

# Amateur Radio

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DECEMBER 1995

# CQ

## SEASON'S GREETINGS

**NEW**  
Holiday Gift  
Ideas Inside!



U.S. \$2.95 CANA



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AMATEUR'S JOURNAL



# HF TREASURE

Intelligent Digital Enhanced Communications System

## 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

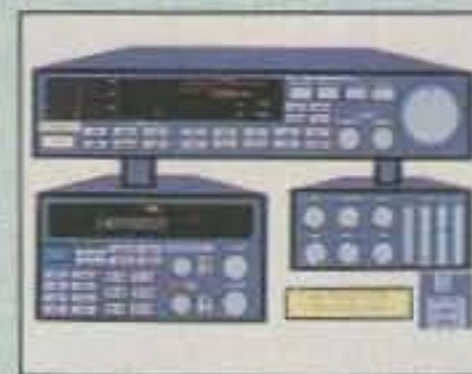
Choose from 2 methods of noise reduction: Line Enhancer Method (LEM) or Speech Processing/Auto Correlation (SPAC). LEM allows you to custom-shape a filter curve around a target signal, essentially 'carving' it out of the background noise — a powerful tool in SSB operation. For tough CW conditions use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

# KENWOOD

KENWOOD COMMUNICATIONS CORPORATION  
 AMATEUR RADIO PRODUCTS GROUP  
 P.O. Box 22745, 2201 E. Dominguez St., Long Beach, California 90801-5745  
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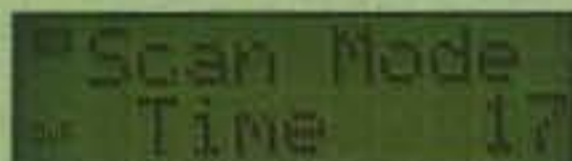
# Smart Dual-Bander

## 144MHz/440MHz Dual-Band Operation

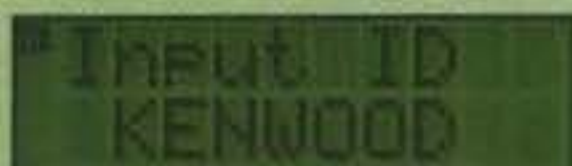
Ultra compact, lightweight in design, this smart FM dual-bander offers a superb combination of operating ease and powerful performance for handheld communications. As well as providing single-band operation, the TH-79A(D) features extensive dual-band functions, including full-duplex operation and the ability to receive two frequencies simultaneously, even on the same band. And for especially demanding applications, a high-power version — the TH-79A(D)H — is also available.

## Dot-Matrix LCD & Menu System

In addition to frequency data, the easy-to-read dot-matrix LCD, a Kenwood exclusive, offers access to a menu system with full alphanumeric display of functions and settings. You can also scroll through a summary of your current operational status.



Scan Mode  
Time 17



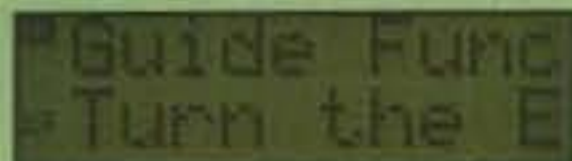
Input ID  
KENWOOD

## 82 Non-Volatile Memory Channels with ID

The memory channels are all capable of storing transmit and receive frequencies independently — thus allowing split-frequency operations — and an alphanumeric ID can be used to identify each one.

## Guide Function

There's no need to carry a manual with you: the dot-matrix LCD provides access to a handy guide function that displays simple to understand operating instructions at the touch of a button.



Guide Func  
Turn the E

## Wide-Range Flexible Antenna

A high-performance flexible antenna ensures excellent reception over the TH-79A(D)'s extended RX range — including Air Band, weather channel and other service frequencies.

GET CASHBACK  
FROM KENWOOD  
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FOR DETAILS!



## DTMF Keypad with DTMF Memory

The built-in DTMF keypad enables direct frequency entry and direct recall of memory channels. Up to ten 15-digit DTMF codes with alphanumeric ID can be stored for telephone autopatch use.

## Wireless Clone Function

If you're operating two or more transceivers, the ultimate time-saver is the TH-79A(D)'s cloning function. Essential data is transferred rapidly, without needing a cable.

## Other Features

- Efficient FET power module
- Automatic Band Change
- Full band scan, programmable band scan, memory scan with memory channel lock-out
- TO & CO scan stop modes
- DTSS with page and answer-back function
- Power-on call sign display
- Built-in CTCSS tone encoder/decoder
- Tone alert system with elapsed time indicator
- Cross-band repeater function
- Auto repeater offset (VHF)
- Can use as a remote controller for TM-733A/742A/642A/942A
- Lock functions
- 3-position output power control (High, Low, Economy Low)
- Auto power-off and battery save 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.

# TH-79A (Deluxe)

F M D U A L B A N D E R

ISO 9002 Meets ISO Manufacturing Quality Standards

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# Cushcraft

**WHERE PERFORMANCE IS A TRADITION**

Cushcraft is the leader in new and innovative antenna designs to make your amateur radio operation more satisfying. Whether you are new to the hobby or have many years of experience there is a Cushcraft antenna for you. Call or visit your local dealer. He has Cushcraft antennas in stock.



**13B2  
Boomer**

**BOOMERS.** The contest winning **17B2** for EME, Tropo, SSB, CW or the **13B2** for FM, Packet or SSB over the whole 2 meter band. Both models have the new UltraMatch balanced feed system. Computer aided design gives you the cleanest pattern and the highest gain available

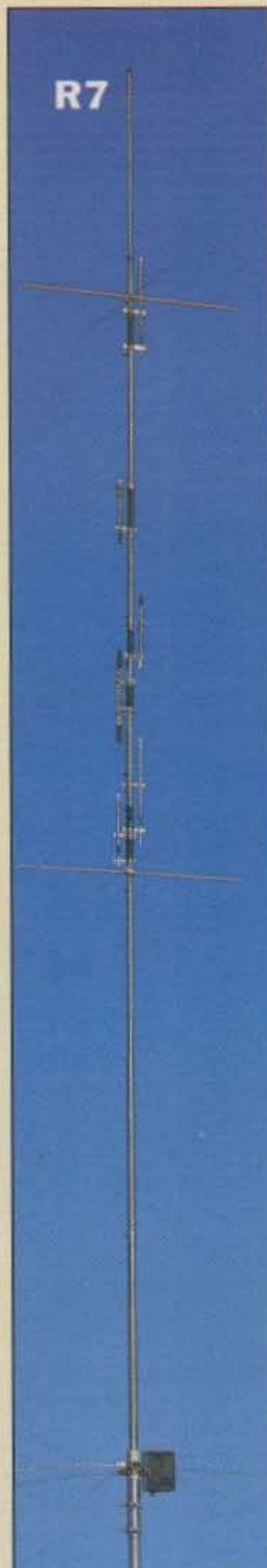


**A148-10S**

**PERFORMANCE AND VALUE LEADERS.** Our newest computer optimized 2 meter Yagis. **A148-3S**, a 3 element compact for Packet, FM or even portable use. Easily rear mounted. **A148-10S** is one of our best value designs with excellent gain and front-to-back. Great for FM or full band 2 meter operation.



**40-2CD  
Monobander**



**R7**

**SKYWALKER  
MONOBANDERS.**

10, 15, 20 and 40 meter Yagis for more contacts, less waiting and a better signal. Preferred by contesters and DX-peditions worldwide.



**A3S  
Tribander**

**HF TRIBAND BEAMS.** **A3S** - The most popular compact 10, 15, 20 meter beam. **A4S** - A high performance 18' long wideband beam. Both models come with stainless steel hardware and have optional 40 meter add-on kits.

**Dual Band Mobile.**  
**CS-270M** - Designed for durability and great performance.



**CS-270M  
Dual Band  
Mobile**



**AR-270B  
Dual Band**

**Dual Band Ringos.** **AR-270** - Only 45 inches tall! A must for the new dual band transceivers covering 70 cm and 2m. **AR-270B** - This new dual band features high gain with a low angle of radiation and stands only 7.7 feet tall. **ARX-270UN** - High performance, 16.5 foot, fiberglass with exceptional gain. Three piece construction assembles in minutes.

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HALFWAVE VERTICALS**

Amateur radio's most popular vertical design now gives you 7 band performance including 30 & 40 meters, without ground radials. Only 22 feet tall, R7's small footprint and ground independence give you "mount anywhere" flexibility. R5, with the same great features as the R7, covers 10, 12, 15, 17 and 20 meters.

**RINGO RANGER II.** Still the world's favorite 2 meter, 70 cm or 220 MHz omni antenna, with more gain. A must for your FM or packet station. Models: **ARX-2B, ARX-220B, ARX-450B, ARX-450BN**



**Ringo  
Ranger II**

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# The Radio Amateur's Journal



**ON THE COVER:** Santa was able to hire some new "digital elves" this year thanks to the latest in modern computer technology. We'd like to join them all in wishing you a joyous holiday season with family and friends. (Photo by Larry Mulvehill, WB2ZPI. Elf costume designed and created by Jenny Mulcahy.)

**DECEMBER 1995**

**VOL. 51 NO. 12**

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# ZERO BIAS

## AN EDITORIAL

**O**kay, someone looked through some telescope in California and saw a spot or two on the sun. Is that reason enough to rejoice when band conditions are not great and some are deathly quiet? You bet! As we leave 1995 and enter into 1996, we can anticipate heading into the good old days again—those being another sunspot high. After experiencing about four cycles, I can tell you that it's like waiting for summer to come after winter. The only variable is the quality of spring. Summer always comes back, as do the bands, like swallows from Capistrano, or wherever. Knowing how it works makes it predictable and usable, and gives you time to prepare. Not knowing how it works is costly in time, effort, and sometimes a lot more, as you'll find out by reading Bob Rose's article in this issue.

When I look back on 1995, I have to conclude that all in all it's been a pretty good year for me. I've managed to work through most of my list of things I wanted to accomplish, including a healthy start on redoing my shack. It's taken just about four LIMARC Fleamarkets to sell off all the excess "good stuff," plus I've thrown out piles of junk. There are two new antennas up, and there are definite clear lanes to walk through my basement. I've got a few bucks put aside for new "good stuff" next year, and when the new cycle really takes hold, I intend to be ready. Right now the only folks who seem happy with low sunspot numbers are the "top band" aficionados, as you can tell by checking the results of *CQ's* 160 Meter Contest for 1995 in this issue. It was a much bigger turnout than usual, with higher scores. For the rest of us, though, the best is yet to come.

I still don't have the 100-foot-plus tower with stacked Yagis like the ones I see as I look longingly at *CQ's* Amateur Radio Calendar for 1996-97. Actually, if I looked out my window and saw such an array, I'd know I was dreaming. My neighbors, and most certainly the local municipality, would be all over me before I had the chance or was even close to putting up something like that. It's okay, though. It's still nice to dream about things.

One thing I've dreamed about adding to my shack for about twenty years is finally going to happen. I guess that this year I finally decided that I really deserve it and should have it. I'll tell you more about it when it actually arrives and happens.

What about you? Is Santa going to drop off some great stuff this year? There are a lot of neat things coming on the amateur market these days, and there is certainly no point in waiting for a sunspot high to get in on the fun. This is the best time to start some serious thinking about adding the stuff you wished you had during the last cycle high. What better time is there to think about and shop for new gear than the holiday season? As usual we have plenty of gift suggestions in this issue, plus product reviews to help you in your quest. You'll also notice a catalog of *CQ* prod-

ucts and ads for two new periodicals we're bringing out. These magazines are targeted, written, and produced for two avid groups. The first, *CQ VHF*, focuses on the amateur world above 50 MHz. It is designed for the newcomer to the hobby and for this spectrum space. It's what you can do, how you can do it, what you'll need, and everything in between. No, it's not going to replace anything in *CQ*, or change our normal coverage. It will, though, provide far more monthly coverage than we can now offer. The second periodical, *CQ Contest*, will come out ten times a year and is geared for the super-competitive, hard-core contester. It is global in concept and will feature the best international coverage of contests and contesters, and absolutely everything that concerns them. Again, everything we now cover in *CQ* regarding contests, including results, will stay the same. If contesting and VHF activities are your main areas of interest and you want every scintilla of information available, put these two new magazines on your holiday list. Check the ads for them in this issue.

Part of the holiday excitement is certainly the exchanging of gifts. For the amateur this excitement translates into a focus on new gear. The holiday season obviously has far more import than a simple rationale for the exchange of gifts. The gifts are reminders that we celebrate traditions this time of year. A link to the past and a thread to the future. I know that some of our fellow amateurs look at the hobby as a religious experience, but most of us know that it isn't. Whichever holiday you celebrate, it's important to keep in mind the reasons for and traditions of the celebration.

This year as you check catalogs, read product reviews, look at new product announcements, and see what columnists and feature writers have to say, remember that our traditions in a sense are very young. In terms of history, we're basically one generation away from the origin of the hobby itself. Amateur radio hasn't been around that long, and there are many amateurs out there who met or knew some of the original amateurs. Our tradition, dogma, and procedures periodically change drastically in direct relation to changes in technology. Things that have "always been done that way" have only been done that way since the technology allowed it, people adopted it, and it remained in favor. A number of us are involved in various modes and technologies that were unheard of and not even dreamed about when we first started. We take it for granted now, get comfortable with it, and balk when it too gets supplanted by something newer.

These days things get "newer" quicker. It's not that things get bigger or smaller, sport a different color, or even acquire one added small feature or improvement. They are totally different, offering new and wonderful features, and yes, in some cases they are incredibly small. It's a total learning experience. On the digital front you find out quickly that there

is no front, and the future is as vast as space itself. The transition from "Why would I need that?" to "How did I get along without it and can I get some more?" is almost instantaneous. All you have to do is open your eyes to see which way and how fast we're going. It's never going to be the same as it was.

As for myself, I have a few things on my holiday list and my 1996 list that I'd like to have and try out, things I didn't have a few years ago. Recently I had the chance to borrow and try out one of the super-new and super-small rigs, and suddenly I had visions of mobile and portable operation. Once I figured out what all the items on the menu were, and how flexible this rig could be, a whole range of possible amateur activities opened up. I had to give this back, of course, but something like it is definitely on my 1996 list. With the promise of a new cycle, there are also a number of other things I'd like to add to my shack this holiday season. I still believe that the best is yet to come. I have no great desire to replicate the way things were when I started in 1953. They were great and exciting then, but each new era in technology brought so much more to the hobby than was ever dreamed of in the '50s.

The wonder and awe of amateur radio has been the one constant. Looking back on our year-long celebration of *CQ's* 50th anniversary and the past 50 years of amateur radio in general, the single thread winding its way through our hobby has been the desire to make the world a smaller place—a neighborhood, a community. In 50 years we've learned to accept as normal and commonplace the fact that we can walk or drive around with a tiny, low-powered HT, and a friendly voice, though distant, is only a repeater away. We've learned to complain and rant and rave about conditions during famous DX pile-ups, while waiting our turn to hear "5/9." Fifty years ago that would have been virtually impossible except for the very few "chosen" amateurs with super stations. Our signals can span any part of the globe with relative ease, in real time, in many modes, using all sorts of wonderful hardware and technology, and it truly is awesome. Fifty years from now this probably will look like smoke signals, jungle drums, and heliographs.

As you celebrate and enjoy the holiday season, contemplate some new amateur gear, 1996, Cycle 23, and all the opportunities that await you. It's more of the same if that's what you want, but you'll be missing out and probably be left behind if you don't try to keep up. If you're the kind of person who makes New Year's resolutions, make a few about amateur radio this year and try to keep them.

All of us at *CQ* would like to wish all of you a very happy holiday season and a terrific 1996. We'd also like to thank everyone for their comments and support in helping us celebrate a really great 50 years in amateur radio publishing. Here's to the future.

73, Alan, K2EEK



# IC-738 THE NEXT GENERATION



Don't let your contest results depend on "previous generation" technology. Get the Dxr's advantage with the "Next Generation" IC-738.

## FEATURES

- New DDS Technology
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40W AM Standard
- AT-170 High Speed Automatic Antenna Tuner (160-10 Meters)
- Two Antenna Connectors (Front Panel Switchable)
- 4 Function Meter (SWR/ALC/PO/S)
- VOX
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- Pass Band Tuning
- Notch Filter
- 10 Electronic Scratch Pad Memories
- 101 Memory Channels (10 split, 2 scan edge)
- RIT/ $\Delta$ Tx Functions
- Quick Split w/Simultaneous Display
- Speech Compressor
- Attenuator (20 db)
- Pre Amplifier (20 db)
- Double Band Stacking Registers
- Set Mode Menu to Customize Operation
- Menu Selectable CW Filters
- Noise Blanker
- Fast/Slow AGC
- High Dynamic Range/Low Distortion
- Built-in Electronic Keyer
- Direct Keyboard Entry
- Hand Microphone Included (HM-36)
- Computer Control Port (CI-V)

## NEXT GENERATION TECHNOLOGY

### Next Generation Circuitry

**DDS (Direct Digital Synthesis)** ICOM's unique DDS IC is used for the LPL Circuit. High tech and compact, the PLL unit improves frequency resolution to 1 Hz step. You'll experience an analog feeling of the tuning, faster PLL lockup times, improved phase noise blocking and high dynamic range.

### Next Generation Tuner

**AT-170 Advanced Tuner** Preset memories, in 100kHz steps, provide very high speed tuning. "Automatic re-tune" turns the AT-170 on, and tunes, when SWR exceeds 1.5:1. "Through inhibit" permits tuning at SWR conditions up to 3:1 (when your antenna can't be tuned to 1.5:1). "Sensitive/Normal" gives you the choice of minimum possible SWR or 1.5:1. This eliminates tuning each time you transmit, unless desired.

### Next Generation Duty Cycle

**100% Full Duty** The final power amplifier outputs a stable 100 W in SSB, CW and FM modes. The aluminum die cast frame, large heatsink and innovative twin cooling fan system stabilize the PA circuit to ensure 100% duty cycle operation.

### Next Generation Frequency Management

**Quick Split Operation** Pre-programmable offsets, simultaneous display of Tx and Rx frequencies and XFC (Transmit Frequency Change) give you a competitive edge when calling Dx stations operating split frequencies. "Split Lock" permits changes in your transmit frequency while protecting your receive frequency against accidental changes.

### Next Generation CW Operation

**CW Contest Package** Our built-in electronic keyer with separate key jack, full break-in (QSK) and separate jacks for an extended CW key or memory keyer, make a competitive package for CW contesting. For example, use a memory keyer (or TNC with CW capability) to make contacts easily, then use your paddle for normal operation.

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# ANNOUNCEMENTS

• **The following Special Events are scheduled for December:**

**W3OK**, from the twin Christmas Cities of Nazareth and Bethlehem, Pennsylvania; The Delaware-Lehigh ARC; to celebrate the Christmas season; December 16-17; operation on 3.965, 7.265, 14.265, 21.365, and 28.365. For certificate, send QSL and 9 x 12 SASE to DLARC, RR 4, Greystone Building, Nazareth, PA 18064.

**W4NC**, from Winston-Salem, North Carolina; The Forsyth ARC; to celebrate the 65th anniversary of the founding of the Forsyth ARC; December 30; 1300-2100Z; in the lower General phone and CW portions of 40, 20, 15, 10 meters. For replica 1930 QSL, send SASE to FARC, P.O. Box 11361, Winston-Salem, NC 27116.

**5-land**, from Houston, Texas; members of Clear Lake ARC and Bay Area QCWA Chapter 184; to celebrate the end of hurricane season; 0000Z December 2 through 0000Z December 4; operation in the General class portion of the HF bands and on the CLARC repeater at 442.75 MHz. For certificate and QSL, send QSL and 9 x 12 SASE to the station worked.

**WA5DTK**, from Round Rock, Texas; celebrating the 150th anniversary of Texas statehood throughout December; in the General class subbands (SSB and CW) primarily on 14.250. QSL and SASE to Barry Brewer, 603 Broken Bow Dr., Round Rock, TX 78681-7401.

**KE7PE**, from Mesa, Arizona; EVARG; to commemorate the sinking of the *USS Arizona*; operation in the lower portion of 20 meters. For certificate send 9 x 12 SASE to EVARG, P.O. Box 1424, Gilbert, AZ 85299-1424.

**VA1S**, from Sydney, Nova Scotia, Canada;

to mark the 93rd anniversary of Marconi's successful transmissions from Canada to England; Marconi Amateur Wireless Society; Dec. 1-31 on CW and SSB on all bands 10-160 meters, depending on conditions. QSL card and certificate (certificate issued to stations making contact with VA1S on five different bands during 1995; provide log details, \$5.00 [10 IRCs], request certificate) sent to those who request them. Send requests to Alan Leith, VE1AL, Marconi Amateur Wireless Society, 846 George St., Sydney, Nova Scotia B1P 1L9 Canada.

**SP8TPAX**, Poland; to commemorate the 70th anniversary of the first amateur radio contact in Poland; The Editor of the Radioamateurs Bulletin "QTC" and the HQ of PZK; Dec. 1 to Dec. 15; operation on all HF bands, CW, SSB, and RTTY. Send QSL cards via SP2FAP or directly to the "QTC" Magazine address (P.O. Box 18, 82-312 Elblag 13, Poland).

• **The following hamfests, etc., are slated for December:**

Dec. 1-2, **The Arkansas DX Convention**, Little Rock, Arkansas. For more info, contact ADXA, 200 S. Bradley, El Dorado, AR 71730.

Dec. 2, **Central Illinois Winter Superfest**, Turner Junior High School, Jacksonville, Illinois. Information send SASE to Rich Tavender, KB9IXO, 721 East State, Jacksonville, IL 62650. Exams contact Tim Childers, KB9FBI, 773 E. College, Jacksonville, IL 62650 (217-245-2061).

Dec. 2, **Superstition ARC Hamfest**, Mesa Community College, Mesa, Arizona. For more information, contact Rick Checketts, KA0KZB, 602-898-9158; or Edward Cole, KB7RMO, 5264

East Hannibal Street, Mesa, AZ 85205; or Gary Roberts, KB7VCP, Chairman, 602-461-0644. For exam information, contact Larry Kuck at 602-986-2298 (walk-ins only).

Dec. 2, **Dothan Hamfest**, Wiregrass Recreational Center, Dothan, Alabama. For more info, contact Joe Higginbotham, KE4HUN, Hamfest Chairman, WARC, P.O. Box 958, Dothan, AL 36302 (334-814-4542). (Exams.)

Dec. 2, **Courage Center Handi-Ham Winter Hamfest**, The Eagles Club, Faribault, Minnesota. For info, contact Don Franz, W0FIT, 1114 Frank Avenue, Albert Lea, MN 56007.

Dec. 3, **Hazel Park ARC 30th Annual Swap & Shop**, Hazel Park High School, Hazel Park, Michigan. For more info, write to HPARC, Box 368, Hazel Park, MI 48030.

Dec. 3, **Hancock ARC Hamfest '95**, Hancock County 4H Fairgrounds, Greenfield, Indiana. Contact Tom Donaldson, N9LFU, P.O. Box 335, Greenfield, IN 46140 (317-326-3168).

Dec. 9, **Columbia ARS 1st Annual Tailgate/Hamfest**, Florida Sports Hall of Fame, Lake City, Florida. Write to Colen Boutwell, WA5RKR, P.O. Box 1649, Lake City, FL 32056.

Dec. 28-29, **Hamfest India '95**, The Tejpal Auditorium at Gowalia Tank, Central Bombay, India. Contact Adolf B. Shepherd, VU2AF, General Convenor, 27/585 BPT Qtrs., Reynolds Road, Wadala, Bombay 400 037.

Jan. 6-7, **Ft. Myers Hamfest**, Araba Shrine Temple Hall, Ft. Myers, Florida. For more info contact Jackie Kampfert, KR4MZ at 941-542-6675 (JKKampfert@AOL.com); or Amy Acosta, KD4KIS, at 941-574-1663 (Amilita@AOL.com). (Exams.)

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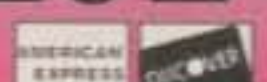


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## OUR READERS SAY

### Back To His Roots

Editor, CQ:

I am a former subscriber to CQ, and had been for several years. Somehow I let the subscription drop—nothing intentional, I just forgot it. Enclosed is my subscription renewal.

The dynamic driving my desire to renew is that I recently picked up a copy of CQ (April 1995) at the newsstand and read Dave Ingram's article "Morse Mania—The Romance Continues" and could not agree more. Of all the amateur magazines I have read, it is CQ to which I most often return. Articles such as the one mentioned above keep me returning to your publication. Possibly you read an article in the July 1993 issue of QST which they graciously published for me. If you did, you know that I am being drawn again to the basics. Therefore, things such as Morse, keys, QRP, and the classics are high on my priority list.

I have been something of a fan of Ingram for some time. I have read lots and lots of what he has written. I really like what I read. I have, and cherish, his book, which you published, entitled *Keys, Keys, Keys*, as well as *Getting Started in QRP*. I am afraid the *Keys* book is a bit worn from my frequent perusals. But it is one of the few books which I rarely loan. Also, I read with great interest his "QRP: More Fun Than Ever" in the February 1992 issue of CQ.

From my story it would be an easy guess that I am returning to my roots. Maybe there is something about my up-coming half-century birthday, as well as some other powerful dynamics that are operative in my life right now, causing the return. Whatever the reason, I seem to be again embracing the basics.

Sitting right beside my Bencher chrome paddle and custom cover is an old open-face J-38. I often find myself reaching for the latter more frequently than the former. Such is life.

There are a couple of reasons why I wanted to write. First, to renew my CQ subscription. Then, I just wanted you to know that your publication, and writers like Ingram, are a treasure to the Hobby (capital used because the word "hobby" by itself just seems terribly inadequate). Maybe I just like the content of CQ. But I think it is really deeper than that. Possibly it is the way your writers in general, and Ingram in particular, present (share) themselves and Amateur Radio. Whatever the reason, I'm glad to be back in the CQ fold again.

Keep up the good work. Know that you are appreciated. Continue to be an inspiration!

Randy W. Barthel, KF8TV  
Toledo, OH



K9ARZ and the vintage station equipment he used for the CQ 50th anniversary operation.

### Vintage CQ 50

Editor, CQ:

Just thought I'd drop you a line and let you know how much I enjoyed operating in the CQ-50 operation back in January. There seemed to be a lot of interest in the operation, and I must commend my fellow amateurs for their patience and courtesy throughout the month.

In keeping with the spirit of the 50th anniversary of CQ magazine, I thought the operation would be more interesting if vintage gear were used. A breakdown of the equipment used follows:

On 80 meters: Collins KWM-2A and 51S1.

On 40 meters: Hallicrafters HT-32 and SX-115

On 20 meters: Collins 32S3, 75S3B, and an old (1968 vintage) Henry 3K.

Congratulations to CQ for providing amateurs with the best amateur radio magazine for the past 50 years. I am grateful to you for allowing me the opportunity to participate as an author. I hope I live long enough to see another 50 years of CQ magazine. By the way, this year I too will celebrate my 50th birthday. 73, and keep up the good work!

Lawrence W. Stark, K9ARZ  
St. Charles, IL

PS: Enclosed is a photograph of one of the stations used at K9ARZ/50.

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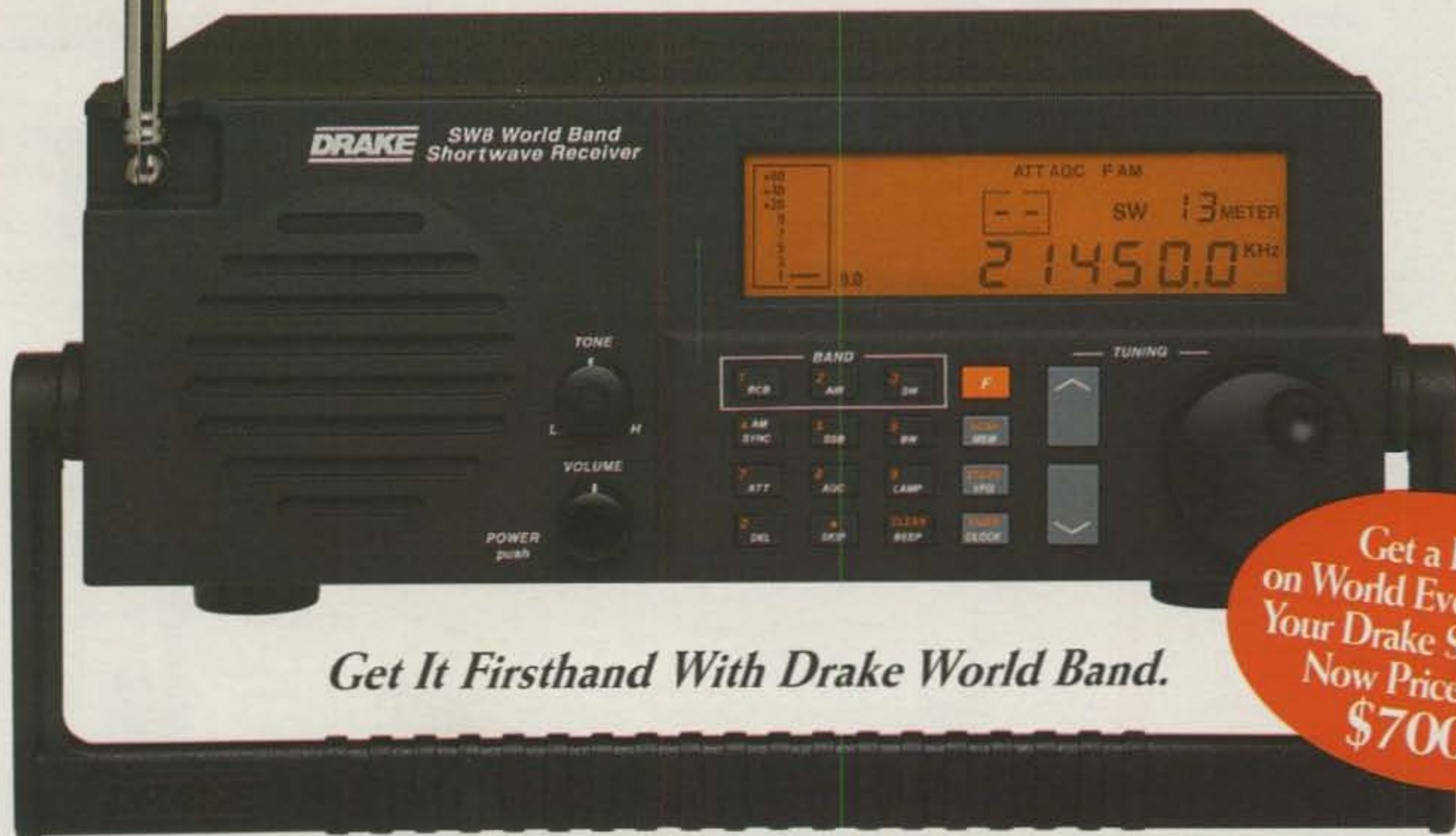
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# Results of the 1995 CQ WW DX 160 Meter Contests

BY DAVID L. THOMPSON\*, K4JRB

**A** sure sign that 160 meter conditions have improved is the increase in logs received for both modes again this year. Received this year were 857 CW logs and 559 SSB logs, for an increase of 15% over 1994. The master log shows 4301 CW and 5212 SSB stations active, or an increase of 203 stations. While not as dramatic an increase as 1994, this shows that 160 can support a large volume of contest stations. DXCC in a weekend is entirely possible, as there were 127 countries logged on CW and 115 on SSB. OH5PT's log showed SV5TH, A71CW, EY8MM, R1FJL, TF3DX, 7Z5OO, SU2MT, and OH0/OH1AF worked in just a few hours. Other rare entries included XX9X, 5T5JC, VS6BG, 4S7RPG, 3D2HI, LX4A, TA2DS, A92BE, and DU. 9M2/9M6 were logged by the fortunate JA and USA West Coasters. A 9V1 is putting up a 4-square array for the 1996 contest. Not too long ago 50 or 75 countries took years to work. Now the top contest entries match this in a weekend!

The biggest drawback to working the DX is the wall-to-wall QRM. This is the reason for the DX Window. The CQ Contest Committee is asking that stations stay out of the window (1.830 to 1.835 MHz) from dusk to dawn local time. Every year 5N0MVE, LU1FA, and A92BE complain that they aren't heard because everyone is busy with same continent QSOs. Remember this is a DX contest with a fringe benefit of WAS and WAE thrown in. **Please do not park your CQ machine in the window; have the courtesy of allowing others to have a crack at the DX.** Too many DX stations in Asia, Africa, and South America don't participate because they can't be heard. Let's make the window work and bring these stations back.

Notable were the QSO records set. WB9Z in the multi-op SSB category logged an incredible 1655 stations. AB4RU (1468) and W2GD (1425) both made over 1400 SSB QSOs, along with VE3EJ's single operator high of 1497. Top CW QSOs were recorded by W2GD (1430 as multi-op) and VP9AD (1291 as single operator). Twenty two stations on CW and 23 stations on SSB logged more than 1000 Q's. As late as 1988 this would have been an incredible feat. OT5T operating from the ON4UN station worked 82 countries on CW, followed by G3ZEM (78), OZ1LO (76), and S59A (76). OT5T topped SSB with 68 countries, followed by IR4T (66) and IK1GPG (60). Top USA/VE on CW was W2GD with 70 countries and 48 on SSB. Again this year the European stations dominated the DXCC count.

Now 1996 is expected to be the year of the lowest sunspot count as the sunspot cycle winds down. Get those transmitting and receiving antennas ready for what could be the most exciting set of contests ever. Remember to



RV1CC, who is active on both modes with his homebrew station.

obey the rules, properly submit your logs, and have fun!

## Good Logs and Bad Logs

Before you send in your log please make sure you can read every page. Are multipliers well marked? Are the points correct? These are the top problems each year and why contest checkers get gray hair. A quick reading of the rules shows that each MM station counts 5 points and that Karelia (RN1) is no longer a WAE counter. At least 25% of all logs had one of these wrong! Read through your log and correct all the little errors before you submit it.

The rules clearly state that if you submit a log on diskette, a hard copy is also required. If everyone submitted a diskette in CT or NA format then this would not be an issue. However, only 30% are received with diskettes although 70% are computer generated. Paper is still the best way to cross check, and we don't want to discourage the paper log submissions either. In the past I have warned those who don't send along the hard copy and have usually gotten the required copy. This year I gave small penalties. Starting in 1996 each log received without the hard copy will be subject to a 10% score reduction. Repeat offenders may be disqualified.

Every log with over 200 QSOs must have a dupe or check sheet. This is simply an alpha

sorted list of stations worked. Leave duplicate contacts in your log and clearly mark them as duplicates with no points. This an aid to cross checking and may save your contact or multiplier credit.

## CW Contest January

The top single operator score came from the OT5T station in Belgium with 959K. John hosts the ON6MS club station at his location, and he used their special call to nudge out N3RD at VP9AD (946K). Last year's winner, P49I, fell to third as Mike encountered noisy conditions; 883K is still a fine score. Ken, K4TEA, again journeyed to KP2A and moved up to fourth place with 676K. VE3EJ topped the W/VE crowd (660K) for fifth place. K5ZD nudged out AA1K for USA high.

The top multi-op score also came from Europe and G3ZEM with 785K. W2GD set up at the U.S. Coast Guard Station at Sandy Hook, New Jersey, which juts out into New York Bay. From this location the crew topped W/VE and placed second in the world with 692K. XE2/W7WA turned in a whopping 633K from Baja for third place. They promise to be back with a more competitive station next time. WW2Y placed second W/VE and fourth world, and PA6A placed fifth with 537K. The remainder of the world top 10 multi-ops came from Europe. I4JMY, 7S3OWG (SM), EA3KU, SP5GRM, and

\*4166 Mill Stone Court, Norcross, GA 30092



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**USA BY K4TEA:** Winner Randall Thompson, K5ZD.  
**CANADA BY W8BLA:** Winner John Sluymer, VE3EJ.  
**ZONE 3 BY KM4MG:** Winner Preston Smith, N6SS.  
**ZONE 4 BY KI4XO:** Winner James H. Hurt III, KC8MK.  
**ZONE 5 BY WA4CUG:** Winner Jon Zaimes, AA1K.  
**AFRICA BY K4MZW:** Winner Juan Carlos Maceda Bermudez, EA8AHH.  
**ASIA BY NE4S:** Winner Riki Kline, 4X4NJ.  
**EUROPE BY N4TMW:** Winner Leif Ottosen, OZ1LO.  
**OCEANIA BY KM4FV:** Winner Jack Wheeler, KH6CC.  
**SOUTH AMERICA BY K4JAG:** Winner Mike Greenway, P49I (K4PI).  
**JAPAN BY WØZV:** Winner Tatsuro Yamasaki, JA5BJC.  
**NORTH AMERICA\* by CQ (N4IN Memorial):** Winner David Hawes, N3RD, operating VP9AD.

### PHONE

**WORLD BY K5AAD (N5JJ Memorial):** Winner John Sluymer, VE3EJ.  
**USA BY K4JRB:** Winner Don E. Barclay, N5OLS.  
**CANADA by K5NA:** Winner Jeff C. Heggie, VE3AQH.  
**ZONE 3 BY N4UCK:** Winner Bob Wending, NW6N.  
**ZONE 4 BY KC4MJ:** Winner Jerry L. Fisher, NXØI.  
**ZONE 5 BY K4ODL:** Winner John L. Giasi, AA1AA.  
**AFRICA BY WB4ZNH:** No winner (not enough entries).  
**ASIA BY W8BLA (W4LVM Memorial):** Winner A. Selim Canbeken, TA2DS.  
**EUROPE BY N4NX:** Winner John Devoldere, ON4UN, at OT5T (ON4WW Operator).  
**OCEANIA BY K4DLI & KB4SSS:** Winner Jack Wheeler, KH6CC.  
**SOUTH AMERICA BY AE6E:** Winner Edgar J. Ochoa G., YV2IF.  
**NORTH AMERICA\* by CQ (N4IN Memorial):** Winner Len Reisenweber, VP2VE Operating KP2A.

### MULTI-OPERATOR CW

**WORLD BY N4RJ:** Winner G3ZEM.  
**USA BY WS9V:** Winner John M. Crovelli, W2GD.

### SSB

**WORLD BY SOUTHEASTERN DX CLUB:** Winner John M. Crovelli, W2GD.  
**USA BY WB9Z:** Winner John R. Olsen Jr., K1NG.

*\*North America outside USA and Canada.*



*W8ILC mobile on CW.*



*OM7M (OM3TZW) busy working the pile-up.*

OM7M all did yeoman duty, finishing in sixth to tenth place. VA2AM (209K) was the top VE, and W7XR, N6DX, KVØQ, and WXØB made significant scores from more westerly locales.

Tight CW single operator races in New York, Florida, West Virginia, Indiana, Japan, Finland, Germany, Romania, Russia, and Sweden, plus multi-op races in New Jersey, Michigan, Colorado, and Germany highlighted the certificate hunt. Often only a few contacts or an extra multiplier mean the difference.

UX8IX made the world high QRP score with 70K. WA4PGM was the top USA score at near-



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## ENJOY THE RIDE



Kantronics KPC-9612



## AGGREGATE CW AND SSB CLUB SCORES

*Minimum of three entries required for listing.*

CLUB	SCORE	CW	SSB	CLUB	SCORE	CW	SSB
FRANKFORD RADIO CLUB	9,995,589	VP9AD	W2GD	CAROLINA DX ASSN.	316,130	AA4V	AA4V
SOUTHEASTERN DX CLUB	5,973,327	P49I	AB4RU	MOSCOW DX CLUB	296,544	RA3AUU	—
SLOVENIA CONTEST CLUB	3,424,970	S59A	S50K	CENTRAL VIRGINIA CONTEST CLUB	295,254	KG4W	KG4W
MAD RIVER RADIO CLUB	3,111,071	KN8Z	AA8U	PDXC (ITALY)	250,324	I5NSR	—
YANKEE CLIPPER CONTEST CLUB	2,708,696	K5ZD	AA1AA	TEXAS DX SOCIETY	250,012	K5DX	K5DX
NORTH COAST CONTESTERS	2,089,113	VE3EJ	VE3EJ	OKLAHOMA DX ASSN.	241,452	N5OK	WM4Z
POTOMAC VALLEY RADIO CLUB	2,054,690	W3LPL	KX3Q	KENTUCKY CONTEST GROUP	200,240	K4TO	KC4DWT
RHEIN RUHR DX ASSN.	1,905,821	OT5T	OT5T	NORTH ALABAMA DX CLUB	198,616	KA2DRH	KA2DRH
BAVARIAN CONTEST CLUB	1,848,068	DL0CS	—	ROCHESTER DX ASSN.	184,370	K8FC	KA2PHQ
SOCIETY MIDWEST CONTESTERS	1,579,781	WB9Z	WB9Z	URE (SPAIN)	180,049	EA7BJ	EA3ALD
KTU RADIO CLUB	1,345,245	LY6K	LY6K	NO SHENANDOAH DX ASSN.	179,533	VO1SF	VO1SF
SP DX CLUB	943,018	SN3A	SP5ES/5	UKRAINE (UARL)	172,625	UY2ZA	US5ZCW
HUDSON VALLEY CONTESTERS	741,937	W2XL/VE9	N2IWE	DARC (GERMANY)	172,566	DL1NCT	DL0MI
SOUTHERN CALIF CONTEST CLUB	679,403	N6DX	N6DX	CALGARY ARC (CANADA)	168,936	VE6AO	VE6NAO
PZK (POLAND)	664,736	A71CW	SQ5O	TENNESSEE CONTEST GROUP	129,821	WR3O	K0EJ
LITHUANIAN DX GROUP	648,829	LY1DR	LY1FW	HAMFESTERS RADIO CLUB	129,318	N9RIT	W9LNQ
DANISH DX GROUP	590,103	OZ1LO	—	VERON (NETHERLANDS)	127,720	PA0LOU	—
ARI (ITALY)	583,126	IT9ZGY	I6FLD	WESTERN WASHINGTON DX CLUB	114,836	W7LZP	KG7GA
LEFT COAST CONTEST CLUB	578,342	W7XR	WA7FAB	CENTRAL ARIZ. DX ASSN.	109,811	N7RT	KE7GH
NORTH TEXAS CONTEST CLUB	479,452	W5FO	N5OLS	SOUTH PARK ARC	47,202	W4LMJ	W4LMJ
MINNESOTA WIRELESS ASSN.	418,130	W0HW	N0AXL	SO. CALIFORNIA DX CLUB	40,654	W6RCL	KJ6HO
KANSAS CITY DX CLUB	414,951	KC0EI	NX0I	SO. CONNECTICUT WIRELESS SOCIETY	23,586	N1HRA	KB1LN
UKRAINIAN CONTEST CLUB	407,760	UA9CR	UR4E	MDXC	16,794	—	KA9ZZT

ly 55K. The number of QRP entries increased nearly 200% with many winning certificates for their efforts. HA8EK continued the European trend as high world low-power score with 324K. VE3ABG topped the W/VE gang and came in third in the world with 252K. WA1LNP was top USA and seventh in the world in a fine effort. Refer to the Top 5 or 10 charts for a snapshot of the top competitors in every category.

### SSB Contest February

John, VE3EJ, moved back to single operator this year and scored the world high single operator by a comfortable margin over OT5T operated by ON4WW. Canada was the place to be, as VE3AQH and VE3RM placed third and fourth world single operator. N5OLS broke the bank as top USA and 5th world high. Texas seems to be a location for running up nice QSO totals. Reaching 28 countries didn't hurt either. Fine USA scores were turned in by AA1AA, W3GH, NX0I, and N3MKZ. AA6TT did well from Colorado, but operator AA5B noted their lack of Europe or Africa as a factor in keeping them from the top 10.

W2GD again traveled to the Coast Guard station and came away with world high SSB multi-operator at 435K. LX4A made a splash as second world high and top in Europe, making it into 22 states and provinces. K1NG from rare Rhode Island just nudged last year's top scorer, AB4RU, for third place, overcoming AB4RU's QSO count. WB9Z placed fifth in the world and broke the record for contacts with a whopping 1655 put in the log. VE3DC made it into tenth place as the top VE scorer. KD9SV, NC0P, and W0CEM made nice scores from farther west. K5PGW made an impressive showing from Louisiana in their first contest effort. Come back on both modes next year, please.

Close single operator races occurred in Connecticut, New Jersey, Pennsylvania, Mississippi, Ohio, Hawaii, and Colombia. Close multi-op races in Ohio and Germany left anxious moments. NH6T nearly knocked off KH6CC in about the closest race of the contest.

WT3W beat out last year's QRP winner, WA4PGM by 2.5K for world high QRP score.

K5WXZ placed a close third. I0KHP was the top QRP DX score, and Ivan at VE3DO topped Canada. The number of quality low power entries increased, and IK1GPG made it into 18 states to place world high. WA1LNP placed a close second and USA high. K1BNQ and KV7S both scored higher than last year's top score. VA3WTO took top Canadian low power honors. Remember to read the Top 5 or 10 tables for a recap of the major competitors.

### Club Competition

The Frankford Radio Club passed the 10 million mark for their second winning club effort in a row. This is a new record and will be hard to beat once the sunspots start to climb. The Southeastern DX Club again placed second but ran into heavy QRN on both modes, keeping scores down. The Slovenian Contest Club was again impressive as the top DX group and placed third for the second year. The Mad River bunch traded places with the Yankee Clipper group this year. All of the Top 10 had impressive club totals.

Club competition is a "for fun" competition that fosters higher scores and more entries. Remember that three logs are required for a club to be listed. Please try to keep the club name or abbreviation the same for all entries. If the clubs will send me a list of members, I'll make sure they get every possible credit (unless the competitor has clearly marked another club). Make sure the club is clearly noted under club competition or the score may not be included. Preprinting the club or group at the top of the log is not sufficient for entry in the club competition.

### Helpers

Thanks to two PCs (a 386 laptop and a 486); Helen (N4IN's XYL); my XYL, Jean; and Gail and the CQ staff for their assistance. A special thanks to Karin at RT Systems for the use of SAM to make sure USA and Canadian ops were of the right class and location. Please don't send any more logs to N4IN's QTH and

pass the word! N4TMW and K4ODL are helping with plaques. We had a problem getting some donors to pay for the 1994 plaques, and we are going to be more careful this year.

### Logging Notes

Remember to always send along a hard copy of the computer logs as well as the diskette. This is a CQ Contest Committee requirement! Please send me a postcard or SAE or SASE with a stamp or IRC rather than the registered reply route. I live in fear of a log being returned because I forgot to pick it up or was out of town. Try to send the logs to the Contest Director to save a delay in my verifying that your log was in fact received.

### Next Time

The 160 Meter CW Contest will be held the last full weekend in January 1996 (January 26 to 28). The SSB Contest is the last full weekend of February 1996 (February 23 to 25). Times for both contests are 2200Z Friday start and 1600Z Sunday ending. You penalize yourself if you miss the 2200Z start time, as up to 60% of the winning scores are made in the first 6 to 9 hours. Last year at least one publication listed the start time as 1600Z on Friday. Thankfully only a few logs arrived with many QSOs before the official start. Contacts made after 1600Z on Sunday carry a double penalty. No logs were submitted with any late contacts in 1995.

If you need a paper log or a summary sheet send along a business-size SASE or SAE with 1 IRC to CQ 160 Contests, CQ Magazine, 76 North Broadway, Hicksville, NY 11801 USA. Make sure your computer log program puts 40 or 50 Q's per page and provides totals for Q's, points, and multipliers on *each page!* Every contact should include a location such as 599GA or 59GW. Multi-operators should either list the operator on each page or provide a summary of operator/hours. There are only two classifications—single operator or multi-operator. Using packet or a spotting net puts an entry in the multi-operator class. Low power



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## WINTER 1995

### DR-150T



This exceptional 2 Meter Mobile is the new standard in satisfaction. 2 Meters with Airband receive + 440MHz receive.

50/25/10W power output adjustable. 100 Memories. Packetable 1200 or 9600 Baud with pin change. Air or Cable Cloning. (This allows two or more users to exchange CPU memory without a PC). Two VFOs. Channel Scope visually monitors frequency action. Built-in S-meter Squelch and Squelch Timer. Three different scan modes. LITZ Emergency alert function. Remote control microphone with DTMF Standard. 6"W x 2"H x 7"D 3.75lbs.

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HF+50MHz All Mode Transceiver. The DX-70T is compact and very user friendly. Wide range general coverage. 100 memories with 10 memory group scans. Detachable front panel. CW Auto Break-in. Built in narrow band filter. Full QSK. 2.25"(H) x 7"(W) x 9"(D) 6.25lbs.



### DR-610T

This versatile radio gives the operator full command of the 2m and 440 bands. Mobile 2m(50W), 440(35W), 120 Memory Channels, 5 Memory Banks, V/V, U/U, LITZ, 9600 Baud Ready. Remote Control.



### DJ-G5TH



2m/440, 5W output, 100 memory ch. per band, V/V, U/U, Backlit keypad, wideband receive, Air Cloning. Allows two or more users to exchange CPU memory without a PC.



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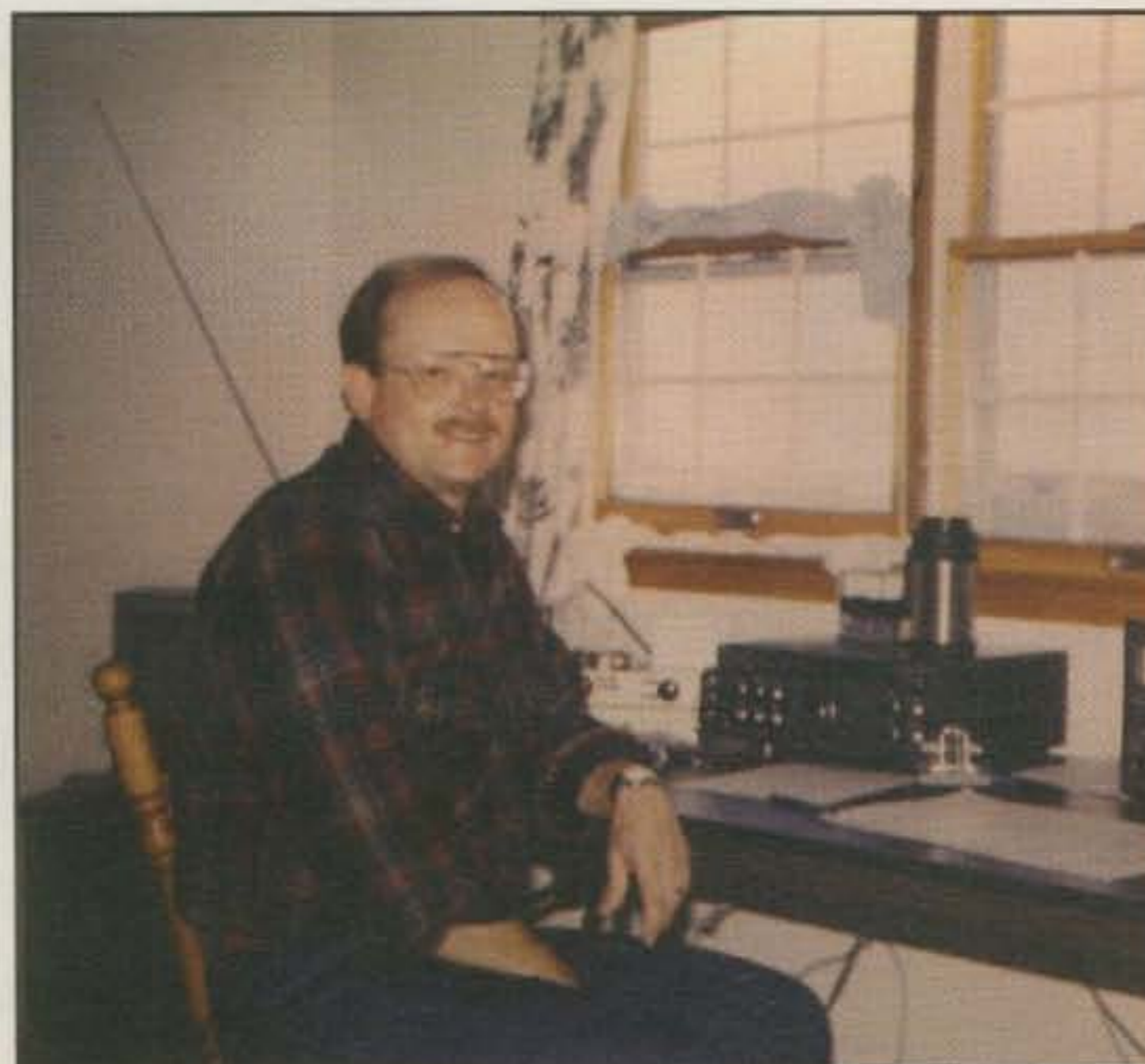
## GUEST/VISITING OPERATORS

### CW

Call	Guest/Visiting Op	Call	Guest/Visiting Op
3D2HI	JA1KJW	SN3A	SP8NR
4U1ITU	KU7U	SP2PMO	SP2FOV
7Z5OO	N3UOC	SP3KEY	SP3RBR
A71CW	SP5EXA	VE7RCN	VE7CYT
DLØDA	DL1VDL	VE7UBC	VE7TTQ
K4VX	N9JF	VP2EWW	AA7VB
K8CC	AA8AV	VP9AD	N3RD
KC8MK	NZ4K	VQ9TP	N5TP
KP2A	K4TEA	W3GH	W9XR
OMØA	OM3NA	W3LPL	KE9A
OT5T	ON4UN	W4PZV	WA4SVO
P49I	K4PI	W9UP	NØBSH
PJ9JT	W1BIH	W9ZRX	KM9D
RZ1AWJ	UA1-169-1400	YO8KOS	YO8AXP
RZ1AWO	UA1-169-1333	Z3ØM	Z31GX
S53M	S51IX	ZA1AJ	OK2ZV

### SSB

Call	Guest/Visiting Op	Call	Guest/Visiting Op
4U1ITU	F5SSM	OT5T	ON4WW
AA6TT	AA5B	SQ5O	SP5GKN
CT8T	CT1ESV	V26AS	YU1NR
KP2A	VP2VE	VE7RCN	VE7CYT
LS5E	LW8EXF	VE7SBO	KE7EQ
LY8K	LY3BS	W9UP	NØBSH
		ZA1AJ	OK2ZV



W2XL/VE9 station with big CW score.

and QRP will be noted as per the complete rules. Multi-operator stations are all listed as high power!

The CW mailing deadline is February 28, 1996 and the SSB deadline is March 31, 1996. The only exception is both logs can be sent at the same time to arrive no later than the SSB deadline. Logs with postmarks after the deadline or that arrive after May 1, 1996 are subject to being labeled "check logs." Send all logs to 160 Contest Director David L. Thompson, K4JRB, 4166 Mill Stone Court, Norcross, Georgia 30092 USA. Please indicate CW, SSB, or both on the envelope and send along photos. Good luck to all!

73, Dave, K4JRB

## Soapbox CW DX

QRV only half the contest this year . . . F6EZV. Two-element delta loop helped me work 31 countries from JA . . . JA7NI. Many American stations were heard in Europe, but only a few answered our calls . . . DL7UBA. Had a pile-up the last two hours . . . RK3DT. HA5JJ/7 checked all the HA logs received better than I could. Thanks . . . K4JRB. I am not a member of any contest club . . . S57DX. Heard XX9X at 2100Z on the 28th with a good signal, but no QSO . . . DJ6TK. Thanks for four new top band countries . . . OH3QJ. I plan on being busy trying antennas so next time I can hear and work the rare DX . . . DL2ØBF. Worked three new countries, but had QRM from my neighbor UXØZZ . . . UT1ZZ. Interesting and amusing (???) contest as always . . . SM6HRR. My mother helped me build the full-wave delta loop and it was no easy task! . . . IK8CHL. My first USA contacts . . . JA1KXT. VP9AD was a new one . . . SP5GH. Band down slightly, but QRM loud as usual . . . P49I. Band conditions went from brilliant to useless depending on if the station answered . . . G4BYG. Just a token entry. Someone to hold the table up! . . . G3KKQ. I picked the only rare place with competition . . . VP2EWW. Here is the CØ7EH log. Mail is almost non-existent for Eduardo . . . AD4IL (tnx, Julio). Started out just to work a few stations and stayed on until matchbox broke down

. . . OE2VEL. Will shoot for 1 million points next . . . ON4UN (OT5T). Someone bootlegged my call early in the contest . . . LA4LN. Returned from Europe on Friday. Hoped this would keep me awake. It didn't . . . VS6BG. Make this a 48 hour contest please . . . 4X4NJ. Winds took down my delta loop and unable to run my amplifier second night . . . ES5MC. I called many stateside stations . . . 4U1ITU (KU7U op.). We will make a better effort next year to be the top multi-op . . . XE2/W7WA. Best European opening ever . . . KL7Y. Too many bugs to compete for top score this time . . . PA6A. Good to have Andy, UA3DPX, as a guest operator . . . I4JMY. Fantastic conditions to Europe on Friday night . . . VP9AD (N3RD op.). WOW! What a weekend . . . KP2A (K4TEA op.). USA S9 second night, but most need receivers . . . 9A2EU. Strange to start the 160 meter contest at my sunrise . . . SMØCNS/DU7. Remember in the Netherlands we can only operate 1.830 to 1.850 kHz . . . PAØLOU. Heavy rains flooded the shack . . . DK1II.

## Soapbox CW W/VE

WE NEED THE WINDOW . . . many USA/VE participants. I was surprised how well the shortened dipole worked . . . WN2R. Usually I go nights without hearing more than a station or two. Then the contest comes along and it's wall-to-wall signals . . . VE6KRR. Surprised I got over my back fence . . . VE3ST. Best conditions yet on 160 . . . VE2AWR. Where were South Dakota and KL7? . . . VA3NN. My first and only contest with low power . . . KE7EQ/VE7 (Bill came back as VE7SBO for SSB with high power—ed.). Snow storm arrived at 1600Z on Saturday. QRM was rough all night . . . W4XD. QRM and QRN covered up the West Coast stations . . . N4MPQ. First time to enter this contest. Could not stay awake past midnight so probably missed most of the DX . . . K4UK. Replace the 5NN report with something more meaningful . . . K4LDR. Mike, P49I, answered my QRP CQ . . . N4ROA/QRP. Too much QRM from an electrical storm . . . W4GTS. Maybe should put up a 160 meter antenna? . . . WA4MCZ. Second night a wipeout due to static . . . W4PZV (WA4SVO op.). You can't go on a two week business trip and then spend the entire weekend in the contest if you want to stay married . . . K4BAM. Biggest thrill was going to sleep as QRM made the band useless . . . K2SWZ. Power outage at

0400 on Saturday . . . KK5GJ. Lost first log sheet, sorry! . . . W5KL. Things were easier when I was younger . . . W9PNE. Who says CW is dead? Try and find a spot during this contest . . . W9LNQ. The locals went nuts when Rich (N1CEV) told them that the beverage was an electric fence for giraffes! . . . K1JKS. Bad intermittent electric noise was traced to the kitchen fridge . . . VO1AH. The N4KG elevated ground plane using my tower worked great. The best 160 transmitting antenna at this QTH . . . K3ANS. I watched Darrell, N6DX, run Europeans, an almost unheard of event from the West Coast. WA6CDR at N6DX. Murphy didn't raise his ugly head for once . . . K7OA. Strange TVI complaint the second night ended my activity . . . K9BG. A22MN and R1FJL called me . . . W2XL/VE9. Still too many QRO USA stations in the DX window . . . KØJPL. One DX station must not keep a dupe sheet as he called me at least three times . . . AA4S. SU2MT answered my CQ for number 248 on 160 . . . AA1K. Europe louder than USA on Friday night . . . K5ZD. Gotta win the lottery and buy new gear . . . K8FC. Site surrounded by salt water on three sides . . . W2GD. Worked all 50 states . . . N6SS. Worked six stations in OH and SM longpath between 1430 and 1530Z. This is a FIRST EVER occurrence . . . W7XR. Loudest DX during daylight goes to XE2/W7WA . . . N8II. 100 total mults . . . KC8MK (NZ4K op.).

## Soapbox SSB DX

Heard many U. S. stations, but hard to get an answer . . . LY1FW. 100 to 200 watts is QRP on 160 . . . RV1CC. QRM so bad that it was often hard to keep European pile-up . . . TA2DS. 400 watts rather 100 watts helps . . . VP5JM. Contest hours don't allow VK to work enough grayline DX. Should be 0001Z to 2400Z . . . VK5GN. Everyone I work say I am loud. So why do I call and call with no reply? . . . PT7BZ. Finally able to work some USA . . . G3NAS. Where was the DX window? . . . KH6CC. Heard W and VE, but no QSO with QRP . . . IØKHP/QRP. Made our first USA contact on 160 SSB in the contest . . . DKØIW (DL5MFL op.). We are getting better each year . . . LX4A. First SSB effort for us . . . OT5T (ON4UN/ON6MS station). Little power this time; wait for the amplifier next year . . . EA1FDI. New half slopers detuned my dipole. Don't put anten-



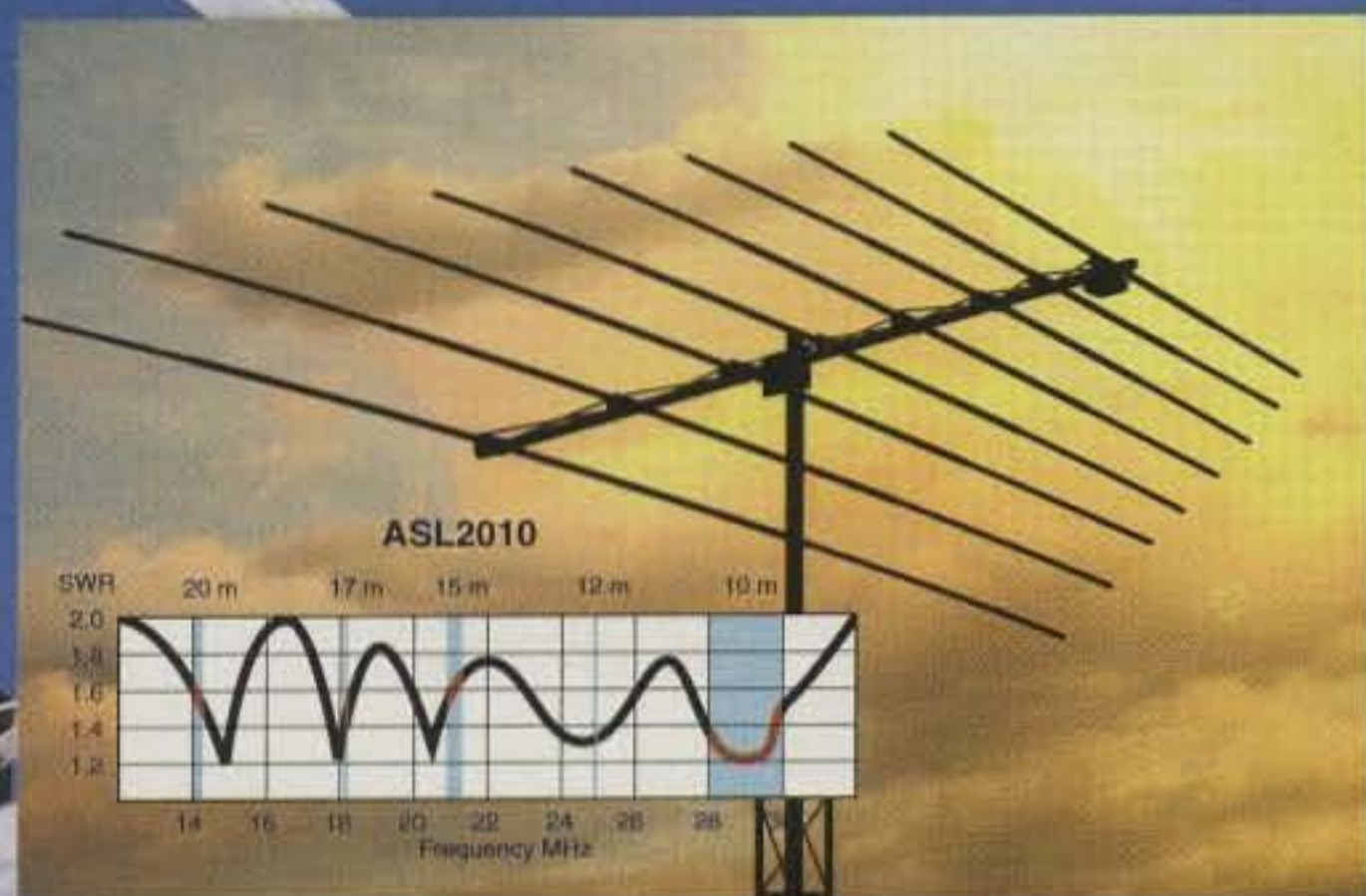
# ASL2010 **Log Periodic**

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This all new log periodic antenna is the most cost effective, high gain, five band antenna on the market today. Skylog offers continuous operation from 13.5 to 32 MHz. Antenna gain and beamwidth are constant for uniform coverage from 10 through 20 meters. The ASL2010 is rated for continuous duty at full legal power.

Skylog is designed for maximum gain on a manageable 18 foot boom with only 10.1 square feet of wind surface area. All stainless steel hardware and rugged element design are only some of the many features that provide years of superior antenna performance.

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- **Constant gain over entire frequency range**
- **6.4 dBd gain, 65 degree beamwidth**
- **20, 17, 15, 12 and 10 meters with one antenna**
- **18 foot boom and 19.25 foot turning radius**

MODEL	ASL2010
Frequency, MHz	13.5-32
No. Elements	8
Forward Gain, dBd	6.4
Front to Back Ratio, dB	15-20
SWR 1.2:1 Typical	
2:1 Bandwidth	18.5 MHz
Power Rating, Watts	2000
3 dB Beam Width, Deg. E Plane	65
Boom Length, ft (m)	18 (5.48)
Boom Diameter, in (cm)	2.0 (5.08)
Longest Element, ft (m)	38 (11.58)
Element Center Dia, in (cm)	1.25 (3.18)
Turning Radius, ft (m)	19.25 (5.86)
Mast Size Range, in	1.5-2
(cm)	(3.18-5.08)
Wind Load, ft <sup>2</sup> (m <sup>2</sup> )	10.1 (.93)
Weight, lb (kg)	55 (25.5)

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## TOP 10 SCORES

### SINGLE OPERATOR

USA CW	USA PHONE
K5ZD .....465,290	N5OLS .....263,848
AA1K .....432,234	AA1AA .....210,756
N2LT .....413,133	W3GH .....207,542
W3BGN .....363,624	NX0I .....202,392
W3LPL .....337,144	N3MKZ .....193,116
KC8MK .....321,600	AA6TT .....175,191
N2NT .....312,500	N3HBX .....173,700
W3UM .....287,799	N2IWE .....172,790
WB9Z .....276,848	WA1LNP .....157,852
W4RX .....276,576	K1BNQ .....147,460

### VE CW (TOP 5)

VE3EJ .....660,348
W2XL/VE9 ...356,580
VE3RM .....308,760
VE3KP .....288,748
VE3ABG .....251,910

### VE PHONE (TOP 5)

VE3EJ .....561,912
VE3AQH ...373,608
VE3RM .....342,842
VA2AM .....212,840
VE5RA .....299,064

### DX CW

OT5T .....959,140
VP9AD .....945,978
P49I .....883,449
KP2A .....675,700
OZ1LO .....576,903
SN3A .....481,845
OK1CM .....423,405
4X4NJ .....405,244
S59A .....380,200
IT9ZGY .....379,051

### DX PHONE

OT5T .....398,084
UT5DK .....242,301
KP2A .....228,138
S50K .....214,839
CT8T .....200,354
9A2TW .....186,807
LY6K .....186,105
G3NAS .....185,760
OK1AY .....166,286
IK1GPG .....165,672

### MULTI-OPERATOR

#### CW (WW)

G3ZEM .....785,000
W2GD .....692,150
XE2/W7WA ...632,541
WW2Y .....571,764
PA6A .....537,420
I4JMY .....532,247
7S3OWG .....500,760
EA3KU .....497,670
SP5GRM .....489,614
OM7M .....473,400

#### PHONE (WW)

W2GD .....435,062
LX4A .....400,302
K1NG .....386,052
AB4RU .....385,458
WB9Z .....350,550
IR4T .....299,796
AA8U .....228,380
WR8C .....219,825
KX3Q .....219,186
VE3DC .....210,730

### QRP

#### TOP 5 CW QRP

UX8IX .....70,453
WA4PGM .....54,663
VE3DO .....52,304
W8VK .....45,720
N4ROA .....38,448

#### TOP 5 SSB QRP

WT3W .....34,741
WA4PGM ...31,270
K5WXZ .....29,624
NZ9Z .....21,338
N0AFW/6 ...20,104

### LOW POWER

#### TOP 10 WORLD CW LOW POWER

IL3/IK2NCJ ...323,783
HA8EK .....304,380
S59AA .....284,830
VE3ABG .....251,910
DL9YX .....242,208
DK8ZB .....227,240
DL5XU .....212,428
WA1LNP .....212,330
9A2EU .....208,518
S50R .....186,660

#### TOP 10 WORLD SSB LOW POWER

IK1GPG .....165,672
WA1LNP .....157,852
K1BNQ .....147,460
LY1FW .....137,072
TA2DS .....134,138
S50R .....102,131
ES5RY .....87,715
KV7S .....86,720
RV1CC .....82,222
N3BUD .....78,900

#### TOP 5 CW USA LOW POWER

WA1LNP .....212,330
K1BNQ .....167,356
K1HTV .....151,470
K7SV/4 .....147,810
K8FC .....116,289

#### TOP 3 DX SSB QRP

I0KHP .....8,154
RV3MA .....1,216
LY3NJM .....810



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FT-1000 HF Transceiver • tx: 160-10m Amateur Bands • rx: 100kHz-30MHz • 100 memories • cross-band dual receive • 200w • built-in antenna tuner w/memories • built-in AC power supply • 6"h x 16"w x 15"d, 58 lbs.

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New! FT-1000MP - Call!



\*\*\* Coupon! See List  
FT-990 HF Transceiver • tx: 160 to 10m Amateur Bands • rx: 100kHz to 30MHz • 90 memory channels • SCAF • FSP • DDS • high speed antenna tuner w/memories • AC power supply • 12 1/2" w x 4 1/2" h x 11 1/2" d, 30 lbs

FT-990DC • DC version w/o built-in AC ps.



\*\*\* Coupon! See List  
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\*\*\* Coupon! See List  
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\*\*\* Coupon! See List  
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FT-900/AT HF Transceiver • tx: 160 to 10m Amateur Bands • rx: 100kHz to 30MHz • 100W • 100 memories • built-in antenna tuner • front sub-panel optionally mounts separately from the main body • CTCSS encode with repeater offset • twin stacking VFOs. FT-900 • does not have built-in antenna tuner.



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FT-912RH Mobile (right) • 1.2GHz



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FT-51R/HP • 5w 2m/440 - Coupon  
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FT-911 • 1w, 1.2GHz HT  
FT-33R • 5w 220 MHz FM HT  
FT-530 • 2m/440 FM HT w/TTP - Coupon  
FT-11R • 1.5w 2M HT - Coupon  
FT-11R/HP • 5w 2M HT - Coupon  
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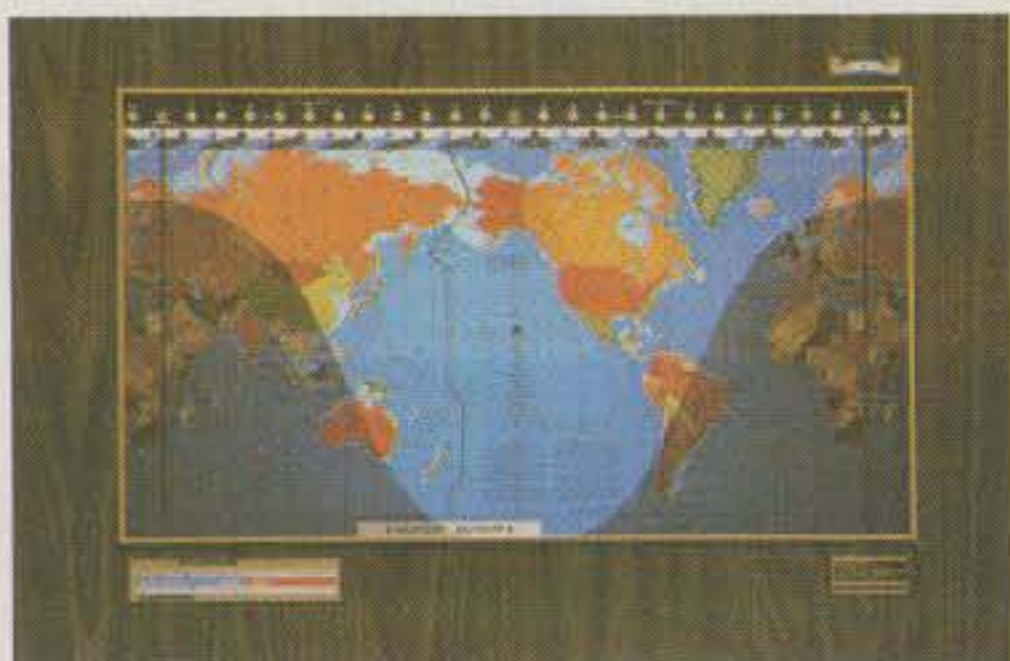
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CIRCLE 21 ON READER SERVICE CARD

nas that may interact on the contest weekend . . . VK3IO. Burned up my power supply, Sorry for my low score . . . LS5E (LW8EXF op.). Computer problem, sorry . . . IKØSHE. Age here is 70 . . . OK2QU. Still not used to new call . . . OK1TP (ex-OK1JDX). First time operating 160 contest . . . SP5ES. Some signals covered nearly one-half the SSB band in Germany . . . DL1FDV. Cut down trees to run USA beverage . . . S57W. Amazed that I worked 160 DX on my R-7 antenna . . . SV2AEL. With low power and no window the contest becomes a domestic USA contest . . . K6GSS/KH6. My antenna was under the roof of the house. Each contact is a true miracle . . . IK5WGK. QRM, QRM, QRM . . . DL8PC.

### Soapbox SSB W/VE

What happened to the DX window? . . . Many ops. With my score I don't worry about QSLing or a dupe sheet . . . VE6BMX/QRP. Must improve my antenna system to compete . . . VO1DAD. "CT" tried to show me as the Caroline Islands not California . . . KC6NEU. Called 51 stations a total of 326 times. Please slow down and listen for Mississippi . . . KG5XA. Just on to work states this time due to low power . . . WA4NID. Attach a 96 foot wire to my vertical for 160 that must be removed to use it on the other bands . . . W4DMB. Had a blast . . . KR4TG. Planned to be packet assisted, but packet broke down 30 minutes before the contest so ran flying blind as single op . . . NE3F. SSB weekend conflicts with XYL's birthday dinner . . . W3BGN. Almost forgot how much fun 160 can be . . . KC3PZ. I have always been impressed with the courtesy of operators on 160 meters . . . WD9INF. WOW! . . . KG8EF. Highlight was being called by 6V6A . . . K5XI. Too many broad signals . . . NW6N. Good contest, pleased with results . . . N9ITX/7. Could hear the DX, but they could not hear me. Back with vertical with 60 radials next year . . . N7WWQ (Nevada). Noisy and crowded as always. Our team will be back next year . . . KEØRO. Why is it that after struggling with the call and report that the "thank you" is always loud and clear . . . WØCEM. Greetings from St. Louis ARC . . . KØLIR. A struggle to make our logging program handle contest scoring . . . WØNZR/4. 500 watts should be low power . . . W4TMR. New record score for us . . . AB4RU. USA stations in the window prevented more DX contacts . . . KX4R. Big thrill to have A92BE call me for all time new one on 160 . . . AA4MM. Do I get extra points for working AA1AA and AA1AB in sequence? . . . KA1CZF/QRP. Need a beverage, as could not hear Europe or west coast . . . W1BK. Conditions much better on CW . . . K1NG. Really excited to get Hawaii with low power and low inverted V . . . KG8AL. Ran most of my stations on 1913 kHz . . . N8II. Next time beverages and a voice keyer . . . KN4RI. Outstanding conditions . . . AA8U. SSB signals from 1800 to 1999 . . . Several ops.

### CW Multi-Op Station Crews

**6D2X:** K5TSQ, W5VX. **7S3OWG:** SM3CVM, SM3BDZ. **9A1A:** 9A2OG, 9A2RA, 9A3GW, 9A3NR, F2CW. **AA1HS** & KA1ATX. **AA2FB** & Packet. **AA2PZ** & Packet. **AA3B** & Packet. **AA4V** & N4SF. **AA8U** & K8MJZ, KC8EK, KF8QE, N8CC, N8AMA. **AA9AX** & Packet. **AB4RU** & KB4GID, KØDI. **DFØBV:** DL6RAI, DL1MAJ, DG1MHY. **DF2UU** & Packet. **DKØEE:** DF4IJ, DL1MFL, DL4MCF, DL4MDO, DL4MEH. **DKØFFO:** DL2BWM, DL2BUM, DL5BRA. **DK1II** & DJ7MG. **DK1NO** & DL1IAO, DF5JT. **DK2OY** & Packet. **DLØCS:** UA2FJ, UA2FM, DK4LI. **DLØKF:** DF4PA, DJ3UL, DJ6TN, DJ9SW, DK8LV. **EA3KU** & EA3AIR. **G3TXF** & Packet. **G3VGG:** G3RLF, G3TQD, G4AAL. **G3ZEM** & G3VMW. **HG5A:** HA5IW, HA5OM, HA5TI, HA5UA, HG5CCC. **HG6V:** HA6GK, HA6IAB. **I4IKW** & I4EAT, I4EWK, I4DCT. **I4JMY** & I4YSS, I4UFH, I4IEE, UA3DFX, I2VXJ, I2VX. **IK2QEI** & IK2PFL, IK2OHG, I2OKW, IW2HPI, IW2INY, IW2JKG, IK2VJF, Packet. **JAØZRY:** JAØDGK, JGØEBW, JP1QGO, JRØBQD, JS3JSB. **JA1YDU:** JHØNZN, JF1TFK. **JA1YXP:** JM1UWB, Ops. **JA3ZOH:** JH3PRR, JE3MAS, JG3MRT, JG3WDN. **JA7YFB:** JM1HBO, JL2OGZ. **KØLIR:** NØIS, WAØIYY, WFØF, AAØA, NØLIK, WDØCHW, KEØYD, NZØV, NØKFE, WBØIUN, NØPKX, NØQEZ, KBØKK. **KØRF** & AAØRS. **K1JKS** & N1CEV. **K1NG** & K1IG. **K2BU** & Packet. **K2SB** & Packet. **K3ANS** & WF3H, N2BIM, N2MZH, AA3JU, N3IYX, Packet. **K3WW** & Packet. **K4UEE** & Packet. **K7ND** & K6PKW, WA7UVJ. **K7OA** & NS7K. **K8CX** & Packet. **K8GM** & K8LX, WA8ZDT. **K8JM** & N8TFR. **K9BG** & Packet. **KA2DRH** & N4YOS, AB4RE, N4SEV, KN4QS, N4UXB. **KCØEI** & KBØISS.



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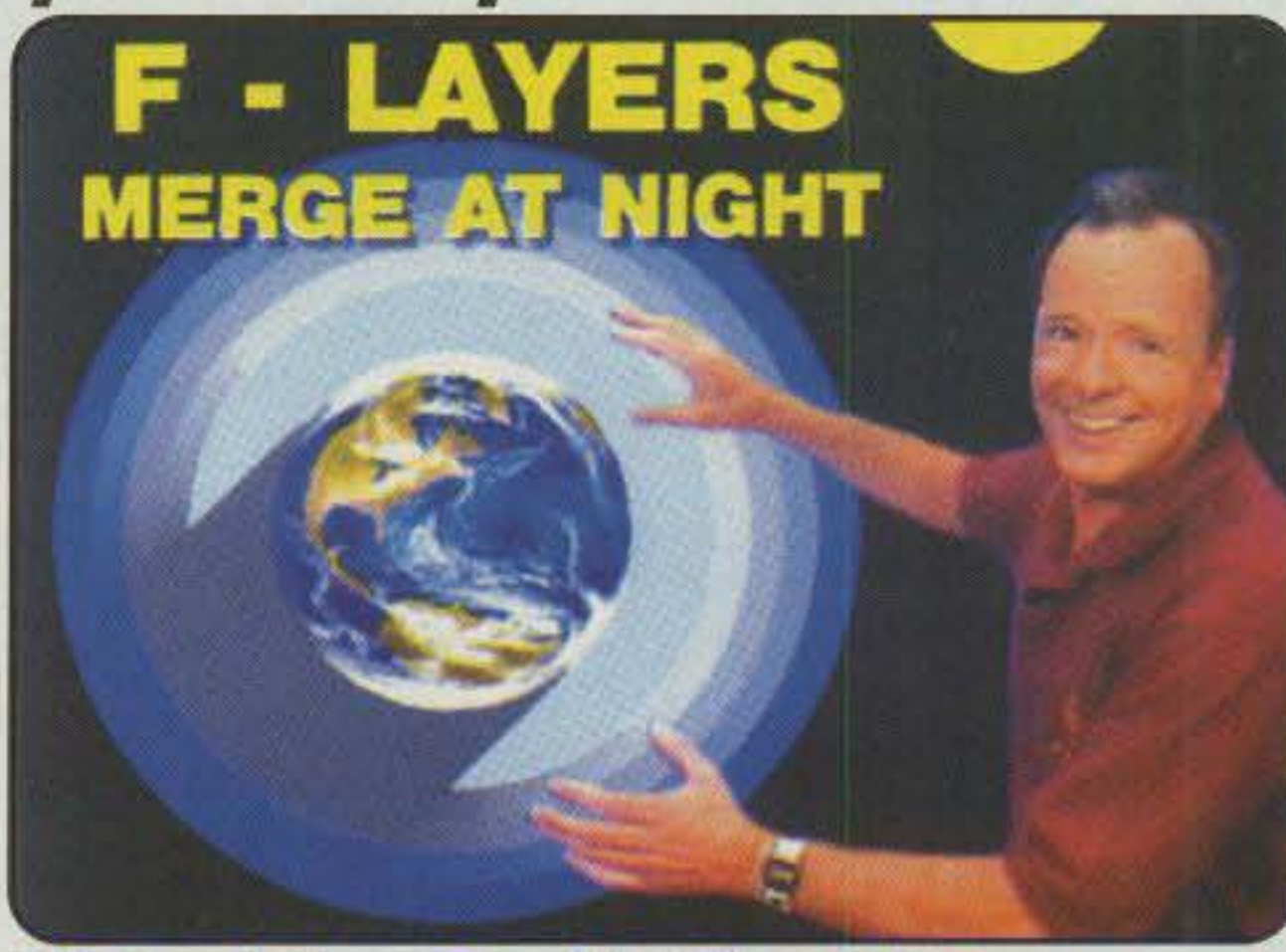
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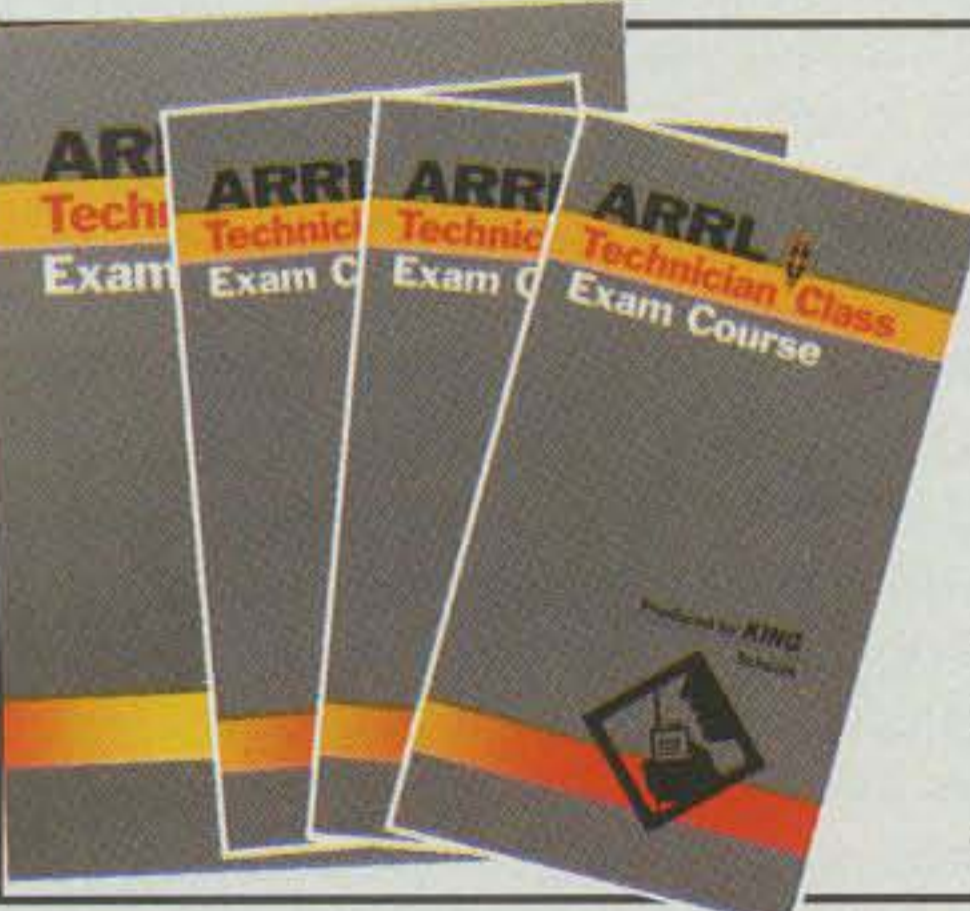
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# The Mode Warrior



The AEA DSP-232 Multi-Mode Data Controller



## The AEA DSP-232

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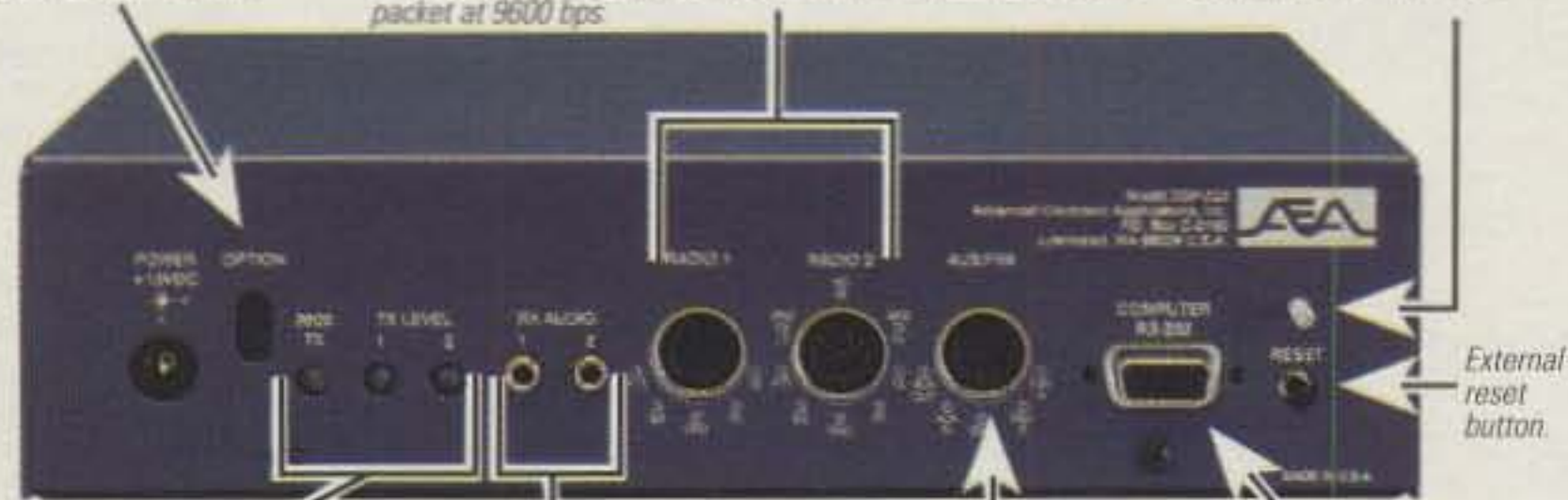
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**N4RJ** & AC4WO, KM9P, W8ZF, **N4VV** & Packet, **N5OK** & N5CG, **N6DLU** & N6LL, Packet, **N6DX** & AD6C, N8SR, N6VR, N6RVZ, WA6CDR, **N8CQA** & Packet, **N8NCV** & KC4FOX, **NC8P** & WA8FLS, WD8GVY, WO8V, **NE1I** & WA1Z, **NX1G** & Packet, **OH0/OH1AF**: OH1EH, OH1NSJ, OH6EI, OH6YF, **OK2KDS**: OK2VWB, OPERATORS, **OK2KJU**: OK2BXU, OK2BXE, OK2PMG, OK2BZM, OK2PWJ, **OK5W**: OK1AEZ, OK1CF, OK1WF, OK1FKD, **OM2I**: OM3VM, OM3TA, OM1II, OM2KV, **OM3A**: OM8AM, OM8DM, OM8WR, **OM7M**: OM3TZW, OM3TZQ, OM3PA, OM3TPV, OM5NU, **PA3BAS** & PA3AFF, PA3AUC, PA3BPL, PA3CLH, PA3DSB, **PA3FNE** & PA3FNE, PA3EYZ, PA8ERA, **PA6A**: PA8PKD, PA3CWM, PA3DFT, **PI4ZLD**: PA3EOB, PA3GCU, **PI50ALK**: PA3CVY, PA3DLA, PA8XAW, **RK9XWH**: UA9XFT, UA9XJV, UA9XMC, **SK3LH**: SM3PZG, SM3JLA, **SM6LPF** & SM6LPG, SM6LJP, SM6REA, **SP5GRM** & SO5AC, **SQ5O**: SP5GKN, SP5GRU, SP5IUK, SP5SSN, **UN2L** & UA9BA, UN4L, **UR4LWC**: UR4LSB, UR4LRG, UR4LQA, US4LGL, US4LCL, **UT2I**: UT2IV, UT2II, UR3ILO.

**VA2AM** & HB9CRV, **VE3DC**: VE3SS, VE3AHQ, VE3DSN, VE3OCY, VE3NYX, VE3OZY, VE3RYI, VE3VFR, VE3VMO, **VE6AO**: VE6AMR, VE6AAV, VE6EX, VE6TO, VE6CIZ, VE6TA, VE6UC, **VE8CF** & VE8NC, **VE9AA** & Packet, **VE9LC**: VE9AS, VE1UA, VE9MY, VE9JW, **WB8C** & AB8Y, K8GG, W8SEY, W8UVZ, **WB8UC** & W1IHN, NA4G, N4HHE, W85M, NO8T, AD4RK, **W1OP**: W1GS, K1JNJ, N1AKO, N1JDA, **W2GD** & WA2SRQ, K2TW, NS2K, WU3A, KU2C, KB2JAQ, **W3AP** & Packet, **W3FV** & Packet, **W3MM** & Packet, **W4PRO** & W4DZH, WB4DNL, **W4QO** & KJ4KR, K4PQC, K4LDI, **W7XR** & K7SS, AA7FT, **W8FJ** & Packet, **W8FN** & KU8E, **WA4VDE** & Packet, **WA6RKE**: AA6DT, AC6DD, WB6ITM, **WB5B** & NET, **WO1N** & Packet, **WR3L** & Packet, **WS7W** & NA7R, N7NG, **WT3Q** & N3BNA, KA2AEV, **WW1N** & WK4Z, AA4G, AA4XR, AB4ZT, KB4FB, K14HL, KJ9N, NY1H, N4DDK, WB4FNH, WB2GMK, **WW2Y** & K2WI, N2NU, K2ZS, **WX8B** & KN5E, AB5QY, WA5Q, **WY3T** & KA3DSX, WC8R, KA3PVA, N3KGL, **XE2/W7WA**: W7WA, AA7IE, WA7UQV, **XX9X**: OH2BC, OH2BH, OH6DO, OH8XX, **ZF1DX**: ZF1DX (W8BLA), K2UFT.

### SSB Multi-Op Station Crews

**7S3OWG**: SM3BDZ, SM3CVM, SM3PXO, **AA1K** & Packet, **AA4S** & Packet, **AA4V** & Packet, **AA8U** & K8MJZ, KC8EK, KF8QE, AA8AV, AA8HZ, NBAMA, **AB4RU** & N9HZQ, KB4GID.

**AB4XA** & N4UF, KC4MII, KS4CW, AC4ET, N4TBI, KD4UJK, WA4B, **DK8IW**: DL5MFL, DJ2CE, **DL8MI**: DL5YDD, DL2YBW, DL9YEN, DL9YEK, DG5YHA, DG6YHA, DG2YIC, **EA1DD** & EA1AKP, **EA3ALD** & EA3CWX, **EW4XA**: Andy, Vlad, **G3SVL** & G3UEG, G7TAJ, **HB9TA**: HB9CXZ, HB9FAN, HB9BLQ, HB9SUL, HB9FBA, **I2OKW** & IK2QEI, I2GXS, **IK2NHW** & IK2UKW, IK2HNA, IK2HNU, IK2SGN, IW2IEM, IK2TCW, **IK2VUE** & IK2XYI, I2-1388-MI, **IR4T**: I4JMY, I4UFH, I4YSS, IK4IEE, **K8LIR**: N8IS, KE8YO, WB8IKR, AA8A, NZ8V, N8LIK, N8PKX, KB8QJX, N8QEZ, WB8IUN, N8KFE, KG8KP, W8DYI, KG8HA, WA8JCO, **K8RW** & G3WJN, NN9K, KB8KRO, AB9W, K9AYK, WB9PVW, N8ONX, KE8FT, KS9W, **K1NG** & K1IG, WF1B, KD1NG, **K3ATO** & Packet, **K3WW** & Packet, **K4KG** & Packet, **K5PGW** & N5ASM, **K6SG** & Packet, **K6XO/7** & K17WX, **K9YUG** & WB9UJW.

**KA2DRH** & N4YOS, N4SEV, KK4QI, N4UXB, **KB7WON** & AB7BJ, KB7FGN, KJ7KK, WS7W, KJ7EO, **KC8EI** & AA2OX/RC2CW, AB5K, N8BIW, WQ1H, **KC4MJ** & K2UFT, **KD9WK** & Packet, **KE8RO** & N8BSA, Becky Craigs, **KG4W** & Packet, **KG7GA** & KA7LDN, N6MZ, **KG8CW** & KG8PE, **KG8EF** & NU8Z, KB8OXK, N8TIB, **KN2L** & KN2T, KD2I, KD2CI, N2RHN, KA2NLX, KA3YIA, **KR4BD** & K2YJL, KS4JP, KD4NAJ, KB4CMQ, AC4PY, K4JMN, N4CBR, NM3U, KR4HT, AD4JJ, N4KTU, **KS4AP** & KB4FAI, **KX3Q** & KF4YH, **LX4A**: LX1KC, LX1NO, DF1AL, **LY2BWJ** & LY3DA, A. Toleikis, V. Kybartas, **LY2ZO**: LYR 346, LYR 728, **N8KOV** & WB8SRP, N8UJQ, WB8ZIV, N8RWB, **N1HRA** & KA1VMG, N1RJF, K1GOX, **N2VW** & Packet, **N3BNA** & Packet, **N3MLV** & Packet, **N4XMX** & Packet, **N6DLU** & N6LL, KA6SAR, WA6OTU, **N6DX** & N6RVZ, AD6C, N8SR, **N8ATR** & WB8K, KF8UN, W8BIN, N8DMM, **NC8P** & WA8FLS, WA8ETC, **OK2OTZ** & OE1OPW, OE3WQB, OK2BX, OK2BXT, **OM2I** & OM3VM, OM3YEC, OM1II, OM2KW, OM3TA, **RK9XWH**: UA9XFY, UA9XJV, UA9XMC.

