FREE Pull-Out Frequency Chart Bound Into This Issue

Amateur Radio

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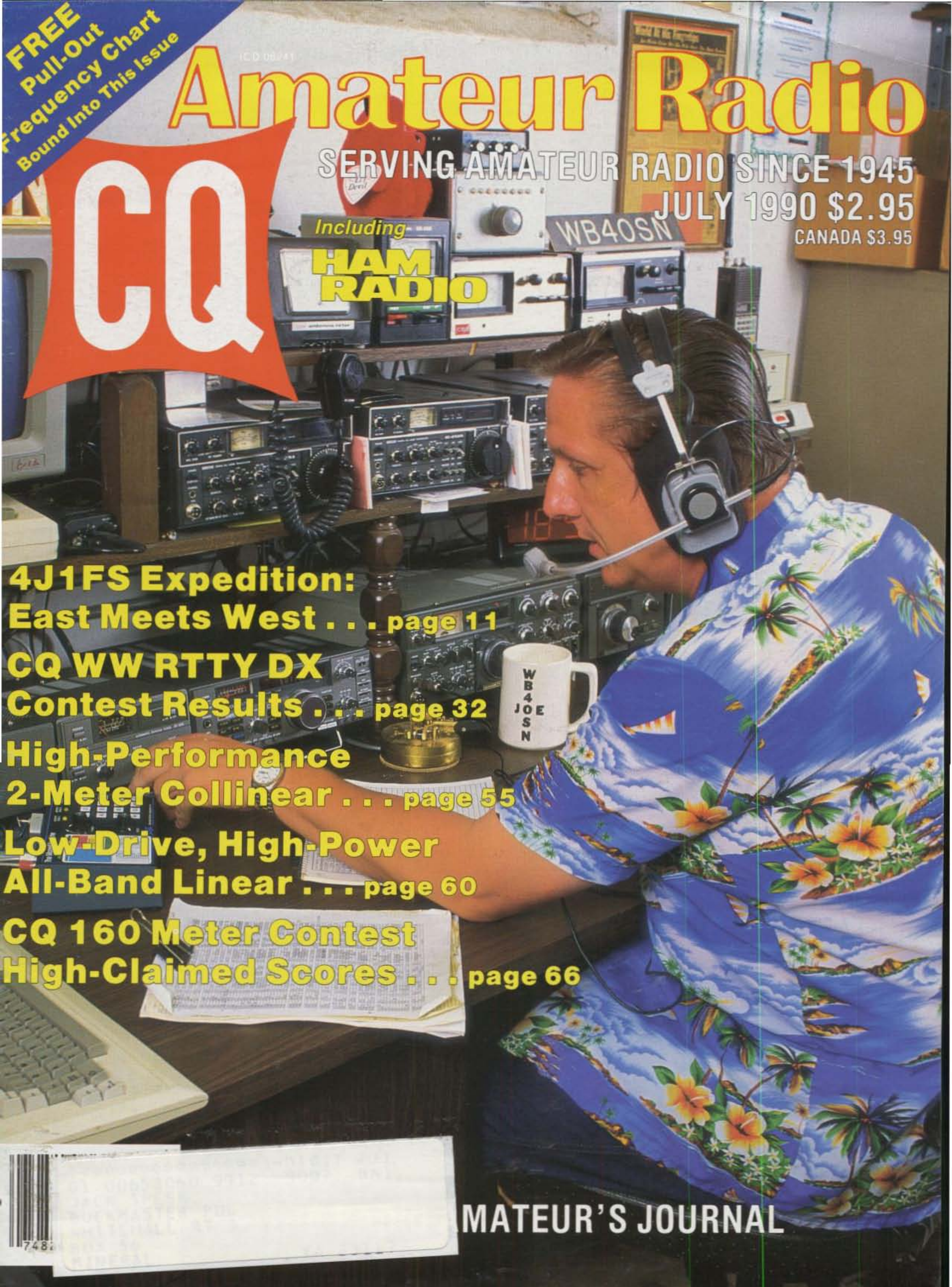

7482

AMATEUR'S JOURNAL

KENWOOD

TS-950SD

"DX-clusive" HF Transceiver

The new TS-950SD is the first Amateur Radio transceiver to utilize Digital Signal Processing (DSP), a high voltage final amplifier, dual fluorescent tube digital display and digital meter with a peak-hold function.

The Ultimate Signal.

• Dual Frequency Receive Function. The TS-950SD can receive two frequencies simultaneously.

• New! Digital AF filter. Synchronized with SSB IF slope tuning, the digital AF filter provides sharp characteristics for optimum filter response.

• New high voltage final amplifier. 50 V power transistors in the 150-watt final section, resulting in minimum distortion and higher efficiency. Full-power key-down time exceeds one hour.

• New! Built-in microprocessor controlled automatic antenna tuner.

• Outstanding general coverage receiver performance and sensitivity. Kenwood's Dyna-Mix™ high sensitivity direct mixing system provides incredible performance from 100 kHz to 30 MHz. The Intermodulation dynamic range is 105 dB.

• Famous Kenwood interference reduction circuits. SSB Slope Tuning, CW VBT (Variable Bandwidth Tuning), CW AF tune, IF notch filter, dual-mode noise blanker with level control, 4-step RF attenuator (10, 20, or 30 dB), switchable AGC circuit, and all-mode squelch.

Complete service manuals are available for all Kenwood transceivers and most accessories.
Specifications, features and prices subject to change without notice or obligation.

DSP

Digital Signal Processing

Without DSP With DSP

• Digital Signal Processor. DSP is a state-of-the-art technique that maximizes your transmitted RF energy.

• High performance IF filters built-in† Select various filter combinations from the front panel. For CW, 250 and 500 Hz, 2.4 kHz for SSB, and 6 kHz for AM. Filter selections can be stored in memory!

• *Multi-Drive Band Pass Filter* (BPF) circuitry. Fifteen band pass filters are available in the front end to enhance performance.

• Built-in TCXO for the highest stability.†
• Built-in electronic keyer circuit.
• 100 memory channels. Store independent transmit and receive frequencies, mode, filter data, auto-tuner data and CTCSS frequency.
• Digital bar meter.

Additional Features: • Built-in interface for computer control • Programmable tone encoder • Built-in heavy duty AC power supply and speaker • Adjustable VFO tuning torque • Multiple scanning functions • MC-43S hand microphone supplied

Optional Accessories
- DSP-10 Digital Signal Processor *
- SO-2 TCXO* • VS-2 Voice synthesizer
- YK-88C-1 500 Hz CW filter for 8.83 MHz IF*
- YG-455C-1 500 Hz CW filter for 455 kHz IF*
- YK-88CN-1 270 Hz CW filter for 8.83 MHz IF
- YG-455CN-1 250 Hz CW filter for 455 kHz IF*
- YK-88SN-1 1.8 kHz SSB filter for 8.83 MHz IF
- YG-455S-1 2.4 kHz SSB filter for 455 kHz IF*
- SP-950 External speaker w/AF filter
- SM-230 Station monitor w/pan display
- SW-2100 SWR/power meter
- TL-922A Linear amplifier (not for QSK)

* Built-in for the TS-950SD
† Optional for the TS-950S

KENWOOD U.S.A. CORPORATION
COMMUNICATIONS & TEST EQUIPMENT GROUP
P.O. BOX 22745, 2201 E. Dominguez Street
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KENWOOD ELECTRONICS CANADA INC.
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...pacesetter in Amateur Radio

KENWOOD

TM-731A/631A

144/450 and 144/220 MHz FM Dual Banders

- **Extended receiver range** (136.000 – 173.995 MHz) on 2 m; 70 cm coverage is 438.000 – 449.995 MHz; 1-1/4 m coverage is 215 – 229.995 MHz. (Specifications guaranteed on Amateur bands only. Two meter transmit range is 144 – 148 MHz. Modifiable for MARS/CAP. Permits required.)
- **Separate frequency display for "main" and "sub-band."**
- **Versatile scanning functions.** Dual scan, and carrier and time operated scan stop.
- **30 memory channels.** Stores everything you need to make operating easier. Two channels for "odd splits."
- **50 Watts on 2 m, 35 watts on 70 cm, 25 watts on 1-1/4 m.** Approx. 5 watts low power.
- **Automatic offset selection.**
- **Dual antenna ports.**
- **Automatic Band Change (A.B.C.)** Automatically changes between main and sub-band when a signal is present.
- **Dual watch function allows VHF and UHF receive simultaneously.**
- **CTCSS encode/decode selectable from front panel or UP/DWN keys on microphone.** (Encode built-in, optional TSU-6 needed for decode.)
- **Balance control and separate squelch controls for each band.**
- **Full duplex operation.**
- **Dimmer switch.**
- **16 key DTMF/control mic. included.**
- **Frequency (dial) lock.**

Optional Accessories:

• **PG-4H** Extra interface cable for IF-20 (for three to four radios) • **PG-4J** Extension cable kit for IF-20 DC and audio • **PS-430** Power supply • **TSU-6** CTCSS decode unit • **SWT-1** 2 m antenna tuner • **SWT-2** 70 cm antenna tuner • **SP-41** Compact mobile speaker • **SP-50B** Deluxe mobile speaker • **PG-2N** DC cable • **PG-3B** DC line noise filter • **MC-60A, MC-80, MC-85** Base station mics. • **MA-700** Dual band 2 m/70 cm mobile antenna (mount not supplied) • **MB-11** Mobile bracket • **MC-43S** UP/DWN hand mic. • **MC-48B** 16-key DTMF hand mic.

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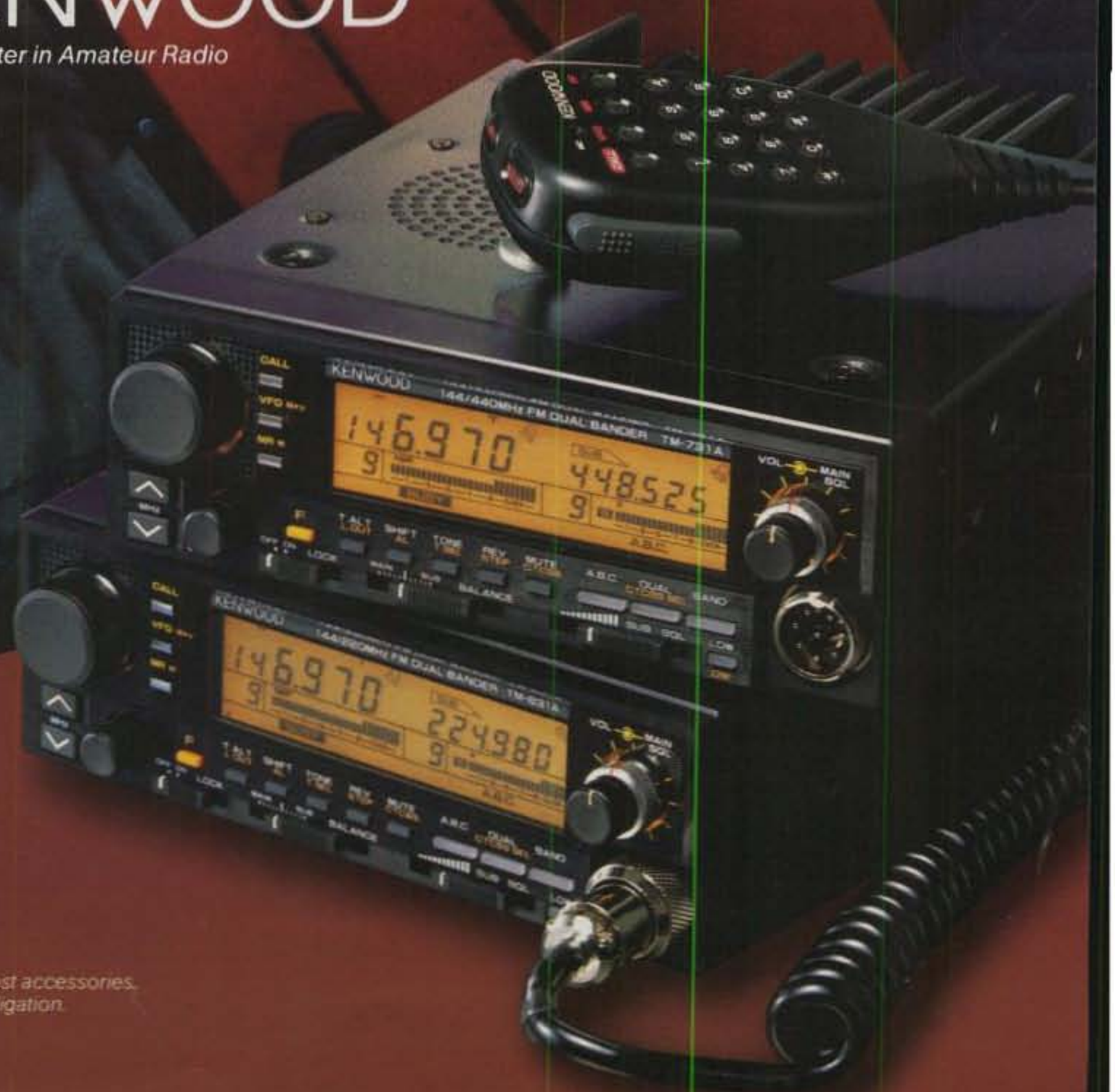
"Dynamic Duals"



Complete service manuals are available for all Kenwood transceivers and most accessories. Specifications, features and prices are subject to change without notice or obligation.

KENWOOD

The DXpeditioner!

TS-440S

Compact high performance HF transceiver with general coverage receiver

Portable reliable performance and ease of use makes the TS-440S your obvious "low bands" choice. It is "Every Ham's" rig to go – ham shack, portable or mobile. But don't let the small size fool you – there's lots of "big rig" performance packed into this package. Built-in antenna tuner option. Continuous duty transmitter. Super DynaMix™ front end. Five filter functions. The TS-440S is at your service wherever you wish to operate.

- **Covers all Amateur bands**
  General coverage receiver tunes from 100 kHz–30 MHz. Easily modified for HF MARS operation.
- **Direct keyboard entry of frequency**
- **All modes built-in**
  USB, LSB, CW, AM, FM, and AFSK. Mode selection is verified in Morse Code.
- **VS-1 voice synthesizer (optional)**
- **Built-in automatic antenna tuner (optional).** Covers 80–10 meters.
- **5 IF filter functions**
- **Superior receiver dynamic range**
  Kenwood DynaMix™ high sensitivity direct mixing system ensures true 102 dB receiver dynamic range. (500 Hz bandwidth on 20 m.)
- **100% duty cycle transmitter**
  Super efficient cooling permits continuous key-down for periods exceeding one hour. RF input power is rated at 200 W PEP on SSB. 200 W DC on CW, AFSK, FM, and 110 W DC AM. (The PS-50 power supply is needed for continuous duty.)
- **Computer interface port**
- **Adjustable dial torque**
- **100 memory channels**
  Frequency and mode may be stored in 10 groups of 10 channels each. Split frequencies may be stored in 10 channels for repeater operation.
- **TU-8 CTCSS unit (optional)**

- **MC-43S UP/DOWN mic. included**
- **Superb interference reduction**
  IF shift, tuneable notch filter, noise blanker, all-mode squelch, RF attenuator, RIT/XIT, and opt. filters fight QRM.
- **Dual SSB IF filtering**
  A built-in SSB filter is standard. When an optional SSB filter (YK-88S or YK-88SN) is installed, **dual** filtering is provided.
- **VOX, full or semi break-in CW**
- **AMTOR compatible**

Optional accessories:

• **AT-440** internal auto. antenna tuner (80 m – 10 m) • **AT-250** external auto. tuner (160 m – 10 m) • **AT-130** compact mobile antenna tuner (160 m – 10 m) • **IF-232C/IC-10** level translator and modem IC kit • **PS-50** heavy duty power supply • **PS-430** DC power supply • **SP-430** external speaker • **MB-430** mobile mounting bracket • **YK-88C/88CN** 500 HZ/270 Hz CW filters • **YK-88S-88SN** 2.4 kHz/1.8 kHz SSB filters • **MC-60A/80/85** desk microphones • **MC-55** (8P) mobile microphone • **HS-4/5/6/7** headphones • **SP-41/50B** mobile speakers • **MA-5/VP-1 HF** 5 band mobile helical antenna and bumper mount • **TL-922A** 2 kw PEP linear amplifier • **SM-220** station monitor (no pan display) • **VS-1** voice synthesizer • **TU-8** CTCSS tone unit • **PG-2C** extra DC cable.

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CQ The Radio Amateur's Journal

ON THE COVER: In beautiful Margate, FL, our CQ roving photographer catches DXer Joe Picior, WB4OSN in the act of snagging a new one. (Photo by Larry Mulvehill, WB2ZPI)

JULY 1990 **VOL. 46, NO. 7**

FEATURES

DEPARTMENTS

ZERO BIAS

EDITORIAL

By now most of you have heard the news. In case you missed it or have not been informed, on April 26, 1990 CQ Communications acquired all of the assets of Communications Technology, Inc., the publisher of *Ham Radio* magazine. That's a big statement, but what does it actually mean, especially to you?

First, for subscribers to *Ham Radio* magazine it means that the balance of your subscription will be honored and fulfilled by *CQ* magazine, or if you choose, by one of our sister publications.

Second, the Ham Radio Bookstore will be enhanced and merged with CQ's Book Shop to provide all of you with the best and widest range of amateur radio and technical reading material possible.

So much for the basic mechanics. Let's get to the core of the perceived issues involved. *CQ* for the last 10½ years has worked very hard to carve out a niche among today's amateurs. By today's amateurs I mean those who are operator oriented and somewhat less technically geared. *Ham Radio* magazine has developed a fine reputation as a technical journal, albeit in a shrinking technological society. However hard they worked to produce this fine magazine, they too realized that they had to increase their acceptance level to bring in more readers. This meant more general-interest articles and small projects, along with operating news. So philosophically *CQ* and *Ham Radio* were coming closer together.

The big emotional hurdle for some of you is the feeling of the loss of what Jim Fisk, W1DTY, and Skip Tenney, W1NLB, created in early 1968. Jim and I were friends for many years, and we all miss him, far and above his contribution to amateur radio and *Ham Radio* magazine. I was thinking of Jim the other day, and I reread his editorials for 1968, that first year. It was also interesting to look at 1968 issues of *CQ* and see where we both were heading.

Several things stood out even then, 22 years ago. Jim was talking about getting people on 220 MHz or facing losing it, and both magazines covered the issues of the day. It was also interesting to note that many of the popular amateur radio authors were writing for both magazines at the time, and one author managed to get the same article in both magazines at roughly the same time. If you have back issues of both for that period, you might want to check it out for yourself.

A number of reasons led up to our acquiring Communications Technology. I think that Skip wants to back off from working very hard at a labor of love for 22 years and begin to pursue other interests. He's more than earned the right. Although some may disagree with the closing of *Ham Radio* magazine, there was no viable, honorable, economical alternative. As I've written many times before, amateurs like things to remain the same forever. Things change, people change, and most certainly the hobby has changed in the past 22 years. It may not be what everyone likes or wants, but this is reality.

What changes are we likely to see within the pages of *CQ*? Probably not too much that you'll notice at first glance other than increased size. We are and will be using some *Ham Radio* editorial material—even in this issue. While it may not stand out as their style, it is the very same material that they have been running and that you seem to enjoy. There will be some additional material and even a bit more technical material written by the same people who have written for both magazines over the years. In fact, some of the people you've come to know and respect over the years—such as Craig Clark, N1ACH, and Terry Northup, KA1STC—will still be working with us, for you.

Right now we are still in a transition stage, finding out what we have in the way of new editorial material and planning how to present it to you. There will be no fundamental changes in what has been *CQ*, right down to the food reviews. I'm sorry that I didn't get to serve on a submarine during WW II (I believe they had an age requirement), but if you'd like to hear some medical corps stories from a later period, I'll try to accommodate you. If this is the first time you are reading *CQ*, welcome aboard. We're glad to have you with us. In spite of how "serious" we all are or seem to be, this is a hobby of fun, and we hope that you can get greater enjoyment out of amateur radio through the pages of *CQ*.

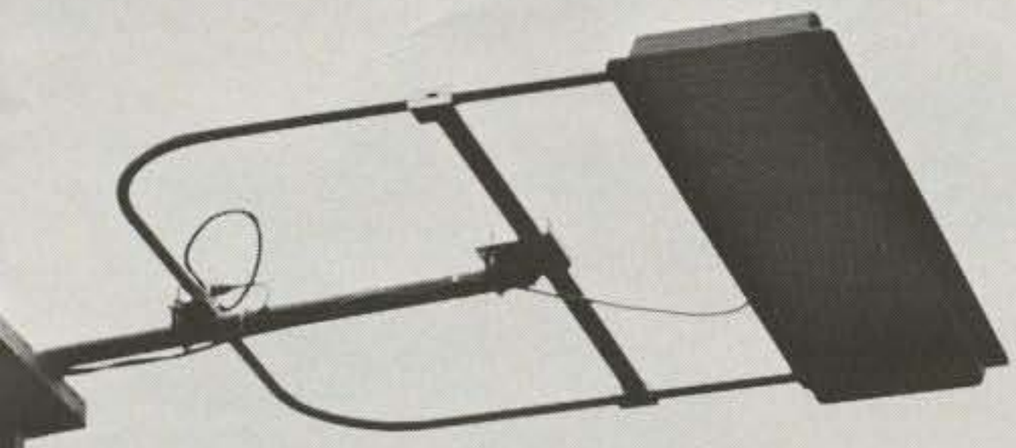
If you are under the impression that our emphasis on enjoying the hobby has kept us away from the leading edges of technology, then refresh your memory. *CQ* pioneered the space age with the dawning of the OSCAR satellite concept. We featured the first works on coherent CW and published the works of Copthorne Macdonald on early SSTV when others said it wouldn't work. The first amateur radio keyboard article by Dr. Robert Suding, W0MLD, appeared in *CQ*. We have been there in the past and will continue to cover new technology as it occurs. It's like anything else: You don't think of it as innovative at the time; it's just something to enjoy and peak your curiosity.

In the months to come we will be adding a few of the regular features of *Ham Radio* to the pages of *CQ*. Obviously, we'd like to add more small projects for you to build (and use), and *Ham Radio* has always had interesting projects for an evening or weekend. I don't think we're quite up to building our own 781½ at the moment (unless I can show you where to get a bank loan for the test equipment). I also don't think that we fall that far from the mark that Jim Fisk envisioned years ago. While part of his passion was high-tech, he was also deeply involved in all aspects of collecting old magazines, books, and early communications gear. He was excited about many aspects of amateur radio and enjoyed them all. To some of you who wish to remember the man as a deity, I'm sorry that you never had the wonderful experience of knowing him and what made him tick. He enjoyed having fun with amateur radio and never took himself seriously. One of my most vivid images of him was the time in Dayton when he found two (yes, two) perfect, immaculate Crosley Pups in their original boxes at the fleamarket, and he was about $50 shy of the price. His excitement and running around to come up with the money had nothing to do with a serious dissertation on semiconductor or digital theory.

I don't have a crystal ball to say where we'll all be 22 years from now. I do know that for some of you amateur radio has changed. I think the changes are positive for all of us, and as with all change there is an element of uncertainty. We faced the same uncertainty 10½ years ago when Dick and I took over an ailing *CQ* and brought it back to life. The major premise then (and now) is that we're all involved in an activity that we are supposed to be enjoying and having fun with. For some of us, in addition to being our hobby, amateur radio is also our business and livelihood. If you want to talk seriously for a moment, this aspect is the same today as it was 10½ years ago. We're serious about making it work and providing you with a magazine, operating programs, contests, and everything else connected with *CQ* that you want and are willing to spend your hard-earned money on. We didn't stint then, and we're not going to shortchange you now. 73, Alan, K2EEK

AEA's IsoLoop™ HF ANTENNA

REVOLUTIONARY COMPACT DESIGN



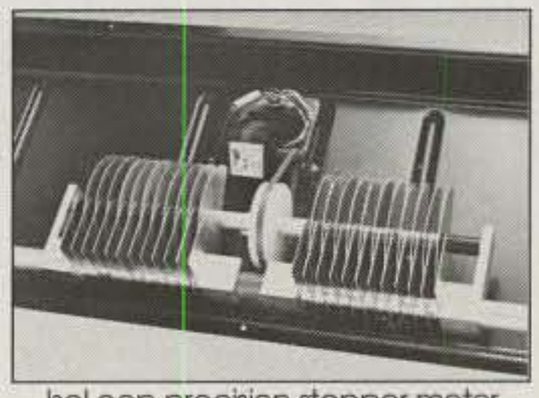
Once again AEA has achieved a significant engineering breakthrough with its high-performance, low profile HF IsoLoop antenna. Performance isn't compromised by its small size. Operate your favorite HF band (14 to 30 MHz frequency coverage) from areas with restrictive zoning ordinances or apartments and condos. Or take it with you on vacation. . . it's the ideal go-anywhere portable antenna. And it's the only antenna you need to cover 14 to 30 MHz. ONE antenna instead of numerous dipoles and without any traps!

150 Watts. Rated up to 150 watts, the IsoLoop transmits and receives on any frequency between 14 to 30 MHz. When mounted with the loop in the horizontal plane, the radiation pattern is omni-directional and horizontally polarized, with the gain of a dipole. Maximum radiation is at low angles which is ideal for DX operation. The IsoLoop may also be mounted with the loop in the vertical plane to provide a null in a desired direction. Tuning is provided by a precision stepper-motor and a small remote control box, the LC-1.

The IsoLoop does not need ground radials and its balanced, shielded feed-loop isolates the feedline from the antenna. The IsoLoop is well-isolated from the feedline. Like AEA's Isopole antennas, your signal is radiated by the antenna and not the feedline. With end-fed antennas, the outside of the coax becomes part of the antenna, resulting in noise and computer hash pickup and increased TVI problems.

High-Q Design. One of the unique features of the IsoLoop is its inherent High-Q. The IsoLoop can be considered a very sharp tunable filter that radiates. The narrow bandwidth suppresses harmonics from your transmitter reducing TVI problems. It also attenuates out-of-band signals from nearby transmitters that could overload your receiver.

Compact. The IsoLoop is square, with rounded corners, and measures 32 inches on a side and weighs only 12 pounds. Because of the IsoLoop's small size, it makes a perfect attic or balcony antenna. It's also excellent for portable operation, recreational vehicles or camp-site use. A rotator is not necessary when used in the omni-directional, horizontally polarized mode.



IsoLoop precision stepper motor provides accurate tuning.

IsoLoop LC-1 control box with variable speed tuning.

Revolutionary. The AEA IsoLoop antenna represents years of research and development. Others may try to imitate the IsoLoop, but none can match the patent-pending design.

AEA also provides technical support from the factory or through your personal computer and modem on CompuServe's HamNet. If you are already a CompuServe member, just type GO HAMNET at any CompuServe prompt. For a free introductory CompuServe membership, call 1-800-848-8199 and ask for representative #48.

AEA Brings You A Better Experience

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ALINCO ELECTRONICS INC.

DR-570T

Set your sights for dual!

The Alinco DR-570T "Twin Bander" has dual LCD readout, volume, squelch and tuning controls. Double barrelled power with 45W on 2M and 35W on 70 cm, plus simultaneous receive on both bands or intermix with four modes of scan. The DR-570T will win the "battle" with its illuminated front function panel and LCD readout, readable in any lighting conditions. Don't let the "Tiny" DR-570T fool you! It's fast, and leaves the competition in the dust with many standard features you expect. Cross band repeat with the flick of a switch. Full duplex, 20 memory channels, call channels, 16-key DTMF Microphone, and subtones are just a few. "Reach" for the DR-570T today!

DR-510T

Best Dual Value on the Market!

The Alinco DR-510T has most of the outstanding features of it's sister the DR-570T, including 14 memory channels, cross band duplex and cross band repeat. The multi color LCD display, and simple tune control panel makes simplicity the key word. The DR-510T with 45/35 watts is the best, feature-packed dual bander on the Amateur market today. See the DR-510T along with the other Alinco "Magnificent" ones at your favorite dealer today!

DR-110T & DR-410T

Tiny 2M Power From Alinco!

DR-110T, this 2M Alinco, enters the nineties a proven winner with the "reputation" of best value. The DR-110T packs a powerful 45W on 2M and sports all the features you expect in todays transceivers. Tuning is a snap with the multi-functioned easy-to-see keyboard, 14 memory channels, subtones, scan, multi-colored LCD readout, reverse, are a few of the many features of the DR-110T. The mobile of the future-today! DR-410T available for 70 cm.

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Delaware Amateur Supply—New Castle, DE
El Original Electronics—Brownsville, TX
Electro-Com—Tacoma, WA
EEB—Vienna, VA
Ericson Communications—Chicago, IL
F & M Electronics—Greensboro, NC
Floyd Electronics—Collinsville, IL
The Ham Station—Evansville, IN
The Ham Hut—Amarillo, TX
Henry Radio—Los Angeles, CA
Hirsch Sales Co.—Williamsville, NY
HR Electronics—Muskegan, MI
Ham Radio Outlet—Anaheim, CA
Ham Radio Outlet—Atlanta, GA
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Madison Elctronics—Houston, TX
Maryland Radio Center—Laurel, MD
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Missouri Radio Center—Kansas City, MO
N & G Electronics—Miami, FL
Omar Electronics Loganville, GA
Omni Electronics—Laredo, TX
Quement Electronics—San Jose, CA
RF Enterprises—Merrifield, MN
R & L Electronics—Hamilton, OH
Radio World—Boulder City, NV
Reno Radio—Reno, NV
Rivendell Associates—Derry, NH
Rogus Electronics—Southington, CT
Rosen's Electronics—Williamson, WV
Ross Distributing Co.—Preston, ID
Satellite City—Minneapolis, MN
Soundnorth—S. Int'l Falls, MN
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ALINCO ELECTRONICS INC.

DJ-500T

Power-Packed Dual Handi!

20 Memory channels, subtones, built-in DC to DC, 700 mah nicad battery, LCD readout with 6W on 2M and 5W on 70 cm (with optional battery) call channels, DTMF Touchtone, and direct keyboard entry, are just the few winning features of the Alinco DJ-500T Dual Band Handheld. Easy to use, and Value Priced at your Alinco Dealer.

DJ-100T/DJ-120T & DJ-200T

Best 2M Micro Value Anywhere!

The Alinco DJ-100T/DJ-120T is "Magnificent" for its tiny size, but stands up to the competition with power and capability. 10 memory channels store offsets and subtones. Has LCD readout with call channel and reverse at your fingertips. 500 mah battery with direct DC to DC is standard. 3W on standard battery, 6W on optional battery leaves the competition in the dust! DJ-200T for 220 MHz.

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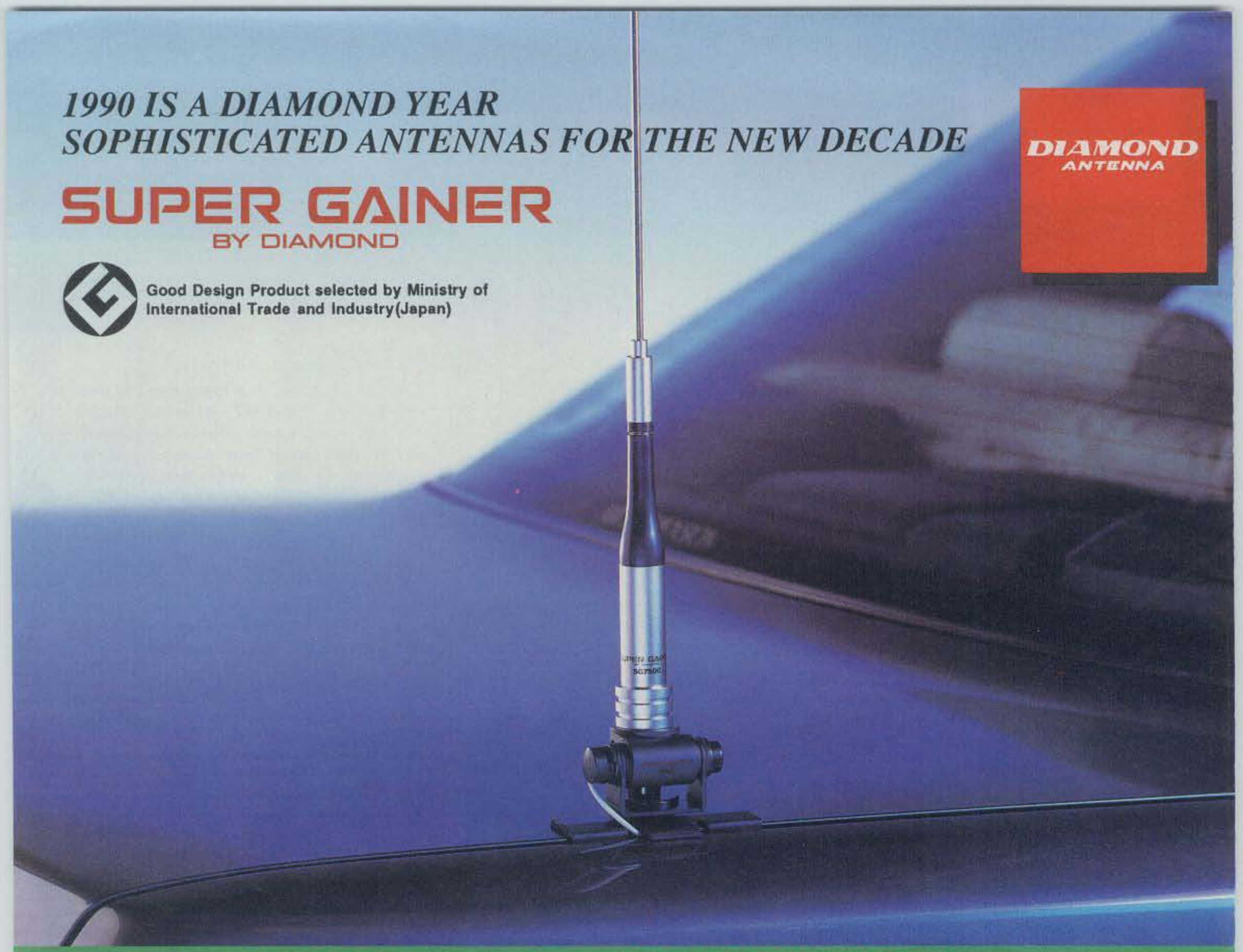

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Message From The Publisher

Many of the readers of this message are already aware that as of May 1, 1990, CQ Communications, Inc., publishers of *CQ* and three other monthlies in the hobby electronics field, has acquired the assets of Communications Technology, Inc. Specifically, CQ Communications, Inc. is now the owner of another one of the great magazines in the Amateur Radio field, *Ham Radio Magazine*.

This is a bitter-sweet business transaction made sweet by the fact that *CQ* now has the opportunity to enhance its already popular product by the addition of a good measure of the kind of material that comprised the editorial meat of *Ham Radio*. The bitter portion of the transaction is obvious: *Ham Radio Magazine* will no longer be published.

As an active ham whose roots are set deep in the technical end of this hobby, I have always enjoyed reading *Ham Radio*. From its beginnings under the almost mystical guidance of the late Jim Fisk, W1DTY, I watched as the magazine rose for a while to the number two position in Amateur Radio publishing, second only to *QST* in readership and stature. The death of Jim in 1981 did not spell the end for the fine magazine, and a succession of good editorial direction kept true to Jim's ideals.

From the earliest days, however, it was a source of amazement to some of us in the publishing field that a magazine of such high technical level could attract a large enough audience to be able to provide ample value to the advertisers without whom the magazine would collapse under the economic burden of publishing. Under the skillful management of Skip Tenney, W1NLB, and also because of the massive commitment of his personal funds over the leanest of years, *Ham Radio* survived. It deserved to survive. It was the best example of much of what was good in Amateur Radio.

But the winds of change blow relentlessly. All my love of the technical essence of Amateur Radio, and Jim's, and Rich Rosen's, and Skip Tenney's, and Terry Northup's could not turn back the tide that is still sweeping over Amateur Radio in the United States. The true ham technician, the person who actually dug into the innards of a radio and made it work, the person who experimented with novel antenna designs and new modes of communications in Amateur Radio, was becoming a smaller and smaller minority. No, that special person has not gone away, nor will he or she. But the technicians among us no longer provide the numbers needed to support a monthly magazine of the caliber of *Ham Radio*. Those who question that statement need only examine the contents of *QST* over the past few years as it relentlessly moves further away from its traditional role as a technical journal, in response to the changing needs of its readers.

Even the energetic editorial revamping of *Ham Radio* by its dedicated staff about two years ago could only forestall what appeared to be a relentless march towards financial reality. A few months ago conversation between my good friend Skip Tenney and me began to move in the direction of Skip's retirement from the publishing business, and the die was cast for the sale of *Ham Radio* to *CQ*, with the clear understanding by both of us that the likelihood of *Ham Radio* continuing as a monthly publication was slim, indeed. We agreed to the concept of integrating the circulation files of the two magazines, and to the broadening of the editorial scope of *CQ* to include more technical material, although it was clear that the very highly technical characteristic of the early *Ham Radio* would not be suitable for the combined audience of *CQ* and *Ham Radio*. The task of striking the fine balance between the traditional *CQ* flavor and the needs of the majority of *Ham Radio* readers would fall to *CQ* Editor Alan M. Dorhoffer, K2EEK, under whose guidance *CQ* has developed into the second most widely read Amateur Radio magazine in the world outside of Japan. Assisting Al will be right-hand Managing Editor Gail Schieber, and providing the *Ham Radio* technical qualities will be former *Ham Radio* Editor Terry Northup, KA1STC, supported by Bob Wilson, WA1TKH.

The entire transaction took place within a rather short time, considering the enormous impact it will have in the landscape of the Amateur Radio publishing field. Quite honestly, we don't have a master plan at hand to guide us along the way. As Craig Clark, NX1G, said recently, it's just going to have to synthesize over months. The issue you are now reading is only the first step, perhaps a slightly wobbly one at that, in the direction that we all feel we must head, but it is a start. Your patience and understanding will certainly be appreciated, but even more important are your letters with constructive criticism.

So far we've received a small handful of letters which cry out with anger and disappointment over the turn of events. But offsetting the few angry and frustrating words are an overwhelming majority of understanding comments and supportive cards, letters, and phone calls. What many *Ham Radio* readers have said is "Okay, I understand why it had to happen. I'm not surprised. But you're going to have to prove yourselves to me." To which we reply, "Fair enough."

It bears mention that the acquisition by *CQ* of *Ham Radio* is anything but a predatory strike at a competitor. While both *CQ* and *Ham Radio* have served the Amateur Radio community for many years (22 years for *Ham Radio*; 46 for *CQ*), they have never been competitors to each other in any editorial sense. Each magazine has had its own clearly-defined mission, and each has worked diligently to accomplish that mission. The acquisition of *Ham Radio* could be construed as a victory for *CQ* by only the most contorted of minds. We at *CQ* do not view this as a glorious accomplishment, but rather as a sad inevitability come to pass. Sorry to say, but the Amateur Radio community comes up the loser in this deal, and there's little cause for celebration in that.

So now let's get on with the world as it is, not as we'd like it to be.

Vy 73
Dick Ross, K2MGA
Publisher, *CQ*

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Malyj Vysotskij sounds like something you studied in freshman biology and the kind of stuff you wouldn't want to get on your hands. However, it is the stuff of which dreams are made, especially amateur radio DX dreams.

4J1FS—East Meets West

A Troika DXpedition To M-V Land

BY MARTTI LAINE*, OH2BH

(with postscripts by Chip Margelli, K7JA, and Boris Stepanov, UW3AX)

QSL card of the 4J1FS M-V Island DXpedition.

Every right-thinking spectrum user knows that DXers are the true internationalists of amateur radio, that they are the top echelon and only accept the very best. But have you ever really thought of what might be the ultimate goal for yourself? Is it to work the rarest, choicest DX in the world from your cozy radio room, or is it maybe to attend the next DX convention to meet those heroes who get many of the notable DX actions going for the Deserving to savor? Or, perhaps your dream is to get your own feet wet and go on a DXpedition to establish amateur radio on a permanent footing in that rare DXCC country counter.

Possibly it is all of these things, but then again, for supreme satisfaction to be derived from a once-in-a-lifetime experience, you should fire up from a most-sought-after country in the world—that far-out desolate island—and take with you a couple of the traditional co-combatants—Americans and Soviets—for a week on that uninhabited island. The gang can sit around the same fireworks and talk about this wonderful world of ours. To coach them into pulling each other's leg, let them have a crack at working the pileups for seven days on end without sleep, sharing in the daily routines of outdoor life out in the woods, and just helping each other establish true lifelong friendships. That is DXism expressed in the language of DXese. It is simply the best. Let it be the ultimate goal for DXing.

Where is M-V Island?

A while back the average DXer, not to mention the man in the street, had never heard of M-V Island. Even some geographers were at a loss to pinpoint it. But today, thanks to amateur radio and DXCC, thousands of DXers the world over know about the island. Malyj Vysotskij, M-V for short, is located at the southern end of the Saimaa Canal, a waterway that links the Finnish Lake District with the Gulf of Finland.

Prompted by economic and military considerations, interest in opening such a canal was first expressed in the Dark Ages. But a formal decision to go ahead with the project was not made until 1843. Following a lengthy construction period, the Saimaa Canal was officially opened in 1856. Traffic along the waterway expanded rapidly until it was brought to a halt in World War II, in 1940, when Finland lost the southern section of the canal to the Soviet Union. Then in 1962 the Soviet Union agreed to lease back to Finland the section that the Red Army had captured plus the island of Malyj Vysotskij.

M-V Island stands alone at 20° 34 'E and 60° 38 'N, only a short distance from the last lock on the canal. Originally, the island was supposed to serve as a staging and storage facility for ships loading and unloading their cargo, but the plan never materialized. With the Soviet borders being heavily guarded due to the USSR's strong military presence in the area, M-V Island was left uninhabited inside Soviet territorial waters.

Even though M-V Island was accorded DXCC status as early as November 17, 1970, it was only fairly recently that a first operation was carried out from the is-

**Nuottaniementie 10 D 20, SF-02230 Espoo 23, Finland*

A strategy session in Finland before the departure for M-V Island. From left to right are K7JA, OH2RF of 1988 4J1FS fame, and OH2BU.

land. Many unsuccessful attempts to activate the island had been made in the past. When the ARRL made its initial ruling 18 years ago, the folks at Newington were certainly unable to anticipate that it would take almost two decades for this newly-minted country to come to life. Probably the DXCC Desk also did not realize that this particular island would bring East and West together for their first joint DXpedition.

Putting Together The 4J1FS Group

Those who have been through it all at the DX end of a pileup will confirm that a key element for DXpedition success is having the best people on board, not only for operating, but for making sure that a variety of tasks always waiting to be tackled can be handled successfully. It is a major undertaking, just like moving an entire circus show into the middle of a desert.

An M-V type of event was certain to present another ultimate challenge. Looking back at the international diplomatic scene, you will recall that in the early years of East-West talks in Geneva, the shape of the negotiating table was the only thing on which they were able to agree, and even that took several weeks to accomplish. We were not prepared to get into that sort of haggling with those from Box 88 over M-V Island.

Following our negotiating in Moscow to secure all the needed permits and to make sure that Soviet waters could be crossed without our being harassed, we

Is this the Iron Curtain? This is certainly where the West ends its borderline and frontier between Finland and the USSR.

OH6DD full of excitement. A first-ever EME QSO from M-V Island with W5UN—using only 100 watts!

realized that the Soviet contingent would be led by their most qualified people. This meant that the western representatives, both U.S. and Finnish, had to be of the same high calibre to meet the challenge.

It was agreed that the Soviet crew would be headed by Boris Stepanov, UW3AX, of the USSR Radio Sport Federation (RSF). Boris was also widely known as the RSF foreign affairs spokesman.

An extensive search for a U.S. operator ensued. The emphasis was placed on the many qualities required of anyone representing the United States of America to ensure the overall success of the event. Charles "Chip" Margelli, K7JA, a well-known amateur and a highly proficient operator (and vice-president of Yaesu U.S.A.) was invited.

Often a gateway between East and West, Finland understood the importance of the event and its full potential. Accordingly, the very best resources were identified. Jari Jussila, OH2BU, current president of the Finnish Amateur Radio League was charged with the responsibility of handling the arrangements and making things jell in general. Additional operators both in the Soviet Union and Finland were screened, keeping in mind the same high standards. A DXpedition aimed to make amateur radio history was ready for action.

Here are the crew members as described by Chip, K7JA:

Alex, UA1ALZ—A very good CW operator, national champion of the USSR, and a nimble tree climber.

Gene, UZ3AU—A gifted engineer. Gene saved the DXpedition with his generator repairs and good humor.

Boris, UW3AX—The leader of the Soviet contingent, an expert in cutting red tape, and the number one toastmaster on the DXpedition.

Enn, UR2AR—An experienced world traveler with an excellent command of English, always ready for a big pileup.

Larry, UA6HZ—Almost like a true-blue American; a great operator and supplier of the caviar!

Ari, OH1EH—A member of the international WPX team and a fine, careful CW operator with a great future for DXpeditions.

Martti, OH2BH—The elder statesman from the Finnish crew, who solved all the impossible problems with his shuttle diplomacy.

Jari, OH2BU—The organizer of the DXpedition's food, equipment, and logistics. Incredibly energetic and eloquent on the air.

Mika, OH2JA—From the new generation of OH DXers, with a great operating style that always seemed to open the dead bands.

Jukka, OH6DD—Grinned from ear to ear with news of the aurora the first day (our VHF man). Worked the first M-V Is-

This is what happened to the operating site when the amplifier blew up. The Finnish contingent (from left to right): OH2BU, OH1EH, OH2JA, OH6DD, and OH2BH.

land EME QSO with W5UN using 100 watts.

Chip, K7JA—Extending the hand of friendship from U.S. amateurs on this very important amateur radio historical event.

Entering The Mystery Of The East

Rounding up all the supplies and equipment needed on an island with no electricity or drinking water required a great deal of effort. Therefore, for our motorized assault on M-V van loads of gear were stacked up to provide the necessary hardware for a multiple-station affair featuring three HF beams as well as VHF/UHF arrays for EME plus Oscar. Our other bells and whistles boasted a prototype FT-1000 for the severest imaginable kind of field testing. The circus wagon was on its way!

Even though K7JA's entry in the show was backed up by the Soviet Embassy in Helsinki, getting a valid visa and sending several telex messages to USSR border guard officials confronted us with a formidable on-the-spot challenge. When Chip's baggage was checked for the umpteenth time in a row, we detected a faint smile on the faces of some border guard officials. An American here for the first time . . . this must be DX glasnost.

Every foreigner is required to specify a Soviet destination when crossing the border. Quite reasonable, isn't it? But in our case Chip was not heading for a Soviet destination. He was on his way to an island leased to Finland, an island situated inside Soviet territorial waters. This had to be magic glasnost—not the regular variety.

It took us several hours to get this situation sorted out, and the bottom line is not clear even today. Nevertheless, Chip was safely trudging along to M-V Island with his Finnish buddies, specially licensed to enter and operate from this DXCC counter.

Reaching the coveted island was just a matter of precise navigation in the canal zone, while extreme care had to be taken not to approach Soviet territory. Yes, some more checking by officials from a nearby naval base and we were ready to set foot on M-V Island.

Those Seven Days Spent Together

When eleven DXpeditioners are busy setting up camp, they seem not to give a darn about world politics or past history. The excitement of putting 4J1FS on the air for the Deserving just seemed to kill those kinds of irrelevant sentiments, and the stage was set for human beings to discover the bonds that unite them—plain and simple.

No time was lost in firing up three stations to meet worldwide demand for a new one. 4J1FS hit the airwaves and we were able to allocate an operator for each band opening whether it was coming from East or West, supported by any culture or accent.

A spirit of true friendship was maintained throughout the week, and people even started pulling each other's legs. If there was someone who had enough operating hours available to himself, it was no doubt K7JA. The Soviets were in fact competing over who would have Chip operate a particular site next. Chip's sleepless week had begun with numerous toasts to lifelong friendship and future reunions. The seven hectic days went by pretty fast while the operators logged a total of 41,000 contacts.

Everyone learned how to propose a

A worn-out Soviet team ready to leave M-V Island. From left to right are UA6HZ, UA1ALZ, UW3AX, UR2AR, and UZ3AU.

A 50 foot motorboat, named Veera, *was made available to us for transporting the operators and their valuable gear and supplies to M-V Island.*

toast—Russian style. Each of us took turns keeping all the sites supplied and going strong, since the stations were scattered all over the one mile long island. Every now and then we took some time to tour the island to see mysterious structures built during the war years. While scampering around in run-down trenches and bunkers, we all kept saying that "it" should never happen again.

Everyone had his share of Murphy, from generator problems and running away from a king-size elk that seemed to be residing on M-V, to being awakened when operating shifts were changed in the middle of the night.

All Good Things Come To An End

When the eleven weary DXpeditioners were ready to board the boat for a trip back home, the saddest part of the show was on hand. It was agreed that the friendships forged during this DX adventure would last forever. The question was raised as to what would be the next new DXCC country. Everyone shared the conviction that the ARRL DXCC program and many of the efforts relating to M-V Island had created a wonderful framework for this historical event. 4J1FS had established a basis for a major east-west happening with the whole world participating. DX was truly alive!

The farewell speeches were heartfelt; both East and West were in tears and we all vowed to do it again . . . forever. The Finnish group—with some ancient true-

Boris, UW3AX, on his first-ever DXpedition. Boris kept up the good spirits and was the number one toastmaster on the DXpedition.

blue Old Timers, those considered the real powerhouses in DXing, tuned to the mystique of DX and cognizant of the Mysteries of the Ages—watched these warm embraces a bit from the sidelines. Indeed, they were all talking to one other to make their services available any time from their homeland on the Arctic Circle with blazing aurora borealis. They stood ready to set up a framework for any future joint East-West venture. Only this time around, it produced a new DXCC country counter—M-V Island!

Whither Next?

There were some firm statements made to further strengthen the relationship between East and West. This very same group of people you now know will be gathering for a reunion in Seattle, Washington in July under the auspices of the Goodwill Games. The theme is "Uniting the World's Best," and top Soviet and American operators with another twelve national teams will be competing in a team radiosport contest—an on-the-air event with everyone invited to participate. Under these circumstances the M-V crew will mark the first anniversary of their East-West DXpedition on the soil of the United States, for the first time ever. The Russians are coming . . . indeed.

Following the Goodwill Games event in Seattle, we all will be converging on Portland, Oregon for the Pacific Northwest DX Convention on July 21-22, 1990 to greet you personally and to tell you how loud you were on M-V Island. We will fill you in on the latest in DX glasnost, which joined people together and made the world a better place in which to live.

Postscripts

Keeping Tabs On Our Eastern Counterparts

By Chip Margelli, K7JA

My participation in the 1989 M-V Island DXpedition, besides being a tremendous honor, represented a further step in the important reconciliation between East and West. My hosts were asking permission of the Soviet Government to transport me through a sensitive defense corridor, while carrying sophisticated communications equipment. Surely this was a great opportunity for amateur radio to display its ambassadorial role to the world . . . and it nearly didn't happen!

The invitation for my joining the 4J1FS crew came a month before the scheduled departure date from Finland. I was also pleased to see my company's interest in shipping the prototype Yaesu FT-1000 along with a fleet of other equipment to Helsinki. With those logistics in place, there remained the matter of securing all needed permissions from both Finnish and Soviet authorities.

Uh-oh! One of the needed documents was my current license now residing in my wallet. My worry level went up by 10 dB. My license, "somewhat" ragged at the edges, was fragile and faded. In truth, it bore a closer resemblance to the Dead

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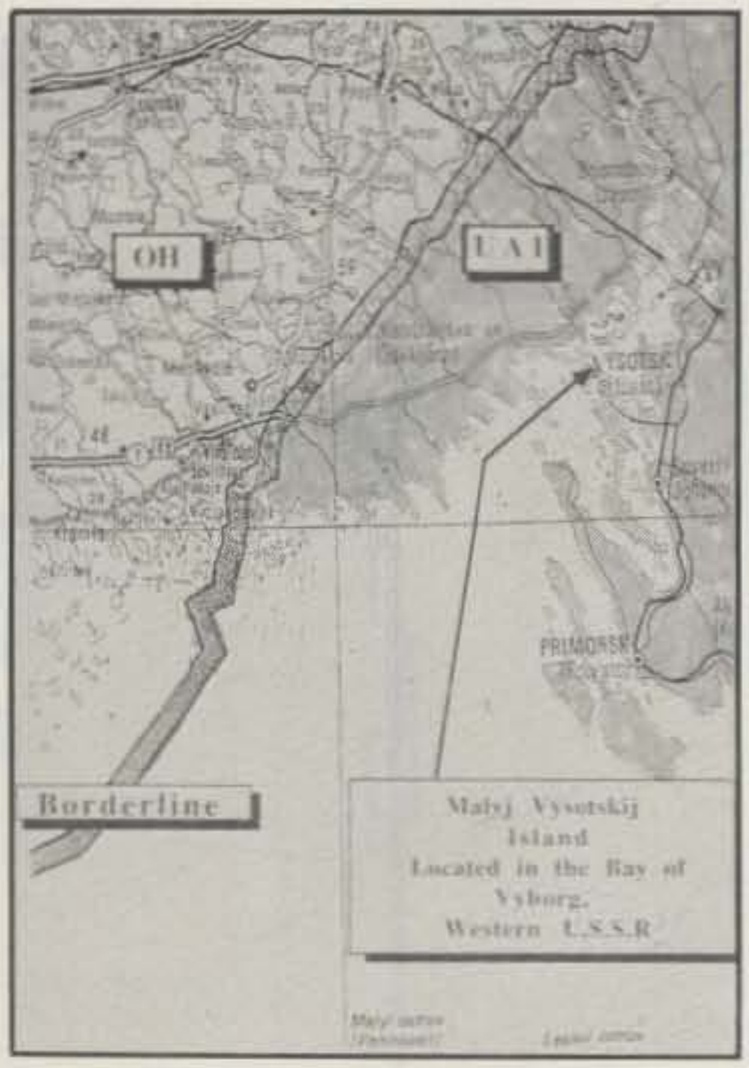
CIRCLE 41 ON READER SERVICE CARD

The flags indicate that M-V Island is indeed leased to Finland and that the island is under Finnish administration, while the Soviet and American flags symbolize this first-ever joint East-West DXpedition.



This is your geography lesson if you don't know where M-V Island is situated. It is not far from Finland, but both Soviet land mass and Soviet islands intervene, thus qualifying M-V for another DXCC counter.

Sea Scrolls than to a current government document.

It is truly a testimonial to the negotiation skills of Boris, UW3AX, that the faded FAX transmission of a poor copy of this tattered license was adequate for him to walk my paperwork through Moscow authorities. Or perhaps Boris's FAX machine uses special "Red Cross" paper that restored my license in Moscow?

Upon arrival on M-V Island, a beautifully wooded islet in the Bay of Vyborg, I set about doing as much as possible to assist the various station crews in setting up antennas. Naturally, this physical exertion caused a serious bit of dehydration. So when the first dinnertime arrived, I was eager to accept Boris's kind offer of a tall glass of Russian mineral water. For those of you contemplating future DXpeditions with Soviet citizens, please be forewarned about the chemical properties of Russian mineral water.

The second day of the operating, the VHF/UHF antennas were up and running. So it was time to activate the FT-736R on Oscar 13. Since we were not using circularly-polarized antennas, the "spin modulation" effect was causing over 20 dB of QSB with a fade rate of a bit under one fade per second. After a few QSOs I turned the microphone over to Boris, who taught me the secret of defeating spin modulation. With some bubbly "mineral water" we shared the celebration of the first Oscar QSO from M-V Island. Boris immediately started weaving back and forth in front of the microphone; his appearance was quite like that of a slow-walking pigeon. But he quickly synchronized himself to the spin rate. Solid copy. Problems solved.

Boris's greatest job of teaching came about three days into the operation. After about 36 hours of hard work without sleep, I became disoriented and took a wrong turn while walking from our north to our south site. A 20-minute stroll turned into a 90-minute trek through dense bushes. Needless to say, I was quite frustrated.

Boris's eloquent response was "Chip, you must remember that I am from a socialist country. I always stay to the left." I never got lost again.

Thanks, Boris.

Keeping Tabs On Our Western Counterparts

By Boris Stepanov, UW3AX

Of course, it happened far too late and several weeks past the deadline. Martti, OH2BH, came up with a vague idea of having an American participant join the 1989 4J1FS DXpedition. I wrote down the name and the callsign and promised to do my best in the attempts to get this gentleman accepted on board for a trip to M-V Island.

A few minutes later, after my heartbeat had come down to an acceptable level, I picked up the telephone to start calling the authorities in Moscow. The problem was that we ourselves were quite late getting the need permission. But now an American coming along . . . Hmmm.

Enn, UR2AR, is a veteran Estonian DXer whom many people remember for his highly successful UK1ZFI DXpedition to Franz Joseph Land.

Martti, OH2BH, now "handing them out" at one of the operating sites on M-V Island. In spite of a major flare that occurred during the 4J1FS operation 41,000 QSOs were made.

After lengthy discussions the officials finally agreed to consider the case subject to receiving the American's paperwork and a copy of his license. I had no FAX facilities in my office, but the Ministry of Telecommunications of the USSR was very kind. They permitted me to use their FAX for fast communication on the needed documents.

A few days later I had a copy of *something*. It is very difficult to describe this item. Looking quite worn-out, that piece of paper must have been used extensively at least since the beginning of this century. I had never met or heard about Chip Margelli, K7JA, and I knew nothing about him. So I kind of judged that OH2BH must have invited one of the grandfathers of U.S. amateur radio to join our DXpedition.

Lucky me, I thought, having a copy of his license, a real masterpiece of amateur radio history, issued at least 70, maybe 80 years ago. I decided not to ask for a more distinct copy. The ancient document might be destroyed in the process of being digested by a FAX machine.

The authorities agreed with me that with a bit of imagination, it would be possible to combine various letters with this copy of K7JA's license to produce the full name and complete callsign of this proposed participant. And sure enough, Chip was put on the list of M-V Island operators.

Now I had only one problem: How to bring to M-V Island sufficient quantities of a special brand of mineral water to maintain the health of this outstanding Old, Old Timer (or maybe Super OOT) at a proper level. But when I finally met face to face with this smiling dark-haired fellow aboard the Finnish boat *Veera,* I understood that he had used his grandfather's license to fool me!

I am quite sure now that to fool me was the only reason for his taking part in this DXpedition. There are at least two things to confirm this. One, M-V Island was not *lonely* after Chip landed there. It was impossible to find a place on the island where Chip would not have been immediately available. Really, I still think we had at least a dozen Chips running around the place. Two, if he was not operating Oscar, he was trying to pull somebody's leg and, in practice, it was always mine. I had to play the same game, but being more in the role of a host, I did not try to win that "contest."

Nevertheless, at our closing meeting on the island I proposed to select Chip as "The Best American on M-V Island." I had no choice. And I live in the hope of running into him once again on a desert island to pull his leg—while taking a few minutes' break from the pileups.

Thanks, Chip.

Four nationalities are represented here: Uncle Sam, Finland, and two USSR republics—Estonia and Georgia.

CQ REVIEWS:

The AEA IsoLoop® HF Antenna

BY BUCK ROGERS*, K4ABT

The UPS truck has its own sound as it rounds the curve just down the ridge from my home here on Pheasant Ridge. I have my ears tuned to listen for that sound, because eight out of ten times that vehicle is coming to this QTH.

On this particular day I met the delivery person at the door and signed for the 3 foot by 2 foot box. Hurriedly I made my way to the computer room, where many of my packet-related projects begin. It took all of 60 seconds to open the box and organize its contents on the floor.

Before me lay the makings of the AEA IsoLoop® multi-band antenna. Except for the tightening of two screws that were purposely loosened for shipping reasons, it was fully assembled. There are some brackets and "U" bolts that are to be added to the antenna, but they are purposely left for the user to install. The Isoloop® can be installed either vertically or horizontally, depending on the operator's preference.

It took a moment to go over the list of supplied parts and connectors. All I needed was a "hank" of four-conductor control cable with shielding (five conductors including the shield) and an equal length of my favorite coax. Well, I already had enough coax to reach the IsoLoop®'s mounting location, but the control cable was a different story.

No Problem

I made a quick phone call to the local supply house to determine if they carried the type and size of control cable that I needed. The friendly voice at the other end of the line informed me that it was no problem as long as I didn't need over 1000 feet. A short trip to town and back, and I was about to be in business.

The Owner's Manual

Oh, I almost forgot to tell you about the "fat" installation and operating manual that you must digest before going to the roof. Only 16 pages of documentation. They're kidding. Nothing in amateur radio comes with only 16 pages of documentation. I poked around in the box to see if I had somehow overlooked or mislaid the "book." Much to my pleasant surprise, everything I needed to know about this antenna was contained in the 16 pages of text and illustrations.

The Best Is Yet To Come

Some of the reports I'd heard about this "new-fangled" IsoLoop® from AEA said that it could be mounted anywhere—apartments, condos, attics, treetops, RVs, and (with a good bumper mount) on the tail end of a pick-up truck. I would hesitate to do the latter, but as many of you know, hams are prone to nonconformity.

The antenna can be mounted vertically to provide a directional pattern rather than the omni-directional, horizontal pattern. Mounting it vertically with a rotor enables the user to "null" an interfering signal. I elected to mount the IsoLoop® in the horizontal plane. While I was at the local supply house, I purchased one of the roof-mounted tripods and a 10 foot mast section. The tripod is now mounted to the roof, and that is where the IsoLoop® resides.

The two 5-pin DIN connectors (supplied with the IsoLoop®)were installed at each end of the control cable, and the two PL-259 connectors were placed on the RG-8. Running the cables, installing the tripod, and attaching the antenna were all accomplished in less than an hour with no rushing and only one installer—*me*.

I must admit, the more I looked at that "compact," 12 pound, 32 inch square antenna, the more anxious I became. I hurriedly completed the installation by attaching the tuning motor, control box to the small power supply (supplied with the IsoLoop®).

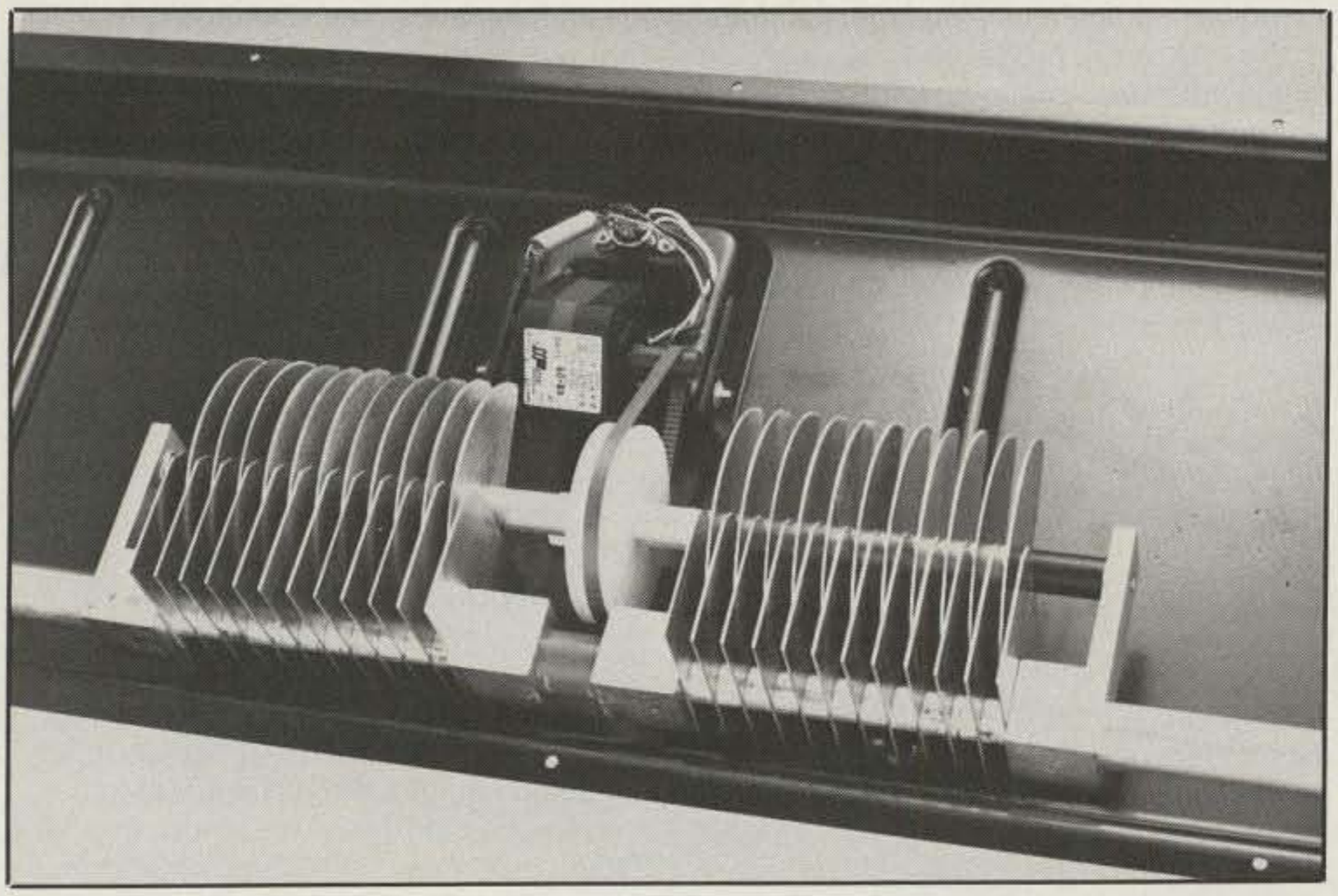
It's Warm in Georgia

I was perspiring heavily after climbing down from the hot rooftop. My wife, Jean Ann, WB4EDZ, must have sensed my thirst, because she walked in with a cold glass of iced tea. This was the perfect moment to stop and read the operating instructions again, about a half-dozen steps. Now tell me, is that like saying "the glass is half full" or "the glass is half empty"? In any case, the tea glass was completely empty by the time I finished reading the steps about how to operate the IsoLoop®.

I connected the coax from the IsoLoop® to the three-antenna coaxial antenna switch, and flipped the switch to the position that has the IsoLoop® connected. I proceeded to tune the Yaesu FT-747 around the 20 meter band. Zilch! I moved the switch to the port with the old 20 meter antenna, and there on 14.105 LSB was the ever familiar sound of 300 baud packet. The signals were running in the neighborhood of S6 to S9, as is the case around 6 PM each evening in Central Georgia.

The AEA Isoloop® antenna can be mounted on a small TV-type tower. It is quite small (about 3 feet square) and can be used horizontally or vertically.

*506 Pheasant Ridge Drive, Warner Robins, GA 31088



The motor-driven tuning section is well made and very high-Q. Part of the reason for the high-Q is that all of the metal connections in the antenna have closely machined and welded connections, therefore ensuring perfect bonding.

I began to wonder if I had a problem in the new coax, or if the signal difference was attributed to the old 20 meter antenna being suspended about 20 feet higher than the IsoLoop®.

Wait, Hold It!

I remembered someone telling me that the IsoLoop® has a very sharp bandpass, and the sharp bandpass serves two purposes. One purpose is to attenuate signals from nearby frequencies so that overload will not affect the user's operation, and the second reason is the IsoLoop®'s narrow bandwidth can suppress TVI and harmonics. Since the bandwidth is tunable, the IsoLoop® is a very sharp tunable filter that radiates.

I reached for the IsoLoop®'s control box, moved the tuning "speed control" to "fast," and pressed the motor control to the right. Six or eight seconds passed, and suddenly the S-meter seemed to

The LC-1 control box is fed wih four-conductor shielded cable. It has two basic controls. One is for rotation direction, and the other governs the tuning speed.

jump upward. The IsoLoop® tuning section performed just as it had been designed to do.

Bingo!

The instructions explained all this to me, but I hadn't realized how sharp the tuning really was. Now I understood the reason for the speed control on the tuning motor.

Wow! The signals were high, then dropped off as I went through resonance of the frequency I was listening on. I moved the "speed control" knob back to about mid-range and moved the switch to the left. This time the S-meter movement was not as rapid, and I was able to set the IsoLoop® to the peak of the signals.

Rocking the coaxial switch between the old antenna and the IsoLoop® port, the IsoLoop® appeared to have the edge by two to four S-units. The signals that were running S6 on the old antenna were now closer to an S9. I was beginning to get the feel for this new combatant of the zoning ordinances.

Ready To Go For A Spin

Well, "It's great as an SWL antenna, but how does it talk?" I connected an antenna tuner with a built-in SWR bridge to the line between the antenna and the coax-switch port. I was ready to test the antenna in the transmit mode, so I placed the 747 into the LSB mode and turned down the power control. I set the antenna tuner to the "Direct" mode so that only the SWR/wattmeter portion would be used. The antenna-tuner portion was *not* active in the antenna system.

I peaked the IsoLoop® for maximum receive signal on 28.195. This is one of the HF spots I like to use, because we are allowed to run 1200 b/s on HF above 28 MHz. I use 1200 b/s a lot now that 10 meters is hot during the day and evening hours. I work a lot of 1200 b/s stations on 28.195 and 28.190, and I use the WW6L BBS and other BBSes on 28.180 and 28.185.

Connected to OA4BR

Activity on 28.195 has diminished since the Conference node was removed, and I was surprised to see a familiar callsign of a friend near Lima, Peru. "Zip," OA4BR, and I have had QSOs here on 10 meters occasionally, and we recently spent some time in an eyeball QSO at the Orlando Hamcation. Our contacts on 10 meters were mostly through a node in southeast Arizona. For the moment I forgot that I was about to tune the rig into the IsoLoop® and began to concentrate on giving Zip a try.

There was a difference in the incoming signals that day, and the difference was I was seeing Zip direct. I quickly typed in the familiar connect request (C OA4BR) and hit the enter key. Expecting the normal two or three tries before I would get the "Connected to OA4BR," I leaned back in the chair and took a sip of melted ice (tea-flavored water). I quickly set down the glass when the "Connected to OA4BR" popped onto the screen on the first try. Remember, I was connected to Zip directly, not through a node. Wow—really great! Was it conditions, or was it the antenna? It didn't matter. We were having fun batting it back and forth, discussing the Hamcation at Orlando.

It was not until we had concluded the QSO that I realized I'd been operating with the power control of the 747 turned down to (according to the wattmeter) below 20 watts. In other words, I was QSOing with Zip directly from the IsoLoop® with less than 20 watts. To say the least, I was and I continue to be impressed.

Saturday morning I had more good DX QSOs, some on 20 meters and more on 10 meters. I got in a few slow-scan pictures on 14.230, too. Time and again the IsoLoop® did a good job of working out.

My 747 is supposed to have an output somewhere near 100 watts, but it strains to make it to 80 watts on 10 meters. Therefore, I don't get too concerned when running the IsoLoop®, because it has a power rating of 150 watts. The antenna would probably handle more power on packet, as packet lengths are normally short in duration.

A Radiating Antenna Tuner

I've long since retired the antenna tuner to the lower HF bands, and I let the IsoLoop® take care of any communications at the upper (14 MHz to 29.990 MHz) HF frequencies. I've used the IsoLoop® on every amateur band in the 14 MHz to 30 MHz spectrum, and I have yet to see the SWR move above 1.2:1.

It didn't take long to discover the manner in which the IsoLoop® functioned and to realize that it can be explained simply as a remote-controlled antenna tuner that radiates. The stepper motor controls the tuning of the IsoLoop® by driving a variable capacitor in the *very* high-Q tuning circuit located up at the antenna. The direction and speed of the capacitor is controlled by the control box at the operator position. Keeping all this in mind, this very high-Q tuning circuit could be the reason why this small antenna might appear to defy the laws of physics.

True, it is not a full-size, four-element beam with broad bandwidths, but it could very easily be the answer that many of us who are hampered by space and height restrictions are looking for.

The AEA IsoLoop® is priced at amateur net $319.95. See your amateur equipment distributor, or contact AEA (Advanced Electronic Applications), Inc., 2006 196th Street SW, Lynnwood, WA 98036 (telephone 206-775-7373). CQ

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W7LLX presents a quick fix for your AEA CP-1.

How To Modify Your AEA CP-1 Computer Interface To Run FSK

BY W. C. MORRISON*, W7LLX

The AEA model CP-1 computer interface and Commodore VIC-20 or C-64 computer are widely used by amateurs interested in RTTY or AMTOR modes of communication. However, you'll encounter a problem when you use the CP-1 with the ICOM 751, 751A, or similar transceiver designed for FSK rather than AFSK input. If the AFSK output of the CP-1 is fed into the microphone connector with the transceiver in the lower sideband mode, proper signals are transmitted, but an important capability of the receiver is lost. Neither of the two possible narrow IF filters are usable. One filter can be switched into the circuit, but it won't pass frequencies which produce audio tones around 2000 Hz—the ones used in RTTY and AMTOR.

When these transceivers are put into the RTTY mode, the combined selectivity of both filters (if installed) is available to eliminate QRM. The input must now be an FSK TTL signal fed into a connector on the back of the transceiver. Fortunately, you can choose between AFSK and FSK output if you make a few simple changes to the CP-1. The drawback is that you'll lose your RS-232 interface capability.

Modifying the CP-1

The CP-1 has a switch which lets you select either TTL or RS-232 signals. It's a double-pole, double-throw switch, half of which is used to break the connection between the TTL keying signals from the computer and the IC (XR2206) that generates the AFSK tones. You simply need to use the other half of the switch to break the connection from the output of the tone generator to the output connector and to bridge the TTL signal directly to the output connector. Do this by cutting two traces on the PC board and adding two jumpers. If any of the ICs used in the RS-232 section are installed in your CP-1, you should remove them from their sockets.

Fig. 1 shows the two traces on the wiring side of the PC board that you must cut. Note that the trace on the left connects to the right side of the switch through a plated-through hole and a trace on the top of the board. To return to RS-232 capability, solder short pieces of wire across each cut. AEA may have used more than one board layout in the CP-1, but fig. 1 shows the layout of my unit.

Fig. 2 shows the modifications you must make to the component side of the board. The "blue wire" that is removed from eyelet 1 on the board goes to the AFSK pin on the output connector. These modifications will leave the operation of the CP-1 unchanged when the switch is in the TTL position. AFSK signals are available on the output connector. With the switch in the RS-232 position, reception is unchanged, but in transmit, TTL level keying signals from the computer are sent directly to the transceiver over what was previously the AFSK wire.

By making this change from AFSK to FSK (in RTTY mode), and by setting the passband tuning control on the receiver to align the two narrow filters, I enjoy significantly improved receiver selectivity on RTTY and AMTOR.

*3050 Hozoni Road, Prescott, AZ 86301

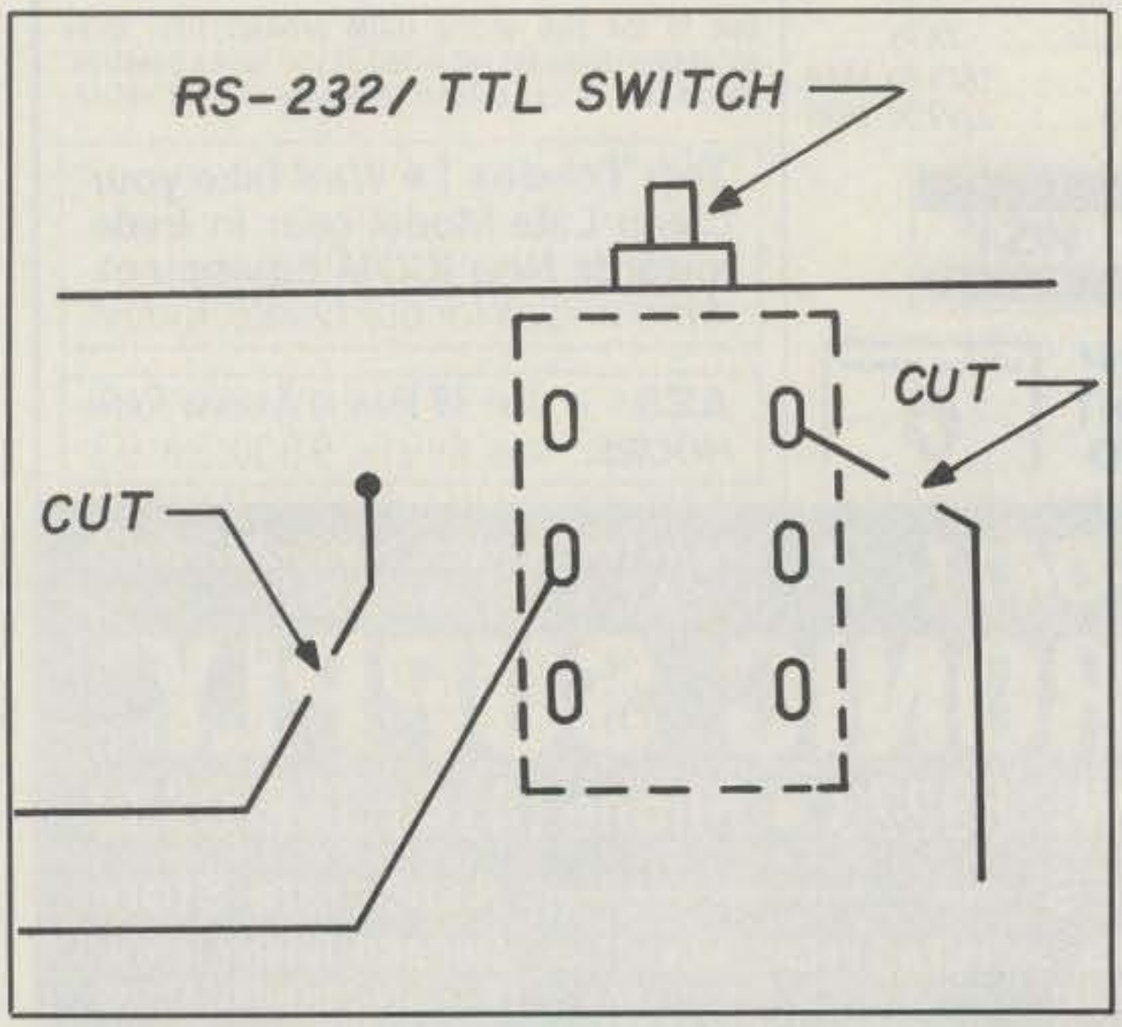

Fig. 1– Location of the two traces to be cut on the bottom of the circuit board.

