150w

Selection Guide: Taller models give max range, shorter models are good choices for use in cities and parking decks. Models with /B are black finish.

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Xcelite TCS200/ST

Tool Case with Tools..... $299 NEW!

This all purpose tool case comes equipped with 10 individual hand tools and 27 Series 99® interchangeable screwdriver/nutdriver blades and handles. Tool case constructed with Cordura®, and features a heavy duty zipper and includes (on outside) 1 pocket featured on one side and 2 smaller pockets on opposite side. The size measurements are 13 1/2 in. X 10 1/2 in. X 2 3/8 in. /343mm X 267mm X 60mm. Cordura® is a registered trademark of DUPONT.

Xcelite 99SPC PC Repair Kit $40

- Ideal for repairs on PC's
- Contains 13 anti-static chip tools, protects chips from ESD damage
- Tools fit securely in a convenient roll-up pouch

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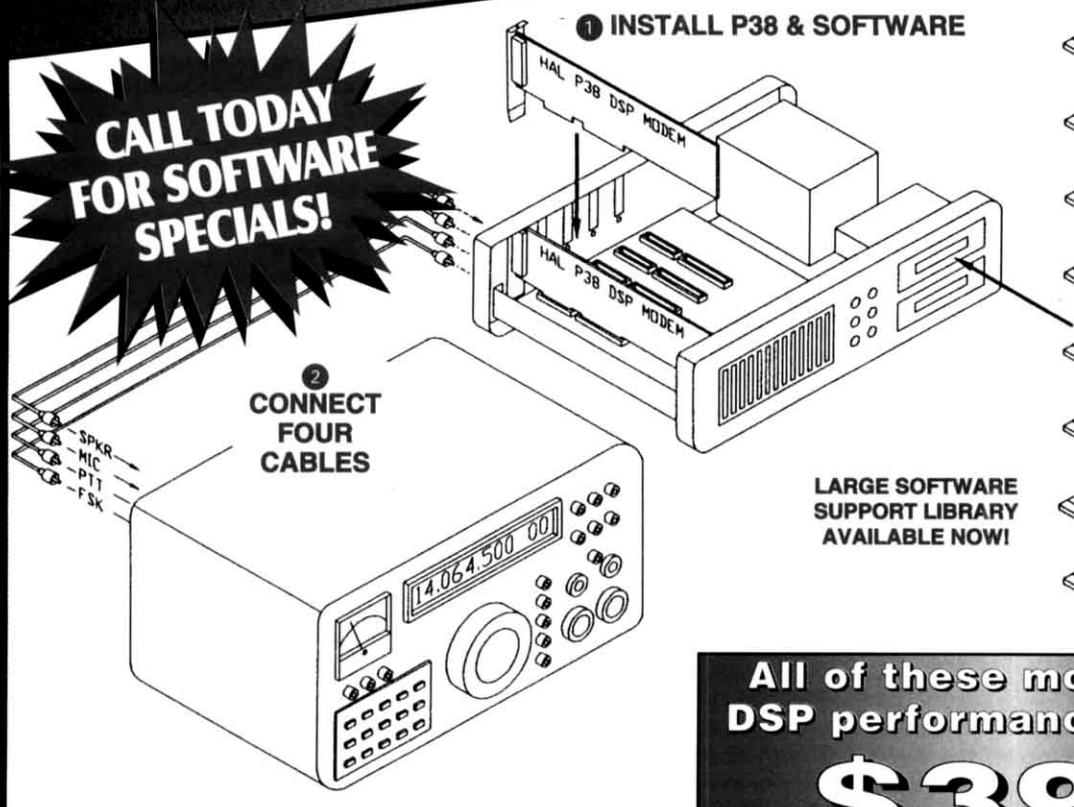

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Ham Ads

1) Advertising must pertain to products and services which are related to Amateur Radio.

2) The Ham-Ad rate is $1.00 per word. This includes firms or individuals offering products or services for sale. **Bolding** is now available for $1.50 a word. A special rate of 30 cents per word applies to individuals seeking to dispose of or acquire personal station equipment, and to hamfest and convention announcements. Please see rate increase notice below.

3) Remittance in full must accompany copy since Ham-Ads are not carried on our books. Each word, abbreviation, model number, and group of numbers counts as one word. Entire telephone numbers count as one word. No charge for postal Zip code. No cash or contract discounts or agency commission will be allowed. Tear sheets or proofs of Ham Ads cannot be supplied. Submitted ads should be typed or clearly printed on an 8½" x 11" sheet of paper.

4) Closing date for Ham-Ads is the 13th of the second month preceding publication date. No cancellations or changes will be accepted after this closing date. Example: Ads received January 13th through February 13th will appear in April *QST*. If the 13th falls on a weekend or holiday, the Ham-Ad deadline is the previous working day. Please contact Robin Micket at 860-594-0209 for further information.

5) No Ham-Ad may use more than 100 words. No advertiser may use more than two ads in one issue. A last name or call must appear in each ad. Mention of lotteries, prize drawings, games of chance, etc. is not permitted in *QST* advertising.

6) New firms or individuals offering products or services for sale must check with us to determine if a production sample (which will be returned) should be submitted for examination. Dealers are exempted, unless the product is unknown to us. Check with us if you are in doubt. You must stand by and support all claims and specifications mentioned in your advertising.

The publisher of *QST* will vouch for the integrity of advertisers who are obviously commercial in character, and for the grade or character of their products and services. Individual advertisers are not subject to scrutiny.

The American Radio Relay League does not discriminate in its advertising on the basis of race, color, religion, age, sex, sexual orientation, marital status, or national origin.

The League reserves the right to decline or discontinue advertising for any other reason.

Please note: Effective with the June 1996 *QST*, there will be a new ham ad rate structure for ARRL members and non-members. In addition, the ham ad rate will increase for individuals seeking to dispose of or acquire personal station equipment, and for hamfest and convention announcements. The new rates will be 50 cents per word for ARRL members, and $1.00 per word for non-members. The ham ad rate for firms or individuals offering products or services for sale will remain at $1.00 per word. **Bolding** will also remain at $1.50 a word. Therefore, ads received March 13th through April 13th for publication in June *QST* must comply with the new ham ad rates.

CLUBS/HAMFESTS/NETS

BOYS: Acquire or upgrade your ham ticket while attending summer camp in the Poconos. Experienced instructors, complete VHF-HF station, access to license exams, field trip to giant ham-computer flea market, plus many other "hands on" science experiences, waterfront programs, sports, etc. Send for free brochure: Science Camp Watonka, P.O. Box 356, Paupack, PA 18451. 717-857-1401.

DATE CHANGE: PHD KC Midwest Amateur Radio Convention May 4, 1996 to May 3, 1997. Information, PO Box 11, Liberty, MO 64068-0011. 816-781-7313.

EME 432 MHz and above '96 International Conference August 15, 16, 17, 18, 1996. Willie, W1ZX, 301-645-5584 between 8 and 10:30 p.m. ET.

FRIEND OF BILL W.?? Join the HAAM net of Saturday, 12:30PM eastern time, 14.290.0; Sunday, 9:30AM Pacific time. 14.340.0; Europe - Saturday, 1400 UTC 7.090.0.

JOIN the **Lambda Amateur Radio Club** for gay, lesbian, bisexual and transgendered hams and their friends. Monthly newsletter, on-air meetings, DXpeditions and local chapters. For more info write to: LARC, P.O. Box 24810, Philadelphia, PA 19130-2405 or send e-mail to: LambdaClub@aol.com

MARCO: Medical Amateur Radio Council, operates daily and Sunday nets. Medically-oriented amateurs (physicians, dentists, veterinarians, nurses, therapists, etc.) invited to join. For information write: MARCO, Box 73, Acme, PA 15610.

QCWA— Quarter Century Wireless Association. If you were first licensed 25 years ago and currently licensed you are eligible. Be one of us! Write Dept BJ, 159 E 16th Ave, Eugene, OR 97401-4017. Call 503-683-0987.

THE ARRL LETTER — Professionally compiled and edited for active amateurs. Send SASE for a sample of the League's biweekly newsletter. Subscriptions are $19.50 (US funds) for a one-year subscription. (US and Canadian ARRL members only.) The ARRL Letter, 225 Main St., Newington, CT 06111.

THE Veteran Wireless Operators Association, a non-profit organization of communications people founded in 1925, invites your inquiries and application for membership. Write VWOA, Ed F. Pleuler, Jr., Secretary, 46 Murdock Street, Fords, NJ 08863.

VIRTUAL HAMFEST online swap meet via Internet. Free classifieds, hamfest calendar, stolen radio listing. http://www.webcom.com/webpub or write Steve, WB8HNC, POB 53441, Bellevue, WA 98015.

ANTIQUE/VINTAGE/CLASSIC

ANTIQUE RADIO CLASSIFIED: Free sample copy! Antique radio's largest circulation monthly magazine. Old radios, TVs, ham equip., 40's & 50's radios, telegraph, books & more. Ads & articles. Free 20-word ad monthly. Subscribe today. Six-month trial: $17.95. Yearly rates: $34.95 ($51.95 by 1st Class). Foreign: write. ARC, PO Box 802-B15, Carlisle, MA 01741. 508-371-0512.

BIG BUCKS for your McIntosh Hi-Fi equipment! Marcus Frisch, WA9IXP, Box 28803, Greenfield, WI 53228-0803. 414-297-9310 anytime.

BROADCAST MICROPHONES and Accessories (Call Letter Plates, Stands) Wanted. Early carbon, condenser, ribbon, dynamic models used in broadcasting. James Steele, WK8X (FM), Box 2525, Kingsland, GA 31548, 912-729-6106.

BUY, Sell, Collect and Restore early tube equipment? Early receivers, transmitters and telegraph gear? Join the Antique Wireless Association which sponsors old-time "meets", flea markets, museum and journal with technical articles and free want ads. Membership and annual dues only $12. Write for information and Museum hours: Bruce Kelley, W2ICE, 59 Main St., Bloomfield, NY 14469.

CALLBOOKS: Buy-Sell-Trade U.S. Callbooks 1900/1975. Bob, W4JNN, list 703-560-7161 or PO Box 166, Annandale, VA 22003.

CODE/CIPHER Machines Wanted! Historian buys code/cipher devices, manuals, books, etc.! All periods! Melton, Box 5755, Bossier City, LA 71171. 318-798-7319.

COLLECTOR: Looking for pre-1960 theatre and sound equip; amps by Western Electric, Brook, ALTEC; large speakers by WE, ALTEC, EV, Jensen, JBL. Mike Somers, 2432 W. Fargo, Chicago, IL 60645. 312-338-0153.