**S50L**: S53EA, S59AA, **S51EA** & S51FA, **SP9KRT**: SP9HNB, SP9ADU, **UT2I**: UT2IV, UR3ILO, **VE2UMS**: VE2FAB, VE2WJW, VE2PEO, VE2TUL, **VE3DC**: VE3AHQ, VE3NVY, VE3NYX, VE3OCY, VE3OZY, VE3RYI, VE3SS, VE3VMO, **VE4JC** & VE4GTR, **VE6AO**: VE6AMR, VE6CIZ, VE6EX, VE6FXR, VE6GO, VE6HMT, VE6KC, VE6KZ, VE6RTL, **VE9LC**: VE9AS, VE9BM, VE9MY, VE9JW, VE9WH, **W8BLK**: KF8AM, W80H, W80HFK, K1LL, KB8FPA, WA8FPR, **W8CEM** & K8WA, AB8S, NJ8M, KB8KIE, **W8MR**: W8YHE, W8SAI, WA8QPO, W3FHF, N8PEY, WB5EMA, **W8NZR** & KB4IJJ, **W1BK** & Packet, **W2GD** & N2AA, WU3A, KU2C, NS2K, K2TW, KB2JAQ, K2ZS, Packet, **W3MM** & Packet, **W4NZJ** & K4AEK, AE4CQ, KE4DYX, **W4UNP** & Packet, **W7SE** & KB7VOV, **WA2JQK** & WA2UKP, **WA3YVN** & WA4VQD, **WA4DAI** & Packet, **WA5DWX** & KJ5IP, K5ZTY, KC5JLN, **WB4ZNH** & WP2A, **WB9Z** & WS9V, KE9KD, **WD4PDZ** & WD4DCY, WA3JPY, **WD9INF** & KN8R, N8AAT, **WR8C** & KU8C, N8MFO, KC8MK, **WT3Q** & N3ADL, **WW2Y** & Packet, **WY2X** & Packet, **WY3T** & WY3T, N3JRX, KA3DSX, W13L.

(Continued on page 154)

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## CQ REVIEWS:

# The ICOM IC-738 Transceiver

BY LEW McCOY\*, W1ICP

**S**ome cliches I love, but some do get a little tiresome. "Bells and whistles" fits into the latter category. Occasionally, however, a tiresome cliché still is the best choice when it comes to describing new transceivers. This is certainly the case with the new ICOM IC-738 transceiver.

When I unpacked the rig and looked at the manual, I quickly realized that reading and understanding all the functions of the unit would take a lot of time. I spent the afternoon studying the manual before, believe it or not, actually turning on the set. But before we get into a description of all the "goodies," let's give the manufacturer's specs on the unit.

The IC-738 has a general-coverage receiver that tunes from 500 to 29,995 kHz. The transmitter covers all amateur bands, 160 through 10 meters. (The IC-736 is very similar, except that it includes the 6 meter band, and is slightly higher in cost.) Modes are SSB, CW, FM, 5 watts through 100 watts output, and with AM, 4 watts through 40. Power-supply requirements are 13.8 volts DC  $\pm$ 15 percent at 20 amps. Current drain is 20 amps transmit (100 watts out) and 1.6 to 2.1 amps receive, depending on audio level. The IC-737 is 13 inches wide, 4.4 inches high, and 11.2 inches deep, and it weighs 17.7 pounds.

The receiver sensitivity, pre-amp on, is rated at less than 0.15  $\mu$ V for 10 dB S/N for SSB and CW. The rating is 2.0  $\mu$ V at 10 dB S/N for AM. My tests indicated that the IC-738 easily meets these specs. In fact, it was slightly better. Selectivity is rated at 2.1 kHz at -6 dB for SSB and CW. A sharper filter option for CW is available. The RIT tuning is  $\pm$ 2.5 kHz maximum.

The transceiver has a very good built-in antenna tuner with a rated matching range of 16.7 to 150 ohm loads—matching to 50 ohms. I say "rated," as I found the range was considerably more. I'll cover that in a moment.

Spurious emissions are less than -50 dB, and carrier suppression is more than 40 dB. Unwanted sideband is down more than 50 dB. The receiver is a triple-conversion superhet with the first IF at 69.011 MHz, the second at 9.0115 MHz, and the last at 455 kHz.

Those are the major specifications, but there is a lot more to the transceiver.

Let's jump back to the built-in antenna tuner first. I believe that ICOM told its engineers, "We need a built-in antenna tuner for our IC-738, so design one that matches loads from, say, 16.7 to 150 ohms." The design engineers did exactly that. You probably are asking why they picked that figure. (Incidentally, other manufacturers use the same range.) The answer is really quite simple: The average trap beam or antenna usually presents loads within that range. If you ask an owner of the transceiver what the matching range is, he will go by the book. However, being a self-admitted anten-

\*Technical Editor, CQ, 1500 West Idaho St., Silver City, NM 88061



The ICOM-738 has plenty of "bells and whistles." The dial readout is large and easy to read.

na guru, I always check the range. In this case I have a center-fed, extended double Zepp on 80 with open-wire feeders that I use on all bands. This antenna presents some really "wide" range loads at the rig—and I do mean loads far outside the specified matching range of the IC-738.

At the rig I used a balancing transformer to go from 50 ohms to the unknown load of the open-wire feeders. Here is the point: I gradually went through 10 meters up to 160 testing for a match. Press the TUNE on the rig, and the automatic tuner goes through its tuning procedures, adding or subtracting inductances and capacitance values until it reaches a match at approximately 1.5 to 1 or less. The tuner is a basic T-match type, and as I expected, I found that I could match these wide-range loads with the built-in tuner on each band. One exception was at the low end of 160 meters. To me that was a real plus. The rig includes a built-in tuner, eliminating another separate station necessity.

In this review I did something entirely different for me. Shortly after I got the transceiver for review, I had to go through heart surgery (a quintuple bypass plus a pacemaker). The surgery put me out of it—and I do mean "out of it"—for several months. It so happened that a good friend of mine, Carl, N5WBC, was having problems with his transceiver. I told him if he wanted, he could borrow the IC-738 and keep notes on its operation. That way I could use his notes in this review. So Carl did just that. Following is what Carl had to say. Keep in mind that Carl is what I consider a typical modern amateur radio operator. And he was not schooled in electronics.

Dear Mac:

It was an extreme pleasure working with the equipment you lent me. I found the ICOM IC-

738 very easy to manage, especially since I am more or less a neophyte in amateur radio.

The evening before setting up the IC-738 I read through and studied the entire instruction manual. One of the major advantages of getting set up was the clarity of the instructions which easily enabled me to hookup and get on the air. There was no bewildering lingo or confusing super scientific jargon. The instructions and pictorial illustrations were clear and understandable, resulting in immediate success.

As my log indicates, I made many immediate contacts all over the U.S. and Canada. Running barefoot on 15 meters, I logged eastern U.S. and Canada and had an exciting contact with a mobile marine station on a ship in the Atlantic off the coast of South America. All signal reports were of excellent and exceptionally good audio quality.

1. RECEIVE: Very sensitive and good, clear reception. Nice quiet rig and nice audio.

(a) RIT (Receiver Incremental Tuning)—worked well to shift the receive frequency.

(b) PBT (Pass Band Tuning)—was very effective in reducing QRM.

(c) NOTCH—noted that SSB filtering reduces noise and interference quite well.

2. FUNCTION DISPLAY

(a) Extra-large, easy-to-read frequency digital display.

(b) All functions of the IC-738 are displayed clearly and accurately.

3. FRONT-PANEL CONTROLS

(a) Good, logical layout enhances ease of operating.

(b) Main dial works smoothly and is easy to use.

(c) Most switches are lighted, plus the digital display shows which mode you selected.

(d) I liked the separate RF power control, which makes it easy to adjust the drive to my amplifier.



### VFO MODE

Each VFO shows a frequency and operating mode. If the frequency or operating mode is changed, the VFO automatically memorizes the new frequency or new operating mode.

When a VFO is selected from another VFO or the memory mode, the last used frequency and operating mode for that VFO appear.

#### [EXAMPLE]



### MEMORY MODE (pgs. 39 - 44)

Each memory channel shows a frequency and operating mode like a VFO. Even if the frequency or mode is changed, the memory channel does not memorize the new frequency or operating mode.

When the memory channel is selected from another memory channel or VFO mode, the memorized frequency and operating mode appear.

#### [EXAMPLE]

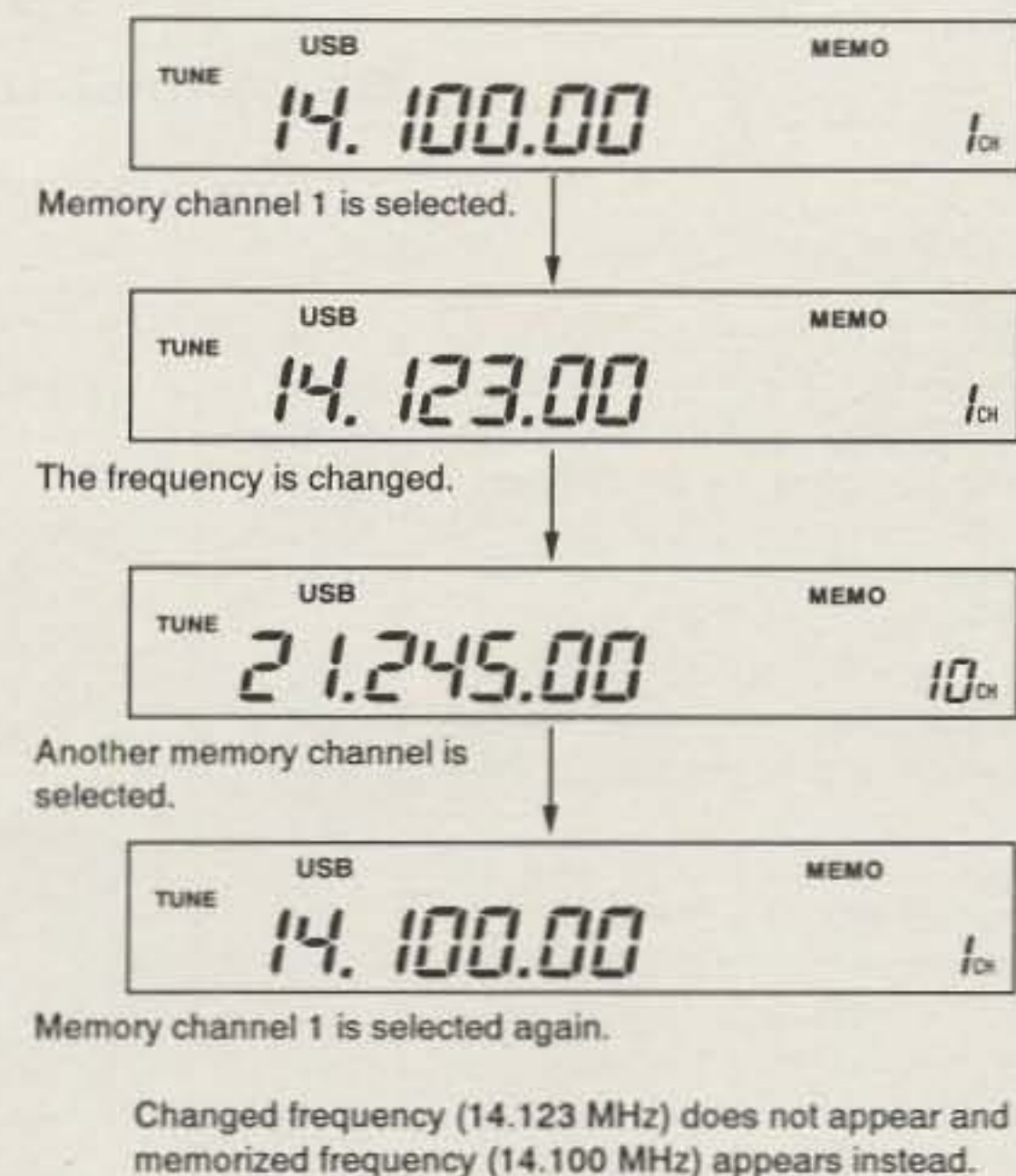


Fig. 1- From the instruction manual, these are the details on the VFO and MEMORY modes.

(e) Key pad is very versatile with no hassle band changing and frequency selection.

(f) I liked the ease of using the AUTOMATIC TUNER, which was very effective in maintaining a flat SWR throughout the range. It's hard to make a mistake with this tuner.

(g) The IC-738 lets you to hook up two different antennas with a switch on the front panel, allowing you to change from one antenna to another—a nice feature.

Mac, I tried to find something negative to report about this unit, but it was all positive—and then some. Thanks for letting me test it for you. (end quote)

Frankly, I was not surprised by Carl's report. The IC-738 is a very nice piece of equipment, and on a scale of one to ten, it easily gets a ten.

Following are some of the other features that impressed me.

There are two major operating modes for the transceiver, either VFO or Memories. There are two VFOs—A and B. These are a necessity in this modern world of DX chasing. In the MEMORY mode there are 101 memory channels available—plenty enough for storing one's most used frequencies. Let's briefly discuss the two modes—VFO and MEMORY. The best way to do this is to show the actual examples from the very fine operating manual (fig. 1).

How about this "bells and whistles" item? The IC-738 has a function switch labeled "MP-W"; this stands for Memory Pad Write. The

transceiver has what is called memo-pad operation. This is separate from memory channel operation. The default number of memo pads is five; however, this can be increased to ten. The memo pad is convenient when you want to memorize a frequency and operating mode temporarily, such as when you find a DX station in a pile-up or when a desired station is busy and you want to search for other stations. How to use these memo pads is explained in clear, detailed language in the manual.

All in all, I would rate the IC-738 very highly. The instruction manual is extremely detailed and easy to follow. All received reports were outstanding as to audio quality. I used the speech processor, and listeners gave me excellent quality reports.

The list price of the IC-738 transceiver is \$1830.00. It is manufactured by ICOM, Inc. and is marketed by ICOM America, Inc., 2380-116th Avenue NE, Bellevue, WA 98004 (206-450-6088). ■

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# How To Build A Cascode Antenna Amplifier

BY MICHAEL D. ALLEN\*, KD6GKR

**T**his article describes a general-purpose, tuned RF amplifier which is usable from 1.8 MHz to over 60 MHz. Table I provides coil and capacitor data to tune the amplifier to all amateur bands from 160 through 6 meters. The unit was originally built to serve as an antenna amplifier to increase the range of a scanner.

The amplifier is stable, has over 20 dB gain, and best of all can be built with parts available almost anywhere. The parts suppliers for the original amplifier were the local grocery store, drug store, liquor store, and of course a Radio Shack store.

A group of engineers and technicians, of which I was one, were working in the field. A communication problem came up which was solved by the use of a cordless phone (no amateur gear was available). The handset was separated from the base by over 100 yards. The base would receive the handset okay, but the handset was noisy and weak when receiving the base. A scanner was available, so it was connected to a half-wave dipole cut to 47 MHz. The scanner was used to receive the base at the handset site. This setup improved communications somewhat, but the S-meter on the

COIL DATA						
Band (meters)	C1 & C2	L2 & L3			L1 & L4	
		Wire	Form	Turns	Wire	Turns
160	220 pF + 220 pF	# 30	1/4 in.	150	#26	14
80/75	100 pF + 47 pF	#30	1/4 in.	150	#26	14
40	47 pF	#30	1/4 in.	91	#26	10
30	47 pF	#30	1/4 in.	50	#26	7
20	2 ea 47 pF in series	#30	1/4 in.	50	#26	7
17	2 ea 47 pF in series	#26	1/8 in.	92	#26	10
15	2 ea 47 pF in series	#26	1/8 in.	70	#26	8
12	5 pF +	#26	1/8 in.	100	#26	9
10/11	5 pF	#26	1/8 in.	100	#26	9
6	—	#22	1/8 in.	65 to 75 (see note 2)	#22	6

RFC 1: 210 turns #30, 1/4 in. form turns.

Note 1: A + sign in the C1 & C2 column indicates that the two capacitors listed are in parallel.

Note 2: Due to the low tuning capacitance used at 6 meters, the circuit is very sensitive to circuit layout and stray capacitance. Coil turns will vary as shown.

\*23872 Calle Hogar, Mission Viejo, CA 92691

Table I—Coil data.

## PARTS LIST

Item	Part #	RS Part #	Comments	Qty.
Circuit Board	—	276-1499	Any 1/16" board will work	2
Binding Post	—	274-662	2 sets per package	1
FET	MPF102	276-2062	—	2
Resistor Assortment	—	271-308	All resistors required are in this assortment	1
Capacitor Assortment	—	272-801	C3, C4, C5, C6, C7, C9, C10	1
Capacitor	—	272-120	4.7 pF Tuning Cap	1
		272-121	47 pF C1 & C2	
		272-123	100 pF (see Table I for value)	
		or 272-124	220 pF (2 per package)	
Capacitor	—	272-1019	C8 1000 $\mu$ F 35 V	1
"F" Coax Connector	—	278-212	2 per package	2
Wall Transformer, 12 to 18 VDC	—	—	If required (see text)	1
Jack to fit Wall Transformer	—	—	J1	1
Soda or Cocktail Straws for Coil Forms	—	—	See Table I for size	
Tin can 2-3/8" x 4"	—	—	Chow mein sauce can	1
Tin can 2" x 3-3/8"	—	—	Pineapple can	1
Magnet Wire Assortment	—	278-1345	—	1
RG-59 Coax, "F" Connectors and Adapters	—	—	Parts required to connect amp to DC isolator can and to receiver	
9V Battery	—	23-583	If required (see text)	2
Connectors for 9V Batteries	—	270-326	2 per package	1
Epoxy	—	—	—	—
Mylar Tape	—	—	—	—

Fig. 1—Parts list for the cascode amplifier.



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scanner showed very little signal and the audio was noisy.

A Radio Shack catalog was checked to see if the parts available could be used to build a 47 MHz antenna amplifier. As it turned out, a very good antenna amplifier was built with Radio Shack parts and a little help from a grocery store. All the electronic parts were supplied by Radio Shack. The grocery store supplied the shield can/chassis box. The sauce can from a Chinese dinner kit was used as the shield can/chassis box. This can is 4 inches in diameter and 2 $\frac{3}{8}$  inches deep. The liquor store supplied the coil forms. The coils were wound on  $\frac{1}{8}$  inch cocktail straws. The drug store supplied mylar tape (Scotch<sup>®</sup> Magic Mending Tape), tubes of epoxy, and emery boards.

Once completed, the performance of the amplifier astounded everyone involved. The scanner went from a barely readable signal and no reading on the S-meter to full deflection of the S-meter and completely quieted audio.

A cascode circuit was used when building the amplifier to assure stability and to avoid neutralizing the amplifier. Those readers who are new to the hobby may not be familiar with the cascode circuit. The cascode circuit using tubes was developed during WW II, and I am told it was considered secret. The cascode circuit came into general use in the 1950s and 1960s in the form of TV tuners and FM radio front ends. Special tubes such as the 6BQ7 and 6BZ7 were developed just for this purpose. Amateurs used these tubes as antenna amplifiers and as front ends in homebrew rigs from 15 meters up through 220 MHz. Noise figures of 6 dB and lower were usually achieved.

The cascode circuit also works well with FETs, so the antenna amplifier was built with MPF102 FETs. The cascode circuit consists of two active devices in series DC wise. The power-supply voltage is usually divided equally between the two devices. The input stage is connected as a grounded cathode/source. The

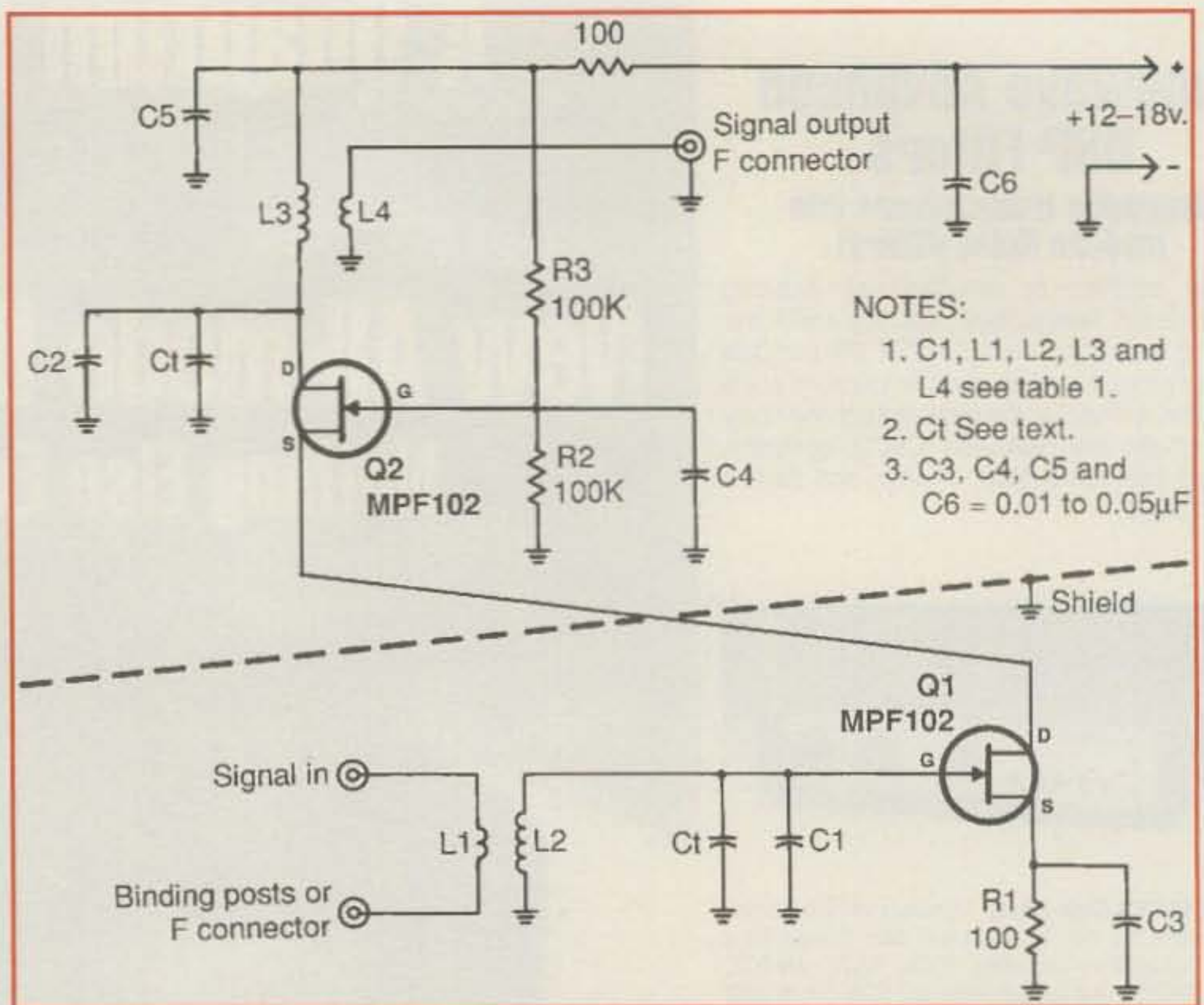
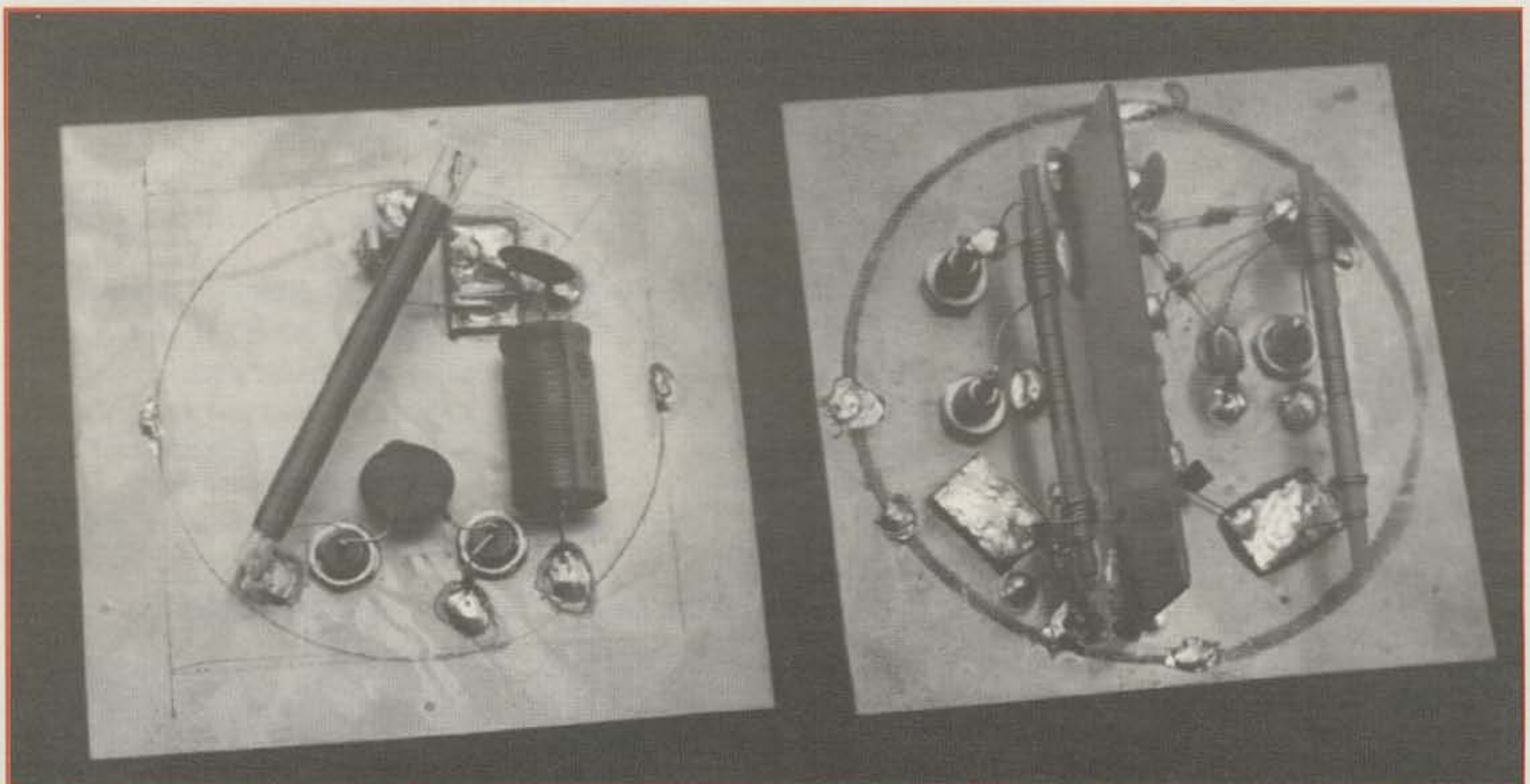


Fig. 2- Schematic of cascode antenna amplifier. The output circuit shown is configured for local power. If power is to be supplied through the lead-in coax, the output circuit must be modified per fig. 4.

output stage is connected as a grounded grid/gate. The plate/drain of the input stage is connected directly to the cathode/source of the output stage. This circuit isolates the input from the output, provides a mismatch from the input device to the output device, and in the process

lessens the Miller effect, or something like that. Anyway, the end result is an amplifier that has good gain and a low noise figure, and requires no special tweaks to make it stable.

So much for history and on to amplifier construction. Build the amplifier on a piece of 4.5"



The right half of this photo shows the amplifier circuit with 6 meter coils installed. Also shown is the DC block circuit board.





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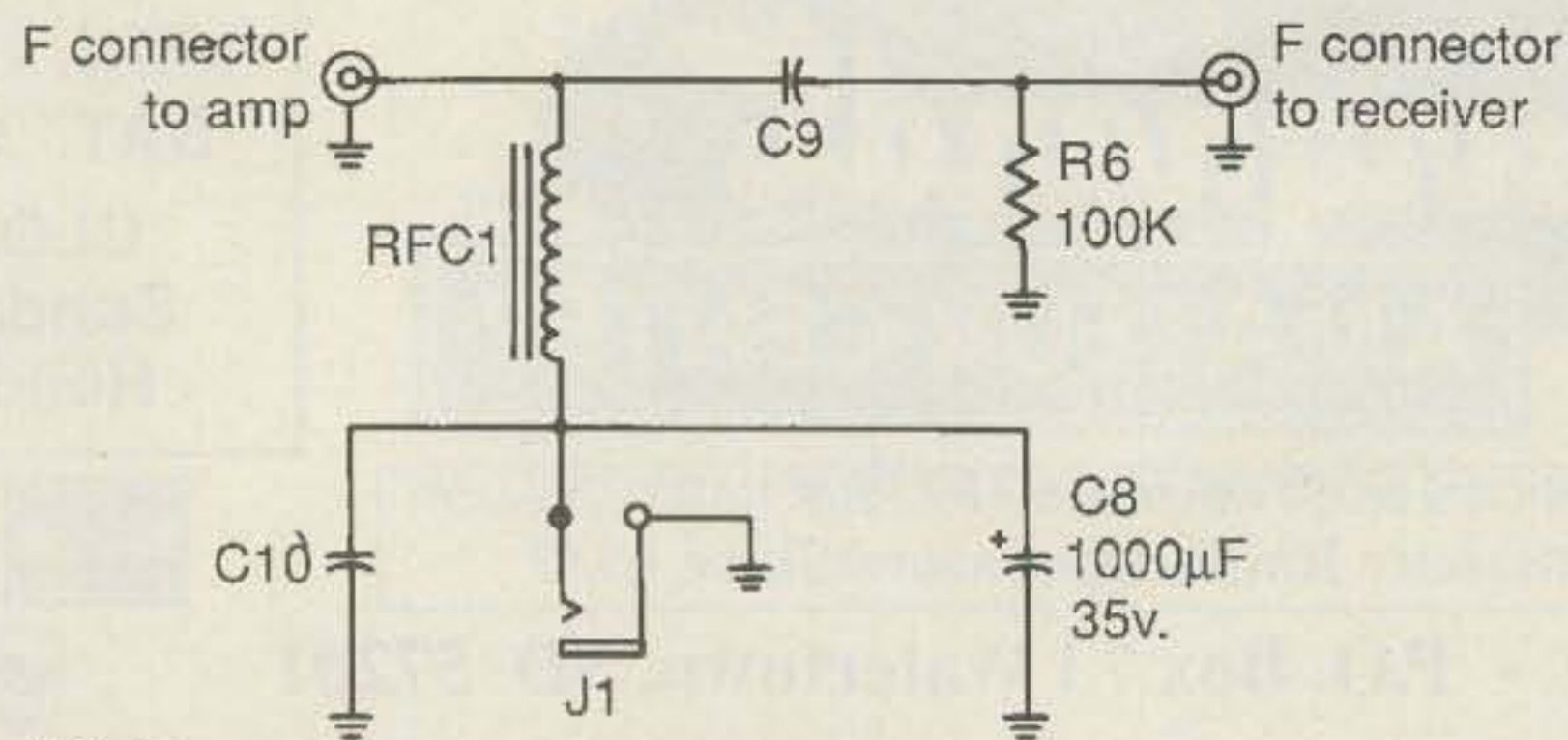
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NOTE:  
C9 and C10 = 0.01 to 0.05µF.

Fig. 3—Schematic of the DC block which is used to supply amplifier power through the down-lead coax. The left half of the photo shows the DC block circuit before the protective can is soldered in place.

× 4.5" copper-clad circuit board (see photo). Cut the amplifier main board from a 4.5" × 6.25" Radio Shack 276-1499 PC board.

Before starting work on the circuit board, scrub it under flowing water with a steel-wool pad and scouring powder until all tarnish is removed. Rinse the board thoroughly and dry before continuing construction.

Use the leftover board to make connection pads and a shield for the amplifier. The shield should measure 3½" × 1½". Cut ¼" × ¼" pieces of board to use as connection pads. A ¼ inch strip cut from the end of the board will yield 18 pads.

Also cut two ¾" × ½" connection pads to connect the hot ends of L2 and L3 to other components. These pads provide all the capacitance needed to tune the coils to 6 meters. The pads are shown as Cp on the schematic.

Strip the copper from the pad side which is to be bonded to the main board. Next cut a notch in the shield to clear the connection between Q1 and Q2. Cut the board by scribing both sides with a sharp hobby knife until the copper is cut through. Once the scribing is complete the board may be cracked at the scribe marks. Clean up the edges of the connection pads with sand paper or a fingernail emery board.

Check the pads to assure there are no copper strands shorting the top and bottom layers. Center the tin can on the 4.5" × 4.5" main circuit board and draw a circle around the can with a pen. This circle will act as a guide when placing the connection pads. Next drill the holes for the binding posts and F coax connectors. If one is careful, these holes can be drilled with a hobby knife. Use epoxy to bond the pads to the main board. A drop of epoxy on the end of a toothpick applied to the main board should do it. After an hour, tin the tops of the pads. This will make part connection easier, and the heat will cure the epoxy.

Wind the coils using data from Table I. After L2 and L3 are completed, wrap two turns of mylar tape around each end of the coils. Wind the coupling links L1 and L4 over the mylar tape at the cold end, winding in the same direction as the L2/L3 windings. The cold end of L2

is the grounded end; the cold end of L3 is connected to C5. All coils and RFC1 are wound close spaced. Coils wound with #22 wire are self-supporting. Coils wound with #26 or #30 wire require some support. Coil supports can be made from short lengths of #22 wire. Wind two turns around each end of the coil form, and solder one loose end to the main circuit board. Do not connect both ends of the coil support wire to the main circuit board, as this will act as a shorted loop. Leave the coil end of the support wire open.

No claims are being made for the LC ratios or the turns ratios of the tuned circuit being optimized for gain, low VSWR, or noise figure.

Capacitors C1 and C2 tune the coils and should be chosen from Table I. If no capacitor is specified, the capacitance of the ¾" × ½" connection pad is sufficient. Capacitors C3, 4, 5, 6, 7, 9, and 10 are used for bypassing and coupling. The values of these capacitors are not critical, and any value between .01 and .05 µF can be used. The original amplifier used .047 µF capacitors only because there were a bunch of them in the assortment purchased.

The amplifier requires 12 to 18 volts for power. Two 9 volt transistor-radio batteries in series or a wall transformer can be used. If the amplifier is to be powered locally, build as shown in fig. 2. If the amplifier is to be used as an antenna amplifier, it will be more convenient to supply power through the coax and place the power supply at the receiver. To supply power through the coax, modify the schematic by adding R5, C7, and reconnecting L4 (fig. 4). A DC block must be added at the receiver end of the coax to insert power, isolate the DC from the receiver, and isolate RF from the power supply. The schematic for the DC block is shown in fig. 3. Build the DC block on another piece of 4.5" × 4.5" circuit board.

Use a 2" × 3¾" pineapple can for a cover. The amplifier coils can be tuned by observing the output on a receiver equipped with an S-meter or by using a signal generator and an RF probe at the output.

To fine tune the coils, spread the turns at the hot end to raise the frequency. To lower the frequency, solder a short piece of #22 wire to the

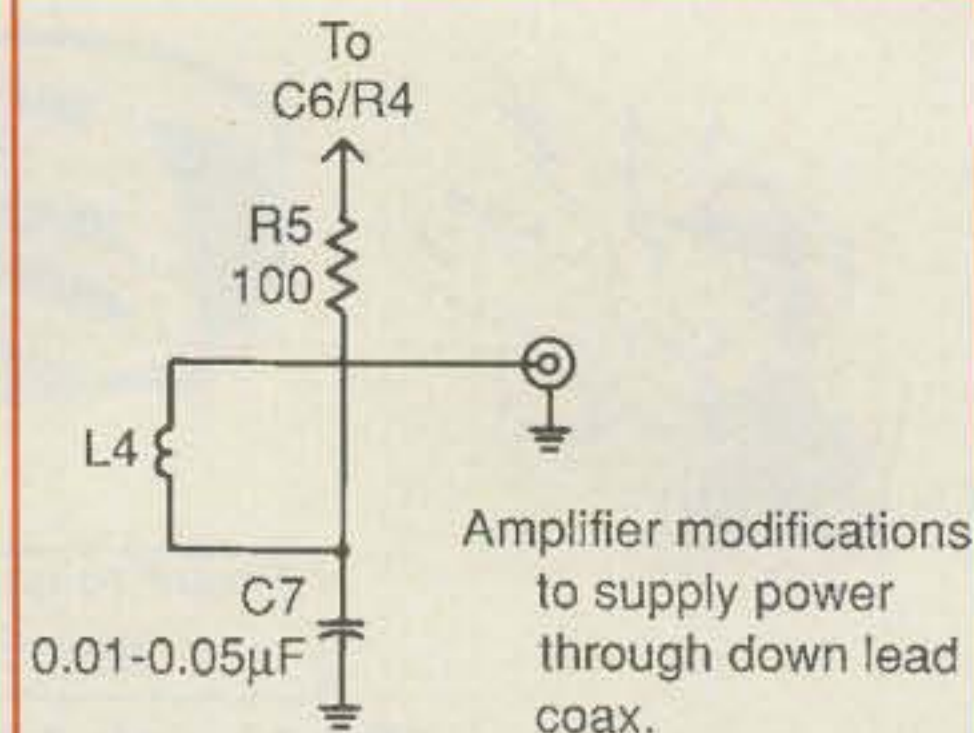


Fig. 4—Shown are modifications to the amplifier board which will enable the user to power the amplifier through the down-lead coax.

circuit board and wrap several turns around the coil's hot end. This tuning wire is labeled Ct on the schematic. If more than three turns of wire are required to tune the coil, add some turns to the coil and start over. Cut off any excess wire.

A small trimmer capacitor may be used to tune the coils. Trimmers were not available when the original amplifier was built, so the wire was used to implement Ct. A piece of wire is also cheaper.

If the unit is to be used as an antenna amplifier, install binding posts at the input. To use this amplifier as part of an antenna, connect it at the center of a ½-wave dipole. Connect the dipole wires directly to the binding posts. The antenna length may be determined by dividing 5616 by the frequency of interest. This gives the antenna length in inches.

If the amplifier is to be used as an inline amplifier, install an F connector at the input.

After tuning the amplifier, place the sauce can over the circuit board and recheck the tuning. Verify at least ⅜ inch clearance between the coils and the can wall. If everything checks out okay, solder the can to the board. Only tack solder the can in four places if you think you may have to get at the circuit some time in the future. Do the same for the DC block.

This project shows that useful circuits can be built with a minimum of tools and equipment.

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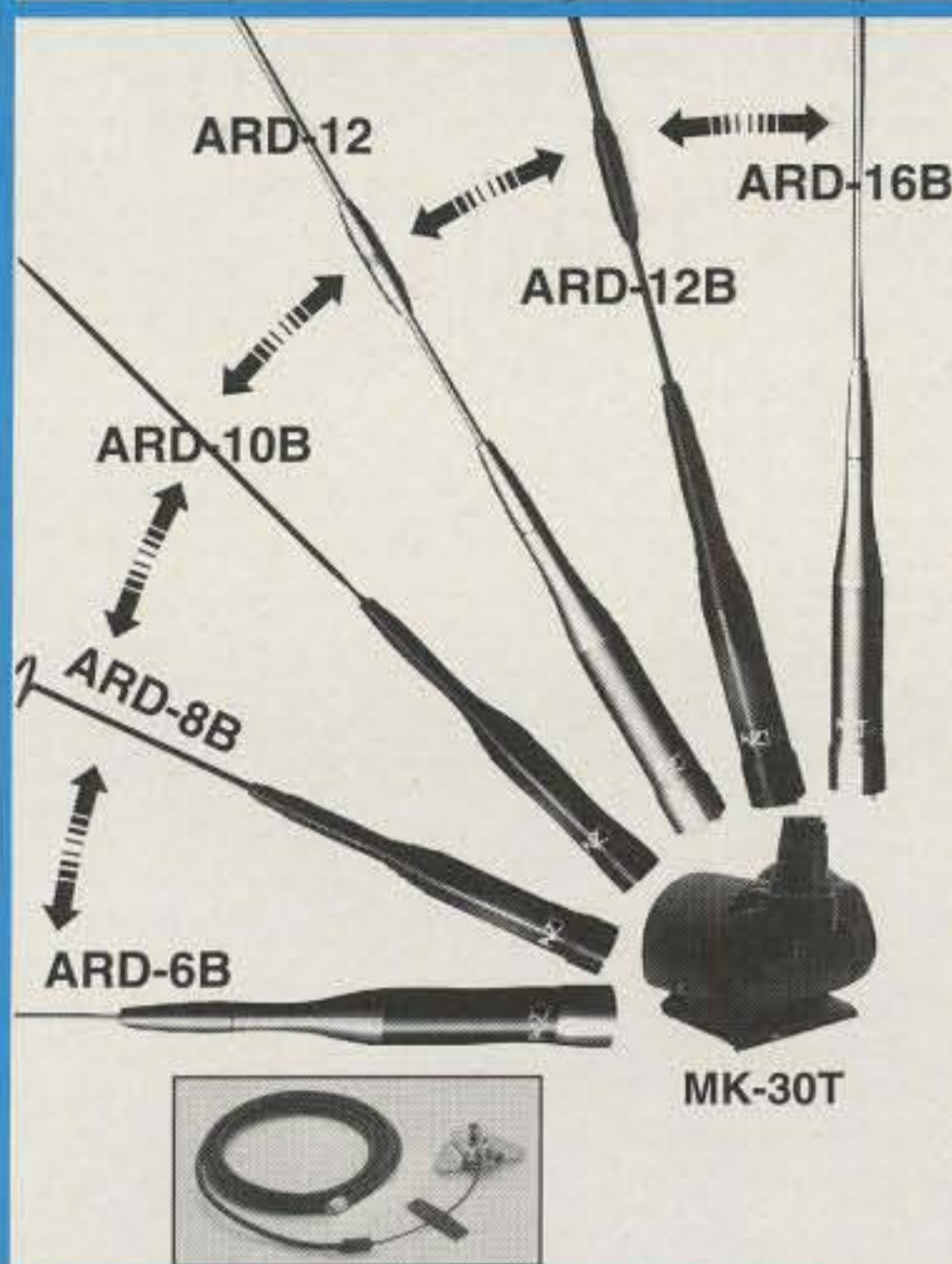
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ARD10/10B	34.4"	2m:3.0/70cm:5.5	120w
ARD11/11B	41.5"	2m:3.7/70cm:6.1	120w
ARD12/12B	48.2"	2m:4.3/70cm:6.8	150w
ARD16/16B	64.8"	2m:5.0/70cm:7.7	150w

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# CQ REVIEWS:

## The Hy-Gain Tailtwister Antenna Rotator And The DCU-1 Programmable Control Unit

BY PAUL CARR\*, N4PC

I bought my first antenna rotator in 1963. I used that unit for many years, and I replaced it with a device that used similar technology. When I was asked to review this rotator system, I was very happy. This is the first time I have had a chance to evaluate state-of-the-art rotator technology. Here is the result of my test.

### General Description

The Tailtwister-D rotator system consists of an extra-heavy-duty rotator unit and the DCU-1 digital control unit. It is recommended that the rotator unit be mounted on a plate inside the antenna tower. From the top of the unit, a mast is extended through the top of the tower to support the antenna. The DCU-1 control unit must be installed indoors and connected to the rotator by an eight-conductor cable.

The Tailtwister is designed for low-temperature operation (-30° F/-34° C). The control cable connects through an AMP connector with gold-plated contacts. The rotator is a high-strength steel drive train. To ensure reliable readout information at the display unit, RF suppression beads have been placed on the potentiometer leads. The unit has a wedge brake, and it has a 26 volt motor.

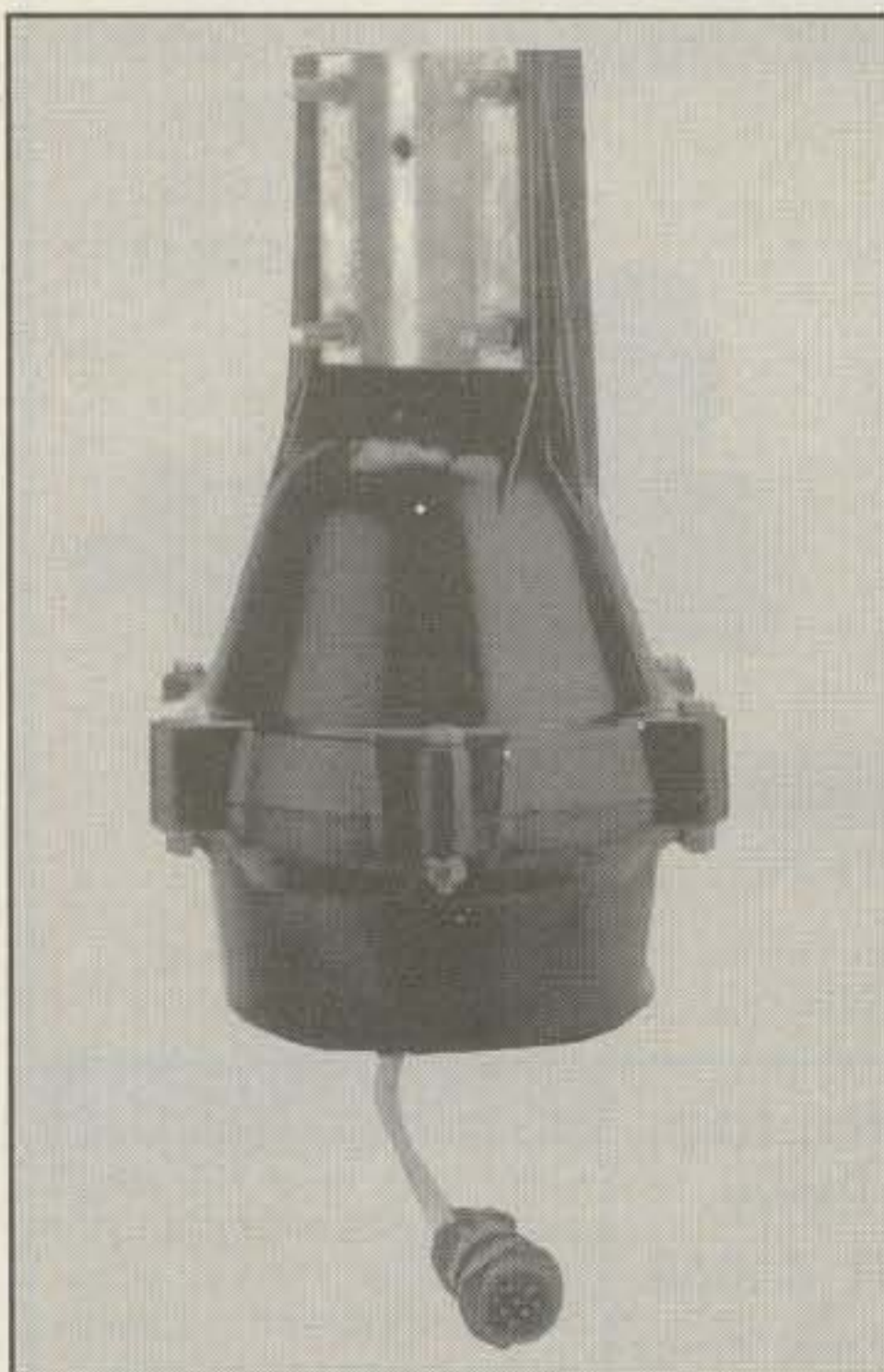
97 West Point Road, Jacksonville, AL 36265



The Hy-Gain DCU-1 programmable control unit.

The DCU-1 digital control unit features a Gas Plasma display with an amber filter. The resolution of the display is 5 degrees (analog) and 1 degree (digital). The system has six memory presets, an automatic eight second brake

delay, and an automatic motor slowdown during the last five degrees. There is a programmable center of rotation for the rotator. The unit can be connected to a compatible computer by means of an RS232 port. The rotator and



Hy-Gain's Tailtwister antenna rotator.

### TAILTWISTER SPECIFICATIONS

#### Electrical

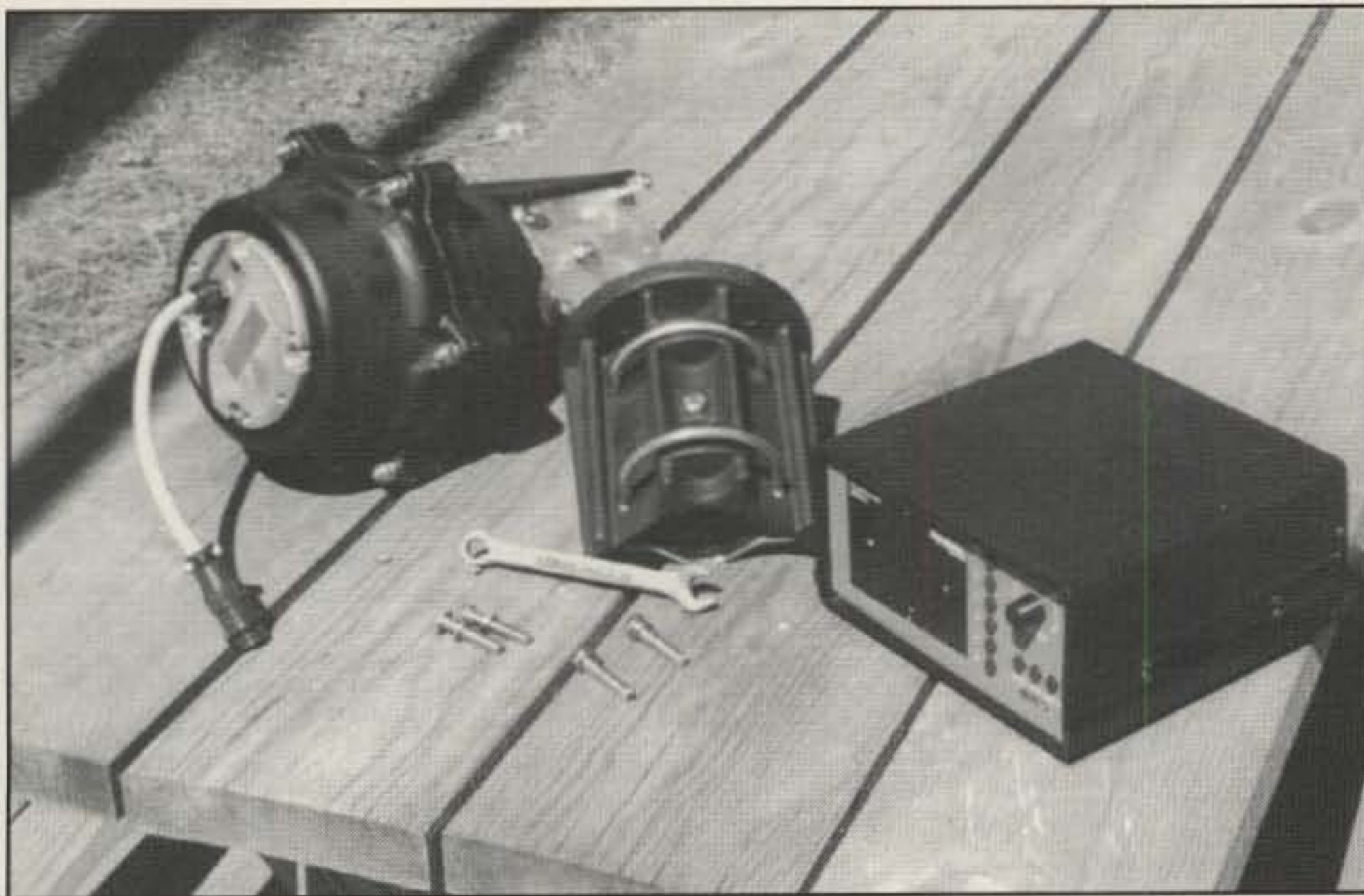
Input voltage.....	120 VAC 50/60 Hz, 3 amp max (or 220 VAC 50/60 Hz, 1 amp max)
Motor.....	24 VAC, 2.25 amp, capacitor start/run
Brake Solenoid.....	24 VAC, 5 amp
Power Transformer.....	120 VAC/26 VAC 10% duty, thermal switch protected (220 volt model has 220 VAC/26 VAC 10% duty, thermal switch protected)
Maximum Cable Resistances	
Pins 1 and 2.....	0.8 ohms
Pins 3-8.....	2.0 ohms

#### Mechanical

Maximum Antenna Size	
Inside Tower Mount	
Wind Surface Area.....	20 sq. ft. (1.86 sq. m)
*Effective Moment.....	3400 ft. lb. (470 kg. m)
Outside Tower Mount	
Wind Surface Area.....	10 sq. ft. (0.93 sq. m)
*Effective Moment.....	1500 ft. lb. (207 kg. m)
Rotator Size.....	9" x 14.1" (OD x H) (23.7 x 35.7 cm)
Antenna Mast Size.....	1.875-2.063 OD (48-52 mm)
Operational Temperature Range.....	-30° F to +210° F (-34 deg C to +99 deg C)
Brake.....	positive, electrically operated wedge, 60 segments, 6 deg apart
Rotation Time.....	50-65 seconds for 360 deg
Mounting Hardware.....	stainless steel bolts and nuts, plated steel clamp

Table I- Specifications of the Hy-Gain Tailtwister antenna rotator.





Unit with lower mast support ready for attachment.

control units are connected via an eight-conductor cable. For cable lengths of 125 feet, the requirements are two #18 gauge and six #20 gauge conductors. For longer runs, heavier gauge conductors are required.

### The Taitwister

It is recommended that this rotator be mounted inside a compatible tower to utilize the maximum rating of the unit. The maximum rating is a wind loading of 20 square feet and an effective moment of 3400 foot pounds. Effective moment is defined as the antenna turning radius multiplied by the weight of the antenna. Antennas with long booms and elements have much more angular momentum and exert more torque on the rotator system than antennas with shorter booms and equal areas.

Not everyone has a tower that will allow the rotator to be mounted inside. I am such an individual. There are two methods of mounting the rotator outside the tower, and both are very straightforward.

The rotator unit can be attached to a plate mounted on top of the tower. A hole must be cut in the mounting plate for routing the control cable to the controller. There is a template provided to allow accurate modification of the mounting plate. The rotator is attached to the mounting plate by six bolts and lockwashers.

There is a lower mast support kit (available as an option) which will allow mounting of the unit on a mast extending above the tower. The lower mast support is also used when the rotator is mounted on a "push-up" mast. When the rotator is mounted outside the tower, the antenna size is restricted to 10 square feet of wind



The Taitwister and DCU-1 control unit ready for installation.

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**DCU-1 DIGITAL CONTROL UNIT SPECIFICATIONS**

<b>Size</b> .....	8.5"W x 4.3"H x 9.0"D (21.6 x 11.0 x 22.8 cm) •same size as T <sup>2</sup> X and HAM IV control boxes
<b>Control Unit Display</b>	
Type .....	gas plasma, amber filter •readable in direct sunlight
Scale .....	5 degree (analog); 1 degree (digital)
Blanking .....	target bearing (30 seconds) total (30 minutes after no activity) •extends display life
Display Life .....	30,000 to 40,000 hours
<b>Memory Presets</b> .....	6 independent, user programmable
<b>Rotation Center</b> .....	user selectable, 0–360 degrees •north, south, or any heading
<b>Brake Delay</b> .....	8 seconds, fixed
<b>Automatic Motor Control</b> .....	
	momentary reverse direction on start-up automatic stop if no rotator movement detected in 8 seconds motor pulse slowdown (half-cycle) on last 5 degrees before stop
<b>Front Control Panel Features</b> .....	
	one knob (24 position digital encoder) •sets target bearing •sets center of rotation in calibrate mode six memory presets (push buttons) one start rotation (push button) •also starts End Point Calibration (EPC) one stop rotation (push button) one display (push button) •turns on display after blanking •enters calibration mode
<b>Rear Panel Features</b> .....	
	one 8-pin socket (rotor control) one RS-232 Host (DB9F) •computer port for rotor control one RS-232 Ext. (DB9M) •pass-through serial port for computer accessories such as radio, terminal TNC, antenna switch, modem, etc. one ground terminal (1/4"-20) one fuse holder one power cord, three-wire available in 110/220 VAC, 50/60 Hz

Table II— Specifications of the Hy-Gain DCU-1 digital control unit.

loading, and an effective moment of 1500 foot pounds.

**The Digital Control Unit**

Under normal conditions, the numeric display in the lower left corner and the outer circle tic mark always indicate the current bearing of the rotator. The numeric display in the lower right corner and the inner tic mark indicate the target bearing. To move the rotator to a new heading, either the rotation control knob on the display unit or memory presets may be used to select the target bearing. After the new heading has been selected, press START. The rotator will turn to the new heading, and after 8 seconds the brake will engage.

To store a heading in memory, select a target bearing with the rotation knob. Then press and hold the appropriate memory location button until the letters "PRE" light up. These presets are stored in non-volatile memory and will be retained even if the unit loses power.

**Prior To Final Installation**

The installation procedure is the same with this equipment as it is with any other component in your system. First study the instructions thor-

oughly. Assemble and test the control cable and ensure the system functions properly in your shack. Place the proper connectors on the control cable and check the cable for continuity and shorts. Program all stops and verify the unit for proper operation. Finally, turn the rotator to a preselected azimuth, and the unit is ready for installation on the tower. This procedure is much easier to do than to write about.

**Final Thoughts**

The rotator is used to turn an eight-element log-periodic antenna at my QTH. The entire system has functioned flawlessly. The antenna has been subjected to wind gusts in excess of 60 MPH with no problems. The unit is well made, and I am looking forward to many years of reliable operation.

**Availability**

The unit is available from Telex Communications, 8601 East Cornhusker Highway, P.O. Box 5579, Lincoln NE 68505-5579 (402-467-5321). The system has a twelve-month limited warranty. The suggested list price for the Taill-twister and the Digital Control Unit is \$799.95. List price for the Lower Mast Support is \$75.95.



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The guts of the AL-80B is its heavy duty power supply. A 26 pound transformer using a high silicone steel core, computer grade capacitors, heavy duty bleeders and ten 3 amp, 1000 V power rectifiers give you a stiff 2700 volts fully loaded. Many amplifiers using two 3-500Zs use such small power supplies they don't deliver much more power output than the AL-80B.



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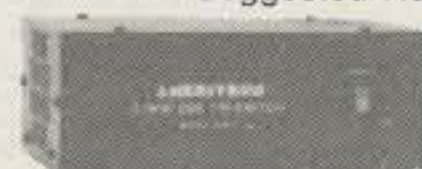
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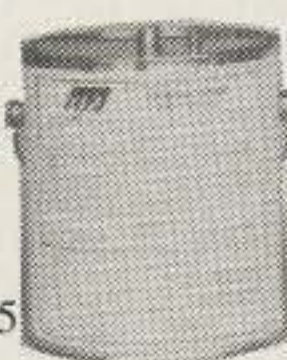


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**Sometimes a QSO can be more exciting than you ever dreamed possible. Occasionally, while tuning across a band you can even hear things that no one expected would be overheard. It's simply propagation conditions, and it's only simple if you know about it.**

## CQ DX, Panzer!

BY BOB ROSE\*, K6GKU/7

Several years ago, the late Walt Hicks, W6UZL, gave me a surplus radio receiver he had used on 10 meters in the late 1940s. He said it had come from a WW II German Panzer tank. After the radio languished for several years on a shelf in my garage, I dragged it out to clean it and to see if it really was from a Panzer tank. The first thing I noticed was that it tuned from 27.2 to 33.4 MHz. Ten meters . . . Hmmm. Initially, I thought it was designed in the early 1930s, during a solar minimum and at a time when 10 meter skywave propagation

would not have been observed. As it turned out, however, this receiver, the *Uke.E.e*, was designed in the mid-1930s, as Cycle 17 was on the rise. The designers apparently did not understand propagation at wavelengths of 9–10 meters.

The panel notation certainly is German. For example, there are notations for *Feineinstellung* (Fine Tuning), *Frequenz-Einstellung* (tuning control), etc. And when I opened the case, the original tubes were of a type that had been produced by Phillips, each stamped with a swastika-on-eagle emblem. It was clear to me that this receiver was of WW II vintage, and it certainly seemed rugged enough to have been

used in a battletank. I wondered what kind of story this radio could tell if only it could talk.

Curiosity got the best of me. A quick check of the 12-month running smoothed sunspot numbers (SSN) for the WW II period in *CQ's The New Shortwave Propagation Handbook*<sup>1</sup> told me that the war was fought primarily during the solar minimum between Cycle 17 and Cycle 18. However, Cycle 17 peaked with an SSN of 120 in mid-1937, and it remained above 50 until mid-1941 (see fig. 1). This meant that the major German operations in Poland, the Lowlands, and North Africa were conducted during a period when signals in the 10 meter band could (and did) "go skywave." To be

\*15514 E. Richwood Ave., Fountain Hills, AZ 85268

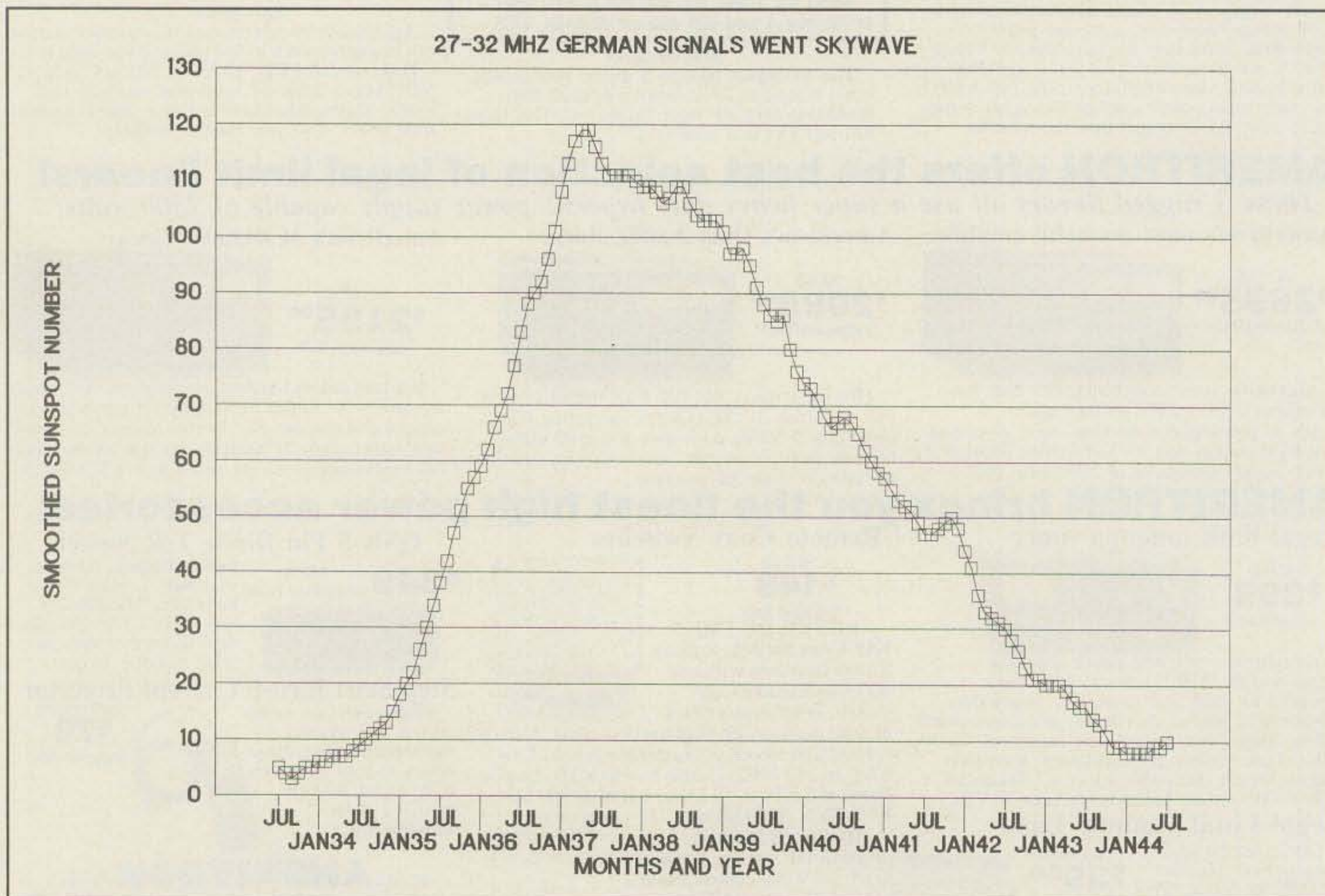


Fig. 1— This is what Cycle 17 looked like during the WW II era. Looking at this, it's easy to see why German 27–32 MHz radio gear went skywave.



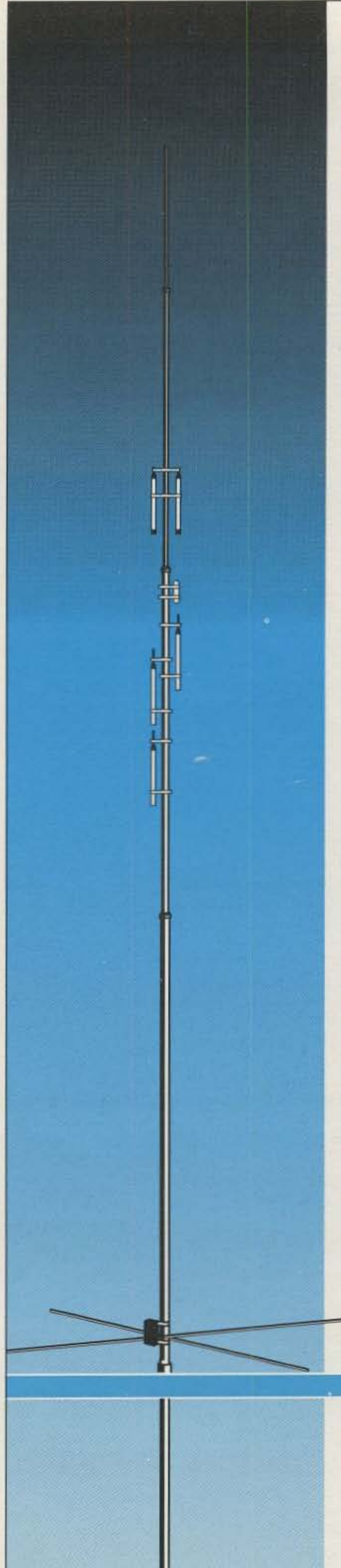
sure, the radios were originally designed for use in short-range, point-to-point communications. But in the 1930s, 28 MHz was considered to be in the "Very High Frequency" (VHF) band (it also was referred to by some as the "ultra-short-wave band"), and propagation there was poorly understood. Some radio amateurs knew that at times low-power signals at 28 MHz were capable of propagating over very long distances. Further, by 1939 a few scientists had postulated that these periods of long-distance communications correlated well with the appearance of dark spots on the Sun called sunspots. Overall, though, the worldwide wireless community did not fully comprehend how ionospheric propagation worked. And so, it appears that the German Armed Forces had designed 28 MHz radios for short-range, point-to-point communications without concern for skywave radiation and the fact that their signals could, at times, be heard at distances of several thousands of kilometers!

Over the last 25 years I have spent a considerable amount of time studying the methods that were (and are now) used to collect High Frequency (HF) skywave signal intelligence. I found the methods used by the British prior to our entry into the war particularly interesting. Winston Churchill believed that Britain's (and indeed the West's) survival depended on our being able to "read the enemies' radio signals."<sup>2</sup> This made me wonder whether or not the British were routinely "reading the Panzers' mail" between 1938 and 1941. Sir Winston Churchill once said, "A fertile mind can often generate more seeds of curiosity than the truth can harvest"<sup>2</sup>; this project, which started over a year ago, is a perfect example of that observation!

Much of the information presented below was provided by people of the so-called "WW II generation," and therefore, it is based largely on recollection and hearsay. Additionally, I have added some educated guesses regarding events of the time that are based on (1) the solar and geophysical conditions of that period, (2) the state of radio technology prior to and during the war, and (3) my knowledge of how signal collection was conducted by the British.

My first real "find" was a note left on the Internet about the existence of a book<sup>3</sup> on German communications equipment; included in the book was a description of my radio. The *Ukw.E.e* ("ultra short-wave receiver, model e") is a seven-tube superhet. It is part of a 10 watt AM (voice or tone) radio system that was designed for groundwave communications over distances of 8 km (roughly 5 miles) when stationary and up to 5 km (roughly 3 miles) when in motion. The 2 meter long whip on each Panzerkampfwagen battletank (*PzKw, Mark III* and *IV*) was close to a quarterwave in the 29-30 MHz band, and to be sure, it was mounted on a very good metal groundplane . . . the tank! Fig. 2 shows the front panel of the receiver; fig. 3 shows one of the radio's RV12P4000 vacuum tubes. The receiver weighs 22 pounds (don't drop it on anything important, such as your foot!) and has a steel case. In every sense, it was designed for a battletank. For those of you who would like to add a radio like this to your collection, get out your checkbook. Another collector offered me the companion transmitter, the *10W.S.c.*, for around \$600. These radios also fetch a hefty price in Europe.

Every amateur who has spent some time on the 10 meter band knows that with an SSN of



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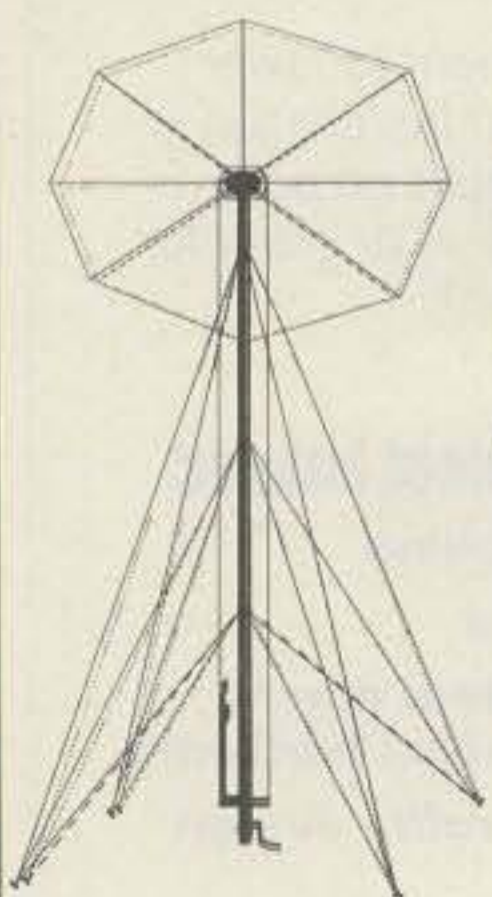
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Fig. 2— Front view of the 10 meter German WW II Panzer tank receiver.

between 50 and 100, and during the daylight hours, signals will be propagated via the ionosphere to distant points around the world. The ability to intercept these signals on a *continuous* basis, however, is another question, unless you have an intercept site within one-hop range (say, 2000–3000 km) of the transmitter. It is known that the United States had a monitoring site in Scituate, Rhode Island, near Providence,<sup>4,5</sup> that could have picked up multi-hop signals. Recent stories in some Rhode Island newspapers indicated that this station routinely intercepted communications among German tanks during the North African campaign, and there even were instances where engine noise and shell firings could be heard together with the voice communications.<sup>6</sup> There also is hearsay evidence to the effect that an amateur on the east coast of the United States heard German tank communications on 10 meters. He is said to have reported the matter to "local authorities," and they are said to have confirmed that the signals were from Rommel's Afrikan Korps.

Another private communication,<sup>7</sup> from the son of a silent key who lived in McLeansboro, Illinois, indicated that his father once mentioned that he had heard and talked, in English, to a German tanker in 1941 using nothing more than his homebrew, low-power 10 meter station. (Technically this was a *no-no*, since certain DX restrictions had been implemented in June 1940.<sup>8</sup>) The German's signal was said to have been very loud for a period of several minutes, and then it was never heard again.

My suspicions were confirmed. The German tankers were radiating signals that propagated worldwide, and amateurs both heard and talked to them. Newcomers to amateur radio may be skeptical about a 10 watt AM signal on any band being propagated around the world. But many amateurs who operated on the 10 meter band during the late 1950s using 10–20 watt AM transmitters know that worldwide DX-ing was commonplace.

In 1940 the United States still had not become officially involved in the growing threat to world peace. However, Britain was, and its Prime Minister, Sir Winston Churchill, never

seemed happy with the amount of intelligence information he was able to acquire. He had learned during the Boer War that you cannot win a war if you don't know your adversary's intentions. Thus, in the middle 1930s he initiated construction of a system that could be used to listen to the signals radiated by combatants during the Spanish Civil War. By the start of WW II, Churchill had at his disposal an impressive system for wireless intercept. Remember, this all occurred prior to the time when the British acquired the German Enigma machine, which allowed the Allies to read all German encrypted signals. Thus, it was a period when every piece of intelligence was of vital importance to the British.

Now here's where some speculation comes into play. From the information available, it makes sense that the British must have had a signal collection center that they used to monitor German armor movements. But where would this reception center have been located? Using a popular propagation prediction computer program<sup>9</sup> and the best geophysical information available for the late 1930s and early 1940s, there appears to be one British location that would have enjoyed one-hop signal propagation to most of the major campaigns in early WW II. This was the British Communications Station—Gibraltar. In fact, a 10 meter intercept center at Gibraltar would have been the optimal location at which to hear German tank communications during the invasion of Poland (SSN = 86), the Low Country invasion (May 1940; SSN = 66), and the North African campaign between March 1941 (SSN = 53) and November 1942 (SSN=21). For example, during the invasion of Poland in September 1939 (SSN = 86), signal reliability at Gibraltar was 75–100% for six hours a day. And at the start of the battle of North Africa in March 1941, reception at Gibraltar was characterized by a circuit reliability of 75% or more over ten hours each day, a reliability of 50–75% for two hours each day, and sporadic intercepts over another six hours each day. This totals 18 hours a day (!) that the British could have been monitoring the German tank forces around Tobruk. By April 1941 the SSN had dropped to



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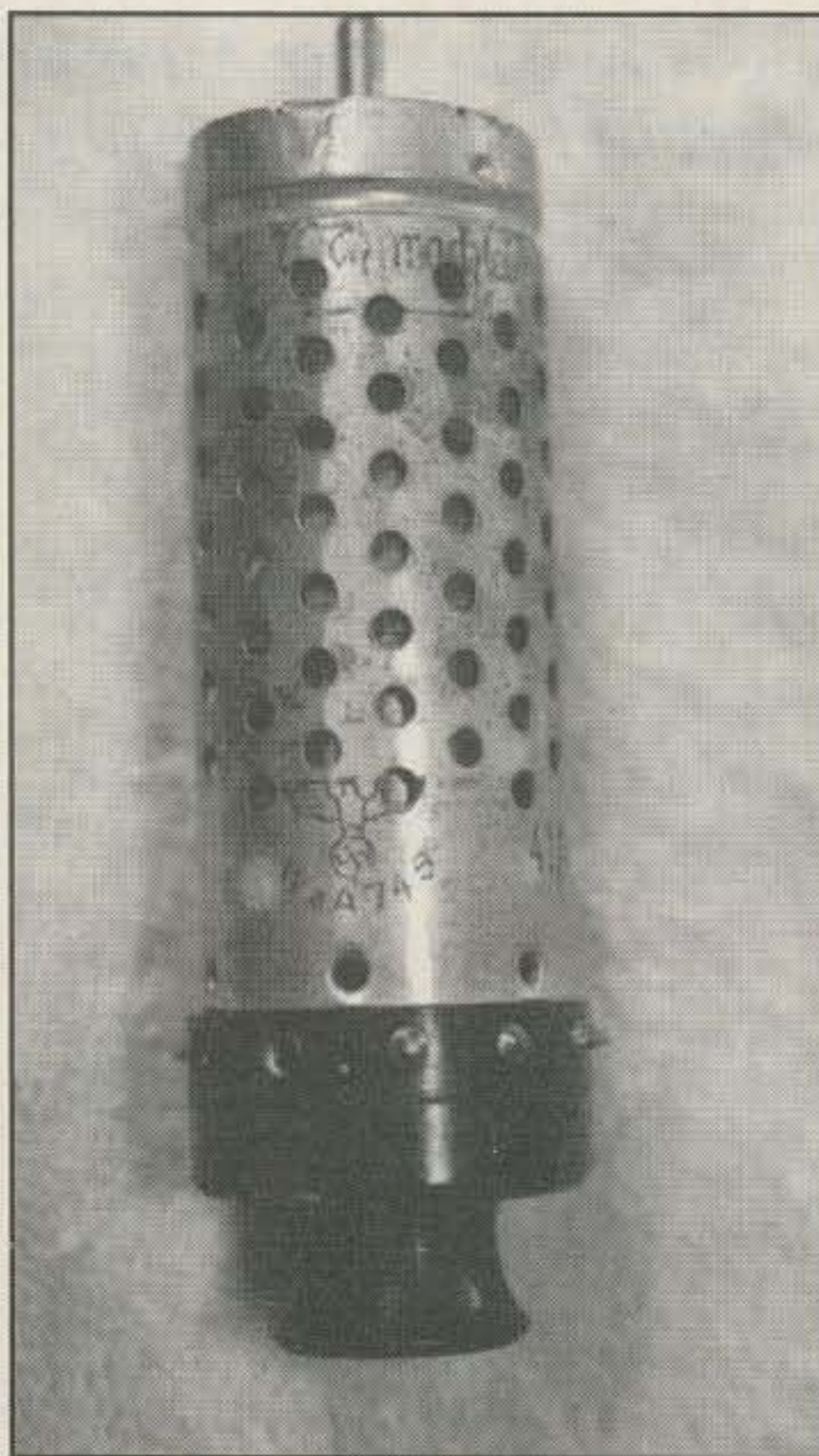
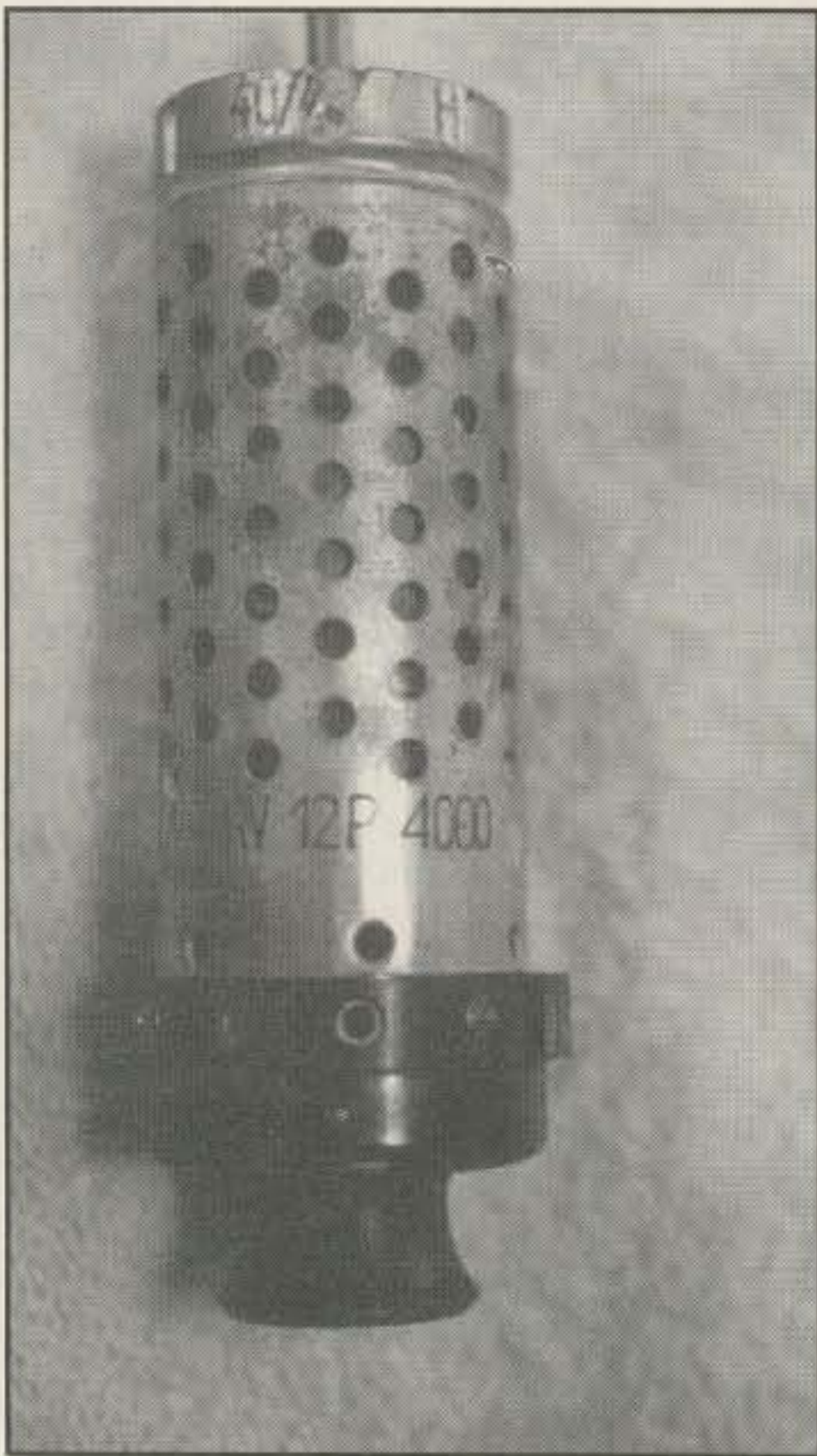


Fig. 3— An original tube from the Uke.E.e receiver. The type number, RV 12P 4000, is printed on one side, and the dating can be done from the swastika-on-eagle imprint seen on the other side.

53, and as such, signals from Tobruk on 28 MHz would only have been available 11 hours of each day. By the end of the campaign in November 1942, the SSN had dropped to 21, and the path to Gibraltar was only open 9 hours a day. Nowhere can I confirm the existence of

such a reception center in Gibraltar, but it's fun to guess at its existence.

I suspect that someone reading this might ask, "Why didn't the British tell us about these intercepts if they had the information?" During the period 1936–1942, the U.S. intelligence

gathering organization was not considered "mature," and Churchill did not trust America to protect his country's secrets. In fact, during the early days of WWII, in matters where British security was involved, Churchill did not share secrets with anyone.

Finally, while I was doing the research for this story, I restored a Hallicrafters SX-24 (circa 1939) and SX-25 (circa 1940) to full working condition. These radios are typical of those radio amateurs used in the late 1930s and early 1940s, before we entered the war. Tests of the sensitivity of these receivers in the 28–30 MHz bands indicated that receiver performance was very dependent on the antenna used. As a matter of fact, all of the radios from the period between 1937 and 1945 that I have restored share one common trait: the sensitivity at the higher frequencies is very antenna dependent. This means that for a U.S. amateur even to hear signals in the 10 meter band from a Panzer tank, much less contact the tank's operator, required both luck and a very good antenna.

### Acknowledgments

I wish to thank Thomas Bryan for providing data on the Ukw.E.e receiver. I also acknowledge the editorial contributions of my colleague, Dr. Theodore J. (Ted) Cohen, N4XX. Finally, I thank Dr. Adolf Paul, a distinguished ionospheric physicist and the man who taught me much of what I know about the ionosphere. Ironically, as a young man, Dr. Paul received military training as a driver of a PzKw. Mark III, his position being on the left side of the tank. The "Funkner" (radio and transmitter operator) sat on the right. At the time, Dr. Paul didn't even know how radio worked or that the ionosphere even existed. As he said, "I just tried to stay on the road!"

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### Addendum

I interested in hearing of experiences readers may have had on the 10 meter band involving German tank transmissions in the period from 1936 through 1942. If I get enough responses, I will write a sequel to this article. Please write to me at 15514 E. Richwood Ave., Fountain Hills, AZ 85268. ■

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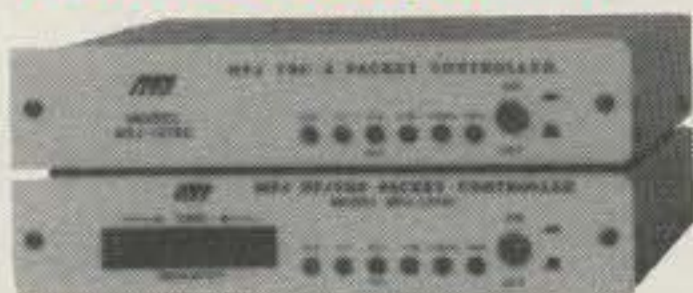
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## CQ REVIEWS:

# The Tucker Electronics T-3000 Multiband Transmatch

BY LEW McCOY\*, W1ICP

**T**he Tucker T-3000 Transmatch is a tuner that is equipped to handle the legal limit, and for all practical purposes it has an unlimited matching range. The circuit uses a very tried and tested T configuration that has been extremely successful for many years.

Let's get the specifications out of the way, and then we'll discuss the circuit in detail. The unit measures 5.5 inches high, 12.5 inches wide, and 12 inches deep, including terminals. It weighs 10 pounds. As to power, it handles 1000 watt key down continuous and 1500 watts PEP. Its tuning and matching range is from 1.8 through 30 MHz.

The T-3000 is equipped (switched via front-panel switch) to handle several different antennas. There are two SO-239 terminals for either of two coax-fed antennas. There are also terminals for either a single end-fed wire or for balanced feeders. These are also switched from the front panel. The controls consist of input tuning and antenna tuning variables, which are a part of the T configuration. Also, the inductance used for matching is a 28  $\mu$ H Delrin roller inductor. It is controlled by a counter dial which has a very smooth action.

There is a dual D'Arsonval cross-needle meter for SWR readings and a bargraph power display. These readings will show both power and SWR. Also on the front panel near the meter is a two-position range switch which permits full-scale reading of 300 or 3000 watts. The bargraph display shows the power level being transmitted on either side-band or CW. There is also a delay switch which controls the speed of the bargraph display.

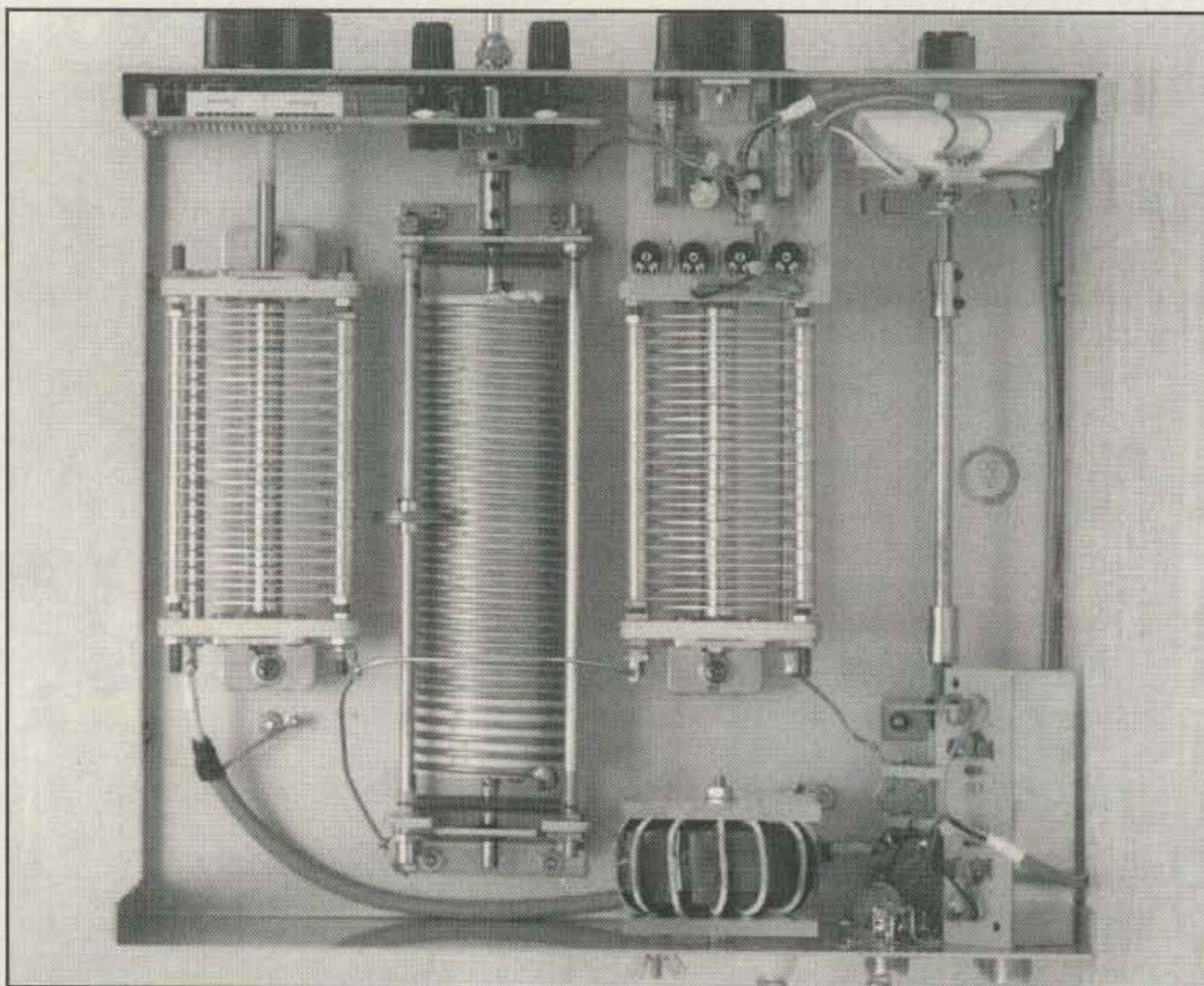
The rear panel has several connections. There are four SO-239 connectors: one fitting for antenna one; another for antenna two; a third used for bypass, or a dummy load, or even a third coax-fed antenna; and the fourth for input from the exciter. There are three isolantite standoffs for either balanced line, or single-wire end-fed antennas.

The instruction manual is quite detailed and clearly written. There is a chart for the user to write down the settings for any given antenna.

When I did the original design for the Ultimate Transmatch, I made many checks as to tuning and matching range, and most important, efficiency. To be very honest, I never came across an antenna load I could



The Tucker Electronics T-3000 Multiband Transmatch. At the left is the SWT/Power meter and just below is the antenna switch. At the upper right is the bargraph indicator.



This photo shows the interior of the Transmatch. The layout of the components is clean and neat. The toroidal transformer for balancing feed is mounted on the rear wall.

\*Technical Editor, CQ, 1500 W. Idaho St., Silver City, NM 88061





This back view shows the various antenna connectors. All of these terminals are capable of being switched from the front panel.

not match. Some very high SWR loads took careful tuning, but they all came up with a 1 to 1 match. The circuit for the T-3000 Multiband Transmatch is basically an offshoot of the original Ultimate Transmatch.

Recently, there was an article in another magazine that treated the inefficiency of this circuit. The article caused me to raise my eyebrows considerably, simply because the writer's efficiency figures certainly didn't agree with mine or those of others. It had been many years since I described the Ultimate Transmatch, so I had to do a lot of digging through old notes and files to find my initial information. The article about tuner inefficiency to which I am referring was based on a computer study, as far as I could determine. However, to me the truth would be in actual power tests against various loads—in other words, "real world" power tests. In the article the writer claimed that this type of Transmatch would show a loss of over 50 percent with an SWR of 8 to 1. I can absolutely guarantee the reader that with the legal amateur limit of 1500 watts, if you had a loss of 50 percent your Transmatch would get hot enough to cook. Smoke and fire would pour out, and you would have one heck of a mess.

To test this tuner, I placed a Bird Wattmeter on the input to the Transmatch, and for a load on the output of the Transmatch I had a coax-fed vertical that went to over 10 to 1 SWR on 80 meters. On the output, in the coax to the antenna, I inserted an RF Applications power-reading bridge. I started out with 100 watts and adjusted the Transmatch for a 1 to 1 match. The Bird, which was on the input, read 100 watts. (I might add that while I didn't depend on the built-in power and SWR meter in the Transmatch, the readings agreed perfectly with the Bird Wattmeter.) I therefore now had a matched tuner, but with a load that was 8 to 1—and an 8 to 1 mismatch is considerable. I then switched on the RF Applications

bridge, and it read right at 100 watts—maybe a shade less, but any difference was not worth writing about. The next step was to put the big shoes to the circuit.

I turned on the amplifier and tuned up to 1500 watts input. (This was a key-down reading or the peak of a peak-to-peak reading.) The wattmeter showed 1500 watts in, as did the built-in meter. I then turned on the RF Applications unit and it showed very close to 1500 watts! Where was the over 50 percent loss the article's author had written about? Beats me!

I ran key down for several minutes and then shut the rig off. I very carefully felt all the components in the Tucker T-3000, but nothing—and I do mean nothing—even felt warm. Needless to say, I made many other tests with even much higher SWR readings, and I was satisfied that my original tests of so many years ago were right.

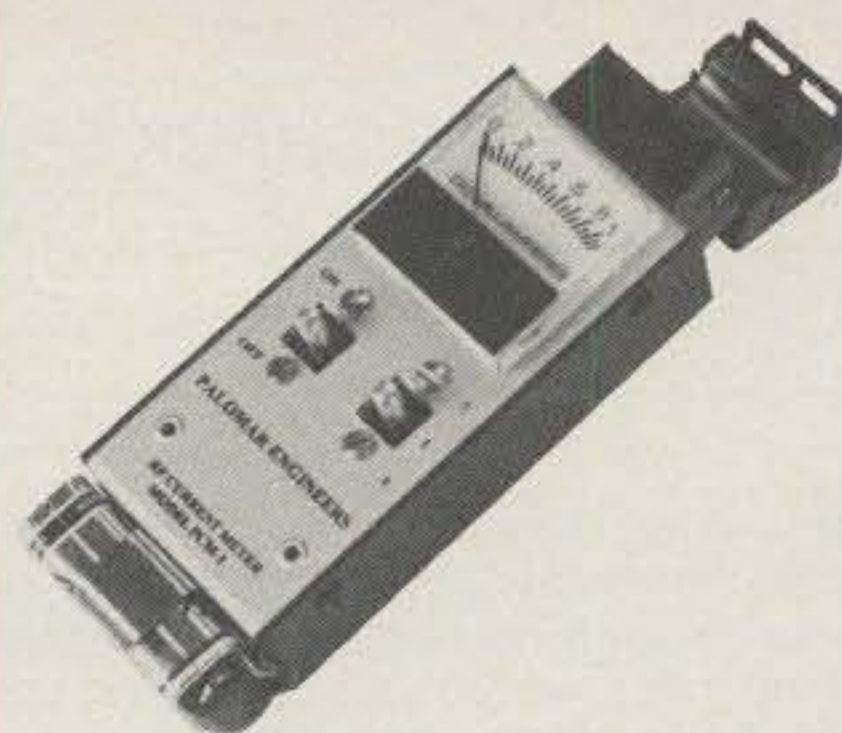
There are a couple more points that need mentioning. This circuit will match a load with high SWR and do so under several different inductor and capacitor settings.