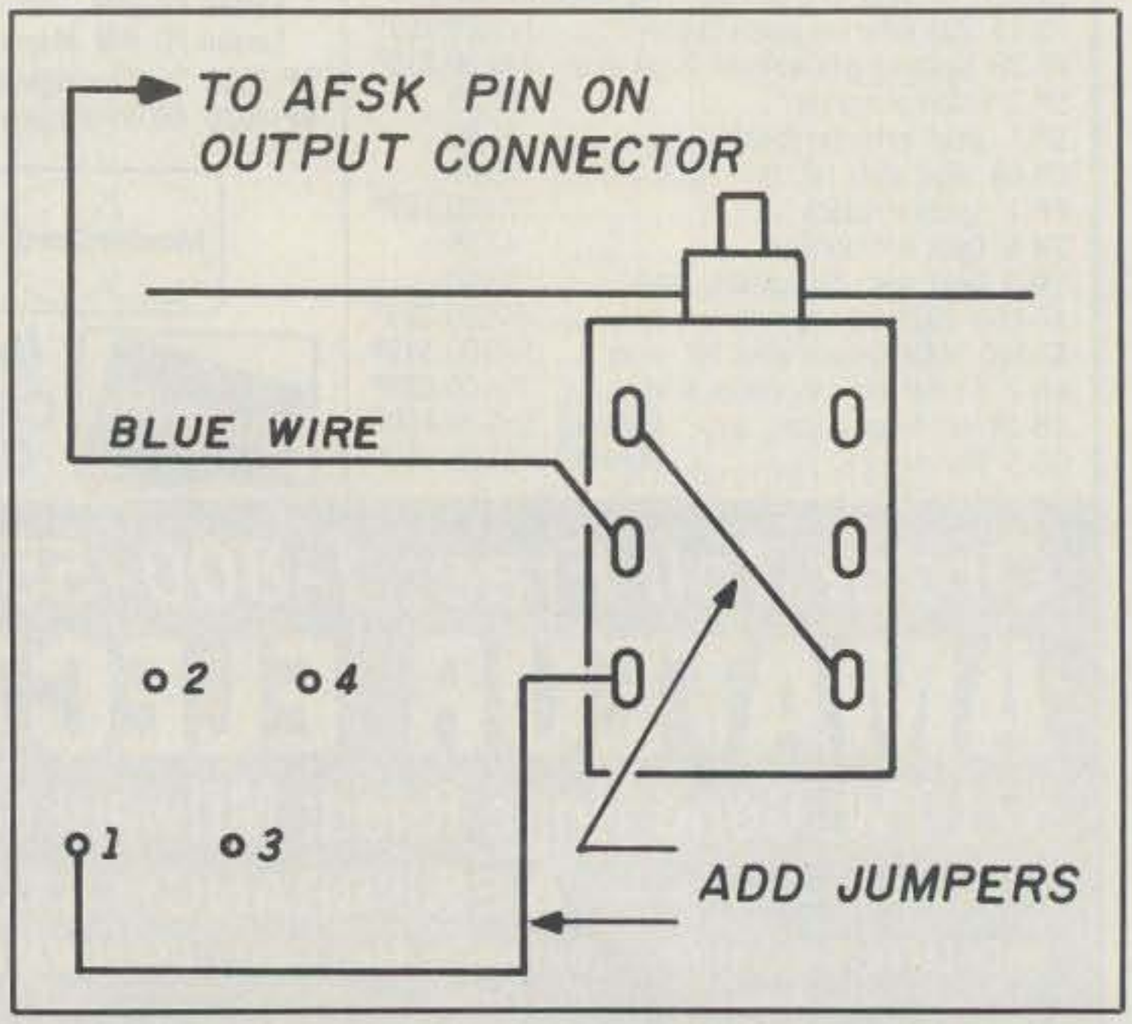

Fig. 2– Two jumpers are added to the board. Note the relocation of the blue wire through the switch.

Ameritron gives you a full Kilowatt from a *quiet desktop* linear . . . for $1095

Ameritron gives you a full Kilowatt *output* of peak envelope power for only $1095 -- from a whisper quiet linear that's perfect for your operating desk because it measures just 8¼" H x 14" D x 14¼" W.

You could spend over *twice* the money for a legal power limit amplifier *twice* the size -- and all you'll get is an additional 1/3 S-unit -- a difference you won't ever notice.

You also get 850 watts output on CW and even 500 watts on RTTY.

All Band Coverage

You get all band coverage: rated output on 160, 80, 40, 20 and 15 meters (10 meters with user mod/export) as well as 80% rated output on MARS and WARC bands.

Tuned Input lets solid state rigs deliver full output

The Ameritron AL-80A uses a direct switched, 100% shielded pi-network tuned input circuit that provides an excellent load for any rig. Even the fussiest solid state transmitter works flawlessly with the AL-80A.

Pi-L Output Tank

A carefully designed Pi-L output tank using the optimum Q for each band gives you exceptionally smooth tuning, extremely wide range load impedance matching and full band coverage -- even on 160 and 80 meters -- *plus* you get an extra 10 to 15 dB of harmonic suppression.

You also get peak performance at different power levels from one end of the band to the other.

Ball bearing vernier reductions drives on both the plate and load control makes tuning precise and easy.

3-500Z Tube in shielded RF compartment gives you nearly 70% efficiency

You get the rugged time proven 3-500Z tube with an estimated life of 20,000 hours ICAS. That's nearly 20 years operating 20 hours a week -- you may never have to replace your tube.

The AL-80A is built on a rugged steel chassis. It has a separate RF compartment that's fully shielded to keep unwanted RF from leaking out. This keeps RFI and TVI to an absolute minimum.

A superb RF design and layout, a Hi-Q tank circuit and commercially rated RF power components give you nearly 70% plate efficiency over the entire operating range. This puts maximum power into your antenna instead of heating up your amplifier.

A whisper quiet internal computer style fan draws in cool air over the power supply components and blows it around the 3-500Z tube. This removes excessive heat and gives you reliable performance.

Built-in adjustable ALC circuit keeps your exciter from overdriving your AL-80A. The result? A clean signal without flat-topping.

A standby switch prevents harmful thermal shock to your 3-500Z filaments by keeping them lighted when you're operating barefoot.

Gutsy Heavy Duty Power Supply

The guts of the AL-80A is its heavy ***heavy*** duty power supply.

A husky 22 pound power transformer using a high silicone steel core, computer grade filter capacitors totaling 26 ufd, heavy duty bleeders and ten 3 amp, 1000 V power rectifiers give a stiff 2700 volts fully loaded.

Some competing high priced amplifiers using ***two*** 3-500Zs *can't* give you much more power output than the AL-80A. Why? Because their lightweight power supplies can't deliver enough high voltage for the tubes.

Step-Start Inrush Protection™

When you first turn on your amplifier, a massive inrush current flows.

Your house lights flicker as you hear a loud "thump" from your amplifier. This terrible inrush current stresses *all* your power supply components to their limits. Your cold tube filament suffers abusive thermal shock.

Eventually, this massive inrush current will damage your amplifier.

The AL-80A special ***Step-Start Inrush Protection™*** *stops* damaging inrush current.

By starting your AL-80A through a 10 ohm current limiting resistor, then shorting the resistor with a relay, the AL-80A gives you a start up sequence that is ***easy*** on your tube and power supply components.

Don't consider a linear amplifier without this critical protection.

Multi-Voltage Primary protects your amplifier and gives you peak performance

Too high a line voltage stresses components and causes them to wear out and fail. Too low line voltage causes a "soft-tube" effect -- low output and signal distortion.

The Multi-Voltage Primary in the AL-80A transformer lets you compensate for too high or too low line voltage.

With the AL-80A you get the longest component life and peak operating efficiency -- regardless of your line voltage.

Before you buy an amplifier make sure it has a multi-voltage primary.

Dual Illuminated Meters

Two large meters give you a complete picture of the operating condition of your AL-80A. They let you know right away if there is a problem.

Grid current of the 3-500Z is monitored continuously by one meter. Grid Current indicates proper amplifier operation better than any other parameter.

You also get a multi-meter that measures plate voltage, plate current, ***peak*** RF watts output and drive power/ALC detector voltage.

Comes completely factory built, tested and guaranteed to work . . .
. . . *not a kit you have to build*

You get a full kilowatt out of the box -- ready to plug in and bust through QRM in minutes.

A kit could actually end up costing you more than your best price on the AL-80A -- and leave you frustrated if you can't get it to work.

A factory built AL-80A has much higher resale and trade-in value than a kit. Why? Because Ameritron's reputation for consistent quality and workmanship is known by hams everywhere.

Two Year Warranty: Twice the protection of our nearest competitor

No other kilowatt amplifier comes with a 2 year warranty. In the unlikely event that there are defects in materials or workmanship, we'll fix it free for 2 full years from the date of purchase.

The 3-500Z is covered by the tube manufacturer's warranty.

Committment to Service

Even after the 2 year warranty period, Ameritron Customer Service Technicians are available to help you keep your AL-80A performing flawlessly -- no matter how long you have it. Just call 419-531-3024.

Call your dealer today

Bust through QRM with a full kilowatt from the Ameritron AL-80A -- right out of the box. Call your favorite dealer for your *best* price and order today!

Lightning Fast QSK Switch

The optional Ameritron PIN-5 QSK switch gives you lightning fast T/R switching for full CW break-in, AMTOR, Packet and other QSK modes for only $189.50.

It lets you switch the legal limit in microseconds into 2:1 VSWR loads with less than 0.5 dB receive attenuation.

Factory installation is available.

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CIRCLE 159 ON READER SERVICE CARD

Last month we passed through the land of Reactance and Impedance on our way to understanding antennas. This month we pick up our travels when we study actual antenna systems.

Basic Antenna Information Part II

BY LEW McCOY*, W1ICP

In the first part of this series I discussed antenna impedances and reactance, plus how to handle them. Now let's get into actual antenna systems.

The "Best" Multiband System

For years I have pushed very hard for one type of multiband antenna system—so hard, in fact, that many amateurs call it the McCoy system. It would be dishonest for me to claim credit, because the antenna system existed long before I started extolling its virtues. Before discussing this and other systems please allow me to philosophize about amateurs and antennas, if I might.

From my years of observations (some 60 years to be exact) I have found that amateurs are essentially lazy, and I am no exception. Why? Such a statement is easy to prove.

After World War II coax feed line became very popular. At the same time television came along, creating severe problems for many, many amateurs. Amateur radio quickly went to completely shielded transmitters, shielded filters, and coaxial feed lines. This created antenna problems for amateurs who wanted to operate multiband but still maintain their 50 ohm integrity in filters and so on.

An amateur named Buchanan, W3DZZ, who was (and is) very smart, came up with the excellent concept of using traps (coils and capacitors) in dipoles and beams to "multiband" them in that he used a single coaxial feed line. (You learned about reactance earlier, and a "trap" is merely a device that presents an extremely high reactance to undesired frequencies, but the reactance doesn't exist on the desired frequency or band.)

*Technical Editor, CQ, 200 Idaho St., Silver City, NM 88061

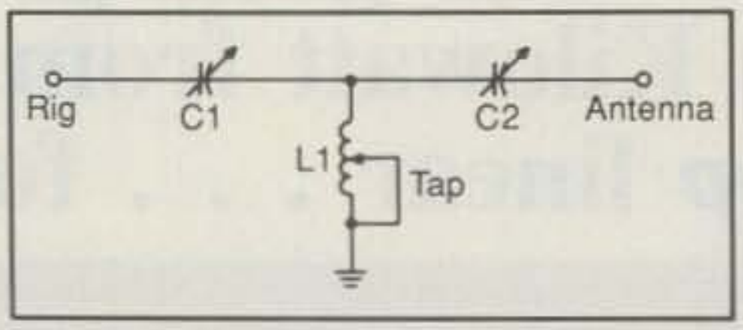


Fig. 1- This is the basic circuit used in many of today's Transmatches. This simple T network will match any load from zilch to zilch. The typical values are as follows: for C1, 250 pF, for C2, 300 pF, and the variable inductor 18 or more micro-Henries to cover from 80 through 10 meters. L1 could be a tapped inductor, but the matching range is not as great.

The impedance of these multiband beams and dipoles would stay somewhere near enough to 50 ohms so that amateurs could use 50 or 70 ohm coax. At that time, in 1953, the transmitters had very flexible amplifier tank circuits in the output of the rig. It was possible to tune out reactance and match the antenna *system* to the rig. Keep in mind that even with trap antennas it was well nigh impossible to have a match of 1.5 to 1 across some bands.

What I am repeating here is that with modern solid-state rigs, a darn near perfect load is required. In fact, I find it amusing, because most of the modern rigs are now marketed with built-in antenna tuners (that sometimes cost extra) which are really an extension of the old-fashioned tank circuits.

What you find with antennas is that it is virtually impossible to come up with a trap or "loaded" antenna that will cover all bands, particularly 80 through 10 meters, and all frequencies and stay below 2 to 1 SWR. There was one broadbanded 80 meter dipole marketed for a while which used a complex transformer in the feed point which was nearly a perfect match across the band, but I haven't heard of it in years. Also, you can install resistors in the antenna network to obtain broadbanding, but I consider this wasteful of power.

There is one approach to always maintaining a 1 to 1 load at the rig, and this is via the use of a Transmatch. If your normal SWR is no higher than 5 to 1 and you are running up to the legal limit, then I would consider it okay to use a Transmatch and a good grade of coax of the half inch diameter type, but *not RG 58/U!*

The Transmatch— Its Importance

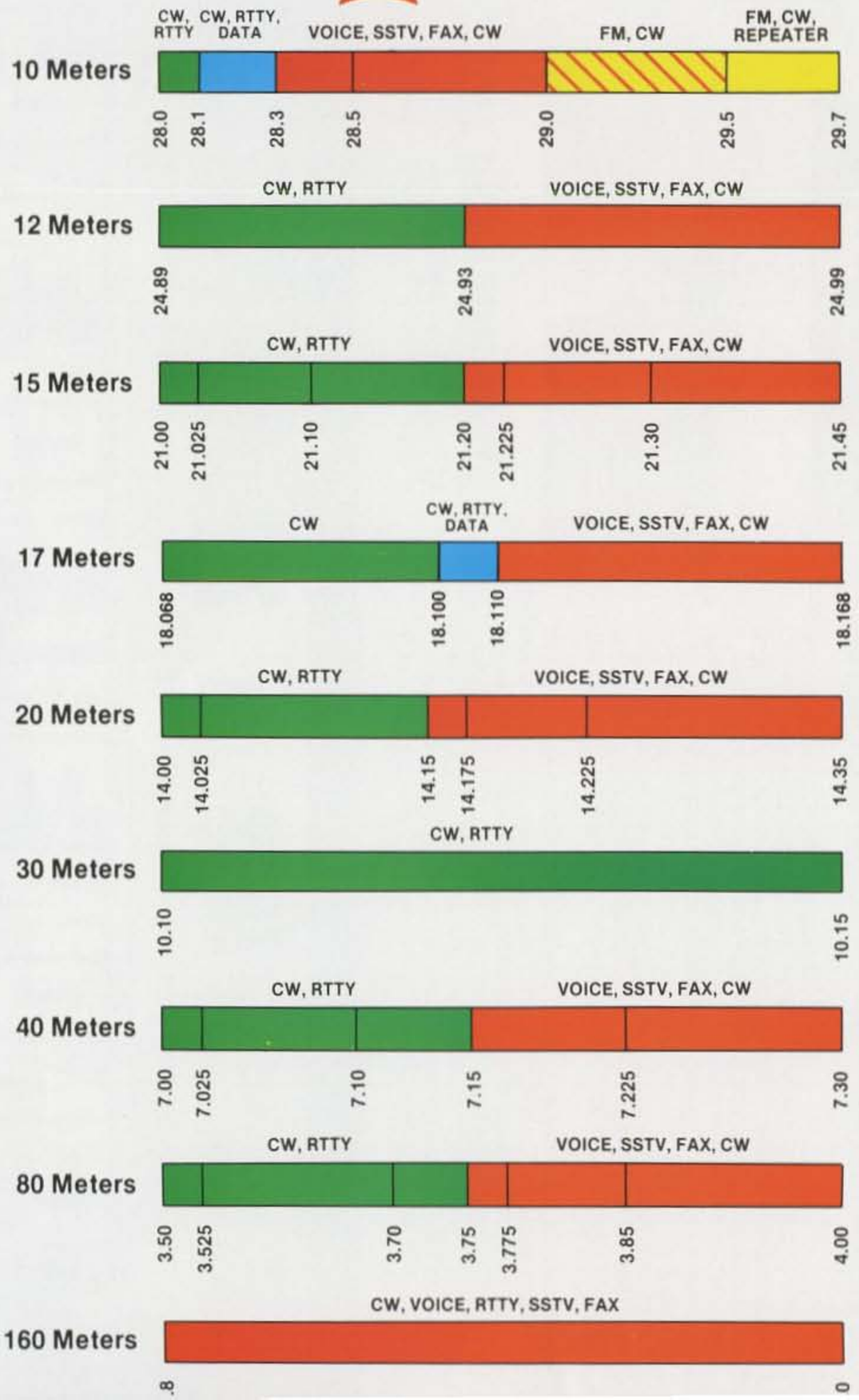
As I stated, we rarely use a resonant antenna, but we can operate quite easily with an antenna system that is always resonant. An "antenna system" can consist of the antenna proper, the feed line, the ground connections or leads, material used to support the antenna, nearby objects, and so on.

As I said earlier, we must "tune out" the reactance in order to get an antenna system to take power. We can do this by using a Transmatch (another but technically inappropriate name is "antenna tuner"). A Transmatch could be called an adjustable RF transformer and reactance "tuner-outer." It basically takes the antenna system load that is presented at the end of the feed line in your station and converts that load to a pure, non-reactive 50 ohm load—or in even simpler terms, a 1 to 1 load.

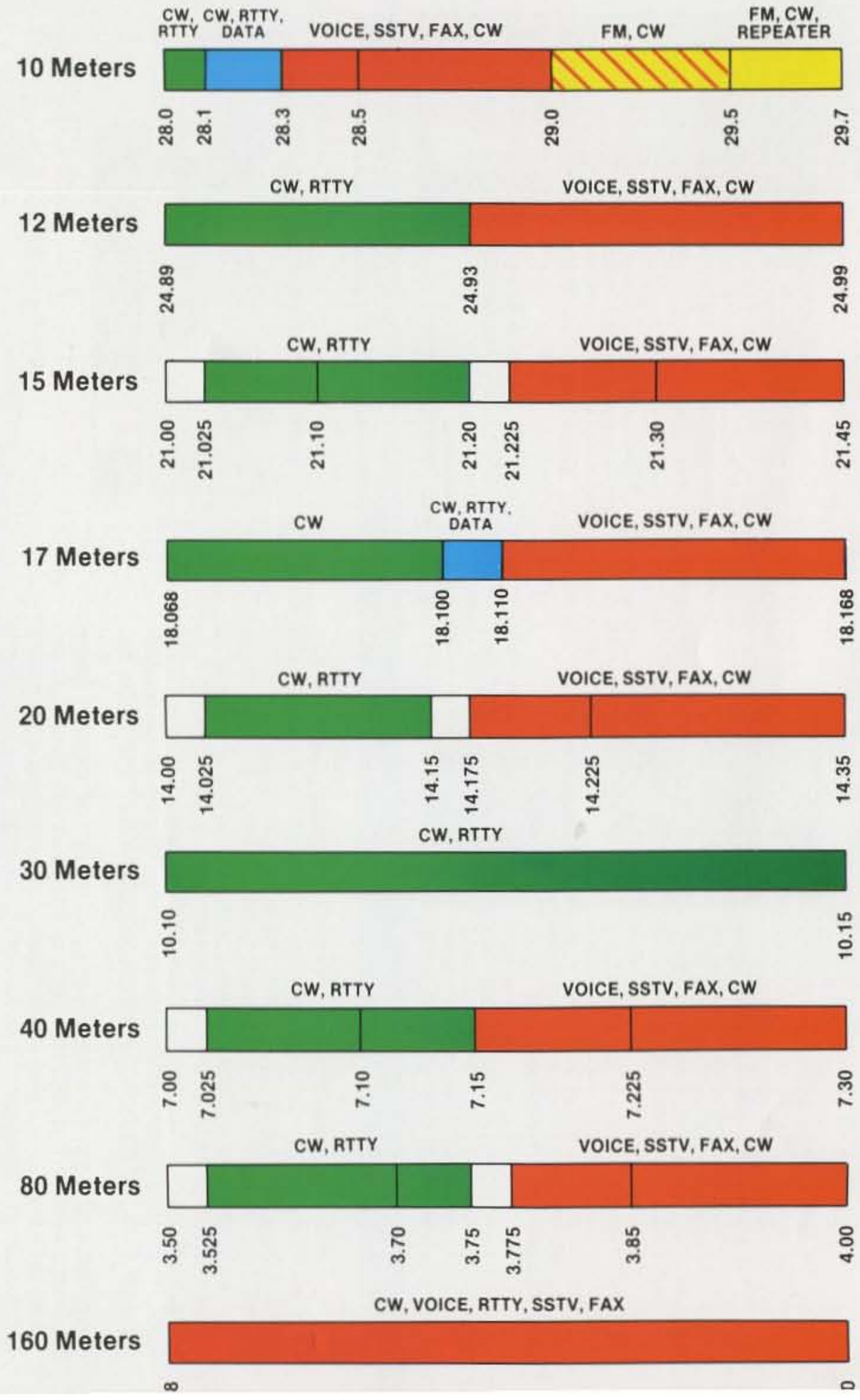
Fig. 1 shows the circuit of a basic Transmatch that is capable of converting any system load to a perfect 1 to 1 load, or very close to it. Also shown is a photo of a Transmatch that I built and described a few years back in *CQ* (September 1986). This unit, called "The No Holds Barred Transmatch," will match anything—and I do mean anything—and is not difficult to

CQ H.F. Amateur Radio Frequency Chart

Extra Class Privileges



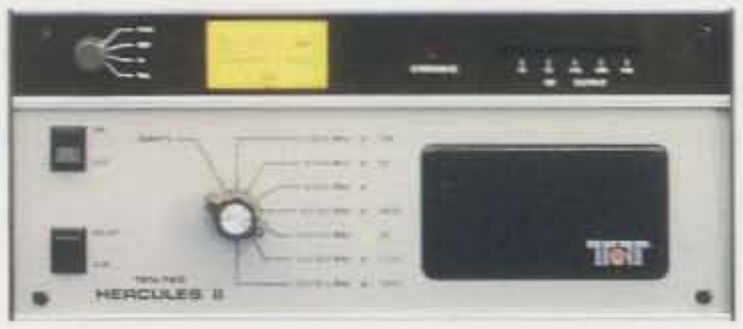
Advanced Class Privileges



"ONE FOR THE MONEY...

High tech simplicity. Isn't that refreshing!

The Paragon, Model 585



The Hercules II, Model 420

Model 253, Automatic Antenna Coupler

A 500 WATT OUTPUT STATION. Here is a full capability station that uses modern technology to simplify operation. The Hercules II amplifier and the new Model 253 automatic, 2 KW, "match anything" antenna coupler are both controlled by the Paragon (or Omni V) transceiver. All bands, 160 through 10 meters, all modes. A 500 watt output "transceiver" that works great with, or without, a world class antenna system. The really good news is that you can own this complete station for a price less than some competitive transceivers alone! Now, who offers the best value!

THE PARAGON is the choice of many of the most experienced operators on Earth. The fussiest phone folks, cw operators that are out-and-out snobs and many of the digital stations that lead the rtty DXCC list. General coverage receive from 100 kHz to 30 MHz. 100 watts of transmitter power from 1.7 to 29.999 MHz. All of the nifty features expected in a computer based design. Dual VFOs. TX and RX offset with display. 62 programmable memories that include frequency, mode and filter plus a 7 character alpha-numeric displayed tag feature. QSK cw with a changeover time of 30 ms. All digital modes with real FSK. Outstanding ssb with a standard speech processor that is a pleasure to hear. I-F filter selection, independent of mode. In short, a truly outstanding do-everything rig.

THE HERCULES II is a really classy solid state, all mode broadband amplifier that does not require any tuning. Remote band switching can be controlled by our Paragon or Omni V. Temperature controlled cooling system is whisper quiet on ssb, yet has adequate capacity to cool the internal heat sinks under key down conditions. Runs on 12-14 vdc for battery operation, mobile or base. (A heavy duty auto battery with a 10 amp charger makes a good, and inexpensive, base power supply.) Not shown is the Model 9420, 100 amp dc power supply that powers the Hercules II and the transceiver. A remote control system is available for mobile Hercules II installations. The Hercules II is fully metered and includes a 10 element LED peak power bar-graph display. Compact, good looking and a signal within one S-unit of the mighty TITAN!

THE MODEL 253, 2 KW AUTOMATIC ANTENNA COUPLER is the latest in our highly regarded line-up of tuners. Functions as an antenna management system with the front panel, four position, antenna switch. Positions 1 thru 3 are dedicated to coax fed antennas. Position 4 may be used for coax, single wire or balanced feeders through the built-in high power balun. Tuning is accomplished with a motor driven, roller inductor and fixed value capacitors selected with enclosed relays. The system is microprocessor controlled with one memory per antenna select position. Nine memories per antenna position are available when used with the Paragon or Omni V where band information is provided. The finishing touch for any station.

UNIVERSAL STATION ACCESSORIES

MODEL 240KW, DRY DUMMY LOAD. Forced air cooled. Designed to operate at 1500 watts "key down" for up to 2 minutes. 1.5 to 150 MHz. Alarm sounds if over-temperature reached. Rear panel connection for scope signal.

MODEL 254 200 WATT TUNER. "T" match design matches a broad range of impedances. Simple and fast to operate. Metered for power out and SWR. Small size and light weight makes this a favorite for mobile and portable operation.

MODEL 238, 2 KW ANTENNA TUNER. Time proven "L" network design will load virtually any antenna from 1.6 through 30 MHz. Metered for power and SWR. High power roller inductor with slide rule position indicator. High voltage variable capacitors are the same style as used in the Titan amplifier.

MODEL 5060 TV/FM HIGH PASS FILTER. Forty dB attenuation below 30 MHz. Insertion loss 2 dB or less. Extruded aluminum housing with a type F female input connector. Output is 4" of RG-59 cable with a type F male connector.

MODEL 5061, 2 KW TRANSMITTER LOW PASS FILTER. Ninth order Chebyshev circuit with less than .2 dB loss. 50 dB attenuation at 50 MHz with 70 dB ultimate attenuation. Unlimited operation at 1500 watts at 2:1 SWR. Rugged extruded aluminum housing with SO239 connectors.

MODEL 605 SINGLE PADDLE ELECTRONIC KEYER. Operation is just like a "bug" except the dashes are also keyed automatically. Adjustable paddle tension, speed and weighting. Also great for mobile use.

MODEL 604 ELECTRONIC IAMBIC KEYER. Unique torque driven paddles and adjustable magnetic tensioning system for the ultimate "touch" control. Front panel adjustment of speed and weighting. A cw operator's delight.

...TWO FOR THE SHOW"

THE OMNI V is unique in all the world. All of the great attributes of digital technology are combined with the demonstrable superiority of a crystal mixed oscillator. Phase noise is simply eliminated as a variable. All ham bands, 160 through 10 meters, in 500 kHz segments with 30 kHz overshoot at the band edges.

Large frequency display that you will appreciate. Selectable narrow filters are available for the 9 MHz I-F as well as the 6.3 MHz I-F. All are front panel selectable, independent of mode. Up to 24 poles of cascaded crystal filtering! Dual VFOs with an offset/split system that allows independent RX tuning throughout the 500 kHz segment. Momentary REVerse button lets you hear/set TX frequency. Fewer controls, fast operation and minimum operator-error opportunities.

QSK cw, real FSK and superb ssb performance. Standard features include speech processor, noise blanker, RS-232 interface, nonvolatile RAM for the 25 channel memory system, memory scratchpad and much more. Status register, clock and calendar are backed with a long life, easily replaced, "drug store" lithium battery. Options for FM and a remote frequency tuning encoder that can be positioned anywhere. The reasoned choice for the operator who places the first priority on optimized performance in the ham bands.

THE TITAN "LEGAL LIMIT" LINEAR AMPLIFIER is a workhorse of proven stamina. The heart of the Titan is a pair of Eimac® 3CX800A7 ceramic triodes. This tube is the popular choice among designers of high realiability commercial and military equipment in this power range. We consider the 3CX800 to be the 3-500Z of the 90s. 1500 watts continuous key-down output with ease. Super clean ssb. Unbelievably fast QSK cw using a Jennings® vacuum relay, rather than diodes. Assured reliability, even if you "pull the trigger" into high SWR. You older, really experienced operators never do that, right . . . .

Another Titan difference is the power supply. The power supply capacity required to maximize the performance of a pair of 3CX800 tubes, in our judgement, dictates a transformer size that will not fit into a RF deck of reasonable proportions. We also like the idea of not compromising the cooling of the tubes by adding the heat from the power supply. The Titan power supply is housed in a separate utility enclosure and remote controlled.

The TITAN has everything but the biggest price, including a limited three year warranty.

THE MODEL 961 POWER SUPPLY is a linear design that will operate at 22 amps and still deliver good clean dc and maintain regulation. A fast action circuit breaker is built-in to protect the transceiver power amplifier. Front panel speaker and styled to match the Paragon and Omni V.

The "FORCE 5" station. Compare in any pileup!

The Omni V, Model 562

The Titan, Model 425

Model 961, Power Supply

HOW ABOUT OUR "CLOSET KILOWATT" CONCEPT!

The ultimate XYL pleaser. The entire station in a Ten-Tec cabinet measuring less than 19" high x 21" wide x 18" deep. 19" rack mount adaptors, with slide rails, are available for all major Ten-Tec equipment models.

OUR BEST FEATURE

is one you may never use. Our service and product support are legendary. Proven, not just claimed! All of our products are designed for field service to the board level. When you call us with a service need, you typically talk to one of the techs who services the model you own. Many times service can be accomplished with a "painless" mail order board exchange. If factory service is required, the work is thorough, fast and at a fair charge.

Send for our free catalog. Full description and specifications on all Ten-Tec equipment and accessories. Our enclosure catalog also available upon request.

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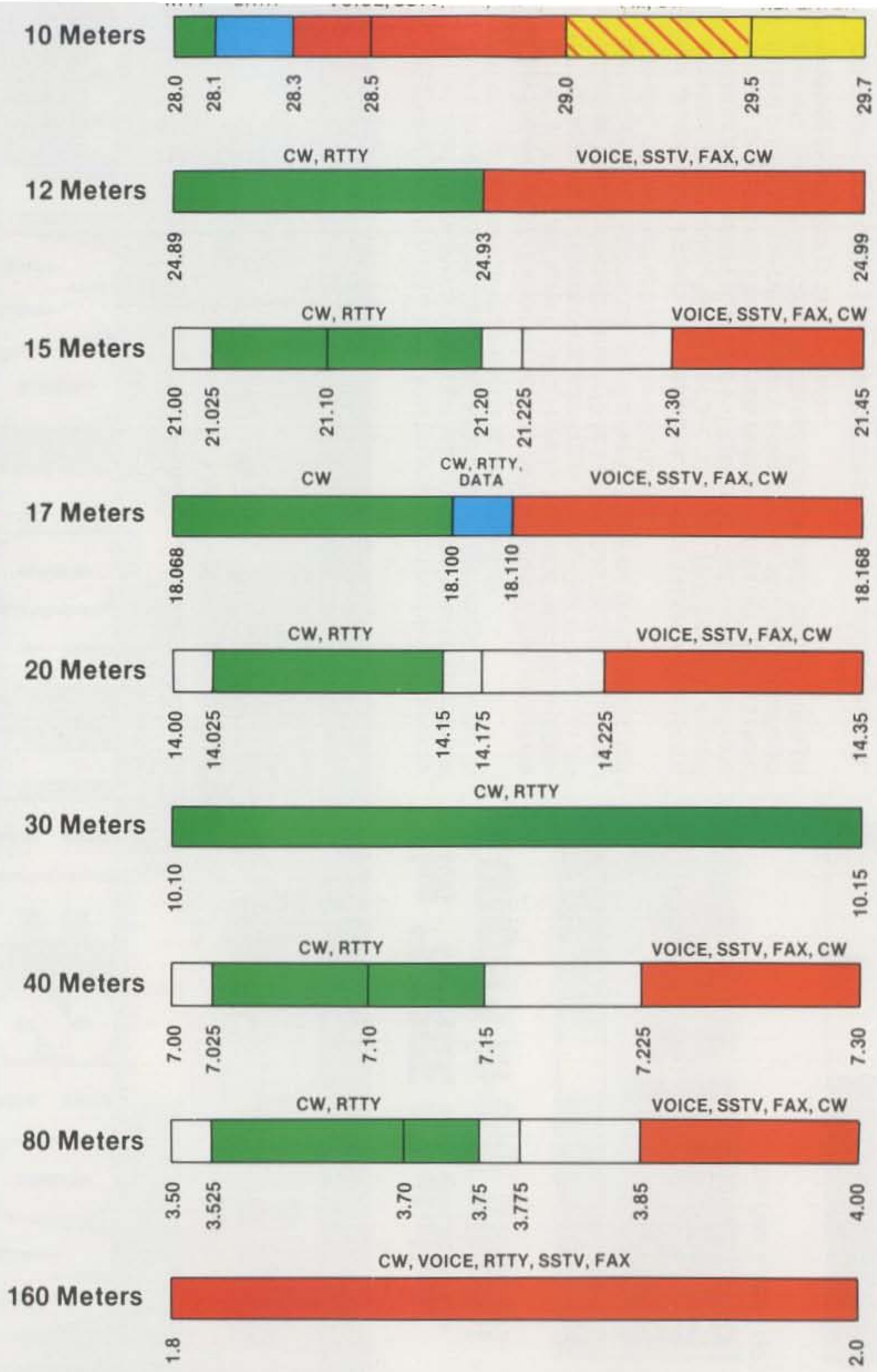
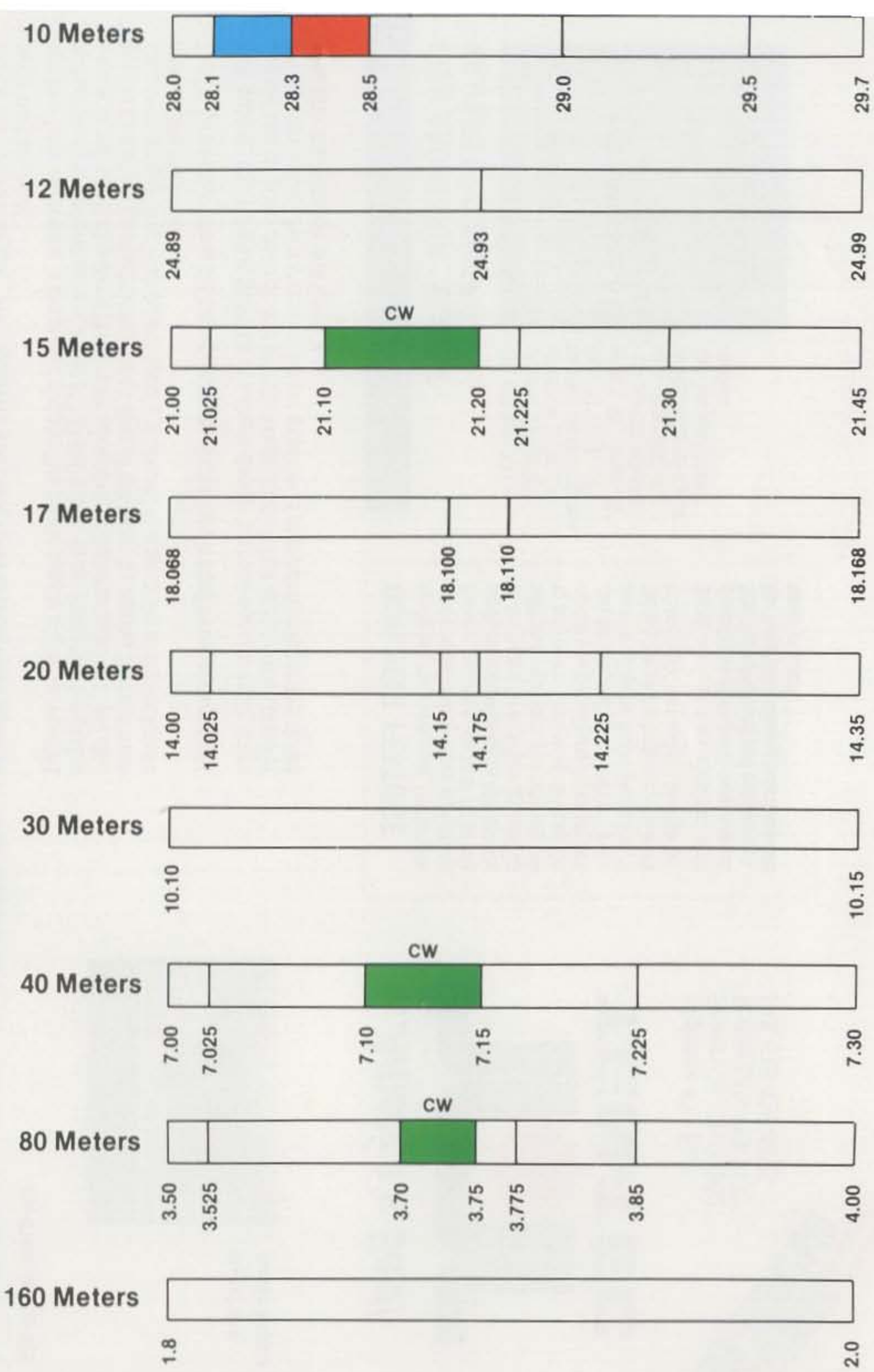
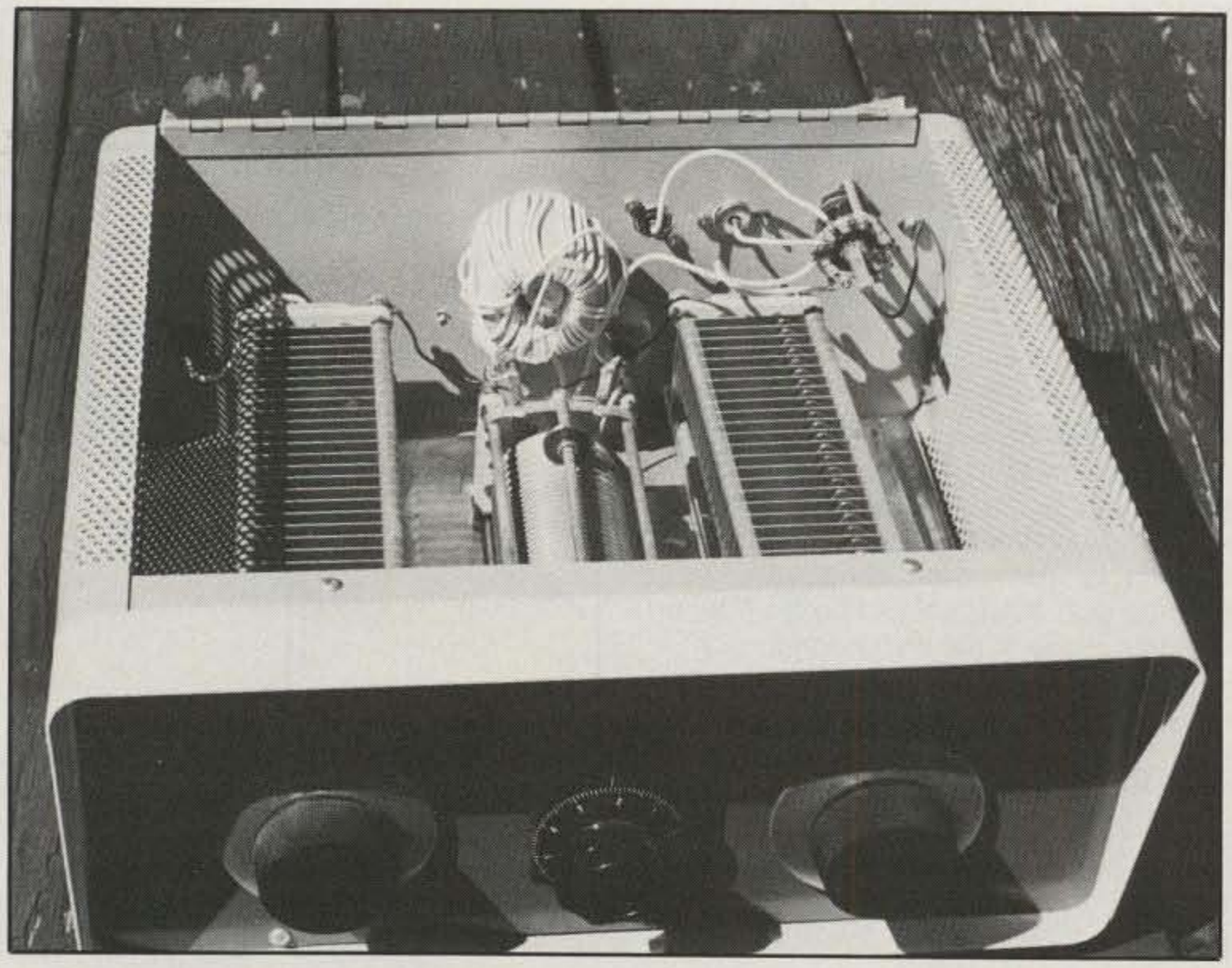


Novice & Technician Class Privileges



NOTES: (1). These charts are intended for general reference by Amateurs and can in no way include full details

shared with fixed service outside the U.S. Use caution to avoid interference with these services. (6). Novices are also per-



This is an interior view of the No Holds Barred Transmatch. This unit will handle the legal limit and will match any *antenna load the user will encounter.*

build. (Photocopies of the article are available from *CQ* for $2.50 and an SASE. A kit of parts for The No Holds Barred Transmatch is available from Radiokit, P.O. Box 973-C, Pelham, NH 03076.)

When amateurs ask me what I suggest for a multiband antenna, my answer is nearly always the same: a dipole of indeterminate length, fed at the center with an open-wire-type line. By indeterminate length I mean finding two supports, making a wire that long, cutting it at the center, and installing an insulator. I feed this with an open-wire line. Oh, yes. How long should the feed line be? Simple. It should be long enough to reach your station. This is what many amateurs call the McCoy antenna system, but as I said above, it was around long before my time. I might add that the antenna works well in an inverted-Vee configuration.

What is the minimum acceptable length for such an antenna? Keep in mind that any piece of metal—even a paper clip—is an antenna or even a multiband antenna. However, as you have already learned, the shorter the antenna, the lower the impedance. As a general rule, the overall length of a multiband dipole, to keep losses low, would be on the order of one-quarter wavelength. In other words, about 60 feet for operation on 80 through 10. That doesn't mean a dipole 30 or 40 feet long won't work on 80 or even 160. It will, but just not as well. The feed line in such cases should be open-wire-line types.

As to length? Another myth in amateur radio is to make the feed line a half wavelength long or multiples thereof. Just think about how stupid this is when you operate all bands and all frequencies. The only time we are interested in using half-wavelength feed lines is to measure the antenna impedance, because the impedance repeats at the half-wave points. Even so, there isn't one amateur in 10,000 who would have the equipment to make such measurements, and the measurements would probably be useless after you got them. How long should a feed line be? Simple. Long enough to reach from your antenna to the rig!

Still another myth I have been hearing more and more is that certain feed-line lengths will change the antenna pattern. That is strictly hogwash. The purpose of a feed line is to carry the power from the rig to the antenna, do it as efficiently as possible, and most important, do it without radiating. If the line radiates, obviously it is an antenna. Keep in mind that in a properly operating feed line the currents or voltages in a balanced line cancel any radiation from the line.

So, is it as simple to make a multiband antenna by just making it reach between two points? The answer is mostly yes, but as I mentioned above, there are a couple of criteria worth following. As I said at the outset in the first part, make the antenna as long as you possibly can. In fact, once you exceed one-half wavelength for any given band, the longer antenna will produce multi-lobes with gain when used on the higher bands.

This is one of my arguments with the G5RV antenna. There is no doubt that this is a popular antenna, but when all is said and done, when used throughout the amateur bands, 80 through 10 meters, it is merely a *tuned system* consisting of a dipole 102 feet in length. In other words, for the antenna to work on all bands and all frequencies, it must be a tuned system using a Transmatch.

There is one very misleading statement made about this antenna which should be cleared up. The antenna proper is 102 feet overall, the center being connected to a 16 foot length of twin lead or open-wire-type line. The implication then is made that this 16 feet of feeders acts as *part of the antenna* (in other words, increasing the length of the antenna to 134 feet, 16 feet times two conductors). A fact of antenna life is that a feed line is not part of an antenna. A feed line should not radiate. If it does, it is an antenna.

Another common misunderstanding is that certain lengths of feed line will change the antenna pattern. Again, don't misunderstand. A feed line can radiate if it has what is called "parallel standing waves" present on the line. Normally this is a very undesired condition. As I told you in Part I, the feed line currents should cancel radiation. But if parallel standing waves are present, this phase relationship of cancellation ceases to exist and the line radiates. I said "normally," and I'll tell you why.

Feeder radiation may or may not be a serious problem. If you buy or construct a beam antenna, you expect a certain pattern as to gain, front-to-back, and front-to-side. However, if the coaxial feed line is radiating, the pattern can be shot to heck—or at the least be messed up. To illustrate this point it is worth telling you about something that happened to me years ago.

Some years ago there was an amateur radio distributor/manufacturer called World Radio in Council Bluffs, Iowa. They put together a package deal which included one of their transmitters, a tower, and a triband trap beam. The deal was popular, and many amateurs, including two neighboring amateurs who lived in south Texas, bought this setup. In other words, they had identical setups—almost!

The problem they encountered was that when they started to make signal comparisons, they found a great variation in the front-to-back patterns of the two antennas for each of the three bands—and I mean *great* variations. One amateur, for example, would have an S3 or 4 difference on 10 meters, while the other would have exactly what was claimed for the antenna.

The result of their confusion was a letter to me when I was working in the Technical Department of the ARRL. Much correspondence flowed back and forth, but I could arrive at no good answer. It turned

out that I had to go to Texas on a lecture tour, so I arranged to visit these two amateurs. After much checking and observing I realized that the only difference was that the amateurs used different lengths of coax in their feed systems. I knew about line radiation, but at that time I did not think it important enough to mess up the patterns. Well, I was wrong. Using a grid dip meter I found that the outside of the outer conductors was resonant in the bands with which we were having the problems, so changing feed-line lengths corrected the problems, and both beams became identical as to front-to-back performance. The result was an article I wrote some years ago in *QST* called "When Is A Feed Line Not A Feed Line?"

Getting back to our discussion, suppose on the other hand you put up a multiband horizontal dipole and got feed-line radiation? Is this necessarily harmful? Probably not, because the feed-line radiation is going to go somewhere and work someone for you, because normally it would not be lost power but actual radiated power. To be honest, I prefer a feed line that doesn't radiate because I then know what to expect. Of course, if you are savvy, you are going to ask, "How do I stop my feed line from radiating?" That is a good question.

If we study a piece of coaxial cable, we find that we have a center conductor and

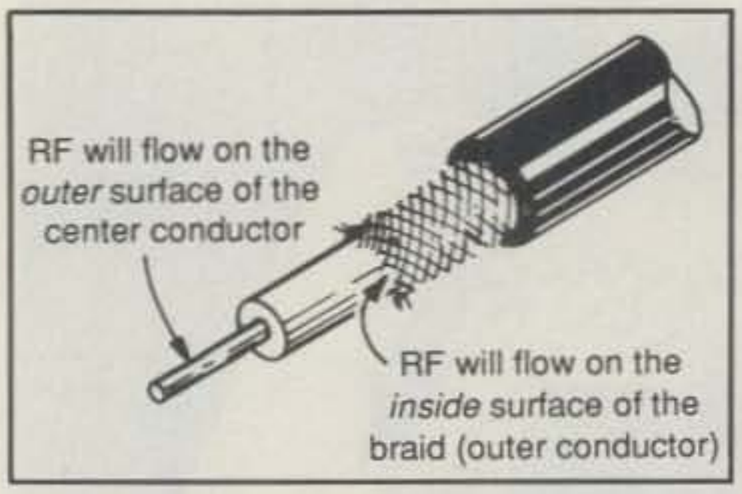


Fig. 2- If you were to cut a piece of coax flat or square across the end and view it, you would see that the RF flow is on the inside *of the outer conductor and on the* outside *of the outer conductor. As I pointed out, there should be no flow on the outside of the outer conductor.*

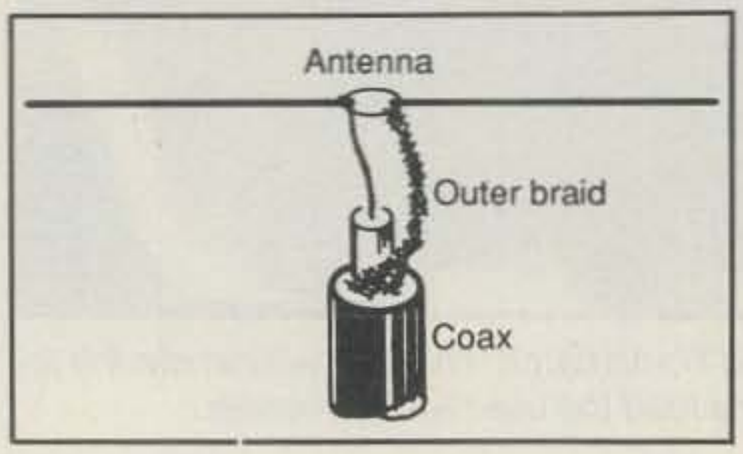


Fig.3- When connecting coax to an antenna directly, you should connect both the inside and outside *of the outer conductor to one side. (See text for explanation.)*

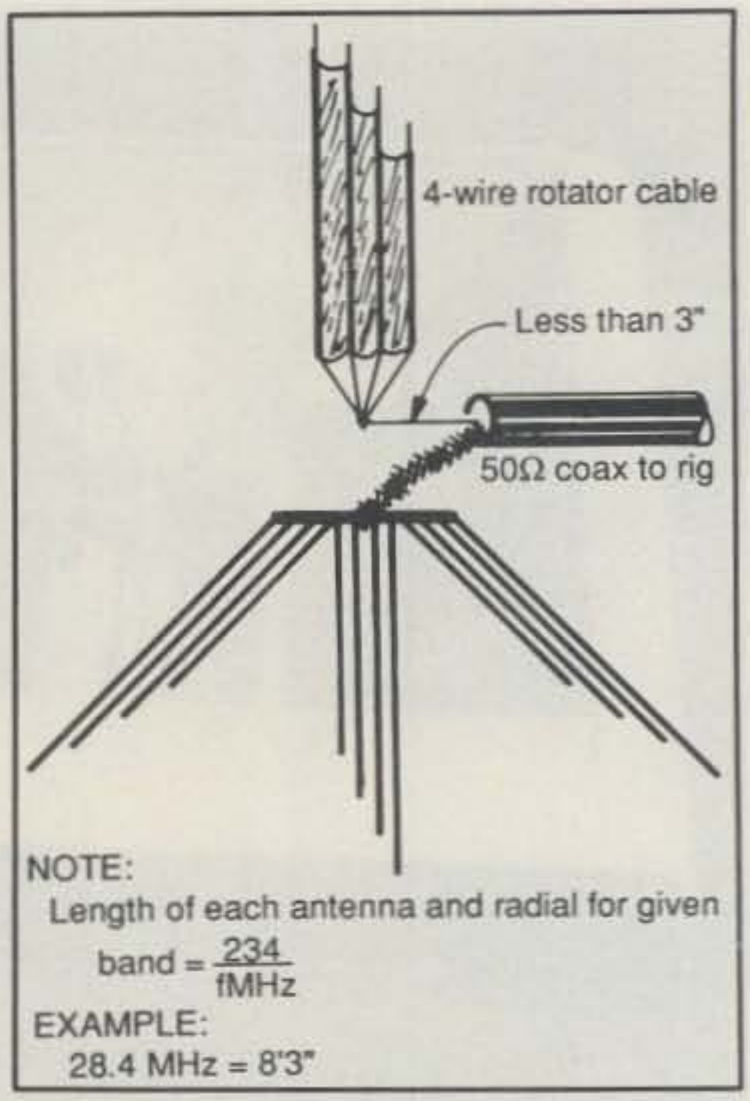
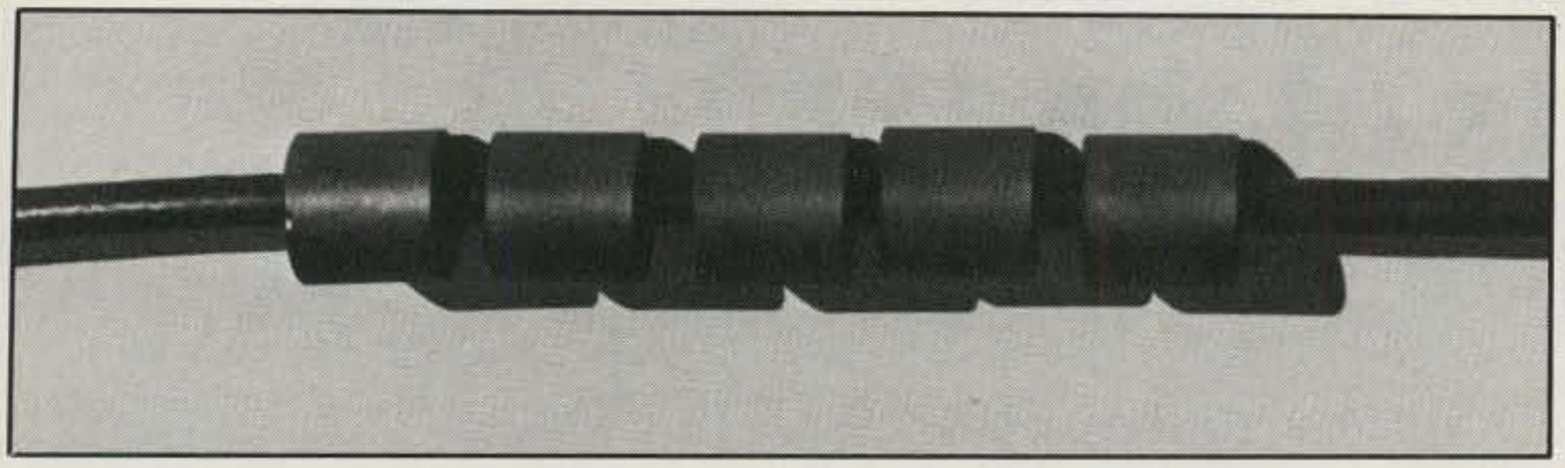


Fig. 4- In Part I, I showed a simple single-band ground plane. Here is a multiband ground-plane vertical. Use ordinary four-conductor TV rotor cable for the antennas. Simply peel back the insulation and cut the antennas and radials to the desired length. The antenna can be suspended, or the vertical section constructed as described previously.



Here is a photo of ferrites slipped over RG-8 type coax to make a sleeve choke as described. This material is available from Palomar Industries.

an outer conductor, the outer conductor being in the form of a sheath of copper strands. RF will flow on the *outside* of the inner conductor and on the *inside* of the outer sheath (see fig. 2). There should be no RF flowing on the outside of the outer conductor. When we connect the coax line to the dipole antenna as in fig. 3, we unavoidably must connect both the *inside* and *outside* of the outer sheath (the entire braid) to one side of the antenna.

Remember earlier I spoke of reactance and how it stops the flow of RF. In this case if there is no reactance at the antenna feed point to stop the flow of RF down the outside of the outer conductor, then we will have parallel standing waves. This isn't an easy concept to explain or understand, but it happens.

Antenna baluns are widely used by amateurs for the purpose of divorcing the feed line from the antenna to prevent such coupling of RF to the outside of the line. The word "balun" means "balanced to unbalanced." In my judgment baluns are fine when they work, and I would certainly recommend them. (The two amateurs in Texas both had baluns on their beams.) Unfortunately, baluns are not always the answer, and here is why.

If the length of the feed-line outer conductor from where it is attached to the antenna to where it ultimately reaches earth ground happens to be electrically resonant to the band or bands we are using, we can have a problem. Let me state first that we don't know where electrical ground is; the line goes through SWR and power bridges, tuners, switches, rigs, etc., before it finally reaches ground and establishes its length.

Let's backtrack a little here. Why are we concerned that the outside of the coax is resonant? Quite simple. The field of RF surrounding a transmitting antenna is very, very strong. Any wire or metal that is resonant and happens to be in that field is going to couple RF to itself, and in our case it happens to be the feed line. (You can see why a balun may or may not help the situation.) I recall when I first got into amateur radio I lived in a house that had old-fashioned knob and tube wiring. Whenever I went on 20 meter CW the lights would blink on and off. The answer was that the wiring was resonant on 20 and of course coupled enough power from the antenna to excite the lights!

So how do you find out if you have this problem? One of the simplest ways is with an RF power or SWR bridge. Nearly all amateurs have one or two. Parallel standing waves have one bad habit: They can get into your bridge and foul up the readings. One method of detecting the presence of parallel standing waves is to set the SWR bridge in the reflected-reading position and get enough of a reading so that you can observe the meter. You only need to run 25 watts or so (I don't recommend doing this at high power.). Once you have the reading, run your hand up and down the outside of the coax, holding your hand around the coax. Your body and hand have enough capacitance to affect the line reading if parallel standing waves are present.

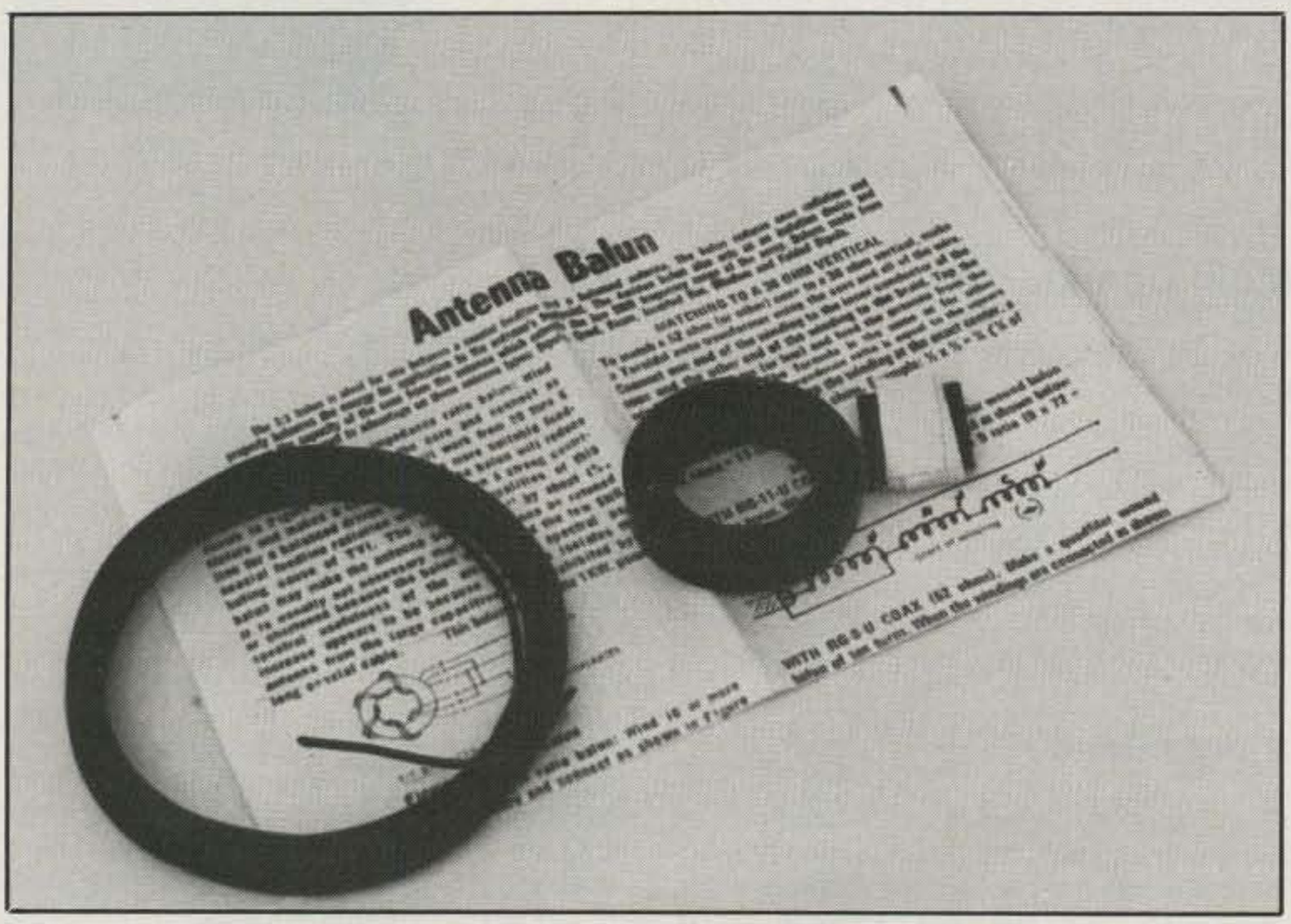
Another method is to use a grid dip-meter. Form a section of the coaxial line into a small loop to fit over the grid-dip coil. Then grid dip the coax (you are actually checking the outside of the outer conductor). If you find a dip in the band with which you are concerned, you should change the length of the line to move that dip out of the band. In other words, make the braid nonresonant. Oversimplifying, you have created a high-impedance and reactive path for that outer braid outer conductor at your antenna.

During WW II the Germans found that their intelligence operations were being compromised. They discovered that the enemy (us) was managing to detect the signals that were supposed to be enclosed inside the coax lines, when actually the signals were leaking to the outside. They found that by using toroidal chokes slipped over the coax, they could eliminate the problem. This cure works for us with antenna feed lines.

Walt Maxwell, W2DU, recently described curing RF on the outside of lines by using toroids slipped over the coax to act as a current choke to choke off the RF flow. (This system has proven very successful in my tests.) I strongly recommend the W2DU approach because a properly designed "sleeve balun" is a very low-loss device, and Walt Maxwell has made very extensive checks to prove the benefits of this type of balun.

I therefore recommend two steps: Use the sleeve balun and also make sure any lines are nonresonant. Then you should not have any problems. See Part III for more on this problem.

All this may be a tempest in a teapot if you'll forgive my cliches. However, I have seen and known many amateurs who bought a beam and then complained about front to back and so on when the fault was feed-line radiation. I know. I've been there. In Part III, I will discuss feed lines and more about antennas. CQ



This is a balun kit also marketed by Palomar, and it is quite simple to construct.

Results of the 1989 CQ World-Wide RTTY DX Contest

BY ROY GOULD*, KT1N

Entries were up almost 15% for this, the third year of the contest. The level of activity grew substantially from the USSR, and the popularity of this event increases each year. Many entries noted that they were new to the digital modes and that this was their first contest ever!

Dale Sinner, W6IWO, of the *RTTY Journal*, which co-sponsors the contest, did an excellent job of publicizing the contest, and many of the staff of the journal sent copies of the rules and log forms to RTTY DXers throughout the world. George, KB2VO, once again helped me compile the results. In February I spent a day at George's QTH in Florida. We sat in front of his computers for the better part of a day as we sorted and ran reports from the data base. A few days after I left, George suffered a heart attack and underwent by-pass surgery. He is home recuperating, and all looks good for a full recovery. Get well soon, George, and thanks for your unselfish help. Also thanks to Roland, N1FTD, my local software helper who spent a number of nights putting together the final pieces.

A number of DXpeditions were planned for this year's contest, but one of them ran into a slight problem. UZ9CWA/A thought they had arrived in Zone 18, but when they arrived at the exact QTH from which they were to operate, they discovered that they were actually in Zone 17. Then as Murphy would have it, they ran into all sorts of equipment problems and only were able to make 100 QSOs. Next year they promise Zone 17 for sure.

As usual there were many logs with errors in scoring, no summary sheets, and the like, but not as many as last year. At least we are getting better at that. Some logs were missing the required data; these I had to change to check logs. On the other hand, there were some logs that were so neat and precise they could win an award just on appearance!

Single-Operator Class

Some great scores and individual efforts were made in 1989. John, TG9VT, made good on his promise to try a single operator attack and as a result made 1029 QSOs for a total score of 1,038,015 points to run away with the World Single-Operator All-Band Plaque. Ted, W2FG, then edged out Barry, W3FV, and Ed, W3EKT, who operated contest station W3LPL, to take North American honors. In South America Jules, W2JGR, the other half of the TG9VT multi-operator team from previous years, went to Ted's HC5K QTH in Cuenca, Ecuador and operated as HD5Z to sneak past Raul, HK1LDG, who was using the call 5K1R, by 50K points.

*P.O. Box DX, Stow, MA 01775

The ops at JTØDX. Left to right are HA1TJ, HAØMM, and HA6NF.

Raul had more QSOs, but Jules had more multipliers to make the difference.

Europe had our globe-trotting friend Walter, DJ6QT, operating from T77C to set a new record for Europe with 875,350 points. Karel, OK2FD, gave chase but fell a bit short of catching Walter. Next in Asia Mike operating as RW9C Asiatic Russia turned in a great effort with 733 QSOs for 756,756 points. Mike stayed behind when the boys went off to the ill-fated Zone 18 DXpedition, and well he did.

Oceania was represented with Ken, KE9A, operating portable DU3. With a score of 242,786 it was more than enough to take the Oceania Plaque. Our only entries this year from Africa were both single-band entries and both were from the Canary Islands, with Juan Jose, EA8AKQ, with 74,942 on 21 MHz and Oscar, EA8RA, on 14 MHz with 73,200 points. Therefore, the plaque goes to Juan Jose. TJ1MW appeared in a number of logs, but no log was received from him. Nice to have TJ active.

Multi-Operator Class

Well, the Association of DX-EX group from Ecuador operating once again as HD8EX smashed their previous record with a score of 2,290,860 points to take the first-place plaque. Next came the boys from Latvia operating as UQØGZW with 1,726,108 points, a great effort. Following next were the LZs, LZ8A with 1,399,032 points and LZ1KAA at 1,074,264. The group from India operating as ATØJ came next with 1,006,343 points.

Single Band

Each year the number of single-band entries continues to grow. I would like to see some additional plaques sponsored to recognize these efforts. Fourteen MHz this year had YU2W with 598 QSOs and a score of 246,272 to take that band. KEØKB had 468 QSOs and a score of 138,205 on 21 MHz. On 28 MHz JH1LBR made 298 QSOs for a score of 107,133. On 7 and 3.5 MHz HB9DCQ had a high score of 46,865 with 224 contacts and SP3SUN had 78 contacts on 80.

Jack, NT3B, at the keys.

Bo, SM4CMG, making one of his 597 QSOs. He was eighth place in the world.

Rules Changes

I received a number of suggestions, questions, and recommendations regarding the rules. Many of these were in regard to multi-op stations. As a result and also to bring the contest closer to other *CQ* WW contests, there are *major rules changes* for this year's contest. There will be two (2) new operator classes, multi-multi and single operator assisted. Look for the rules in this issue. Please pass the word along

PLAQUE WINNERS

WORLD SINGLE OPERATOR: Advanced Electronic Applications, Inc.(AEA). Won by **John Troost, TG9VT.**
WORLD MULTI-OPERATOR: Advanced Electronic Applications, Inc.(AEA). Won by **Association of DX-EX, Ecuador, HD8EX.**
TOP SCORE NORTH AMERICA: HAL Communications Corp. Won by **Ted Marks, W2FG.**
TOP SCORE SOUTH AMERICA: Association of DX-EX, Ecuador, S.A. Won by **Jules Freudlich, HD5Z.**
TOP SCORE ASIA: N5JJ Memorial. Won by **Mike Kochnev, RW9C.**
TOP SCORE EUROPE: HAL Communications, Inc. Won by **Walter Skudlarek, T77C.**
TOP SCORE OCEANIA: The RTTY Journal. Won by **Ken Claerbout, KE9A/DU3.**
TOP SCORE AFRICA: Roy Gould, KT1N, and Roland Belanger, N1FTD. Won by **Juan Jose Laguna, EA8AKQ.**
TOP SCORE SINGLE BAND: Kunihiko Fujii, JH1QDB. Won by **Robert Orghoci, YU2W.**

and help by sending copies of the rules to your RTTY DX friends around the world.

Summary

Thank you for your participation and comments. All the certificates should be in the mail and the plaques ordered. Please consider sponsoring a plaque and talk up the next one to your RTTY friends, September 29–30, 1990. What many do is put the rules in a buffer and send them to a station with which they are in QSO. This really helps spread the word around the world. I have the rules on disk both MS-DOS and Commodore C64 and would be glad to supply same for any MSO and packet bulletin board operators. Drop me a note.

73, Roy, KT1N

RTTY Chatter De USA and Canada

Not enuff activity single band 10; will be back next year single-op all-band . . . *AA5AU*. Once again I could not work AT0J on 40 . . . *W2FG*. Five band QSOs with three stations! . . . *KM1D*. AT0J ain't in Kansas! . . . *N1FTD*. Surprise! On 10 both HV3SJ and A22BW answered my CQs . . . *N6GG*. Where were the states on 10 meters? . . . *K0BJ*. Worked 3 new ones all on 15 meters . . . *K8NN/0*. First RTTY Contest ever. Only worked 10½ hours. When the sun came out I wanted to go outside and play . . . *NK2D*. First time entry, great fun, will be back next year for the full 30 hours . . . *WA4MCZ*. Only one station from Europe. Need more DX participation on 40 . . . *WB5LYT*.

Ran only 50 watts on 40 as RF knocked the computer out . . . *AB4ES*. Thanks for the contest. I'll be back next year. Great fun . . . *WA6SDM*. The remains of *Hugo* broke all my guy ropes. Had to take time to fix them . . . *KD3KW*. Had more "hecklers" this year for some reason? . . . *K6WZ*. If I should win this, it will be my swan song; will give some other

Ken, KE9A/DU3, is all smiles after winning the Oceania Plaque.

guys a chance and enter single band . . . *TG9VT (Let's see if he makes good on this.—ed.)* My first contest! Never thought 20 watts to a vertical would do this well . . . *VE2KRR*. Lost power 6 times due to hurricane *Hugo*; 10 was "hot" on Sunday! . . . *K1EVU*. Gotta find more than 30 watts . . . *NA2Q*.

Glad to help with South Carolina . . . *W8CNL/4*. *Hugo* took down all the antennas just before he contest; tough soldering in the wind . . . *AA4JN*. Maybe getting UQ on three bands justified the electric bill . . . *KI4MI*. Spent half the weekend in a tennis tournament. Should have stayed here! . . . *N5OVV*. I'm fairly new to RTTY. Really enjoyed it . . . *NW0F*. Can't believe I forgot about the contest until the second day . . . *KD2BW*. I meant to have my beam finished, but the vertical did get out. Next year! . . . *WA3ZKZ*. Great to work AT0J and TA2BE in the closing minutes. Fantastic contest! . . . *N8ABW*. Could be the number one RTTY contest by next year . . . *N2WK*.

Murphy struck several times . . . *KL7TF/4*. Not much of a score, but at age 74 my fingers aren't as fast as they were in past years . . . *KK8I*. Lost my all-band antenna the day before, so single band only . . . *K4IBP*. Just browsing looking for new countries and zones . . . *W9CD*. My first RTTY contest. Really enjoyed it, but would like to see a high and low power category . . . *NT3B*. Please make the rules the *same* as the SSB and CW contests . . . *W2KHQ*. Biggest thrill was working Bo, SM4CMG, on 40 . . . *WB6ZHN*. Had a tooth pulled 2 hours before the test. Medication kept me up! Another great contest from *CQ* . . . *NC7K*. Thanks for another great contest. Great condx on 15 . . . *KE0KB*.

Great condx, but WX was too nice to spend the weekend in the shack . . . *VE7BDQ*. My first RTTY contest. Great fun . . . *NE1I*. Operated W3LPL. Great contest station, but I made some serious mistakes and the score shows it; wait til next time . . . *W3EKT, ED*. I chose the right band for single band finally . . . *W6/G0AZT*. I need RTTY filters . . . *AB4LX*. The exchange is too long. Can we make it shorter like the SSB/CW contests? . . . *N3UN*. Biggest thrill was calling CQ and creating a pile-up from the east coast to Japan! . . . *NL7RA*. Amp blew up just before the first QSO . . . *W3FV*. My best score to date . . . *VE2JR*. Hope I did the paperwork right . . . *K7OXB*.

It was amusing to be mistaken for a UB or a YV station . . . *VY9CC*. Lost power first few hours of contest due to *Hugo* . . . *KC2FD*. DXCC is easier when there are contests like this! . . . *W1HFN*. RTTY contesting is a great way to relax . . . *VE7ZZZ*. Managed to snag four new ones despite S9 power line noise all weekend . . . *WB8YJF*. Good contest, but how abt off times 2 hrs instead of 3? . . . *WF5E*. I've only been a ham 2 years. My first contest ever . . . *N8JNB*. Why do I have to separate the states and countries? . . . *WA6UFY. (So I can check the scores more easily.—ed.)* My first RTTY contest was in 1967. Finally came back . . . *N2FF*. My first, but not my last . . . *K0LUZ/4*.

Ten was so much fun I just stayed there . . . *AB8K*. Great condx, great contest . . . *NT0V*. First time I have ever sent an entry in for a contest . . . *W4KQS*. Never agn without an on-line logger . . . *KE5BK*. Picked up countries 230, 231, and 232! . . . *NJ0M*. What a way to spend a nice weekend. Are we nuts? . . . *KA5YSY*. Had a ball . . . *VE7CQD*. I was having a ball til my xcvr died . . . *W8AKS/6*. TJ was a new one for me . . . *K8AC. Hugo* had me worried, but the RF kept him off the New Jersey coast . . . *NO2T*.

RTTY Chatter De DX

There was never a dull moment. Hurricane *Hugo* traffic with one hand and the contest with other. Thank God I only have two hands . . . *9Y4DG*. The standard work week in HZ land is Saturday thru Wednesday, making it impossible to operate a full contest. Big pile-ups! . . . *HZ1AB*. Very fine propagation, FB contest . . . *YO6JN*. Missed UB, EA6/8, LU, CE, got DU, JT, VU, A2 . . . *HB9DCQ*. Thanks for nice contest . . . *SM7BGE*. Thanks for the contest . . . *HA5AEZ*. Had to work this year; sure hurt the score . . . *KX6OI*. Condx fantastic. I have never worked so many stations in an RTTY contest before. Congratulations . . . *SM4CMG*. Wasted one-half hour chasing JT0DX until I realized he was working USA only . . . *HD5Z, Jules*.

Enjoyed the contest, but unable to find the time or stamina to put in a big effort . . . *VK2BQS*. Very few stations on 80 and 40 . . . *HB0/HB9NL*. Excellent 10 meter condx; band was open worldwide . . . *JA2NNF*. More fun than SSB. Be back next year . . . *OE1WWL*. Perhaps first time a CE0, HZ1, KX6, and a KH2 in an RTTY Contest? . . . *F6BVB*. Wonderful propagation. PSE all QSL card via YU2AYZ . . . *YU2W*. Shocked to hear two stations, same call on two different bands at the same time! . . . *AT0J*. Our first RTTY contest . . . *ops at JJ3YBB*. Some great DX on. Guess I will have to add an amp to get through Europe. See you next year . . . *ZL2AKI*. I had to run a 12K race during the rest period, and I won it, but I was

TOP SCORES

SINGLE OPERATOR

WORLD ALL BAND		WORLD—14 MHz	
TG9VT	1,038,015	YU2W	246,272
T77C	875,350	LZ1KDP	197,127
HD5Z	776,195	4M5RY	176,880
RW9C	756,756	G4SKA	172,235
OK2FD	743,175	KF5YE/YV5	159,639
5K1R	725,620	FF1NZH	149,028
IK5CKL	682,746	NB2P	143,136
SM4CMG	643,566	NJ0M	111,144
W2FG	572,684		
W3FV	517,816	**WORLD—21 MHz**	
		KE0KB	138,205
		CE6EZ	122,512

MULTI-OPERATOR

HD8EX	2,290,860	RL8PYL	829,704
UQ0GZW	1,726,108	DL0GK	654,080
LZ9A	1,399,032	UZ3AYR	534,130
AT0J	1,006,343	JJ3YBB	517,824
YT3T	907,882	VE7ZZZ	477,085

F6FNL, second place France, looking forward to doing the paperwork.

very tired at the end of the contest . . . *IK5CKL*.

I'm sorry I missed the one mil mark, but had no time to look. Did work 65 countries! . . . *T77C*. Three new countries and one new state. Great contest. See you next year . . . *VK3EBP*. Great, best contest ever . . . *G0ATX*. Just taking part is a thrill . . . *G0CWC/A*. Biggest thrill was working HD8EX and TG9VT on 80. Station relay problem kept us from 1000 Qs . . . *YT3T*. Had trouble with my antennas . . . *SP6AOI/A*. Our first serious effort. Great contest . . . *RL8PYL*. Condx fantastic. Sri I could not operate the full 30 hours . . . *JR1IJV*. My first RTTY Contest. Excellent . . . *YV6PM*.

See you next year. Great contest . . . *HB9DCW*. Broke many of my own contest records. See you next year . . . *YO2IS*. Worked 30 new countries . . . *G4BWP*. Thank God, written log saved from computer log crash . . . *JH1QDB*. Lots of problems with the computer . . . *HA6PX*. Lots of new ones for my DXCC . . . *JH1LBR*. The best competition ever . . . *4M5RY*. Sorry, but we had many many power supply problems. Better next year . . . *UZ9CWQ/A*. I stayed behind when the boys went to UZ9CWA/A and operated S.O. . . . *RW9C*. KX6OI called me . . . *OZ8RO*. A great contest, my first in mono band . . . *FF1NZH*. Got a zone 2! Maybe WAZ RTTY is possible? . . . *JA6WW*.

Great condx, great DX, but most of all FUN . . . *CE6EZ*. The greatest of all RTTY contests . . . *DJ3IW*. Very good activity . . . *SM5FUG*. Worked my last zone (23); hit a rate of 43 an hour! . . . *OK2FD*. My first mono-band attempt; lots of new ones . . . *HK4BHA*. Got a few new ones, including HC8 on three bands . . . *JA1AYC*. Pse think abt reducing the off times minimum . . . *KE9A/DU3*. Many countries. See you in 90 . . . *SP2UUU*. My first RTTY contest, a beautiful time . . . *UV9UWW*. I find it very difficult to work stateside from this end . . . *DU9LMT*. Good condx on 10. See you all next year . . . *EA5FKI*. I gave up on getting JT0DX and then he called me on 40! . . . *YU3EA*. See you again next year, maybe from a new RTTY country? . . . *ops at UQ0GZW*.