COLLECTOR wants early or oddball bugs and pre-1920 telegraph keys. SASE or e-mail for list of duplicates for trade. K5RW, 612 Stillmeadow, Richardson, TX 75081. 214-234-1653. nmcewen@metronet.com

FOR SALE: Collins 75J2, R388, FM board for 32V2, Hallicrafters S20R, S22R, SX24, SX25, SX100, Heath AR-2, AT-1, VF-1, AC-1. Levine, 516-757-7641.

FOREIGN COLLECTORS: Selling rare and antique laboratory and electronic instruments from my collection. Send 2-IRC for large, illustrated list. Joseph Cohen, 200 Woodside, Winthrop, MA 02152.

MAHLON LOOMIS, INVENTOR OF RADIO (pat. 1872) by Thomas Appleby (Copyright 1967). Second printing available from JOHAN K.V. SVANHOLM, N3RF, **SVANHOLM RESEARCH LABORATORIES,** P.O. Box 81, Washington DC 20044. Please send $25 with $5 for S&H.

MANUALS FOR MOST OLD HAM GEAR. Best source for 20 years! For most gear made 1935/1972, plus many Kenwood. No Quotes. Our catalog "M" ($2 USA, $3 elsewhere) required to order. Hi-Manuals, Box M-802, Council Bluffs, IA 51502.

MARTIN and BUNNELL, MARTIN FLASH KEYS (bugs) wanted by collector. Randy Cole, KN6W, 4540 Fairway St., Dallas, TX 75219. 214-871-8995.

NEW COLLINS 30S-1 VIDEO joins the KWM-2, S/Line and 30L-1 Videos. Package Discounts! HI-Res Communications, 8232 Woodview, Clarkston, MI 48348-4058. 810-391-6660.

NEW MILITARY ANTIQUE KEYS from 1940s: Brelco moisture proof $50, CMH brass $35, postpaid. Some foreign types. TEC, Box 400, Lincoln, MA 01773.

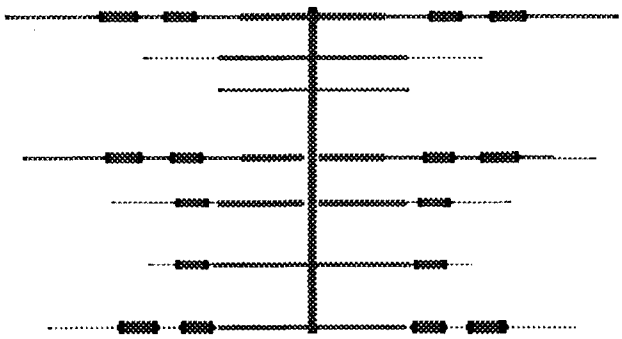
The NEW PRO-67-C* is the ULTIMATE in a 24' boom antenna. Not too big, but large enough to handle the biggest of pile-ups.

This **SEVEN BAND** beauty is the antenna you have been looking for to handle all your operating requirements.

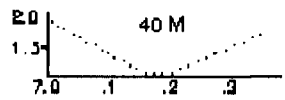
The PRO-67-C*, now has 3 elements on 40, 1 element on 30, 3 elements on 20 3 elements on 17, 3 elements on 15, 3 elements on 12, and a 4 element 10 meter beam ALL IN ONE using only a single feed line. This antenna is HOT!

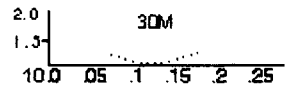
The construction is in the MOSLEY tradition of heavy wall thickness, precision fit, and of course, all STAINLESS STEEL hardware and U-Bolts, as it has always been. The gain, bandwidth, and power capabilities of this antenna is truly amazing.

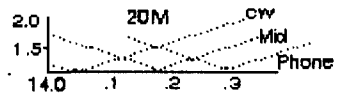
Remember, "The joy of low price is soon forgotten after the high price of poor quality"!

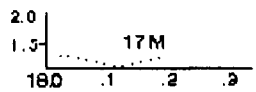


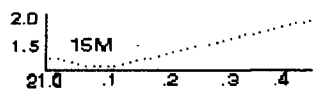
*Patent Pending

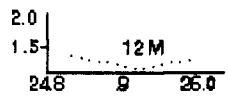


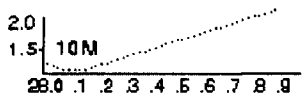












Boom:	(STD)	Dbl Wall 2" x .104 + .125 Splice x 24 ft.
	(OPT)	Dbl Wall 3" x .108 + .125 Splice x 24 ft.
	Alloy	6061-T6 / 6063-T832
Turning Radius:		25.1'
Longest Element:		43' 6"
Sq.Ft.		12
Wind Load / 80 M.P.H.		345 lbs.
Assembled Wt. .		116.00 lbs.
Power:	CW	2,500 w
	SSB	5,000 w
	RTTY	1,000 w
	AM	1,000 w

Band	Gain	F/B	No. of Elem. per Band
40 M			3
30 M			1
20 M			3
17 M			3
15 M			3
12 M			3
10 M			4

Sale Price: PRO-67-C-2*, $1,119.95
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OLD TELEGRAPH/RADIOS/ELECTRONICA Wanted! Collector: K2DCY, 11 Squirehill, N. Caldwell, NJ 07006.

SHURE 55C classic microphone. National 8" speaker. Metal cabinet. Budd, K2PMA, 718-459-3491.

TELEGRAPH INSTRUMENTS WANTED: Collector buys early or unusual telegraph keys, sounders, relays, parts, call boxes, etc. Want pre-1900 telegraph books and related paper items. Also seeking early wavemeters. Larry Nutting, WD6DTC, 4025 Slate Court, Santa Rosa, CA 95405. 707-539-1883.

TELEGRAPH KEYS wanted by collector. Bugs and unusual or unique straight keys or sounders, and tube electronic keyers. Also pre1950 Callbooks. Vince Thompson, K5VT, 3410 N. 4th Ave., Phoenix, AZ 85013, 800-840-KEYS.

TELEGRAPH, surplus to my needs, keys, etceteras. 16 pages illustrated, $2 (refundable) plus 2 stamps. Q. Jacobs, 60 Seaview Terrace, Northport, NY 11768.

"THE VAIL CORRESPONDENT" — telegraph collector's quarterly. $10/year USA. (Sample $2.) Box 88-Q, Maynard, MA 01754.

W7FG VINTAGE MANUALS AND TELEPHONE FILTERS: Most manuals in stock. SASE for catalog or call. Telephone RFI filters $12.95. Visa/Mastercard accepted. 3300 Wayside Drive, Bartlesville, OK 74006. 918-333-7893 or 800-807-6146.

WANTED: ARRL publication, "How To Become A Radio Amateur" 1936 edition. Jim Swafford, W7FF, 5906 West Miramar Dr., Tucson, AZ 85715.

WANTED By Collector: Old Radios, Parts, Microphones, Advertising Signs, and TVs. Jerry Finamore, 1374 Stafore Drive, Bethlehem, PA 18017, 610-861-4660.

WANTED: Cheap MN26 or similar WW2 radio compass receivers and accessories. Robert Brown, W9EXR, 386 Cedar Ridge Rd., Hartwell, GA 30643.

WANTED: Clean late Collins S-Line. AI9T, 414-529-9395 anytime.

WANTED: First annual wireless blue book (Amateur Callbook) dated 1909. Citizens Radio Callbook 1920, 1921, 1922. Citizens Radio Amateur Callbook with Flying Horse cover 1924, 1925, 1926. Department of Commerce Radio Stations of the U.S. 1913, 1915. Bob, W4JNN, P.O. Box 166, Annadale, VA 22003. Call collect 703-560-7161.

WANTED: Hallicrafters model S-2, S-33, S-35, SX-112, EP-132, HT-2, HT-3, HT-12, HT-14, console speaker R-8, RCA model AVR-11, AR-88. Chuck Dachis, "The Hallicrafter Collector," 4500 Russell Drive, Austin, TX 78745.

WANTED: pre-1925 battery radios, crystal sets, and vacuum tubes. Also early telegraph keys and pre-1900 electrical apparatus. Jim Kreuzer, N2GHD, Box 398, Elma, NY 14059, 716-681-3186.

WANTED: Radio, magazines, horn speakers, pre 1930. W6THU, 1545 Raymond, Glendale, CA 91201, 818-242-8961.

WANTED: Telegraph Keys. Collector bitten by the bug! Joel Wisotsky, N2LAI, 31 Cow Lane, Great Neck, NY 11024, 516-482-3241 eve.

WANTED: Vintage fountain pens, Leica cameras. Will swap Heathkits EF1, unbuilt G1703, other electronic items. KB4QGJ, 524 N. Quaker Lane, Alexandria, VA 22304-1827. 703-370-1880, 703-370-9049 Fax.

WANTED: Western Electric audio equipment. Amplifiers, pre-amps, tubes, speakers, parts, mixing boards, etc. 800-251-5454.

WANTED: WWII 1960 X-Band radar/microwave equip civilian, military. Working or not. Parts, test equip. publications. SHF Box 10215, Pittsburgh, PA 15232-0215.

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QUALITY QSLs By WX9X from $18.95. See our display ad on this page.

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IC-775 DSP HF w/TX/RX DSP	$4760.00	Call $
IC-736 New HF Xcvr w/6 Meters	2385.00	Call $
IC-707 New HF	1032.00	Call $
IC-706 HF-6M-144MHz, All Mode	1560.00	Call $
IC-765 All-Mode HF	4125.00	Call $
IC-738 All-Mode, 100w Tuner	1935.00	Call $
IC-728 New, All-Band HF	1325.00	Call $
IC-2KL 500w, Amp	2710.00	Call $
IC-4KL 1 kW Amp	9000.00	Call $
Receiver		
IC-R1 100 khz - 1300 MHz	567.00	Call $
IC-R100 100kHz - 1.85GHz, AM, FM	850.00	Call $
IC-R9000 100kHz - 1.99 GHz w/Scope	6825.00	Call $
GP-22 Ground Pos. Unit	656.00	Call $
IC-R7100A - 25 MHz - 2 GHz Base Model	1850.00	Call $
VHF		
IC-2GXAT Up To 7W Output, HT	359.95	Call $
IC-T21A 2M HT, Rec 440MHz	455.00	Call $
IC-T22A Mini 2 Meter w/Alpha-Numeric	292.00	Call $
IC-2000H 50W Mobile	377.00	Call $
IC-281H 2M Mobile, Rec. 440MHz	488.00	Call $
UHF		
IC-T41 New, 440MHz HT	472.95	Call $
IC-T42A Mini 440MHz HT w/Alpha Numeric	384.00	Call $
DUALBANDERS		
IC-Z1A 2M/70cm Handheld w/ Remov. Panel	599.95	Call $
IC-V21AT 2M/220MHz HT	783.95	Call $
IC-31A 2M/440MHz HT w/Alpha	513.00	Call $
IC-Δ1A 2M/440/1.2GHz, HT	987.00	Call $
IC-X21AT 440MHz/1.2GHz FM	960.00	Call $
IC-2350H 2M/440MHz Small Mobile	616.00	Call $
IC-2700H 2M/440MHz Mobile Detch Panel	959.95	Call $
IC-820H 2M/440MHz All-Mode	1999.95	Call $
IC-970H All-Mode, 45w	3964.00	Call $
IC-Δ100H 2M/440MHz/1.2GHz Mobile	1570.00	Call $
220 MHz		
IC-3SAT, 2.5W, 220 HT	399.00	Call $