Without going into great technical details, it is important that you always use the matching point, SWR 1 to 1, that has the most capacitance in each of the two tuning capacitors. You can get extremely high Q settings under some matching conditions (which means exceptionally high voltages will develop and arcing could result). Don't misunderstand. I didn't have any such conditions with this tuner, but I have had them in the past when running high power.

The Tucker T-3000 is a very fine unit. I was very impressed with its quality and ease of operation. I have many antennas up here, some with feed-line loads of very high SWR. In all cases, the T-3000 handles them with ease.

The Tucker T-3000 lists for \$349.00. It is distributed by Tucker Electronics, 1801 Reserve Street, Garland, TX 75042 (1-214-348-8800; FAX 1-214-348-0367). ■

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# ANTENNAS & ACCESSORIES

A LOOK AT THE SHACK FROM BOTH ENDS OF THE COAX

BY KARL T. THURBER, JR., W8FX

## Software Spinout

**W**here has the year gone? It's already December, the snow is on the ground in many places (although not here in central Alabama), and the holiday season is upon us. What better time to put another log on the fire and take some of the software that's been piling up in the hamshack for a spin? Let's begin.

### Software Notes

**TA 1.0 Terrain Analyzer.** Amateur antennas used to be designed mostly by the seat of the pants or by using stubby pencil and calculator. Either way, performance characteristics were hard to predict accurately. Now you can do the math on your PC. It's nice, indeed, to eliminate much of the traditional "trial and error" in antenna design. With the right software, modeling or simulation is something you can do fairly easily. Best of all, it can save you much work and frustration.

Several years ago in the column Donald Lamy, KM2R, the author of the Long Wire Pro and Vertical Pro antenna design programs, noted that by modeling several possible antennas before actually building them, you can decide what to build on an objective basis. You know the effects of various compromises and tradeoffs, and you can select parameters to maximize gain at a particular takeoff angle and azimuth. Also, modeling may stimulate your creativity in finding better solutions to antenna problems. And the real pleasure comes when you erect an antenna you've modeled and it works as you expected it to work.

We've noted the evolution of Brian Beezley, K6STI's line of modeling software, with his excellent MN, YO, and AO optimizers; NEC/Wires; and NEC/Yagis being offered. Recently, Brian introduced a program to plot elevation patterns for antennas over irregular terrain; he calls it TA 1.0 Terrain Analyzer.

The new program helps you determine antenna performance for your QTH. It uses free-space antenna patterns and 2-D terrain profiles to account for hills, valleys, slopes, diffraction, shadowing, focusing, compound ground reflection, and finite ground constants—factors that offer fascinating and real-world insights into station performance. Using TA, you can find optimal antenna height and siting for the launch angles and directions of interest, using data from a topographical map you supply. You use your mouse to change antenna location, modify ground terrain, or select angular regions for ray tracing (see fig. 1).

TA is self-contained; it doesn't require a separate antenna analysis program, as it comes with a large selection of typical antenna patterns. If your present antenna analysis program generates patterns using the new "OpenPF" plot-file standard, TA can use your

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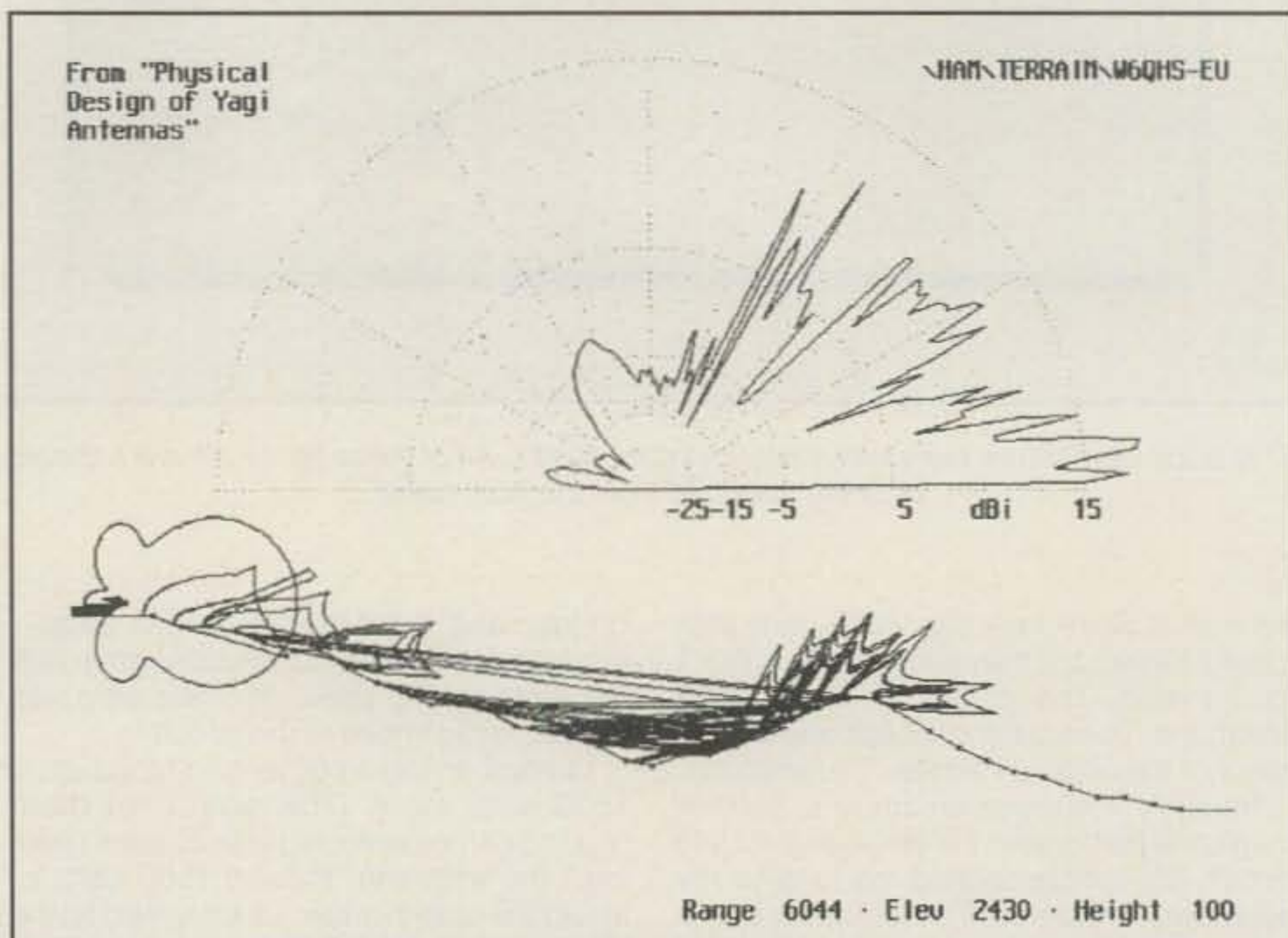


Fig. 1—Brian Beezley, K6STI, offers a new program to plot elevation patterns for antennas over irregular terrain; it's the TA 1.0 Terrain Analyzer. The program helps you determine antenna performance at your QTH. It uses free-space antenna patterns and 2-D terrain profiles to account for a variety of factors that offer real-world insights into station performance.

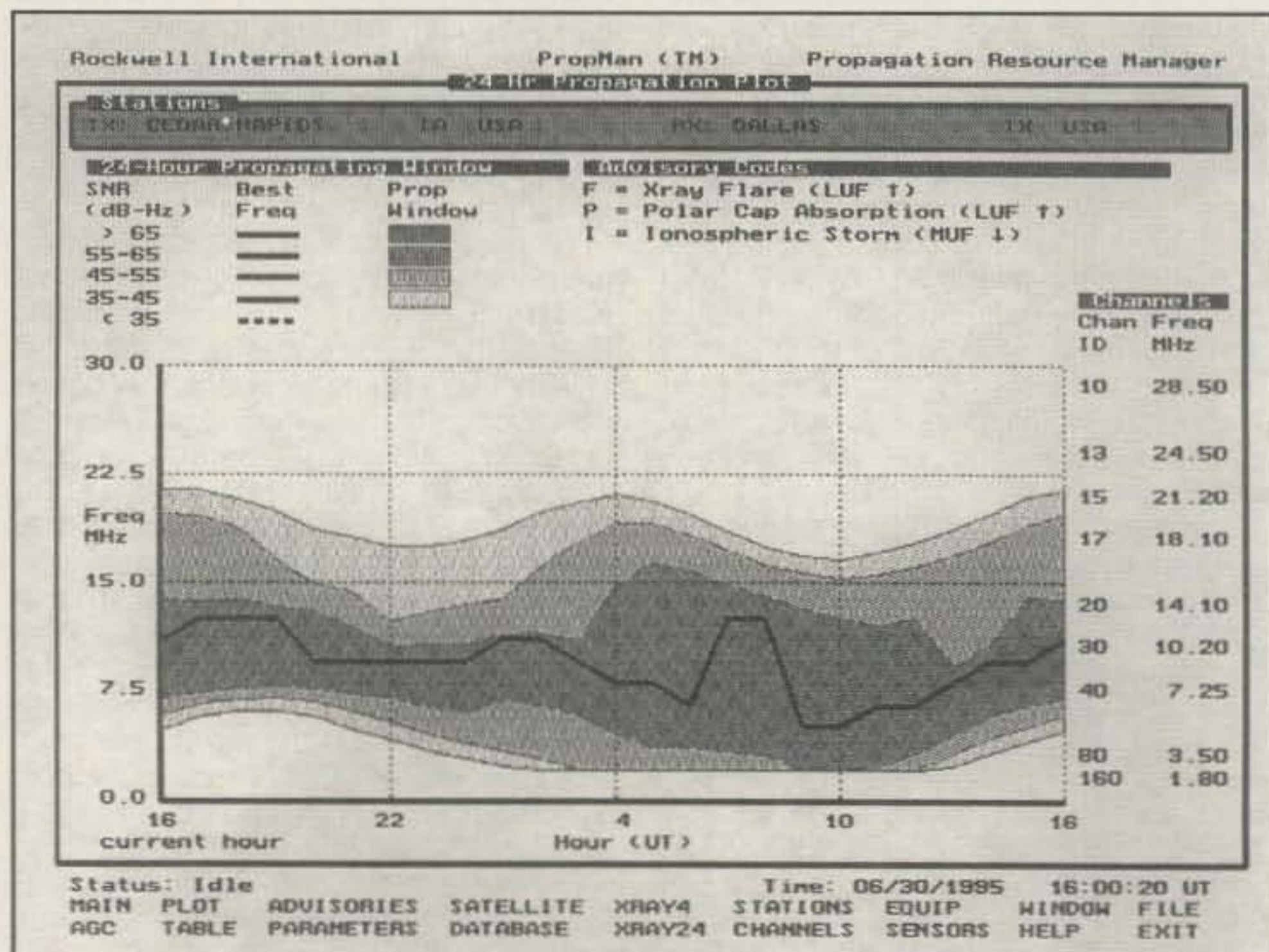


Fig. 2—CACD PropMan originally was designed to enable military radio operators and frequency managers, untrained in HF propagation, to quickly find an adequate frequency for their desired point-to-point communications. The program is strong in its graphic display capabilities; a 24-hour plot is shown here.



own antenna patterns. An included utility converts .PLT plot files generated by older versions of the MN, AO, YO, NEW/Wires, and NEC/Yagis programs to OpenPF files. TA 1.0 is \$60, and Brian offers several "special deals" for various purchase combinations of his antenna modeling programs.

For more information, contact Brian Beezley, K6STI, 3532 Linda Vista Dr., San Marcos, CA 92069 (619-599-4962).

**PropMan.** Some of the most useful hamshack software programs are propagation prediction tools. Computer-based programs, with their reliance on tried and proven propagation algorithms and their access to close to real-time data, have a great deal to offer the aggressive DXer and contest operator. Over the years we have discussed a large number of such programs in the column.

Now there's still another one to consider. It's the PropMan propagation software offered by Rockwell International's Collins Avionics & Communications Division (CACD). CACD is the successor to the original Collins Radio Company of Cedar Rapids, Iowa, certainly HF propagation specialists if there ever were any.

Originally developed for military and government use, PropMan is of considerable interest to radio amateurs. Like other programs of its genre, PropMan helps determine the best frequencies on which to communicate between two selected locations. It accounts for various parameters relating to date, time of day, station equipment, and ionospheric and solar information. PropMan provides outputs in graphical and tabular formats with multiple, user-selectable screens, and it performs its calculations in less than 30 seconds. The program displays frequency and channel information for the current time as well as for the next 24 hours (fig. 2).

PropMan works in concert with, and uses inputs from, the Ionospheric Communications Analysis and Prediction (IONCAP) program, which is furnished. Propagation accuracy is greatly enhanced through use of optional real-time solar activity and ionospheric information inputs to the prediction calculations, if available. Solar flares, polar-cap absorption, and ionospheric storms can be accounted for. If you have a telephone-line connection, for example, the software translates and plots real-time satellite data generated by the Space Environmental Services Center (SESC), using these inputs to improve prediction accuracy.

PropMan is simple to use, despite its many capabilities, complexities, and options. The only thing I didn't care for is that it has a "military look and feel," seemingly being oriented to use by military frequency managers for point-to-point communications. Although it has a database of over 4500 named locations, these are not set up by callsign prefix, and there are no provisions for beam heading and distance calculations. Nevertheless, the best part is that the program is priced at only \$49.95, and for that reason alone it's a bargain.

For more information, contact PropMan, Collins Avionics & Communications Division, Dept. 120-130, 350 Collins Road N.E., Cedar Rapids, IA 52498-0120 (1-800-321-2223).

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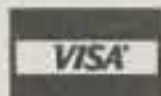
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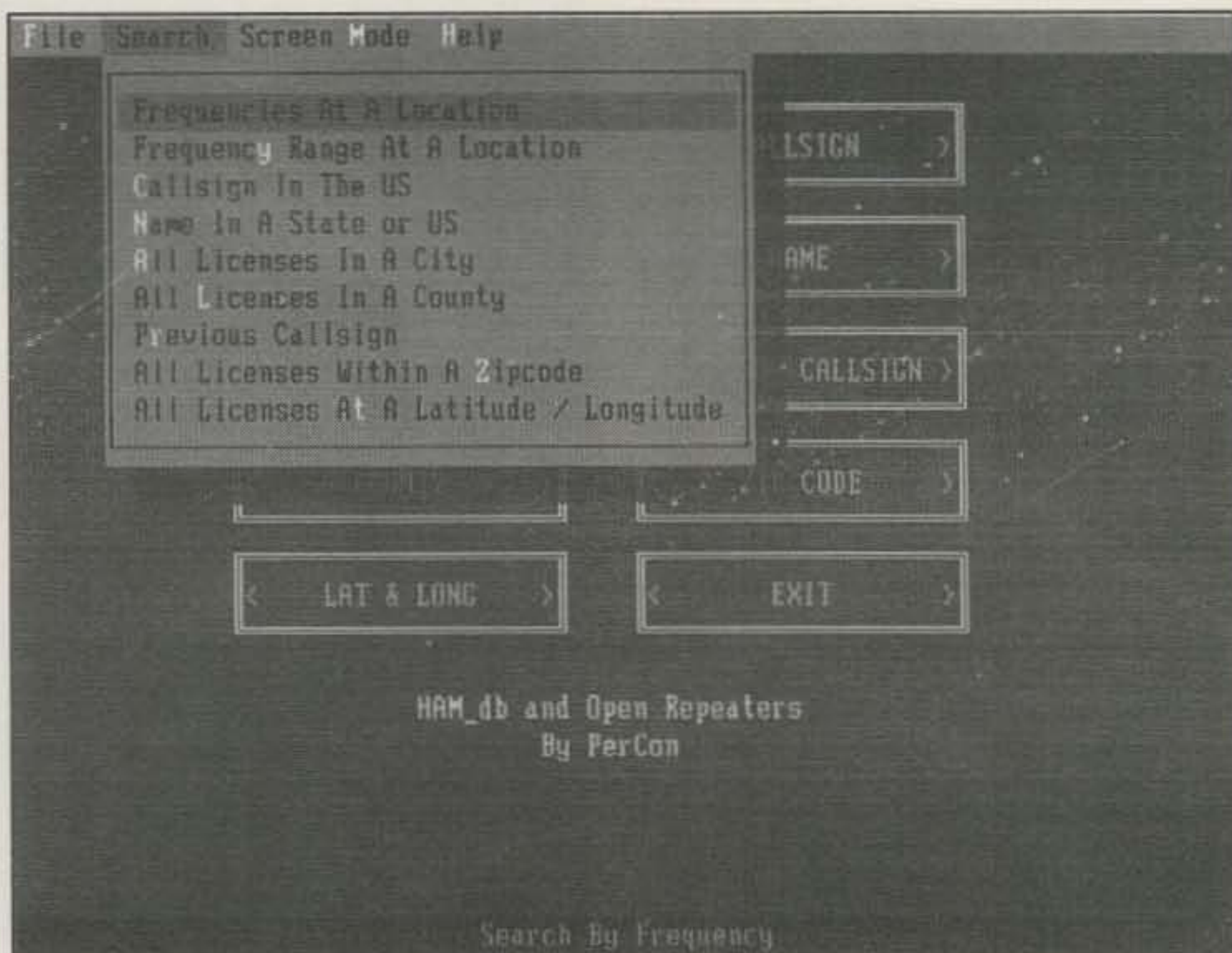


Fig. 3—Percon's HAM\_db and Open Repeaters is an amateur radio callsign database with over 687,000 records that provides up to 43 fields of information per record. There also is a built-in database of over 10,000 open repeaters. You can search the repeaters by frequency, city, county, or state. The DOS program's initial screen is shown here.

Master Frequency Database, organized by region or group. Five regions cover the U.S., with each containing an average of 700,000 records. These are \$129.95 each, or \$550 for the set. Several other FCC databases of commercial interest are available.

More to hobbyists' tastes are several other

products. These are SPECTRUM, SPECTRUM for Scout, and HAM-db and Open Repeaters, for use with Windows, DOS, or Macintosh operating systems.

SPECTRUM (\$29.95) is a frequency database with over 3 million records. Its 15 fields include frequency; callsign; radio service and

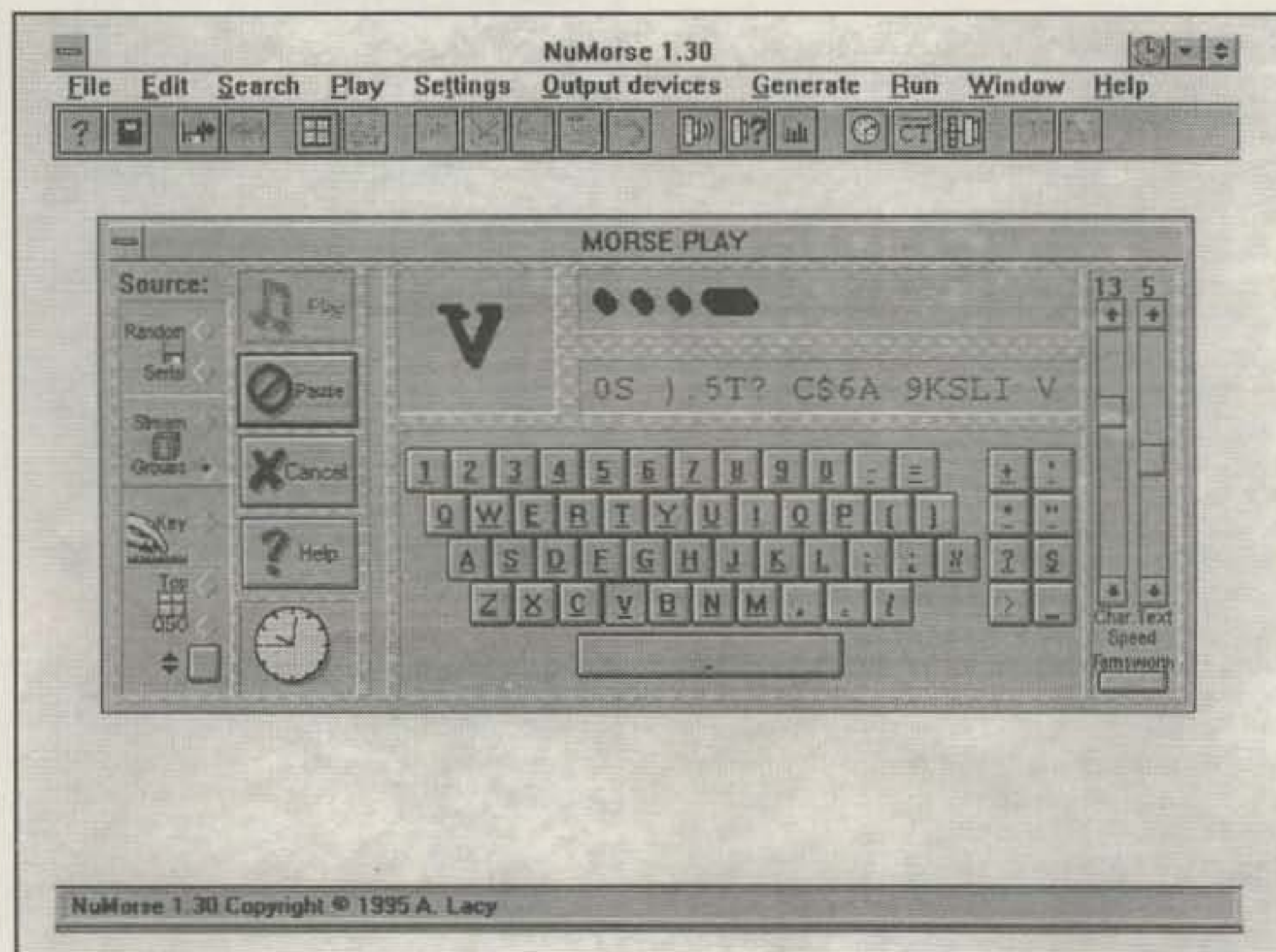


Fig. 4—A topnotch shareware Morse code practice program called NuMorse is offered by Tony Lacy, G4AUD. The very capable and highly customizable program is a Windows application designed to help you learn Morse code, being equipped with many features to help make this process as painless as possible. Some of the features it includes are truly amazing. (See text for details.)



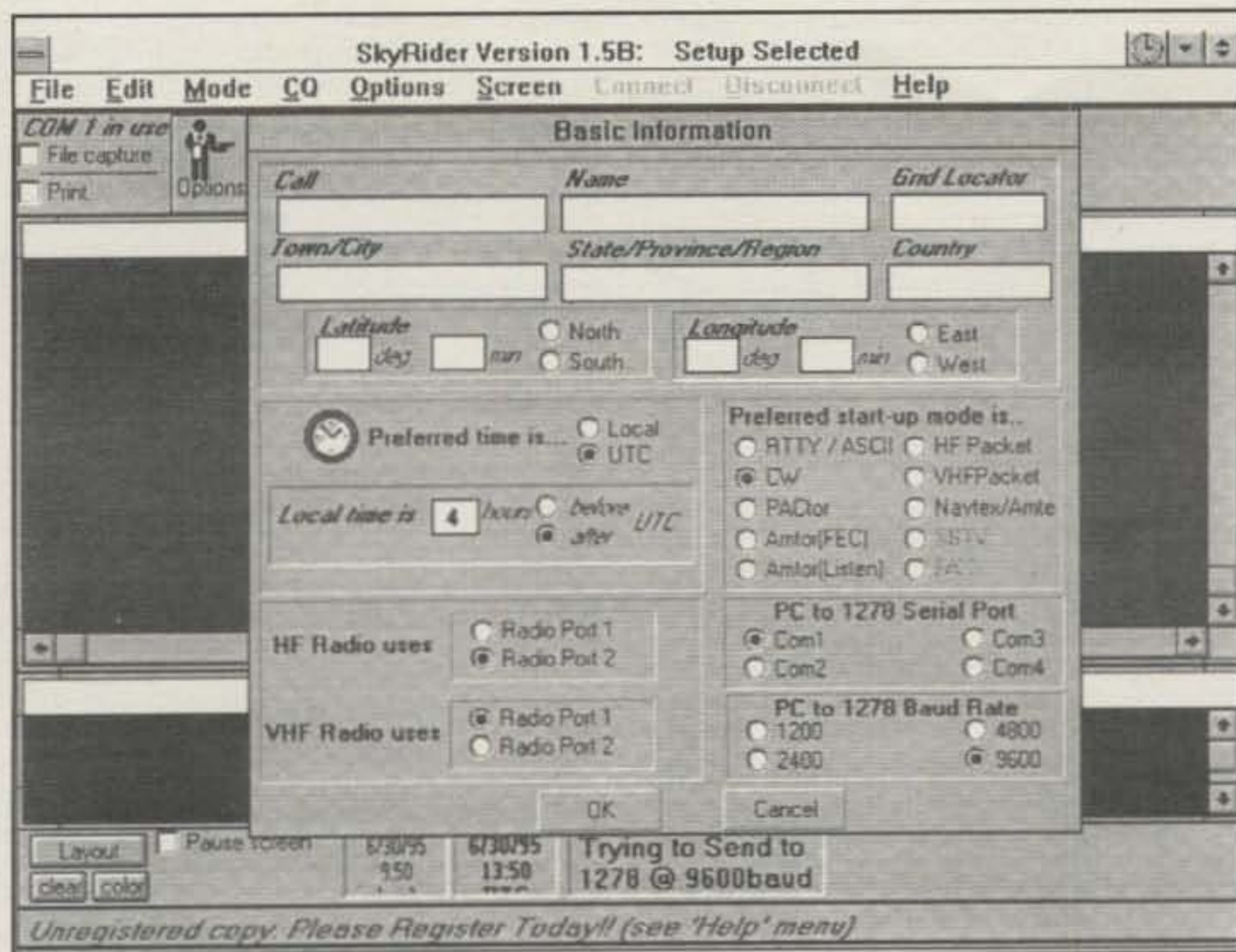


Fig. 5—Bob Rushby, VE3GLA, offers SkyRider, a very capable, Windows-based shareware program for controlling the MFJ-1278 family of multimode controllers. The program greatly simplifies the use of the 1278. SkyRider's setup basic information screen is shown here.

class of service codes; transmitter city, county, and state; latitude and longitude; and the number of units for vehicle, marine, aircraft, portable, and pager services. The program includes a simple-to-use search routine with seven fill-in-the-blank searches. A special Windows-only version, SPECTRUM Lite, is sold by Radio Shack for \$14.95.

Another special version, SPECTRUM for Scout (\$39.95), is designed for use with the OPTOELECTRONICS Scout™ hand-held fre-

quency recorder. It has the same features and data content as SPECTRUM, but also can read and process data from a Scout datafile. The Scout datafiles may be compared with SPECTRUM data.

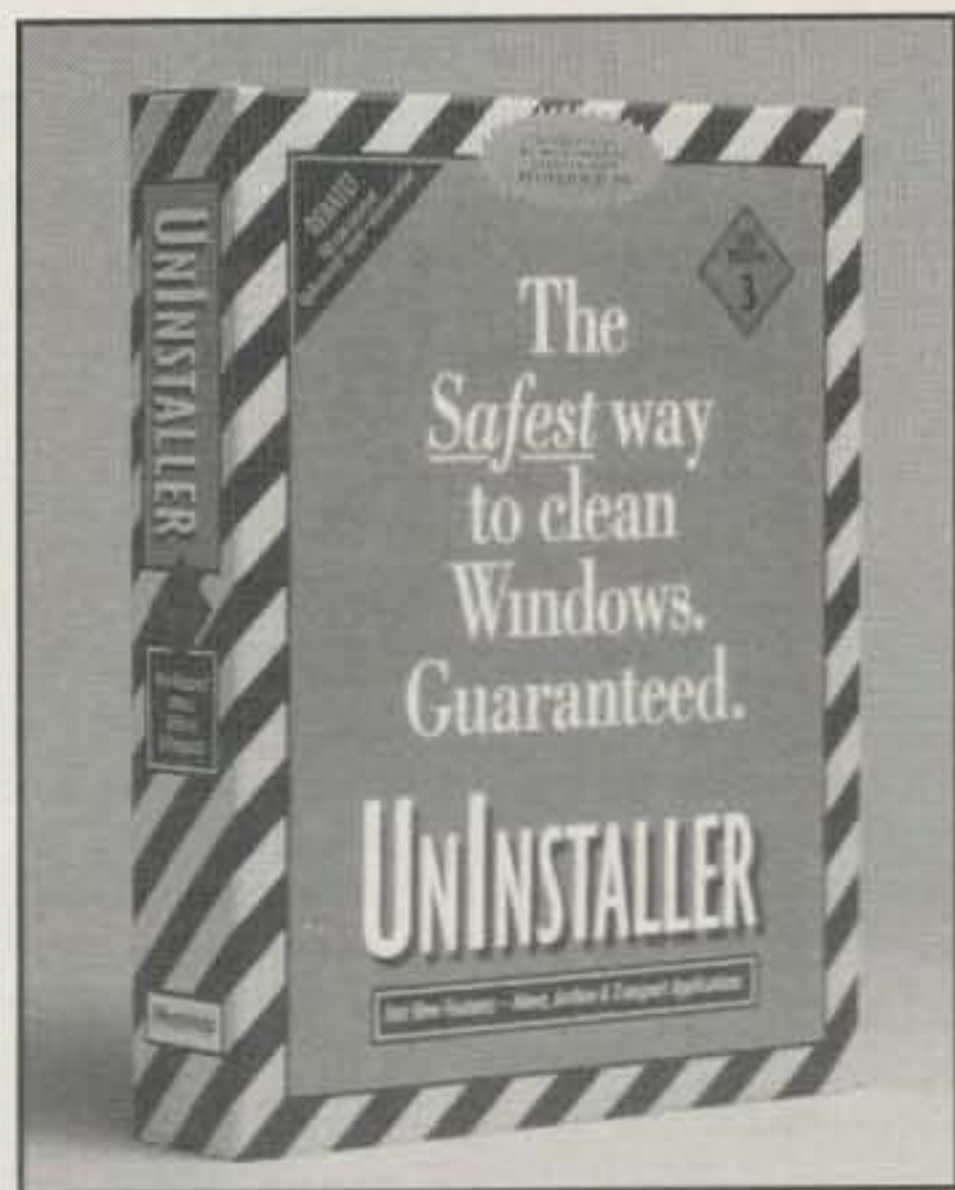
Another product, and probably the one of most interest to CQ readers, is HAM\_db and Open Repeaters, at \$29.95 (fig. 3). It's an amateur radio callsign database with over 687,000 records, providing up to 43 fields per record. Some of the fields included are callsign, previous callsign, name, address, latitude and longitude, date of birth, issue/expiration/last change date, callsign group, FCC file number, operating class, and more.

You can search for data seven ways, and you can display data to the screen, print to a report or mailing label, or export to a file. There also is a database of over 10,000 open repeaters in the U.S. which includes frequency, offset, autopatch, PL tone, repeater city/county/state, and latitude and longitude. You can search for repeaters by frequency, city, county, or state. (HAM\_db, without the repeater information and for Windows only, is \$14.95; it's also available by subscription.)

For more information, contact PerCon Corporation, 4906 Maple Springs/Ellery Road, Bemus Point, NY 14712 (716-386-6015).

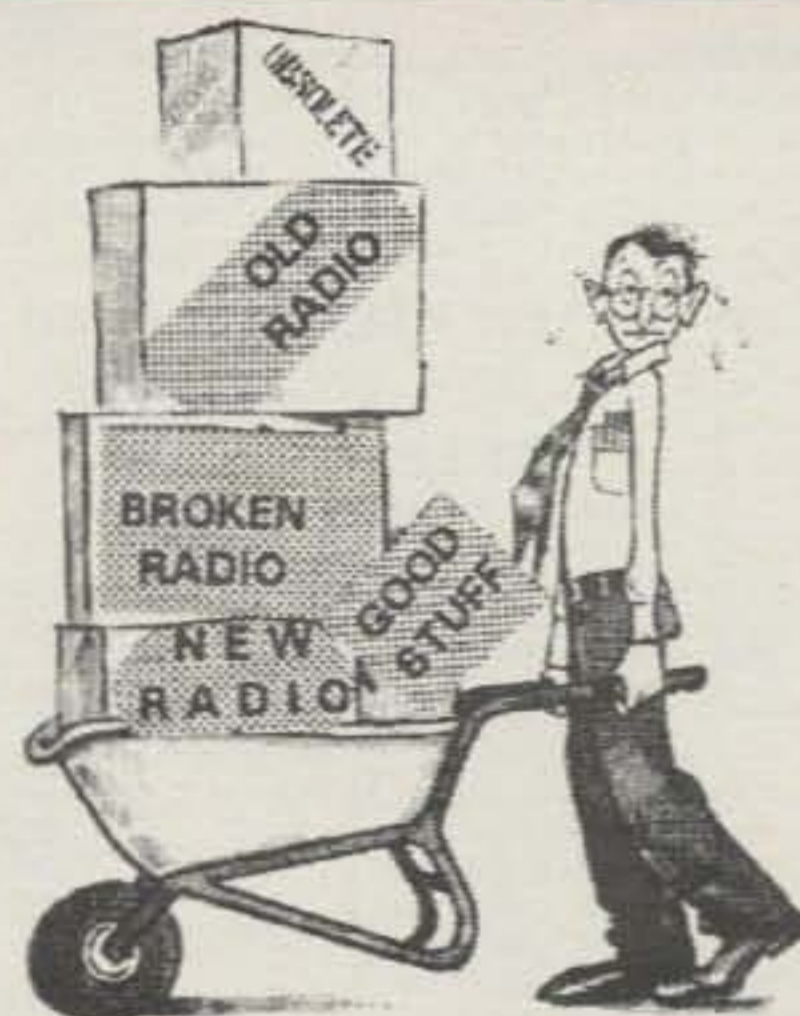
**NuMorse.** Donald Bell, KI5YT, steered us to a British shareware Morse code practice program called NuMorse, by Tony Lacy, G4AUD. The very capable and highly customizable program is a Windows application designed to help you learn Morse code. It's equipped with features to help make this process painless.

The broad range of NuMorse features includes code output via a sound card, PC speaker, port, or even a flashing semaphore window; a variety of character sources (random stream, disk file, or keyboard); several configurable drill modes; QSO generation; performance statistics; and an adaptive speed



MicroHelp's UnInstaller 3 acts like a personal housekeeper for your PC. Among other things, it gives you four application management tools—Delete, Move, Archive, and Transport—to clean up and safely reorganize your hard drive, effectively recapturing lost disk space. (Photo courtesy MicroHelp, Inc.)

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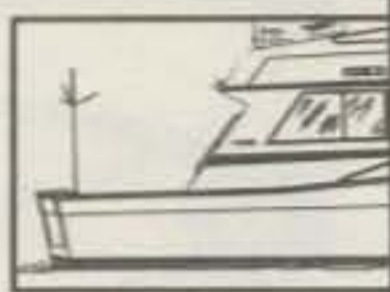
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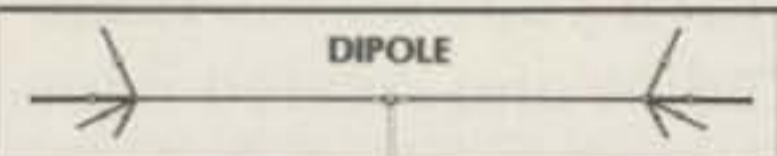
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mode. Other features include log files, support for prosigns and Farnsworth code, mixing of speech within source files, various code character filters, saving of parameters to disk, and much more.

I found NuMorse to have a very comfortable operator interface and to be quite easy to use; it also has great potential for adding customized lesson material. The integrated speech output feature is very interesting, in that you can record your own .WAV files using a PC sound board to yield any mix of speech and code that you like, so that even the narrative content of lessons could be integrated into the NuMorse program. For example, you could possibly prepare and distribute lessons normally distributed via audio tape as NuMorse files, using the program to play them in the same manner as a tape deck.

The program (fig. 4) is available as shareware on CompuServe in the HamNet Forum (GO HAMNET), on other online services, and on BBSes. Registration is \$25 U.S. to A. Lacey, 58 Bilbrook Road, Codsall, Wolverhampton, U.K. WV8 1ER; Lacey's e-mail address is 100030.157@compuserve.com. (Note: Don, KI5YT, can supply an unregistered copy of NuMorse for \$5.95 to cover shipping and handling. He can be reached at the address: Donald Bell, KI5YT, 4021 Taft Blvd., Apt. A-128, Wichita Falls, TX 76308. You can register many shareware programs, including NuMorse, on CompuServe, charging the requested fee to your CompuServe account. To do so, GO SWREG; the registration number for NuMorse is 1721.)

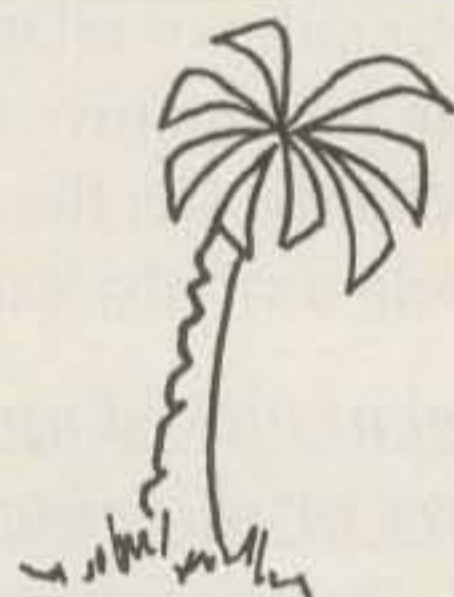
**SkyRider TNC Control Program.** There are more than just a few MFJ-1278 TNCs out there,

to say the least. Bob Rushby, VE3GLA, recently introduced us to SkyRider, his new Windows-based shareware program for controlling the MFJ-1278 family of multimode controllers. Bob originally developed SkyRider for his own use, liking his 1278 a great deal, but wanting to have a modern, Windows-based program to control it. He found that other MFJ users felt the same, and so he decided to make this "labor of love" available economically for others.

SkyRider (fig. 5) is a software tool that simplifies the use of the 1278. Instead of requiring you to memorize a large number of commands, all you need do is "point and click" to easy-to-use icons and on-screen buttons; the program does the rest. If you need to enter more information, SkyRider presents "forms" for you to enter it easily. You also can control your 1278 by using keystrokes if you prefer.

Some of the program's features include a unique packet and PacTOR "speedometer" showing how fast packet and PacTOR links are communicating; and support for PacTOR, CW, RTTY, ASCII, AMTOR, VHF packet, HF packet, and NAVTEX/AMTEX modes. The program has a built-in text editor for "brag files," and it features a simple setup routine that doesn't involve knowing many of the detailed technical parameters for the various modes; the program takes care of most of these details. (Currently SkyRider doesn't support SSTV, FAX, and packet mailbox, although the mailbox mode can be used by directly entering 1278 commands.)

You can find fully functional copies of SkyRider on the ARRL and several other BBSes and on CompuServe's HamNet Forum. The shareware registration fee, which includes a



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An impressive DSP-based filter is the JPS Communications NIR-12 Professional Dual DSP Noise/Interference Reduction Unit. It's actually two DSPs in the same package, and it allows you to utilize any and all functions simultaneously. The NIR-12 quickly and automatically senses and removes multiple tones from communications. (Photo courtesy JPS Communications, Inc.)



The JPS Communications ANC-4 Antenna Noise Canceller uses RF technology implementing vector algebra to cancel locally-generated noise before it gets into the receiver and affects the AGC circuits. This allows reception of signals below the noise level induced by the local interference. It's the only non-DSP unit JPS offers. (Photo courtesy JPS Communications)

printed manual and other goodies, is \$25 U.S. (\$30 Canadian) to Bob Rushby, VE3GLA, SkyRider Systems, RR 21, Cambridge, Ontario, Canada N3C 2V3.

**Uninstaller 3.** We have mentioned before that after you add Windows to your PC and install a few applications, you may find that you're on a one-way street. Why? The problem comes in should you want to *uninstall* (remove) an application. Under DOS this wasn't a problem: you just deleted the program and its directory from your hard disk. Not the case under Windows, where applications leave remnants all over your system.

When you run an application's installation program, the program typically creates one or more directories, copies various files to several places on your PC, makes changes to the CONFIG.SYS and AUTOEXEC.BAT files, modifies the WIN.INI and SYSTEM.INI files, and adds its own "private" .INI configuration file to your Windows directory or elsewhere. Windows 95 does things somewhat differently, but is almost as controlling.

If you decide to remove an application, you may find that it doesn't have an uninstall program. In many cases you must cope with its changes and additions manually, using guess-

work. Removing all traces is not simple—definitely not as simple as just removing the application's icon or the program's executable file. Just finding the changes the application made, much less correcting them, is a chore, even for an experienced user. For a beginner, it may prove too difficult, and result in he or she removing "one file too many" so Windows itself no longer works.

MicroHelp's new Uninstaller 3™ makes the task of removing an application easier. The program analyzes your system and offers to delete everything necessary to completely remove a given application. We reviewed the

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It has all the above features plus a LCD display which shows the characters that are playing, an internal amplified speaker, an ear piece, and selectable random character (Choose specific characters to randomly play). Size 1.1 x 3.8 x 2.4"

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The Morse code Pager has advantages over DTMF or CTCSS pagers. For most repeaters DTMF CTCSS tones are blocked thus making paging features in most radio inoperable. The Morse Code Pager will work through repeaters and also on HF rigs.

Included is a code sender & a decoder which can keep you, open squelch or drive a relay. The code pager has a selectable code combinations of 256 tone patterns.



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Finally an affordable autopatch. This autopatch is packed with many features:

- 1) User programmable password  
(Selectable up to 16 digits)
- 2) Selectable time out function
- 3) Easy to install.
- 4) Adjustable volume
- 5) Compact size 1" x 2-3/8" x 5/8"

Requires: Dual band transceiver, 9 to 12v DC Mike connector, Phone Line



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Over charging your battery pack can destroy or shorten the life of your battery pack.

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original UnInstaller in the February 1994 column and Version 2 in July 1994.

UnInstaller 3 acts like a personal housekeeper for your PC. It gives you four application management tools—Delete, Move, Archive, and Transport—to clean up and safely reorganize your hard drive, and to recapture lost disk space.

Some key features of Version 3 include an improved Delete option to remove unneeded applications; a new Move option to move applications seamlessly to another drive or directory with all related files and Windows settings intact; a new Archive function to let you compress, store, and retrieve infrequently used applications; a new Transport function to gather an application and all related files for use on another PC; an improved Windows Cleanup that helps you rid your system of about 19 types of cluttering files; a comprehensive, user-defined Duplicate File Finder; and an Orphan Finder that removes the remnants of applications you may have tried previously to delete manually. There's also a feature that monitors the installation of new applications, tracking the changes they make from the start.

How well does UnInstaller 3 work? Aside from taking such a thorough, comprehensive approach to hard disk analysis that the program runs somewhat slowly, the basic Delete, Move, Archive, and Transport features are fairly straightforward even for beginners. But you still must have *some* knowledge of what you are doing to safely use the various "cleanup modes" such as Orphan Finder, Duplicate File Finder, and Windows Cleanup.

The program's analyses are good, but they're not perfect. It's still possible to grab files

for deletion that actually are in use, and for that reason it's a good idea to archive or back up applications and files before finally deleting them, "just in case." But UnInstaller 3 certainly takes a most professional approach to all aspects of program uninstallation.

The program is \$79.95 from MicroHelp, Inc., 4359 Shallowford Industrial Parkway, Marietta, GA 30066 (1-800-777-3322).

## Hardware Notes

**JPS Communications NIR-12 and ANC-4.** The future radio hamshack will be invested heavily in PC-controlled radios; digital signal processing (DSP) and related techniques; high-speed modems; digital satellite and spread-spectrum gear; packet networking; multimode TNCs; digital imaging systems such as FAX, FSTV (fast-scan television), and SSTV (slow-scan television); and sophisticated RF technology implementations.

One of the pioneers in Digital Signal Processing (DSP) filter techniques is JPS Communications, which offers DSP technology to simulate analog filters. Such filters are "virtual," existing only in microprocessors. This allows the construction of adaptive filters that vary their characteristics to react to changing conditions. DSP-based filters offer superior performance in reducing interference on voice, CW, and RTTY.

The current JPS amateur product catalog shows a variety of DSP products, such as the NIR series of noise and interference reduction units, originally spin-offs of the firm's government and commercial signal-enhancement equipment. One of the most popular units is the NIR-12 Professional Dual DSP Noise/Interference Reduction Unit (\$349.95).

The NIR-12 is actually two DSPs in the same package, and it lets you utilize any and all functions simultaneously. It, and its predecessor NIR-10, are reportedly the only DSP products that provide "Spectral Subtraction" noise reduction, in addition to dynamic peaking, the method of noise reduction used in competing units. The Spectral Subtraction mode is particularly effective in reducing impulse noise, especially common in urban locations.

The only non-DSP product is the ANC-4 Antenna Noise Canceller. Installed at the antenna connector of the receiver or transceiver, it uses RF technology implementing vector algebra to cancel locally-generated noise, such as power line, computer, and TV noise. This is done before noise gets into the receiver and affects the AGC circuits, allowing reception of signals below the noise level induced by the interference.

The signals from the main antenna and those from a noise antenna or probe are combined in the ANC-4, with the noise antenna signal equal to, but 180 degrees out of phase with, the main antenna signal. Controls are provided on the front panel to allow adjustment of both the phase and magnitude of the local interference, providing extremely deep cancellation of the offending locally-generated interference. You can use the ANC-4 with any receiver or transceiver having an RF power output of 150 watts PEP or less. The \$175 product has proved to be a very effective noise-cancelling product.

For more details and a catalog, contact JPS Communications, Inc., P.O. Box 97757, Raleigh, NC 27624-7757 (919-790-1011).

## Book Notes

**Understanding ACARS, Third Ed.** ACARS, the Aircraft Communications Addressing and Reporting System, is a form of VHF radioteletype that transmits data and messages between commercial aircraft and ground stations. These text messages deal with weather, schedules, engine performance, fuel usage, emergency conditions, and private messages. Radio enthusiasts who enjoy aeronautical listening typically find that ACARS monitoring offers an interesting new insight into aircraft communications.

In the February 1994 and April 1995 columns we noted earlier editions of *Understanding ACARS*, by Ed Flynn, which shed light on this specialized form of aircraft communications. The original ACARS booklet now is a 92-page, perfect-bound, softcover volume that's in its third edition. It provides all the information you need to interpret and understand ACARS messages, and it shows you what signal-decoding equipment is required. The book is \$9.95 from Universal Radio, Inc., 6830 Americana Parkway, Reynoldsburg, OH 43068 (1-800-431-3939).

We also should point out that Universal Radio offers several free, beginner-oriented, "how-to" informational pamphlets that explore various aspects of the amateur radio and short-wave listening hobbies. One of the booklets they offer is "Introduction to ACARS"; it's free for the asking if you send a self-addressed, stamped envelope (SASE) to Universal Radio at the address we indicated above.

**The Outer Space Frequency Directory.** In several recent columns, and in articles we've written for other publications, we have presented material of interest to readers who are involved in radio astronomy and the search for extraterrestrial intelligence (SETI). While researching these fascinating topics we came across a very useful reference by Anthony R. "Tony" Curtis, K3RXK. It's *The Outer Space Frequency Directory*.

In his literally far-out book, Tony "boldly tunes where few have tuned before." He covers the broad range of signals from space—almost every kind of satellite, from communications to recreational satellites; Space Shuttle communications; interplanetary probes; naturally generated signals coming from deep space; terrestrial signals; and more. The author also shows you how to tune in these signals, and discusses the receivers and antennas needed for each type of space reception. There also is a master list of over 2000 space and space-related frequencies. The 67-page book is \$17.95 plus \$2 S/H from Tiare Communications, P.O. Box 493, Lake Geneva, WI 53147 (414-248-4845).

**Special Edition Using the World Wide Web with Mosaic.** Are you on the Internet yet, surfing the World Wide Web? It's not all that easy to productively use the Internet, so lots of software and book publishers have jumped in to fill that void.

Several good, mostly jargon-free books on the Web have crossed my desk recently. One such Macmillan book, with the Que imprint, is *Special Edition Using the World Wide Web with Mosaic*, by Bill Eager and Mary Ann Pike. At 1024 pages it's a complete reference that offers considerable detail on how to get the most from the Web. Thorough and easy to use,

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with many explanations and screen examples, the book comes with a CD-ROM that includes SuperMosaic, plus numerous Internet and Web related utility programs. The \$49.99 book also samples the best the Web has to offer in business, education, government, entertainment, and more. Included are tips on navigating, searching, gathering, and even adding to the information on the Web.

Contact Macmillan Computer Publishing USA, 201 West 103rd St., Indianapolis, IN 46390 (1-800-858-7674). Or if you're already on the Web, check out the Macmillan USA Information SuperLibrary™ Web site at the address <http://www.mcp.com>.

## Letters

**A Quick Acknowledgment.** Once again, we're rapidly running out of space, so we'll have to wrap things up shortly. But we would like to acknowledge some of the many folks who have written or sent messages to your columnist over the past several months. A tip of the hat goes to Charles Wertz, KA9ACS; Don Johnson, W6AAQ; Rich Moseson, NW2L; Maurizio Bertolino; Archie Miller, WD6CSL; and Roger Root, KC7LZ. Thanks for your input.

## Looking Back Five

Now you know what the column looks like in December 1995. But what were the major topics of discussion five years ago, in December 1990? This column focused on new books, catalogs, and publications of interest for the hamshack. The column was entitled "From the Bookshelf."

Book-wise, we perused *Wireless Antenna History*, by Walter J. Schulz, K3OQF; *Genius at Riverhead*, by Alberta I. Wallen, all about Dr. Harold H. "Bev" Beverage, ex-W2BML; and *Stay Tuned: A Concise History of American Broadcasting*, by Dr. Christopher H. Sterling and Dr. John M. Kittross. We also looked at *Alternator Whine*, by David Navone, N6SWX; the monthly NGDC Bulletins of solar and geomagnetic indices that are issued by the National Geophysical Data Center (NGDC); *Boardwatch Magazine*; and the RF Limited communications accessory catalog.

Antenna-wise, we revisited Universal Towers' freestanding tower products, and we discussed NVIS (Near Vertical Incidence Skywave) antennas and the Sabre Communications vertical NVIS antenna. We also featured the Alpha Delta Communications CLP Control Line Protector; and we followed up on the novel, wideband Digitrex DC-2515 Discone that includes HF coverage.

Soft-wise, we discussed IONSOUND, the ionospheric propagation prediction program by Jacob Handwerker, W1FM; Amateur Radio Station Logbook, by Gene Brewer, KI6LO; Total Ham, a logging and duping program by Dick Miller, WD4AZG; and the WJ2O Master Log, by Dave Farnsworth, WJ2O. We also peeked at Super VR-85, a C-64 satellite tracker, by RLD Research; and INFO SELECT, a personal information manager (PIM) from Micro Logic Corp.

A special feature of the December 1990 column was a reminder that we are an information clearinghouse, and that fact bears reiterating today. While we publish prices, specs, and often even shipping information, several

months elapse between the time we write up the information for the column and the time you read it. A great deal can, and often does, change in the meantime. Thus, we expect that you will first contact the offerer to confirm current availability, specs, and prices, for anything we mention.

We don't intend that you send money, sight unseen, for any product or service we highlight. Be sure to contact offerers and evaluate their product literature before committing yourself to purchase. Also, include an SASE or IRCs when writing to us if you expect a personal reply, and contact us directly (at the address on the first page of this column) rather than send your correspondence through CQ's Hicksville, New York office.

In any case, if you find a topic we covered in this or a previous column to be of interest, please obtain the back issue directly from CQ's New York office, rather than requesting the article from us. Most back issues are available from CQ for \$3.50 postpaid. (CQ also offers a number of "back issues special" sets to help you complete your collection, plus other reasonably priced deals on back issues. Check their ad in this issue, or call them at 1-800-853-9797 to order the issues you need.)

## Wrap-Up

That's all for this time, gang. Next time more Antennas and Accessories topics of current interest. See you then.

*Overheard:* Haven't times changed? What used to be considered failure is now just another alternate lifestyle.

73, Karl, W8FX

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### Models and Prices.

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  - » 128k RAM - add \$20.
- PicoPacket with 2nd serial port, 128k RAM, Real Time Clock, Open Squelch DCD - \$189.
- PicoPacket Battery pack model with 32k RAM - \$189.
  - » Open Squelch DCD - add \$15.
  - » 128k RAM - add \$20.
- PicoPacket Battery pack model with second serial port, 128k, RTC, Open Squelch DCD - \$249.
- PicoPacket/GPS. Same as model directly above plus internal GPS receiver and GPS antenna - \$629.
- Companion GPS receiver w/active antenna, data cable - \$399.
- Extra battery pack - \$30.



## WHAT'S NEW AND HOW TO USE IT

### A "One Chip" Micro-Power 6 Meter FM Transmitter

As most experimenters are no doubt aware, almost all of the current low-cost cordless telephones in use today operate in the 47 to 49 MHz region, just below the 6 meter amateur band. As a result, the integrated circuits available for use in these products are manufactured in large quantities and are quite expensive. What is interesting to note is that these ICs will also operate in the 6 meter band. They can therefore form the basis of a very low-cost 6 meter transceiver when coupled with single-chip receiver circuits such as the ones described several months ago in this column. Since the response from readers for the receivers was overwhelming, we felt that a "companion" transmitter would be in order. As

*c/o CQ magazine*

a result, our offering this month is the description of a simple "one chip" FM transmitter.

Fig. 1 is the schematic of such a transmitter. The heart of the circuit is the Motorola MC-2833 "Low Power FM Transmitter System." This chip contains a microphone amplifier, FM reactance modulator, crystal oscillator, buffer, and two power transistors designed to be used as final amplifiers. The circuit is designed to be crystal controlled and oscillates at one third the final operating frequency. The output is then tripled in the tuned circuit connected between pins 13 and 14. The output level at this point is -30 dBm. The RF produced is then applied to the first power transistor connected to pins 11, 12, and 13 and then to the final transistor connected to pins 7, 8, and 9. Power coupled to the antenna by this stage is +10 dBm, or 10 milliwatts.

The modulator stage produces a 5 kHz deviation narrow-band FM signal which is what is normally expected for this type of equipment and is fully acceptable for amateur use. Any electret microphone capable of producing 3 millivolts of audio is all that is needed for proper operation, and the circuit provides bias for such a microphone. Other types may require a slight variation of the microphone input circuit. Varying the value of the resistor across pins 4 and 5 will vary the gain of the microphone amplifier as needed.

When building the circuit be sure to observe proper 50 MHz wiring techniques. Use short leads, a good ground plane, and quality bypass capacitors, and you should have no problems. "Dead-bug" type construction on copperclad PC board materials is okay, but

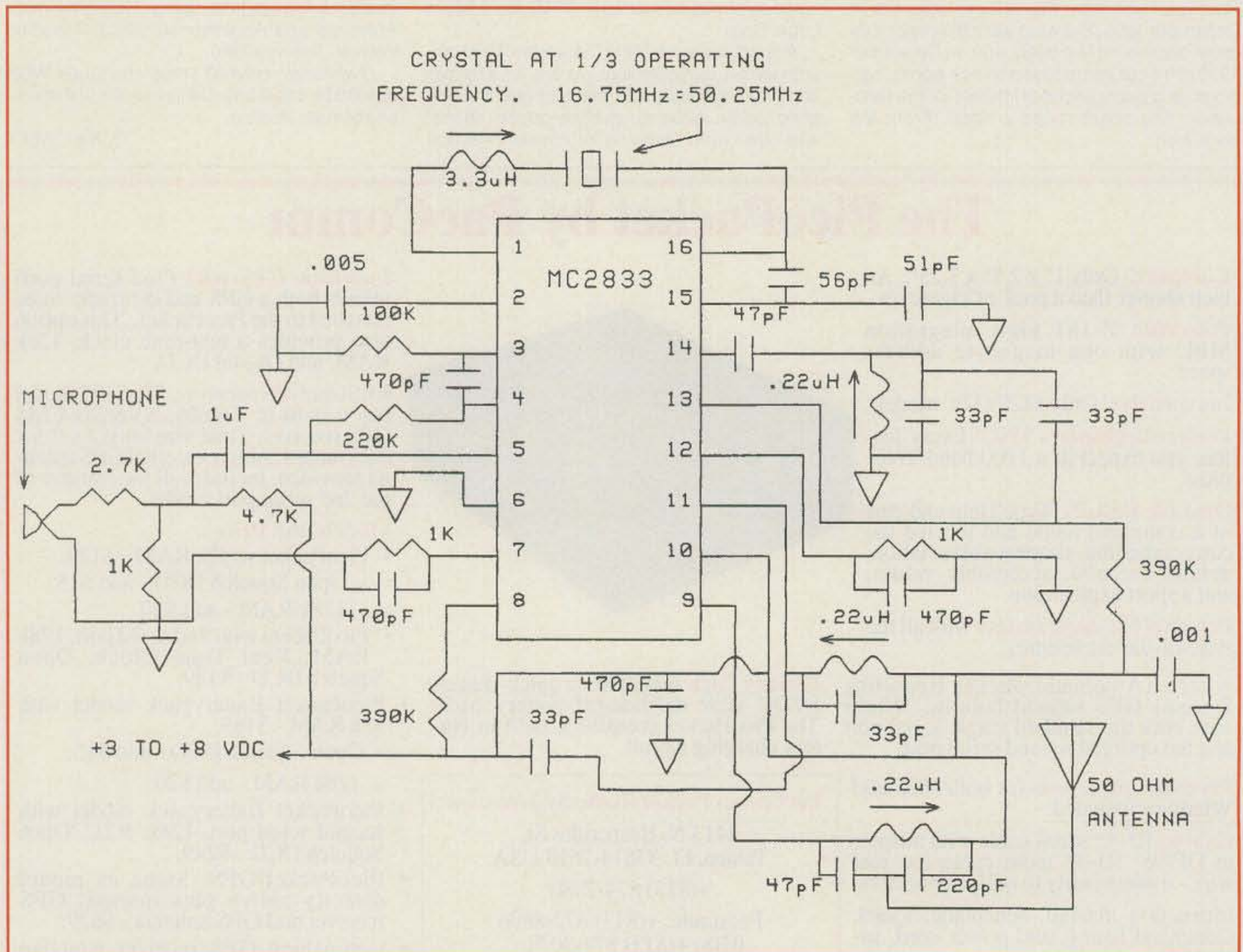


Fig. 1- The 10 mw, 50.250 MHz FM transmitter.



plug-in breadboards probably will not work well due to excessive capacitance and inductance.

To align the circuit, first apply power and check for RF at pin 14. With a high-frequency scope (at least 50 MHz) connected to pin 11, tune the coil connected to pins 13 and 14 for maximum output. Finally, with a field strength meter loosely coupled to the actual antenna you plan to use, retouch all coils for maximum output and you are on the air!

While 10 milliwatts is not a great deal of power, it is a fully modulated FM signal and certainly enough to drive a class C amplifier of your own design. When used as is, with a properly loaded antenna, it should be enough for short-range communications at a flea market or the like.

If you should come into possession of a 49 MHz cordless telephone, chances are the transmitter circuit will be very similar to the one shown. In fact, by proper rewiring and crystal changes you may be able to convert the entire handset to a full-duplex, low-cost, battery-operated 6 meter transceiver.

## Summary

As 1995 draws to a close, I would like to extend my sincere wishes to all of my loyal readers for health, happiness, and prosperity. I thank you for your comments and support during the past year and am always happy to hear from each and every one of you. I am also well aware of the frustrations and disappointments that life sometimes brings, and I sincerely hope that everything you hope and dream for will come true this coming year.

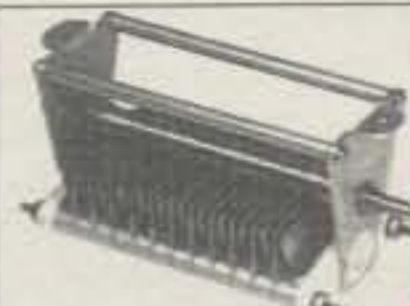
73, Irwin, WA2NDM



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#CAV-75-74	Dual 23-259pF @ 2.5kv (.075")	\$95	(3-12)\$90
#CAV-154-3-1	25-500pF @ 2kv (.045")	\$55	(3-12)\$52
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## What Should Be In That Stocking?

**S**anta has his work cut out for him this year. If you have a large enough stocking to hold all the goodies that are ready for the new, the wanna-be, and the seasoned packeteer, then be prepared for the best digital holiday yet.

I've read enough mail lately to know that many of you are going for the all-mode digital controllers. The four big manufacturers (AEA, MFJ, Kantronics, and PacComm) have the selection to fill just about any digital-mode need. If I were many of you and I had the occasion to take my best shot, I would ask Santa for an all-mode controller that included (in addition to 1200) 9600 baud packet capability. This same approach should be applied when considering a new VHF transceiver: be sure that it is 9600 baud ready. To make this point clear now will prevent any disappointments in 1996.

### We're In This Together

During 1995 I covered a few applications of

211 Luenburg Drive, Evington, VA 24550

the now well-known APRS system by Bob Bruninga, WB4APR. (Bob, in our conversations you never really defined just what you intended. Is it Automatic *Packet* Reporting System or Automatic *Position* Reporting System?) Since then a lot of activity has taken place around APRS and its use. Lately on the Internet I've read several "nasty-grams" being exchanged between the users of low-power SSB stations and some newcomers to our ranks. It appears that some *new* users of APRS decided to start another APRS operating frequency at the low end of 144 MHz where many SSB and low-power stations operate.

Without becoming embroiled in the discontent that may be brewing, let's look at the present system as it is now being applied. Up front, APRS has become well entrenched at 145.790 MHz. For anyone who has not listened or looked at 145.790 MHz, do so!

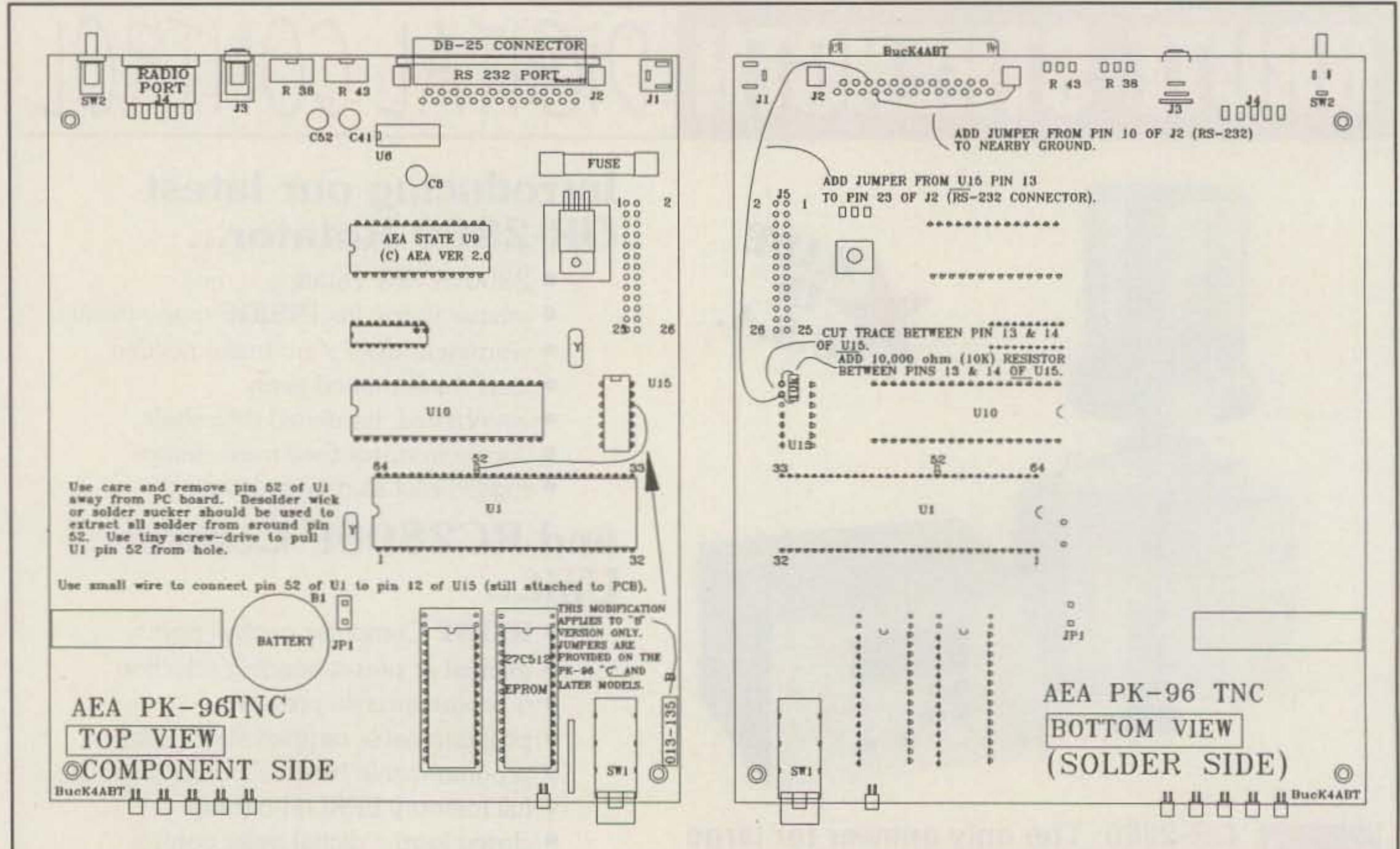
At this point, there is no purpose in trying to reinvent the wheel or start another snowball rolling downhill by attempting to begin a second operation on an already heavily used SSB voice frequency. We're in this thing together,

so let's make the best of the band plan that is in place.

### What's Wrong With This Picture?

I'm not professing to have read the documentation for the APRS software a dozen times. However, when I did read it a couple of times (last year), I don't recall much information about the use of nodes to supplement and propagate coordinates and APRS data across the network. Looking at the APRS frequency of 145.790 MHz, I find packet controllers with the standard TNC2 EPROM being employed as *digipeaters* to relay the APRS coordinates and data across the network.

In a recent conversation with Bob, W4BLD, I learned that the sysops of these remote TNCs have to go to the site(s) to set the beacon text and other parameters into the TNC to make them perform the function as an APRS "digipeater." As a "digipeater"! Hold that thought for a moment. What's wrong with this picture?





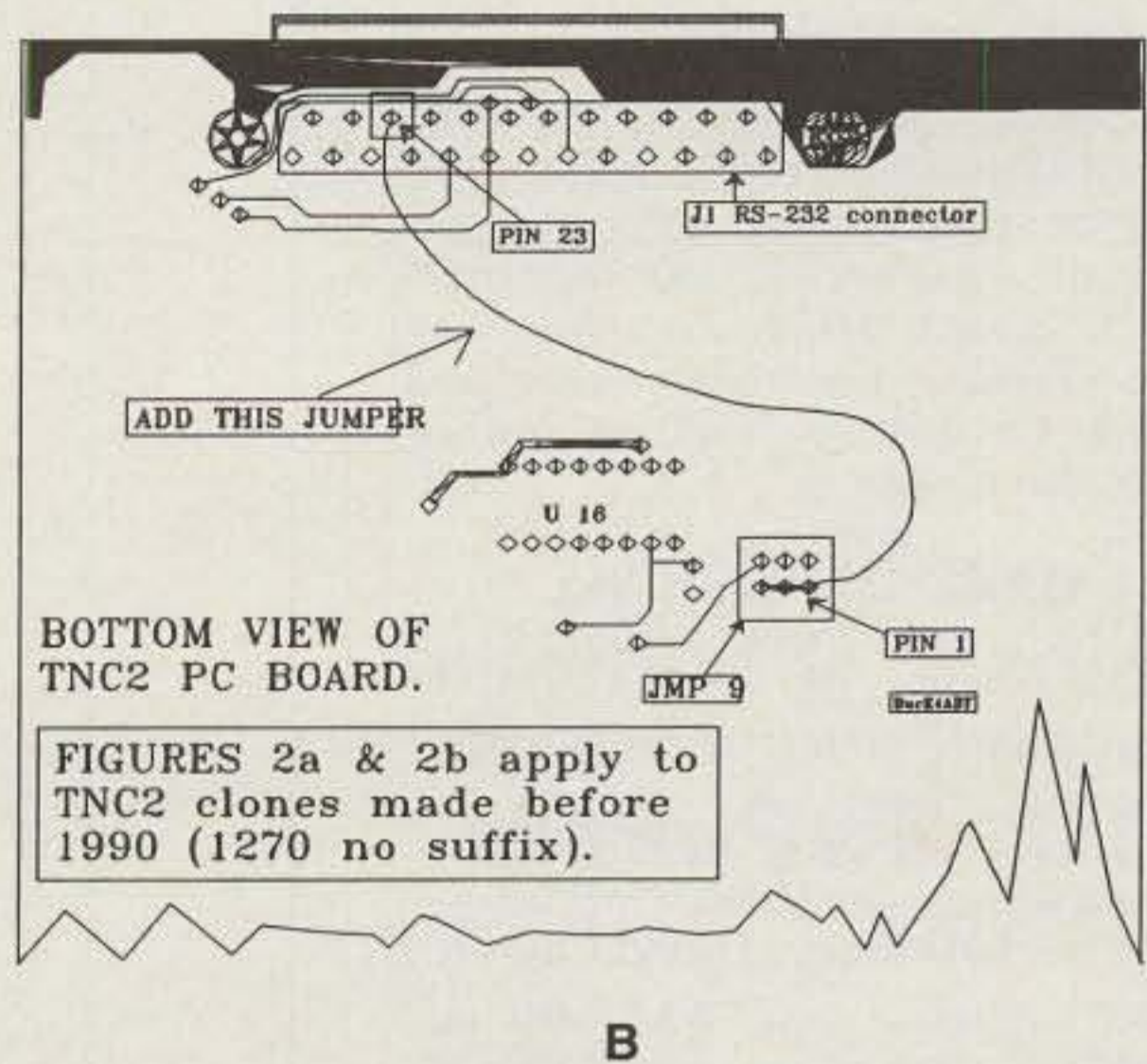
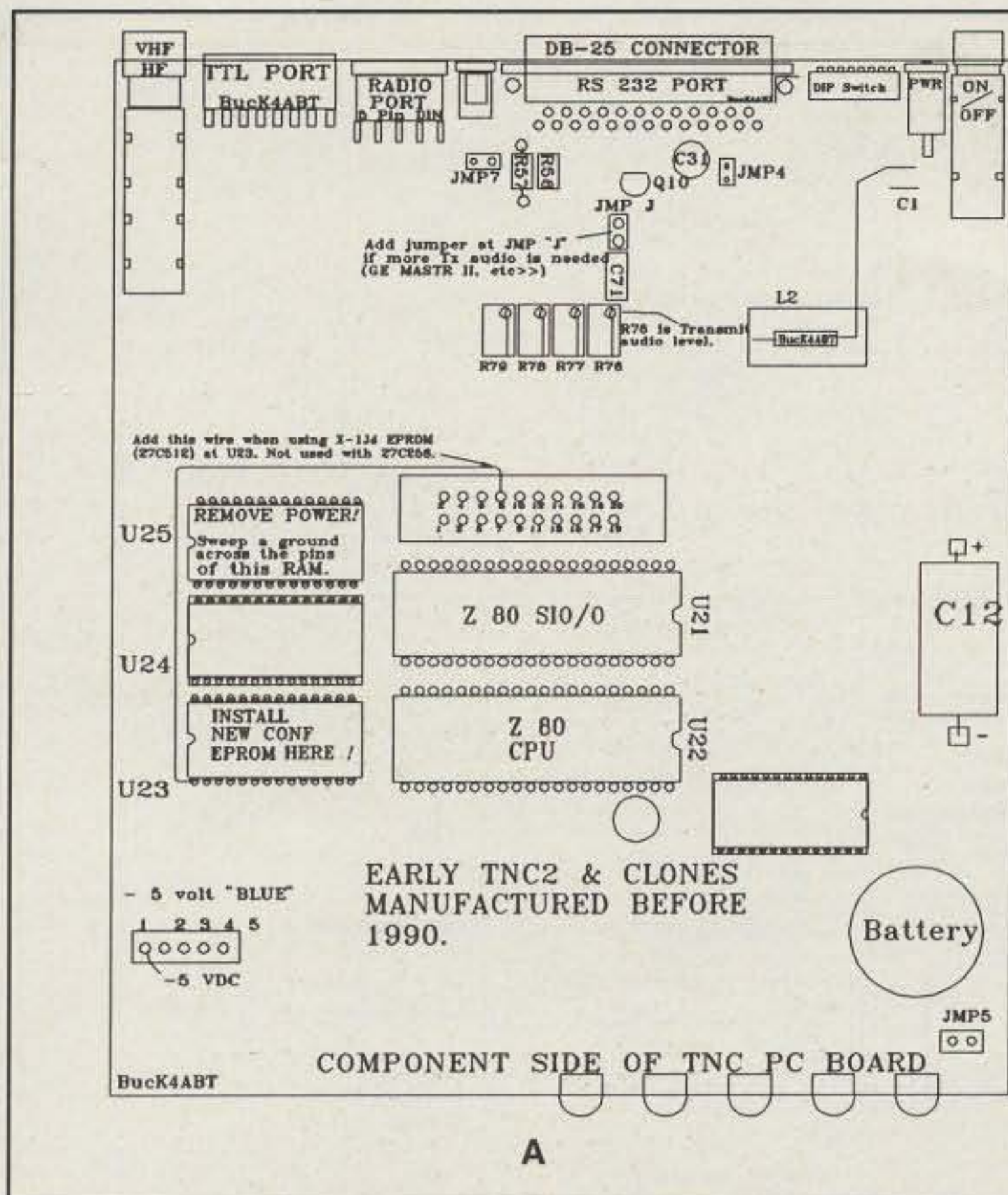


Fig. 2- (A) This drawing illustrates the location of EPROM U23. Use 27C256 for CONVERS or 27C512 EPROM for X-1J. (B) This minor modification enables flow control back to back or when connected to a diode matrix to form a multi-port gateway.

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1300MSAX	215	1792	33	1760
1800FSX	287	2150	36	2200

Model	Roto Tq.	Brk Tq.	Vert Tq.	Vert Tq.	Max Load#
EV700D5X	57	717	215	358	880H 220V

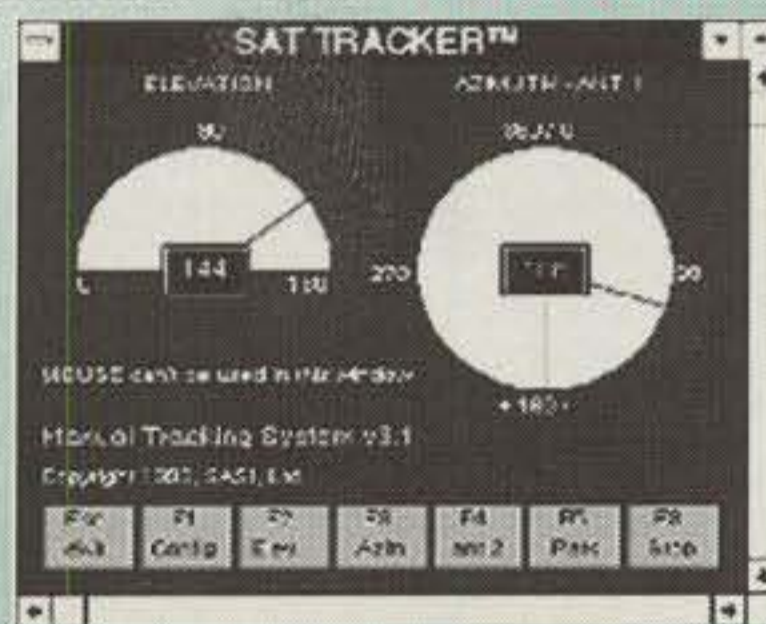
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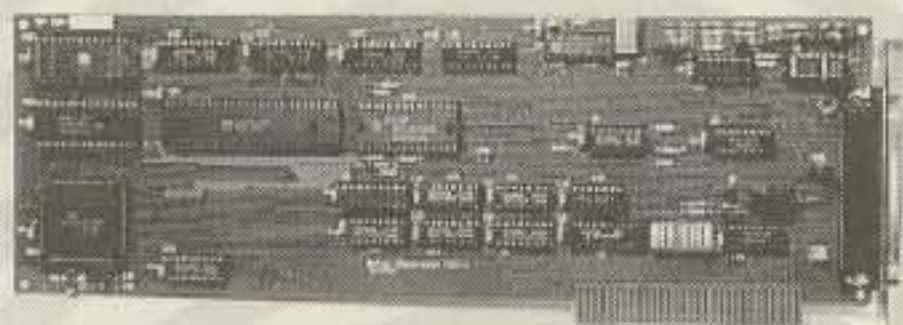


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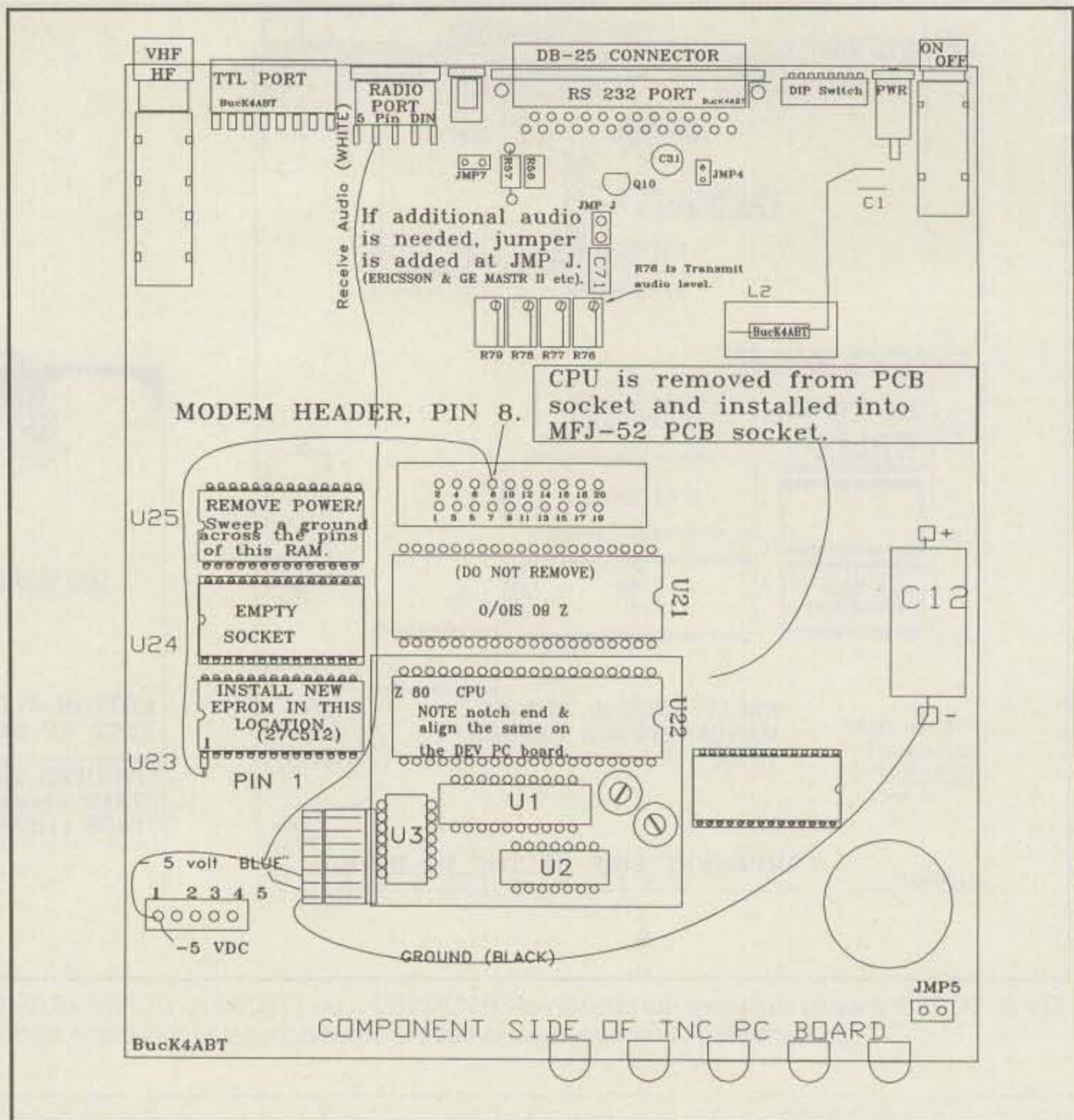


Fig. 3- Installing the MFJ-52# into the MFJ-1270B TNC. This same technique applies to the MFJ-1270C/Rev 10 and MFJ-1270C/Rev 11. Complete alignment details are provided in the handbook (see text).

Now Bob is also a dedicated SEDAN node operator who maintains the SEDAN node CVSDN on 145.770 MHz near Waynesboro, Virginia. Not realizing he had done so, Bob provided me with some useful food for thought.

I investigated further and discovered that true, the APRS network is made up mostly of digipeaters. I found that I had to "digi" via most of the network. While traversing via the digis, it soon became obvious that few nodes existed on the APRS (145.790) network. As a matter of fact, I was able to find only two, and only one of them was of the X-1J TheNET series.

What I'm about to describe may save the APRS sysop a few trips to the digi/node site, not to mention the added convenience of being able to configure the node/digi from his home QTH (remote).

It would appear that instead of having the TNC operate as a plain TNC, why not build it into a full-blown X-1J4 node. By doing so, the system node operator (SNO) of the node eliminates the need to go to the digipeater site—with a dumb-terminal or laptop to set the digipeater functions.

## WIDE, WIDE, WIDE

"What about the 'WIDE' and APRS broadcasts?" you ask. Well, that too is an easy-to-

handle task when using the X-1J4 EPROM in the TNC.

Remember, the X-1J4 node code allows the use of more than the personality node alias. The X-1J4 code also enables the use of the **DXCAlias**, or better still, the **HOSTAlias**. So often I see a device or feature in a node that would accommodate another facet of packet.

I have tested the X-1J4 node using both aliases. First I burned the EPROM with the node alias **APRS79**. That took care of the node name. Once I had the node up and running, I set the **DXCAlias** to **WIDE**. And to make sure that I was taking advantage of more of the X-1J4 features, I set the **HOSTAlias** to **RELAY**.

Just for the record, the node name alias may be changed remotely and at any time the SNO desires. All he/she has to do is enter the command level of the node using the password and issue the command **ALIAS (NEW NODE NAME)**. The **DXCAlias** and **HOSTAlias** may be added or changed in the same manner. Only the callsign cannot be changed remotely.

The purpose of the **RELAY** alias is to allow the TNC user to participate as a relay station. By setting the **MYAlias** command to **RELAY**, mobiles (or runners) trekking cross-country are permitted to use the **RELAY** digi as they pass nearby. This in turn notifies the rest of the APRS network as to the geographic coordinates of



the mobile or runner. The position (location) and time are displayed in the map on network users' screens.

### Minor Configuration Changes

Once you have the TNC2 clone or the PK-96 outfitted with the X-1J4 EPROM, the next step is to configure the parameters and mode settings similar to the following:

```
P 50 19 70 254 4 3 2000 16 180 2 3
180 4 4 600 64 10 4 4 10 60 0 1 0 1 1
MO 0 0 6 3 0 40 0 600 0 3600 1 27
0 1 1 0 0
```

Next set the HOSTAlias to WIDE, and turn the HOST feature OFF by setting the HOST command to minus.

```
HOSTA WIDE
HOST - (minus)
```

### Include A Deviation Meter In Your APRS Node

Don't forget that the X-1J4 code for the TNC2 supports the use of an analog-to-digital converter (MFJ-52B) that functions as a deviation meter. This same PCB also has support for an inexpensive means to read the remote-site voltage, and the temperature, both inside and outside.

Besides the MFJ-52B, I'm told that Pac-Comm also has an add-on PCB to support these features. I've not seen one of the Pac-Comm units, so I don't have the model or other details of the device.

The deviation meter is actually a peak audio level meter. It is the first of a series of applications built into TheNet X-series firmware that makes use of an analog-to-digital converter (ADC). The ADC can be (optionally) added quite simply to a TNC2. The audio input is amplified and converted to a DC peak representation. This voltage is read by the ADC, which has a range of 0-3 volts, and converted into an 8-bit binary value in the range 0-255.

The software is configured (remotely) to read the ADC at the end of each valid packet. A packet is considered valid if its CRC is correct. As soon as a valid CRC is detected, the ADC is instructed to start converting on the deviation-meter channel, this conversion taking 30 microseconds. Just before the formatted frame is linked into the chain of pending received frames, the ADC is read and the value stored with the frame. The reading therefore corresponds to the peak audio level at the end of a packet. If there are no nonlinear elements between the receiver's discriminator and the meter input, this will correspond fairly accurately to the peak deviation. The value received is transferred to the internal Heard list format without conversion. It is still in the 8-bit count (0-255).

When a user displays the Heard list, the deviation meter parameter (as set with the METER command) is used to control the display. If it is zero, the deviation details are not displayed in the Heard list. If it is non-zero, then the 8-bit count value is multiplied by the METER value to give a deviation reading in Hertz. This is displayed as *kiloHertz* in the Heard list.

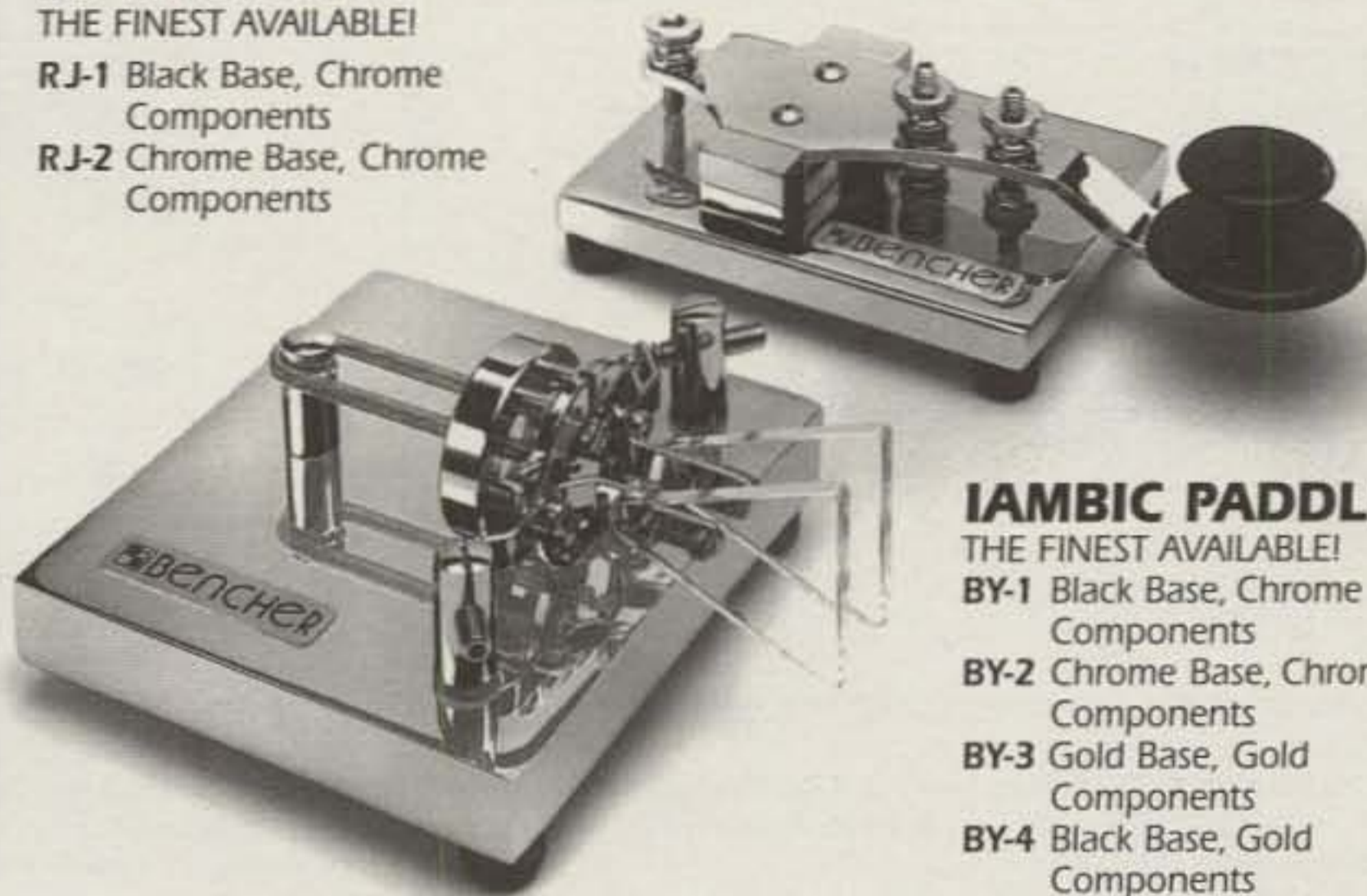
If the METER setting is "1" it will have a full-scale range of 0.2 kHz (not very useful). If set

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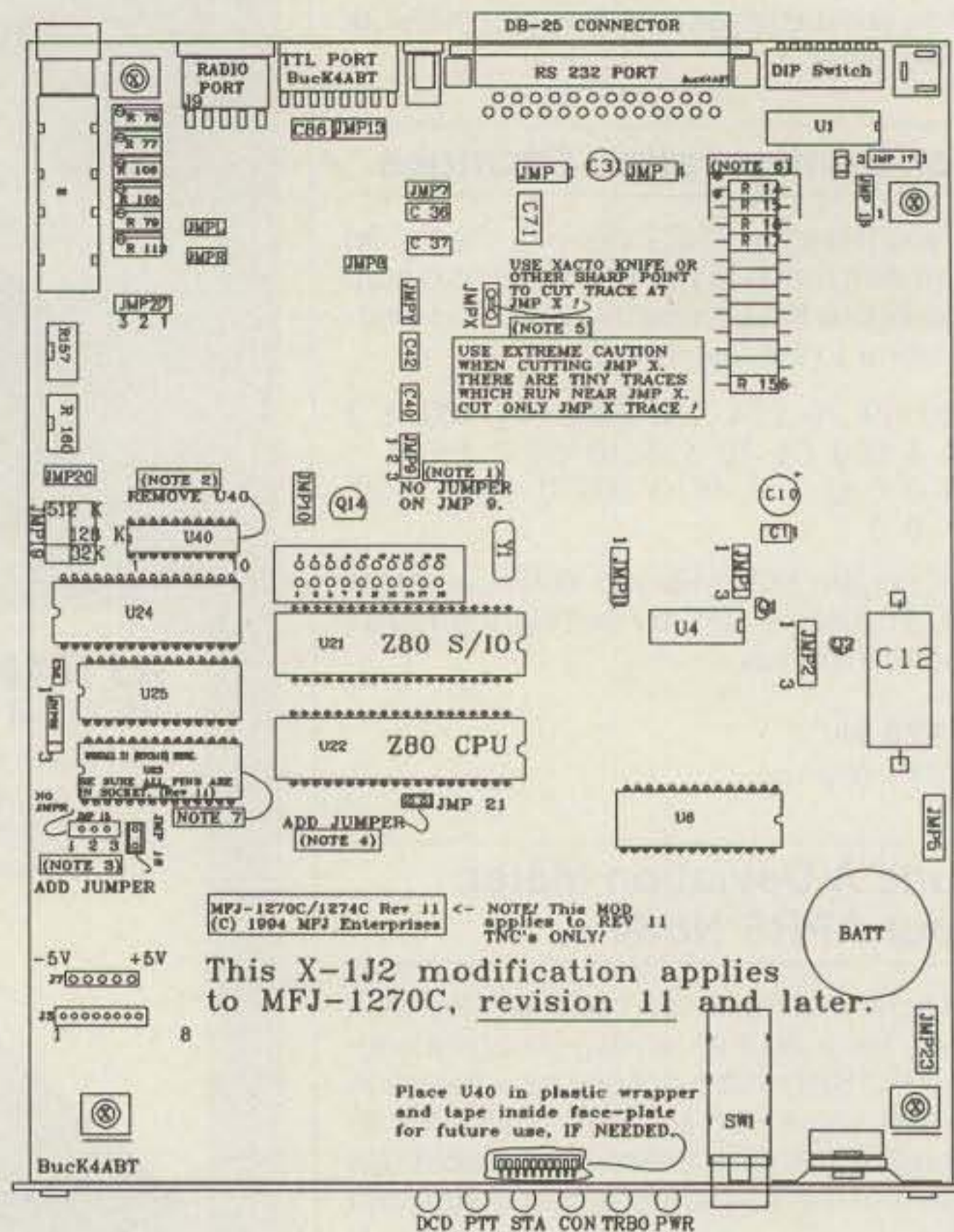
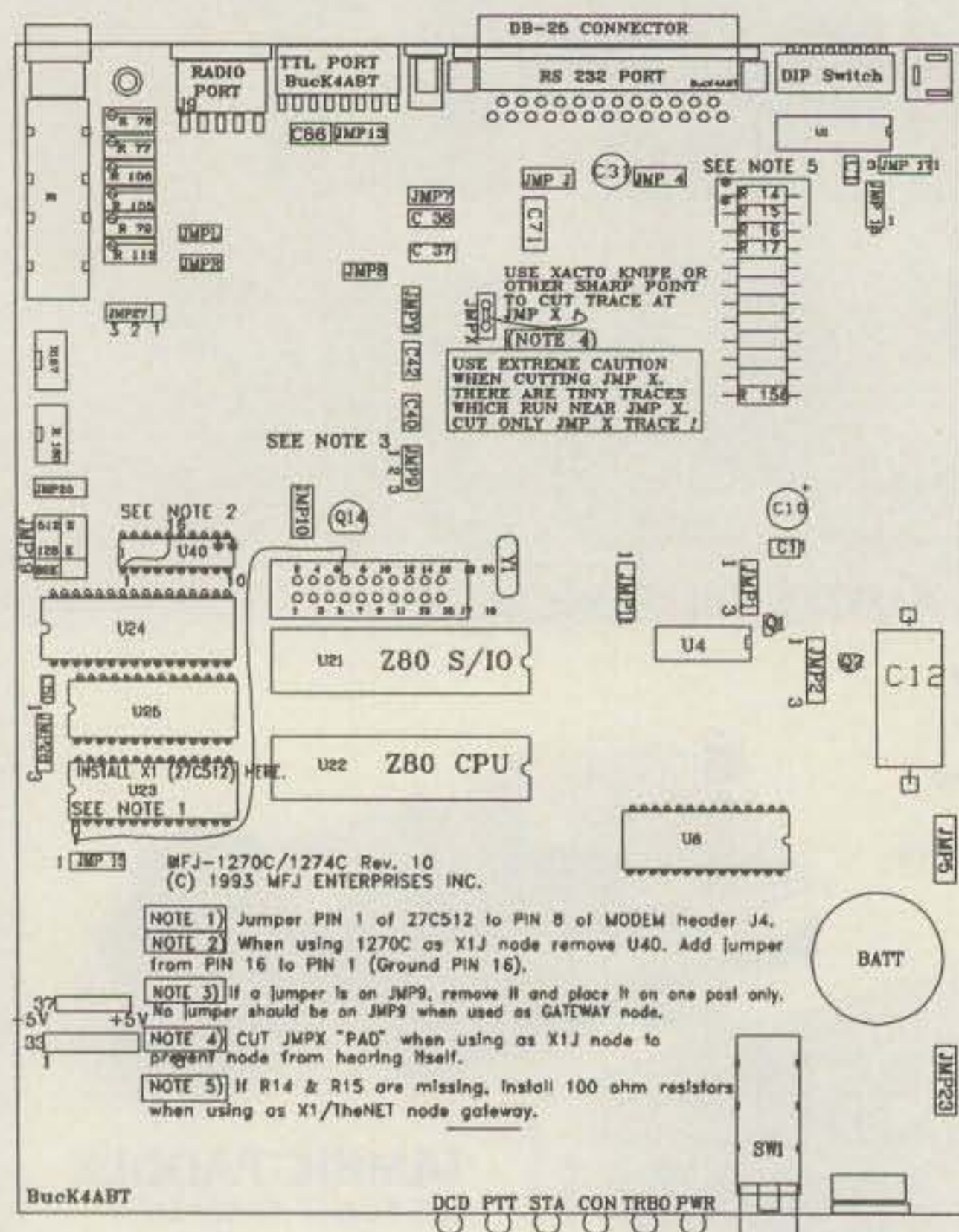
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- Note 1: Remove jumper from all pins of JMP 9. Jumper may be used later in this TNC to X-1J2 node modification.
- Note 2: Remove IC U40. After the modification is complete, place U40 into a plastic wrapper and tape inside the front faceplate for use if the node is ever returned to normal TNC service.
- Note 3: Remove any jumpers at JMP 15. Add jumper at JMP 16.
- Note 4: Add jumper at JMP 21.
- Note 5: Cut trace between pads of JMP X. Use extreme caution when cutting JMP X. Notice that tiny traces are close to JMP X; DO NOT CUT any other trace. CUT ONLY THE TRACE AT JMP X. Use a sharp X-acto® knife or similar tool. Exercise caution when handling this type of tool!
- Note 6: If TNC is to be used as a GATEWAY between two frequencies or baud

- rates, ensure that R14 and R15 are installed. If they are not, then remove the PC board to add R14 and R15. R14 and R15 are 100 ohms @ 1/4 watt each. To remove the PC board, remove the front faceplate (two screws). Then remove the screw that attaches Q3 (regulator) heatsink to the front of the TNC. Next remove the four screws that hold the PC board in place. They are shown in the drawing using this symbol: [Symbol]
- Note 7: Remove EPROM at IC U23. CAREFULLY install new X-1J2 EPROM into socket at U23. BE SURE ALL PINS ARE IN SOCKET HOLES. No pins are left out of pin 1 as was done with older revisions of this TNC. This modification applies to the MFJ-1270C Rev 11 and later versions.