Raul, HK1LDG, 5K1R, second place single-op South America.

Station Operators, Multi

LA3T: LA7SP, LA2ZAA, LA6OEA & LA7QM. **HZ1AB:** N4KT, N0AE & K1VBM. **AT0J:** VU2JX, VU2SGY, VU2UM & VU2NTA. **SP1PBW:** SP1BZZ, SP1AMU & SP1B22. **OK1KSL:** OK1FAK, OK1AHG & OK1AQ. **JJ3YBB:** JA3FHL, JA3PJL, JH3FQF, JH3UHG & JE3TXA. **G0CWC/A:** G0CCD & G4OJJ. **UO40WQ:** UO5OLW, UO5ONV, RO4OR & UO5ONA. **YT3T:** YU3HR, YU3BQ & YT3EW. **RL8PYL:** UL7PCZ, UL7PEZ & RL8PY. **RW9C:** UZ9CU, UA9CQA & UA9CR. **VE7ZZZ:** VE7ARS, VE7AV, VE7BVS, VE7DRS, VE7DSN, VE7EAP, VE7SK & VE7SSS. **HD8EX:** HC5K, HC5T, HV8VB, WS7I, WV7Y & WA7EGA. **JA1YFG:** JO1IDL & JO1RUR. **UB4LWC:** RB5LIX, RB5LTZ, UB4LSB, UB4LRQ, UB5LKD & UB5LMV. **LZ1KAA:** LZ1PV, LZ1KX & LZ1RF.

UZ3AYR: UA3DQF, UA3DRG, UA3-170-793 & RA3-170-123. **JT0DX:** HA0MM, HA1TJ & HA6NF. **KC1BS** & KA1SSU. **SP3BLD:** SP3HZG & SP3IBM. **UB4IZA:** Nehaenko & Borsuckij. **DL0GK:** DL9YAJ, DL2DBS, DF8QB, DJ6VP, DF7XE, DJ6VE & DL8YBW. **KY1F** & KA1RJJ. **FF6KRJ:** FC1JEN & F5CW. **VK2RT:** VK2RT & Ben. **UZ3DWH:** RA3DUT, UA3FA & UV3DR. **LZ9A:** LZ2XA, LZ2BE, LZ2DF, LZ2E-41 & LZ2H-133. **EA2UAD:** EA1BXJ & EC2ATG. **EA3RCL:** EA3GCT, EA3GCV & EC3CSJ. **UQ0GZW:** RV9FQ, UV9FM, UA9FBV, UQ2GM, UQ2GID & UQ2GKL. **OK3RJB:** OK3TCL, OK3CKW & OK3TCN. **UZ9CZM:** RA9CPQ & RA9CFB. **SP9KVF:** SP9TCE, SP9TCF & SP94455KA. **UZ9CWA/A:** UA9CGA, UA9CR & UZ9CU.

Number groups after call letters denote following: Final Score, Band (AB = all), Number of QSOs, Points, Zones, Countries, and State/Canadian Provinces. Winners are in listed in boldface.

CLASS AB—SINGLE OPERATOR
NORTH AMERICA
UNITED STATES

CALL	SCORE	CL	QSOs	POINTS	ZONES	COUNTRIES	W/VE
W2FG	**572,684**	**AB**	**644**	**1582**	**82**	**181**	**99**
W3FV	**517,816**	**AB**	**558**	**1532**	**71**	**173**	**94**
W3LPL	504,340	AB	605	1510	68	169	97
K8NN/0	**421,032**	**AB**	**604**	**1324**	**72**	**140**	**106**
NT0V	377,917	AB	552	1231	64	136	107
N6GG	**335,223**	**AB**	**412**	**1071**	**74**	**134**	**105**
K0LUZ/4	**333,756**	**AB**	**495**	**1143**	**63**	**144**	**85**
K6WZ/0	269,352	AB	468	1032	58	128	75
AB4ES	267,282	AB	471	958	69	137	73
KG5EG	**243,810**	**AB**	**452**	**903**	**58**	**113**	**99**
NC7K	**238,276**	**AB**	**427**	**839**	**67**	**102**	**115**
K0BJ	224,504	AB	381	844	64	114	88
N2FF	187,137	AB	327	783	65	121	53
NO2T	184,460	AB	319	802	59	124	47
NB2P	**143,136**	**14**	**431**	**1008**	**31**	**69**	**42**
K1EVU	**142,285**	**AB**	**308**	**715**	**43**	**99**	**57**
KE0KB	**138,205**	**21**	**468**	**1055**	**26**	**65**	**40**
N2WK	120,652	AB	222	556	57	117	43
AA4JN	117,066	AB	255	537	50	100	68
NJ0M	**111,144**	**14**	**428**	**842**	**27**	**58**	**47**
W1BIH	110,547	AB	198	519	43	94	76
NT3B	109,368	AB	253	651	45	83	40
NK2D	108,810	AB	231	585	50	101	35
KI4MI	97,110	AB	213	498	44	102	49
W8CNL/4	96,480	AB	190	480	54	111	36
W1BYH	95,760	AB	191	456	54	112	44
W2KHQ	95,749	AB	208	529	47	98	36
N3UN	**95,542**	**14**	**310**	**713**	**26**	**65**	**43**
WF5E	**89,516**	**14**	**321**	**644**	**30**	**62**	**47**
KC2FD	83,160	14	344	693	25	54	41
W9KDX	**82,698**	**AB**	**195**	**537**	**43**	**95**	**16**
NM3U	81,158	AB	181	434	52	93	42
W1IHN	78,864	AB	187	496	45	95	19
K9CW	71,734	AB	162	403	55	90	33
N9CWE	71,145	AB	243	459	37	68	50
KO4J	70,794	AB	189	437	40	81	41
W8LNK	**67,989**	**AB**	**161**	**393**	**46**	**94**	**33**
N1FIO	67,500	AB	158	375	32	112	36
WA3ZKZ	63,840	AB	162	380	47	84	37
NX7K	63,036	AB	156	412	45	83	25
AB8K	**62,800**	**28**	**240**	**628**	**22**	**60**	**18**
W6/G0AZT	**60,723**	**21**	**262**	**519**	**24**	**54**	**39**
WB8YJF	59,625	AB	148	375	53	77	29
KA5YSY	**58,681**	**21**	**274**	**581**	**18**	**45**	**38**
N8ABW	57,761	28	243	649	23	51	15
K8AC	55,735	AB	152	355	45	72	40
WA4SSB	53,856	AB	168	408	34	68	30
W2FCR	**53,833**	**21**	**211**	**533**	**22**	**56**	**23**
W6JOX	51,450	AB	153	350	40	69	38
W4TOY	49,731	AB	137	363	43	80	14
K7OXB	49,404	AB	122	358	43	90	5
KE5BK	46,460	21	203	460	22	50	29
WB2IVO	**46,458**	**28**	**196**	**522**	**22**	**54**	**13**
WA6SDM	46,306	AB	153	274	48	53	68
W1HFN	45,430	AB	133	295	45	68	41
W8PBX	41,422	AB	131	278	42	64	43
N2LT	41,230	AB	114	310	40	80	13
WA4MCZ	40,896	AB	113	284	48	73	23
K4JYS	**40,590**	**21**	**163**	**410**	**22**	**54**	**23**
NI5M	37,323	AB	104	261	47	61	35
AA5AU	**36,105**	**28**	**184**	**415**	**20**	**47**	**20**
KE0Y	34,580	AB	120	260	42	62	29
NA4M/5	34,028	21	184	362	21	36	37
WJ7S	**33,712**	**14**	**158**	**344**	**24**	**38**	**36**
W3KV	32,487	AB	97	273	39	75	5

MFJ MultiCom™ . . .

No set-up required -- just load and use this new MFJ-1278 software that gives you multi-gray level pictures and maps, easy mode change menu, on-line help and tons more . . . for only $59.95

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Receive exciting wire service news photos right in your shack!

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The MFJ-1278 with gray level modem using MFJ-1289 MultiCom™ program is the *only* multi-mode that lets you see — and transmit — these actual news photos with multiple gray levels. Your MultiCom™ manual shows you exactly where to tune to see these fantastic pictures.

You can transmit and receive multi-gray level WeFAX weather maps that show you actual cloud desnsity with gray levels — not just two level representations.

You can also transmit and receive multi-gray level SSTV pictures and brilliant, *full-color* packet pictures.

MFJ's exclusive One-Key Macros™ let a single keystroke do the work of many

A key feature of MFJ MultiCom™ is the exclusive One-Key Macro™ system of operation. By combining multiple keystrokes into a single touch you'll get snappy multi-mode operation.

Here's an example of how you can use it:

Say you're ragchewing on 20 Meters RTTY with your buddy in Alaska. On your other rig, you hear a station in the Falklands getting ready to transmit an SSTV picture showing the guts of his homebrewed linear amplifier.

Without thinking, you go to the One-Key Macro™ menu and press *one key* to select a One-Key Macro™ that changes radio ports, changes the mode to SSTV and sets up your MFJ-1278 and computer to receive his picture. His linear appears on your computer screen.

MFJ MultiCom™ gives you 80 One-Key Macros™ — plenty to simplify every conceivable MFJ-1278 operation.

MFJ Call-Alert™: Sounds an alarm when characters you specify are received

Only MultiCom™ gives you the new MFJ **Call-Alert™** that sounds an alarm through your computer speaker if a character sequence you specify is received by your MFJ-1278.

Now you can monitor any channel for DX

Multi-Gray AP Photo Received on 20.738 MHz

reports on a certain call, a favorite packet buddy or a ragchew on a specific subject.

And you don't even have to be at your station — so long as you can hear your speaker.

MFJ Auto-Set™ lets you instantly switch modes without retyping command parameters

MFJ Auto-Set™ lets you instantly switch modes without tediously retyping command parameters one at a time.

Why? Because Auto-Set™ lets you store, select and instantly send a set of command parameters that correctly sets up each mode.

You can use Auto-Set™ to set up a second MFJ TNC for a function like Easy-Mail™.

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Before MFJ MultiCom's Auto-Router™, you had to type in a digipeater node path *exactly* every time you wanted to use it. If you made just one mistake, you had to start over.

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MFJ's exclusive Packet Mutli-Plex™ lets you send and receive packet messages during binary file transfer

MFJ's new Packet Multi-Plex™ lets you carry on a packet dialogue *at the same time* you're making a binary file transfer.

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MFJ Multi-Word™: the only word processor specifically designed for multi-mode communications

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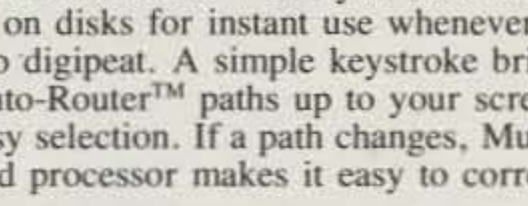

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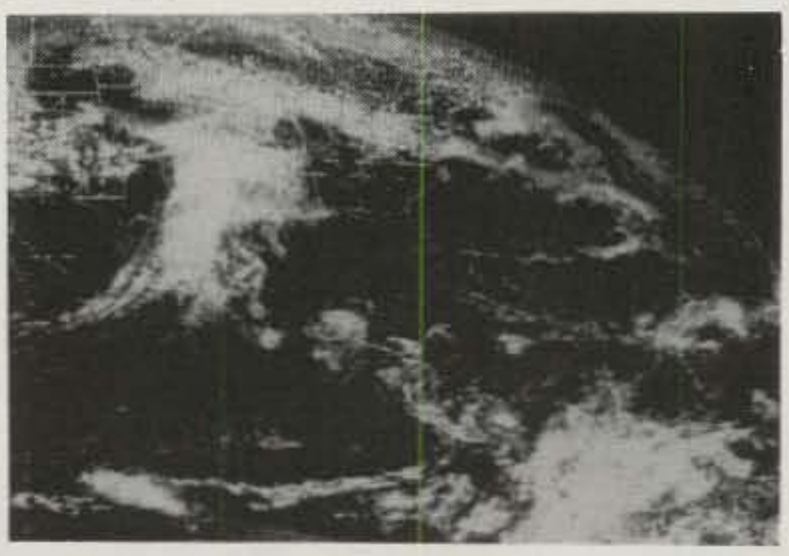

Multi-Gray WeFAX Map Received on 16.410 MHz

transmit any portion — no matter how large or small — *directly* from that file. All you do is bring up the file, mark what you want to send as a block and press the F9 key to transmit.

Multi-Word™ makes it easy to create and edit your Auto-Set™ and Auto-Router™ files.

Pressing a single function key brings up Multi-Word™ with on screen help when you need it. It's so friendly and so comprehensive that you'll want to use it for your every day word processing.

Point, shoot and transmit a video picture — all in one smooth sequence

MultiCom™ lets you integrate the optional MFJ-1292 video digitizer and the MFJ-1278 with multi-gray level modem. With a video camera you can shoot a video picture and transmit it by SSTV, FAX or Packet — all in one smooth sequence.

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Get yours today

MFJ MultiCom™ and the MFJ-1278 with multi-gray level modem gives you more modes, more features, more performance — *much* more for your money — than any other multi-mode.

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W4KQS	32,258	AB	110	254	35	61	31
W6IWO	29,025	AB	105	225	27	69	33
WB6ZHN	28,829	AB	104	227	40	56	31
N8JNB	26,035	AB	100	205	32	41	54
WA6UFY	25,842	AB	109	219	37	45	36
W9CD	21,780	AB	74	198	43	58	9
NA2Q	19,320	AB	85	184	30	49	26
KM1D	**18,834**	**28**	**98**	**258**	**18**	**43**	**12**
K4IBP	**16,929**	**14**	**95**	**209**	**21**	**38**	**22**
W3HXI	**16,549**	**21**	**96**	**247**	**18**	**41**	**8**
K9JNB/7	14,700	AB	69	175	21	48	15
KK8I	14,028	AB	57	167	28	54	2
KA0SIX	10,726	21	102	173	12	24	26
KD3KW	**10,004**	**28**	**62**	**164**	**15**	**36**	**10**
N1FTD	9,331	28	83	217	11	23	9
KQ3G	9,288	AB	52	129	29	32	11
AJ9C	8,960	AB	62	140	26	31	7
KL7TF/4	7,938	21	62	147	14	28	12
KD2BW	7,370	21	55	134	13	32	10
W8AKS/6	5,850	21	49	117	16	25	9
KD3KW	**5,508**	**7**	**66**	**102**	**10**	**15**	**29**
KE2NK	5,304	14	54	104	14	19	18
W4DEC	5,170	21	53	110	10	23	14
WB5LYT	**4,312**	**7**	**82**	**98**	**9**	**9**	**26**
NE1I	4,128	AB	29	86	17	29	2
NR1J	**2,958**	**14**	**34**	**102**	**9**	**20**	**0**
N5OVV	2,272	28	27	71	8	19	5
W1UDB	2,200	AB	28	50	15	16	13
AB4LX	**1,932**	**28**	**24**	**69**	**11**	**17**	**0**
NW0F	**1,416**	**28**	**20**	**59**	**8**	**16**	**0**

ALASKA

NL7RA	**35,070**	**AB**	**136**	**334**	**27**	**31**	**47**
KL7PG	21,520	AB	101	269	18	38	24

CANADA

VY9CC	**217,330**	**AB**	**401**	**1055**	**38**	**105**	**63**
VE2JR	**74,100**	**AB**	**174**	**475**	**40**	**86**	**30**
VE2QQ	67,497	AB	162	447	40	81	30
VE6CNV	**67,392**	**AB**	**179**	**432**	**40**	**64**	**52**
VE2KRR	38,870	AB	122	299	33	55	42
VO1EE	**29,718**	**AB**	**88**	**254**	**32**	**59**	**26**
VE7CQD	**25,476**	**AB**	**130**	**193**	**36**	**50**	**46**
VE3JAN	**22,440**	**14**	**103**	**264**	**21**	**36**	**28**
VE7BDQ	13,944	AB	66	166	24	38	22
VE1CEL	**11,644**	**AB**	**64**	**164**	**20**	**34**	**17**

COSTA RICA

TE2M	**68,775**	**21**	**369**	**917**	**23**	**52**	**0**

GUATEMALA

TG9VT	**1,038,015**	**AB**	**1029**	**2563**	**78**	**173**	**154**

HONDURAS

JA6WFM /HR2	**328,860**	**AB**	**530**	**1260**	**40**	**95**	**126**

MEXICO

XE3EB	**32,301**	**14**	**130**	**333**	**18**	**48**	**31**

PANAMA

HP1KZ	**68,150**	**AB**	**191**	**470**	**32**	**64**	**49**
HP1AC	63,360	AB	189	480	32	57	43

TRINIDAD

9Y4DG	**411,482**	**AB**	**500**	**1454**	**53**	**121**	**109**

AFRICA

CANARY ISLANDS

EA8AKQ	**74,942**	**21**	**237**	**707**	**25**	**43**	**38**
EA8RA	**73,200**	**14**	**305**	**915**	**16**	**30**	**34**

ASIA

ASIATIC RUSSIA

RW9C	**756,756**	**AB**	**733**	**2079**	**78**	**186**	**100**
UW9CY	269,696	AB	421	1204	51	115	58
UV9UWW	174,522	AB	369	986	48	81	48
UV9CC	100,928	AB	236	664	37	88	27
UA9FAR	**41,832**	**14**	**184**	**498**	**19**	**46**	**19**
UA0JV	21,663	AB	99	249	30	35	22
UA9FAL	15,045	AB	90	255	24	31	4

INDIA

VU2SJV	**91,314**	**AB**	**191**	**534**	**47**	**98**	**26**

JAPAN

JH1QDB	**421,670**	**AB**	**517**	**1490**	**69**	**136**	**78**
JA1BWA	377,160	AB	455	1347	71	130	79
JF4GJB	126,260	AB	204	590	60	107	47
JH1LBR	**107,133**	**28**	**298**	**871**	**28**	**58**	**37**
JR1IJV	105,288	28	294	856	27	59	37
JA6WW	103,016	AB	211	652	49	74	35
JR2CFD	76,464	28	226	648	28	59	31
JA2NNF	67,155	AB	149	407	57	86	22
JA3EOP	**49,541**	**21**	**162**	**463**	**27**	**48**	**32**
JA3EVZ	49,060	21	160	446	27	50	33
JA1AYC	43,416	AB	113	324	43	61	30
JI1MNT	20,293	AB	77	223	34	50	7
JA7KM	9,828	AB	54	156	23	33	7
JA7MJ	7,672	4A	49	137	20	31	5
JA3BSH	3,420	AB	28	76	18	21	6
JP1ODJ	3,306	21	33	87	14	24	0
JA1EUL	2,135	AB	22	61	13	21	1
JA1WYQ	2,074	AB	21	61	15	19	0
JA3BCT	1,600	AB	20	50	15	17	0
JH8QBY	**570**	**14**	**11**	**30**	**8**	**9**	**2**

EUROPE

AUSTRIA

OE2XTL	**173,055**	**AB**	**289**	**695**	**68**	**131**	**50**
OE1WWL	**5,405**	**21**	**42**	**115**	**15**	**14**	**18**
OE1TKW	4,644	AB	33	86	19	23	12

BULGARIA

LZ2KIM	**300,288**	**AB**	**445**	**1173**	**55**	**105**	**96**
LZ1KDP	**197,127**	**14**	**524**	**1341**	**29**	**67**	**51**
LZ1IA	27,060	AB	102	246	36	57	17
LZ1BJ	2,176	AB	23	64	12	14	8

CORSICA

TK/OE3CHC	**17,202**	**AB**	**69**	**183**	**32**	**36**	**26**

CZECHOSLOVAKIA

OK2FD	**743,175**	**AB**	**671**	**1835**	**83**	**178**	**144**
OK2BXW	**13,260**	**14**	**99**	**255**	**17**	**33**	**2**
OK1AMS	9,288	14	70	172	12	29	13
OK3KSK	946	14	18	43	11	7	4

DENMARK

OZ1FGS	**246,848**	**AB**	**391**	**1102**	**55**	**84**	**85**
OZ8RO	131,454	AB	231	603	58	109	51

EAST GERMANY

Y27AO/A	**129,117**	**AB**	**259**	**669**	**51**	**89**	**53**
Y24MN/A	126,800	AB	249	634	58	100	42
Y48YN	115,200	AB	224	576	54	96	50
Y24UD	**82,764**	**AB**	**196**	**484**	**53**	**87**	**31**
Y23IL	55,568	AB	150	368	47	81	23
Y23LG	51,606	AB	136	366	39	59	43
Y48VN	30,012	AB	92	246	39	54	29
Y43GO	27,068	AB	104	268	31	39	31
Y24MK	19,694	AB	79	229	27	30	29
Y22GC	16,560	AB	70	184	27	41	22
Y51RF	11,502	AB	67	162	24	35	12
Y24MB	**8,964**	**14**	**73**	**166**	**14**	**34**	**6**
Y22HF	8,515	AB	48	131	24	29	12
Y23VB	**7,152**	**21**	**56**	**149**	**15**	**22**	**11**
Y24VF	6,760	AB	46	130	19	19	14
Y32WF	6,262	AB	38	101	20	26	16
Y51XO	5,040	AB	39	105	20	24	4
Y23ZL	4,224	AB	40	96	13	23	8
Y21GO	4,059	14	42	99	11	24	6
Y25KO	3,913	14	38	91	11	25	7
Y24UD	2,320	28	27	80	10	10	9
Y32ZA	2,196	AB	26	61	12	17	7
Y21WI	1,836	AB	20	51	14	18	4
Y32XF	1,519	AB	20	49	12	17	2
Y22SA	252	AB	9	18	5	9	0
Y26EH	**60**	**3.5**	**5**	**10**	**2**	**4**	**0**

ENGLAND

G0ATX	**404,982**	**AB**	**490**	**1341**	**69**	**131**	**102**
G4SKA	**172,235**	**14**	**516**	**1295**	**26**	**58**	**49**
G4UZN	**48,960**	**28**	**176**	**510**	**21**	**38**	**37**
G4BWP	25,056	AB	82	232	34	43	31

ESTONIA

UR2FU	**47,880**	**AB**	**227**	**399**	**30**	**68**	**22**

EUROPEAN RUSSIA

RA3DX	**115,322**	**AB**	**251**	**529**	**57**	**127**	**34**

BEST OF MFJ

MFJ, Bencher and Curtis team up to bring you America's most popular keyer in a compact package for smooth easy CW

MFJ-422B **$134.95**

The best of all CW world's -- a deluxe MFJ Keyer using a Curtis 8044ABM chip in a compact package that fits right on the Bencher iambic paddle!

This MFJ Keyer is small in size but big in features. you get iambic keying, adjustable weight and tone and front panel volume and speed controls (8-50 WPM), dot-dash memories, speaker, sidetone and push button selection of automatic or semi-automatic/ tune modes. It's also totally RF proof and has ultra-reliable solid state outputs that key both tube and solid state rigs. Use 9 volt battery or 110 VAC with MFJ-1305, $12.95.

The keyer mounts on a Bencher paddle to form a small (4-1/8 x 2-5/8 x 5½ inches) attractive combination that is a pleasure to look at and use.

The Bencher paddle has adjustable gold plated silver contacts, lucite paddles, chrome plated brass and a heavy steel base with non-skid feet.

You can buy just the keyer assembly, MFJ-422BX, for only $79.95 to mount on **your** Bencher paddle.

Deluxe 300 W Tuner

MFJ-949D **$149.95**

MFJ-949D is the world's most popular 300 watt PEP tuner. It covers 1.8-30 MHz, gives you a new peak and average reading Cross-Needle SWR/Wattmeter, built-in dummy load, 6 position antenna switch and 4:1 balun -- in a compact 10 x 3 x 7 inch cabinet. Meter lamp uses 12 VDC or 110 VAC with MFJ-1312, $12.95.

Antenna Bridge

MFJ-204B **$79.95**

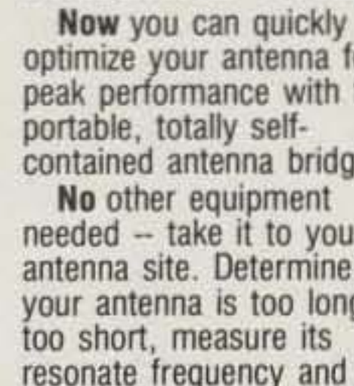
Now you can quickly optimize your antenna for peak performance with this portable, totally self-contained antenna bridge.

No other equipment needed -- take it to your antenna site. Determine if your antenna is too long or too short, measure its resonate frequency and antenna resistance to 500 ohms. It's the easiest, most convenient way to determine antenna performance. Built in resistance bridge, null meter, tunable oscillator-driver (1.8-30 MHz). Use 9 V battery or 110 VAC with AC adapter, $12.95.

Super Active Antenna

"World Radio TV Handbook" says MFJ-1024 is a "first rate easy-to-operate active antenna ... quiet ... excellent dynamic range ... good gain ... very low noise ... broad frequency coverage ... excellent choice."

Mount it outdoors away from electrical noise for maximum signal, minimum noise. Covers 50 KHz to 30 MHz.

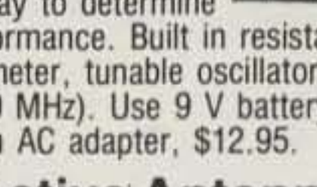


Receives strong, clear signals from all over the world. 20 dB attenuator, gain control, ON LED. Swtich two receivers and aux. or active antenna.6x3x5 in. Remote unit has 54 inch whip, 50 ft. coax and connector. 3x2x4 in. Use 12 VDC or 110 VAC with MFJ-1312, $12.95.

MFJ-1024 **$129.95**

VHF SWR/Wattmeter

MFJ-812B **$29.95**



Covers 2 Meters and 220 MHz. 30 or 300 Watt scales. Also reads relative field strength 1-170 MHz and SWR above 14 MHz. 4½x2¼x3 in.

MFJ Coax Antenna Switches

$34.95 MFJ-1701

$21.95 MFJ-1702B

$59.95 MFJ-1704

Select any of several antennas from your operating desk with these MFJ Coax Switches. They feature mounting holes and automatic grounding of unused terminals. They come with MFJ's one year **unconditional** guarantee.

MFJ-1701, $34.95. Six position antenna switch. SO-239 connectors. 50-75 ohm loads. 2 KW PEP, 1 KW CW. Black alum. cabinet. 10x3x1½ inches.

MFJ-1702B, $21.95. 2 positions plus new Center Ground. 2.5 KW PEP, 1 KW CW. Insertion loss below .2 dB. 50 dB isolation at 450 MHz. 50 ohm. 3x2x2 in.

MFJ-1704, $59.95. 4 position cavity switch with lightening/surge protection device. Center ground. 2.5 KW PEP, 1 KW CW. Low SWR. Isolation better than 50 dB at 500 MHz. Negligible loss. 50 ohm. 6¼x4¼x1¼ in.

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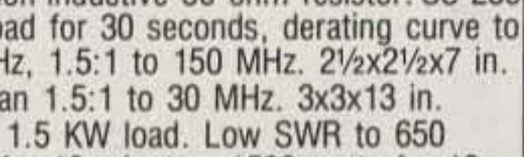

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CIRCLE 119 ON READER SERVICE CARD

The ops at AT0J, fourth place multi-op. Shown left to right are VU2JX, VU2SGY, VU2RUM, and VU2NTA.

Mike, RW9C, top scorer in Asia.

John, TG9VT, World Single-Op Plaque winner, is all smiles after the finish.

UA4HBW	75,780	AB	238	421	62	79	39
UA3TN	60,840	AB	162	390	48	85	23
RW3DX	**50,456**	**14**	**236**	**476**	**22**	**56**	**28**
RA3UC	29,148	14	146	347	21	51	12
RA1AW	**4,218**	**21**	**51**	**114**	**12**	**21**	**4**
FINLAND							
OH2LU	**251,312**	**AB**	**342**	**904**	**64**	**129**	**85**
OH2DW	53,935	AB	126	335	46	90	25
FRANCE							
FD1LVW	**343,980**	**AB**	**468**	**1323**	**53**	**93**	**114**
F6FNL	280,280	AB	412	1078	64	121	75
FF1NZH	**149,028**	**14**	**406**	**1129**	**28**	**54**	**50**
F6BVB	142,545	AB	249	645	58	109	54
F6GVK	4,400	AB	45	110	13	25	2
HUNGARY							
HA6PX	**193,177**	**AB**	**316**	**851**	**54**	**98**	**75**
HA5CP	153,144	AB	277	709	59	104	53
HA6VV	124,938	AB	241	631	54	102	42
HA0IV	42,500	AB	128	340	39	59	27
HA1WD	**27,378**	**28**	**124**	**351**	**16**	**30**	**32**
HA6NA	25,344	AB	96	256	27	42	30
HA5AEZ	9,152	28	61	176	15	18	19
HA0ML	**6,854**	**21**	**58**	**149**	**12**	**21**	**13**
ITALY							
IK5CKL	**682,746**	**AB**	**747**	**2014**	**74**	**154**	**111**
IK1DFH	149,838	AB	270	678	63	107	51
I3MIQ	115,083	AB	238	693	39	76	46
I2TQU	100,464	AB	216	546	53	112	19
I0ZSG	**82,482**	**14**	**274**	**699**	**22**	**51**	**45**
I4XQG	55,042	AB	142	377	43	61	42
IV3AVQ	**54,324**	**21**	**182**	**503**	**24**	**42**	**42**
I4IBR	35,179	AB	108	277	45	58	24
IK0CNA	33,300	AB	123	333	28	70	2
IK0CNA	**22,268**	**28**	**103**	**293**	**20**	**54**	**2**
I6KYL	17,484	AB	72	186	31	45	18
IK6NAQ	14,141	AB	70	179	23	35	21
IK2IKW	6,649	AB	49	109	24	35	2
IO0KHP	**1,638**	**7**	**32**	**63**	**6**	**18**	**2**
LIECHTENSTEIN							
HB0/HB9NL	**343,676**	**AB**	**419**	**1138**	**63**	**127**	**112**
THE NETHERLANDS							
PA3DBS	**255,793**	**AB**	**413**	**1117**	**50**	**89**	**90**
NORWAY							
LA7AJ	**314,916**	**AB**	**409**	**1141**	**64**	**143**	**69**
POLAND							
SP9BCH	**98,940**	**AB**	**243**	**582**	**47**	**97**	**26**
SP6AOI/A	**60,168**	**21**	**206**	**552**	**23**	**43**	**43**
SP2UUU	28,946	21	123	353	23	30	29
SP3XR	**18,040**	**14**	**146**	**328**	**12**	**36**	**7**
SP3IBM	16,055	AB	66	169	36	48	11
SP3AMZ	13,936	21	97	268	14	21	17
SP3BGD	13,090	21	97	170	20	35	22
SP4KEV	6,116	14	62	139	9	31	4
SP3SUN	**4,864**	**3.5**	**78**	**152**	**5**	**27**	**0**
SP3RBT	3,375	AB	31	75	19	22	4
SP9AUV	684	14	16	36	7	10	2
SP3SBO	**18**	**7**	**3**	**6**	**1**	**2**	**0**
PORTUGAL							
CR7CKP	**29,866**	**AB**	**120**	**274**	**32**	**59**	**18**
ROMANIA							
YO2IS	**250,470**	**AB**	**406**	**1089**	**57**	**102**	**71**
YO6JN	**32,172**	**14**	**155**	**383**	**19**	**47**	**18**
YO6CFB	**14,322**	**21**	**96**	**231**	**17**	**34**	**11**
SAN MARINO							
T77C	**875,350**	**AB**	**947**	**2501**	**63**	**152**	**135**
SPAIN							
EA5FKI	**33,573**	**28**	**126**	**361**	**22**	**36**	**35**
EA1AW	**22,088**	**AB**	**98**	**251**	**28**	**37**	**23**
EA1BIM	**16,827**	**14**	**100**	**237**	**15**	**42**	**14**
EA1JO	11,264	AB	52	128	41	33	14
EA3CZM	8,008	AB	54	143	22	30	4
EA7BBK	4,872	AB	32	87	23	23	10
EA3FNI	**2,470**	**21**	**28**	**65**	**12**	**22**	**4**
EA1ZL	2,030	AB	34	70	8	21	0
EA1YW	1,416	21	25	59	5	11	8
SWEDEN							
SM4CMG	**643,566**	**AB**	**597**	**1617**	**86**	**191**	**121**
SM5FUG	469,686	AB	544	1477	73	148	97
SM4AAY	110,230	AB	267	730	38	55	58
SM7BGE	18,601	AB	83	209	30	45	14
SM3DXC	**5,152**	**21**	**65**	**161**	**11**	**21**	**0**
SM5PPS	**3,535**	**28**	**37**	**101**	**11**	**14**	**10**
SWITZERLAND							
HB9CAL	**379,755**	**AB**	**510**	**1455**	**53**	**88**	**120**
HB9DCW	167,881	AB	318	827	51	90	62
HB9DCQ	**46,865**	**7**	**224**	**515**	**19**	**49**	**23**
HB9FMF	16,296	AB	75	168	33	46	18
UKRAINE							
RB5TW	**5,616**	**28**	**52**	**144**	**14**	**23**	**2**
WALES							
GW0ANA	**88,938**	**AB**	**202**	**486**	**49**	**110**	**24**
WEST GERMANY							
DJ6JC	**387,900**	**AB**	**470**	**1293**	**71**	**126**	**103**
DL4MCF	257,535	AB	335	873	70	150	75
DF3CB	244,268	AB	299	773	83	164	69
DF1IK/P	82,336	AB	185	496	46	64	56
DJ3IW	**66,930**	**28**	**204**	**582**	**26**	**48**	**41**
DJ2YE	**15,745**	**14**	**100**	**235**	**17**	**41**	**9**
DF9IZ/P	13,650	AB	67	175	26	38	14
DF0DG	6,741	AB	43	107	26	24	13
DK5KJ	3,483	AB	33	81	16	22	5
DF2EY	1,225	14	22	49	8	15	2
DF5BX	**480**	**3.5**	**16**	**30**	**5**	**11**	**0**
YUGOSLAVIA							
YU3EA	**401,367**	**AB**	**591**	**1191**	**80**	**189**	**68**
YU2W	**246,272**	**14**	**598**	**1664**	**30**	**64**	**54**

OCEANIA

AUSTRALIA							
VK2BQS	**18,423**	**14**	**93**	**267**	**18**	**28**	**23**
VK3EBP	17,860	14	82	235	19	37	20
INDONESIA							
YB5QZ	**7,344**	**AB**	**38**	**108**	**30**	**34**	**4**
MARSHALL ISLANDS							
KX6OI	**99,568**	**AB**	**264**	**784**	**37**	**64**	**26**
KX6OI	**49,572**	**28**	**206**	**612**	**18**	**37**	**26**

NEW ZEALAND								
ZL2AKI	**41,285**	**AB**	**125**	**359**	**35**	**50**	**30**
PHILIPPINES								
KE9A/DU3	**242,786**	**AB**	**367**	**1042**	**65**	**109**	**59**
DU9LMT	**3,450**	**21**	**46**	**138**	**8**	**16**	**1**
SOUTH AMERICA								
ARGENTINA								
LU9DBK	**149,058**	**AB**	**285**	**819**	**45**	**68**	**69**
BRAZIL								
PY4VD	**39,144**	**28**	**159**	**466**	**18**	**34**	**32**
CHILE								
CE6EZ	**122,512**	**21**	**337**	**988**	**23**	**54**	**47**
CE6GEE	**31,195**	**14**	**130**	**367**	**22**	**36**	**27**
CE3BFZ	**28,900**	**AB**	**103**	**289**	**32**	**47**	**21**
COLOMBIA								
5K1R	**725,620**	**AB**	**865**	**2555**	**51**	**117**	**116**
HK4BHA	**44,589**	**21**	**171**	**501**	**17**	**44**	**28**
HK4EGW	**17,812**	**14**	**84**	**244**	**16**	**36**	**21**
HK4NTY	7,956	21	57	153	16	28	8
HK4FXF	570	21	13	30	7	8	4
EASTER ISLAND								
CE0ZIG	**71,412**	**AB**	**202**	**541**	**34**	**56**	**42**
ECUADOR								
HD5Z	**776,195**	**AB**	**794**	**2345**	**65**	**121**	**145**
URUGUAY								
CX5AE	**73,290**	**21**	**239**	**698**	**23**	**45**	**37**
VENEZUELA								
4M5RY	**176,880**	**14**	**451**	**1340**	**25**	**67**	**40**
KF5YE/YV5	159,639	14	423	1257	22	60	45
YV6PM	**95,550**	**28**	**306**	**910**	**17**	**47**	**41**

CLASS B—MULTI-OPERATORS

ASIA								
ASIATIC RUSSIA								
UZ9CZM	**34,006**	**B**	**113**	**347**	**31**	**63**	**4**
UZ9CWA/A	27,550	B	105	290	28	52	15
INDIA								
AT0J	**1,006,343**	**B**	**895**	**2587**	**92**	**195**	**102**
JAPAN								
JJ3YBB	**517,824**	**B**	**633**	**1856**	**69**	**136**	**74**
JA1YFG	205,446	B	366	1059	48	88	58
KAZAKHISTAN								
RL8PYL	**829,704**	**B**	**814**	**2292**	**82**	**198**	**82**
MONGOLIA								
JT0DX	**301,712**	**B**	**543**	**1384**	**55**	**114**	**49**
SAUDI ARABIA								
HZ1AB	**362,065**	**B**	**554**	**1595**	**49**	**108**	**70**
EUROPE								
BULGARIA								
LZ9A	**1,399,032**	**B**	**1161**	**3048**	**90**	**221**	**148**
LZ1KAA	1,074,264	B	966	2633	81	183	144
CZECHOSLOVAKIA								
OK1KSL	**178,190**	**B**	**321**	**865**	**55**	**93**	**58**
OK3RJB	129,156	B	269	687	50	84	54
ENGLAND								
G0CWC/A	**48,125**	**B**	**154**	**385**	**30**	**51**	**44**
EUROPEAN RUSSIA								
UZ3AYR	**534,130**	**B**	**677**	**1723**	**71**	**148**	**91**
FRANCE								
FF6KRJ	**16,037**	**B**	**79**	**203**	**26**	**34**	**19**
KALININGRAD								
UZ3DWH	**227,755**	**B**	**438**	**1111**	**49**	**96**	**60**
LATVIA								
UQ0GZW	**1,726,108**	**B**	**1461**	**3802**	**93**	**211**	**150**
MOLDAVIA								
UO4OWQ	**375,500**	**B**	**601**	**1502**	**58**	**124**	**68**
NORWAY								
LA3T	**174,724**	**B**	**325**	**836**	**52**	**98**	**59**
POLAND								
SP3BLD	**49,528**	**B**	**127**	**328**	**50**	**66**	**35**
SP1PBW	21,854	B	77	223	25	30	43
SP9KVF	7,682	B	71	167	14	27	5
SPAIN								
EA2UAD	**43,053**	**B**	**131**	**339**	**33**	**47**	**47**
EA3RCL	7,056	B	58	126	14	31	11
UKRAINE								
UB4LWC	**66,960**	**B**	**202**	**496**	**37**	**77**	**21**
UB4IZA	12,369	B	97	217	15	35	7
WEST GERMANY								
DL0GK	**654,080**	**B**	**731**	**2044**	**67**	**137**	**116**
YUGOSLAVIA								
YT3T	**907,882**	**B**	**871**	**2434**	**79**	**155**	**139**
NORTH AMERICA								
CANADA								
VE7ZZZ	**477,085**	**B**	**647**	**1505**	**65**	**119**	**133**
UNITED STATES								
KY1F	**77,216**	**B**	**206**	**508**	**39**	**76**	**37**
KC1BS	25,990	B	90	226	37	62	16
OCEANIA								
AUSTRALIA								
VK2RT	**126,629**	**B**	**309**	**911**	**43**	**66**	**30**
SOUTH AMERICA								
GALAPAGOS								
HD8EX	**2,290,860**	**B**	**1697**	**4895**	**89**	**212**	**167**

CHECKLOGS. Our thanks to the following stations who sent in checklogs: VE7DTA, SP2ZCD, SM6EZI, OH2BGD, HK6HFY, I2HWI, LA0BX, YO5BLA, SM6APB, OZ7FN, Y43XN, SP4KM, SM5EIT.

CQ REVIEWS:

The Texas Bug Catcher

BY LEW McCOY*, W1ICP

For a while low-frequency mobile took a back seat to VHF repeater operation, but now more and more amateurs are becoming aware of the fun of HF mobiling. There is no doubt that VHF repeater work has changed the face of amateur radio in that it has almost become a necessity for every amateur. However, in the last 10 years or so solid-state design and the fact that such design is primarily for 12 volt operation, plus the compactness of modern transceivers, has really opened the door for high-frequency (160 through 10) mobile operation.

Anyone who has come into the hobby in the last ten years or so has no real knowledge of what used to be involved in getting into mobile operation. Many of us "old timers" went through the post WW II era using motor generators, extra batteries, and generally very complicated installations, far more than is required these days. All you need now is a good antenna and a modern transceiver.

This review is about a good mobile antenna. The maker calls it the Texas Bug Catcher (and you will see why in a moment). Let's look at some of the problems of using mobile whips, particularly on the low bands, 160 through 40 meters.

Take 80 meters, for example. The feedpoint impedance on an 80 meter whip (without matching, of course) is on the order of a few ohms. For the sake of discussion, let's call it 3 ohms (it is more important that I get the point across here than get into exact impedances). The 3 ohms we are talking about here is composed of primarily two types of resistance—ohmic resistance and radiation resistance. The ohmic resistance is the actual real resistance in the connections to the chassis of the vehicle, the resistance of the chassis proper, and so on. The important point is that any power fed to this part of the resistance is dissipated as heat; it doesn't make contacts for you. The other resistance is the radiation resistance, and this portion is what (oversimplifying here) provides the radiation of your signal.

Here is a close-up of the center, or loading, coil and the capacitive hat. Note the excellent construction. The adjustable tap is visible in this shot.

But here is the clinker of this situation. Of the 3 ohms impedance, the majority of the power—and I do mean majority (well over 95 percent)—goes into the ohmic resistance to be lost as heat. Only a small fraction of the power fed to the antenna is radiated. An important partial solution to the problem of this ratio of ohmic losses to radiation resistance is to reduce the ohmic losses as much as possible so the ratio between the two is not as great. This means good grounding of the frame of the vehicle by bonding any metal parts together. Assuming we have reduced the ohmic losses as much as possible, we are then left with what is the best antenna, and this is why antenna performance is so important.

Naturally, amateurs over the years have done a lot of testing to find the best type of vertical to use. Or to put it another way, what is the best radiator all else being equal? Using our 80 meter example we must take an 8 or 10 foot long whip and make it resonant as a quarter-wavelength radiator. This is normally accomplished in one of two ways. One method is to helically wind enough wire on a whip made of insulated material, such as fiberglass. The second and much more popular method is to use a coil of wire with the correct number of turns on it to bring the antenna to resonance. We can install the coil near the base or farther up the vertical to the center or higher. Center or upper portion loading of the vertical turns out to be the best, and the performance can be improved further by using a capacitive "hat" above the coil.

There are a few other points to be considered, mostly in the type of coil used. It has shown to be desirable (in fact it is a "must") to have a coil with a high "Q" factor and with good mechanical connec-

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This view shows more of the antenna.

tions (reduce ohmic losses) throughout.

Finally we come to the antenna being reviewed here—the GLA Systems Texas Bug Catcher designed and marketed by Henry Allen, WB5TYD. The Texas Bug Catcher meets all of criteria I laid out above. WB5TYD markets several coils for different applications. For this review the coil I used was 3 inches in diameter, 6 turns per inch, 10 inches long, and had an adjustable clip for band changing.

I used a whip length of 58 inches above the capacitive hat. The support rod below the coil was 38 inches long, so the entire antenna with base mount was approximately 10 feet long. This made the coil loading at the center or slightly higher. An excellent capacitive hat was used above the coil. The coil itself has about as high a "Q" as one can achieve for this type of operation.

As I pointed out earlier, the base feed impedance is rather low, so a matching coil 2 inches in diameter, 2 inches long, with 4 turns per inch is used for matching (a tap is used to find the correct matching point). Capacitors can be used rather than inductive matching, but the problem with this type of matching means lugging around a box of different capacitors. With the tap, matching is simplified.

As you can see from the photos, the capacitive hat is relatively large in relation to the coil and whip. When driving, the hat can create a wind drag which tends to pull the whip over horizontally. I tested the antenna mounted on the rear bumper of my Buick and ran a length of nylon fishing line from above the capacitive hat up to the front of the vehicle. This corrected the drag problem. In my other installation I mounted the antenna on the roof of my Coachman 27 foot trailer. However, in this case I didn't use the antenna mobile, but rather I waited until I was parked.

I did a lot of testing on all bands, 80 through 10 meters, with both installations. I'll admit it took a while to find all the matching points with the coil taps, but once found it was a quick and simple matter to change bands—and I might add, to a perfect 1 to 1 match. The manufacturer didn't provide any instructions, so I cannot comment on such. It may be that the manufacturer assumes the buyer knows how to match such an antenna. In any event, it is a fairly simple procedure.

Let's use 80 meters as an example. Put an SWR indicator in the line to the antenna and then turn on your receiver using a frequency of your choice. Move the tap up and down on the large center loading coil looking for an increase in the background noise. Find the point that produces the most receiver sensitivity or noise and tighten the tap. Next tap onto the first turn, top or bottom, of the base matching coil and then check the SWR using enough power to get an indication on the SWR bridge. Keep moving the tap one turn at a time until you approach a match, and then you may have to use a portion of a turn to get a perfect 1 to 1 match. It may take some minor adjustments of the tap on the top coil to get a perfect match.

You'll find the SWR 2 to 1 bandwidth on 80 is not very great, but that is to be expected on this band. Of course, mark the tap points so you can find the settings when you change bands. As I said earlier, it takes a little work to go through all the bands, but I find such a task enjoyable because there is a real sense of satisfaction as you find each 1 to 1 match.

The material used throughout the system is absolutely top grade. All threads are standard 3/8-24 SAE. The bottom, or supporting, mast is a ¾ inch O.D. stainless steel tube with stainless steel threaded inserts in each end. The capacitive hats are made from 2024-T4 aluminum. The center, or coil support, rod is 1 inch diameter. All in all, the antenna is best classified as very rugged.

As to performance, the mobile antenna is excellent. Electrically (and mechanically) GLA Systems uses all the best methods. GLA Systems sells various configurations depending on the buyer's desires. There are several different coils available as well as four different size capacitive hats and other accessories. The antenna shown and described here works out to be approximately $100 or so. However, we suggest you write and get their catalog. The address is GLA Systems, P.O. Box 425, Caddo Mills, TX 75005 (telephone 214-527-4163, evenings and weekends). CQ

CQ REVIEWS:

The Kenwood TS-950S/ TS-950S Digital HF Transceivers And The SM-230 Station Monitor

BY JOHN J. SCHULTZ*, W4FA

The TS-940S has become a classic workhorse amateur radio transceiver. No one, however, doubted that in spite of the great success of the TS-940S Kenwood would eventually bring out a TS-950S.

I first started hearing of the TS-950S in early 1989 when some European magazines began carrying "peek" reviews of the rig. Many of these reviews were not based totally on good information, much less on dealing with the actual hardware.

Well, the TS-950S is here, and by now many readers have heard the transceiver on the air. It is by all measures an outstanding new transceiver, and it introduces some new signal-processing technology. During a contest did you ever try to work a station that had a tremendously strong signal but just kept calling "CQ"? This station apparently could not hear many of the operators trying to respond because the station had been "fine-tuned" for transmit-only performance. Well, if such a station had been using a TS-950S, it could have had the best of both worlds. I had the "advantage" of receiving the TS-950S on a day when some recent solar storms made the bands from 10 on down almost completely dead. Using the TS-950S I could suddenly hear *and* work stations I could not hear on my other equipment. It's not that the TS-950S turned a dead band into a totally live one, but it certainly demonstrated that there was something new and different about the TS-950S using digital processing. So much for the quasi-hyperbole. Now let's get down to some facts.

An Overview

The TS-950S transceiver is a stand-alone unit, but it really is part of a "system." The basic part of the system is, of course, the transceiver, but the other major parts are the optional DSP-10 Digital Signal Processor and the optional SM-230 Station Monitor. Both units are new designs specifically meant to interface with the TS-950S. The DSP-10 mounts within the transceiver, but only a "plug-in" installation is required. The SM-230 is separately housed, but interconnects with the transceiver via simple interconnecting cables that are supplied.

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The front panel is nicely arranged with all of the controls grouped around the rectangular display field. Almost all of the controls are self-explanatory from their labeling, a feature not all that common for a sophisticated transceiver! The display field contains the large main frequency display, two smaller frequency displays, filter selection indicators, a bargraph meter, and numerous smaller indicators.

As an alternative to the TS-950S, Kenwood offers the TS-950S Digital, which is the TS-950S but with the DSP-10 and four optional filters already installed. The four optional filters are the 500 Hz CW units for both the 8.83 MHz and 455 kHz IFs, the 250 Hz CW unit for the 455 kHz IF, and the 2.4 kHz SSB unit for the 455 kHz IF. Basically, these are all the optional filters available. Since the digital processing interacts with the slopes of the filter responses, it makes sense that the TS-950S Digital package is a complete one.

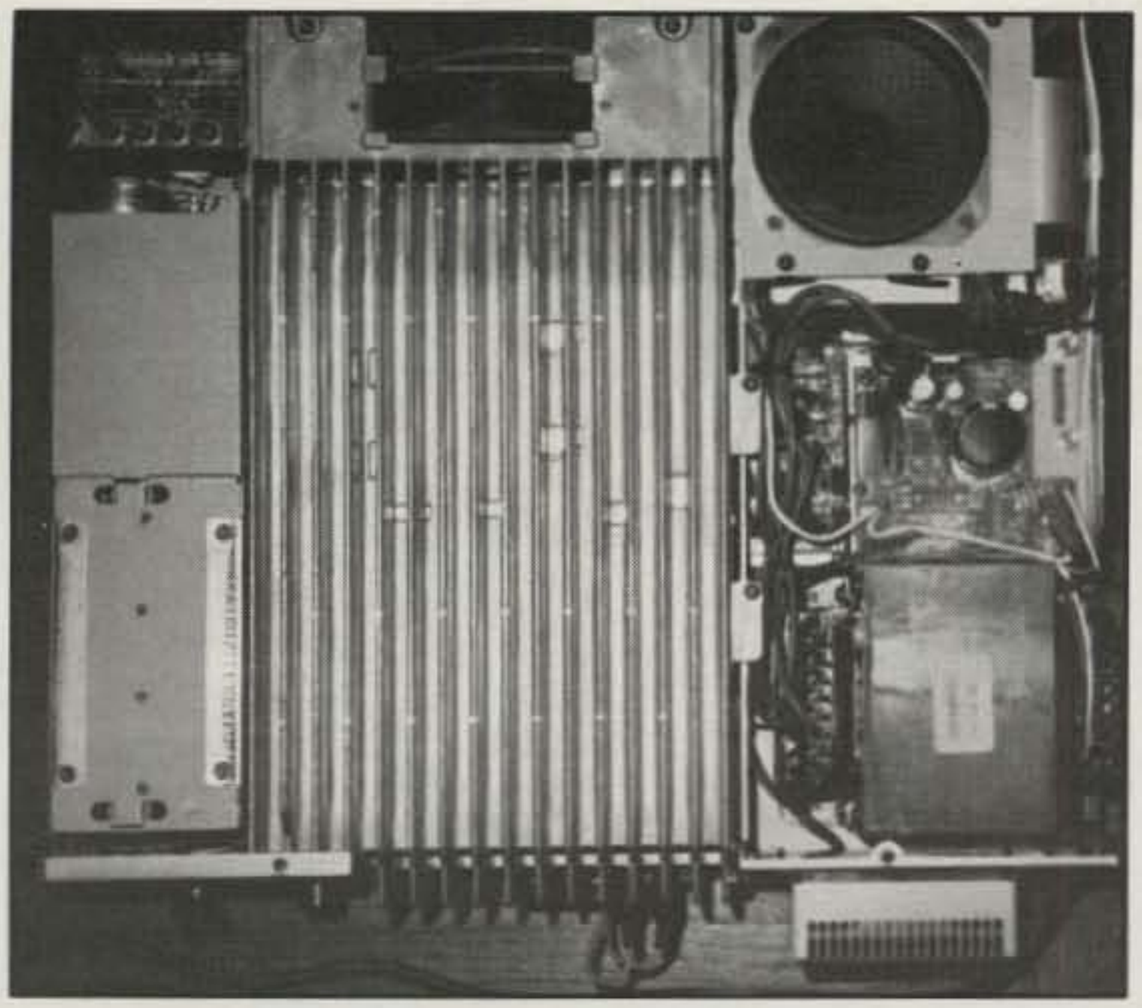
There are many microphone, speaker, headphone, etc., accessory items available. For specialized interests there are the IF-232C Personal Computer Interface and the VS-2 Voice Synthesizer. The latter provides for synthesized voice frequency readout if used alone in the transceiver, but it also can be controlled by an external computer.

I think the Kenwood approach is a very sensible one in that an operator can purchase the essential high technology of the TS-950S at its basic price or the digitally-included technology of the TS-950S Digital, and then add the SM-230 for "seeing" as well as hearing signals or add other accessories as hobby interests and/or the pocketbook allows. Top-of-the-line transceivers such as the TS-950S are not likely to become outdated quickly, since it takes two to three years of design effort to produce such equipment. Therefore, you would have time to expand upon the basic transceiver if and when you wish to do so.

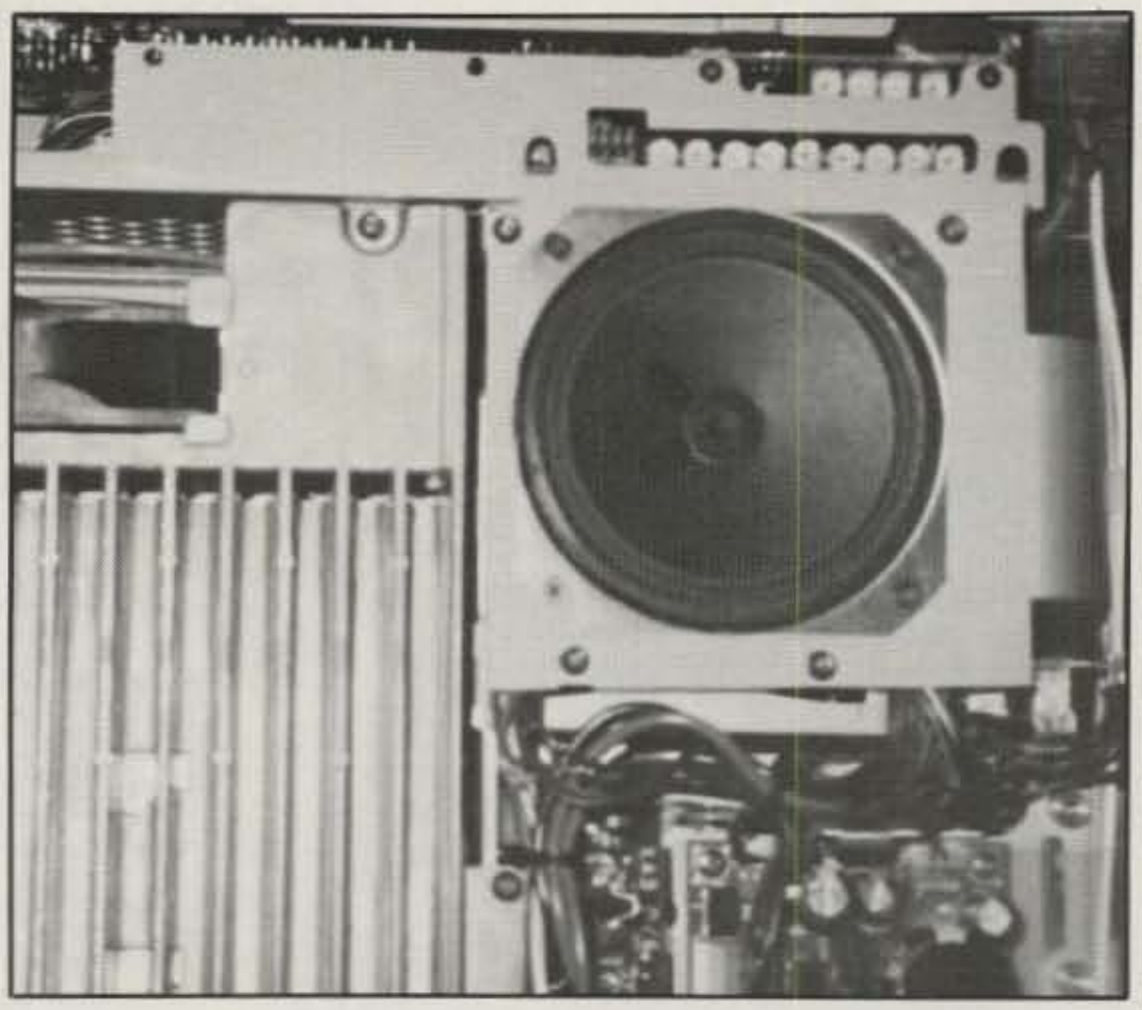
In this article we'll take a detailed look at the TS-950S, the digitally enhanced version of the TS-950S, the new SM-230 Station Monitor, and just a brief look at a few other accessory items.

The TS-950S Transceiver

The TS-950S is a very solid, 51 lb., self-contained transceiver package that can operate on *any* mode on any amateur band within the HF range. It has a nominal 150 watt CW/SSB *output* on the transmit side and some rather extraordinary specifications on the receive side. It borrows some circuitry (about 40%) from the TS-940S transceiver. Aside from that, it contains a significant amount of new circuitry and a complete redo of the front panel as compared to the TS-940S, with many improved front-panel control and indicator arrangements. There are 100 memory channels that store various operating parameters besides the operating frequencies. The memories can be scanned in several ways. There is a dual receive function with a separate frequency display and separate tuning for the sub-receiver. An electronic keyer is built-in, and you can



Taking off the top cover, one immediately sees the very large power amplifier heatsink. The automatic antenna tuner is in a separate, shielded enclosure to the upper left of the heatsink. The power transformer is to the lower right. It has its own separate cooling fan mounted behind it on the rear panel. There is an additional fan for the heatsink mounted in the upper middle area of the heatsink.



Taking a detailed look at the upper right-hand corner with the top cover removed, you can see an interesting array of trim potentiometers above the speaker. Apparently, many of the alignment adjustments contained on individual PC boards have been "brought out" to a single location. There is a "dip" switch above the speaker which allows the selection of four dot/dash ratios for the built-in keyer and also auto or manual weighting for the keyer.

shape the keying as desired. The built-in automatic antenna tuner is fast and memorizes the settings it has found. General-coverage receive is provided from 100 kHz to 30 MHz. Except for a few switches or controls that you normally set only once, absolutely all of the controls are "up-front" on the front panel. The usual analog meter on the front panel has been replaced by a digital meter. In fact, it is the first digital meter I have seen that makes any sense in terms of truly presenting information instead of trying to be just a "light" display.

Table I presents the specifications for the transceiver. By taking a look at the table you can gather a good idea of the general capabilities of the transceiver. The table cannot, however, detail all of the transceiver's capabilities. Note that some of the specifications differ a bit under the headings of TS-950S and TS-950S Digital to take into account the effect of the digital processing and the extra filters standard in the TS-950S Digital.

There is no way I can recite all of the features of the TS-950S without taking up far too many pages. I'll assume that most readers who might be interested in a transceiver of the TS-950S class are already fairly well acquainted with the mundane features of solid-state transceivers. Therefore, I'll just try to highlight what I found to be the most interesting features of the TS-950S both as I actually operated it and as I took a look underneath the covers.

Main Display

When you first turn on the transceiver, there appears a display field of about 1½ by 10¼ inches. The display is of a fluorescent type utilizing up to three colors, and the brightness can be varied over a wide range. The main operating frequency, down to 10 Hz, is displayed at the center. The RIT/XIT offset, when activated, is displayed in smaller digits to the right, as are the memory channel numbers from 00 to 99, when activated. Below the main frequency display is a semi-analog scale (switchable to cover 100 kHz or 1 MHz), so you can easily see where you are tuning within a band without having to constantly watch the digits on the main frequency display.

Still further to the right are two smaller frequency displays (both complete down to 10 Hz readout). One yellow display is for the frequency to which the sub-receiver has been tuned. The other display is for the transmit frequency when operating in the split mode. Both displays can be made to track as the sub-receiver is tuned, but more about that later!

To the immediate left of the main frequency display is a filter display. Under headings of 8.83 and 455 for the two IFs involved, little blocks illuminate to show which filters have been switched into each IF. Any combination of any of the filters installed can be used in any mode. To the far left is the digital multimeter. It displays all of the usual things—"S" units, power output, SWR, compression dB, ALC, and Ic. However, these are displayed in a way that finally makes sense for a digital meter and makes analog meters appear obsolete. The "S" meter bargraph is blue up to S9 and red thereafter. The power output bargraph is blue up to 100 watts and red from 100 to 150 watts. These two displays are always active. You can then call up one or more of the other parameters mentioned (each has a separate scale). For instance, you could simultaneously call up the compression and ALC scales, which is especially useful when using the RF speech processing. The compression bargraph is blue and ranges from 0 to 20 dB. The ALC bargraph is yellow and moves across a red ALC range line. Therefore, while transmitting you can simultaneously monitor power output, compression level, and ALC.

The interesting thing is that the display is not at all confusing because of the separation and different colors of the bargraphs. It's like having several analog meters operating simultaneously, but without the confusion of trying to see when one or more meters indicate an excessive level.

There are numerous other smaller indicators in the display field which show which VFO (A or B) is active, the scannng mode being used, if split operation is active, etc. There is even a little "PRG" indicator that comes on when memory channels 90 to 99 are selected to remind you that only those memories can be set up with both lower and upper frequency limits for scanning. This is an extremely neat, functional display.

Frequency Tuning, Entry, Etc.

I don't think many of us have much difficulty in operating a new transceiver when we see analog controls that are marked AF/RF Gain, Notch, RIT, etc. The confusion factor seems to surface when it comes to frequency manipulation. Manufacturers have tried to give us the benefit of the tremendous technology that is available, but they often fail to make that technology user-friendly. The TS-950S is an exception. It is true that the transceiver contains a multitude of controls, but simply by looking at the labeling you can understand most of the features available.

If you keep in mind that frequency manipulations center around the tunable VFO A/B concept, the rest becomes relatively simple. For receive purposes you select VFO A or B and manually tune either VFO to any desired frequency. Or, you can enter any desired frequency into either VFO by direct keypad entry.

A nice feature here is that when an "ENT" key is depressed, each key on the keypad

Specifications \ Model			TS-950S	TS-950S DIGITAL
General	Mode		J3E (LSB, USB), A1A (CW), A3E (AM), F3E (FM), F1A (FSK)	
	Memory Channels		100	
	Antenna impedance		50 ohms With Antenna Tuner 20 ~ 150 ohms	
	Power requirement	K and P type	120VAC ± 10%	
		M type	120/220VAC ± 10%	
		W type	220/240VAC ± 10%	
		X type	120/240VAC ± 10%	
	Power dissipation	Receive mode with no input signal	110W	
		Transmit mode	700W (7.5A)	
	Operating temperature		−10 to +50°C (+14 to +122°F)	
	Frequency stability		Less than ±10 PPM	Less than ±0.5 PPM
	Frequency accuracy		Less than ±10 PPM	Less than ±0.5 PPM
	Dimensions (W×H×D) (Projections included)		409×154×446mm (16-3/22"×6-1/16"×17-9/16")	
	Weight		23kg (50.6lbs)	
Transmitter	Frequency range	160m band	1.8 to 2.0 MHz	
		80m band	3.5 to 4.0 MHz	
		40m band	7.0 to 7.3 MHz	
		30m band	10.1 to 10.15 MHz	
		20m band	14.0 to 14.35 MHz	
		17m band	18.068 to 18.168 MHz	
		15m band	21.0 to 21.45 MHz	
		12m band	24.89 to 24.99 MHz	
		10m band	28.0 to 29.7 MHz	
	Output power	1.9 ~ 24MHz, SSB, CW, FSK, FM, MAX	150W	
		1.9 ~ 24MHz, SSB, CW, FSK, FM, MIN	20W	
		1.9 ~ 24MHz, AM, MAX	40W	
		1.9 ~ 24MHz, AM, MIN	10W	
		28MHz, SSB, CW, FSK, FM, MAX	110W	
		28MHz, SSB, CW, FSK, FM, MIN	20W	
		28MHz, AM, MAX	40W	
		28MHz, AM, MIN	10W	
	Modulation	SSB	Balanced modulation	
		FM	Reactance modulation	
		AM	Low level modulation	

Table I– Kenwood's specifications for the TS-950S and TS-950S Digital.

(which also doubles as a bandswitch) is back illuminated in soft green with the number it represents. If you enter the complete frequency (e.g., 21.355.55), after you enter the last digit, the key illumination disappears and the VFO is set. If only a partial entry is made (e.g., 21.3), the "ENT" key has to be depressed again. Leading zeros do not have to be entered for frequencies above 4 MHz.

The keypad, when used as a bandswitch, recalls the last frequency used within a band, the mode, IF filter selections, and sub-tone (the latter only in the FM mode; 39 sub-tones are built-in for the FM mode). Complete split-operation flexibility is provided in that if one VFO is designated by a pushbutton action for TX, a separate frequency display illuminates and you can tune that VFO independently by a knob separate from the main tuning knob for *any* frequency split within a given band.

A reverse button allows you to temporarily reverse the VFOs while in split operation. However, a far more nifty feature is to activate the sub-receiver by a separate button marked "TF-W" (transmit frequency watch). In this case, another complete frequency display (in yellow) comes on below the one mentioned above. Now if the separate tuning knob is used, both of the small frequency displays will track, and you can hear activity on both the VFO A frequency and the VFO B frequency. If a DX station is operating split, you can monitor the activity over whatever range of split frequencies the DX station is listening. You can tune for a clear spot to transmit on or set up on the frequency of the last station which the DX station worked. If you combine all of this with the panoramic frequency display on the SM-230 Station Monitor, which has a separate marker on the display as the sub-receiver is tuned, you have the most powerful DX-chasing system imaginable.

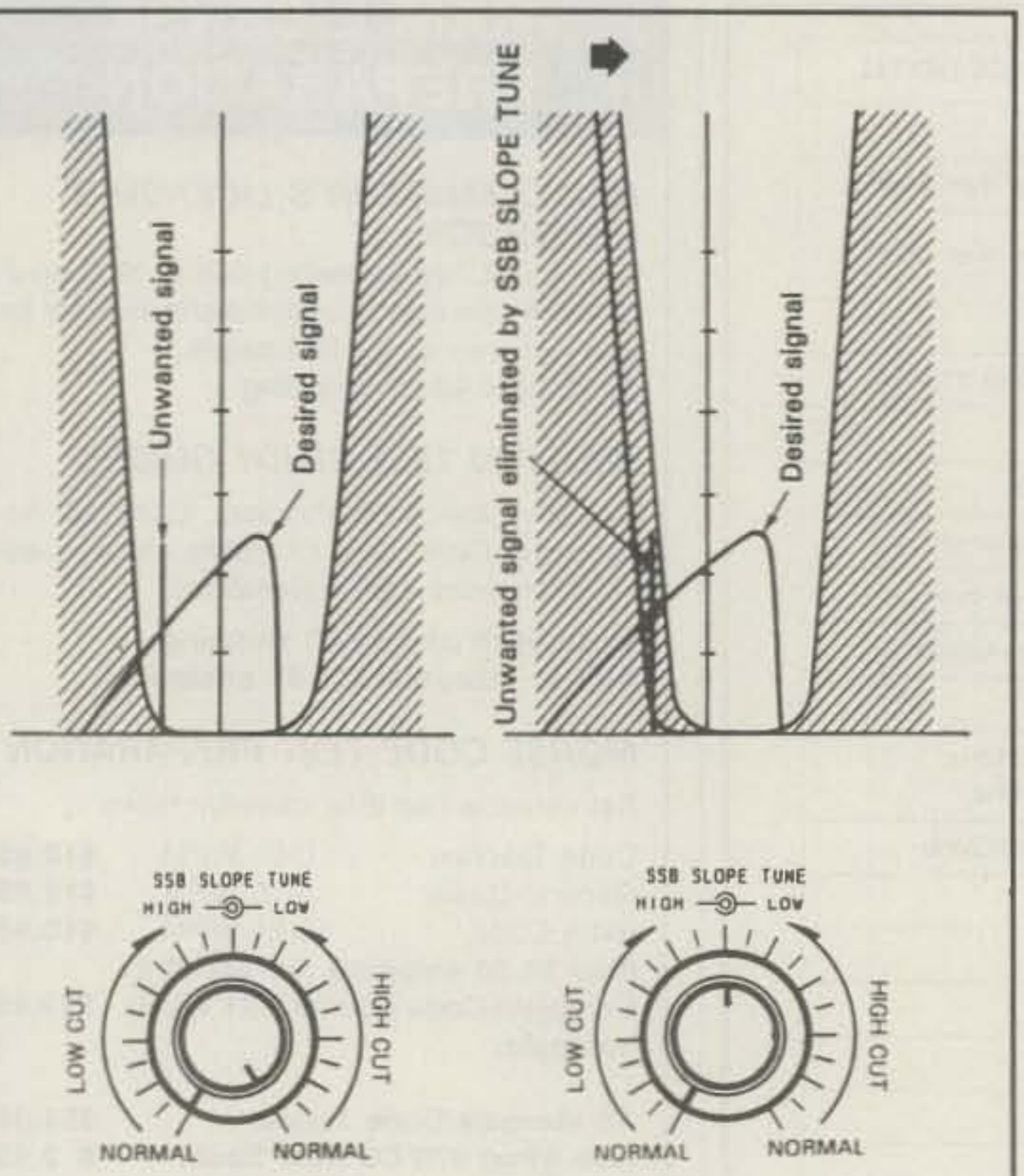
A perhaps more mundane but quite interesting use for the sub-receiver is casual monitor-

Specifications / Model			TS-950S	TS-950S DIGITAL
Transmitter	Spurious radiation		Less than −40dB	
	Carrier suppression (with 1.5kHz reference)		More than 40dB	More than 50dB
	Unwanted sideband suppression (with 1.5kHz reference)		More than 50dB	More than 60dB
	Maximum frequency deviation (FM)		Less than ±5kHz	
	Frequency response (−6dB)		400 to 2600Hz	200 to 3100Hz
	XIT variable range		±9.99kHz	
	Microphone impedance		500 ohms to 50 kΩ	
Receiver	Circuitry	Main	SSB, CW, FSK, AM	Quadruple conversion superheterodyne
			FM	Triple conversion superheterodyne
		Sub	SSB, CW, FSK	Double conversion superheterodyne
	Frequency range			100kHz to 30MHz
	Intermediate frequency		Main	1st: 73.05MHz, 2nd: 8.83MHz, 3rd: 455kHz, 4th: 100kHz
			Sub	1st: 40.055MHz, 2nd: 10.695MHz
	Sensitivity	SSB, CW (at 10dB S+N/N)	100kHz ~ 150kHz	Less than 2.5μV
			150kHz ~ 500kHz	Less than 1μV
			500kHz ~ 1.62MHz	Less than 4μV
			1.62MHz ~ 30MHz	Less than 0.2μV
		AM (at 10dB S+N/N)	100kHz ~ 150kHz	Less than 25μV
			150kHz ~ 500kHz	Less than 10μV
			500kHz ~ 1.62MHz	Less than 32μV
			1.62MHz ~ 30MHz	Less than 2.0μV
		FM (at 12dB SINAD)	28MHz ~ 30MHz	Less than 0.5μV
	Selectivity		SSB, AM(N), FSK	−6dB: 2.4kHz, −60dB: 3.8kHz
			AM(W)	−6dB: 6kHz, −50dB: 15kHz
			CW(N)	— / −6dB: 250Hz, −60dB: 550Hz
			CW(W)	−6dB: 2.4kHz, −60dB: 3.8kHz / −6dB: 400Hz, −60dB: 900Hz
			FM	−6dB: 12kHz, −60dB: 24kHz
	Image ratio			More than 80dB
	1st IF rejection			More than 70dB
	Notch filter attenuation			More than 45dB
	RIT variable range			±9.99kHz

ing. If VFO A or B is set to a frequency of interest but one that is not immediately active (a net frequency, for instance), the sub-receiver can be activated, set for the same frequency, and then be independently tuned ± 500 kHz. While tuning the sub-receiver, if you come across a frequency of interest on which you want to operate, the frequency can be transferred to one of the VFOs by a reverse use of the "TF-W" button. There are separate AF gain controls for the main and sub-receiver sections, so you can blend the audio output level for each receiver as desired. Each receiver also has separate noise-blanker-level controls.

Use of the memory channels is quite simple if you again remember the VFO A/B idea. If you tune in a frequency with a VFO and want to store it, you press the "M-IN" button, select the memory channel number to be used, and again press the button. Upon the second press the frequency (as well as other data) is entered, and the VFO can be tuned again as desired. If no memory channel is selected, the data simply is set in the last used memory position, and the previous data in that position is erased. Going the other way around, a memory channel can be selected and then transferred to a VFO by the "M-VFO" button to make the memory completely "tunable," if desired (the original memory channel information is not lost). RIT is active on any recalled memory channel without transfer to a VFO.

Memory positions 00–89 store frequency (including splits), mode, filter settings, and tone frequency data (FM). Positions 90–99 do not store tone frequency data, but store everything else plus a high and low set frequency for scanning purposes. The high/low frequencies can be anything from the full receive range of the transceiver down to a tiny portion of any part of the HF spectrum. Memory scroll allows for checking the data entered into each memory channel without affecting VFO A/B operation. You can even do it while in the receive



SSB SLOPE TUNE (HIGH CUT, LSB) control

Fig. 1– Illustration of SSB slope tuning. If the unwanted signal was on the opposite side of the desired signal, the high cut control could be used to eliminate it. Basically, the high and low cut controls allow you to form an SSB filter with any desired bandwidth.

Switch Position	S1		S2	
	SSB	AM	SSB	AM
0	110Hz	75Hz	2600Hz	2900Hz
1	200Hz	185Hz	2750Hz	2900Hz
2	300Hz	300Hz	2900Hz	2900Hz
3	400Hz	400Hz	3100Hz	2900Hz

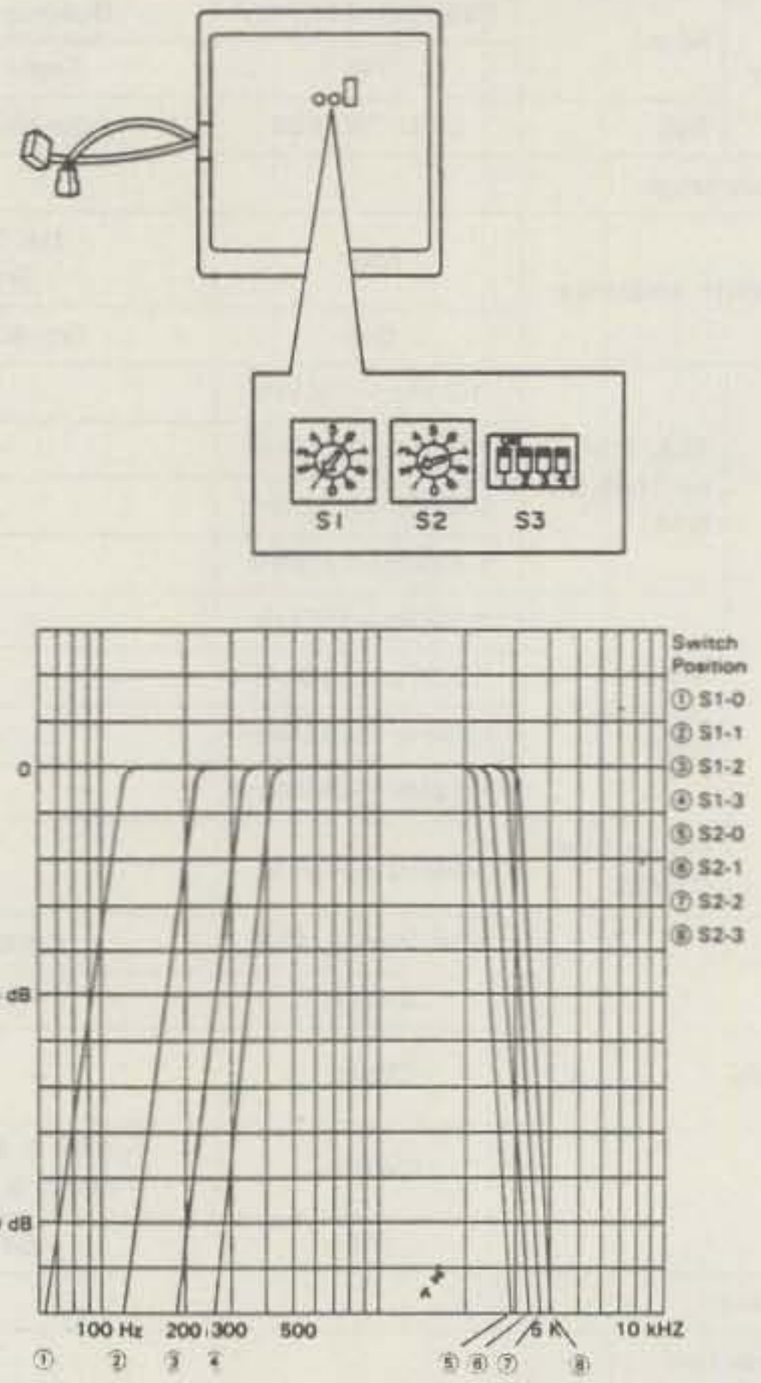


Fig. 2– Controls on the DSP-10 Digital Signal Processor allow you to precisely tailor the transmit *audio response on SSB or AM. Tailoring of the CW waveform rise/decay times is also possible (see text).*

mode during a QSO. Memory channels can be accessed by a continuously rotating "M CH" control or by numeric keypad entry.

Scanning can be accomplished in several ways. **Memory Scan** steps through each memory channel except those which have no data or those which have been deliberately locked out. **Group Scan** is a variation of the foregoing in which you select which memory group only should be scanned (e.g., channels 00 through 09, 10 through 19, etc.). **Band Scan** uses memory channels 90 through 99, and you can scan through the high/low frequencies set in each memory channel. The scanning speed is adjustable from the front panel over more than a 1:10 range (50 Hz to 600 Hz per second); a digital display (01–99) indicates which scan speed has been selected!

