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Amateur Radio

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CQ

Packet and AMTOR Special

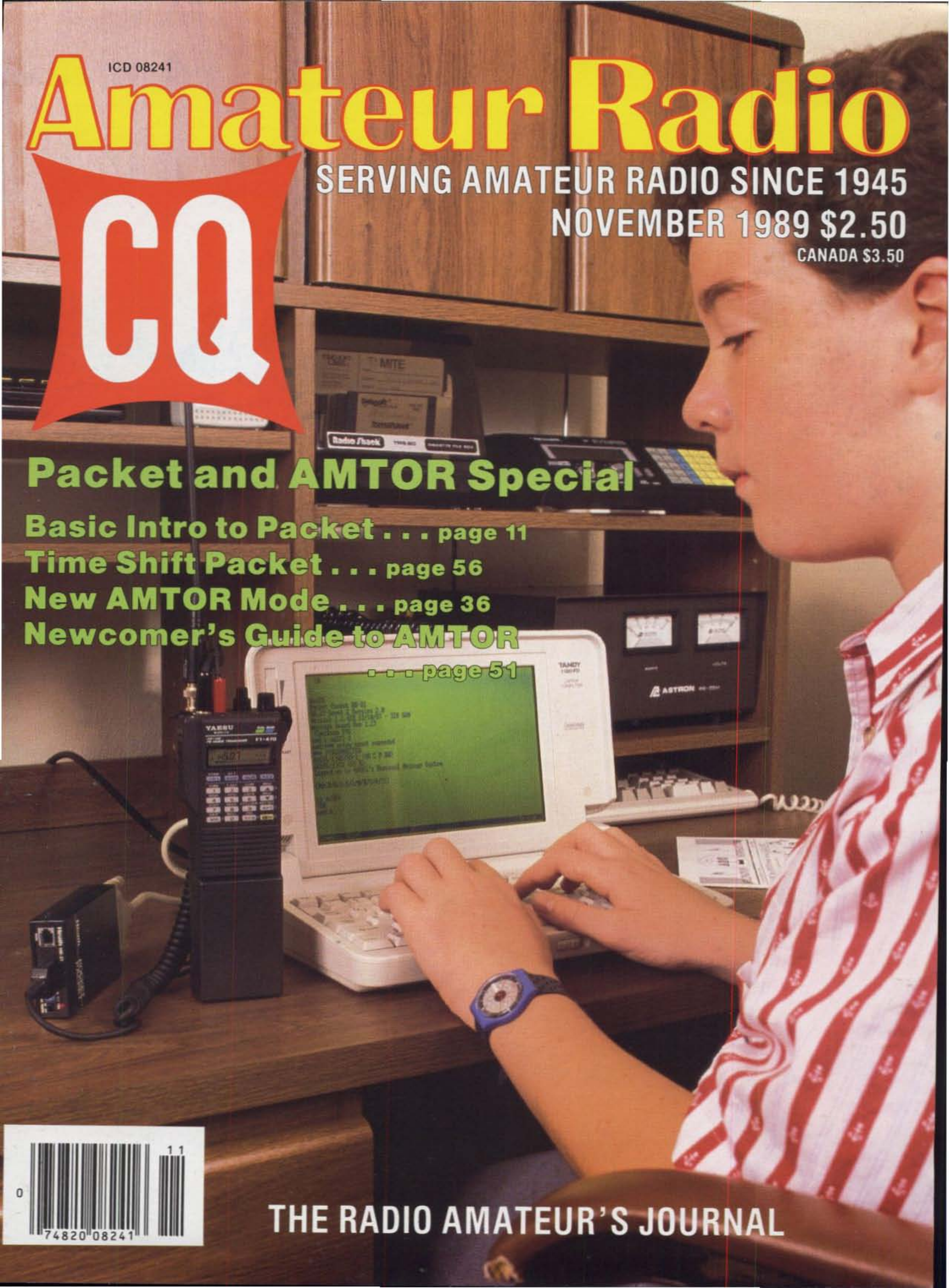
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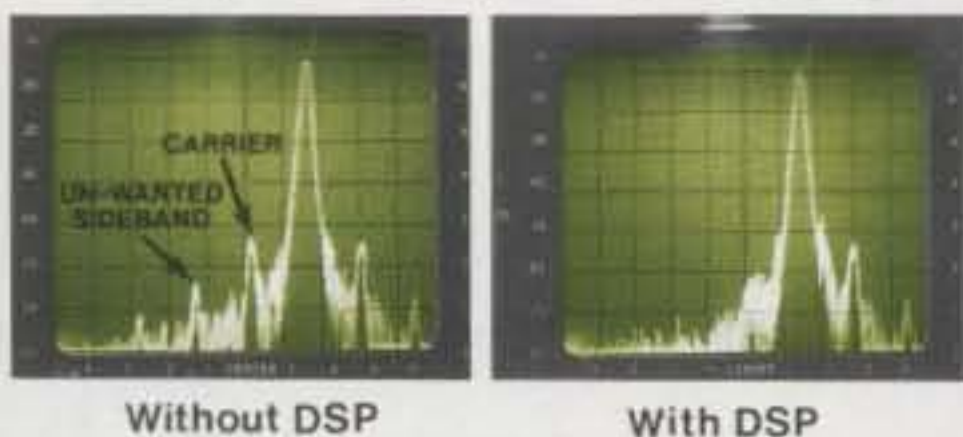


THE RADIO AMATEUR'S JOURNAL



DSP
Digital Signal Processing

Digital Signal Processing



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.

• **Digital Signal Processor.** DSP is a state-of-the-art technique that maximizes your transmitted RF energy. Your signal stands out because it is much more pure than your competition! You can even tailor your transmitted CW or voice signal waveshape!

• **Dual Frequency Receive Function.** The TS-950SD can receive two frequencies simultaneously. The sub-receiver has independent controls for frequency step size, noise blanker, and AF gain and its own digital display!

• **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.** 50V power transistors are used in the 150W 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.** The new antenna tuner is faster and you can store the settings in memory! (Manual override is also possible.)

Transmit the ultimate signal.

• **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.

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

• **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!

• **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.

• **Built-in TCXO for 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 • Optional VS-2 voice synthesizer • Built-in heavy duty AC power supply and speaker • Adjustable VFO tuning torque • Multiple scanning functions • MC-43S hand microphone supplied

KENWOOD U.S.A. CORPORATION
COMMUNICATIONS & TEST EQUIPMENT GROUP
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Mississauga, Ontario, Canada L4T 4C2

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Optional Accessories

- VS-2 Voice synthesizer
- SP-950 External speaker w/AF filter
- SM-230 Sta-

- tion monitor w/pan display
- SW-2100 SWR/power meter
- TL-922A Linear amplifier (not for QSK)



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

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NEW!

Affordable DX-ing!

TS-140S

HF transceiver with general coverage receiver.

Compact, easy-to-use, full of operating enhancements, and feature packed. These words describe the new TS-140S HF transceiver. Setting the pace once again, Kenwood introduces new innovations in the world of "look-alike" transceivers!

- **Covers all HF Amateur bands with 100 W output.** General coverage receiver tunes from 50 kHz to 35 MHz. (Receiver specifications guaranteed from 500 kHz to 30 MHz.) Modifiable for HF MARS operation. (Permit required).
- **All modes built-in.** LSB, USB, CW, FM and AM.
- **Superior receiver dynamic range** Kenwood DynaMix™ high sensitivity direct mixing system ensures true 102 dB receiver dynamic range.



- **New Feature! Programmable band marker.** Useful for staying within the limits of your ham license. For contesters, program in the suggested frequencies to prevent QRM to non-participants.
- **Famous Kenwood interference reducing circuits.** IF shift, dual noise blankers, RIT, RF attenuator, selectable AGC, and FM squelch.

- **M. CH/VFO CH sub-dial.** 10 kHz step tuning for quick QSY at VFO mode, and UP/DOWN memory channel for easy operation.
- **Selectable full (QSK) or semi break-in CW.**
- **31 memory channels.** Store frequency, mode and CW wide/narrow selection. Split frequencies may be stored in 10 channels for repeater operation.
- **RF power output control.**
- **AMTOR/PACKET compatible!**
- **Built-in VOX circuit.**
- **MC-43S UP/DOWN mic. included.**

Optional Accessories:

- **AT-130** compact antenna tuner • **AT-250** automatic antenna tuner • **HS-5/HS-6/HS-7** headphones • **IF-232C/IF-10C** computer interface
- **MA-5/VP-1** HF mobile antenna (5 bands)
- **MB-430** mobile bracket • **MC-43S** extra UP/DOWN hand mic. • **MC-55** (8-pin) goose neck mobile mic. • **MC-60A/MC-80/MC-85** desk mics.
- **PG-2S** extra DC cable • **PS-430** power supply
- **SP-41/SP-50B** mobile speakers • **SP-430** external speaker • **TL-922A** 2 kW PEP linear amplifier (not for CW QSK) • **TU-8** CTCSS tone unit
- **YG-455C-1** 500 Hz deluxe CW filter, **YK-455C-1** New 500 Hz CW filter.



TS-680S

All-mode multi-bander

- 6m (50-54 MHz) 10 W output plus all HF Amateur bands (100 W output).
- Extended 6m receiver frequency range 45 MHz to 60 MHz. Specs. guaranteed from 50 to 54 MHz.
- Same functions of the TS-140S except optional VOX (VOX-4 required for VOX operation).
- Preamplifier for 6 and 10 meter band.



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

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All-mode
tri-bander!

Warp Drive!



TS-790A Satellite Transceiver

The new Kenwood TS-790A VHF/UHF all-mode tri-band transceiver is designed for the VHF/UHF and satellite "power user." The new TS-790A is an all-mode 144/450/1200 MHz transceiver with many special enhancements such as automatic uplink/downlink tracking. Other features include dual receive, automatic mode selection, automatic repeater offset selection for FM repeater use, VFO or quick step channel tuning, direct keyboard frequency entry, 59 memory channels (10 channels for separate receive and transmit frequency storage), multiple scanning and multiple scan stop modes. The Automatic Lock Tuning (ALT) on 1200 MHz eliminates frequency drift. Power output is 45 watts on 144 MHz, 40 watts on 450 MHz, and 10 watts on 1200 MHz. (The 1200 MHz section is an optional module.)

- **High stability VFO.** The dual digital VFOs feature rock-stable TCXO (temperature compensated crystal oscillator) circuitry, with frequency stability of ± 3 ppm.
- **Operates on 13.8 VDC.** Perfect for mountain-top DXpeditions!
- **The mode switches confirm USB, LSB, CW, or FM selection with Morse Code.**
- **Dual Watch allows reception of two bands at the same time.**
- **Automatic mode and automatic repeater offset selection.**
- **Direct keyboard frequency entry.**
- **59 multi-function memory channels.** Store frequency, mode, tone information, offset, and quick step function. Ten memory channels for "odd split."
- **CTCSS encoder built-in.** Optional TSU-5 enables sub-tone decode.
- **Memory scroll function.** This feature allows you to check memory contents without changing the VFO frequency.

- **Multiple scanning functions.** Memory channel lock-out is also provided.
- **ALT—Automatic Lock Tuning—on 1200 MHz eliminates drift!**
- **500 Hz CW filter built-in.**
- **Packet radio connector.**
- **Interference reduction controls:** 10 dB RF attenuator on 2m, noise blanker, IF shift, selectable AGC, all mode squelch.
- **Other useful controls:** RF power output control, speech processor, dual muting, frequency lock switch, RIT.
- **Voice synthesizer option.**
- **Computer control option.**

Optional Accessories:

- **PS-31** Power supply • **SP-31** External speaker
- **UT-10** 1200 MHz module • **VS-2** Voice synthesizer unit
- **TSU-5** Programmable CTCSS decoder
- **IF-232C** Computer interface • **MC-60A/MC-80/MC-85** Desk mics • **HS-5/HS-6** Headphones
- **MC-43S** Hand mic • **PG-2S** Extra DC cable

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The Radio Amateur's Journal

ON THE COVER: Thirteen year old Jonathan Miller, KB5GVO of Fort Worth, TX uses a lap-top computer, mini-TNC and an H.T. to work Packet Radio. Photo by Larry Mulvehill, WB2ZPI.



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Zero Bias

AN EDITORIAL

Well, we've reached another contest season, and if last year's scores are any indication—and if the sunspots cooperate—we are going to have a banner turnout this year. While you personally might not be into contests, a DX contest brings out a multitude of new countries and new and special prefixes for the occasion. This is the ideal time to work a bunch of DX and work toward some operating awards. A contest makes your signal, no matter how strong or weak, a desirable contact for someone. Don't be afraid to just jump right in.

This month we're offering you a glimpse into the world of digital communications. We've put together some basic information on packet and AMTOR to get you exposed to an area of amateur radio that is quite sophisticated yet easy to learn.

For the most part, any activity associated with amateur radio is a learning experience. These experiences can be used to hone skills or acquire new ones. The underlying factor, though, is that famous word *fun*. The contesteer who avidly chases a first-place certificate or the "paper chaser" who seeks different certificates confirming various operating achievements is having fun in his own way. The rag-chewer, the tinkerer, the dreamer, and the casual operator all are deriving satisfaction from the hobby while picking up tidbits along the way. Even the curmudgeons who continually talk about how rotten everything has become and how CB language is in use by some amateurs keep us up to date on CW abbreviations which they use in speech. So, it's all a learning experience and it's all fun, if you want it to be.

What also might be fun to think about and try is learning another language. Those of us who were born and raised in English-speaking countries sometimes think that the whole world speaks English. Well, a lot of amateurs only speak a form of English or jargon strictly limited to a basic QSO (CW abbreviation). If you vary the conversation, you'll soon find out that you're out in the cold and that the other person doesn't understand what you're saying. Of course, there are a lot of multi-lingual amateurs out there, but it might be an interesting winter project to try to learn another language, or two.

Of course, to the super-serious and super-conservative amateur the only second language needed is CW. It is possible to have a complete conversation using

only Q signals as long as you don't want to exchange very much personal information or share ideas, QSL? I don't mean to deride CW as a communication mode, but it is more likely that more amateurs throughout the world speak Spanish, for example, as a major means of communicating.

Whatever language you might want to try to learn, make sure you learn a few useful phrases up front, the premise being that once you use a few words of that person's language, he might assume that you are fluent in it. We all know how that happens. So, learn how to say, "Please speak slowly," and "Could you please repeat that or say it phonetically."

Hurricane Hugo

This is being written as Hurricane Hugo menaces the Caribbean area, having passed through the island of Guadeloupe. The news media coverage has included several reports from amateur radio operators. The amateurs that I've seen and heard have been quite articulate and have done a marvelous job of explaining the situation to the general public. The rest of us can take pride in our fellow amateurs who have extended themselves in this time of need and tragedy. Amateur radio has been getting through reliably when nothing else could. It speaks well for all of us, and especially for the amateurs who stepped forward and got the job done.

Bernie Welch, W8IMZ

One of the best parts of being associated with *CQ* is the number of wonderful people you get to meet, know, and work with. Sometimes you sort of take them for granted in that you expect them to be there forever, forgetting in a way that both you and they are getting older each year. Sometimes, as with Bernie, you get caught up in the finality of things and have some time to really look at them.

About three years ago Bernie told me he was ill and his doctors had given him two years at the outside to live. Bernie then put that fact aside and began to talk about improving our contests. I guess you could have called him a pragmatist, but the illness wasn't going to change his lifestyle or affect what he wanted to do. Perhaps he looked at it like the ultimate contest, and he was going to set a new record.