YAESU

HF Equipment	List	Jun's
FT-1000 Transceiver w/PS/Tuner	$4099.00	Call $
FT-1000D Top Performer	$5199.00	Call $
FT-1000MP New, with EDSP	$3599.00	Call $
FT-990 Transceiver w/PS/Tuner	$2699.00	Call $
FT-990DC All Mode	2299.00	Call $
FT-840 New Compact HF	1099.00	Call $
FT-900 Mobile Or Base	1499.00	Call $
FT-900AT New HF Mobile	1699.00	Call $
FL-7000 15m-160m Solid State Amp	2459.00	Call $
Receivers		
FRG-100B Mini Receiver	699.00	Call $
VHF		
FT-10R, Compact HT, Choice Of Keypads	TBA	Call $
FT-11R, Worlds Smallest 2M HT	369.00	Call $
FT-11RH 5 Watt Version of FT-11R	389.00	Call $
FT-23 R/17 Mini HT	309/329	Call $
FT-2200 50w, 2m Mobile	479.00	Call $
FT-2500M Rugged 2M Mobile	449.00	Call $
FT-290R/690R 6M, All Mode Portable	729/859	Call $
UHF		
FT-40R, Compact HT, Choice Of Keypads	TBA	Call $
FT-41R, Worlds Smallest 440MHz HT	429.00	Call $
FT-7200 35w, 440MHz Mobile	599.00	Call $
FT-7400H New, Rugged 440MHz Mobile	589.00	Call $
FT-790 R/II 70cm/25w Mobile	839.00	Call $
VHF/UHF Full Duplex		
FT-736R, All Mode, 2m/70cm	2299.00	Call $
Dual Bander		
FT-51R 2m/70cm HT w/ "Windows"	609.00	Call $
FT-530 2m/70cm HT	589.00	Call $
FT-5100 Compact 2m/440 Mob.	779.00	Call $
FT-5200 Compact 2m/440 Mob.	819.00	Call $
FT-6200 Cpt 440/1.2 GHz Mob.	899.00	Call $
1.2 GHz		
FT-911 Compact HT	549.00	Call $
FT-912 10w Mobile	729.00	Call $
Rotators		
G-450XL	269.00	Call $
G-800SDX	483.00	Call $
G-1000SDX	589.00	Call $
G-2700SDX	1099.00	Call $
G-2800SDX	1329.00	Call $
G-500A	319.00	Call $
G-5400B	609.00	Call $

STANDARD

✓Cash Discount or FREE Speaker/Mic on Selected Radios - ends soon

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		List	Jun's
✓	**C168A** Mini 2 Meter	469	Call $
✓	**C188A** Mini 2 Meter Dlx	489	Call $
	C288A 220MHz, HT	499	Call $
✓	**C468A** Mini 440 MHz	480	Call $
✓	**C158A** Affordable 2M	339	Call $
	C1208DA 2 Meter Mobile	699	Call $
✓	**C178A** Mini 2 Meter	459	Call $
	C508A Mini Dualband HT	345	Call $
✓	**C228A** 2M/220MHz	695	Call $
✓	**C558A** 2M/440MHz	689	Call $
	C628A 440MHz/1.2 GHz	727	Call $
✓	**C528A** 2M/440MHz Twinbander	495	Call $
	C5718A 2M/440MHz	849	Call $
	C568A 2M/440MHz, 1.2GHZ Triband HT	649	Call $

CCR-708A
Communications Test Receiver With Spectral Display Scope
List $750 Call $

Mobile

C1208DA 2M/440 Receive
List $529 Call $
C5718DA 2M/440
List $849 Call $

ALINCO

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DX-70T *HF + 6 Meters*

- 100 Watts (10W On 6 Meters)
- Dual VFO's
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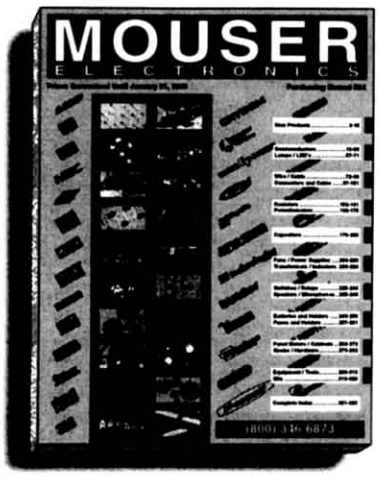

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LMR 400 DBL SHLD IIIA JACKET 2.7 dB @ 450MHz	.58/FT	.56/FT
LMR 400 *UltraFlex* DBL SHLD "TPE" JACKET 3.1 dB @ 450MHz	.75/FT	.72/FT
LDF4-50A 1/2" HELIX 1.51 dB @ 450MHz	2.10/FT	
FSJ-50 1/4" SUPERFLEX 2.23 dB @ 150MHz	1.50/FT	
COAX (HF GROUP)		
RG213/U MIL-SPEC DIRECT BURIAL JACKET 1.5dB @ 50MHz	.36/FT	.34/FT
RG8/U FOAM 95% BRD UV RESISTANT JACKET 1.2dB @ 50MHz	.32/FT	.30/FT
RG MINI 8X 95% BRD BLK SILVER, or CLEAR UV RES JKT	.15/FT	.13/FT
RG214/U (2) SILVER BRAID SHEILDS MIL-SPEC	1.60/FT	1.45/FT
RG393/U DBL SILVER SHLD "TEFLON" 25,000 WATTS, @ 10MHz	4.00/FT	3.75/FT
RG142/U DBL SILVER SHLD "TEFLON"	1.10/FT	1.00/FT
RG58/U 95% BRAID	.15/FT	.13/FT
RG58A/U 95% TC BRAID	.17/FT	.15/FT
450 OHM LADDER LINE	.12/FT	.11/FT
450 OHM LADDER LINE 16GA STRANDED	.18/FT	.17/FT
ROTOR CABLE		
5971 8/COND (2/18 6/22) for runs upto: 125ft BLK UV RES JKT	.20/FT	.18/FT
4090 8/COND (2/16 6/20) for runs upto: 200ft BLK UV RES JKT	.35/FT	.34/FT
1418 8/COND (2/14 6/18) for runs upto: 300ft BLK UV RES JKT	.47/FT	.45/FT
18GA TINNED COPPER 4/C GRAY PVC JACKET	.20/FT	.18/FT
18GA TINNED COPPER 5/C GRAY PVC JACKET	.22/FT	.20/FT
18GA TINNED COPPER 7/C GRAY PVC JACKET	.26/FT	.24/FT
ANTENNA WIRE		
14GA 168 STR "SUPERFLEX" UNINSULATED	.12/FT	.10/FT
14GA 7/22 "HARD DRAWN" BC UNINSULATED	.08/FT	.07/FT
14GA SOLID "COPPERWELD" UNINSULATED	.08/FT	.07/FT
14GA SOLID "BARE COPPER" UNINSULATED	.08/FT	.07/FT
16GA 26/30 "BARE COPPER" PVC INSULATED	.09/FT	.07/FT
DACRON ROPE DBL BRD 3/16" 770# TEST	.12/FT	.09/FT
DC POWER "ZIP" CORD		
10GA 2/C "FLEXIBLE" OIL & GAS RESISTANT RED/BLK "ZIP"	.40/FT	.38/FT
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18GA, 16GA & 14GA STOCKED TOO		
COAX W/SILVER TEFLON PL259's EA END	**PRICE**	
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50FT RG213/U MIL-SPEC DIRECT BURIAL JKT 1.5 dB @ 50MHz	25.00/EA	
100FT RG8/U FOAM 95% BRD UV RESISTANT JKT 1.2 dB @ 50MHz	40.00/EA	
50FT RG8/U FOAM 95% BRD UV RESISTANT JKT 1.2dB @ 50MHz	22.50/EA	
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(Also see the excellent review in Nov. 1989 QST.)

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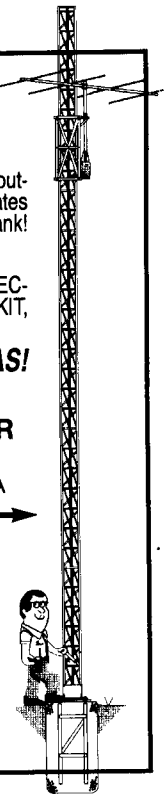

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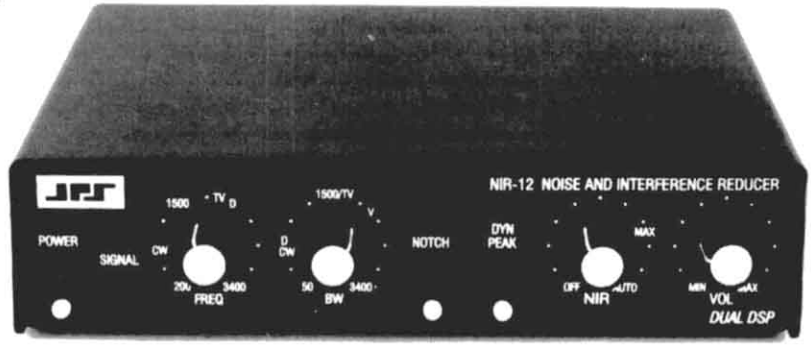

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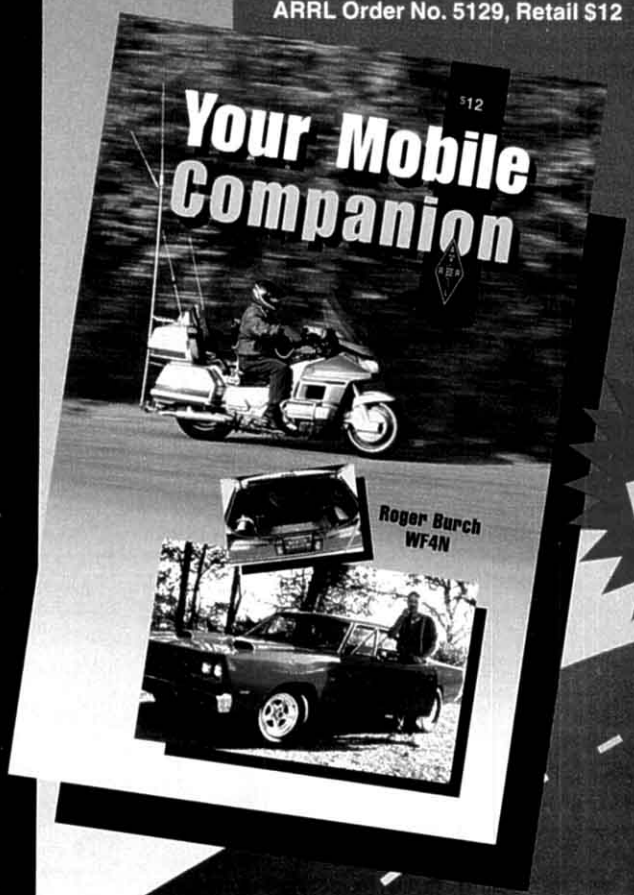
ARRL • 225 Main Street • Newington, CT 06111-1494 **Fax 203-665-1166**

It's time for your Hamshack to hit the road!