Fig. 4— Overview of the MFJ-1270C Rev 10. See notes one through five for modification highlights. (See text for details.)

to 10, it will have a full-scale range of 2.5 kHz. If set to 255, it will display up to 64 kHz. A typical setting will therefore be in the range 30 to 50, depending on the analog setting. The objective is to set it such that the maximum possible audio level from the receiver, given its filters, corresponds to just under the 3 volt maximum input to the ADC.

The deviation is displayed to a resolution of 100 Hz, but it should not be assumed to be this accurate. Small fluctuations in the reading can be expected. To guard against an unnoticed over-range, the display in the Heard list will precede the deviation reading with a chevron (>) if the value read from the ADC is greater than 254 or 255.

Setup and configuration instructions are included with the MFJ-52B. Additional parameter-setting information is contained in the handbooks described next.

I prepared the figures in this month's column to illustrate the various TNC2 types and how they are to be modified. Figs. 1(A) and 1(B) are the description of the early PK96 conversion for the PKX1J4 node. The late models are PKX1J4 ready with only minor changes.

Figs. 2(A) and 2(B) reflect the modification of the older TNC2 clone. Notice fig. 2(B) modification is for use in the early TNC2 to enable RS-232 port communications within a node-stack. Fig. 3 gives the layout for installation of the deviation meter PCB. Figs. 4(A) and 4(B) explain the difference in modifying the MFJ-1270C "REV 10" and "REV 11" (4B) for node service.

## The Best Is Yet To Come

For the rest of the picture, I'm including the drawings that relate to how we make the TNC2 clone into an X-1J4 node. If you would like to receive the book set that describes the application, installation, and configuration of an X-1J4 node, I still have a few of the free handbooks available. There are two books. One covers the use of the AEA PK-96 as an X-1J4 node, and the other covers the TNC2 clones such as the MFJ-1270 (B and C versions) and the PacComm units. These books are free. However, you must provide a 9" x 12" self-addressed, postage-paid (\$3.00) return envelope.

Domestic mail only; sorry no IRCs! I will not purchase additional postage, I do not address envelopes, I do not provide envelopes, and I do not "format" disks. If you include a formatted MS/DOS disk, I will supply the X-1J4 (TNC2), the PKX-1J4 (PK-96), and the CONVERS/Conference node code.

## New APRS Support EPROMs From AEA

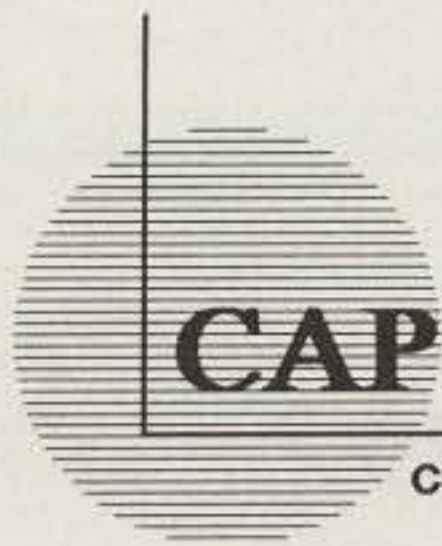
To round out this month's "Packet User's Notebook," I have one added note for the APRS enthusiast. AEA recently has upgraded their firmware (EPROMs) to make operating with APRS easier. The new AEA Packet Controller code includes remote setup for installing APRS useful commands and activating APRS-related features.

More info is available from Advanced Electronic Applications, Inc., 2006 196 Street SW, P.O. Box C2160, Lynnwood, WA 98036 (206-774-5554).

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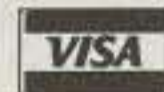
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## A LOOK AT THE WORLD AROUND US

### Horizon Expanding Treats For The Holidays

**S**easons Greetings to all! And here's hoping 1995 was a very good year for you, 1996 will be even better, and your shack will soon be overflowing with neat goodies to enjoy during the fascinating times ahead.

In light of those glad tidings and good wishes, we have a double treat in store for you this month. First, we are featuring holiday gifts especially for amateurs. Second, we have also combined some gift ideas with this column's main theme of exploring new worlds of special interests. Together they illustrate some easy ways to expand your horizons and increase

your enjoyment of our great hobby, even if you are not an electronics wizard or rocket scientist. I will also show you how to get started in these new pursuits while being the envy of your neighborhood by investing in unique gear and accessories.

Sound interesting? Great! Let's get started, as we have something in our showcase for everyone, from new Tech Lites to old pro Extras!

Please remember that inquiries and/or orders for featured items should be directed to the manufacturer or dealers—not to me. I am only your guide on this window-shopping tour, and the tour doesn't end here. It continues throughout the ad pages of *CQ*. Remember to order

early to avoid "sold out" disappointments. Now let's check out the goodies!

#### First Class QRP

Want to add some real excitement and pizzazz to your usual hamming activities? Check out Index Labs new QRP Plus transceiver shown in photo 1. This little delight is a QRPer's dream unit with features and performance equal to or surpassing many of today's 100 watt "economy" transceivers. Why continue to be a small fish in a big pond when this gem can make you "top banana" in the world of QRP?! Do I sense someone saying QRP does not have "big-time

4941 Scenic View Drive, Birmingham, AL



Photo 1—Index Lab's new QRP Plus HF transceiver is our first pick for 1995's hottest special-interest gift idea. Unit covers 160 through 10 meters on SSB and CW, is loaded with deluxe features, is extremely well built, and is a QRPer's dream rig.

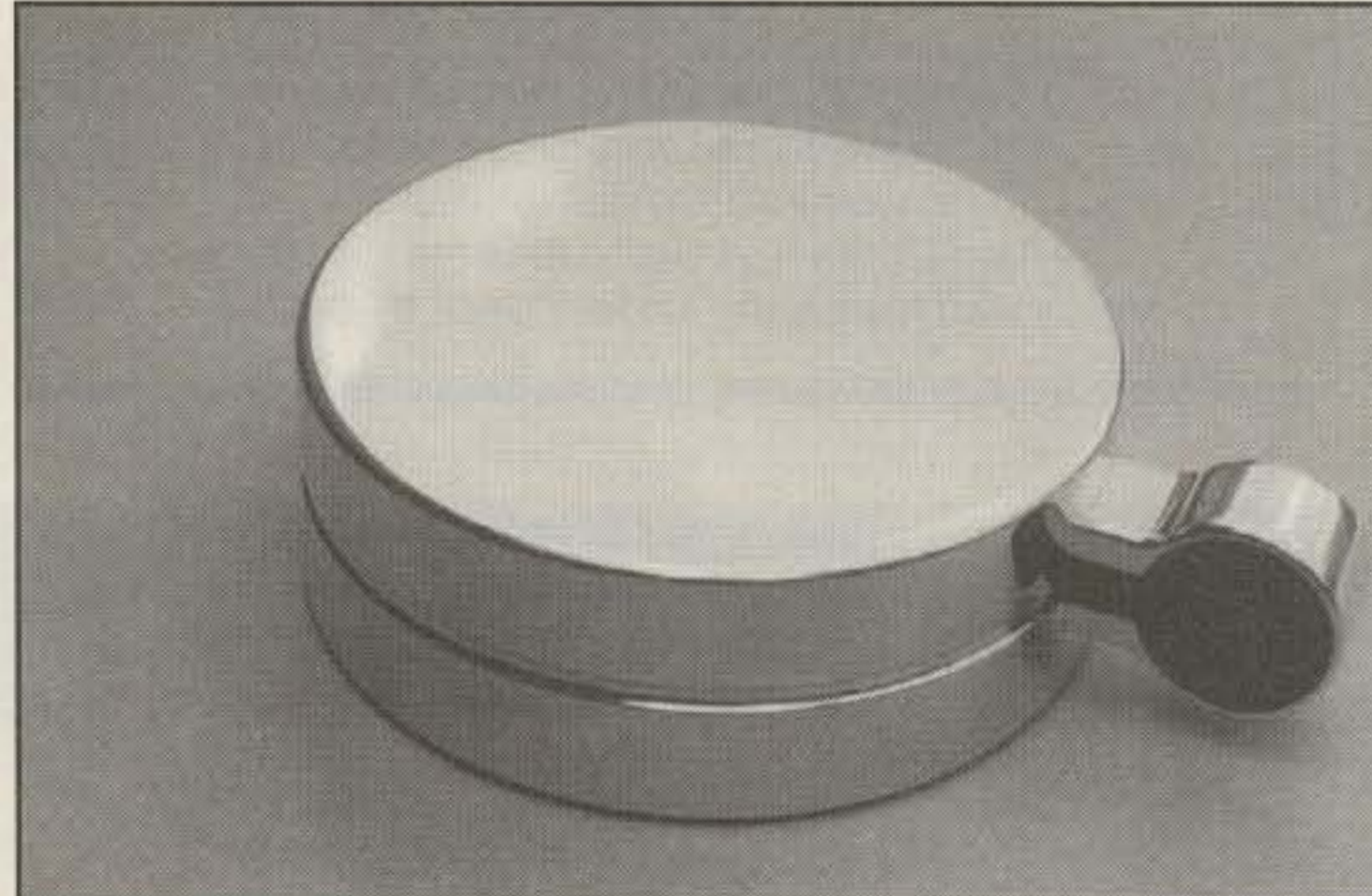


Photo 2—Every year's holiday column needs a touch of gold, and this one is dazzling! It's Cal-Av's all-electronic "touch paddle," which handles like silk and looks like it's right out of Fort Knox! Paddle is also available in chrome and brass.



Photo 3—Radio Works' new Big Sig 3/2-wavelength Delta Loop antenna does a QRP Plus (or even a larger transceiver) justice, especially on lower HF bands where beams are almost out of the question. Antenna is supplied fully assembled, ready to unpack and install.

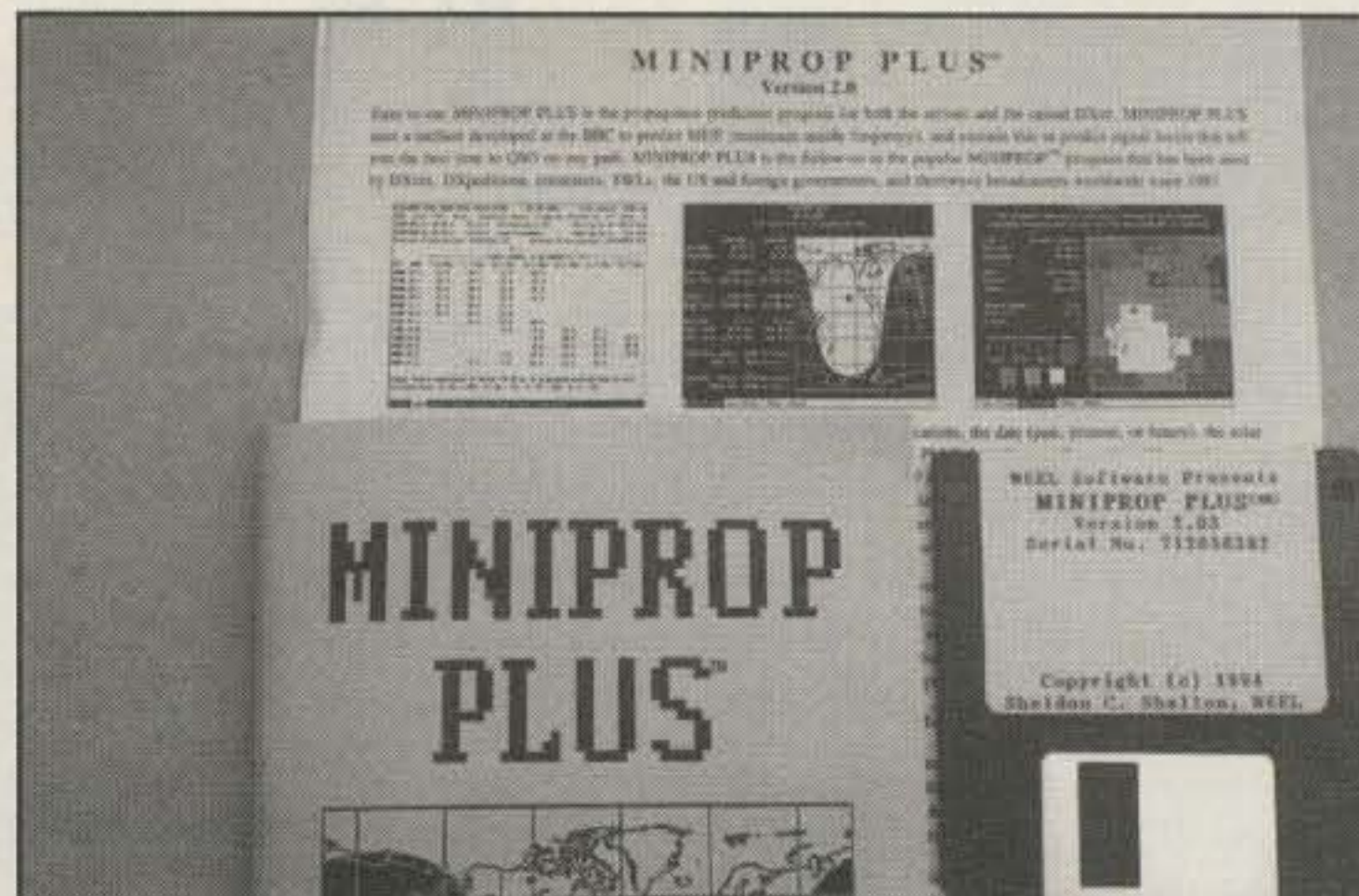


Photo 4—W6EL's MiniProp Plus software package for IBM compatibles is a superb DXing aid any amateur will appreciate using day in, day out. It calculates when bands will be open to your selected areas, and much more.



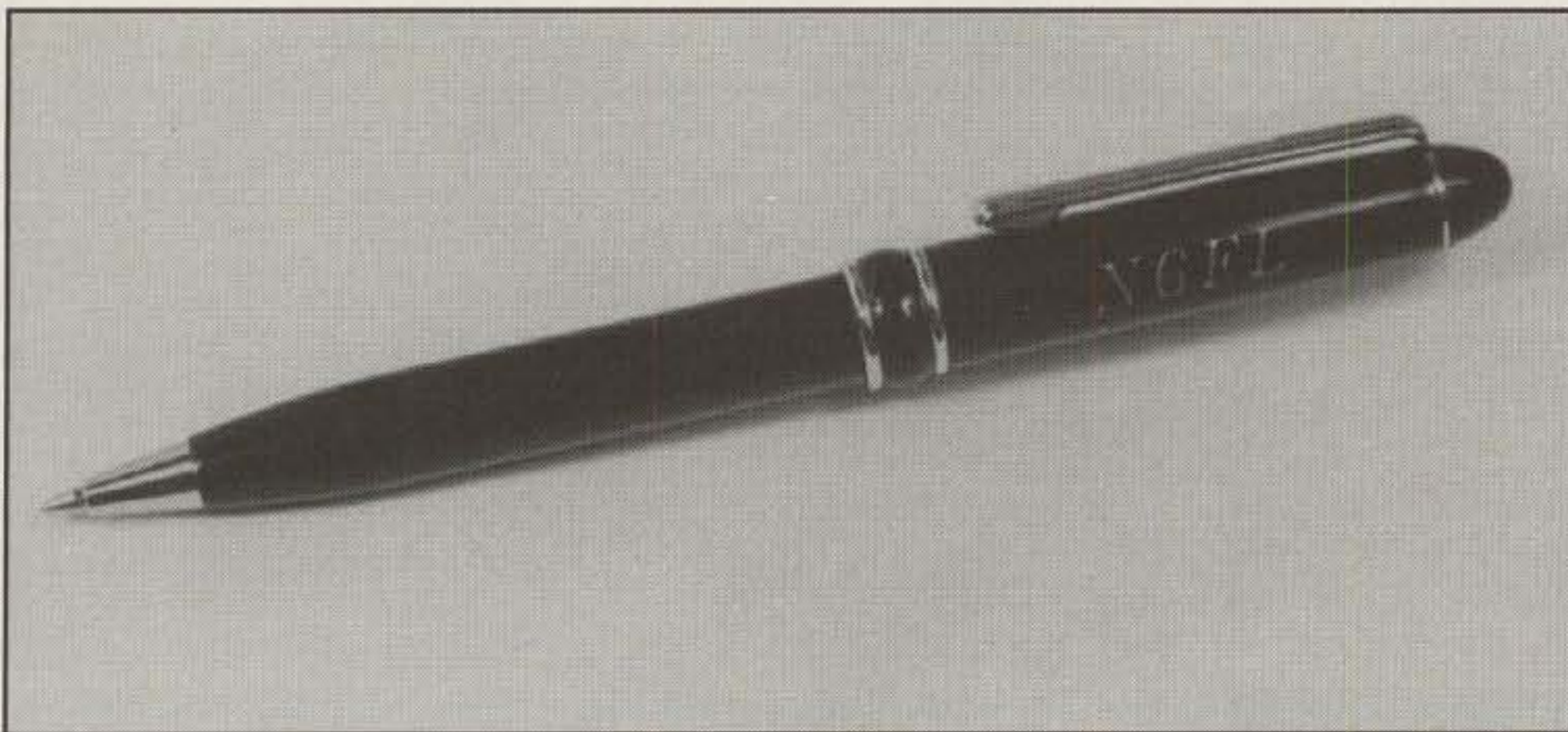


Photo 5— Ready to move up in the world? Check out Kilo-Tec's roller-ball pen. It has a high-gloss black-lacquer finish, gold-toned trim, and comes laser-engraved with your callsign.

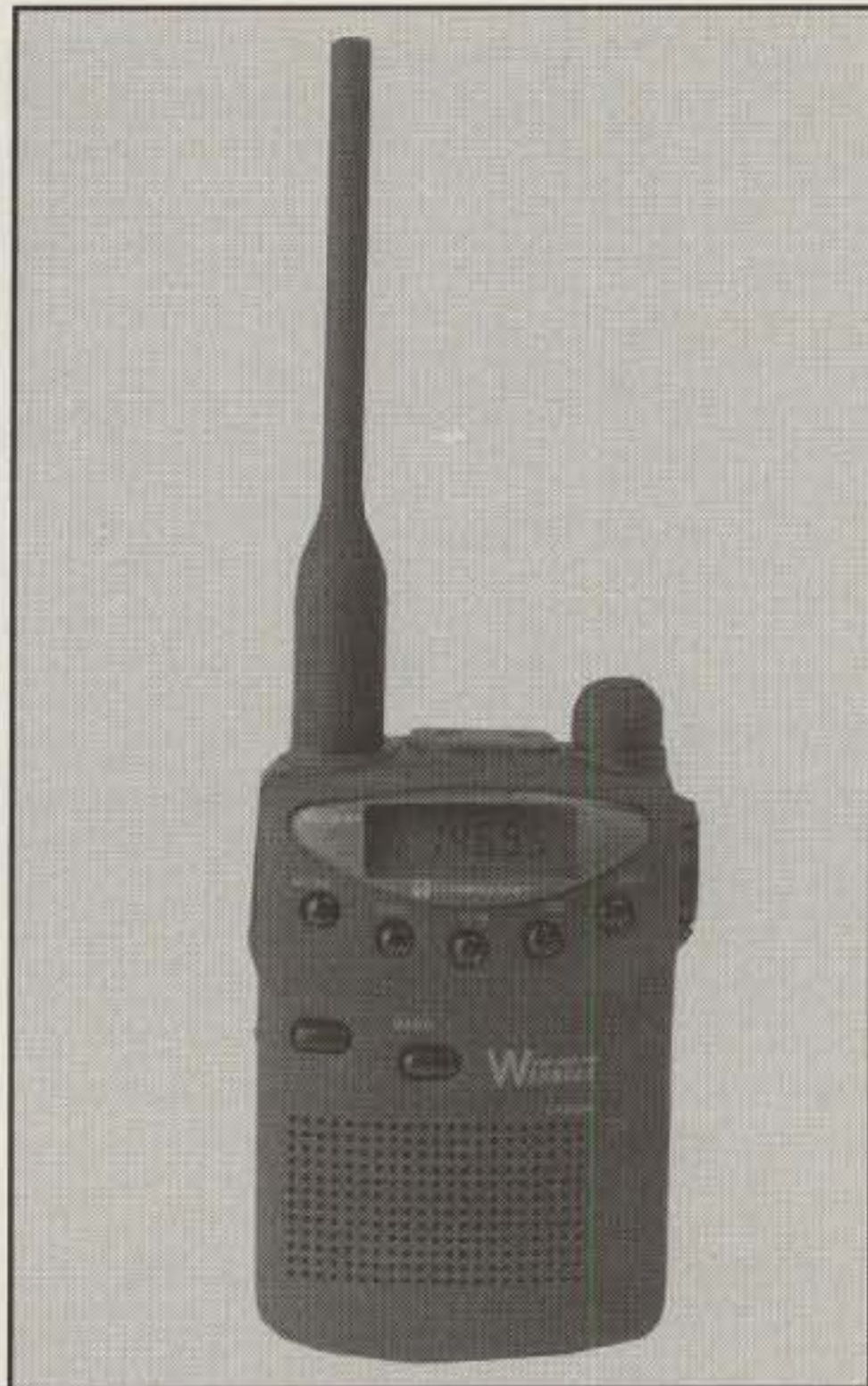


Photo 6— Standard's QRP-size C508A is the world's smallest 2 meter/70 cm FM handheld. Unit is loaded with features and is amazing.

radio clout?" Tisk! Tisk! The day after my QRP Plus arrived, I used it to work 30 stations in 40 (casual) minutes during a Saturday Sprint contest—on 20 meters and using a ground mounted vertical. Several of the QSOs were European DX! Maybe you can't work everything with 5 watts that you can work with 100, but I'll bet a dollar-to-a-donut that what you miss with 5 watts will also be missed with 100 watts!

The QRP Plus works SSB and CW on 160 through 10 meters, and has 5 watts output, 20 memories, RIT, XIT, split VFO capability for DXing, and general-coverage reception for SWLing. It also has incredibly smooth full break-in, an internal CW keyer, and digital

SCAF filters that, like keyer speeds, are selectable right from the main tuning knob. Any bandwidth from 2.4 kHz to 100 Hz can be dialed up and used on SSB or CW, as desired. Further, there is no ringing—even at 100 Hz. Everything about the QRP Plus is first class, from its unique 4" x 5.5" x 6" cabinet and professional instrument-type construction to its exceptionally low current requirement when used portable with batteries. Comparing the QRP Plus to other low-power transceivers is obviously next to impossible!

Initial orders for QRP Plus transceivers exceeded all expectations. Bruce Franklin/Index Labs is now starting to catch up on back orders

and is building extra stock for Christmas. The backlog could soon start again, so interested amateurs should contact Index Labs at 9318

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- △ SDU5000 is designed to work with the AR3000A (modified with 10.7MHz output) using RS232 link with or without a computer. Other receivers with 10.7MHz IF output but digital linking may not be straight forward. **CONTACT YOUR FAVORITE DEALER!**



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Photo 7— This fully self-contained 12 volt/7 amp battery pack is called the "Power Station," and it is hefty! See text discussion of combining it with a big mobile transceiver to make a super-power 2 meter portable rig.

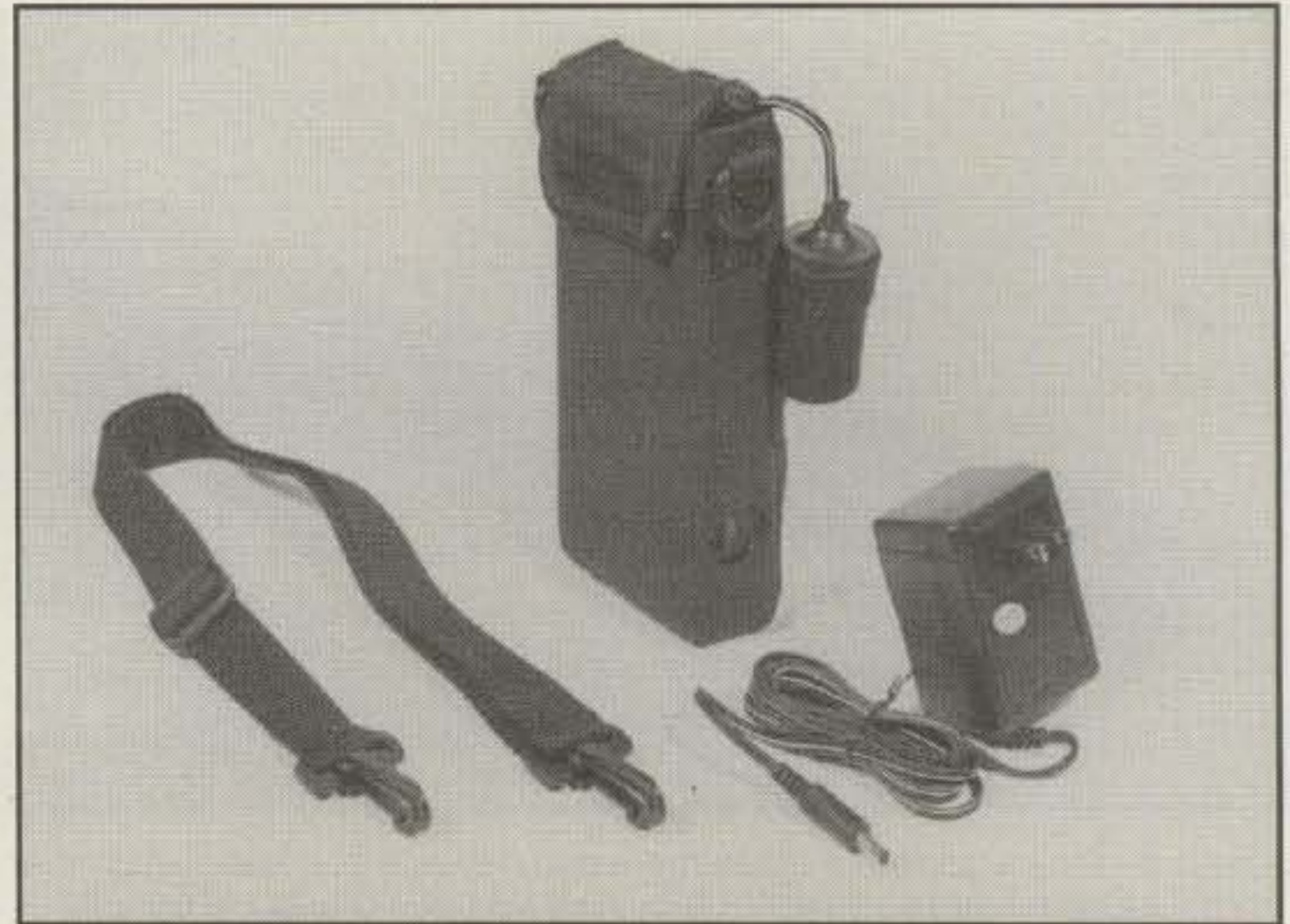


Photo 8— The new "Mini Power Station" shown here is a talkie-size 12 volt/2.3 amp battery pack designed for long-time use with big FM handhelds. I also see it as the ideal mate for a QRP Plus HF transceiver (see text discussion).

Randall Dr. NW, Gig Harbor, WA 98332 (telephone 206-851-5725) soon.

## Terrific Toppings

One of the most appealing aspects of QRP is you can gear-up with the fanciest new rig imaginable and still have money left for adding exotic accessories. Yes, and we are going to spotlight some that really shine—on or off the air! First up is a genuine touch of glamour guaranteed to put any QRP (or higher power) setup in a class of its own: The new gold-plated "Spirit" paddle shown in photo 2. A photo cannot capture all the sheer glitz of this extraordinary item. It knocks your socks off! Rather than using a conventional mechanism, the Spirit is fully electronic in nature. Sensors mounted in each side of the non-moving "fingerpiece" respond to finger pressures from one ounce to one pound; their sensitivity is adjustable by rear-mounted 20-turn potentiometers. The paddle is super-solid (its casing is 5 pounds of solid brass!), totally silent in use, and a blast to operate. Its internal circuitry is powered by a built-in battery that lasts several months

between recharges. The gold Spirit is rather expensive (over \$500), but it is also available in chrome or brass for more conventional-minded amateurs. These Spirit paddles are custom made by Ken Hirschberg, K6HPX, Cal-AV Labs, Inc., 515-B Westchester Dr. Campbell, CA 95008 (telephone 408-369-1000).

Next we have two hot QRP-boosting wire antennas from The Radio Works (Box 6159, Portsmouth, VA 23703; telephone order line 1-800-280-8327): their new-style  $\frac{3}{2}$  wavelength Delta Loop and their famous Carolina Windom. The Delta Loop (photo 3) is ideal for pumping out a big signal on your favorite (single) HF band. It fits in a space just slightly larger than required for a dipole and runs circles around that basic antenna in performance. The Radio Works' "big Delta" is supplied complete with a custom balun at the feedpoint, and with or without RG8X feedline, as you desire. Nice!

The Radio Works' Carolina Windom is an absolute winner for multiband operation. Indeed, I still remember my first contact when using one: a BY on 15 meters when the band seemed "closed." Numerous other DX QSOs (many via QRP) continue to grace my logs when using the Carolina Windom. In fact, it

often drives me to get out test gear and double-check my (almost equal in performance) beam. The Carolina Windom is amazing! It is available in a full-size version (132 feet long; 80 through 10 meter operation) and QRP record-setting half-size version (66 feet long; 40 through 10 meter operation). These two Radio Works antennas truly do a QRP Plus (or any "big rig") justice!

Now let's ensure you make plenty of QRP QSOs and work your fair share of DX even during our present sunspot minimum. How? Just include a copy of the MiniProp Plus computer program in your holiday shopping/wish list. This software, shown in photo 4, calculates when your favorite HF band(s) will be open to any desired area—near or far—and it calculates those times for every half hour of a day. In other words, it can accurately advise you when to check 10 meters (or 80 or 30, etc.) for a surprise opening into a needed country. It also shows day/night areas, beam headings, optimum signal radiation angles (for crank-up antennas!), and much more. MiniProp Plus runs on any IBM compatible with 512K of RAM (or more) and is available on 3 $\frac{1}{2}$  or 5 $\frac{1}{4}$  inch disk. Order it from W6EL Software, 11058



Photo 9— Like to see some of those SSTV pictures you hear being exchanged over the air? Adding Radioware's SSTV Explorer package to your IBM compatible computer is the quick, easy, and inexpensive answer!





Queensland St., Los Angeles, CA 90034-3029.

Rounding out our killer HF QRP setup is the perfect DX logging instrument: Kilo-Tec's extra-classy roller-ball pen shown in photo 5. What makes this pen special? It looks like a million dollars, is top quality throughout, uses standard refills, and comes with your callsign laser-engraved on the side. These snazzy pens are available from Kilo-Tec, P.O. Box 10, Oak View, CA 93022 (telephone 805-646-9645).

## Beyond HF QRP

Want to experience some genuine fame and notoriety in two worlds at once? Go all-out QRP by including it in your daily 2 meter and 70 cm activities! Is it dependable? Sure! In fact, you may already know how well QRP works if you use an FM handheld on its lowest power (battery conserving) position for local repeater and neighborhood communications. The difference in going "total QRP" is gearing up with a true QRP-size rig everyone envies and knows is "dedicated QRP."

Filling that bill to a tee is Standard's new mini-dual-band model C508A shown in photo 6. This has to be the most incredible FM handheld yet. It measures only 3.35"H x 2.28"W x .98"D, and covers 144 to 148 and 438 to 450 MHz with 280 milliwatts (.28 watt) output plus receives 100 to 180 and 340 to 480 MHz with great sensitivity. Best of all, this little wonder hides in the palm of your hand. Add a small strap through its belt clip, and the C508A can be a wrist radio. Yes, and the C508A has real big-rig appeal such as 60 memories, 39



Photo 10—A kaleidoscope of treats for the holidays and all year round is available right now from CQ. A small sampling of goodies like that shown here includes the collector's edition CQ mug, 50th Anniversary CQ logo knit shirt, and CQ logo backpack. Cheers!

CTCSS tones, half a dozen scan types, weather, aircraft, police and marine band reception, magnified and backlit display, plus much more. This little handheld is a heart-throb! The

C508A is available from dealers nationwide. If you cannot find one or need more info, contact Standard Amateur Radio Products, Inc., P.O. Box 48480, Niles, IL 60714.

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## Portable Powerhouses

Now for all our "still unconvinced on QRP" friends, we feature a very handy item and clever expansion idea that will definitely turn heads (and solid QSOs!) anywhere you go—the Power Station. This compact device (see photo 7) is available from Joe Brancato/The Ham Contact, P.O. Box 3624, Long Beach, CA 90803 (telephone 310-433-5860). Simply explained, it is a 12 volt/7 ampere gel cell battery complete with its own charge monitoring system, built-in voltmeter, and cigarette-lighter socket plus recessed terminals for heavy-duty output. The Power Station is enclosed in a strong plastic case measuring 7 1/2"H x 8"W x 2 1/2"D and comes complete with an AC wall charger plus cigarette-lighter cable for charging while mobiling. Best of all, it has an automatic shut-off feature so you can charge or just "top up" the battery once a month or every day without worry of "memory buildup" as with a nickel-cadmium battery.

The Power Station is obviously a blessing during emergencies, but let's get more creative with its use. Suppose we pop our high-power 2 meter mobile rig out of the car, connect it to the Power Station, strap it on the back opposite the voltmeter with some bungee cords, and add an SO-239 socketed mobile antenna on two right-angle adapters. We have a 50 watt portable "beach rig" that works distant repeaters or crossband repeats C508As like a champ! The sky is the limit on this idea. You take it from here!

*Flash!* The Ham Contact just announced a new "Mini Power Station" that uses a 2.3 amp

gel cell, and is sized comparable to a regular FM handheld. It has the same "charge or top up anytime" and auto shut-off features as the Power Station, has a cigarette-lighter socket-type outlet, and comes with an AC wall charger plus belt carry pouch (photo 8). This gem's main attraction is all weekend "walking portable" use with big 5 watt FM talkies, but it is an ideal power source for a QRP Plus when IOTA expeditioning or backpacking. Further, the full setup will fit in a knapsack! Check it out!

## SSTV Package

Our final area of special interest in the spotlight is Slow Scan TV. Getting started in this globe-spanning visual mode is easier today than ever before. The key is adding an interface package such as the popular Pasokon SSTV system to your IBM-compatible home computer (286 or better with 640K or more RAM). You just install its SSTV board in the computer, load supporting software, add speaker/mic cables between the Pasokon board and rig, and you're set to unlock a new world of amateur radio fun. SSTVers are a very congenial group. They exchange pictures almost continuously around 14.230 MHz, and the SSTV net on 14.230 at 1800 GMT Saturdays always welcomes newcomers.

Prefer "testing the water" by just "looking in" before going for the gusto? Check out Pasokon's little brother, the SSTV Explorer, shown in photo 9. A micro receive-only converter is built in the db25 connector. You simply plug it into your computer's extra serial "com" port, plug its attached cable's end into

your receiver's speaker socket, load its software, and start viewing off-the-air pictures. This is a neat and low-cost holiday gift every amateur will love!

So how do you spot a serial com port on your computer's rear panel? It looks like a 25-pin printer socket, but has pins rather than holes showing. Yes, it has been sitting back there waiting for you to explore SSTV. Hookup takes only a minute. Go for it!

The Pasokon and SSTV Explorer packages are available from Radioware, P.O. Box 1478, Westford, MA 01886 (telephone 1-800-950-WARE). They are true radio "good guys."

Concluding this year's view of goodies is the combination of CQ treats shown in photo 10—a collector's edition mug, 50th anniversary knit polo shirt, and a CQ-logo backpack. The mug is a classic collectible, and the shirt outclasses those alligator-logo jobs by a mile. The backpack? I added side rings and a long strap to mine, and it makes the best shoulder bag imaginable for books and rigs. There are more CQ items shown in the CQ merchandise, calendars, books, etc., ads in this magazine. Get some while they are available, and join the celebration. CQ's toll-free order number is 1-800-853-9797.

## Summary

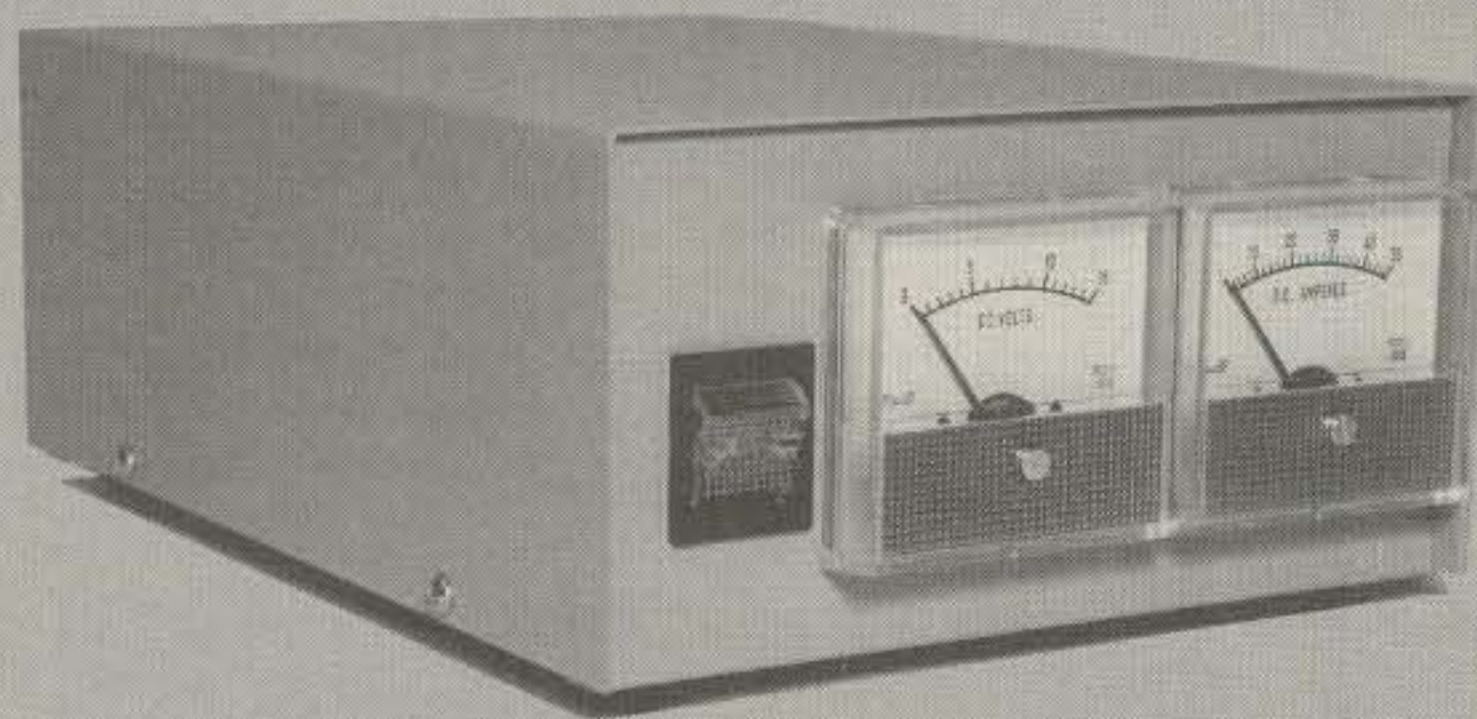
We are out of space! Have a great holiday season, and I'll see you next year with more special topics. I'll also be listening for friends and fans on 20 SSB and 30 CW over the holidays.

73, Dave, K4TWJ

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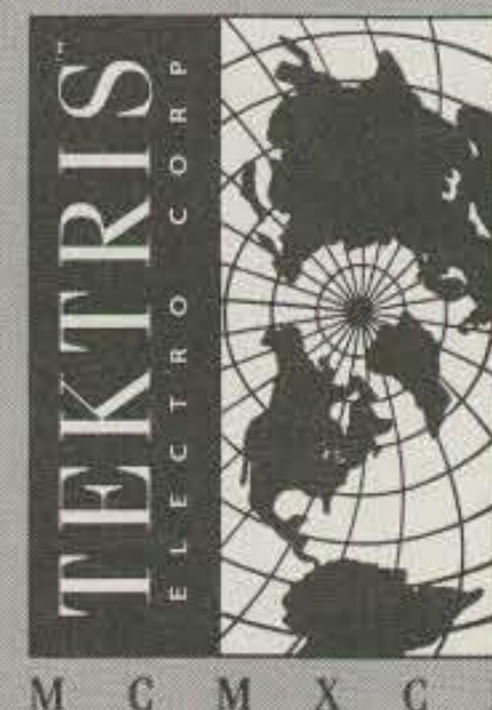
means they **consume much less power, are less expensive to operate and generate less heat** than competitive units. A 500 Watt unit takes up only 7" x 3.5" x 10" and weighs less than 5 lbs!

Another terrific feature: Multiple units can be paralleled to achieve even higher output currents, up to 5000 W! Example: Two units will provide 12-14 VDC at 60A and three of them will provide 12-14 VDC at 90A. A 19" version (110/220 VAC selectable input) and an OEM (90-265 VAC universal input) version are available. A 500 Watt Model, RF 420S14M, is only \$174.95. Pricing for OEM models with universal input is available.

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Frequency step resolution 5, 12.5 & 25 KHz.

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The Bearcat 9000XLT gives you pure scanning satisfaction with amazing features like TurboSearch™ to search VHF channels at 300 steps per second. This base and mobile scanner is ideal for surveillance professionals because it has a selectable attenuator to help eliminate annoying intermodulation from adjacent frequencies in highly populated areas and selectable AM, Wide FM and Narrow FM modes that allow you to change the default receiving mode of the BC9000XLT. Other features include **Auto Store** - Automatically stores all active frequencies within the specified bank(s). **Auto Recording** - This feature lets you record channel activity from the scanner onto a tape recorder. **Hi-Cut filter** to help eliminate unwanted static noise. You can even get an optional **CTCSS Tone Board** (Continuous Tone Control Squelch System) which allows the squelch to be broken during scanning only when a correct CTCSS tone is received. For maximum scanning enjoyment, order the following optional accessories: **PS001** Cigarette lighter power cord for temporary operation from your vehicle's cigarette lighter \$14.95; **PS002** DC power cord - enables permanent operation from your vehicle's fuse box \$14.95; **MB001** Mobile mounting bracket \$14.95; **BC005** CTCSS Tone Board \$54.95; **EX711** External speaker with mounting bracket & 10 feet of cable with plug attached \$19.95. The BC9000XLT comes with AC adapter, telescopic antenna, owner's manual and one year limited warranty from Uniden.

## CB/GMRS Radios



The Maxon GMRS 210+3 transceiver is a PLL synthesized 10 channel radio on General Mobile Radio Service frequencies. It's the ideal radio for long range communications. Two repeater channels are programmable and one channel (462.675 MHz.) is set aside for emergency and safety communications. The seven remaining interstitial frequencies 462.5625, 462.5875, 462.6125, 462.6375, 462.6875 & 462.7125 MHz are all-purpose GMRS radio channels. 2 watts of RF power for exceptional transmitting range. Up to 5 watts when used with the supplied 12 volt vehicular DC power cord.

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### Octavia Company R&R Callsign Database Ver. 2.01

Octavia Company recently began shipping a new version 2.01 of R&R Callsign Database, a computerized lookup program that gives immediate access to more than 50,000 amateurs in the CIS countries: Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russian Federation, the Ukraine, Uzbekistan, Tajikistan, and Turkmenistan. Octavia has been specializing in direct QSL addresses for all over the CIS since 1989. Their proprietary software was used to convert Russian addresses into the English language equivalents. Abbreviations and regional names are presented in a form recognizable by both International and Russian postal workers.

R&R 2.01 includes improvements and additions such as: the ability to import text files containing a list of callsigns; the ability to export one selected entry into ASCII format for printing; browsing data in callsign order; editing compressed R&R data as well as adding new entries; and a Notepad function that allows for writing a full-page description of a contact. The database also has many amateur's home telephone numbers with area codes; and for QSLing amateurs not included in the database, R&R contains a list of over 500 CIS QSL Bureau addresses organized by callsign prefix. R&R includes pull-down menus, customizable

screen layouts, and on-screen Help. The program has a multi-lingual interface and the user has a choice of English, German, and Italian.

Minimum system configuration: a 286-based PC, 640 Kb of RAM, DOS 3.30 or higher and hard disk with 2.5 Mb disk space for installation. R&R Callsign Database is updated every April and October. Octavia also publishes the CIS Call Directory, a paper version of R&R. The 1995 edition is available in Cyrillic. R&R '95 single issues cost \$25 (US) plus \$3 airmail shipping and handling; R&R '95 subscription (April and October releases) costs \$35 (US) plus \$6 airmail s/h; and The CIS Call Directory 1995 (Russian Edition) costs \$10 (US) plus \$7 airmail s/h. (Money orders only.)

Octavia Products are distributed by Jan Bexner, SM7DEW, Villa Dalen Berghem, S-34191, Ljungby, Sweden; phone +46 (0372) 14149, fax +46 (0372) 15260. For more information, contact SM7DEW at above address, or circle number 100 on the reader service card.

### Cruising Equipment Co. E-Meter™

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keeps track of battery charging efficiency and key historical battery information, including deepest depth of discharge, number of recharging cycles, and average depth of discharge.

The E-Meter is available through large marine dealers including West Marine. It is available in Europe through Mastervolt of the Netherlands and Odelco of Sweden. For more information, contact Cruising Equipment, 6315 Seaview Ave. NW, Seattle, WA 98107 (phone 206-782-5869, fax 206-782-4336), or circle number 101 on the reader service card.

### GPS Firmware With AEA Packet Controller

Advanced Electronic Applications' PK-96 dual-speed 9600/1200 bps packet controller is now shipping with GPS firmware. The PK-96 now also includes in the packaging: AEA's PC PakRatt Lite™, the packet-only, DOS TNC ter-



minal control software and the Automatic Packet Reporting System (APRS™) software developed by Bob Bruninga, WB4APR, for GPS use, as does AEA's PK-12 1200 bps packet TNC.

The new GPS firmware incorporated in both the PK-12 and PK-96 automatically detects if there is a GPS receiver connected to the TNC upon power-up. If a GPS receiver is detected, an initialization string will be sent and the TNC will be ready for GPS work; if no GPS receiver is detected, the TNC will be ready for traditional packet data work.

The biggest new feature of the AEA's PK-96 and PK-12 is that the GPS commands can be remotely programmed; therefore, in Stand Alone Tracking applications where a TNC, GPS receiver, and radio (no computer) are installed in a vehicle, the unit does not need to be removed and connected to a computer to change GPS parameters. It is all done remotely. PK-96s and PK-12s automatically transmit their position information at user-defined intervals and now can also be remotely polled for GPS location information at any time. Other new features include time and date setting from the GPS receiver, remote programming of the GPS receiver itself, and the ability to operate as a wide and relay digipeater. Exact time and date information can be extracted from the GPS receivers to set the PK-96 and PK-12's internal clocks.

Both TNCs work with AEA's APRS Adapter Cable, which saves a communication port on the computer. This cable allows the TNC and GPS receiver to connect to a single COM port.

GPS firmware upgrades for early PK-96s and PK-12s are available directly through AEA for \$10.00 (free shipping). Call the AEA Upgrade Hotline at 206-774-1722 to order the GPS upgrade. The PK-96 and PK-12 packet controllers and AEA APRS Adapter Cable are available from amateur radio dealers. For more

information, call AEA's Literature Request line at 1-800-432-8873, fax to 206-775-2340, or circle number 105 on the reader service card.

### New World Wide Web Site From Raymond Sarrio Co.

A new World Wide Web site on the Internet has been established for amateur radio operators around the world. This site brings some new features to the World Wide Web. One of the more unique aspects of the site is its Amateur Radio Poll. Topics of interest to ham radio operators are presented each month. Amateurs are asked to vote on these issues using a five-point scale, and these voters are also asked to state their license class and age. Votes are immediately registered and added to the vote totals. It is also possible to see how the vote breaks down by age and license class. The results are posted on-line immediately.

This web site also includes a Ham Radio Discount Catalog. The catalog uses a search engine that allows amateurs to click in the parameters for their search, and the search is completed with the available amateur products listed. Some of the companies that have products listed in the catalog include: CQ Communications, Inc., ARRL, Artsci, Worldradio, Gordon West, Antenna's West, Palomar Engineering, AmSoft, A&A Engineering, Tigertronics, and Battery Tech. A classified section is being added to the site and will be available at no charge to all who want to list for-sale items on the web.

Ray Sarrio, WB6SIV, is the owner of this web site. Visit Ray's web site by accessing URL# <http://www.csz.com/sarrio.html>. E-mail Ray at [wb6siv@lightside.com](mailto:wb6siv@lightside.com); phone him at 1-909-987-7761; write to him at 6147 Via Serena St., Rancho Cucamonga, CA 91701; or circle number 108 on the reader service card.

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## CONSTRUCTION PROJECTS, TECHNIQUES, AND THEORY

## Solid-State RF Amplifiers—Some Design Tips

There are two principal performance problems associated with homemade solid-state RF power amplifiers, if certain design procedures are not followed closely. Instability is a common foe that we must encounter. Less-than-optimum output power is the other culprit faced by some amateur designers. Both of these problems can be avoided if the design approach and the physical layout of RF amplifiers are done with care. This article treats both maladies, along with providing answers to some frequently asked questions about amplifier design.

### Single, Parallel, or Push-Pull Transistors?

QRP enthusiasts prefer using single-ended transistor amplifiers for generating output power levels up to 10 watts. The operating voltage ( $V_{CC}$ ) is typically +12 for bipolar transistors and +12 to +24 volts for power MOSFETs. These power and voltage levels make it an easy matter to match the characteristic input and output impedances of a specified transistor. A typical 5 watt amplifier operating from a 12 volt power supply has in input impedance on the order of 10–15 ohms. The collector impedance is 14.4 ohms. These impedances are comfortably within the range of broadband matching transformers. Conversely, a 50 or 100 watt amplifier would have a much lower base impedance, and the collector impedance would decline to 1.44 ohms at 50 watts of output power when using a  $V_{CC}$  of 12. Therefore, push-pull operation at power levels from, say, 25 to 100 watts becomes mandatory in order to ensure a practical solution to impedance matching. These problems can be remedied by using devices that require higher operating voltages, such as 25 or 50, but most amateurs prefer equipment that requires +12 volts. The collector impedance is determined from the formula  $Z = V_{CC}^2/2P_O$ , where  $P_O$  is the desired RF output power in watts. In a like manner we can calculate the drain impedance of a power-FET RF amplifier.

Parallel operation of two or more transistors is tempting from the viewpoint of circuit simplicity, but the complications are the same as when using a single transistor. Small-signal transistors, such as the 2N2222 or 2N4401, can be operated in parallel (up to eight transistors) without the input and output impedances becoming difficult to match. This is because the output power is usually less than 5 watts. If this approach is chosen, it will be necessary to use a 1 or 1.5 ohm resistor between each emitter and ground to provide ballasting. This prevents any one transistor from hogging the current and destroying itself. A set of matched transistors might eliminate the

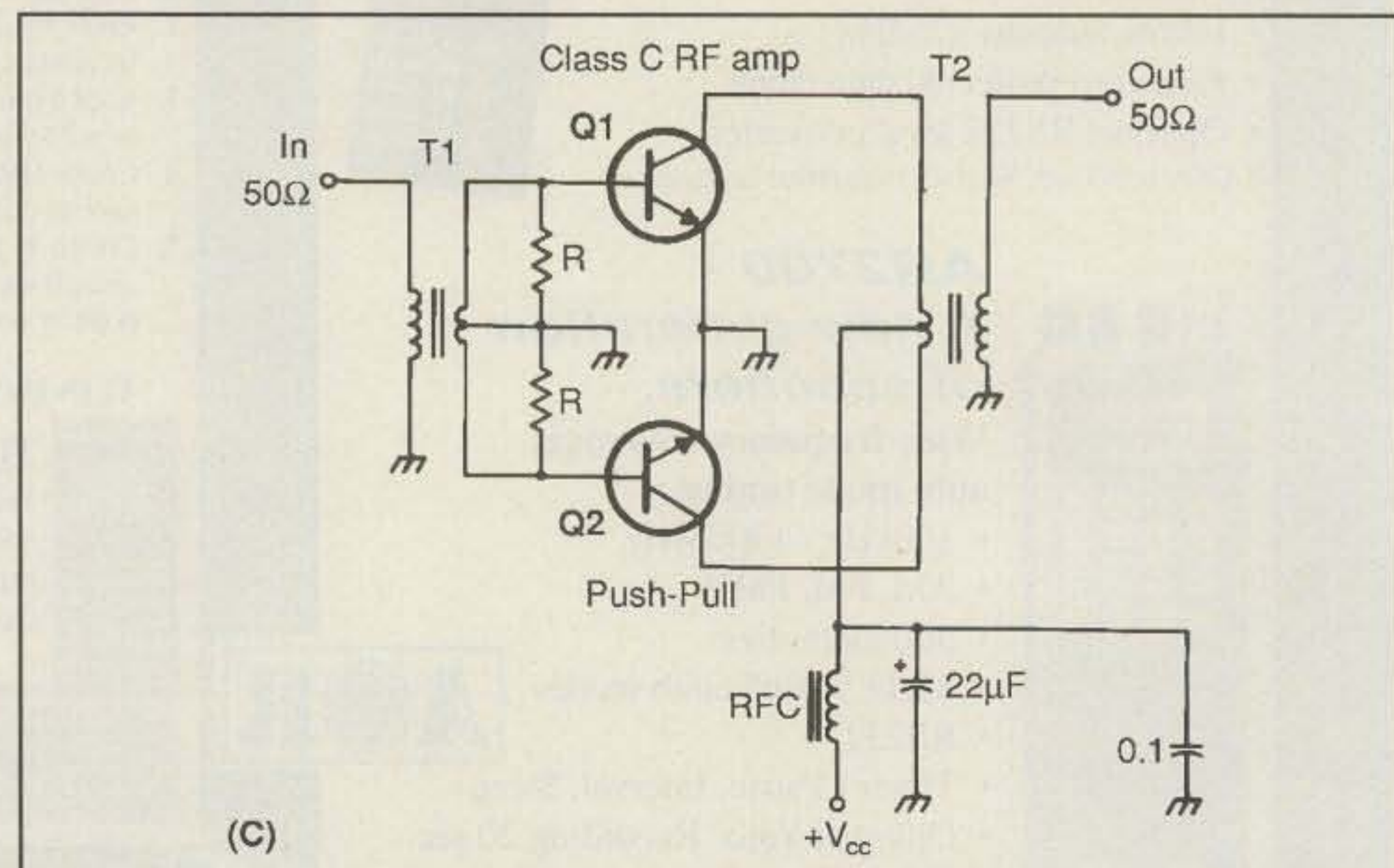
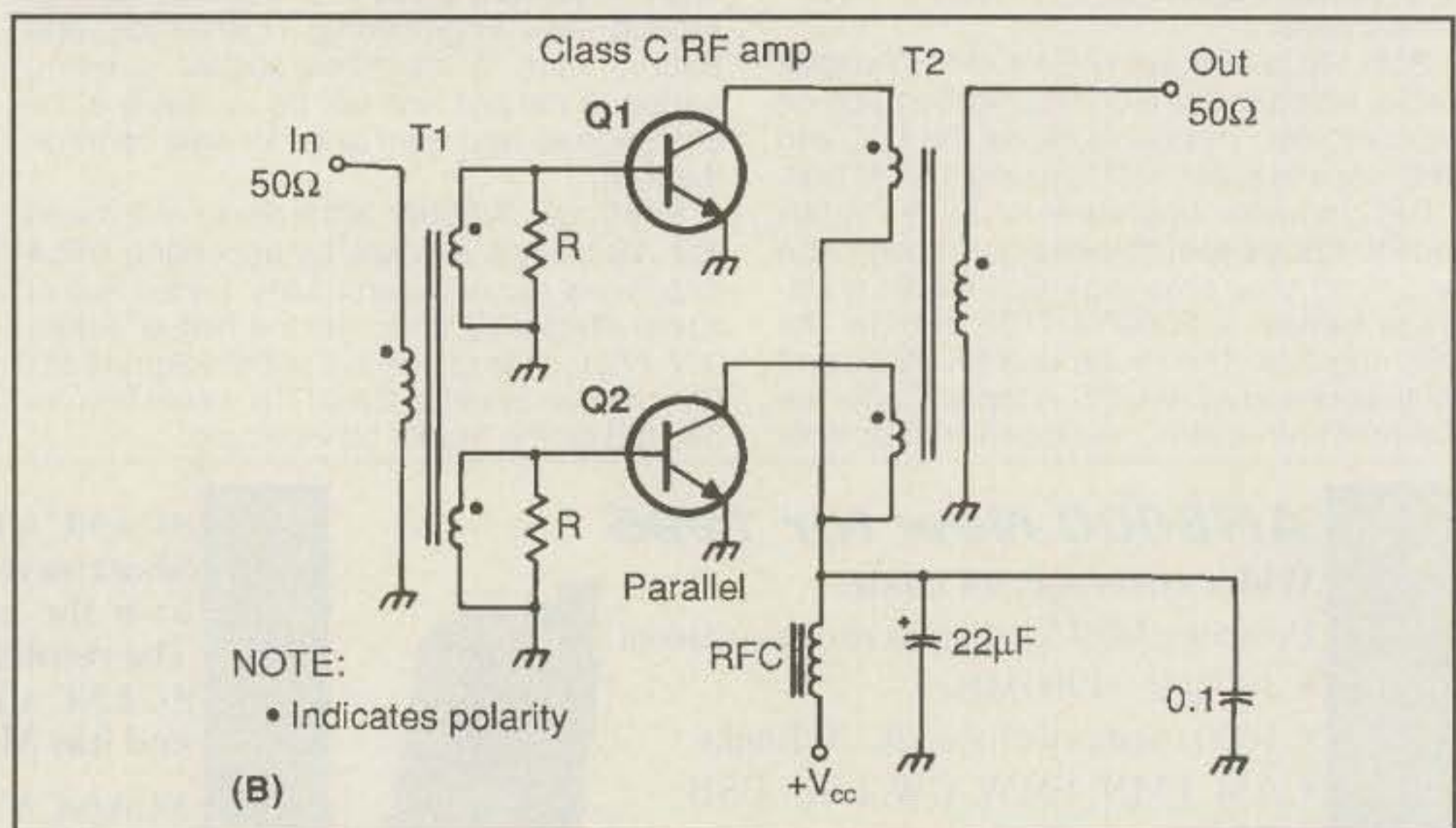
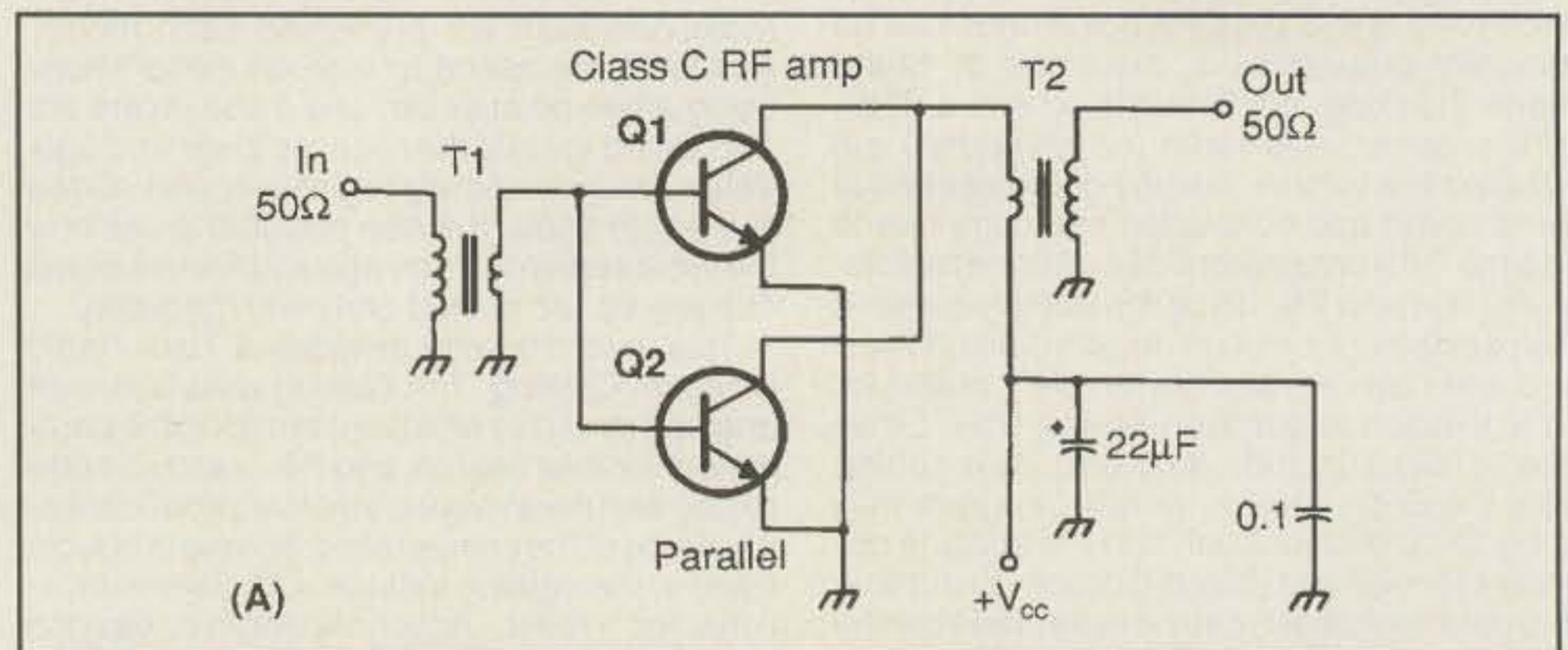


Fig. 1—Examples of basic amplifier configurations. Parallel operation is shown at (A) and (B). Circuit (B) illustrates the use of separate base and collector windings to make impedance matching easier than at (A); see text. The circuit at (C) shows a basic push-pull hookup.





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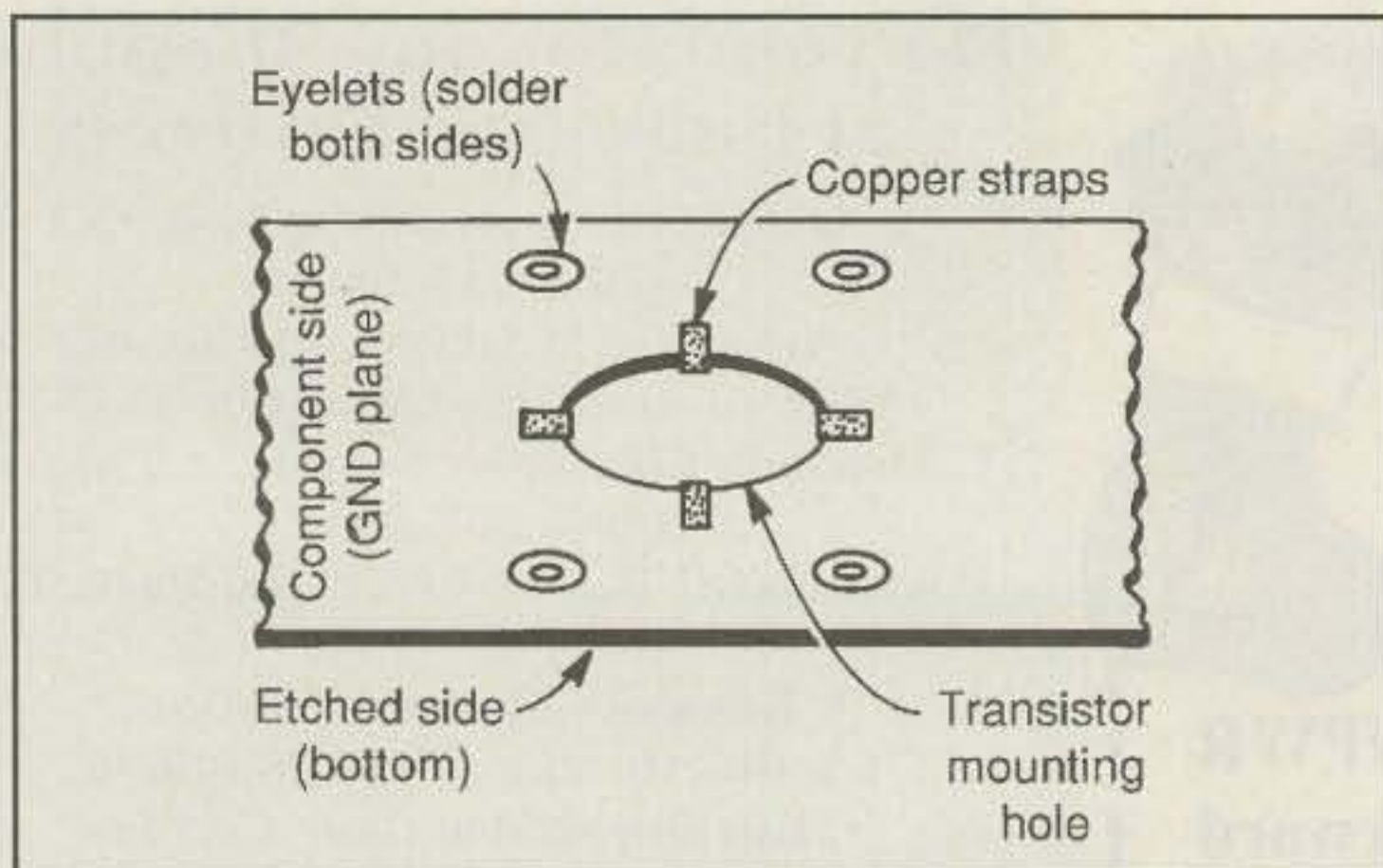


Fig. 2- Pictorial view of a PC-board section showing the use of eyelets and bonding straps for joining the copper ground plane to the ground conductors on the opposite side of the board. This reduces emitter degeneration to ensure maximum amplifier gain (see text).

need for individual emitter resistors. Fig. 1 shows the basic arrangements for parallel and push-pull amplifiers at (A) and (C). Parallel operation is more practical when the circuit of fig. 1(B) is adopted. The input and output transformers have additional windings to permit in-phase drive and output connections for each transistor used in parallel operation. This makes it less difficult to effect an impedance match (higher terminal impedances), but complicates the transformer and PC-board design. Practically, it would be much better to use the push-pull arrangement of fig. 1(C).

## Amplifier Gain and Device Choice

An RF power transistor should be selected on the basis of its  $f_T$  (the frequency at which it has a gain of 1, or unity) and  $h_{fe}$  (gain) at the desired operating frequency. A practical rule of thumb is to select a device with an  $f_T$  of approximately five times the proposed operating frequency. Thus, for 7 MHz work the  $f_T$  should be at least 35 MHz. The chosen transistor should have a gain of 8–12 dB at the highest desired operating frequency. However, you need to be aware that the higher the  $f_T$  and gain, the greater the chance for amplifier instability, especially at the low end of the operating range in a multiband amplifier. This is because the gain for a given bipolar transistor increases markedly at each lower octave of operating frequency. It is prudent to avoid using VHF or UHF transistors at HF because of this instability potential. For the same reason, do not use UHF devices at VHF. Many low-cost audio power and switching transistors are suitable as RF amplifiers at HF because they have  $f_T$ 's in the VHF range. They should not be overlooked when you build an amplifier.

The gain of a common emitter RF amplifier is dependent also on how effectively we AC-ground the emitter of the device. The more reactive (unwanted inductance) the circuit-board conductor, the lower the amplifier gain. This is caused by unwanted degeneration. Therefore, it is imperative that the emitter be returned to a PC ground conductor that is as short and wide as practicable. It is essential that we use a double-sided PC board, with the

component surface of the board acting as a ground plane. The ground conductors on the etched side of the board are connected to the ground plane atop the board at several points by means of eyelets that are soldered to the ground conductors on both sides of the board. Ideally, some of the eyelets are placed as near to the emitter site as possible. Plated-through holes in the PC board also accomplish this task, but they are beyond the workshop capability of most amateur builders. Fig. 2 illustrates two ways to connect the ground plane to the bottom-side ground conductor. Eyelets are shown, along with four copper straps on the perimeter of the hole where the transistor is mounted for contact with the heat sink. The straps are used to join the top and bottom ground conductors. This greatly minimizes unwanted  $X_L$  at the emitter connection, thereby preventing a loss of gain, plus enhancement of stability in certain situations. The component pigtailed that join the top and bottom ground conductors do not serve the foregoing purpose because RF currents flow on the surface of conductors. However, when eyelets or straps are used, the current will flow between the two circuit-ground elements to provide a suitable RF path. If eyelets are used, do not solder across their holes.

The ground-plane side of the circuit board, in combination with the etched foils on the opposite side of the board, form low-value capacitors with glass-epoxy as the dielectric. These function as VHF and UHF bypass capacitors to aid stability at VHF and above when high- $f_T$  transistors are used.

## The Instability Challenge

Few experimenters have escaped the annoyance of amplifier instability. Despite careful layout and device selection I have had a number of "oscillator-amplifiers." Transistors are capable of self-oscillating from audio through the UHF region, with the low RF and audio frequencies being the predominant region of the spectrum for instability. This is because of the gain-per-octave phenomenon that I mentioned earlier.

Some amplifiers self-oscillate at low drive or operating voltage levels, but are stable when the collector current is increased. It is wise to

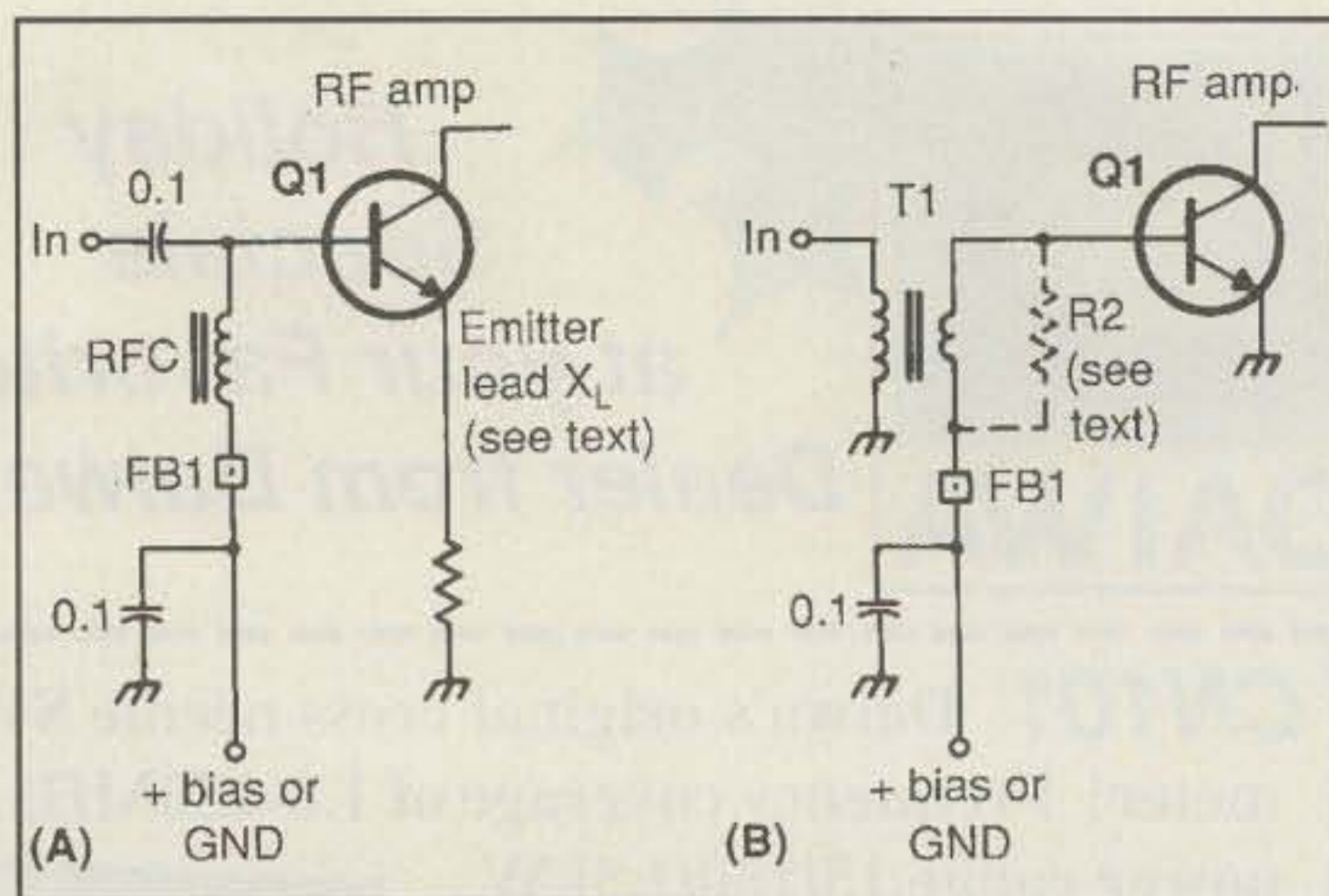


Fig. 3- Methods for lowering the input-circuit  $Q$  to enhance stability. FB1 at (A) lowers the RF choke  $Q$ . A 10 ohm resistor may be used in place of FB1 in circuit (A). R2, at (B), offers an alternative to FB1 for lowering the input  $Q$  (see text).

check a completed RF amplifier for stability from zero drive to full drive. The easiest way to do this is by observing the output waveform with a 50 or 100 MHz scope while the amplifier is terminated by a resistive 50 ohm load. A properly formed sine wave will be seen if oscillations are not present. A distorted sine wave, additional responses on or near the sine wave, and "grass" on the waveform are indications that something is amiss.

Another form of instability is referred to by some amateurs as a "subharmonic." A spurious signal appears at one half the operating frequency, such as a 75 MHz signal from a 150 MHz amplifier. This phenomenon is more likely to be observed in VHF and UHF solid-state amplifiers than in HF circuits, although I have encountered it at HF. This oscillation is brought on by the varactor effect in the base-collector diode junction, or in combination with the base-emitter diode junction, according to H. Granberg.<sup>1</sup> This is most common when using a 12.5  $V_{CC}$  and/or low driving power. The remedy for half-frequency oscillation is the same as for other common forms of self-oscillation. This calls for lowering the  $Q$  (de- $Q$ 'ing) of the amplifier input circuit at the bases of the transistors. Fig. 3 shows how this is achieved. The RF chokes (RFC1) in the base circuit have their  $Q$ s reduced by adding an 850  $\mu_i$  miniature ferrite bead to one of the choke pigtailed. I checked a 10  $\mu H$  RF choke with a Boonton  $Q$  meter before and after adding a bead, and found the initial  $Q$  to be 40. Upon adding the bead, the  $Q$  dropped to 10. A low-value resistor (R1) of 10 or 15 ohms will serve the same purpose. Placing a resistor (R2) in parallel with the choke or secondary winding of a broadband transformer will also lower the circuit  $Q$ . At HF a parallel resistor of 10 to 47 ohms is suitable for this purpose.

The lower the resistance value for parallel de- $Q$ 'ing the greater the driving power needed to obtain the rated output power of the transistor: Some of the driving power is dissipated in the resistor.

## Bypassing Versus Stability

Effective bypassing is essential for all frequencies when designing a solid-state amplifier. Specifically, we need to ensure that the



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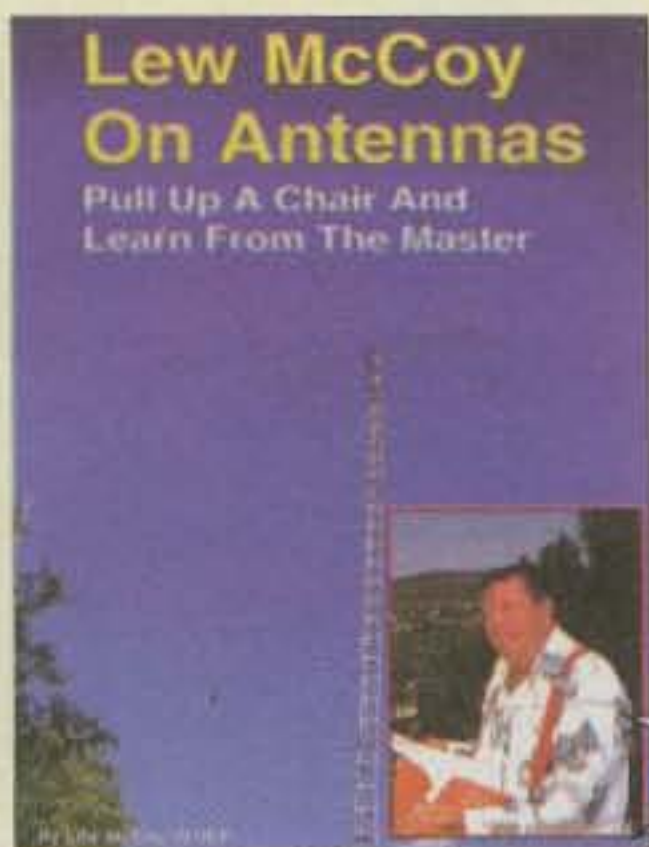
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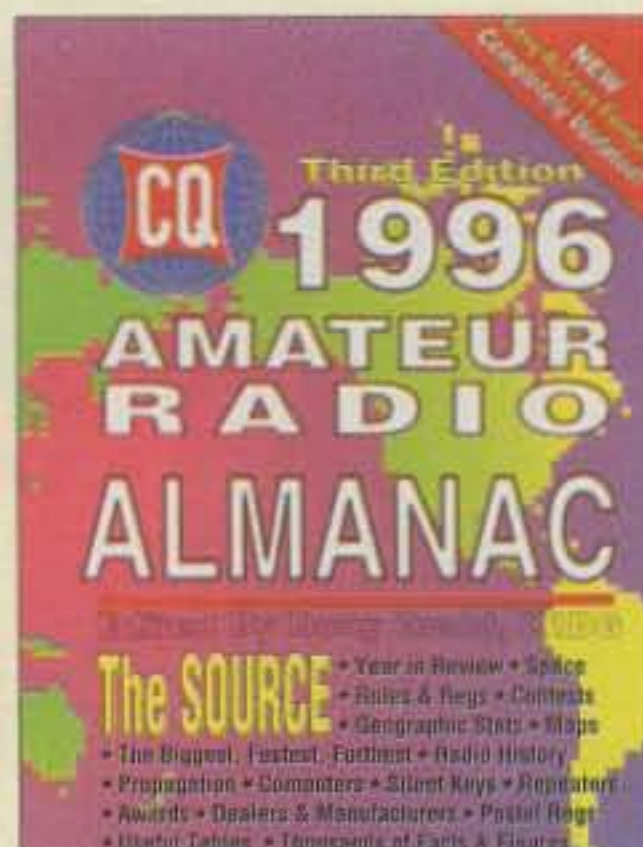


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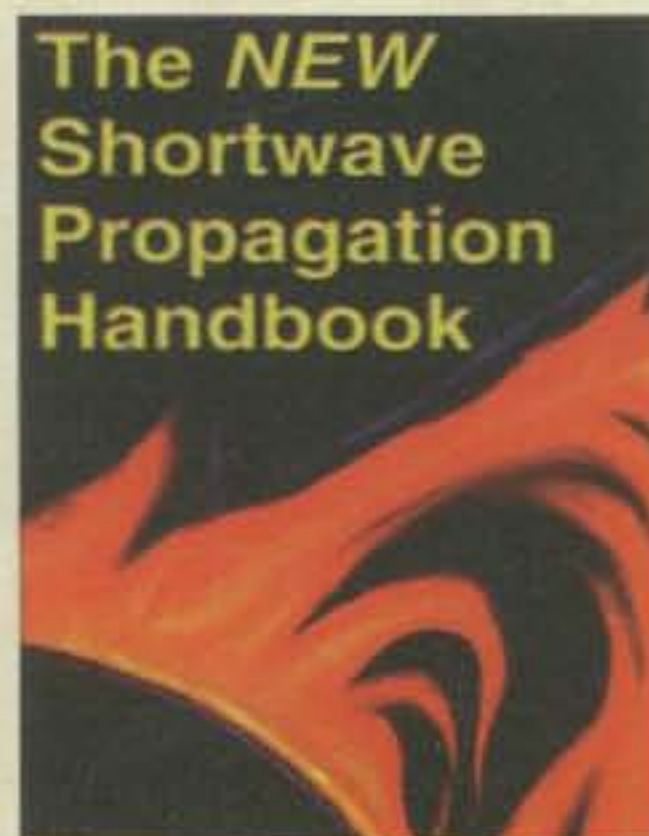


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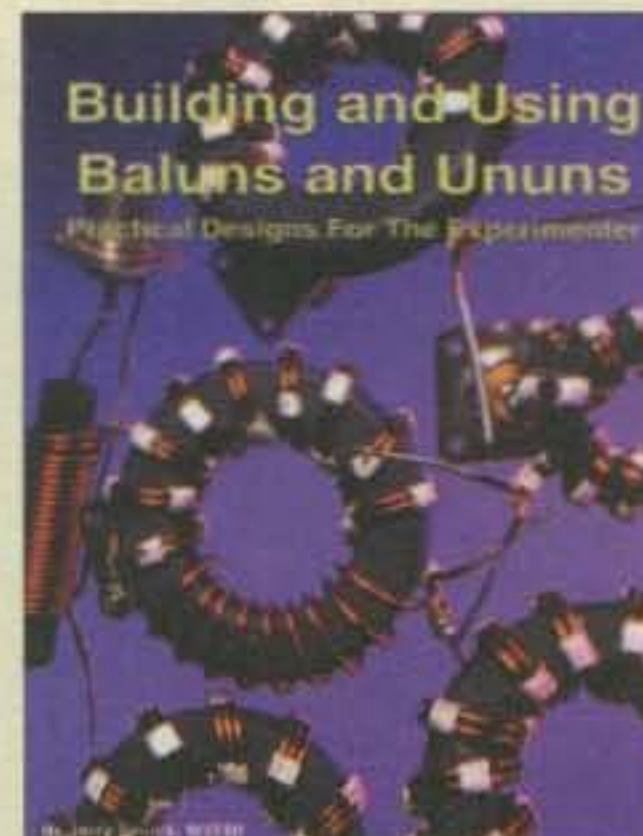


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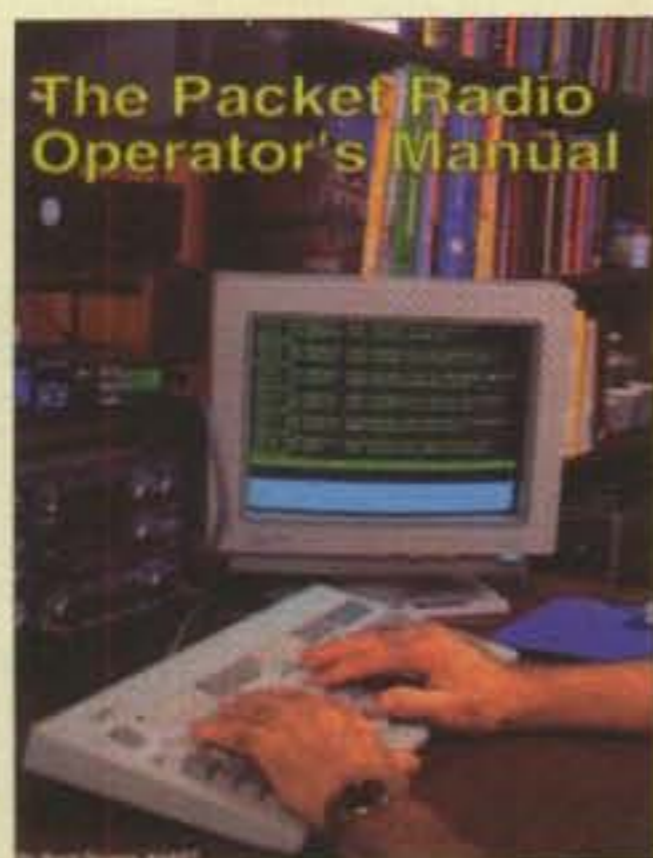
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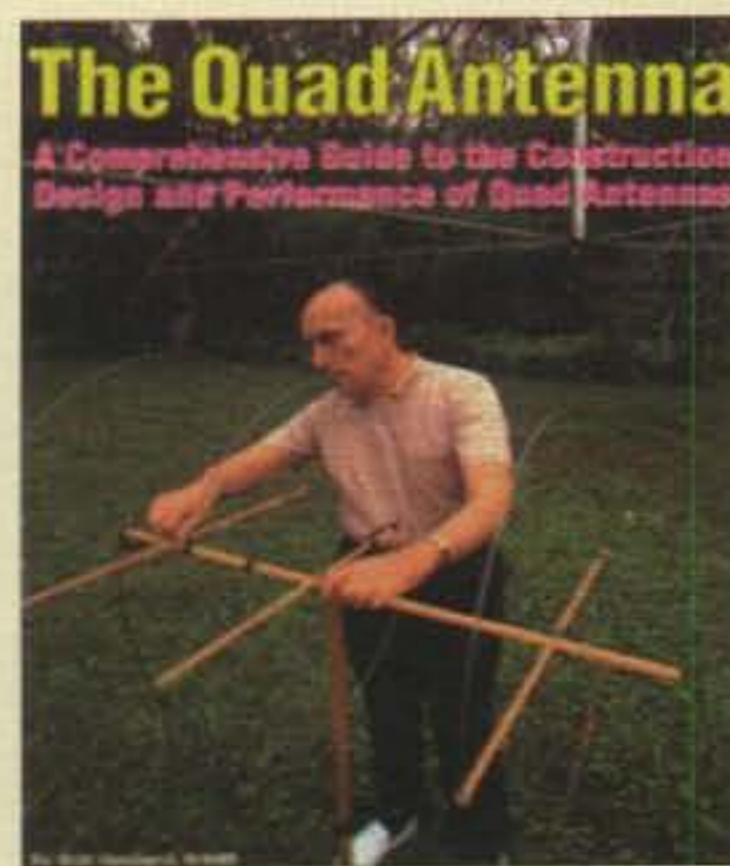
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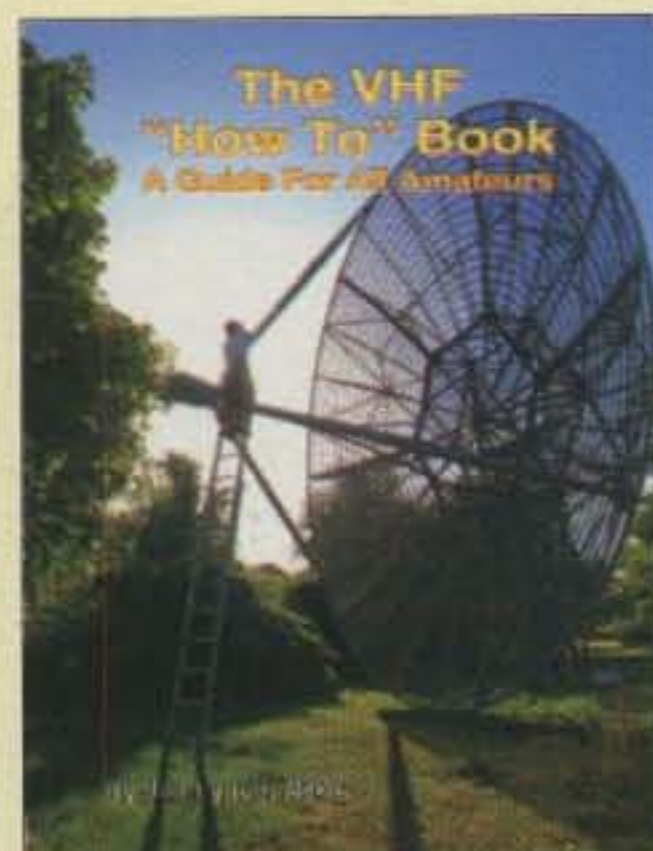
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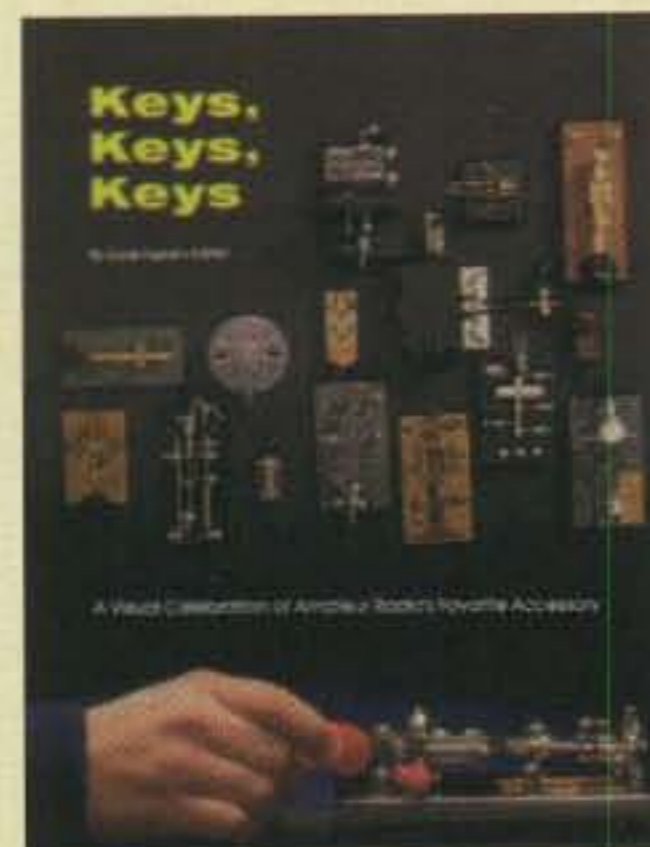
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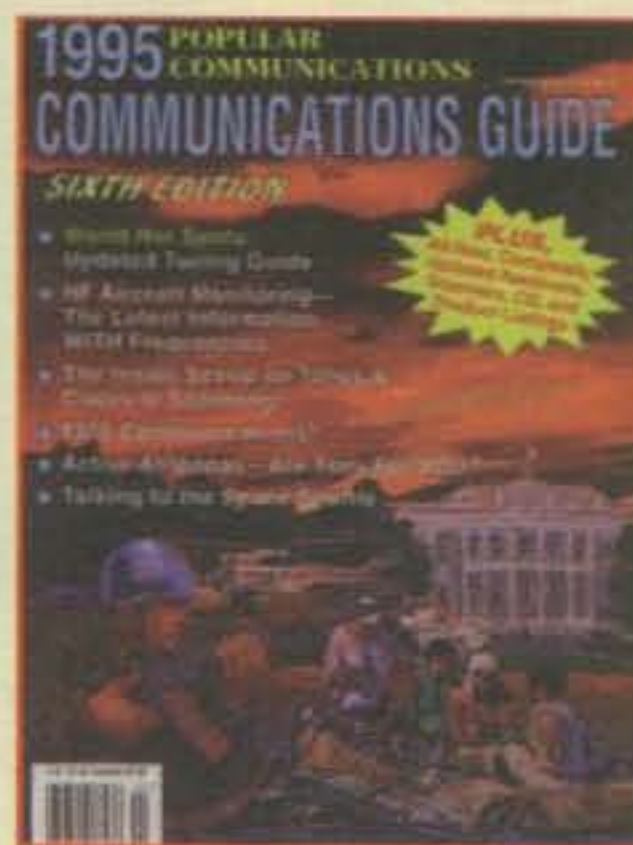
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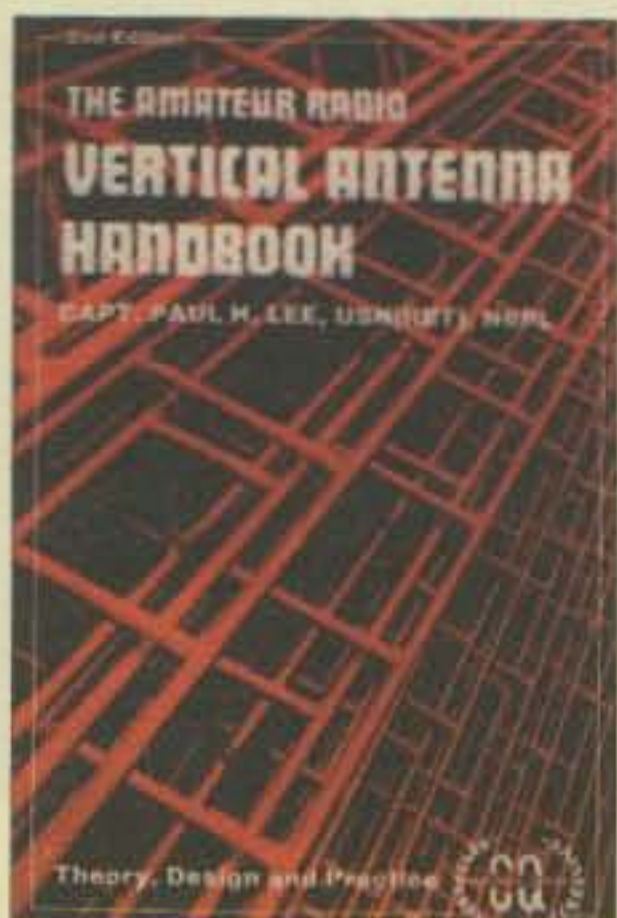
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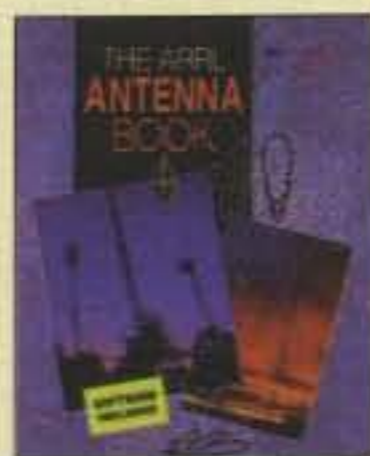
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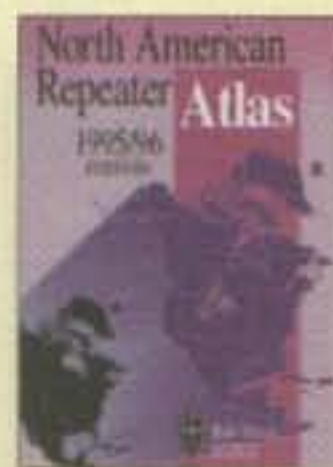