Just last month we featured a picture of Bernie being presented his plaque as the newest inductee in *CQ*'s Contest Hall of Fame. Bernie was devoted to amateur radio and contesting, and it was my pleasure and privilege to be associated with him for over a quarter of a century. In the few weeks before his passing his thoughts and actions were still heavily involved with amateur radio. He was upgrading his station and adding packet radio capabilities even as the clock ticked faster.

Well, the contest period ended for Bernie about noon on September 7, 1989, and he was indeed a winner by almost another year. He had maximized his contest period by making everything count and utilizing strengths and sheer force of will to set an example for all of us. We all will miss him more than words can say. Our sympathies and condolences go out to the Welch family.

My Apology to Mr. Maxim

I have to admit that I didn't do my homework when it came to learning how to spell the ARRL's "Rettysnitch" for my September editorial. Although I am median age, I'm not quite old enough to remember its actual use. Several readers have been kind enough to point out the error of my ways and to tell me what Mr. Maxim would have done to me had he found out.

ARRL Submits Its Code-Free License Proposal

In early September the ARRL filed its code-free license proposal, joining about a dozen others. It is expected that theirs will be the catalyst for action on all of the proposals. There probably will be an NPRM issued by the FCC by the end of the year, with a suitable time period for comments.

What will be proposed by the FCC will in all likelihood reflect what they feel they can "physically handle" in the way of paperwork and administrative people-hours at the Gettysburg facility. One might argue that it's "their problem" to solve, but their attitude and cooperation can be heightened by the proposal that is both simple and economical to implement. What is most important to amateur radio now is the fact that there is a formal proposal on the table from the ARRL for a code-free license.

73, Alan, K2EEK

AEA's NEW PK-232MBX With PakMail™

Now AEA's popular PK-232MBX multi-mode data controller has all of the features you've been asking for...PakMail™ mailbox with third-party traffic, seven-character AMTOR sel-call, TDM (Time Division Multiplexing) Rx for SWL and priority acknowledgment features. Compatible with almost every computer or data terminal, you can enjoy the full spectrum of digital communications with the PK-232MBX.

All Operational Modes. The PK-232MBX includes all of the **recognized** data modes available today... AMTOR, ASCII, Baudot, CW, FAX Tx and Rx, NAVTEX marine and packet.

Modem Superiority. An eight-pole chebyshev bandpass filter limiter-discriminator modem enhances the signal-to-noise ratio at the detector and virtually eliminates interference from adjacent signals. This system is superior to PLL modem technology which was designed for minimal noise interference.

PakMail.™ PakMail™ mailbox with third-party traffic is now a standard feature. Leave and retrieve packet messages around the clock. The PakMail™ plug-in board/update is compatible with all PK-232's. Contact factory for details. The upgrade also includes TDM (Time Division Multiplexing) decoding and seven-character AMTOR sel-call. Priority acknowledgment is also included to reduce packet collisions.

FAX Transmission. The **first** multi-mode TNC to transmit FAX, the PK-232/MBX supports the widest range of printers using the optional RS-232/printer cable.

Host Mode. Only AEA provides a fully functional Host Mode which enables programs to control the TNC more efficiently. Programs include PC-Pakratt with FAX for IBM PC and compatible computers, COM-Pakratt with FAX for the Commodore 64 and 128, and now MacRATT with FAX for the Macintosh.

Two Radio Ports. Independent radio connection ports allow interchangeable HF or VHF operation, selectable from the front panel for convenience.

Signal Analysis. The PK-232MBX internal software has the exclusive SIAM™ (Signal Identification and Acquisition Mode) feature which lets you tune an unidentified signal. The PK-232MBX can automatically determine the signal's mode, baud rate or speed and configuration.

You Deserve the Original. AEA was the first to produce a multi-mode TNC, and it still remains the standard by which all other TNC's are compared. Don't settle for less.

Advanced Electronic Applications, Inc.

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Lynnwood, WA 98036
206-775-7373

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CIRCLE 130 ON READER SERVICE CARD



Announcing

• **Madeira Activity Week** - From November 23-30 amateurs from Madeira together with those from other European countries will be on the air as CT3MAW mostly on CW but also RTTY and AMTOR. Frequencies: 1.832, 3.505, 7.005, 14.026, 21.026, and 28.026 MHz. In case of a pile-up they will work split 2 up. In addition, the group will be on as CT3M in the CQ WW DX CW Contest. QSL: over the bureau to CT3EE, or directly to Luis Camacho, CT3EE, P.O. Box 4055, P-9051 Funchal Codex, Madeira, Portugal.

• **Russian Phrases for Amateur Radio Update** - A 90-minute cassette has now been added to this 20-page syllabus compiled by W6HJK to help non-Russian speaking hams better communicate with Soviet amateurs (see "Announcing," August 1989 CQ.). A cost of \$5.00 (\$7.00 international) for the booklet and \$6.00 (\$8.00 international) for the audio cassette are payable to the Beyond War Foundation, the original sponsor. Requests should be sent to: Russian Phrases for Amateur Radio, Len Traubman, W6HJK, 1448 Cedarwood Dr., San Mateo, CA 94403.

• **North American Youth Network** - This net is open to all amateurs regardless of age, QTH, or license class. The net is on seven days a week at 2359Z on 28.450 MHz. For more information, contact KA0ZZU.

• **Ten-Tec Amateur Radio Equipment Owners Group** - This group, independent of Ten-Tec, Inc., promotes the exchange of information about Ten-

Tec equipment and publishes user reports, plus more. For more information, send and SAE and two IRCs to TTOG, Jurgen K. Jagelle, DF9AI, Garkenburgerstrasse 52, D-3000 Hannover 81, West Germany.

• **BCS Amateur Radio Special Interest Group** - The Boston Computer Society has announced this special-interest group, which includes monthly meetings, a newsletter, technology-related projects, and Novice license classes. For more information, contact The Boston Computer Society, One Center Plaza, Boston, MA 02108 (617-367-8080).

• **World Bank ARC, 4U1WB** - The United Nations has granted the World Bank ARC the callsign 4U1WB. The club station is located at the Bank's headquarters, 1818 H Street NW, Washington, DC 20433. Contacts with the station count as the United States for DXCC purposes. QSL cards direct with SASE to The World Bank ARC, or via the bureau to the manager, KK4HD.

• **Denver W5YI VE Team Schedule** - This VE team holds exam sessions at 9 AM the first Saturday of every month at the Bemis Library, Littleton, Colorado. For more information, contact Tony Marquette, KA0CSL, at 303-773-2087.

• **The following Special Events will take place during November:**

W4MM, from Mule Day Event, Calvary, GA; Albany ARC; 1200-2400Z Nov. 4 (rain date Nov. 11); freqs. 3.975, 7.245, 14.250, 28.383.

For certificate, send large SASE to AARC, Inc., P.O. Box 70601, Albany, GA 31705.

W4NJA, from White Haven Tourist Center, Paducah, KY; Paducah ARA; 1600-2300Z Nov. 5; 25 kHz up from the bottom of the General freqs. SSB and CW. For QSL send SASE to David Tucker, NU4N, Secretary PARA, 1500 Massac Church Rd., Paducah, KY 42001.

N50K, from Will Rogers Days, Claremore, OK; Rogers County Wireless Assn.; 1300-2300Z Nov. 4-5; lower 15 kHz of General band on 20 and 15 meters and 28.430. Send QSL and SASE to RCWA, Rt. 3 Box 793, Claremore, OK 74017.

W7FO, from 100th Anniversary of Montana's statehood, Butte, MT; Butte ARC; Nov. 6-12; on 3.890, 7.280, 14.280, 21.370, 28.470. For certificate send 9 x 12 SASE to Butte ARC, P.O. Box 4036, Butte, MT 59701.

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

Nov. 4, **Enid, Oklahoma ARC Hamfest**, Convention Hall, Enid, OK. Contact Tom Worth, P.O. Box 261, Enid, OK 73702 (405-233-8473).

Nov. 4, **"6.91 Friendly Fest,"** Serb Hall, Milwaukee, WI. Contact The Milwaukee Repeater Club, P.O. Box 2123, Milwaukee, WI 53201. (Exams given.)

Nov. 5, **Oak Park ARC Swap and Shop**, Southfield Pavilion Center, Southfield, MI. Contact Oak Park ARC, P.O. Box 1422, Royal Oak, MI

(Continued on page 70)

PLUG INTO PACKET!

Simple and Easy.

Here's the easiest packet radio yet, you don't even have to buy a TNC to join the digital revolution. Just let your PC do the work. Plug a PC Packet Adapter into any expansion slot and get on the air in minutes, just like an expert. And you'll still be able to use the PC for other work! The complete VHF system is only \$139.95!

Sophisticated, Too.

When you've mastered the basics, use the PC*Packet Adapter for simultaneous dual-band HF/VHF, multiconnect, BBS, TCP/IP, DXer's PacketCluster, 2400 baud (and higher). Even use the Developer's Package to write your own packet application.

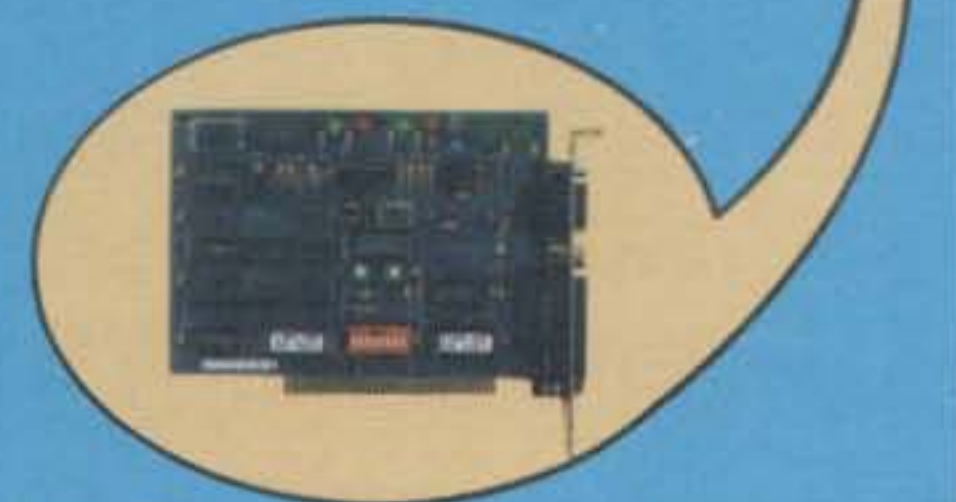
Software Included.

Unlike others, DRSI includes all the software you need. The THS terminal package has split screen, file save/send, binary file transfer, print, scroll, review and more.

2400 BAUD

Many areas are upgrading their packet nets to this higher speed. DRSI's M-24 modem for 2400 baud connects simply with no modifications to your rig and lets you operate both 1200 and 2400 simultaneously with your present radio. Step up to this new speed for just \$79.95, today!

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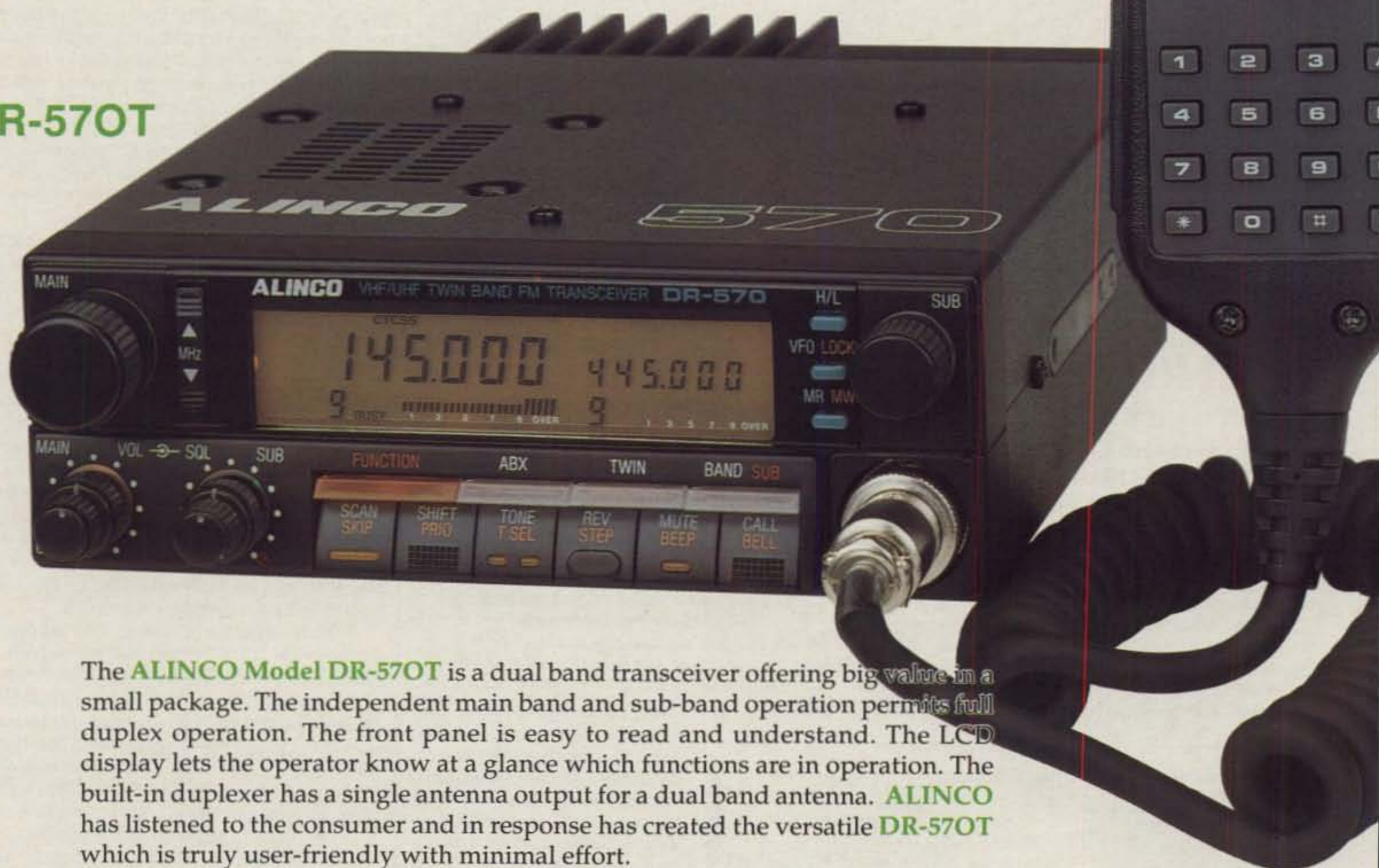


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DR-570T



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45 watts on 2M and 35 watts on 70 cm. Approximately 5 watts low power.

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(130-169.995 MHz) on 2M, 144-147.995 MHz transmit. 440-449.995 MHz on 70 cm. (transmit and receive)

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FULL FEATURES

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Transmit on one band while receiving on the other band -- telephone style.