If mobile operating starts your engine, you'll want to know about the brand new ARRL book, *Your Mobile Companion*. It's the latest in our popular series of companion titles.

Behind the wheel is long-time mobile operator Roger Burch, WF4N, who'll steer you through the ins and outs of mobile operating—beyond the 2-meter repeater.

Mobile operating is an exciting multi-faceted aspect of Amateur Radio. Packed with practical hints and techniques, *Your Mobile Companion* will be an indispensable co-pilot to have along on your adventures.
ARRL Order No. 5129, Retail $12



Your Mobile Companion covers:

- The many ways of operating mobile, from motorcycle CW to aeronautical mobile.
- How to buy mobile gear, including transceivers and antennas.
- How to install mobile gear.
- How to operate mobile for maximum efficiency and fun.
- How to avoid the interference problems that can plague mobile communication.
- How to operate safely.

NEW!

Other titles in our companion series include: ***The DXCC Companion***; ***Your Ham Antenna Companion***; ***Your HF Digital Companion*** and ***Your Packet Companion***. Ordering information and full descriptions can be found in the **ARRL Publications Catalog** elsewhere in this issue

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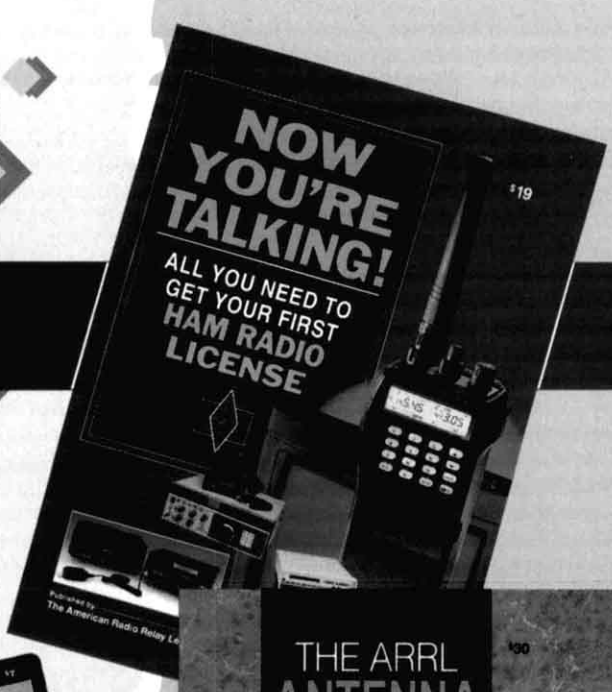
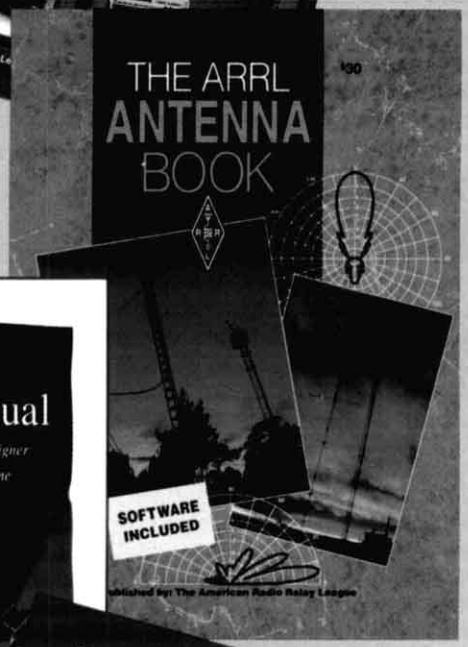
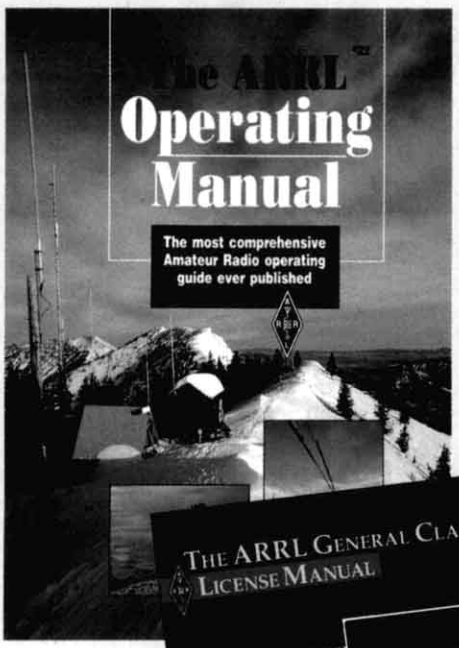
ARRL Publications Catalog

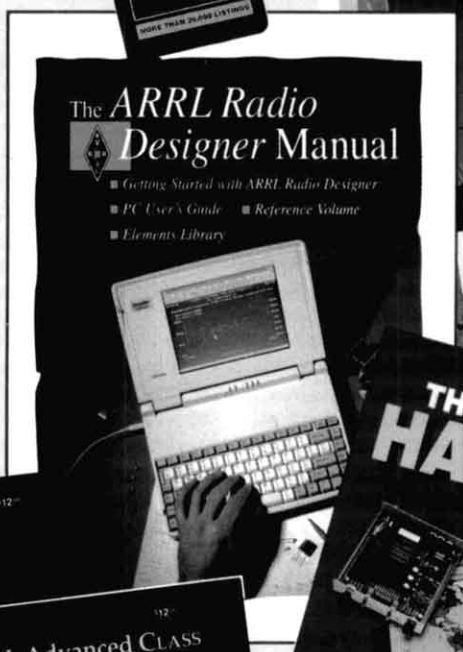
Your guide to the best books and tapes from

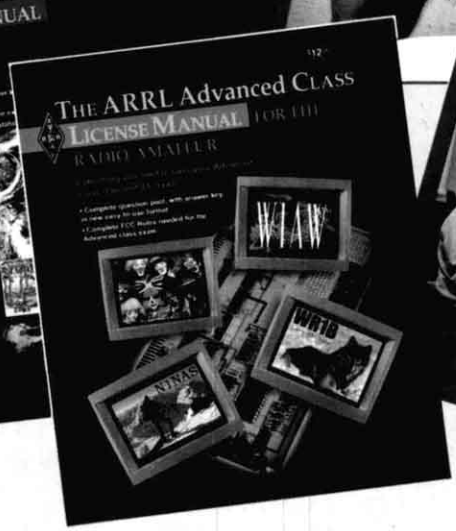
The American Radio Relay League











Now You're Talking!: All You Need to Get Your First Ham Radio License is a complete study guide for the Technician exam and the Novice written exam. But it's far more! It will help you select—and set up—radios, accessories and antennas for your ham radio station. It will also guide you through your first contacts on all the popular operating modes, including FM repeaters and packet radio. Practical information every beginning ham needs is presented clearly and simply, in small doses. Whether you start with the Technician or the Novice license, ***Now You're Talking!*** shows you how to enjoy ham radio to the fullest.

If you're starting with the Novice license you should also purchase audio cassettes or computer software to learn Morse code (described below).

Now You're Talking!: All You Need to Get Your First Ham License. 2nd ed, ©1993, 400 pages ..... #4173 **$19**

ARRL Technician Exam Review Guide, by Larry Wolfgang, WR1B, makes it easy to study for the code-free Technician exam. Following a "Question and Answer" format, the book includes everything you need to know for the exam. Brief explanations of the correct answers reinforce learning. 1st ed, ©1995, 240 pages ..... #5153 **$9.95**

The **ARRL Video Courses** are the fast, easy and fun way to prepare for your Novice- and Technician-class written, General-class, or Advanced-class exams. Imagine: Courses with everything you need to get your first ham license or upgrade to your General or Advanced-class class license. Watch them straight through or review any or all sections at your convenience.

In the **ARRL Technician Class Video Course**, you get three exciting video tapes (5 full hours of instruction), a detailed 164-page course book and six practice exams. In the **ARRL General Class Video Course**, you get three video tapes (4 full hours of instruction), a detailed 96-page course book and 3 practice exams. One section of this course is devoted to learning Morse code, and we've included a free copy of Morse Academy Morse code learning software to help make it fun and easy for you to learn the code. In the **ARRL Advanced Class Video Course**, you get three video tapes (5.5 hours of instruction), a detailed 208-page course book and three practice exams. All courses cover every FCC question—with correct answers, detailed explanations and full-screen graphics and animation. There's even optional Exam Review software.

Produced in association with King Schools, a world leader in video training courses, the **ARRL Video License Courses** come with the assurance of a money-back guarantee: You pass your test, or you don't pay! Call for details.

With our exclusive Licensing Video Courses, you'll be on the air or get your upgrade in no time!

ARRL Technician Class Video Course, ©1993 ..... #4572 **$99**
Extra Course Books (with course purchase) ©1993 .... #4637 **$19**
ARRL Technician Class Video Course with Computerized Exam Review Software, ©1993. IBM Compatible, 3.5- and 5.25-inch disks and Macintosh 3.5 inch (hard disk req'd) ..... #4580 **$129**

ARRL General Class Video Course, ©1994 ..... #4750 **$99**
Extra Course Books (with course purchase) ©1994 .... #4793 **$19**
ARRL General Class Video Course with Computerized Exam Review Software, ©1994. IBM compatible, 3.5- and 5.25-inch disks and Macintosh 3.5 inch (hard disk req'd) .... #4769 **$129**

ARRL Advanced Class Video Course, ©1995 .... #5277 **$99**
Extra Course Books (with course purchase) ©1995 .... #5331 **$19**
ARRL Advanced Class Video Course with Computerized Exam Review Software, ©1995. IBM compatible, 3.5- and 5.25-inch disks ..... #5315 **$129**

California residents include 7.25% state sales tax on Video License Course orders.

Hampass—ARRL's license-exam-review software is a great way to prepare for the Novice and Technician tests. ***Hampass*** drills you on the Novice or Technician question pools by selecting questions from the entire pool or from subelements you specify. It also creates sample tests. Each package includes 5.25-inch *and* 3.5-inch disks.