Confusing? Not really. In fact, there is even more, such as 1 MHz up/down buttons (switchable to 500 kHz up/down) and a quick, continuously variable control that slides the VFO up/down in 10 kHz steps (switchable to 5 kHz steps)! Rather than being confusing, I would say that all of the features indicate the extreme versatility possible. It is unlikely that any operator is going to continuously utilize all of the frequency manipulation features. However, the menu is there from which to choose.

Selectivity Features

Aside from the digital processing option, all of the selectivity features are basically the same as in the TS-940S, and I would cast a big vote of agreement for having left them so. The most notable change concerns buttons and indicators so you have complete control over choosing any IF filter (8.83 MHz or 455 kHz) in any combination and for any mode. It is quite surprising sometimes how a filter not intended for use for a given mode can nonetheless prove quite useful.

There is both variable AF and IF bandwidth tuning for CW reception and SSB Slope Tuning on SSB. The latter, which Kenwood has developed into a classic feature, still provides the most effective selectivity for SSB in my opinion. Fig. 1 indicates the basic idea involved. You can independently "pull in" either the upper or lower side of the IF passband to reject QRM. It's almost like having available an infinite number of SSB filters for reception. Combined with the other SSB reception aids such as the variable notch filter and RIT, I've rarely encountered a QRM situation with the TS-950S too difficult to handle, although I'll very quickly have to say that only in conjunction with the following paragraphs.

The Front-End

No matter how eloquently one waxes about the signal-handling capabilities of a transceiver, one does have to put the picture in a bit of perspective. An antenna, be it a simple wire or beam, delivers a tremendous amount of RF energy at all frequencies to the input circuitry of a transceiver. The transceiver can only receive the desired signal if it is capable of ignoring wideband, undesired RF "garbage" and of being able to select what we want out of a field of acceptable signals. A lot of sophisticated terms are properly used to describe such receive action, but the basic reality remains that if you can't receive a weak DX station in the midst of QRM, you can't work that station, and if you can't receive moderately weak stations

comfortably, you are not going to enjoy a QSO with them, be they DX stations or not.

Kenwood's approach in the TS-950S was first of all to greatly increase the number of input bandpass filters to a total of 15 to provide immediate front-end bandwidth reduction, to use a cascade FET RF amplifier, and then to pass the signal to an elaborate balanced mixer using four FETs (actually two such mixers, one for the main and one for the sub-receive sections). The RF amplifier, which has a gain of about 10 dB, can be switched in or out. With the amplifier switched out, the dynamic range approaches 110 dB and the third order intercept point is about +20 dBm. I could not detect any overload problems on any band under any QRM conditions, and reception is absolutely quiet. In fact, reception is so quiet that I can often tune across a band such as 10 meters and hear DX stations "pop in" when the band seems to be absolutely dead.

Automatic Antenna Tuner

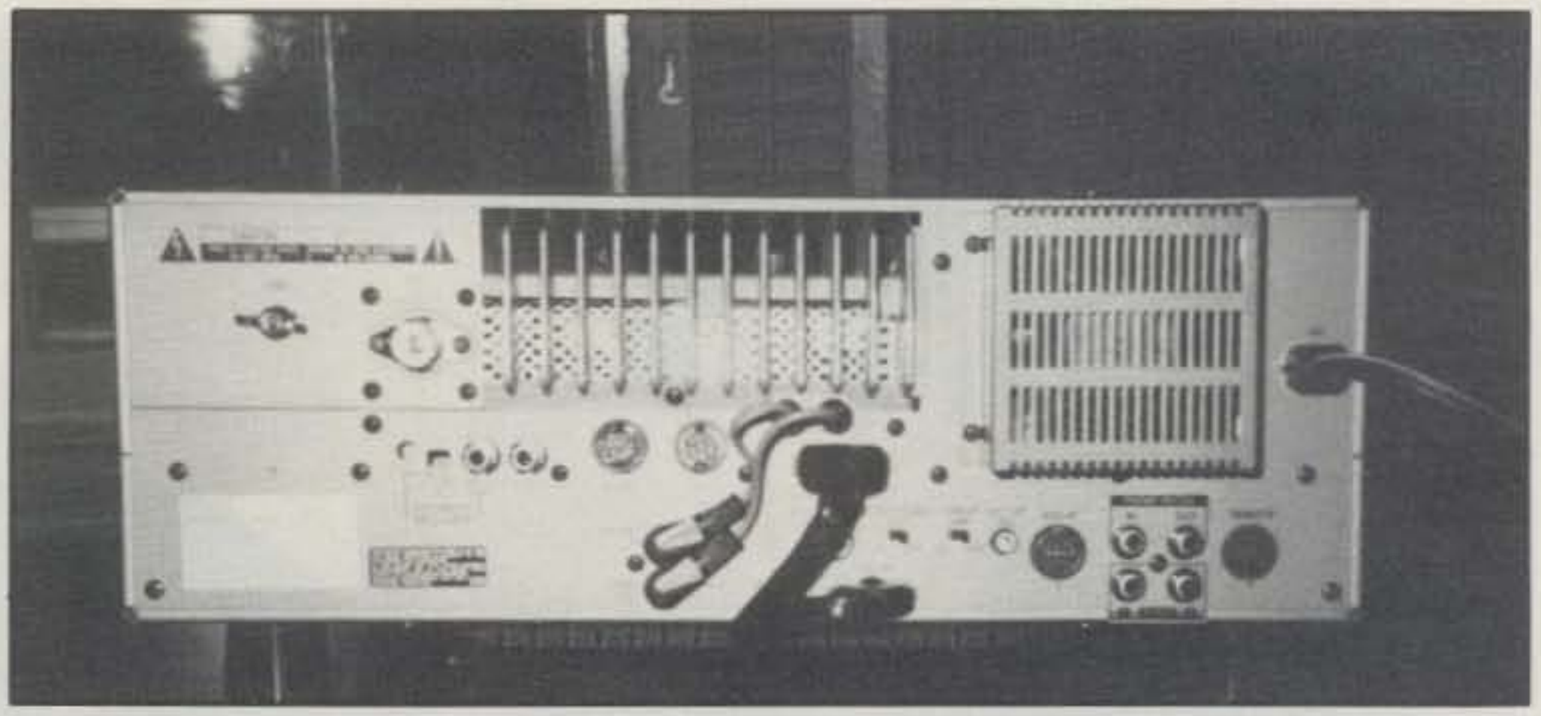
The tuner is much faster and seems to be more versatile than the one used in the TS-940S. The tuner uses a T-network design with relay switched taps on the inductor section and two variable capacitors. The tuner appears to memorize the settings last used on any given band and returns to those settings whenever a frequency within that band is recalled. In any case, I never found that it took more than a second for the tuner to respond when the "AT TUNE" button was depressed. If the tuner cannot find a match after two tuning cycles, a warning signal sounds. However, the tuner tries to find a match with only 10 watts of carrier power. Therefore, you can attempt to use it to match into random loads as long as you respect the warning signal and do not try to force full power into a badly matched antenna load.

In reality, I found the tuner perfectly capable of matching random antenna loads presenting up to a 5:1 SWR. By switching on the SWR meter display you can actually watch the SWR dip as the tuner tests its matching range. If a good match is not achieved, you could possibly vary the length of a wire antenna so a good match is achieved. No harm to the automatic tuner should result if it is allowed to operate at its automatically set tuning level of 10 watts, even at high SWRs, with the power output level of the transceiver reduced accordingly.

SSB/CW Features

The TS-950S incorporates basically the fine RF SSB speech processor used in the TS-940S, including a true sidetone monitoring capability at the actual operating frequency so the complete effect of the SSB filters, processing, different microphones, etc., can be heard.

In the TS-950S CW buffs seem to have been given a bit more attention. There are, of course, sidetone monitoring and the choice of semi or full break-in operation. An electronic keyer is built-in which includes either the choice of several sets of manual weight adjustments or an automatic speed-tracking weight adjustment such that the dash lengths decrease as the keying speed is increased. I found the keying and full break-in to be very smooth over the range of a few WPM to well over 20 WPM (the keyer will go faster, but not the operator here).



The rear panel has interconnection possibilities for any application. The number of connectors doesn't appear all that great because of the use of four multiple-pin "DIN" jacks. The two umbilical cords which seem to go to the underside of the transceiver are for the digital processing unit.

I think CW buffs will really enjoy the TS-950S because the transmit features are matched by a whole range of selectivity features on receive such as IF and AF variable bandwidth tuning, notch and pitch functions, and a choice of various optional CW filters. The pitch control tracks to match the AF variable bandwidth tuning center frequency. Zero beating is accomplished by adjusting the main tuning to equalize the received tone with the CW monitor sidetone frequency.

DSP-10 Digital Signal Processor

The DSP-10 is an optional unit for the TS-950S. Space is provided for it in a cavity on the underside of the transceiver, and it simply plugs in via two multiple conductor cables. Basically, the DSP-10 takes over various analog functions and does them digitally. This includes providing SSB, CW, AM and FSK modulation/keying, generating the FM carrier, and providing AF slope tuning which tracks the IF slope tuning during SSB receive. The three PC boards which make up the DSP-10 contain analog/digital, digital/analog ICs as well as a maze of other ICs and discrete transistors. I would not attempt to understand the circuitry of the DSP-10, but its effects are apparent when the unit is in use.

On SSB modulation is produced digitally by a phase-shift process. Some readers may recall old-fashioned SSB phase-shift generation from the 1950s. It always did sound better than the SSB generated via the filter method, but various problems doomed it until now. In on-the-air tests I consistently received reports that the SSB modulation was cleaner and fuller using the DSP-10. On SSB receive the DSP-10 definitely did enhance the operation of the slope tuning controls. The signal flanks seemed to pull in much more quickly because both the IF and AF responses were tracking.

Because of the digital processing, certain signal characteristics can be modified more easily than with analog circuits. For instance, the DSP-10 has set switches which you can use to tailor the SSB transmit audio response on both SSB and AM. Fig. 2 shows the effect of various switch settings on the unit. S1 alters the high-pass filter response, and S2 does the same for the low-pass filter response. Almost

■Function list
- AUTO INFORMATION ON/OFF setting
- Same function as microphone UP/DOWN switch
- DATA mode ON/OFF setting
- VFO A, VFO B and memory frequency selection and readout
- SUB VFO frequency selection and readout
- Filter setting
- VFO A, VFO B and memory frequency TX/RX setting
- Model No. readout for transceiver recognization
- Display of transceiver's current condition
- F.LOCK ON/OFF setting and display
- Memory channel setting
- Mode setting
- Memory display
- Memory entry
- AIP switch ON/OFF setting
- PITCH control setting
- RIT/XIT frequency clearance
- RIT/XIT frequency UP/DOWN
- METER switch setting
- RIT ON/OFF setting
- RX: For receive operation, TX: For transmit operation
- SUB key ON/OFF setting, TF-W key ON/OFF setting
- Scan ON/OFF setting
- Slope tune band setting and readout
- Meter signal output
- STEP ON/OFF setting
- Sub-tone frequency setting
- TONE ON/OFF setting
- VBT passband setting and display
- Generation of synthesized voice
- XIT ON/OFF setting

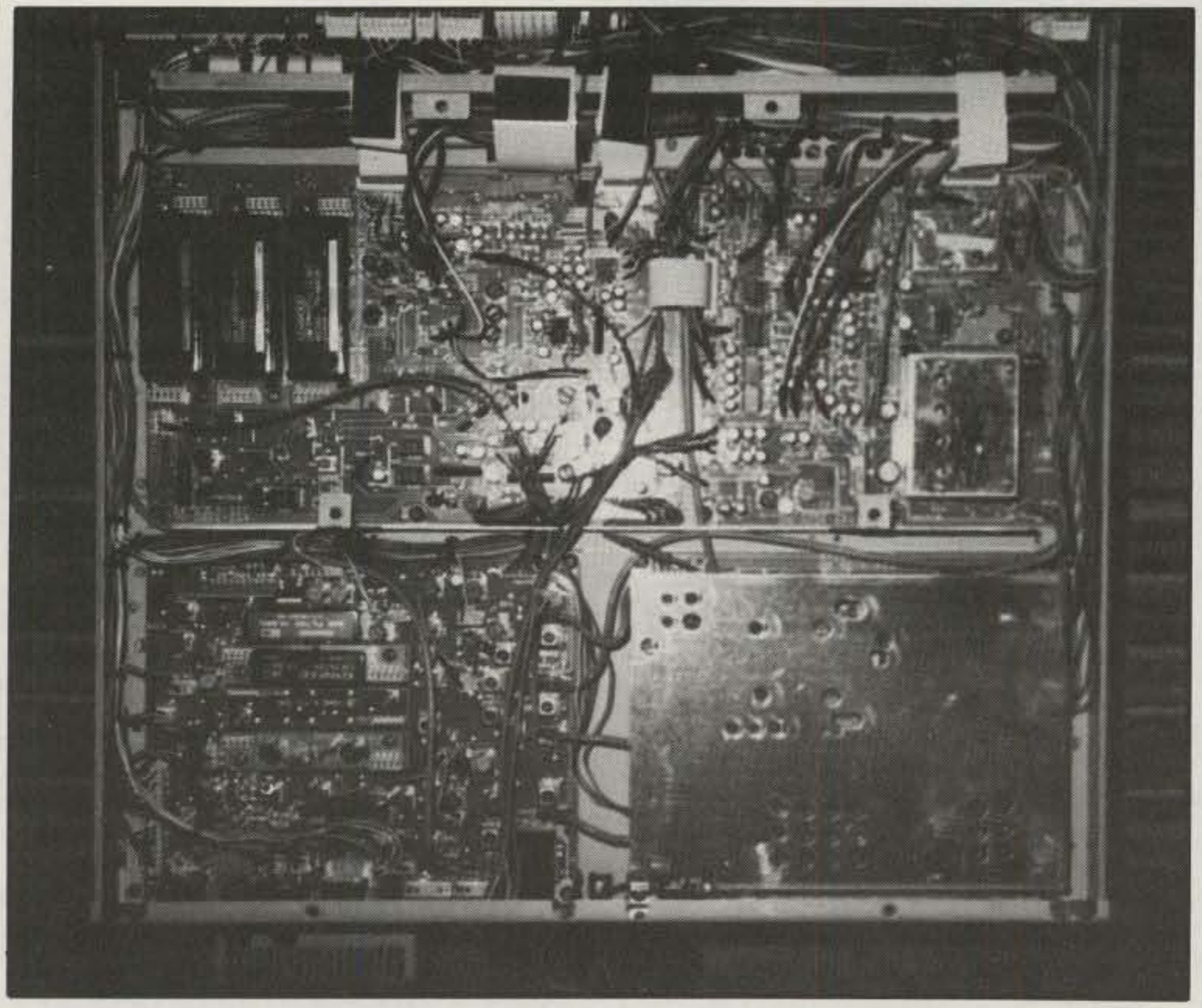
Table II– Function List for Personal Computer Control of the TS-950S.

regardless of the microphone being used, you can go from a soft, extended frequency response to a quite crisp one that DXers might find very useful.

The unit can also change the leading/trailing edge characteristics of the CW waveform. One choice is 4 ms for rise/decay time which is useful at low keying speeds with normal weighting. The other choice is an extremely fast 2 ms to favor high-speed CW operators who also are likely to be using full break-in.

There is even a switch to alter the ripple factor of the digital filter from a flat to a shaped response. I haven't been smart enough to figure out yet how to utilize it.

There is no doubt in my mind that the digital processing does make a difference, especially



Taking off the bottom cover, you can see most of the circuitry associated with signal generation and filtering. The construction is very neat. The 455 kHz filters are the larger units in the upper left corner of the photo.

on transmit. You can enjoy a TS-950S perfectly well without the processor, but it does provide that noticeable extra "edge." It's probably also a glimpse at the technology that will be used in the next generation or two of transceivers.

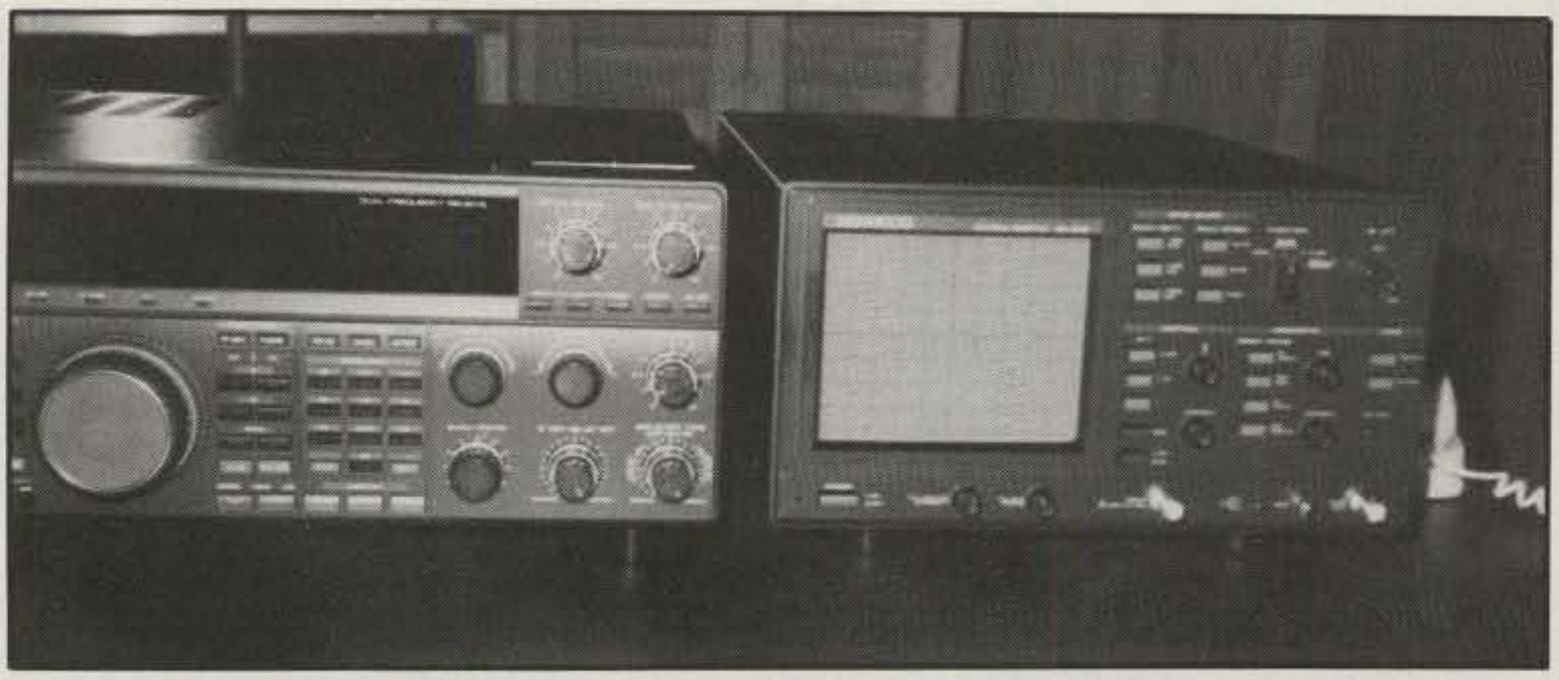
Computer Interface

Although the TS-950S has a built-in capability for computer control, an IF-232C Level Translator accessory is necessary to interface with the RS-232C terminal of a personal computer. With the TS-950S Kenwood supplies a separate "External Control Instruction Manual" which goes into complete detail on computer interface.

Just about every function can be computer controlled. Table II is a listing of the functions. Most of the terms should be clear. AIP on/off refers to switching in/out of the receive preamplifier. Synthesized voice generation requires an optional VS-2 Voice Synthesizer.

Manual

The manual for the TS-950S/TS-950S Digital is excellent for such a sophisticated unit. Recognizing that most operators want to try out the transceiver as quickly as possible, the manual first presents a concise summary of each control's function. Then it goes on to a more detailed description of the use of the controls for



The SM-230 station monitor exactly complements the TS-950S in appearance. It has a quite large 6 inch screen and can be used for several applications, as covered in the text.

operation in various modes and for specific functions such as memory operation, scanning, and repeater operation. There are plenty of illustrations and examples which you can duplicate while learning the controls. Basic circuitry descriptions are provided as well as a block diagram and circuit schematics. Amateurs who are interested in learning a bit about what is inside the transceiver they have purchased will appreciate these details. The schematics may be useful for a bit of troubleshooting by an *experienced* technician.

A separate "Service Manual" is available with complete circuitry details, PC-board layouts, and alignment details. However, it would be a rare case indeed if the transceiver required any alignment before many years of service. Besides, you would have to own test equipment costing several times the price of the transceiver to perform meaningful alignment.

The two minor pages "Antenna Installation" and "Before Installation" are, I suppose, meant to be useful, but they turn out to sound a bit naive for the operator who would purchase this class of transceiver (e.g., "turn off the power and pull out the power plug if the unit should start to smoke").

Seriously, the only fault I could find with the manual, and it is a minor one, is that it fails to mention that the front-panel VOX, Keyer Speed, and Monitor Level controls have pop-out shafts. I was going to comment that those controls required very awkward finger-tip adjustment until I discovered that for easy access their shafts pop out from their recessed position by a push-in motion.

Miscellaneous and Summary Comments

Before I do fly off with too many superlatives about the TS-950S, I make the following miscellaneous comments:

• The tuning "feel" and flywheel effect are superb. There is no tuning speed selection, and yet I found tuning effortless using any IF filter combination on any mode, and that includes using the 250 Hz filter on CW. Internal circuitry does vary the tuning rate depending upon how rapidly the main tuning knob is rotated, but I have no figures to present.

• The power output on SSB/CW was a consistent 150 watts on all frequencies, including up to 29.9 MHz. I didn't check the transmit frequency overrun on all of the bands, but here is some sampling:

Band (Meters)	Frequency (MHz)
160	1.620–2.000
80/75	3.0–4.0
40	6.5–7.5
15	20.5–21.5
10	27.5–30.0

• The excellent signal reports I received on SSB led me to at least generally check IMD products. As best as I could determine, third-order IMD products (full output on 20 meters) were an excellent −38 to −40 dB. Fifth-order products were −50 dB or more!

• There are two fans in the TS-950S, one to cool the power-amplifier heat sink and another for the power-supply area. The latter will sometimes switch to a higher speed during receive periods. The fan noise is very low, and I never

found that it interfered with either the receive or transmit functions.

• The tuning knob for the sub-receiver is undistinguished in size from various adjacent controls. I think a larger knob would have better highlighted the important sub-receiver function and made tuning easier. The knob can easily be removed and replaced by a larger one. In fact, in a nice note in the TS-950S manual under "Cleaning" it is suggested that the knobs be removed, after a long period of use, for cleaning using a neutral soap solution. So why not temporarily replace some knobs with different-size ones to suit your own preferences?

• The TS-950S presents itself as the top-of-the-line Kenwood HF transceiver. It definitely deserves that place in all possible respects whether you are going to enjoy it for truly comfortable casual operation or for very serious DX chasing.

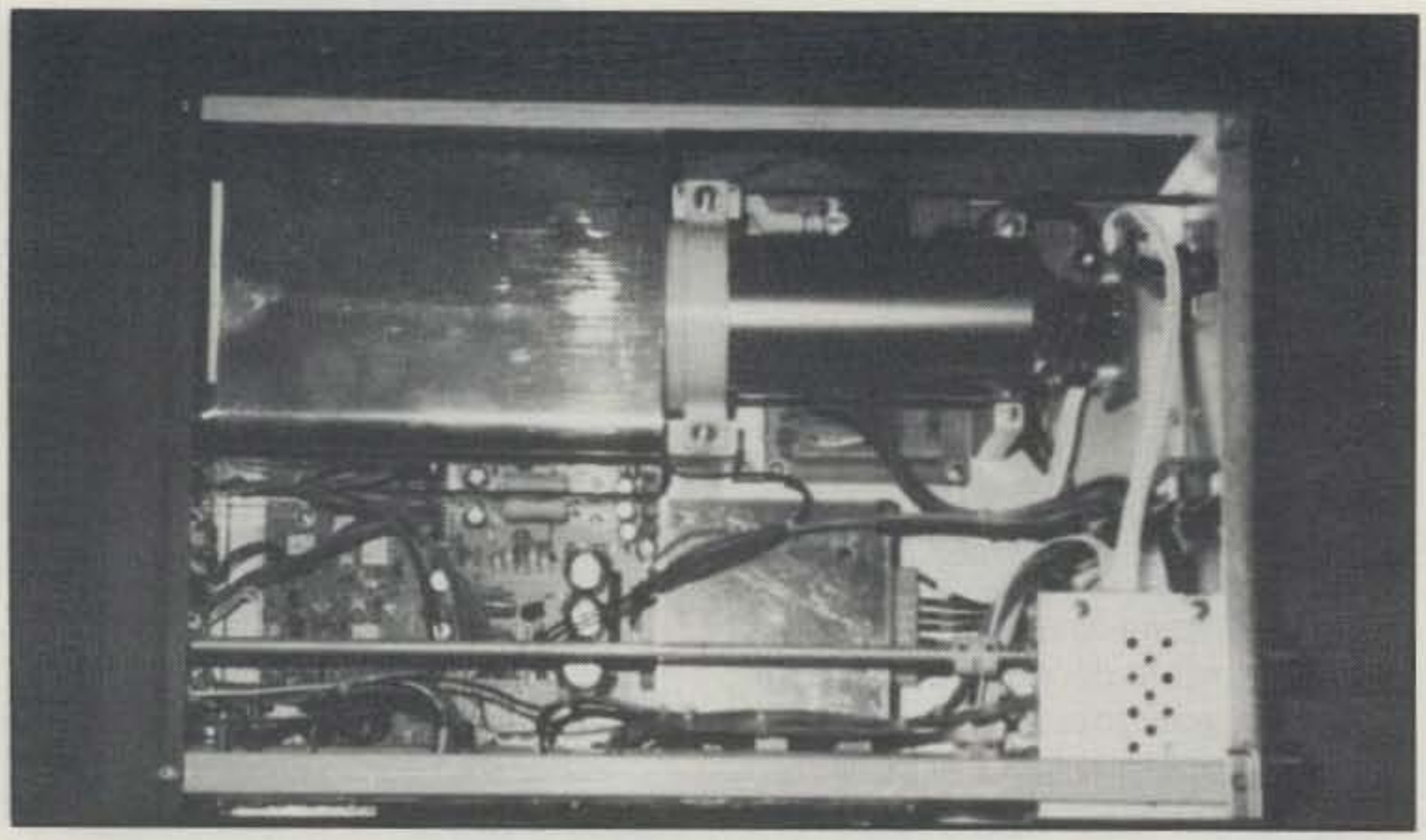
The SM-230 Station Monitor

The SM-230 is a monitor specifically developed as an accessory for the TS-950S. Very basically, it allows you to "see" the signals you receive and the signal you transmit. The objective is to visually "see" a far wider bandwidth of signals than you could possibly hear and to confirm that a transmitted signal is properly modulated. In addition, the unit can observe signal waveforms up to 150 MHz; functions as a general-purpose, high-sensitivity 10 MHz oscilloscope; and has a built-in two-tone audio signal generator for various test/tune functions. It features a quite large 6 inch square CRT.

Table III presents the specifications for the unit. Note that they are divided into sections for the transmit waveform monitor section, two-tone oscillator section, panoramic receive (bandscope) section, and oscilloscope section. The panoramic receive function is designed to work with the 8.830 MHz IF used in Kenwood equipment, but aside from that the unit is really a general-purpose test unit. Additionally, it will provide an RTTY cross-pattern display for RTTY reception. Connections to the TS-950S are extremely easy using a completely supplied set of cables.

The most interesting function of the SM-230, is, of course, the bandscope feature, or what we used to call panoramic reception display. Centered on the receive frequency, you see a visual display of the signals on either side of the receive frequency. The display width is selectable for ± 25, 100, or 250 kHz. There is no doubt that it is fascinating to be able to watch band activity visually. You can quickly see where band activity is concentrated and where the clear spots are. You can spot the clearer spots easily when, for instance, a DX station is operating split and tuning over a certain range or simply above a certain frequency. You can even distinguish the modulation characteristics of various SSB signals.

It does take a bit of practice to learn how to use the SM-230 most effectively both in terms of choosing the scan width and adjusting the vertical gain to suit band activity conditions for the clearest display. At first, you have the impression of seeing dozens of jumping beans all active at once, but things can quickly be sorted out. A special feature is that when the sub-receiver in the TS-950S is activated and when scan is set for ±25 kHz, a marker appears on the display to show where the sub-receiver is



Just a look inside the SM-230. The CRT (upper half) is completely shielded. The small enclosure to the lower right contains RF sampling circuitry so you can monitor your transmitted signal either from the TS-950S or from the output of a linear driven by the TS-950S.

Item		Specifications
CRT		6-inch-square, internal gradations
TRANSMITTED WAVE MONITOR TERMINAL		
Observable frequency		1.8 – 150 MHz
Maximum power throughput	1.8 – 80 MHz	2 kW_{PEP} (up to 5 min at max ATT)
	30 – 150 MHz	100 W_{PEP}
Deflection sensitivity (input, 5 W)	1.8 – 80 Hz	More than 1 div
	30 – 150 MHz	More than 0.6 div
Attenuator		6-step
TWO-TONE OSCILLATOR PORTION		
Oscillator frequencies		1,000 Hz, 1,575 Hz ±10%
Output voltage		5 mV (in TWO-TONE mode) ±20%
Output impedance		600 ohm
BAND SCOPE PORTION ("SLOW" SCAN SPEED)		
Input center frequency		8.830 MHz
Resolution		1 kHz (6 dB bandwidth)
Input sensitivity		More than 1 div per 10 μV rms
SCAN width		±25 kHz, ±100 kHz, ±250 kHz selectable
Marker precision		±10% (Marker displayed only in ±25 kHz range)
OSILLOSCOPE PORTION		
Vertical Unit		
Deflection sensitivity		10 mV/div – 10 V/div ±5%
Frequency characteristics	DC	DC – 10 MHz (–3 dB)
	AC	5 Hz – 10 MHz (–3 dB)
Input impednace		1Mohm ±2%, Less than 50 pF
Attenuator		1, 1/10, 1/100, and GND (interrange deviation: less than ±3%)
⚠ Maximum tolerable input voltage		250 V (DC + AC_{peak}) or input voltage 500 Vp-p (below 1 kHz)
Sweep circuit		
Sweep mode		trigger sweep (in absence of signal, auto free run)
Sweep frequency		10 Hz – 100 kHz (4 ranges and interrange fine adjust possible)
Sweep linearity		Less than 5%
Triggering		
Trigger sensitivity		Less than 1 div (10 Hz – 10 MHz sine wave)
Trigger level		FIX mode
Coupling		AC
Polarity		Rising
Calibration voltage		
Amplitude		0.5 Vp-p ±3% square wave, + polarity
Frequency		1 kHz ±5%
X-TUNE PORTION		
Sensitivity		300 mV/8 div ±20%
Input impedance		50 kohm ±20% (at 1 kHz)
Frequency characteristic		100 Hz – 10 kHz (within –3 dB)
⚠ Maximum tolerable input voltage		3 V_{rms} [4.5 V (DC + AC_{peak})]

Table III – Specifications for the SM-230 Station Monitor.

tuned. It tracks the tuning of the sub-receiver. Therefore, you can audibly check what looks like a clear spot by tuning the sub-receiver to it and turning up the sub-AF gain. Or if any unusual signal activity appears within the scan width of the display, the same action can be taken without changing the main tuning.

Besides its quite serious usefulness to many operators, the display is a great tool when illustrating amateur radio. Even if a visitor doesn't really understand much about radio, the visual display of all sorts of stations being active "out there" adds a new dimension.

The SM-230 does have two SO-239 connectors on its back panel so you can connect a transceiver's output through it to an antenna lead. The SM-230 samples the RF output and displays various waveforms depending on the modulation being used (including the "AH" vowel test). In any case, you can detect things such as carrier leakage, and if too much audio gain is being used such that signal peaks start to flatten. On CW you can observe the actual keying waveform. Since the SM-230 has a 1000/1575 Hz dual tone test oscillator built in (either tone alone or both can be selected), you can route the tone output to the microphone input on the TS-950S and see displayed one of the standard SSB test patterns so you can check for linearity, control settings, etc. The SM-230 comes with an interconnecting cable to the TS-950S for this purpose.

Separate X and Y inputs are provided on the back panel. Therefore, for RTTY the usual cross-pattern tuning indication can be displayed by connections to an RTTY terminal unit.

Use of the SM-230 as a general-purpose DC to 10 MHz oscilloscope is facilitated by a separate BNC input connector on the front panel. No wiring has to be changed which would disturb the station monitor role of the unit. The vertical input sensitivity is 10 mV/div., and the horizontal sweep range is 10 Hz to 100 kHz, continuously variable in four ranges.

Other Accessories

There is, of course, the whole line of Kenwood microphone, speaker, headphone, etc., items that can be used. Although the TS-950S comes with an MC-43S hand microphone, you are going to get tired of using it because if you acquire a TS-950S you are going to spend long hours using the radio. I would suggest an MC-85 for the TS-950S and an MC-80 for the TS-950S Digital. You don't need the speech-shaping/compressor action in the MC-85 with the TS-950S Digital.

Summary

That's the TS-950S "system," as I call it. It was fun writing this review, and I hope I did the gear reasonable justice. However, I'm glad writing about the radio is finished. Now I can get back to operating it and receiving those flattering signal reports!

The TS-950S is priced at $3299.95 amateur net, and the TS-950S Digital is priced at $4399.95 amateur net. The SM-230 is priced at $999.95, and the DSP-10 is $599.95, both amateur net. For further details write to: Kenwood Corp., 2201 E. Dominguez Street, Long Beach, CA 90810.

It's time for a quick trip to the hardware store for some PVC, aluminum tubing, and a fresh hacksaw blade. KB6IC shows us how to build a new 2 meter antenna.

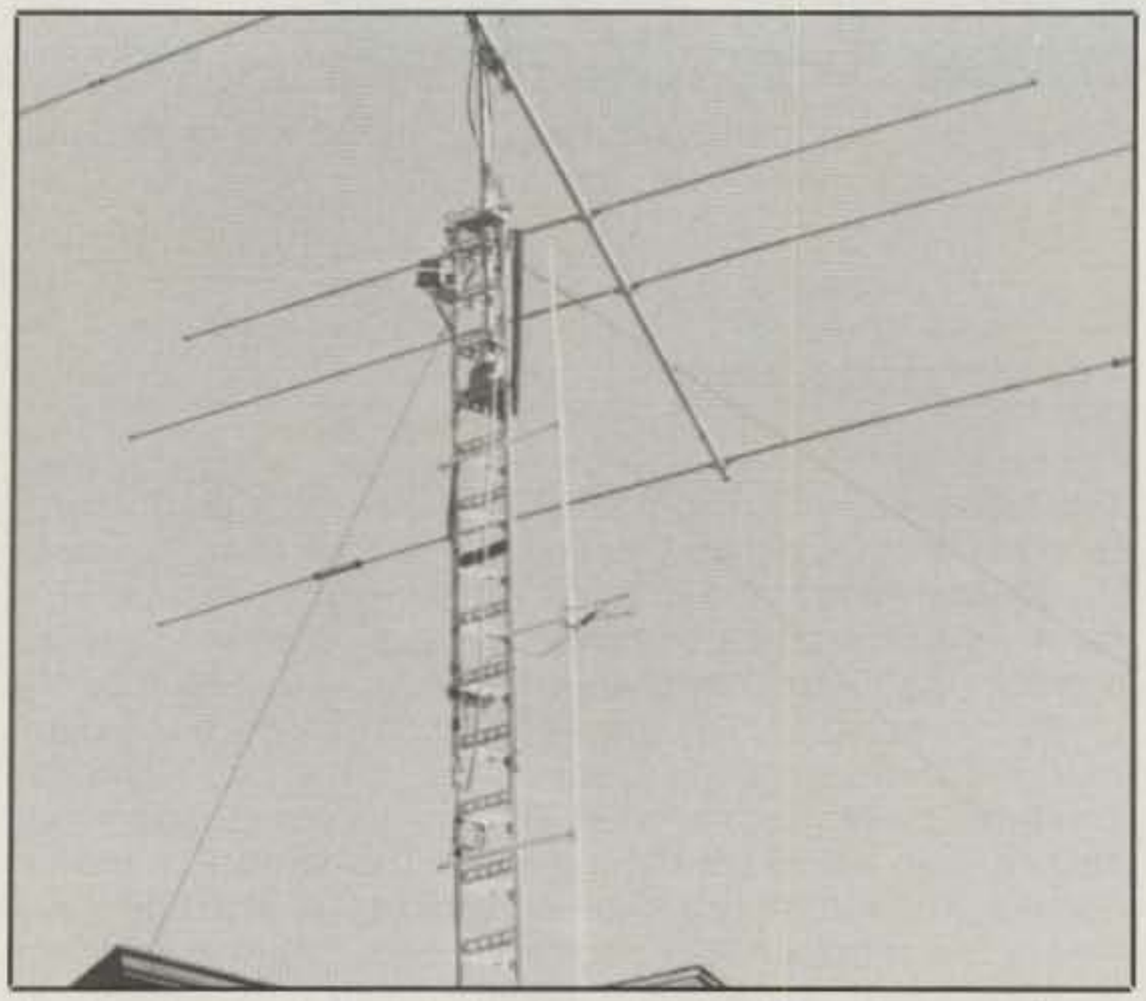
Build Your Own High-Performance Two Meter Collinear Antenna

BY LEWIS F. MCINTYRE*, KB6IC

VHF collinear antennas provide a vertically polarized pattern with good gain. However, they have a high impedance feed and a reputation (perhaps undeserved) for being difficult to build. I've built a two-wavelength unit; I'd like to share the design with you. I must admit, I dislike antenna design immensely, and consider it close to witchcraft; nevertheless, this antenna was relatively easy to assemble and gives good results for under $25.

Collinear dipoles are just two or more dipoles in a line. Figs. 1A, B, and C show two-, three-, and four-element collinear arrays, respectively. Note that a two-element collinear is simply a full-wave dipole. With proper phasing and spacing, the characteristic dipole "doughnut" radiation pattern is compressed to a flatter angle, achieving gain in the broadside direction. If the array is mounted vertically, omnidirectional coverage is preserved. This antenna is well suited for repeaters, home stations, and perhaps Field Day operations.

My antenna is a four-element (two wavelength) array and is shown in fig. 1C. Quarter-wave stubs provide a 180-degree phase reversal at the half-wave points, ensuring that each of the four dipoles are fed in phase.



Completed installation of side-mounted 2 meter collinear antenna on tower.

Mechanical Construction

Fig. 2 shows the mechanical layout and dimensions, cut for a frequency of 146 MHz. I used ⅞ inch aluminum tubing and ¾ inch PVC tubing, tees, and end caps throughout. For some reason PVC is measured in inside diameter (ID) and aluminum in outside diameter (OD), hence the difference in measurements. This means the aluminum tubing fits nicely into the PVC fittings. All are readily available in local hardware stores all over the United States. The quarter-wave stubs are detailed in fig. 3. These 16½ inch lengths of 300 ohm twinlead are housed inside PVC tubing. This tubing is capped at the ends to protect the stubs from the elements and provide convenient mounting brackets for the antennas. The dimensions shown for these tubes aren't critical, but I recommend you use 18 to 24 inches to allow for secure mounting. To prevent them from parting company with the antenna during high winds, use 6 × 1¼ inch hardware through the tees, as shown in fig. 3. Don't rely on PVC cement. The middle tube provides support only and contains no electrical components. Drill drain holes, as indicated, at the bottom of each tube. You should also drill a drain hole through the cap you plan to place at the bottom of the antenna.

Use care when cutting the aluminum elements; at these frequencies ½ inch is equal to 1.88 MHz!

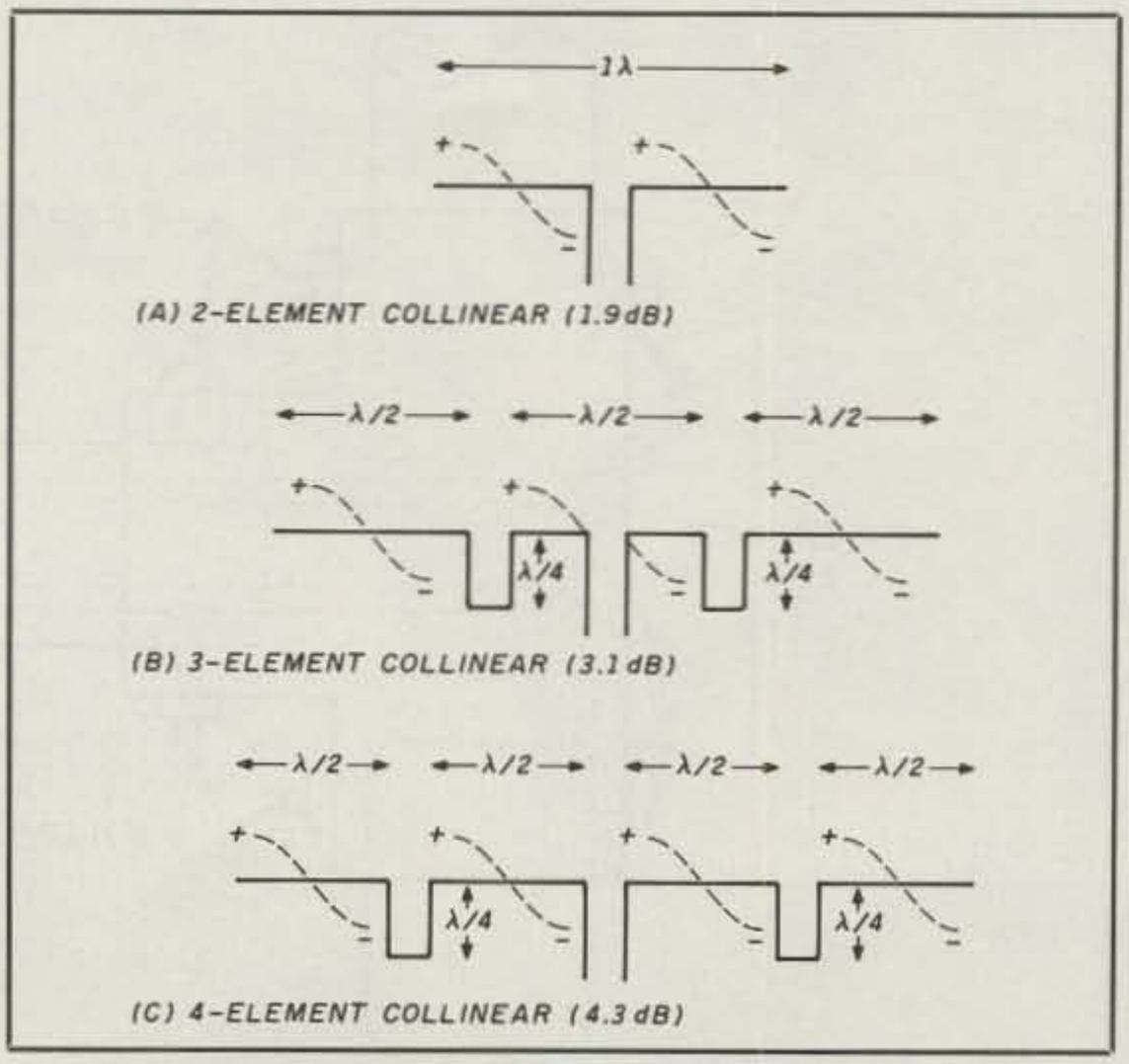
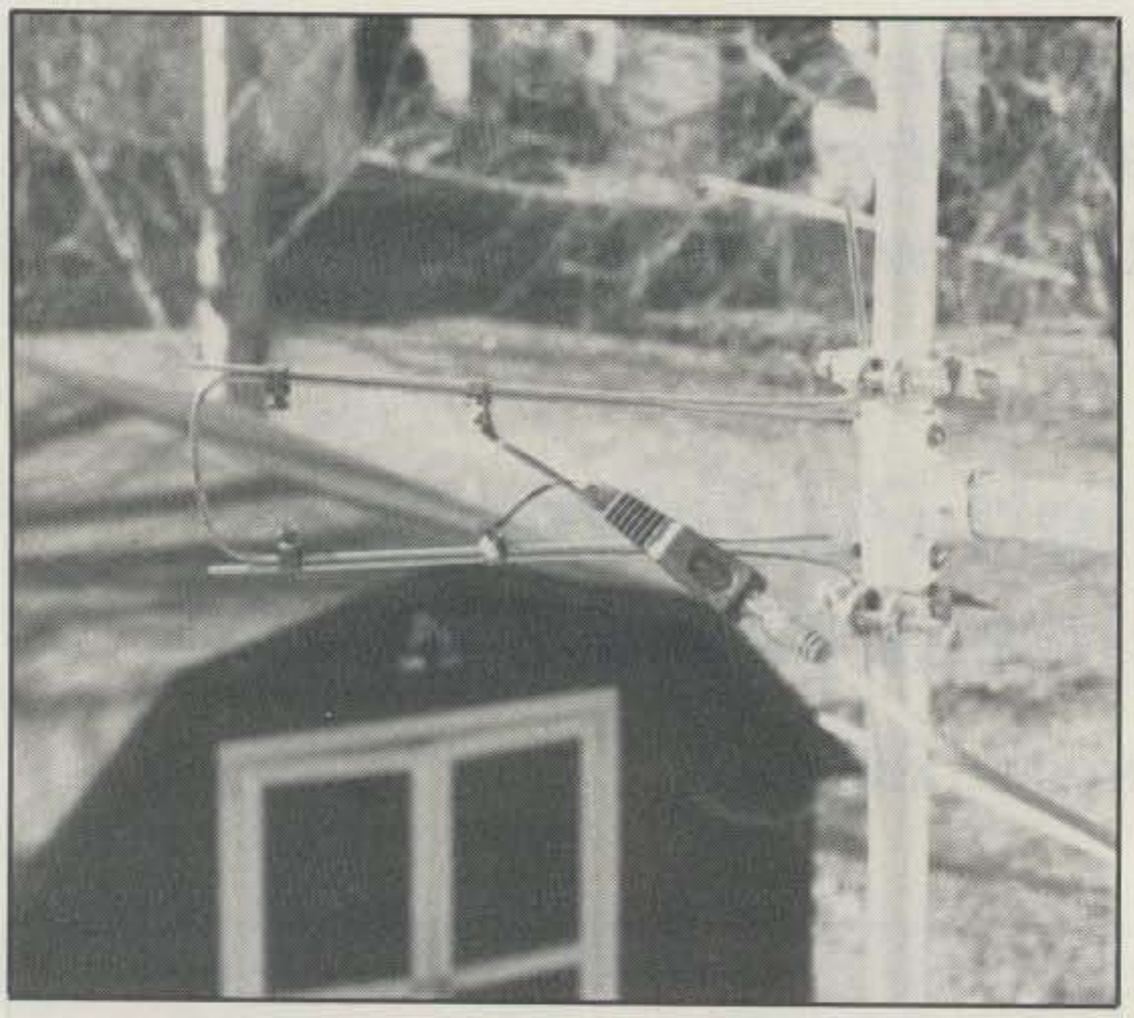


Fig. 1– Two-, three-, and four-element collinear arrays.

*3711 Gayle Avenue, Omaha, NE 68123



Closeup of the "trombone" matching network and TV balun attachment.

Feeding the Antenna

The collinear dipole requires a balanced high impedance feed. This antenna showed about 3:1 VSWR when fed with 300 ohms. I used a matching network, called a "universal stub," to match the 300 ohm feed to the antenna. The dimensions are shown in fig. 4; a closeup of the completed network is shown in an accompanying photo. The network is made up of three pieces of ⅛ inch copper-clad welding rod. Two 36 inch lengths, available at most hardware stores, will provide you with enough material. The three pieces are clamped with four electrical wire screw splices. This allows the outer piece of the network to slide in and out, like a trombone slide. A TV 75 to 300 ohm balun provides a 300 ohm feed, and is soldered to the innermost electrical splice. This arrangement is mounted to the antenna with two ⅞ inch pipe grounding clamps.

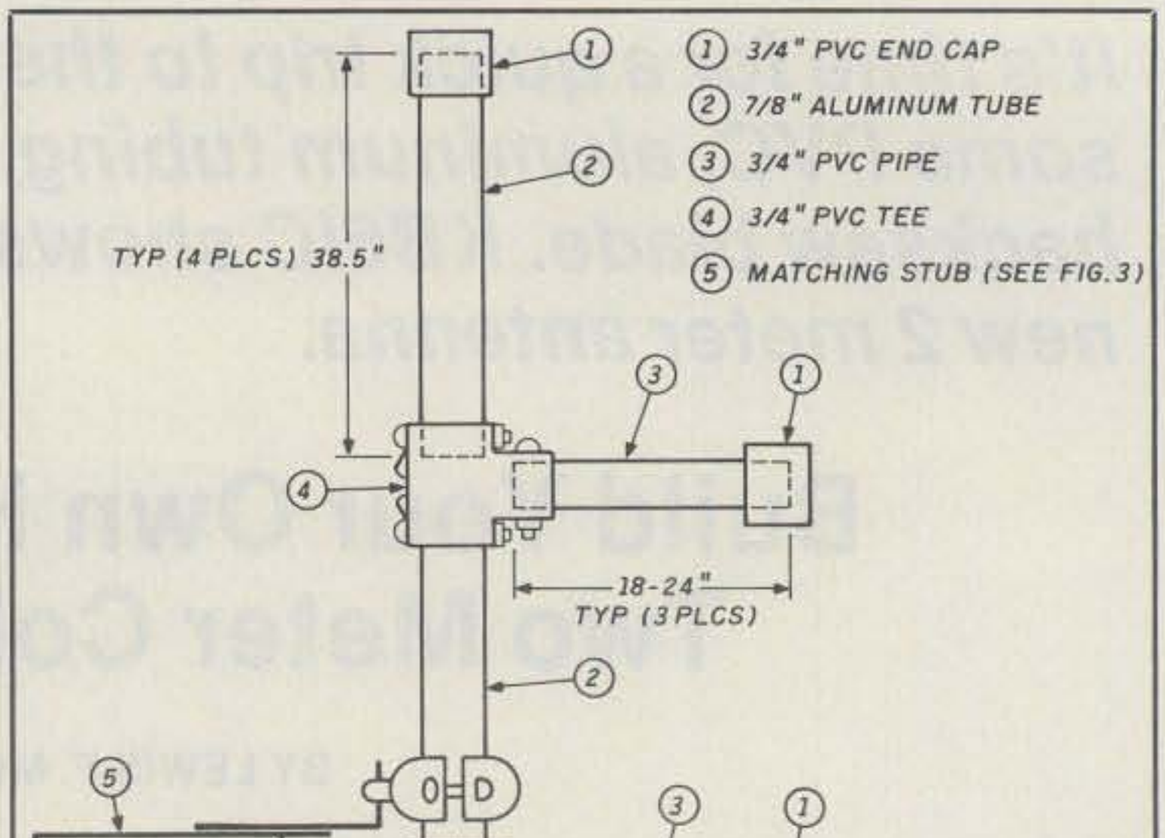


Fig. 2– Physical dimensions of 2 meter collinear antenna. Note: Center extension is for mounting only; it may be omitted. It does NOT contain 300 ohm twin lead, as do the matching stubs (fig. 3).

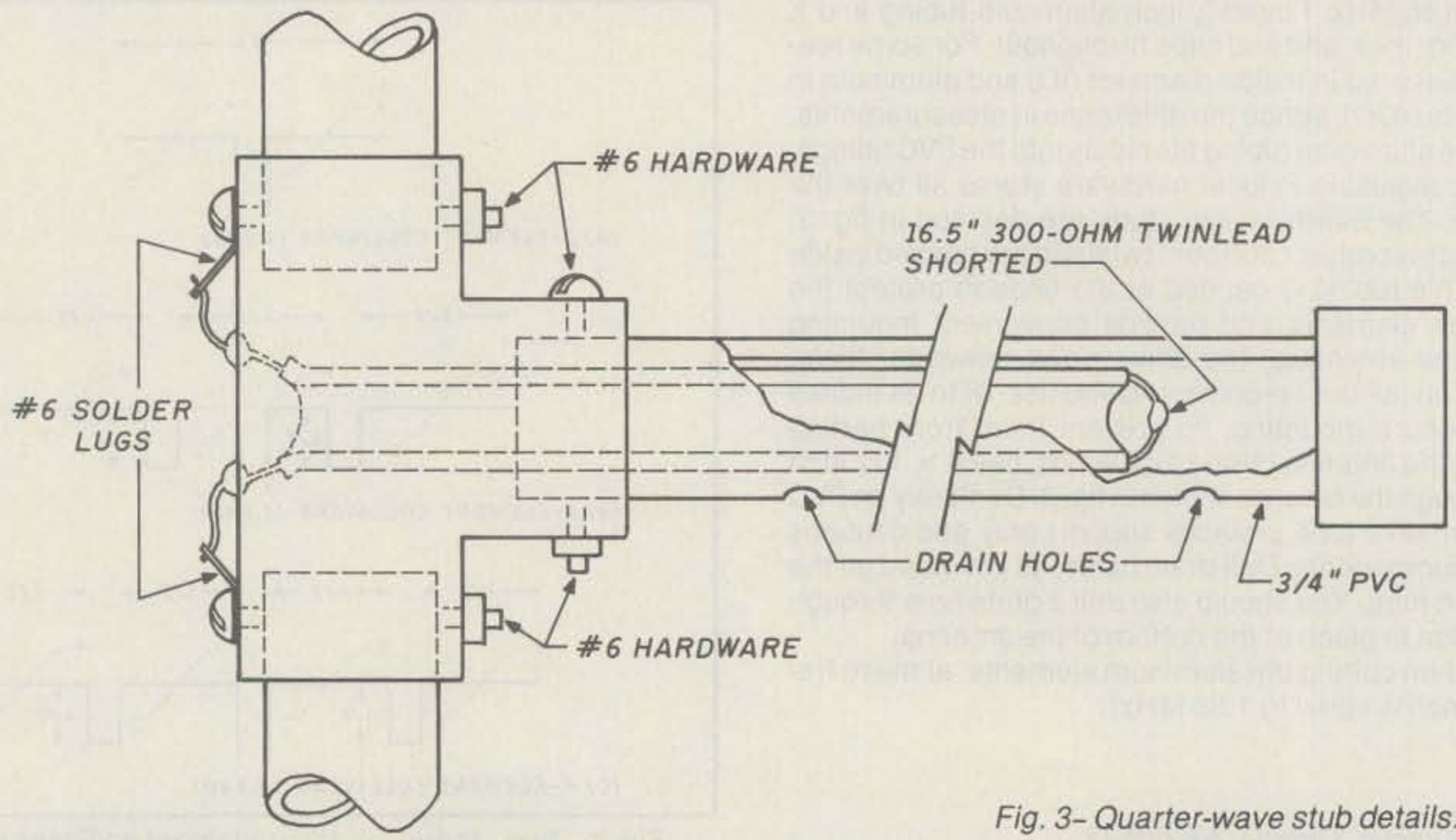


Fig. 3– Quarter-wave stub details.

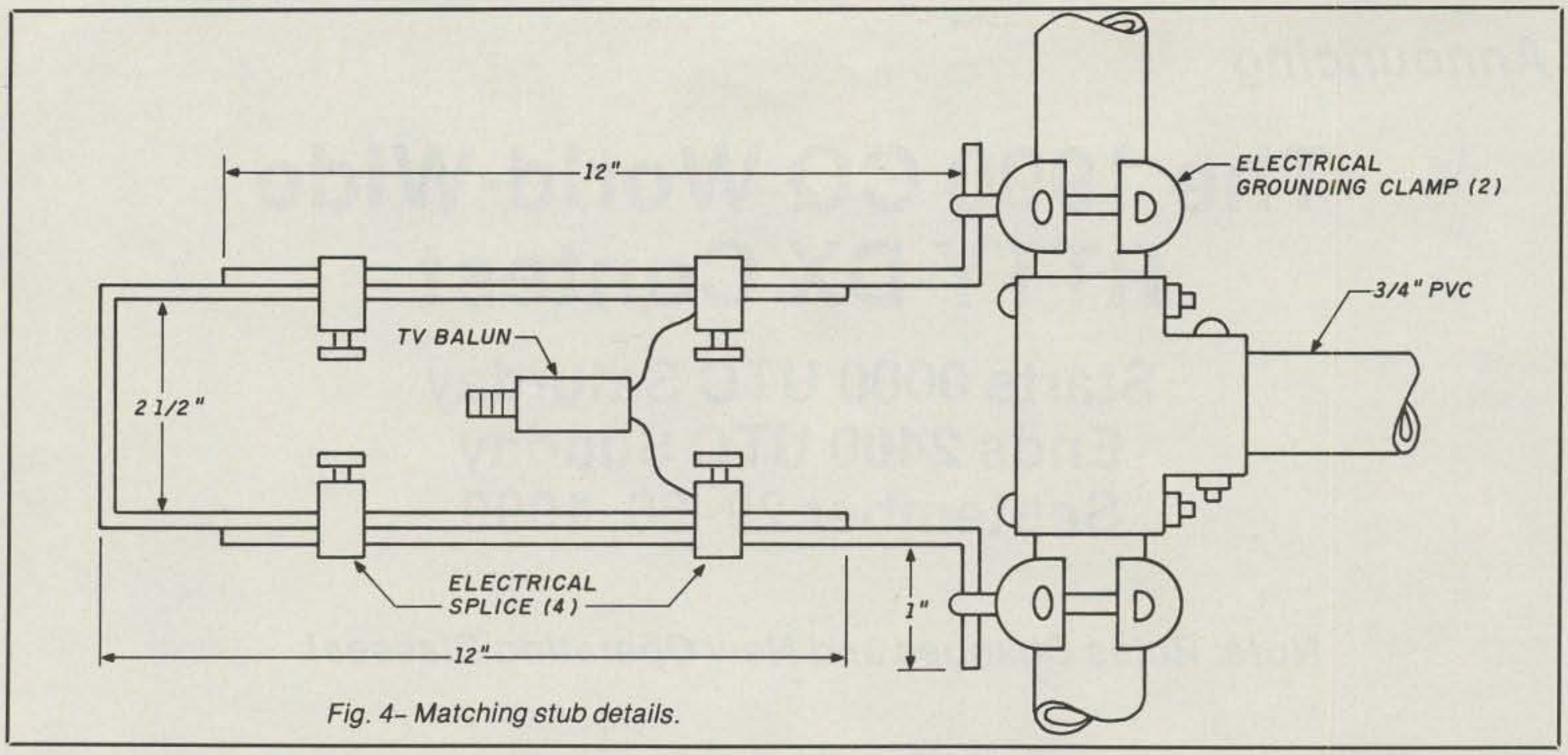


Fig. 4– Matching stub details.

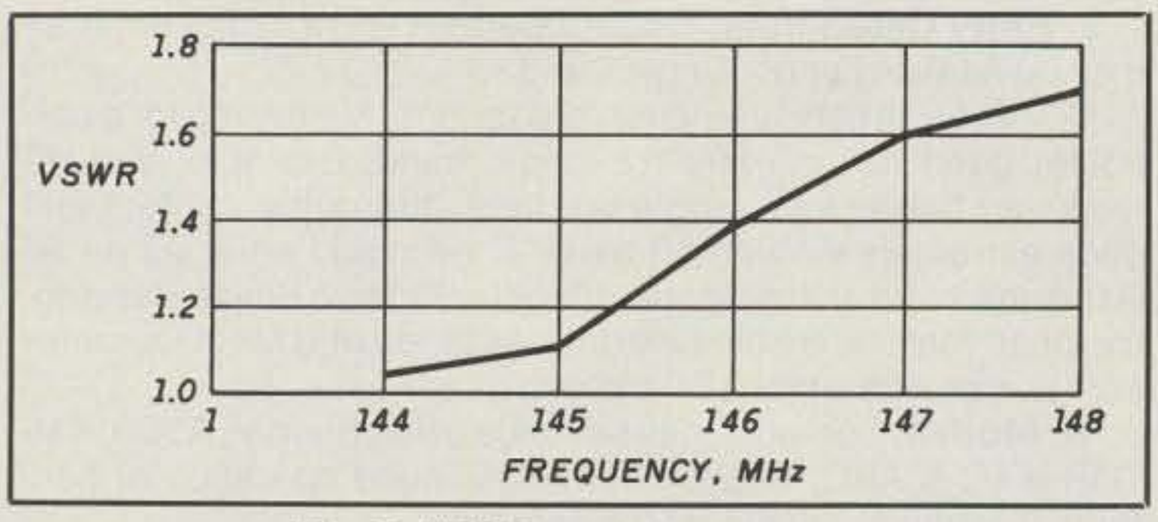


Fig. 5– VSWR versus frequency.

Installation and Tuneup

I mounted the antenna vertically. The three PVC tubes are clamped to my 30 foot tower at about the 20 foot point. Make sure that the drainhole cap and each tube's drainholes face downward. Keep at least 1 foot of clearance between the tower and the antenna.

When the installation is complete, set the trombone slide on the matching stub so the stub is about half extended for a total length of 18 inches with the balun connected about 9 inches from the antenna, or halfway. Make all fittings finger tight. Measure the VSWR as close to the antenna as possible. Using the initial settings described above, tune the antenna at 146 MHz and adjust the balun's position on the stub for lowest VSWR. Then slide the trombone in. Continue these two adjustments until you achieve the lowest VSWR; then tighten all four clamps. If you're a real stickler for accuracy, you can retrim the antenna for optimum resonance. Fig. 5 shows the VSWR as plotted for my antenna across the band. I missed my intended resonance point by about a MHz, which is close enough for me.

If you can't resist the temptation to modify a good design, consider replacing the TV balun with a coaxial balun of about 13½ inches of RG-59—especially if you run over 50 watts. And, if you want to match your antenna to the operating frequency precisely, consider installing telescoping tubing in the center of each of the four half-wavelength sections. Match the inner section first, with the two outer half-wavelength sections removed. Then add the outer two sections, tune them, and rematch.

Results

I'm extremely pleased with this antenna. It hits all repeaters within 50 miles with just 10 watts and a very lossy feedline. It's physically rugged and has withstood winds up to 50 mph. Tune-up was very simple. I think amateurs who want a high-performance vertical for 2 meters will find this is the project for them. And anyone who hates building antennas, as I do, will like it too!

Announcing

The 1990 CQ World-Wide RTTY DX Contest

Starts 0000 UTC Saturday
Ends 2400 UTC Sunday
September 29-30, 1990

Note: Rules Changes and New Operating Classes!

I. **Announcing:** The Fourth Annual *CQ* WW RTTY DX Contest, co-sponsored by *The RTTY Journal*.

II. **Objective:** For amateurs around the world to contact other amateurs in as many *CQ* zones and countries as possible using the digital modes.

III. **Contest Period:** 0000 UTC September 29 to 2400 UTC September 30, 1990. The total contest period is 48 hours, but no more than 30 hours of operation are permitted for single operator stations. The 18 hours of *off* time can be taken any time during the contest period, but *off* periods may *not* be less than three (3) hours in length. All *on* and *off* periods *must* be clearly noted in the log and summary sheets.

(a) Multi-operator and multi-multi stations may operate the entire 48 hour period.

(b) A single operator *may* operate more than the 30 hours, but only the *first* 30 hours will count toward the official score. (This allows rarer DX to give their multiplier to more stations.)

IV. **Operator Classes: Note new operator classes!**

1. **Single Operator, All Band and Single Band.** One person performs all operating and logging functions. Use of spotting nets, DX Alert Packet Systems, telephone, etc., are *not* permitted.

2. **Single Operator Assisted, All Band Only.** One person performs all operating and logging functions. However, the use of DX spotting nets or any other form of DX alerting assistance *is* allowed. The operator can change bands at any time.

3. **Multi-Operator, Single Transmitter.** All band entry only. More than one person operates, logs, checks for duplicates, use of a spotting net, etc.

a. Only one (1) transmitter and one (1) band permitted during the same time period (defined as ten [10] minutes). Once the station has begun operation on a given band, it *must* remain on that band for 10 minutes; listening time counts as operating time.

Exception: One—and only one—other band may be used during the same time period if—and only if—the station worked is a new multiplier. Logs found in violation of the ten (10) minute rule will be automatically reclassified as multi-multi to reflect their actual status.

4. **Multi-Operator, Multi-Transmitter.** All band entry only. No limit to the number of transmitters, but only one (1) signal per band permitted.

a. All transmitters must be located within a 500 meter diameter or within the property limits of the station licensee's address, whichever is greater. The antennas must be physically connected by wires to the transmitter.

V. **Entry Categories:** Single Operator entries may enter either (A) All Band or (B) Single Band.

NOTE: An all band entry may also submit his/her log for a particular band as an entry for single band. Example: W0LHS works all bands as a single operator during the contest and does extremely well on 10 meters. He could enter as an All Band entry and also enter his 10 meter log as a Single Band entry for 10 meters. Single Operator Assisted and Multi-Operator entries can only enter all band only.

VI. **Modes:** Contacts may be made using Baudot, ASCII, AMTOR (FEC & ARQ) Packet. (No unattended operation or contacts through gateways or digipeaters.)

VII. **Bands:** 80, 40, 20, 15, and 10 meters. Don't forget that VE stations cannot operate below 7.100 and that the Novices/Techs cannot operate below 28.100.

VIII. **Valid Contacts:** A given station may be contacted only *once* per band regardless of the digital *mode* employed. Additional contacts are allowed with the same station on each of the other bands as well.

IX. **Exchange:** Stations within the 48 Continental United States and the 13 Canadian areas must transmit RST, State or VE area, and *CQ* zone number. All other stations must transmit RST and *CQ* zone number.

X. **Countries:** The ARRL and WAE DX Country lists will be used. **Note: The USA and Canada count as country multipliers.** Example: The first US State and Canadian area you work not only count as a multiplier for the state or area, but also count as a country multiplier for each band.

XI. **QSO Points:** One (1) QSO point for contacts within your own country. Two (2) QSO points for contacts outside your own country but within your own continent. Three (3) QSO points for contacts outside your own continent.

XII. **Multiplier Points:** One (1) multiplier point for each US state (48) and each Canadian area (13) on each band. One (1) multiplier point for each DX country in the ARRL and/or WAE lists on each band. *Note:* KL7 and KH6 are country multipliers *only* and *not* state multipliers. One (1) multiplier point for each *CQ* zone worked on each band. A maximum of 40 per band.

Note: Canadian areas are VO1, VO2, VE1 N.B., VE1 N.S., VE1 P.E.I., VE2, VE3, VE4, VE5, VE6, VE7, VE8 N.W.T., and VY Yukon.

XIII. **Final Score:** Total QSO points times the total multipliers equals the total claimed score.

XIV. **Contest Entries and Logging Instructions:** *CQ* WW

RTTY DX logs and forms should be used to facilitate scoring and checking. All logs must:

1. Show times in UTC.
2. All sent and received exchanges are to be logged (call-sign, RST, Zone, Country, State/VE, points claimed).
3. Indicate State/VE area, Zone, and Country Multiplier only the *first time* it is worked on *each band.*
4. Use a separate log sheet for *each band.*
5. A check list of duplicate contacts for *each band* (dupe sheet).
6. A *multiplier* check sheet for each band.
7. An overall *summary sheet* showing total QSOs, Points, Zones, countries, and States/VE areas worked.
8. Each entry must be accompanied by a signed declaration that all contest rules and regulations for amateur radio in the country of operation have been observed.

Contest forms are available from *CQ, The RTTY Journal,* and the Contest Director. *The RTTY Journal*'s address is 9085 La Casita Avenue, Fountain Valley, CA 92708. Please include a large SASE with 2 units of US first-class postage or IRCs.

XV. **Disqualification:** Operating in an unsportsmanlike manner, manipulating scores or times to achieve a score advantage, or failure to omit duplicate contacts which would reduce the overall score more than 2% are grounds for disqualification. The use of non-amateur means such as telephones, telegrams, etc., to elicit contacts or multipliers *during* the contest is unsportsmanlike and the entry is subject to disqualification. Actions and decisions of the Contest Committee are official and final.

XVI. **Awards:** Plaques will be awarded to the first-place finishers in each of the operator classes. Certificates will be awarded to second and third. Certificates will be awarded to the first-place finishers in each of the U.S. and Canadian call areas. Certificates will be awarded to the first-place finishers in each DX country. In addition the highest scoring Novice/Technician will receive a certificate.

XVII. **Deadline:** All entries must be postmarked **no later** than December 1, 1990. An extension may be given if requested. Logs should be mailed to: Roy Gould, KT1N, *CQ* WW RTTY DX Contest Director, P.O. Box DX, Stow, MA 01775, USA.

XVIII. **Plaques (Donors):**

Single Operator, All Band
World—AEA, Advanced Electronic Applications ,Inc.
North America—HAL Communications Corp.
South America—Association of DX-EX, Ecuador
Europe—HAL Communications Corp.
Oceania—*The RTTY Journal*
Asia—N5JJ Memorial
Africa—Roy Gould, KT1N, Roland Belanger, N1FTD

Single Operator, Single Band
Single Band, High Score—Kunihiko Fujii, JH1QDB

Single Operator Assisted
World—Open
Continents—Open

Multi-Operator Single Transmitter
World—AEA, Advanced Electronic Applications, Inc.
Continents—Open

Multi-Operator, Multi-Transmitter
World—Open
Continents—Open

There are many plaques looking for sponsors—single band, a specific country, multi-op by continent, etc. If you are interested, contact the Contest Director.

Here's a project that will get your imagination soaring and your workbench cleared almost as fast. KN5S presents us with an amplifier requiring only 30 watts of drive that delivers 1500 watts from 160 through 6 meters.

A Low-Drive, High-Power All-Band Tetrode Linear Amplifier

BY MARK MANDELKERN*, KN5S

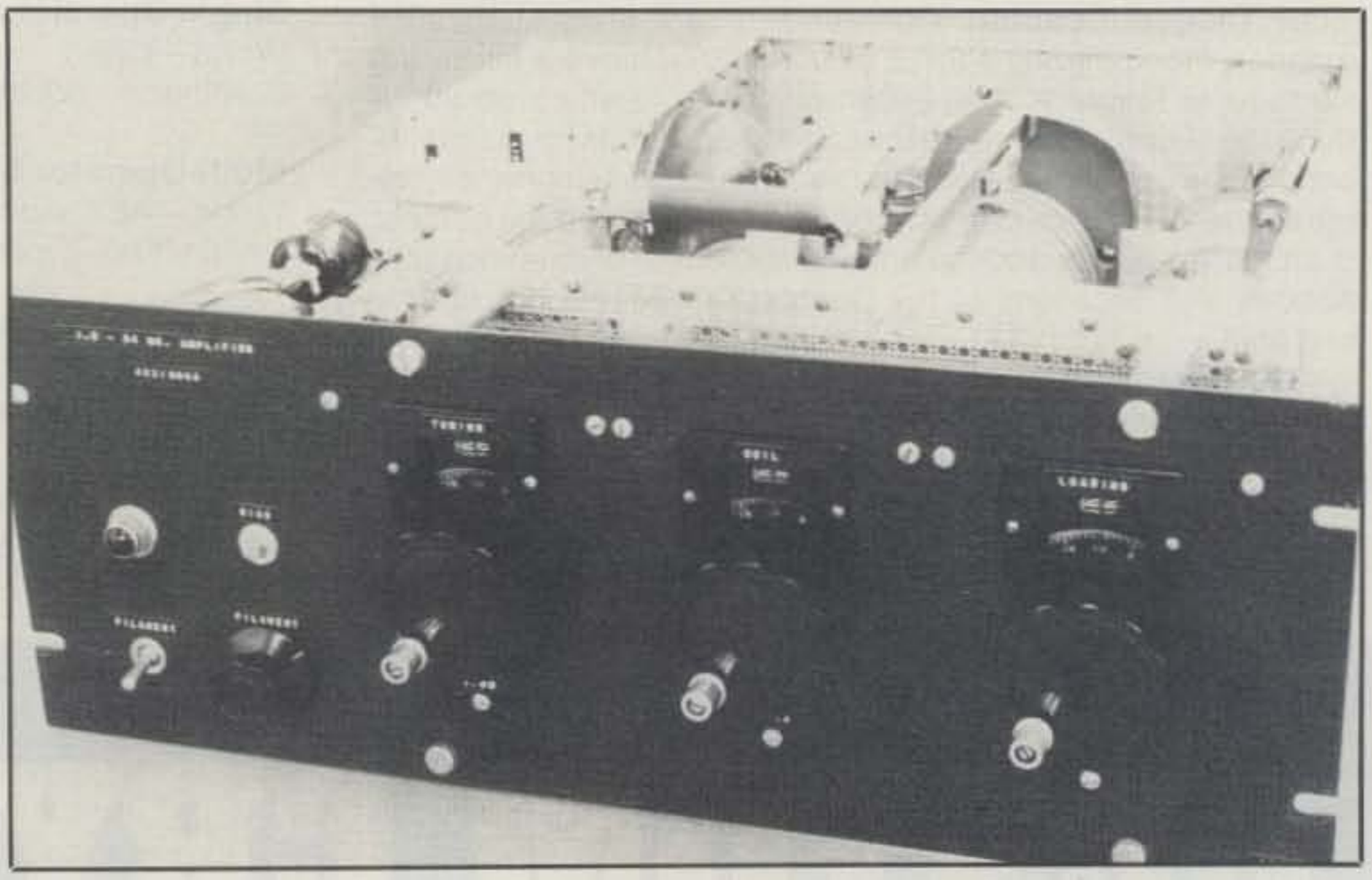
Here's an amplifier project that demonstrates the simplicity you can obtain using a high gain tetrode with an untuned passive grid input circuit. This amp delivers 1500 watts output with 30 watts drive on all bands from 1.8 to 54 MHz. There's no bandswitch, just a rotary coil and two vacuum variables. Even if new bands are granted in the future, this amp won't become obsolete. It was fun to build and has given smooth and reliable service.

The drive required in class AB1 consists only of circuit losses, usually less than a watt. To use such super high gain you'd need input matching and tuning circuits, and neutralization. By including a 50 ohm resistor in the grid circuit, you can obtain absolute stability without neutralization, while avoiding input tuning. For a 4CX1000A, the resistor absorbs just 30 watts. This is well within the CCS limits of almost any exciter—even on RTTY. In the end, you've traded super high gain for absolute stability and simplicity. However, you still have all the gain you need—17 dB.

The amplifier is built in three sections: RF deck, control and metering panel, and HV supply. I built the control panel separately so I could add RF decks for VHF and UHF (when I have the time) without duplicating all the protective and metering circuits. Tetrodes are very rugged, but they do need adequate protective circuitry. They are easily destroyed if run beyond their control grid and screen grid limits. I've described the protecting control panel in another article.[1]

The project took a year to complete. In the years that followed, I spent many hours improving the design. The HV supply for this amplifier is borrowed from an older amplifier.[2,3] You may want to use your old HV supply, or build one described in the *The ARRL Handbook*.[4]

The RF deck circuit is shown in fig. 1; it's very straightforward. Some of the tank components are more expensive and harder to find on the surplus market than they were when I first built this rig, but you can substitute any suitable components. The blower cool-down delay circuit isn't shown here; you'll find it in the March 1989 issue of *QST*, page 35. The low pass filter and antenna relay are separate. The sequencing control for the antenna relay and amplifier is also separate. You'll find it in *Ham Radio*, November 1987, page 17.



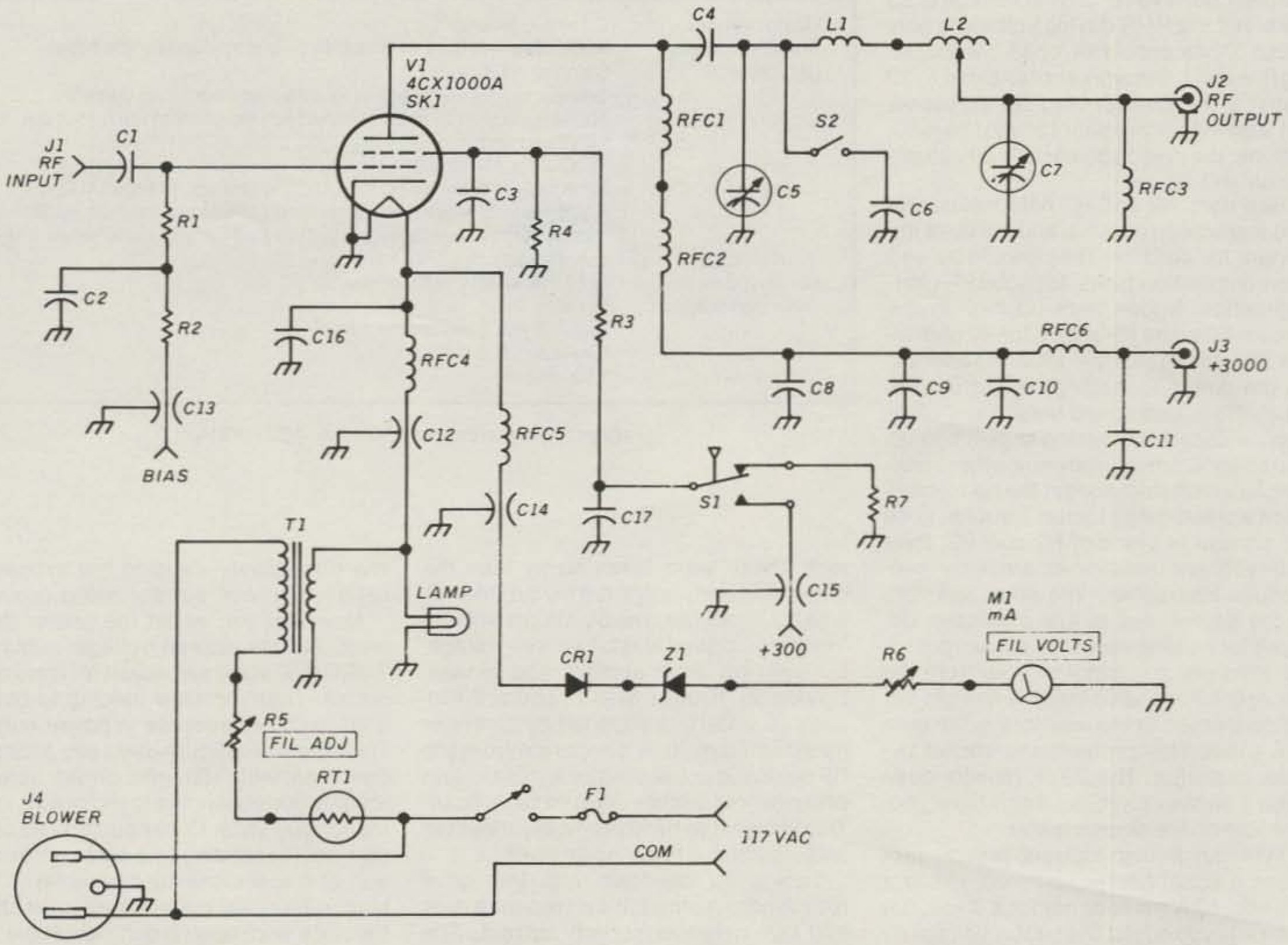
The front panel features the three turns-counter dials and a minimum of controls. The metering and protective circuitry are on another panel, as described in the text.