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- **REPEATER REVERSE FUNCTION**

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- **BEEP FUNCTION**

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One touch selection with pressing of twin key

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Aug. 21, 1987

Wilson Antenna Company Inc.
3 Sunset Way Unit A-10
Green Valley Commerce Center
Henderson, Nevada 89015

Subject: Comparative Gain Testing of Citizen's Band Antennas

Ref: Rye Canyon Antenna Lab File #870529

We have completed relative gain measurements of your model 1000 antenna using the K-40 antenna as the reference. The test was conducted with the antennas mounted on a 16' ground plane with a separation of greater than 300' between the transmit and test antennas. The antennas were tuned by the standard VSWR method. The results of the test are tabulated below:

FREQUENCY (MHz)	RELATIVE GAIN (dB)	RELATIVE POWER GAIN (%)
26.965	1.30	35
27.015	1.30	35
27.065	1.45	40
27.115	1.60	45
27.165	1.50	41
27.215	1.60	45
27.265	1.75	50
27.315	1.95	57
27.365	2.00	58
27.405	2.00	58

A complete description of this test is contained in file #870529. Excerpts of this report are enclosed.

Approved:
W. C. Weikel, Group Engineer
Antenna/ATS Support Laboratory

Louis Wilson, Antenna Engineer
Electromagnetics Laboratory

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Our Readers Say

Somebody Cares

Editor, CQ:

Yesterday's mail brought my "Novice Century Club" Certificate of Merit. Please accept my sincere thanks for CQ's efforts in originating this program and for taking the initiative in encouraging Novice activity. I wish I could say it was my first award since earning my Novice ticket at age 59—ARRL's "Rag Chewers' Club" certificate is already on the wall—but I hope it will not be my last. I was particularly impressed by the fact that it arrived in a nice sturdy mailing tube and was wrinkle-free.

Charles G.E. Stalfort, Jr., KC4FRU
Orange Park, FL

Hung Up on The Code

Editor, CQ:

That was a very interesting "Zero Bias" in the March 1989 issue of CQ. I also feel the time is past to make some positive, constructive changes in amateur radio.

If we are "hung up" on the present license structure, why don't we add another "entry level" for Digital entry, equivalent to the present Novice? Have a dual entry with a comprehensive examination on R&R, theory, digital/computer operation, etc. NO CW. NO voice. 902 MHz and up. How many? 30 questions?

Leave the existing Novice as it is.

From here both would step up to the present Technician class, which would remain the same as it is also. Next I would remove the code requirement for the General class. Maybe beef up the written exam portion to compensate, though not really needed. Next would still be the Advanced class, which I would leave alone, as it is. The Extra class I would leave for those who feel *code is a must*. A place for them to *get away* from the rest of us.

I finally became a HAM after some 30 years ago as a Civil Air Patrol radio operator. Squadron, Group, Wing, and Region NCS/ANCS as well as being both a Class A and Class C CB operator for many years. I am currently a Technician class and am hung up on the code for General. (I passed the written exam under the old rules.) I would upgrade to Advanced with little or no trouble. Extra code probably would still be too much for me.

My wife has also been a CAP communicator for almost 30 years and is still trying to master the Novice code. She has passed the written exam—twice. She seems to have a "tin ear" and just can't seem to distinguish a dash from a dot. Here are two people who would make good ham operators.

I can also think of an Extra class, 1 x 2 call-sign, in 6-land who was a disgrace on 10 meters several months ago. My point is that the code, per se, doesn't "keep out the riff raff."

I am as active as I can be on 2 meters and 10 meters and just acquired a rig for 70 cm. Basically, I only have weekends to enjoy ham radio. I commute to work, 55 miles each way. That doesn't leave me too much time for anything else. One of these weeks/months I will change jobs and will have more time for ham radio. I look forward to the day when I can finally become a *real ham operator*. When I upgraded to Technician I was congratulated for that. The person next to me, who upgraded to General, was welcomed to "the fraternity." What the heck.

Richard E. Wonson, N7IID
Belle Foursche, SD

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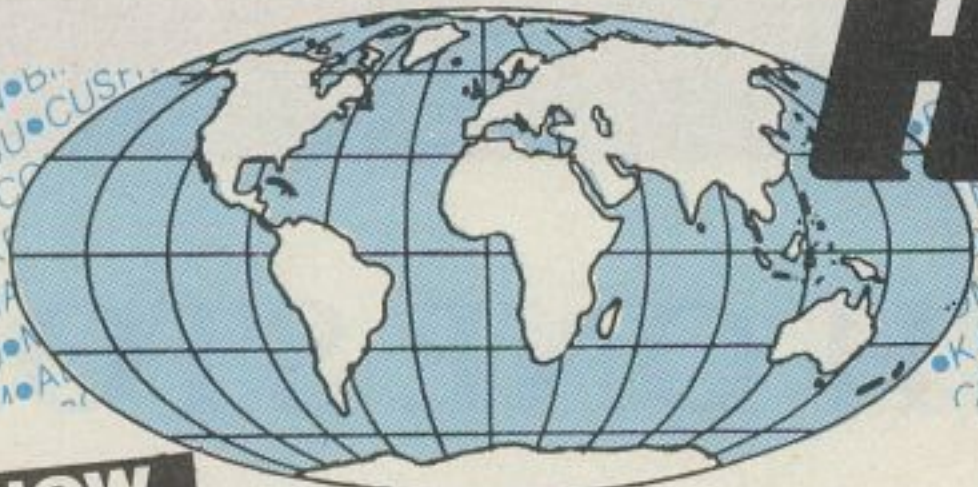
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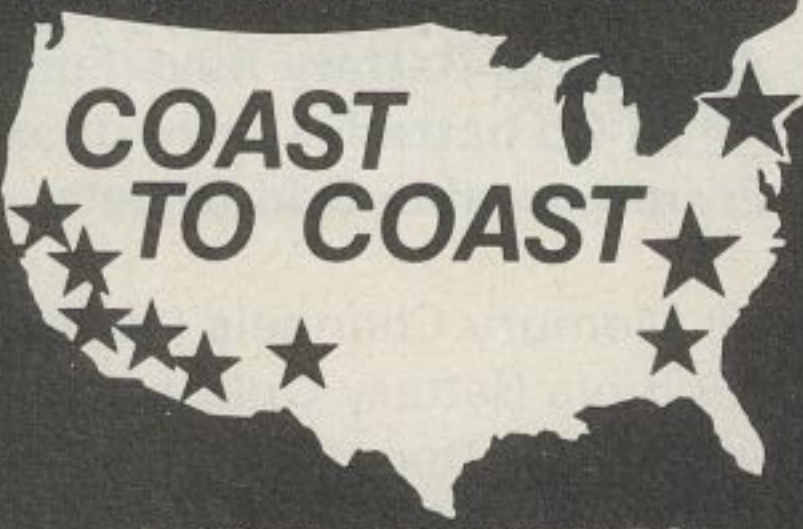
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If you've been on the fence or just a bit timid with regard to trying out packet radio, then you've come to the right place. K4ABT, our Packet Editor, has put this Starter Packet together just for you.

Starter Packet

BY BUCK ROGERS*, K4ABT

Packet radio has, without a doubt, immortalized itself within the ranks of amateur radio. Those of us who were here at the onslaught can attest to the fact that packet has grandfathered its space into the hobby. If you are new to packet, I'm sure that you've heard how packet performs many great works that are related to communications. Whatever you heard is probably true, and what's more, it was likely understated!

It is my goal in each month's "Packet User's Notebook" to focus on the latest packet technology without trying to make a digital research and design engineer of the reader. In the years that we've been writing this column, there has not been a month when a new avenue of packet hasn't been mentioned or explored. Every effort is made to keep it that way. My intention is to keep the packeteer informed of the latest concepts and innovation in packet radio. From time to time we must stop and address a few of the milestones that have been crossed on our way to this point in time.

This is One of Those Times

In this issue of *CQ* we are addressing some of those milestones, aside from the information given in the regular "Packet User's Notebook" column. We are going to review some of the moments many of us have had in the packet hobby. The biggest reason is because of the enormous amount of mail that I have received lately asking for information to fill some voids that are not understood by new packeteers. Let's face it. Packet radio has come of age. Our ranks are beginning to bulge, and the LAN frequencies are even becoming active at all times of the day and night.

In October 1984 the ARRL Board of Directors voted for the approval of what is now called the link-layer protocol of packet radio. Several years of planning and work were involved in this newly devel-

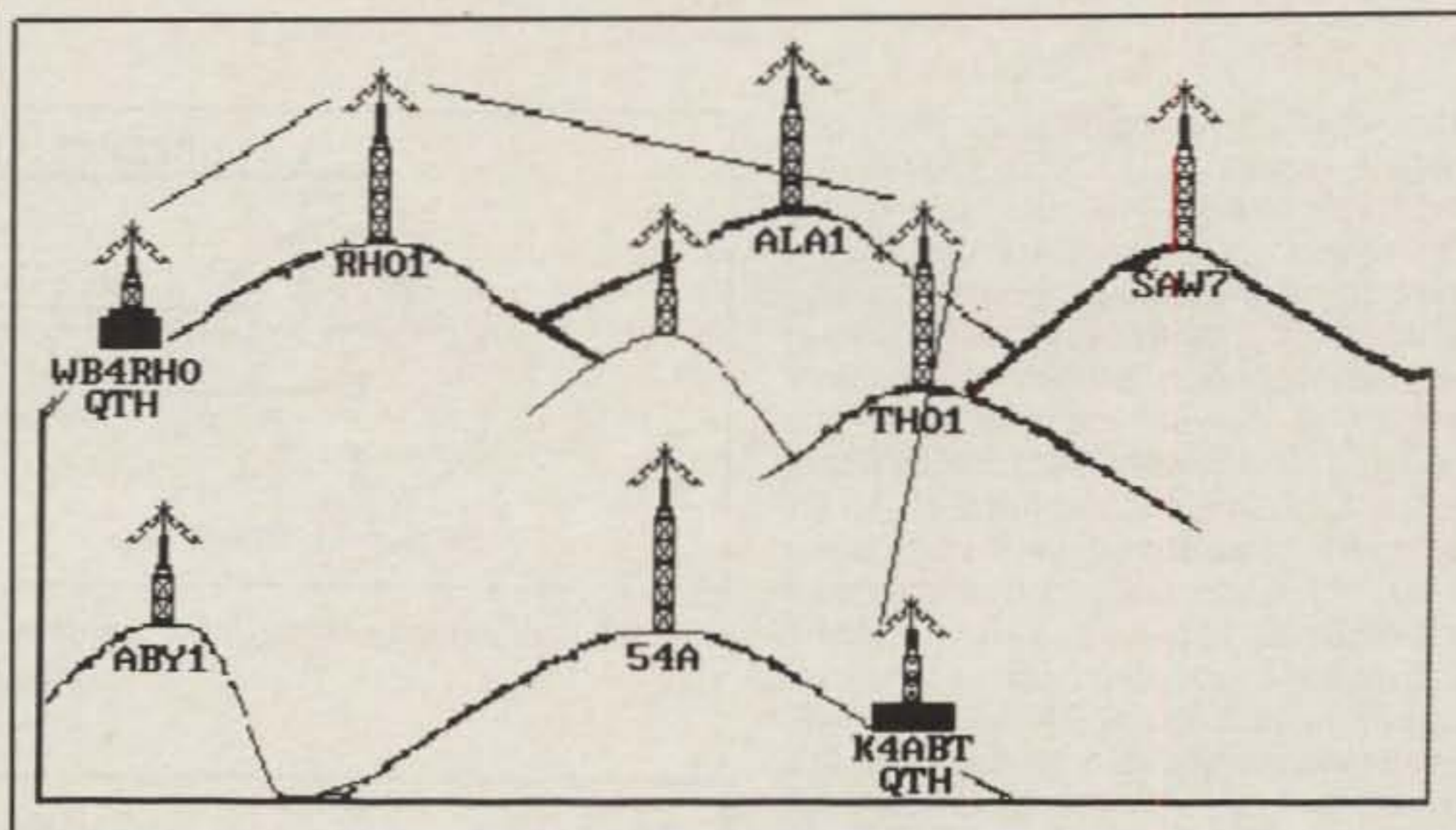


Fig. 1—WB4RHO connects to K4ABT via nodes/digis, RHO1 and THO1.

oped system for linking data terminals across the country. This same ARRL Board set up an Ad Hoc Committee on Amateur Radio Digital Communication. Whether you are new to packet, or a seasoned veteran, take a look at the new additions to the fastest growing segment of our hobby. And it has all taken place in less than five years.

This month I hope to give you a "heads-up" and edge in packet technology that will quickly bring you up to speed with the packet practices and protocol(s).

Let's first remove from our minds any taboos about packet. Now we are ready to show you how very easy and interesting this communications mode really is. You will soon discover that packet is not the hurdle that you may have been lead to believe it is.

Where Do We Begin?

About 75% of all packet radio communications takes place on the VHF bands, with most operation on the 2 meter band alone. The conventional 2 meter FM transceiver or handi-talki represents one third of the required packet station. In addition to the FM transceiver, the packet station consists of a computer or video

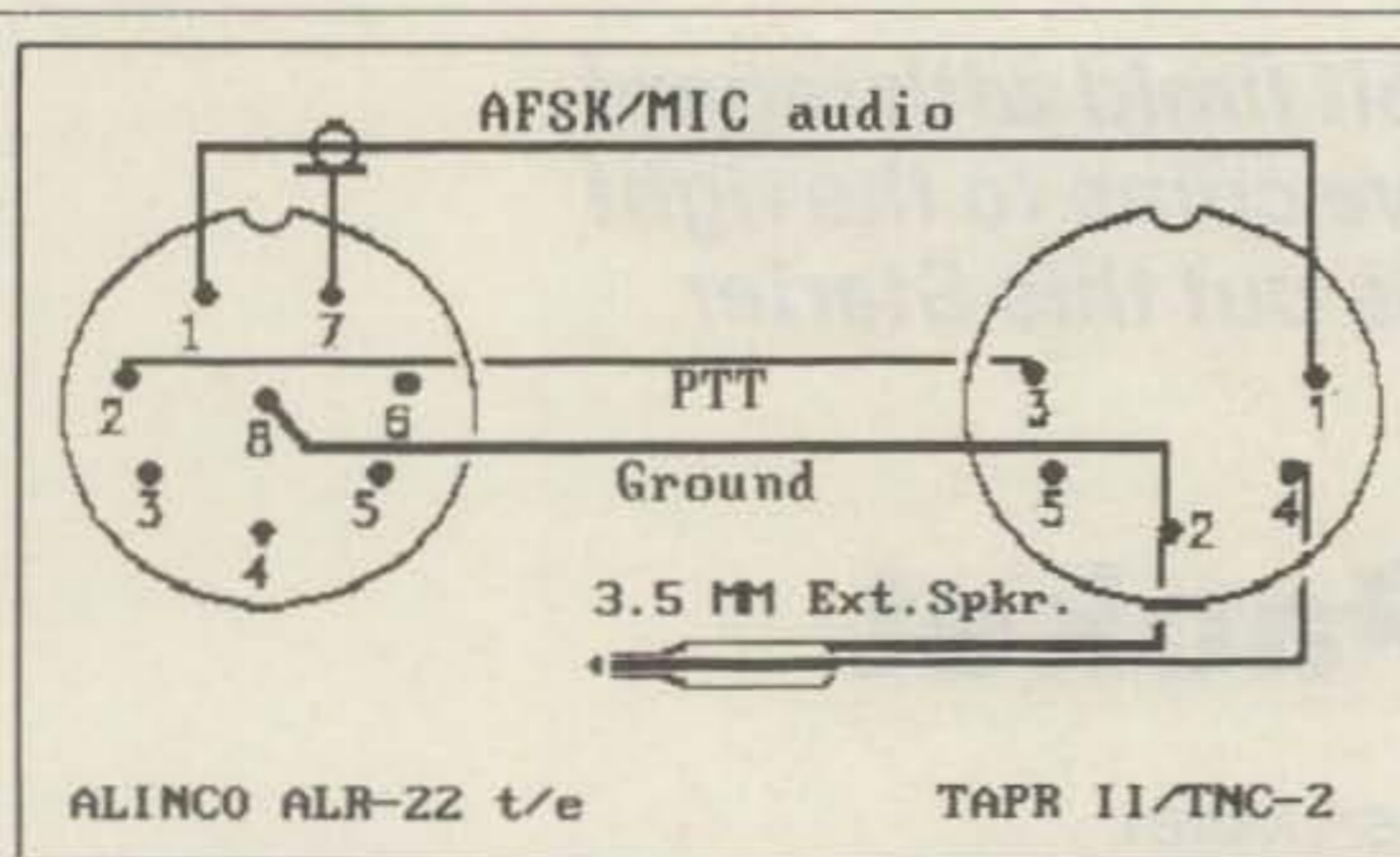
terminal and a *terminal node controller*, more commonly known as the *TNC*. The task of the TNC is to send and receive information to and from the computer or terminal, for display and transmission.