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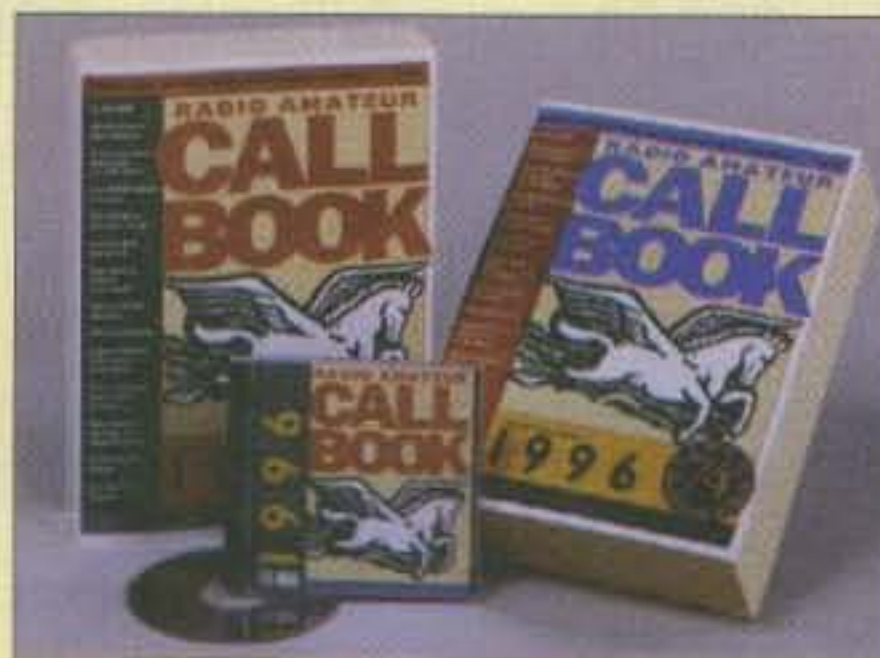
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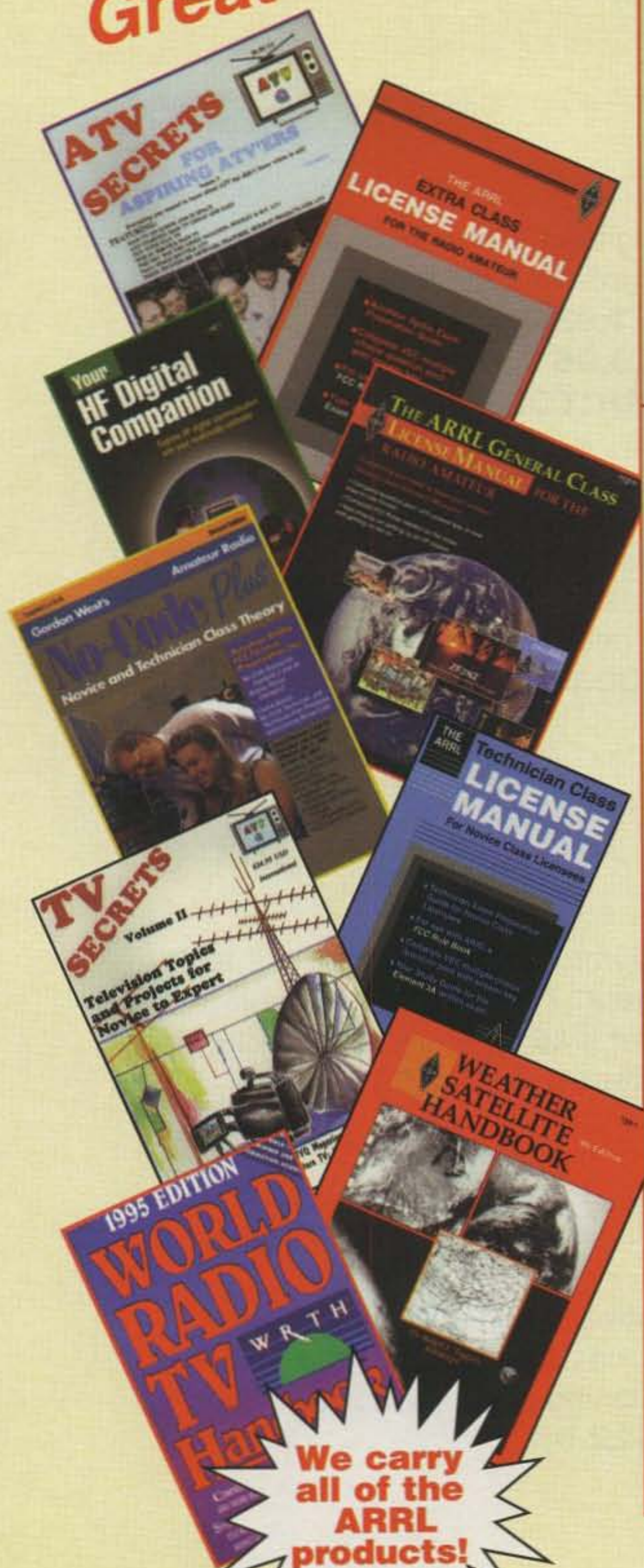
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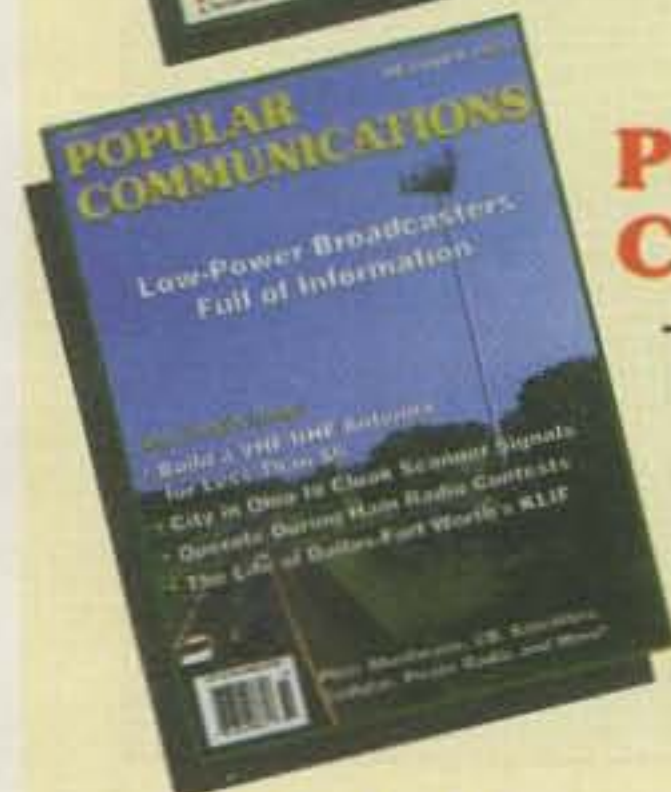
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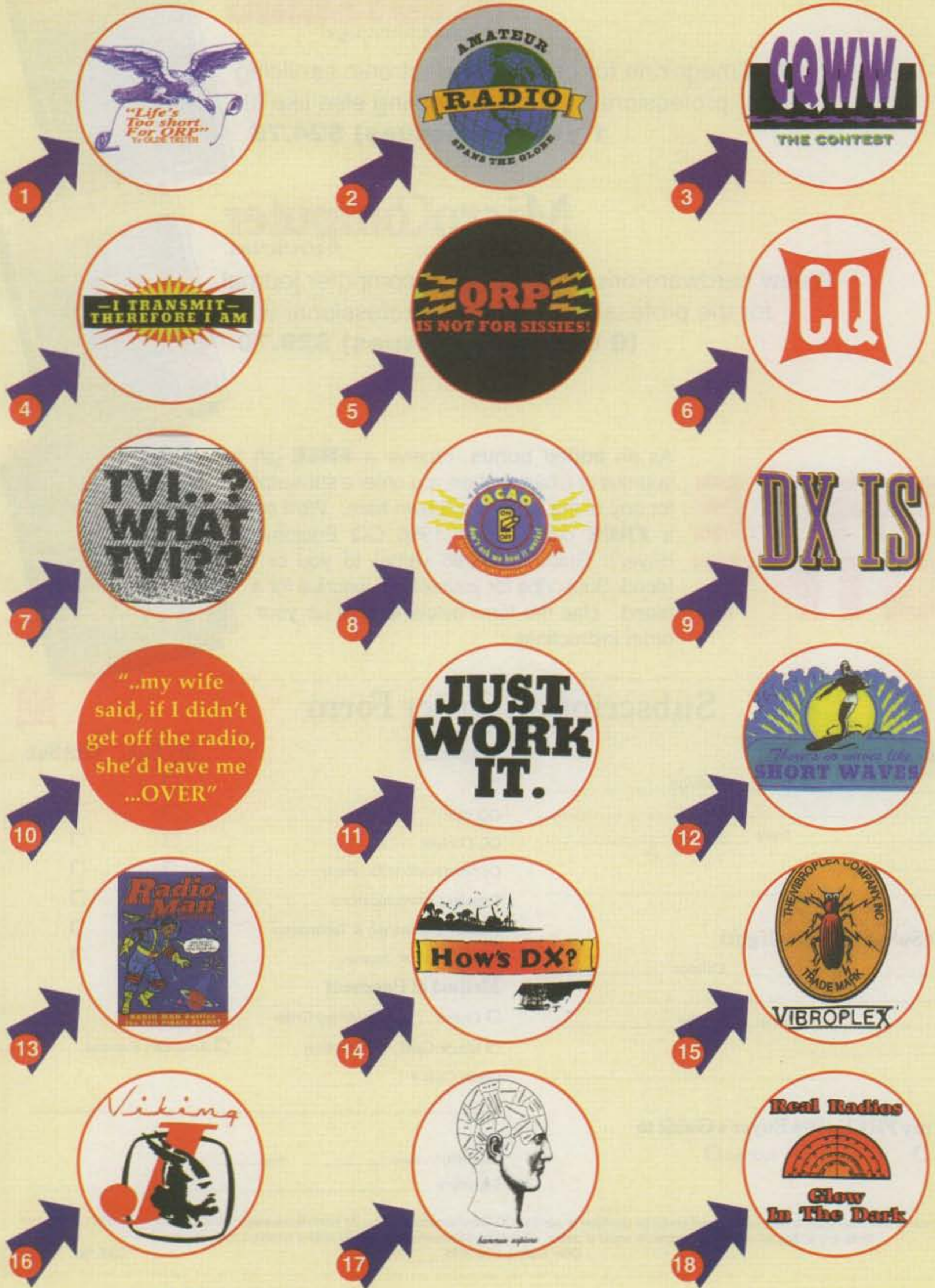
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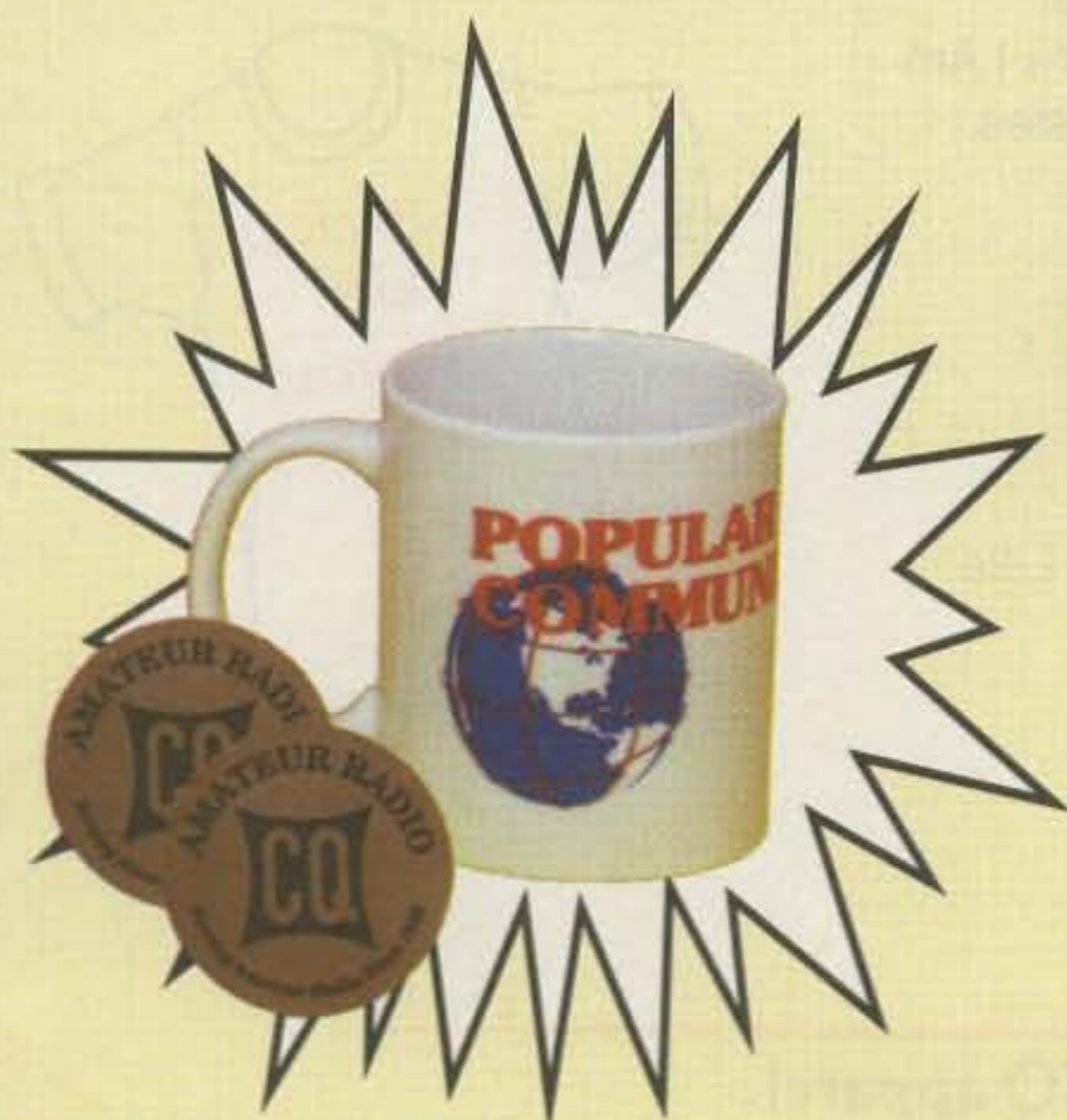
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## The Importance of Proper Matching

It is common knowledge that maximum power transfer occurs only when unlike impedances are matched. Certainly, this applies to the input and output circuits of solid-state amplifiers. It is not unusual to find that an amateur builder has ignored this important rule, and that dreadful mismatches exist at both ends of his or her amplifier. The harmonic filter at the output of the amplifier cannot perform its function if it is not matched to the collectors and antenna. Furthermore, serious mismatches can cause the amplifier to self-oscillate. In fact, the transistors may be destroyed quickly if this happens, owing to high RF voltage peaks that can occur during self-oscillation or high SWR periods. Protection against these voltage peaks can be aided by connecting a 36 volt, 1 watt Zener diode (for a 12.5 volt amplifier) from each collector to ground.

Faulty impedance matching at the amplifier input circuit will result in lower amplifier output

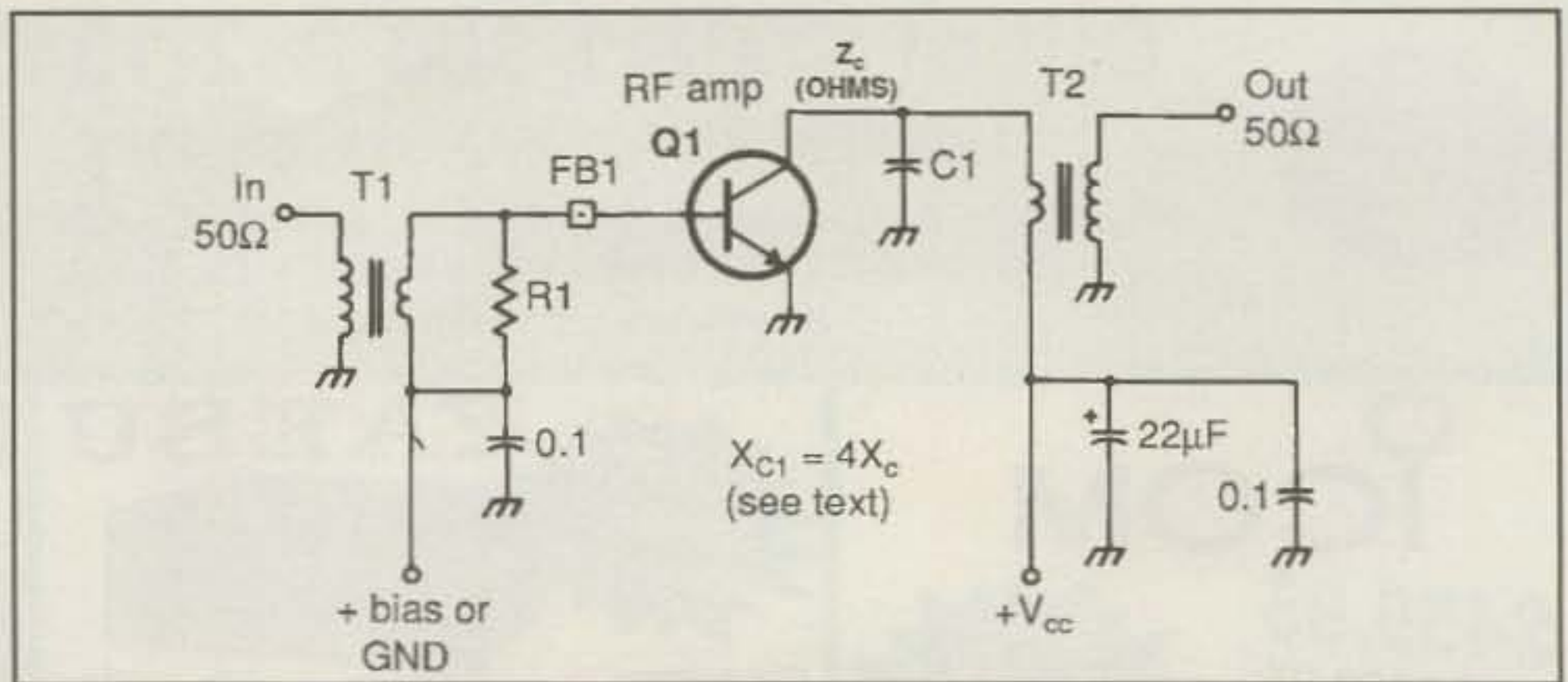


Fig. 4—FB1 may be added to damp VHF self-oscillations. C1 can be used to damp VHF oscillations and reduce VHF harmonics in an HF amplifier (see text).

power unless the drive level is increased to compensate for the mismatch losses. A high input SWR usually occurs when the builder doesn't understand the principles of impedance matching, or when he picks up bits and pieces of circuits from magazine articles and combines them in a reckless manner. Comprehensive solid-state design data are available, in plain language, in three ARRL publications.<sup>2</sup> These publications are recommended for experienced and neophyte builders of transmitters, receivers, and accessory equipment.

## VHF Harmonics And Oscillations

It is not unusual to observe VHF harmonic cur-

rents in the output waveform of a solid-state HF amplifier. This is most likely to occur when transistors with a high FT are employed. VHF self-oscillations may also occur.

A simple cure for the latter condition is the use of FB1 at the transistor base, as shown in fig. 4. The addition of C1 will help to damp VHF oscillations, and it will greatly attenuate unwanted VHF harmonics. The use of this capacitor is not well known, and it is seldom seen in commercially produced amplifier circuits. I have used the C1 approach successfully for many years.

You must be careful about the C1 value chosen, lest it attenuate RF energy at the desired operating frequency. The  $X_C$  of C1 should be approximately 4 times the collector impedance,  $Z_C$ .

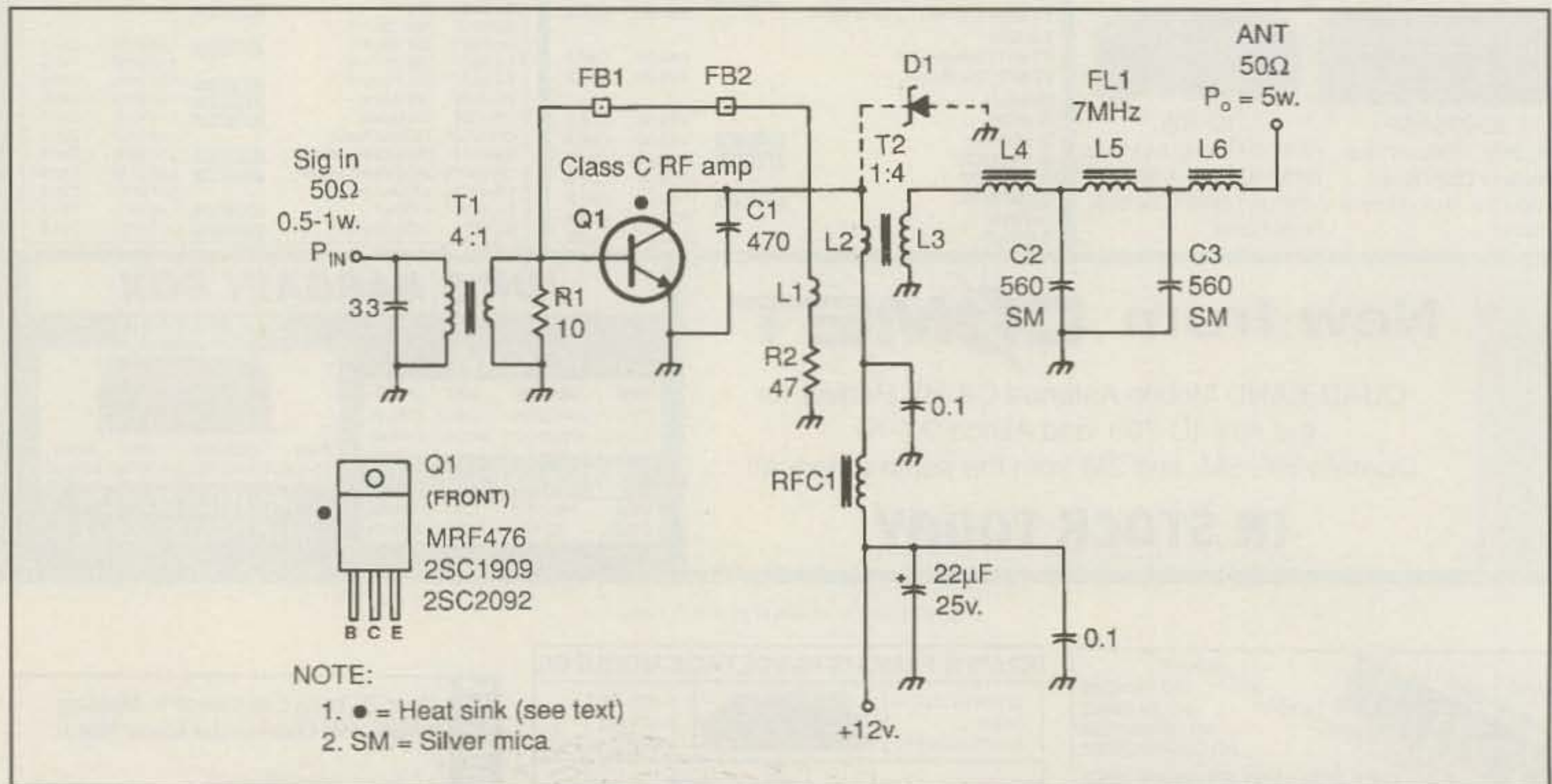


Fig. 5—Schematic diagram of a practical 5 watt class-C amplifier for 7 MHz. FB1 and FB2 are 850  $\mu$ i ferrite beads. D1—a 36 volt, 1 watt Zener diode—may be added for SWR protection (see text). L4 and L6 consist of 14 turns of No. 26 enameled wire on an Amidon T37-2 toroid (0.8  $\mu$ H). L5 uses 20 turns of No. 26 enameled wire on a T37-2 toroid (1.67  $\mu$ H). T1 contains 12 primary turns of No. 26 enameled wire on an Amidon FT-37-43 ferrite toroid. The secondary winding has 6 turns of No. 26 wire. L3 of T2 has 12 turns of No. 24 enameled wire on an FT-82-43 toroid. Use 6 turns of No. 24 wire for L2. L1 is a 1-turn winding. See text and fig. 4 for data about C1. RFC1 has 10 turns of No. 24 enameled wire on an FT-37-43 toroid. This amplifier is described in detail, along with a PC-board pattern, in the 2nd edition of W1FB's QRP Notebook (see note 2). Information is provided for operation from 160 through 10 meters.



## October Column Correction

Thanks to the sharp eyes of Bill Coffey, W2PX, and other readers, I am compelled to advise you of an error that Murphy helped me to introduce in my October column, page 82, fig. 1. The equation for crystal load capacitance was written for series rather than parallel capacitance. My apology for the confusion I may have caused in fig. 1. The correct equation is:

$$C_{LOAD} = \frac{(C1 + C_{IN}) C2}{C1 + C_{IN} + C2}$$

$$C_{LOAD} = \frac{(33 + 6) 100}{33 + 6 + 100} = 28.06 \text{ pF}$$

Hence, if the amplifier delivers 10 watts of output power and has a +12.5 V<sub>CC</sub>, the Z<sub>C</sub> will be 20 ohms. Four times Z<sub>C</sub> equals 80 ohms. From this we determine that C1 for operation at 7 MHz is 280 pF. A standard-value 270 pF capacitor may be used. This is determined from the formula:

$$C_{\mu F} = 1/(f_{MHz} \times X_{C1} \times 6.28)$$

C1 is not recommended as part of the routine design procedure. It should be included only when treating the foregoing VHF problems, since it will have a slight shunting effect on the circuit impedance at the operating frequency.

## A Practical 5 Watt Class-C Amplifier

Many of the design tips in this article are apparent in the circuit of fig. 5. Shunt feedback (FB1, FB2, L1, and R2) is included. This network is used to level the amplifier gain so that it may be used from 1.8 through 29 MHz by merely changing the values in FL1. Gain leveling is necessary in order to prevent Q1 from having excessive gain at the lower frequencies, as discussed earlier. L1 is a one-turn winding that has been added to T2. The value of R2 determines the amount of feedback. D1 is optional for preventing Q1 damage if the SWR is high, or should self-oscillation occur.

The fig. 5 amplifier can be operated linearly in class B by lifting the grounded end of the T1 secondary winding, adding 0.1 μF and 22 μF bypass capacitors, and supplying the base of Q2 (via T1) with +0.7 VDC regulated. Linear operation requires a larger heat sink for Q1 than is needed for class-C operation. This is because the transistor draws idling current in class B, and does not rest (cool down) between CW characters or words.

## In Summary

This article is by no means all-inclusive with respect to solid-state amplifier design. I have tried to address the most common problems experienced by amateur builders. Certainly, the subjects of proper transistor mounting, heat sinking, and harmonic suppression have been ignored. There is also the matter of generating large amounts of power and combining 50 or 100 watt amplifier modules by means of splitters and combiners when developing amplifiers in the 200 to 1000 watt class. A number of excellent Motorola application notes are

available for those who wish to build large linear amplifiers with bipolar transistors or power FETs. The references in note 1 also contain information on this general subject.

## Notes

1. H. Granberg, K7ES, "Good RF Construction

Practices and Techniques" (originally published in *RF Design* for Sept./Oct. 1980), Motorola Semiconductor Prod., Inc., Box 20912, Phoenix, AZ 85036.

2. D. DeMaw, W1FB, and W. Hayward, W7ZOI, *Solid State Design for the Radio Amateur* (ARRL, Inc.). D. DeMaw, *W1FB's QRP Notebook and W1FB's Design Notebook* (ARRL, Inc.).

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## NEWS/VIEWS OF ON-THE-AIR COMPETITION

### When Are Enough Rules Really Enough?

**T**here are very few contesters who get the "opportunity" to peruse contest rules like I do. Every month I pore over scores of E-mail, snail mail, FAXes, and handwritten requests for rules to be included in this column. In most cases I'm glad to oblige.

While most rules tend to follow a somewhat standard format, there is quite a bit of variance when looking at the extremes. The ARRL Straight Key Night, reported this month, limits its primary rules to the simple requirement of a hand key. Use of keyer, it is rumored, is punishable by having to write *QST's* Section News on the blackboard 100 times! The other end of the rulemaking spectrum is *CQ's* World-Wide DX Contest rules. Three printed pages are needed to detail all of the intricacies of the contest (including trophies). The question is: When have you said enough in "the rules"?

Sponsors of major contests (i.e., *CQ WW*, ARRL DX, ARRL SS, *CQ WPX*) have a dilemma when publishing their rules. They have to constantly mediate between the need for completeness and the desire to not require participants to hire an attorney for interpretation. The past five years or so have seen this unfortunate scenario dramatically escalate. With the advent of technology and the creative thinking of many operators, it's become necessary to fine-tune rules time and time again.

Let me suggest some guidelines that I hope all rulemaking bodies will consider. For starters, rules should be written with the general operating population in mind. A rule designed for one individual situation is a bad rule in my opinion. Second, rules should never be written in a vacuum. One of the benefits of the *CQ* and ARRL structures is that this cannot happen. Rules written "by committee" provide a fighting chance to avoid confusing language or other inconsistencies. Another area to consider is bad rules. Despite the best intentions at a given point in time, some rules are either poorly written or have become obsolete. It's perfectly acceptable to eliminate bad rules for whatever reason.

One of the strengths—and liabilities—of the *CQ WW* Contest is its longstanding collection of records. Many world-class operators have gone to great lengths to keep or break category records. I personally feel that everything possible should be done to preserve these records when considering scoring changes in *CQ's* contest rules. Having said that, though, changes that ultimately make the contest better should never be rejected outright just because of tradition.

Speaking of tradition, one of the most asked questions of the *CQ WW* Committee is why we continue to sponsor our *CW WW* Contest on Thanksgiving weekend. If we're honest, tradition does play a part. A very full contest cal-

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Dec.	3	QRP ARCI Holiday Sprint
Dec.	9-10	ARRL 10 Meter Contest
Dec.	31	ARRL Straight Key Night
Dec.	31	RAC Canada Winter Contest
Jan.	6-7	ARRL RTTY Roundup
Jan.	6-7	North American CW QSO Party
Jan.	12-14	Japan Int'l. Low Band CW Contest
Jan.	13-14	YLRL Novice/Technician Day
Jan.	13-14	Michigan QRP Club CW Contest
Jan.	13-14	HA DX Contest
Jan.	13-14	North American SSB QSO Party
Jan.	15-20	UTA DX Marathon Contest
Jan.	20-21	ARRL VHF Sweepstakes
Jan.	19-21	YL Int'l. CW QSO Party
Jan.	21	QRP ARCI Winter Fireside SSB Sprint
Jan.	26-28	<b>CQ WW 160 Meter SSB Contest</b>
Feb.	10-11	PACC Contest
Feb.	10-12	YLRL YL-OM SSB Contest
Feb.	16-18	YLRL Int'l. SSB QSO Party
Feb.	17-18	ARRL CW DX Contest
Feb.	23-25	<b>CQ WW 160 Meter CW Contest</b>
Feb.	24-26	YLRL YL-OM CW Contest
Feb.	25-26	Winter QRP QSO Party

endar is also a major contributor. And, there is the reality that the *CQ WW* is, by its very name, a world-wide contest in which many participants do not celebrate the U.S. Thanksgiving holiday. I'd say there are some pretty strong arguments for keeping it the way it is.

Well, let's get to the bottom line. To be honest, I'm bothered by the complexity of some contest rules. I'm even more bothered by those who seemingly spend most of their waking hours looking for ways to circumvent the intent of rules, thus generating the need for more rules. I've always had a very simplistic view of operating. I can honestly say that I haven't reviewed a set of contest rules in years with my own personal contest operation in mind. Contest operating to me and many others is nothing more than "getting on and working the boys (and girls!)." My focus is in areas such as station, propagation, activity, preparation, and drive, and most important "copying the call-signs and exchanges, and getting them into my log without errors." Sure, you can call that "W1-mentality" where the need to find an extra operating edge is less necessary, but I think it's a good model for everyone to follow.

Has the proliferation of contest rule growth gone too far? Probably not, but it's sure getting there. I'd like to know what you think!

#### 1994 *CQ WW* Errata

The following are corrections to unfortunate mistakes recently reported in the 1994 *CQ WW* Contest results.

#### December's Contest Tip

Even though winter is fast approaching and the possibility of tower projects are fading, it's never too late to consider a wire antenna project. You'd be amazed how quickly you can get a signal on 160 meters for the upcoming 160 contests with a simple inverted "L" hung from a tree and four or five radials. Take a look through some of the antenna books and check it out. All you need is a good pair of gloves and you're well on your way!

#### SSB

DF9LJ should have been listed as DJ9LJ in the 1.8 MHz, Low Power category.

The operator of PQ0MM was PP5JR.

IK7WUE's score was 50,676, not 17,219.

The multi-single score of LU4AA (3,256,715) was erroneously omitted.

JH6AUS should have been listed as a 28 MHz single band entry.

#### CW

The single operator, low power score of KJ9C (197,000) was erroneously omitted.

W9VNE should have been included in the VP5VW operator list.

Teams 5 and 6 should have been reversed in the team contesting box.

The winner of the European multi-single trophy should have been OT4T. The operators were: ON4WW, DL1SBR, DJ4AX, DL1VJ, DK7PE, RA3AUU, ON6TT, ON4UN, ON6WU, ON5NT, ON4AAC, ON6KD, ON6HE, ON7UF, ON5UK, ON4AFZ, ON1BEJ, ON4TJ, ON4EJ, ON1ACV, ON1CIK, ON7GB, ON4ANT, Marlene, and Stefan.

The single operator score (2,624,410) of LP4H (LU6BEG op.) was erroneously omitted due to the log being sent to the WPX contest committee.

#### New Magazine—*CQ Contest*

As you may have noticed in last month's issue, *CQ Communications* is launching two new magazines, *CQ VHF* and *CQ Contest*. The premier issue of *CQ Contest* is scheduled for January 1996 (mail date December 12th) and will be published ten times a year. The editor is our very own *CQ* World-Wide Contest Director Bob Cox, K3EST.

One of the principal goals of *CQ Contest* will be its international focus, scope, and depth. The magazine will concentrate on coverage of people, analysis, techniques, reporting, and technology. *CQ Contest* will also include technical articles, product reviews, and regular columns on contest clubs, VHF contesting, and the contest participation of women, young people, and shortwave listeners.



Something that has been widely debated recently is the changes amateur radio magazine publishers are considering for contest coverage. The new magazine in no way signals the abandonment of contest reporting in *CQ* magazine. Rather, *CQ Contest* reflects *CQ*'s continuing commitment to contesting and testers. The intent is to provide a new depth of coverage of the worldwide contest scene which is impossible to justify in a general-interest magazine such as *CQ*. However, *CQ* itself will continue to cover contesting, as always.

For additional information (including ordering info), see the *CQ Contest* advertisement found elsewhere in this issue.

## Final Comments

This is a last-ditch reminder that you have only a few more days to return your *CQ* Contest survey (see September *CQ*). I'll be reporting the results within the next few issues.

One of the "benefits" of publishing is that we get to think about the Christmas season way before most people. It seems strange, even as I type this in 80 degree weather, that the holidays will be nearly upon us as you read this. In any event, I wish all of you and your families the best for this holiday season. The world of contesting just keeps getting better and better. I hope the same goes for you, too!

Remember, all Contest Calendar submissions for the March issue must arrive in Hicksville no later than January 3rd.

73, John, K1AR

## ARRL 160 Meter CW Contest

2200Z Fri. to 1600Z Sun., Dec. 2-4

This is the 25th year for this "Top Band" activity. Exchange is between US stateside, VE, and DX stations. DX to DX is not permitted for contest credit.

**Classes:** Single operator, high, low, and QRP; and multi-operator single transmitter.

**Exchange:** RST and ARRL section for W/VE. RST only for DX stations; ITU Region for maritime and aeronautical mobiles.

**Scoring:** Contacts between stations in ARRL sections count 2 points, with DX stations 5 points.

**Multiplier:** Determined by number of ARRL sections and DX countries worked (for W/VE). DX use ARRL sections only.

**Final Score:** Total QSO points times the ARRL section and DX country multiplier.

**Awards:** Certificates to the top-scoring single operator station in each ARRL section and DXCC country. And to the top-scoring multi-operator station in each ARRL Division and continent.

Indicate the multiplier in a separate column only the first time it is worked. Entries with 200 or more QSOs are required to include a dupe sheet. Official log forms are recommended and are available from the ARRL. A large SASE and 45 cents postage or 2 IRCs will get you a supply for more than 300 contacts.

The usual grounds for disqualification (violation of established rules, excessive duplicate contacts, etc.) will prevail.

Mailing deadline for logs is January 4th to: ARRL Communications Dept., 160 Contest, 225 Main Street, Newington, CT 06111.

## ARRL 10 Meter Contest

0000Z Sat. to 2400Z Sun., Dec. 9-10

This is the 23rd annual 10 Meter Contest organized by the ARRL. It's a extremely active competition (even with low solar activity) in which stations can work each other within their own country as well as around the world.

A maximum of 36 hours operating time is permitted out of the 48-hour contest period for all stations. The same station can be worked on SSB and again on CW for QSO points.

**Categories:** Single operator, mixed mode, SSB only and CW only. Multi-operator, single transmitter, mixed mode only.

**Exchange:** W/VE stations (including KH6 and KL7) send RS(T) and state or province. DX stations (including KH2, KP4, etc.) send RS(T) and QSO number starting with 001. Maritime or aeronautical mobile stations use RS(T) and ITU region. Novice/Tech stations must identify themselves with a /N or /T designator.

**Scoring:** SSB QSOs are worth 2 points, CW 4 points, Novice/Tech CW QSOs 8 points.

**Multiplier:** U.S. states (50 plus District of Columbia), Canadian provinces (NB, PEI, NS, VE2-8, VY1, VO1, VO2), DXCC countries, and ITU regions (1, 2, 3).

**Final Score:** Total QSO points times the sum of U.S. states, Canadian provinces, DX countries, and ITU regions, per mode.

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  - Slovenian Contesting
  - To QSL or not to QSL
- The Best of Operating Basics
- Winning from the Canary Islands
- An Inside Look at CQ WW Logchecking
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**Awards:** Certificates will be awarded to the top-scoring single operator station in each category (including /N and /T) for each ARRL section and DXCC country. Also, the top-scoring multi-operator station in each ARRL division and each continent will receive certificates.

Indicate a new multiplier only the first time it is worked. Dupe sheets are required for logs with 500 or more QSOs. The usual disqualification criteria will be enforced. A large SASE will get you log and instruction forms. The standard ARRL policy for electronic logs applies to this contest (contact the ARRL Contest Branch if you have any questions).

Mailing deadline for all entries is January 10th to: ARRL 10 Meter Contest, 225 Main Street, Newington, CT 06111.

### ARRL Straight Key Night

0000Z to 2359Z, Dec. 31

This is a friendly meeting on the air using a straight key only. Suggested frequencies on 80, 40, and 20 meters are 60 to 80 kHz up from lower band edges, 10 kHz from lower edge of Novice bands.

Use SKN instead of RST in the exchange to clue-in other stations. Include a list of stations worked plus your vote for the best fist heard during that period (not necessarily one you've worked).

This is not a contest, so any additional chatter is encouraged.

Send your report and vote for "best fist" and "most interesting QSO" to ARRL SKN, 225 Main Street, Newington, CT 06111 by January 10th.

### 1995 RAC Canada Winter Contest

0000Z to 2359Z Sun., Dec. 31

In December each year the Radio Amateurs of Canada sponsor the Canada Winter Contest. Amateurs all over the world are invited to participate.

**Classes:** Single operator, all band, single band, and low power (100 watts); and multi-operator.

**Exchange:** Canadians send RS(T) and province/territory. All other stations send RS(T) and serial number.

**Bands:** 160 through 2 meters, SSB and CW. CW operating frequencies: 25 kHz up from bottom band edge. SSB operating frequencies: 1850, 3775, 7075, 7225, 14175, 21250, 28500 kHz.

**Scoring:** All Canadian contacts are worth 10 points. QSOs with a RAC official station are worth 20 points. All other QSOs outside of Canada are worth 2 points. Multipliers are Canada's ten provinces and two territories. Count multipliers once per band (192 maximum). Final score is total QSO points times multiplier.

**Awards:** A generous trophy and certificate and trophy program is available to category winners. Be sure to mail your log in.

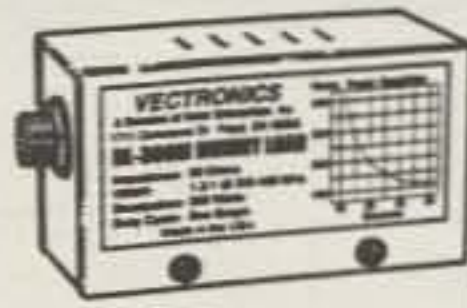
Logs must be postmarked no later than January 31st. Send all entries to: RAC, 614 Norris Court - Unit 6, Kingston, ON K7P 2R9, Canada.



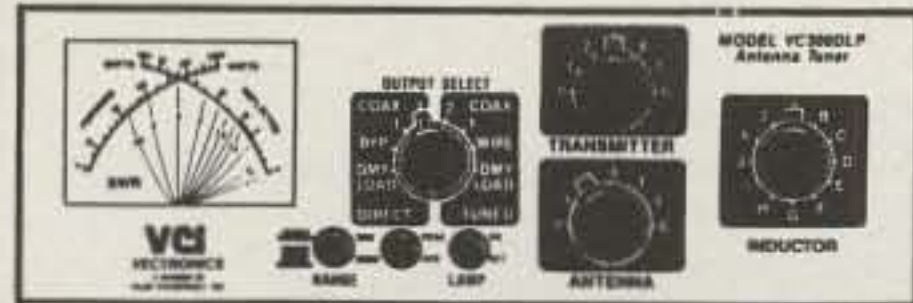
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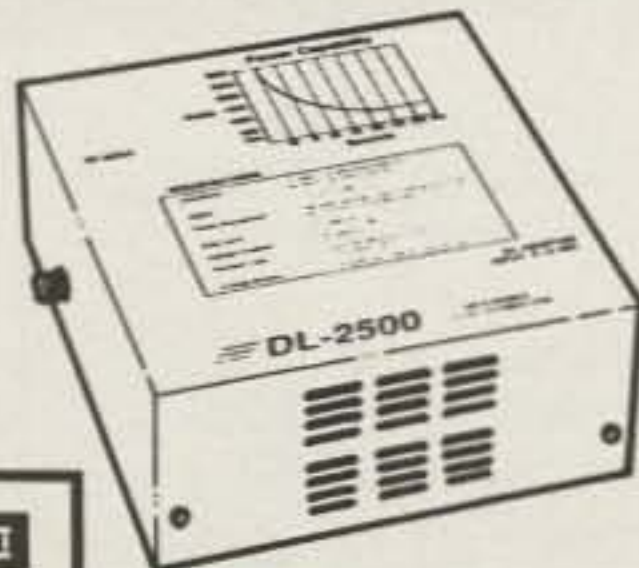


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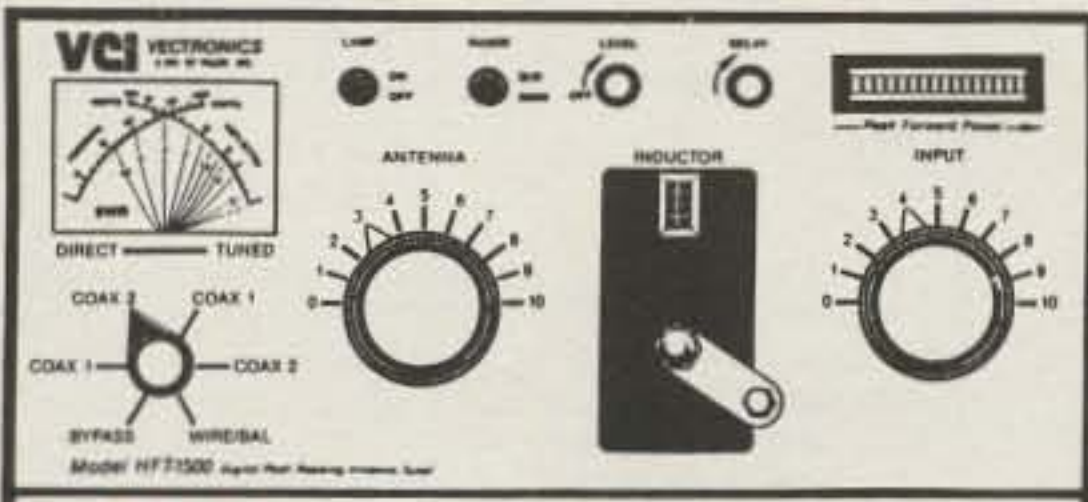
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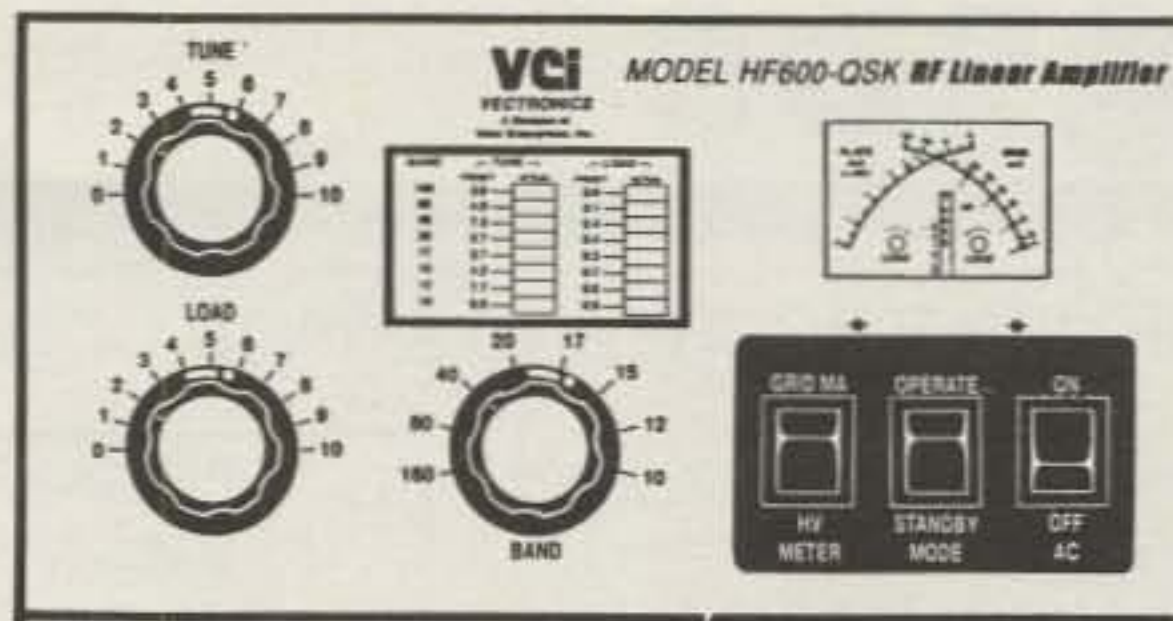
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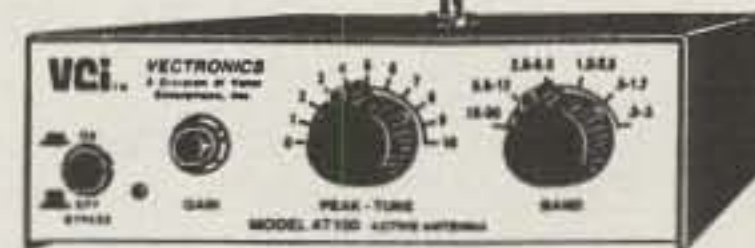


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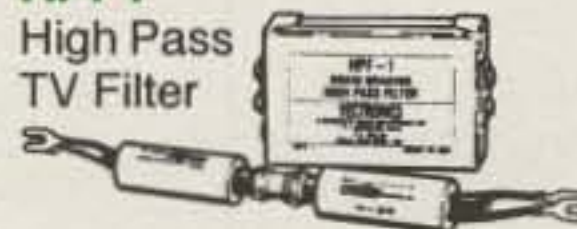


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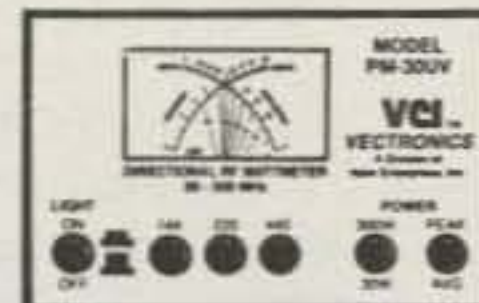
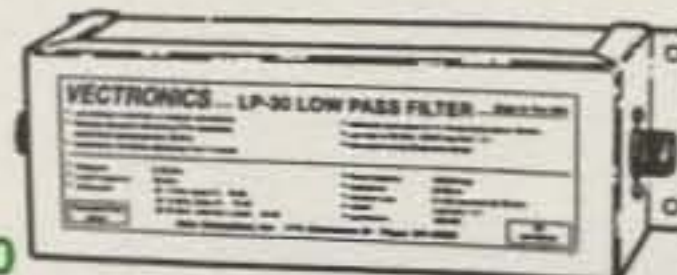
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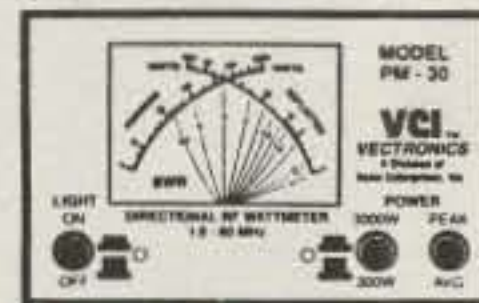
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## NEWS OF CERTIFICATE AND AWARD COLLECTING

**T**his month we salute USA-CA award winner:

### John D. Peters, K1ER USA-CA #871

John started in amateur radio in 1948, but this interest was interrupted by 31-plus years in the Navy, six years of which were spent under water. His tours were spent on the *Battleship Iowa*, as a navigator on an icebreaker, and on a destroyer, a troop transport, and many submar-



John Peters, K1ER, USA-CA #871.

ines (guided missile, ballistic missile, and fast attack).

John made one trip to the Antarctic and three to the Arctic. He was Commanding Officer of a nuclear submarine for five years, and Military Assistant to the Secretary of Defense. In spite of all of these duties, John is on the DXCC Honor Roll, has been a CQ WW DX CW Contest winner, and has a CQ WAZ award and other such wallpaper.

Following his career in the Navy, John was a Program Manager and Systems Architect for IBM. John is a past president of the North Colorado Chapter of QCWA, the Honolulu DX Association, and several other DX clubs.

John started giving out counties—but collecting none—about ten years ago. He finally started chasing counties en route to Dayton, Ohio in 1994. Other family members who are hams are his wife, Joan (KA4DPW), son Dave (WD4RAP), and daughter Sarah (KA4DQZ).

Box 76, Pleasant Mount, PA 18453-0076

### SPECIAL HONOR ROLL

Raleigh L. Wert, W8QOI  
USA-CA All Counties #882  
September 3, 1995

Bob Voss, N4CD  
USA-CA All Counties #883  
September 11, 1995

Steve Wilson, KF7SG  
USA-CA All Counties #884  
September 22, 1995

Randy Hatt, KN4RI  
USA-CA All Counties #885  
September 24, 1995

I had the pleasure of presenting John with his award at the annual Mobile Amateur Radio Awards Club Convention in Hamburg, New York this past July. He and his lovely wife drove over 8000 miles this past summer, with the convention early in the loop. Then in September he gave out Hawaii counties to end his trip.

John tells me that he has his certificate properly framed and next to the DXCC wallpaper. Congratulations to John on his achievement.

### Awards Issued

**USA-CA 500:** Raleigh L. Wert, W8QOI, #2882; Bob Voss, N4CD, #2883; Steve Wilson, KF7SG, #2884; Victor Hugo Botero, HK6ISX, #2885; Jack Reynolds, AA9BO, #2886; Randy Hatt, KN4RI, #2887.

**USA-CA 1000:** Raleigh L. Wert, W8QOI, #1389; Bob Voss, N4CD, #1390; Steve Wilson, KF7SG, #1391; Victor Hugo Botero, HK6ISX, #1392; Jack Reynolds, AA9BO, #1393; Scott Travis, KB5GEO, #1394; Randy Hatt, KN4RI, #1395.

**USA-CA 1500:** Raleigh L. Wert, W8QOI, #1161; Bob Voss, N4CD, #1162; Steve Wilson, KF7SG, #1163; Randy Hatt, KN4RI, #1164.

**USA-CA 2000:** Raleigh L. Wert, W8QOI, #1066; Bob Voss, N4CD, #1067; Steve Wilson, KF7SG, #1068; Randy Hatt, KN4RI, #1069.

**USA-CA 2500:** Raleigh L. Wert, W8QOI, #992; Bob Voss, N4CD, #993; Steve Wilson, KF7SG, #994; Randy Hatt, KN4RI, #995.

**USA-CA 3000:** Raleigh L. Wert, W8QOI, #901; Bob Voss, N4CD, #902; Steve Wilson, KF7SG, #903; Randy Hatt, KN4RI, #904.

### HONOR ROLL

<b>500</b>		KF7SG	1163
W8QOI	2882	KN4RI	1164
N4CD	2883		
KF7SG	2884	<b>2000</b>	
HK6ISX	2885	W8QOI	1066
AA9BO	2886	N4CD	1067
KN4RI	2887	KF7SG	1068
		KN4RI	1069
<b>1000</b>			
W8QOI	1389	<b>2500</b>	
N4CD	1390	W8QOI	992
KF7SG	1391	N4CD	993
HK6ISX	1392	KF7SG	994
AA9BO	1393	KN4RI	995
KB5GEO	1394		
KN4RI	1395	<b>3000</b>	
		W8QOI	901
<b>1500</b>		N4CD	902
W8QOI	1161	KF7SG	903
N4CD	1162	KN4RI	904

The total number of counties for credit for the United States of America Counties Award is 3076. The basic award fee for subscribers is \$4.00. For nonsubscribers it is \$10.00. Initial application must be submitted in the USA-CA Record Book, which may be obtained from CQ Magazine, 76 North Broadway, Hicksville, NY 11801 USA for \$2.00. To qualify for the special subscriber rate, please send a recent CQ mailing label with your application. To be eligible for the USA-CA Award, applicants must comply with the rules of the program as set forth in the revised USA-CA Rules and Program dated June 15, 1991. A complete copy of the rules may be obtained by sending an SASE to Norm Van Raay, WA3RTY, USA-CA Award Manager, Box 76, Pleasant Mount, PA 18453-0076 USA. DX stations must include extra postage for airmail reply.

### Awards Available

**Israel Digital Award.** A certificate measuring 29 x 21 cm with a full-color oval map of the world in the background and gold digital-type writing is available from the Israel Amateur Radio Club. The rules are as follows.

The award is available to licensed amateurs. Contacts on or after January 1, 1994 count for the award. Do not send QSL cards. A list showing full details of contacts with QT locator should be certi-

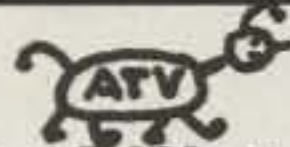


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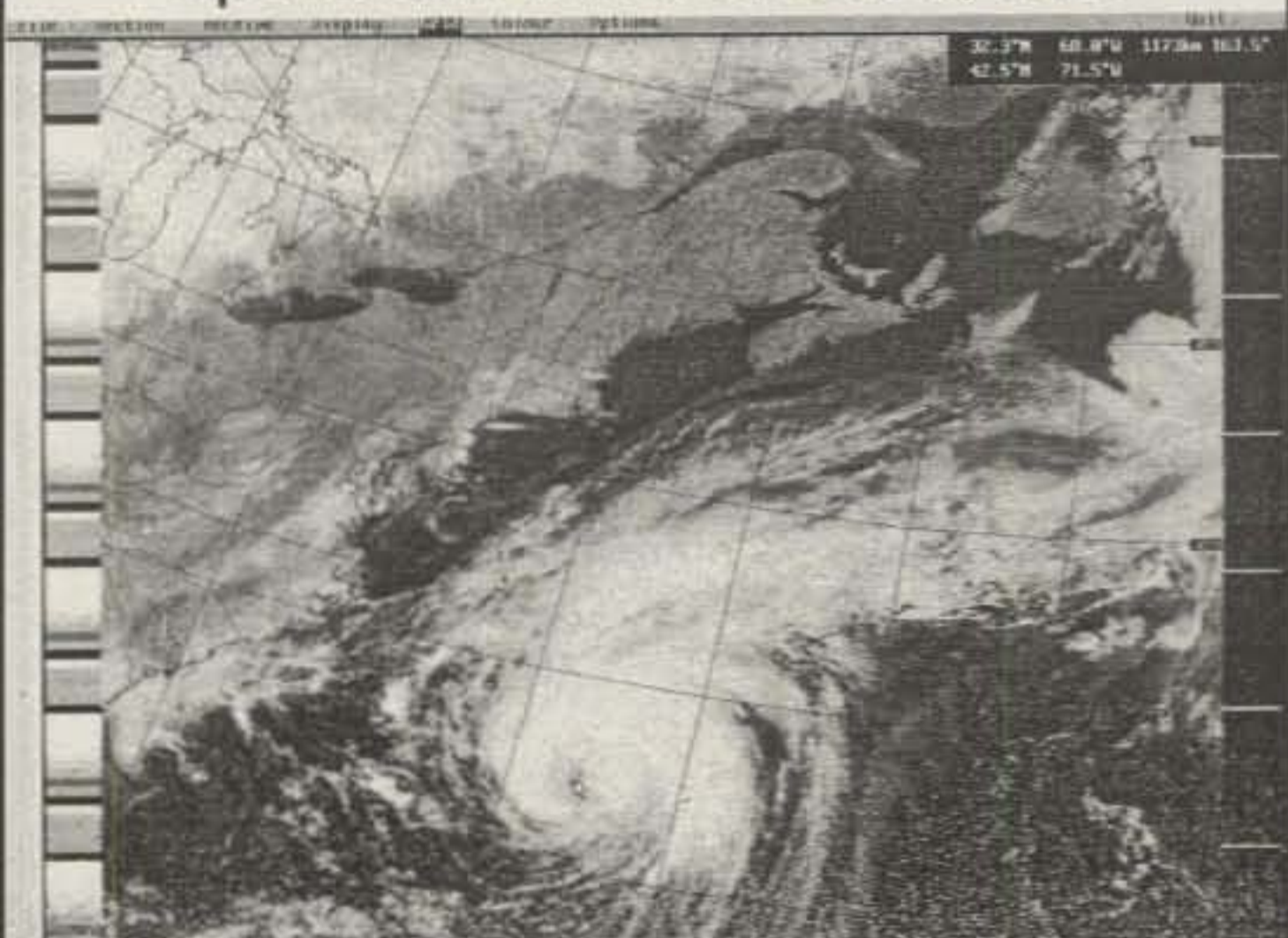
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<b>50 MHz</b>					
0503G	1-5	10-50	6	15/0.6	LPA
0508G	1	170	28	15/0.6	Standard
0508R	1	170	28	+	Repeater
0510G	10	170	25	15/0.6	Standard
0510R	10	170	25	+	Repeater
0550G	5-10	375	60	15/0.6	HPA
0550RH	5-10	375	60	+	Repeater HPA
0552G	25-40	375	55	15/0.6	HPA
0552RH	25-40	375	55	+	Repeater HPA
<b>144 MHz</b>					
1403G	1-5	10-50	6	15/0.6	LPA
1406G	25	100	12	15/0.6	Standard
1409G	2	150	25	15/0.6	Standard
1409R	2	150	24	+	Repeater
1410G	10	160	25	15/0.6	Standard
1410R	10	160	24	+	Repeater
1412G	25-45	160	20	15/0.6	Standard
1412R	25-45	160	19	+	Repeater
1450G	5	350	56	15/0.6	HPA
1450RH	5	350	56	+	Repeater HPA
1452G	25	350	50	15/0.6	HPA
1452RH	25	350	50	+	Repeater HPA
1454G	50-100	350	40	15/0.6	HPA
1454RH	50-100	350	40	+	Repeater HPA
<b>220 MHz</b>					
2203G	1-5	10-40	6	14/0.7	LPA
2210G	10	130	20	14/0.7	Standard
2210R	10	130	19	+	Repeater
2212G	30	130	16	14/0.7	Standard
2212R	30	130	15	+	Repeater
2250G	5	220	40	14/0.7	HPA
2250RH	5	250	40	+	Repeater HPA
2252G	25	220	36	14/0.7	HPA
2252RH	25	250	36	+	Repeater HPA
2254G	75	220	32	14/0.7	HPA
2254RH	75	250	32	+	Repeater HPA
<b>440 MHz</b>					
4403G	1-5	7-25	4	12/1.1	LPA
4410G	10	100	19	12/1.1	Standard
4410R	10	100	18	+	Repeater
4412G	20-30	100	19	12/1.1	Standard
4412R	20-30	100	18	+	Repeater
4448G	5	100	22	12/1.1	HPA
4448R	5	100	22	+	Repeater HPA
4450G	5-10	175	34	12/1.1	HPA
4450RE	5-10	175	34	+	Repeater HPA
4452G	25	175	29	12/1.1	HPA
4452RE	25	175	29	+	Repeater HPA
4454G	75	175	25	12/1.1	HPA
4454RE	75	175	25	+	Repeater HPA



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50 MHz	0520N	.5	25	N
144 MHz	1420B	.5	24	BNC
144 MHz	1420N	.5	24	N
220 MHz	2220B	.5	22	BNC
220 MHz	2220N	.5	22	N
440 MHz	4420B	.5	18	GNC
440 MHz	4420N	.5	18	N
1.2 GHz	1020B	.9	14	BNC
1.2 GHz	1020N	.9	14	N



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fied by the award manager or two other licensed amateurs. The fee for the award is US \$5 or DM. 10. Applications should be sent to: Shlomo Mussali, 4X6LM, Post Box 8225, Jaffa 61081, Israel.

Contacts with stations in Israel only. All bands with digital modes only be used (RTTY, PACTOR, AMTOR, packet, or SSTV). Packet radio messages are available with full details. Contacts with the same station and different bands are permissible.

**Requirements:** Minimum of 10 points. Contacts with packet radio stations count a 1 point. Contacts on HF bands count 2 points.

To confirm via packet, send your CQ message to:

SB IDR@4Z4AAA.ISR.MDLE or  
SB IDR@4X4HF.ISR.MDLE or  
SB IDR@4Z4YU.ISR.MDLE or  
SB IDR@4X4LI.ISR.MDLE or to award manager 4X6LM@4Z4AAA.ISR.MDLE

### Amateur Achievement Awards.

Duane E. Traver, WV2B, writes that interest in the Amateur Achievement Company Awards programs continues to grow. Current standings of award recipients are as follows.

**Native American Counties Award.** This award plaque is issued for contacts with all the U.S. counties the names of which are derived from Native American subjects. Current recipients are: #001 AC4MP, #002 KA2CNG, #003 KD2Q, #004 K7CLO, #005 KC3X, #006 KG5UZ, #007 WB9STT, #008 KJ5PQ, #009 PS8YL, #010 KBØFQC, #011 KC9EU, #012 N1FJR, #013 WV2B.

**United States Prefix Award.** This award plaque is issued for contacting 200 different callsign prefixes assigned to the U.S. and possessions. Endorsement plates are available for the 400, 600, and 700 levels, and each new 100 prefixes past the 700 level. Any difference in the letters and numbers in the first part of a call denotes a new prefix. For example, AA1, AB1, K1, KA1, N1, W1 are all different prefixes. Portable operation will not affect the prefix claimed. Only the prefix of the assigned call may be counted. The only exception is operation from a state or possession which counts as a separate DXCC country. For operations from KH6, KL7, KP2, KP4, etc., you must count the prefix in the portable identifier.

**200 prefixes:** #001 AC4MP, #002 VE3MS, #003 HR1KAS, #004 ONL4003, #005 KF6A, #006 KA2CNG, #007 PY2DBU, #008 PS8YL, #009 LY2ZZ, #010 DK4SY, #011 W6RQQ, #012 I2DMK, #013 S53EO, #100 WV2B.

**400 prefixes:** #001 HR1KAS, #002 ONL4003, #003 DK4SY, #004 I2DMK, #005 S53EO, #100 WV2B.

**600 prefixes:** #001 HR1KAS, #002 DK4SY, #003 I2DMK, #004 S53EO.

**700 prefixes:** #001 HR1KAS.

**48/100 Award.** This award plaque is issued for contacting 100 or more countries, as defined by the current DXCC list, during any 48 period. For this award contacts must be made from one station location and using one callsign. In the case of multi-op or guest-op situations the plaque will be issued to the callsign used, but the callsigns of the operators may also be listed on the plaque. Duplicate plaques may be obtained for each operator. You may apply for this award as often as you qualify.

The current award holders are: #001 ONL4003—148 countries, 1993 CQ WW DX SSB; #002 LY2ZZ—144 countries, 1989 CQ WW DX SSB; #100 W3KXR—103 countries, 1991 CQ WW DX SSB; #101 WV2B—108 countries, 1992 CQ WW DX SSB.

For further information about these awards, applications forms, cost, etc., contact Duane E. Traver, WV2B, 99 Oregon Hill Rd., Lisle, NY 13797. Our thanks to Duane for providing this information to us.

**Mayflower II Award.** Once again the Whitman Amateur Radio Club, Inc. gives us the opportunity to celebrate Thanksgiving on the air with its Mayflower II Award. You hopefully have received this issue in time to participate.



The certificate offered for the Thanksgiving Special Event station Mayflower II, WA1NPO, which is sponsored by the Whitman Amateur Radio Club.

The Whitman ARC will operate a Special Event station, WA1NPO, on Saturday, November 25 and Sunday, November 26, 1995. Suggested frequencies are 3.970, 7.270, 14.270, 18.140, 21.370, and 28.270 during the hours of 1400Z until 2100Z each day. The stations will be set up on the beautiful, historic site of our forefathers' first successful settlement in the New World overlooking Cape Cod. A special QSL card will be sent to those amateurs and SWLs who send an SASE. Also a handsome 7.5" x 10" certificate with the Mayflower II in the background is available for the event. All applications go to the Whitman ARC, P.O. Box 48, Whitman, MA 02382.

73, Norm, WA3RTY





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

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**NEW SBB-5/SBB-5NMO** • Dual-band 146/446MHz w/fold-over  
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**CX-224/CX-224NMO** • Tri-band 146/220/446MHz w/fold-over  
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**B-20/B-20NMO** • Dual-band 146/446MHz w/fold-over  
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## THINGS TO LEARN, PROJECTS TO BUILD, AND GEAR TO USE

### Terrain Analysis

In the real-estate game, a prospective home buyer quickly finds out that the three most important factors in making a purchase are (1) location, (2) location, and (3) location. The same three factors seem to apply to DX operation. Given the fact that most HF Yagis antennas are equal (give or take a few dBs), it is curious that Joe Blow with a 3-element beam at 50 feet always seems to beat out Jasper Sideband, who runs the same power and also has a 3-element beam at 50 feet. What's going on? Superior operator? Maybe. Location? Yes.

It's difficult to analyze a DX QTH. Is the side of the hill better than the top? What influence does a low range of hills a mile or two away have on your path into the Middle East? Why does your buddy get out like a bomb, running only 100 watts? Should you raise your antenna? Lower it? What about factors such as ground slope, shadowing, focussing, compound ground refraction?

Well, your guess is as good as mine—at least up until now. This fellow Beezley, K6STI, decided to do something about this information void in amateur radio. He developed a Terrain Analyzer program to work on a DOS system (386+387, or better, plus VGA).

Using the Uniform Geometrical Theory of Diffraction, ray tracing, and assembly language to implement realistic algorithms (whew), Brian has come up with a fascinating program. The plots give you pause to consider, believe me. Look at fig. 1. This is a plot of a representative 5-element, 20 meter Yagi, 100 feet above ground at the QTH of W6QHS. The Yagi is aimed at Europe. (In all examples to follow, the test antenna height is set at 100 feet for comparison purposes. The program operator, however, can change the antenna and antenna height at will.)

Observe the rays in the angles below 20 degrees. Look at the ground reflection which occurs out to several thousand feet in front of the antenna. W6QHS fires across a valley and gets reflection from the hills on the other side of the valley. He's putting a lot of power at low DX angles, right down to the ground!

Fig. 2 shows the plot at K1KI (the rays are not shown here, only the pattern). The antenna representation is a 5-element job, examined at 100 feet. Not much below 5 degrees, even though K1KI has a nice falloff in the direction under examination.

A 5-element Yagi at KM1H, shown in fig. 3, does a lot better job at the low DX angles. And the 5-element Yagi at W6QHS exhibits an entirely different pattern in fig. 4. Compare it with fig. 1, taken in a different direction!

Well, the point is that you can input your terrain with elevation data from a geodetic survey map, place your antenna at various spots on your property, vary antenna height, and determine for yourself the optimum antenna loca-

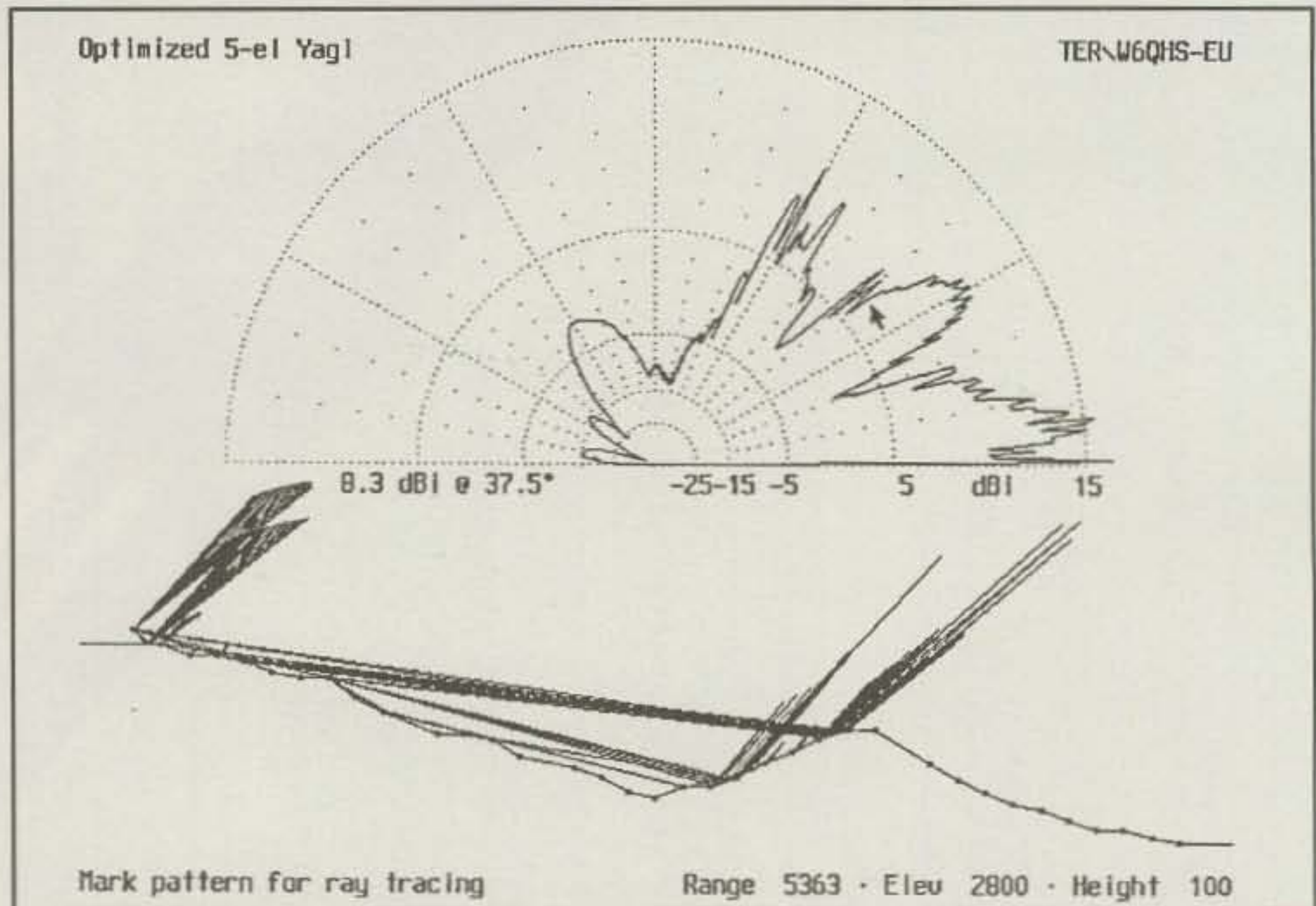


Fig. 1—Terrain analysis at W6QHS with beam aimed at Europe. Antenna height is 100 feet. Note reflections from hills at right, in line of fire.

tion for the principal directions that catch your fancy. A lot easier to move the antenna around via computer than it is to dig holes for your tower! You only want to do that once!

Fig. 5 shows a dipole at 50 feet elevation atop a ridge. In one direction (to the left in the illustration) is a small secondary ridge, below the peak of the main ridge on which the dipole

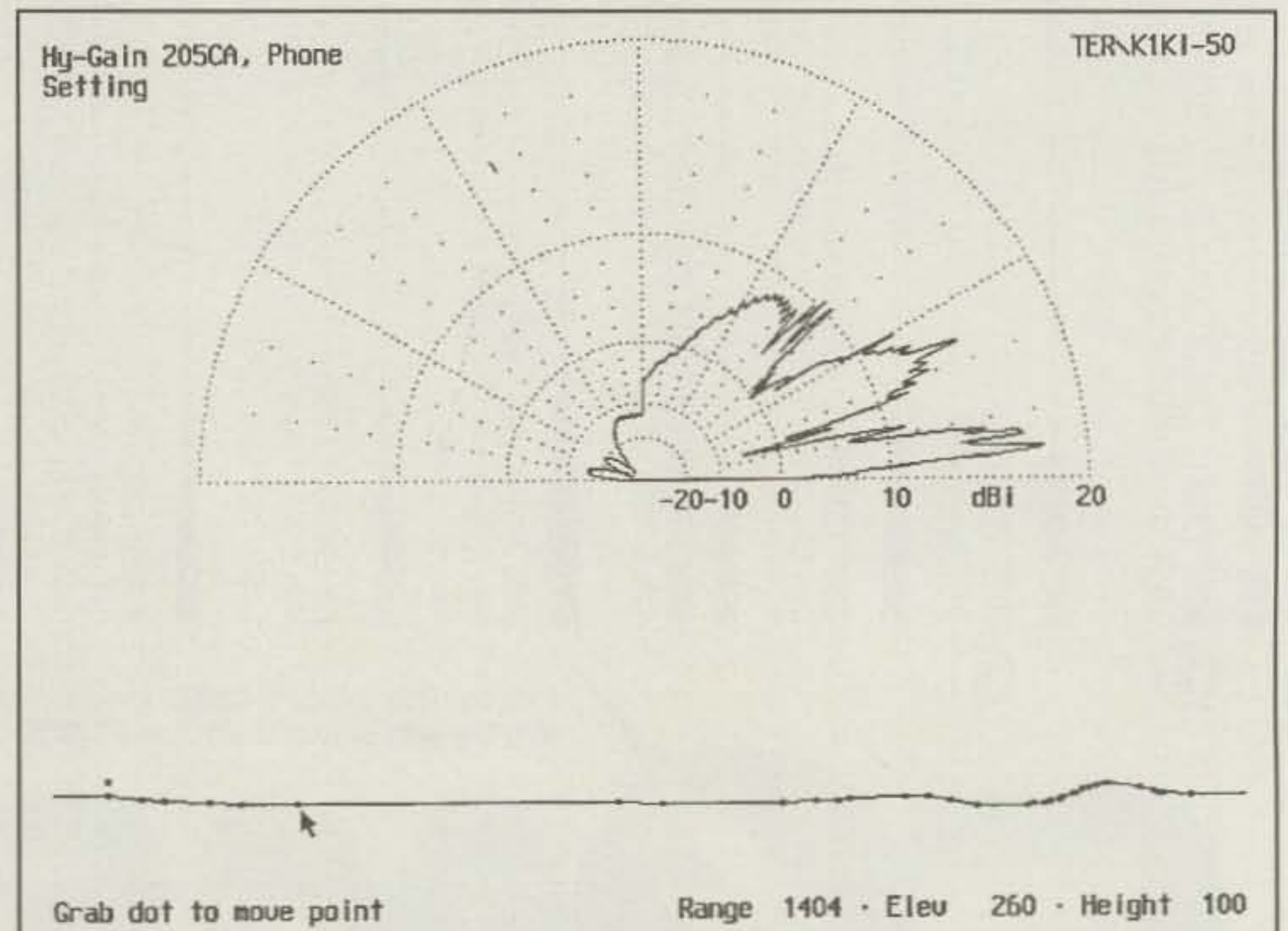


Fig. 2—Plot of antenna at 100 foot elevation at QTH of K1KI. Location is on relatively flat ground. Ray reflections are not shown.



is situated. Look at how it alters the dipole pattern! Surprised? Yes. Using the Analyzer Program, you can now find out why Jasper Sideband beat you out on that juicy low-angle DX!

## A "Rush Box" For Low-Cost VHF Reception

In my December 1994 column I described a three transistor shortwave receiver for the beginner. It was designed by Charles Kitchen, N1TEV, of Analog Devices, Inc., Wilmington, Massachusetts. A lot of readers built the little set and had fun with it. Now Charles has come up with a two transistor, one IC receiver based upon a super-regenerative circuit (fig. 6). It has microvolt sensitivity and low power consumption. It works well with both wideband and narrowband FM, as well as AM. Tuning range is from 88 to 210 MHz, depending upon the size of the detector coil. It draws only about 10 ma from two 9 volt batteries.

The little receiver has a 2N4416 RF stage, a second 2N4416 as a super-regenerative detector, and an AD745JN chip as an audio amplifier. The tap on coil L1 should be determined by experimentation. The higher up the tap is on the coil, the greater the sensitivity, but also the greater the loading on the detector.

Detector oscillation is controlled by the 2 pF capacitor between the source and the drain. Again, you may have to vary this a bit to compensate for variations in circuit layout.

Output from the detector drives a low-noise op-amp. A low-pass filter removes the quench voltage from the detector's audio output.

Charles stresses the fact that stray circuit capacitance or multiple ground paths can prevent the detector from oscillating. You must locate the detector coil L1 clear of other objects, particularly chassis ground, and the bottom and sides of the enclosure, if it is metal. In other words, keep the coil in the clear!

(This receiver won a Design Award and was described in the July issue of *EDN* magazine, the design magazine of the electronics industry, from which this material has been extracted. *EDN* is published by Cahners Publishing Co., Newton, MA 02158. It is a controlled-circulation publication.)

I remember building my first 5 meter super-regenerative receiver in 1934. It used a single UY-227 tube and has a 20 inch whip antenna on it. Right off the bat I heard signals! What a wonderful device that was. The receiver described herein is more sophisticated, but it does the same job, and tunes a greater range to boot. For a full discussion of super-regeneration, refer to Charles Kitchen's in-depth article covering this lost art in the Fall 1994 issue of *Communications Quarterly* (published by CQ Communications).

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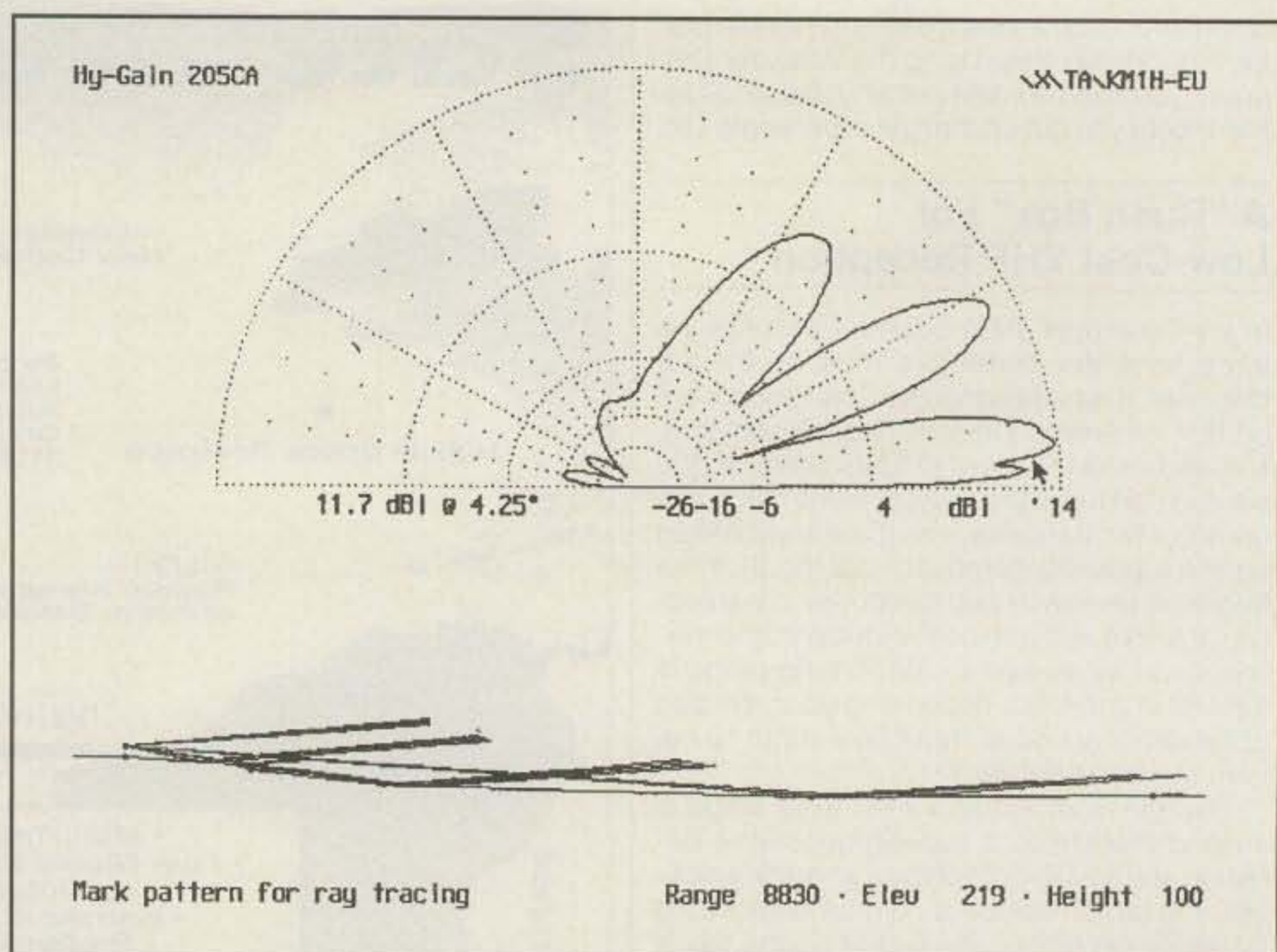


Fig. 3- Yagi at 100 feet at KM1H shows super low-angle shot. A wonderful QTH for this direction.

bon anode rated at 160 watts dissipation.

The tube was a success, but United Electronics wasn't. It disappeared from the scene shortly after the new tube was launched. The 572B, however, was too good an idea to die, and subsequently the design was taken over by others, sometimes with grim results. A succession of imported 572s gave the tube a bad name, and unused United Electronics tubes commanded a large premium, when and if they could be found.

In recent months a new company, Svetlana Electron Devices, headquartered in Leningrad, Russia, has burst on the scene with high-

quality products imported into the U.S. via their headquarters in Huntsville, Alabama.

A recently introduced product is the Svetlana 572B (see photo). This is an updated version of the original 572B. It has a carbon anode plus a hard-glass envelope, intended for high-temperature operation. The internal structure is aligned with respect to the base pins to avoid internal shorts in equipment designed for horizontal tube mounting. The tube has a unique getter in that the carbon plate is coated with titanium, which has a very high index of gas absorption.

The electrical characteristics of the new

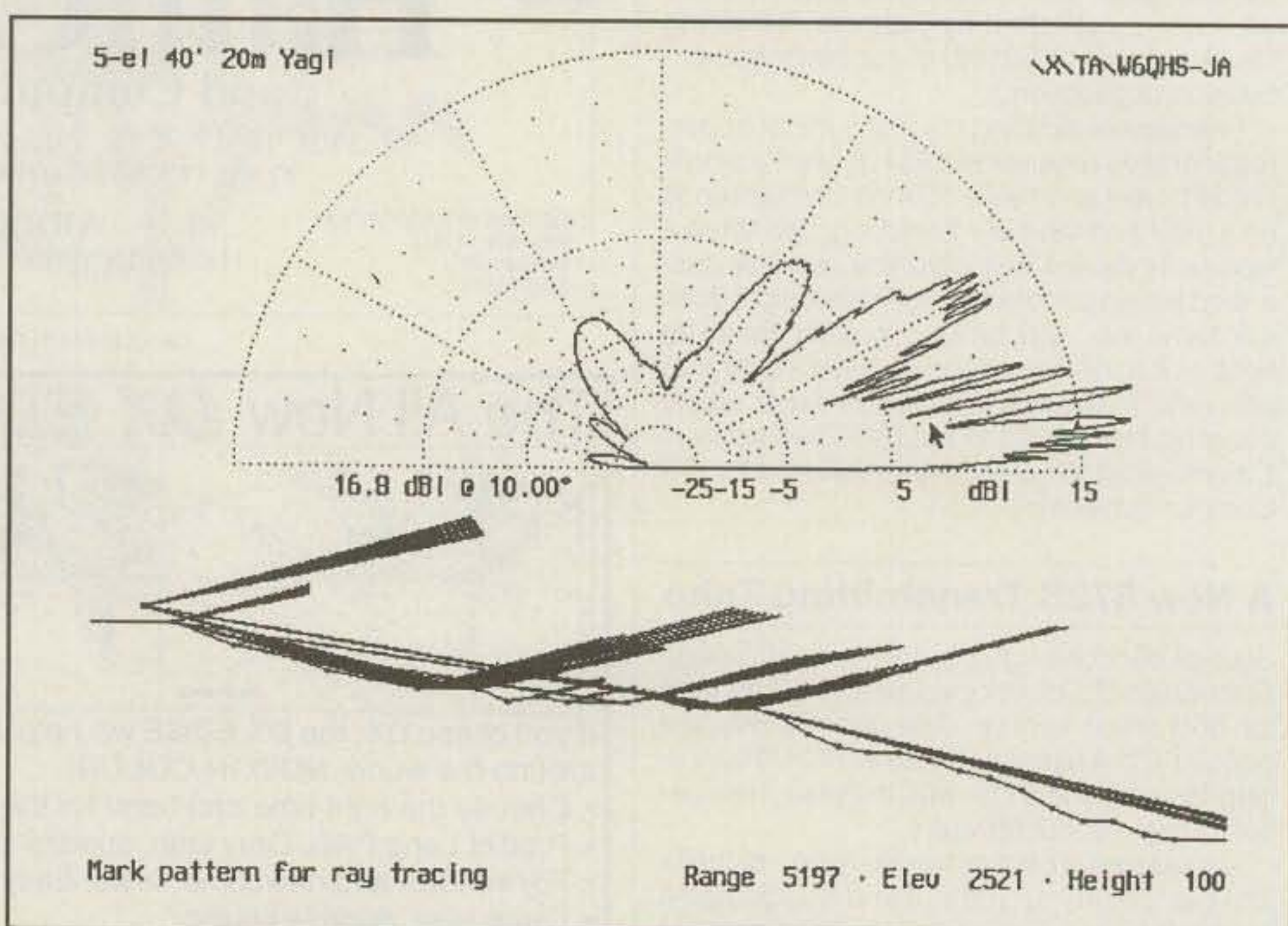


Fig. 4- Antenna pattern at W6QHS in direction of Japan.



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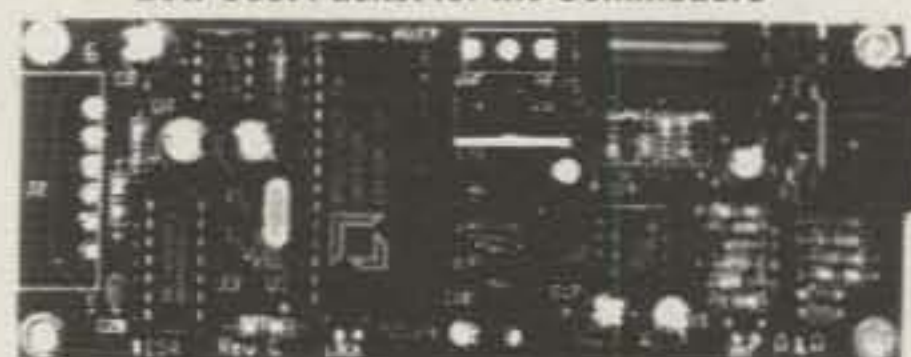


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572B are given in Table I. A pair of these tubes in grounded-grid service would deliver a 1 kW PEP (input) punch and would seem to be a candidate for a new generation of inexpensive, homemade HF linear amplifier!

## A Rig For The Upcoming Sunspot Cycle

Yes, the year 1933 is a bad one. DX-perts say it is due to some crazy sunspot cycle and that things will get better soon. I hope so. Ten meters has been deserted for a long time, but is showing a little sign of life. I heard a W9 on the band a few weeks ago.

In any event, if you are interested in 10 meters, here's an inexpensive phone rig, designed by Bud Bane, W6WB, and described in the September 1933 *Radio* magazine (fig. 7). It is thoroughly modern and uses a variable oscillator, link coupling, and inexpensive receiving tubes. Power input is about 10 watts, fully modulated.

A 59 pentode serves as the electron-coupled oscillator, link-coupled to a 46 class-C plate-modulated amplifier, running at 250 volts. Plate current is 40 ma. Bias is supplied from a 45 volt battery.

A double-button carbon mic is used, with a 56 speech amplifier and a 59 pentode modulator. A simple 50 ma, 30 Henry filter choke couples the modulator to the amplifier.

The little rig is tuned in the conventional manner, the tap on the oscillator coil having a great effect on harmonic output and excitation to the amplifier. Three turns from ground is about right. A recommended antenna is a center- or

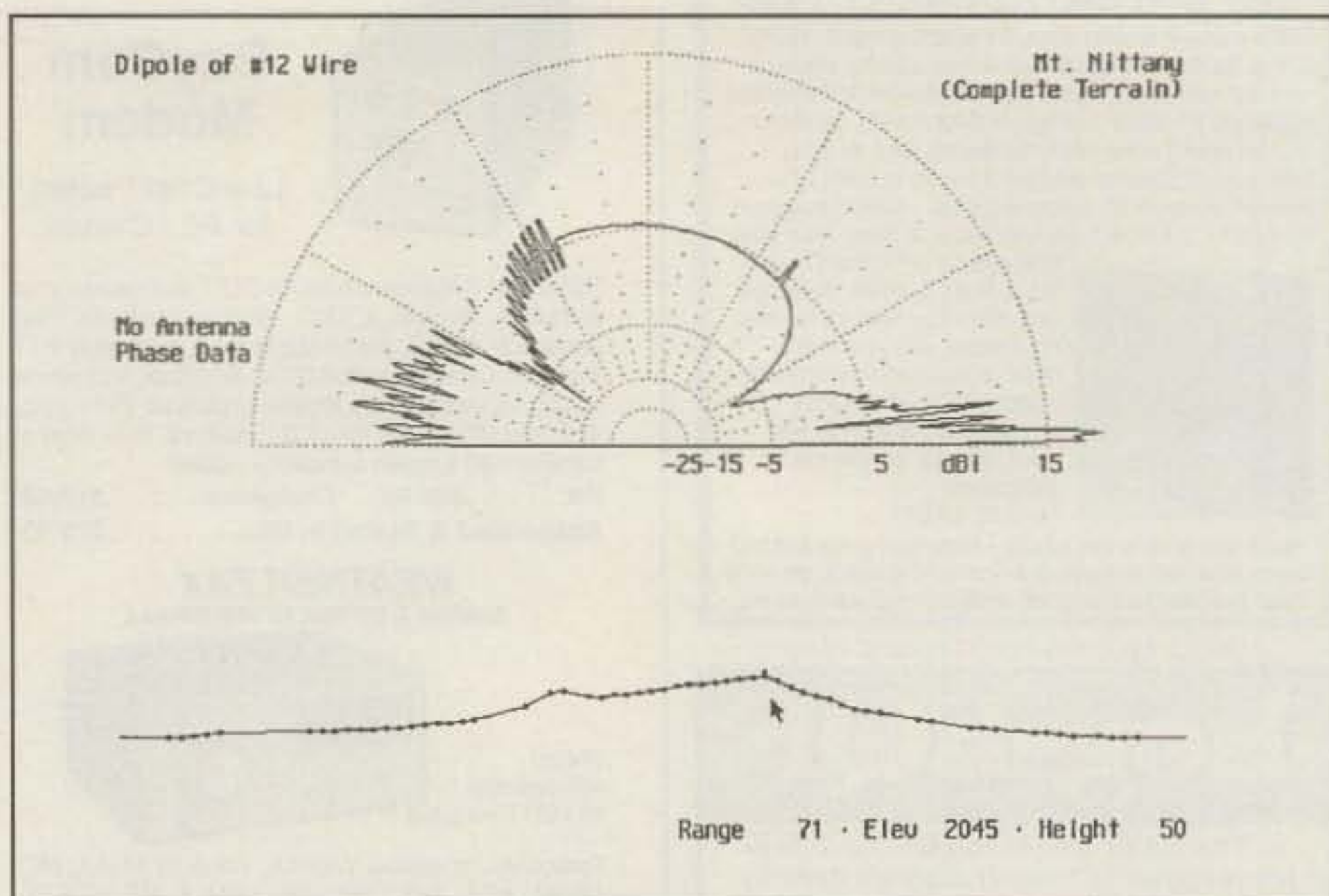


Fig. 5— Here's a dipole atop a ridge. Smaller ridge affects pattern (seen at left).

end-fed Zepp. Build this and enjoy the coming DX days on 10 meter phone!