I built the amplifier before high power was allowed on 160 meters. Thus, the provision for high power is strictly a retrofit. A padding capacitor is switched by S2 at the rear of the amplifier. Use a long shaft and switch it from the front panel. A 600 pF vacuum variable would alleviate the need for the padder, but it may be difficult to find such a capacitor with the low minimum capacity (10 pF) needed on 6 meters. This low capacity is absolutely essential for efficiency on this band.

In most amplifiers, the power output drops off on the higher bands. The drop-off is usually caused by excessive minimum plate-tuning capacity. This high Q results in high circulating tank currents. In short, heat is produced in the tank circuit rather than RF at the antenna. For example, I recently rebuilt an SB-220 for 6 meters. Before rebuilding, it put out only 800 watts on 10 meters. With a new VHF high voltage plate tuning capacitor, it delivers 1200 watts output on 6 meters. There were no other changes that could account for this increase in efficiency. I used the same 3-500Zs, along with a portion of the old 10 meter tank coil. The new capacitor covers about 4 to 16 pF and resonates near the low capacity end. If I use less coil and force the capacitor to resonate near full capacity, the output begins to drop.

The 6 meter provision was an after-

*5259 Singer Road, Las Cruces, NM 88005



Parts List

C1,2—0.01 μF silver mica transmitting capacitor
C3—1500 pF screen grid bypass (internal to tube socket)
C4—2000 pF, 5 kV, two 858S capacitors in parallel, Centralab
C5—Vacuum variable, 10 to 300 pF, 10 kV, Jennings UCS-300 (plate tuning)
C6—300 pF, 5 kV, Centralab-type 858S
C7—Vacμum variable, 3000 pF maximum, 3 kV, Jennings UCSL-3000 (loading)
C8—0.0014 μF, 10 kV (EM)
C9—0.005 μF, 15 kV oil capacitor
C10,11—500 pF, 20 kV "TV doorknob," Centralab
C12—0.05 μF, 20 A feedthrough, Sprague
C13,14,15—1000 pF feedthrough
C16—0.1 μF, 100 volts DC disc ceramic
D1—Silicon diode, 1N4148 or 1N914
F1—3 A fuse
J1—BNC chassis mount
J2—N chassis mount
J3—HN chassis mount, used with RG213 for 3 kV feed
J4—Chassis-mount AC outlet, Amphenol 160-2N, AL part no. 713-5202
Lamp—No. 47 6.3 volt lamp
L1—3.5 turns no. 10 silver-plated wire, 1 inch ID, 2 inches long, self-supporting
L2—24 H roller inductor, Johnson 226-1 (EM, CC)
M1—1 mA DC meter movement, filament voltage
R1—50 ohm, 60 watt noninductive resistor, thirty 1500 ohm 2 watt carbon composition resistors connected in parallel (see text)
2—1000 ohm, 2 watt carbon composition
R3—100 ohm, 2 watt carbon composition
R4—220 K, 2 watt carbon composition
R5—25 ohm, 25 watt wirewound adjustable
R6—1000 ohm, 2 watt carbon or wirewound pot
R7—10,000 ohm, 2 watt carbon composition
RFC1—28 turns no. 18 wire solenoid wound on 0.5 inch OD by 2.5 inch ceramic form (plate choke)
RFC2—Plate choke, surplus part (suggest B&W 801)
RFC3—74 turns no. 20 wire solenoid wound on 0.75 OD by 3 inch ceramic form
RFC4—9 μH 15 A RF choke, surplus part (suggest Dale no. IH15, HF no. 18-105)
RFC5—1.0 mH RF choke
RFC6—10 H, 1 A RF choke
RT1—Surgistor, GC 25-933-S
S1—Air flow switch, Rotron 2A-1350
SK1—Eimac socket, Sk-810B; chimney SK-806 (BY)
T1—Transformer, 6.3 volts AC at 10 A second—ary, Thordarson 21F12, AL 704-2019
Z1—Zener diode, 6.2 volts, 1N473

Fig. 1– The RF deck circuit. The feed-through capacitors indicate the boundaries of the shielded grid compartment. Most of the parts can be garnered from fleamarkets and the sources indicated in Table II.

thought in this 4CX1000A amplifier, as I already had a homebrew 6 meter kilowatt. After several years of use, I noticed that I was still using three and a half turns of the coil—even on 10 meters. I wondered how high it would tune. A few minutes later, to my great surprise, it was running almost 1500 watts on 6 meters with no special plate choke or plate coil! I added these later, as a matter of principle, with little effect. You might also arrange for operation on 2 meters using a switch, and a completely separate tank circuit.

For input grid loading resistor R1, I use thirty 1500 ohm 2 watt carbon composition resistors in parallel. This is a 60 watt resistor pack. The actual power dissipated is calculated as follows:

At a grid bias voltage of –55 volts, the grid will just begin to draw current when

the *peak* positive RF driving voltage is 55 volts. But the RMS driving voltage is only about 70 percent of this, or 38.5 volts. Using $P = E^2/R$, this works out to close to 30 watts. If the correct bias setting works out a bit higher or lower for your particular tube, the driving power will vary slightly from this figure.

Resistors R2 and R3 help isolate the grid and screen circuits, and are quite important for stability. They should be carbon composition types, for good RF characteristics. Notice their position in the circuit. C2 is the RF return for 50 ohm input resistor R1; R2 is positioned *after* C2 (in the direction leading away from the tube). R3 is positioned *before* any other bypass capacitor, leaving socket bypass capacitor C3 free from any other reactances which might upset the socket balance worked out by Eimac. I wouldn't use RF chokes in place of R2 and R3; their self-resonant frequencies are likely to introduce instabilities. The other resistors in the screen circuit are protective devices for holding down the screen potential (that which it might pick up from the plate) in any condition where it might not be connected to the resistors in the control panel. This protects the socket bypass capacitor. The 220 K resistor does draw a bit over 1 mA, but this is barely noticeable on the screen meter.

RT1, an in-rush current limiter, provides gradual heater warm-up. Using a 6.3 volt, 10 A transformer for a 6 volt, 9 A tube lets you adjust the heater voltage by varying the potentiometer, R5. It also allows for some drop in RT1. The use of a zener diode in the heater voltage meter circuit results in an expanded scale effect, with readings from 5 to 6 volts. You'll note that the heater voltage sampling line is connected directly to the tube socket and has its own feedthrough capacitor. Zener diodes behave strangely at low currents; it may be necessary to try diodes of different ratings from different manufacturers. I obtained linearity from only 5.4 to 6.0 volts, which is more than adequate. (For those who demand precision, an op amp expanded scale metering circuit might be easier.)

Calibration at only a few points is sufficient because the meter is used merely for reference, as you'll see in a moment. However, the expanded scale is certainly worthwhile. The heater voltage should be set just above the point where lower voltage results in reduced power output. This will give your tube the longest life.[5] For my tubes, 5.7 to 5.8 volts has been best. The required 3 minute warm-up period is provided by a thermal delay relay in the bias circuit, using a normally open 3 minute Amperite no. 6NO180 tube. The bias control and delay tube are located on the RF deck, while the circuit is shown in conjunction with the control switch on the control panel schematic.[1]

Table I gives the operating parameters. These were taken partly from the data sheet and partly from my experience with this amplifier. The bias is set with the "key" line closed and full screen voltage, but with **no** drive applied. The blower, Dayton no. 1C982 (rated 93 cfm at 0.4 inches of water), is supplied by Grainger (listed in Table II). It's separate from the RF deck and connected by a short length of household clothes dryer exhaust hose. This allows it to be acoustically mounted and results in a lower noise level.

Heater voltage	5.7 to 6.0 (see text).
Warm-up time	**3 minutes—failure to observe this may destroy the tube.**
Grid voltage	Standby – 150 volts Operating – 55 volts; adjust to obtain correct idling current
Screen voltage	300 volts; adjust to obtain correct key-down plate current under full drive conditions.
Plate voltage	3000 volts, key-down
Grid current	0 mA; adjust drive for normal ALC indications. Without ALC, adjust drive until slight grid current indications are seen on voice peaks; then reduce drive so that the grid current meter *never* indicates while operating.
Screen current	– 30 mA to + 10 mA
Plate current	Standby 0 mA Idle 250 mA quiescent or carrier Key-down 800 mA
Output	1500 watts

Table I – Operating parameters, 4CX1000A.

Tuning up key-down with **low** drive *isn't* recommended; it can produce over 100 mA negative screen current. The constant current curves do have small ellipses in places, representing poles. If you get into these regions, it's normal for the screen current to soar to destructive levels. This is one very important reason for complete protective circuitry.[1] For tuneup, a pulsed driving signal is best.

Tuneup is easy using dits from a keyer at 60 wpm and full drive level. Always use a monitor scope. Set the rotary coil for a total circuit inductance of about 0.15 μH per meter. For example, use 6 μH at 7 MHz. With the screen voltage switch on **zero**, adjust the drive level for about 0.1 mA grid current, or normal ALC indication. It's very difficult to hold the grid at 0.1 mA without ALC. Consequently, ALC is necessary for maintaining peak power without splattering. The ALC circuit is located on the control panel and is described in another article.[6] I've heard that operators using tetrodes in homebrew amplifiers sometimes receive splatter complaints from neighbors. While some might blame the tetrode, I think the trouble is caused by overdrive due to lack of ALC. Improper tuning will also cause trouble. With the **zero** screen voltage setting, it's now easy to adjust the drive level and check out the ALC while running no plate dissipation. Otherwise, you face the dilemma of either driving the tube to high plate current before you resonate the tank circuit, or trying to resonate the tank at low drive level—causing the excessive negative screen current noted above.

Now that you've set the proper drive level, set the screen voltage switch to **TUNE** (150 volts) and adjust for maximum output. Then *increase* loading to obtain a 20-percent **decrease** in power output. This 20-percent figure gives you a loading condition, with 150 volts on the screen, roughly corresponding to the proper loading for 300 volts. Consequently, you can now set the loading to a first approximation at a low dissipation level. With the bias set for 300 volts screen operation, the plate dissipation is quite low in the 150 volt tune position, and you can take your time resonating the tank circuit. There's

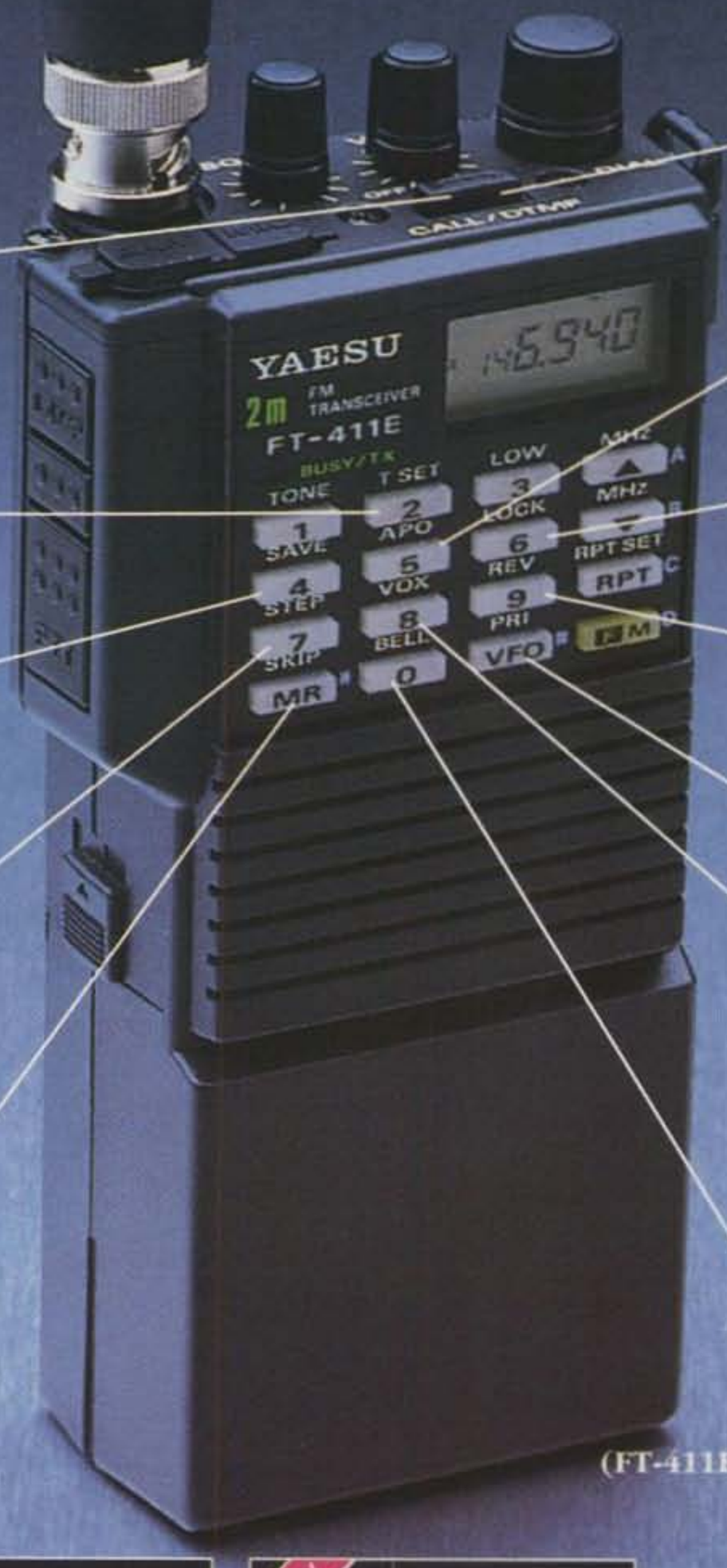
(AL)	Allied Electronics, 401 E. 8th Street, Fort Worth, TX 76102. Telephone: (800) 433-5700.
(BY)	Barry Electronics Corporation, 512 Broadway, New York, NY 10012. Telephone: (212) 925-7000 (Eimac tubes, sockets, chimneys).
(EM)	Alan Emerald, 8956 Swallow Avenue, Fountain Valley, CA 92708. Telephone: (714) 962-5940 (plate tank components).
(GR)	W.W. Grainger, Inc., many branches. Telephone: (800) 521-5585, in Illinois (800) 872-5585 (blowers).
(HF)	Hosfelt Electronics, Inc., 2700 Sunset Boulevard, Steubenville, OH 43952. Telephone: (800) 524-6464 (chokes, etc.)
(CC)	Cardwell Condenser Corporation, 80 E. Montauk Highway, Lindenhurst, NY 11757. Telephone: (516) 957-7200 (rotary inductors).

Table II – Component suppliers. (Two-letter designators before the company names are for use with the parts list which accompanies fig. 1.)

INDUSTRY FIRST!

FT-411E

(ENHANCED)



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INDUSTRY FIRST!
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INDUSTRY FIRST!
APO (Automatic Power Off)

INDUSTRY FIRST!
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INDUSTRY FIRST!
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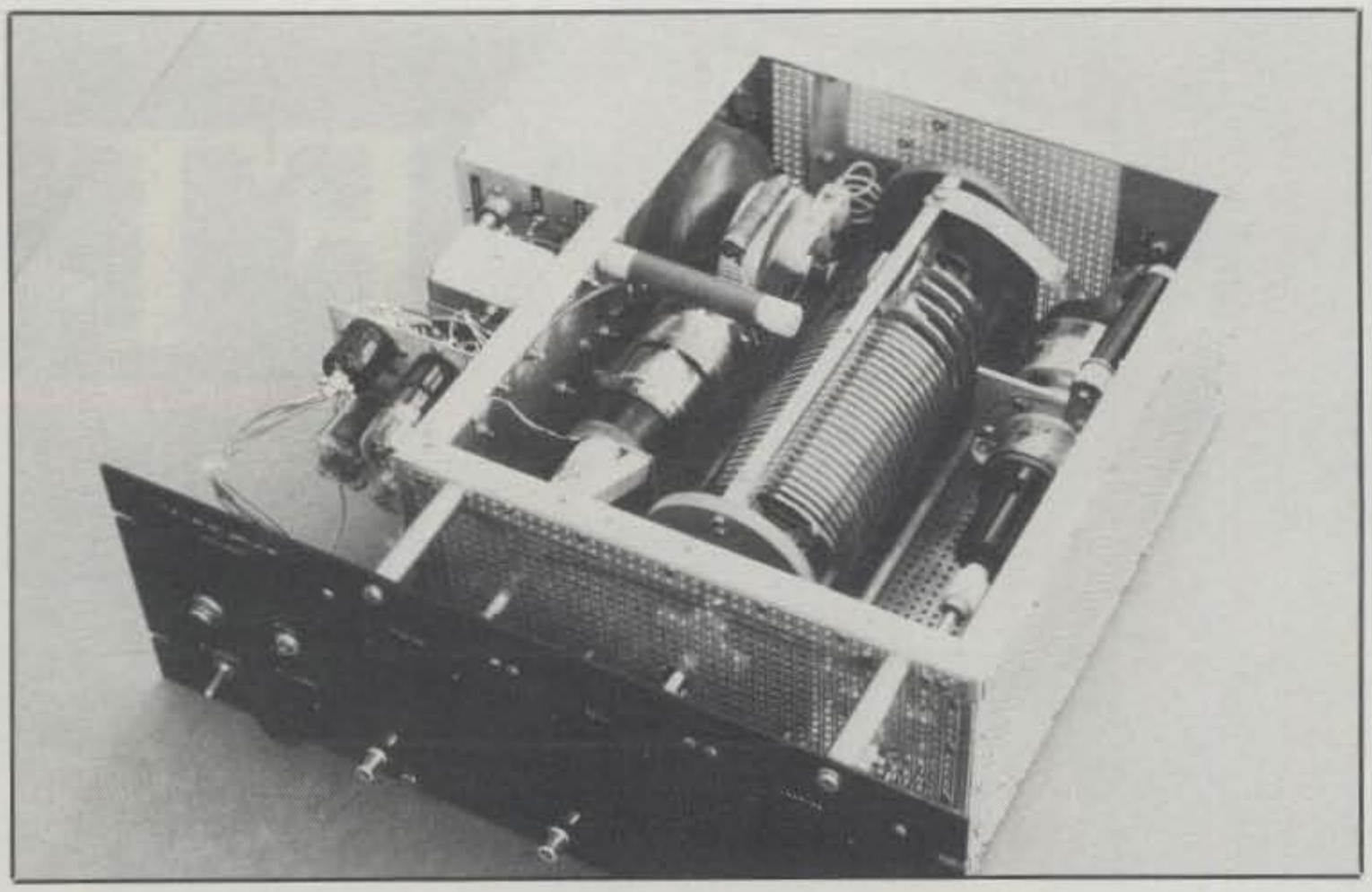

The grid and plate chambers are completely isolated. All leads into the grid compartment are routed through feed-through capacitors. The plate/output compartment is fairly straightforward and is made from standard aluminum stock available at local hardware stores. The front panel unplugs and is easily removable. This amplifier was built using a 7 inch rack panel, making contruction a rather intriguing exercise. A better method would have been to use an 8¾ inch panel. You can dress it up or detail it to suit your own taste.

no need to tune frantically while holding the key down for two seconds at a time!

Switch to 300 volts and read the screen current meter. The goal for a first approximation is something near 10 mA negative, although this varies from tube to tube. Adjust the loading accordingly. Increased loading (less output capacity) results in less (more negative) screen current. Tune for peak output with 300 volts on the screen. **Always** retune the input capacitor for resonance after adjusting the loading. Note that you're still running dits at 60 WPM. At this point you can touch the straight key for a second and check all the meters to get the key-down readings. (I always have a straight key on the bench plugged in and ready for emergencies.)

The screen current is the best indicator of resonance and loading conditions.[7] **Don't** try to dip the plate current yet. Resonate the input capacitor by tuning for maximum screen current. If this doesn't result in a reading very close to maximum output, somthing is wrong. A correspondence between a peak in screen current and maximum RF output indicates a stable, or neutralized, amplifier.[5] This doesn't just refer to amplifiers which have neutralizing adjustments, but also to those in which the in-phase feedback is kept very low by screen bypassing and/or grid loading. The screen current versus RF output check indicates an absence of regeneration. This amplifier uses both screen bypassing and grid loading. The screen bypass capacitor is built into the Eimac socket. If the capacitor were to open, you'd probably notice a discrepancy in the screen current and RF output peaks right away (if not more alarming symptoms!).

Adjust the output capacitor until this screen current peak is the value which yields the maximum output for your tube. About 10 to 20 mA negative screen current has been right for mine. After you've found the settings for maximum output, **increase** the loading so the output drops 50 watts. This procedure will give you the cleanest signal, and you lose only 0.1 dB. Record this optimum screen current value. Read both the dit tuneup and key-down values. The relation between these two values depends in part on the keyer characteristics and the meter damping. Once you find the proper values for your tube, you can use these to tune up on different frequencies. It's much easier than watching the output power, because it tells you *which way* to adjust the loading. After the dit tuneup, a quick key-down check will let you read input and output power. Record the counter dial settings. When you change bands, simply set the dials and do a quick dit test while you check the monitor scope and the screen current.

Results? You bet! This amp has given reliable service for 19 years under very strenuous contest operating by me and (some years ago) my junior op David, now

N6IHC. The most important result is the "type acceptance" by local operators working only a few kHz away.

CAUTION: This project requires the use of high voltages and currents which are potentially lethal. Always remember to be aware that SAFETY comes before anything else.

Footnotes

1. Mark Mandelkern, KN5S, "Protecting Power Tetrodes," *QST*, November 1989, pages 22–25.
2. Mark Mandelkern, KN5S, "Plate-current Meter Over-load Protection," *QST*, November 1987, page 41.
3. Mark Mandelkern, KN5S, "Stable High-voltage Metering," *QST*, December 1988, page 43.
4. *The ARRL 1990 Handbook for the Radio Amateur*, American Radio Relay League, Newington, Connecticut, 1989.
5. R.I. Sutherland, *Care and Feeding of Power Grid Tubes*, Eimac Divison, Varian, San Carlos, California, 1967, pages 88 and 142.
6. Mark Mandelkern, KN5S, "ALC for Class AB1 Amplifiers," *QST*, July 1986, pages 38–39, 47.
7. D. Meacham, "Understanding Tetrode Screen Current," *QST*, July 1961, pages 26–29.

1990 CQ 160 Meter Contest
High-Claimed Scores

Following are the high-claimed scores as of May 3, 1990. An asterisk after the call denotes multi-operator.

Phone

UG6GAW	406,597
VP9AD*	337,932
WB9Z*	209,182
KC5NQ	208,828
YZ1E*	174,114
K5NA*	172,095
LZ2DF	156,506
YV1CP	143,280
K3KG	134,685
WB8IFP*	120,404
OK5TOP*	116,372
AB4RU*	115,764
RA3WA	113,064
K2WI*	112,815
K3TUP	106,800
WD9INF*	104,676
KD9SV	103,044
OK1DXS	93,764
W3TS	93,568
K8MJZ	91,920
WZ8D*	87,114
HK4DUM	83,888
KB4WQO	83,820
IO4YSS	83,408
W0ZV	78,988
K1IK	76,734
WE8Z*	76,405
KY1H*	75,980
A92BE	75,768
AA4MM	75,320
K8EX*	74,124
WB8J*	70,851
K4LLQ	66,472
WB4ZNH*	66,120
K0LIR*	64,515
KZ3H/KP2	60,858
AA4NU	60,378
W3BGN	60,144
VE3NXA	59,254
LZ1KWZ	57,760
	(LZ1DM Op.)
WF2W	57,399
WB4UMJ	57,350
K5WXZ	55,755
RF6FM	54,950
AA4V*	53,100
NK7U*	52,026
K5QBG	51,464
K4PI*	49,706

CW

UG6GAW	323,968
YT2R*	282,978
VE6OU/3	274,092
OK5TOP*	269,790
KP2A	252,048
	(K4TEA Op.)
J37XT*	251,496
W2GD*	228,138
YT3T*	223,058
PJ9JT	210,540
K2WI*	201,510
GM3IGW*	195,860
LZ2DF	192,356
AA1K	184,184
LY2BTA	180,682
OK3KAP*	175,492
AA4S	175,122
DK5WL*	174,788
PA0ERA*	173,646
K5NA	172,142
K3KG	170,079
AB4RU*	168,867
OK1KSO*	166,425
W3BGN	154,980
OK1KQJ*	151,572
ES2WX*	150,506
VE3DO	149,886
UA1DZ	144,432
W0ZV	139,416
4X4NJ	136,344
KY1H*	132,246
W9AZ*	131,439
OH1AF	128,702
DK8ZB	125,070
VE3KP	124,120
K1IK	123,044
N6TR/5	120,712
V73AZ	117,713
N6DX*	116,356
DK0BN*	112,464
KY0A*	109,624
DL8OH*	109,175
WO0G	106,750
K2SG	104,583
UA9AQN	104,118
WA2SRQ	102,453
N4XM*	101,750
UZ2FWA*	101,292

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ARX-2B Ringo Ranger II
A147-11 11-el 146-148MHz
215WB 15-el wide band 2M
32-19 19-el. 2M beam
4218XL 18-el 2M Boomer
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PACKET USER'S NOTEBOOK

BY BUCK ROGERS, K4ABT

CONNECTING YOU AND PACKET RADIO IN THE REAL WORLD

"Un"complicating The TNC Throughput/Timing Commands

In several of the recent issues of *CQ* we've covered the packet world outside the ham shack and concentrated mostly on LAN building. No, this is not the same as enriching the soil on the back-forty. If you've kept track of my recent articles about node building, back-bones, trunking, and high-speed modems for the LAN nodes, you may have noticed that most of the jargon occupied the position of looking outward rather than inward. It is great to have a good LAN, but there are times when we must think about local housecleaning.

During this vacation time of year most of us are taking a few days away from the work place to venture down south for a much needed vacation. It is when we return from vacation that we discover we need a rest from the vacation. By now many of us have learned to get home a day or two before returning to the work place. This early return allows some moments to tidy up the yard—and the ham shack. While all this tidying up is taking place there are some ways to also tidy up the packet station.

Remember when you finally got around to purchasing the TNC? As soon as you got it home, you made a mad dash to the shack to put it all together and get on the air as soon as possible. Everyone gets a case of the "hurry-ups" at one time or the other. Trust me! Almost daily I get a call from some unfortunate newcomer to packet who went "ballistic" to get the new packet station on the air, only to discover the system wouldn't work after everything was connected.

Many times the new packeteer won't seek help before trying to interface the system, and many times there is no help to seek. Be that as it may, we sometimes tend to get it on the air and leave it at that.

Even when you have the station up and running, you feel that even though the deviation was set and the station will connect to the packeteer across town, there is still something missing. Well, there is. Here is what that "something" could be.

If It's Broken, Fix It

So often we settle for the axiom "If it's not broken, don't fix it." This may be true in some areas, but in the world of digital data transfer it is vitally important that our parameters be set within a window that will complement the configuration of the nodes and the neighboring users. Consider also that some users do not always have the correct configuration in their TNCs. The problem here may be that your packet station "is" broken, but you are not aware of it.

506 Pheasant Ridge Drive, Warner Robins, GA 31088

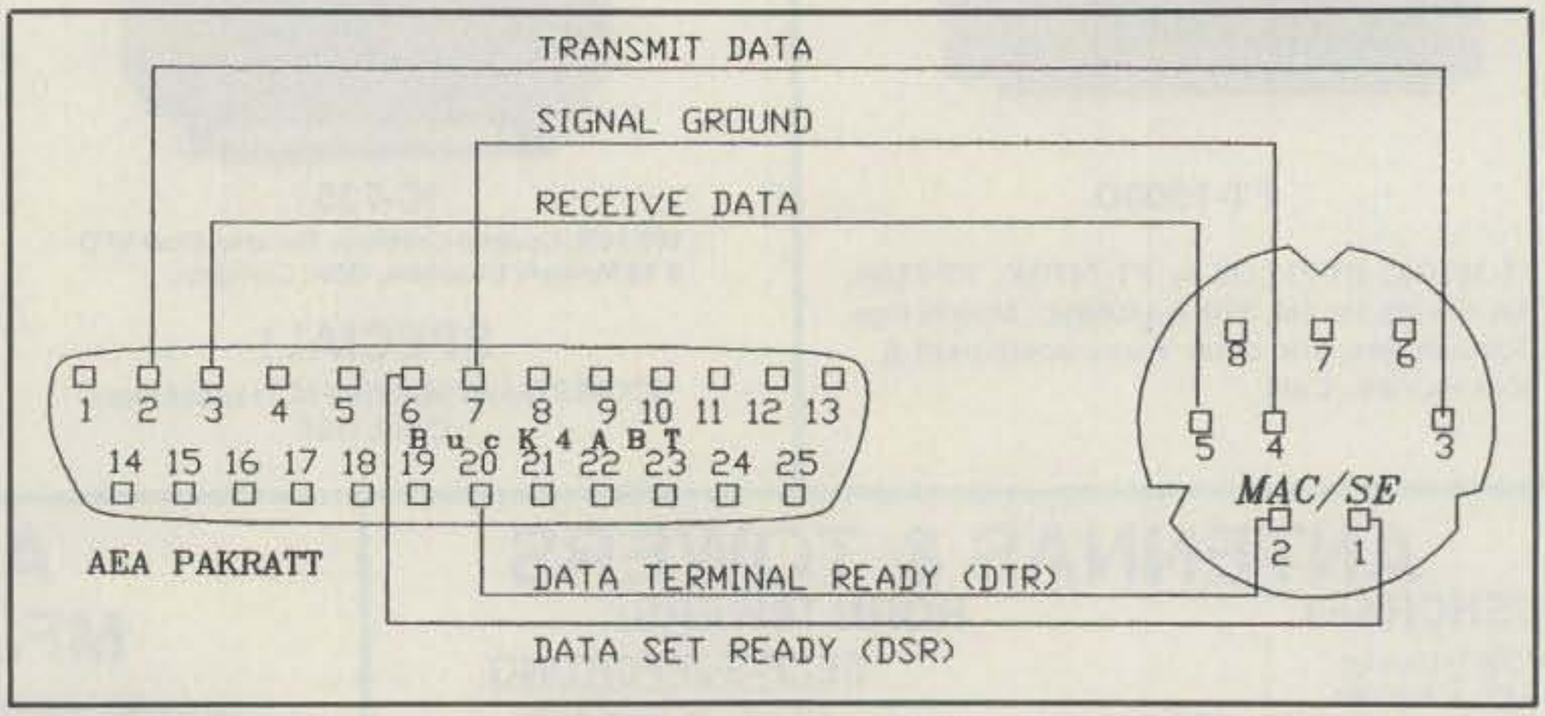

Fig. 1– Macintosh SE interfaced to AEA Pakratt 232 or PK-88.

TXD = Switching Time From TX to RX

Switching between transmit and receive is often a difficult problem for new packeteers to overcome. The reason the TXD becomes so difficult is due to the "key-up time" of most transceivers. Some of us have added linear amplifiers to the VHF packet station in an effort to claim the territory between us and the far-off node. When we add the extra power amplifiers, we fail to consider that the built-in antenna change-over system within the power amplifier is an electro-mechanical device. This electro-mechanical relay takes time to traverse from the receive state to the transmit state.

Many of us also have the linears which have an internal receive pre-amplifier. This too adds more time to the transmit "up time," or transmit delay.

By now you should have figured out that the acronym TXD means *transmit delay*. The transmitting station is ready to send data, and the operator inputs a line of text to send to the station connected at the distant end. The <enter> key is pressed to send the packet of text, but instead of an ACKnowledgement returning from the distant station, there is a NAK, or *Non-ACKnowledge* returned. This means the distant station never received the complete packet. Thus there will be a retry, or worse, there will be many retries and the connect request will retry OUT. A disconnect message will appear on your screen. This could be an indication that your TNC TXD is too short.

We don't want the transceiver to start sending usable data at the exact instant the radio keys up, so we install a delay stream of maybe Hex 7Es or HEX 00s at the beginning of each packet. This transmit delay period between the radio key up and the beginning of the data stream is what we are referring to when we talk about the TXD. The TXD is used to give the radio enough time to reach full output before the usable data begins to flow.

Most VHF radios need 100 to 150 milliseconds to come up to power, or full output. In addition, there is the key-up time for the linear amplifier. This too is measured in milliseconds. The key-up time for the power amplifiers varies from 50 ms to 150 ms, depending on the type and number of relay(s) used inside the linear. Since most TNC and data-controller TXD time is measured in 10 millisecond blocks, we use the sum of all the times listed above and divide by 10. Our answer is somewhere between 20 and 30, give or take 5 (50 ms). Since we want to be on the safe side, and also consider the time it takes the receiving station to open its squelch, we "take" the 5 ms.

Let's enter this number 35 into the TNC with the TXD command (**TXD 35**), and

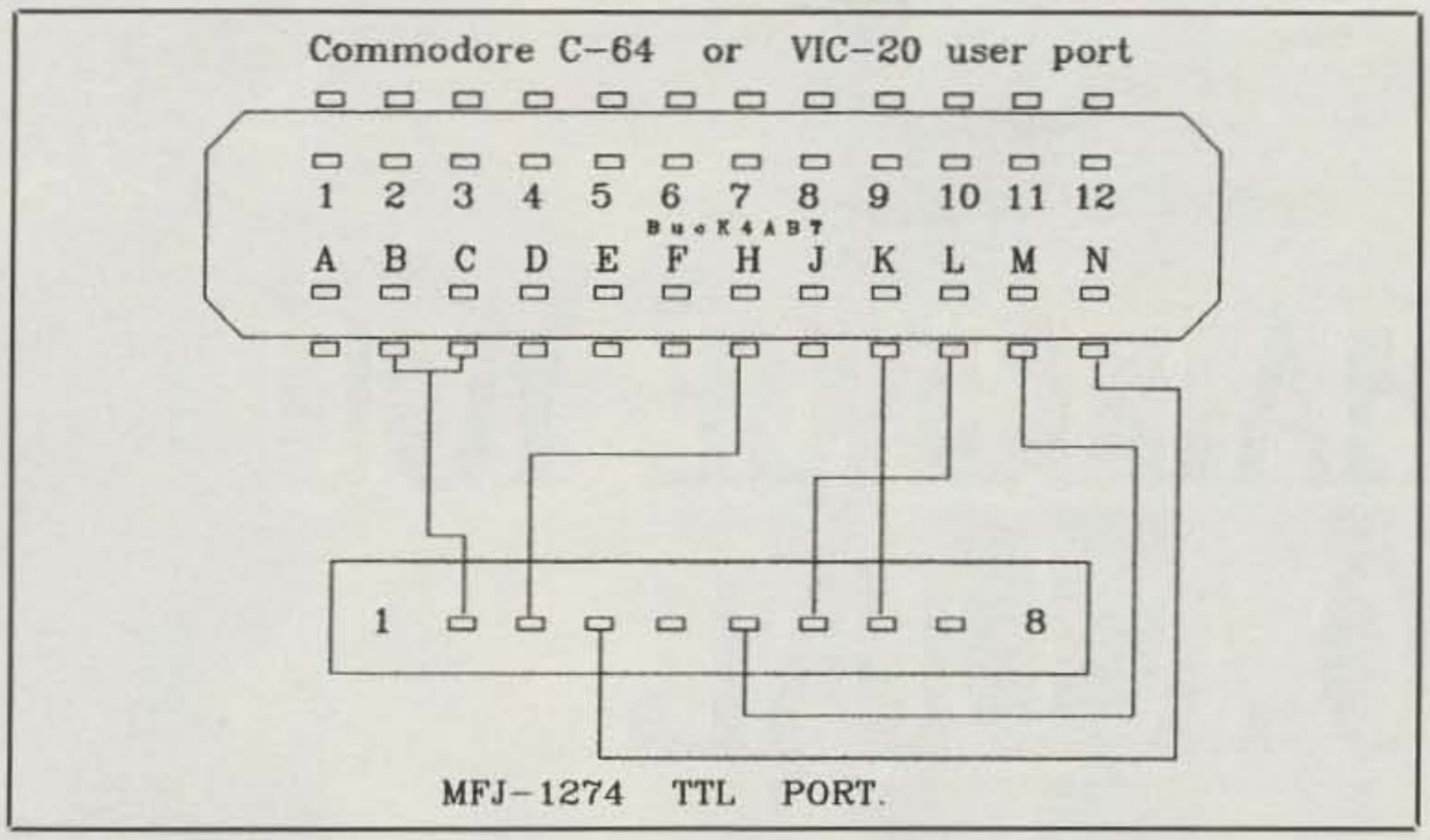

Fig. 2- Commodore C64 or Vic-20 to MFJ-1274 TTL port.

quite possibly this TXD will allow the connect to that distant station to hold. This time the ACK from the connected station will not let us retry out.

FRame ACKnowledge (FRACK)

We can make this TNC command short and sweet, or we can complicate it to the greatest possible level. I'm for reducing the complications within the command structure of the packet TNC. Too often I see new writers going after the complicated rendition of the TNC commands, only to end up confusing themselves. Packet radio is very easy to use, and as long as we keep it this way, we all will benefit from it and more users will enter its ranks.

FRACK should never be set below 3! FRACK has a rule of order that can be used in the following manner. If you are about to connect to a friend who is 3 nodes away, add that number to the TNC setting of 3; thus we have 6. If the station to which you wish to connect is only one node away, use that number to add to the TNC FRACK of 3 (3 + 1 = 4). This is the manner with which I make the system work for me, and at the same time it "uncomplicates" the FRACK command for us.

DWait (Digipeater Wait)

DWait was once the means used to allow the radio/TNC combination to handshake with each other. It was considered by many users that DWait was used to allow the AGC to recover after returning to the receive mode from the transmit mode. In a sense, this thought has some merit, because if you set the DWait too short, you may discover that the receiver in your radio will be unable to recover fast enough to allow the first of each received packet to get to the TNC on time. That is the long explanation. Following is the real purpose of the DWait command.

The DWait command is a command agreed upon by all members of a Local Area Network (LAN). This is why it is good to have packet users groups, or a packet club where the LAN members can meet so that issues of this kind can be talked through and agreed upon by the users of the LAN. By so doing the LAN members are establishing a means to reduce the number of collisions. Even with the new "anti-collision" features in many of the TNCs, we must remember that all LAN users do not have this new feature in their TNC. Most TNCs support a DWait of 16 as the default setting, but we have found that a DWAIT on our LAN of 8 to 12 is suitable for our needs and for use when downloading files from the local BBS.

PACLen

Let's really uncomplicate these final two commands. I can bet on at least 40 letters from some of my friends and some users who are old-timers (or who think they are) giving me "the dickens" or a rebuttal about these next two commands.

I'm about to simplify these two commands to the point of possible over-simplification. Over-simplification of a command is not to the liking of a few users. They feel that because their early packet days were difficult, so should be everyone else's. No one has more reason to complain about those days than I do, but who wants to complain? Even in those days we were having fun with packet. The only difference between packet radio now and then is now we have more packeteers with whom to QSO, and the terminal program features have given us a medium that is far more than the "TYPE and SEND" system of six or seven years ago.

Now that the history lesson is over, let's get to the PACLen setup of the TNC. There are three simple rules for this command, and they are:

1. When using nodes or digipeaters on VHF, set **PACLen 128** (normal default of most TNCs).

2. When using *direct* connects, and with near perfect connect paths, set **PACLen 255** (some TNCs accept PACL 0 as 255).

3. When operating *HF* packet, set **PACLen 32 for 300 b/s** or **PACLen 64 for 1200 b/s.** *(Note: 1200 b/s is legal above 28 MHz.*

MAXFrame

Again, let's not complicate the commands any more than we have to. This is another of the "throughput" timing commands in the TNC which can be made into a monster. Let's use some common sense and simplify its use by applying two simple and easy-to-remember rules for its use.

1. When operating **VHF, use the (default) value of 4.** If **connected direct** with good connect path and no other traffic, use **MAXFrame 7**.

2. When using the **HF** bands, good or favorable conditions use **2 FAIR**, or poor conditions use **1.**

Have a happy vacation, and by all means have fun digitally.

73, de BucK4ABT

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ANNOUNCEMENTS

•Computer Networking Conference Call for Papers - The deadline for receipt of camera-ready papers for the joint ARRL/CRRL Computer Networking Conference is August 6. Those wishing to submit a paper should obtain an author's package from Lori Weinberg, ARRL, 225 Main St., Newington, CT 06111. Topics will include, but are not limited to, HF packet, packet satellites, network development, hardware, protocols, packet services, and future systems. The conference is to be held September 22 in London, Ontario, Canada.

•574th/565th SAW BNS Reunion - To be held in July 1990. For details write to Angel M. Zaragoza, W6ZPR, 1581 Ninth St., San Bernardino, CA 92411.

•Tennessee on Ten QSO Party - Sponsored by the several chapters of 10-10 International, this event will take place from 0000Z July 27 to 2400Z July 29, on 10 meters only, any mode. Exchange call, name, state, 10-10 number, and chapter basic numbers. Count one point for each QSO, 10-10 number, chapter numbers, and one extra point for each Tennessee contact (maximum 7). Log sheet and chapter assignment (one of sponsoring) to L.B. Cebik, W4RNL, 2414 Fair Drive, Knoxville, TN 37918 by August 31. Dupe sheet required if over 100 contacts. SASE for results.

•The following special events will take place during July:

KY2F, from Central New York International Air Show, Fulton, NY; Oswego County ARES and Fulton ARC; July 7 & 8 from 1300–1900Z each day; General 20, 15, 10, and 2 meter bands, and Novice portion of 10 meters. For certificate send QSL and large SASE to Fred Swiatlowski, KY2F, P.O. Box 5227, Oswego, NY 13126.

K4BV, from amateur radio equipped balloon, Crystal River, Florida Airport; Stratonet Florida sponsored by the Daytona Beach ARA; beginning at 1300Z, July 14 (alternate dates July 15 and July 21 with Inverness, FL alternate launch site); net control N4EEB in operation on 7.155 MHz LSB beginning at 1000Z. Certificate available to amateurs checking into the net who provide signal reports or tracking information. For more information or a certificate, contact John Bayne, N4EEB, 7 Castle Manor Drive, Ormond Beach, FL 32174 (904-677-8520).

KD5RZ, National Royal Ranger Special Event, Hobbs, NM; New Mexico Dist. Royal Rangers; 1300–0100Z July 28; freq. 3.870, 7.350, 14.250, 21.320, 28.520/28.380. For certificate send QSL and large SASE to: KD5RZ, c/o 2214 Thomas, Hobbs, NM 88240.

W6VPZ, from anniversary of first flight of B-2 bomber, Hawthorne, CA; Northrop Radio Clubs; 1100–1100 PST, July 21–22; 25 kHz from lower band edges of Novice and General bands (10, 15, 20, 40, 80) and 1.920. For QSL contact Northrop Radio Club, W6VPZ/6, 8900 E. Washington Blvd., Pico Rivera, CA 90660.

WA6OPZ, from Boy Scouts Special Event, Emerald Bay, Catalina Island, CA; 1500–0700Z daily, July 8–14; freqs. around 28.45, 14.30, and General portion of 15 and 40 meter phone bands, CW around 7125 and 21,150 kHz. For certificate send QSL and 9 × 12 SASE to Marshall Jacobson, 16441 Gilmore St., Van Nuys, CA 91406.

KG6GF, from Gilroy Garlic Festival, Gilroy, CA; Gabilan ARC; 1600–2400Z July 27, 28, 29; freqs. 14.260, 21.360, 28.360. For certificate and QSL, send SASE to GARC, P.O. Box 2178, Gilroy, CA 95021-2178.

7-land, from Sportman's Holiday & Calapooia Roundup, Sweet Home, OR; East Linn ARC; 1800–0100Z July 14–15; General 80, 40, 20 meter phone bands, Novice 10 meter phone, and 15 meter Novice CW. For certificate, send QSL and SASE to operator's *Callbook* address.

7-land, from Centennial of Wyoming Statehood, Pony Express Award; High Plains ARC members; month of July; freqs. SSB 50.125, 28.550, 21.300, 14.275, 7.250, 3.875; CW 50.050, 28.050, 21.050, 14.050, 7.050, 3.550; Novice in center of Novice bands. For more information on awards and plaques, and for applications, contact Lee Milner, KT7V, 111 Camino Del Rey, Torrington, WY 82240.

KT7V, from Wyoming Centennial, Fort Laramie, WY; High Plains ARC; 0000Z July 4 to 0000Z July 5; freqs. SSB 3.850, 7.250, 14.250, 21.360, 28.550; CW 50 kHz up from lower edge of the band. For QSL send business-size SASE to KT7V, 111 Camino Del Rey, Torrington, WY 82240.

W7VNJ, from Wyoming Centennial, Casper, WY; Casper ARC; 1500–2300Z July 24; freqs. 14.300, 21.300, 28.400 (plus or minus QRM). For centennial QSL send SASE to Casper ARC, P.O. Box 2802, Casper, WY 82602.

KD8FJ, from "Heritage of Our Country," Thompson, OH; on July 4 starting at 1400Z; operation in the lower portion of the 40 meter General phone band and 10 meter phone at 28.453 if conditions allow. QSL with large SASE to KD8FJ, 386 Cedarbrook Drive, Painesville, OH 44077.

W8VY, from High on Kalamazoo Airshow, Kalamazoo, MI; Kalamazoo ARC and Southwest Michigan AR Team; 1300–2200Z July 7–8; operation on 10 and 2 meters. For certificate send QSL and SASE to W8VY, c/o Jack Price, KA8AOB, 1511 Center St., Kalamazoo, MI 49001-1859.

KE8DL, from 1990 Coast Guard Festival, Grand Haven, MI; North Ottawa ARC; 1500–2300Z July 30 to August 4; lower 25 kHz of 40 and 20 meters and between 28.400 and 28.450. (Contact any NOARC member during the week and those will also be recognized. For certificate send QSL and No. 10 SASE to KE8DL, 1815 Hillcrest, Grand Haven, MI 49417.

W9ZL, from International Experimental Aircraft Assn. Fly-in & Convention, Oshkosh, WI; daylight hours July 28–31; General portion of 10, 15, 20, 40 meters on as many modes as possible, including packet (VHF & HF), CW, phone, RTTY, and ATV. For certificate send QSL (all QSLs must include contact numbers) and 8 × 10 SASE to Wayne Pennings, WD9FLJ, 913 N. Mason St., Appleton, WI 54914.

W0KEM, from Tom Sawyer Days, Hannibal, MO; Hannibal ARC; July 7–8 from 1500–2100Z each day; freqs. 14.315, 18.130, 21.360, 28.410. For certificate send QSL and 9 × 12 SASE to Hannibal ARC, P.O. Box 1522, Hannibal, MO 63401.

W0MLY, from celebration of the last steam locomotive built, Rippey, IA; July 7–8; freqs. 7250, 14250, 21250, 28350, CW 25 kHz up. For QSL with picture of locomotive send SASE to W0MLY, Box 7, Rippey, IA 50235.

0-land, from Roseau County Fair, Roseau, MN; Lake of the Woods Repeater Assn.; July 17–19 from 1900–0100Z each day; SSB 75, 40, 20, 15, 10 meters. For certificate send QSL and SASE to Bill Adams, W0WJK, 309 Seventh Ave. SE, Roseau, MN 56751.

W0AA, from Olympic Festival, Minneapolis/St. Paul, MN; 2000–0400Z weekdays and 1700–0400Z weekends, June 11 to July 15; all bands phone and CW. For QSL send SASE to 292 Heather Lane, Long Lake, MN 55356.

WR0U & WB0B, from Grand National Shoot, Bloomfield, IA; Civil War Skirmish Assn.; July 7–5; CW 7.046, 7.105, 14.046, 21.105, 28.048; SSB 7.255, 14.260, 21.357, 28.360. For QSL send SASE or for certificate 9 × 12 SASE to *Callbook* address of station worked.

KD0FW, from balloon flight, Kansas City, MO; Kansas City ATV Group; beginning at 1500Z July 7 or 8, weather permitting; balloon will have 3 transmitters—one sending live ATV camera video on 439.250, one sending audio beacon signal on

144.340 MHz, and about 10 milliwatts on 6 meters at about 50.400; also HF reporting net on or about 7.232 MHz on 40 meters. For QSL send SASE to Mike Bogard, 2128 South Norton Ave., Independence, MO 64052.

WB0RMK, from B-B-Q Days, Belle Plaine, MN; Southwest Metro ARTS; July 14 from 1500–2100Z; freq. 7245, 14245, 28345. Send QSL and SASE to WA0CXW, Secretary of SMARTS, P.O. Box 144, Chaska, MN 55318.

GB-land, from open house of RAF Chicksands Air Force Base, UK; 1000–1900Z July 7–8; phone 28.480 or 14.280 MHz, CW 28.180. For QSL/certificate send QSL and SASE to Martin R. Mullican, GB2USA, RAF Chicksands UK, Box 1841, APO NY 09193-5000.

VE4IHF, from International Peace Garden on U.S./Canadian border; 9 AM to 6 PM CST July 13 & 14; 80 meters 3.941, 40 m. 7.255, 20 m. 14.255, 15 m. 21.355, 10 m. 28.355. For certificate send 2 IRCs and SASE to Dave Snydal, VE4XN, 25 Queens Crescent, Brandon, Manitoba, Canada R7B 1G1.

• The following hamfests, etc., are slated for July:

June 30–July 1, **West Virginia State Convention,** Jackson's Mill State 4-H camp, near Weston, WV. Contact Chuck McClain, K8UQY, 304-366-5401.

July 1, **Murgas ARC Ham & Computerfest,** Ice-A-Rama, Wilkes-Barre, PA. Contact K3SAE/KB3GB, RD 1 Box 214, Pittston, PA 18643 (717-388-6863). (Exams—to register contact Joe Caffrey, W3DZH, 79 Kellers Lane, Plymouth, PA 18651.)

July 4, **Firecracker Hamfest,** Bressler Picnic Grounds, Harrisburg, PA. Contact Dave Dormer, KC3MG, 1-717-939-4957.

July 7, **Ontario Hamfest 90,** Milton Fairgrounds, Burlington, Ontario, Canada. Contact Rick Jones, VE3WRJ, 639-0724.

July 7, **South Milwaukee ARC Swapfest,** American Legion Post 434, Oak Creek, WI. Contact South Milwaukee ARC, P.O. Box 102, South Milwaukee, WI 53172-0102.

July 7–8, **Indianapolis Hamfest & Central Division ARRL Convention,** Marion County Fairgrounds, intersection of I-70 and I-465. Contact Indianapolis Hamfest, P.O. Box 11776, Indianapolis, IN 46201.

July 7, **Des Moines Radio Amateur Assn. Hamfest,** Sacred Heart School, West Des Moines, IA. Contact Harold Ober, N0HZK, 515-289-1330. (VE exams.)

July 8, **Wood County ARC Ham-A-Rama,** Wood County Fairgrounds, Bowling Green, OH. Contact N8DJB, 7368 Scotch Ridge Rd., Pemberville, OH 43450.

July 8, **DuPage ARC Hamfest & Computermart,** American Legion Post 80, Downers Grove, IL. Contact Edwin Weinstein, WD9AYR, 7511 Walnut Ave., Woodridge, IL 60517. (VE exams.)

July 8, **North Hills ARC Hamfest,** Northland Public Library, Pittsburgh, PA. Contact Bob Ferry, Jr., N3DOK, 9821 Presidential Drive, Allison Park, PA 15101 (412-367-2393). (VE exams.)

July 13–15, **North Dakota/Manitoba Hamfest,** Peace Garden, a few miles north of Dunseth, ND. Contact John A. Swanke, KA0SLI, Box 304, Lakota, ND 58344.

July 14, **Eau Claire ARC Hamfest,** 4-H Building, Eau Claire, WI. Contact Liz Searing, N9EQR, 1129 McKinley Rd., Eau Claire, WI 54703, or call 715-834-1303. (Walk-in VE exams 9 to 1.)

July 15, **MIT Computer, Amateur Radio, Electronics Fleamarket,** Albany and Main Streets, Cambridge, MA. Call 617-253-3776.

July 15, **Zero Beaters ARC Hamfest,** Bernie H. Hillerman Park (Washington Fairgrounds), MO. Contact Dane Brockmiller, Rt. 2 Box 623, Union, MO 63084 (314-583-2323). (Walk-in VE exams starting at 10 AM.)

July 15, **Denver Radio Club Hamfest & ARRL Colorado State Convention,** Jefferson County Fairgrounds, lakewood, CO. Contact Keith, N0LSL, 303-680-0862.

July 15, **SCARC '90,** Sussex County Fairgrounds, Augusta, GA. Contact Don Stickle, K2OX, 185 Weldon Rd., Lake Hopatcong, NJ 07849 (201-663-0677).

July 21, **Ausable Valley ARC Swap-Shop,** Mio, MI. Contact Tim, KA8YWV, 517-826-5549.

July 21–22, **Mountain ARC Swap-Shop,** Red Rocks Campground, Pike National Forest, Woodland Park, CO. Contact MARC, Box 1012, Woodland Park, CO 80866, or call Joe Tafoya, N0CMD, 719-687-3641.

July 21–22, **1990 Northwest DX Convention,** Monarch Motor Hotel, Portland, OR. Contact Willamette Valley DX Club, P.O. Box 555, Portland, OR 97207.

July 22, **Van Wert ARC Hamfest & Computer Show,** Van Wert County Fairgrounds, Van Wert, OH. Contact Bob Barnes, WD8LPY, 419-238-1877.

July 22, **Amateur Cross Link Repeater Assn. Hamfest/Computerfest,** "The Hall," Berwyn, IL. Call 1-708-795-0380. (Handicapped accessible.)

July 26–29, **Central States VHF Society Convention,** Marriott Hotel, Wichita, KS. Contact Lonnie Roberts, WD0L, 628 Elaine, Clearwater, KS 67026 (316-584-6465).

July 28, **Tri-County ARS Hamfest,** Gowanda American Legion Post 409, Gowanda, NY. Contact Andy, 716-532-2250.

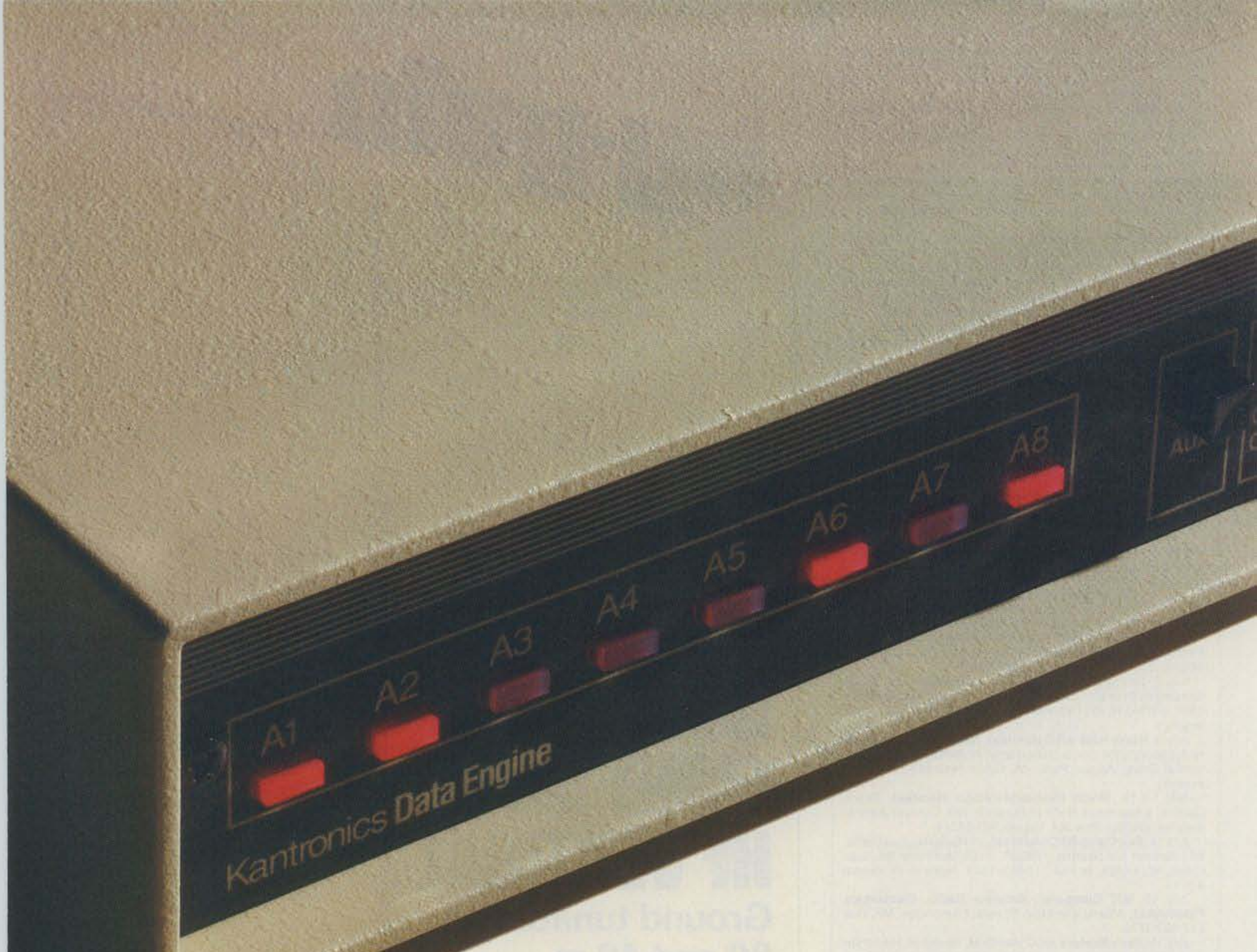
July 28, **Western Carolina ARS Hamfest,** Fireman's Training Center, west of Asheville, NC. Contact Phil, KA4CAC, 704-667-3212. (VE exams, preregistration only.)

July 28, **Upper Peninsula Hamfest & Electronics Show,** Marquette Lakeview Arena, Marquette, MI. Contact Hiawatha ARA, P.O. Box 1183, Marquette, MI 49855.

July 29, **Ashtabula County Hamfest & Computer Show,** Ashtabula Branch of Kent State University, Ashtabula, OH. Contact Ken Stenback, AI8S, 722 Lyndon Ave., Ashtabula, OH 44004 (216-964-7316, 9 AM to 9 PM).

July 29, **BRATS Maryland Hamfest & Computerfest,** Maryland State Fairgrounds, Timonium, MD. Call 301-583-9147. (VE exams, preregistration required; handicapped accessible.)

July 29, **Hamfesters' Hamfest & Computerfest,** Will County Fairgrounds, Peotone, IL. Contact Don Burch, N9DWI, 8438 S. Kolin Ave., Chicago, IL 60652 (312-582-9776). (Exams.)



TNC development platform

Designed with the requirements of today's rapidly changing communications environment in mind, the Kantronics DataEngine represents the state of the art in speed, adaptability, and programmability.

The DataEngine was designed with an open architecture. This PC computer compatible system is fully capable as a backbone node, high-speed TNC or a BBS station and fully adaptable to diverse future applications from multi-node data communication networks to remote sensing operations.

A dual port, full duplex TNC, the DataEngine offers high speed capability and accommodates up to two internal or external modems. The DataEngine is shipped with a base configuration consisting of AX .25 firmware and one 1200 baud modem with three keyboard selectable carrier detect options.

A 16-bit V40 PC compatible microprocessor running at 10MHz provides the compute power essential for creating and managing custom programs. Additional features include a 85C30 communications controller, sockets for .5 Mb EPROM and .5 MB RAM, eight V40 controlled LEDs, technical developer's manual, and two dead-front windows for future devices requiring LEDs, making the Kantronics DataEngine "developer ready".

The DataEngine was designed to be fully compatible with existing communication networks as well as advanced enough for those yet to be designed. In line with this, each unit is shipped with end-user firmware including terminal mode, BBS mode and KISS mode. ROSE X.25, TCP/IP and G8BPQ code for the DataEngine are currently under development.

For a detailed technical specification sheet, call your Kantronics dealer or contact Kantronics direct.

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Kantronics**DataEngine**

ANTENNAS & ACCESSORIES

A LOOK AT THE SHACK FROM BOTH ENDS OF THE COAX

BY KARL T. THURBER, JR., W8FX

From the Notebook—Part VI

This time more Antennas & Accessories news and views. Let's first dig into the antenna side of the spectrum.

Antenna Notes

Procomm/Digitrex Supercone. Since the new WARC bands have been added to those which we amateurs may use, more "all-band" antennas have been offered. However, most of these so-called all-band antennas have been limited to HF frequencies.

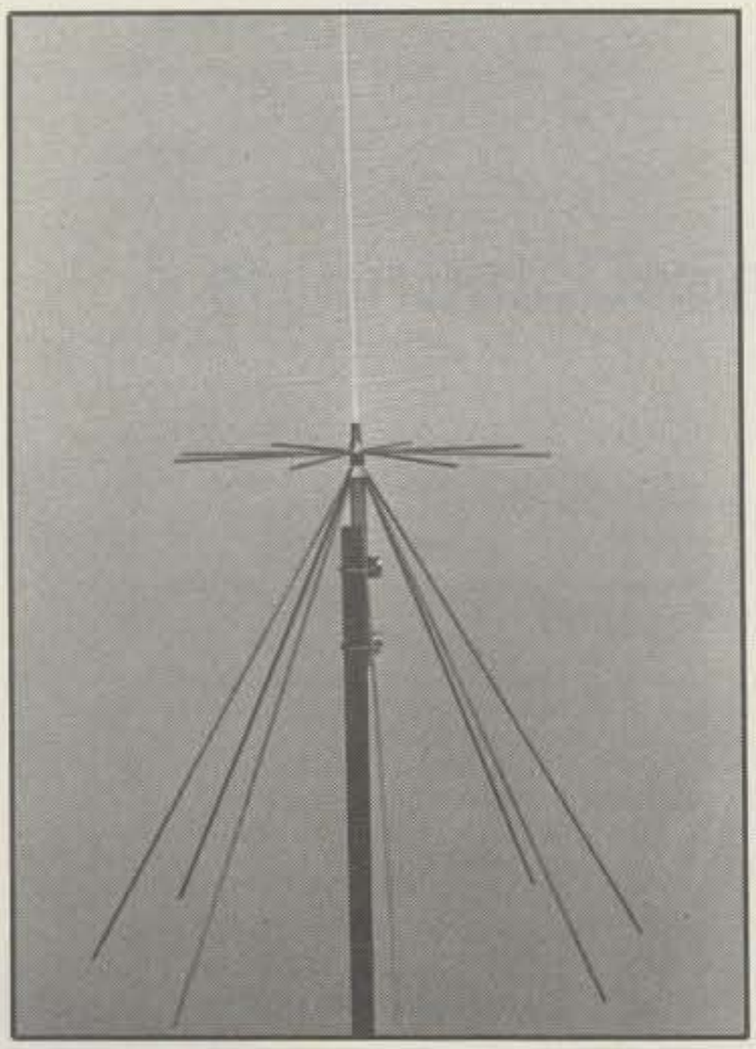
Aware of the lack of VHF-and-up coverage, Procomm/Digitrex has developed a single antenna that can be used not only on HF, but on VHF, UHF, and microwave bands as well. The antenna is the DC-2515, which covers 25 MHz to 1.5 GHz for receiving, and which allows transmission on the 10, 11, 6, and 2 meter bands, as well as on the 220 MHz, 440 MHz, and 1296 MHz bands. The standard DC-1515 can be converted to the DC-2515 Plus with a five-band expander kit, which makes use of standard Hustler-style resonators. Adding resonators allows receive coverage from as low as the AM broadcast band through 1.5 GHz; amateur transmission is now possible on any five of the HF amateur bands (80, 75, 40, 30, 20, 17, 15, 12, or 10 meters).

The basic design is that of a discone antenna, consisting of a series of horizontal radial spokes which form the disc, plus a series of drooping radial rods which form the cone. The disc and cone skeleton are made of stainless steel rods, and they attach to a milled aluminum brass center hub. Differing from other discones, the DC-2515 has a separate, helically wound vertical whip extending upward from the center of the disc, forming a separate vertical ground-plane antenna for 10 meters.

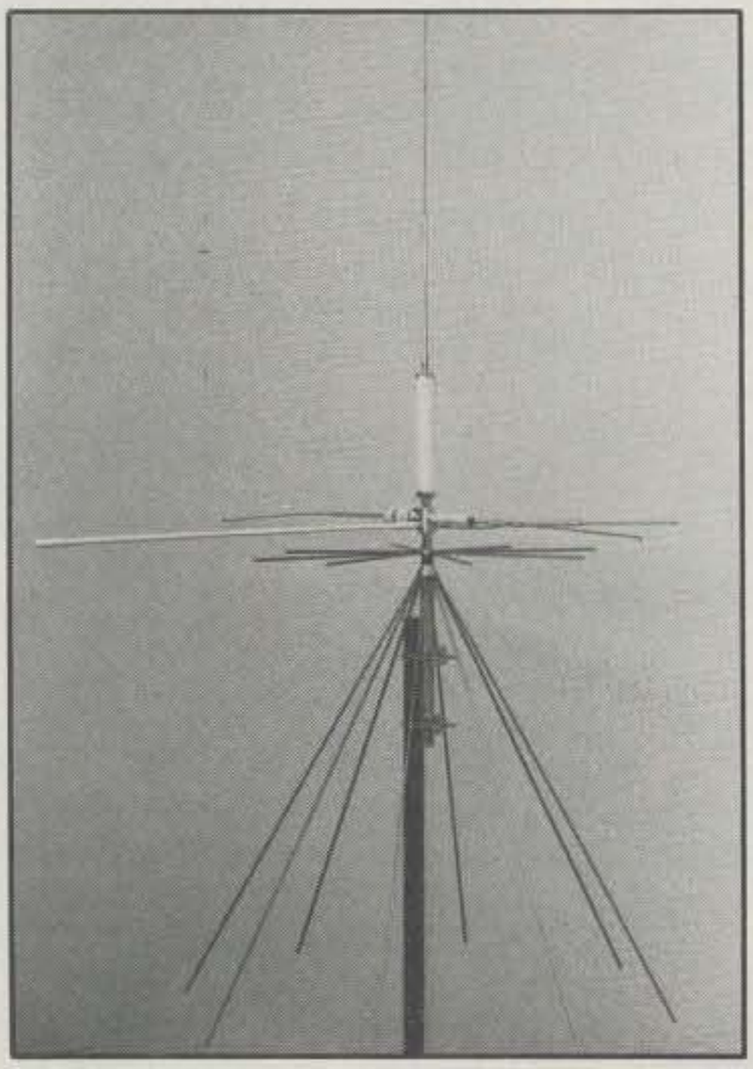
The standard DC-1515 Supercone stands 69 inches tall with the 10 meter whip installed, and it is 37 inches wide at the base and consists of 16 stainless steel elements. Its transmit coverage is continuous (rather than discrete) from 50 MHz to 1.5 GHz, plus 10 meters. With the addition of one or more expander adapters, receive and transmit coverage on the HF bands can be added. Here the Discone itself becomes the ground plane for the HF bands. No tuning is said to be required on the VHF, UHF, and microwave bands, and SWR values are typically 1.5:1 or less on the HF bands. No added ground radials are required, and automatic HF bandswitching is afforded. The power-handling rating of the standard DC-2515 is 300 watts, but this may be increased to 2 KW with the appropriate HF resonators. Weight is a nominal 2 lbs.

The antenna is designed to be mounted on a standard TV-type mast, and it can also be mounted alongside a tower using standard hardware. The compact, "all-in-one" character of the antenna makes it suitable for apartment dweller and other limited-space users, as well as mobile and marine use. In addition to amateurs, the antenna is popular with scanner users, businesses, government and public safety agencies, and others. The standard DC-2515 is priced at $99.95; the "expand to five" coupling and the HF band resonators are priced extra.

For more details, contact Procomm/Digitrex, 1948 Coventry, Thousand Oaks, CA 91362.



Shown here is the DC-2515 Supercone described in this month's column with the 10 meter whip installed atop the unit. The basic unit covers 25 MHz to 1.5 GHz with transmit capability on a number of amateur frequency bands. It is available from Procomm/Digitrex. (Photo courtesy Procomm/Digitrex)



The DC-2515 Plus Supercone is similar to the DC-2515, but adds up to five resonators to allow coverage of the popular HF amateur bands. It is shown here with five resonators installed. (Photo courtesy Procomm/Digitrex)

PopDrop Plus. Anyone who reads the software part of my monthly column knows that I'm something of a nut on IBM PC utility software—anything to make the PC run better, smarter, faster, or smoother, as they say. With such an orientation in mind, I was attracted to BlocPublishing's PopDrop Plus, a double-barreled software package that allows you to manage often-troublesome "terminate and stay resident" (TSR) programs and even stuff them out of harm's way in so-called "expanded memory" when you're not actually using them. The objective of all this is to reduce RAM cram and provide another way for you to sneak an end run around the infamous DOS 640K barrier.

PopDrop Plus is composed of two separate software packages that are boxed together. One is PopDrop, which uses just 1K of RAM and which helps you to manage your RAM-resident (TSR) programs. As you are probably aware if you've made use of any TSRs (keyboard macro programs, spell checkers, thesauri, desktop organizers, etc.), these pop-ups are convenient and productivity-enhancing. However, such programs are notorious for creating memory and keyboard conflicts, and as a result you need to carefully manage their use to avoid such problems.

PopDrop, which mainly works in the conventional memory area, allows you to remove, replace, deactivate, and reactivate these programs without rebooting your PC. You can clear all TSRs out of memory, or you can work with them in layers to free up the RAM these programs need. TSR conflicts are thus minimized.

PopLoad is the other part of the package—sort of an extension of PopDrop into the realm of so-called "expanded memory," which is increasingly being included with the newer 80286, 80386, and 80386SX computers. The package takes the TSR management process one step further, letting you not just manage TSRs but also allowing you to load them into expanded memory. Doing so keeps your precious 640K lower memory free for your applications, rather than cramming it with TSRs you may or may not use all of the time. PopLoad requires a mere 27K to manage TSRs, allowing you to load up to 50 RAM resident programs into expanded memory and letting you execute them from there with a couple of keystrokes.

317 Poplar Drive, Millbrook, AL 36054

FM &/or PACKET

Looking for a way to work your local FM repeater. . .
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The DVR 2-2 is ideal as a dedicated 2-meter transceiver for voice (FM) and/or packet. It features fast switching, fast squelch and DCD, with separate voice and data connectors, small size, and low-cost. And it's designed with data in mind.

For packet, the DVR 2-2 has discriminator output available on the rear panel. This makes the radio high speed packet ready without modification, when used with a higher rate modem. And the data connector is plug compatible with the Kantronics' KAM and TNCs.

For FM, it's an excellent low-cost alternative for FM communication via your local amateur repeater. Great for control links too. And it's compatible with the RFC VHF 30-watt amplifier if you wish to out-reach your local repeater.

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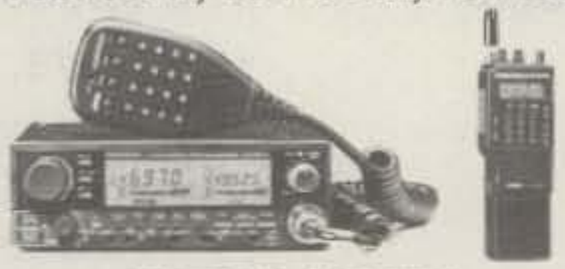

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MFJ 1270B, 1274, 1278

KANTRONICS KAM

After working with both programs for a month or so, I found that on my system (a new Gateway 2000 80386SX) PopDrop worked just fine, affording me the opportunity to fine-tune my management of the package of TSRs I regularly use. Although there are some restrictions on how you can use PopDrop, these were easily worked around. It's a good program, much more flexible than some of the public-domain programs I've seen that manage TSRs.

On the other hand, PopLoad was a disappointment, at least on my PC; the prospect of loading 50 or more TSRs into expanded memory and calling them out at will didn't work out as planned. In fairness, it's not necessarily the program's fault. The program is dependent on some of the technical aspects of how expanded memory is implemented in your machine. In other words, all expanded memory isn't created equal. Although my PC had 1 MB of available expanded memory, the "page frame size" was only 64K and couldn't easily be changed. Thus, the largest TSR with which I could work was 64K, and it didn't matter that I had a full 1 MB ready and waiting for TSRs.

Multi-Rotating Antennas. TIC General has issued a flyer on its "Multi-Rotating Antennas" hardware. Billed as "the Original Ringrotor," these devices allow you to rotate your directional antennas, including large phased arrays, at any mounting location on your tower. In addition to amateur applications, the Ringrotor is also used by the military to rotate floodlights and security cameras, and by cable TV and land mobile operators to rotate search antennas from any point on the tower.

The basic Model 1032 TIC Ringrotor, with a windload of less than 2 square feet, can handle a maximum tower face width of 28 inches and a maximum leg diameter of 1½ inches; an antenna boom of from 2 to 3½ inches can be accommodated. The unit features rugged steel ring construction, a steel gear assembly, a heavy-duty gear reduction motor, and one degree accuracy. The System 2001 Electronic Control Box permits 360 degree rotation and has gear-tooth sensor feedback. The control unit has one degree resolution and has a three-digit LED readout. The system shipping weight is about 128 lbs.

TIC General also offers an elevation system to be used in conjunction with the Ringrotor, along with other options such as pole and crank-up tower mounts, a truss assembly, and cadmium plating. Other size Ringrotors are also available in addition to the Model 1032 described here.

For more details and pricing information, contact TIC General, 302 E. Third St., P.O. Box 1, Thief River Falls, MN 56701.

CUBEX Quads. Karl W. Scharping, W6KWF, recently sent me a brochure on his 30-plus year old firm's line of complete quads and quad kits, which he bills as "the Cadillac of Quads." Both completed quads and quad kits are offered.

As far as complete quads go, CUBEX features the MK III/MK III-FG series of single, dual, or triband quads in 2-, 3-, or 4-element models, with everything included, down to a 2 foot mast stub to attach to the top of your rotor. Users are offered a choice of several methods of feedline connections.

In the category of quad kits, CUBEX offers the Skymaster Fiberglass Quad Kits. These kits are offered in 2-, 3-, and 4-element models and employ the same support structure design as used in the CUBEX MK III. All of the kits include a complete instruction manual, which contains all of the detailed information and design data necessary for constructing and installing 2- to 4-element, 1- to 3-band quads of CUBEX design. The manual is available separately for $4.95 ppd.

All of the CUBEX quads are known to be mechanically sound, with one-piece spider castings of high-strength aluminum alloy, heat-treated for strength and durability. One-piece fiberglass arms are used, with reinforcements at butt and element attachment points. Nothing under 2 or 3 inch seamless aluminum tubing is used in construction to avoid spider "rotation" and "boom-droop."

In addition to the quads themselves, CUBEX also offers the do-it-yourself quad builder a complete line of hardware and parts. Available components include end spiders, fiberglass arms, elements, matching transformers, arm clamps, booms, and other hard-to-find goodies.

For more information, contact CUBEX Company, P.O. Box 732, Altadena, CA 91101.

Rotatable 12/17 Meter Antennas. SV Products of Woodburn, Indiana now offers two models of rotatable trap dipoles suitable for mounting above another beam antenna or rotating with a small TV rotator. They also offer a 2-element dual-band beam for 12 and 17 meter use.

The Model 1824D rotatable dipole is designed for dual 12 and 17 meter operation. The antenna is 25 feet long and weighs 6 lbs.; it is rated at 1500 watts. The Model 2128D is designed for 10/15 meter use and is 22 feet 5 inches long; it also weighs in at about 6 lbs. Both antennas use traps designed for high strength and good power-handling capability. The trap capacitor is tested to 25 KV, and the dipole elements are made of 6061-T6 aluminum. Each dipole is priced at $89.95.

Recently a 2-element, 12/17 meter beam, the Model 1824 2L, has been added to the product lineup. The new antenna weighs in at 16 lbs. and it has a boom length of 8 feet. Power rating is 1500 watts, and typical SWR is claimed to be 1.2:1 over the two bands.

For more information, contact SV Products, 4100 Fahlsing Road, Woodburn, IN 46797.

New from DX Engineering. Dick Ewing, KO7N, and Bill Sattler, NØXX, longtime DXers and contesters, have teamed up to launch a line of heavy-duty HF antennas, phasing systems, and rotating systems. As active operators, they will not sell any product that they would not use in their own stations.

Central to their product line are a number of monoband Yagis for the 40, 20, 15, 10, and 6 meter bands; models containing from 3 to 8 elements are offered, depending on band. These antennas were designed using computer modeling of both individual antennas and single- and multi-band stacked arrays. All of their systems use a "hairpin" matching system and employ an insulated driven element; the hairpin matching system is used so that there will be no matching capacitors to fail. A current-type balun with external ferrite beads is used to ensure a balanced pattern, rather than using ferrite baluns which, along with the gamma capacitors, are considered by many to be prone to failure.

The DX Engineering designs take an interesting approach to element spacing. Dick and Bill note that because classical antenna theory indicates that an antenna's gain depends primarily on the length of the boom, and that the number of elements isn't all that critical,

many people have concluded that wide-spaced Yagis always provide the best performance. However, their research has indicated that while fewer elements can provide as much gain on a given boom length, the antenna will have a much higher "Q," resulting in narrower bandwidth for both front/back (F/B) ratio and SWR. Their antennas "are optimized for the maximum gain available for a given boom length, while still providing adequate SWR bandwidth and F/B ratios."

Their antennas use close spacing where needed, near the driven element, and wide spacing farther from the driven element in order to minimize weight and wind load. Using this approach, they claim to have been able to significantly broaden antenna bandwidth to offer excellent performance across the band.

In addition to the 40, 20, 15, 10, and 6 meter Yagis, DX Engineering has under development 12, 18, and 30 meter HF Yagis; VHF and multiband Yagis are also under development. The firm also makes the "Ø-Box" (the Phase Box), used to achieve correct power distribution to stacked arrays of 2, 3, or 4 Yagis; a similar unit, known as the "Vertical Ø-Box," is offered to provide proper power distribution and phasing for phased vertical arrays, such as the "four square," in which four verticals are arranged in a square, spaced one-quarter wavelength on a side. Stacking and phasing assemblies, a 5-antenna remote coax switch, a 5 KW current-type balun, and a Yagi side-mount unit (a device for mounting antennas on the side of a tower) are also offered.