We use repeaters for packet just as we do with VHF FM voice repeaters. We add a slight twist to the method used to transmit the data to a distant station. The conventional voice repeater is a duplex system that transmits (repeats) the signal on a frequency separate from the frequency that is being received. Packet radio uses a system that is radically different, because it uses only one frequency, less equipment, and a less complicated (simplex) installation.

The packet repeater is called a *digital repeater*, or more commonly, the *digipeater*. The digipeater is a store-and-forward device that receives a packet of data (usually 128 bytes or characters) and stores it on an internal buffer. It then "listens" to be sure the frequency is clear before it transmits (forwards) the packet to the next digipeater or the target station. (See fig. 1.)

The digipeater does not require a duplexer or other distinguishing control circuits that you would find in a voice repeat-

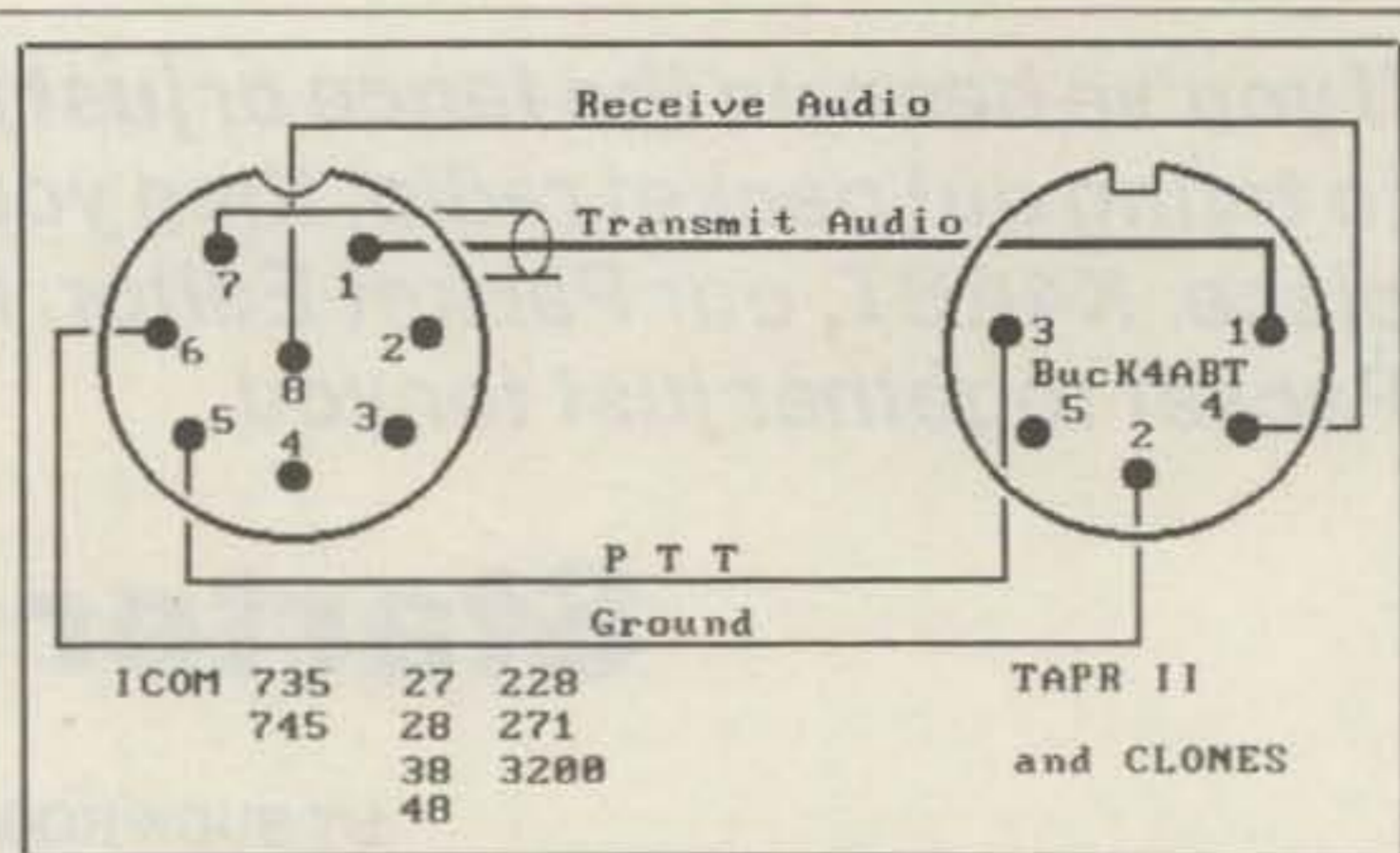
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ALINCO ALR-22 t/e

TAPR II/TNC-2

Fig. 2A- 8-pin Mic connector is Radio Shack P/N 274-025.



TAPR II and CLONES

Fig. 2B- ICOM(s) to TAPR II/TNC-2.

er installation. A digipeater consists of a transceiver and a TNC. The digipeaters and nodes (A node is a new "super" digi that stores routes to other digipeaters and nodes.) are usually located on high buildings or mountaintops. A digipeater normally consumes an insignificant amount of power and can easily be mounted inside a ventilated box on a tower and sometimes at the base of the antenna. By using more than one digipeater in my packet connects, I am able to cover enormous distances with very low power. As a matter of interest, I have a small laptop portable computer, TNC, and a 5 watt handi-talki in my briefcase and I use this to communicate with friends who are 400 and 500 miles away.

When a "digipeater" is used to establish a contact (connect) to a distant station, the callsigns of the digipeater will appear in the packet, along with the callsigns of the sending and receiving stations. Once the packet is received by the digipeater, it is analyzed, and if the packet is error-free, it is then forwarded to the callsign of the target station or the next digipeater.

HF, VHF, UHF, and Microwave There are No Boundaries

The boundaries of packet have become limitless. Soon we will be using the BBSes and mailboxes that are resident on the amateur satellites. Packet QSOs with stations on the other side of our globe will soon become commonplace. Even your HT will soon provide global communications via PACSAT. There are packet QSOs being conducted on the satellites as I compose this document. With minimal investment, we are now sending and receiving CGA, EGA, and VGA "PLUS" high-resolution, color pictures, digitized voice, and any kind of computer program that is stored in an ASCII or binary format.

Bringing The TNC To Life

When power is applied, packet-radio TNCs are normally in the disconnected state and/or monitor mode. This allows

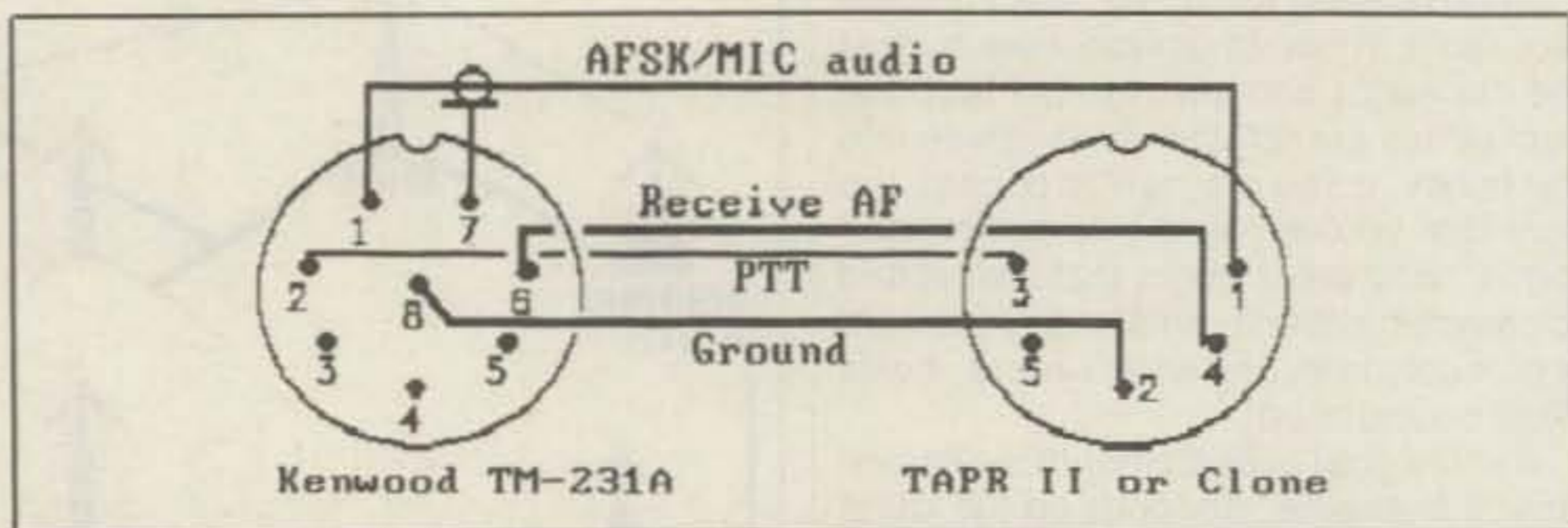


Fig. 2C- Kenwood to TAPR II/TNC-2. Note receive AF at pin 6 of the Kenwood Mic connector.

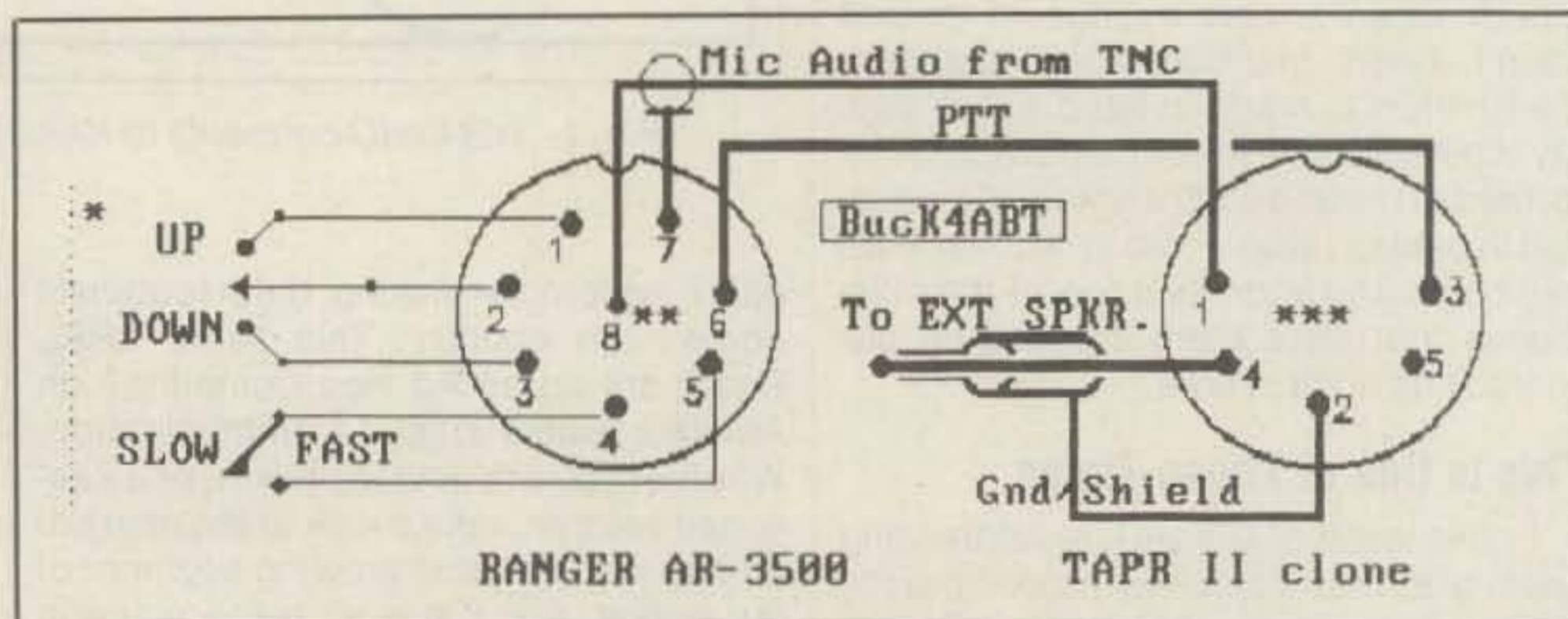


Fig. 2D- Optional connections for frequency control. QSY can also be controlled on the front panel of the Ranger AR-3500. **Radio Shack P/N 274-025; ***Radio Shack P/N 274-003.)

the activity on the channel to be seen by the terminal display. In addition, the TNC will see any attempt to connect (called a "connect request") to your station when it is in the MONitor mode.

When station one wishes to connect to station two, a connect frame is issued from the command mode and a time-out timer is set into action. If station two is on the air, a "connect" is established, and station two returns an acknowledgment (ACK) frame. If station two is not on the air or for some reason doesn't respond, the timer runs out, and station one will display:

"retry count exceeded, DISCONNECTED"

After the link connection is established, the TNCs will enter the data transfer or the "CONverse" mode. In this state the two stations can exchange data or other digital information in any number of ways, from the good old rag-chew session of the CONverse mode to the transfer of high-resolution, color pictures that appear on the screen as they are received, but in the transparent mode.

Make The Commitment

Once we have opened the box containing the packet controller, like it or not we are committed! It may seem a bit strange or foreign for the first moment or so, but

"Thanks for the new country (Taiwan)! Your Heath gear sounds great!"