Hampass for DOS, for IBM PC or compatible (286 or better microprocessor best), DOS 3.1 or later, hard disk, EGA or better display, mouse recommended but not required #4475 **$35**

Hampass for Windows 3.1, for 286 or better microprocessor, DOS 3.3 or later and Windows 3.1 or later, hard disk with 1 MB of free space, VGA graphics card and color monitor, mouse recommended but not required ..... #4467 **$35**

Upgrade Your License the Easy Way!

After you receive your license and get on the air, you'll probably want to explore additional operating privileges. The ***ARRL License Manual Series*** represents the best study material for the Technician, General, Advanced and Extra Class Amateur Radio exams. Each book is carefully revised and updated as new exam questions are released by the VEC Question Pool Committee. The appropriate examination question pool, complete with an answer key, is included for easy reference. The answer key contains page references so you can locate appropriate text explanations as you review the questions before your exam. Our ***FCC Rule Book*** should be used along with each publication in the series.

ARRL License Manual Series

Technician Class for Novice Class Licensees, 2nd ed, ©1993 (good through June 30, 1997), 224 pp ..... #4181 **$6**

General Class, 2nd ed, ©1994 (good through June 30, 1998) Now includes study material for all FCC Rules questions on the General class exam, 320 pages ..... #4688 **$12**

Advanced Class, 4th ed, ©1995 (good through June 30,1999), Now includes study material for all FCC rules questions, 480 pages ..... #4947 **$12**

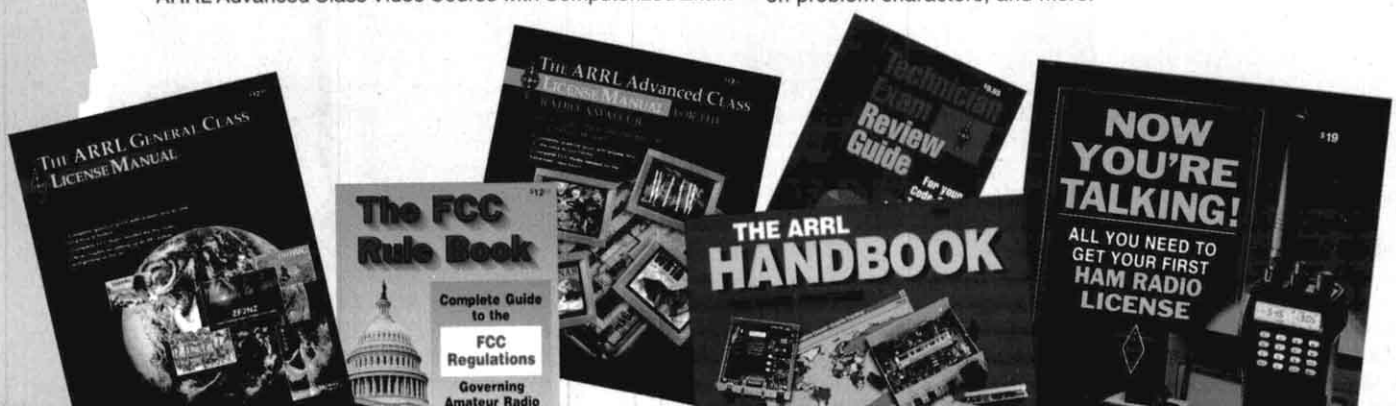
Extra Class, 5th ed, ©1990 (good through June 30,1996), 320 pages ..... #3282 **$8**

The FCC Rule Book: ***Complete Guide to the FCC Regulations Governing Amateur Radio*** includes such significant rules changes as: vanity call signs, "instant" operating privileges, new digital-links subband at 219-220 MHz and more. 10th ed, ©1995, 320 pages ..... #5102 **$12**

Code Proficiency

When it comes to the code, whether you're just starting out, or you're working on your Extra Class upgrade, practice makes perfect!

The ARRL produces five sets of Morse code tapes to get you from 0 to 22 words per minute. Each set includes two C-90 cassettes. ***GGTE Morse Tutor*** software for IBM PCs and compatibles teaches you the code, provides plenty of practice for exams and helps keep your code speeds sharp in easy, self-paced lessons. Features include code speeds from 1 to more than 100 words per minute, standard or Farnsworth modes and random QSOs. The ***Morse Tutor Gold*** has even more features. You can send code from an ASCII text file that you create on the computer, save to disk the random QSOs created by the program for later replay, and even create your own practice text with special emphasis on problem characters, and more.



Your Introduction to Morse Code, our cassette program for beginners, makes learning the code fun. It teaches you all the characters and provides plenty of practice ..... #3487 **$10**

ARRL Code Practice Cassettes. Each set of two C-90 tapes provides three hours of practice.

Set 1: 5 to 10 WPM ..... #2227 **$10**
Set 2: 10 to 15 WPM ..... #2235 **$10**
Set 3: 15 to 22 WPM ..... #2243 **$10**
Set 4: 13 to 14 WPM (standard format) ..... #2251 **$10**
GGTE Morse Tutor (5.25-inch) ..... #2081 **$20**
GGTE Morse Tutor (3.5-inch) ..... #2936 **$22**
Morse Tutor Gold (5.25-inch) ..... #3231 **$30**
Morse Tutor Gold (3.5-inch) ..... #3258 **$30**

Help for Beginners

Ham Radio Made Easy, by Steve Ford, WB8IMY, may be the only beginner-level book with "attitude". With a sprinkling of wit and opinion, *Ham Radio Made Easy* will help you get on the air quickly and painlessly. This is a book you'll actually *enjoy* reading, whether you're fond of FM, packet, satellites, HF operating or whatever. No jargon. No mind-numbing mathematics. Just practical advice that you can use right away.
1st ed, ©1995, ... #5374 **$15.95**

W1FB's Help for New Hams, by Doug DeMaw, offers sound advice on getting started in Amateur Radio after you get your license. Covers how to select equipment, station layout and accessories, building and using antennas, and operating. Whether you're into HF or VHF, this book will get you on the air. 2nd ed, ©1994, 304 pages ..... #4432 **$10**

Novice Notes: The Book is a selection of articles for the beginner from the popular ***QST*** series. It's filled with useful information: What you should do before your license arrives; how to buy used gear; and much more.
1st ed, ©1989, 76 pages ..... #2561 **$6**

Written in an easy-to-understand style for electronics beginners, ***Understanding Basic Electronics*** is also for those who want to brush up on electronics principles. Loaded with illustrations, the book starts with math skills and progresses to dc and ac electronics principles. It concludes with clear, simple explanations of how components like diodes, transistors and integrated circuits work. 1st ed, ©1992, 448 pp ..... #3983 **$17**

First Steps in Radio by Doug DeMaw, W1FB, is a tutorial on electronics principles tailored to the beginner. Reprinted from the popular ***QST*** series, this book will help you learn the electronics theory helpful for licensing exams and to gain some insight into how radio equipment works.
1st ed, ©1985, 88 pages ..... #2286 **$6**

Handy References

The 1996 ARRL Handbook

The brand new ***1996 ARRL Handbook*** is packed with new projects and updated information. And, for the first time in ***Handbook*** history, the 1996 edition includes SOFTWARE. See the following full description of disk for details! Whether you're an Amateur Radio beginner, an experienced operator, electronic technician, engineering student or engineer, you'll **find each chapter of the *1996 ARRL Handbook* a standalone "mini-book"** that will cover your favorite topics and provide invaluable reference material, fascinating facts and some great new do-it-yourself projects.

Here's some of the highlights in the 1996 edition:

- **Amplifiers**—2-meter "brick" amplifier can boost an HT to 25 or 50 W (builder's choice), and a 3CX1200Z7 provides 1.2 kW. Now that's talk power!
- **Modulation Sources**—Learn about G-TOR. Get an overview of PACTOR II.
- **Antennas**—More antennas for new hams! Examples: a simple wire loop for 28 MHz and a copper 2-meter J-pole. Also, selected antenna Hints and Kinks.
- **Station Accessories**—12-V distribution boxes for station (and mobile) accessories. An audio break-out box feeds several accessories from a single source. Use the RF Sniffer to track down sources of RF. A simple two-channel analog-to-digital converter project lets your computer make measurements and compute SWR. An audio display for meters is handy for both vision impaired and sighted hams. Several hams tell how to transport HTs conveniently. And keyers for all! An updated Uncle Al's keyer *reads* code too, two more basd on the Curtis 8044ABM IC, and a CW send and receive system for IBM compatible computers.
- **Satellites**—Learn about plans for the new Phase 3D bird. Build a "Junk Box" Satellite Receiver or a Mode-S Receive Converter.
- **Transceivers**—Check out the new multiband QRP transceiver from Wayne Burdick, N6KR, and the NorCal QRP club: Operate 160 through 10 meters with plug-in band modules. Try a VLF transceiver (no license required) or a QRP transmitter built from a single IC.
- **Filters**—A new DSP filter offers 18 different modes, including DTMF and CTCSS tone decoding.

This year's ***ARRL Handbook*** includes a 3.5-inch, 1.44-MB IBM compatible diskette with a variety of standalone applications and programs used with projects in the book.

TISFIND, a *Windows* application from the ARRL's Technical Information Service, provides you with the names and addresses of nearly 900 Amateur Radio vendors and organizations. Your frustrating hunts for suppliers are history!

COILS, from Brian Beezley, K6STI, calculates the important characteristics of solenoidal coils.

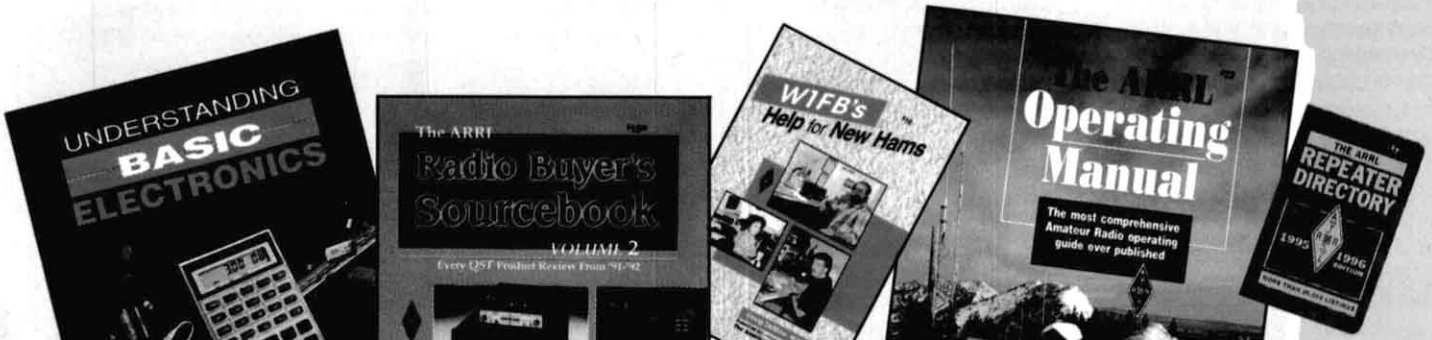
ACTFIL is for designing active audio filters described in the filters chapter.