## A Solid-State, 1 KW Amplifier For 13.56 MHz

A feature article in the August 1995 issue of *RF Design* magazine (a controlled-circulation

publication of Argus Integrated Media, Atlanta, Georgia) describes a four transistor, class-C amplifier operating at 13.56 MHz. The amplifier uses four inexpensive ARF444/ARF445, 900 volt RF power MOSFETs in TO-247 plastic packages. These devices are electrically identical, except they are packaged in "mirror image" pairs to facilitate a symmetrical layout. They are manufactured by Advanced Power

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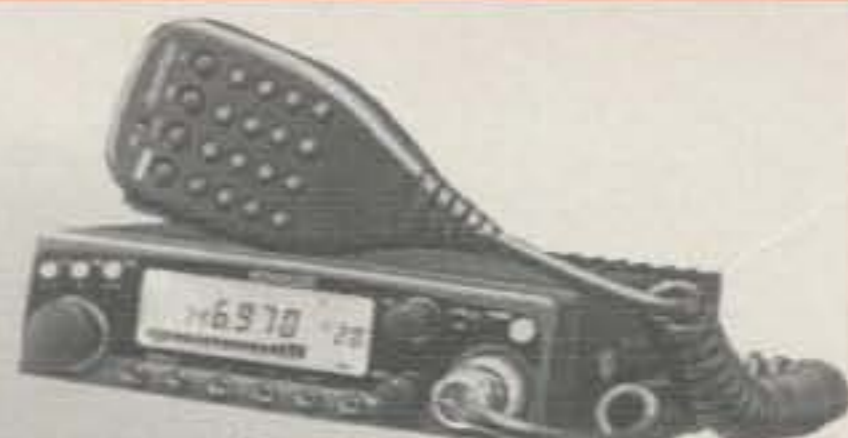
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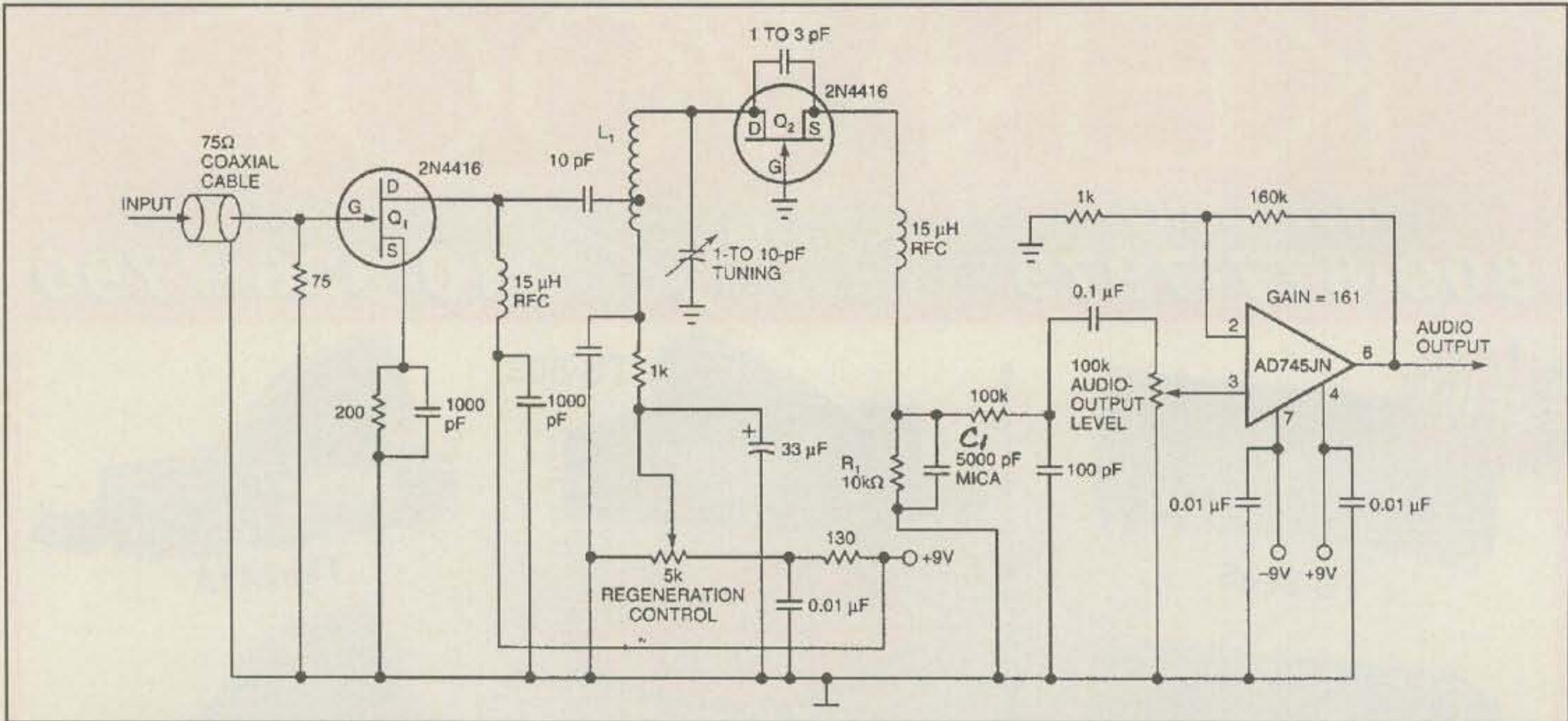


Fig. 6— This super-regenerative receiver's sensitivity is better than 1 μV, and it operates over a wide range of VHF. It draws less than 10 ma and costs about \$20 to build. (Courtesy EDN.)

Technology, Inc., 405 SW Columbia St., Bend, OR 97702.

The amplifier described uses four devices in a push-pull, parallel configuration. It operates from a 300 volt, 5 ampere power supply. In CW service the amplifier provides 1 KW output with 25 watts driving power. Amplifier efficiency is about 80 percent. The devices are

advertised for sale by Richardson Electronics, Ltd. (800-737-6937). Price is \$40 in quantity.

What does this breakthrough in solid-state HF high power mean to amateur radio? Well, the devices are not designed for SSB service, and that limits their appeal. However, as the article states, this is only the beginning. Very soon, I predict, the solid-state 2 KW PEP ampli-

fier for SSB/CW service in the HF region will be at hand, and at a realistic price, too!

### Thank You!

A sincere "thank you" to the following readers who have taken the time and trouble to write to

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LMR 400 UltraFlex DBL SHLD "TPE" JACKET 3.1dB @ 450MHz		.75/FT	.72/FT
LMR 600 DBL SHLD IIIA JACKET 1.72dB @ 450MHz		1.38/FT	1.32/FT
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73, Bill, W6SAI

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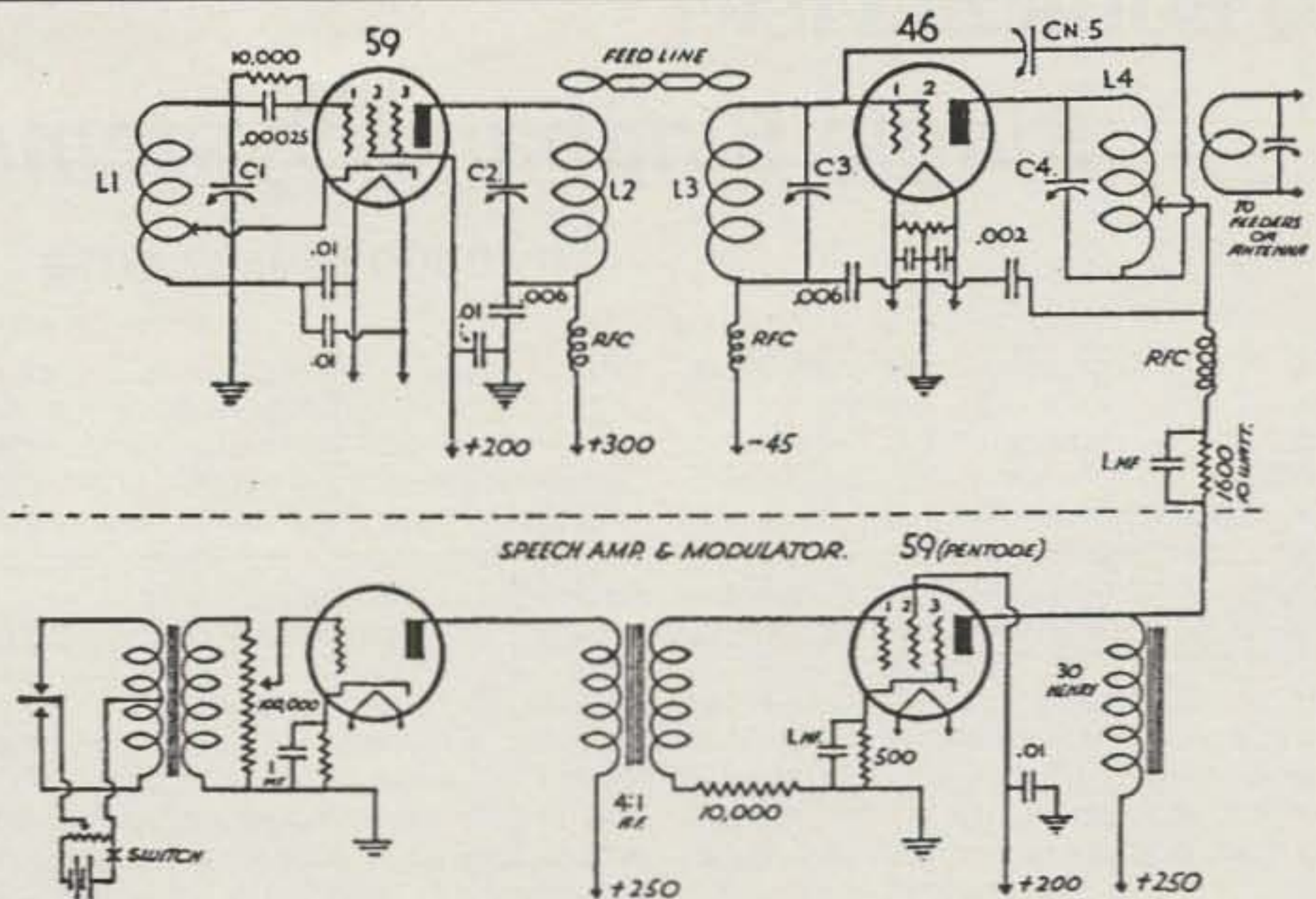
#### Typical Operation

(frequencies to 30 MHz)	ICAS**
DC plate voltage.....	2400 V
DC grid voltage.....	-2 V
Zero-signal DC plate current*.....	45 ma
Single-tone DC plate current.....	250 ma
Driving power.....	50 W
Single-tone useful output power*.....	300 W

\*Approximate value.

\*\*Intermittent commercial and amateur service.

Table 1—Type 572B tube specifications.



Circuit Diagram, showing all values, for 10 m. phone.

A Type 56 is used as speech amplifier.

L1—9 turns, 2 in. dia., 1/8 in. copper tubing.  
L2, L3, L4—4 turns each, 2 in. dia., 1/8 in. copper tubing.

C1, C4—13 plate condensers, with alternate

plates removed. Cardwell type 405-B.

C2, C3—100 mmFd. Pilot Midget Variables with alternate plates removed.

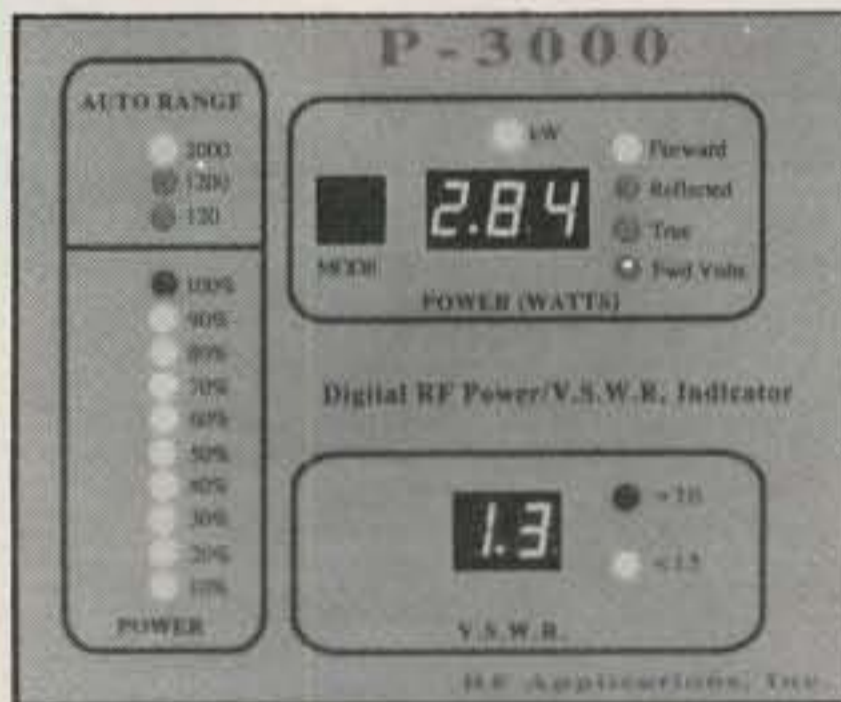
CN5—5 plate Pilot Midget, single spaced.

RFC—Radio Frequency Chokes, No. 36 D.C.C. wire, 1/4 in. form, winding space 2-1/2 in. long, single layer of wire.

Fig. 7—A nifty 1933-style phone transmitter for 10 meters.

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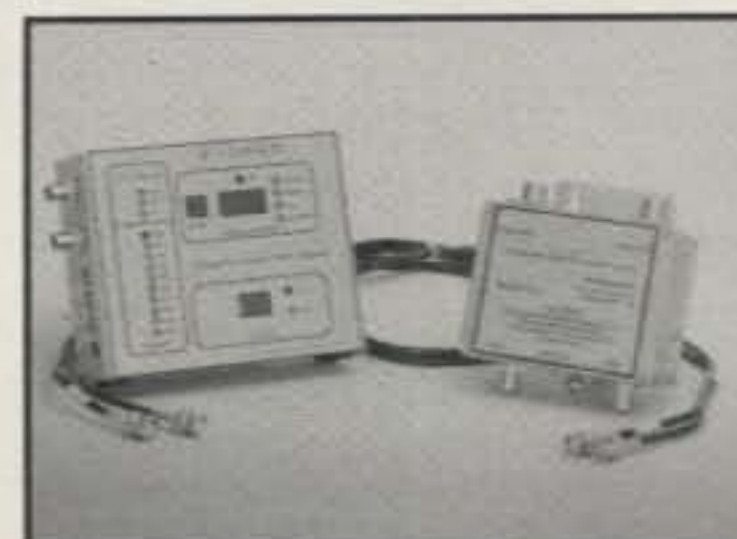
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## CQ BOOK REVIEW:

# Single Sideband Systems & Circuits

BY DOUG DeMAW\*, W1FB

The first edition of *Single Sideband Systems & Circuits* was written by E. Pappenfus, W. Bruene, and E. Schoenike some 23 years ago, and was published by McGraw-Hill. It remains a classic, and has been the standard SSB reference for design engineers and amateurs since it was released. Now we are fortunate to have a second edition of *Single Sideband Systems & Circuits*. The new volume was edited by well-known Collins-Rockwell engineer and technical writer Bill Sabin, WØIYH. The co-editor is one of the original authors, Edgar Schoenike. Both are retired from the Collins Avionics and Communications Div. of Rockwell Corporation in Cedar Rapids, Iowa.

This second edition is not a handbook of practical circuits that can be duplicated by experimenters. Although there are numerous schematic diagrams included with the plain-language text, very few of the components have assigned values. The diagrams are intended mainly to support the design discussions. Information about producing specific circuitry is presented clearly for

those who wish to design quality SSB products. The theory of design and performance standards for SSB transmitting and receiving equipment is nicely detailed in this book. That should be an incentive to purchase the volume, even though the reader may have no desire to construct SSB gear.

*Single Sideband Systems & Circuits* contains 17 chapters. A 3.5 inch computer diskette is included with the book. This software has a number of public-domain programs for use with IBM-compatible PCs. The programs enable the user to design filters plus analyze cascaded noise figures and intercepts, and there are SPICE sub-circuit files for three Collins mechanical filters. There is also a Chebyshev bandpass filter program. Another program handles design, analysis, and synthesis of PLLs and their filters. The Fano method for broadband matching is also available on the disk, as are digital SSB receiver analysis procedures.

Among the important topics treated in this book are System Design Considerations, HF Link Establishment, Receiver Design, Exciter and Transceiver Design, and IF Analog Filters. The list continues with Speech Processing, Squelch and Noise Blanking,

Digital Signal Processing, Preselectors and Postselectors, Synthesizers, and Frequency Standards for SSB. Solid-state power amplifiers are discussed in detail, and there is a chapter on ultra-low distortion power amplifiers. High-power linear amplifiers are covered in depth by W. Bruene, and there is a section on antenna matching techniques. Receiver measurements and EMI techniques, along with Software for SSB, complete the chapter lineup.

It is important to say that in addition to the chapters written by the two editors, many other Collins-Rockwell engineers prepared text for this volume. Certainly this book belongs in the libraries of broadcast engineers, RF design engineers, and technically inclined radio amateurs. This reviewer will continue to cherish the first edition of *Single Sideband Systems & Circuits*, while relishing the presence of the new and expanded second edition.

*Single Sideband Systems & Circuits* (1995) has 652 pages, inclusive of the index, and has a cover price of \$75.00. It is published by McGraw-Hill, Inc., New York, NY 10020 in hardbound 6" x 9 1/4" format (ISBN 0-07-912038-5).

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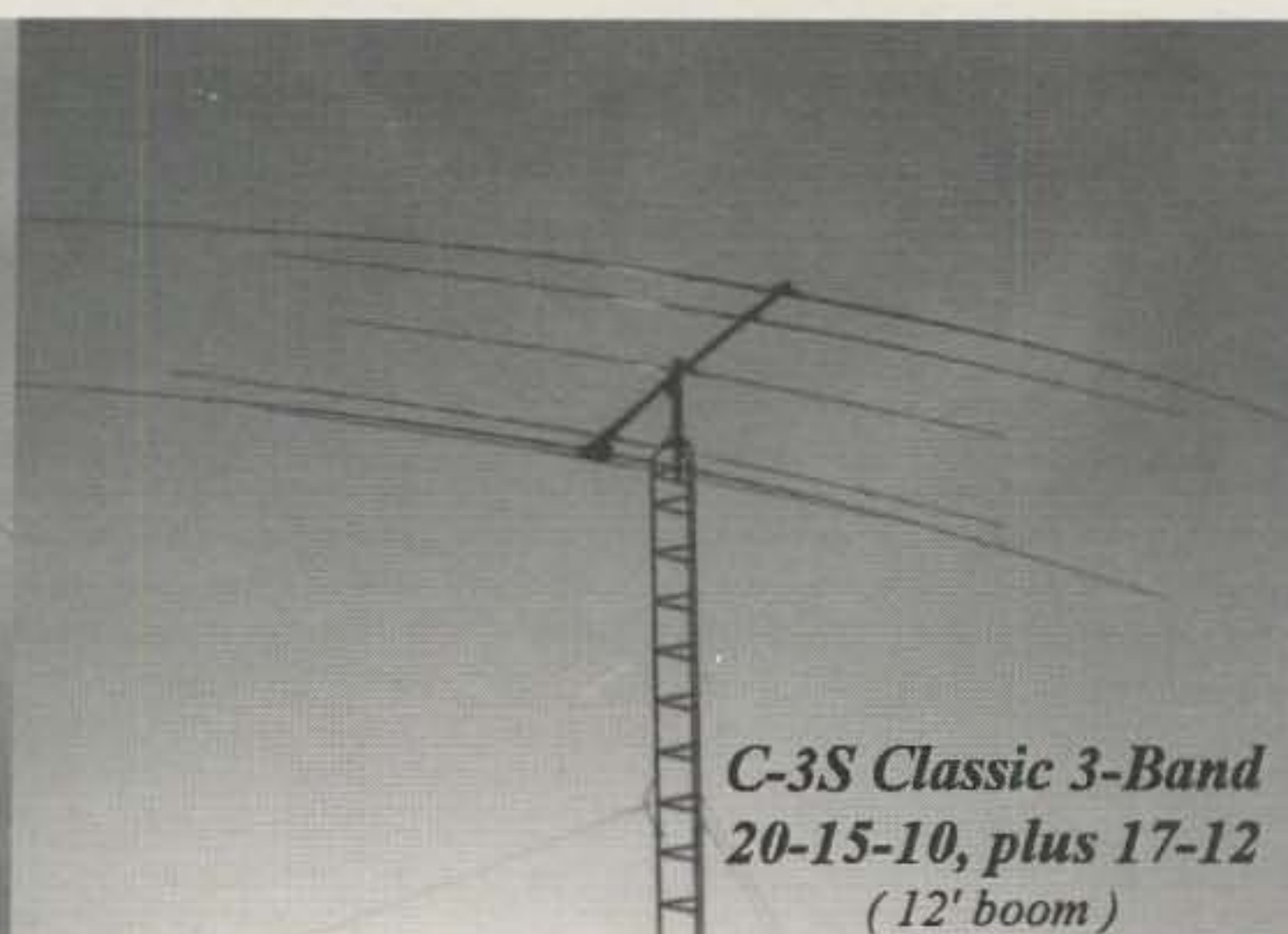




# In response for a smaller model of the fantastic C-3, we put it on a little diet: the C-3S.



*C-3 Classic 3-Band  
20-15-10, plus 17-12  
(18' boom)*



*C-3S Classic 3-Band  
20-15-10, plus 17-12  
(12' boom)*

## C-3S NUTRITIONAL INFORMATION PER SERVING

Serving Size (Mtrs)	20-15-10 primary + 17 & 12	Elements (all full size)	6
Net Wt.	26 Pounds (12 kg)	Length of Boom	12'
Power Handling	5KW	Wind Load (sq.ft.)	4.9
Fat	0	Wind Rating (min.)	>80 mph
Average Gain (20-15-10)	4.5dBd	Average F/B (20-15-10)	>14dB
Number of Traps per Antenna	0	Efficiency	>98%
Number of Phasing Lines	0	Average Time for Assembly	1 hour
Pre-aligned elements (on boom)?	YES	Riveted Construction?	YES
Easy-On™ Mount?	YES	Optional Bands per Antenna	40 Mtrs
Standard Packaging	4' box	1:1 Balun or RF Choke Required?	YES
Percentage of Minimum Daily Radio Enjoyment		100%	

The unbeatable C-3 performance has been extended to a smaller footprint. The C-3S incorporates a re-designed 10 mtr section allowing the boom to be only 12'. The trade-off is the C-3S covers about 1.1 MHz (i.e. 28.200-29.300) with a 2:1 VSWR, where the C-3 covers the entire 10 mtr band. The gain of the C-3S is within .1 to .2dB of the C-3. The C-3S can also cover 40 Mtrs, with 130 kHz 2:1 VSWR. This is the C-4S. The C-4C conversion can be utilized later to make the C-3S into a C-4S in the field.

Force 12 has the finest line-up of antennas to cover the classic 20-15-10 bands with a single feedline. The antennas also feature gain on 17 and 12 mtrs, with a VSWR of about 2.8:1, easily matched with any tuner. All are trapless and are acclaimed as outperforming all the various trapped antennas. Included in the line-up is the C-3XL, a composite of larger monobanders.

The complete series of antennas for the classic 3 bands (plus 40 mtrs) is the following:

<b>C-3S</b> 20-10 mtrs, 12' boom	<b>C-4S</b> 40-10, 12' boom	<b>C-4SXL</b> 40-10, 23' boom (includes 2 el on 40)
<b>C-3</b> 20-10 mtrs, 18' boom	<b>C-4</b> 40-10, 18' boom	<b>C-4XL</b> 40-10, 30' boom (includes 2 el on 40)
<b>C-3XL</b> 20-15-10, 32' boom, which has a 3 el 20, 3 el 15 and 4 el 10, all with separate feedlines for maximum versatility.		

Force 12 has more than 60 antennas from 160-6 mtrs. They include rotatable dipoles for 160, 80/75, 40, 30; 2 and 3 element yagis for 80, 40 and 30. Several combinations of 40/20, 40/30/20 and 40/30 yagis; the **MAGNUM 2 / 2** which has 2 el on 80 and 2 el on 40. Multibanders for 20-17-15-12-10, 20-17-15, 17-15-12-10, 15-10, 17-12; all without traps or phasing systems. There are also magnetic transmitting and receiving loops (**MTR's**) for 80, 40 and 40-20 made from 2" tubing. They provide an excellent antenna for confined or restricted locations. **MTR's** are perfect for regional coverage with NVIS propagation. There is more.

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## "HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

### Goodies—Conclusion

**H**ere is the concluding portion of this article. The first part covered the ARRL's items, backpacks, badges, banners, beam headings, belts, bumper stickers, calendars, clocks/watches, clothing, CQ items, cups/mugs, decals, gift register, key items, license plate items, lights, maps, medals, money clips, and patches.

**Pendants.** (See *One-of-a-Kind/Pins.*)

**Pens.** Kilo-Tec offers a variety of pens which can be engraved to show one's callsign and/or name. These pens feature free engraving of up to 25 letters or numbers (including spaces), gold-toned clip and accents, high-gloss black-lacquer finish, iridium point nibs, solid brass casings, and standard refills. Ballpoint and rollerpoint pens are priced at \$15.75 to \$19.95 each, depending on the quantity ordered. Fountain pens range from \$20.75 to \$24.95 each, according to quantity. The ballpoint pen is also sold with a nickel-silver finish. A \$4 s&h fee applies to each order. Kilo-Tec's address is P.O. Box 10, Oak View, CA 93022 (telephone 805-646-9645).

(Also see *PBB Engraving/Badges.*)

**Pins.** One of a Kind sells sterling callsign tie tac/lapel pins and pendants. The pins measure 0.25 by 1.25 inches and have raised sterling letters inside a sterling silver frame. The cost per item is \$20.95, including shipping. These pins and pendants are also available in 14K and 18K gold at different prices. Their address is 145 East Sixth Street, Durango, CO 81301 (telephone 970-247-5884).

(Also see *ARRL; Camelia Trophy Shop/Plaques; Curiosity Sales/Badges; Lane 4 Awards/Plaques; Paul Washa/Clothing.*)

**Plaques.** Blacksmith Brownie is Jeffry Brown, WX2Z. He sells a very nice 3.5 by 5 inch plaque which features a genuine hot-forged pony shoe that is polished before it is hand stamped (with the purchaser's callsign) on an anvil. The pony shoe is detailed in gold prior to being mounted with authentic horseshoe nails on a 0.75 inch thick piece of finished red oak wood. The corners and edges of the plaque are milled out using a stone grinding wheel, leaving interesting looking friction burns on the milled out indents. The plaque is then finished with a natural oak stain. Last of all, two coats of a clear high-gloss polyurethane sealant is applied to protect and enhance the beauty of the wood. A routed notch on the back side makes it easy to wall mount the plaque. If preferred, this plaque can be ordered with a desktop mounting bracket. The price of a basic plaque is \$17, including s&h fees. A gold ARRL logo or ARRL Life logo pin can be added (between two horseshoe nails) at the additional cost of \$5. It is interesting to note that Jeffry has been a real black-

smith more than two decades. Each buyer must clearly list the callsign to be stamped on the pony shoe. One can order a plaque with their class of license burned into the wood. The date one's license was initially issued can also be burned into the wood. A popular version of this plaque has GOOD DX burned into the wood. BRASSPOUNDER, GOOD LUCK, MEMBER ARRL, RAG CHEWER, #1 DX'er, #1 FIST, #1 HAM, OR 10-10 # can also be burned into one's plaque.

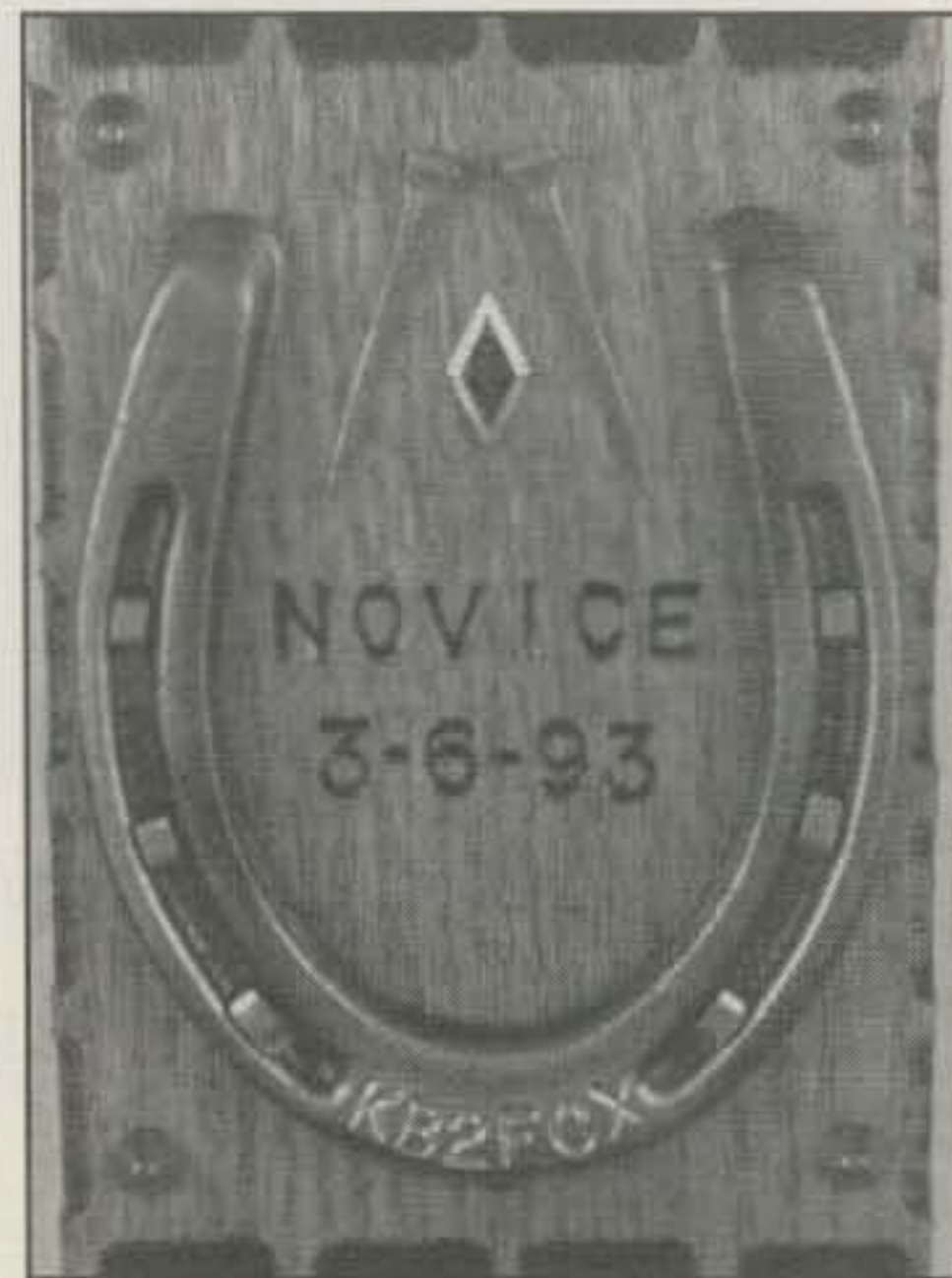
Blacksmith Brownie's address is P.O. Box 382, Hamburg, NJ 07419 (telephone 201-827-5414).

The KN3A-Camelia Trophy Shop is run by Keith Campbell. The address is 590-B Schilinger Road South, Box 96, Mobile, AL 36695 (telephone 334-633-7591). His product line includes acrylic desk plates, callsign key rings, callsign pins, plaques, and plastic/brass desk plates. Their standard plaques are engraved to show the following operating achievements: multiband 6 continents (\$35.90), 6 continents (\$35.90), 50 countries (\$55.90), 50 states (\$3.45), and 100 countries (\$73.90). Plaques can be engraved to meet every requirement, and on black or red metal with gold or silver lettering. The 12-inch name and callsign desk plates have white lettering engraved in red or blue plastic and they sell at \$20.90. They are mounted in brass holders. The acrylic name and callsign desk plate is engraved on the rear and it sells at \$33.95. The callsign key ring with engraved plate sells at \$10. The hat/shirt pin has white lettering in black, or red plastic and it sells at \$6.25 each. Shipping and handling charges are included in these stated prices.

CMS offers a station identification certificate which is suitable for easel or wall mounting. As desired, one's callsign, license class, name, street, city, state, zip, original license date/call, and up to four organization affiliations can be shown on the certificate. Available in an 8 x 10 inch wood frame at \$19.95 for wall mounting. A deluxe frame for easel or wall mounting costs an extra \$4.25. Plexiglass is used for added safety and durability. The address is Box 147, Marion, MA 02738 (phone 508-748-0468). Deliveries are postpaid. Allow 4 weeks for delivery.

Lynnea Perry, KB7REM, runs custom Tiles by Perry. 4.25 x 12.75 inch plaques are hand painted and fired with overglaze. Plaques can be customized to one's QSL card or other design. The prices are \$47.50 (basic block letters), \$67.50 (customized to a QSL), and \$82.50 (with caricature). The address is P.O. Box 493, Keno, OR 97627-0493 (telephone 503-882-8246).

Larry Plotkin, K4JXI, runs Lane 4 Awards, which sells a nice assortment of club pins, decals, medals, patches, and ribbons. His assortment is too extensive to cover in this article. Complete details can be requested from Lane 4 Awards, P.O. Box 693944, Miami, FL 33269.



Blacksmith Brownie's plaque features a genuine hot-forged pony shoe along with several choices of type.

Eugene Modjeski, N0PZA, offers a variety of operating award certificates. Your SASE and request will bring data. The address is 1801 Cimmarron Trail, Choctaw, OK 73020.

(Also see *ARRL; Blue Ridge Office Products/Badges; PBB Engraving/Badges.*)

**Publications.** A few of the best suppliers of amateur radio publications are listed herein for your use. Their data can be requested directly. CQ Communications, 76 North Broadway, Hicksville, NY 11801. The American Radio



KN3A-Camelia Trophy Shop's line includes plaques, acrylic desk plates, callsign key rings and pins, and plastic/brass desk plates.

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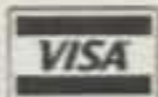
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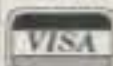
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ELNEC is a MININEC-based program with nearly all the features of EZNEC except transmission line models and a limitation of about 127 segments (6-8 total wavelengths of wire). Not recommended for quads, long Yagis, or antennas with horizontal wires lower than 0.2 wavelength; excellent results with other types. Runs on any PC-compatible with 640k RAM, CGA/EGA/VGA/Hercules graphics. Specify coprocessor or non-coprocessor type.

Both programs support Epson-compatible dot-matrix, and HP-compatible laser and ink jet printers.

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The *Amateur Radio Language Guide* provides hundreds of phrases which are useful to amateurs. The guide is printed in five volumes selling at \$10 each. Volume 1 covers French, German, Japanese, Polish, and Spanish. Volume 2 covers Italian, Norwegian, Portuguese, Serbo-Croatian, and Swedish. Volume 3 covers Czechoslovakian, Danish, Hawaiian, Korean, and Russian. Volume 4 covers Chinese, Dutch, Finnish, Rumanian, and Vietnamese. Volume 5 covers Arabic, Hungarian, Indonesian, Tagalog/Philippino, and Turkish. Their address is ROSE, P.O. Box 796, Mundelein, IL 60060-0796. These volumes give us a chance to expand contacts with DX amateurs.

AntennasWest offers their "Radio Adventure" publication at \$1.00. This booklet covers wire antennas in detail, using easily understood explanations. HT 2 meter Pico-J, tiger tail, walking stick, and whip antennas are included in this manual. Dipoles include BumbleBee, folded, Kansas, quietflex, quietflex fan, and today's no tune (TNT) antennas. Loop antenna coverage includes compact distributed capacity (DC), G4EZG, multiband, notch, omni, random, sandwich, Swiss, and UniLoop antennas. Corner beam, gap, G5RV, half-square, slinky, and windom antennas are also detailed in this booklet. Directivity, gain, height, HFDX, and radiation angle factors are explained in simple language. Baluns, masts, QSL cards, solar power, support line, and wire antenna erection gear are also covered in this manual. The address is AntennasWest, Box 50062, Provo, UT 84605-0062.

The *Antique Radio Classified* is a monthly magazine with more than 8000 subscribers. It includes articles, classified advertisements, book data, early radio ('40s and '50s data), and a lot more information. A 6-month trial subscription costs \$17.95, whereas \$34.95 pays a full year's subscription. Subscribers are entitled to a 20-word advertisement at no extra

charge. A free copy of this publication can be requested. Their address is P.O. Box 2, Carlisle, MA 01741 (phone 508-371-0512; FAX 508-371-7129).

Buckmaster Publishing offers every issue of 73 magazine on microfiche from October 1960 through the end of 1993 at \$290, including domestic s&h. Every issue of *QST* from December 1915 through the end of 1993 is available on microfiche at \$505, which includes domestic s&h. Annual updates cost \$10. They also sell their U.S./International Ham Call CD-ROM at \$55, including s&h charges. It provides quick reference to domestic and foreign callsign data for 113 countries, with almost one million listings. Buckmaster also publishes a Digits-to-Go CD-ROM which has more than 600,000,000 numbers which can be used to create cryptographic messages and systems, plus provide a large base of random numbers that can be used in other mathematical applications. The price is \$25, including s&h fees. This company publishes several other CD-ROM items. Their address is Route 4, Box 1630, Mineral, VA 23117 (phone 540-894-5777 and 800-282-5628).

A yearly subscription to the *Digital Journal* costs \$25 U.S., \$42 DX airmail (U.S. funds only). It is published 12 times per year and features articles for the digital communicator—rigs, operations, computers, software, news, and reviews. The address is IDRA, P.O. Box 2550, Goldenrod, FL 32733-2550 (FAX 407-671-0194).

DX Enterprises has assumed production of the "Go List," which provides a very complete compilation of the managers who handle QSL cards for DX amateurs. Gary Yarus originally published The Directory of QSL Managers. Jay, W5GO, and Jan, K6HHD, O'Brien took over publication of the list in March 1980, and they issued The W6GO/K6HHD List until the summer of 1994, when they changed to producing an electronic and diskette publication. Their last printed issue was No. 176, dated Dec. 1994. Pat, AE4AP, and Nancy, KB4RGW, Smith assumed the task and they put out issue 177 in January 1995, with the printed version restored in April 1995. This data is available by diskettes, by files one may download from the DX-BBS electronic bulletin board system, or by printed newsletters. The 12-page newsletter





7-Mike Hamstuff sells QSL storage boxes and index dividers.

shows more than 3000 of the most active DX QSL routes. It is printed monthly in a form that is easily stored in a three-ring binder. A sample copy of the "Go List" costs \$3 sent to U.S. addresses and \$4 sent to foreign addresses. The yearly subscription rates are \$30 and \$45 to USA and foreign addresses, respectively. Their address is P.O. Box 2306, Paducah, KY 42002-2306 (phone 502-898-8863; FAX 502-898-8865).

*Electric Radio* is published monthly by Barry Wiseman, N6CSW. If you are interested in the

histories of manufacturers and antique radio equipment, this publication should appeal to you. The domestic yearly subscription rates are \$28 and \$38 for second- and first-class mail, respectively. Their address is P.O. Box 57, Hesperus, CO 81326 (phone/FAX 970-247-4935).

A one-year subscription to *Ham Trader Yellow Sheets* costs \$18. This publication is issued twice each month and is mailed first class. It advertises amateur radio equipment and accessories which are for sale or wanted.

The address is Box 2057, Glen Ellyn, IL 60138-2057. A sample copy is available to anyone who requests one and sends a self-addressed, stamped envelope.

A copy of the *Island News* publication is available to anyone who requests it and sends their SASE to P.O. Box 701, Fernandina Beach, FL 32035-0701.

KDC Sound markets their 208-page *Ultimate Modification Bible Volume IV* at a cover price of \$29.95. It shows microphone connections to more than 800 rigs, 375 equipment modifications, 50 crystal charts, 25 scanner modifications, and much more. Their address is 17294 FM 3038, Conroe, TX 77302.

The *Radio Amateur Callbook* is sold in two versions. The North American and International issues are priced at \$35 each. Their CD-ROM is sold at \$49.95. Their address is P.O. Box 2013, 1695 Oak Street, Lakewood, NJ 08701 (phone 1-908-905-2961; FAX 1-908-363-0338. Your local radio store probably has these books.

"Radio Works Catalog 951" has a \$4 cover price, but Jim Thompson, W4THU will send one free to any reader who requests it. This catalog covers the Big Sig Loop, Carolina Beam, G5RV-Plus, Inverted-L, and many other types of antennas. Antenna wire, coaxial cable, filters, and insulators are also advertised in this catalog. His 128-page "Reference Catalog" is very useful to amateurs who are unfamiliar with wire antennas. It provides easily understood explanations at a cost of \$4. The address is Box 6159, Portsmouth, VA 23703.

The *Vail Correspondent* is a quarterly journal devoted to bugs, keys, and other telegraph apparatus. A sample copy costs \$2. The yearly subscription rate is \$10. The address is Box 88, Maynard, MA 01754.

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The *59(9) DX Report* is a weekly DX newsletter. A sample copy is available to anyone who sends an SASE with his request. The address is Box 73, Spring Brook, NY 14140.

(Also see *ARRL; CQ; JWO Services/Video; Vibroplex; Paul Washa/Clothing.*)

**Purses.** (See *Leather & West/Belts.*)

**QSL Items.** Wayne Carroll, W4MPY, offers 250 eyeball QSL cards (2 x 3.5 inches) at \$20. He also sells 4.5 x 6.5 inch airmail envelopes one can send to DX amateurs for their use in sending cards back to us without having to bend them. These envelopes are priced at \$6 for 50, including the cost of first-class mailing. Wayne also sells the 5 x 7.5 inch brown Kraft paper envelopes which are preferred by several ARRL incoming DX regional QSL bureaus. These envelopes include the clasp closure. They are priced at 10 for \$3 and 20 for \$5, including the cost of first-class mailing. The address is 682 Mt. Pleasant Road, Monetta, SC 29105 (phone/FAX 803-685-7117).

Creative Imprinting Company offers amateur radio callsign imprinted calling cards, cocktail napkins, match books, and pencils. The cards (5 lines, maximum) sell at \$16.95. Fifty napkins are priced at \$11.95. Twenty-four matchbooks are priced at \$7.45. Twelve pencils cost \$4.49 and 24 cost \$6.79. Each stated price includes s&h charges. The address is 6522 Chesterfield Avenue, McLean, Virginia 22101 (telephone 703-827-0616). Dick Little, WB4FIH, runs this company.

Joe Saunders, K3UAL, has clear-plastic QSL card holders which enable an amateur to display received cards without having to damage them with tape and thumbtacks. I have used this type of QSL display many years. It has the added flexibility of allowing one to quickly and easily change the cards displayed. These plastic display holders sell at \$6 for a package of 3, plus \$2 s&h. Each holder can be used to display up to 20 QSL cards. Joe is also a QSL card printer. His address is Club Printers, 1520 Jutewood Avenue, Hyattsville, MD 20785 (phone 301-773-9383 and 301-773-5074). If you want sample, send 50 cents (stamps or cash) with your request.

William J. Plum offers several interesting items. His QSL card album includes 30 two-pocket pages which can be used to display up to 120 4 x 6 inch QSL cards in a green 3-ring binder with white lettering on the spine and front side. A world map is shown on the binder's front cover. Descriptive inserts are provided to allow cards to be cataloged and sheet lifters are included in the binder. A single album is priced at \$14.95, plus shipping costs. A pair of albums cost \$25. Additional 20 packs of insert pages are priced at \$5 each, plus shipping costs. The album can hold up to 250 cards. Eyeball QSL cards are sold with raised letter printing, 1000 priced at \$26 to \$39.50, depending on the style chosen. Personalized note sheets are included in the product line.

Attaching foreign airmail postage to one's SASE greatly improves the chances of receiving a desired DX QSL card without delay. Top DX amateurs report better than a 90% return ratio when this system is used. Airmail stamps are available from William Plum for 167 DX countries. He sells a combination of a European airmail envelope (4.75 x 6.5 inches) and a European airmail return envelope (4.5 x 6.25 inches) which augments his DX airmail postage program very well. Simply address the smaller envelope to yourself and attach the



Shack Attack has hand-cut in wood callsigns. A desktop base is also available.

correct DX airmail postage stamp to it. Insert your SASE and QSL in the larger envelope, address it per the callbook address, and mail it to the DX amateur. These envelopes are also available with your name, callsign, and address printed appropriately on them. Five-hundred each of the unprinted outgoing and return envelopes are priced at \$80. Five-hundred each of the printed outgoing and return envelopes are priced at \$120. QSL envelopes are also available in four other sizes. The address is 12 Glenn Road, Flemington, NJ 08822-3322 (phone 908-788-1020; FAX 908-782-2612).

Spangler X-Pressions offers 1000 full-color 3.5 x 2.0 inch eyeball QSL cards at \$79. The address is P.O. Box 6262, Kansas City, KS 66106 (phone 1-800-466-1616; FAX 913-722-4334).

7-Mike Hamstuff sells QSL storage boxes and index dividers. The sets of dividers are for all 50 states, all DXCC countries, 1 through Ø, A through Z, 10 through 160 meters (including the WARC bands), and a set of do-it-yourself dividers. Lee Finkel, KY7M, also sells a wood cover for the Bencher paddle plus miscellaneous accessories and parts. His address is 7-Mike Hamstuff, P.O. Box 14455, Scottsdale, AZ 85267-4455.

(Also see *MFJ/Clocks; Personalized Photo/Clothing; Rusprint/Clothing.*)

**Ribbons.** (See *Lane 4 Awards/Plaques.*)

**Rubber Stamps.** Tom Ebbert, WB8OUV, runs Ebbert Graphics. He sells rubber stamps and QSL cards; 12-point Krome-Kote card stock is used. The basic QSL cost is \$24.50 for the first 100 cards, plus \$12.50 for each additional 100 cards. The s&h charge is \$4 per order. Rubber stamps range in price between \$15.50 and \$18, including s&h; they are sold in five styles. Tom also sells ARRL logo (\$2) and state outline (\$10) rubber stamps, stamp pads (\$5), and telegraph keys (\$3.50), plus s&h fees. The address is P.O. Box 24280, Columbus, OH 43224 (FAX 800-863-8873). Visa/MasterCard orders are accepted.

(See *Blue Ridge Office Supplies/Badges.*)

**Safety Items.** J. Martin Systems offers an

inexpensive accessory bus which makes it easy to properly ground a station. "GROUND IT" features a solid copper bus bar that is 0.125 x 0.5 inch at four standard lengths from 2 to 6 feet, with other lengths available on special request. This bus is only intended to provide an AC power or coaxial cable shield ground. Stainless steel grounding studs are spaced 6 inches apart along each bus bar. Prices range from \$11.95 to \$31.95, plus s&h costs. Flexible rope copper grounding straps with end terminals are sold at \$2 per foot. The address is 35 Hilltop Avenue, Stamford, CT 06907.

The ONV Safety Belt Company sells a combination safety belt and seat harness at \$93.95, which includes s&h charges. A seat belt without the seat harness costs \$78.95. A tool pouch is offered at \$19.95, including s&h costs. Their address is P.O. Box 404, Ramsey, NJ 07446 (phone/FAX 201-327-2462).

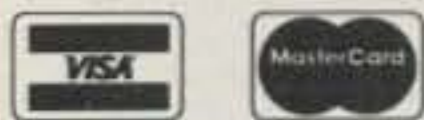
**Signs.** Gary Hansen, WA9DAU, is marketing a scroll-sawed hand-finished callsign mounted in the purchaser's choice of maple, oak, or walnut wood at \$19.95, including s&h. The address is 550 Wichert Way, Sevierville, TN 37876 (phone 615-428-1226).

Shack Attack sells callsigns hand cut in 0.25 inch thick pine wood. The letters and numbers are two inches high. The price is \$31. A desktop base costs \$2 more. The shipping fee is \$3. The address is 1394 North 770 West, Orem, UT 84057 (phone 801-225-3340).

Whiterook Products Company sells an RF-actuated callsign display (Model CSD-1) which lights up to display one's callsign while one is transmitting 5 watts (or more) on any HF, VHF, or UHF frequency. The price is \$54.95. A 12 VDC adapter (Model DC-1) is included. A delay is built in to eliminate flickering during transmissions. If you prefer "ON THE AIR" in large lettering instead of having your callsign displayed in large letters with "on the air" displayed in smaller letters below your callsign, you can order their Model CSD-2 at the same price. The CSD-10 and CSD-20 are larger versions (5.0 x 1.5 x 5.25 inches) of the CSD-1 and CSD-2, respectively. These displays are



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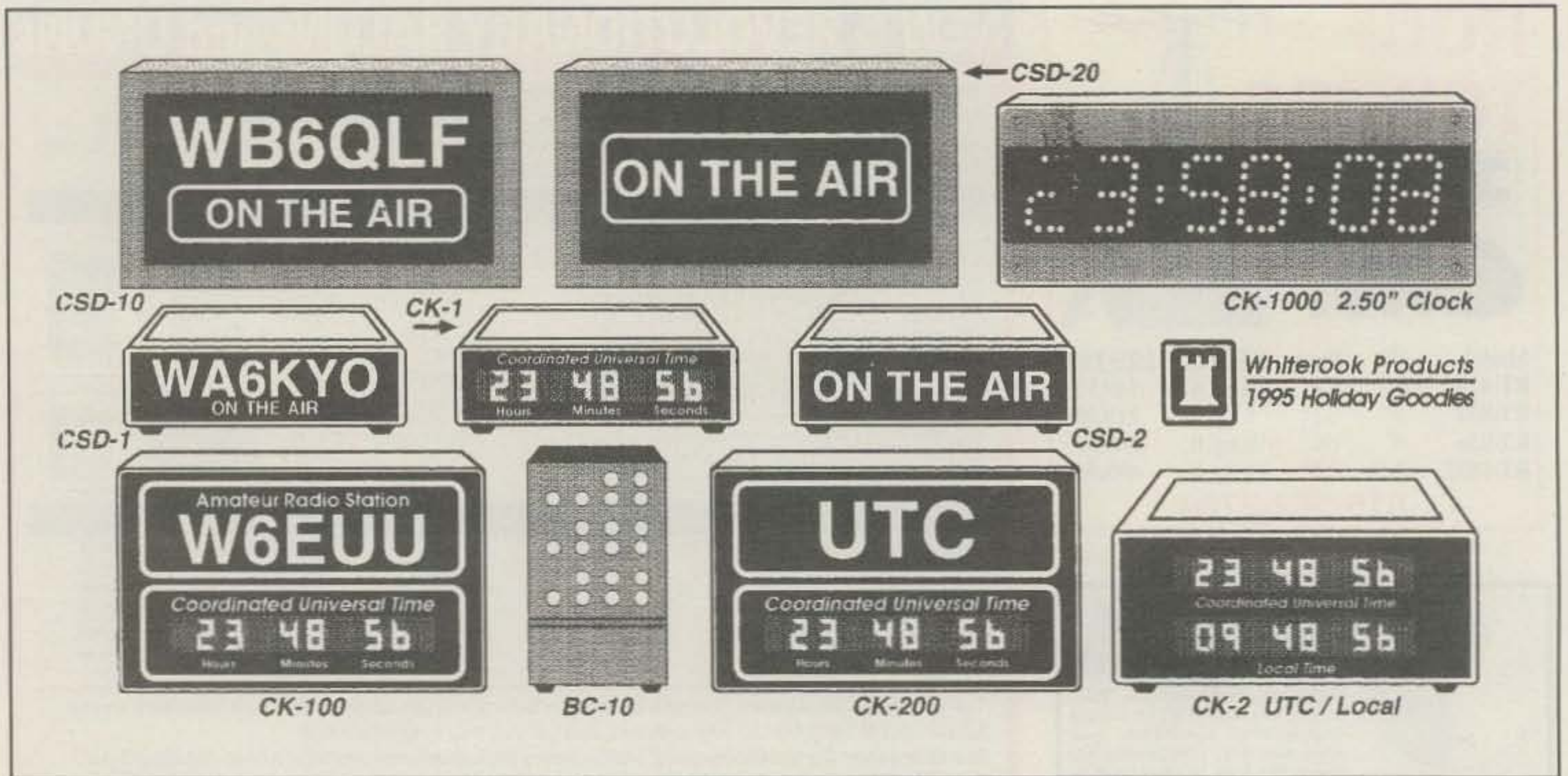
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Whiterook Products sells an array of illuminated callsign displays and clocks.

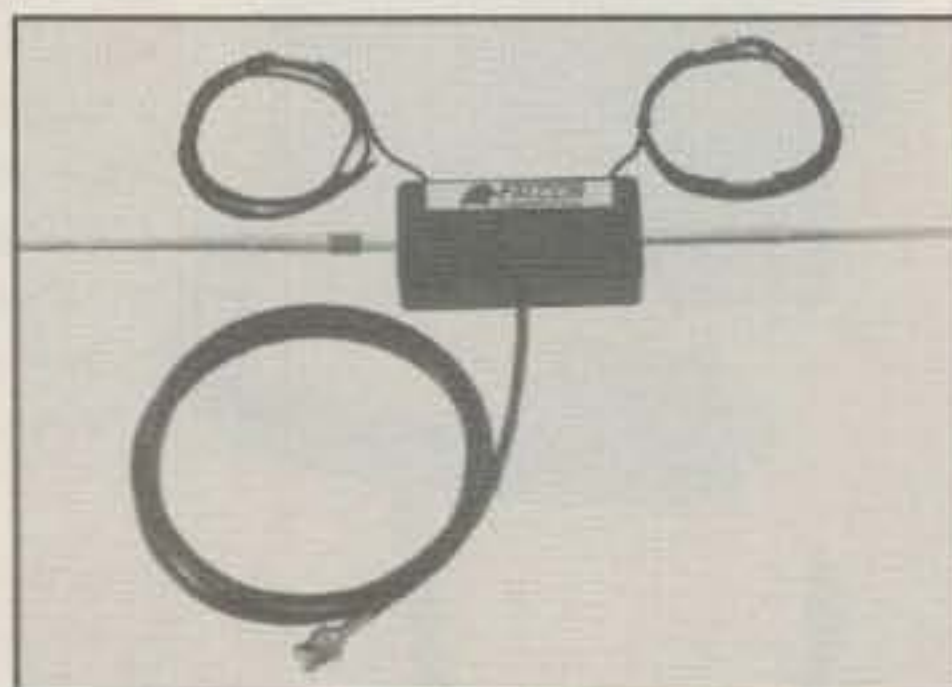
easy to mount on walls. Their size is 15.25 x 7.25 x 2.0 inches. Each model sells at \$84.45. Their Model CK-1 is 5 x 1.5 x 5.25 inches; it provides UTC time in a bright red LED display featuring 6-digit (hours, minutes, and seconds) time. The CK-1 price is \$79.95. The Model CK-2 is a dual UTC and local six-digit

clock. It's size is 6.1 x 2.5 x 6.2 inches and the cost is \$124.95. The Model CK-100 includes the 6-digit UTC clock with one's unlit callsign above it. The CK-100 price is \$79.95. The size of the CK-100 is 6.25 x 3.75 x 2.0 inches, and it is easy to mount on a wall. Unlike other manufacturer's models, the CK-1 and CK-100

operate accurately from AC house power, eliminating the need for batteries. The CK-100 is also available with UTC instead of one's callsign; this version is the CK-200 and it is priced at \$79.95. The BC-10 binary clock costs \$74.95; it displays 12- or 24-hour time in the binary format. The Model CK-1000 clock fea-



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tures a 2.5 inch six-digit display. It's size is 15 x 6 x 2 inches and the cost is \$129.95. Each clock purchase price includes the \$5 s&h fee. House power adapters are available for use with all of these clocks. John Roblin, WA6KYO, suggests submitting orders well in advance of Christmas. A free catalog covering these products is available. The address is 309 South Brookshire Ave., Ventura, CA 93003 (phone/FAX 805-339-0702).

(Also see Blue Ridge Office Supplies/Badges; Camelia Trophy Shop/Plaques; Leather & West/Belts; LQV Engraving/Badges; Old West Graphics/Clothing; PBB Engraving/Badges; W5YI Group.)

**Software.** AmSoft sells a CD-ROM amateur radio callsign tri-annual (Jan./May/Sept.) database at \$42, including s&h. A three-issue annual subscription costs \$99 plus s&h. Their address is P.O. Box 666, New Cumberland, PA 17070-0666 (phone 717-938-8249; FAX 717-938-6767).

Engineering Systems is run by Paul Schmid, W4HET. He offers Skycom 1.1 worldwide hourly high-frequency predictions at \$30. His more sophisticated Skycom 1.5 is also available at \$30, or both can be purchased at \$50. His DX Window shows gray-line data relative to one's station location; it is priced at \$35 for floppy disk and a detailed instruction manual. The expanded Beam Headings List and Program sells at \$6; it is supplied free with a Skycom 1.1 or 1.5 order. His Satellite Prediction program costs \$50. The s&h fee is \$5 more domestically and \$10 internationally. These predictions are unusual in that they take total path loss into consideration. The address is P.O. Box 939, Vienna, VA 22183 (phone 1-703-687-3000; FAX 1-703-687-5861).

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The Vibroplex Company has available a variety of items of interest to the code enthusiast.

HamWindows markets a low-cost entry-level software program in three variations. The address is 19032 Pauline Lane, Huntington Beach, CA 92646 (phone 714-729-4222; FAX 714-644-6277).

Martha's Vineyard Henley's, Inc. offers their Easyterm Program for Windows. This program includes 43 useful features at \$52.95, including s&h fees. Their address is P.O. Box 2154, Edgartown, MA 02539-2154 (phone 800-336-7796).

RT Systems markets an amateur radio database which enables one to quickly and easily locate amateurs by names or call signs. One can search for a specified city, state, or ZIP code. This database is available in CD-ROM or disk form at \$44.95 each, including s&h charges. Search filters allow searches by address, age, call sign area, call sign prefix, call sign suffix, first name, and license class.

Options (\$7.50 each) provide county cross-reference, date first licensed, date of birth, license expiration date, and previous call sign data. Their address is 8207 Stephanie Drive, Huntsville, AL 35802 (phone 1-800-723-6922 and 1-205-882-9292).

Alan Yorinks, WB2OPA, offers his LogMaster Plus/Plus all-band all-mode logging system designed for use with PC compatibles. It supports ICOM, Kenwood, Ten-Tec, and Yaesu transceivers. The price of a complete system is \$89.95. A demonstration disk is available at \$5, which can be applied towards a later purchase of the complete system. Their address is Sensible Solutions, P.O. Box 474, Middletown, NJ 07748-0474 (phone 908-495-5066).

Shadow Software offers vanity call sign disks showing all call signs that will be available for reassignment. Each call sign area is covered, listing about 85,000 call signs. The VANITY4



This is Stan Farley, NØABA, of Valley Center, Kansas. As the wallpaper on his shack walls shows, he is an avid Morse code operator.



version shows all unassigned 1 by 2 and 2 by 1 callsigns. The VANITY5 version shows available 1 by 3 and 2 by 2 callsigns. Their address is 3496 Velma Drive, Powder Springs, GA 30073 (phone 770-943-3223).

Dave Farnsworth, WJ2O, offers a versatile software logging program which is more than its name implies. It features color and monochrome monitor compatibility, DXCC country identification (including CQ and ITU zones), 50-page instruction manual, 14 choices of QSO printouts, QSO's logged in a single main database, customized or standard printing of QSL cards and labels, QSL tracking, simple step-by-step menus, hand net operation format, adjustable DXCC prefix file (to accommodate changes), single keystroke pop-up utilities (such as DXCC list, international prefixes, Q-signals, state abbreviations, etc.), plus import and export files. The domestic (USA and Canada) and foreign prices for the logging program, including the manual, are \$49.95 and \$59.95, respectively. Their domestic address is WJ2O Master QSO Logging Program, P.O. Box 16, McConnellsville, NY 13401 (phone 315-245-1010; FAX 315-245-1336).

Sheldon Shallon is W6EL. W6EL Software offers the MINIPROP PLUS propagation prediction program for IBM and IBM compatible computers. Miniprop Plus predicts signal levels for every half hour of the day on any path, and on any frequency, between 3 and 30 MHz. World maps show the great-circle path and day/night regions for any date and time; plus the best frequency to use to contact each of the 57 areas of the world. Also, MUFs, beam headings, sunrise/sunset times and more are

included. All screens are in full color on suitably equipped computers. A printed manual has detailed instructions. Miniprop Plus is \$60. W6EL Software's address is 11058 Queensland Street, Los Angeles, CA 90034-3029.

NuMorse, which is a Windows 3.1 application that functions as a Morse code training aid, was developed by Tony Lacy, G4AUD. It performs code drills and prepares sample tests. Most of the code training programs operate only in DOS, whereas the NuMorse program is written to be run under the Microsoft Windows operating environment. The program is distributed as "Shareware" via the CompuServe online service. To order by mail, send \$25 to A. Lacy, 58 Bilbrook Road, Codsall, Wolverhampton, WV8 1ER, United Kingdom.

(Also see *Buckmaster/Publications; JWO Services/Video Tapes.*)

**Stationery.** (See ARRL.)

**Tie-Tacs.** (See *One of a Kind/Pins.*)

**Trophies.** Trophies by Edco is run by Rick Cordary, KN4CV. This is an excellent source of advertising specialties, badges, plaques, and trophies. Their address is 3702 Davie Boulevard, Ft. Lauderdale, FL 33312-3494 (phone 305-587-0137; FAX 305-581-7680).

**Umbrellas.** (See CQ.)

**Vibroplex.** The Vibroplex Company, Inc. offers several items which may be of interest to code enthusiasts. Each item features the famous Vibroplex logo (bug) in some way. Their baseball-type light-blue hat (\$6.95) is fully adjustable. It has the Vibroplex emblem in black, red, and gold. The key chain (\$6.95) is cast solid brass, and it features the bug logo. Their black-glaze English ironstone mug

(\$8.95) shows their bug logo in 22 karat gold. An 8 x 18 inch black felt pennant (\$3.95) shows the Vibroplex name and logo in gold. A light-blue T-shirt (\$11.95) is half cotton and half polyester. It is available in small, medium, large, and extra-large sizes and features the bug logo. A \$5 shipping charge applies to orders being shipped to USA addresses. The Vibroplex address is 11 Midtown Park East, Mobile, AL 36606 (phone 1-800-840-8873; FAX 205-476-0465). Vibroplex offers several other items that are of interest to amateurs. Vibroplex Company is covered in detail in a 91-page book priced at \$19.95; it includes copies of their advertisements, nameplates, and patents.

**Video Tapes.** JWO Services offers amateur radio books, software, and video items at discount prices. The address is 12 Hickory Pl., Camp Hill, PA 17011 (phone 717-731-4747; FAX 717-730-9373).

(Also see ARRL; CQ.)

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73, Bill, W6DDB



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## NEWS OF COMMUNICATION AROUND THE WORLD

**Niagara Falls**

In late September, Region 2 of the International Amateur Radio Union (IARU) held its triennial conference in Niagara Falls, Ontario, Canada. Several items of interest to DXers were discussed or announced at the conference.

Before we get to those items, however, a little background is in order. The IARU is the internationally recognized body that represents amateur radio at the highest levels of telecommunications politics. For example, the IARU has official observer status with the International Telecommunications Union (ITU), the agency of the United Nations with control over all aspects of radio, among other duties. It was the IARU, through its members and delegates, that won three new HF amateur radio bands at the World Administrative Radio Conference (WARC) in 1979. The 30 meter and 17 meter bands have been particularly useful for DXing at this point in the sunspot cycle.

The IARU members are the national amateur radio societies, and there are nearly 150 of them. The ARRL is one such society, and it serves as the secretariat of the IARU. Other such societies include the new Radio Amateurs of Canada, the host of the Niagara Falls conference, the RSGB, DARC, JARL, etc.

The IARU is composed of three Regions, on the lines of the ITU regions. Region 1 is Europe and Africa; Region 3 is Asia and Oceania; and Region 2 is the Americas. Each Region holds an in-person conference once every three years. This was the year for Region 2.

Since the members of the IARU are amateur radio societies and not individuals, the actual number of "members" of Region 2 who attended the 1995 conference was only 20. Many of these members held proxy votes from other societies unable to attend the conference, so there were 29 societies represented at Niagara Falls.

Voting in the conference is based on the United Nations system of one country, one vote. Thus, the ARRL delegation had one vote, and the tiny Montserrat Amateur Radio Society (MARS) also had one vote. But on the DX-related actions.

### International Amateur Radio Permit Established

By the far most exciting event at the conference was the announcement of the establishment of the International Amateur Radio Permit (IARP). This permit has been a long-term goal of the IARU for many years. Since the early 1980s, the IARU, through its relationship with CITEL, the Inter-American Telecommunication Commission, has been trying to get the Organization of American States (OAS) to approve a means of allowing amateur radio operators from one country to operate in another without having to go through the process of obtaining a reciprocal license. Not only is the reciprocal

P.O. Box 50, Fulton, CA 95439



Jose, T12JJP, returns to Cocos Island as T19JJP in October. Thanks to heavy geomagnetic storms at the time, his signals sounded as though they were coming from under water.

licensing program cumbersome and time-consuming, but also there are many countries that don't have reciprocal agreements with other countries.

The IARU goal was a system similar to that now in effect in Europe, the CEPT license. Amateurs licensed by countries that are member states of the European Community can operate without any additional paperwork in other member states. Thus, a German amateur can go on an island DXpedition in France, solely on the basis of a CEPT license. (Peru and New Zealand have also signed onto the CEPT license.)

The IARP was approved in June 1995 at a meeting of the OAS in Haiti. This was the result of many years of behind-the-scenes work by both the IARU and its member societies, and demonstrates the important of the IARU to individual amateurs.

What the IARP will mean, once all the necessary structure is in place, is that a US amateur can travel to any other country that is a member of the OAS, and has signed onto the IARP, and operate without any additional licensing paperwork. While the US has reciprocal licensing agreements with many of these countries, and most are very helpful toward vis-



IYRL (left) is a frequent traveller to the rarer countries of Europe, on CW only. IK1SLP accompanied Luc to Monaco.



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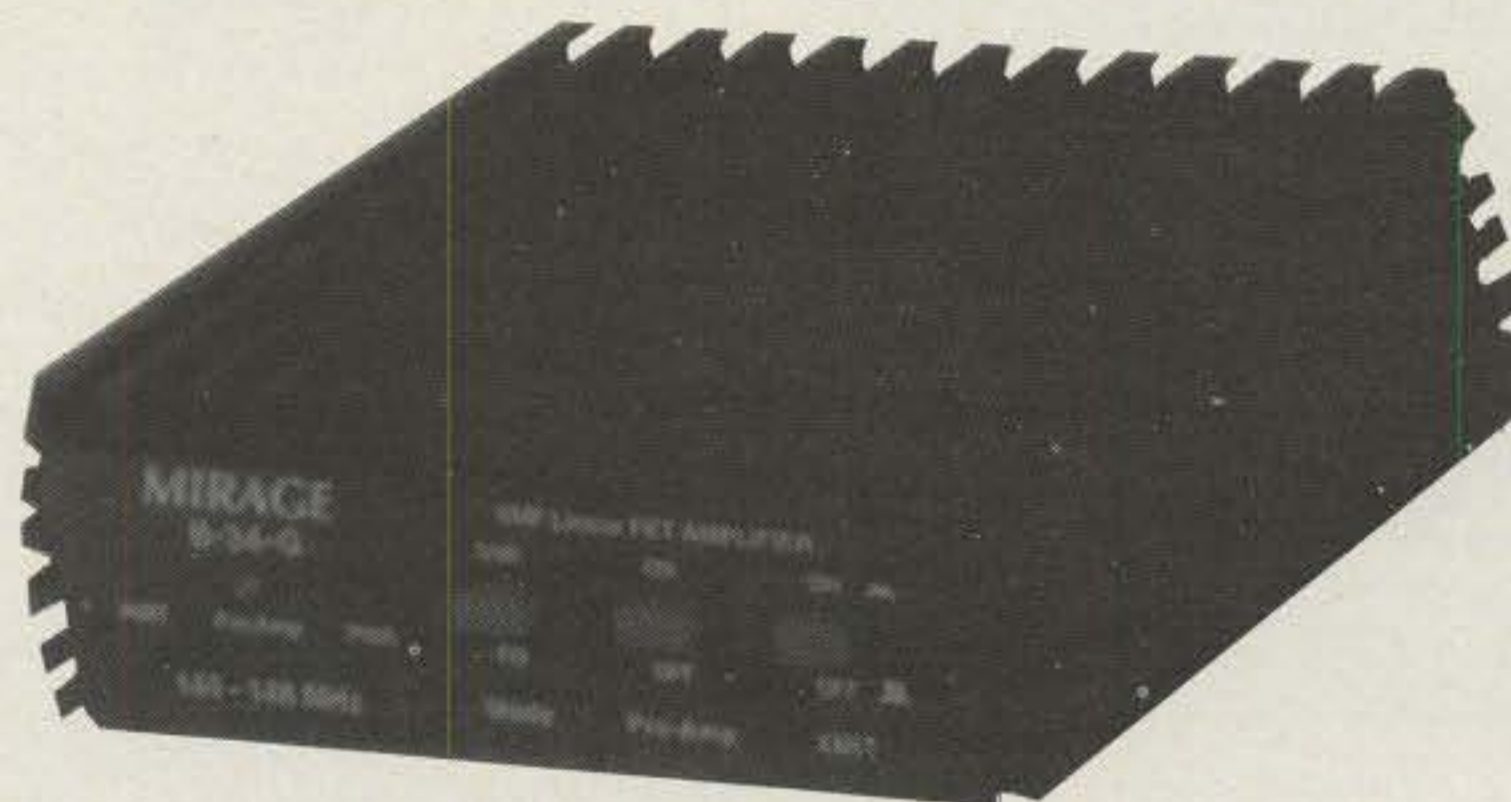
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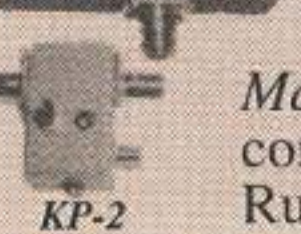


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Mixed: 450 LU5EW, WA4ZXA, DL9FCD, W4RTE. 500 LU5EW, WA4ZXA, W4RTE. 550 LU5EW. 600 LU5EW. 650 LU5EW. 700 LU5EW. 1000 5N0ETP. 1050 5N0ETP. 1100 5N0ETP. 1400 JN3SAC. 1450 JN3SAC. 1950 W3KH. 2250 KS3F. 2750 KF2O. 2800 KF2O. 3750 W2FXA.

SSB: 350 KA5TTC, WA4ZXA, RA3LZ, AA6WJ. 400 KA5TTC, WA4ZXA, RA3LZ, AA6WJ. 450 KA5TTC, WA4ZXA, RA3LZ, AA6WJ. 500 KA5TTC, WA4ZXA, RA3LZ, AA6WJ, TU7DBS. 550 RA3LZ, AA6WJ, T17DBS. 600 RA3LZ, AA6WJ. 650 RA3LZ. 700 RA3LZ. 750 JA2OCU, RA3LZ, DL8AAV. 800 JA2OCU, RA3LZ, DL8AAV. 850 RA3LZ. 900 RA3LZ. 950 JH1LPZ, RA3LZ. 1000 RA3LZ. 1950 KS3F. 2000 KS3F. 2350 KF2O. 2400 KF2O, LU8ESU.

CW: 500 LU5EW, LU7EAR. 400 LU5EW, LU7EAR. 450 LU7EAR. 500 K3WWP, VE2ABO, LU7EAR. 550 9A3UF, LU7EAR. 600 LU7EAR. 650 LU7EAR. 700 LU7EAR. 900 YU1TR. 1000 DF7HX. 1350 KS3F. 1400 KS3F. 1850 KF2O. 1900 KF2O.

20 Meters: DL8AAV  
40 Meters: K3WWP, AA7WJ  
80 Meters: 5N0ETP

Asia: DL8AAV, 5N0ETP  
No. Amer.: K3WWP

**Award of Excellence Plaque Holders:** 18YRK, W4CRW, SM0AJU, K5UR, K6XP, N5TV, K2VV, VE3XN, W6OUL, DL1MD, DJ7CX, DL3RK, WB4SIJ, SM6DHU, N4KE, I2UIY, DL7AA, ON4QX, WA8YTM, YU2DX, OK3EA, I4EAT,

OK1MP, N4NO, ZL3GQ, VK9NS, DE0DXM, DK4SY, UR2QD, AB9O, FM5WD, I2DMK, W4BQY, I0JX, SM6CST, VE1NG, I1JQJ, WA1JMP, PY2DBU, HI8LC, KA5W, K0JN, W4VQ, KF2O, K3UA, HA8XX, HA8UB, W8CNL, K7LJ, W1JR, F9RM, W5UR, WB8ZRL, SM3EVR, CT1FL, K2SHZ, UP1BZZ, W8RSW, WA4QMQ, EA7OH, K2POF, DJ4XA, IT9TQH, W8ILC, K2POA, N6JV, W2HG, ONL-4003, VE7DP, K9BG, W5AWT, KB0G, HB9CSA, F6BVB, W1BWS, YU7SF, G4BUE, N3ED, DF1SD, K7CU, I1POR, LU3YLW4, NN4Q, KA3A, YB0TK, VE7WJ, VE7IG, K9QRF, YU2NA, N2AC, W4UW, NX0I, W9NUF, N4NX, SM0DJZ, DK5AD, WB4RUA, DK5AD, WD9IIC, W3ARK, I6DQE, LA7JO, VK4SS, K6JG, I1EEW, I8RFD, I3CRW, VEFXR, N4MM, KC7EM, ZS6BCR, CT1YH, IV3PVD, KA5RNH, ZP5JCY, F1HWH, KC8PG, NE4F, VE3MS, K9LJN, ZS6EZ, YU2AA, I1WXY, IK2ILH, DE0DAQ, LU1DOW, N1IR, IK4GME, WX3N, KC6X, N6IBP, W5ODD, I0RIZ, I2MQP, I5ZJK, JA0SU, S51NU, K9XR, W0ULU, HB9DDZ, F6HMJ, I2EOW, IK2MRZ, KS4S, KA1CLV, WZ1R, CT4UW, K0IFL, IN3NJB, WT3W, IN3NJB, S50A, UT5-186-2.

**Award of Excellence Plaque Holders with 160 Meter Endorsement:** CT1YH, IV3PVE, KA5RNH, ZP5JCY, AB9O, FM5WD, SM0DJZ, DK5AD, SM6CST, I1JQJ, PY2DBU, W3ARK, HI8LC, KA5W, UR2QD, VE3XN, K6XP, LA7JO, W4VQ, K6JG, K3UA, HA8UB, W4CRW, N4MM, K7LJ, SM0AJU, KF2O, SM3EVR, K5UR, UP1BZZ, OK1MP, N5TV, K2POF, W8CNL, DJ4XA, IT9TQH, DL9RK, N6JV, ONL-4003, W1JR, W6OUL, W5AWT, KB0G, F6BVB, W4BQY, YU7SF, W5UR, N4NO, DF1SD, K7CU, I1POR, W8RSW, N4KE, I2UIY, YB0TK, W8ILC, W1BWS, VE7WJ, K9QRF, NN4Q, W4UW, NX0I, G4BUE, LU3YLW4, I4EAT, WB4RUA, VE7WJ, N4NX, DE0DXM, VE7IG, K9BG, I1EEW, AB9O, CT1YH, IV3PVD, KA5RNH, ZP5JCY, I2MQP, I0RIZ, W5ODD, WX3N, IK4GME, HA8XX, YU1AB, F6HMJ, HB9DDZ, K9XR, K0JN, ZS6EZ, JA0SU, I5ZJK, I2EOW, KS4S, KA1CLV, K0IFL, K9LJN, WT3W, IN3NJB, S50A, UT5-186-2.

Complete rules and application forms may be obtained by sending a business-size self-addressed, stamped envelope (foreign stations send extra postage if airmail desired) to: "CQ WPX Awards," P.O. Box 593, Clovis, NM 88101-9511 USA.

iting amateurs, the IARP will open some doors long closed. It certainly will encourage DXpeditioning in the Americas, especially between countries that lack reciprocal licensing.

The exact details of the administration of the IARP remain to be worked out. However, in broad terms, here's what we expect to happen. Each member country of the OAS must first adopt the resolution, signing on to the IARP concept. These countries must then set up a procedure to issue the permits. The idea is for the member societies to have this authority delegated to them. Thus, a US amateur might apply to the ARRL for the permit. There will be two difference license classes: a VHF-only and a full-privilege license. The former would be equivalent to our Technician class, while the other would be closer to our Extra class. Each IARP issuing organization would have to figure out how to fit their own licenses into this simplified structure. In the US, for example, Techs and Tech-pluses might get the VHF-only permit, while higher classes might get the full-privilege license.

Armed with the permit, the traveller could then go to any other country that has adopted the resolution and operate under the amateur radio rules of that country.

Farther down the road are even more intriguing possibilities. The OAS and the CEPT could agree to honor each other's permits, creating a single permit for operating in both Europe and the Americas. Eventually, this could be expanded worldwide.

In any case, do *not* apply to the ARRL for your IARP at this time. The procedures for issuing the permits have not yet been established.

## The WAZ Program

### Single Band WAZ

#### 15 Meter SSB

486 .....KA5TTC

#### 20 Meter SSB

974 .....KA5TTC 976 .....KJ4SW

975 .....CX7BV

#### 40 Meter CW

184 .....OE2DYL

#### 160 Meters

81 N4XR—30 zones

#### All CW

79 .....WB2NQT 80 .....IK0IZW

#### All Band WAZ

#### SSB

4294 .....N4OLE 4297 .....YV5AAX

4295 .....CT1CBI 4298 .....CX3CE

4296 .....WA9WKK

#### CW/Phone

7611 .....WA6KUI/4 7615 .....KN6DI

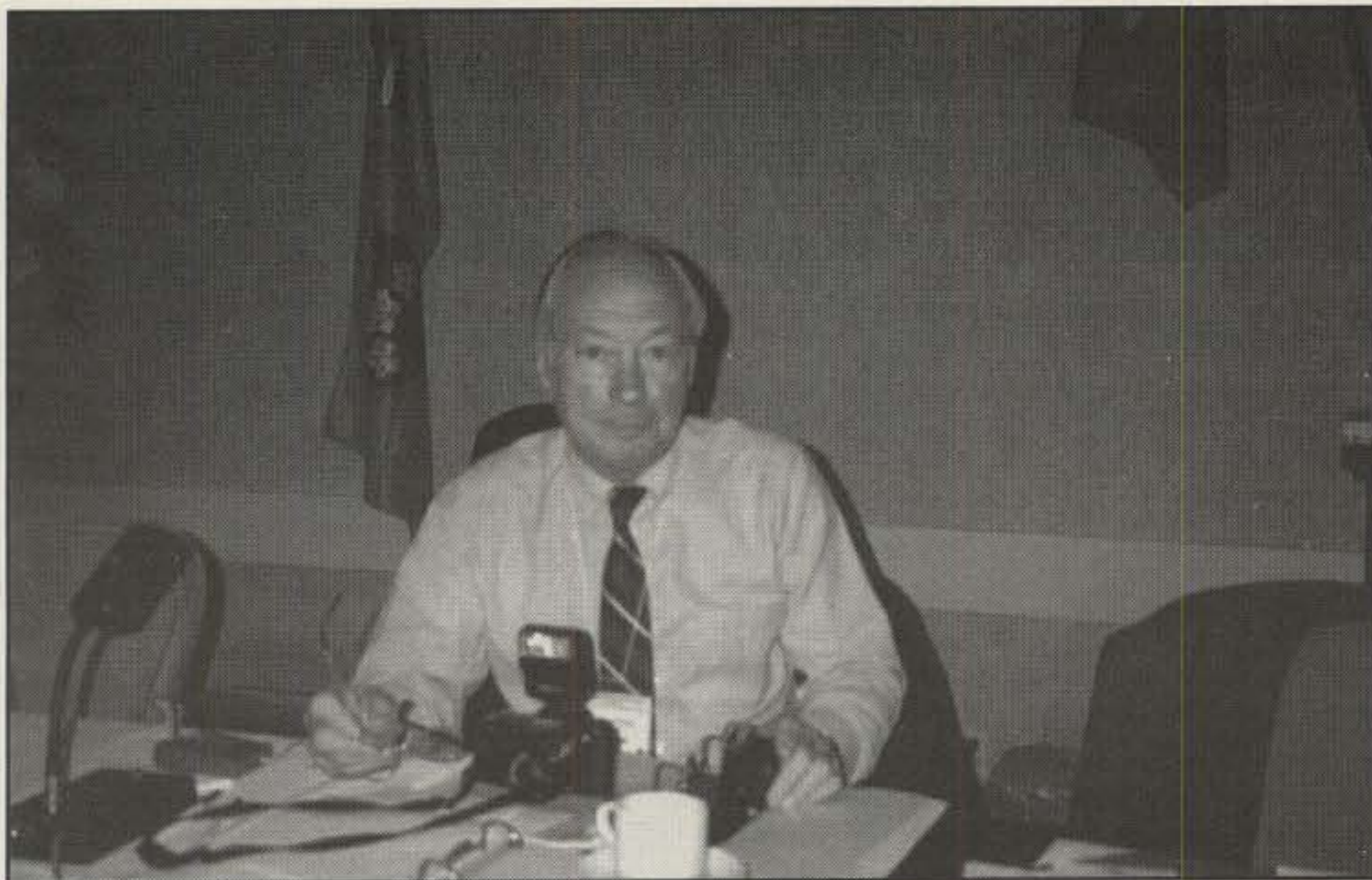
7612 .....W6DN (CW) 7616 .....YV5JDW

7613 .....W9IAL 7617 .....JG1BWW

7614 .....WA9WKK 7618 .....KD2L

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and \$1.00 to: WAZ Manager, Jim Dionne, K1MEM, 31 DeMarco Road, Sudbury, MA 01776. The processing fee for all CQ awards is \$4.00 for subscribers (please include your most recent CQ mailing label or a copy) and \$10.00 for nonsubscribers. Please make all checks payable to the Award Manager. Applicants sending QSL cards to a CQ checkpoint or the Award Manager must include return postage. Questions regarding the WAZ Award may be sent to K1MEM with an SASE.





International Amateur Radio Union Region 2 President Tom Atkins, VE2CDM, was one of two recipients of the first IARPs ever issued.

## 5 Band WAZ

As of August 31, 1995, 426 stations have attained the 200 Zone level.

New recipients of 5 Band WAZ Award with all 200 Zones confirmed:

LZ2JE  
OK2FD  
T77C

The top contenders for 5 Band WAZ (zones needed, 80 meters):

N4WW, 199 (26)	RA3AUU, 199 (1)
AA4KT, 199 (26)	UY5XE, 199 (27)
K7UR, 199 (34)	SM6AHS, 198 (12, 31)
NAØY, 199 (26)	UA3AGW, 198 (1, 12)
WØPGI, 199 (26)	VO1FB, 198 (19, 27)
W2YY, 199 (26)	EA5BCK, 198 (27, 39)
W9WAQ, 199 (26)	KZ4V, 198 (22, 26)
W1JR, 199 (23)	K4PI, 198 (23, 26)
VE7AHA, 199 (34)	G3KDB, 198 (1, 12)
W1FZ, 199 (26)	DK2GZ, 198 (1, 24)
IK2GNW, 199 (1)	KG9N, 198 (18, 22)
W9CH, 199 (26)	KM2P, 198 (22, 26)
ACØM, 199 (34)	I1ZXT, 198 (1, 1 on 40)
IK8BQE, 199 (31)	GM3YOR, 198 (12, 31)
JA2IVK, 199(34, 40m)	OE6MKG, 198 (12, 31)
KA5W, 199 (26)	NN7X, 198 (17, 34)
K1ST, 199 (26)	DKØEE, 198 (19, 31)
ABØP, 199 (23)	KØSR, 198 (22, 23)
KL7Y, 199 (34)	

The following have qualified for the basic 5 Band

LZ2JE, 200 Zones	EA5CZ, 158 Zones
OK2FD, 200 Zones	T77C, 200 Zones

WAZ Award:

KØSR, 198 Zones	WB4DBB, 196 Zones
WB2NQY, 192 Zones	

Endorsements:

978 Stations have attained the 150 Zone level as of August 31, 1995.

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and \$1.00 to: WAZ Manager, Jim Dionne, K1MEM, 31 DeMarco Road, Sudbury, MA 01776. The processing fee for all CQ awards is \$4.00 for subscribers (please include your most recent CQ mailing label or a copy) and \$10.00 for nonsubscribers. Please make all checks payable to the Award Manager. Applicants sending QSL cards to a CQ checkpoint or the Award Manager must include return postage. Questions regarding the WAZ Award may be sent to K1MEM with an SASE.

However, the very first IARP permits were issued at the Niagara Falls conference, by officials of Industry Canada, the government arm that is handling amateur radio licensing in Canada. The first recipients of the permits were IARU Region 2 President Tom Atkins, VE3CDM, and Radio Amateurs of Canada President Farrell Hopwood, VE7RD.

## Other Actions

There were many other items of interest to DXers discussed at the conference, most in meetings of Committee B, in charge of HF and technical considerations at the conference. (The committee elected the delegate from the Montserrat Amateur Radio Society, one Chod Harris, VP2ML, as its president!)

There was considerable dialogue on the need for a Morse code requirement for HF privileges. Under current ITU rules any person seeking an amateur radio license must demonstrate the ability to send and receive Morse code. (The requirement may be waived for VHF-only licenses.) The IARU has consistently backed retaining this requirement, technically known as Regulation 2735, in the ITU rules. Region 2 unanimously voted to continue this stance.

A group in New Zealand, however, unaffiliated with the New Zealand IARU society, has been pushing to delete this regulation. This group has succeeded in getting the New Zealand authorities to put the question on the agenda for the next WARC, and is actively seeking support from other administrations.

Is this the beginning of the end of Morse code? Probably not. In the first place, the deletion of 2735 does not, by itself, change any country's amateur radio regulations. It would simply no longer *require* code ability. Each country would have to decide whether to continue its own requirements. Given widespread amateur support for the code requirement, countries are unlikely to make wholesale changes in their licensing requirements in the near future.

Second, the deletion of 2735 is by no means

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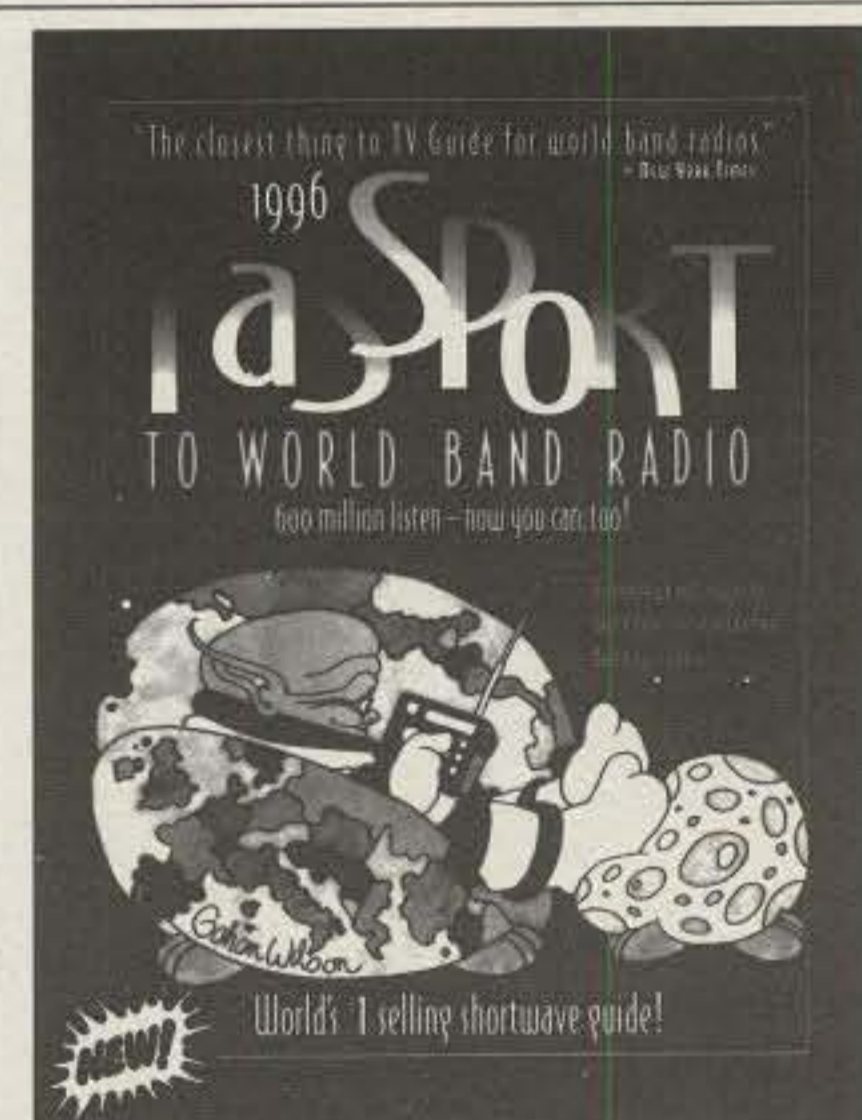
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## The WPX Honor Roll

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### MIXED

4642	9A2AA	3200	I2PJA	2761	IT9QDS	2418	WB2YQH	2041	N2AIF	1729	VE9RJ	1437	K0IFL	1272	K9BQL	759	EA2BNU
4323	K2VV	3166	YU1AB	2759	YT7DX	2390	S53EO	2039	KB0G	1668	PY2DBU	1394	IK1GPG	1235	AA7FL	739	VE6JAV
4143	IT9TQH	3154	N4UU	2741	HA8XX	2375	K8LJG	2034	W6OUL	1663	LU8DY	1393	I1-21171	1149	IK2PZG	689	W4RTE
3703	EA2IA	3153	N4MM	2714	KF2O	2362	HA5NK	2013	KS4S	1655	WB3DNA	1392	EA3CWK	1127	G4SDJ	671	H18LC
3583	W2FXA	3135	I1EEW	2689	SM7TV	2230	K5UR	1946	WB2ABD	1650	CT1QF	1352	ND3A	1123	WT3W	670	KB5OHT
3507	K6JG	3036	KA5W	2676	N2AC	2164	W4UW	1909	SM6CST	1617	HA9PP	1321	W9IAL	1068	IK2DUW		
3482	VE3XN	3032	WA8YTM	2535	HA8HW	2162	S51NU	1901	NV9S	1604	I8AOF	1317	KS8Z	1066	IT9JPK		
3462	N4NO	2999	9A2NA	2478	I2EOW	2122	IK2ILH	1855	S58MU	1532	AE5B	1316	NH6T	1038	N4PYD		
3393	N6JV	2890	PA8SNG	2470	K2POF	2122	N6JM	1846	G4OBK	1498	WZ1R	1315	WA3HUP	1020	WU1F		
3326	W1BWS	2876	YU7SF	2452	SM6DHU	2069	W8UMR	1796	KA5TQF	1491	KC6X	1305	CT1EEB	1003	WB2PCF		
3286	N9AF	2855	HA8DU	2445	4N7ZZ	2063	W9IL	1794	HA8QC	1484	I2EAY	1295	I1-50156	993	VE6BMX		
3237	SM3EVR	2825	YU7BCD	2440	S5OA	2056	9A4RU	1773	WB8ZRL	1476	JN3SAC	1286	HP2CWB	785	W2EZ		

### SSB

4143	IT9TQH	2722	OZ5EV	2319	KF2O	1956	KF7RU	1558	IK2DUU	1375	EA5OL	1145	KB0G	1020	K0IFL	831	W6RQQ
4053	I0ZV	2709	I1EEW	2309	LU8ESU	1933	CX6BZ	1526	KS4S	1360	DK5WQ	1143	K9BQL	1006	ND3A	827	EA5DCL
3658	K2VV	2707	EABAKN	2228	EA3AQC	1907	IN3QCI	1521	KA5TQF	1360	K3IXD	1124	EA1KK	1000	IT9JPK	799	HA9PP
3622	VE1YX	2691	N4NO	2206	YU7BCD	1902	K5UR	1520	CT1DIZ	1335	OE2EGL	1081	N5QDE	990	IK2PZG	798	EA7CRL
3555	ZL3NS	2660	I4CSP	2174	I2EOW	1847	CT1BY	1514	CT1BWW	1306	CT1EEB	1080	KC6X	974	EA8BGY	796	EA3EQT
3361	F6DZU	2612	NJ0C	2160	CT4UW	1811	SM6DHU	1463	AE5B	1305	IK1GPG	1074	EA1IF	955	DF7HX	782	CE5FSB
3258	K6JG	2572	KA5W	2108	EA5AT	1801	K2POF	1462	K2EEK	1293	IK2AEQ	1069	WZ1R	931	WU1F	729	N3DRO
3189	I2PJA	2554	PA8SNG	2087	CT1AHU	1749	LU8DY	1445	N2AC	1250	NG9L	1054	EA8PP	930	WT3W	714	SM6CST
3114	WD8MGQ	2491	HA8XX	2039	N4UU	1643	N6FX	1411	KB0C	1249	K8MDU	1047	KB4HU	911	EA1AX	710	KE4BM
2951	CT4NH	2466	I4ZSQ	2026	4X6DK	1630	W5AWT	1403	W6OUL	1242	G4OBK	1042	WA2FKF	890	SV3AQR	706	IK4HPU
2804	N4MM	2376	9A2NA	2000	EA2AOM	1608	K8LJG	1401	IK0EIM	1223	T30JH	1033	N4PYD	867	I6KYL	681	H18LC
2768	F2VX	2375	I2MOP	1983	K5RPC	1604	YU7SF	1389	HA5NK	1158	HP2CWB	1028	AA6BB	851	VE4ACY	658	VE9RJ
2755	EA2IA	2366	WA8YTM	1957	W4UW	1565	LU7HJM	1383	WB8ZRL	1151	EA5GKE	1027	NH6T	839	S51NU	601	KJ8F

### CW

4139	IT9TQH	2408	N2AC	1959	KA7T	1787	K5UR	1538	I1EEW	1259	KA1CLV	1038	4X6DK	714	EA2BNU	617	9A3UF
3715	K2VV	2397	K9QVB	1933	HA5NK	1785	SM6CST	1523	W6OUL	1254	G4MVA	1032	W4UW	703	I2EOW	613	VE4ACY
3630	WA2HZR	2314	WA8YTM	1932	S51NU	1748	N6FX	1467	IK3GER	1253	EA7TG	1030	AC5K	695	HA9PP	602	WT3T
3366	N6JV	2253	YU7BCD	1869	KF2O	1734	OZ5UR	1443	KS4S	1233	EA7AAW	1009	KC6X	679	EA5FV	602	KB5OHT
3056	VE7CNE	2250	KA5W	1866	K2POF	1728	W1WAI	1435	DJ1YH	1225	JH3SAC	964	KA5TQF	676	HL5AP		
2979	N4NO	2245	G4UOL	1851	G3VQO	1726	ZS6EZ	1432	G4OBK	1156	EA6AA	923	ND3A	674	EA1AUJ		
2825	YU7LS	2164	N4MM	1842	SM6DHU	1710	KB0G	1406	SM5DAC	1122	WB8ZRL	871	I2MOP	663	K0IFL		
2784	N4UU	2057	W8IQ	1823	T14SU	1692	VR2UW	1395	EA6BD	1098	9A3SM	855	PY4WS	656	VE6BMX		
2746	K6JG	2026	S51NR	1822	K8LJC	1652	VE9RJ	1355	LU2YA	1080	WZ1R	836	KL7UR	651	IK1GPG		
2729	EA2IA	2017	9A2NA	1817	W5AWT	1609	I7PXV	1326	I2EAY	1067	9A2HF	803	IK5TSS	650	KF7JF		
2591	YU7SF	1999	JA9CWJ	1788	HA8XX	1599	S58MU	1289	H18LC	1053	W9IAL	801	K2LUQ	647	ZS1AFZ		

a certainty. The fact that it is up for discussion at the next WARC is an important milestone in amateur radio, but most IARU societies will continue to pressure their ITU delegates to retain the provision.