K3YGU, Maryland

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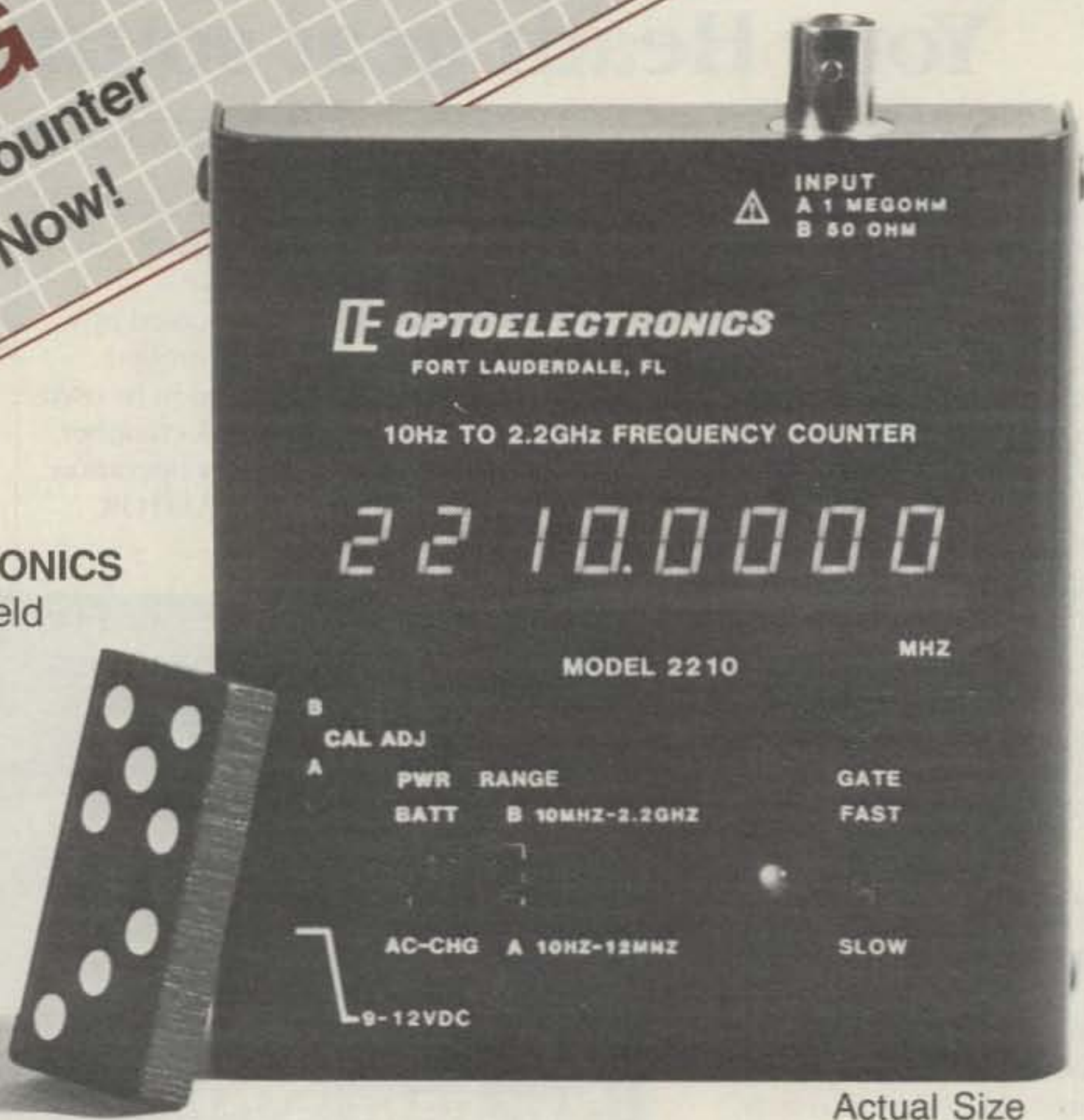
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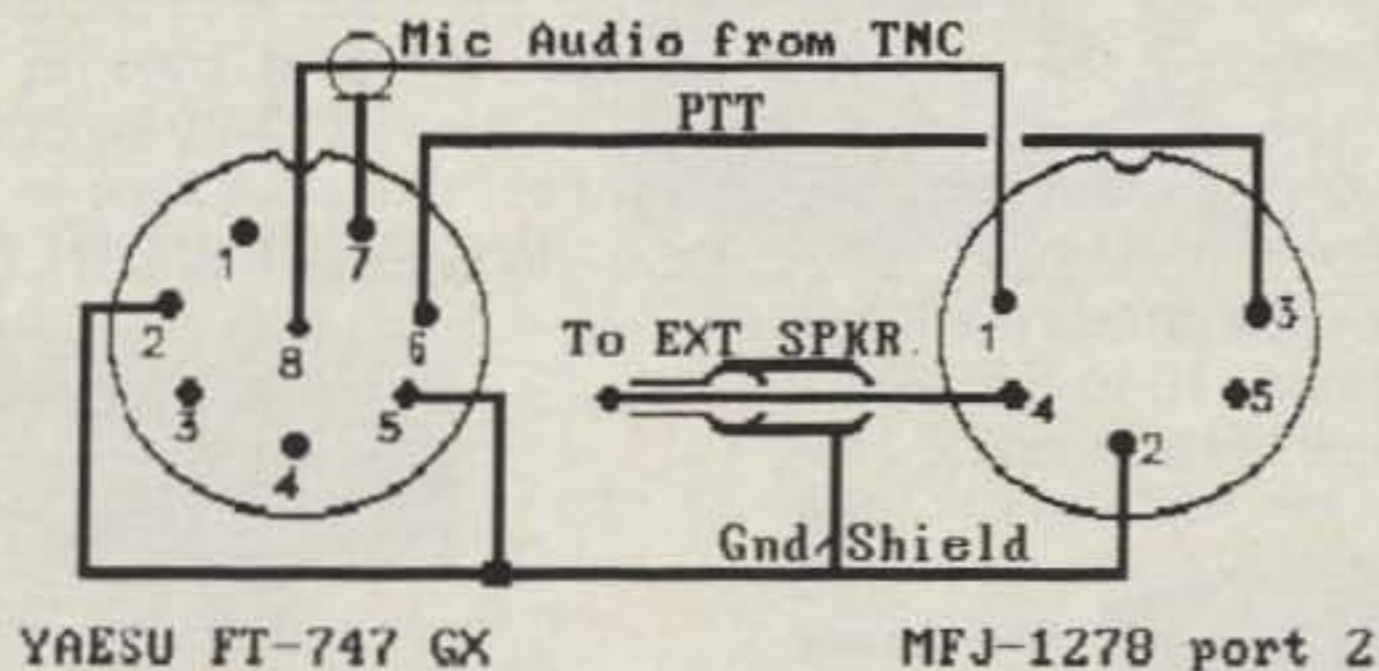


Fig. 2E- Yaesu FT-747 to TNC-2 or MFJ-1278 port. Both port one and two of the MFJ-1278 multi-mode controller use the same wiring configuration.

after a few minutes of holding the controller, we soon realize that it does not bite. The packet industry has come to us in the form of a box full of firmware (that's the name given to lots of software captured inside an erasable, programmable, read-only memory, EPROM). Nonetheless, we have gathered all the necessary parts and tools which will be needed to build our packet station.

Before we get too deeply involved in the text of the packet controller manual, it is first necessary to look at some of the small, but important items which we may have overlooked. Most packet controllers will come supplied with the cables and connectors for the controller end of the interface cables. The other end of the cables are the points of interest now.

The packet controller manufacturers had no idea of the kind of radio or computer terminal you might choose. There was no way to supply the correct connector for your RS-232 port or the microphone connector for your transceiver.

Checking our list further, we observe a need for some type of terminal program. Most terminal programs for the telephone modem will work, but there are many custom-written programs for packet which work much better. You may al-

ready have a favorite software package that you wish to use instead. Here is a partial list of some of the popular terminal programs with which I am familiar.

IBM PC and clones uses: BOBCOM, MFJCOM, MFJXFER, PACFILE, PACPRO, PROCOMM, PTP, YAPP.

TRS-80 Color Computer use: AUTOTERM, Color Term Plus, ColorCom/E, VIP TERM, and MICKEY-Term.

Commodore 64 and 128 use: BOBTERM, KANTERM 64 or MFJ-1282.

Macintosh SE use: REDRYDER or MFJ-1287.

ATARI ST 1040 or 512 use: UNITERM or "FLASH."

Gathering the Parts

The first thing we do with a project of this nature is to define the task. You soon discover that the project flows together with much greater ease than you had first imagined.

It was once a chore to find some of the special connectors for some of the imported transceivers. This is no longer the case. A trip to Radio Shack or the local supply house will prove refreshing when you discover the many types of connectors for both the computer and the trans-

ceivers. Some of the popular supply houses will even have the ever popular Alinco, ICOM, Kenwood, Ranger, Yaesu, and others... 8-pin mic connector, Radio Shack part number 274-025. (See figs. 2A, 2B, 2C, 2D, and 2E.)

A Few Tools are Needed

Next on our list are the tools we will need to complete our afternoon project. Look over the list and be sure you have everything you will need before you start. Most of these items are already in our tool caddy.

Starter Packet Tool-Kit

- Small-tip 25 to 70 watt soldering iron (controlled heat if available)
- Small straight-blade screwdriver
- Small Philips-blade screwdriver
- Medium straight-blade screwdriver
- Medium Philips-blade screwdriver
- Needle-nosed pliers
- Diagonal cutters
- Solder, 60/40, rosin core (No. 22 if possible)
- "Third hand," a device which holds small parts and connectors while both your hands are free to solder and manipulate other tasks that require more appendages than are available.
- Necessary connectors for the computer terminal and the transceiver microphone input.

Miscellaneous Items

- Small roll of wire-wrap insulated wire, No. 24 or 26 solid, tinned.
- Small roll of insulated No. 22 or 24 stranded wire.
- Magnifying glass (stand mounted preferred, but hand-held will suffice).
- UL-approved multi-outlet AC strip with bond and 15 ampere or less circuit breaker built in.
- A work area that is clear of any matter except those items with which you are currently working. There should be ample light over the work area.

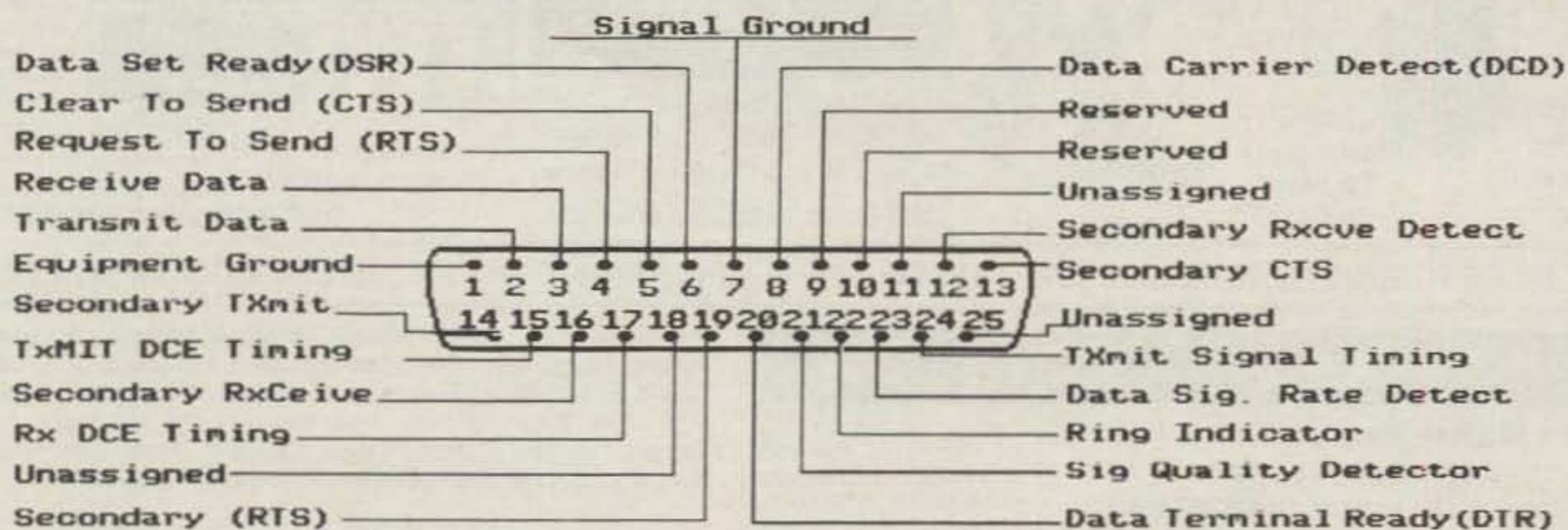


Fig. 3- This illustration shows the relationship of the RS-232 signals to the pins of the DB25 connector. Most PC serial ports have this configuration.

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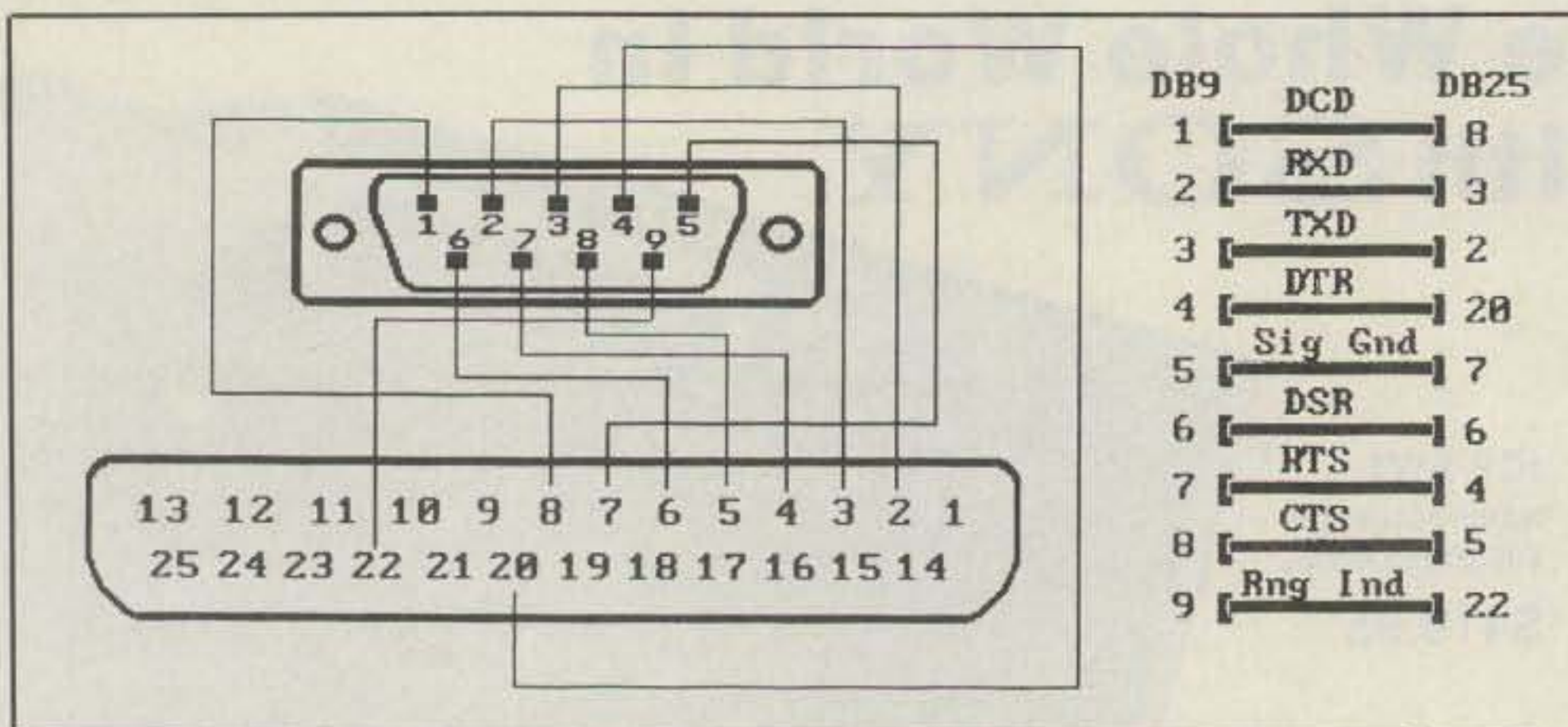


Fig. 4—DB25 to DB9 adapter, enables interfacing to the late-model PCs and clones.