The disk also features the software side of several projects in the book: an SSTV interface from Ben Vester, K3BC; a PC interface for sending CW from Ralph Taggart, WB8DQT; and a PC voltmeter from Paul Danzer, N1II.

Other software is useful for helping to find true North; for designing shortened, inductively-loaded diploes; and for designing Pi and Pi-L matching networks.

If it's ham radio, it's in ***The 1996 Handbook***. With 1168 pages and over 1000 charts and illustrations, ***The ARRL Handbook*** is an exceptional value. Softcover ©1995 ... #1735 **$38**

The fifth edition of ***The ARRL Operating Manual*** has been extensively revised and updated to reflect the many changes that have taken place in Amateur Radio during the last five years. ***The Operating Manual*** is your most valuable resource for whatever operating-oriented questions you may have. How



do I use a repeater autopatch? Where is the CW subband on 20 meters? How do I use a QSL bureau? What is grayline propagation and how do I make it work for me? How do I get started on the ham satellites?

You'll find an impressive and colorful section that features dozens of US and overseas operating awards, and a handy reference section includes an ARRL DXCC Countries List, beam-heading information, a series of maps, US counties, sunrise/sunset tables, and much, much more.
©1995, 576 pages ..... #4939 **$22**

The 1996 Amateur Radio Mail Order Catalog and Resource Directory is a one-stop sourcebook of dealers and vendors of electronic parts, components, software, books, tapes and equipment for the ham or electronics enthusiast. 220 categories, from Alternate Energy to Wire and Cable, arranged in an easy-to-use format. *The Resource Directory* includes such practical information as 100+ Free Catalogs and a Glossary of common ham radio terms. Edited by David L. Thompson, K4JRB. 5th ed, ©1995, 256 pages ..... #5242 **$15.95**

The ARRL Radio Buyer's Sourcebooks are for anyone who buys, sells or owns Amateur Radio equipment. Two volumes are available: ***The ARRL Radio Buyer's Sourcebook*** covers selected ***QST*** Product Reviews from 1981 through 1991 and a few "golden oldies." ***The ARRL Radio Buyer's Sourcebook Volume 2*** contains *all* ***QST*** Product Reviews published in 1991 and 1992.

Both books explain what radios do, how well they do it, where to get them serviced and where to find articles about modifications. Handy comparative feature and performance charts cover equipment reviewed in the books. Each contains a history of Amateur Radio technology and a glossary of radio features and terms. Heading for a hamfest or ham dealer? Don't leave home without both ***Radio Buyer's Sourcebooks.***

The ARRL Radio Buyer's Sourcebook
1st ed, ©1991, 384 pages ..... #3452 **$15**

The ARRL Radio Buyer's Sourcebook Volume 2
1st ed, ©1993, 240 pages ..... #4211 **$15**

The ARRL Electronics Data Book is a valuable aid to the radio amateur, RF design engineer, technician and experimenter. All those commonly used tables, charts, and those hard-to-remember formulas and semiconductor pin-out diagrams are found in one handy source. You'll also find hundreds of popular circuits and "building blocks," including oscillators, mixers, amplifiers, other devices and their operating parameters. By Doug DeMaw, W1FB. 2nd ed, ©1988, 232 pages ..... #2197 **$15**

The 13th edition of ***Hints and Kinks for the Radio Amateur*** has the best tips, suggestions and projects from the popular ***QST*** column (covering the years 1987-91). It's loaded with helpful techniques and easy projects that will enhance your operating enjoyment. ©1992, 176 pages ..... #3851 **$10**

The 1995-1996 ARRL Repeater Directory includes more than 20,000 listings for voice and digital repeaters and propagation beacons located in North, Central and South America. This edition also lists more than 600 beacons from 7 MHz to 10 GHz. You'll also find band plans, a CTCSS tone chart, a list of frequency coordinators, ARRL Spectrum Committee, Digital Committee and Future Systems Committee, and a user-friendly list of ARRL Special Service Clubs. The ***Repeater Directory*** comes in a handy pocket size for your operating convenience.
24th ed, ©1995, 688 pages ..... #4971 **$7**

The ARRL Electronic Repeater Directory, 1995-96 Edition, by Jerry Redington, KD6PPC, allows quick and easy access, via IBM-compatible computer, to all the information in the printed *Repeater Directory*. Powerful search utility makes it easy to find, and optionally print out, lists of voice, packet or ATV repeaters based on location, features and frequency–or any combination. Also includes list of beacons, band plans, frequency coordinators, repeater lingo and more. Computer requirements: MS-DOS, 286 or higher processor, 380 kB of system memory, 1.3 MB of hard disk space, VGA-compatible video graphics adapter and Microsoft-compatible mouse (optional). 3.5-inch disk, ©1995 ..... #5188 **$14.95**

The North American Repeater Atlas is for the ham on the go who wants to keep in touch with nearby repeaters. Whether you are heading out on a business trip, touring the country in your RV, or just find yourself on a trip to unfamiliar territory, this book will help keep you in touch. Inside you'll find: repeater maps for every US state, every Canadian province, Mexico, Central America, and the Caribbean; street maps showing repeater frequencies for most US metropolitan areas; repeater listings for 10 meters, 2 meters, 220 MHz, 440 MHz, 900 MHz, and 1.2 GHz; and more.
1995-1996 ed, ©1995, 168 pages ..... #5072 **$10**

Your Mobile Companion, by Roger Burch, WF4N, is a practical, easy-to-digest introduction to the fun that awaits the mobile operator. You'll find answers to such questions as: Which bands should I use? Which transceivers and antennas are best, and why? How do I install the antenna without ruining my truck? And how can I deal with interference? It's all here, and more, in one handy book. 1st ed, ©1995, 192 pages ..... #5129 **$12**

The ARRL DXCC Countries List is the ideal way to record the DXCC countries you've worked and QSLed. The latest printing includes DXCC Advisory Committee members, an expanded cross reference for prefixes and exotic countries and more. (Free shipping).
October 1995 ed, ©1995, 28 pages ..... #0291 **$2**

The ARRL Net Directory lists hundreds of Amateur Radio nets of interest to North American hams—DX, ragchew, special-interest, fun and public service nets—they're all here.(Free shipping). 1995-1996 ed, ©1995, 48 pages ..... #4998 **$3**

Your QRP Operating Companion shows that you don't need special rigs or expensive equipment to enjoy the excitement and challenge of low-power operating. Ragchewing, DXing, contesting—all are more enjoyable with QRP. Includes operating tips, lists of QRP clubs and organizations, net and calling frequencies, and much more.
1st ed, ©1992, 96 pages ..... #3762 **$6**

Passport to World Band Radio is the "TV Guide" of shortwave listening. Updated annually, ***Passport*** contains comprehensive schedules for hundreds of international shortwave broadcast stations—when they're on, who they're targeting and what languages they're using—in an easy-to-understand format.

Also included are useful reviews of nearly every shortwave radio currently available, and excellent articles describing the best shows to be found on the international shortwave bands.

Increase your knowledge of today's changing world with ***Passport to World Band Radio*** and make the most of your listening. 1996 ed, ©1995, 528 pages ..... #5293 **$20**

Ferrell's Confidential Frequency List is recognized throughout the world as the most comprehensive list of shortwave utility stations available. What ***Passport to World Band Radio*** is to shortwave broadcasting, ***Ferrell's*** is to utility DXing. This 9th edition has been considerably expanded and now contains

well over 30,000 CW, SSB, RTTY and fax frequencies from 4-28 MHz—military, maritime, aeronautical and more—they're all here. ©1994, 386 pages ..... #2206 **$23**

World Radio TV Handbook is your personal 24-hour guide to the world's broadcasters and their services. Information is listed by country and in an hour-by-hour guide to English language shortwave broadcasts. Comprehensive station information includes call signs, station locations, frequencies, transmitter power, operating times, languages and much more. Join the many who have discovered the world of the international listener. 1995 ed, ©1995, 608 pages ..... #4963 **$25**

VHF/UHF/Microwave Communications

Your VHF Companion lets you explore the fascinating activities on the VHF bands: FM and repeaters, packet, CW and SSB, satellites, amateur television, transmitter hunting, and more. A handy reference section helps you locate equipment, books, magazines and software. A must for all new hams—and all "veterans" as well! 1st ed, 208 pages ..... #3878 **$8**

The ARRL UHF/Microwave Experimenter's Manual is written for the growing number of radio amateurs who are discovering that there is life on our frequencies above 420 MHz. Technicians and engineers will find this book particularly useful. You'll find information on design and fabrication techniques, propagation, antennas and feed lines, transmission media and much more. Companion software is available for IBM PCs and compatibles.
Book, 1st ed, 448 pages ..... #3126 **$20**
Software (3.5-inch) ..... #4726 **$10**

The ARRL UHF/Microwave Projects Manual contains dozens of construction articles for transverters, preamplifiers, power amplifiers, antennas, and test and measurement equipment. Some articles are previously unpublished; others are reprinted from conference proceedings, *QST*, and *QEX*. If your interest lies in the bands above 432 MHz, you'll find this book to be invaluable.
1st ed, ©1994, 352 pages ..... #4491 **$20**

If you're tired of hunting for bits and pieces of information on spread spectrum, the ***ARRL Spread Spectrum Sourcebook*** is for you. You'll find reprints of most spread spectrum articles from ***QST*** and ***QEX***, as well as articles and news items from the ***AMRAD Newsletter*** that show how SS developed from theory to a viable communications system.
1st ed, ©1991, 384 pages ..... #3177 **$20**

Beyond Line of Sight: A History of VHF Propagation from the Pages of QST explores the ways hams helped discover and exploit the propagation modes that allow VHF signals to travel hundreds and even thousands of miles. It's a subject all hams will find fascinating.
1st ed, © 1992, 234 pages ..... #4025 **$12**

Radio Auroras by Charlie Newton, G2FKZ, from the RSGB, details the interesting and unpredictable world of Amateur Radio communications via auroral propagation.
©1991, 96 pages ..... #3568 **$18**

VHF/UHF Manual, from RSGB, is must reading for the VHF and UHF enthusiast. You'll find information on the history of VHF/UHF communications, propagation, tuned circuits, receivers, transmitters, integrated equipment, filters, antennas, microwaves, space communications, and test equipment.
4th ed, ©1983, 528 pages ..... #R630 **$30**