Looking way down the road, however, given the extremely rapid rate of development of next technologies for communications, perhaps requiring mastery of a 100-year-old skill to get an amateur radio license makes no more sense than requiring skill with a buggy whip to drive a car. After all, Japan has had a code-free HF license for many years, and has more amateurs than the rest of the world combined, with a healthy amateur radio industry.

No, Morse code isn't going to disappear in the foreseeable future, but the mere fact that discussion of eliminating the code requirement was tolerated at a high-level IARU conference is a sign of the changing times.

Another very controversial topic at the conference was the IARU Region 2 forty meter band plan. Most countries in Region 2 want the 7050-7100 range to be used for contacts between Region 2 stations and stations in other Regions. In Regions 1 and 3, the part of the 40 meter band above 7100 kHz is shared with broadcasters, and as anyone tuning the 40 meter band at night quickly learns, SSB DX contacts in that part of the band are almost

impossible. While the IARU continues to work toward a worldwide, exclusive 40 meter allocation of more than 100 kHz, no such band can be expected before the end of this century. The question remained how to best distribute 40 meter operations under current restrictions.

The ARRL's 40 meter band plan encourages digital operation below 7100, to avoid interfering with Novice operation in the 7100-7150 kHz range. These mutually incompatible stances led to considerable arguments which were resolved until the final day of the week-long conference. The ARRL proposed a compromise that moves digital communications within Region 2 to the 7100-7120 kHz range. (The rest of the compromise resolution is typical politicalese.) It will be interesting to see if the ARRL follows up on this new 40 meter band plan.

In another HF matter, the Radio Amateurs of Canada brought up the question of a contest-free zone on 20 meter SSB. The president of Committee B quickly killed that unworkable suggestion!

Another interesting subject was the expansion of the IARU beacon network, but that will be the subject of a future column.

This report barely scratches the surface of the many aspects of amateur radio discussed at the Niagara Falls conference. The work days began with informal breakfast discussions and

dragged on far into the night. There were meetings set for 9 PM on many evenings, for example. It was fascinating to see the enthusiasm and energy of the delegates, most of whom are volunteers who paid their own way to the conference. With people like this supporting amateur radio at the national and international levels, the future of amateur radio looks bright. While individuals cannot directly join the IARU, they can help by supporting their IARU member society in their country.

### DXAC Matters

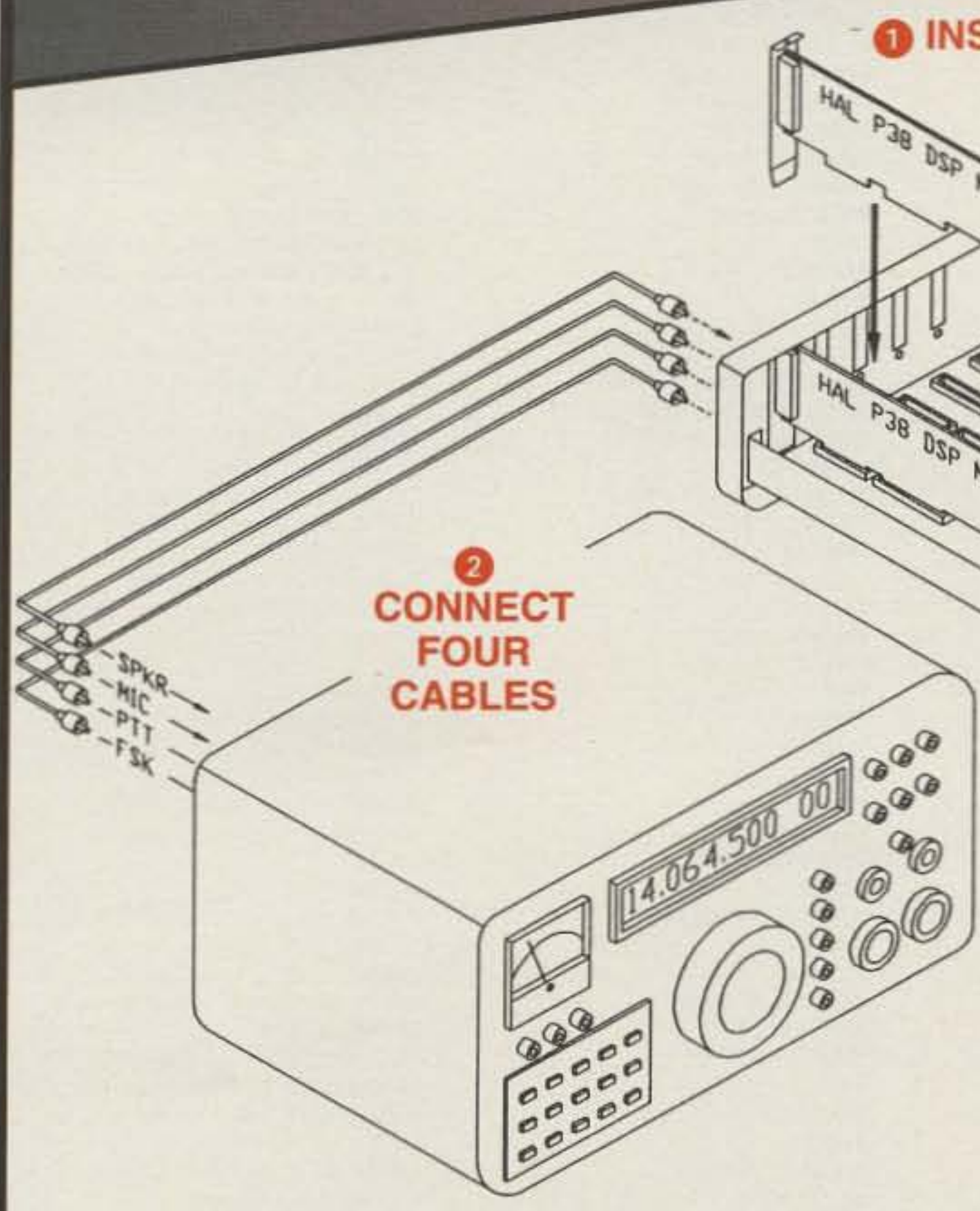
There has been little progress on Scarborough Reef or Pratas Island over the past few months (see the October 1995 DX column for details). The ARRL Board-requested revote on whether Pratas BV9 should be added to the DXCC countries list is set for late November, about the time you receive this issue.

At the Niagara Falls conference DX Advisory Committee (DXAC) chairman Garth Hamilton, VE3HO, briefly commented on the possible outcome of the vote. He stated that some DXAC members still had questions about the Point 1 status of Taiwan. Since the official position of the United States government is that there is one China, and that Taiwan is a



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province of mainland China, one could argue that Taiwan is not a Point 1 country, despite meeting many of the country criteria as listed in the DXCC rules.

I questioned the difference between the two Chinas and North and South Korea. The two Koreas both claim to the legitimate government of the entire Korean peninsula, and both avow to eventually reunite the country. However, the DXAC voted a few years ago to add North Korea to the DXCC countries list. Garth said the difference between the Chinas and

the Koreas is that an armistice exists between the two Koreas, while no such document has been signed between the two Chinas.

When asked about the 1990 DXAC report that determined that Taiwan was a Point 1 country, Garth said that report had never been approved by the ARRL Board of Directors, and thus wasn't binding on the DXAC. These discussions showed that questions remain over the Point 1 status of Taiwan, and thus the DXCC country status of Pratas. (If Taiwan is not a Point 1 country, Pratas does not meet the DXCC



## CQ DX Awards Program

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928.....KA5TTC

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320.....KA5TTC/324      28 MHz.....W1WTG

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300.....K7JYE/302      200.....KA5TTC/234  
275.....K8HQW/296

Total number of active countries is 326. The basic award fee for subscribers to CQ is \$4. For non-subscribers, it is \$10. In order to qualify for the reduced subscriber rate, please enclose your latest CQ mailing label with your application. Endorsement stickers are \$1.00. Updates not involving the issuance of a sticker are made free when an SASE is enclosed for confirmation of total. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business-size, No. 10 envelope, self-addressed and stamped, to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. DX stations must include extra postage for airmail reply. Please make all checks payable to the awards manager.

country criteria as a separate country, as it is too close to mainland China.)

In the matter of Scarborough Reef, as we reported in this column in October, the DXAC and the ARRL Awards Committee had agreed to disagree, leaving the matter up to the Membership Services Committee (MSC) of the ARRL Board of Directors to decide. The MSC met in August, but the DXAC had not provided its arguments against adding Scarborough Reef to the countries list, so the Committee was



Montserrat Amateur Radio Society's delegate to the IARU Region 2 conference in Niagara Falls was elected president of Committee B.

not able to reach a decision. The president of the ARRL has asked Garth Hamilton to provide the DXAC reasoning in the near future so that the matter can be decided at the January ARRL Board meeting.

Thus, it appears that both these issues will remain pending for another couple of months.

## CQ WW CW DXpeditions

As usual, there will be numerous DXers heading out to various locations to provide some interesting multipliers in the CQ WW CW DX Contest November 25-26. Among those who have provided a few months' advance notice are: **T32BE** from Christmas Island, Eastern Kiribati, by Paul Lange, WC5P; **S92P** from Principe Island, by F5OGL and others; **IG9R** from the new CQ WW country of African Italy, by I2VXJ; **J48Y** from Salamis Island (Greece) by SV1BKN and others; **8P9Z** by K4BAI; **3A/K1VWL** from Monaco by K1VWL; and **A61AF** from United Arab Emirates, by KQ1F and K1XM. Good luck in the contest!

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## THE SCIENCE OF PREDICTING RADIO CONDITIONS

### New-Cycle Spots Observed

There are observable patterns on the sun that herald the ending of one cycle and the beginning of a new one. These patterns are the locations of spots on the sun's surface and the polarity of their magnetic fields. Old-cycle spots occur mainly near the sun's equator, while new-cycle spots break out at high solar latitudes. Old and new spots on the same side of the solar equator have magnetic fields of opposite polarity (see fig. 1)

During late August the Big Bear Solar Observatory operated by Cal Tech reported sighting the first sunspots of a new solar cycle. The spots had the required reversed magnetic polarity and the proper location on the sun's disk to be identified as belonging to a new cycle.

Scientists generally date the end of one cycle and the beginning of another when the number of spots associated with each cycle are equal in number. In August the mean value of spots associated with the present sunspot cycle, Cycle 22, stood at approximately 15; the number associated with a new cycle stood at approximately 3. This would indicate that the official end of Cycle 22 and the beginning of Cycle 23 is at least six months away, possibly occurring as early as mid-1996. If this date holds true, Cycle 22 will expire somewhat earlier than expected. This will be discussed more fully in next month's column.

#### Sunspot Cycle 22 Conditions Noted During 1995

Sunspot Cycle 22 continued to decline during 1995 much as expected. The year began with a smoothed count of 24, and the cycle is estimated to have dropped into the mid-teens by the end of the year.

Propagation on the HF bands during 1995 was affected by the continuing low phase of solar activity. The number of days that the 10, 12, and 15 meter bands opened were considerably reduced. Openings on 17, 20, and 30 meters were of noticeably shorter duration. On the other hand, as expected, some improvement in conditions was noted on 40 meters, and more so on 80 and 160 meters.

Fig. 2 plots the progress of Cycle 22 since its beginning in 1985 to date in terms of "Smoothed Sunspot Numbers."

The Royal Observatory of Belgium, the world's official keeper of sunspot records, reports a mean sunspot number of 15 for August 1995. Daily values ranged between a high of 41 on August 26th to a low of 0 on the 14th, 19th, and 21st. The mean level for August results in a 12-month smoothed sunspot number of 23 centered on February 1995. This is a drop of one point from the previous month's level. A smoothed sunspot number in the mid-teens is forecast for December 1995 as the

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#### LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for December 1995

Propagation Index.....	Expected Signal Quality			
	(4)	(3)	(2)	(1)
Above Normal: 7-8, 11, 20	A	A	B	C
High Normal: 3, 5-6, 9-10, 14-15, 21, 26, 30	A	B	C	C-D
Low Normal: 1-2, 12-13, 18-19, 25, 28-29	B	C	D	D-E
Below Normal: 4, 16-17, 22-23, 27, 31	C	C-D	D-E	E
Disturbed: 24	C	D	E	E

Where expected signal quality is: A—Excellent opening, exceptionally strong, steady signals greater than S9.

B—Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S9 and S6, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S3, and with considerable fading and noise.

E—No opening expected.

#### HOW TO USE THIS FORECAST

1. Find propagation index associated with particular band opening from Propagation Charts appearing on the following pages.
2. With the propagation index, use the above table to find the expected signal quality associated with the band opening for any date of the month. For example, an opening shown in the charts with a propagation index of 3 will be fair (C) on December 1st and 2nd, good (B) on the 3rd, fair-to-poor (C-D) on the 4th, fair (C) on the 5th and 6th, etc. Good conditions (B) are expected during the ARRL 10 Meter DX Contest on December 9th and 10th.

22nd sunspot cycle is expected to continue its steady decline towards a minimum.

A corresponding 10.7 cm mean solar flux level of 74 was reported for August 1995 by the Dominion Radio Astrophysical Observatory, Penticton, B.C. This results in a smoothed solar flux value of 80 centered on February 1995. A smoothed 10.7 cm flux level of approximately 75 is expected during December 1995.

Next month's column will feature a forecast of solar activity expected during 1996, as well as a prediction for the remainder of Cycle 22 and the expected beginning of Cycle 23.

#### December Band Openings

Twenty meters should continue to be the best band for worldwide DX during December. The band should open on most days just after sunrise and remain open until an hour or two after sunset. Signals should peak towards Europe and the east about noon, towards Africa during the early afternoon, towards South America during the late afternoon, towards the Pacific area and Australasia during the early evenings, and towards Antarctica a bit later in the

#### Bulletin!

This issue of CQ should reach most readers in time for the CW weekend of the CQ World-Wide DX Contest, November 25 and 26. Here is an updated day-to-day propagation forecast for the weekend made at press time.

Conditions continue to look pretty much as forecast last month. A radio storm is expected to occur during the contest weekend, but the odds are that it will be of minor intensity. Paths crossing the high latitudes and polar regions likely will experience somewhat degraded propagation conditions (Below Normal), especially at night. At mid- and low latitudes conditions should remain at least Low Normal, and may at times climb to High Normal in equatorial regions. There is the possibility that the storm may intensify on Sunday, towards the end of the contest weekend.

evening. When conditions are High or Above Normal, the band may remain open for DX until as late as midnight. Even though we're near the bottom of the present sunspot cycle, look for some fairly good DX openings on 15 and 17 meters when conditions are High or Above Normal. Check for openings towards Europe, Africa, and the east before noon, towards South America during the early afternoon, and towards the Pacific and Australasia during the late afternoon. Although not likely to happen very often, look for some 10 and 12 meter DX openings when conditions are High or Above Normal. Best bet is for openings towards South America during the early afternoon, although the band may also open briefly towards Africa from the eastern half of the country and towards the Pacific and Australasia from the western half.

With hours of darkness at a maximum in the northern hemisphere, and static levels at seasonally low values, a considerable improvement is expected in DX propagation during the hours of darkness on the 30, 40, 80, and 160 meter bands. Thirty and 40 meters should open for DX during the early afternoon, with the first signals coming from Europe. After sundown the band should open to Africa and to South America. Signals from the Pacific area, the Far East, and Australasia should peak just before sunrise, but the band may remain open for an hour or two later. Fairly good DX is also expected on 80 meters between sundown and sunrise. Signals from Europe, Africa, and the east should peak before midnight; signals from South America should be in for most of the hours of darkness; signals from Australasia and the Pacific area should peak just before sunrise. There will be many nights during December when 80 meters will be the best band for DX propagation. Check 30, 40, and 80 me-



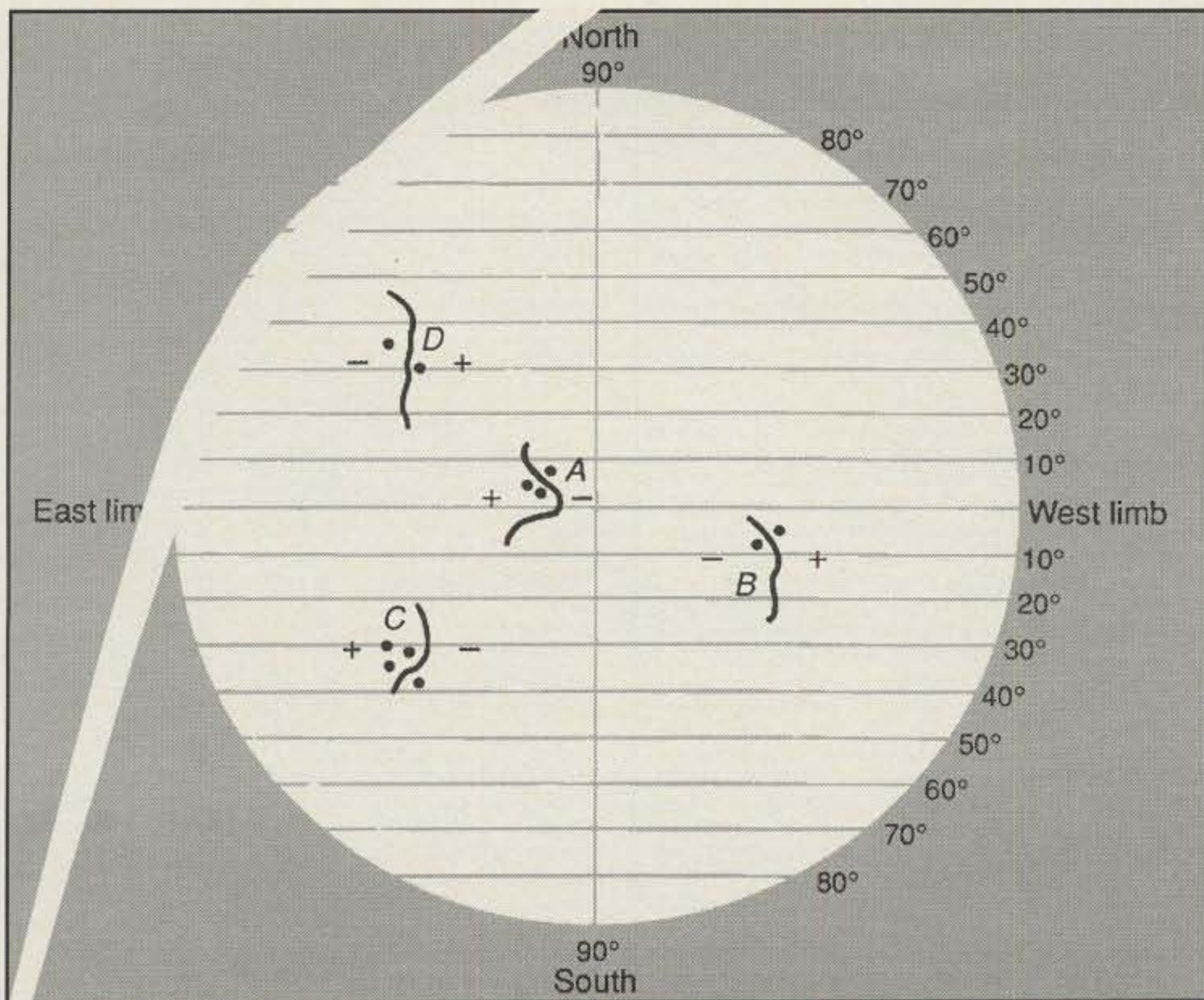


Fig. 1— Positions of sunspots associated with an old solar cycle (A and B) and with the start of a new solar cycle (C and D). Note the opposite polarity of the magnetic fields associated with the old and new spots on a given side of the solar equator.

ters for long-path openings during the sunrise and sunset periods.

December should be an active month for 160 meter DXers, with the ARRL 160 Meter Contest scheduled for December 1-3. Expect fairly good conditions on this band, probably

better than they have been during the past 10 years. Conditions on 160 meters are generally at their best during periods of very low solar activity. Look for openings towards Europe and the east as early as 8 PM in the EST time zone, with the band remaining open until 2 AM.

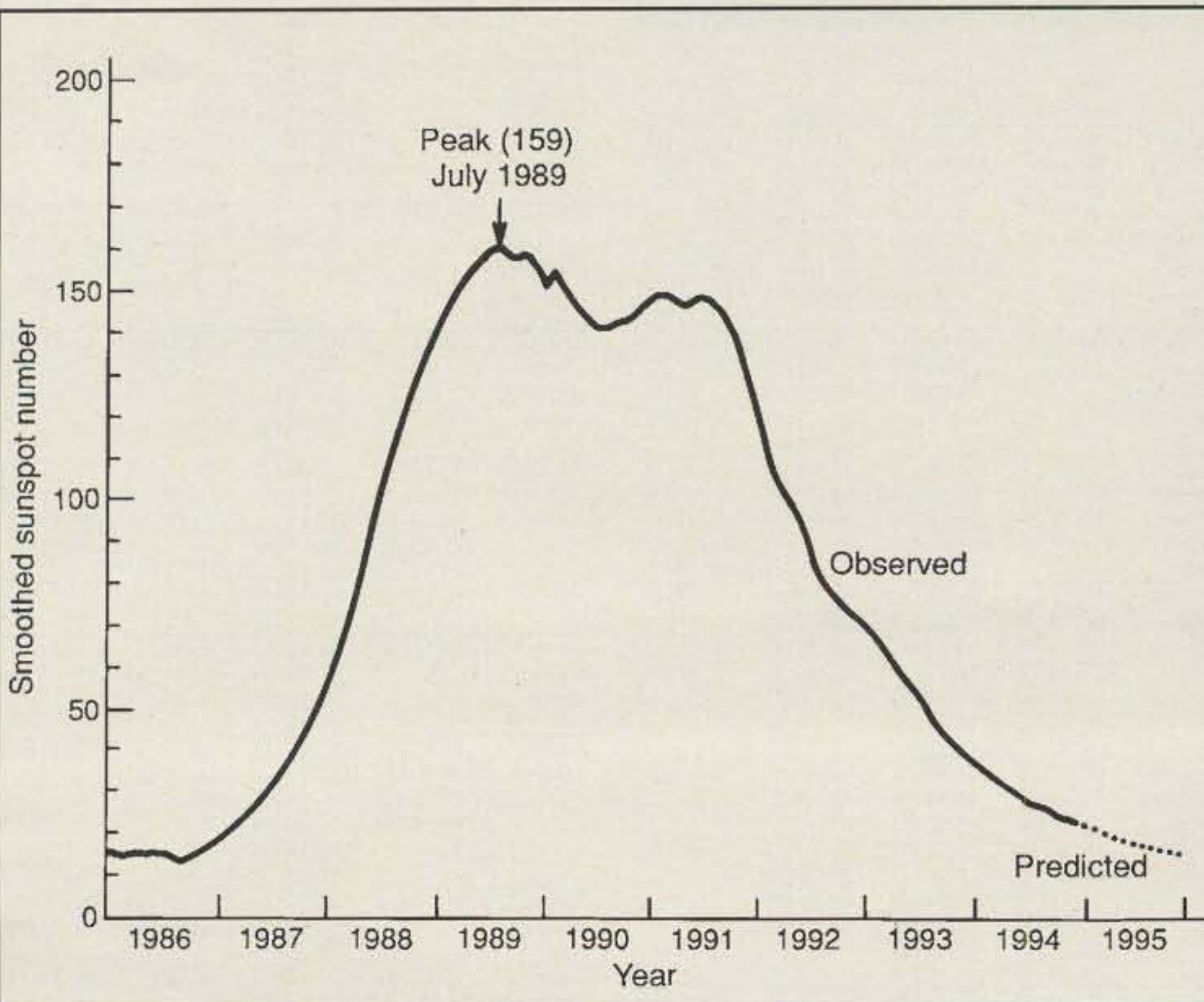


Fig. 2— Cycle 22 smoothed sunspot progress through 1995.

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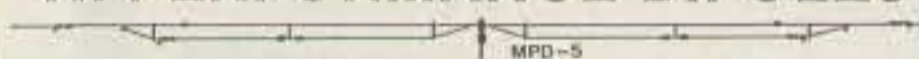
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MPB-15	1 x 30 x 1	14.55	0.25	
MPB-16	1 x 32 x 1	15.45	0.25	
MPB-17	1 x 34 x 1	16.35	0.25	
MPB-18	1 x 36 x 1	17.25	0.25	
MPB-19	1 x 38 x 1	18.15	0.25	
MPB-20	1 x 40 x 1	19.05	0.25	
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## HOW TO USE THE DX PROPAGATION CHARTS

1. Use chart appropriate to your transmitter location. The Eastern USA Chart can be used in the 1, 2, 3, 4, 8, KP4, KG4, and KV4 areas in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9, and 0 areas; the Western USA Chart in the 6 and 7 areas; and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (15 through 80 meters) for a particular DX region, as shown in the left-hand column of the charts. An \* indicates the best time to listen for 160 meter openings. An \*\* indicates best time to check for 10 meter openings.

3. The propagation index is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of days during the month on which the opening is expected to take place as follows:

- (4) Opening should occur on more than 22 days
- (3) Opening should occur between 14 and 22 days
- (2) Opening should occur between 7 and 13 days
- (1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual dates on which an opening with a specific propagation index is likely to occur, and the signal quality that can be expected.

4. Times shown in the charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. Appropriate standard time is used, not GMT. To convert to GMT, add to the times shown in the appropriate chart 8 hours in PST Zone, 7 hours in MST Zone, 6 hours in CST Zone, and 5 hours in EST Zone. For example, 13 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 04 GMT, etc.

5. The charts are based upon a transmitted power of 250 watts CW, or 1 kw, PEP on sideband, into a dipole antenna a quarter-wavelength above ground on 160 and 80 meters, and a half-wavelength above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 dB gain above these reference levels, the propagation index will increase by one level; for each 10 dB loss, it will lower by one level.

6. Propagation data contained in the charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept of Commerce, Boulder, Colorado 80302.

Region	15 Meters	20 Meters	40 Meters	80 Meters
South-east Asia	16-18 (1)	07-10 (1)	06-08 (1)	06-07 (1)
Far East	16-18 (1)	06-07 (1)	05-08 (1)	05-08 (1)
East	07-09 (2)	17-18 (1)	17-18 (1)	09-11 (1)
				15-17 (1)
				17-19 (2)
				19-21 (1)
South Pacific & New Zealand	13-15 (1)**	05-07 (1)	01-02 (1)	04-05 (1)
	12-14 (1)	07-10 (2)	02-04 (2)	05-07 (2)
	14-17 (2)	10-18 (1)	04-07 (3)	07-08 (1)
	17-18 (1)	18-20 (2)	07-08 (2)	04-07 (1)*
		20-22 (1)	08-09 (1)	
Australasia	14-16 (1)**	06-07 (1)	03-05 (1)	05-06 (1)
	12-15 (1)	07-10 (2)	05-08 (2)	06-07 (2)
	15-17 (2)	10-12 (1)	08-09 (1)	07-08 (1)
	17-18 (1)	15-16 (1)	17-19 (1)	17-18 (1)
		16-19 (2)		05-07 (1)*
		19-21 (1)		
Caribbean, Central America & Northern Countries of South America	10-15 (1)**	06-07 (1)	17-18 (1)	18-20 (1)
	08-09 (1)	07-08 (3)	18-19 (2)	20-21 (2)
	09-12 (2)	08-09 (4)	19-21 (3)	21-04 (3)
	12-16 (3)	09-11 (3)	21-03 (2)	04-06 (2)
	16-17 (2)	11-15 (2)	03-06 (3)	06-07 (1)
	17-18 (1)	15-17 (3)	06-07 (2)	21-03 (1)*
		17-18 (4)	07-08 (1)	03-05 (2)*
		18-19 (2)		05-06 (1)*
		19-20 (1)		
		01-03 (1)		
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina and Uruguay	11-15 (1)**	06-07 (1)	19-21 (1)	21-03 (1)
	08-09 (1)	07-09 (2)	21-02 (2)	03-05 (2)
	09-11 (2)	09-10 (1)	02-05 (1)	05-06 (1)
	11-13 (1)	12-14 (1)	05-06 (2)	03-05 (1)*
	13-14 (2)	14-15 (2)	06-07 (1)	
	14-15 (3)	15-16 (3)		
	15-16 (2)	16-17 (4)		
	16-17 (1)	17-18 (3)		
		18-19 (2)		
		19-20 (1)		
		22-00 (1)		
McMurdo Sound, Antarctica	15-17 (1)	07-09 (1)	22-00 (1)	Nil
		17-18 (1)	00-02 (2)	
		18-20 (2)	02-06 (1)	
		20-22 (1)		
		22-00 (2)		
		00-02 (1)		

## Time Zones: CST & MST (24-Hour Time) CENTRAL USA TO:

	15 Meters	20 Meters	40 Meters	80 Meters
Western & Southern Europe & North Africa	09-11 (1)	06-08 (1)	15-17 (1)	17-19 (1)
		08-10 (2)	17-19 (2)	19-00 (2)
		10-12 (3)	19-12 (3)	00-01 (1)
		12-13 (2)	23-01 (2)	20-01 (1)*
		13-15 (1)	01-02 (1)	
Northern Europe & CIS (former European USSR)	08-11 (1)	07-08 (1)	16-18 (1)	18-00 (1)
		08-11 (2)	18-19 (2)	20-00 (1)*
		11-12 (1)	19-22 (1)	
			22-00 (2)	
			00-01 (1)	
Eastern Mediterranean & Middle East	08-11 (1)	07-09 (1)	17-19 (1)	19-22 (1)
		09-12 (2)	19-22 (2)	
		12-14 (1)	22-23 (1)	
		22-00 (1)		
Western Africa	09-12 (1)**	06-07 (1)	17-20 (1)	19-22 (1)
	08-09 (1)	07-09 (2)	20-23 (2)	22-23 (2)
	09-11 (2)	09-11 (1)	23-01 (1)	23-00 (1)
	11-13 (3)	11-13 (2)		21-23 (1)*
	13-14 (2)	13-15 (3)		
	14-15 (1)	15-16 (2)		
		16-18 (1)		
Eastern & Central Africa	09-12 (1)	07-12 (1)	18-19 (1)	19-22 (1)
		12-14 (2)	19-21 (2)	
		14-16 (3)	21-23 (1)	
		16-17 (1)		
Southern Africa	10-12 (1)**	07-13 (1)	18-19 (1)	19-22 (1)
	08-10 (1)	13-15 (2)	19-21 (2)	
	10-13 (2)	15-16 (3)	21-23 (1)	
	13-14 (1)	16-17 (2)		
		17-18 (1)		
		22-00 (1)		
Central & South Asia	17-19 (1)	07-10 (1)	06-08 (1)	06-07 (1)
		19-21 (1)	18-21 (1)	18-20 (1)
South-east Asia	17-19 (1)	06-07 (1)	06-08 (1)	06-07 (1)
		07-09 (2)	17-19 (1)	17-19 (1)
		09-12 (1)		
		17-20 (1)		



Far East	17-19 (1)	06-07 (1)	01-03 (1)	02-04 (1)
		07-09 (2)	03-07 (2)	04-06 (2)
		09-11 (1)	07-08 (1)	06-07 (1)
		15-17 (1)		04-06 (1)*
		17-19 (2)		
		19-20 (1)		
South Pacific & New Zealand	12-16 (1)**	06-07 (1)	23-01 (1)	00-01 (1)
	11-13 (1)	07-11 (2)	01-02 (2)	01-06 (2)
	13-15 (2)	11-16 (1)	02-06 (3)	06-08 (1)
	15-17 (3)	16-17 (2)	06-07 (2)	03-07 (1)
	17-18 (2)	17-19 (3)	07-09 (1)	
	18-19 (1)	19-20 (2)		
		20-21 (1)		
Australasia	14-17 (1)**	07-08 (1)	01-03 (1)	03-05 (1)
	11-15 (1)	08-11 (2)	03-07 (3)	05-07 (2)
	15-17 (2)	11-18 (1)	07-08 (2)	07-08 (1)
	17-18 (1)	18-20 (2)	08-09 (1)	04-07 (1)*
		20-21 (1)		
Caribbean, Central America and Northern Countries of South America	10-15 (1)**	06-07 (1)	18-20 (1)	19-21 (1)
	08-09 (1)	07-10 (3)	20-22 (2)	21-05 (2)
	09-10 (2)	10-14 (2)	22-00 (3)	05-06 (1)
	10-13 (3)	14-16 (3)	00-04 (2)	23-05 (1)*
	13-15 (4)	16-17 (4)	04-06 (3)	
	15-16 (3)	17-18 (3)	06-07 (1)	
	16-17 (1)	18-19 (2)		
		19-21 (1)		
		23-01 (1)		
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina and Uruguay	11-15 (1)*	06-07 (1)	19-21 (1)	21-05 (1)
	08-09 (1)	07-09 (2)	21-02 (2)	00-04 (1)*
	09-11 (2)	09-13 (1)	02-04 (1)	
	11-13 (1)	13-14 (2)	04-06 (2)	
	13-14 (2)	14-15 (3)	06-07 (1)	
	14-15 (3)	15-17 (4)		
	15-16 (2)	17-18 (3)		
	16-17 (1)	18-19 (2)		
		19-20 (1)		
		22-00 (1)		
McMurdo Sound, Antarctica	15-17 (1)	07-08 (1)	22-00 (1)	
		08-09 (2)	00-02 (2)	
		09-11 (1)	02-06 (1)	Nil
		17-18 (1)		
		18-20 (2)		
		20-22 (1)		
		22-00 (2)		
		00-01 (1)		

South Pacific & New Zealand	14-16 (1)**	07-08 (1)	20-22 (1)	00-03 (1)
	11-13 (1)	08-13 (2)	22-00 (2)	03-06 (2)
	13-14 (2)	13-15 (1)	00-07 (3)	06-08 (1)
	14-16 (3)	15-16 (2)	07-08 (2)	03-06 (1)*
	16-18 (2)	16-18 (4)	08-09 (1)	
	18-19 (1)	18-19 (2)		
		19-21 (1)		
Australasia	14-16 (1)**	07-08 (1)	01-03 (1)	03-05 (1)
	12-13 (1)	08-11 (2)	03-05 (2)	05-06 (2)
	13-15 (2)	11-17 (1)	05-07 (3)	06-08 (1)
	15-17 (3)	17-18 (2)	07-08 (2)	04-07 (1)*
	17-18 (1)	18-19 (3)	08-09 (1)	
		19-20 (2)		
		20-21 (1)		
Caribbean, Central America and Northern Countries of South America	11-14 (1)**	06-07 (1)	18-20 (1)	19-21 (1)
	08-09 (1)	07-09 (3)	20-21 (2)	21-03 (2)
	09-10 (2)	09-13 (2)	21-23 (3)	03-04 (1)
	10-12 (3)	13-15 (3)	23-01 (2)	21-03 (1)*
	12-14 (4)	15-16 (4)	01-03 (3)	
	14-15 (3)	16-17 (3)	03-04 (2)	
	15-16 (2)	17-18 (2)	04-05 (1)	
	16-17 (1)	18-00 (1)		
		00-02 (2)		
		02-03 (1)		
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina and Uruguay	11-14 (1)**	06-07 (1)	19-21 (1)	22-05 (1)
	08-10 (1)	07-09 (2)	21-00 (2)	00-04 (1)*
	10-12 (2)	09-13 (1)	00-02 (1)	
	12-14 (3)	13-15 (2)	02-04 (2)	
	14-15 (2)	15-16 (3)	04-06 (1)	
	15-16 (1)	16-17 (4)		
		17-18 (2)		
		18-21 (1)		
McMurdo Sound, Antarctica	14-16 (1)	07-08 (1)	21-00 (1)	Nil
		08-09 (2)	00-02 (2)	
		09-11 (1)		
		15-17 (1)		
		17-19 (2)		
		19-21 (1)		
		21-23 (2)		
		23-01 (1)		

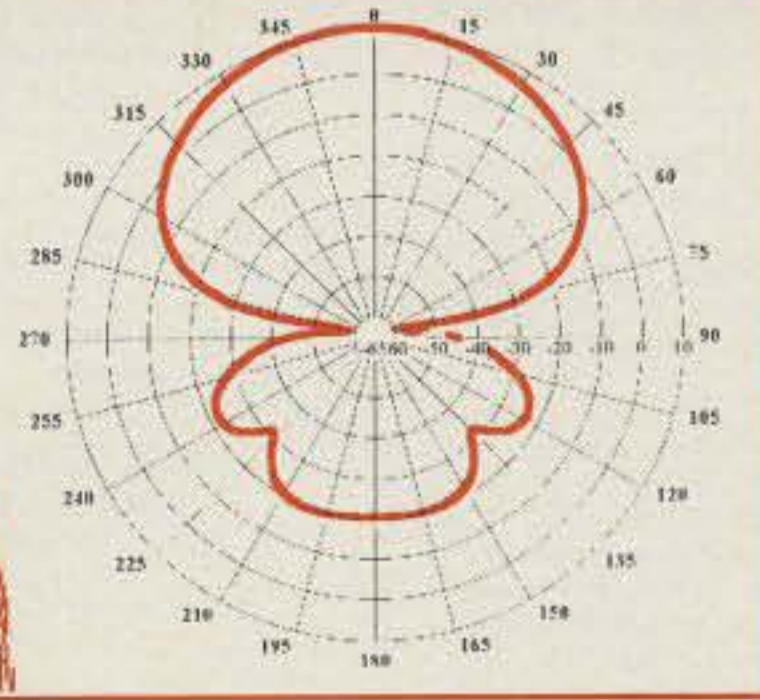
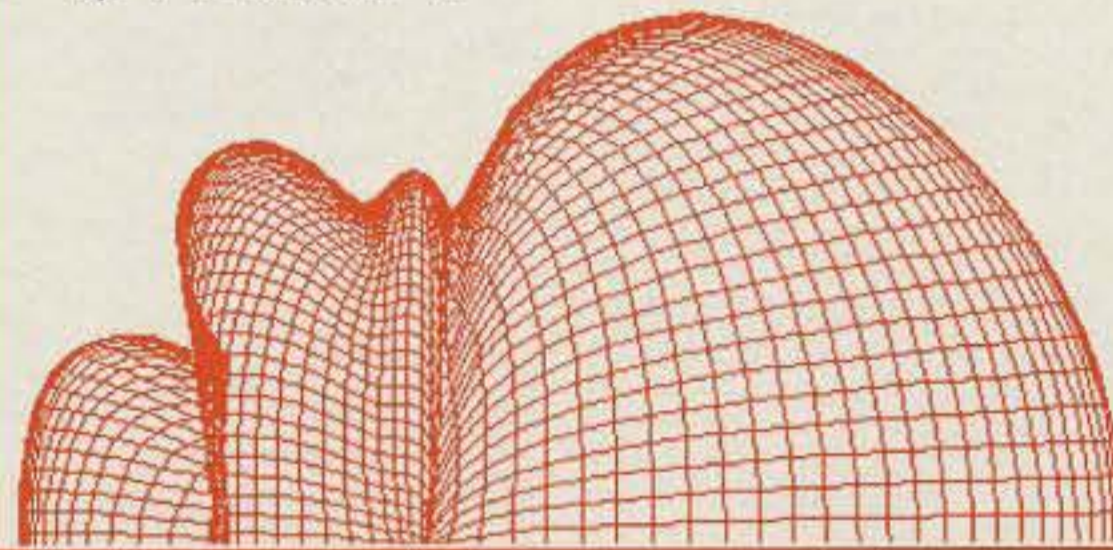
\* Indicates best time for 160 meter openings.  
 \*\* Indicates best time for 10 meter openings.  
 For 12 meter openings interpolate between 10 and 15 meter openings.  
 For 17 meter openings interpolate between 15 and 20 meter openings.  
 For 30 meter openings interpolate between 40 and 20 meter openings.

**Time Zone: PST  
 (24-Hour Time)  
 WESTERN USA TO:**

	15 Meters	20 Meters	40 Meters	80 Meters
Western & Southern Europe & North Africa	08-10 (1)	06-07 (1)	17-21 (1)	18-20 (1)
		07-11 (2)	21-23 (2)	20-22 (2)
		11-13 (1)	23-01 (1)	22-23 (1)
		23-01 (1)		19-22 (1)*
Northern Europe & CIS (former USSR)	08-10 (1)	06-07 (1)	17-00 (1)	19-22 (1)
		07-10 (2)		19-21 (1)*
		10-12 (1)		
		23-01 (1)		
Eastern Mediterranean & Middle East	08-10 (1)	07-10 (1)	06-08 (1)	06-08 (1)
		10-12 (2)	18-22 (2)	18-21 (1)
		12-13 (1)		
		21-23 (1)		
Western Africa	09-11 (1)**	07-10 (1)	18-23 (1)	19-22 (1)
	08-09 (1)	10-13 (2)		
	09-12 (2)	13-16 (3)		
	12-13 (1)	16-17 (2)		
		17-18 (1)		
Eastern & Central Africa	09-11 (1)	08-10 (1)	06-08 (1)	06-08 (1)
		13-16 (1)	18-22 (1)	18-21 (1)
		21-23 (1)		
Southern Africa	08-10 (1)	09-13 (1)	18-21 (1)	18-20 (1)
	10-12 (2)	13-16 (2)		
	12-14 (1)	16-18 (1)		
		23-01 (1)		
Central & South Asia	17-19 (1)	08-10 (1)	05-08 (1)	05-07 (1)
		17-18 (1)	17-19 (1)	
		18-19 (2)		
		19-20 (1)		
South-east Asia	14-15 (1)	08-10 (1)	01-04 (1)	04-07 (1)
	15-17 (2)	13-16 (1)	04-07 (2)	
	17-18 (1)	16-18 (2)	07-09 (1)	
	18-20 (1)			
Far East	14-15 (1)	08-10 (1)	22-00 (1)	23-01 (1)
	15-17 (2)	13-14 (1)	00-02 (2)	01-06 (2)
	17-18 (1)	14-15 (2)	02-06 (3)	06-08 (1)
		15-17 (3)	06-08 (2)	01-06 (1)*
		17-18 (2)	08-10 (1)	
		18-19 (1)		

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Check for European openings in the CST time zone between 8 PM and 1 AM, from 8 PM to midnight in the MST zone, and to 11 PM in the PST zone. Some openings towards the south, especially to the Caribbean area, should be possible from about 10 PM to 2 AM in all time zones, and possibly right up until local sunrise. Openings towards the Pacific and Australasia favor west coast stations, but it will be worth looking for these openings in all time zones between 4 AM and sunrise. A good rule to remember about 160 meter DX openings is that conditions tend to peak about the time that the sun rises at the easternmost terminal of a DX path, or during the night-to-day "grayline" period.

On the other hand, the ARRL 10 Meter DX Contest, which will be held on the weekend of December 9 and 10, will probably experience the poorest HF propagation conditions in the past 10 years. Despite this, check the DX and Short-Skip Charts for December to find the best times to try for 10 meter openings. The results of this contest should provide interesting propagation data for assessing conditions on this band during low solar-cycle periods. There is a good chance that High Normal conditions may exist during the contest weekend, which could be helpful, particularly for 10 meter openings in low latitudes and equatorial regions. Short-skip conditions during December fa-

vor the 40 and 80 meter bands for daytime openings less than 250 miles in length. Try 80 and 160 meters for this same distance at night. For openings between 250 and 750 miles, 40 meters should be optimum during the day and both 80 and 160 meters at night. Try 20 meters during the day for openings between 750 and 1300 miles; 30, 40, or 80 meters from sunset to midnight; and 80 meters from midnight through the sunrise period. Try 30 and 40 meters again for an hour or so after sunrise. For openings between 1300 miles and the maximum one-hop distance of 2300 miles, 17, 15, 20 meters should be optimum during the day; 20, 30, and 40 meters from sundown to midnight; and 40 and 80 meters from midnight to sunrise. Ten and 12 meters should also provide some short-skip openings between 1300 and 2300 miles during the daylight period, when conditioned are High Normal or better.

This month's column contains DX Propagation Charts valid through February 1996. Note that the "band" column headings have been changed this month to reflect the changes in propagation conditions expected during the present minimal solar period. Short-Skip Propagation Charts for use during December appeared in last month's column.

## VHF Ionospheric Openings

Quite a bit of meteor shower activity is expected during December. *Geminids*, a major meteor shower, should take place between December 4th and 16th. It is expected to peak with a meteor rate of about one a minute on December 13th. This should permit some fairly good meteor-type openings on 10, 6, and 2 meters. A second, but less intense shower period, called *Ursids*, is expected later in the month. This shower should take place between December 17th and 24th, peaking on the 22nd with a meteor rate of about 15 an hour.

A secondary seasonal peak in sporadic-E propagation usually takes place during December (the major peak is during the summer months). This should result in occasional short-skip openings on 10 and 6 meters as short as a few hundred miles and as long as 1400 miles.

Some auroral-type VHF ionospheric openings are also likely to occur during December, especially when ionospheric conditions on the HF bands are Below Normal or Disturbed. Be sure to check the Last-Minute Forecast at the beginning of this column for those days that are forecast to be in these categories during the month.

During years of high solar activity, F-layer DX propagation on 6 meters was often possible to many areas of the world during December. For the very patient, however, a trans-equatorial-scatter or TE opening may be possible on 6 meters between the southern half of the USA and South America. Openings, if any, will likely be few and far between, and will be distorted by flutter fading. The best time to try for a TE opening is between 8 and 11 PM.

## Season's Greetings

The editor of this column would like to take this opportunity to extend his warmest greetings for the Holiday Season to everyone, everywhere. Wishes for peace, good health, and good propagation during 1996.

73, George, W3ASK

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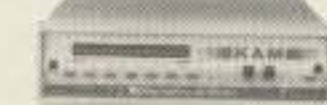
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MODEL	Colors		Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
	Gray	Black				
SL-11A	•	•	7	11	2 <sup>5</sup> / <sub>8</sub> x 7 <sup>5</sup> / <sub>8</sub> x 9 <sup>3</sup> / <sub>4</sub>	12
SL-11R	•	•	7	11	2 <sup>5</sup> / <sub>8</sub> x 7 x 9 <sup>3</sup> / <sub>4</sub>	12
SL-11S	•	•	7	11	2 <sup>5</sup> / <sub>8</sub> x 7 <sup>5</sup> / <sub>8</sub> x 9 <sup>3</sup> / <sub>4</sub>	12
SL-11R-RA	•	•	7	11	4 <sup>3</sup> / <sub>4</sub> x 7 x 9 <sup>3</sup> / <sub>4</sub>	13

### RS-L SERIES



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MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
RS-4L	3	4	3 <sup>1</sup> / <sub>2</sub> x 6 <sup>1</sup> / <sub>8</sub> x 7 <sup>1</sup> / <sub>4</sub>	6
RS-5L	4	5	3 <sup>1</sup> / <sub>2</sub> x 6 <sup>1</sup> / <sub>8</sub> x 7 <sup>1</sup> / <sub>4</sub>	7

### RM SERIES



MODEL RM-35M

#### • 19" RACK MOUNT POWER SUPPLIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
RM-12A	9	12	5 <sup>1</sup> / <sub>4</sub> x 19 x 8 <sup>1</sup> / <sub>4</sub>	16
RM-35A	25	35	5 <sup>1</sup> / <sub>4</sub> x 19 x 12 <sup>1</sup> / <sub>2</sub>	38
RM-50A	37	50	5 <sup>1</sup> / <sub>4</sub> x 19 x 12 <sup>1</sup> / <sub>2</sub>	50
RM-60A	50	55	7 x 19 x 12 <sup>1</sup> / <sub>2</sub>	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5 <sup>1</sup> / <sub>4</sub> x 19 x 8 <sup>1</sup> / <sub>4</sub>	16
RM-35M	25	35	5 <sup>1</sup> / <sub>4</sub> x 19 x 12 <sup>1</sup> / <sub>2</sub>	38
RM-50M	37	50	5 <sup>1</sup> / <sub>4</sub> x 19 x 12 <sup>1</sup> / <sub>2</sub>	50
RM-60M	50	55	7 x 19 x 12 <sup>1</sup> / <sub>2</sub>	60

### RS-A SERIES



MODEL RS-7A

MODEL	Colors		Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
	Gray	Black				
RS-3A		•	2.5	3	3 x 4 <sup>3</sup> / <sub>4</sub> x 5 <sup>3</sup> / <sub>4</sub>	4
RS-4A	•	•	3	4	3 <sup>3</sup> / <sub>4</sub> x 6 <sup>1</sup> / <sub>2</sub> x 9	5
RS-5A		•	4	5	3 <sup>1</sup> / <sub>2</sub> x 6 <sup>1</sup> / <sub>8</sub> x 7 <sup>1</sup> / <sub>4</sub>	7
RS-7A	•	•	5	7	3 <sup>3</sup> / <sub>4</sub> x 6 <sup>1</sup> / <sub>2</sub> x 9	9
RS-7B	•	•	5	7	4 x 7 <sup>1</sup> / <sub>2</sub> x 10 <sup>3</sup> / <sub>4</sub>	10
RS-10A	•	•	7.5	10	4 x 7 <sup>1</sup> / <sub>2</sub> x 10 <sup>3</sup> / <sub>4</sub>	11
RS-12A	•	•	9	12	4 <sup>1</sup> / <sub>2</sub> x 8 x 9	13
RS-12B	•	•	9	12	4 x 7 <sup>1</sup> / <sub>2</sub> x 10 <sup>3</sup> / <sub>4</sub>	13
RS-20A	•	•	16	20	5 x 9 x 10 <sup>1</sup> / <sub>2</sub>	18
RS-35A	•	•	25	35	5 x 11 x 11	27
RS-50A	•	•	37	50	6 x 13 <sup>3</sup> / <sub>4</sub> x 11	46
RS-70A	•	•	57	70	6 x 13 <sup>3</sup> / <sub>4</sub> x 12 <sup>1</sup> / <sub>8</sub>	48

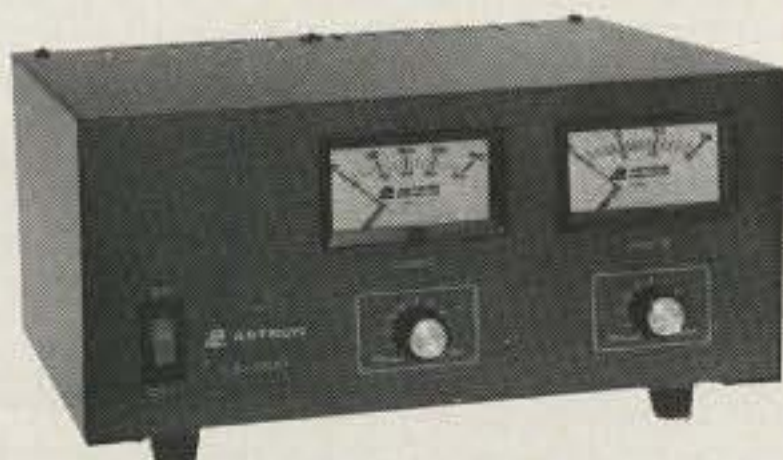
### RS-M SERIES



MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4 <sup>1</sup> / <sub>2</sub> x 8 x 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 x 9 x 10 <sup>1</sup> / <sub>2</sub>	18
RS-35M	25	35	5 x 11 x 11	27
RS-50M	37	50	6 x 13 <sup>3</sup> / <sub>4</sub> x 11	46
RS-70M	57	70	6 x 13 <sup>3</sup> / <sub>4</sub> x 12 <sup>1</sup> / <sub>8</sub>	48

### VS-M AND VRM-M SERIES



MODEL VS-35M

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MODEL	Continuous Duty (Amps)			ICS* (Amps) @13.8V	Size (IN) H x W x D	Shipping Wt. (lbs.)
	@13.8VDC	@10VDC	@5VDC			
VS-12M	9	5	2	12	4 <sup>1</sup> / <sub>2</sub> x 8 x 9	13
VS-20M	16	9	4	20	5 x 9 x 10 <sup>1</sup> / <sub>2</sub>	20
VS-35M	25	15	7	35	5 x 11 x 11	29
VS-50M	37	22	10	50	6 x 13 <sup>3</sup> / <sub>4</sub> x 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5 <sup>1</sup> / <sub>4</sub> x 19 x 12 <sup>1</sup> / <sub>2</sub>	38
VRM-50M	37	22	10	50	5 <sup>1</sup> / <sub>4</sub> x 19 x 12 <sup>1</sup> / <sub>2</sub>	50

### RS-S SERIES



MODEL RS-12S

#### • Built in speaker

MODEL	Colors		Continuous Duty (Amps)	ICS* Amps	Size (IN) H x W x D	Shipping Wt. (lbs.)
	Gray	Black				
RS-7S	•	•	5	7	4 x 7 <sup>1</sup> / <sub>2</sub> x 10 <sup>3</sup> / <sub>4</sub>	10
RS-10S	•	•	7.5	10	4 x 7 <sup>1</sup> / <sub>2</sub> x 10 <sup>3</sup> / <sub>4</sub>	12
RS-12S	•	•	9	12	4 <sup>1</sup> / <sub>2</sub> x 8 x 9	13
RS-20S	•	•	16	20	5 x 9 x 10 <sup>1</sup> / <sub>2</sub>	18
SL-11S	•	•	7	11	2 <sup>3</sup> / <sub>4</sub> x 7 <sup>5</sup> / <sub>8</sub> x 9 <sup>3</sup> / <sub>4</sub>	12



## ALL ABOUT THE WORLD ABOVE HF

### Some Basic Guidelines for Weak-Signal Operating

**R**ecently there has been much discussion about band plans, propagation capabilities, and the calling frequencies of the VHF+ amateur bands on the Internet. Because of that I have decided to repeat some portions of previous columns as a way of acquainting some of us new to the hobby (and reacquainting some of us who have been around awhile) what the VHF+ amateur bands are all about.

*Please note:* The band plans outlined below are based on information supplied by the American Radio Relay League. These band plans only apply to U.S. domestic operations (although similar band plans may exist in Canada). While some of these band plans are by "gentlemen's agreements," others, such as the experimenter's portion of the 125 cm band, are FCC-designated segments of the band. Operating in violation of FCC-designated band segments can subject one to an FCC citation. Also, operating that is not consistent with volunteer band plans (such as not coordinating a repeater pair with the coordinating agency in your area) can also elicit an FCC citation.

It is up to you to make yourself aware of the FCC rules and regulations. Copies of the FCC rules are available for purchase from various amateur radio publishers. Nevertheless, the old axiom "When in doubt, don't" works quite well when governing your amateur radio operating activities.

**VHF+ Amateur Bands:** The VHF+ amateur bands start at 50 MHz and go to light. Below is a list of the amateur bands, most common propagation modes, the authorized types of operating, generally accepted band plans, and calling frequencies for each of them.

Regarding operating privileges, all Technician and Technician Plus class licensees and all other license classes above Technician are authorized to use all privileges on all the VHF+ frequencies. Novice class licensees are authorized full access to the 222–225 MHz amateur band and a portion (1270–1295 MHz) of the 1240–1300 MHz amateur band—but with reduced power output. Recently, the Amateur Radio Service was authorized packet operation within a new frequency allocation of 219–220 MHz. Coordination of authorization of permits to operate in this portion of the 125 cm band is taking place presently. Permits to operate will be issued in the near future (if they are not already by the time this is published).

**A note on calling frequencies:** You will see below a number of frequencies that are designated "calling frequencies." On 6 and 2 meters these frequencies are used to initialize a contact. Once a contact is established, the two stations making the contact are obliged to

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#### VHF PLUS CALENDAR

December 3	Poor EME conditions
December 7	Full moon and highest declination.
December 9	Moon apogee.
December 10	Poor EME conditions
December 14	<i>Geminids</i> meteor shower predicted peak.
December 15	Last Quarter moon.
December 17	Moderate EME conditions.
December 21	Lowest moon declination.
December 22	New moon and moon perigee. <i>Ursids</i> meteor shower predicted peak.
December 24	Very poor to good EME conditions.
December 31	Poor EME conditions.

move off the calling frequency, thereby freeing it for others to initialize contacts. Please note that it is considered rude operating to dominate a calling frequency.

Because there is little activity on the higher bands, it is not necessary to move off, unless of course the frequencies become busy. Then, as with 6 and 2 meters, it is common courtesy to move off the calling frequency in order for others to initialize contacts.

**Weak Signal Operating:** The term "weak signal" is somewhat of a misnomer because it implies that all this specialist of the VHF+ frequencies does is spend time looking for weak signals. While, as you will read shortly, that is somewhat the case, often the "weak signals" heard can be quite loud. Nevertheless, this specialist is looking for the challenge of copying signals much weaker and oftentimes thought impossible to hear on the VHF+ frequencies. To give you examples of weak-signal operations, let's look at each of the bands of the VHF+ frequencies and see what the weak-signal operator is looking for.

**6 Meters.** This band is sometimes thought of as the last of the HF bands and sometimes thought of as the second VHF band (10 meters being the first) because it so often shares characteristics of both HF and VHF propagation. Throughout the year, but in particular during extended periods twice a year, the VHF+ operator will experience sporadic-E propagation. This is propagation that will allow for completion of contacts in the 1200–1300 mile range, and sometimes much more, depending on whether or not it is single-hop or multiple-hop sporadic-E. Occasionally, multiple-hop sporadic-E propagation can make possible contacts in distant (5000+ miles) parts of the world. Signals from single-hop sporadic-E propagation can be quite loud.

Almost every day of the year tropospheric scatter propagation exists. In addition, almost every day meteor scatter is present, although it is better during the months of July through December. Also, meteor-scatter propagation is better in the early morning hours. Each of these two forms of propagation permit contacts upwards of 1300 miles or more. Signals

from tropospheric scatter are often weak, but signals from meteor-scatter propagation can burst through very loudly for a few seconds to upwards of a couple of minutes.

Auroral propagation is occasionally present, mostly in the northern latitudes. Amateurs in these areas have been known to make contacts using auroral propagation in excess of 2500 miles by propagating their signals along the auroral oval. Often signals via auroral propagation are weak and watery sounding.

During peaks in the sunspot cycle F2 propagation is present. How often this propagation exists depends on how high and how long the peak in the sunspot cycle exists. When it is available, this mode of propagation permits contacts 6000+ miles or more. Related to F2 propagation is transequatorial, or TE, propagation. This form of propagation permits contacts between stations who are equidistant from each other across the equator. Signals via these two forms of propagation are mostly weak, but sometimes can be quite loud and intense. While in Oklahoma I once watched my "S" meter for a half hour while a station from Australia kept the needle at the 20+ dB mark during that entire time.

Bouncing signals off the moon on this band has been around for some time. However, it is enjoying a resurgence following the decline of the sunspot cycle. Those weak-signal operators who are hooked on worldwide communications find that EME communications is about the only way left to make these kinds of contacts. Signals from the moon are mostly quite weak, and you need high power and big antenna arrays to regularly communicate via this mode. This is principally the form of propagation that earns the weak-signal operator the reputation for chasing after that "weak signal."

The 50.000–50.100 MHz portion of the band is exclusively for CW operation. The section of the band between 50.000 and 50.020 MHz is unofficially reserved for EME operation. The section of the band between 50.060 and 50.080 MHz is reserved for unattended U.S. beacon stations, although foreign (non-U.S.) and attended U.S. beacons can be found anywhere within the CW portion of the band. Rarely





Ron Klimas, WZ1V, supports his new 432 MHz beam while Joe Reisert, W1JR, tests its gain at the Eastern States VHF Conference. (Photo courtesy NW2L)



Tom Williams, WA1MBA, uses a bagel on an arrow to explain how polarization affects scatter during his 10 GHz Eastern States VHF Conference seminar. (Photo courtesy NW2L)



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do stations who use this portion of the band for CW contacts operate below 50.090 MHz.

The 50.100–50.300 MHz portion of the band is for SSB operation, although CW contacts are permitted and do sometimes take place. The section of the band between 50.100 and 50.125 MHz is reserved for DX contacts only. Domestic contacts within this window are greatly discouraged.

The frequency of 50.110 MHz is the international DX calling frequency. Usually this is reserved for DX stations to call CQ and for domestic stations to listen. The frequency of 50.125 MHz is the domestic calling frequency.

The 50.300–50.600 MHz portion of the band is open for all modes of operation. However, AM operation is often conducted around 50.400 MHz. The 50.600–50.800 MHz portion of the band is reserved for non-voice communications, such as packet.

The 50.800–51.000 MHz portion of the band is reserved for radio control operations, for controlling model airplanes or cars. Note that there is a 20 kHz separation between each frequency used for such operations.

The 51.000–51.100 MHz portion of the band is reserved for a Pacific and European DX window. Because some countries have not granted privileges below these frequencies, DXers know to look here for some opportunities to work DX.

With some exceptions that are listed below, the 51.120–53.980 MHz portion of the band is used for FM and repeater operations. The frequencies of 51.500–51.600, 52.020–52.040, 52.520–52.540, and 53.000–53.020 MHz are

all reserved for FM simplex. The frequencies of 53.100, 53.200, 53.300, 53.400, 53.500, 53.600, 53.700, and 53.800 MHz are all reserved for radio remote-control operations. The frequency of 52.525 MHz is the national FM calling frequency.

**2 Meters.** Originally designated an experimenter's band, this band has become the workhorse for the repeater operator. Nevertheless, the weak-signal operator makes very good use of this band to make many weak-signal contacts.

During the peaks of sporadic-E activity on 6 meters occasionally this band also will enjoy such propagation. However, it is short lived and only rarely will permit contacts in excess of 1300 miles. As on 6 meters, signals can be quite intense. Occasionally, when sporadic-E is dying out on 6 meters, propagation via field-aligned irregularities, or FAI, pops up. Signals via this mode of propagation are weak and watery.

Tropospheric propagation is a regular event on this band. As a repeater user, you may occasionally be exposed to this form of propagation when you hear stations from distances of 150 or more miles coming through your repeater. You know that these signals can be fairly loud into your repeater. They also can be consistently loud to the weak-signal operator, although often they are weak but steady.

Meteor-scatter propagation is quite popular on this band. Contacts around 1000 miles or so can be made regularly. Meteor-scatter enthusiasts know when each shower occurs and plan their activities accordingly. Signals from

meteor scatter are often weak, but occasional pings can last for a fraction of a second to as long as a minute or so. These signal bursts can be quite loud, sometimes being several dB above S-9.

Auroral propagation is present on this band, but not like on 6 meters. Contacts in the area of 500–800 miles are possible. The signals are weak and buzzy sounding.

While F2 has never been reported on this band, TE propagation has been documented, although on very rare occasions. Signals are very weak, and sophisticated equipment is necessary to work this mode of propagation.

Bouncing signals off the moon is quite popular on this band. As on 6 meters, signals are quite weak.

The 144.000–144.100 MHz portion of the band is exclusively for CW operation. The section of the band between 144.000 and 144.050 is reserved for EME operation. The section of the band between 144.050 and 144.100 is reserved for both EME and weak-signal CW operation.

The 144.100–144.275 MHz portion of the band is for SSB operation, although CW contacts are permitted and do sometimes take place. The section of the band between 144.100 and 144.200 is used for weak-signal and EME SSB operation. The section of the band between 144.200 and 144.275 MHz is used for general SSB operation. The frequency of 144.200 MHz is the national weak-signal calling frequency.

The 144.275–144.300 MHz portion of the band is for beacon stations. The 144.300–



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— Gregory Buhyoff, KN4FR

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144.500 MHz portion of the band is for amateur satellite operations. The 144.500–144.600 MHz portion of the band is for Linear Translator inputs. The 144.600–144.900 MHz portion of the band is for FM repeater inputs.

The frequency of 144.340 is the Amateur Television (ATV) coordinating frequency used by operators who generally operate on an ATV transmitter on 439.25 MHz. The frequency of 146.430 MHz is the ATV coordinating frequency used by operators who generally operate on 434.000 MHz.

The 144.900–145.100 MHz portion of the band is for weak-signal and FM simplex operation, although weak-signal operation in this portion of the band does not exist. The 145.100–145.200 MHz portion of the band is for Linear Translator outputs. The 145.200–145.500 MHz portion of the band is for FM repeater outputs. The 145.500–145.800 MHz portion of the band is set aside for experimental activities, such as communication between the Shuttle and Earth.

The 145.800–146.000 MHz portion of the band is for satellite operations. The 146.010–146.370 MHz portion of the band is for FM repeater inputs. The 146.400–146.580 MHz portion of the band is for FM simplex operation. The 146.610–147.390 MHz portion of the band is for FM repeater outputs. The frequency of 146.520 MHz is the national FM calling frequency. The 147.420–147.570 MHz portion of the band is for FM simplex operation. The 147.600–147.990 MHz portion of the band is for FM repeater inputs.

**125 cm.** Following the loss of the bottom 2 MHz of this band a few years ago, weak-signal activity, which had a designated portion of that lost section, almost ceased to exist. Because of so much uncertainty, weak-signal operators lost interest and quit the band. However, as of February 1, 1993 the FCC has designated the bottom 150 kHz as experimental, thus paving the way for a resurgence of activity by the weak-signal operators.

About once every seven to ten years or so someone reports contacts via sporadic-E. It is very rare, indeed. When it occurs, though, signals are weak to fairly strong; but they do not last long. Tropospheric propagation occurs quite regularly. Signals are moderately strong.

Meteor-scatter contacts are made on this band but with more difficulty than on 2 meters. Signals are weak and the propagation lasts for fractions of a second to just a few seconds.

Auroral contacts are possible, but much less often than on 2 meters. As on 2 meters, the signals are weak and buzzy sounding. Transequatorial contacts have been documented, but only on very rare occasions.

Contacts via the moon can be made anytime. However, because of the previous uncertainty of the future of weak-signal operations on this band, this mode of propagation has fallen into disuse.

The 219.000–220.000 MHz portion of the band is reserved for high-speed point-to-point packet operations. The 222.000–222.150 MHz portion of the band is reserved exclusively for nonrepeater type operation. It is by mutual nationwide agreement that only CW and SSB operations will take place within this portion of the band. The frequency of 222.100 MHz is the national weak-signal calling frequency.

The 222.150–222.250 MHz portion of the band is for general-purpose CW and SSB operation, and by local agreement, FM repeater

inputs. The 222.250–223.380 MHz portion of the band is for FM repeater inputs.

The 223.400–223.520 MHz portion of the band is for FM simplex operation. The 223.530–223.640 MHz portion of the band is for digital and packet operations, and 223.500 MHz is the national FM calling frequency.

The 223.640–223.700 MHz portion of the band is for link and control operations. The 223.710–223.850 MHz portion of the band is for simplex and packet operations and for FM repeater outputs. The 223.850–224.980 MHz portion of the band is for FM repeater outputs.

**70 cm.** This is a workhorse band for the weak-signal operator, principally because of tropospheric and EME contacts. Tropospheric propagation occurs regularly. Signals are moderately strong. Meteor-scatter contacts are made but with much more difficulty than on 125 cm. Auroral contacts have been made but rarely. Transequatorial contacts have been documented but are very rare. EME contacts are made quite often and are still very weak but somewhat louder than on the lower bands. Certain geographical power restrictions apply to this band. Consult the FCC rules and regulations to see if your location is governed by one of these restrictions.

The 420.000–426.000 MHz portion of the band is for ATV simplex or repeater operations, with 421.250 MHz being the video carrier frequency. This portion is also used for experimental and control links. The 426.000–432.000 MHz portion of the band is for ATV simplex operation, with 427.250 MHz being the video carrier frequency.

The 432.000–432.070 MHz portion of the band is exclusively reserved for EME operation. The 432.070–432.100 MHz portion of the band is reserved for CW weak-signal operation. The 432.100–432.300 MHz portion of the band is reserved for CW and SSB weak-signal operation. The frequency of 432.100 MHz is the national weak-signal calling frequency.

The 432.300–432.400 MHz portion of the band is reserved for beacons. The 432.400–433.000 MHz portion of the band is reserved for CW and SSB weak-signal operation, although weak-signal operation on this portion of the band is non-existent.

The 433.000–435.000 MHz portion of the band is reserved for auxiliary and FM repeater links. The 435.000–438.000 MHz portion of the band is set aside for satellite operations throughout the world. The 438.000–444.000 MHz portion of the band is for ATV repeater inputs, with 439.250 MHz being the video carrier frequency.

The 442.000–445.000 MHz portion of the band is reserved for repeater inputs and outputs, on a local option. The 445.000–447.000 MHz portion of the band is shared by auxiliary and control links, repeaters, and simplex operation, on a local option. And 446.000 MHz is the national FM calling frequency.

The 447.000–449.000 MHz portion of the band is reserved for FM repeater inputs and outputs, on a local option. The 449.000–450.000 MHz portion of the band is reserved for FM repeater inputs and outputs, on a local option. However, it may also be shared with wind profilers in your area. Consult your local coordinating organization before establishing transmitting equipment on this portion of the band.

**33 cm.** This is another band that has a clouded future because of uncertainty. Several services are vying for frequency allocations with-



in this band. Because of this uncertainty, only weak-signal operators and amateur television enthusiasts make regular use of it (and in some areas repeater operations).

It is unfortunate that the cyclical nature of lack of operations is underway. As mentioned above, the band has a clouded future. Because of that, operations are infrequent. Because operations are infrequent, the justification of the band as an amateur band is suspect. Therefore, the future of the band is clouded. This is very important: If we expect to keep this band, we amateurs need to break this cycle of diminishing use!

Tropospheric propagation occurs regularly. EME contacts have been made and are quite possible, but owing to the lack of activity, they are not often made. Only a couple of aurora contacts have been documented. No other exotic propagation modes have been documented to date.

The 902.000–904.000 MHz portion of the band is reserved for narrow-band and weak-signal operation. The 902.000–902.800 MHz portion of the band is reserved for SSTV, FAX, ACSSB, and experimental operation. The 902.300–902.400 MHz portion of the band is reserved for beacons. The 902.800–903.000 MHz portion of the band is reserved for future EME and CW expansion.

The 903.000–903.050 MHz portion of the band is exclusively reserved for EME operation. The 903.050–903.100 MHz portion of the band is reserved for CW operation. The 903.100–903.400 MHz portion of the band is reserved for CW and SSB operation. The frequency of 903.100 MHz is the national weak-signal calling frequency.

The 904.000–906.000 MHz portion of the band is reserved for digital transmissions. The 906.000–909.000 MHz portion of the band is reserved for FM repeater outputs. The frequency of 906.500 MHz is the national FM calling frequency.

The 909.000–915.000 MHz portion of the band is reserved for ATV operation. The 915.000–918.000 MHz portion of the band is reserved for digital transmissions.

The 918.000–921.000 MHz portion of the band is reserved for FM repeater inputs. The 921.000–927.000 MHz portion of the band is reserved for ATV operation. The 927.000–928.000 MHz portion of the band is reserved for FM simplex and link operations.

**23 cm.** This band enjoys a lot of popularity with the weak-signal operator. Tropospheric contacts are made regularly. When the band is open these contacts can extend out to 800+ miles. EME contacts are made all the time.

Certain geographic restrictions apply to operations on this band. Consult the FCC rules to see if your location is affected.

The 1240.000–1246.000 MHz portion of the band is reserved for ATV operation. The 1246.000–1248.000 MHz portion of the band is reserved for NBFM point-to-point and digital operations. The 1248.000–1252.000 MHz portion of the band is reserved for digital communication operations.

The 1252.000–1258.000 MHz portion of the band is reserved for ATV operation. The 1258.000–1260.000 MHz portion of the band is reserved for NBFM point-to-point and digital operations. The 1260.000–1270.000 MHz portion of the band is reserved for satellite uplink operations. It's also reserved for wideband experimental and simplex ATV operation.

The 1270.000–1276.000 MHz portion of the band is reserved for FM repeater input operations. The 1276.000–1282.000 MHz portion of the band is reserved for ATV operation. The 1282.000–1288.000 MHz portion of the band is reserved for FM repeater output operations.

The 1288.000–1294.000 MHz portion of the band is reserved for wideband experimental and simplex ATV operation. The 1294.000–1295.000 MHz portion of the band is reserved for narrow-band FM simplex operation.

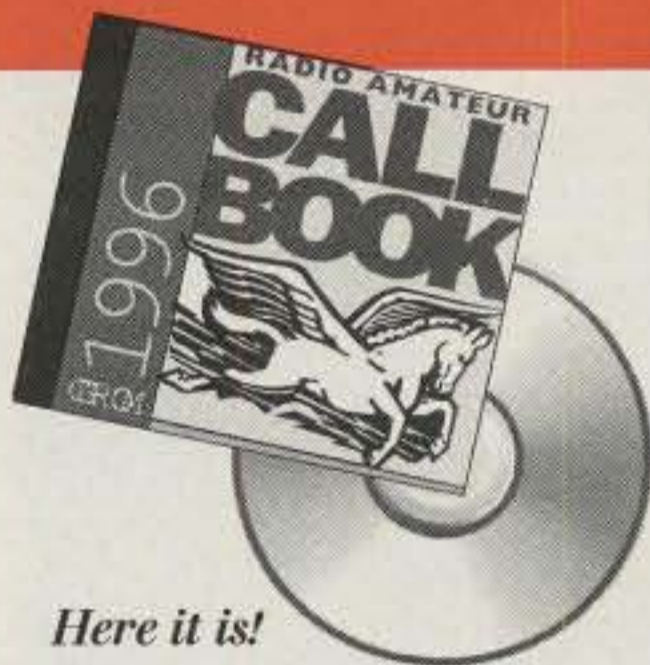
The 1295.000–1297.000 MHz portion of the band is reserved for narrow bandwidth weak-signal operation (no FM). The 1295.000–1295.800 MHz portion of the band is reserved for SSTV, FAX, ACSSB, and experimentation operation. The 1296.000–1296.050 MHz por-

tion of the band is exclusively reserved for EME operation.

The 1296.050–1296.100 MHz portion of the band is reserved for CW operation. The 1296.070–1296.080 MHz portion of the band is reserved for beacons. The 1296.100–1296.300 MHz portion of the band is reserved for CW and SSB operation.

The 1296.300–1296.400 MHz portion of the band is reserved for beacons. The 1296.400–1296.800 MHz portion of the band is reserved for crossband linear translator operation. The 1296.800–1297.000 MHz portion of the band is exclusively reserved for experimental beacons. The 1297.000–1300.000 MHz portion of the band is reserved for digital communication operations.

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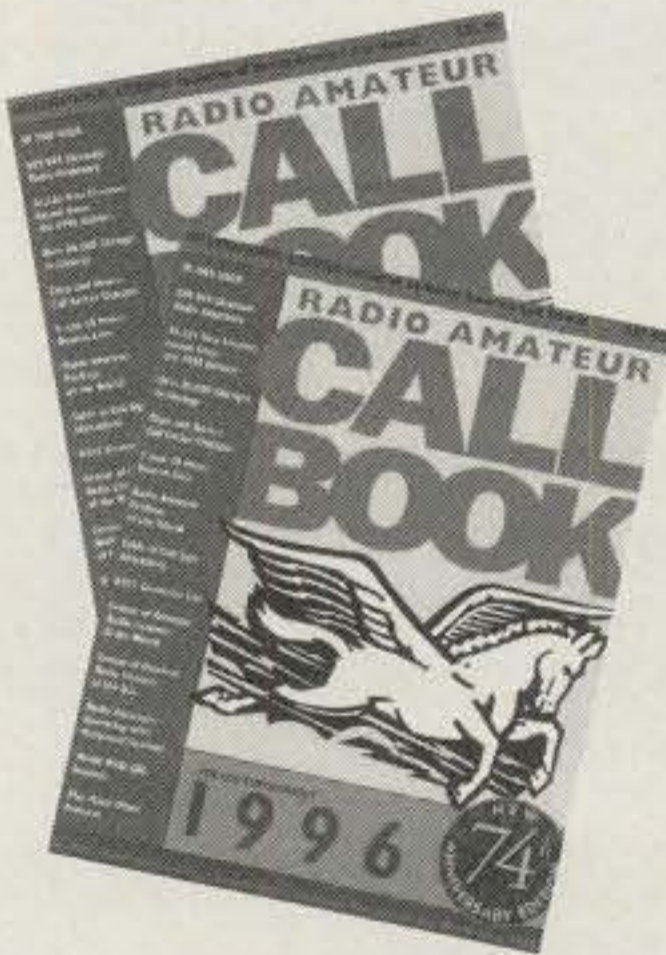
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**13 cm.** As commercial equipment becomes increasingly available, this band will gain in popularity. As it is now, only weak-signal operators who build their own equipment or put together their own kits are on this band. Tropospheric operation is regular. As with 23 cm when the band is open, it can extend outward for quite some distance. EME propagation is quite possible, although only a handful of operators are regularly pursuing it.

There is a cloud over the future of this band because the National Telecommunications and Information Agency (NTIA) has indicated that a portion of the band will be auctioned off in the near future (now scheduled for sometime in 1996).

The 2300.000–2303.000 MHz portion of the

band reserved for high-speed digital communications. The 2303.000–2303.500 MHz portion of the band is reserved for packet operation. The 2303.500–2303.800 MHz portion of the band reserved for TTY packet operation. The 2303.800–2303.900 MHz portion of the band is reserved for packet, TTY, CW, and EME communications.

The 2303.900–2304.100 MHz portion of the band is reserved for CW and EME operations. The 2304.100–2304.200 MHz portion of the band is reserved for CW and SSB operations. The frequency of 2304.1 MHz is the national weak-signal calling frequency.

The 2304.200–2304.300 MHz portion of the band is reserved for SSB, SSTV, ACSSB, FAX, packet AM, and AMTOR communications. The

2304.300–2304.320 MHz portion of the band is reserved for propagation beacon networks. The 2304.320–2304.400 MHz portion of the band is reserved for propagation beacons. The 2304.400–2304.500 MHz portion reserved for SSB, SSTV, ACSSB, FAX, packet AM, and AMTOR Experimental.

The 2304.500–2304.700 MHz portion is reserved for crossband linear translator inputs. The 2304.700–2304.900 MHz portion is reserved for crossband linear translator outputs.

The 2304.900–2305.000 MHz portion is reserved for experimental beacons. The 2305.00–2306.000 MHz portion is reserved for FM simplex (25 kHz spacing). The frequency of 2305.600 MHz is the national FM calling frequency. The 2306.000–2309.000 MHz portion of the band is reserved for FM repeater inputs (25 kHz spacing).

The 2309.000–2310.000 MHz portion of the band is reserved for control and auxiliary links. The 2390.000–2396.000 MHz portion of the band is reserved for fast-scan TV operations.

The 2396.000–2399.000 MHz portion of the band is reserved for high-rate data transmissions. The 2399.000–2399.500 MHz portion of the band is reserved for packet operation. The 2399.500–2400.000 MHz portion of the band reserved for control and auxiliary links.

The 2400.000–2410.000 MHz portion of the band is set aside for satellite operations around the world, with 2403.000–2408.000 MHz reserved for satellite high-rate data transmissions. The 2410.000–2413.000 MHz portion of the band is reserved for FM repeater outputs (25 kHz spacing).

The 2413.000–2418.000 MHz portion of the band is reserved for high-rate data transmissions. The 2418.000–2430.000 MHz portion of the band is reserved for fast-scan TV operations. The 2430.000–2438.000 MHz portion of the band is reserved for satellite operations, with 2430.000–2438.000 MHz reserved for satellite high rate data transmissions. The 2438.000–2450.000 MHz portion of the band is reserved for wide-band FM, fast-scan TV, FMTV, and slow-scan experimental operations.

**9 cm.** Again, because of the lack of equipment, only a few weak-signal operators use this band. Tropospheric propagation is the principle mode of communication. EME contacts can be made, but few have the equipment to do so.

The 3300.000–3456.000 MHz portion of the band is reserved for local options. The 3456.000–3456.050 MHz portion of the band is reserved for EME operations. The 3456.050–3456.100 MHz portion of the band is reserved for CW operations. The 3456.100–3456.300 MHz portion of the band is reserved for CW and SSB operations. The frequency 3456.100 MHz is the national weak-signal calling frequency. The 3456.300–3456.400 MHz portion of the band is reserved for beacons.

**5 cm.** This band also suffers from lack of activity because of lack of equipment. Tropospheric propagation again is the principal mode of communication. Again, EME contacts can be made, but only a very few have the equipment.

The 5760.000–5760.050 MHz portion of the band is reserved for EME operations. The 5760.050–5760.100 MHz portion of the band is reserved for CW operations. The 5760.100–5760.300 MHz portion of the band is reserved for CW and SSB operations. The frequency of 5760.100 MHz is the national weak-signal call-

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ing frequency. The 5760.300–5760.400 MHz portion of the band is reserved for beacons.

**3 cm.** Owing to the availability of surplus RADAR transmitters and detectors and Gunnplexers, this band is quite popular for short-range contacts. Frequent "over the horizon" contacts are possible. EME contact have been made but by less than two dozen people. Nevertheless, this mode of propagation is enjoying a resurgence thanks to the efforts of the gang that regularly travels to the Algonquin observatory in Canada and a faithful few experimenters in Europe and the U.S. southwest.

The 10.3683–10.3684 GHz portion of the band is reserved for beacons. The frequency of 10.368 GHz is the national weak-signal calling frequency.

**1.2 cm and above.** The 1.2 cm band is increasing in popularity with those operators who first started out on 3 cm. Again, homebrew equipment is being used for short-range contacts. It is, however, the highest band (excepting LASER frequencies) where any regular experimental communications is taking place. Propagation is affected by factors such as water vapor and oxygen. The frequency of 24.368 GHz is the national weak-signal calling frequency.

Experimental work is being done on 47 GHz by operators in Europe. Experimental work is also being done on 120 and 145 GHz by operators in Europe and in the U.S. Above these bands, except for LASER, no regular or experimental work is taking place.

**LASER.** Occasionally, LASER experimental work takes place but not on any regular basis. It appears that the only challenge exists when

someone has broken someone else's record. Then the equipment is dragged out and a new record is attempted. The only regular LASER communications takes place during contests, and then principally for increasing one's score with multipliers from this operation.

There you have it, a summary of the wonderful world of weak-signal operation and the band plans on the VHF+ amateur bands. As you can see from the above, there are many, many opportunities to operate on these bands. Your only restrictions are the equipment available to you and your interests in operating.

## VHF Conference Reports

The following is from my friend Rich Moseson, NW2L, the editor of our new sister publication *CQ VHF*.

### Eastern States VHF /UHF Conference:

"The secrets of sporadic-E and 10 GHz rain scatter during a tornado (!) highlighted the 21st annual Eastern States VHF/UHF Conference, held August 26 in Vernon, Connecticut. Over 150 people attended and packed the main conference room for session after session.

"Among the most popular speakers were Ken Neubeck, WB2AMU, who conducted a "Review of the Amazing Sporadic-E Phenomenon" and Tom Williams, WA1MBA, who explained rain scatter on 10 GHz and showed how two amateurs in Massachusetts not only made contact that way during a storm that spawned a tornado, but used the Doppler shift of returning signals to calculate the wind speed at over 140 mph.

"Other featured speakers included Frank Potts, NC1I, on EME; Steve Powlisken, K1FO, about the business of manufacturing UHF amplifiers; Dick Frey, WA2AAU (of W2SZ fame), on techniques and equipment for 24 GHz; and Down East Microwave owner Steve Kostro, N2CEI, who spoke about construction techniques.

"The conference also featured band sessions for each band from 6 meters to 13 cm, noise figure measurements by the ARRL Lab's Zack Lau, KH6CP/1, and Joe Reisert, W1JR, conducting antenna gain measurements. Amateurs at the 2 meter band session, in particular, discussed the need for encouraging new amateurs to experiment with SSB and CW, and for providing the 'Elmering' needed to help them learn the 'right' way to operate."

**Mid-Atlantic VHF Conference:** "Can amateurs help discover life on other planets? Paul Shuch, N6TX, thinks we can and would like our help in Project Argus, an effort to recruit 5000 hams around the world to 'listen' to the sky at specific microwave frequencies, in hopes of tuning in signals from other worlds.

"Paul, the dinner speaker at the Pack Rats' annual Mid-Atlantic VHF Conference outside Philadelphia on September 30, is Executive Director of the SETI League, a New Jersey-based group that is trying to carry on NASA's Search for Extra-Terrestrial Intelligence (a victim of federal budget-cutting).

"Other featured speakers at the conference included Tom Frobese, N3LLL, who discussed the need to explore new technologies in the face of increasing pressure on our bands from commercial interests; Al Katz, K2UYH, on facts

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and fallacies of impedance matching; ARRL Contest Advisory Committee Chairman J. P. Kleinhaus, AA2DU, on rules changes in ARRL VHF contests (particularly rover rules); Dave Wood, WB4KPD, on applying cellular-telephone spread-spectrum technology in amateur radio; Tom Dinyovsky, KB2AH, on building high-power amplifiers for 1296 MHz, and Tom Williams, WA1MBA, repeating his Eastern States presentation on 10 GHz for those who missed it the first time."

**Northwest VHF Conference:** The following is from Tim Marek, NC7K. "The Northwest VHF Conference held the third weekend of September was a great success! It was attended by 50+ Weak Signal VHFers from WA, OR, CA, NV, ID, MT, and VE7.

"Russ, N7ART, gave a very informative talk on tubes used in VHF amplifiers. My presentation was about mountaintop operating. Bill, NØXX, talked about antenna design and construction, and Ernest Manley, W7LHL, supplied us with the perspective of operating VHF from the 40s to now. Things sure have changed since then!

"It was nice to finally meet the folks I've been working all these years. Norman Pedersen, KB6KQ, was on hand to introduce folks to his new line of mobile antennas for SSB/CW. Don, K7HSJ, did a bang-up job organizing the event which came off quite well. Saturday night several of us travelled down the road to the home of Russ, N7ART, to view his new 28 foot dish. The old one blew apart last year, and the new one should survive all of us. What a work of art! All computer controlled, darn near cheating, hi! On the way home Sunday AM we stopped in Klamath Falls to have breakfast with Dan, WA7TDZ, and see Sam, WA7TDU's EME array for 144 MHz.

"I rode with Pat, N6RMJ, and Jeff, KE6ILX, who, after putting in a full day's work, left southern California at 7:00 PM Thursday, arriving in Reno at 6:00 AM Friday. I drove the rest of the way while they tried to catch a few Zs. Thanks for the lift, guys! This was the most fun I've had at one of these events in several years.

"It was announced that next year it will be hosted in the Puget Sound area at a date and time still to be determined. Not a bad way to spend a weekend.—73 de Tim Marek, NC7K."

## CQ VHF Magazine

As mentioned above, we have a new sister publication devoted to our spectrum of operation. As of the first of the year, CQ Communications, Inc., publisher of CQ magazine, is launching CQ VHF, a magazine dedicated entirely to VHF and UHF. It will cover the full spectrum of VHF+ activities, from FM and repeaters to satellites, ATV, and weak-signal work, with a mix of features and regular columns that should keep it interesting to newcomer and old-timer alike. Rich Moseson, NW2L, will be the editor, and writers slated for the first issue include (among others): Ken Neubeck, WB2AMU; Gordon Beattie, N2DSY, and Barry Baines, WD4ASW, along with CQ magazine veterans Lew McCoy, W1ICP, Dave Ingram, K4TWJ, and Don Stoner, W6TNS. CQ VHF will be available on newsstands as of mid-December, and will be available to charter subscribers at the introductory price of \$19.95 (\$2.00 off the regular subscription price). And while CQ VHF will provide broader and deep-

er coverage of VHF+ activities than is possible here, loyal readers of this column have no need to worry. CQ itself will continue to support its readers' VHF interests, as always, through this column and VHF/UHF-related features.

## Current Meteor Showers

Two showers occur this month. The first, the *Geminids*, is predicted to peak between 0700 and 1300 UTC on 14 December. It is a good north-south shower, producing an average of 100-110 meteors per hour at its peak.

The second, the *Ursids*, is predicted to peak around 2330 UTC on 22 December. It is an east-west shower, producing an average of only 5-10 meteors per hour, at its peak.

## And Finally . . .

As you can see, Santa (or evidence of his appearance) has made his annual way to the cover of CQ magazine. It signifies that it is time for another year to come to an end.

As I reflect back on this year, it has been a series of ups and downs. In February I was once again in Cuba where I was able to help with members of the Cifuentes ARC assemble their club station and present plaques to the winners of certain categories of the 1994 ARRL June VHF QSO Party. In March I was in Ecuador where I worked on a couple of the transmitters at the world-famous missionary radio station HCJB. While there I got to interview Beni Santos, HC1BI.

In April amateur radio saw one of its finest hours in one of this nation's most horrific disasters, the Oklahoma City bombing. In May I had my personal loss, that of saying goodbye to my best friend, my brother, as he lost his battle with cancer.

In June I was beginning my month long stay in Bosnia. While there I was able to visit with the amateurs in Zenica and make many wonderful friends. In July I was able to once again see two of my Cuban ham radio friends, Arnie

Coro, CO2KK, and Oscar Morales, CO2OJ, as Lauren Libby, KXØO, hosted them at the Central States VHF Conference.

This fall I embarked on my new career, that of attending seminary at the Perkins School of Theology, in preparation for ordination in the United Methodist Church. Amateur radio has not been left behind, however. I managed to find the amateur radio club in the School of Engineering at Southern Methodist University (the parent school for my seminary). I even ended up getting elected (or better put, being volunteered for) vice-presidency of the club.

Looking forward into next year, I hope to go back to countries that I have travelled within this year. I feel that there is much to be done in the realm of amateur radio diplomacy to make this world a more peaceful place in which to live. And I want to continue to do my part.

As I reflect on the above activities, I am constantly reminded of the presence of my fellow amateur radio operators. So many of you have become dear personal friends. I have received so much supportive correspondence over the course of this year. Your kindness and sensitivity have deeply affected me. I will always remember it.

New Year's resolutions? I plan to get that backlog of QSL cards out the door—really! Thanks for your patience in understanding how hectic my schedule has been this year.

My best wishes go to you, my wonderful readers, for a fantastic holiday season. May you receive the most important gift at all, that of peace in your heart. If you are wondering how to get that gift, look for someone to give it to, and you in turn will be the recipient of it.

As always, you can contact me via the address and Internet and Compuserve numbers at the beginning of this column. You can also phone me at 405-528-6625, or fax me at 405-528-0746. Please realize that these phone numbers are in Oklahoma City. When I am in school in Dallas during the week I cannot get your phone call. Therefore, I must return it on the weekends I am in Oklahoma City.

Until next year . . .