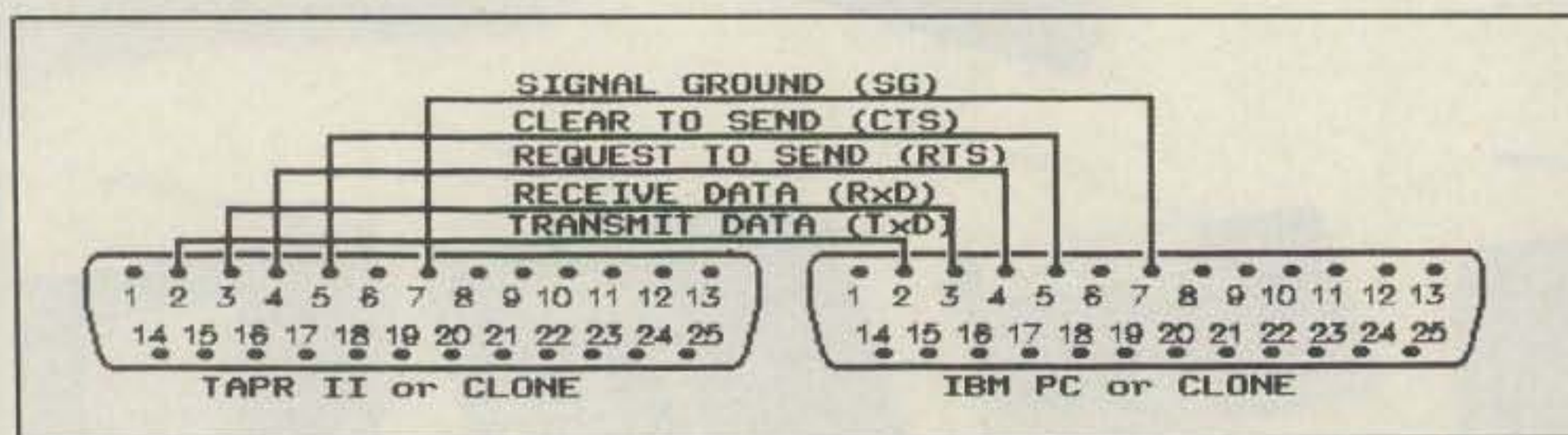


Fig. 5—This illustrates the TNC-2 to PC RS-232 interface.

- The manual for your radio or transceiver nearby, as it will be necessary to look at the schematic of the microphone connector to determine the correct wiring of the AFSK, PTT, and ground connections. Better yet, have a copy of the *Packet User's Notebook* available from CQ Communications handy.

Remember the magnifying glass I mentioned earlier? Well, here is your chance to use it.

Note: Some transceivers allow the receive audio to be taken from a vacant pin of the mic connector. The ICOM uses pin 8, or the center pin for this purpose. In this way all connections can be made through the one cable from the radio to the TNC. Look at the schematic of your radio to see if receive audio is available at the MIC connector.

If your radio does not provide for receive audio at the MIC connector, then you should use the (3.5 mm jack on most makes) external speaker jack for the TNC receive audio. Observe the wiring colors in the cable from the TNC to the radio. Be sure the grounds are indeed grounds, and the signal shields are connected as required. The reason I mention this is because some radios use a floating shield for the audio input, separate from the system, PTT ground.

RS-232 or TTL?

Now that the transceiver and TNC are connected, let's turn our attention to the TNC-to-computer interfacing. Most TNCs

provide the means to connect to, and operate with, both TTL and RS-232 communications ports. There are a few TNCs that require an additional TTL to RS-232 converter. Such a signal converter will be needed with the Commodore 64 and some Atari models when used with some of the earlier-type TNCs. Most TAPR II and clones support both kinds of interface hardware.

Let's assume you plan to interface your TNC to the standard RS-232 port. All TNCs support the RS-232 standard in one form or the other. I have illustrated the EIA RS-232 standard functions in fig. 3. Typically, we would quickly use a ready-made cable, but this time we need to stay within the rule and build our cable with the one which is furnished, or by using the one described in the packet controller

manual. If it is the standard DB-25 connector and RS-232 standard, then use pins 2, 3, 4, 5, and 7. These wires will go pin to pin DB-25 to DB-25 connector. Observe the gender of the computer serial or com port connector, and above all **don't** make the mistake of plugging your TNC cable to the "PRINTER" port of your PC. It is wise to also check the kind of connector used on the TNC. Some dual-port TNCs use connectors other than the standard DB-25. To add some fun to our plight, some computers have adopted connectors of their own design, and you will find that this connector is *not* easy to find. (See fig. 4.) Some of the new computers are using the 9-pin connector (DB-9) since the manufacturers have found that only 5 signals are necessary in most communications applications. For other computer-to-TNC interface configurations, see figs. 5, 6, 7, and 8.

Remember Murphy and the law, and don't fall prey to it. The "ounce of prevention and pound of cure" theory is about to come into play. Recheck the wiring of both cables. It might even be worthwhile to check the manufacturer-supplied cable wiring. After you complete the checklist, connect the cabling to its respective component and turn on the TNC.

If all works in the manner the manual says it should, then "boot" your terminal program, and set the parameters to the default parameters of the TNC if possible. In most TNCs these are as follows:

Baud (ABaud)—1200

Word length (databits)—7 or 8, begin with 7

Stopbit(s)—1

Parity—EVEN (if wordlength is 8, then use NONE)

We should now place our computer into the terminal or communications mode. Next we turn the TNC off for a moment and turn it back ON. Some characters, which can vary from garbage to plain text, should appear on our screen.

If the first thing you see is a sign-on message and the prompt **CMD:** you have really gone beyond the call of duty. If you are unable to get the sign-on message at

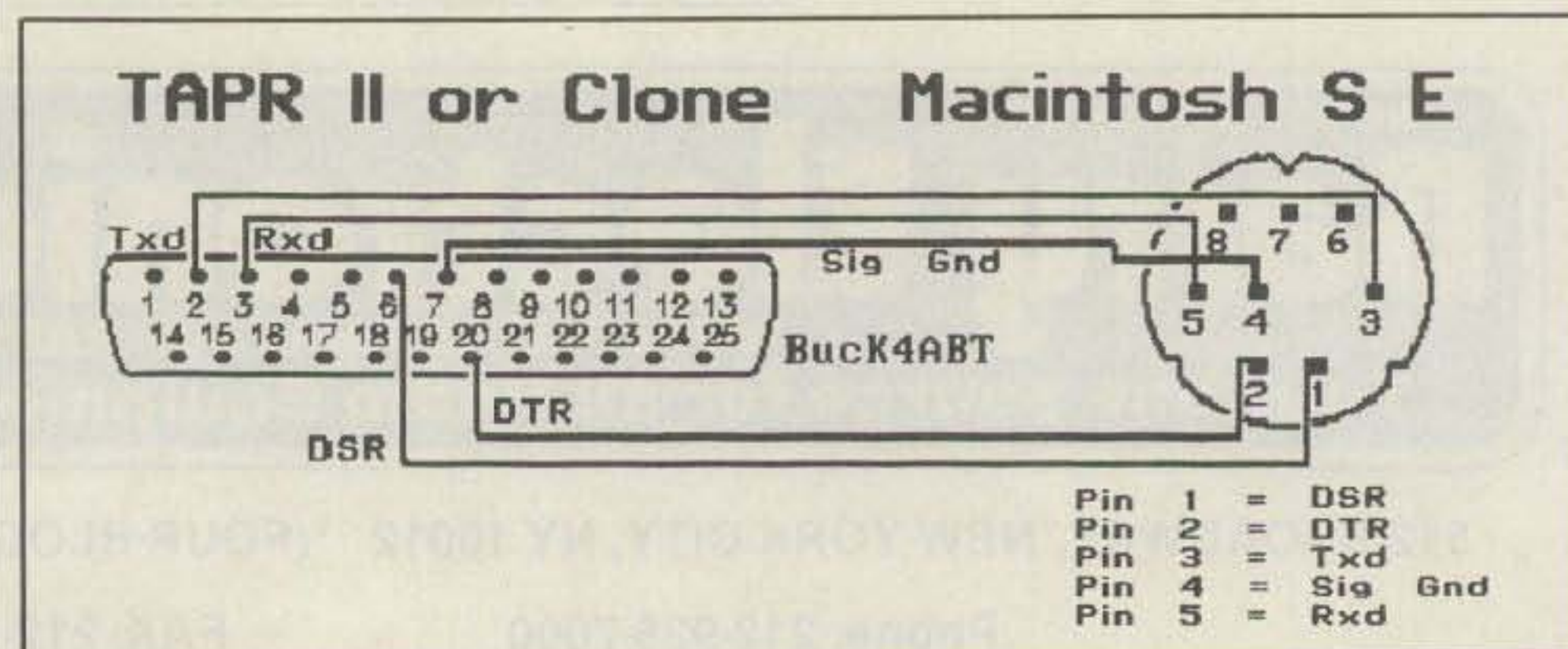


Fig. 6—Macintosh SE interfaced to the TAPR II clone.

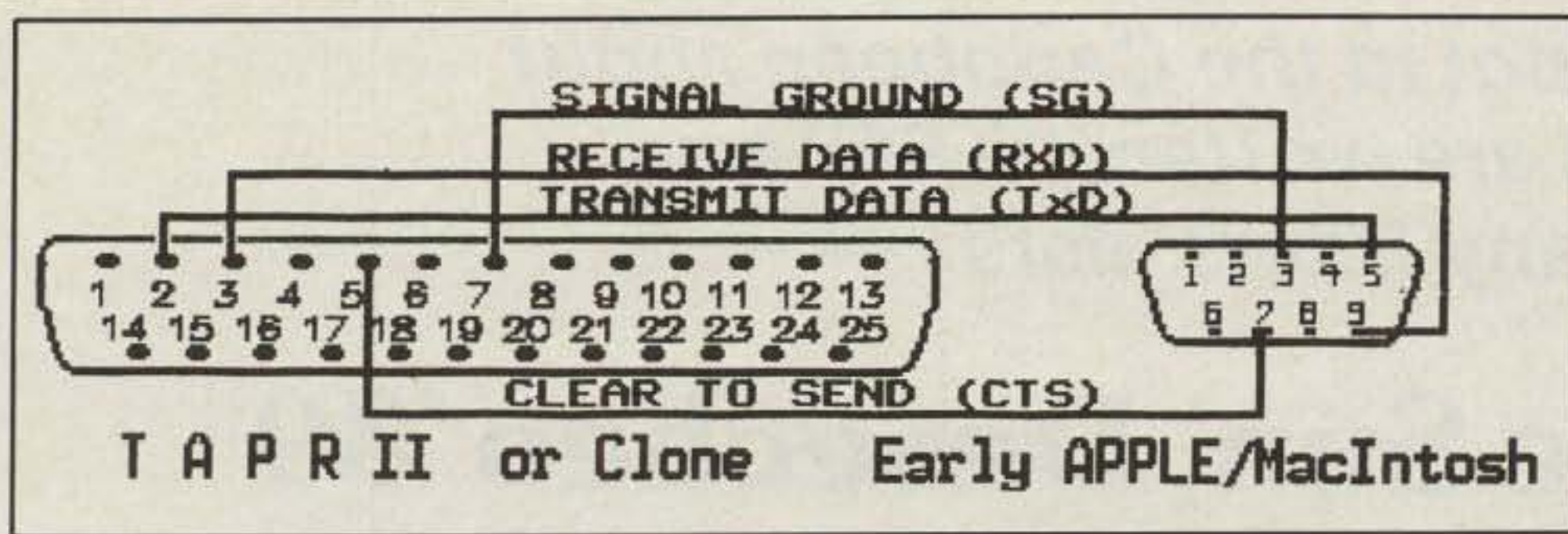


Fig. 7- TAPR II and the Apple computer. Note CTS line.

Most TNCs have a **CALIBRATE** or similar command that allows you to key the rig and send a packet tone. Listen to your transmitted signal with another rig, and set the level until the perceived volume stops increasing. (Be sure you adjust the mic gain control and not the deviation control. The mic gain control is before the limiter and the deviation control is after the limiter. At this point, you are up first, don't be alarmed. Check the TNC manual for the section dedicated to the TNC setup.

As soon as you have the **CMD:** prompt on the screen, you should enter your call sign—e.g., at the **CMD:** prompt type **MYCALL** (your call).

If you are seeing double letters displayed to the screen, set **ECHO OFF**. If you desire to have a faster screen display, then our next step is to set the **ABAUD** (TNC-to-computer speed) to a higher baud rate. To make the change, set the DIP switches on the TNC to the appropriate setting, or if you are using a TNC which has the "AUTOBAUD" feature, you can let it set itself to your terminal-to-TNC ABAUD rate, then **PERM** it or turn the **AUTOBAUD** command **OFF**.

A good terminal program will allow you to set the terminal parameters on the "fly" or while engaged in TNC-to-terminal communications. If you have a terminal program that allows you to save the cur-

rent configuration, do so now. In addition, recycle the system again by turning the TNC **OFF** for a few seconds and then turning it **ON** again.

Setting The Transmit Audio

One of the big problems we have found is that many users feed a signal from their TNC to their transceiver microphone input that is too high in level, and the result is over-deviation, distortion, and in general it causes the system to respond in an erratic manner. It is good to remember that most 2 meter radios have limiter diodes somewhere in the audio path, and if your input audio level is too high, you will be hitting the diodes with too much audio and cause rectification of the AF. This will allow a DC component to cause an equal amount of clipping to occur. This clipping can materialize on the air sounding like distortion. In fact, it will be distortion, and distortion is one component that packet does not care for.

Modern VHF and UHF rigs that use a condenser or electret microphone require an audio level somewhere in the range of 10 to 20 millivolts peak-to-peak. The best level for which to adjust is between 3½ and 4 kHz deviation, with a "deviation meter." If an FM deviation meter is not available, then you may want to try the following technique.

against the limiter diodes. Now back off the input level (level of audio from the TNC to the 2 meter radio) until you hear the volume decrease. Turn it down a bit more, and you will be close enough for practical operating or until you can acquire the services of the proper test equipment.

The audio should sound clean with no distortion or harshness. TAPR-2 TNCs and clones have an adjustment pot on the board. Other TNCs have fixed output levels that are selected with various jumper positioning. These jumper positions can render a level that is sometimes close to that needed to make contact. On occasion, one of these jumper settings may prove to be too much, and other problems can develop. You may have to set the mic level control inside the rig as we described earlier. It is advisable to check the modulation of your FM transceiver with a deviation meter to be sure there is no adjacent frequency interference.

Making A Packet "Connect"

If there are no stations in your area on at the time you wish to make your initial test, you may wish to try the "LOOPBACK" test. If you are using the TAPR II or a clone, you can initiate this test in the following way.

1. Remove the cover from the TNC.
2. Unplug any cable(s) from the TNC radio port.
3. Locate the jumper pins on the main PC board designated as **JMP 10** and install a jumper between (short) the two pins.
4. Turn the system on and be sure your call sign is installed by typing at the prompt **CMD: MY <enter>**. The system should respond with **CMD:was (your call)**.
5. For this test, at the prompt **CMD:FULLDUP <space> ON <enter>**.
6. Issue a connect request to your call sign in the following manner: **CMD:CONNECT (your call)**. Be sure to use the call that was entered into the TNC earlier.

You should receive the following message on your display:

***** CONNECTED to (your call)**

If your **CONMODE** command is set to the normal default of **CONVERSE**, then you will not see the **CMD:** displayed until you re-enter the command mode. This is achieved by issuing a **CONTROL C** (press the **C** key while holding the **<Ctrl>** key down).