Microwave Handbook, Volume 1, from RSGB, covers operating techniques, system analysis and propagation, microwave antennas, transmission lines and components, microwave semiconductors and tubes.
©1989, 220 pages ..... #2901 **$35**

Microwave Handbook, Volume 2, from RSGB, continues where Volume 1 leaves off with construction techniques, common equipment, microwave beacons and repeaters, test equipment, safety, filters and additional circuit data.
©1991, 244 pages ..... #3606 **$35**

Microwave Handbook, Volume 3, from RSGB, contains a review of microwave theory and practice, reference information, practical designs, hints and tips. Covers 1.3-24 GHz. ©1992, 284 pages ..... #3975 **$35**

Satellites/Space

The Satellite Experimenter's Handbook has the information you need to communicate through or receive signals from a growing "fleet" of orbiting satellites. Whether your interest is in Amateur Radio, weather, TV-broadcast or other spacecraft, you'll find an immense store of valuable data—everything from satellite design to ground station equipment and antennas. Written by Martin Davidoff, K2UBC.
2nd ed, 352 pages ..... #3185 **$20**

Weather Satellite Handbook by Ralph Taggart, WB8DQT, is a popular and easy-to-use reference for anyone interested in viewing our world from space. The revised and expanded 5th edition features an interface project that allows you to capture fascinating images from various weather satellites and HF WEFAX broadcasts (a kit is available). You'll learn how weather satellites function, how to build or modify your own receiving equipment and how to buy or build the right antennas. Companion software (revised for the 5th edition of the book) is available for IBM PCs and compatibles.
Book, 5th ed, ©1994, 224 pages ..... #4483 **$20**
Software (3.5-inch, requires high-density drive) .... #4653 **$10**

ARRL Satellite Anthology contains the best recent *QST* satellite articles on all amateur spacecraft from OSCAR 10 through OSCAR 27, including: how to work DX via OSCARs 10 and 13, and how to get on the Pacsats and the Russian "Easysats." There's even a glimpse into the future with two articles about the advanced Phase 3D satellite. 3rd ed, ©1994, 128 pages ..... #4645 **$10**

Antennas and Transmission Lines

The ARRL Antenna Book is the definitive source for information on state-of-the-art antenna and transmission line theory and construction. The 17th edition presents the best and most highly regarded coverage of antenna fundamentals, propagation, transmission lines, Yagis and quads, as well as all popular wire antenna designs. You'll find a new chapter on HF Yagi Arrays based on the latest computer modeling software. The Radio Wave Propagation chapter has been revised to include comprehensive statistical data on the range of elevation angles needed for communication from all areas of the US to important DX locations. Included with this edition is a 1.44 MB 3.5-inch diskette for the IBM PC/XT/AT and compatible computers with software by K6STI, W1FM and N6BV for Yagi analysis, propagation prediction, transmission-line evaluation, and more. ©1994, 736 pages ..... #4734 **$30**

Four volumes are available in ***The ARRL Antenna Compendium series***, and each is packed with previously unpublished articles on all the popular types of HF/VHF/UHF antennas and some you've never heard of! In ***Volume 1*** you'll find articles on

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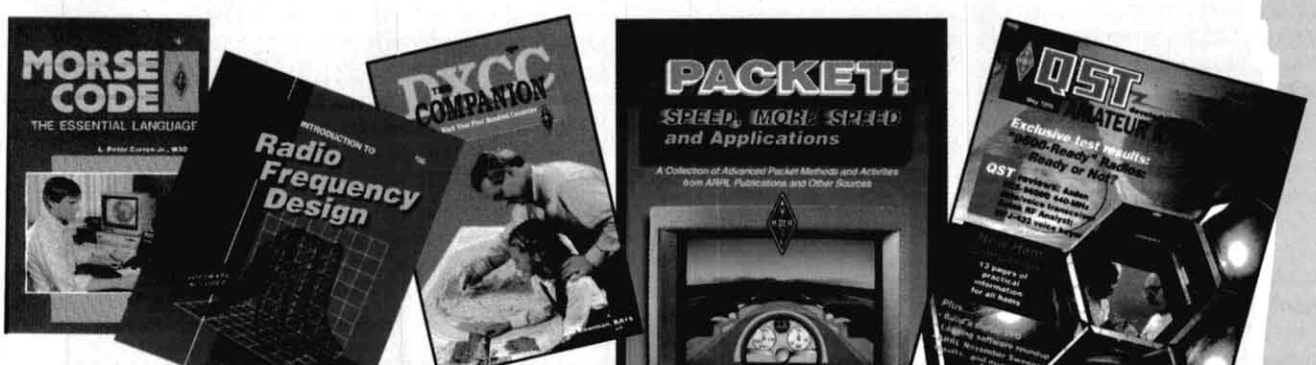

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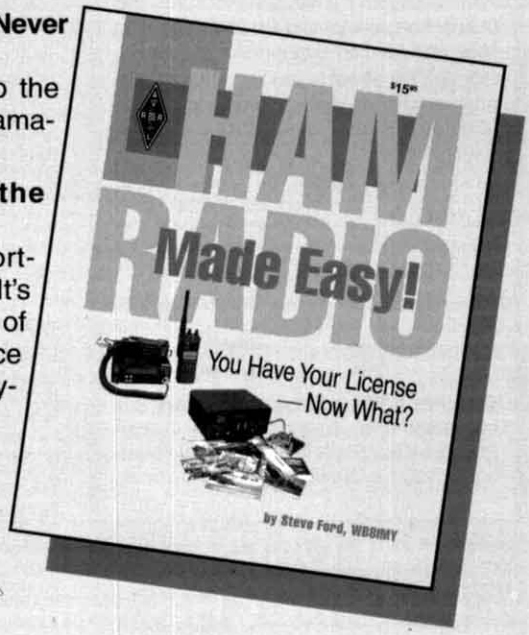

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Duplexer Built-in
Under $500

IC-2000H
Two Meter Mobile
50W • 50 Mem. Ch.
Under $300

IC-T22A $235 • IC-W31A $409

YAESU

FT5100 $30 Off **FT8500 $30 Off**

FT-5100
Dual Band Transceiver 2M/70CM
50 Watt VHF • 35 Watt UHF
V+V • U+U • V+U
47 Memory Channels Per Band
Tone Encode & DTMF Coded Squelch

Holiday Specials
from
Austin Amateur Radio Supply
1-800-423-2604

Great Price!
FT-900AT $100 Off

FT-900AT
Compact HF Transceiver
100 Watt • 160-10M
Detachable Front Panel
Two VFOs Each Band
100 Memory Channels

FT2200 $40 Off

FT-2200
Compact & Full Featured
Two Meter 50 Watt • 50 Memory Channels
Tone Encode & DTMF Coded Squelch

NEW **FT1000MP DSP**

Enhanced **DSP**

FT-1000MP
All Mode HF Transceiver
Enhanced Digital Signal Processing • Dual In-Band Receive
Collins SSB Mechanical Filter • Adjustable 5 to 100 Watts Power

FT840 $100 Off

FT-840
Compact HF Transceiver
100 Watt • 160-10M
100 Memory Channels

FT-2500M
Heavy-Duty
Two Meter 50 Watt
31 Memory Channels
Tone Encode Built-in

FT2500M $30 Off

Call
Austin Amateur Radio Supply
1-800-423-2604

The First Dual Band HT with WINDOWS!

FT51R $30 Off

FT-51R
Dual Band Handheld Transceiver 2M/70CM
2 Watt VHF • 1.5 W UHF
Back-Lit Keypad
60 Memory Ch Per Band
Tone Encode & Decode
DTMF Coded Squelch

FT-51R 5 Watt
As Above w/5 Watt Battery

Good Performance with Confidence!

FT-11R
2M Handheld Transceiver
1.5 Watt
Back-Lit Keypad
150 Memory Channels
Tone Encode
DTMF Coded Squelch

FT11R $30 Off

FT-11R 5 Watt
As above w/5 Watt Battery

Great Price!
FT-530 $70 Off

Under **$379**
UPS 2 Day *Included!*
In the 48

FT-530
Dual Band Handheld Transceiver 2M/70CM
2 Watt VHF & UHF
V+V • U+U • V+U
41 Memory Ch Per Band
Tone Encode & Decode
DTMF Coded Squelch

YAESU Rotators *To Turn Your Head!*

G800S G800SDX $25 Off

G450XL	**10.6 Sq. Ft.**
G800S	**17 Sq. Ft.**
G800SDX	**17 Sq. Ft.**
Azimuth-Elevation	
G5400B	**8.6 Sq. Ft.**

Coupons Expire 1/31/96

VHF/UHF All-Mode Transceiver FT-736R

"Why bother with imitation satellite rigs, when the FT-736R has more bands, and AC and DC, too?"

"Right! And Yaesu also makes a choice of two companion rotators!"

"Yaesu did it again!"

Satellite leader for eight years, far and away.

Demanding VHF and UHF amateur operators know their "stuff." That's why the Yaesu FT-736R, and companion G-500A or G-5400B rotator, have been their station of choice for over eight years. To sustain that leadership position, Yaesu engineers specifically designed the FT-736R to meet the mandates of this unique operating interest.

Not only does the FT-736R come with 144 and 430 MHz bands, easy-to-install modules instantly add two more, for a total of four. To customize your transceiver, choose from bands available in 50, 222, or 1240 MHz. Four bands – available on only one radio – the FT-736R.

No tuning problems with the FT-736R, either. Unlike other "me-too" transceivers, Yaesu's pioneering VFO Tracking System (VTS) automatically sets the uplink frequency on inverted or non-inverted transponders, and the built-in Discriminator Center Meter displays the frequency in use and allows precise tuning on LEO satellite FM downlinks. For flexible operating power needs, the FT-736R uses either 13.8 VDC, or its own built-in AC power supply. To simplify station setup, interface jacks for PTT, external speakers, TNC Connection, and linear amplifier make installation a snap!

Low receiver noise figures, and a built-in IF CW filter make the FT-736R ideal for weak signal work: EME, Meteor Scatter, FAI, Sporadic-E, or Tropo. Add the G-500A or G-5400B Rotator to the FT-736R, and your complete and exclusive Yaesu package for satellite operation is up and running.

There's no rig quite like the FT-736R. For sheer numbers of specialized features, unquestionable benefits, and satellite rotators made by the only radio manufacturer in the world, let Yaesu take you far and away.

Specifications

- Frequency Coverage
  2m: 144-148 MHz
  70cm: 430-450 MHz
- 100 Memory Channels
- Full Cross-band Duplex w/Inverted Tracking for AO-13
- Easy Interface to TNC via Data In/Out Jack
- RF Output Power:
  25 W on 144, 222 & 430 MHz
  10 W on 50 & 1240 MHz
- 117/220 VAC, 13.8 VDC
- Emission Types
  LSB/USB (J3E Voice), CW (A1A)
  FM (F2D, FSK, F3E Voice)
  TV (A3F optional, for 1.2 GHz*)
  *Requires optional Unit

YAESU

Choice of the World's top DX'ers

G-500A

Elevation rotator for space communication antennas.