73, Joe, N6CL

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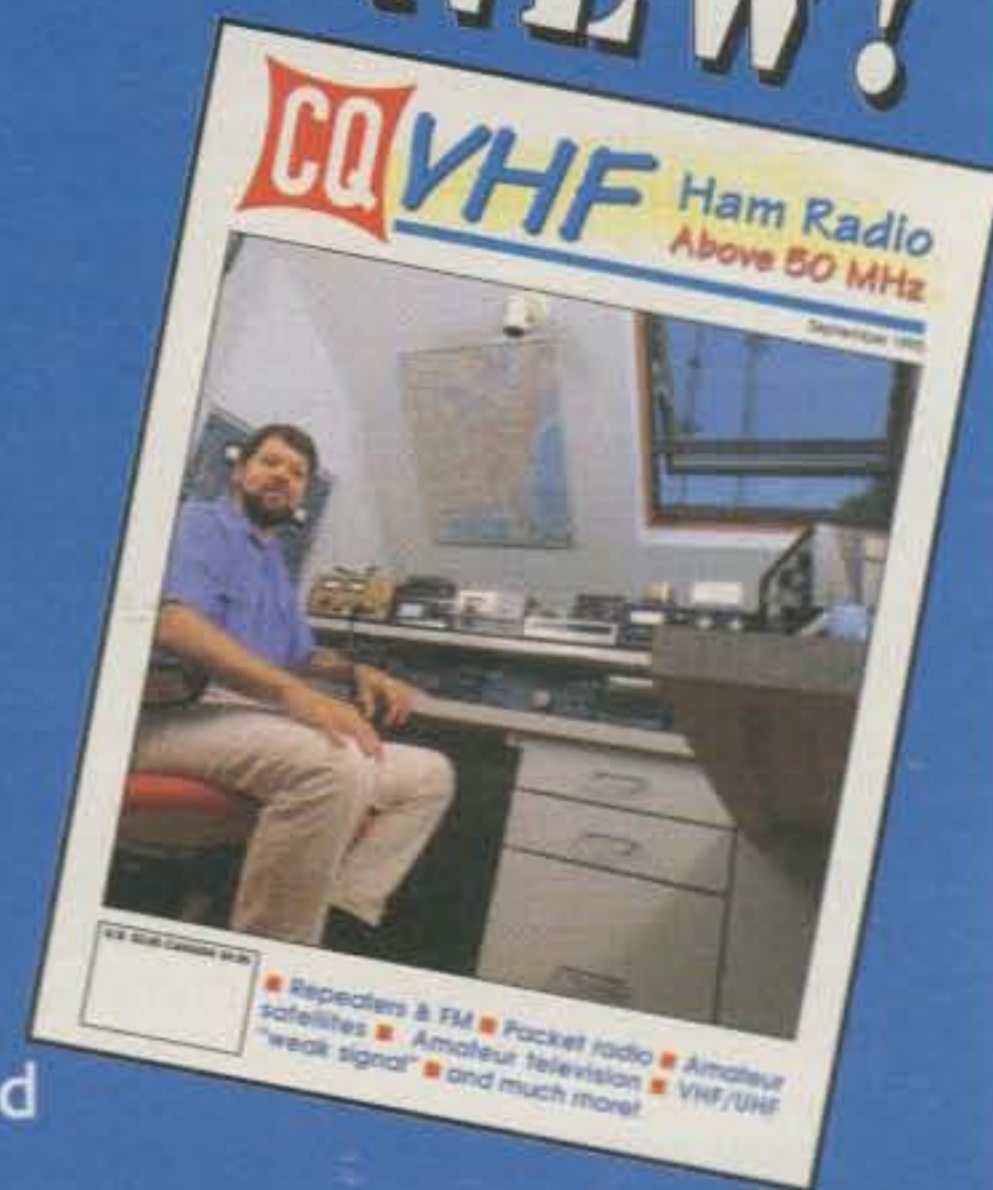


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W1BYH	59,334	361	51	15
<b>*WE1B</b>	<b>52,085</b>	<b>397</b>	<b>46</b>	<b>9</b>
K1FWF	20,450	159	39	11
W1AX	18,920	192	38	5
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KY2T	84,512	415	53	23
K2AZ	72,520	345	50	24
W2XN	61,800	233	47	28
K2PS	61,479	296	47	22
*N200	59,102	439	50	8
*N2PLE	47,908	353	50	9
K2DM	35,336	250	45	11
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K3JGJ	19,600	161	41	9
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*N2INN	10,164	100	40	2
*W2LRO	9,735	131	32	1
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*N2NFG	90,972	634	55	8
KW2J	46,700	426	46	4
*K2OMF	34,540	247	43	12
*AA2GS	28,908	279	37	7
K5NA	26,649	106	40	23
*N2PEB	26,364	219	48	4
*WN2R	19,052	231	43	1
*W2KTF	16,107	183	35	4
*K2SHL	16,104	149	34	10
*N2FF	11,240	124	37	3
KU2Q	7,474	73	28	9
*W2OMV	4,584	85	23	1
*KB2EEJ	4,524	78	22	4
*N2DBI	4,368	69	26	2
N2WK	2,262	39	26	0

**DELAWARE**

AA1K	432,234	1171	58	53
NW3Y	17,784	209	34	4
<b>*NY3C</b>	<b>16,100</b>	<b>212</b>	<b>33</b>	<b>2</b>
*WN3K	11,377	157	25	6

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K3ZO	208,525	719	56	39
<b>*K1HTV</b>	<b>151,470</b>	<b>704</b>	<b>56</b>	<b>29</b>
*WK3I	75,012	375	54	22
K3TLX	67,456	386	51	17
W3DAD	38,505	336	45	6
K3EI	34,870	277	48	7
*W3UJ	18,424	171	44	3
*W3CPB	16,872	201	35	3
KE3Q	15,960	140	43	4
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N3MKZ	46,428	214	53	20
W3TDF	45,297	279	55	8
K3CP	43,860	221	48	20
<b>*K3JJG</b>	<b>43,434</b>	<b>328</b>	<b>50</b>	<b>7</b>
K3ND	40,256	188	47	21
K3MD	40,250	370	44	6
*W3W	38,460	255	48	12
*W3UHP	28,991	248	48	5
*ADBJ	22,352	226	41	3
*W3EHZ	21,800	205	45	5
*K83TS	20,592	201	38	6
NE3F	17,020	151	39	7
*K3NL	13,899	139	33	8
*NK3U	13,631	124	36	7
*N3IMF	9,826	120	32	2
KU3X	9,768	130	30	3
<b>KB3AFT/GRP</b>	<b>5,249</b>	<b>83</b>	<b>29</b>	<b>0</b>
W3KV	4,592	75	24	4
*W3AQE	2,736	51	24	0
NM3K	1,027	38	13	0

**ALABAMA**

KB4FAI	48,662	366	52	6
<b>*W4DEC</b>	<b>28,077</b>	<b>263</b>	<b>44</b>	<b>5</b>
*K4ZGB	8,892	119	33	3
W4NTI	4,165	60	29	2

**FLORIDA**

<b>*K05M</b>	<b>75,670</b>	<b>456</b>	<b>53</b>	<b>17</b>
W4PZV	73,227	321	47	30

**GEORGIA**

KX4R	130,800	678	55	25
AE6E	85,050	455	52	23
K4SB	53,865	364	52	11
N4VZ	52,416	348	51	13
*KR4DL	41,180	315	50	8
*K4LDR	39,144	304	47	9
KS4Q	33,002	238	49	9
W4DMB	27,976	241	45	7
*N4ZTT	22,248	167	45	9
*K4EZ	18,186	193	35	7
*KR4UJ	17,190	170	41	4
W4GTS	15,190	141	43	6
W4NZJ	14,985	139	40	5
W4FTM	14,920	163	34	6
K4DDL	13,386	115	36	10
AC4PO	13,320	153	37	3
N4XMX	10,428	101	39	5
K4KG	10,336	120	36	2
*AD4JU	8,136	104	35	1
*K4BAI	2,247	52	20	1
N4H0H	418	15	10	1

**KENTUCKY**

<b>*K4TO</b>	<b>113,616</b>	<b>682</b>	<b>56</b>	<b>16</b>
N4XM	7,805	94	30	5

**NORTH CAROLINA**

AA4S	212,314	980	55	28
N4UH	28,215	219	46	9
*W88MV	27,587	245	42	7
*N4MPQ	16,120	197	37	3
<b>W4TMR/GRP</b>	<b>15,582</b>	<b>187</b>	<b>41</b>	<b>1</b>
*K4DGJ	11,703	116	43	4
W4NID/GRP	2,185	40	21	2
W1IHN	1,060	25	20	0

**SOUTH CAROLINA**

AA4NN	90,048	638	55	9
W4YDD	11,096	129	33	5

**TENNESSEE**

WR30	79,808	547	54	10
K0EJ	42,845	352	50	5
W4NL	34,752	204	50	14
<b>*AB4SW</b>	<b>32,184</b>	<b>267</b>	<b>49</b>	<b>5</b>
K4LTA	23,712	203	48	4
*K14KR	7,752	105	33	1
*WA4MCZ	7,490	101	35	0

**VIRGINIA**

W4RX	276,576	925	56	40
<b>*K7SV</b>	<b>147,810</b>	<b>736</b>	<b>55</b>	<b>23</b>
KG4W	114,576	498	54	30
<b>WA4PGM</b>	<b>54,663</b>	<b>428</b>	<b>51</b>	<b>6</b>
/GRP				
W4XD	45,441	401	46	5
N4ROA/GRP	38,448	389	44	4
W4JVN	28,956	193	42	15
W4LJM	23,460	200	46	5
*W4JHY	17,320	200	37	3
K4BAM	13,923	165	38	1
*K4UK	11,050	146	33	1
N3RC	10,642	133	31	3
W3FTG	10,540	139	32	2
N4MM	9,072	77	39	3
W4PSJ	3,168	51	20	2

**ARKANSAS**

<b>*KJ5WX</b>	<b>40,832</b>	<b>321</b>	<b>53</b>	<b>5</b>
W5KL	25,843	299	42	1

**LOUISIANA**

<b>*AB5HD</b>	<b>4,512</b>	<b>66</b>	<b>30</b>	<b>2</b>
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**MISSISSIPPI**

W5XX	84,370	576	53	12
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**NEW MEXICO**

K85UL	93,388	529	56	18
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**OKLAHOMA**

WV5S	84,609	591	55	8
K7LFY	53,376	361	57	7

**TEXAS**

<b>*W5FO</b>	<b>77,520</b>	<b>478</b>	<b>55</b>	<b>13</b>
W5XJ	61,620	458	51	9
K5DX	57,664	377	53	11
*NA5B	46,680	343	53	7
*NMSM	36,888	282	49	9
K5PC	35,518	250	50	9
W5ASP	32,224	275	46	7
*N5NMX	30,444	200	46	13
<b>K5WXZ/GRP</b>	<b>28,782</b>	<b>233</b>	<b>49</b>	<b>5</b>
*W5CWO	19,981	156	46	7
*N6ZZ	18,350	170	47	3
*N5XJLS	12,285	113	42	3
*W5SK	11,920	143	38	2
W5MW	6,786	75	35	4

**CALIFORNIA**

NW6N	175,200	650	55	18
AA6KX	116,545	557	54	11
N1BT	86,656	435	52	12
W7CB	59,136	351	53	13
<b>*W6JTI</b>	<b>47,672</b>	<b>297</b>	<b>52</b>	<b>7</b>
*W6BIP	45,032	177	45	7
K6FO	35,282	228	51	8
K6NY	33,605	205	49	6
K6MO	22,172	150	39	7
K6LRN	15,884	152	33	5
N6GI	15,444	141	41	3
<b>N6CMF/GRP</b>	<b>11,700</b>	<b>143</b>	<b>33</b>	<b>3</b>
K6NA	11,130	109	37	5
*W6HAL	10,716	126	37	1
*W8AKS	10,222	110	35	3
K6TS	10,184	94	35	3
*K6JHO	10,160	108	37	3
*W6LLY/6	5,115	71	28	3
K6HRT	3,795	71	21	2
*W6EGE	3,432	49	21	3
N6AW	3,390	58	1	5
*W6RCL	2,793	55	19	2
*W6FGV	2,088	52	17	1
*N6NF	1,900	33	17	3
*A6EE	1,854	4		



<b>NIGERIA</b>				*OK1FHI 36,240 194 0 40				<b>IRELAND</b>				RA6LW 64,032 261 1 47				<b>MARSHALL ISLANDS</b>			
5N0MVE	2,310	17	1 13	*OK2PPM 30,932 179 0 37	<b>ITALY</b>				UA6LV 60,966 205 3 51				V73GT 31,320 117 16 11						
<b>SOUTH AFRICA</b>				<b>OK2PCN /QRP 24,922 158 0 34</b>				<b>*IL3 /IK2NCJ 323,783 755 19 64</b>				<b>PHILIPPINES</b>							
ZS6EZ	24,640	71	10 30	*OK2BOB 18,360 114 0 34	<b>I5NSR 188,790 523 15 55</b>				*SM8CNS /DU 4,472 37 3 10										
*ZS6NW	9,454	38	7 22	OK1GS 15,764 121 0 28	<b>*IK4WMMG 87,804 330 3 51</b>				<b>SOUTH AMERICA</b>										
<b>ASIA</b>				<b>*OK2PLK 14,644 144 0 28</b>				<b>*IK8ZUT 50,149 219 2 45</b>				<b>ARUBA</b>							
<b>ASIATIC RUSSIA</b>				<b>*OK1AXB 14,592 96 0 32</b>				<b>*IK8CHL 41,722 183 0 46</b>				P49I 883,449 804 54 57							
UA9CR	148,450	323	2 48	*OK2QX 12,810 80 2 28	<b>*IK8RRS 40,392 187 1 43</b>				<b>BRASIL</b>										
UA9WQK	118,534	276	0 47	*OK1DXW 11,919 86 0 29	<b>*IK0FWI 7,803 83 1 26</b>				PT7BZ 17,892 51 17 19										
*UA9MR	51,948	177	0 36	OK2PBG/QRP 11,253 70 0 33	<b>*IK0FSP 3,312 40 0 16</b>				PY1BVY 4,336 31 11 5										
RA0FU	30,216	201	11 13	OK2YNV/QRP 6,417 58 0 23	<b>*IK0XBW 2,595 41 0 15</b>				<b>CHILE</b>										
*UA0DW	764	38	2 2	<b>DENMARK</b>				XQ8ABF 3,060 20 10 7											
<b>AZERBAIJAN</b>				<b>OZ1LO 576,903 976 27 76</b>				<b>ITU GENEVA</b>				<b>NETHERLANDS ANTILLES (CURACAO)</b>							
*4K9W	45,612	135	0 36	<b>OZ7AX 51,208 279 1 36</b>	<b>*4U1ITU 98,210 420 4 42</b>				PJ9JT 8,100 32 17 10										
<b>HONG KONG</b>				<b>OZ7NB 30,118 158 4 33</b>				<b>KALININGRAD</b>				<b>URUGUAY</b>							
VS6BG	4,966	69	1 12	*OZ5WQ 28,431 141 4 35	<b>UA2FF 356,454 775 18 64</b>				CX4SS 560 12 2 5										
<b>ISRAEL</b>				<b>OZ2RH 20,898 78 5 49</b>				<b>LATVIA</b>				<b>VENEZUELA</b>							
4X4NJ	405,244	508	15 67	OZ5MJ 9,510 61 0 30	<b>YL2IP 125,840 352 8 57</b>				YV10B 75,750 153 35 15										
<b>JAPAN</b>				<b>OZ5DX 5,187 50 0 21</b>				<b>LY2CZ 12,825 76 0 27</b>				<b>MARITIME MOBILE</b>							
JA5BJC	161,216	302	17 47	<b>ENGLAND</b>				SLOVAKIA				OK4FCJ /MM 140,790 424 49 16							
JH5FXP	146,095	273	18 43	G4BYG 308,754 500 31 71	<b>LITHUANIA</b>				UA0ZDA/MM 51,205 210 6 43										
JA7NI	42,435	130	10 31	G3XTT 226,620 424 28 62	<b>LY2IJ 202,279 524 12 59</b>				<b>CW MULTI-OPERATOR NORTH AMERICA</b>										
*JH2QMT	34,304	83	8 24	*G3KKQ 12,128 73 6 26	<b>LY3ID 126,382 408 6 52</b>				<b>UNITED STATES CONNECTICUT</b>										
*JE1SPY	6,420	66	7 8	*G6QQ 740 16 0 10	<b>LY3BU 88,412 379 4 42</b>				N1HRA 18,915 220 38 1										
J11NJC	6,256	62	7 9	<b>ESTONIA</b>				<b>SLOVENIA</b>				<b>MASSACHUSETTS</b>							
JE2WEN	2,106	19	8 5	*ES5MC 198,253 553 9 58	<b>LY2OU 76,097 307 2 47</b>				S59A 380,200 623 24 76				KY1H 430,920 1181 58 56						
JK6IHP	1,242	24	3 6	<b>FINLAND</b>				S50A 318,333 632 16 71				WO1N 51,894 309 44 18							
*JR6CF	630	11	2 5	OH8LAE 186,776 469 14 60	<b>LY1CX 52,000 195 3 47</b>				S58MC 311,320 627 26 60				AA1HS 38,428 270 38 14						
JA4ESR	275	7	2 3	OH2BCI 184,106 471 9 64	<b>LY2FN 26,752 171 0 32</b>				*S59AA 284,830 556 27 64				<b>NEW HAMPSHIRE</b>						
JA7YFB	75	3	2 1	OH30J 83,720 369 0 46	<b>LY1DF 21,120 127 0 32</b>				S53M 257,808 529 16 66				NX1G 73,010 308 46 24						
*JA1KXT	40	2	2 0	*OH1AJ 68,016 256 5 47	<b>LY2TX 20,361 125 0 33</b>				S57DX 203,770 548 10 61				NE1I 35,694 263 43 11						
*JK2VOC	26	13	0 1	OH3MMH 41,610 231 1 37	<b>LY1CN 12,712 97 0 28</b>				S53R 190,008 449 17 61				KC1F 31,640 215 45 11						
<b>KAZAKHSTAN</b>				<b>*OH6KZP 34,208 221 0 32</b>				<b>LY3NJM/QRP 6,174 63 0 21</b>				S50R 186,660 518 17 51				<b>RHODE ISLAND</b>			
*UN7ID	56,696	155	0 38	*OH7NW 24,325 143 0 35	<b>LY2OQ 4,312 41 0 22</b>				S56M 155,350 460 8 57				K1NG 449,401 1047 58 55						
UN7CU	2,904	34	0 11	*OH2VF 13,797 113 0 27	<b>LY3BA/QRP 3,456 42 0 18</b>				S51WV 143,388 427 7 56				W10P 119,184 494 50 28						
<b>KUWAIT</b>				<b>*OH2OM 318 16 0 6</b>				<b>LUXEMBOURG</b>				<b>VERMONT</b>							
9K2ZZ	76,140	186	1 44	<b>FRANCE</b>				*LX1HX 2,210 34 0 13				K1JKS 117,822 658 54 19							
<b>QATAR</b>				F5IN 277,440 588 25 55				<b>MACEDONIA</b>				<b>NEW JERSEY</b>							
A71CW	284,900	444	10 60	F6EZV 148,757 313 25 54	<b>MOLDOVA</b>				W2GD 692,150 1430 57 70										
<b>SAUDI ARABIA</b>				*F6EPO 51,968 167 7 49				ER5AL 44,874 160 2 52				WW2Y 571,764 1244 56 60							
7Z500	107,616	256	2 46	*F3AT 23,364 127 5 31	<b>NORWAY</b>				K2BU 62,852 265 51 25										
<b>SRI LANKA</b>				F6IRA 16,095 111 2 27				LA4LN 124,488 428 7 49				AA2PZ 54,002 308 49 18							
*4S7RPG	680	12	0 8	<b>GERMANY</b>				LA7AK 28,490 162 2 33				K2SB 43,364 186 48 28							
<b>EUROPE</b>				DL2NBU 255,612 603 21 63				<b>NETHERLANDS</b>				<b>UKRAINE</b>							
<b>ALBANIA</b>				*DL9YX 242,208 415 31 65				PA8LOU 57,512 189 9 47				UX5UO 117,876 402 3 54							
*ZA1AJ	163,200	525	4 56	*DK8ZB 227,240 477 22 70	PA3BTH 54,643 207 3 50				UX8IX/QRP 70,453 289 0 47										
<b>AUSTRIA</b>				*DL5XU 212,428 409 25 67				*PA3GNO 48,672 193 0 48				UT7ND 69,701 302 0 47							
OE9SLH	46,548	150	12 42	DJ6TK 196,876 461 18 65	*PABSOL 6,475 57 0 25				*UT8IM 67,774 272 2 45										
*OE2VEL	25,234	130	1 36	DL7UBA 145,410 420 11 63	*PA3BNT 3,077 38 0 17				*UY2ZA 64,636 241 0 52										
*OE1TKW	23,188	135	0 34	DL6QT 138,908 327 17 60	*PA2NUN 1,755 24 0 15				*UT7ZT 54,379 230 1 46										
OE5SPW	20,691	125	0 33	DL6NCY 101,246 320 11 51	<b>NORWAY</b>				*UX5EF 45,747 244 0 39										
<b>BALAERIC ISLANDS</b>				*DL1JF 96,720 320 13 49				LA7AK 28,490 162 2 33				*US7IGF 39,858 211 0 39							
EA6ZY	60,000	206	12 38	*DL0DA 89,060 278 10 51	LA8LA 22,714 106 3 38				*UT1WW 38,780 233 0 35										
<b>BELARUS</b>				*DL6CIA 82,488 291 7 49				LA5QC 3,540 37 0 20				*UR5EAT 36,260 206 0 37							
*EU4EU	40,032	222	0 36	*DK4RM 78,528 240 12 52	LA9FFA 1,350 18 0 15				UT20T 35,061 177 0 39										
<b>BELGIUM</b>				*DL20BF 67,455 344 0 45				<b>NETHERLANDS</b>				UY5TE 28,224 163 0 36							
OT5T	959,140	1147	48 82	*DL7BQ 64,043 281 6 43	PA8LOU 57,512 189 9 47				UX1VT 38,480 217 0 37										
*ON4AUC	45,115	259	0 35	*DF3OL 63,888 176 12 54	PA3BTH 54,643 207 3 50				*UR5EAT 36,260 206 0 37										
<b>BOSNIA</b>				*DL1NCT 57,800 242 8 42				*PA3GNO 48,672 193 0 48				UT20T 35,061 177 0 39							
T99W	274,650	666	15 60	*DL1EMY 52,848 235 2 46	*PA3BNT 3,077 38 0 17				*UY5TE 28,224 163 0 36										
T94DD	42,365	223	2 35	*DL1DTL 46,450 197 0 50	*PA2NUN 1,755 24 0 15				UX5UO 117,876 402 3 54										
<b>BULGARIA</b>				*DL6KVA 34,400 192 0 40				<b>NETHERLANDS</b>				*UT8IM 67,774 272 2 45							
*LZ2JE	60,818	212	4 43	*DL4HRT 33,300 207 0 37	PA8LOU 57,512 189 9 47				*UY2ZA 64,636 241 0 52										
*LZ3AB	3,612	34	1 20	DL2DWA 22,272 70 0 48	PA3BTH 54,643 207 3 50				*UT7ZT 54,379 230 1 46										
<b>CROATIA</b>				*DL2RUG 21,571 120 0 37				*PA3GNO 48,672 193 0 48				*UX5EF 45,747 244 0 39							
9A2TW	263,220	534	20 62	*DL8MKW/P 20,124 110 0 39	*PA3BNT 3,077 38 0 17				*UT1WW 38,780 233 0 35										
*9A2EU	208,518	577	8 61	DL6MTA 19,425 119 0 35	*PA2NUN 1,755 24 0 15				UT20T 35,061 177 0 39										
*9A2OB	186,408	469	10 62	*DL8WCM 19,307 90 1 42	<b>NETHERLANDS</b>				UY5TE 28,224 163 0 36										
<b>CZECH REPUBLIC</b>				*DL7GOL 64,043 281 6 43				PA8LOU 57,512 189 9 47				UX1VT 38,480 217 0 37							
OK1CM	423,405	787	30 67	*DL7BO 63,888 176 12 54	PA3BTH 54,643 207 3 50				*UR5EAT 36,260 206 0 37										
OK1JDX	145,200	447	15 51	*DL1NCT 57,800 242 8 42	*PA3GNO 48,672 193 0 48				UT20T 35,061 177 0 39										
*OK1DRU	121,068	413	9 50	*DL1EMY 52,848 235 2 46	*PA3BNT 3,077 38 0 17				*UY5TE 28,224 163 0 36										
OK1DQT	120,080	251	23 56	*DL1DTL 46,450 197 0 50	*PA2NUN 1,755 24 0 15				UX5UO 117,876 402 3 54										
OK2GG	116,600	432	7 48	*DL6KVA 34,400 192 0 40	<b>NETHERLANDS</b>				*UT8IM 67,774 272 2 45										
*OK1FF	93,708	328	10 47	*DL4HRT 33,300 207 0 37	PA8LOU 57,512 189 9 47				*UY2ZA 64,636 241 0 52										
*OK1FUT	86,072	300	7 49	DL2DWA 22,272 70 0 48	PA3BTH 54,643 207 3 50				*UT7ZT 54,379 230 1 46										
*OK1FWQ	69,200	286	3 47	*DL2RUG 21,571 120 0 37	*PA3GNO 48,672 193 0 48				*UX5EF 45,747 244 0 39										
*OK2WM	66,420	343	3 38	*DL8MKW/P 20,124 110 0 39	*PA3BNT 3,077 38 0 17				*UT1WW 38,780 233 0 35										
*OK2BMU	62,698	279	3 44	DL6MTA 19,425 119 0 35	*PA2NUN 1,755 24 0 15				UT20T 35,061 177 0 39										
OK1HC	56,400	254	0 40	*DL8WCM 19,307 90 1 42	<b>NETHERLANDS</b>				UY5TE 28,224 163 0 36										
*OK1FJH	52,275	199	4 47	DL6GRH 16,840 82 4 36	PA8LOU 57,512 189 9 47				UX1VT 38,480 217 0 37										
OK1DT	42,777	166	5 44	DL7UMS 16,320 121 0 30	PA3BTH 54,643 207 3 50				*UR5EAT 36,260 206 0 37										
OK1DWC	40,248	215	1 38	DL6NCY 101,246 320 11 51	*PA3GNO 48,672 193 0 48				UT20T 35,061 177 0 39										
*OK2SBJ	37,635	200	0 39	*DL1JF 96,720 320 13 49	*PA3BNT 3,077 38 0 17				*UY5TE 28,224 163 0 36										
<b>ICELAND</b>				*DL0DA 89,060 278 10 51				<b>NETHERLANDS</b>				<b>YUGOSLAVIA</b>							
*TF3DX	76,538	301	4 45	*DL6CIA 82,488 291 7 49	PA8LOU 57,512 189 9 47				*YU7SF 148 8 0 4										
<b>IRELAND</b>				*DK4RM 78,528 240 12 52				PA3BTH 54,643 207 3 50				<b>OCEANIA</b>							
<b>ITALY</b>				*DL20BF 67,455 344 0 45				*PA3GNO 48,672 193 0 48				<b>AUSTRALIA</b>							
<b>JAPAN</b>				*DL7BQ 64,043 281 6 43				*PA3BNT 3,077 38 0 17				*VK3IO 756 18 1 5							
<b>KAZAKHSTAN</b>				*DF3OL 63,888 176 12 54				*PA2NUN 1,755 24 0 15				<b>FIJI ISLANDS</b>							
<b>KUWAIT</b>				*DL1NCT 57,800 242 8 42				<b>NETHERLANDS</b>				*3D2HI 20 2 0 2							
<b>QATAR</b>				*DL1EMY 52,848 235 2 46				PA8LOU 57,512 189 9 47				<b>HAWAII</b>							
<b>SAUDI ARABIA</b>				*DL1DTL 46,450 197 0 50				PA3BTH 54,643 207 3 50				KH6CC 282,429 450 51 12							
<b>SRI LANKA</b>				*DL6KVA 34,400 192 0 40				*PA3GNO 48,672 193 0 48				<b>MARSHALL ISLANDS</b>							
<b>EUROPE</b>				*DL4HRT 33,300 207 0 37				*PA3BNT 3,077 38 0 17				V73GT 31,320 117 16 11							
<b>ALBANIA</b>				DL2DWA 22,272 70 0 48				*PA2NUN 1,755 24 0 15				<b>PHILIPPINES</b>							
<b>AUSTRIA</b>				*DL2RUG 21,571 120 0 37				<b>NETHERLANDS</b>				*SM8CNS /DU 4,472 37 3 10							
<b>BALAERIC ISLANDS</b>				*DL8MKW/P 20,124 110 0 39				PA8LOU 57,512 189 9 47				<b>SOUTH AMERICA</b>							
<b>BELARUS</b>				DL6MTA 19,425 119 0 35				PA3BTH 54,643 207 3 50				ARUBA							
<b>BELGIUM</b>				*DL8WCM 19,307 90 1 42				*PA3GNO 48,672 193 0 48				P49I 883,449 804 54 57							
<b>BOSNIA</b>				DL6GRH 16,840 82 4 36				*PA3BNT 3,077 38 0 17				<b>BRASIL</b>							
<b>BULGARIA</b>				DL7UMS 16,320 121 0 30				*PA2NUN 1,755 24 0 15				PT7BZ 17,892 51 17 19							
<b>CROATIA</b>				DL6NCY 101,246 32															



<b>SOUTH CAROLINA</b>	JA1YDU 62,172 175 21 23	<b>MASSACHUSETTS</b>	*NK3U 4,860 78 27 0	<b>ARIZONA</b>	*KV7S 86,720 599 55 9
AA4V 192,456 836 55 33	JA1YXP 23,608 122 16 10	AA1AA 210,756 1007 58 26	W3AP 3,440 80 20 0	NF7E 42,398 293 55 3	*KE7GH 15,120 165 40 2
<b>TENNESSEE</b>	JAGZRY 3,894 60 6 5	*AA1EY 41,104 315 49 7	<b>ALABAMA</b>	*K7OX 6,420 98 29 1	<b>IDAHO</b>
N4VV 53,300 341 53 12	JA7YFB 75 3 2 1	K1FWF 36,108 238 47 12	WZ4F 146,256 1005 56 10	<b>MONTANA</b>	KE7BT 79,065 517 54 9
<b>VIRGINIA</b>	<b>KAZAKHISTAN</b>	*WO1N 13,038 133 38 3	<b>FLORIDA</b>	N9ITX/7 132,308 830 56 6	W7LR 48,256 331 54 4
W4PRO 91,056 348 52 32	UN2L 261,235 429 3 62	*KC1SS 8,215 122 31 0	AA4MM 128,480 513 53 35	<b>NEVADA</b>	N7MBX 43,512 319 51 5
<b>LOUISIANA</b>	<b>MACAO</b>	NY1E 72,360 512 51 9	*WB4MAI 19,451 148 44 9	*N7WWQ 33,110 251 51 4	<b>OREGON</b>
KG5VK 19,740 187 44 3	XX9X 60,885 219 3 38	N1CGP 33,400 289 45 5	*K4VUD 11,058 128 33 5	N7AVK 45,194 305 53 6	WA7FAB 37,488 318 44 4
<b>OKLAHOMA</b>	<b>EUROPE</b>	W1CEK 12,691 122 47 2	*KC4HW 9,272 110 34 4	*W7JXU 12,985 143 33 2	K7GWK 8,954 101 33 4
N5OK 121,856 777 56 12	<b>AALAND ISLANDS</b>	<b>NEW HAMPSHIRE</b>	*KJ4WH 5,148 69 33 0	<b>UTAH</b>	KI7KA 18,876 186 43 1
<b>TEXAS</b>	OHØ 463,930 1021 17 68	WA1LNP 157,852 858 56 20	<b>GEORGIA</b>	*W7HS 11,046 114 41 1	<b>WASHINGTON</b>
WXØØ 221,788 973 56 33	<b>CROATIA</b>	K1HAP 56,236 300 52 16	KX4R 125,856 804 56 13	W7LZP 17,176 177 36 2	*K7EN 7,648 90 31 1
KK5GJ 43,149 332 50 7	9A1A 462,080 836 24 71	*NM1W 8,032 95 29 3	K4PI 100,252 618 56 15	*W5TV 5,292 78 28 0	<b>WYOMING</b>
WB5B 12,600 118 40 5	<b>CZECH REPUBLIC</b>	<b>RHODE ISLAND</b>	K4SB 60,264 412 52 10	KI7W 39,480 300 55 1	*WA7KYM 11,653 122 43 0
<b>CALIFORNIA</b>	OK5W 277,791 519 23 70	*K2MN 10,640 127 32 3	K4DDL 37,288 255 47 12	*K87M 7,236 81 36 0	W8SII/7 5,712 80 33 1
N6DX 339,600 859 57 43	OK2KJU 175,700 460 20 50	*KB1LN 3,800 54 30 0	*KQ4HC 31,164 297 48 1	<b>MICHIGAN</b>	*KN4RI 67,210 560 52 3
WA6RKE 108,992 451 53 11	OK2KDS 5,760 63 0 20	AA1GV 1,071 27 17 0	KR4TG 29,362 236 48 5	*K8BAL 19,092 198 43 0	*K8CVC 18,492 180 46 0
N6DLU 15,134 112 37 9	<b>ENGLAND</b>	<b>NEW JERSEY</b>	AE6E 27,378 220 48 6	W8ROS 15,657 141 51 0	*WABKEM 10,920 140 39 0
<b>UTAH</b>	G3ZEM 785,000 969 47 78	N2NT 69,793 338 51 20	W4DMB 24,242 240 43 3	<b>OHIO</b>	KW8N 64,285 421 54 11
K70A 64,008 421 55 8	G3VGG 94,888 290 16 42	*AA1AB 57,938 421 50 9	AC4SH 19,084 145 49 3	K8MR 59,223 457 56 1	K8MR 59,223 457 56 1
<b>WASHINGTON</b>	G3TXF 60,112 149 13 55	NR2H 52,277 362 51 10	*K4EZ 13,640 154 37 3	*KA8D 47,112 410 51 1	W8KKF 43,247 359 54 5
W7XR 432,374 1004 58 48	<b>GERMANY</b>	N2LT 41,292 249 48 14	*W4GTS 7,844 95 33 4	W8KKF 43,247 359 54 5	*WABLOW 34,998 277 53 4
K7ND 70,320 462 53 7	DK1NO 456,300 739 36 72	K2OWE 30,037 271 45 4	KL7TF/4 2,254 46 23 0	W8BK 32,148 248 55 2	*N6WLX 22,616 230 40 4
<b>WYOMING</b>	DLØCS 428,544 677 35 73	WA2ASM 21,320 232 40 1	*N4TOL 2,047 40 23 0	*K8SVT 20,592 185 46 2	*KA8ZPT 16,060 163 42 2
WS7W 161,460 809 58 20	DKØKF 259,644 615 17 67	WAZWYR 16,650 131 43 7	K4UEE 128 4 1 3	*WV8B 7,548 102 34 0	N8AXA/QRP 6,150 95 30 0
<b>MICHIGAN</b>	DKØEE 237,006 573 22 59	K2TD 15,885 143 38 7	<b>KENTUCKY</b>	W8LAQ 58,590 440 55 8	*KABOUT 3,458 56 26 0
WØCD 232,462 937 57 37	DK20Y 231,924 528 20 64	*KF5HK 10,865 110 37 4	KC4TX 99,552 739 55 6	<b>ARKANSAS</b>	W5KL 520 20 13 0
AA8U 225,259 922 57 32	DK1II 227,441 533 26 53	*WA2VYA 10,200 155 30 0	*KC4DWT 14,391 165 39 0	W5KL 520 20 13 0	<b>LOUISIANA</b>
K8GM 154,380 739 56 27	DFØBV 160,512 516 11 55	W2XN 8,568 88 30 6	W4BUW 52,136 428 52 4	N5ASO/5 47,734 340 53 5	W8LAQ 58,590 440 55 8
K8JM 107,091 606 55 18	DF2UU 92,322 276 6 63	*WB2REM 7,378 107 33 1	*AC4EX 11,172 127 38 0	<b>MISSISSIPPI</b>	KV5F 11,567 118 40 3
N8CQA 3,042 51 25 1	DKØFFO 64,183 250 6 47	*K2JLA 7,347 102 30 1	<b>SOUTH CAROLINA</b>	K65XA 10,032 126 38 0	KV5F 11,567 118 40 3
<b>OHIO</b>	<b>HUNGARY</b>	*KD3HN 6,510 90 33 2	W4BUW 52,136 428 52 4	<b>NEW MEXICO</b>	N5OLS 263,848 1256 58 28
KN8Z 375,435 1246 58 45	HG5A 308,880 698 14 66	*W2LRO 6,076 82 31 0	*AC4EX 11,172 127 38 0	59,580 439 54 6	K5DX 92,344 571 55 13
KV8O 142,154 820 54 20	HG6V 56,800 282 0 40	*W5KI 4,472 73 25 1	<b>TENNESSEE</b>	KB5UL 17,350 150 46 4	*KE5FI 50,740 385 53 6
W8FN 110,726 582 57 20	<b>ITALY</b>	*W1GD 4,340 67 28 0	KØEJ 7,168 100 32 0	<b>OKLAHOMA</b>	*NM5M 38,936 273 55 7
K8CX 34,260 235 56 4	I4JMY 532,247 794 40 69	WB2WIH 2,220 51 20 0	WA4PQM 31,270 262 50 3	WM4Z 23,712 232 48 0	K5WXZ/QRP 29,624 235 51 5
N8NCV 9,916 125 0 37	I4IKW 381,472 602 31 73	K2PS 1,584 38 18 0	N4MM 14,490 107 40 2	*N5OHL 11,275 127 41 0	W5ASP 17,040 200 36 4
<b>ILLINOIS</b>	IK2QE 296,384 611 25 63	WAØQQA 900 36 12 0	W4LMJ 11,726 113 36 5	<b>NEW JERSEY</b>	N5NMX/QRP 10,164 109 41 1
K9BG 132,090 615 57 28	IK2VJF 20,558 112 0 38	N2NYR 715 26 13 0	W4PSJ 7,791 74 47 2	*WK5K 7,630 109 35 0	N5NUS 2,553 54 23 0
<b>INDIANA</b>	<b>LITHUANIA</b>	AA2U/QRP 30 5 3 0	*W3FTG 1,476 38 18 0	<b>TEXAS</b>	*AB5KD 598 20 13 0
KD9SV 318,144 1108 58 38	LY6K 409,318 799 24 67	<b>NEW YORK</b>	<b>ARKANSAS</b>	N5OLS 263,848 1256 58 28	N5OLS 263,848 1256 58 28
AA9AX 40,716 306 51 7	LY2ZO 159,992 544 5 51	N2IWE 172,790 1003 57 17	W5KL 520 20 13 0	K5DX 92,344 571 55 13	K5DX 92,344 571 55 13
<b>COLORADO</b>	<b>NETHERLANDS</b>	*N2NFG 55,637 407 50 9	<b>LOUISIANA</b>	*KE5FI 50,740 385 53 6	*NM5M 38,936 273 55 7
KØRF 280,535 964 58 37	PA6A 537,420 852 39 67	*NA2A 51,064 446 50 2	W8LAQ 58,590 440 55 8	KB5UL 17,350 150 46 4	K5WXZ/QRP 29,624 235 51 5
KVØQ 259,346 917 59 35	PA3FNE 442,666 761 28 70	*WA1BBB 35,450 362 49 1	N5ASO/5 47,734 340 53 5	<b>OKLAHOMA</b>	W5ASP 17,040 200 36 4
<b>IOWA</b>	PA3BAS 197,200 390 26 59	KA2PHQ 33,275 265 51 4	<b>MISSISSIPPI</b>	WM4Z 23,712 232 48 0	N5NMX/QRP 10,164 109 41 1
NCØP 227,298 1075 57 29	PI4ZLD 148,566 422 14 52	*KA2CKI 23,250 207 46 4	KV5F 11,567 118 40 3	*N5OHL 11,275 127 41 0	N5NUS 2,553 54 23 0
<b>KANSAS</b>	PI5ØALK 11,984 90 0 28	W2XL 18,944 229 37 0	K65XA 10,032 126 38 0	<b>NEW MEXICO</b>	*WK5K 7,630 109 35 0
KCØEI 135,720 824 57 15	<b>POLAND</b>	WR2V 16,800 179 39 3	<b>LOUISIANA</b>	<b>TEXAS</b>	*N5XUS 2,553 54 23 0
<b>MISSOURI</b>	SP5GRM 489,614 725 32 74	*KA2DWW 9,570 127 32 1	W8LAQ 58,590 440 55 8	N5OLS 263,848 1256 58 28	N5OLS 263,848 1256 58 28
KØLIR 131,625 914 56 9	SQ5O 192,192 584 8 56	*K2ØMF 8,032 95 28 4	N5ASO/5 47,734 340 53 5	K5DX 92,344 571 55 13	K5DX 92,344 571 55 13
<b>CANADA</b>	<b>SLOVAKIA</b>	*N2LQO 1,819 46 17 0	<b>NEW MEXICO</b>	*KE5FI 50,740 385 53 6	*NM5M 38,936 273 55 7
<b>NEW BRUNSWICK</b>	OM7M 473,400 790 31 69	*N2PEB 1,596 35 21 0	59,580 439 54 6	KB5UL 17,350 150 46 4	K5WXZ/QRP 29,624 235 51 5
VE9LC 105,850 390 50 23	OM3A 210,096 528 13 59	*WB2DVU 288 13 9 0	<b>OKLAHOMA</b>	<b>OKLAHOMA</b>	W5ASP 17,040 200 36 4
VE9AA 80,358 268 48 11	OM2I 156,378 450 9 58	<b>DELAWARE</b>	WM4Z 23,712 232 48 0	WM4Z 23,712 232 48 0	N5NMX/QRP 10,164 109 41 1
<b>QUEBEC</b>	<b>SPAIN</b>	NY3C 20,254 244 38 0	*N5OHL 11,275 127 41 0	*N5OHL 11,275 127 41 0	N5NUS 2,553 54 23 0
VA2AM 209,055 538 55 22	EA3KU 497,670 754 36 70	NW3Y 15,132 173 38 1	<b>NEW JERSEY</b>	<b>NEW MEXICO</b>	*AB5KD 598 20 13 0
<b>ONTARIO</b>	<b>SWEDEN</b>	<b>MARYLAND</b>	N3HBX 173,700 1007 58 17	59,580 439 54 6	N5OLS 263,848 1256 58 28
VE3DC 186,030 581 50 15	7S3ØWG 500,760 816 34 70	K3IXD 56,316 435 53 4	K3IXD 56,316 435 53 4	<b>OKLAHOMA</b>	N5NMX/QRP 10,164 109 41 1
<b>ALBERTA</b>	SK3LH 188,784 514 8 61	*WR3E 36,661 247 53 8	*WR3E 36,661 247 53 8	WM4Z 23,712 232 48 0	N5NUS 2,553 54 23 0
VE6AO 147,559 520 54 5	SM6LPF 121,968 356 11 52	*KC3PZ 30,951 240 54 3	*KC3PZ 30,951 240 54 3	*N5OHL 11,275 127 41 0	N5NUS 2,553 54 23 0
<b>NORTHWEST TERRITORIES</b>	<b>UKRAINE</b>	WV3B 13,530 147 39 2	WV3B 13,530 147 39 2	<b>NEW JERSEY</b>	*AB5KD 598 20 13 0
VE8CF 1,612 22 9 4	UR4LWC 119,925 348 6 59	WA3WJD 9,048 141 29 0	WA3WJD 9,048 141 29 0	<b>TEXAS</b>	N5OLS 263,848 1256 58 28
<b>NORTH AMERICA</b>	UT2I 77,440 270 5 50	<b>PENNSYLVANIA</b>	<b>PENNSYLVANIA</b>	N5OLS 263,848 1256 58 28	N5OLS 263,848 1256 58 28
<b>ALASKA</b>	<b>CW CHECK LOGS:</b> Thanks to the following stations for their valuable check logs for CW, DL3ARX, DL3BXX/P, EABURT, JE1CTM, K4VUD, KK4RV, LA2KD, LA4KF, LA4ØGA, NE9A, OH1XX, OH2KQ, OH5PT, OH6UC, ON/N1ØI, OZ5PA, SM3CVM, SM5BFJ, SM5LI, SM6ØLL, SP2DX, SP4JWR, SP4JYA, SP9ØØH, SP9CTT, VA3TEE, VE2EM, VE4AAU, W2LRLJ, YO2BP, YO3FRI.	W3GH 207,542 1079 59 23	W3GH 207,542 1079 59 23	<b>NEW MEXICO</b>	N5OLS 263,848 1256 58 28
KL7Y 129,704 335 42 20	<b>SSB RESULTS</b>	N3MKZ 193,116 1042 58 19	N3MKZ 193,116 1042 58 19	59,580 439 54 6	N5OLS 263,848 1256 58 28
<b>CAYMAN ISLANDS</b>	<b>SINGLE OPERATOR</b>	W3TS 127,374 805 58 11	W3TS 127,374 805 58 11	<b>OKLAHOMA</b>	N5NMX/QRP 10,164 109 41 1
ZF1DX 382,656 706 55 41	<b>NORTH AMERICA</b>	NE3F 125,195 735 58 15	NE3F 125,195 735 58 15	WM4Z 23,712 232 48 0	N5NUS 2,553 54 23 0
<b>MEXICO</b>	<b>UNITED STATES</b>	W3BGN 98,601 530 50 19	W3BGN 98,601 530 50 19	*N5OHL 11,275 127 41 0	N5NUS 2,553 54 23 0
XE2/W7WA 632,541 1196 58 33	CONNECTICUT	KU3X 95,770 702 56 5	KU3X 95,770 702 56 5	<b>NEW JERSEY</b>	N5NMX/QRP 10,164 109 41 1
ØD2X 432,042 907 56 31	*K18NØ 147,460 844 55 18	*N3BUD 78,900 579 56 4	*N3BUD 78,900 579 56 4	<b>TEXAS</b>	N5OLS 263,848 1256 58 28
<b>ASIA</b>	KTVWL 135,135 728 58 19	N3GSC 64,860 489 55 5	N3GSC 64,860 489 55 5	N5OLS 263,848 1256 58 28	N5OLS 263,848 1256 58 28
<b>ASIATIC RUSSIA</b>	WV1C 30,550 280 46 4	KC3MR 56,705 465 53 2	KC3MR 56,705 465 53 2	<b>NEW MEXICO</b>	N5NMX/QRP 10,164 109 41 1
RK9XWH 280,566 451 4 62	KA1CZF 14,076 179 36 0	NN3Q 51,852 351 44 14	NN3Q 51,852 351 44 14	59,580 439 54 6	N5OLS 263,848 1256 58 28
<b>JAPAN</b>	W1TS 4,968 80 27 0	N3JLL 43,424 303 51 8	N3JLL 43,424 303 51 8	<b>OKLAHOMA</b>	N5NMX/QRP 10,164 109 41 1
JA3ZØH 96,696 240 20 31	*N4REE/1 4,392 81 24 0	WT3W/QRP 34,741 320 46 3	WT3W/QRP 34,741 320 46 3	WM4Z 23,712 232 48 0	N5NUS 2,553 54 23 0
		K3TEJ 29,164 286 42 4	K3TEJ 29,164 286 42 4	*N5OHL 11,275 127 41 0	N5NUS 2,553 54 23 0
		K2DOX 27,675 297 39 2	K2DOX 27,675 297 39 2	<b>NEW JERSEY</b>	N5NMX/QRP 10,164 109 41 1
		KØ3TS 26,901 237 42 7	KØ3TS 26,901 237 42 7	<b>TEXAS</b>	N5OLS 263,848 1256 58 28
		*KA3SDP 22,450 223 49 1	*KA3SDP 22,450 223 49 1	N5OLS 263,848 1256 58 28	N5OLS 263,848 1256 58 28
		K3NW 20,520 194 42 3	K3NW 20,520 194 42 3	<b>NEW MEXICO</b>	N5NMX/QRP 10,164 109 41 1
		KA3AVB 20,328 213 42 2	KA3AVB 20,328 213 42 2	59,580 439 54 6	N5OLS 263,848 1256 58 28
		*W3UHP 19,950 222 41 1	*W3UHP 19,950 222 41 1	<b>OKLAHOMA</b>	N5NMX/QRP 10,164 109 41 1
		K3II 14,350 153 38 3	K3II 14,350 153 38 3	WM4Z 23,712 232 48 0	N5NUS 2,553 54 23 0
		AD3Z 14,085 130 42 3	AD3Z 14,085 130 42 3	*N5OHL 11,275 127 41 0	N5NUS 2,553 54 23 0
		*KB3AFT 13,838 172 36 1	*KB3AFT 13,838 172 36 1	<b>NEW JERSEY</b>	N5NMX/QRP 10,164 109 41 1
		W3UM 13,790 182 35 0	W3UM 13,790 182 35 0	<b>TEXAS</b>	N5OLS 263,848 1256 58 28
		K3ND 12,222 104 36 6	K3ND 12,222 104 36 6	N5OLS 263,848 1256 58 28	N5OLS 263,848 1256 58 28



*K9BQL KI0G/GRP	3,584 1,558	58 38	28 19	0 0					
<b>KANSAS</b>									
K8BSHE *NOBY W0BR	128,704 11,440 1,980	924 128 42	56 40 22	8 0 0					
<b>MINNESOTA</b>									
N8AXL KJ0B KG0JP W8HW	115,648 68,853 15,265 7,630	805 510 167 100	56 3 43 35	8 3 0 0					
<b>MISSOURI</b>									
NX8I *KMBL	202,392 20,727	1227 195	58 49	14 0					
<b>NORTH DAKOTA</b>									
NT8V	34,143	252	52	5					
<b>NEBRASKA</b>									
W8DEY	68,400	505	56	4					
<b>CANADA</b>									
<b>NEWFOUNDLAND</b>									
*V01SF *V01DAD	30,420 10,933	141 79	26 27	13 2					
<b>NEW BRUNSWICK</b>									
VE9AA *VE9DXR	116,044 6,094	330 62	51 20	16 2					
<b>NOVA SCOTIA</b>									
VE1UK	152,082	452	40	23					
<b>QUEBEC</b>									
VA2AM VE200 *VE2AWR	212,840 41,760 3,088	649 161 44	58 44 16	10 4 0					
<b>ONTARIO</b>									
VE3EJ VE3AQH VE3RM VE3PN *VA3WTO *VE3ZTH VE300/GRP	561,912 373,608 342,842 161,129 75,582 3,002 2,592	1497 1078 964 571 320 34 33	59 58 14 53 48 19 18	19 16 16 6 3 0 0					
<b>MANITOBA</b>									
*VE40V VE4JB	35,604 25,467	165 139	46 39	0 0					
<b>SASKATCHEWAN</b>									
VE5RA *VE5VL VE5SF	200,064 17,550 6,475	668 102 59	57 37 25	7 2 0					
<b>ALBERTA</b>									
VE6JY *VE6FR *VE6LDX VE6KRR VE6NAO VE6LB VE6BMX/GRP	82,364 40,000 28,208 17,442 17,352 16,668 8	303 177 160 119 108 100 4	53 47 39 33 33 35 1	6 3 2 1 3 1 0					
<b>BRITISH COLUMBIA</b>									
VE7SBO VE7IN VE7RCN *VE7ERY	108,982 68,794 48,598 24,640	405 276 220 131	52 48 45 37	6 5 2 3					
<b>YUKON</b>									
VY1JA	15,190	108	29	2					
<b>NORTH AMERICA</b>									
<b>ANTIGUA</b>									
V26AS	104,380	276	44	24					
<b>CAYMAN ISLANDS</b>									
ZF1EJ	27,060	129	31	10					
<b>DOMINICAN REPUBLIC</b>									
*HI8OMA	5	1	0	1					
<b>MEXICO</b>									
XE1VIC XE2HWH	22,172 4,389	94 43	41 19	5 2					
<b>TURKS &amp; CAICOS</b>									
VP5JM	126,436	326	51	22					
<b>US VIRGIN ISLANDS</b>									
KP2A	228,138	433	54	40					
<b>AFRICA</b>									
<b>CANARY ISLANDS</b>									
EA8BWW	2,028	19	0	12					
<b>ASIA</b>									
<b>ASIATIC RUSSIA</b>									
*UA9MR	52,780	300	0	26					
<b>BAHRAIN</b>									
A92BE	37,037	115	3	34					
<b>KAZAKHSTAN</b>									
UN20	52,904	166	0	34					
<b>QATAR</b>									
A71CW	4,770	30	0	18					
<b>TURKEY</b>									
*TA2DS	134,138	294	1	46					
<b>EUROPE</b>									
<b>ALBANIA</b>									
*ZA1AJ	51,324	238	1	41					
<b>AUSTRIA</b>									
OE3V *OE1TKW	16,337 11,180	111 86	0 0	31 26					
<b>AZORES ISLANDS</b>									
*CU2CE	37,214	140	8	38					
<b>BELARUS</b>									
*EU1EU	56,889	261	0	43					
<b>BELGIUM</b>									
OT5T *ON4AUC	398,084 36,371	755 201	24 0	68 37					
<b>BOSNIA</b>									
T94DD T93M T99W	157,251 119,224 100,912	412 399 336	14 5 8	55 51 45					
<b>BULGARIA</b>									
*LZ2JE *LZ3AB	59,780 935	232 16	4 0	45 11					
<b>CROATIA</b>									
9A2TW *9A3KR	186,807 46,059	458 232	18 0	55 39					
<b>CZECH REPUBLIC</b>									
OK1AY OK1TP *OK1JN *OK2PBV OK2BHM *OK2PLK *OK2BNF OK1FUT *OK2QU *OK1FQY	166,286 62,874 31,920 27,676 25,488 12,369 10,700 8,586 7,961 1,430	534 310 172 203 145 85 91 126 73 22	4 2 2 0 1 0 0 0 0 0	57 40 36 34 35 31 25 27 23 13					
<b>DENMARK</b>									
OZ5EV OZ1FQY	17,578 1,430	101 22	0 0	34 13					
<b>ENGLAND</b>									
G3NAS	185,760	258	20	52					
<b>ESTONIA</b>									
*ES5RY	87,715	314	0	53					
<b>FINLAND</b>									
OH1MLB OH6LNI OH3MMH *OH7NW	77,221 57,132 40,885 5,544	334 248 227 50	0 0 0 0	47 46 37 24					
<b>FRANCE</b>									
*F8WE	28,934	154	2	35					
<b>GERMANY</b>									
DJ6QT *DL6CIA *DL8PC *DL1FDV *DL1SWB *DL7UTA *DL7VMM DL1EFO *DL2DBH DF2UU *DL8SDC DK3ML	142,025 68,450 66,591 41,265 26,784 19,720 19,008 17,250 10,411 10,304 5,928 1,224	453 330 296 200 169 124 113 130 79 71 50 24	10 1 4 3 0 0 0 0 0 0 0 0	55 49 45 42 36 34 36 30 29 32 24 12					
<b>GREECE</b>									
SV8CS *SV2AEL	148,267 1,984	514 26	3 0	56 16					
<b>ITALY</b>									
*IK1GPG IK3SSJ I6FLD IK4MTK *IK8SHE IK2AEQ I0KHP/GRP *I0TIC	165,672 119,884 117,546 74,784 46,436 40,040 8,154 6,096	440 314 360 323 201 195 67 61	18 20 12 7 4 4 0 0	60 48 54 41 43 40 27 24					
<b>LITHUANIA</b>									
LY6K *LY1FW *LY2TX *LY2OU LY1DR LY3NJM/GRP	186,105 137,072 24,222 12,928 3,280 810	638 507 152 81 43 21	2 3 0 0 0 0	55 49 33 32 16 9					
<b>LUXEMBOURG</b>									
LX1PX	49,062	252	1	38					
<b>MOLDAVA</b>									
ER3ED	22,653	163	0	27					
<b>NETHERLANDS</b>									
*PA0ZH *PA0JLM *PA2SWL	39,603 20,020 10,500	178 124 75	4 1 0	39 34 28					
<b>NORWAY</b>									
LA4LN LA2WHA	43,428 100	205 5	0 0	42 4					
<b>POLAND</b>									
SQ50 SP5ES/5 SP5INQ *SP6CZ *SP8GMU SP9VCK	122,528 109,450 66,700 46,840 28,690 10,324	425 382 260 230 151 73	3 6 1 1 0 0	53 49 49 39 38 29					
<b>PORTUGAL</b>									
CT8T CT1DIZ CT1AVR	200,354 77,624 6,116	372 217 59	28 14 0	49 48 22					
<b>RUSSIA</b>									
*RV1CC RU4AA *RA3WA RV3MA/GRP	82,222 70,686 32,604 1,216	350 253 166 19	0 2 0 0	49 52 38 8					
<b>SARDINIA</b>									
IS0QDV	53,280	263	0	40					
<b>SLOVAKIA</b>									
*ON3OM	45,906	216	0	42					
<b>SLOVENIA</b>									
S50K S57DX S52CO S51WV *S50R S59L S50A *S51WA S57W S55A *S54X *S57AW *S56A	214,839 121,352 109,615 104,784 102,131 64,974 64,220 56,202 40,524 38,171 28,492 11,350 8,176	547 425 389 334 380 314 241 219 188 191 174 96 64	15 8 5 9 4 2 5 4 2 2 0 2 0	58 48 50 50 49 40 47 46 40 39 34 23 28					
<b>SPAIN</b>									
EA3CCN EA5GRC *EA3GHQ EA3AMS *EA1DVY *EA1FDI EA7EWX *EA1AAA	110,837 59,508 30,114 29,885 16,488 3,276 1,408 270	351 214 145 141 80 40 31 12	10 4 4 4 9 0 1 0	51 50 38 39 27 18 10 6					
<b>SWEDEN</b>									
*SM6HRR	10,320	69	0	30					
<b>UKRAINE</b>									
UT5DK *UX5NQ UT7ND UR4E UX5UO UR5EDU *UT1ZZ *UY2ZA UR5EDX *UR3PDT *UT4ZA *UR5VND US5ZCW *UT1WW *UR7IAY	242,301 69,960 30,732 27,072 24,444 20,328 20,243 19,992 18,598 13,427 13,020 12,964 10,314 3,808 2,223	876 257 166 160 153 123 160 124 107 98 95 102 78 49 37	2 3 0 0 0 0 0 0 0 0 0 0 0 0 0	49 52 39 36 36 33 31 34 34 29 30 28 27 17 13					
<b>YUGOSLAVIA</b>									
YZ1MB	54,675	238	0	45					

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## J.M.S.

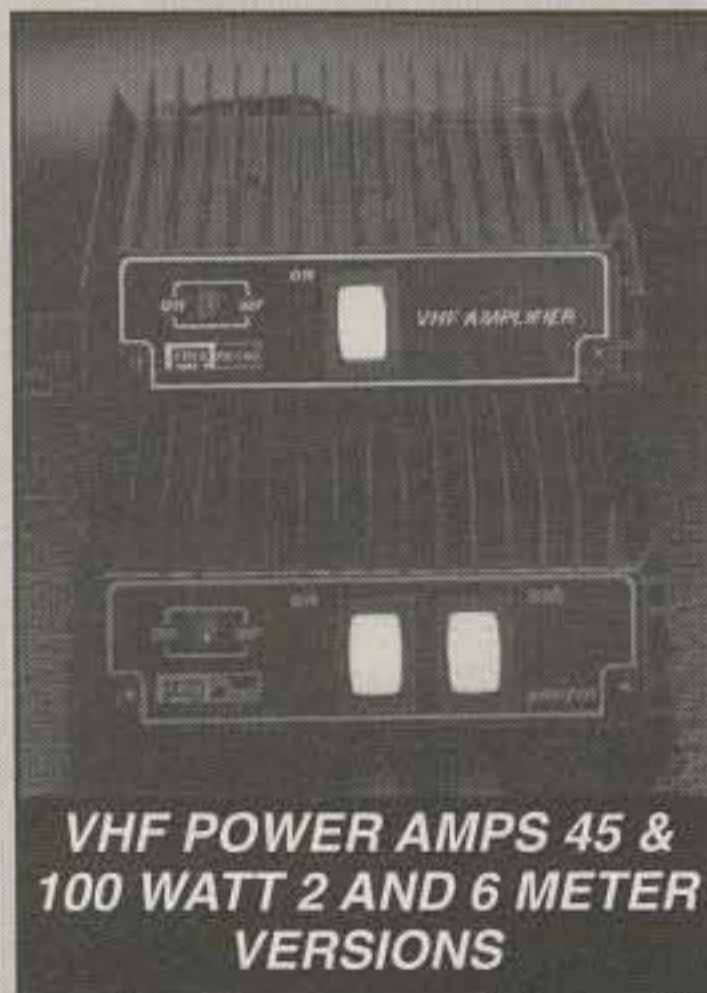
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VK5GN	14,580	52	25	5	W2GD	435,062	1425	59	48	KX3Q	219,186	1131	58	24	KEØRO	47,355	384	53	2	G3SVL	54,150	213	9	41
*VK3IO	455	30	2	3	KN2L	178,596	894	58	24	KG4W	66,500	289	54	22	NCØP	179,133	1121	57	14	DKØIW	44,252	193	4	42
<b>HAWAII</b>					<b>NEW YORK</b>					<b>LOUISIANA</b>					<b>IOWA</b>					<b>GERMANY</b>				
KH6CC	57,988	155	30	8	WA2JQK	44,899	327	51	8	NØCEM	160,197	1076	57	10	KØRW	118,958	942	52	6	DLØMI	40,950	221	2	40
NH6T	57,816	133	43	1	<b>DELAWARE</b>					<b>TEXAS</b>					<b>MINNESOTA</b>					<b>ITALY</b>				
*K6GSS/KH6	78	5	1	2	AA1K	51,750	243	50	19	K5XI	147,600	844	57	18	WØMR	60,200	481	54	2	IR4T	299,796	617	20	66
<b>SOUTH AMERICA</b>					<b>PENNSYLVANIA</b>					<b>CALIFORNIA</b>					<b>MISSOURI</b>					<b>LITHUANIA</b>				
<b>ARGENTINA</b>					<b>ALABAMA</b>					<b>UTAH</b>					<b>SOUTH DAKOTA</b>					<b>LUXEMBOURG</b>				
LU1FA	2,716	41	9	5	KA2DRH	82,026	601	55	7	K6X0/7	40,545	323	51	2	WØBLK	57,400	439	53	3	LX4A	400,302	878	22	59
*LU2NI	310	18	1	4	KS4AP	30,186	251	52	2	KG7GA	77,934	510	54	8	VE9LC	35,860	271	46	9	LY2ZO	81,098	344	2	44
*LS5E	34	7	0	2	<b>FLORIDA</b>					<b>WASHINGTON</b>					<b>CANADA</b>					<b>POLAND</b>				
*LU5ER	30	6	0	2	AB4XA	107,991	664	55	16	KG7WON	85,365	578	57	6	VE2UMS	53,169	309	37	0	OM2I	93,177	356	3	48
<b>BRASIL</b>					<b>GEORGIA</b>					<b>WYOMING</b>					<b>NEW BRUNSWICK</b>					<b>SLOVAKIA</b>				
PT7BZ	15,213	49	16	17	AB4RU	385,458	1468	58	44	W7SE	52,542	419	49	5	VE3DC	210,730	690	58	7	S5ØL	86,060	325	6	46
PW8CZ	2,235	20	5	10	WB4ZNH	112,292	762	55	12	AA8U	228,380	1313	58	18	VE4JC	37,842	155	51	0	S51EA	46,412	236	1	40
<b>CHILE</b>					<b>KENTUCKY</b>					<b>MICHIGAN</b>					<b>QUEBEC</b>					<b>SLOVENIA</b>				
XQ8ABF	9,476	51	17	6	KR4BD	47,898	415	52	2	KG8CW	102,272	710	57	7	VE6AO	63,072	254	50	4	EA3ALD	101,893	334	8	51
<b>COLOMBIA</b>					<b>NORTH CAROLINA</b>					<b>OHIO</b>					<b>ONTARIO</b>					<b>SPAIN</b>				
*HK6ISX	8,880	38	19	5	AA4S	131,054	759	56	18	WR8C	219,825	1271	57	18	VE6AD	63,072	254	50	4	EA1DD	7,800	69	1	23
*HJ6WQH	8,050	36	17	6	WD4PDZ	32,376	266	50	7	WD9INF	204,254	1220	58	15	VE9LW	122,950	263	0	50	7S3OWG	154,086	491	2	59
*HJ6VKH	6,160	29	17	5	<b>CONNECTICUT</b>					<b>ILLINOIS</b>					<b>ALBERTA</b>					<b>SWITZERLAND</b>				
*HKGAUG	1,250	13	8	2	N1HRA	35,770	317	44	5	KB7WON	85,365	578	57	6	VE9LW	122,950	263	0	50	HB9TA	158,405	451	14	51
<b>URUGUAY</b>					<b>INDIANA</b>					<b>ASIA</b>					<b>SWEDEN</b>					<b>UKRAINE</b>				
CX4SS	316	17	0	4	KD9SV	197,496	1205	58	14	RK9XWH	122,950	263	0	50	EW4XA	13,797	105	0	27	UT2I	46,013	194	1	46
<b>VENEZUELA</b>					<b>EUROPE</b>					<b>EUROPE</b>					<b>EUROPE</b>					<b>EUROPE</b>				
YV2IF	117,780	199	42	23	<b>BELARUS</b>					<b>EUROPE</b>					<b>EUROPE</b>					<b>EUROPE</b>				
<b>SSB MULTI-OPERATOR NORTH AMERICA</b>					<b>EUROPE</b>					<b>EUROPE</b>					<b>EUROPE</b>					<b>EUROPE</b>				
<b>UNITED STATES</b>					<b>EUROPE</b>					<b>EUROPE</b>					<b>EUROPE</b>					<b>EUROPE</b>				
<b>CONNECTICUT</b>					<b>EUROPE</b>					<b>EUROPE</b>					<b>EUROPE</b>					<b>EUROPE</b>				
N1HRA	35,770	317	44	5	<b>EUROPE</b>					<b>EUROPE</b>					<b>EUROPE</b>					<b>EUROPE</b>				
K2SX	10,212	116	35	2	<b>EUROPE</b>					<b>EUROPE</b>					<b>EUROPE</b>					<b>EUROPE</b>				
<b>MASSACHUSETTS</b>					<b>EUROPE</b>					<b>EUROPE</b>					<b>EUROPE</b>					<b>EUROPE</b>				
W1BK	11,235	144	34	1	<b>EUROPE</b>					<b>EUROPE</b>					<b>EUROPE</b>					<b>EUROPE</b>				

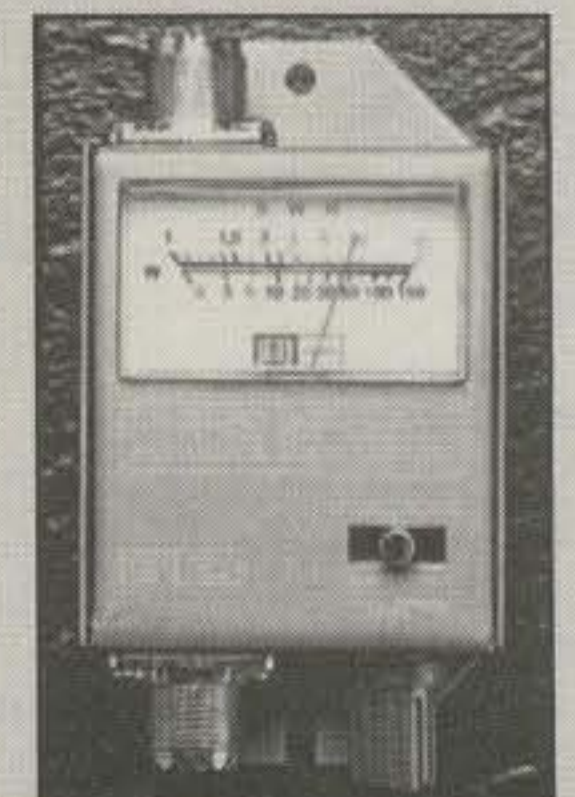
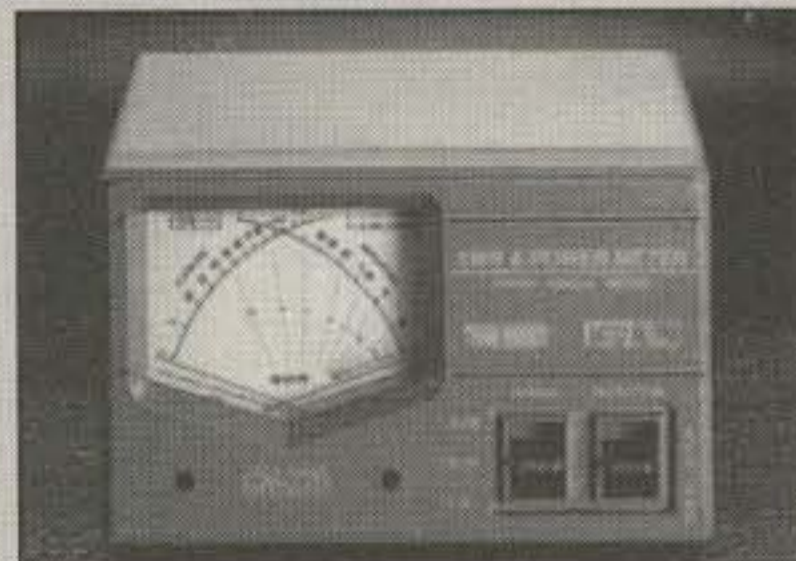
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### Unscrambling The Mystery of The Amateur Callsign

**W**e get dozens of letters from readers every month as a result of this column. We can't answer them all personally, and we put the ones of universal interest in a pile for later coverage. Without a doubt, we get more inquiries about amateur station callsigns than any other subject. It seems that half the letters we get ask about them.

Many readers are totally baffled, or are a victim of bad information! The confusion is particularly widespread among newcomers to amateur radio. This month we have boiled down a stack of letters from readers into a column that answers every question asked on the three amateur callsign programs. These are the Sequential, Vanity, and Special Event callsign systems. To explain each in detail is a little demanding, since there are so many variations and special situations. At present only sequential callsigns are available, but vanity and special event station callsigns are on the horizon!

#### Sequential Callsign System

You get a new station callsign when you qualify to become an amateur radio operator. A sequential callsign is always systematically selected by the FCC's computer from an alphabetized list appropriate for your license class and geographic region.

You have no choice but to accept the callsign assigned to you by the FCC from these lists if it is your first callsign. New amateurs simply get the next callsign in line. You always have the option, however, of retaining your current callsign if you already have one and are upgrading to a higher license class and qualify for a different callsign.

Once a callsign is assigned, it will not be changed unless the licensee specifically makes a request and is eligible for a change. The licensee always has the option of keeping the current callsign upon license renewal, upgrade, change of station location, change of mailing address, or change of name.

**Prefixes:** The format of all amateur station callsigns consists of one or two prefix letters, a single-digit numeral, and up to three suffix letters. The prefix, which can be one or two letters, is determined by international agreement among the countries of the world.

Single-letter prefixes are either K, N, or W. Two-letter combinations are either AA-AL, KA-KZ, NA-NZ, or WA-WZ. Certain prefixes are also reserved for U.S. possessions and the states of Alaska and Hawaii. Prefixes for these non-contiguous areas are AH, AL, KH, KL, KP, NH, NL, NP, WH, WL, and WP.

**Area numerals:** The digit is always a single number, 0 through 9, which usually indicates a geographical district within the continental United States. Area digits (also between 0 and

9) of amateur stations outside of the contiguous U.S. are arbitrarily assigned by the FCC. For example, the area digit for American Samoa is the number 8.

**Suffix letters:** The suffix can be one, two, or three alphabet letters. Single-letter suffixes are all letters A through Z. Two-letter combinations are all between AA and ZZ. Three-letter combinations are AAA-ZZZ. Some suffixes such as common Q-signals (example, QST), distress symbols (like SOS), and other combinations are not used (for example, certain letter combinations that make up words of bad taste.) The FCC has never released their list of excluded suffixes, probably because they do not wish to be criticized for their sometimes inconsistent censorship.

The letter "X" also cannot be the first of three suffix letters in a Group D (two-by-three) callsign. By law, those suffixes go to Experimental rather than amateur radio stations.

**Callsign Groups:** There are four different categories for each of the ten different geographic regions. They are designated Groups A, B, C, and D. The group system is based on rewarding higher license class amateurs with what is generally considered to be more desirable callsigns. And make no mistake about it: radio amateurs place the utmost importance on station callsigns.

Radio amateurs have the option of changing their station callsigns when upgrading to a new callsign group. They also may change their callsign to one of a lower group. That is, an Extra Class amateur qualifies for not only a new sequentially issued Group A callsign, but a Group B, C, or D as well. Again, upgrading amateurs may not choose their own callsign letters. They are systematically issued by the FCC's computer.

Shorter callsigns are easier to communicate (especially by CW) and are generally a status symbol among amateur radio operators. You can frequently determine how long an amateur has been licensed and his license class by the station callsign. That is about to go out the window when the Vanity Callsign System gets going. And it is right around the corner!

The shorter Group A (one-by-two, two-by-one, and certain two-by-two callsigns beginning with the prefix AA through AL) are reserved for Extra Class radio amateurs. For example, my callsign, W5YI, is a Group A one-by-two callsign. That means one prefix letter, an area number, and two suffix letters.

A Group B callsign has a two-by-two format such as KB1AA) and is assigned to Advanced Class amateurs.

One-by-three Group C callsigns with the first letter N are assigned to new Technician, Technician Plus, and General Class amateurs. Group C callsigns can also start with the letters K and W, but those prefix letters are not initially assigned to first-time licensees and are only available through the "vanity" callsign system, which we will get to later.

Two-by-three format callsigns go to Novice operators. An example of a Group D callsign is KA1ABC. When all callsigns have been assigned within a specific grouping, then callsigns are assigned from the next lower group. That is why most Technicians today are getting two-by-three format callsigns. All N-by-three callsigns have been assigned in most regions.

#### The Vanity Callsign System

The basic difference between the Sequential and the Vanity Callsign System is that instead of the FCC assigning a station callsign from a "no choice" alphabetized list, the callsign is selected from a list of callsigns submitted by the licensee.

The vanity callsign program has yet to get underway and is being held up by three obstacles. First, the American Radio Relay League (and others) have submitted *Petitions for Reconsideration* asking that the final vanity callsign rules be modified. Second, release of the Vanity Callsign application form (FCC Form 610-V) is being delayed pending FCC action on the petitions. Third, no one is sure what the cost will be to get a station callsign of choice.

One thing we do know, however, is that the special callsign will not be free! There will be a fee for a user-selected callsign. At this point, the exact cost is up in the air.

Vanity callsigns got their start in 1993 as part of President Clinton's much publicized Deficit Reduction Plan. In it was a provision for the FCC to collect a \$7 annual fee to bankroll the administrative cost of providing an amateur callsign chosen by the user. The fee would be collected in advance, and based on its ten year license term, it would be \$70.

Congress, however, later revised and reduced the Schedule of Regulatory Fees for vanity callsigns to \$3.00 per year, or \$30. At the urging of the ARRL, a third plan has emerged. HR1869, the FCC Authorization Bill currently being worked on by the House of Representatives, suggests a one-time vanity callsign "Authorization" fee of \$150. The cost therefore will either be \$30 or \$70 every time you renew your license, or a one-time cost of \$150.

But we do know how the program will work. That essentially has been nailed down. The final vanity callsign rules have been adopted by the FCC and released to the public. The vanity callsign system will be implemented in four phases, or "starting gates," as requested by the ARRL.

A Public Notice will announce when the FCC vanity callsign application Form 610-V is available and the opening date of each gate. Our understanding is that the FCC has already approved the form, but that it cannot be released until the pending *Petitions for Reconsideration* are acted upon. This could happen at any minute and may have already occurred by the time you read this column.

National Volunteer Examiner Coordinator,  
P.O. Box 565101, Dallas, TX 75356-5101  
(817-461-6443)



It is possible, however, that the FCC Form 610-V might require further modification if the FCC is forced to change the program due to the Petitions for Reconsideration.

The bet here, however, is that all of the petitions will be denied. The vanity callsign program will then go forward once the application form is available and the FCC is ready to begin processing special callsigns for amateurs.

We have arranged with the FCC to send us a print master of the Form 610-V just as soon as it is released for printing. The FCC gets their printing done at federal prisons, and the wait to get back forms is sometimes lengthy. We will immediately print the Form 610-V ourselves and send a free copy to anyone who sends us a business-size, self-addressed, stamped envelope. Send it to: The W5YI Group, Inc., P.O. Box 565101, Dallas, TX 75356, Attn.: Vanity FCC Form 610-V.

## How Vanity Calls Will Be Handled

Amateurs must submit the Form 610-V applications listing up to 25 callsigns in order of preference to this special address: FCC, Amateur Vanity, P.O. Box 358924, Pittsburgh, PA 15251-5924. The proper fee (whatever it turns out to be) must be included. This is actually the address of the Mellon Bank in Pittsburgh, which serves the FCC's fee collection contractor. The bank will strip the fee from the application, approve, and forward to the FCC in Gettysburg, Pennsylvania. The first assignable callsign from the Form 610-V list will be shown on the license grant, and the applicant's previous callsign will be vacated. Any application received without the fee will be returned.

The payment may be submitted in the form of a check, bank draft, or money order and made payable to the Federal Communications Commission. Special arrangements are being made also to accept Visa and MasterCard credit cards.

If none of the callsigns requested are assignable, the callsign vacated by the applicant will be shown on the license grant. To put it differently, if all 25 callsigns requested are assigned, you get back your previous callsign.

The W5YI Group is offering a special Vanity Callsign Service to enable the amateur community to know which callsigns are still unassigned. Our amateur callsign data base of assigned calls is updated daily right from the FCC. (Please note our advertisement that appears elsewhere in this publication.) We offer a custom list on a computer disk of every unassigned callsign for which a specific amateur is qualified.

## The Starting Gates

You may file your application for a special callsign once your "gate" opens. The starting four gates for the submission of Form 610-V applications are:

**GATE 1:** Any class operator applying for:

A. The callsign that was previously shown in his or her primary station license, or

B. The callsign that was previously shown on the primary station license of a deceased spouse, child, grandchild, stepchild, parent, grandparent, stepparent, brother, sister, stepbrother, step-sister, aunt, uncle, niece, nephew, or in-law, or

C. The callsign that was previously shown on the club station license for which the applicant is currently the license trustee.

It is assumed that the applicant will have to prove by a copy of the original license that he/she held the callsign. The FCC has not said that they will allow any other method (such as a callbook entry) to establish a prior callsign.

**GATE 2:** Any Amateur Extra Class operator who is applying for a callsign for his or her primary station or for the club station for which he/she is currently the license trustee.

**GATE 3:** Any Advanced Class operator who is applying for a callsign for his or her primary

station or for the club station for which he/she is currently the license trustee.

**GATE 4:** Any class operator applying for

A. A callsign for his or her primary station or for the club station for which he/she is currently the license trustee.

B. A callsign that was previously shown on the primary station license of a deceased person, and who is acting with the written consent of the deceased person's spouse, child, grandchild, stepchild, parent, grandparent, step-parent, brother, sister, step-brother, step-sister, aunt, uncle, niece, nephew, or in-law, for the club station for which he/she is currently the license trustee.

Only unassigned callsigns that are available under the sequential callsign system are available to the vanity callsign system. This stipulation eliminates all AA-AL-by-three and NA-NZ-by-three callsigns which were never part of the Systematic Call Sign Assignment System of 1978 on which the Group D sequential callsigns are based.

Some other exceptions:

1. A callsign shown on an expired license is not available to the vanity callsign system for two years following the expiration of the license, and

2. A callsign shown on a surrendered, revoked, set aside, cancelled, or voided license is not available to the vanity callsign system for two years following the date such action is taken, and

3. Except for close relatives and club stations acting with the consent of a close relative, the callsign of a deceased amateur is not available to the vanity callsign system for two years following the person's death or for two years following the expiration of the license, whichever is sooner. Close relatives and amateur radio clubs may apply for a deceased amateur's callsign regardless of their or the trustee's license class.

You may request a vanity callsign only when you hold an unexpired amateur operator/primary license document, and where applicable, a club station license document (FCC Form 660). An amateur (or club station) who has let his/her license expire—or has yet to receive a callsign—must first obtain a sequential callsign before trading it in for a vanity callsign. Military recreation and RACES stations are not eligible to apply for a vanity callsign.

Except for Gate 1 and the written consent portion of Gate 4, you may list on the Form 610-V one to 25 specific callsigns in order of your preference. Each callsign requested must be from the group designated under the sequential callsign system for your, or a lower, operator license class.

In other words, Amateur Extra Class operators may apply for any available Group A, B, C, or D callsign. The Advanced Class may apply for Group B, C, or D calls. Technician, Tech Plus, and General Class operators may apply for Group C or D. And Novice operators are restricted to Group D, two-by-three callsigns.

The geographical region designator used in the sequential callsign system is an option left to the applicant. For example, an amateur with an 8th call area mailing address could apply for a callsign that is available in the 5th call district. This point is being challenged by the ARRL. The League only wants amateurs to apply for callsigns within their own district. The FCC has already considered and decided



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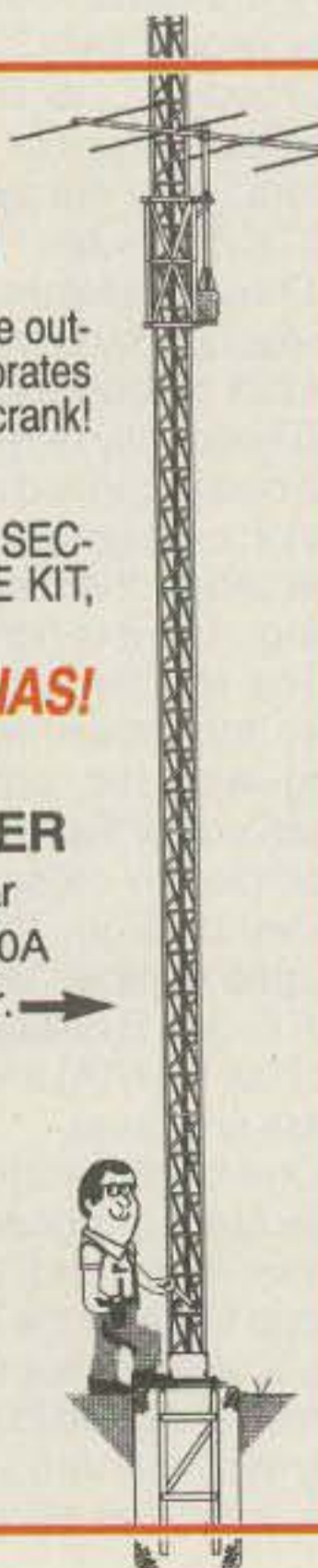
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against this restriction, but the ARRL has requested reconsideration.

## Special Event Callsign System

A procedure for the temporary use of special event callsigns is also in the works. The FCC has set aside all one-by-one callsigns to be used "... to meet the needs of amateur operators for temporary operation of their stations during events that are of special significance to the amateur service community."

The special event callsign would be temporarily substituted for the callsign shown on the license of the person making the request while the station is transmitting in conjunction with the special operation.

A one-by-one callsign consists of a single prefix letter (K, N, or W), the region number (0 to 9) and a single suffix letter (A to Z). An example of a one-by-one callsign would be W1A. There are 780 such callsigns—none of which are currently assigned.

The ARRL requested in their formal vanity callsign comments to the FCC "... that one-by-one callsigns be reserved for assignment to stations operating in conjunction with short-term events of special significance."

The Commission has now issued a Notice of Proposed Rulemaking which would permit an amateur to submit an informal list of one-by-one callsigns in order of preference to the FCC in Gettysburg, Pennsylvania. Unlike the vanity callsign system, there would be no cost to obtain a temporary special event one-by-one callsign.

The request, which must be made at least 6 months in advance, would indicate the nature

### Late Bulletin!

During October the FCC acted on the Petitions for Reconsideration that were holding up implementation of the special callsign assignment program. Here are the changes that the FCC made in the Vanity Callsigns System.

1. The ARRL (and others) wanted amateurs to only be able to select a callsign for their own callsign area. The FCC said they had already decided against this provision, since it would severely limit the number of callsigns available to an applicant. They did, however, agree that there were a very limited number of callsigns designated for licensees located outside of the continental 48 states. Amateurs with mailing addresses in Alaska, Hawaii, and various Pacific and Caribbean island possessions will be the only ones permitted to select callsigns that have been specifically designated for their area. Prefixes chosen for areas outside the lower 48 states are: AH, AL, KH, KL, KP, NH, NL, NP, WH, WL, and WP. Thus, amateurs located in the 48 continental states will be able to select any available callsign appropriate for their (or a lower) license class **in any area** except those with the above eleven prefixes. Amateurs located in U.S. states and possessions that are outside of the 48 states may not only select their designated prefix, but also a prefix designated for the continental U.S.
2. The FCC also added a new "Gate 1-A." The first gate permits the station callsign of a deceased amateur to be selected by a close relative. New Gate 1-A will next permit the club station of the deceased to obtain his/her callsign if it is not claimed by a relative.

of the event and certify that it is of special significance to the amateur service community.

The request must include the licensee's name, address, and primary callsign. It is not necessary that the geographical numeral in the callsign coincide with the licensee's mailing address or the location in which the operation is planned.

The first assignable callsign on the list (which could be in letter form and contain any number of one-by-one callsigns) would be stamped "granted," and a copy of the list would

be returned to the person making the request.

The special event vanity callsign could be used for a period not to exceed that of the special event or for 15 days, whichever is less.

Again, it must be pointed out that only the Sequential Callsign System is in operation at this time. The Vanity Callsign System and Special Event Callsign System still must complete the required rule-making process, which is expected shortly. All systems should be operational, however, within six months.

73, Fred, W5YI

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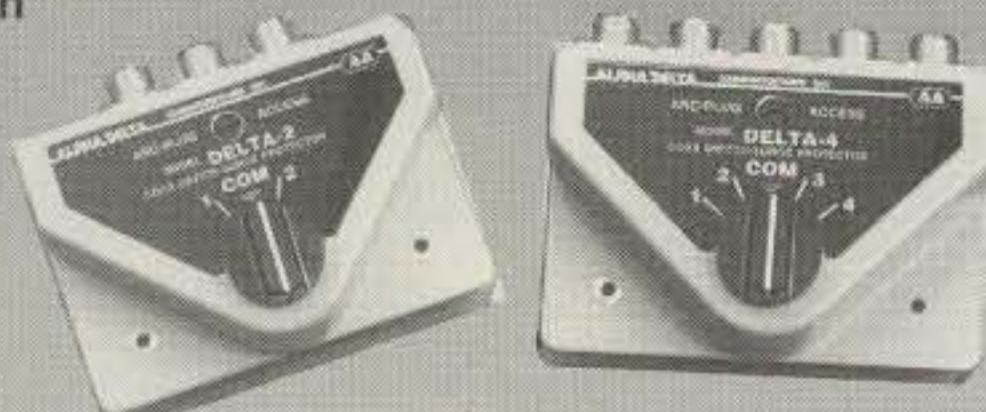
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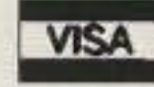
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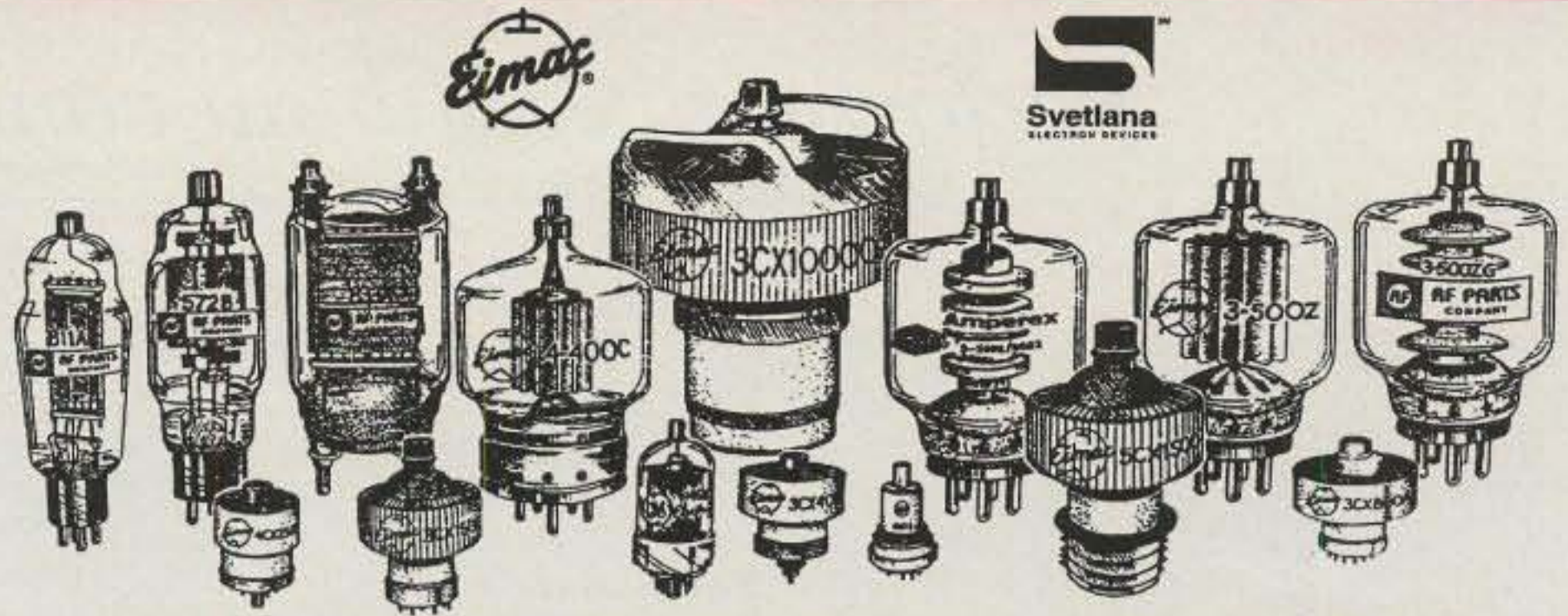


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2M/70cm HTs  
**FT-11RH**  
5 Watt Model

## RECEIVER



**FRG-100**  
Receiver

## ROTATORS



Model	Applications	Mast Size	Rotator Size	Pre-sets	Wind Load
G-450XL	Light/Medium-duty	1 1/4-2 inches	12 1/2" H x 7 1/2" Dia.	No	10 Sq. Ft.
G-800S <b>\$25 OFF</b>	Medium-duty	1 1/2-2 1/2 inches	12 1/2" H x 7 1/2" Dia.	No	17 Sq. Ft.
G-800SDX <b>\$25 OFF</b>	Medium-duty	1 1/2-2 1/2 inches	12 1/2" H x 7 1/2" Dia.	Yes	17 Sq. Ft.
G-1000SDX <b>\$25 OFF</b>	Heavy-duty	1 1/2-2 1/2 inches	12 1/2" H x 7 1/2" Dia.	Yes	23 Sq. Ft.
G-2800SDX <b>\$25 OFF</b>	Extra Heavy-duty	1 7/8-2 1/2 inches	13 5/8" H x 8" Dia.	Yes	34 Sq. Ft.
G-5400B	Azimuth-Elevation Rotator combination	1 1/2-2 1/2 inches (Boom Dia. 1 1/4-1 5/8 in.)	Mounted together 12 1/2" H x 7 1/2" Dia.**	No	11 Sq. Ft.
G-500A	Elevation Only	1 1/2-2 1/2 inches (Boom Dia. 1 1/4-1 5/8 in.)	10 1/2" H x 7 1/2" Dia.	No	12 Sq. Ft.



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- \$ 25 OFF FT-G-2800SDX, G-1000SDX, G-800SDX, G-800S

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"Built-in duplexer and 94 memories!"

"Great price and smallest dual band made, too!"

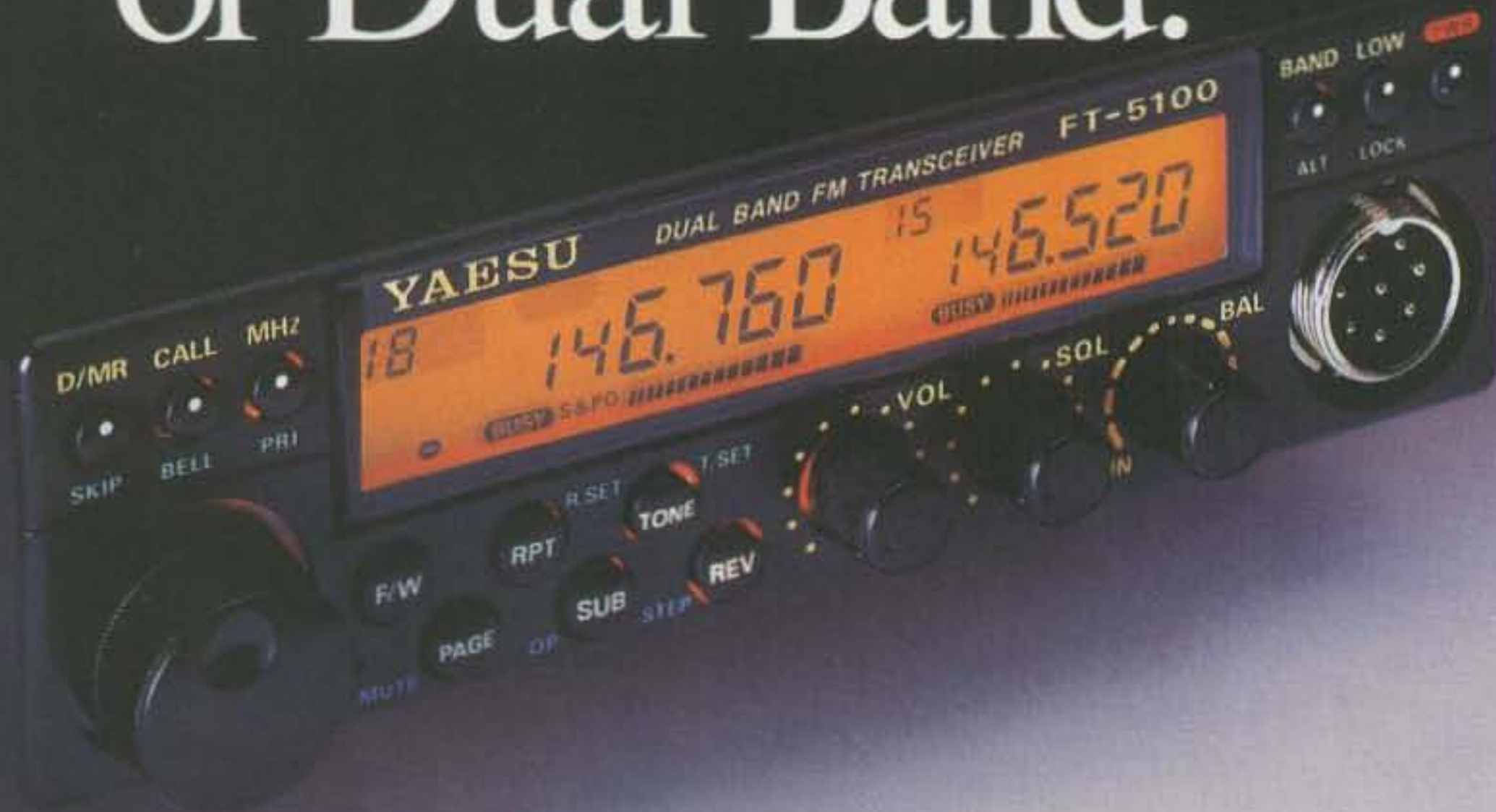
"Comes with a backlit DTMF Mic!"

"Yaesu did it again!"

## FT-5100 Dual Band Mobile

- **Frequency Coverage:**  
2M: 130-174 MHz RX  
144-148 MHz TX  
70 cm: 430-450 MHz RX/TX
- 94 Memories (47 per band)  
Odd Splits In Any Memory
- Dual in-band receive  
(V/V, U/U or V/U Receive Operation)
- DTMF Paging and Coded Squelch Included.
- Packet Radio TNC Jack  
Built-In To Back of Radio
- CTCSS Encode Built-In
- Dual Receive with Balance Control
- Full Duplex Cross Band Operation
- Built-In Antenna Duplexer
- Back Lit DTMF Microphone
- Automatic 8 Level Display Dimmer
- Built-In Cross Band Repeat
- RF Output Power:  
2M: 50/5 watt (high/low)  
70 cm: 35/5 watt (high/low)
- **Accessories:**  
FTS-22 CTCSS Dual Decoder  
SP-7 External Speaker  
MW-2 Wireless Microphone/  
Controller

# The ultimate definition of Dual Band.



Now you can listen to two, 2 meter frequencies, or two, UHF frequencies, at the same time with In-Band Dual Receive\*. Although equipped with traditional dual band, Yaesu has taken receive two steps beyond in the remarkable FT-5100. Combined in one compact mobile transceiver, it's the ultimate meaning of "dual band".

With 94 memory channels – more than any other radio in its class – and the optional MW-2 Wireless Mic, the flexibility of the FT-5100 is matchless. But to make sure the FT-5100 is complete, and an even better value, unlike the competition, there's a backlit DTMF mic included.

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Priced for the shrewd buyer, you've got to hear it to believe it. Dual band re-defined. Combinations like this can't

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UHF/UHF



VHF/VHF

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with Remote Control.



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\*In-Band Dual Receive available only on FT-5100.



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COMPUTER  
PROGRAMMABLE**

Ultra Compact Handhelds

# FT-10/40R

**ARTS**  
Tracks range of 2 identically programmed HTs.

**TOP NOTCH™**  
Multi-function knob controls programming and volume.

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Ergonomically designed, conveniently located, insures maximum comfort.

**ALPHANUMERIC DISPLAY**  
Allows 4-character labelling of important frequencies.

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"This HT is the first amateur radio with built-in Digital Coded Squelch (DCS) for RX and TX."

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## Military spec commercial grade HTs loaded with new features and a choice of keypad, too.



### Specifications

- Frequency Coverage  
FT-10R  
2m: RX: 140-174 MHz  
TX: 144-148 MHz  
FT-40R  
70cm: RX: 420-470 MHz  
TX: 430-450 MHz
- Choice of 4 keypad options (6, 16 or Deluxe and DVRS16 Keypads)
- 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 for better voice clarity
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30 Channels

**FTT-10/A06**  
6-Key, CTCSS Enc, DCS Enc/Dec,  
30 Channels

**FTT-10/A16D**  
16-Key, CTCSS Enc/Dec, DCS Enc/Dec,  
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- AM aircraft receive

## — superior — WIDE BAND — reception —

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- Code squelch/pager (UT-101 required)
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