For more information and spec sheets, contact DX Engineering, Inc., 87296 Chinquapin Loop, Veneta, OR 97487.

Antenna Tuner Do's and Don'ts. Antenna tuners are great accessories for the ham-shack, and we have generally promoted their use. Unfortunately, they often are misused, and are the subject of many inquiries which we receive.

In the April 1989 *CQ*, colleague John J. Schultz, W4FA, summarized some "general do's and don'ts regarding antenna tuners" which are useful to repeat here. If John will forgive me for paraphrasing what he so ably stated in the April issue, I'll proceed to do so here:

1. Don't use your antenna tuner to hide a poor antenna just so it will "load." Forcing power into a poorly dimensioned or improperly designed antenna accomplishes little.

2. Don't waste power in a tuner when using a random-length wire if it can be helped. Almost anything will load today, but as a rule "the more wire out there the better."

3. Be careful of antenna length when using a random-length wire antenna. When a "random" antenna happens to be a half wavelength long, or a multiple thereof, it presents a voltage maximum at the tuner. This may cause arcing, so consider adjusting the antenna's length to move towards a voltage minimum at the tuner.

4. Use a good ground with an antenna tuner (and the station itself). Do this not only for the sake of smooth tuning and loading, but for electrical and lightning protection purposes as well.

5. Don't rely on a tuner alone if your station needs a lowpass filter due to TVI. Some tuner networks can offer up to 30 dB of harmonic attenuation under some circumstances, but the actual attenuation offered can vary greatly from band to band and with different antenna loads.

6. Realize that some tuners can show false resonances. Some combinations of control settings can mean that most of the transmitter power is being dumped into the tuner's inductor. While this isn't a common condition, one telltale sign is a tuner that runs overly warm.

7. Don't expect too much out of so-called "automatic antenna tuners" used in many of the newer transceivers. These tuners are usually designed to handle only moderate SWR situations (up to 1.5:1 or so), a condition you might encounter when a properly resonant dipole or beam is used at band edges. Mistreating such tuners can cause internal components to arc or even burn up.

From the Software Notebook

IONSOUND. Jake Handwerker, W1FM, has developed a very comprehensive and sophisticated HF ionospheric propagation prediction and "RF link quality assessment" software program intended for use with the IBM PC and compatibles.

The new, low-cost ($24.95) menu-operated program has a surprising range of capabilities. The program is designed around the basic goal of producing easy-to-interpret tabular and graphic prediction and assessment of RF link performance between any two locations on the earth's surface, accomplished by accounting for actual end-to-end operating conditions. The program also provides distance and bearing (heading) information. The graphic presentation depicts what is known as "simulated oblique sounding," which provides a useful tool for determining the best possible communications frequency predictions. A 26-page operator's manual is included on the disk; you print it out using your own printer.

Differing from the more familiar propagation prediction programs we've encountered, which mostly are satisfied with knowing an index of solar activity and little else, IONSOUND requests a good deal of input from you to make its calculations of overall end-to-end performance in terms of signal-to-noise (S/N) ratio and total link reliability. These additional inputs include factors such as local receive noise condition, receiver bandwidth, transmitter power, antenna type or gain at both transmitter and receiver, short versus long path, minimum S/N required, and minimum elevation angle.

Program output is in both tabular summary form and a so-called "Simulated Oblique Incidence Ionospheric Chirp Sounder" or "chirp plot" graphic format to provide an understandable prediction of band openings tailored to your operating conditions. The tabular summary and the Chirp Plot, viewed together, are designed to allow you to make a very intelligent assessment of the path's overall quality.

I found IONSOUND to be a very high-quality product that wasn't too difficult to use once I got used to the more demanding and insistent way of doing things than I was used to with more conventional propagation prediction programs which mostly are concerned with a simple "go/no go" over a given path. Thus, it's more akin to, say, Sheldon Shallon, W6EL's MINIPROP than Base (2) Systems' MUFPLOT.

As such, IONSOUND affords a good deal of flexibility and allows you to change parameters to check out various "what-if" scenarios (changed power, different antenna, different S/N ratio, etc.). However, although the program is fully menu-driven and straightforward in its operation and contains a minimum of technical jargon, all this fine-tuning takes time and requires some work on your part. Also, interpretation of the results is more involved than some users would prefer.

If you're simply interested in casual, bottom-line propagation prediction, the program may not be for you. But if you're a serious student of propagation phenomena, an inveterate DXer, or an electronics engineer, IONSOUND is a great investment.

IONSOUND is designed for the IBM PC and compatibles with 320K RAM minimum; CGA, EGA, and VGA are supported. A math coprocessor is optional, and a separate version of the program is included for use with PCs having coprocessors. The package is $24.95 plus $2.50 shipping and handling. Contact Jacob Handwerker, W1FM, 17 Pine Knoll Road, Lexington, MA 02173.

Fig. 1 shows the IONSOUND main menu.

Satellite Pro. Several times we've discussed the Macintosh amateur radio programs from MacTrak Software. A recent addition to the product line is Satellite Pro™, a satellite tracker that is somewhat similar to the earlier product, Satellite Helper, which tracks up to 10 satellites plus the sun and the moon, and which includes a propagation prediction feature.