Max. Antenna Wind Load: 12 sq. ft.

Mast Size: 1⅛"-2¼"

Boom Dia.: 1¼"-1⅝"

G-5400B

Azimuth-Elevation combination for space communication antennas. DIN connection for computer operation.

Max. Antenna Wind Load: 11 sq. ft.

Mast Size: 1⅛"-2½"

Boom Dia.: 1¼"-1⅝"

Rotator Size: 12½"H x 7⅛" Dia. (Mounted together)

(GS-232 Computer Interface Available)

2m/70cm Mobiles **FT-2500M/FT-7400H**

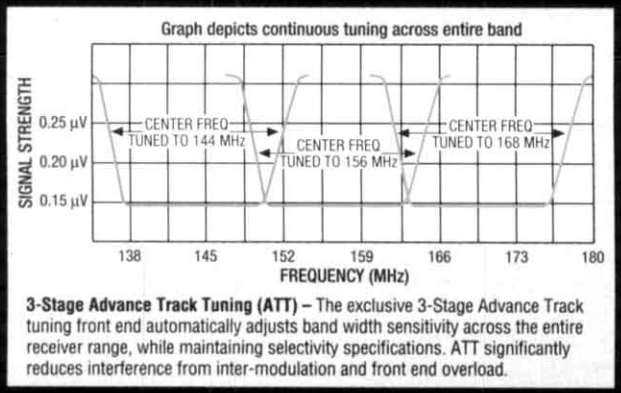
Advanced Track Tuning, Mil Spec, true FM. All in one radio!

Outside, you can easily see why the FT-2500M stands up to the shock and vibration like no other. We engineered the first mobile radio to meet the rigid standards set by the U.S. Military back in the '80s, and that same critical design is in the FT-2500M. From the simplified front panel, rubber coated knobs, durable pebbled finish coating, and huge Omni-Glow™ display to the one-piece die-cast chassis, the FT-2500M can take whatever you throw at it!

Inside, the electrical circuitry meets standards so uncompromising the FT-2500M can respond like no other radio. Built-in 3-Stage Advance Track Tuning (ATT), automatically retunes from 140 to 174 MHz permitting consistent receiver sensitivity across the entire band.

But there's more. Like alpha-numeric display capability! Lets you program a frequency or a 4-character name on any of the 31 memories. With three selectable power output levels and up to 50 watt power output, the FT-2500M extra large heat sink means forced air cooling is not necessary. And, as a bonus, Yaesu's exclusive backlit DTMF mic comes with every FT-2500M.

Experts say the FT-2500M is the only commercial-grade amateur radio available. So, for tough manufacturing standards, inside and out, with true FM clarity, and outstanding performance, the FT-2500M is your mobile.



3-Stage Advance Track Tuning (ATT) – The exclusive 3-Stage Advance Track tuning front end automatically adjusts band width sensitivity across the entire receiver range, while maintaining selectivity specifications. ATT significantly reduces interference from inter-modulation and front end overload.

Specifications

- **Frequency Coverage:**
  FT-2500M
  RX: 140-174 MHz
  TX: 144-148 MHz
  FT-7400H
  RX/TX: 430-450 MHz
- Rugged Military Spec Design
- Advanced Track Tuning (ATT)
- Selectable Alpha-Numeric Display
- Omni-Glow™ Display, largest available
- Power Output:
  FT-2500M 50/20/5 Watts
  FT-7400H 35/15/5 Watts
- Flip Up Front Control Panel hides seldom used buttons
- Backlit DTMF Mic
- 31 Memory Channels
- CTCSS Encode Built-in
- Automatic Power Off (APO)*
- Time-Out Timer (TOT)*
- Manual* or Automatic Backlighting Adjustment
- **Accessories:**

FP-800	20 Amp HD Power Supply w/ Front Mounted Speaker
FRC-6	DTMF Paging Unit
FTS-17A	CTCSS Decode Unit
SP-4	External Mobile Speaker w/ Audio Filters

*FT-2500M

YAESU

Performance without compromise.℠

"Just look inside. Military spec really means something to Yaesu!"

"A QST review says 'the FT-2500M exhibited superior 10 MHz offset IMD dynamic range of 103 db!'"

"This Advanced Track Tuning practically eliminates intermod!"

"Yaesu did it again."

US MILITARY APPROVED MIL-SPEC 810

FT-2200/7200

Just 5.5"W x 1.6"H x 6.5"D, the FT-2200/7200 radios are designed to fit into today's more compact cars with ease.

SPECIFICATIONS • Frequency Coverage: FT-2200 RX: 110-180 MHz, TX: 144-148 MHz. FT-7200 RX/TX: 430-450 MHz. • Wide Receiver Coverage: 110-180 MHz • AM "Aircraft" Receive: 110-139 MHz • Built-in DTMF Paging/Coded Squelch • Selectable Channel Only Display • 10 Memory DTMF Auto Dialer • Backlit DTMF Mic • Power Output 50/20/5 Watts (FT-7200 35/15/5 Watts) • 50 Memory Channels • Remote Operation w/ Optional MW-2 • CTCSS Encode Built-in • Optional Digital Voice Storage System. Accessories: See your authorized Yaesu dealer.

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.

ADMS-1B COMPUTER PROGRAMMABLE

Ultra Compact Handhelds FT-10/40R

FEATURES	**Yaesu FT-10/A16D**	Kenwood TH-22AT
Rugged MIL-SPEC Rates	**Yes**	No
DCS (Digital Coded Squelch) Built-in	**Yes**	No
Alphanumeric Display	**Yes**	No
True FM for Better Voice Clarity	**Yes**	No
Transmit Battery Saver	**Yes**	No
CTCSS Encode & Decode Built-in	**Yes**	Optional
ARTS (Auto Range Transpond System) *(Alerts you when a similarly programmed HT is out of range)*	**Yes**	No
Optional Digital Voice Recorder	**Yes**	No
Scans for DCS Tones	**Yes**	No
Computer Programmable w/ADMS-1B	**Yes**	No

The Best vs "the rest."

Features

- Frequency Coverage
  FT-10R
  2m: RX: 140-174 MHz
  TX: 144-148 MHz
  FT-40R
  70cm: RX: 420-470 MHz
  TX: 430-450 MHz
- Auto Range Transpond System™ (ARTS™)
- MIL-STD 810
- High Audio Output
- 12 V DC Direct Input
- Alphanumeric Display
- RX/TX Battery Savers
- Digital Coded Squelch (DCS)
- Digital Voice Recording System (DVRS) w/FTT-10/A16S
- True FM
- High Speed Scanning
- 2.5 and 5 W available
- Track Tuning Reduces Receiver Intermod
- Water Resistant Design
- Optional Keypads Available
- Full line of accessories

No other amateur handheld compares to the hot new FT-10/40R – the first amateur HT ever to be rated MIL-STD 810! Its built to tough, military spec commercial radio standards inside and out. The FT-10/40R is packed with more than 10 exclusive features not found on any other HT. Important, useful, exclusive features add real value to the FT-10/40R, and it's priced right! All this – and the FT-10/40R is small enough to pocket, too!

For manufacturing excellence, breakthrough design, and value, no one can touch Yaesu. And, no other radio can touch the FT-10/40R for exciting features, commercial-caliber toughness, and performance. Compare for yourself!

YAESU

Performance without compromise.℠

For the latest Yaesu 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.

Best Dual-Banders on Wheels

SEE AUTHORIZED KENWOOD DEALER FOR YOUR SPECIAL SAVINGS!

TM-733A

FM DUAL BANDER

ISO 9002 Meets ISO Manufacturing Quality System

144MHz/440MHz Dual-Band Operation

Kenwood's TM-733A is a versatile FM dual-bander with sophistication and power (144MHz; 50W/440MHz; 35W) for high performance mobile communications. As well as receiving simultaneously on VHF and UHF bands, it can receive two frequencies on the same band.

Six-In-One Programmable Memory

Six entire operating profiles—including everything from the frequency range to the dimmer level can be stored in the programmable memory for recall at the press of a button. It's like having six transceivers in one.

Data Connector for 1200/9600 bps Packet

Using the 6-pin mini DIN connector on the front panel, you can hook up a TNC to the TM-733A for either 1200 or 9600 bps packet communications.

1200/9600 bps packet compatible

* permits required for MARS and CAP use. Specifications guaranteed for Amateur bands only.

Theft-Deterrent Features

For the added safety, you can choose the quick-release detachable front panel kit (option). The transceiver unit can be concealed under a seat or in the trunk.

Theft Deterrent Faceplate

Other Features

■ 72 multi-function memory channels ■ AIP (Advanced Intercept Point ■ Built-in DTSS with page ■ Cross-band repeater ■ Wireless clone function ■ Wireless remote function ■ Auto simplex checker ■ Built-in CTCSS encoder & optional TSU-8 decoder ■ Key function display ■ Modifiable for MARS/CAP*

144MHz/440MHz & 144MHz/220MHz Operation

The TM-742A (144MHz; 50W/440MHz; 35W) and TM-642A (144MHz; 50W/220MHz; 25W) dual-band mobile transceivers can be converted into tri-banders with the addition of an optional FM band unit: 28MHz (50W), 50MHz (50W), 220MHz (25W; TM-742A only), 440MHz (35W; TM-642A only), or 1200MHz (10W). The transceiver can display and even receive three bands simultaneously.

101 Memory Channels

For each band, there are 100 memory channels plus 1 call channel. Each channel can store transmit and receive frequencies independently or odd split repeaters.

Other Features

■ Built-in DTSS selective calling with page ■ Independent SQL & VOL controls for each band ■ Built-in CTCSS encoder & optional TSU-7 decoder ■ Wireless remote control function ■ High-visibility illuminated panel keys ■ Wide-band VHF/UHF receive coverage (including Air Band) ■ Date & time display, stopwatch, alarm, on/off timer ■ Cross-band repeater function ■ Modifiable for MARS/CAP*

*Permits required for MARS and CAP use. Specifications guaranteed for Amateur bands only. Kenwood follows a policy of continuous advancement in development. For this reason specifications may be changed without notice.

Separate Control & Display Units

The display and controls can be mounted separately on either side of the steering wheel, for example — while the main unit is concealed in the trunk.

TM-742A/642A

FM MULTI BANDER

ISO 9002 Meets ISO Manufacturing Quality System

KENWOOD

KENWOOD COMMUNICATIONS CORPORATION
AMATEUR RADIO PRODUCTS GROUP
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Repair Locations/Parts (800) KENWOOD Bulletin Board Service (BBS) (310) 761-8284
INTERNET http://www.kenwood.net

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