Note: Some TNCs may require an increase in TNC output (transmit) audio to enable loopback tests connecting. Check your manual for more information.

After a successful "loopback" test, remove the jumper from **JMP10**, replace the radio connecting cable to the radio port, and replace the cover to the TNC.

Your packet station should be ready to communicate.

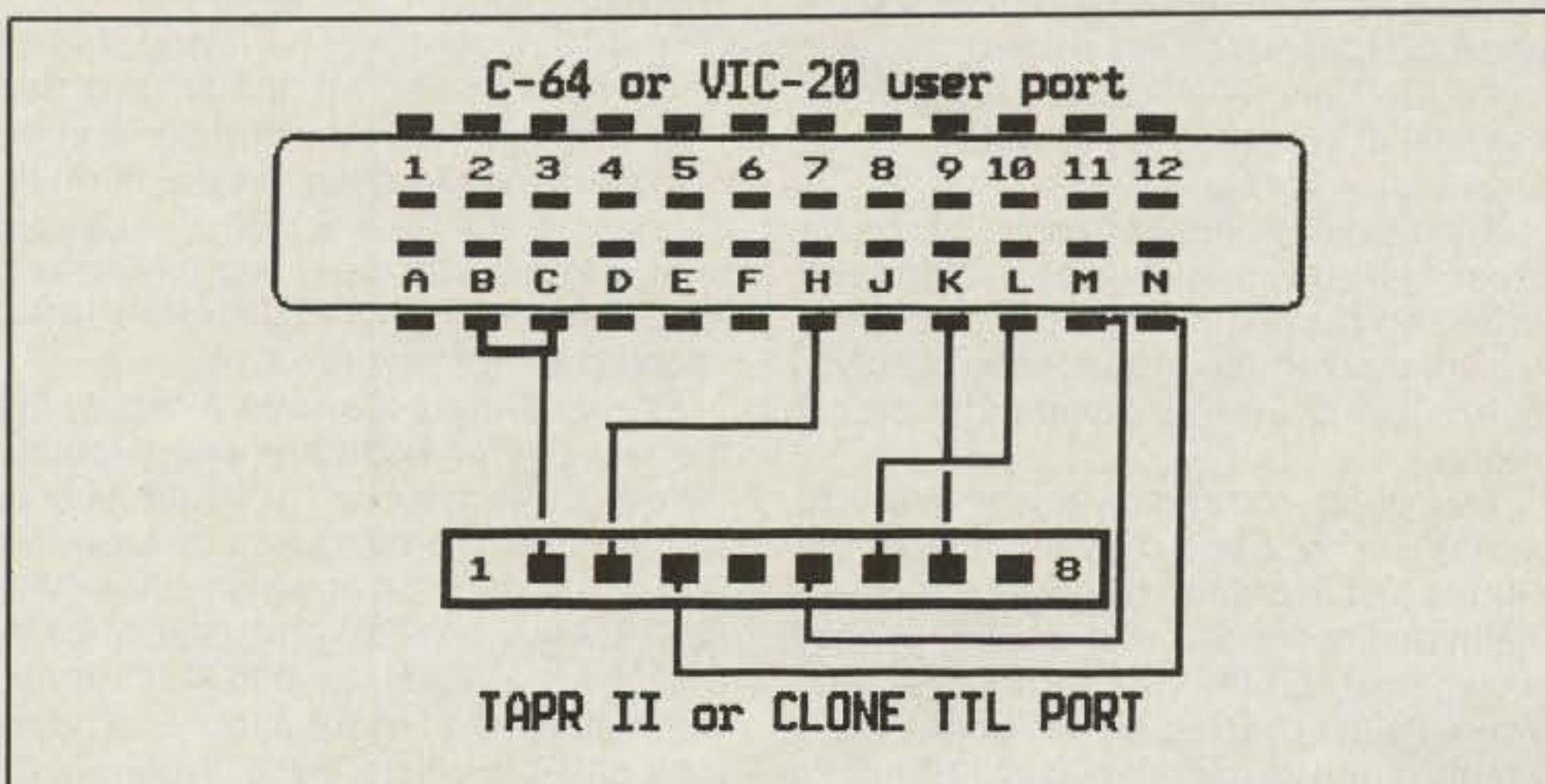


Fig. 8- TTL port to Commodore 64 or VIC-20.

While not quite the spot in the Caribbean about which calypso songs are written, "KP5" was certainly music to many DXers' ears.

Fun In the Sun, Desecheo '89 The VP5 Story

BY PAUL MEACHAM*, VP2EXX

Ah the Caribbean! Lounging on the beach, cool tropical drink, melting beneath the gently tanning sun, playing a bit of radio here and there. That was the vision all over the world, I'm sure. Out of the thousands of islands in the West Indies, we picked a dandy little spot for a trip. Our travel agent warned us, but we paid no heed and set off anyway.

Our little vacation gem was Isla Desecheo, known as "Goat" Island to the folks of western Puerto Rico who occasionally catch a glimpse on a clear day, but familiar to DXers everywhere as "KILO PAPA FIVE." My part of this journey started as I left home on February 24 for St. Thomas in the U.S. Virgin Islands.

After arriving typically late, there was a fast shakedown at customs, a quick handshake with chief expeditioner John, KP2A, then before I could catch my breath, off to Puerto Rico. John and I flew the short stretch of water from St. Thomas to Puerto Rico, then the entire 100 mile length of the "Big Island" KP4. Right off the western tip we could spot what we came for. We dropped altitude and buzzed our future home. The seas around the island were quite docile and had me doubting all of the horror stories surrounding the Mona Passage where Desecheo is perched some 30 miles from landfall.

My curiosity being satisfied, John sat his plane down at Mayaguez airport where Arnold, NK4X, was practicing his CW on the horn of our rental car. After yet another check at customs we began the task of removing all of our "stuff" from John's tiny plane and coaxing it all into an even tinier Japanese station wagon.

After that workout, we headed south to Puerto Real, where we stashed our equipment courtesy of Wilfred and Nilda of Quality Marine Supply. This included another transfer of our assorted equipment and boxes into a storage container. All this moving about brought up the very serious question "Are we having fun yet?"

We really looked and smelled as if we



The luxury accommodations we shared in Puerto Real as we awaited our departure for Desecheo.

had done some heavy-duty work when we headed down to our hotel. "Hotel" is a choice word. Our luxury accommodations were three rooms above an ESSO station and 6,000 gallons of diesel fuel on the pier at Puerto Real. The facilities were down the hall, of course, and hot water was an unavailable luxury.

The next day consisted of shopping for those last odds and ends plus a trip back to St. Thomas. We all had a ball practicing our Espanol in the stores around Mayaguez. Too bad no one wanted a signal report.

Our other comrades, Harry, W8KKF, and Wynn, W6CDR, showed up from the States just in time to help test the equipment and pull together a few things they would need on the trip. During this time Arnold and I erected an all-band vertical on the pier. We cranked up as KP2A/KP4 just to let everyone know we were on our way.

On the 26th we purchased our groceries and kitchen items, expecting to leave for Desecheo on the morning. Late that afternoon we got the word from John, who had flown out over the island, that we would have to hold off at least one day. That was not really a surprise, and we could see "white caps" in the normally dormant Puerto Real. So with one day just to sit around, the groceries looked very inviting to those of us who had lived off of "soda pop" for several days.

Mother Nature gave us a break, and the last day of February was beautiful. "We go in the morning," John announced to his delighted campers. Because we had no alarm clock, and being the youngest, I got the job of staying up and waking everybody at 2 AM. Around 1:30 I knew I was not going to make it, but I found my pal Ed, NT2X, on the band. When we finished our QSO at 2 AM I was geared up and ready to go! On my wakeup rounds I

*Katouche Bay, Anguilla, B.W.I.

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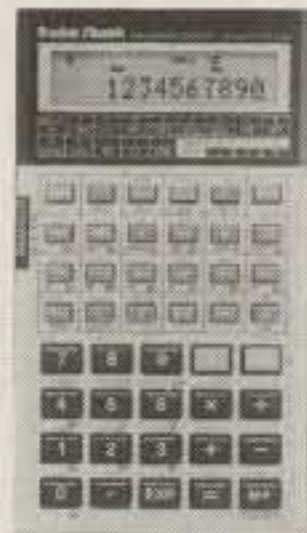
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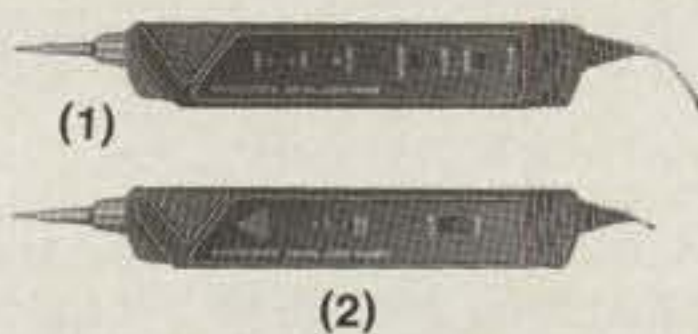
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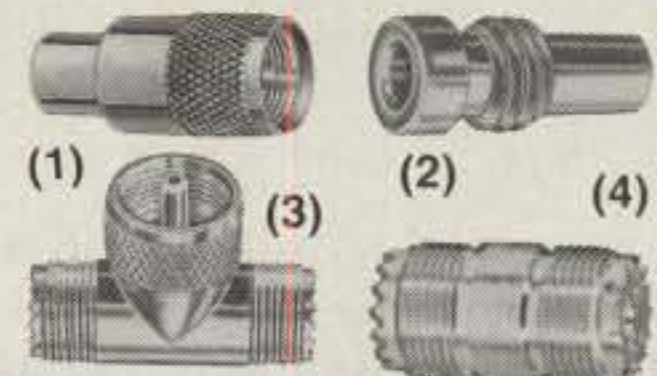


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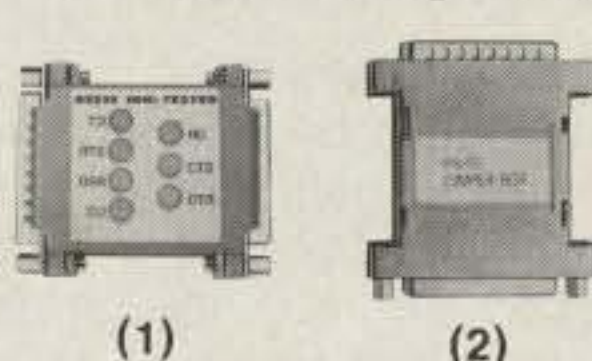
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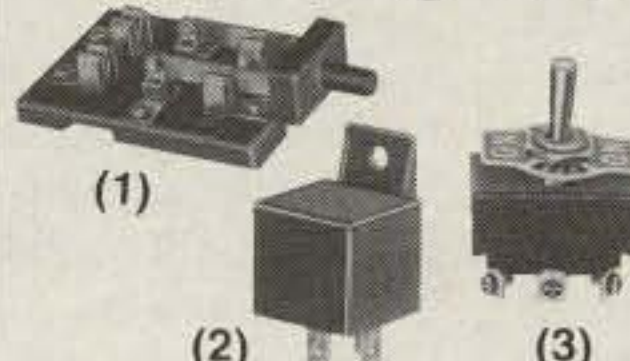
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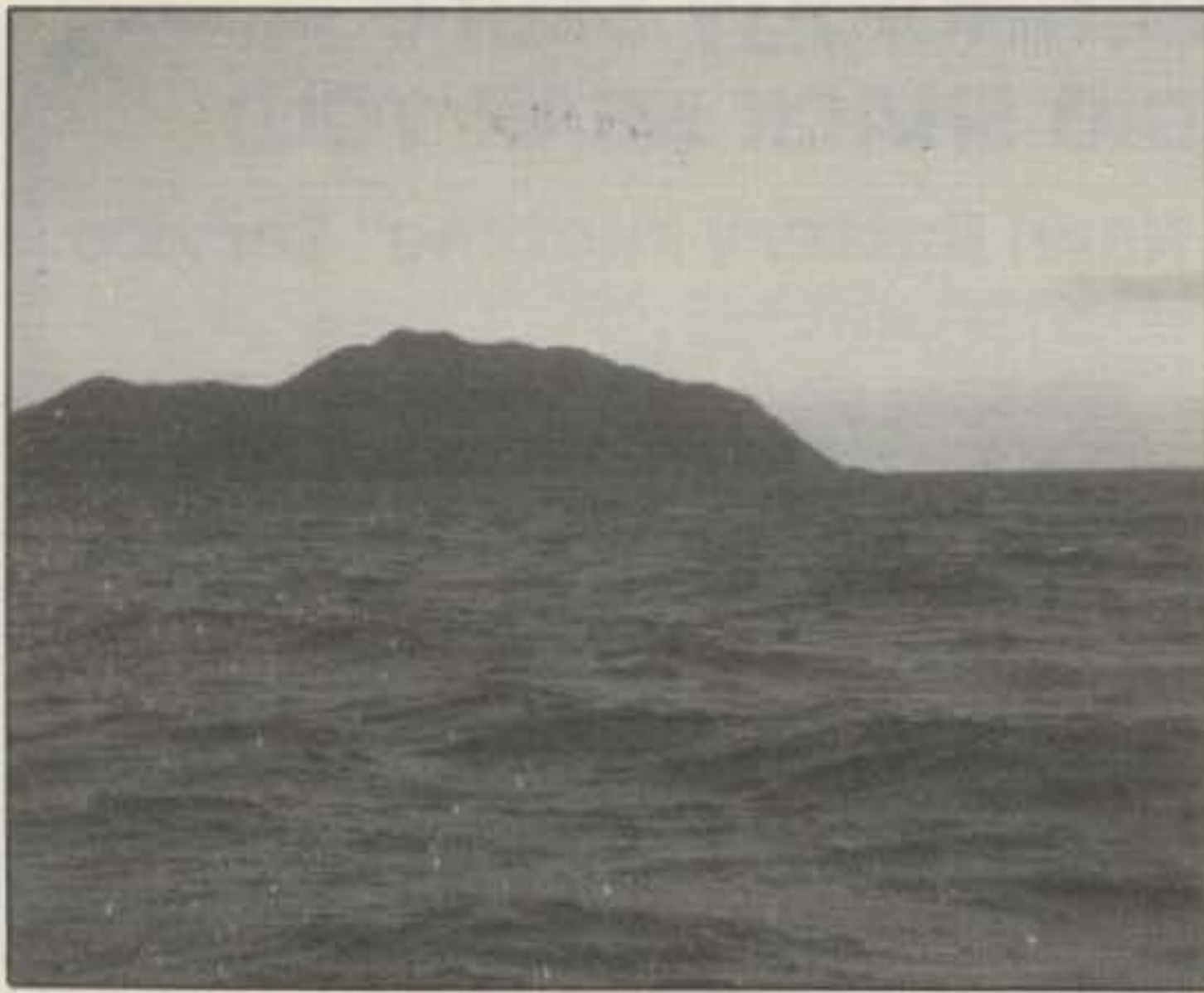
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Desecheo looms on the horizon and adventure awaits.



The only landing spot is a 20 foot wide stretch of beach.

was greeted by groggy but excited voices. Some cold water on the face changed us to all seriousness as we loaded our hired boat the *M.V. Wandelyn* under the lights of the pier. By 3:30 AM we were on our way. With the lights of Puerto Rico fading behind us, we all curled up on the damp deck of the rocking boat for some sleep, praying that we did not get thrown off into the sea.