Satellite Pro extensively implements the

```
          ********** W1FM IONSOUND, VER 2.14  **********

MAIN MENU
          TO CHANGE MAJOR TX/RX VALUES          Ø
          TO CHANGE LOCATION(S) OR S/L PATH     1
          TO CHANGE SUNSPOT/SOLAR FLUX          2
          TO CHANGE FREQUENCIES                 3
          TO CHANGE MONTHS                      4
          TO CHANGE TIMES                       5
          TO CHANGE MODES                       6
          TO CHANGE TX POWER                    7
          TO CHANGE MIN F-MODE ELEV. ANGLE      8
          TO SWAP TX AND RX LOCATIONS/COLOR     9
          TO EXIT                               1Ø
ENTER CHOICE    <DEFAULT = Ø OR RETURN>
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Fig. 1– Shown here is the IONSOUND V 2.14 main menu. IONSOUND is an unusually detailed and comprehensive HF propagation forecasting and link quality assessment software package. The package was developed by Jake Handwerker, W1FM.

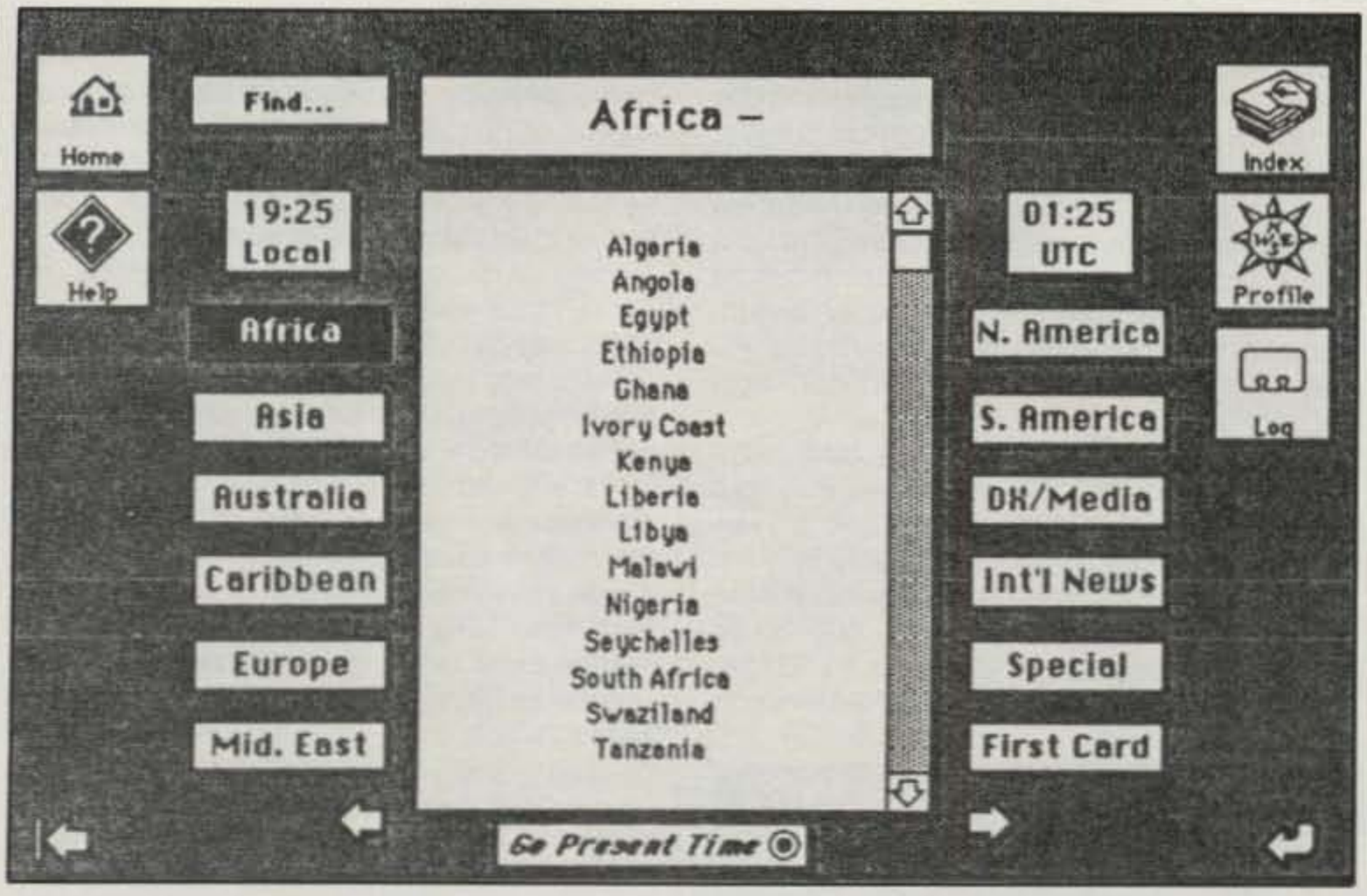

Fig. 2– This screen composite depicts some of the profiles and features of Shortwave Navigator, a Macintosh program designed to help SWLs keep up with changing international shortwave broadcasting schedules. The program interface consists of a number of cards which can be stacked in various ways. A logbook feature is also included.

Macintosh graphic user interface, including pull-down menus, scroll bars, edit fields, and "radio buttons." The program locates and tracks up to 30 satellites, featuring a perspective view of the earth and the satellite that provides a three-dimensional picture of the satellite's motion around the earth. Successive coverage circles may be overlaid showing the total area covered by the satellite during its orbit.

The program displays the sub-satellite ground track as well as the "squint angle" (the angle between the direction of the satellite's antennas and the direction to your location), and it can save its tabular output to a text file for editing with a wordprocessor. Double-precision math routines are used for improved accuracy, and the program is optionally available with math coprocessor support. The program requires 1 MB of memory. Unlike Satellite Helper, Satellite Pro doesn't include radio propagation forecasting.

Satellite Pro is priced at $99.95 postpaid; the 60-page instruction manual can be ordered separately for $3.50 should you wish to obtain a more comprehensive description of the program's features. Contact MacTrak Software, P.O. Box 1590, Port Orchard, WA 98366.

Shortwave Navigator. Jim Frimmel has come up with a very useful product for serious shortwave listeners, also designed for the Macintosh. Shortwave Navigator is a rather sophisticated database-type program that is intended to help serious SWLs keep track of program schedules on their favorite shortwave outlets, with the special objective of helping them through the summer/winter program schedule changeover periods. The basic program is designed to get you through the first year of on-the-air use; a subscription-like series of upgrades will be offered, with the purchase price including one free upgrade.

The program lets you keep track of various items of interest such as DX/media programs, English language international news programs, frequency schedules, broadcaster profiles, and the like by continent or region. You can also customize some portions of the program to suit your listening tastes. There

also is a built-in program log that you can use to record reception of SW broadcasts; the log is presented to you much as a stack of index cards that you can arrange and sort in several different ways, going directly to the schedule card pertaining to any log entry immediately. By the time this appears in print, a "Memory Manager" enhancement to the program should be available that will be of interest to those users having memory-type receivers.

Shortwave Navigator is designed for the Macintosh with a minimum of 1 MB RAM and a hard disk drive. Your Mac must also be equipped with HyperCard V1.2 or later as a necessary application to run the Shortwave Navigator. The program is priced at $49.50 and is available from DX Computing, 232 Squaw Creek Road, Willow Park, TX 76087.

Fig. 2 is a composite screen profile of the program's main features as shown by the various "cards" and "stacks" it uses and produces.

Also, after several telephone calls with the technical support people at BlocPublishing, I found that computers that take so-called "extended memory" and convert it to expanded memory have trouble with PopLoad. Thus, I'd check with the folks at BlocPublishing before purchasing PopDrop Plus to see if they have information on any problems your particular PC may have had in using the PopLoad portion of the package.

PopDrop Plus, which includes both modules, is priced at $99.95 and comes with both 5.25 and 3.5 inch diskettes. PopDrop is available alone for $49.95 and is available in either 5.25 inch or 3.5 inch diskettes. For more information, contact BlocPublishing, 800 S. W. 37th Ave., Suite 765, Coral Gables, FL 33134.

Ctrl-Alt. This novel shareware RAM-switching package—named for the two computer keys which invoke it, the CTRL and the ALT keys—performs a somewhat similar function as that of PopLoad, which we just described. Ctrl-Alt frees up memory for large programs by swapping memory resident programs (TSRs) to your disk, thereby giving you access to up to 24 pop-up programs such as Sidekick, PC Tools, Lotus Metro, or whatever your favorite TSRs may be.

Requiring but 15K of memory, the program can be popped-up at any time within any application to load and run a TSR program. All of the TSRs you decide to turn over to Ctrl-Alt for management are displayed on a menu, and they can be selected with a highlight bar or by a single keystroke. Claiming to be compatible with most TSRs, the program doesn't require setting aside memory for the largest TSR that you will be using. It is further designed to eliminate conflicts between TSRs and between applications and TSRs; with Ctrl-Alt, you can pop up any TSR even within a graphics program.

What all this means is that after telling Ctrl-Alt the names of the TSRs you want it to control, upon loading it creates a "paging file" that creates a memory image on disk of the whole list of TSRs you specified. The paging file is normally kept on your hard disk, but you can direct it to a network disk (as you might do in a business environment) or to a RAMdisk.

Placing the image file on a hard disk results in some sluggishness in popping up your TSRs, but if you place the file on a RAMdisk located in expanded or extended memory, the result is a slick, reliable way of stuffing your TSRs up into "high memory" and calling them out when you need them. The price, of course, is that you need hard disk or RAMdisk space at least equal to the total size of all of the TSRs you want to manage, not just the size of the largest one, as in PopLoad. In my case, I regularly work with about eight TSRs that require a total of about 300K; this means I set up a RAM disk somewhat larger than 300K in expanded memory for the paging file. Although other programs can't use this space, its loss is a small price to pay for the added flexibility involved.

Ctrl-Alt is shareware, and the version you'll likely download from your favorite bulletin board (BBS) is a test-drive version. It's limited in the sense that only two TSRs can be used at a time, rather than the 24 TSRs that the registered version, priced at $39, can handle. For more details on Ctrl-Alt, contact Biologic, 11982 Coverstone Circle, Suite 1622, Manassas, VA 22110.

Incidentally, Ctrl-Alt is but one of six IBM PC utilities offered by Biologic. Also available are utilities to convert extended to expanded memory through software, a cursor "unblinking" utility, a fast hard disk backup program, a PC-to-PC file transfer program, and a program that forces your wordprocessor or spreadsheet to automatically save your data to disk at preset intervals. At the time this was written, all six utilities could be had for the package price of $88.

Wrapping It Up

That's all the space we can reasonably take up this month, gang. Next month more Antennas & Accessories topics of interest. See you then.

Overheard: Many folks are too busy making a living to actually make life worth living.

73, Karl, W8FX

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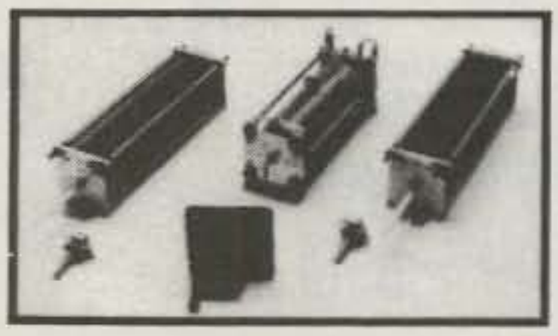

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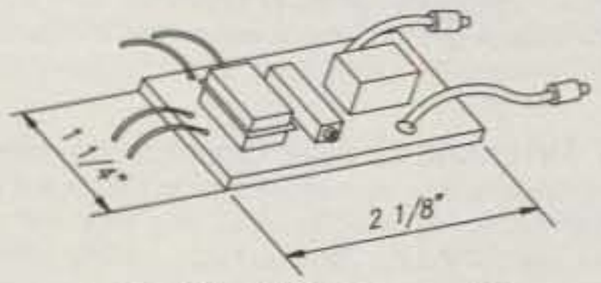

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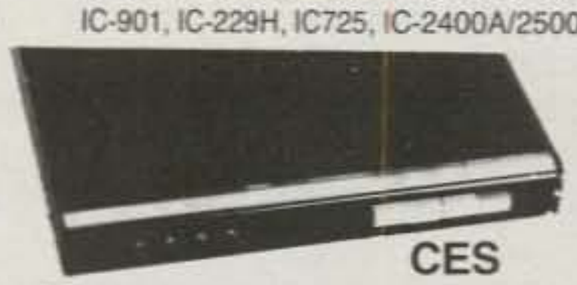

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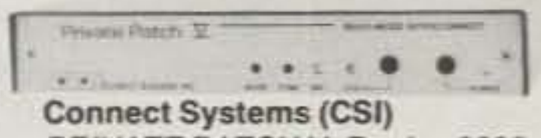

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CONTEST CALENDAR

BY JOHN DORR, K1AR

NEWS/VIEWS OF ON-THE-AIR COMPETITION

Are Contesters Real Hams?

There are three things that we can always depend on in life—death, taxes, and another amateur's opinion about contest operators. This month we are going to begin the process of disclosing to the amateur community how closely contesters fit the model of the "perfect ham."

For years contest operators have been accused of limiting the breadth of their involvement in the hobby to cluttering up the bands on selected weekends (all weekends, according to some). Personally, I can't find fault with contesters who choose to restrict their interest in amateur radio to operating on contest weekends. By any measure, they are much more involved in the hobby than the thousands of "licensees" who haven't been near a radio in years. Nevertheless, I want to take a bold step and profile the "involvement factor" contest operators maintain in other aspects of the hobby through the survey found later in this month's column. As in last year's survey, your additional comments are appreciated and necessary.

Calendar of Events

Jun.	23-24	ARRL Field Day
Jul.	1	Canada Day Contest
Jul.	8-9	Venezuela SSB Contest
Jul.	**14-15**	**CQ WW VHF WPX Contest**
Jul.	14-15	IARU HF World Championship
Jul.	20-21	SEANET CW Contest
Jul.	20-21	World Radiosport Team Champ.
Jul.	28-29	6M Activity Day Contest
Jul.	28-29	Venezuela CW Contest
Aug.	4-5	ARRL UHF Contest
Aug.	11-12	Worked All Europe CW
Aug.	18-19	SEANET SSB Contest
Aug.	18-19	New Jersey QSO Party
Aug.	25-26	All Asian CW Contest
Sept.	8-9	Worked All Europe SSB
Sept.	15-16	Scandinavia CW Contest
Sept.	22-23	Scandinavia SSB Contest
Sept.	**29-30**	**CQ WW RTTY Contest**
Oct.	**27-28**	**CQ WW SSB DX Contest**
Nov.	3-5	ARRL CW Sweepstakes
Nov.	10-11	OK-DX Contest
Nov.	17-19	ARRL SSB Sweepstakes
Nov.	**24-25**	**CQ WW CW DX Contest**

Contester's Roster

Have you ever needed to contact another contest operator and were unable to locate their work or home telephone number? There have been many times when I have been frustrated by not having this information when I wanted to visit another contester on a business trip, wanted to compare the breakdowns of the top 5 contenders in my operating category, or needed to find a roommate in Dayton.

Beginning with this month's survey, I would like to compile a contesters' roster that includes the work/home phone numbers and addresses of contesters worldwide. If you are interested in participating, you may provide the information through the survey or by sending your information to me directly. Contest club secretaries can significantly contribute to the project by sending me their latest club rosters. If possible, I would prefer these rosters to be sent on a MS-DOS formatted 5¼ inch diskette composed in a popular WP format (e.g., WordPerfect V5.0) or standard ASCII. My intent is to provide the roster via the mail on an "as requested" basis rather than through my column for space reasons. With minimal support you can look forward to availability in three or four months (around the time when stationless contesters begin the annual "*CQ* WW host-operator begging process").

2 Baldwin Street, Windham, NH 03087

Closing Remarks

I have several corrections to report this month regarding the Canada Day Contest. Please note that the contest is on *Sunday*, July 1, 1990 (not Friday as reported). Second, there is a new exchange that does not require a serial number as in previous years. For scoring purposes non-Canadian QSOs are only worth 2 points. Finally, there is a new mailing address for entries to: Jeff Parsons, VE3IWF, R.R. 1, Oxford Mills, ON K0G 1S0 (Canada). Please accept my apologies for the mistakes.

Although it's already July, space does not permit me to comment on some of the memorable events of this year's Dayton Hamvention 1990. I'll try to fit it in next month. Remember, the deadline for the October column is August 1.

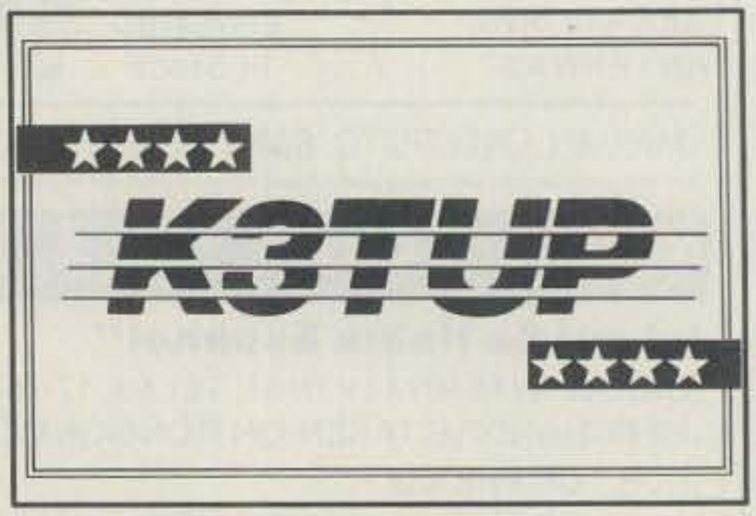
73, John, K1AR

CQ Profiles
John Kanzius, K3TUP

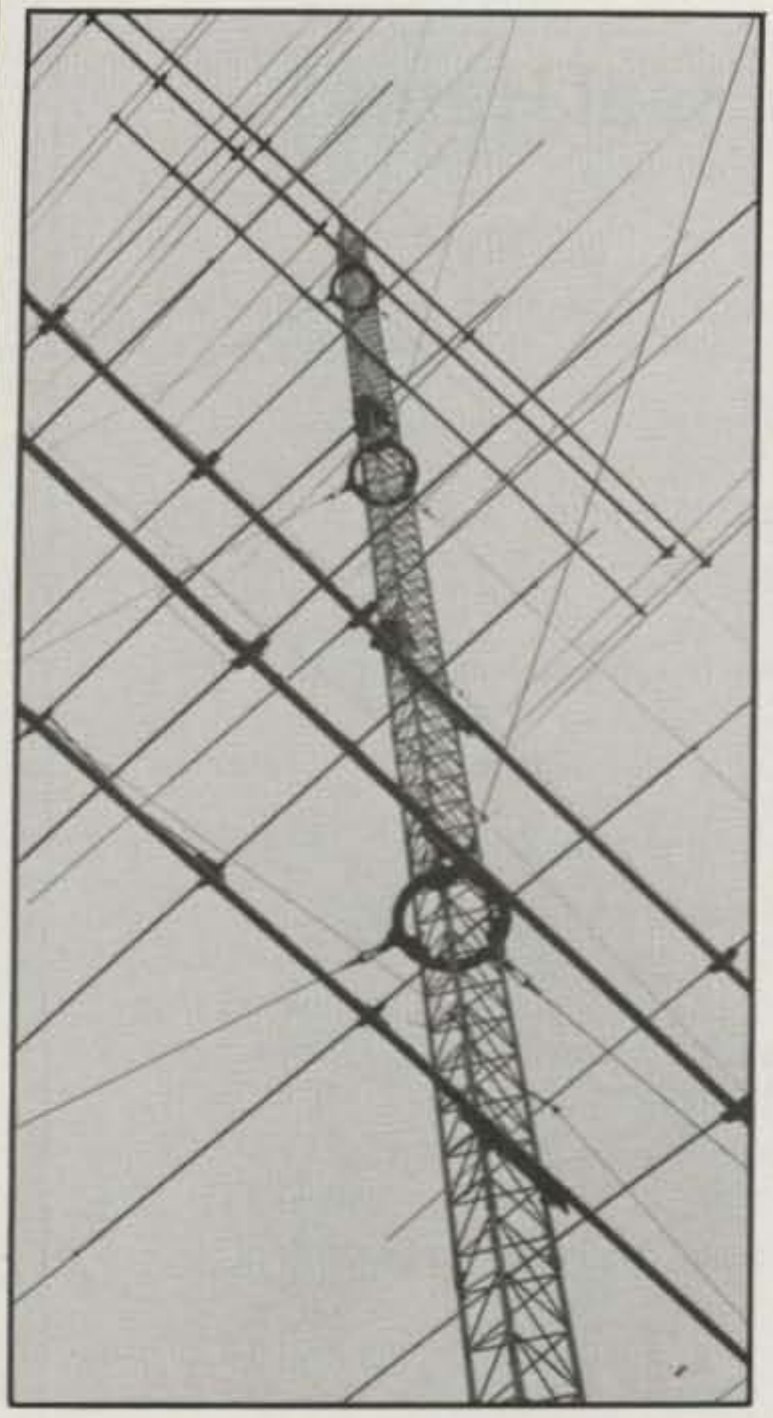
Winning DX contests within the United States requires several decisive ingredients: exceptional operating ability, above-average hardware, experience, and a station located within a few hundred feet of the Atlantic. John Kanzius, K3TUP, has delivered all of these components with the exception of one. That exception makes his contesting accomplishments even more spectacular, as he has created a winning contest station within an earshot of W8! K3TUP has become a force to contend with for serious contesters everywhere.

John has been playing the amateur radio game for over 30 years. His father, W3NRE, was also a ham and provided the catalyst for John's future interests. It is with pride that John recalls his early interests in electronics as he began building broadcast receivers when he was only 10 years old.

Although John has been an active amateur for over three decades, his first contest experience was in the 1971 *CQ* WW Contest where he won 15 meters for the Third District. K3TUP has been operating seriously in contests for about the past 10 years and has a cabinet drawer filled with plaques and certificates from dozens of winning single/multi-single operations. These include First-Place *CQ* WPX Multi-Multi 1986, back-to-back S/O All Band wins by K3LR in the ARRL DX 1988/89, and a new USA high-claimed record by K5ZD in the 1989 *CQ* WW CW contest. John prefers to operate in 160 meter contests and takes the role of "host op" for the *CQ* WW and ARRL DX Contests.



K3TUP's QSL card is well known by many contesters.



One of the reasons for the big signal from K3TUP (140 foot rotating tower).

John Kanzius, K3TUP, ready for battle from his impressive shack.

Tower #1: Rotating 140 foot tower. Antennas: 7/7 10M (42 foot booms), 6/6 15M, 4/4 20M (52 foot booms).

Tower #2: 100 foot fixed tower. 4/4 40M KLMs, 4-el Cushcraft 20M.

Tower #3:10 foot fixed tower. 6-el LTA 10M Yagi (31 foot boom), 5-el LTA Yagi (31 foot boom), 6-el 10M Yagi at 50 feet fixed south, 5-el 15M rotary Yagi, 6-el 10M rotary Yagi.

Other Antennas: 4-el W1CF design 80M vertical, 80M Delta Loop, ¼-wave 160M vertical wire, two 160M inverted Vees, Beverages.

Station: two IC-765, three TS930S, four Alpha 77D, two AL-1500.

Table I– K3TUP station/antenna layout.

Over the years John has had the pleasure of hosting some of the world's finest operators. He has enjoyed their camaraderie and admired how different yet similar they can be in operating strategy and approach to winning. John feels that contesting has developed some of the finest operators in the world who offer tremendous potential for service during a national or international disaster.

Any station that produces as many QSOs as K3TUP will ultimately run into a crisis situation that seems impossible to solve. During a contest operated by K3LR, Tim began to hear a pulsing sound that was ultimately tracked to a neighbor's electric fence about ¼ mile away. As you might expect, it was in the dead of winter with the outside temperature hovering around 8 degrees. Although John had just returned from a cocktail party, he was more than willing to put on a golf jacket and jeans over his pajamas and run over to his neighbor and short the fence with a cliplead. John recalls the electrical arc to be especially dramatic. Although the noise was now gone, John assumed that his 240 pound neighbor would not join in with their jubilation. So a few hours later John trudged back to his neighbor's fence and pulled a large tree onto the fence, eliminating the noise permanently (and the fence). After hearing his neighbor's chainsaw buzzing the following afternoon, John ran over to confess and bought him a new solid-state fence and a couple of cases of beer. Now that's dedication!

John feels strongly that contesting in Erie, Pennsylvania requires a different operating style than that of the "east coast." Timing your band openings is much more critical, as an hour or two can make the difference between a winning and losing effort.

John has an impressive station that can best be defined as a single operator's dream. The station is designed so that the operator can easily switch antennas or turn rotators from a single physical location without needing to move around the operating table. When the operator chooses to change bands, a custom-designed antenna switch automatically selects the appropriate antenna and amplifier. These features combined with K1EA's logging software make operating nearly automatic.

John's stacked antennas have been designed for switching upper/lower or both combinations. Each antenna has been moved up and down the tower over 50 times to optimize their forward gain when new antennas are added. His experimentation has proven that antenna movement of only one or two feet can often make a dramatic difference in overall performance.

John, 46, is a very successful broadcasting executive who maintains responsibilities as President of JET Broadcasting Company, Inc. and WHOT, Inc. in Youngstown, OH. In addition, he is married to his wife, Marianne, and has two daughters, Sherry and Toni. There are very few who realize John's past includes being an electrical engineer in RCA's broadcast electronics division. And as many noticed this winter, John is one of few who can put up a 40 meter KLM by himself in the middle of the winter! So much for the theory of a broadcasting executive "buying his way" into the hobby.

In the world of contesting K3TUP is many things. To his fellow competitors he can be described as an outstanding operator, superb station designer, and a technical perfectionist. However, K3TUP is truly committed to furthering technology in amateur radio. The desire to win contests has produced a "magic" station. K3TUP has taken contesting in western Pennsylvania to new heights with the future holding even more enhancements. Always changing, always improving . . . the "TUP" way.

Contesting Survey—Are Contesters Real Hams?

Your Call Area/Province/Country or Callsign:

Contesting Experience (years):

Home Telephone Number (see column):

Work Telephone Number (see column):

Address:

1. Do you regularly answer your bureau/direct QSL cards?
   ☐ YES ☐ NO

2. How many unsolicited outgoing QSLs have you sent in the past 12 months?
   a. zero
   b. 1–5
   c. 5–25
   d. greater than 25

3. Do you actively track your DXCC country totals?
   ☐ YES ☐ NO

4. Are you currently involved in a local radio club (non-contest)?
   ☐ YES ☐ NO

5. Have you administered an Amateur Radio Exam in the past 12 months?
   ☐ YES ☐ NO

6. How many QSOs with a non-contester have you made in the past 12 months that were longer than 10 minutes in duration?
   a. zero
   b. 1–5
   c. 5–25
   d. greater than 25

7. Do you operate special modes from your station (e.g., RTTY, SSTV, AMTOR)?
   ☐ YES ☐ NO

8. Have you ever been an "elmer" for another amateur?
   ☐ YES ☐ NO

9. How many hamfests did you attend in the past 12 months?
   a. zero
   b. 1
   c. 2
   d. 3 or greater

10. Have you participated in a public service activity (e.g., 2 meter communications in parades, road races, concerts) in the past 12 months?
    ☐ YES ☐ NO

11. Circle the following awards you have obtained:
    a. 5BDXCC
    b. 5BWAZ
    c. 5BWAS
    d. DXCC Honor Roll
    e. Worked All Counties

12. Have you "home-brewed" a piece of amateur equipment in the past 12 months?
    ☐ YES ☐ NO

13. Have you ever held an amateur service position (e.g., Section Manager, VEC, OO, etc.)?
    ☐ YES ☐ NO

Comments (use additional sheet if necessary):

Return survey to: John Dorr, K1AR
CQ Magazine Contest Column Editor
2 Baldwin Street
Windham, NH 03087 USA

Deadline: September 15, 1990

Venezuelan Contest

SSB: July 7–8 CW: July 28–29
0000Z Sat to 2400Z Sun.

This is the 29th annual contest celebrating Venezuela's independence. It's a world-wide-type contest. Therefore, do not confine your activity to working YVs only. Working other DX is encouraged.

Use all bands, 80–10 meters (no WARC bands).

There are four classes: single operator, single and all band, and multi-operator, single and multi-transmitter. (No limit to transmitters, but only one signal per band.)

Exchange: RS(T) and QSO number (i.e., 59-035).

Points: Contacts between stations in the same country, 1 point. Between stations in different countries but the same continent, 3 points. Between stations on different continents, 5 points.

Multiplier: One for each YV call area, and one for each different country worked on each band (including own).

Final Score: Total QSO points from all bands multiplied by the sum of the multiplier from each band.

Awards: A plaque to the highest scorer in each class and certificates to stations making more than 10% of the next highest score.

Use a separate log sheet for each band. Each YV call area (9), and each country (DXCC list) should be indicated in a separate column only the first time they are worked on each band.

Include a summary sheet showing the scoring, your name and address in block letters, and the usual signed declaration that all contest rules and regulations for amateur radio in the country of the contestant have been observed.

Include 2 IRCs or the equivalent to cover cost of mailing and processing of any awards.

Mailing deadline is September 30th for SSB entries and October 30th for CW. They go to: Radio Club Venezolano, Concurso Independencia, P.O. Box 2285, Caracas 1010-A, Venezuela.

IARU HF Championship

1200Z Sat. to 1200Z Sun., July 14–15

This is the fifth annual IARU World HF Championship. All six bands, 10 through 160 meters, and the full 24 hours may be used by both single and multi-operator stations. (No WARC bands.)

Categories: Single operator, CW only, phone only and mixed modes. Multi-operator, single transmitter, mixed mode only. Must remain on a band for at least 10 minutes at a time. (Exception: Only IARU member-society HQ stations may operate simultaneously on more than one band with one transmitter on each band/mode.)

Exchange: RS(T) and ITU zone. HQ stations: RS(T), and official society abbreviation.

Points: Contacts within own zone or with an HQ station, 1 point. Contacts within own continent but different zone, 3 points. Contacts with different continents, 5 points.

Multiplier: Total number of ITU zones plus IARU HQ stations worked on each band. (Note: HQ stations do not also count for zone multipliers.)

Final Score: Total QSO points from all bands times the sum of the multiplier from each band.

Awards: Certificates to the top scorers in each category, in each state, each ITU zone, and each DXCC country. In addition, achievement awards will be issued to those making at least 250 QSOs or having a multiplier of 50 or more.

Entries with more than 500 QSOs are required to include a dupe sheet with their log. A three QSO reduction will be assessed for each duplicate QSO for which credit has been taken. Disqualification may occur if the overall score is reduced by 2% or more.

It is recommended that you check *QST* (April 1989 issue) for more detailed information. A large SASE with 2 units of first-class postage or 2 IRCs will get you official forms and a ITU zone/prefix/continent map.

Mailing deadline for entries is August 10th to: IARU Secretariat, Box AAA, Newington, CT 06111 USA.

CQ WW VHF WPX Contest

0000Z Sat. to 2400Z Sun., July 14–15

This is the 6th annual World-Wide WPX VHF Contest. Complete and detailed rules can be found in the May issue, but will be reviewed here briefly. However, I strongly recommend that you refer to the May issue for detailed information.

Bands: All VHF bands, 6 meters through 23 cm, may be used. And 50, 70, 144, 220, 432, 902, and 1296 MHz.

Classes: 1. Single Operator (a) all band, (b) single band, (c) all band low power, (d) single band low power (30 watts PEP). 2. Multi-operator (a) all band, (b) single band. 3. Portable (temporary power source only). 4. FM only.

Exchange: Call sign and grid square (4 digits—e.g., FN20). Signal report optional.

Scoring: One point per QSO on 50, 70, and 144 MHz. Two points on 220 and 432 MHz. Four points on 902 and 1296 MHz. Stations may be worked once per band regardless of mode.

Multiplier: Number of prefixes worked, additive on a band-to-band basis.

Final Score: Total QSO points times the sum of different prefixes worked on each band.

A prefix is considered to be the three letter/number combination which forms the first part of the call sign—i.e., N1, W2, WB3, AA6, 4X4, Y32, etc. A station in a call area different from that indicated in the call is required to sign portable. The location of the portable determines the prefix.

Awards: A large selection of certificates and plaques will be awarded in each class in all major geographic areas, North America, Europe, and Japan. (US states, Canadian provinces, European countries, and Japan call areas.) Additional areas will be considered as returns justify.

Logs must be posted no later than August 30 and this year go to: CQ VHF WPX Contest, *CQ* Magazine, 76 N. Broadway, Hicksville, NY 11801.

World Radiosport Team Championship

2100Z Fri. to 0700Z Sat., July 20–21

This is one of the summer's premier operating events as amateurs worldwide work each other and the World Radiosport Championship Teams. The World Radiosport Team Championship is in cooperation with the Goodwill Exchange Program of the 1990 Goodwill Games. Invited teams from the United States, the USSR, and up to 21 other countries will compete for the world championship from stations located in the Seattle, Washington area. Championship teams will operate with the special /WG designator after their callsign.

Bands: 80–10 meters (no WARC activity). CW: 25 kHz up from 3525, 7025, 14025, 21025, 28025. SSB: 3775–3925, 7150–7200 (and split), 14200–14300, 21300–21400, 28400–28500.

Classes: All bands only. Single Operator, Multi-Single, Multi-Multi using *CQ* WW rule criteria.

Exchange: RS(T) and serial number (e.g., 599001). Work any station once per band/mode.

Multipliers: US, VE, JA call areas; DXCC countries, WRTC stations (/WG). Multipliers count per band/mode.

Scoring: QSO points times multipliers. Credit 50 points for WRTC stations (signing /WG per band/mode), 3 points for different continent, 2 points for same continent/different country, 1 point in same country. Assign 2× QSO point multiplier for CW QSOs.

Awards: The top three winning Radiosport Championship Teams will receive gold, silver, and bronze metals. Work 5 WRTC QSOs and receive a certificate, 30 WRTC QSOs and receive a WRTC commemorative pin. The top 500 scores will receive a WRTC T-shirt (indicate size on summary sheet).

Logs must be postmarked by August 20, 1990 and sent to: World Radiosport Team Championship, 4821 51st SW, Seattle, WA 98116, U.S.A.

SEANET Contest

CW 0000Z Sat. to 2400Z Sun., July 20–21
SSB 0000Z Sat. to 2400Z Sun., Aug. 18–19

This is an annual event sponsored by the Singapore ARTS. The objective is for amateurs worldwide to work stations in Southeast Asia.

Bands: 160–10 meters (no WARC bands).

Classes: Single operator (single band and all bands) and multi-single.

Exchange: RS(T) and serial number (e.g., 59001).

Multipliers: Multipliers are SEANET country prefixes: A4, A5, A6, A7, A9, AP, BV, BY/BZ, DU/DV/DX, EP, HL, HS, JA, JD1, JY, KH2, P29, S79, VK1–9, VQ9, VS6, VU, V85, XU, XV, XW, XX9, YB/YC/YE, ZK, ZL, ZM1–4, ZL6/ZM6, ZM9, 3B6/3B7, 3B8, 3B9, 4S7, 4X/4Z, 8Q7, 9K2, 9M2, 9M6/9M8, 9N1, 9V. Multipliers are calculated by total number of SEANET countries times three (times 2 for SEANET-SEANET contacts).

Scoring: QSOs with SEANET countries count 2 points on 20/15/10 meters; 5 points on 40/80 meters; 10 points on 160 meters. (SEANET-SEANET QSOs count 1, 3, 6 points, respectively.) Double the QSO points for contacts in: DU, HS, YB, 9M2, 9M6/9M8, 9V, and V85. QSOs in your own SEANET country do not count. Final score is total multiplier times QSO points.

Entries must be received by October 31, 1990 and sent to: SEANET '90, Maxwell Road, P.O. Box 2728, Singapore 9047. Include 2 IRCs for a copy of the final results.

Colombian Independence Contest

0000Z to 2400Z July 21

This is a world-wide-type contest. Use all bands, 3.5–28 MHz, phone or CW.

Classes: Single operator, single and all band; multi-operator, single transmitter; multi-operator, multi-transmitter.

Exchange: RS(T) plus serial no. (e.g., 59001).

Scoring: *For non-HKs*—QSOs with HKs 5 points; with other countries 3 points, with own country 1 point.

For HKs—QSOs with other continents 5 points; 3 points in same continent; HKs 1 point.

Multiplier: Number of different countries and HK call areas worked on each band.

Final Score: Total QSO points times the sum of the multiplier from each band.

Awards: Certificates to each station showing a minimum of 100 contacts. Plaques to the overall winning HK and non-HK in each class and each mode; for HKs in each call area; and continental winners.

Use a separate log sheet for each band. Indicate the multiplier in a separate column only the first time it is worked on each band. A summary sheet showing the scoring and other essential information, and the usual signed declaration, is also requested.

Disqualification rules regarding taking credit for duplicate contacts, violation of rules and regulations, etc., will be strictly enforced.

Mailing deadline is August 31st to: Liga Colombiana de Radioaficionados, Colombian Independence Day Contest, Apartado 584, Bogota, Colombia.

Six Meter Activity Day Contest

1400Z Sat. to 0300Z Sun., July 28–29

This year's event is sponsored by the Colorado Six Meter Invitational Net. Participants make all valid QSOs on 6 meters exchanging Callsign, First Name, Grid Square, and S.I.N. number (Six Meter Invitational Net number) if appropriate. S.I.N. member QSOs count for 3 points and all others 2 points. The final score is obtained by multiplying total QSO points by overall grid square amount. First- and second-place winners will receive certificates. All entrants will receive the final results with an SASE. Logs are to be postmarked by August 31, 1990 and sent to: Clay Schneider, KAØMKF, 1034 S. Ventura Way, Aurora, CO 80017.

WORLD OF IDEAS

BY DAVE INGRAM, K4TWJ

A LOOK AT THE WORLD AROUND US

Surviving and Enjoying Life as a Cliff Dweller

Unfair as it may be, antenna restrictions and zoning ordinances are often serious problems in amateur radio life. This article does not advocate ignoring or sneaking around such limitations, but rather suggests securing a mutual agreement or relocating to more favorable grounds. Good luck, and if you get cited for a violation, I don't know you! —K4TWJ

Over the years I have compared notes on apartment-complex and condo hamming with many amateurs, and I have compiled some very beneficial information in the process. Although I never anticipated becoming a full-time cliff or cave dweller myself, changes can occur in anyone's life.

That fact came into clear focus when we recently moved into a temporary townhouse right in the middle of a large apartment complex. I had previously enjoyed amateur radio from beach condos during vacations, but those brief stints were noticeably different from full-time cliff dwelling! Our townhouse did not have a balcony, outside rail, or deck; we were in direct view of the clubhouse, swimming pool, and the manager's office; and all potential antenna-supporting trees were across a continuously traveled road. Why did I accept such a verboten location? It was a good place for big-time hamming.

No way, you are saying. Dave has been sniffing the ozone much too long. On the contrary, friends. Read on.

During the six months I lived in that apartment complex I worked over 100 countries, built and perfected several classic rigs, made DXCC mobile, and enjoyed multiband hamming almost every day. My main rigs were barefoot transceivers, and my antennas were a camouflaged triband beam on a roof tower, a non-visible Carolina Windom, an occasionally erected Cushcraft R5 vertical, and my bed's metal frame.

Being firmly convinced that any truly enthusiastic amateur cannot be stifled or discouraged, this month's column shares my tried and proven hints and notes that you too can use for hamming amidst handicaps. Understand I am not talking about makeshift indoor antennas and random wires hidden from landlord detection, but rather I am discussing big-time amateur radio with management and tenant blessings. In other words, going for the gusto!

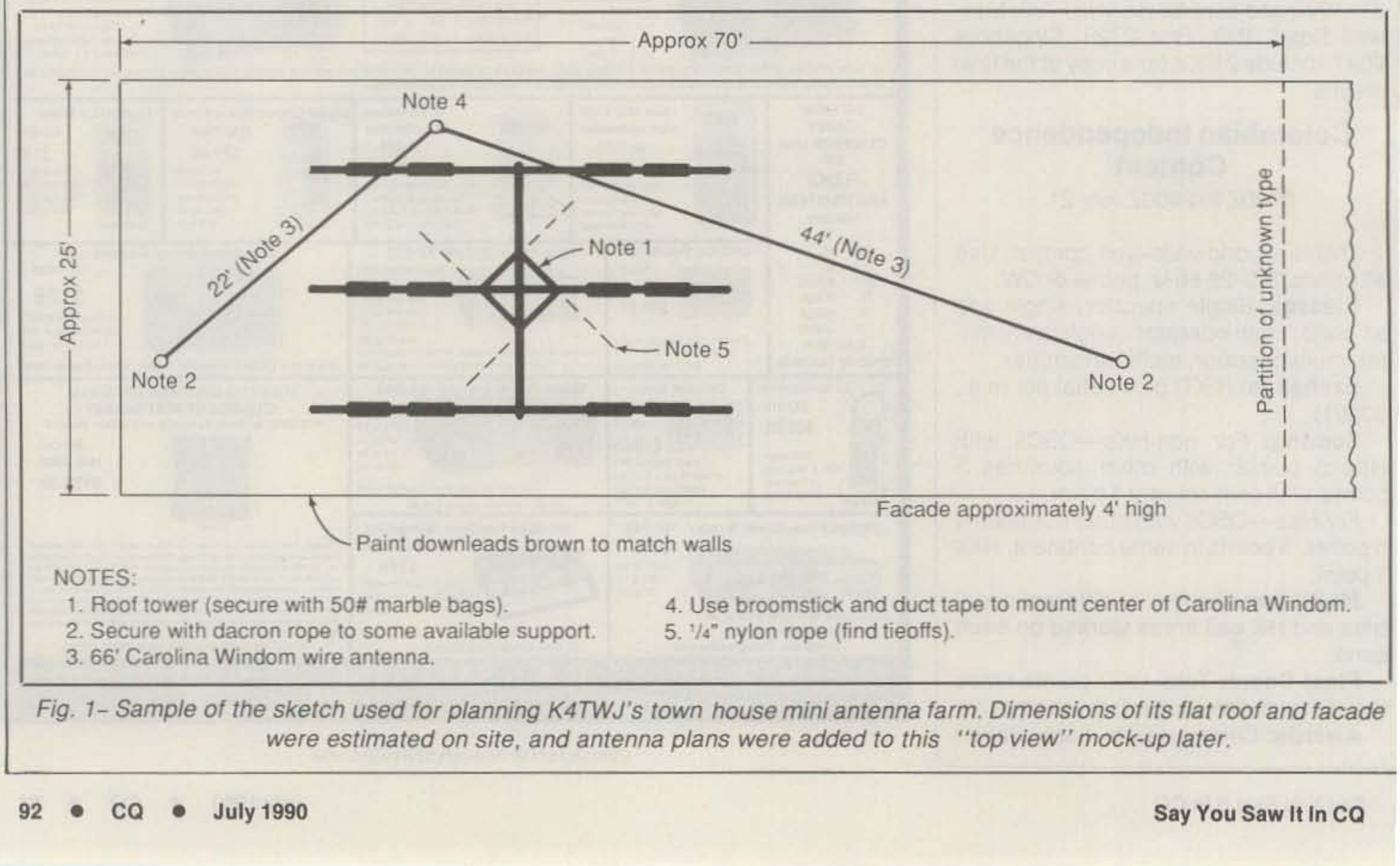
4941 Scenic View Drive, Birmingham, AL 35210

The Situation

We all know that life as a cliff dweller has its disadvantages, so I will not elaborate on that point. Instead, let's focus on how its assets and our amateur radio knowledge can be used to our advantage.

First, apartments are short-term leased housing of our own choice. For every fifteen landlords not interested in amateur tenants, there are two or three in better DXing locations who are receptive to conscientious amateurs with a favorable image.

Second, even high-performance an-



NOTES:
1. Roof tower (secure with 50# marble bags).
2. Secure with dacron rope to some available support.
3. 66' Carolina Windom wire antenna.
4. Use broomstick and duct tape to mount center of Carolina Windom.
5. 1/4" nylon rope (find tieoffs).

Fig. 1– Sample of the sketch used for planning K4TWJ's town house mini antenna farm. Dimensions of its flat roof and facade were estimated on site, and antenna plans were added to this "top view" mock-up later.

tennas often can be cloaked by natural surroundings or covers. A hopelessly obvious antenna also need only show when in use, and that is usually less than 12 hours a week. Third, and most important, TVI, RFI, and RF feedback are honest problems that must be eliminated right from day one. A proud and respectable image is vital.

Finally, there is consolation in knowing that life in one undesirable apartment is not permanent. You can also use that time to expand your areas of interest rather than restrict them. If DXing like a big gun does not work out, try satellites, WARC bands, and/or mini-DXpeditioning. Have fun handling QSLs and applying for awards during "TV hours." Work fixed mobile with a big antenna from a nearby mountaintop on Sunday afternoons. The avenues of enjoyment in our great hobby are endless!

Some additional points also warrant mentioning. Apartments or condos in good operating locations are just as obtainable as those in flood-prone valleys. Why buy bologna when you can have filet mignon for the same price?! Multi-dwellings usually have congenial management and tenants if you do not cause interference and try to elude discovery. In fact, interference and "ugly(?) antennas" are the main reasons why places are closed-minded to amateur radio.

Ponder the following scenario. Assume you are residing in a very prim and well-manicured complex or garden home with a clean new car in the front driveway. A couple of times a week you snap a neat, no-radials-required vertical or minibeam on a mast to the car's trailer hitch. No interference, no TVI, and you remove the antenna an hour later. Suppose that hour was during an event such as the recent California earthquake or Voyager's flyby of Neptune, and your efforts were spotlighted on local TV news that same evening. Wonderland? No. That is similar to my own true story two weeks after moving into a townhouse. After my second TV appearance other tenants came by with congratulations and inquiries about getting into amateur radio. That's right. Make amateurs of them and everyone wins!

Your knowledge of various antennas, their radiation patterns, grounding, cabling, and basic electronic effects is also very important to successful cliff life. As an example, we know dipoles radiate maximum RF energy around their length with minimum RF off their ends (similar to light from a neon tube). Mount one parallel to street wiring or a building with power and TV cables built into the walls, and you have a TVI-promoting open-air transformer. The same facts hold true for close-to-roof Yagis. Their elements radiate "downward" just like they radiate horizontally. For best results position your dipole(s) at right angles to wires that can pick up RF energy. If a beam cannot be raised above "coupling distance" or rotated for minimum TVI, use plenty of filters (additional information later). Verticals may offer solutions if they do not require ground radials and can be mounted above roof level or away from obstructions. Verticals always need a clear horizon view to work properly.

This subject could obviously continue indefinitely. The ideal antenna for all installations is not a particular item. In fact, it probably does not exist. That is why numerous books and magazine articles highlight antennas. Read all of them you can, and remember their information for later use. Your greatest asset is knowing the best antenna to use in a given situation.

Selection of Apartments And Antennas

There are one or two ham havens waiting to be discovered in almost every area. The keys to spotting them are trained investigation and open eyes. A good starting point is using the free apartment guides available at local grocery and book stores. They usually include descriptions and photos and will give you a general idea of locations atop high points, layout of power lines, and suitable antenna types to use. Apartment locator groups and loaner video-tape apartment guides are also available in many cities, especially if a military base is nearby. Check your telephone book's *Yellow Pages* for the latter.

Using those techniques, my own selection of a DX-worthy apartment was narrowed down from fifteen to six possible choices. Some were adjacent to open land perfect for phased verticals and elaborate wire arrays, some had fenced yards for privacy, and one seemed to have roof accessibility. Telephoning your screened choices will often clarify layouts and acceptance to a small shortwave radio and an outdoor antenna (or alert you to restrictions). Note the previous steps can be handled by telephone at your convenience. In my case it also narrowed down the selection to four choices.

The next step is physically checking out your apartment choices, and this is when a good mobile setup really proves its worth. Listening on the air while enroute will give you a good idea of signal propagation and band noises of the day. Assuming signal levels are high and power-line noise is low when you stop near a particular apartment, visually check for natural obstructions to camouflage antennas. If everything is still favorable, use your best finesse to secure conditional approval of your TVI-proof rig and inconspicuous antenna. (Think like a politician: carefully plan your words, then quickly and smoothly bring the subject in and out of the conversation).

Before proceeding to your next apartment-complex choice, casually admire the scenery while mentally planning antenna types and estimating distance between supports. Draw a mock-up sketch in your car while everything is fresh in your mind.

Your knowledge of antennas is very beneficial at this point. A vertical placed close to a building is blocked in radiation and a good candidate for RF feedback. One solution to those pitfalls is mounting that same vertical on a rotor with a right-angle bracket and counterweight at the roof or chimney level. The vertical lays flat and out of view except when you are on the air and rotate it up (90 degrees). An outstanding multiband wire antenna (if you can mount it away from or at right angles to power and TV cables) is the half- or full-size Carolina Windom made by The Radio Works (Box 6159, Portsmouth, Virginia 23703).

I have installed this skywire in exactly the same location, at the same height, with the same tilt on wires, etc., as a G5RV antenna, and its performance has been *like* a two-element beam compared to a dipole. Do not prematurely rule out minibeams. Butternut's HF2B is a gem for 20, 15, and 10 meters, plus WARC bands. Pretuning it before installation, however, is vital. Also, take a lesson from the radomes the military uses to cover antennas near coastal areas. You can

achieve similar results with a small swimming-pool cover. Use your imagination, and the possibilities are endless!

In my case, the previously discussed apartment evaluations and antenna ideas resulted in two choices. One apartment was flanked by a huge open area atop a rise with a view for miles in all directions. The second choice townhouse was even higher. Its roof was surrounded by a 4 foot facade to hide air conditioners (and my antennas). That location was also landscaped, so trees, driveways, and buildings blocked roof/antenna views.

Before moving day I purchased a small roof tower plus rope and two 50 pound bags of marble chips to anchor it, and painted my triband blue/gray with plastic paint. The beam was then pretuned and marked for quick reassembly, and my Carolina Windom was packed into a brown paper bag. Using my preplanned guide (fig. 1) and the assistance of two maintenance men, I installed the antennas behind the facade the day after moving in. I painted downlead coax to match building bricks, then slipped back inside completely unnoticed. At this point you could look directly at the building and never realize it supported a mini antenna farm. Both antennas worked great, and my first contact on the Carolina Windom was BY4RB in China—barefoot!

TVI, RFI, and RF Feedback

Due to the concentration of people in an apartment complex and your close-to-building antenna(s), RF-related entanglements are a priority consideration. That includes both television and telephone interference, and obligations of manufacturers or utility carriers mean nothing to the general public. They did not experience interference before you arrived, so you are the villain. Don't pull the big switch yet, however. Working solutions are nearby.

First, TVI is separated into two categories: reception of harmonic and spurious radiation falling within TV channels and sheer "clean signal" RF overloading. The former is usually caused by older rigs or haphazard installations and is obvious on a TV screen as herringbone, diagonal lines, or Zs. The latter (and more common interference) appears as horizontal bars or lines that vary with modulation. Remember those facts! If you are using a modern transceiver with good harmonic and spurious radiation suppression and see herringbone-type TVI, clean up your station. Clean every antenna joint, solder all connections, and do not settle for mere crimped-to-connect PL-259 coax shields. Install one short and direct ground cable, connect it to each cabinet's rear ground lug, and remove all unnecessary wires or jumpers. Use flat braid for a ground strap, not round coax or wire. Strive to route it to an outdoor-installed ground rod. "Break up" long/resonant lengths with snap-on toroids (MFJ sells these in four-packs). Do not assume cold-water-pipe systems do not use plastic lines in out-of-sight locations or one or two half-soldered PL-259s are not serious. Also do not expect low-pass filters to magically clear TVI. Go "better" than my hints rather than ignoring one or two, and herringbone TVI should disappear.

Horizontal bar-type TVI, telephone and house appliance interference, results from pure induction-field RF energy "getting into" those items' related cables (remember our analogy of an open-air transformer?). In severe cases you actually may be able to light a small neon bulb touched to telephone or power lines picking up RF (but do not try that dangerous test). A low-pass filter installed at your rig obviously does very little to minimize this malady. Your spectrally clean signal must be choked out of all wires going to RF-offended items. If that interference is very light, a simple high-pass filter and/or previously mentioned snap-on toroids might suffice.

The best solutions I have found, however, are TCE Labs "BX" TV filters, "TP" telephone filters, and "KW-1" AC line filters (available from TCE Labs, 5818 Sun Ridge, San Antonio, Texas 78247, telephone 1-800-KILL TVI). When they say you can run high power to a close-in antenna without a trace of telephone or TV interference, believe it! No, I am not "pushing" TCE's filters. I am simply sharing great news. After moving from the townhouse and into my present QTH, I fired up my "super amp" and cremated my TV. The TCE filter took it out—completely! If only RF feedback was as easy to cure!

RF feedback occurs when transmitted RF energy gets back into your own amateur radio gear, and it can be a bear with makeshift antennas or poor grounds. It appears as growls, squeals, or chopped audio on your signal, eratic meter readings, improper power supply or automatic antenna operation, or the old hot mike or key syndrome. Clearing RF feedback is not easy. Working solutions typically involve moving your antenna and/or changing its type (to minimize in-shack RF), shortening long grounds acting like a phantom antenna, and installing toroids on all cables.

Often-overlooked feedback-promoting items include rotor cables, mike and key leads, semi-plastic rig cabinets, and generic AC supplies with inadequate shielding. Every feedback problem is different, and one "fix" seldom cures everything. Be progressive and diligent in your pursuit of cures, and a solution will be eminent (spoken by the voice of experience!).

Summary

This month's column is not a cure-all guide for cliff dwellers, but rather is an encouraging look at modern ideas and techniques which you can use advantageously. My notes on television and telephone interference are really important news for all amateurs and should be considered quite seriously. Why get into complex maneuvers when working solutions are so simple?

Again, I remind you to check antenna zoning restrictions and local ordinances before signing a lease.

Good luck, and don't give up. Amateur radio is great!

73, Dave, K4TWJ

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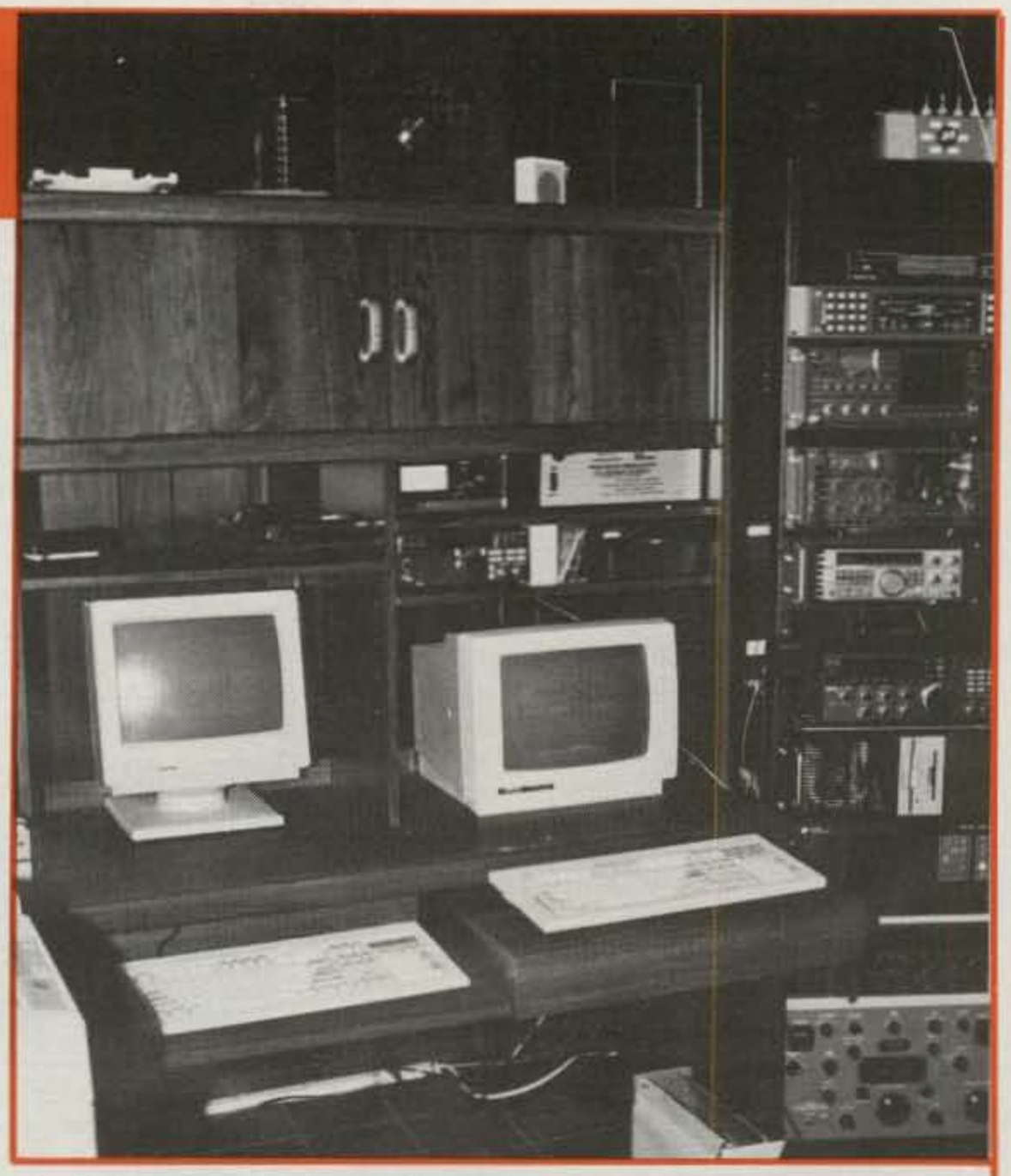

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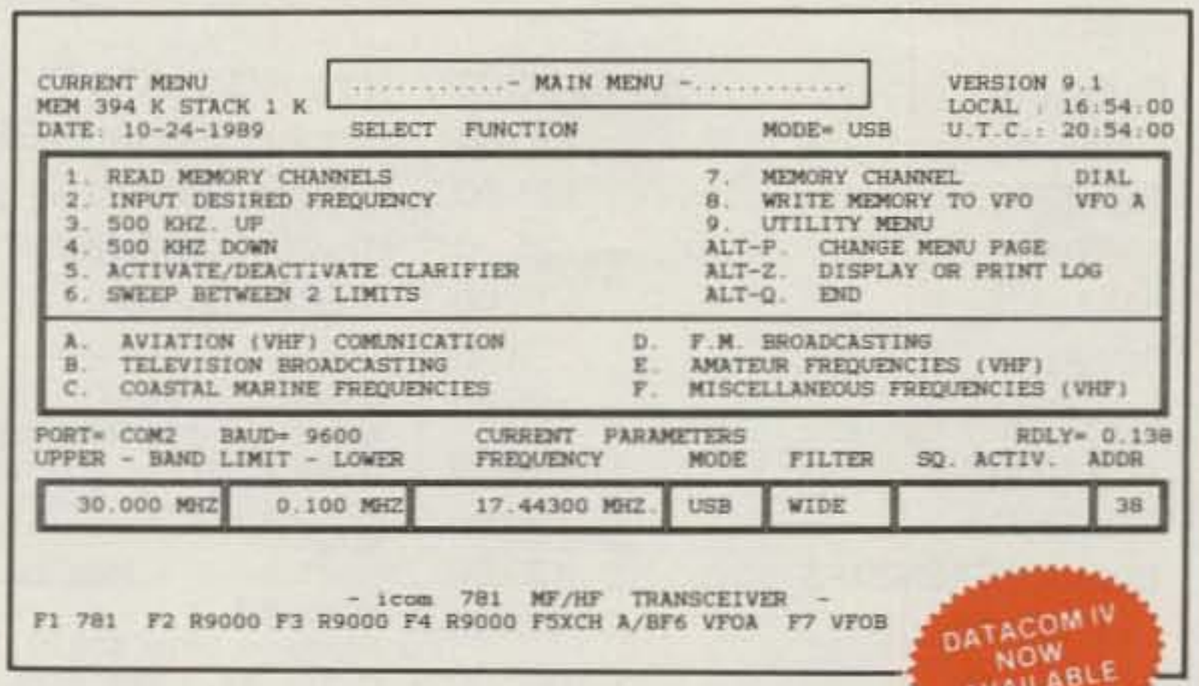

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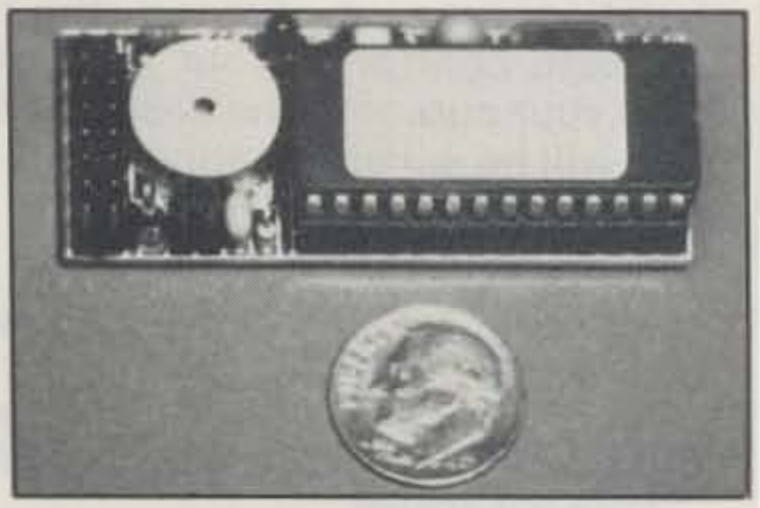
The AL-82 covers 160, 80, 40, 20, and 15 meters and gives 80% rated output on 12 and 17 meters. In addition, it can be modified to cover 10 meters upon presentation of a proper amateur license. An export model is also available. Price of the AL-82 is $1995. For more information, contact Ameritron, 921 Louisville Road, Starkville, MS 39759, or circle number 103 on the reader service card.

A & A Engineering The Signal Sentry

The Signal Sentry is a microprocessor-controlled DTMF decoder with program and store capabilities which can be user programmed to store and remember caller's ID number and eight distinct notification numbers. It is small enough to fit into most radios, including some HTs. It requires 6 to 16 VDC and uses 12 microamps when in the sleep mode. A current of 12 milliamps is used when a call notification is in progress. It is also suited for use as a radio re-



mote controller. The unit provides a serial output of all 16 DTMF tones for computer use.

The Signal Sentry is available in kit form (model #173-KIT) for $69.95, or assembled and tested (model #173-ASY) for $89.95. Each comes with an 18-page instruction manual. For more information, contact A & A Engineering, 2521 W. LaPalma, Unit K, Anaheim, CA 92801, or circle number 107 on the reader service card.

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AEA's ET-1 Econo-Tuner™ is an all-band antenna tuner designed to match virtually any

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The ET-1 is priced at $149.95. For more information, contact AEA (Advanced Electronic Applications, Inc.), P.O. Box C-2160, Lynnwood, WA 98036, or circle number 104 on the reader service card.

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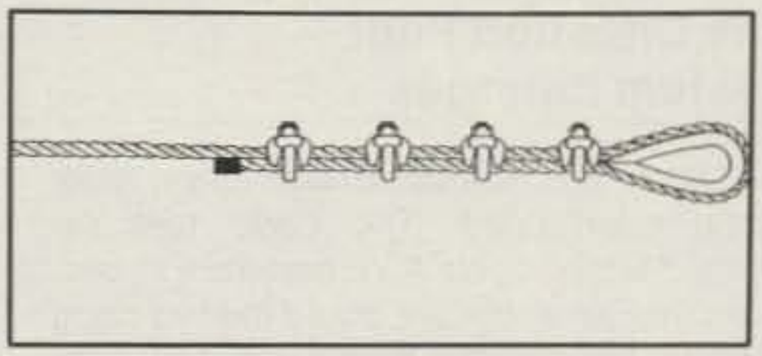

For more information, contact Phillystran, United Ropeworks (U.S.A.) Inc., 151 Commerce Drive, Montgomeryville, PA 18936, or circle number 110 on the reader service card.

WASHINGTON READOUT

BY FREDERICK O. MAIA, W5YI

REGULATORY HAPPENINGS FROM THE WORLD OF AMATEUR RADIO

The Novice Examination At The Crossroads!

There are two amateur radio operator testing programs. The Novice program informally tests beginners for entry-level licenses. The more structured VEC system handles all other license classes, Technician through Extra class.

The Novice license began in 1951 when newcomers were allowed 75 watts of crystal-controlled power. The license granted Morse code communication privileges for only one year; you either upgraded or went off the air. The Novice license may be coming to an end, however. The FCC has proposed to abolish the class and substitute the code-free Communicator.

Background of the Novice Class

Things improved for the Novice in 1967 as part of Phase One of the FCC's new Incentive Licensing program. The license term was increased to two years and the Novice license could be renewed by retaking the examination. Power levels were increased to 250 watts and VFOs (variable frequency oscillators) were also allowed for the first time. Beginners could now slide around their bands instead of being rock bound. They were still prohibited, however, from passing traffic or from portable/mobile operation.

I bet you weren't aware that Novices used to have 2 meter voice privileges. They did, but the 145-147 MHz band was taken from them as part of Phase Two. Actually it wasn't much of a loss. Two meter repeaters had yet to make their appearance. The band simply wasn't used. That left them with CW only on four HF bands—50 kHz each on 80 and 40 meters, and 100 kHz in the 15 and 10 meter bands. You simply had to learn the code to be an amateur radio operator. It was part of your indoctrination. There were many who thought CW meant "Chains and Whips." You had to take your punishment to become a ham.

Once the applicant passed the code test before a single volunteer examiner, the VE would send in the application Form 610 and request a written test from the FCC which arrived in a sealed envelope. The 20-question written examination had to be returned to the FCC in Gettysburg within 30 days and they graded the test. If successful, the applicant was rewarded with a callsign a few weeks later which contained an "N" (meaning Novice) after the initial letter. The "N" was removed when the Novice upgraded. The whole process was a real paperwork snarl to the Commission.

National Volunteer Examiner Coordinator, P.O. Box 565101, Dallas, TX 75356-5101

The Question Pool System Emerges

In 1983 the Novice examination was again overhauled. The code test remained unchanged. A VE had always certified that an applicant could indeed copy 5 words-per-minute. A new question pool system was adopted which permitted one volunteer examiner to systematically select 20 questions from a lineup of 200 questions. The questions were publicly released by the FCC in PR Bulletin 1035A, Element 2 Examination Questions. The questions were divided into 20 blocks of 10 questions each. One question had to be randomly selected from each block.

Examinees for the first time knew the exact questions that might be asked of them. What they didn't know were the answers! The FCC came up with the questions, but left it up to the volunteer examiner to come up with the correct answer! The answer format could be in any form —multiple choice, oral interview, single answer, even true/false. The change was revolutionary and set the stage for a newer amateur testing program to be adopted, the VEC System. The ARRL supplied multiple-choice answers to the initial Novice pool questions, which became the defacto standard.

In the interest of standardization, the Volunteer Examiner Coordinators cooperated to supply the multiple-choice answers to the questions on the balance of the license classes. At first, VEs were not required to use the suggested multiple choices. A Question Pool Committee (QPC) was established to periodically update the questions and answers.

The VECs at their annual conference in 1986 unanimously agreed that in the future every VEC would use the same multiple-choice answer verbatim to curb the possibility of some examination answer formats being easier than others and to preclude applicants from shopping for them. Your author, Fred, W5YI, is QPC Vice Chairman.

The FCC turned over the responsibility for developing all questions to the collective VECs, who were directed to cooperate in maintaining a single question set for each license class. The amateur community would now completely handle the Commission's amateur radio operator license examination program.

Novice Enhancement Doesn't Work

The FCC again changed the Novice program in 1987. For the first time entry-level amateurs were allowed to use the voice mode on the Novice amateur bands instead of communicating only by Morse code. The idea was to increase the number of entrants into the Amateur Radio Service. The new privileges included thin slivers of voice spectrum in the 10 meter, 1.25 meter, and 23 centimeter bands.

When Novice Enhancement took effect in 1987, the FCC also increased the number of examination questions and examiners required to administer the tests. A Novice test used to be given by only one General class or higher level examiner. Now it would take two. The objective of Novice Enhancement was to revitalize amateur radio. Well, it didn't work!

The influx of newcomers never happened! There was a flood of newcomers at first, but that rush was simply from examinees trying to get in under the deadline before the Novice examination became much harder! The VEC's Question Pool Committee developed substantially more questions for the Novice examination bank. Now there were 30 blocks of questions instead of 20; the passing mark became 22 instead of 15.

A hallmark of amateur radio examinations seems to be if privileges are to be expanded, then applicants should have to work harder for them. Immediate retesting of failed elements was allowed providing a different examination was administered. Another major 1987 change was to add a second volunteer examiner to improve examination integrity.

No-Code Takes Shape

Three events occurred in 1988 which really got the amateur community think-

ing about the possibility of a no-code license.

In late 1988 the International Maritime Organization dropped a bombshell on the Morse code world! The IMO is composed of some 66 countries accounting for nearly all of the world's ocean shipping. On November 11, 1988 the IMO decided to phase out Morse code at sea. No longer will sea-going radio officers be required to be proficient in CW when new equipment is installed in ships starting in 1993.

A new safety system utilizing modern satellite technology will be installed on all ocean vessels. The Global Maritime Distress and Safety System allows a crew to send a distress signal by simply pushing a button. Ships will also carry a radio beacon which will automatically give their position and float free if the ship sinks suddenly. No longer will their safety be dependent upon a radioman on duty. The code has given way to modern technology.

The status of the 220-225 MHz band had actually hung in limbo since WARC '79. The FCC is on public record as far back as ten years ago saying that there was a distinct possibility that this spectrum could be reallocated. Still, it came as a surprise to many when two megahertz, 220-222 MHz, was reallocated to narrow-band business interests in August 1988. The unthinkable had happened. Two megahertz had been lopped off of our allocations. The amateur ranks weren't growing, and the need for our frequencies was sky-rocketing.

About this same time it became apparent that Canada would definitely be restructuring their Amateur Service. Their plan was to have a code-free entry into amateur radio. They had been working on it for some three years. Actually Canada had a code-free digital amateur ticket, but it was very unpopular due to its extreme difficulty. It provided few new entrants to amateur radio. Most holders were already licensed.

Canadian amateur radio beginners will be able to operate all bands all modes, 30 MHz and higher, by passing 60 out of 100 multiple-choice questions beginning this fall. The test will not be difficult, and the projection is that many newcomers will be added to the Canadian amateur ranks. Several petitions from the U.S. amateur community were submitted to the FCC proposing an easy code-free entry into amateur radio here as well.

ARRL and No-Code

In response to these 1988 events and other efforts to get U.S. amateur radio revitalized, the American Radio Relay League appointed a committee made up of amateurs, amateur groups, and members of the amateur industry to look into the possibility of establishing a code-free amateur class. The nine-member committee released their recommendations in April 1989 for consideration by the full Board of ARRL directors.

Basically, they suggested the Technician class be available to newcomers without a code requirement. The Committee recommended the code-free class have all privileges above 30 MHz except 2 meters, where only digital operation between 144.9 and 145.1 would be authorized. Also suggested were distinctive callsigns. The code-free applicant would have to pass Elements 2 and 3A (the Novice and Technician written tests) before three VEs accredited by a VEC. No credit would be allowed for passing Element 2 before two General class VEs.

There certainly was no suggestion that the Novice and Technician classes be discontinued. The current Technician class would simply be renamed "Technician Plus" code.

ARRL Version of No-Code

It was decided at the League Board of Director's meeting in July 1989 to go with a slightly different no-code version. The ARRL proposed a sixth Communicator class offering privileges above 222 MHz at a maximum of 250 watts. The Communicator would require a written examination more comprehensive than the current Technician class but without a code requirement.

The examination would consist of the 30-question Novice and an expanded 30-question Technician/Element 3A administered under the three VE/VEC System. No credit would be accorded from any examinations administered under the Novice (two VE) testing program. The additional five questions would be added on digital techniques and the use/application of Morse code.

Communicators would not be permitted to be repeater or auxiliary station control operators. Callsigns would be issued from the current 2×3 Group D callsign block now assigned to the Novice class. The ARRL acknowledged that adding another class to an already complex licensing structure would add to the burden of the volunteer examiner program.

FCC Issues Their Proposal

On February 8, 1990 the FCC proposed in PR Docket 90-55 to establish a new class of amateur operator license which would not require the applicant to demonstrate proficiency in manual Morse code telegraphy.

Their proposal basically followed the ARRL petition, with one startling departure. The FCC proposed to abolish the Novice and Technician classes and substitute the code-free Communicator class who would be authorized all modes above 222 MHz. While existing Novice and Technician licenses could be renewed or modified indefinitely, no new licenses would be issued.

Other features include power levels limited to 200 watts PEP, and VEC-approved Advanced class amateurs would administer the 60-question exam. Apparently the two VE team was not secure enough. In any event, the three VE system is perceived by most amateurs to be more credible.

A controversial feature of the FCC Notice of Proposed Rulemaking is that no license will be issued when a Communicator upgrades by passing the 5 wpm code test. The Communicator will simply append "/AC" to his callsign when operating on 2 and 6 meters plus the Novice HF bands. Many feel this confusing callsign is a harsh price to pay in return for upgrading.

Teleconference Radio Network

On April 8, 1990 amateurs representing the VECs, TAPR (Tucson Amateur Packet Network), AMSAT (Amateur Satellite Corp.), and various educators, publications, and other groups conducted a nationwide broadcast over amateur repeaters. The repeaters were tied together via a teleconference bridge located in Minnesota. The panel of experts gave their position on a no-code license and fielded questions from an audience estimated at 50,000. The ARRL declined to participate in the network.

It was unanimously agreed by the participants that the Novice license should not be discontinued and the no-code privileges should extend down to the 30 MHz level—similar to the position of Canada.

There was unified agreement that if the no-code Communicator was confined to 222 MHz and above, due to the lack of nationwide activity at this frequency the newcomer would adopt procedures that differ from those of the general amateur radio community. An immediate blending of newcomers with experienced operators was deemed important.

There was also agreement that the Novice license should not be discontinued. Instead it was felt it would be better to establish a dual entry into amateur radio. A newcomer could choose either the Novice or the Communicator route. The Novice requirement would be the same as now exists, with the Morse-free Communicator class an option for those who find the code a barrier into amateur radio.

The Novice license has been with us for just about 40 years, and while many find the code a hardship, just as many apparently do not. The dual entry into amateur radio appears to be a justifiable and logical option. We haven't come across anyone who agrees with the FCC proposal to abolish the Novice class.

You still have time to file your views with the FCC on PR Docket 90-55, the Communicator class proposal. The FCC's comment period closes on August 6, 1990. Address your remarks to: Secretary, FCC, Washington, DC 20554. Be certain to mention that you are expressing your views on PR Docket 90-55, the no-code Communicator amateur radio class.

Novice Questions Change On July 1!

One of the problems of having a separate Novice testing program is that there is no way for the VECs to know who is giving the examinations. Novice-level VEs aren't accredited and are essentially unknown to the VECs' Question Pool Committee, which drafts the Novice question bank. This presents a serious problem when test questions are changed.

Actually, most examiners are not aware that the VECs "phase in" questions. We might change a question now, but not have it appear in our examinations for six months. This allows license preparation publishers time to get study guides out to the public. Even though the FCC made massive amendments to Part 97 nearly a year ago, they are just now showing up in our examinations. We simply do not ask the new questions in fairness to those who may have studied a manual they recently purchased.

The VECs' Question Pool Committee released new Novice questions into the public domain during April 1989 to be implemented on November 1, 1989. We had no way of knowing that the FCC would be revising the Amateur Regulations (Part 97 of the Commission's Rules) the following June. As a result, the QPC had to go back to work to revise the Novice question pool once again to conform to the new rules.

Another new Novice question pool was released in February 1990 with an implementation date of July 1, 1990. The problem is, since Novice examiners are unknown to the VECs, we don't know to whom to send the new Novice test questions. As a result, we feel that most Novice examinations will be improperly administered. It is essential that the Novice program be combined in some way with the VEC System.

Another problem with not having Novice-level examiners known to the VEC organizations is the code test. Recent information indicates that few Novice 5 wpm code tests are properly administered. The FCC requires code tests to run at least 5 minutes in length and contain all alphabet letters, numerals, and certain punctuation and prosigns. It appears that most Novice code tests do not contain the required characters. We either should change the rule or do it right.

The W5YI-VEC has taken the liberty of developing properly constructed Novice written and code examinations. The cost is $4.95 if you would like a copy of our "How to Administer the Novice Examination" booklet, plus an assortment of properly prepared current Novice written and code examinations. In any event, be aware that the latest round of newly revised Novice Element 2 questions goes into effect on July 1, 1990. It is very important that you use the correct ones in your Novice examinations.

The Radio Amateurs Licensing Manual

"Are you certain the test questions are the current ones?" is an inquiry we constantly get! We can certainly understand that query. Not only does the VECs' Question Pool Committee revise the written questions on a periodic basis, but sometimes there are unscheduled revisions due to rule changes, etc. To assist you in getting the correct license preparation material, we have developed and published the *Radio Amateur's Licensing Manual*.

This 300-plus page book is actually made up of seven individual booklets bound together in a single publication. The book consists of all five question pools—complete with the multiple choices and correct answer identified—plus the Novice testing program and Technician through Extra class level VE instruction manuals.

The book constantly changes depending upon revisions to the individual question-pool booklets. When one pool changes, we simply substitute another updated booklet version. The publication is ideal for everyone, from applicants desiring to enter amateur radio or wishing to upgrade their present ticket to those who conduct Novice or VEC coordinated (Technician through Extra class) examinations.

It is a fact that all five (Novice, Technician, General, Advanced, and Extra class) question pools have been recently revised to take effect this year. The *Radio Amateur's Licensing Manual* reflects all of the changes. Cost is $9.95 (plus $2.00 shipping) from: W5YI, P.O. Box 565101, Dallas, TX 75356.

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TM-2530A - 2M, 25W TM-2550A - 2M, 45W
TM-2570A - 2M, 70W TM-3530A - 220, 25W
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TH-26 - 2M Tiny HT TH-25 - 2M Tiny HT
TH-225 - 2M, 5W HT TH315 - 220 HT

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AL82 - 1500W AL80A - 1000W
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IC-2400 - VHF / UHF Mobile Xcvr.
IC-228A - 2M - 25W Mobile Xcvr.
IC-228H - 2M - 45W Mobile Xcvr.
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IC-24AT - VHF / UHF - 2M Tiny HT.
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IC-2SAT - 2M - Tiny Handie Talkie.

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202 / 204 Nx Bridges ..... 59 / 79
250 / 260 / 262 Loads 49 / 29 / 69
407 / 401 Keyers ..... 69 / 49
422 MFJ / Bencher Combo 129

ASTRON

12 VDC POWER SUPPLIES

MODEL	AMPS	ICS	PRICE
RS4A	3	4	$ 49
RS7A	5	7	59
RS12A	9	12	79
RS20A	16	20	99
RS20M	16	20	119
RS35A	27	35	159
RS35M	27	35	179

Models With "M" Suffix Have Meters.

OTHER ACCESSORIES

AEA PK232MBX - AllMode TNC.
KANTRONICS KAM - All Mode
NYE MBV-A - 3KW Antenna Tuner.
RF CONCEPTS - Amplifiers.
MIRAGE - VHF / UHF Amplifiers.
OTHERS TOO. - PLEASE CALL!

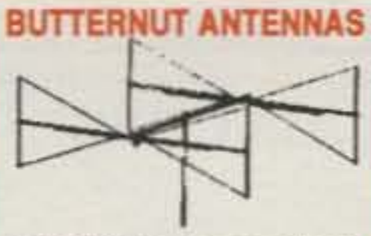
HEATH

HW2P - 2M Tiny Handie Talkie.
HW-24T - 2M/70CM Handie Talkie.
Call For Price All Heath Models!

TEN - TEC

Paragon - General Coverage Xcvr.
Omni V - Ham Bands Only Xcvr.
Titan - 1500W HF Linear Amplifier.
Call For Prices On All TEN - TEC Equipment! Most Items In Stock.

BUTTERNUT ANTENNAS



HF5B Butterfly - Compact Triband Beam. 6FT Boom Length - 12.5 FT Element Length. **$ 259.95**
HF6VX - 6 Band Vertical Antenna. Handles Full Legal Power **$ 159.95**
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RMKII - Roof Mount Kit $ 59.95
STRII - Radial Kit 59.95
TBR160 - 160M Coil 59.95
30MRK - 30M Kit 39.95

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RG213/U - 95% Shield - Non Contaminating Jacket. $ .39 / FT.

RG8X - 95% Shield - Mini-SizeCoax. Uses UG176 Adapt. $ .25 / FT.

9086 International - Equivelent to Belden 9913 - 100% Shield - Solid Center Conductor $ .45 / FT.

Connectors:

Amphenol PL259 - Silver - $ 1.50.
Amphenol UG21B - N Male 3.50.
Amphenol N Male For 9913 4.95.

ANDREW HELIAX®

LDF4-50 - 1/2 Copper (/Ft.) $ 2.19
LDF5-50 - 7/8 Copper (/Ft.) .. 5.49
Connectors: 1/2" - 29.00, 7/8" - 69.00

ROTOR CABLE

Standard 8 Conductor Rotor Cable. (2 #18Ga. & 6 # 22Ga.) $ .25 / FT.

Heavy Duty 8 Cond. Rotor Cable. (2 # 16Ga. & 6 # 18Ga.) $ .45 / FT.

ROTATORS

Telex CD45II - 8.5 SQ. FT.
Telex HAM4 - 15 SQ. FT.
Telex TAILTWISTER - 20 SQ. FT.
Telex HDR300 - 25 SQ. FT.
Yaesu G500A Elevation Rotor.

Please Call For Prices On Rotors!

cushcraft

A3S - 3 Element Triband Beam.
A4S - 4 Element Triband Beam.
A743 / A744 - 30/40 Kit For Above.
R5 - 20-10M, No Ground Vertical.
AP8 - 80-10M Vertical Antenna.
D40 - 40M Rotatable Dipole.
40-2CD - 2 Element, 40M Beam.
A50-5 - 5 Element, 6M Beam.
215WB - 15 Element, 2M Beam.
230WB - 30 Element, 2M Beam.
4218XL - 18 Element, 2M Beam.
3219 - 19 Element, 2M Beam.
ARX2B - 2M Vertical antenna.

Call For Prices On All Cushcraft!

PHILLYSTRAN GUY CABLE

HPTG1200I - 1200 Lb. Rating. $ .32
HPTG2100I - 2100 Lb. Rating. $ .36
HPTG4000I - 4000 Lb. Rating. $ .59
HPTG6700I - 6700Lb. Rating. $ .79

Phillystran Guy Cable Is Non-Conducting - No More Insulators. Also, The New Phillystran No Longer Uses Potting Heads, But Uses Regular Cable Clamps. Please Call Us For Details!

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All Models Shipped Factory Direct - Prepaid.
Features: All Steel - Hot Dipped Galvanized - Self-Supporting - With Rotor Shelf and Wench.

Model	Height	Load
HG37SS	37 FT.	9 S.F.
HG52SS	52 FT.	9 S.F.
HG54HD	54 FT.	16 S.F.
HG70HD	70 FT.	16 S.F.

Accessories For Hygain Towers Are Also Available For Immediate Delivery. CALL FOR PRICE!

TELEX HYGAIN ANTENNAS

New DX88 HF Vertical Antenna.
7-2 Discoverer - 2 El., 40M Beam.
7-3 Discoverer - 3rd El. add-on Kit.
Explorer14 - 3 Element Tribander.
QK710 - 30/40M Add-on Kit.
V2S - V3S - V4S - VHF/UHF Vert.
TH5MK2S - 5 El., Triband Beam.
TH7DXS - 7 El., Triband Beam.
205BAS - 5 El., 20M Beam.
155BAS - 5 El., 15M Beam.
105BAS - 5 El., 10M Beam.
204BAS - 4 El., 20M Beam.
64BS - 4 El., 6M Beam Antenna.
18AVT/WBS - 80-10M Vertical.
18HTS - 80-10M Hytower Vertical.

Call For Prices On All Hygain.

ROHN

GUYED TOWER PACKAGES

HEIGHT	25G	45G	55G
50	849	1229	1549
60	939	1389	1939
70	999	1719	2159
80	1199	1869	2369
90	1289	2039	2579
100	1369	2199	2989
110	1449	2459	3209
120	1669	2619	3429

These Towers Are Shipped Complete With The Following: All Guy Hardware, Base Section, Rotor Plate; According To ROHN Specifications. 70 MPH Design. Towers Are Shipped Freight Collect From Plano, TX. **IN STOCK NOW!**

FOLDOVER TOWERS

Model	Height	Load Cap.
FK2548	48 Ft.	15.4S.F.
FK2558	58 Ft.	13.3 S.F.
FK2568	68 Ft.	11.7 S.F.
FK4544	44 Ft.	34.8 S.F.
FK4554	54 Ft.	29.1 S.F.
FK4564	64 Ft.	28.4 S.F.

GGK25GII - Double Guy Kit $ 299.
GGK45GII - Double Guy Kit $ 319.

The Above Specifications Are At 70 MPH, With The Above Double Guy Kit Properly Installed. ROHN Foldover Towers Are Drop Shipped Freight Paid; Cost 10% Higher West Of The Rockies.

STACKED SECTIONS

20G - Light Duty 12 Inch $ 54.50
25G - Medium Duty 12 In 65.50
45G - Heavy Duty 18 Inch 153.50
55G - Extra Heavy 18 Inch 197.50

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US TOWER

All Steel Crank Up Towers And Poles. Hot Dip Galvanized To Withstand Rust. Totally Self Supporting - No Guy Wires! Coax Arms, Thrustbearings, Masts, Motor Drives, Optional Bases, And More Are Also In Stock For Quick Delivery. **Call For Special Pricing.**

Model	Min Ht.	Max Ht.	Load	Price
MA40	21 Ft.	40 Ft.	10 Sq.'	629
MA50	22 Ft.	50 Ft.	10 Sq.'	999
TX438	22 Ft.	38 Ft.	18 Sq.'	919
TX455	22 Ft.	55 Ft.	18 Sq.'	1385
TX472	22 Ft.	72 Ft.	18 Sq.'	2279
HDX555	22 Ft.	55 Ft.	30 Sq.'	2079
HDX572	22 Ft.	72 Ft.	30 Sq.'	3559

Shipping On US Tower Models is Collect From Visalia-California. Calif. Residents Please Add 6% State Tax.

ROHN SELF SUPPORTING BX TOWERS

Model	Height	Load	Weight	Price
HBX40	40 Ft.	10 Sq.'	228	$ 449
HBX48	48Ft.	10 Sq.'	303	589
HBX56	56 Ft.	10 Sq.'	385	699
HDBX40	40 Ft.	18 Sq.'	281	569
HDBX48	48 Ft.	18 Sq.'	363	689

All ROHN BX Series Towers Are Shipped Freight Prepaid In The Contenental United States. These Towers Come With The Base Stubbs At No Additional Charge As Well As The Rotor And Top Plates. The Above Antenna Load Ratings Are At 70 MPH. Please Note That ROHN Does Not Reccomend Using This Tower With Antennas That Have A Boom Length Exceeding 10 Foot.

GUY WIRE AND HARDWARE

3/16 EHS Guywire (3990 Lb. Rating)	.15 / Ft
1/4 EHS Guywire (6650 Lb. Rating)	.18 / Ft
5/16 EHS Guywire (11,200 Lb. Rating)	.29 / Ft
5/32 (7X7) Aircraft Cable (2700 Lb. Rating)	.15 / Ft
3/16 CCM - Cable Clamp For 3/16 or 5/32	.45
1/4 CCM - Cable Clamp For 1/4	.55
1/4 TH - Thimble For All Guywire Listed	.45
3/8 EE - 3/8 X 6 Eye And Eye Turnbuckle	6.95
3/8 EJ - 3/8 X 6 Eye And Jaw Turnbuckle	7.95
1/2 X 9 EE - 1/2 X 9 Eye And Eye Trnbkl.	9.95
1/2 X 9 EJ - 1/2 X 9 Eye And Jaw Trnbkl.	10.95
1/2 X 12 EE - 1/2 X 12 Eye And Eye Trnbkl.	12.95
1/2 X 12 EJ - 1/2 X 12 Eye And Jaw Trnbkl.	13.95
5/8 X 12 EJ - 5/8 X 12 Eye And Jaw Trnbkl.	16.95
3/16 Preformed Guy Grips (Replaces CCM)	2.49
1/4 Preformed Guy Grips (Replaces CCM)	2.99
GAS604 - 6 In. X 4 Ft. Earth Screw Anchor	19.95
500D - Guy Insulator (Up To 3/16)	1.99
502 - Guy Insulator (Up To 1/4)	3.49
Ground Rod - 5/8 X 8 Ft. Copper Clad	12.95
Coax Seal - Waterproofs Coax Connectors	2.50

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CIRCLE 136 ON READER SERVICE CARD

AWARDS

BY DOROTHY JOHNSON, WB9RCY

NEWS OF CERTIFICATE AND AWARD COLLECTING

The Story of the Month for July is:

Keith M. Retzer, W7KEU USA-CA All Counties #620 Mixed, 6-6-89

"I originally became interested in county hunting after visiting the shack of Bill, WA7JBE, when we both lived in Oregon. Bill moved to Weber County, Utah, where I worked him for his county. I pursued those early counties with Jim, WB7TAZ. I think Jim finished 500 also, but he has been absent from county hunting for some years.

"My working for the USA-CA 500 award was interrupted for a short time as my family and I moved to the jungles of Peru and the Jungle Center of Wycliffe Bible Translators at Yarina Cocha. There I worked in the radio repair center and, along with my family, as part-time dorm parent of missionary children at the center. I tuned the bands on my Kenwood TS-180S as I awaited my W7KEU/OA8 and OA8AX licenses.

"I returned to the U.S.A. in 1980 and completed my USA-CA 500 in April 1981. More job relocations and different priorities meant that my quest for USA-CA All Counties would be slowed, until a good QTH in Missoula, Montana helped speed the contacts along.

"With 300 counties left to finish I made another move, to Crawford County, Kansas, where I was able to complete USA-CA All Counties from the mobile station.

"It was Saturday morning, May 27, 1989. Will the band be open to Colorado? A weak signal was heard from the mobile enroute to the last one. The signal got stronger with 20 minutes left to the county. The time neared, and the signal faded a bit. *Then:* WB0VNN was announced in Hinsdale County, Colorado, my last. Ron gave me a call and listened. The band held up! I had worked my last one! The congratulations flooded in as the net paused for a moment.

"How can anyone possibly thank all the mobiles and friends on 14.336 MHz for the hours of county hunting fun. My special thanks go to WB0VNN for my last, and to many others for special help on and off the net.

"USA-CA 3076—yes, it is special!
73, Keith, W7KEU"

333 South Lincoln Ave., Mundelein, IL 60060

USA-CA Honor Roll

2500

NA8Q	762
KJ4LG	763

2000

NA8Q	831

1500

WB9HPR	914

1000

DL0WW	1109
W9WOC	1110

500

PZ1AV	2401
VE7ACM	2402
EA7TV	2403
DL0WW	2404
KA3DBN	2405
W9WOC	2406
CT1CQK	2407
WA2CNJ	2408

The total number of counties for credit for the United States of America County Award is 3076. The basic award fee for subscribers to *CQ* 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 Communications, 76 North Broadway, Hicksville, NY 11801 U.S.A. for $1.25. To qualify for the special subscriber rate please send a recent *CQ* mailing label with your application. To be eligible for the USA-CA, applicants must comply with the rules of the program as set forth in the revised USA-CA Rules and Program dated April 2, 1985. A complete copy of the rules may be obtained by sending an SASE to Dorothy Johnson, WB9RCY, USA-CA Custodian, 333 South Lincoln Avenue, Mundelein, IL 60060, USA. DX stations must include extra postage for airmail reply.

Awards Issued

Clare H. Stead, NA8Q, added to his good record by claiming USA-CA 2500 #762 and USA-CA 2000 #831, All Mobiles, dated 3-12-90.

Henry Petersen, KJ4LG, filed his good application and received USA-CA 2500 #763, Mixed, dated 3-28-90.

Charles W. Lenhart, WB9HPR, extended his count of confirmed county contacts and received USA-CA 1500 #914, Mixed, dated 3-5-90.

DARC, Lampertheim, West Germany, DL0WW, received USA-CA 1000 #1109 and USA-CA 500 #2404, Mixed, dated 3-19-90.

Frank E. Rossner, W9WOC, claimed USA-CA 1000 #1110, Mixed, dated 3-23-90.

USA-CA 500 certificates went to:

Oscar W. Frijmersum, PZ1AV, USA-CA 500 #2401, All CW, 3-3-90; #2 to PZ.

Garry Cameron, VE7ACM, USA-CA 500 #2402, Mixed, 3-14-90.

Adolfo Salazar, EA7TV, USA-CA 500 #2403, Mixed, 3-19-90.

DARC, Lamphertheim, DL0WW, USA-CA 500 #2404, Mixed, 3-19-90.

John L. Rouse, KA3DBN, USA-CA 500 #2405, Mixed, 3-21-90.

Frank E. Rossner, W9WOC, USA-CA 500 #2406, Mixed, 3-23-90.

Luis Filipe Teireira, CT1CQK, USA-CA 500 #2407, All SSB, 3-29-90.

Ray E. Skrabut, WA2CNJ, USA-CA 500 #2408, All 20M SSB, 3-30-90.

Awards Available

La Rioja Award. This permanent award, organized by the Radio Club Rioja and sponsored by the Rioja Autonomous Community, is open to all licensed radio amateurs in accordance with the following rules and conditions.

The La Rioja Award is a plaque with the coat of arms of the Rioja and is engraved with name, callsign, and serial number. Valid contacts are those made on or after 11 June 1984. The award may be obtained on HF or on VHF, UHF, SHF. Modes are CW and SSB. FM is also permitted on VHF, UHF, SHF.

To obtain the award, QSLs of contacts with five different stations in the Rioja must be presented. At least one of these stations must be located outside the capital, Logrono. Contacts via active repeaters are not valid, and QSLs for VHF, UHF, SHF contacts must not be questionable in this regard. Contacts with mobile or portable stations are only valid on VHF, UHF, SHF. If one of the stations contacted is EA1RCR then a QSO with a station outside Logrono, the capital, will not be necessary.

QSLs and a list of details of each QSO should be sent to Radio Club Rioja, La Rioja Award, P.O. Box 318, Logrono (La Rioja), Spain.

The La Rioja Award sponsored by the Rioja Autonomous Community, Spain.

Any violation of these rules involving deception or unsportsmanlike conduct will result in permanent disqualification. All decisions regarding the interpretation and application of these rules will be made by the Awards Committee of the Radio Club Rioja. Their decisions will be final.

Pitcairn Island Bicentennial. During the entire year of 1990 Pitcairn Island amateurs are commemorating the island's bicentennial. A handsome 11″ × 14″ multicolored document is offered. The rules are as follows.

The anniversary period to qualify for the bicentennial award is from 0001 UTC 1 January 1990 to 2359 UTC 31 December 1990. All contacts must be made during this period.

You need to work only one Pitcairn Island station for the basic bicentennial award. You may work a bicentennial station using the call VR200PI/ and the last two letters of the operator's regular call for the award with a gold engraved endorsement sticker. You may work a VR6, then work a bicentennial station at a later date for the endorsement sticker.

No membership is required in any club or organization to participate in the bicentennial celebration. Amateur radio and shortwave listeners must complete an application to qualify (available from the award manager). No QSL cards are required. However, stations seeking confirmation should request QSL route from station worked.

Send completed application within three months of the close of the bicentennial to Bicentennial Award Manager, Dr. G. O'Toole, KB6ISL, 9605 San Gabriel Ave., So. Gate, CA 90280 USA. *(For additional information and guidelines, contact KB6ISL at the above address.)*

Pelendava-Craiova Award. The Pelendava-Craiova Award is sponsored by the Dolj County Radio Club. To qualify for this award, European radio amateurs have to prove contacts with any three stations in Craiova City, and radio amateurs outside Europe have to prove contact with two stations located in Craiova City. All contacts have to have been made after January 1, 1960. Any bands and/or modes are acceptable.

Applicants must submit a certified list of contacts (GCR), QSL cards from Romanian stations located in Craiova City, and 7 IRCs to Radioclubul Judetean Dolj, P.O. Box 107, R-1000 Craiova, Romania.

The members of the radio club are YO7AEW, AHR, AHT, AKL, AOT, AOS, AOZ, ARY, ARZ, AWZ, BEN, BGA, BID, BSK, CCK, COA, COV, CWP, CYT, CKP, DEM, DEO, DL, DO, KAJ, KFK, KJH, KJX, LAD, LAI, LAT, LBU, LCC, LCD, LCU, LCZ, LDL, LDT, LDX, NJ, VJ, VS, WUG (only July 1981), and YOØKAJ (only 1986).

Scottish Tourist Board Awards. The Scottish Tourist Board (Radio Amateur) Expedition Group issues two awards.

The Pelendava-Craiova Award offered by the Radioclubul Judetean Dalj, Romania.

The Thistle Award is issued for contacting four separate Scottish Tourist Board events in Scotland. To claim the award, forward log extract (QSL cards via bureau) to the awards manager, enclosing one pound, $2.00 US, or the equivalent, plus postage. (Note for USSR stations: for both awards USSR mint stamps equivalent to the aforementioned values are acceptable.) This award must be claimed separately prior to applying for the Supreme Tartan Banner Award.

The second award, the Supreme Tartan Banner Award, is issued for contacting a total of six Scottish Tourist Board events (i.e., including four for the Thistle Award). Claims are to be forwarded as above, enclosing 1.50 pounds, $3.00 US, or the equivalent, plus postage. (Please quote the number of your Thistle Award.)

"Annotations" will be awarded to The Supreme Tartan Banner Award on a yearly basis for contacting a further six events in a year. Cost is 50p, $1.00 US, or the equivalent. (Please quote the number of your Tartan Banner Award.)

Following are 1990 events acceptable for the Scotish Tourist Board awards.

GB2SSD May 12/13: Heritage of Whisky, four distillery event. GB2OBD Bushmills, EI7M Midleton, EI2WW John Jamesons, GB2SSD Edradour Distilleries. Overseas stations contact any two distilleries. UK and Ireland stations contact any three distilleries.

GB2NTS July 15/22: Castle Country, four castles event. Drum Castle, Castle Frazer, Craigievar Castle, and Leith Hall. Cost and rules as above.

August 18/19: Robert Burns International Event. Contact any two countries. Participation of four countries is planned; details to be published in *Practical Wireless* and *Radcom*.

September 22/23: Second Five Nations National Trust Event—GB2NTS, GB2NTU, GB2NTW, GB2NTE, and EI7M. Overseas stations contact any three stations. UK/Ireland contact any four stations. Cost as above.

Claims for all Scottish Tourist Board Awards should be sent to Robbie, GM4UQG, Awards Manager, P.O. Box 59, Hamilton, Lanarkshire, ML3 60B, Scotland.

Canadian Amateur Radio Federation Awards. The Canadian Amateur Radio Federation has announced the following awards available to all radio amateurs worldwide.

CANADAWARD: A colorful certificate will be issued to any amateur who confirms two-way QSOs with all Canadian provinces and territories. All QSOs must be on one band only. Separate awards are issued for each band on which the applicant qualifies (12 cards per band—see list below).

A mode endorsement is available if all QSOs are made on the same mode (e.g., all on RTTY). Only contacts made after 1 July 1977 will count for this award. Submit the 12 cards with $8.00 Canadian or $8.00 US for foreign addresses. CARF members send only $5.00.

5 Band CANADAWARD: A special plaque is available to any amateur who confirms two-way QSOs with all Canadian provinces/territories on each of five separate bands (total of 60 cards, 12 cards per band—see list below). Only contacts made after 1 July 1977 will count for this award. Submit the 60 cards with $40 Canadian or $40 US for foreign addresses.

All prices include postage, packing, and return of QSL cards.

List of Canadian provinces and territories: VO1/VO2 Newfoundland/Labrador, VE1 Nova Scotia, VE1 New Brunswick, VY2/VE1 Prince Edward Island, VE2 Quebec, VE3 Ontario, VE4 Manitoba, VE5 Saskatchewan, VE6 Alberta, VE7 British Columbia, VE8 North West Territories, and VY1/VE8 Yukon.

All amateur bands may be used. Each distinct satellite mode will count as a separate band.

Note: VO2, Labrador is part of the Province of Newfoundland and counts for Newfoundland. Prince Edward Island amateurs may be using the original prefix of VE1 or the new prefix of VY2 issued in 1989. Similarly, Yukon amateurs may be using either prefix VY1 or VE8. Applicants should note that the award is based upon the province or territory of residence of the QSL card, not the prefix.

Mail applications for CANADAWARDS to Awards Manager, CARF Inc., P.O. Box 356, Kingston, Ontario, Canada, K7L 4W2.

Zone 12 Award. The Rapa Nui Radio Amateur Center has established a new Zone 12 Award. It is available to all licensed amateur radio stations and SWLs in accordance with the following rules.

Proven contacts with three zone 12 stations after 1962 are required. Any mode on any band is acceptable. Only land-based stations are valid for the award. Do not send QSL cards. A list showing the date, time, signal report, mode, callsign, and band is sufficient.

The fee for the award is $6.00 US. Send check log to the award manager, Ovidio Bustamante, CE2NJ, P.O. Box 3847, Valparaiso, Chile.

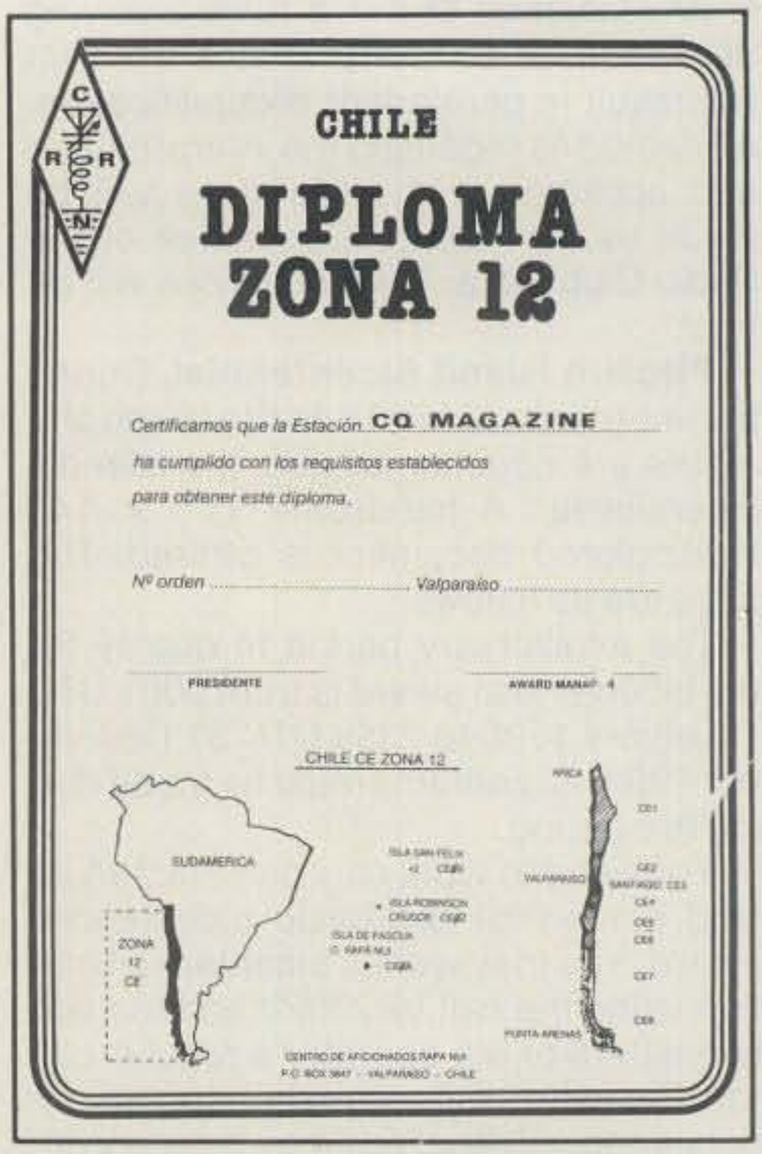
Japan Award Hunters Group Awards. Following are awards available from this amateur radio group.

The Samuri Award: To qualify for the Samuri Award, work five members of the JAG. Send application with certified list plus 10 IRCs to the Award Manager, JA1JKG, T. Hosogai, 3095 Yanokuchi, Inagi-city, Tokyo, 206 Japan.

The All Chiba Award: The All Chiba Award is issued by the Chiba Award Hunters Group. It may be applied for by all licensed radio amateurs and SWLs who can prove contacts with 100 stations of Chiba Prefecture. To make application, send QSL list plus 2 IRCs to the Award Manager, JR1DOQ, Kazuya Mitsuhashi, 882 Nakazawa Kamagaya Chiba, 273-01 Japan.

Worked Japan 1st Call Area: The Worked Japan 1st Call Area Award may be applied for by all licensed radio amateurs and SWLs who can prove contacts with 500 stations of the JA1 area. Applicants may include special calls such as 8J1HAM, 8J1XPO, etc., but not 8J1RL, 8J1RM. A station may be counted for different bands. Endorsements for every 500 stations will bring you a special shield.

Worked Japan 1st Call Area Award II: The Worked Japan 1st Call Area Award II may be applied for by all licensed radio amateurs and SWLs who can prove contacts with 100 stations of the JA1 area including 8 prefectures as follows: Tokyo, Kanagawa, Chiba, Saitama, Ibaraki, Tochigi, Gunma, and Yamanashi.



The Zone 12 Award available from the Rapa Nui Radio Amateur Center, Chile.

World Wide Award: The World Wide Award may be applied for by all licensed radio amateurs and SWLs who can prove contacts with a total of 601 stations as follows: 100 in AF, 100 in AS, 100 in EU, 100 in NA, 100 in SA, 100 in OC, and 1 in Antarctica.

To apply for the Worked Japan 1st Call Area Awards and the World Wide Award, send only a QSL list to the award manager, JA1CKE, Yukio Hoshino, 1821-248 Tate-Machi, Hachioji-city, 193 Tokyo, Japan.

P.E.I. Award Correction

Word has been received from the Prince Edward Island Amateur Radio Association about erroneous award information as follows.

There was a "Generic QSL Card" provided to P.E. Island amateurs which carried information that for the Abegweit Award only contacts after January 1, 1989 are valid. The date should have been January 1, 1960. Here is the exact wording that should have been printed on the card. "Prince Edward Island Abegweit Award Requirements: VE1s, VY2s, and VO1s—QSO all 3 P.E.I. Counties. The rest of Canada and the United States QSO any 3 P.E.I. stations. DX stations QSO any 2 P.E.I. stations. Contacts made after January 1, 1960 will count. Submit logs, certified by 2 other amateurs. QSL cards must be in possession. Send $5.00 or 10 IRCs to Awards Manager, P.O. Box 1232, Charlottetown, P.E.I., Canada, C1A 7M8."

Happy DXing/County Hunting.

73, Dorothy, WB9RCY

MorseMan Plus

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"A slick commercial program that clearly ranks among the top Morse trainer programs I've laid my hands on.", Karl hurber, W8FX, March 1990 - **CQ Magazine**

" Morseman Plus is the slickest program to come along in a long time and I highly recommend it to those who want to earn Morse properly", Ike Kerschner, N3IK, May 1990 - **Monitoring Times** magazine

" One of the top Morse Code trainers available", Gordon West, WB6NOA, **West Radio School**

he reviews are in and ***Morseman Plus*** has scored the highest marks yet! The premier Morse Code trainer for the IBM-PC and compatibles will take the the newcomer om ground level to expert in record time! It is also ideal for the experienced ham trying to get to the 13 or 20 wpm level.

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ou can get your copy for $24.95 (plus $2.00 s/h) by calling **1-800-525-7235** (M-F, 9-5 CST) and using your Visa or Mastercard or send a check/MO (no cash please) to e address below. **(specify 5.25" or 3.5" disks)**

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-192 PC:File 5.0 - THE shareware star in database ems. Easy to use with an extensive users manual. tomize your own powerful database system.

Cardex - a Rolodex type free format database em. Very easy to use.

As Easy As - A true Lotus 1-2-3 clone. Does about of what 1-2-3 does - and then some! Well supported.

Labelmaster - PC Magazine's Editor's choice in l management systems. Makes mailing lists and e.

The Draw - A great, full featured ANSI character ving program - saves to many formats, including M and Bsave.

-276 DanCAD-3D **(2 disk set)** - A very sophistica- 3D frame and drawing program. Good general pur- e CAD system.

PC-Key Draw - Top draw/paint/CAD system with y features, including antimation. Prints to IBM/Epson ters.

-288 PC-DOGS CAD **(10 disk set)** - Very full ured CAD system in the same league as AutoCAD. nplete with detailed documentation. (hard drive d)

Flowdraw - Full-featured program for drawing ematics, flowcharts, HIPO's and more. (CGA req'd)

Printshop Clipart - 500 pictures in Printshop/ tmaster format. Many topics represented.

-684 C Tutor **(2 disks)** - An excellent way to learn C programming language. Comes with several rce code examples.

GTE's DOS Tutor - A great, graphically oriented, ractive DOS tutor system. Very through.

761 Fortran Library - 142 routines for the Microsoft and Lahey FORTRAN compilers.

1082 Ham Radio 2 - Packet Terminal Programs - YAPP and Packtalk - both work well with most TNC's.

1084 Ham Radio 4 - Smith Charting, antenna design, counties listings and more (needs BASIC).

1085 Ham Radio 5 - AntennaX antenna analysis, RF engineering, antenna design program, Smith Chart matching and more.

1086 Ham Radio 6 - Sunrise/sunset predictions, circuit analysis and tropospheric path loss prediction

1087 Ham Radio 7 - QSL Maker, engineering programs, grid square calcs and more (req's BASIC)

1089 Mapper - EGA Great world map system. Shows grayline and shortpath , longpath, muf, luf plus much more by entering a prefix (EGA/VGA req'd).

1090 Miniprop 2 - Great propagation prediction program - the predecessor to Miniprop 3.

1091 TrakSat - nice satellite tracking system w/ good graphics & several example tracks

1092 PC-Track - The tops in EGA/VGA satellite tracking. Great graphics and easy to use. Easy to add new "birds".

1093 Telemetry Decoders - collection of telemetry decoders for the new PACSATS

1094 Icom Rig Control - Control IC735 with your PC.

1095 Paragon Rig Control - Control Ten Tec's Paragon HF rig with the PC.

1096 Radio Mods - A through listing of several modifications to many popular HT's, scanners and HF rigs.

1097 SSTV - View on the air SSTV activity. Hooks between game port and receiver. (CGA req'd).

1098 Yaesu FT767 Rig Control - Control FT757 and FT767 HF rigs with your PC.

1099 Kenwood Rig Control - Three programs to let you control your TS 140/440/940 with your computer.

1101 CW Decoders - a collection of on the air CW decoders. Turn your PC into a CW tx/rx unit

1110 K1EA DX Contest Logger 4.25 - The tops in contest logging for CQ WW DX & WPX, WAE & ARRL DX contests.

1112 Contest Logging - An assortment of contest logging programs for Field Day and other contests.

1119-1120 Total Ham (2 disks) - Excellent multipurpose station utility. Logging, awards keeping, counties, countries and much more.

1121 ARL Logbook - Fast logbook system. Add, delete, lookup QSO's and more.

1131 Hamfest - Hamfest mailing list system - keeps track of vendors and attendees with year(s) attended

1140 W0RLI Packet BBS - The dominant packet BBS system - complete with all information.

1142 Packet Mailbox - Personal mailbox for older Kantronics TNCs that don't have a firmware mailbox.

1143 Kam RTTY - A dedicated RTTY/ASCII/CW terminal program for the KAM TNC.

1145 PK232 Terminal Program - Dedicated term-prog that takes advantage of the special features of the AEA PK232 TNC.

1148 K4ABT's PicPro - Send and receive packet pictures with a KAM TNC. Also includes WEFax pgm (EGA req'd)

1149 GeoClock - similar to DX edge - shows full view of Earth and moves light/dark areas real time (Herc/ CGA/MCGA/ATT)

1150 Geoclock EGA - the same as # 1149 except for EGA and VGA monitors.

1151-1152 ACE (2 disks) Astrosoft Computerized Ephemeris - top notch database of astronomical information. Deep sky & Messier objects, double stars, more.

1153-1154 Deep Space (2 disks) - Excellent star map system. Includes all stars down to magnitude 2. Displays any skyview from any Earth vantage point (CGA req'd)

1155 USN Floppy Almanac - By the US Naval Observatory - good retreival system with data for Messier & radio objects plus 1536 stars

1156 Skyglobe - The best star viewing system we've seen! Many, many features (CGA or EGA req'd)

1201 Storm - Hurricane tracking at its finest - includes several sample tracks of past storms.

1249 World 29 - Nice CGA map system. View the Earth from any vantage point and "zoom" in. Includes "quizzing" function.

1250 World Atlas - Online information base - includes data on countries, rivers, cities and much more.

1311-1317 On Line Bible (7 disks) - The King James version of both Old and New Testaments. Has an online and browse facility. (hard drive req'd)

1320 PC Board Layout - good printed circuit board design and layout program.

1321 Motorola Database - good cross-referencing system for Motorola semiconductors (hard drive req'd)

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CIRCLE 14 ON READER SERVICE CARD

BILL'S BASICS

BY BILL WELSH, W6DDB

"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

Courage Handi-Ham System

The Courage Center is a rehabilitation center for the physically disabled. The Courage Center was previously known as the Minnesota Society for Crippled Children and Adults. It was founded in 1928, and it conducts more than 70 programs which serve more than 19,000 people each year. The Courage Center is headquartered in the Golden Valley, which is a suburb of Minneapolis. It has five major facilities, all of which are in Minnesota.

One of the many Courage Center Activities is the Courage Handi-Ham System, which started 20 years ago with 15 members and now has more than 6500 members worldwide. Four paid staff people support the large group of dedicated amateurs who keep Handi-Ham active and successful. These volunteers conduct licensing courses and FCC examinations, duplicate training cassette tapes, and read material to blind students. In addition they modify, repair, and package equipment to be used worldwide by licensed amateurs.

Any handicapped person who is interested in becoming an amateur radio operator can request an application and additional information by writing to the Courage Handi-Ham System, Courage Center, 3915 Golden Valley Road, Golden Valley, MN 55422 (telephone 612-588-0520). Bruce L. Humphrys, KØHR, is their rehabilitation technology director. Sister Alverna O'Laughlin, WAØSGJ, provided most of the material used in this article; she is the educational services coordinator.

When the application has been received, it should be filled in and returned to Handi-Ham with the $10 membership fee payment. Handi-Ham will contact the applicant and will recommend an appropriate course of study. If the applicant does not know a local amateur who is willing to provide assistance, Handi-Ham attempts to locate such a person. The local volunteer provides aid, which usually includes setting up the station and guiding the new amateur through the first few contacts.

These associations often produce long-term friendships. If you are an experienced amateur, and if you are willing to help candidates in your area, please send a note to let Handi-Ham know that your assistance is available. There is no fee related to being a Handi-Ham volunteer.

**45527 Third Street East, Lancaster, CA 93535-1802*

MFJ's computer tutor series for all classes of license.

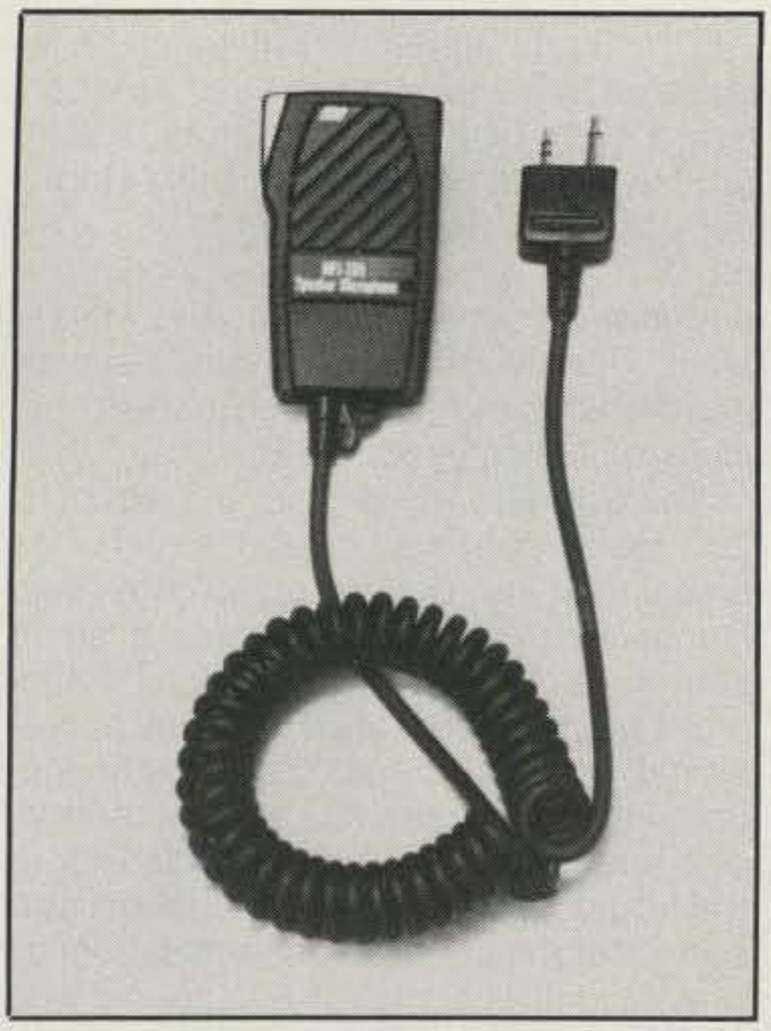
Handi-Ham helps people (children and adults) with physical disabilities and/or sensory (blind, deaf) impairments obtain licenses and establish stations. The instruction and equipment are adapted to meet special needs of these people. Lois Baskerville transcribes amateur radio data into Braille at no charge for deaf and blind students. Details of this service can be obtained by writing to Northern Nevada Braille Transcription, 1015 Oxford Avenue, Sparks, NV 80431. Tony Tretter, WØKVO, has produced a set of raised line drawings for Novice and General examinations study. Each book contains more than 50 drawings, complete with Braille explanations. These books are available at no charge to Minnesota residents, but a fee applies to all others. The address is Minnesota State Services for the Blind, 1745 University Avenue, St. Paul, MN 55113.

The Courage Handi-Ham System conducts a highly successful program of Courage Radio Camps. These one-week camp sessions provide intensified training to prepare candidates to pass FCC license upgrade tests. Class size is normally limited to ten students. Courses are conducted for Novice, Technician, General, Advanced, and Amateur Extra class licensing. The January camp is held in California, and the September camp is conducted in Minnesota. They combine fun and recreation with concentrated training. Volunteer examiners conduct FCC tests during the last full day of each camp term. Campers believe these camps are successful, whether they pass or fail the FCC examinations.

Here is 51-year-old Ben Metcalfe, Jr., N4XIW, of Augusta, Kentucky. A 1962 swimming accident left him almost completely paralyzed from the neck down. He has limited use of his arms and hands. His CB activity created an interest in amateur radio. The Greater Mason County Amateur Radio Association helped him prepare for (and pass) Novice and Technician tests. Bennie is active on the air and he is getting ready to pass the General tests. Harold Woodward, WA4NUY, submitted this photograph.

The radio camp fee is $100 and the annual membership fee is $10. However, it actually costs about $1000 to have a student participate in one of these training camps. This program enjoys great success, but it has cost the Courage Center about $300,000 during the past decade.

A comprehensive series of cassette tapes is available to Handi-Ham members who are unable to use printed materials. Some of the subjects covered with these tapes are antennas, code, introductions to amateur radio and Handi-Ham, operating, and theory. These tapes



MFJ's miniature speaker/microphone combinations can be used with hand-held transceivers.

The MFJ-1112 connects to a DC power supply and has six pairs of binding posts to connect station accessories.

are available at their replacement fee, or users can supply fresh replacement cassettes.

Handi-Ham loans station equipment and accessories to members at low cost. Many of these units have to be modified/customized to meet the unique needs of individual amateurs. If you are looking for a good home for a spare unit, I hope you will decide to donate it to Handi-Ham. They need both equipment and accessories of all types. Some donated equipment is modified, as needed, and it is then sold to Handi-Ham members at reasonable prices.

The Handi-Ham technical net control is Ronald Johnson, WA2PJC. This net starts at 0001 UTC Thursdays (Wednesday evenings, local time) on 3865 kHz. The 10 meter Handi-Ham net meets on 28,390 kHz Mondays from 1600 to 1630 UTC. If UTC (Universal Time Coordinated) is confusing to you, simply listen to WWV (10 MHz is usually good); their time announcements are stated in UTC.

"Hand-Ham World" is published quarterly and is sent to all Handi-Ham members. It is also available in cassette form. Handi-Ham member Tom Carten, K1PZU, tape records each issue of *Worldradio*. These tapes are available to Handi-Ham members at $3.00 per year. Tom's address is 1602-S King's College, Wilkes-Barre, PA 18711.

The callsign of the Handi-Ham headquarters station is WØZSW. The station has two HF operating positions, plus VHF and packet. Handi-Ham members are welcome to use this station.

If you want a unique club program, you can request the loan of "Making Contacts, Making Friends—the Courage Handi-Ham Story." This 24 minute VHS should be requested 6 to 8 weeks before a scheduled viewing date.

The Handi-Ham endowment fund presently totals about $325,000. It is hoped that the goal of $500,000 will be reached within two years. All earnings from this fund go directly to supporting the Courage Handi-Ham System. If you are interested in possibly making a donation, bequest, deferred gift, or corporate contribution to this organization, you should call the Courage Center development officer at 612-520-0531.

The ARRL supports Handi-Ham in several ways. In addition to a $10,000 grant, the League provides free ads in *QST* and hundreds of study manuals. League personnel support license preparation and testing activities at radio camps.

If you want to provide financial support to Handi-Ham, a few of the specific items you can sponsor for the use of students are a code practice tape ($5.00), Novice study material ($10), Handi-Ham promotional VHS tape ($15), a code practice oscillator with handkey ($25), bench repair fee ($30), Novice transceiver ($200), one printing and mailing of the Handi-Ham world newsletter ($500), or one person's radio camp session cost ($1000). The Courage Center is a federally tax exempt non-profit organization, and it is a United Way Agency.

If you know someone who might be interested in Handi-Ham, please give her/him a copy of this introductory article. She/he should request from Handi-Ham a copy of "How would you like to be . . . radioACTIVE," which provides good introductions to amateur radio and Handi-Ham. The Kiwanis International Foundation provided the grant which made it possible to publish this booklet.

The Courage Handi-Ham System merits support. You may be able to serve as one of their instructors, or you could help Handi-Ham members get on the air in your area. Any donation of useful equipment and/or accessories would be appreciated, and should qualify as a tax deduction. Financial support is always needed, of course, whether it is immediate or in the future. Amateur radio can take a person out of the confines of her/his room by providing direct contact with people who may be anywhere from next door to the other side of the world—or perhaps in space. Your help can make lives richer and better.

In summary, Handi-Ham has developed a successful amateur radio course which is supported by essential auxiliary services. Many resources exist outside the Courage Center. Students who need special help receive it. Each student is unique and has special needs which are met.

It is interesting that David Cruz, KP4KN, is a member of the Puerto Rico Senate. He is a Handi-Ham member. David is the first blind or disabled person to serve as an elected public official in Puerto Rico.

KA1GDG Collection

My December 1989 column includes coverage of telegraph apparatus collections. If you are in the New England area, you may want to make an appointment to see the collection owned by Brad Wilson, KA1GDG, 22 Tiffany Road, Norwell, MA 02061. His telephone number is 1-617-826-2746. Brad also has four complete combinations of the Drake 2-C receiver and 2-NT transmitter. I would like to receive information about any other key collections I have not covered.

Propagation Forecasting Software Tool

Jacob Handwerker, W1FM, sells a high-quality 1.8–30 MHz propagation forecasting and link quality assessment software tool. The ppd price is $27.45 to North American addresses and it is $29.95 to addresses outside the North American continent. Massachusetts residents must also pay a 5% sales tax. The address is 17 Pine Knoll Road, Lexington, MA 02173

(telephone 617-862-6742). W1FM can furnish additional information about this operating aid.

Theory Instruction By Computer

MFJ Enterprises sells a computer tutor series which can be used by people preparing to take any class of amateur radio license. If you are preparing to pass a test and you have access to an IBM compatible computer, you could make use of this material. Each current question pool is covered in a uniquely effective manner. Tests are provided, plus expanded explanations of answers to difficult questions. These tutors sell at $29.95 each, plus shipping. The model numbers are MFJ-1610-Novice, MFJ-1611-Technician, MFJ-1612-General, MFJ-1613-Advanced, and MFJ-1614-Extra. The MFJ address is P.O. Box 494, Mississippi State, MS 39762. Their numbers are 601-323-5869 (phone), 800-647-1800 (toll-free order phone), 601-323-6551 (FAX), and 534590 (telex).

Miniature Speaker/Microphone

MFJ sells miniature combination speaker and microphone units which can be used with handheld transceivers. Each unit consists of a top-quality electret microphone element and a wide-range loudspeaker, providing excellent audio quality during transmit and receive. Each of these units also has a push-to-talk button, a swivel lapel/pocket clip, a lightweight retractable cord, and an earphone jack. The MFJ-285 and MFJ-285L (with "L" connector) mate with ICOM, Santec, and Yaesu equipment. The MFJ-287 and MFJ-287L (with "L" connector) mate with Kenwood equipment. If your local MFJ dealer does not have a desired unit on hand, it can be ordered from MFJ Enterprises, P.O. Box 494, Mississippi State, MS 39762. Their toll-free ordering telephone number is 800-647-1800. These units retail for $24.95 each.

Multiple DC Power Outlet

The MFJ-1112 connects to a DC power supply. It has six pairs of heavy-duty binding posts, which can be used to connect station accessories. Radio frequency bypassing keeps RF on the DC outlet line out of the power supply. This handy accessory measures 2.5" × 2.75" × 13.5". Its price is $24.95. If your local MFJ dealer does not have an MFJ-1112 Multiple DC Power Outlet in stock, it can be ordered from MFJ Enterprises, P.O. Box 494, Mississippi State, MS 39762 (toll-free ordering 800-647-1800).

PROPAGATION

BY GEORGE JACOBS, W3ASK

THE SCIENCE OF PREDICTING RADIO CONDITIONS

Sunspot Cycle Stall Continues

Sunspot Cycle 22 continues to be stalled at approximately the 157 level.

The Royal Observatory of Belgium reports a mean sunspot number of 141 for March 1990. Daily values varied widely between a low of 71 reported for March 9th and a high of 214 reported for the 20th. This monthly mean value results in a 12-month running smoothed sunspot number of 157 centered on September 1989. Cycle 22 has remained at the 157/158 level for a five-month period.

Values of smoothed sunspot numbers observed since Cycle 22 began during September 1986 are shown in Table I.

According to daily observations made at the Algonquin Radio Observatory in Ottawa, Ontario, the mean level of 10.7 cm solar flux during March 1990 was 187. This results in a 12-month running smoothed level of 206 centered on September 1989.

Fig. 1 depicts graphically the simultaneous progress of smoothed sunspot numbers and solar flux levels recorded to date for Cycle 22. A smoothed sunspot number of 155 (plus or minus 19) is forecast for July 1990 with a corresponding solar flux level of 202.

What about the peak of Cycle 22? According to Prof. A. Koeckelenbergh of the Royal Observatory of Belgium, it occurred during July 1989 with a smoothed count of 159. The National Geophysical Data Center at Boulder, Colorado continues to favor February 1990 as the date of maximum, but with a downward revision of 168 as the peak value.

If Prof. Koeckelenbergh is correct, Cycle 22 rose from its beginning in September 1986 to its peak value in 2.8 years, which would make Cycle 22 the fastest rising cycle ever recorded. The time required for previous cycles to go from start to peak value varied between 2.9 and 6.9 years, with the average time being 4.1 years. If the peak of Cycle 22 took place in February 1990, the time span from start to peak was 3.4 years—an unusually short span, but not a record.

Radio Storminess

While high solar cycles generally produce much improved propagation conditions on the HF bands, periods of radio storminess also increase with sunspot number. This results in what has often been called the "Swiss-cheese effect"—that is, periods of exceptionally good propagation conditions punctured by frequent periods of radio storminess.

A recent study conducted by the Space Environmental Services Center, Boulder, Colorado compared the number of active solar flares observed during the first 40 months of Cycles 20, 21, and 22. These are the flares that are most often associated with radio storminess. During the first 40 months in the life of Cycle 20, 994 active flares were observed. Cycle 20 peaked with a sunspot count of 111 in November 1968. During the same period for Cycle 21, 1325 active flare regions were observed. This cycle peaked with a count of 165 in December 1979. During the first 40 months of the present cycle, Cycle 22, 1174 active regions have been observed.

11307 Clara Street, Silver Spring, MD 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for July 1990

	Expected Signal Quality (4)	(3)	(2)	(1)
Propagation Index				
Above Normal: 11, 13, 23-24, 26	A	A	B	C
High Normal: 5-6, 10, 12, 14, 16, 20-22, 25	A	B	C	C-D
Low Normal: 3-4, 8-9, 15, 17, 19, 27, 30-31	B	C	D	D-E
Below Normal: 1, 7, 18, 28-29	C	C-D	D-E	E
Disturbed: 2	C-D	D	E	E

Where expected signal quality is: **A—Excellent opening, exceptionally strong, steady signals greater than S9.**

B—Good opening, moderately strong signals varying between S6 and S9 +, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S6, with some fading and noise.

D—Poor opening, with weak signals varying between S0 and S3, and with considerable fading and noise.

E—No opening expected.
3 dB per S-Unit.

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 day of the month. For example, an opening shown in the charts with a *propagation index* of 3 will be fair-to-poor (C-D) on July 1, poor (D) on the 2nd, good-to-fair (B-C) on the 3rd and 4th, good (B) on the 5th and 6th, etc.**

Smoothed Sunspot Numbers Recorded To Date During Cycle 22

	1986	1987	1988	1989
January	—	18	58	142
February	—	20	65	145
March	—	22	71	150
April	—	24	78	153
May	—	26	84	157
June	—	28	94	158
July	—	31	104	158
August	—	35	114	158
September	12	39	121	157
October	13	44	125	—
November	15	47	130	—
December	16	51	138	—

Table I– Values of smoothed sunspot numbers observed since Cycle 22 began in September 1986.

July Propagation

Fifteen meters should be the best band for worldwide DX during the daytime hours, with *17* and *20* meters not far behind. Excellent DX propagation conditions are forecast for *15* meters throughout most of the daylight hours, and through the evening hours to as late as midnight. Conditions should peak, with openings expected to most areas of the world, during the late afternoon and early evening hours.

Twenty meters should open for DX shortly after sunrise and remain open to most areas of the world for a period of about two hours. High solar absorption will reduce DX possibilities considerably from about 9 AM through the early afternoon hours. Expect signals to begin to increase again by 4 PM, with optimum conditions expected after sundown. Exceptionally strong signal openings to most areas of the world should be possible during the hours of darkness.

Due to the continuing high level of sunspot activity, some exceptionally good *10* and *12* meter DX openings are forecast to many areas of the world during the hours of daylight. Conditions are expected to peak during the afternoon, with openings favoring southern and tropical regions.

During the hours of darkness, along with optimum conditions on *20* meters, look for some good DX openings to many

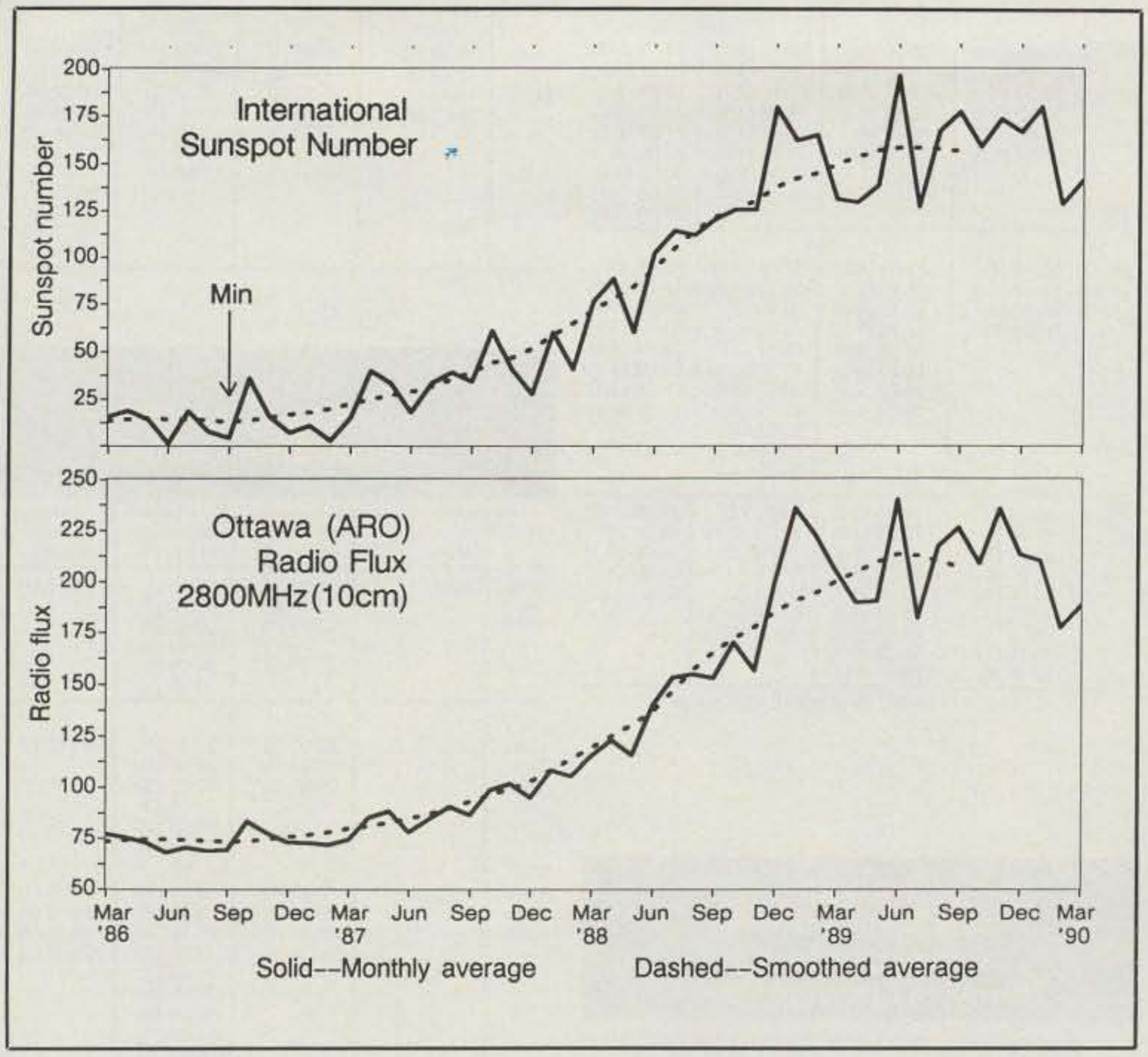


Fig. 1– Graphs of sunspot numbers and 10.7 cm solar flux levels observed to date during Cycle 22. (Courtesy SESC)

areas of the world on *30* and *40* meters. However, seasonally high static levels may often make these bands noisy. High static levels may also make DX propagation difficult on *80* meters, but some fairly good openings should be possible during July. Don't expect much DX on *160* meters due to the high static level and increased solar absorption experienced during July. Some openings may be possible to the Caribbean area and the northern countries of South America, and perhaps towards the South Pacific, about an hour or two before sunrise.

Check last month's column for comprehensive band-by-band DX propagation predictions for July.

Short-Skip Openings

This month's column contains Short-Skip Charts for July and August 1990. Optimum short-skip conditions on most bands are expected during July, mainly as a result of the seasonal peak expected in sporadic-E propagation. During the daylight hours considerable short-skip openings are forecast for *10*, *12*, and *15* meters over distances ranging between approximately 500 and 1300 miles, with some double-hop openings extending out to as much as 2300 miles. Excellent short-skip openings on *17* and *20* meters, ranging between approximately 250 and 2300 miles, are expected almost around the clock, with conditions expected to peak during the late morning hours and again during the late afternoon and early evening.

Good daytime short-skip openings can be expected on *30* and *40* meters for distances ranging between approximately 100 and 600 miles. Excellent nighttime openings should be possible on these bands for distances between 250 and 2300 miles. Good *80* meter short-skip openings are forecast for the daylight hours up to distances of about 300 miles, with the range extending out to 2300 miles during the hours of darkness. While no *160* meter short-skip openings are expected during the daylight hours, some openings should be possible during the hours of darkness for distances up to approximately 1300 miles. When static levels are low, *160* meter nighttime openings may extend considerably beyond this range.

VHF Ionospheric Openings

With a seasonal peak expected in sporadic-E propagation, look for frequent short-skip openings on the *6* meter band. Most

HOW TO USE THE SHORT-SKIP CHARTS

1. In the Short-Skip Chart, the predicted times of openings can be found under the appropriate distances column of a particular Meter band (10 through 160 Meters) as shown in the left hand column of the Chart. For the Alaska and Hawaii Charts the predicted times of openings are found under the appropriate Meter band column (10 through 40 Meters) for a particular geographical region of the continental USA as shown in the left hand column of the Charts. An * indicates the best time to listen for 80 meter openings.

2. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. On the Short-Skip Chart, where two numerals are shown within a single set of parenthesis, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. The index indicates the number of *days* during the month on which the opening is expected to take place, as follows:

(4) Opening should occurr on more than 22 days
(3) " " " between 14 and 22 days
(2) " " " between 7 and 13 days
(1) " " " on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual *dates* on which an opening with a specific *propagation index* is likely to occur, and the signal quality that can be expected.

3. Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M. etc. On the Short-Skip Chart appropriate *daylight time* is used at the *path midpoint*. For example, on a circuit between Maine and Florida, the time shown would be EDT; on a circuit between N.Y. and Texas, the time at the midpoint would be CDT, etc. Times shown in the Hawaii Chart are HST. To convert to daylight time in other USA time zones *add* 3 hours in the PDT zone; 4 hours in the MDT zone; 5 hours in the CDT zone, and 6 hours in the EDT zone. *Add* 10 hours to covert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 15 or 3 P.M. in Los Angeles; 18 or 6 P.M. in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *daylight* time in other areas of the USA *subtract* 7 hours in the PDT zone; 6 hours in the MDT zone, 5 hours in the CDT zone and 4 hours in the EDT zone. For example, at 20 GMT it is 16 or 4 P.M. in N.Y.C.

4. The Short-Skip Chart is based upon a transmitted power of 75 watts c.w. or 300 watts p.e.p. on sideband; the Alaska and Hawaii Charts are based upon a transmitter power of 250 watts c.w. or 1 kw p.e.p. on sideband. A dipole antenna a quarter-wavelength above ground is assumed for 160 and 80 meters, a half-wave length above ground on 40 and 20 meters, and a wave-length 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 10dB loss, it will lower by one level.

5. Propagation data contained in the Charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Department of Commerce, Boulder, Colorado, 80302.

CQ Short-Skip Propagation Chart July & August 1990 Local Daylight Savings Time At Path Mid-Point

Band Meter	Distance Between Stations (Miles)			
	50-250	250-750	750-1300	1300-2300
10	Nil	08-10 (0-1)* 10-14 (0-3)* 14-18 (0-1)* 18-22 (0-2)* 22-08 (0-1)*	08-10 (1)* 10-14 (3)* 14-18 (1-2)* 18-22 (2-3)* 22-08 (1)*	08-10 (1-0)* 10-14 (3-1)* 14-18 (2-1)* 18-20 (3-2) 20-22 (3-1)* 22-08 (1-0)*
15	Nil	08-10 (0-2)* 10-14 (0-3)* 14-18 (0-2)* 18-20 (0-3)* 20-22 (0-2)* 22-08 (0-1)*	08-10 (2)* 10-14 (3)* 14-18 (2)* 18-20 (3)* 20-22 (2)* 22-00 (1-2)* 00-08 (1)*	08-10 (2)* 10-14 (3)* 14-18 (2-3) 18-20 (3-4) 20-22 (2-3) 22-00 (2) 00-08 (1-0)
20	10-01 (0-1)*	07-10 (0-2)* 10-18 (1-4)* 18-22 (1-3)* 22-00 (1-2)* 00-07 (0-1)*	07-10 (2-4) 10-18 (4) 18-22 (3-4)* 22-00 (2-4)* 00-02 (1-3)* 02-07 (1-2)*	08-10 (4) 10-16 (4-3) 16-00 (4) 00-02 (3) 02-07 (2) 07-08 (4-3)

40	08-10 (2-4)* 10-15 (3-4) 15-20 (4) 20-22 (2-4) 22-00 (1-3) 00-08 (1-2)*	08-10 (4) 10-12 (4-3) 12-17 (4-2) 17-18 (4-3) 18-22 (4) 22-02 (3-4) 02-05 (2-4) 05-08 (2-3)	09-10 (4-1) 10-12 (3-1) 12-17 (2-1) 17-18 (3-1) 18-21 (4-3) 21-05 (4) 05-06 (3-4) 06-08 (3) 08-09 (4-2)	09-18 (1-0) 18-19 (3-0) 19-20 (3-1) 20-21 (3-2) 21-22 (4-3) 22-06 (4) 06-07 (3-2) 07-08 (3-1) 08-09 (2-0)
80	06-12 (4) 12-16 (4-3) 16-00 (4) 00-06 (3-4)	07-08 (4-2) 08-10 (4-1) 10-12 (4-0) 12-16 (3-0) 16-18 (4-1) 18-20 (4-2) 20-22 (4-3) 22-07 (4)	07-08 (2-1) 08-10 (1-0) 10-16 (0) 16-18 (1-0) 18-19 (2-0) 19-20 (2-1) 20-21 (3-1) 21-22 (3-2) 22-05 (4) 05-06 (4-3) 06-07 (4-2)	07-19 (0) 19-20 (1-0) 20-21 (1-0) 21-22 (2-1) 22-04 (4-3) 04-05 (4-2) 05-06 (3-1) 06-07 (1-0)
160	18-19 (0-1) 19-20 (1) 20-22 (3-2) 22-00 (4-3) 00-06 (4) 06-08 (3-2) 08-09 (1) 09-10 (1-0) 10-18 (0)	19-20 (1-0) 20-21 (2-0) 21-22 (2-1) 22-00 (3-2) 00-04 (4-2) 04-06 (4-3) 06-08 (2-1) 08-09 (0-1) 09-19 (0)	21-22 (1) 22-01 (2-1) 01-04 (2) 04-06 (3-2) 06-07 (1) 07-08 (1-0) 08-21 (0)	21-23 (1-0) 23-01 (1) 01-06 (2-1) 06-07 (1-0) 07-21 (0)

*Predominantly Sporadic-E Openings

HAWAII
July & August 1990
Openings Given In Hawaiian Standard Time

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern USA	13-16 (1)	06-09 (1) 09-12 (2) 12-16 (3) 16-18 (2) 18-20 (1)	13-15 (1) 15-17 (2) 17-18 (3) 18-22 (4) 22-00 (3) 00-02 (2) 02-04 (3) 04-06 (2) 06-08 (1)	18-20 (1) 20-00 (2) 00-02 (1) 21-00 (1)**
Central USA	12-14 (1) 14-16 (2) 16-17 (1)	05-06 (1) 06-12 (2) 12-14 (3) 14-16 (4) 16-18 (3) 18-20 (2) 20-21 (1)	06-08 (2) 08-14 (1) 14-16 (2) 16-18 (3) 18-00 (4) 00-02 (3) 02-04 (4) 04-06 (3)	20-21 (1) 21-22 (2) 22-01 (3) 01-02 (2) 02-03 (1) 20-22 (1)** 22-00 (2)** 00-02 (1)**
Western USA	10-12 (1) 12-14 (2) 14-18 (3) 18-20 (2) 20-21 (1)	06-07 (1) 07-08 (2) 08-10 (3) 10-18 (4) 18-20 (3) 20-22 (2) 22-00 (1)	05-08 (4) 08-10 (3) 10-13 (2) 13-15 (3) 15-22 (4) 22-00 (3) 00-05 (2)	18-19 (1) 19-20 (2) 20-02 (4) 02-04 (3) 04-05 (2) 05-06 (1) 19-20 (1)** 20-22 (2)** 22-02 (3)** 02-03 (2)** 03-04 (1)**

ALASKA
July & August 1990
Openings Given in GMT

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern USA	*NIL*	21-00 (1) 00-02 (2) 02-03 (1)	12-15 (1) 22-00 (1) 00-02 (2) 02-04 (3) 04-05 (2) 05-06 (1)	07-10 (1)
Central USA	*NIL*	20-00 (1) 00-03 (2) 03-05 (1)	13-16 (1) 22-00 (1) 00-03 (2) 03-06 (3) 06-07 (2) 07-09 (1)	08-12 (1)
Western USA	01-04 (1)	17-22 (1) 22-00 (2) 00-02 (3) 02-04 (4) 04-05 (2) 05-06 (1)	13-14 (1) 14-15 (2) 15-19 (3) 19-01 (2) 01-03 (3) 03-06 (4) 06-08 (3) 08-09 (2) 09-11 (1)	07-09 (1) 09-12 (2) 12-13 (1) 09-12 (1)**

**Indicates best time for 80 meter openings. Openings on 160 meters are most likely to occur during those times when 80 meter openings are shown with a propagation index of (2) or higher.

See explanation in "How To Use Short-Skip Charts" which appears in the box at the beginning of this column.

Note: The Alaska and Hawaii Propagation Charts are intended for distances *greater* than 1300 miles. For shorter openings, use the preceding Short-Skip Propagation Chart.

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.

openings should fall within the 600–1300 mile range, but some may be as long as 2300 miles, and others may be somewhat shorter than 600 miles. The best times for these openings are a few hours before noon and again during the early evening hours, although they can take place at any time of the day or night. During many *6* meter sporadic-E short-skip openings, signal levels may reach exceptionally strong levels.

Be sure to check the *2* meter band during intense *6* meter openings. Generally, *2* meter short-skip openings can take place when the shortest skip heard on *6* meters is on the order of 600 miles or less. *Two* meter openings, when they occur, are likely to range in distance between 1000 and 1300 miles.

Chances are good for meteor-type ionospheric openings on the VHF bands during the last days of July. A major meteor shower, the *Delta Aquarids*, should take place between the 28th and 31st.

Although not expected to reach peak intensity until mid-August, the *Perseids*, another major meteor shower, is expected to begin during the last days of July and should provide some openings on the VHF bands.

Considerably fewer trans-equatorial (TE) openings are expected on *6* meters during July, but some may still be possible from locations in the southern tier states. The best time to check for TE openings to South America should be between 8 and 11 PM local daylight time.

Some VHF short-skip openings may be possible during July as a result of auroral ionization. The best dates to look for such openings are shown as Disturbed or Below Normal in the Last Minute Forecast at the beginning of this column.

73, George, W3ASK

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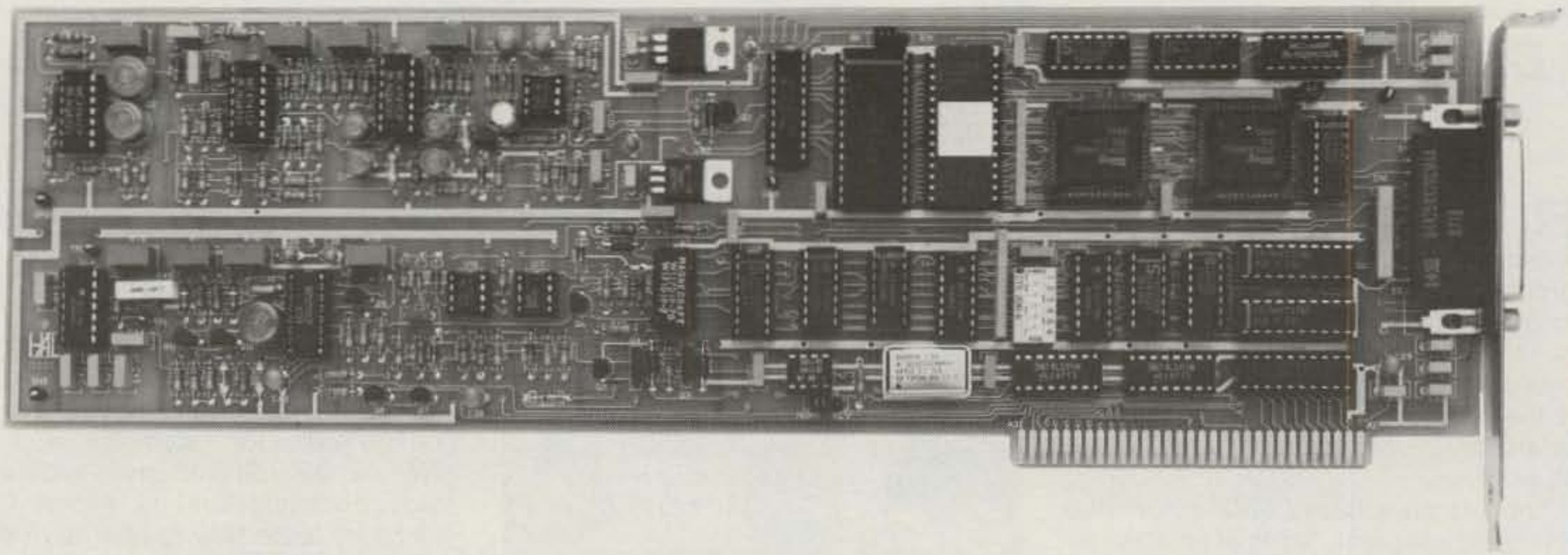
The PCI-3000 and SPT-2 from HAL!



The HAL PCI-3000/PC-AMTOR system is designed to put your PC on the HF bands with outstanding performance at an affordable price. Amtor allows you to get through when other methods fail. If you've ever been DX-ing with someone on Amtor when 20 meters dies out in the evening, you know what we mean. Things may slow down, but you can usually keep up the QSO!

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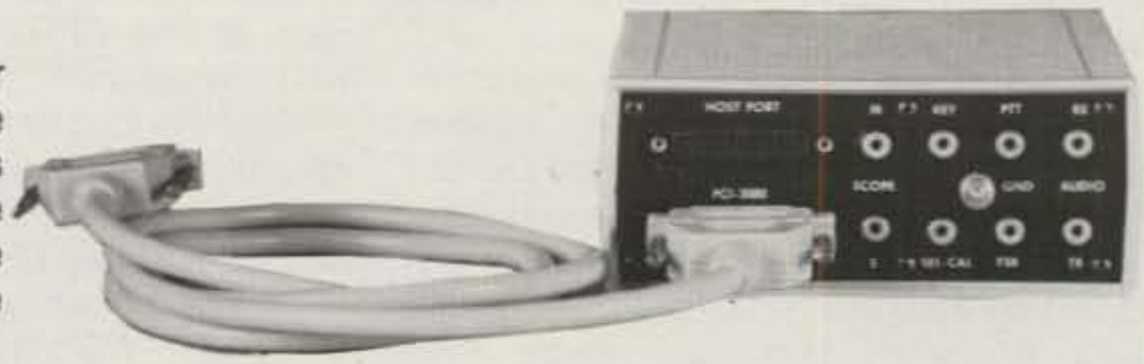

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CIRCLE 58 ON READER SERVICE CARD

BY CHOD HARRIS, VP2ML

NEWS OF COMMUNICATION AROUND THE WORLD

DXpedition Disqualification Criteria Discussed At ARRL

Repercussions from the 3Y5X Bouvet DXpedition continue to reverberate throughout the DX community. The disagreeable behavior of a few people on 14,145 kHz (and to a somewhat lesser degree on 14,022 kHz) during the first part of the 3Y5X operation prompted many amateurs to complain to their ARRL Director.

The League's Board of Directors had justifiable concerns. Some of amateur radio's high-frequency (HF) band allocations will likely come under attack at the next World Administrative Radio Conference (WARC) in 1992. Other services, especially international broadcasting, would love to prove that amateurs don't deserve their extensive HF frequencies. Playing a few tape recordings of the shenanigans on 14,145 kHz could convince delegates from many countries that "self-policing" and "public service" are no longer trademarks of the amateur service. The League's Board is particularly vulnerable in this situation, as the League sponsors the DX Century Club award.

Thus, at the March 10 meeting of the Executive Committee of the League's Board, the committee requested the DX Advisory Committee to "research and recommend disqualification criteria for DXpeditions." This action caused an uproar in DX circles.

At the DX Forum at the International DX Convention in Visalia, California in April, the major topic was disqualification criteria. Sentiment among the several hundred DXers attending the forum was that developing disqualification criteria was a bad idea.

Jim Maxwell, W6CF, DXAC representative from the Pacific Division, moderated the discussion. Jim first pointed out that the ARRL Board did not recommend that the 3Y5X Bouvet operation be disqualified from the DXCC program, and in fact no such suggestion was ever considered.

Several DXers at the forum pointed out that disqualifying a DXpedition because of the action of a few jammers and hecklers was punishing the good guys (the vast majority of the DXers) for the action of a few bad apples. In other words, this would play directly into the hands of the jammers: by expressing their negative opinions during the DXpedition, they could prevent DXers everywhere from gaining DXCC credit for their hard-won contacts. This would only encourage such jamming and lead to more "if I can't work 'em, nobody can" thinking.

The ops of LQ5A, special call for LU8DPM in the 1989 CQ WW WPX CW Contest. Left to right, rear, are Pablo, LU7UAF; Alex, LU5UL; and Ariel, CX5OA. Front: Osvaldo, LU8EIN; Jorge, CX8BBH; and Mario, LU8DPM.

Other DXers pointed out that disqualification criteria contained great potential for sabotaging legitimate DXpeditions. How many hecklers would it take to cause the DXpedition to lose DXCC credit? Couldn't a handful of disgruntled persons push a well-meaning DXpedition into disqualification?

Another point voiced at the forum was that the DXCC procedures already contained disqualification "teeth" in the form of the ARRL Awards Committee, which is composed of active amateurs at ARRL Headquarters in Newington, Connecticut. The Awards Committee has final say in any accreditation question and has disqualified DXpeditions in the past, most notably several "DXpeditions" by Don Miller, W9WNV.

While all DXers agreed that something should be done to prevent a recurrence of the jamming on 14,145, the group almost unanimously questioned disqualification criteria as the way to accomplish this.

Most DXers felt that a three-pronged approach aimed at prevention of the problem was better than an after-the-fact disqualification. The first prong in this effort would be to establish suggestions for DXpedition operating style, to reduce the confusion and frustration that accompanied the first part of the 3Y5X DXpedition. A DXpeditioner who regularly signs his or her callsign, who announces (and listens on) the listening frequency, who uses reasonably small frequency ranges (14,200-220, for example), and who gives the QSL route often will avoid all but inadvertent interference. (Some DXers will *never* learn how to operate their radios in split-frequency mode.) As an example of how to do it right, listen to Eric Sjoland, SM0AGD, on one of his too-infrequent DXpeditions. Eric maintains order on the bands, works thousands of deserving DXers, and even takes the time to personally thank every single station working him.

A second part of a constructive approach to reducing havoc on DXpedition transmitting frequencies is a technical one. Jim Maxwell pointed out that today's digital radios can be programmed not to transmit outside US subbands. He invited manufacturers to incorporate this feature in future rigs. As an interim fix Jim suggested an outboard accessory that would sound a horn if the DXer tried to transmit on improper frequencies—a lid alarm.

The third prong would be to educate DXers and non-DXers alike that this type of deliberate interference and jamming is detrimental to all of amateur radio. *Someone* must know who these jammers are. Local amateurs can recognize friends, etc. Rather than shrugging one's shoulders and ignoring the infraction, the con-

VE4OX shown here in the shack is 82 years old and holds DXCC #351. He was first licensed in 1960.

P.O. Box 50, Fulton, CA 95439

The WPX Program

Mixed

1446	WA1N	1451	DK7SB
1447	WA4SFN	1452	N6OU
1448	KA3DBN	1453	IK2BLA
1449	LZ2JE	1454	4X4RE
1450	W9ESD		

SSB

2140	N9ICH	2146	CT1BWW
2141	KV1M	2147	HL2KAT
2142	N7CNH	2148	WD8EOL
2143	OE6CLD	2149	DF1ZN
2144	N4HID	2150	W1FYI
2145	EA1AX	2151	N4MCH

CW

2626	N4IR	2629	K7OVM
2627	WA1N	2630	N4RNR
2628	VE3PYA		

Endorsements

Mixed: 450 WA1N, KA3DBN, LZ2JE, W9GCH, DK7SB, N6OU, IK2BLA. 500 WA1N, KA3DBN, LZ2JE, DK7SB, N6OU, IK2BLA. 550 WA1N, KA3DBN, LZ2JE, DK7SB, N6OU, IK2BLA. 600 KA3DBN, LZ2JE, DK7SB, IK2BLA. 650 KA3DBN, LZ2JE, DK7SB, KU0A, IK2BLA. 700 KA3DBN, LZ2JE, DK7SB, KU0A. 750 KA2DBN, LZ2JE, DK7SB, KU0A. 800 KS4S, KA3DBN, LZ2JE, DK7SB, KU0A. 850 KS4S, KF4FP, KA3DBN, LZ2JE, DK7SB, VE7EIK. 900 KS4S, KA3DBN, LZ2JE, DK7SB, VE7EIK. 950 KS4S, KA3DBN, LZ2JE, NX0I, DK7SB, VE7EIK. 1000 KS4S, LZ2JE, NX0I, DK7SB, VE7EIK. 1050 KS4S, LZ2JE, VE7EIK. 1100 KS4S, LZ2JE, VE7EIK. 1150 G3VQO, KS4S, LZ2JE, VE7EIK. 1200 VE7EIK. 1350 KS3F. 1750 W4UW. 1900 IT9TQH. 1950 IT9TQH. 2000 IT9TQH, I1EEW. 2050 IT9TQH. 2100 IT9TQH. 2200 IT9TQH. 2250 IN3ANE. 2950 W8RSW. 3000 W8RSW.

SSB: 350 N4IR, EA1AX, CT1BBW, HL2KAT, W9GCH, DF1ZN, KK3Q. 400 N6SFV, DF7YN, KF7RU, EA1AX, CT1BBW, HL2KAT, JJ1SBO. 450 N4IR, KF7RU, EA1AX, CT1BWW, OZ1DY1, HL2KAT, DF7YN. 500 N4IR, KF7RU, EA1AX, CT1BBW, KB8DAE, SV0FC, HL2KAT, K2EEK. 550 N4IR, CT1BBW, HL2KAT. 600 N4IR, CT1BWW, HL2KAT. 650 N4IR, CT1BBW, G3UKH, KU0A. 700 N4IR, CT1BBW, G3UKH, KU0A. 750 N4IR, N4IR, NX0I, NU0A. 800 N4IR. 850 N4IR. 900 N4IR, KC9DS. 1100 OE1PC. 1150 OE1PC, W8ESU. 1200 OE1PC, LU8ESU. 1250 N2AC, OE1PC, LU8ESU. 1300 LU8ESU. 1350 LU8ESU, KK0L. 1400 LU8ESU, KL7AF. 1650 IT9TQH, W4UW. 1700 IT9TQH. 1750 IT9TQH. 1800 IT9TQH, I1EEW. 1850 IT9TQH. 1900 IT9TQH. 3050 ZL3NS.

CW: 350 WA1N, ZS6NT, N4RNR. 400 WA1N, W8EAO, AH6JF, ZS6NT, N4RNR. 450 N4RNR. 500 N4RNR. 550 N4RNR. 600 W4UW, N4RNR. 650 N4RNR. 700 WA2EYA, N4RNR. 750 GM3YTS, N4RNR, DK8NM. 800 GM3YTS, I1EEW, N4RNR. 850 GM3YTS, N4RNR. 900 GM3YTS, N4RNR. 950 GM3YTS. 1100 AK9Z. 1150 OK1DKR. 1550 IT9TQH. 1600 IT9TQH. 1650 IT9TQH. 1700 IT9TQH. 1750 IT9TQH. 1800 IT9TQH, W3TVB. 1850 IT9TQH. 2750 N6JV.

10 Meters: KF7RU, N4HID
20 Meters: K8MDU, KA4GID, DK8NM
80 Meters: KV1M
160 Meters: KA0ZFX, KV1M

Asia: KF7RU, DK7SB, I8KCI
Africa: I8KCI
No. America: KV1M, KF7RU, G3EZZ, WA4SFN, DK7SB, I8KCI, N6SFV
So. America: WB4FOT, I8KCI
Europe: DK7SB, I8KCI, KB8DAE, KU0A
Oceania: WB4FOT, I8KCI

Award of Excellence: W4UW, NX0I

Award of Excellence with 160 Meter Bar: W4UW, NX0I

Award of Excellence Plaque Holders: W9NUF, N4NX, SM0DJZ, DK5AD, WD9IIC, W3ARK, LA7JO, VK4SS, K6JG, N4MM, I8YRK, 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, UR2**, 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, LU3YL/W4, NN4Q, KA3A, YB0TK, VE7WJ, VE7IG, K9QFR, YU2NA, N2AC, W4UW, NX0I.

Award of Excellence Plaque Holders with 160 Meter Endorsement: G4BUE, LU3YL/W4, I4EAT, VE7WJ, W9NUF, N4NX, VK9NS, DE0DXM, VE7IG, K9BG, AB9O, FM5UD, SM0DJZ, DK5AD, SM6CST, I1JQJ, W3ARK, HI8LC, KA5W, UR2**, 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, YB0TK, W8ILC, W1BWS, VE7WJ, K9QFR, NN4Q, W4UW, NX0I.

Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage if air-mail desired) to CQ WPX Awards, P.O. Box 1351, Torrance, CA 90505-0351 U.S.A.

Sy Moskowitz, N4KEL, has worked more than 275 countries on SSB, all mobile! Here he prepares to ascend Beartooth Mountain in Wyoming.

Vern Veenhuis, KU0S, recently earned his 275-country sticker and was added to the CQ DX CW Honor Roll list.

cerned amateur should immediately contact the offender and explain the harm this person is doing to amateurs everywhere.

What will the DX Advisory Committee do about this Board directive to recommend disqualification criteria? It's too early to say, but individual DXers can make their views on the subject known to the DXAC. Send your comments and suggestions to the DXAC, c/o ARRL Headquarters, 225 Main Street, Newington, CT 06111.

The Beginner's Corner
The DXer's Log

Current FCC regulations do not require amateur radio operators to maintain a log of transmissions. However, as long-time DXers have known for years, a complete, detailed logbook is one of the DXer's most valuable tools. Let's look at a log of an active DXer.

The most obvious log entries are DX contacts. Any standard log format will force that DXer to note the vital statistics for important contacts—date, time, frequency, mode, signal report. A beginning DXer might think that after confirming that *both* the date and the time are in UTC and the time is accurate (by checking regularly with WWV) the log is complete. However, an experienced DXer will not be satisfied with these basics.

First double-check band, mode, etc., after an important contact. With modern, no-tune rigs it is very easy to chase a DX station from band to band, and forget to note the change in the log. An increasing number of DXpeditions are typing logs into a computer QSLing program, with each band being handled by a different manager. If the DXer has the wrong band on the QSL card, the response may be the dreaded "not in log."

In fact, a DXer should stop chasing DX for a moment or two after making an important contact. After reconfirming that the time is within a minute or so of WWV, the date is in UTC, and the band, mode, and signal report are accurate, the experienced DXer then logs the callsigns of the next five or six contacts the DX station makes. This helps protect against the "not in log" problem. If the initial QSL request comes back with that comment, the DXer can then write a note saying that the next consecutive contacts were with so-and-so, which should help the QSLer pinpoint the proper spot in the log and perhaps correct an incorrectly logged callsign. At the same time the DXer should log any other identifying information about the DX station: operator (if known), listening frequency (if split), where the DX station moved to or from, if near the beginning or end of a run, etc. The more information the DXer puts in the log, the greater the chances of getting around "not in log" problems.

The complete DX log contains more than just QSO data. A look through the log of an experienced DXer shows a variety of other information. Many DXers log the WWV solar data (given at 18 minutes after the hour and repeated on WWVH at 45 minutes after) on a daily basis. Over a period of time this can be very useful to determine propagation and band openings. If the DXer notes that he or she can make long-haul 80 meter contacts after a couple of days of low A indices, the DXer can watch for that phenomenon and plan to stay up late or get up early to catch that opening. Putting general propagation observations in the log can supplement the WWV data. For example, the DXer might note that signals over the poles are watery, but the skew path to either side of the pole provides good DX.

George "Dick" McKercher, W0MLY, won the coveted DX Hog Award at the Northern Illinois DX Dinner.

Another important log entry is any change in station configuration or antennas. Sometimes antennas interact, or even the placement of gear in the shack can affect station performance. By logging these changes the DXer has a good idea where to start looking, should the station not appear to function normally. This can also make the effort to erect a new antenna seem worthwhile. If the log entries immediately following a note about a new antenna show improvement, the DXer can feel better about the time spent on the tower.

Finally, the DX log can help track QSL cards. The DXer can log not only the QSL route, but also the date the card was sent and how it was sent (bureau, direct with US $1.00, etc.) This simplifies follow-up QSL requests and helps prevent duplication of an unsuccessful QSL procedure.

Used properly and kept complete and up-to-date, the DXer's log is one of the most useful tools in DX.

July Happenings

The most exciting DX event scheduled for July is the 1990 World RadioSport Team Championship, July 20-21. Twenty-three two-operator teams from the US, the USSR, and many other countries will compete head-to-head during the 8-hour event (2100Z July 20 to 0700Z July 21). Each team will sign /WG (for World Games). DXers around the world will enjoy an opportunity to be part of this event by working the /WG stations during the competition. These DXers can earn a certificate by making 5 contacts with the /WG stations, or a commemorative pin by making 30 /WG contacts. Complete details about the competition and awards are in the July Contest Calendar column. This is the first such competition; make it a memorable event for all concerned by making as many /WG contacts as you can.

Immediately following the competition many of the competitors from around the world will travel to Portland, Oregon to attend the 1990 Northwest DX Convention sponsored this year by the Willamette Valley DX Club. The convention provides a unique opportunity to meet dozens of world-class operators. For details contact the WVDXC at Box 555, Portland, OR 97207. See you there!

Also on the convention circuit is the Leningrad '90 International Hamvention sponsored by the Finnish Amateur Radio League. The convention will be in Leningrad, USSR, August 3–6. DXers can get permission to operate from the USSR for the trip. DXers will meet in Helsinki, Finland and travel by train into the USSR. For details about this adventure contact the Consulate of Finland, Frank Smith,

The WAZ Program

Single Band WAZ

10 Meter SSB

353	G3SNN	355	I4WZT
354	OH2EE		

15 Meter SSB

333	YC1RED	335	XE1VIC
334	EA5CXL	336	WE2L

20 Meter SSB

791	KE8CQ	793	SP1EYI
792	KE5PO	794	K9KJS

10 Meter CW

78	W0JLC	80	JA6VU
79	WR7C	81	JA8TRT

15 Meter CW

177	JA3KLT	179	KY7M
178	JA7JI		

20 Meter CW

361	JA7JI	364	W1MK
362	PY1OL	365	KI7DBV
363	NQ1W	366	AB1U

40 Meter CW

119	W1MK

ALL BAND WAZ SSB

3533	OE6CLD	3541	EA5CGU
3534	EA1DZA	3542	KM9W
3535	WA9BDX	3543	WA1UDU
3536	LA9FFA	3544	WB8HIW
3537	JA1CUK	3545	DL3KCJ
3538	JA1RBQ	3546	W5ILR
3539	WB2RNH	3547	HB9DAC
3540	W9RXJ		

CW/Phone

6764	KA3DBN	6776	W7QDM (CW)
6765	KE8CQ	6777	I6DQE (CW)
6766	JA0MGR	6778	PY1OL (CW)
6767	NQ5C (CW)	6779	W8KZM
6768	UA0FZ	6780	DL3ECK
6769	N5DRV	6781	DJ4AZ (CW)
6770	JR8NTR (CW)	6782	DL1HX (CW)
6771	SM5HV/HK7 (CW)	6783	AB1U (CW)
6772	JR1DTD (CW)	6784	DL6NW
6773	KO7V (CW)	6785	KA2HTU
6774	NB0Q	6786	KB1FK (CW)
6775	F9QI (CW)		

Applications and reprints of the latest rules may be obtained by sending a self-addressed stamped envelope (65 cents) size 4½ × 9½ to the WAZ Manager, Jim Dionne, K1MEM, 31 DeMarco Rd., Sudbury, MA 01776. Applicants forwarding QSL cards either direct to the WAZ manager or to a check point should include sufficient postage for safe return of their QSL cards. The processing fee for all *CQ* awards is $4.00 for subscribers and $10 for non-subscribers. Please make all checks payable to the Awards Manager. In order to qualify for the subscriber rate, please enclose your latest *CQ* mailing label with your application. Send any questions to K1MEM by mail and include an SASE (please do not telephone).

5 Band WAZ

As of April 1, 1990, 270 stations have attained the 200 zone level.

New recipients of 5 Band WAZ Award with all 200 zones confirmed:

KC7EM, K9JF, YU2CBM, OH7XI, G4IUF, OH2EE, N2MF, K8EJ, K5TSQ

The top 25 contenders for 5 Band WAZ are:

1. N4WW, 199
2. UQ1GXX, 199
3. W7OM, 199
4. K1MEM, 199
5. SP9PT, 199
6. K6YRA, 199
7. K5UC, 199
8. LA4HW, 199
9. PY7ZZ, 199
10. DL9WW, 199
11. ON6HE, 199
12. K0CS, 199
13. HA8XX, 198
14. K7UR, 198
15. I8IGS, 198
16. VE7DX, 198
17. W0PGI, 198
18. SM6AHS, 198
19. HA0MM, 198
20. K1ST, 198
21. CT1TM, 198
22. KB8DB, 198

651 Stations have attained the 150 zone level as of April 1, 1990.

Applications and reprints of the latest rules may be obtained by sending a self-addressed stamped envelope (65 cents) size 4½ × 9½ to the WAZ Manager, Jim Dionne, K1MEM, 31 De Marco Rd., Sudbury, MA 01776. Applicants should include sufficient postage for safe return of their QSL cards. The processing fee for all CQ awards is $4.00 for subscribers and $10 for non-subscribers. Please make all checks payable to the Awards Manager. In order to qualify for the subscriber rate, please enclose your latest *CQ* mailing label with your application. Send any questions to K1MEM by mail and include an SASE (please do not telephone).

CQ DX Honor Roll

The CQ DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more ACTIVE countries for the mode indicated. The ARRL DXCC Countries List is used as the country standard. Honor Roll listing is automatic when submitting application or endorsement for 275 or more countries. Deleted countries do not count and are dropped from listing as they occur. Total countries are now 324. To remain on the CQ DX Honor Roll, annual updates are required. Honor Roll updates may be made at any time, in any number. Updates indicating "no change" will be accepted to meet the annual requirement. All updates must be accompanied by an SASE for confirmation. The fee for endorsement involving the issuance of a sticker is $1.00.

CW

W9DWO	324	W6PT	316	N2KW	311	W1WAI	302	WA4DAN	294	I2OMU	281
K2FL	324	K4XO	316	K8PYD	310	YU2TW	301	W6YQ	294	K7ZR	280
K2TQC	324	N4PN	315	AA6AA	309	I3OBO	301	K4CXY	292	I5XIM	280
K4CEB	323	DL7AA	315	K9IW	309	W0JLC	301	N5DX	291	G3KMQ	280
DL1PM	323	W1NG	315	W9RY	308	WB4RUA	300	KB0G	291	W2LZX	280
K9MM	322	N4KG	315	IT9ZGY	308	DL6QW	300	IT9QDS	290	KB9XG	280
ON4QX	322	W8KPL	314	K9BWQ	308	NN4Q	300	N4AH	290	W9NUF	280
K6JG	322	DL8CM	314	W4OEL	307	I8WY	300	WA4IUM	290	K9TI	280
SM6CST	321	K3UA	314	W6SN	307	KZ4V	300	W1WLW	289	VE7DX	280
N4JF	321	N6CW	313	KQ9W	307	W6DN	299	W4BV	289	KB8DB	280
N6AV	321	EA2IA	313	SM6CTQ	306	K3FN	298	K1VHS	289	HB9AFI	279
K6LEB	319	WA2HZR	313	K2OWE	306	DJ7CX	297	G2GM	289	KA2DIV	279
K1MEM	319	W2FXA	312	W9WAQ	305	K8LJG	297	K8NA	288	KA3R	278
N4MM	319	K6EC	312	W2UE	305	N8MC	297	G2FFO	287	DL1QT	277
W4BQY	318	YU1HA	312	WA4JTI	305	LA9XG	297	W9SC	287	K4JLD	277
DL3RK	318	W0IZ	312	AB4H	304	WD9IIX	296	WA8YTM	287	K9DDO	277
K9AB	318	DJ1XP	311	WD9IIC	303	KD8V	296	DJ2PJ	286	KU0S	277
SM3EVR	317	W6ID	311	W0HZ	303	NY5L	295	K2JF	283	NS7Z	276
N6AR	317	K9QVB	311	WA8DXA	302	N5FW	294	JH1VRQ	282	K4SE	275
OK1MP	317	W0SR	311	W7CNL	302	IT9TQH	294	W3BBL	282	F3TH	275

SSB

K2FL	324	VE7WJ	318	F2MO	312	KA3HXO	306	I6PLN	299	WA6DTG	288
W6EUF	324	DJ1XP	317	W0SD	312	KZ8Y	305	KA8T	299	N6CGB	288
W4UG	324	KD8VM	317	K9RF	312	K8VFV	305	KB2FC	299	EA3KW	287
VE1YX	324	N4WF	317	K9HDZ	312	EA1QF	305	DJ7CX	298	AB9E	287
F9RM	323	K4PQV	317	LA7JO	312	K4RIG	305	K9SM	298	W9SC	287
DJ9ZB	323	WD8MGQ	317	LU3YL	312	K8ZZU	305	JH4PRU	298	PA0XPQ	287
K6WR	323	SV1ADG	317	N6OC	312	I4WZK	305	EA9IE	298	I2EOW	287
W9DWO	323	W9OKL	317	NA5W	312	SM6CST	305	XE1HI	298	N8BJQ	286
W4DPS	323	NY5L	317	W8ILC/QRPp	312	WA4IUM	305	KF5DX	298	N3ARK	286
W0YDB	323	KR9O	317	I2MQP	312	KD8V	304	K5DUT	297	N9CPW	286
ZL1AGO	323	I8LEL	317	NN4Q	312	KC8YM	304	HP1JC	297	K9MNT	286
EA4DO	323	KC8EU	317	KS0Z	312	W6MFC	304	YU7KV	297	IK7DBB	286
DL9OH	323	WA4JTI	317	IK2GNW	312	K4LR	304	XE1OW	297	KB5RF	285
YU1HA	323	I8ACB	316	W4SSU	311	KB0SY	304	WD9GQV	297	KF5AR	285
I0ZV	323	K8PYD	316	K6EC	311	WE2L	304	KB1JU	297	IK8BMW	285
4Z4DX	323	K4XO	316	K8NA	311	KA9TNZ	304	WB3GPR	296	KC7EM	284
ZL3NS	322	N4KG	316	NJ0C	311	XE1KS	303	KB3KV	296	KR9F	284
K8LJG	322	AI8S	316	I8XTX	311	W2LZX	303	I0SGF	296	WB3HAZ	283
W4EEE	322	W0SR	316	WA4DAN	311	KB0U	303	K8NWD	296	VE3MV	283
OA4OS	322	VE3MRS	316	AG9S	311	W0ULU	303	KB0G	296	ZP5JCY	283
W2SUA	322	WB1DQC	316	KB4HU	311	W4BQY	303	EA4KK	296	I4CSP	283
VE3GMT	322	VK4LC	316	G4ADD	311	XE1XM	303	W0IYR	295	I8DVJ	283
I0AMU	322	TI2CC	316	DK2BL	310	K7EHI	303	KK0C	295	YB3CEV	283
VE3MR	321	G4CHP	316	AA6AA	310	K1MEM	302	G3XTT	295	K3NEE	283
I8AA	321	KZ2P	316	AB9O	310	N5FG	302	VE3XO	295	AE2B	282
OZ3SK	321	W2CC	316	KU9I	310	W6FET	302	KI3L	295	AI9R	282
N4JF	321	9H4G	316	N6AHV	310	I3OBO	302	I7UNX	295	TG9EP	282
K9MM	321	W7FP	316	KB9OC	310	K9UAA	302	VE3DLR	295	VE3NUP	282
EA2IA	321	K2JLA	316	K1MIZ	310	KP4EOF	302	K4JLD	295	N1ALR	282
W9SS	321	XE1AE	315	I2OMU	310	N5FW	302	WD0BNC	294	PY2DBU	281
N9MM	321	I8YRK	315	IV3YRN	310	XE1MDX	302	I5BDE	294	NP4CC	281
K6JG	321	I8KDB	315	XE1OX	310	VE2PJ	302	WB3CQN	294	NX0I	281
TI2HP	320	K9LKA	315	I5EFO	310	WA2FKF	302	KB8O	294	G4FAM	280
K6YRA	320	ON5KL	315	I1POR	310	IK8GCS	302	VE5FX	294	KU9Z	280
I4LCK	320	OZ8BZ	315	W6BCQ	310	KZ4V	302	K4SE	293	W9VA	280
OK1MP	320	K1UO	315	KB3OQ	310	WA3HUP	301	KC8JH	293	KB5DN	279
KS2I	320	YV5DFI	315	N4PN	309	VE3FJE	301	AI5I	293	EA6DE	279
YU1AB	320	W9RY	315	WD9IIX	309	WB4NDX	301	W9NUF	293	JH8NYK	279
PY1APS	320	I4EAT	315	K9QVB	309	YU2TW	301	KD5ZM	293	KX5V	279
W3GG	320	NJ2C	315	K4CXY	309	N4CRU	301	VE6PW	293	WN5K	279
I4ZSQ	320	W4UNP	315	W6NLG	309	KZ0C	301	TI2LTA	293	K4BYK	278
YV1KZ	320	YS1RRD	314	WB6PSY	309	N8BKF	301	WA4LOF	292	VE3IUE	278
W2FXA	320	K3UA	314	VK4VC	308	WT4T	301	AC0A	292	DF6EX	278
VE2WY	320	I2LLD	314	YV5AIP	308	KB2HK	301	VE3FEA	292	KG9N	278
W4NKI	320	W1NG	314	N6AV	308	K7LAY	301	VP9CP	292	I8WYD	278
YS1GMV	320	W1LQQ	314	AI8M	308	KB9KD	301	W8LKG	292	WB0UFL	277
K9BWQ	320	SM4CTT	314	NS7Z	308	K2JF	301	SV1JG	292	W4PTT	277
N6AHU	320	W6SN	314	YV1AJ	308	W5LLU	301	WA8YTM	292	WD0DMN	277
W7OM	320	WB4UBD	314	K8CMO	308	KC2FC	301	TI2JJP	292	K8YVI	277
ZS6LW	319	K9IW	314	K4MQG	308	IN3ANE	301	KE7UL	292	HK6BER	277
W3AZD	319	N2KW	314	I0MBX	307	VE4AT	300	VE3IPR	291	NC9T	277
N7RO	319	K9HQM	314	KV2S	307	SV8CS	300	W4JFE	291	N0AMI	276
W0SFU	319	EA4LH	313	VK3JF	307	G4GED	300	DU9RG	291	N7ASL	276
OZ5EV	319	W8PCA	313	VE4SK	307	WB5TED	300	XE1CI	291	WA4OPW	276
IT9XGY	319	N2SS	313	KB3OQ	307	I2ZGC	300	KB2MY	291	KC2RS	276
VE3XN	319	OE2EGL	313	KA9ABC	307	NW5K	300	KB7VD	291	WA9IVU	276
CT1FL	319	ZL1BIL	313	WA2MID	307	WB6GFJ	300	K9TI	291	K0HQW	276
W6DN	319	WZ4I	313	WA4ECA	307	JH1VRQ	300	K1HDO	291	I2WZX	276
W9JT	318	IT9TGO	313	WB4PUD	307	IT9TQH	300	N4KEL/M	291	KC4MJ	276
DL6KG	318	K0GT	313	WB6OKK	307	IK8BQE	300	VE3CKP	290	KA5YCM	276
OE3WWB	318	W2FGY	313	N4KE	306	K1VHS	300	F6BFI	290	KI4FW	276
K5OVC	318	G3VOF	313	KB5FU	306	IK8CNT	300	I4UFH	290	WB1EAZ	275
W8ILC	318	WB3DNA	313	KE3A	306	WA9RCQ	300	W9TA	289	NX4Y	275
N6AR	318	WA4WTG	313	K3LUE	306	I8IGS	300	JA5PUL	289	VE7BSM	275
KM2P	318	KQ9W	313	CX4HS	306	PY4OY	300	AI9U	289	W0FF	275
K9AB	318	W4UW	313	WD8PUG	306	ZL1BOQ	300	WD9IIC	289	I8INW	275
VE7DX	318	I8KCI	313	KE4HX	306	WA0TKJ	299	OK1AWZ	288	WB8TLI	275
KB8DB	318										

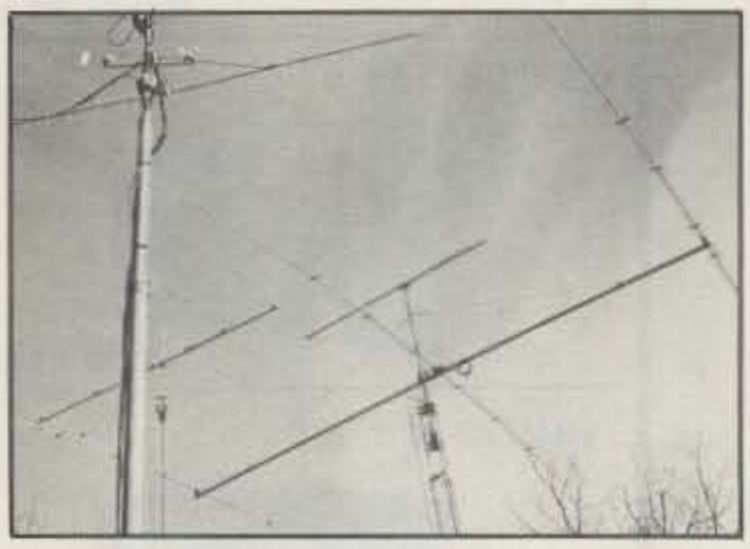
John, W0JLC, recently earned his 5-Band Worked All Zones award after tracking down the tough ones on 80 meters—zones 18, 22, 23, 24, and 26. John has also operated from 21 countries and has earned numerous contest awards, including top multi-single entry in the 1985 CQ WW CW Contest as V3A.

KF7PO, 5933 West Grovers Avenue, Glendale, AZ 85308.

In another on-the-air event George "Dick" McKercher, W0MLY, will operate /RR July 7-8, celebrating the last steam locomotive built in the world. Try 7250, 14,250, 21,250, or 28,350 kHz on SSB, and 25 kHz up on CW. QSL via W0MLY, Box 7, Rippey, IA 50235.

Finally, David Reinhart, WA6ILT, Darryl DelGrosso, WA1WYN, and Steve Caplowe, KA1UQS, will conduct their second "domestic DXpedition" July 27-29, operating portable from Rhode Island. Watch 28,465, 21,315, 14,240, 7240, and 3865 kHz on SSB, and 28,150, 21,150, 14,040, 7125, and 3725 kHz on CW. SSB during even hours; CW during odd hours. QSL with SASE to WA6ILT.

Looking farther ahead, the *CQ* WW SSB is coming up soon. Do you have plans to go on a DXpedition this year? Please share this information with your fellow DXers by sending your intentions to Box 50, Fulton, CA 95439 before July 20th. A wrap-up of planned DXpeditions will be in the October column. For those who haven't made their plans, the T32T



John, W0JLC's antenna farm includes a KLM KT34XA, a 3-element KLM 40 meter beam, and phased verticals on 40 and 80 meters.

QSL Information

(Add country name as required.)

3B9FR to F6FNU
3C1EA to EA4CJA
3D2AG to W9TU
3D2QB to SM5BQB
3DA0DX to ZS6BRZ
3G6MBQ to CE6OS
3X1SG to ON7GV
4B2A to N7BSA
4D9RG to DU9RG
4J0QWJ to UA0QBO
4K2BDU to UA9MA
4K2OT to UB5KW
4K3BB to RB5CB
4K3BCE to RA3SD
4K4AFM to UA1AFM
4K4BAN to RB5FO
4K4BCU to RA3YG
4K4POL to UA0KCL
4L3GG to RQ2GG
4M7A to YV7QP
4M9X to YV5ARV
4N2D to YU2BHI
4N4A to YU4EJC
4N4C to YU6EZC
4N5C to YU5DRS
4T4DX to OA4OS
4U1UN to NA2K
4U3/K4SXT to WB4KZW
4U5ITU to OH0XX
4X5OYT to 4X6YT
4X8MR to VE3MR
4Z4DX to WA4WTG
5B4YX to G0KKT
5H3TW to K3ZO
5N0ELT to G4OHX
5N1MRE to K4ZKG
5R8JD to F6FNU
5R8JD to F6FNU
5T5FA to IK3GES
5U7NU to F6FNU
5W1GF to ZL2ULE
5W1HK to SM7PKK
5W1HM to JA4IFF
5W1IY to WI0S
5Z4BI to W4FRU
5Z4BI to W4FRU
5Z8FO to KB4EKY
6D2DX to WB7A
6I7CQ to XE2TCQ
6W1QB to DK3NP
6Y5FS to G3RFS
7J6CAS to KE7PL
8P9AC to JA2MNB
8P9AD to VE3CRG
8Q7ZL to DK3ZL
8R1RPN to OE2GKL
9H3JR to DJ0QJ
9H3MA to DF2PI
9H3SR to DJ0QJ
9H4E to WB1GUZ
9J2FR to I2ZZU
9K2DR to 9K2MJ
9K2YA to OE6EEG
9L1CM to N4DW
9L1EY to F6GZA
9L1US to WA8JOC
9M2AX to JA5DQH
9M2ZZ to N4RMF
9M6ET to WB2KXA
9M8MKS to 9M2FH
9Q5DX to KQ3S
9Q5TE to SM0BFJ
9Q5UN to OH3GZ
9V1YB to OH1NYP
9X5NH to DJ6EA
A15AA to DJ6SI
A15AW to DK2WV
A22BW to DK3KD
A41KC to KA1XN
A41KJ to N5FTR
A51JS to VK9NS
A61AD to WB2DND
AH3C to K9UIY
BV2A to K2CM
BV2DA to DL7FT
C31SD to CT1AMK
C56/G3YJH to G3YJH
C56/G4RUT to G4LJA
CE0/JR4ISF to JA3EGE
CF2DWH to VE2DWH
CF2SA to VE3GCO
CF3DX to VE3XN
CF3HO to VE3HO
CF6UX to VE6UX
CN8FC to WA4QMQ
CQ7A to CT1AHU
CR0M to CT1CWT
CT3CU to W2ZZ
CT3EU to G3PFS
CT9/OH7XM to OH7XM
CU3LB to KB3JKB
CZ7Z to VE7ZZZ
D2/LU6ELH to N4THW
D68TW to K3ZO
DK1CE/H44 to DJ9ZB
DU1KK to W1ILD
ED1SIT to EA1EDJ
ED5MDX to EA5YU
ED5PLA to EA5DLD
EJ7GK to EI7GK
EK0DR to RW3DR
EK0KBZ to UA0KBZ
EL2CX to N2AU
EL2DK to G3OCA
EL2WK to G3OCA
EX0M to UM8MO
EX9B to UA9AM
EX9S to UA9SA
F2JD/HR6 to F6AJA
FG5R to W7EJ
FG5SBP to KA3DSW
FJ/N0IMH to N0IMH
FK8GA to FK1SB
FM5WD to W3HNK
FO0IGS to F6EEM
FO0XXL to YASME
FO4NR to F6ELE
FO5BI to F6HSI
FO5FO to F2BS
FO5LQ to F6CEE
FR4FD to F6FYA
FT4XG to FD1AAS
FT5XA to F6ITD
FT5XH to F2CW
FT5XV to F6GVI
FV1O to F6AJA
FY5EW to F6BFH
FY5FO to F6BYZ
G0JFX/5V7 to G7AUQ
G4WYG/ST2 to G4OHX
GJ0LYP to F6FYP
GM90CC to GM0EEH
H44/DL5UF to DL5UF
H73A to SM0KCR
HC8JG to WA6ZEF
HF0POL to KB6GWX
HI500UD to HI3UD
HK0TCN to K4TXJ
HL8A to HL1IE
HR1LW to JA1LW
HR2BDC to AA5ET
HR2JEP to WB6QPG
HR5/F2JD to F6AJA
HS0B to WA4BCQ
HS0E to ZL1BMU
HS0M to WA4BCQ
HS0SM to WA4BCQ
HZ1AB to K8PYD
IA8A to IK8DOI
IA90KM to IK4GNH
IB0/I5XFW to I5XFW
ID1V to I1HAG
IE8A to IK8DOI
IG1A to I1RBJ
IL3WWF to IV3YYK
IQ9W to IT9BLB
IU3A to I3MAU
IY0A to I0JBL
J20TW to K3ZO
J28SI to DJ0SI
J34LTA to W5PWG
J37XC to W2BJI
J77A to JJ1TZK
J8/JJ3IMX to JL3UIX
J88BS to WA4WIP
J8AA to JJ1TZK
JA2EZD/J3 to JA2MND
JG2CLS/JD1 to JG2CLS
JG3KUT/CE0 to JA3EGE
JJ3IMX/J6L to JL3UIX
JP1DMS/HI8 to JA1ELY
JR4ISF/CE0 to JA3EGE
JU1DX to JT1XJ
JW1UG to LA5NM
JY9SR to W3FYT
K4SXT/DU3 to WB4KZW
K4YT/DU8 to K4YT
KB6DDV/DU3 to WA6LBU
KG4CL to KC3CL
KG6SL to WA6AHF
KH0/JK1ZHW to JK1ZHW
KH0SAC to K7ZA
KH6JEB/KH7 to KH6JEB
KH8/SM7PKK to SM7PKK
KT8Y/VP2E to KT8Y
LP3F to LU6FAZ
LS1H to LU1HM
LT5F to LU5FCI
LU1F to LU1FLY
LU1ZA to LU2CN
LU6ELF/D2 to N4THW
LW1DIO to LU4AA
LZ6W to LZ2KSQ
N6QLQ/5N0 to N6QLQ
OB4ZV to OA4ZV
OH0AM to OH2QV
OH0BCI to OH2BCI
OH6XY/OH0 to OH6XY
OL4A to OK1AEZ
OQ7AR to ON4AAQ
OX3LX to OZ1DJJ
OX3XR to OZ3PZ
OY3QN to OZ1ACB
P29BT to N5FTR
P29CG to WB9SVK
P35SP to 5B4ES
P4/N4XCF to WD4IBP
P40V to AI6V
PJ0B to WA2NHA
PJ2/OH3VV to OH3VV
PJ2/OH6RI to OH6RI
PJ4A to K2SB
PJ6/W4OVU to W4OVU
PJ6/WS4E to WS4E
PJ9J to W1AX
PJ9JT to W1AX
PQ2DX to PY5TT
PQ4OD to PY4OD
PZ5DX to K3BYV
PZ5JR to K3BYV
R6L to UZ6LWZ
RA0AD/JT to RA9YD
RA9F to UA9FAR
RA9YU to UA9YAB
RD8D to LZ1KVZ
RI6O to RI1OA
RL1P to RL8PYL
RV3E/JT1BY to UA3EAC
RV8T/UZ0SXF to UZ0SXF
RX9J to UC2ABA
S01EA to EA2JG
S2IU to JA1UT
S77A/J6 to JJ1TZK
SN5W to SP5PBE
SN6O to SP6PAZ
SN9C to SP9PKR
ST4/WZ6C to W4FRU
SV5/DK6AS to DJ8MT
T32AB to N7YL
T32AW to K1RH
T32BD to KB6IDX
T32BN to W9GW
T32CDF to WH6CDF
T32CI to N6HYK
T32CK to N6RZC
T32IO to AH6IO
T32LB to JH1BSE
T32PG to WH6CEW
T32T to KH6VP
T32VP to KH6YP
T50DX to I2JSB
T5YD to F6AJA
TA0A to TA2BK
TA3C to DL5YCQ
TE8IP to TI0RC
TI10E to TI4SU
TI2JJP to I0WDX
TI2YO to KU9C
TJ/AH6HQ to AH6HQ
TJ1BJ to K4UTE
TK/DL7HZ to DC7HZ
TL8CK to F6EWM
TL8DO to W8XM
TL8WD to DL8CM
TM6A to F6AUS
TQ6A to F6EXV
TR8JLD to AK1E
TU2PA to KE0LS
TU2VE to WB4UBS
TY1DX to IK6FHG
TZ6FIC to F6CRS
TZ6RC to NM3B
TZ6VV to N0BLD
U0K/UV1POL to UA0KCL
UA0/GB4MSS to GM1AUZ
UA0KBA to RA3YG
UA0KJ/A to UA0KCL
UA1O/UB5MAL to UZ1PWA
UC1AWC to UC2ABC
UC5A/UA6EO to UC2AHZ
UD6DKW to W3HNK
UD7ODC to UD6DC
UD7ODJ to UD6DJ
UD7KWB to UG6GAT
UG6GAW to JA3RL
UG6GCC to UG6GAT
UG7GWG to UG6GAT
UH8EA to RA3AR
UI8QU to K9FD
UK6ASI to DL7SI
UL7JC to K8BTH
UM8NU to F6FNU
UW8V/UA0UBG to UA9AB
V2/JJ1TKX to JJ1TKX
V31KX to KR5N
V47A to JJ1TZK
V47BVS to WA9BVS
V47EZD to JA2MNB
V47NXX to KC8JH
V47NZD to W1JZB
V51E to K8EFS
V63AA to KB3R
V63AD to WA7VVA
V63AN to JA2NQG
V63AO to KC6IN
V63AZ to JA0GZ
V73AQ to KX6BU
V73AS to KK4QV
V73AX to KX6BU
VK6HX to VK6AVO
VK9LE to VK3OT
VK9TR to VK5FG
VO3MP to VO1MP
VP2E to KC8JH
VP2EHF to KA3DBN
VP2EXX to KC8JH
VP2MEZ to JA2MNB
VP2V/KG6WI to KU9A
VP2VM to KW1K
VP5P to WN5A
VP5VMK to W7FKF
VP5VPX to W4NPX
VP8BUB to G4YLO
VO9/W3JJ to K3ZO
VO9HB to KA6V
VO9JT to K5DIY
VO9LW to WA2ALY
VO9NS to NV7S
VR2OOPI to KB6ISL
VR6JR to G3OKQ
VS6CM to W0JLC
VS6DX to WA4BCQ
VS6WO to VE3MR
VS6WV to K0TLM
VU2N8T to WA4FVT
VU2NUD to VU2NRJ
VU2XYL to VU2RX
VU2ZAP to W3HNK
VY2OX to VE1FW
WL7BWA to KL7AF
XE3XE to XE3EB
XF1C to WB6JMS
XM1TV to VE1TV
XM5FX to VE5FX
XM9CCA to VE1DH
XT2BW to WB2YQH
XU8DX to F2YS/W2
XV0SU to 3W3RR
XX9KA to KC9V
YB0ATA to N4JR
YB8HX to K8PYD
YL1ZW to UQ2GKL
YL2JN to K7GEX
YL2LW to UQ1GWW
YN3EI to KF7GH
YT2A to YU7GMN
YT7A to YU7GMW
YV0AA to YV5AK
YW1A to YV1AVO
YZ4Z to YU6FRS
Z21CA to NM7G
ZB2/F2JD to F6AJA
ZD7CW to N4CID
ZD7KM to G3JKB
ZD9BV to W4FRU
ZF2NE/8 to W5ASP
ZK1XC to VE3BQL
ZK1XL to DL3MDJ
ZK1XN to KR0B
ZK1XQ to SM5BOQ
ZK2KK to SM7PKK
ZL0LC to HB9SAA
ZM0AEM to NW4Y
ZS6AIS/9 to ZS6AIS
ZS8MI to ZS6PT
ZV7AA to PT7AA
ZV7AZ to PT7AZ
ZV7BI to PY7BI
ZW5B to PY5EG
ZX5C to PY5CC
ZY0FX to W9VA
ZY5TT to PY5EG
ZZ0TA to PP1CZ
3B9FR to Box 31, Rodrigues Island
3W2RR to Romeo, Box 308, Moscow 103009 USSR
4K4QQ to Box 1, Cherepovits 162611
4N4K to Box 4, 72240 Kakanj, Yugoslavia
4S7WP to Box 80, Colombo
5N8KBM to Box 105, Kano, Nigeria
5T5SR to Box 50, Atar
5W1GF to Box 7344, Wellington
5W1KT to Box 1672, Apia
5Z4FM to Box 34168, Nairobi, Kenya (2 IRCs)
5Z4FN to Box 45681, Nairobi
7X2DS to Box 105, Rouiba 35300
7X3DA to Hamid Djoudi, P.O. Box 1033-LM, Laghouat 03000 Algeria 9K2CS to Mohamed-al-Sabah, Box 476, Safat, Kuwait
9K2KS to Box 3181, Safat City 13032
9Y4DA to Dave, Box 1164, Port-of-Spain, Trinidad & Tobago
A41JV to Box 2447, CPO Seeb, Oman
A45ZO to P.O. Box 981, Muscat, Oman
BV4OB to Box 146, Taichung
BY5TS to Box 901, Fuzhou PRC
CE0DFL to Box 7, Easter Island, Chile
EA9KD to Box 291, Ceuta, Spain 11780
EK0DAP/4K4 to Box 73, Moscow 103051
EL7X to Box 538, Monrovia, Liberia
EP2MKN to P.O. Box 1175, Mashhad 91375
ES0ZA to Box 55, Kaerdio, Estonia 203200 USSR
ES1WN to Box 1647, Tallinn
FO0MGZ to Box 91608, Papetta
FR5EL to Box 87, Letamiox Cedex 97832 Reunion Island
HI8BG to Box 163-9, Santo Domingo, Dominican Republic
HK0EFU to P.O. Box 464, San Andreas
HK0NZI to P.O. Box 1019, San Andreas
OD5AS to P.O. Box 121, Tripoli
OD5SK to Box 180, Tripoli
RL5D/UW9YY to Alex Korshikov, Box 34, Rubtsovsk Altai 658222 USSR
RL7AA to Box 193, Shevchenko 466200
RL7GA to Box 47, Alfa Ata 480000
RT9U/UB4MM to Box 73, Lisichansk 349918
RV6AF to Box 3, Novokubansk 352210
SU1HN to Hameo Nassar, Box 1578 Alf Maskan Cairo
T30JH to Box 299, Ryde Sydney Australia 2112
TA3D to Box 963, Izmir
TA7E to Box 76, Trabzon NR 61000
TG9NR to Tony, P.O. Box 1200, Guatemala City
TG9YV to P.O. Box 362, Guatemala City
TL8PS to Serge, Box 265, Hague Nau 67500 France
TU2QQ to P.O. Box 3023, Abidjan 01
UA0FE to Box 29, Sakhalin Island 693007 USSR
UA9TS to Box 14, Orsk 26 462426
UB5BCD to P.O. Box 91, Ternopol 282001
UB5NGC to Box 3054, Vinnitsa
UD7ODKW to Box 220, Baku 370000
UJ8JX to Box 327, Dushanbe 734001
UL7LEB to Alex, P.O. Box 29, Rudny 9, 459120 Kazakh USSR
UL7MU to Box 95, Uralsk 6, 417006
UM8NA to Box 1, Tashkumyr 715430 Kingliza
UM9MYY to Box 1724, 720023 Frunze
V31SW to Scotty, Box 1522, Belize City, Belize
V32SW to Box 286, Belize
V51NAM to Box 1100, Windhoek, Namibia
V51P to Box 9080, Windhoek
VP8BXG to Peter, Box 260, Port Stanley, Falklands
VP8BXK to Paul Chatfield, Signey Island, South Orkney Via Falkland Isl
VU2TNA to P.O. Box 4250, Bangalore
VU2TTC to Box 54, Villup Uram 605602
XW8KPL to Thong, Box 310, Veintiane
YK1AO to Box 245, Damascus
YL1XX to Box 100, Riga 007
YN3CC to Box 2971, Managua
ZD7DP to Desmond Peters, Box 86, St Helena, South Alantic UK
ZK2KY to Kiyoho, Box 3, Tokamura 31911 Japan
ZS3PH to Box 9080, Windhoek, Namibia
ZS9A to P.O. Box 2327, Walvis Bay 9190, Rep. of South Africa
ZV7SY to P.O. Box 3344, Fortaleza Cearo ZC 60032

team that operated from Christmas Island in the *CQ* WPX SSB Contest is pulling together another multi-multi team for the *CQ* WW SSB Contest. Cost will be about $1350 from Honolulu. For complete details contact Mary Jay, 59-335 Wilinau Road, Haleiwa, HI 96712.

WPX Award Update

Due to increased supplier material costs, as of July 1 the fee for the *CQ* WPX Award of Excellence plaque is $60. Original Honor Roll applications are now $4.00. The 160 meter endorsement fee remains at $5.25.

QSL Notes

AA5BL reports that he is **not** the manager for **9K2CS**. QSL direct to Mohamed Al-Sabah, P.O. Box 8974, 22060 Salmiyah, Kuwait.

N7EB cannot confirm contacts with **9N1MM** made by Les, SP9LJD, in November 1989. QSL to IKØGRS instead.

K1ZLA can no longer confirm QSOs with **ZS3KC**, as he has not received any logs after March 1988.

The February operation of **9S5G** from Zaire can be confirmed via operator KD3P, W.S. Georgia, 7031 Wilson Lane, Bethasda, MD 20817. He also handles cards for his son, **9T5MD**.

Kai Mauseth, LA2TO, QSL manager for **9H1EL** and **9H3DN**, has moved. His new address is Ragnhild Schibbyes V 60, N-0968 Oslo 9, Norway.

QSL the February/March operation of **ZMØAEM** to Mark Foster, NW4Y, 3409 Darlene Circle, Huntsville, AL 35810.

YL2LW, ex-RQ2GGI and UQ2GLW, is Victor Apauco, P.O. Box 104, Riga 63, Latvia 226063, USSR.

QSL **IU4K** to Paolo Peggi, I4ABF, via Molino di Pescarola 64, 40131 Bologna, Italy.

QSL **PJ9W** via Carl Ikaheimo, OH6XY, P.O. Box 1, SF-21171 Korppoo, Finland. QSL **PJ2/ON6NU** via his new address: Tim Korhonen, Pillilammenk 5, SF-40270 Palokka, Finland. QSL **PJ2/ON6RM** and **PJ9M** via Touko Kapanen, SF-77980 Istunmaki, Finland.

Conflicting information about QSLing **V31BB**. K4CKA gives his address as Jim Zimskind, San Pedro, Ambergris Caye, Belize, but K7APT says Jim does *not* QSL. K7APT says his experience is that Jim doesn't respond even to US $1.00.

Also in Belize is **V31SW/V32SW**, Scott Williams, P.O. Box 1522, Belize City, Belize.

Olli Rissanen, OHØXX, can handle cards for all of his contest operations, including **/OJØ, /EA, /EA9,** 1982 WPX SSB **4U1ITU**, 1987 *CQ* WW CW **CR9BZ**, 1989 *CQ* WW CW **PY1RO**, and 1986-88 *CQ* WW operations of **FY5YE**, whose regular QSL manager is W5JLU.

V63CQ QSLs via his home call, KB5FGL, *after* his return in June.

CU3LD can be confirmed via Howie Hatfield, Box 1739, APO New York 09406.

Bob, W7TSQ/YB3ASQ, has returned to Washington state. QSL direct to 809 Cary Road, Edmonds, WA 98020, with a business-size SASE. Cards sent via the YB bureau will take a few years to get to Bob.

ES6DO, ex-UR2RDO, is Neil Viskov, P.O. Box 73, Linna, Valga Maakond, 202532, Estonia. The Estonia QSL bureau is P.O. Box 125, Tallinn, 200125, Estonia.

QSL the **OQ7AR** WPX SSB operation via Peter, ON4AAQ, P.O. Box 1, B-9230 Melle, Belgium.

Club station UT4UXW will use the special contest call **RT1U** during several large contests in 1990. QSL RT1U via P.O. Box 785/1, Kiev 58, 252058 USSR.

Correction: Baldur, **DJ6SI**, says he is still a member of the DARC. However, he will *not* respond to cards via the DARC bureau.

Joanie, KA6V/7, reports she has logs for **XV5AB** April 12, 1974 to March 4, 1975, and for **XW8FA** and **XW8EZ** December 13, 1972 to April 14, 1974.

The Council of Europe Radio Amateurs Club says that as long as the DX Advisory Committee of the ARRL refuses to recognize **TP2CE** as a separate DXCC entity, cards arriving from the ARRL outgoing bureau will be rejected. QSL direct to Francis Kremer, F6FQK, 31 rue Louis Pasteur, 67490 Dettwiller, France.

QSL the 1990 WPX SSB operation of **4M9X** via YV5ARV, P.O. Box 3636, Caracas 1010-A, Venezuela.

Corrections: Although we make every effort to publish accurate QSL information, occasional errors creep in due to misunderstandings, copying errors, etc. NØBCD is not the manager for **TZ6VV**; the correct manager is NØBLD. Although N2OO can and does answer QSL requests for **XX9OO**, the correct QSL route is via K8CW. The manager for **XE1L** is WA3HUP, not WA3HVP. And the manager for **VP5T** is WB3DNA, not WB3BNA.

CQ DX Awards Program

SSB

1758	K7EHI	1762	N8IBW
1759	KE7UL	1763	KA1UJ
1760	IK2GNW	1764	KD4MM
1761	W2FXA	1765	VE7HIM

CW

787	KB8DB	789	YU1TR
788	TI4SU	790	I8IYW

SSB Endorsements

320	K2FL/324	310	KB8DB/318
320	W6EUF/324	310	KC8EU/317
320	W4UG/324	310	WA4JTI/317
320	VE1YX/324	310	I8LEL/317
320	K6WR/323	310	KR9O/317
320	W9DWQ/323	310	9H4G/316
320	W4DPS/323	310	W4UNP/315
320	WØYDB/323	310	K9HQM/314
320	DL9OH/323	310	I8KCI/313
320	YU1HA/323	310	W4UW/313
320	ZL1AGO/323	310	IK2GNW/312
320	4Z4DX/323	310	KSØZ/312
320	IØZV/323	310	I1POR/310
320	W2SUA/322	310	KB3OQ/310
320	VE3GMT/322	300	WA4IUM/305
320	OA4OS/322	300	K7EHI/303
320	N4MM/322	300	XE1XM/303
320	IØAMU/322	300	KZ4V/302
320	W9SS/321	300	ZL1BOQ/300
320	K6JG/321	275	KF5DX/298
320	W4NKI/320	275	VE5FX/294
320	N6AHU/320	275	KE7UL/292
320	K9BWQ/320	275	N4KEL/M/291
320	W2FXA/320	275	K1HDO/291
320	VE2WY/320	275	NC9T/277
320	YS1GMV/320	200	SP1MHV/208
310	W6DN/319	200	KD4MM/201
310	W7OM/318	150	KA1UJ/150

CW Endorsements

320	W9DWQ/324	275	W6DN/299
320	K2FL/324	275	WA4IUM/290
320	K2TQC/324	275	W6YQ/294
320	DL1PM/323	275	KB8DB/280
320	K6JG/322	275	KA3R/278
310	N4MM/319	275	KUØS/277
310	K1MEM/319	250	YU1TR/255
300	K8BWQ/308	250	OZ5UR/253
300	K2OWE/306	200	TI4SU/236
300	W1WAI/302	150	N4KEL/M/181
300	KZ4V/300	150	G4ASL/150

Total number of active countries is 323. 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 air-mail reply. Please make all checks payable to the awards manager.

THE WORLD RADIOSPORT TEAM CHAMPIONSHIP

BE A PART OF HISTORY

In July and August, 1990, 2,500 invited world-class athletes from around the world will gather in Seattle for the 1990 Goodwill Games™. "Uniting the world's best™" is the motto of these Games.

In keeping with the spirit of the Goodwill Games, a similar competitive event with world class amateur radio contesters has been planned. The World Radiosport Team Championship, held in cooperation with the Goodwill Exchange Program of the 1990 Goodwill Games, is endorsed by the Radio Sport Federation in the Soviet Union and the American Radio Relay League in the U.S.

On July 20th, 1990, up to 23 international teams of the world's best HF contesters will participate in the historic World Radiosport Team Championship.

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In addition to the four US and four USSR teams, competitors have been invited from Japan, Canada, Spain, Yugoslavia, Hungary, Bulgaria, England, Sweden; Finland, Italy, France, Germany, Czecheslovakia, Brazil and Argentina. All teams will use fully equipped ICOM stations.

Members of the American team include K1AR, KQ2M, K7JA, K1DG, KRØY, W9RE, W7EJ and AA4NC. The Honorary U.S. Team Captain is Katashi Nose, KH6IJ, and the alternates are K1CC, N2AA and KNØE. The international teams are now being finalized.

The ten-hour competition begins on July 20, 1990, at 2100 UTC. All standard contest bands from 80-10 meters will be used on both CW and SSB. Official WRTC stations will be identified by having /WG (World Games) after their call. Check the July issue of most ham magazines for complete rules.

In addition to our sponsors, the WRTC is also supported by CQ Magazine & Joe Mullan, W3RLR.

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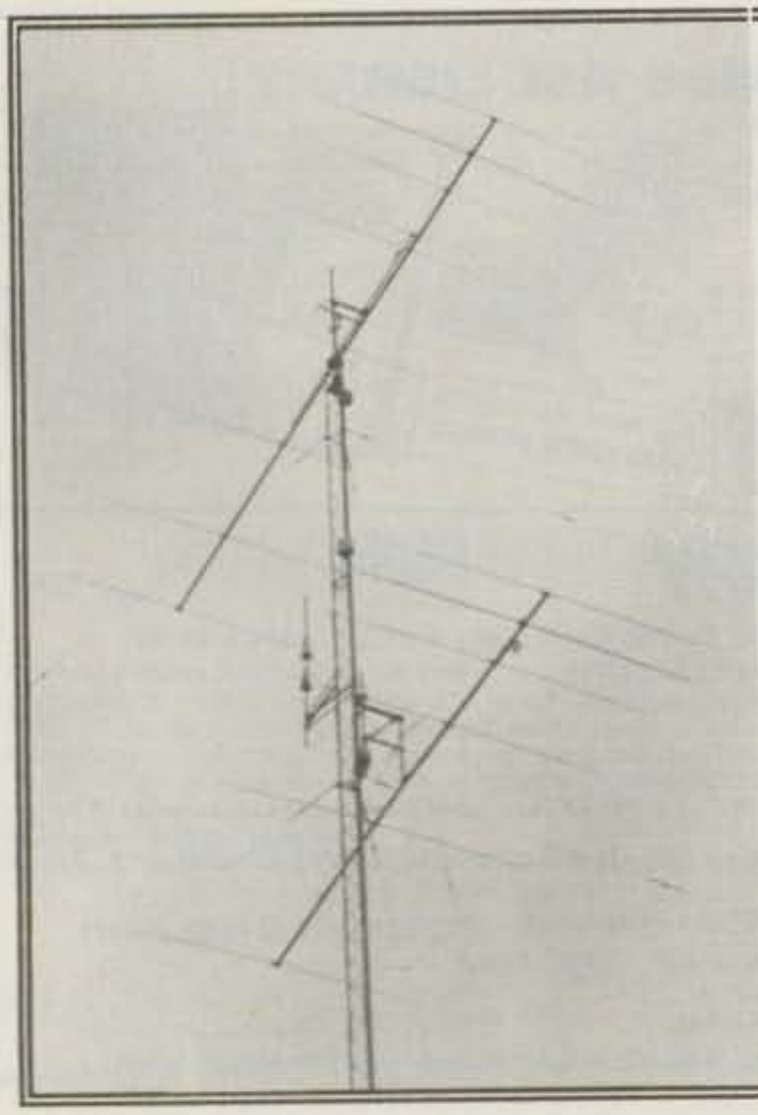

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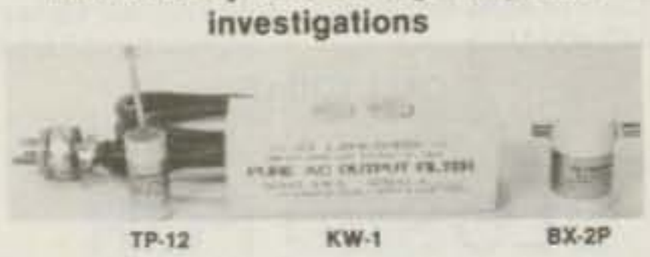

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SALE: Heath SB-104, excellent shape, $150. Tempo One, speaker P/S, mike and book, needs work, make offer. Chris, KB4MRH. HCR 04 Box 78A, Millboro, VA 24460 or 703-863-5186.

HELP: Have Clipperton-L, with bad transformer. Need either to sell unit as is, with twelve 811s, or buy transformer to repair unit. N2CLS, 10009 White Cascade, Charlotte, NC 28213 (704-549-9339).

NEED DIAGRAMS and technical manual of the Collins Receiver 51Q-1 (51J-4). Will pay cost and M.E. Thank you. Giuseppe Babini, via Del Molino 34, I-20091 Bresso MI, Italy.

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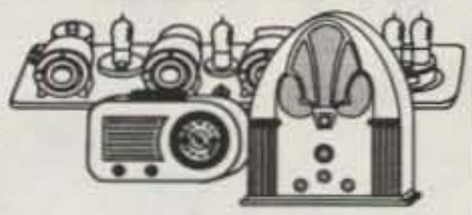

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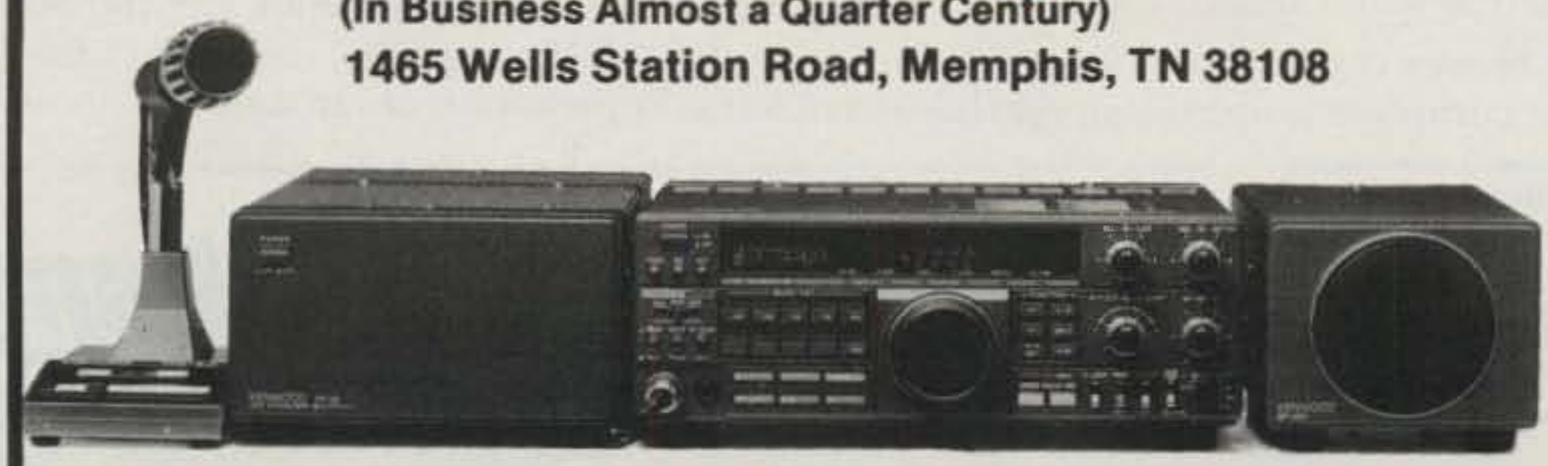

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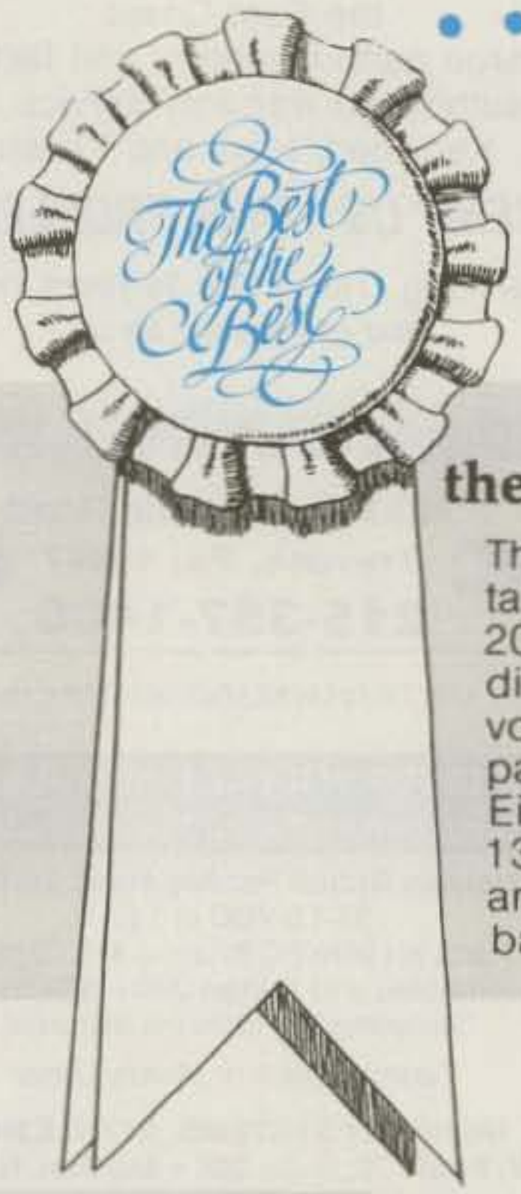
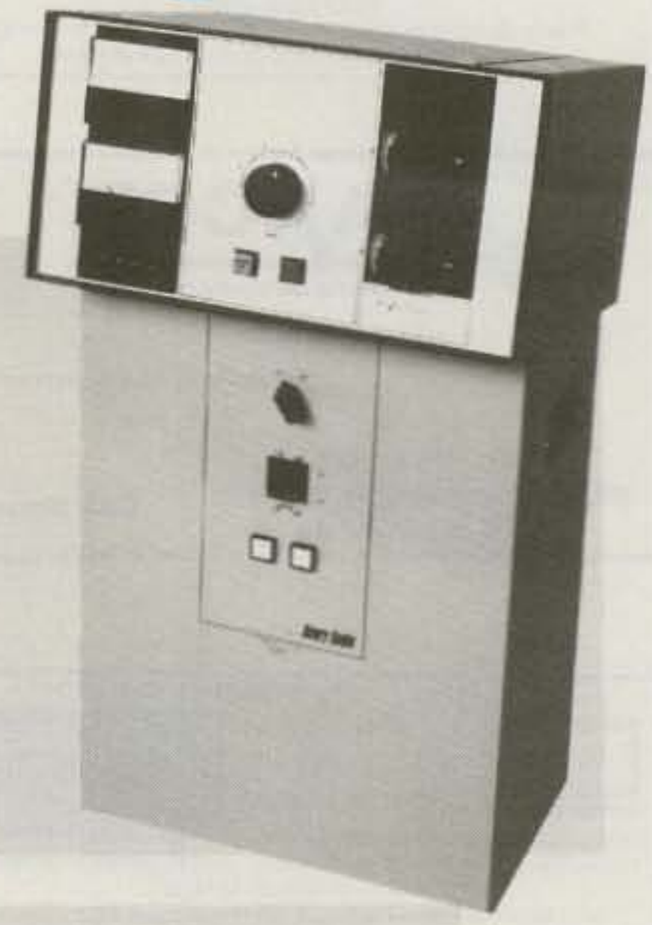
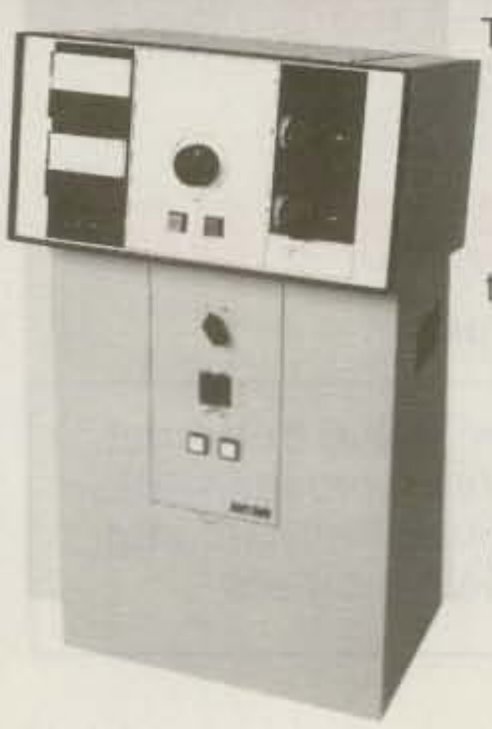


the FT-1000 the 3K Classic X

The FT-1000, Yaesu's finest, features Direct Digital Synthesis, continuous adjustable output from 20 to 200 watts, simultaneous reception of two different frequencies, 100 memories, digital voice storage, and so much more. A wonderful partner, the 3K Classic X, Henry's finest, uses Eimac's superb 3CX1200A7 tube. . .more than 13 db gain. it's an absolute workhorse and every amateur's dream. Operates on all amateur bands*. Loafs along at full legal power all day.



FT-767GX and the 2K Classic X



The FT-767GX, a wholly new concept in convenience, control and reliability. Receives from 100kHz to 29.99999 MHz continuously and transmits on all amateur bands. The 2K Classic X is a rugged, durable 2000 watt amplifier that was designed and built to push your signal to the limit. . .with almost no effort.*

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the 747GX and the 2KD Classic

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CIRCLE 73 ON READER SERVICE CARD

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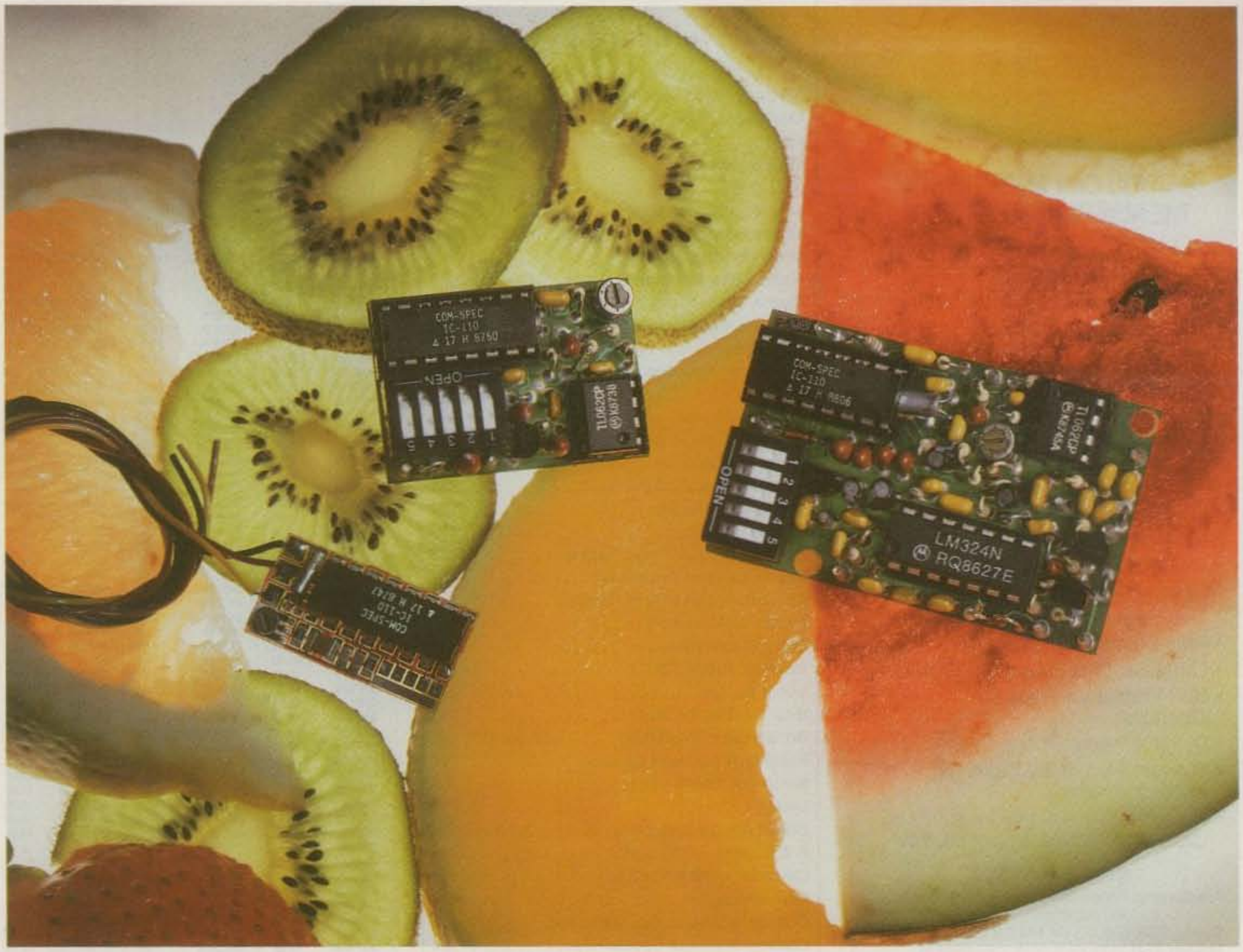
(Continued on page 135)



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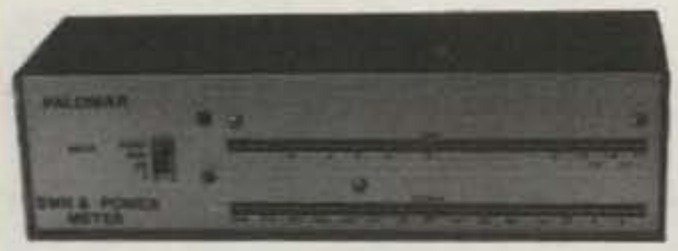

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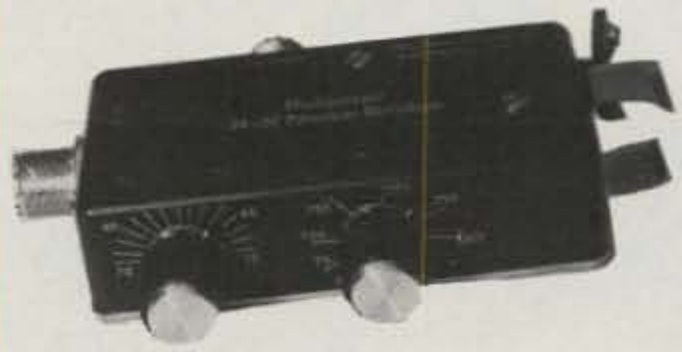

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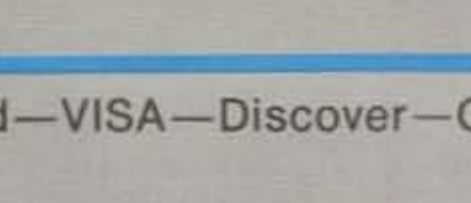

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MULTI-FUNCTIONAL CRT DISPLAY
Can be used as a terminal to display DX packet cluster information!

SEPARATE RIT & TX FOR EACH VFO

SPECTRUM SCOPE

AUTOMATIC ANTENNA TUNER

DUAL WIDTH NOISE BLANKER

FULL CW BREAK-IN

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1777 Phoenix Parkway, Suite 201, Atlanta, GA 30349
3071 - #5 Road, Unit 9, Richmond, B.C. V6X 2T4 Canada

Remotely Unique.*

First and only detachable remote control panel all-mode HF radio.

FT-747GX: Good things come in small packages

The Yaesu FT-747GX packs more features you want into a size you can handle—on the road or at home.

When interior space in your vehicle is at a premium or security is a concern, the optional remote kit (RMK 747) allows you to mount the FT-747GX control panel on the dashboard, center console or any convenient area.

While the detached transceiver can be installed anywhere—in the trunk or under the seat.

Trust Yaesu to give you the best—powerful transceivers delivering clear communications and trouble-free operation for years to come.

The FT-747GX was made for you. Check these features:

- General coverage: continuous reception from 100 kHz to 30 MHz.
- Ergonomic design includes front panel mounted loudspeaker and unobstructed display/control layout.
- Easy one-touch dual VFO control to select a favorite frequency or operate split with minimum effort.
- 20 memory channels store mode and skip-scan status for auto resume scanning of selectable memories. (Up to 18 memories can store independent TX and RX frequencies—great for split frequency combinations!
- 100 watts of PEP output on all HF amateur bands.
- Compact and lightweight SSB, CW, AM and FM (optional) transceiver.

Standard model shown.

Yaesu has a little something for you

If the FT-747GX or FT-757GX II sounds like the transceiver you've been looking for, contact the Yaesu dealer nearest you.

FT-757GX II: All mode transceiver

The remarkable heatsink design of the FT-757GX II includes a whisper-quiet cooling fan, with a duct flow cooling system incorporated into the body of the transceiver.

The FT-757GX II offers a full array of features as standard items, such as: built-in USB, LSB, AM, CW and FM. 600 Hz CW filter, iambic keyer. Full break CW. 25 kHz marker generator. IF shift and notch filters, effective noise blanker and AF speech processor.

- 10 memory channels which store both frequency and mode for tranceiver or general coverage reception—without band switching.
- 100 watts of PEP output on all HF amateur bands.
- General coverage: continuous reception from 150 kHz to 30 MHz.

YAESU

*Performance without compromise.*SM

*Optional remote kit (RMK-747) shown.