At dawn I woke to find that Puerto Rico had disappeared into a silhouette on the horizon and that our target was well within reach. We had sailed for four hours and had just over an hour left to travel. The seas by this time had churned themselves up fiercely. Our tiny vessel climbed up and then slammed down again to meet some more of the 20 foot swells.

We anchored, and being within landing distance brought everyone's sea-wary spirits back. Wynn, Harry, and I were chosen to go in first with two of the captain's men.

The first load consisted of the five of us, plus some food and clothing. The little dinghy moved slowly under our weight, finally reaching the breakers at the beach. Captain Papi's men took the boat in bow first, and the next wave swamped our craft completely. We jumped into the surf and dragged the water-laden dinghy to safe landing on the beach. It took every bit of five men to remove the soaked containers from the dinghy. As Papi's men headed back for the *Wandelyn*, Wynn and I began moving our things up above the high-water mark on the beach.

The second load came with Papi himself aboard. He instructed his crew to take the dinghy in backwards so that the bow of the boat would pierce the oncoming surf. This trip everything survived the landing, dry, but the engine of the dinghy struck a rock and was rendered useless. One of Papi's men took a 200 foot stretch

of rope and swam out to the waiting *Wandelyn*. The rope was just long enough to be tied from shore to the main vessel. Without the engine, the crew had to pull themselves back to the boat hand over hand down the line. Using this method all the subsequent trips were successful. We lost nothing to the rough surf. The most difficult part was struggling to move the two 4 kilowatt generators and gasoline cans up above the high-water mark on the beach.

There are only a few man-made structures on Desecheo, the largest being a helicopter landing pad, the huge concrete surface built so that a cable station on the island could be maintained. The cubical building of the now defunct cable station

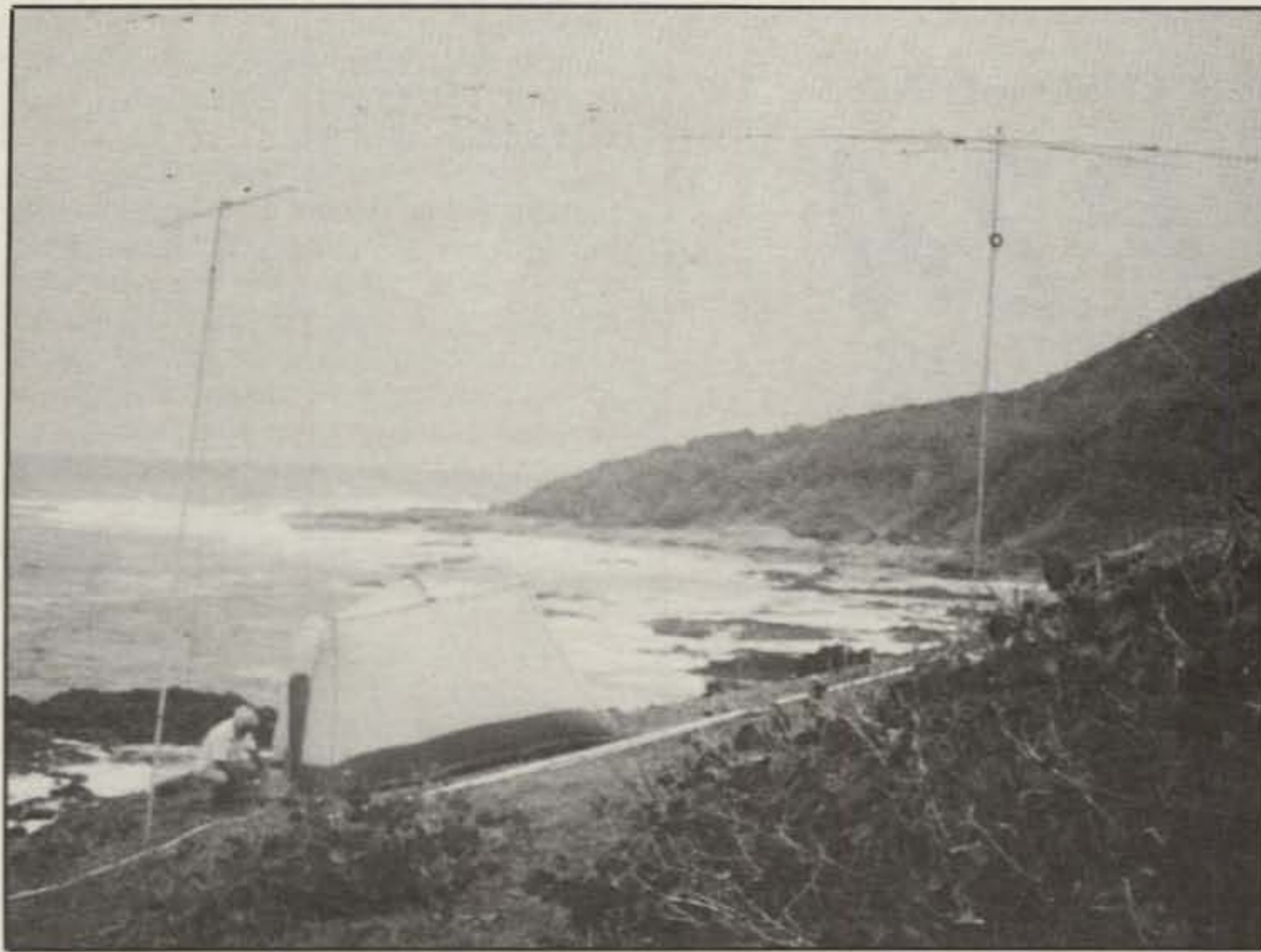
and two huge concrete signs are the only other foreign things on this deserted island. The heliopad is elevated up above the beach so we cleared a path up to it. Harry and Wynn set up their tent near the foot of the path and mine was just down the beach under some low shade trees. John and Arnold set up camp on the south side of the heliopad.

Now was the time to think about getting "on the air." The first operating tent went up on the north side of the pad and an all-band vertical was raised in the water below.

I cranked up on 20 meters with a TS-440 and MLA-2500 at 2349Z on March 1 as KP2A/KP5. K1FY was the first to get through in what would be two weeks of



The beach camp with its waterfront view.



The hillside shack offered a great view.

solid pile-ups. After initially getting on the air, things began to go much smoother. On March 2 we had a 4-element tribander, a 3-element 10 meter Yagi, plus a giant 160 meter inverted-L up in the air. The tribander was set up by the operating position near the heliopad. The 10 meter Yagi was raised near our second station down on the beach. We were rolling by then!

March 3rd, my 16th birthday, brought us our first excitement (other than radio) since arriving. Around 11 PM Wynn disappeared. He was gone for such a long time that Harry and I got worried. I went out to look for him. I had looked for about 15

minutes, with no luck, until I heard him call me from John and Arnold's tent.

Wynn and Arnold were huddled together in the dark both pretty frightened. There had been a brightly lit boat off shore all night. Wynn had spotted some figures moving around our camp and signaling the boat with flashlights. All of this time, Harry and I had been wandering around looking for Wynn. Breaking the monotony of the search, we flashed a CQ call out towards the boat. At first I was sure Wynn had seen us, but where we were and where the lights were did not match up. Wynn said that there was also a second boat with no visible lights that

would flash a signal to the first boat. This was news to me! Wynn had called out to the figures and flashed a light their way. No response. Something was definitely up. The situation got very tense. We all knew too well that Desecheo is a haven for illegal immigrants and drug smuggling.

We got up our courage and went outside to investigate. We reported this story to John, who had been on the air during all of this. He got out the binoculars and we found that our visitors were setting up camp on a rugged strip of northern shoreline. They appeared to be fishermen just stopping by to collect some of the night-crawling hermit crabs which troop around in abundance. There was nothing we could do at this point except go to sleep and wait for daylight. Nobody really slept comfortably that night.

In the morning the boats were gone and our visitors were packing up to leave. All of our fears were unfounded. We all felt much better. The island was crowded that morning. Including us and our visitors the population rose to about twenty. The weekend fishermen from Puerto Rico had come out to enjoy *their* hobby.

This was the weekend of the ARRL DX Contest. For the test Harry cranked up on 10 to give out W8KKF/WP5 to the tune of 6,000 QSOs. Wynn did the same as W6CDR/WP5 on 15 and 20 for a total of 2,000 contacts. John and I being the only CW operators spent Saturday and Sunday away from the contest on the CW bands.

That same weekend I got my first freshwater shower since Puerto Rico. Rain collected on top of our tarps, so I broke out the soap and shampoo. It felt good to be clean, but it didn't last too long. I took a photographic expedition up the largest peak (700 feet). After the climb up in the mud, I got down only to find that my roll of film was somewhere back up the hill. (No,



Allen, N2KW, running a string of 15 meter CW contacts.



The only dining spot in all of downtown Desecheo. Harry, W8KKF, and Wynn, W6CDR, take a break for dinner.

GREETINGS FROM DESECHEO ISLAND



DX-PEDITION

KP2A

portable KP5

ZONE 8
 GRID FK68
 QSL VIA N6CW

TO: VP2ESM
 FROM: KP2A/KP5
 CONFIRMING QSO:
 DATE TIME MHZ RST 2-WAY
 02/03/89 0000Z 3.8 59 SSB

73's KP2A, John; N2KW, Allen; NK4X, Arnold;
 VP2EXX, Paul; W6CDR, Wynn; W8KKF, Harry.

In case you missed getting one, this is what they look like.

I didn't go look for it.)

Wynn and Harry were scheduled to go home after the first five days. We were expecting the *Wendelyn* to come for them in the morning, but it showed up late that afternoon. Instead of waiting until the morning, Wynn and Harry packed as quickly as they could to get off the island by nightfall. Arnold grabbed the chance to head north. The climate was just not agreeing with him. John and I watched them sail off, preparing to face a week more all alone.

On the morning of March 5, I ran into Wenty, 6Y5IC, who wanted to know who the new operator was. "New operator?" I questioned. "Nobody here except John, the goats, and me." Apparently Wenty had heard that someone was coming out when Papi came for the other guys. Wenty seemed to know more than we did.

Around mid-day Allen, N2KW, showed up much to our surprise and relief! With him came a cooler full of cold drinks. He immediately won our friendship! Allen had missed Papi's boat after not arriving in San Juan in time from the States. He paid a good fee to some fishermen to take him to the island. The tiny boat made it in about an hour. But Allen came out ahead on the deal. We found out later that it took the fishermen 6 hours in their tiny open boat to get back to Puerto Rico in a sudden gale.

Our daily dose of excitement did not end with Allen's arrival. As the sun began to set over the passage, a helicopter came and harassed our campsite. At first I figured they were just joy-riders, but the noise from its engines was so deafening I had to stop my 10 meter pile-up. I went outside to investigate. When I had reached the top of the path to the pad, the 'copter came down about 5 feet over a flat grassy plateau just above the heliopad. That's

when a camouflage-clad person leaped out with an M-16 machine gun in hand. My heart skipped a beat, and I ran back down to the pile-up on 10 and told everybody to QRX, as we had quite a problem brewing. With all the nerve I could muster I went back up to find four more camouflaged men leading Allen from his operating position and rounding up John from his tent. We were asked to explain ourselves and guided to the center of the heliopad, where they kept us at gunpoint.

Our passports and radio licenses did not impress them, but John finally found our landing permit and visiting permission from the United States Parks Service. When they saw the official documents, the tension broke and we could all breathe again.

We found out that they were part of an illegal drug enforcement program. Their surveillance aircraft had reported suspicious activity on the island, and it was these fellows' job to come look us over. Satisfied, they waved goodbye with a smile and left us to carry on. We were all very happy that nobody had a police record.

The next days passed by smoothly. It proved to be the calm before the storm. Two nights before our scheduled departure we spent a hellacious night of driving rain and wind. Our tents were soaked and filling with water faster than we could do anything about it. The tents were constantly bent over under the force of the wind. It was a struggle to keep the operating tables from going over backwards.

As if things weren't bad enough, the weather reports out of Puerto Rico were calling for this to continue for several days. Those who heard us on 40 meters that night knew first hand of our desperate situation. We are deeply grateful to all those Stateside and Canadian guys who

helped us get word out to our families back home, and to the amateurs in Puerto Rico for keeping us up to date with the local weather conditions.

On the 12th we notified our boat captain that the seas were too rough to make our getaway and to hold off for one more day. Despite our warning the *Wandelyn* showed up in the morning. On their attempt to come in, a wave picked up the dinghy and tossed it upside down like a toy. John and I ran to the rescue and helped pull the three crewmen out of the pounding rocky surf. Papi told us in his best English, "You stay here; I don't know how long! Our vacation had just been extended.

Even with the bad news we somehow rejuvenated our spirits and set forth to make the best of our extended stay.

Gasoline conservation went into immediate effect. The day partially off the air gave us time to clean up, relax, and enjoy the life on Desecheo. We declared the expedition officially over and a success. We were now stranded.

The waiting got to Allen, so he decided to be constructive. He took parts of two verticals that had been destroyed by the weather and constructed a huge 40 meter ground plane, in the middle of the heliopad. Allen took his credit and named his creation the "Singer Stinger" after himself, of course. We got good use out of the monster antenna even though the bands were in poor shape on the 13th and 14th.

On the 14th things looked good weather-wise, so we made arrangements to escape the next day. We gathered up what we could, knowing that we might not make it off the rock. We went to sleep that night with our fingers and toes crossed for good luck.

The DX gods smiled on us. In the morning the seas were calmer than we had ever seen them. When the boat came into sight we knew we were going home.

When the stations finally came down our mission was accomplished. Thirty-five thousand contacts on ten bands and three modes, with well over 200 countries worked. John even made the first ever 18 MHz contact from Desecheo.

Our staging the day before paid off. With the help of Papi's men we were loaded in just a few hours. A final inspection was made, and we were satisfied that we had fulfilled John's promise of leaving the place cleaner than we found it.

As we sat on the deck of the *Wandelyn*, John, Allen, and I had a chance to sit back and reflect on the two weeks. Comedy, drama, adventure, and even horror all rolled into one. Too bad Harry left early with the video equipment, as we had all the makings of a great movie.

We pulled away watching the island grow smaller on the horizon. We felt sorry that it all had to end. Of course, the rest of the way home we planned where to go next. Any requests?

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There's still time to spruce up your antenna system before the contest. One way to improve on performance is to check and possibly replace tired cable. As we find out, the best is not always the most expensive.

Cutting Your Losses

A Low-Loss Transmission Line (For Free)

BY STAN JONES*

Is your antenna farm down on the south forty? At the other end of your house? Hidden way out back? Are you losing more signal that you care to admit in your transmission lines? Help may be as near as your local cable television company.

Cable companies routinely throw out partial reels of .412, .500, and .750 aluminum coaxial cable because it is in too short lengths for their use. A visit to any

*131 York, Monroe, LA 71203. Stan Jones is technical director of Cable Management Associates, Inc. of Dallas and is a frequent contributor to several electronics magazines.

cable company probably will turn up several reels containing 50 to 200 feet each of perfectly good cable that can usually be had for the asking. Practically nothing (short of helical cable) makes a better download or transmission line for the higher frequencies.

Typical losses are shown in dB in Table I. Actual losses may vary slightly because of the wide variety of cable in use today. This cable is manufactured to a high degree of accuracy and will yield a near perfect VSWR if terminated properly. It is, however, 75 ohm cable and many rigs will need a matching device. Most cable manufactured today has a copper-clad aluminum center conductor, which due to the "skin-effect" of higher frequencies

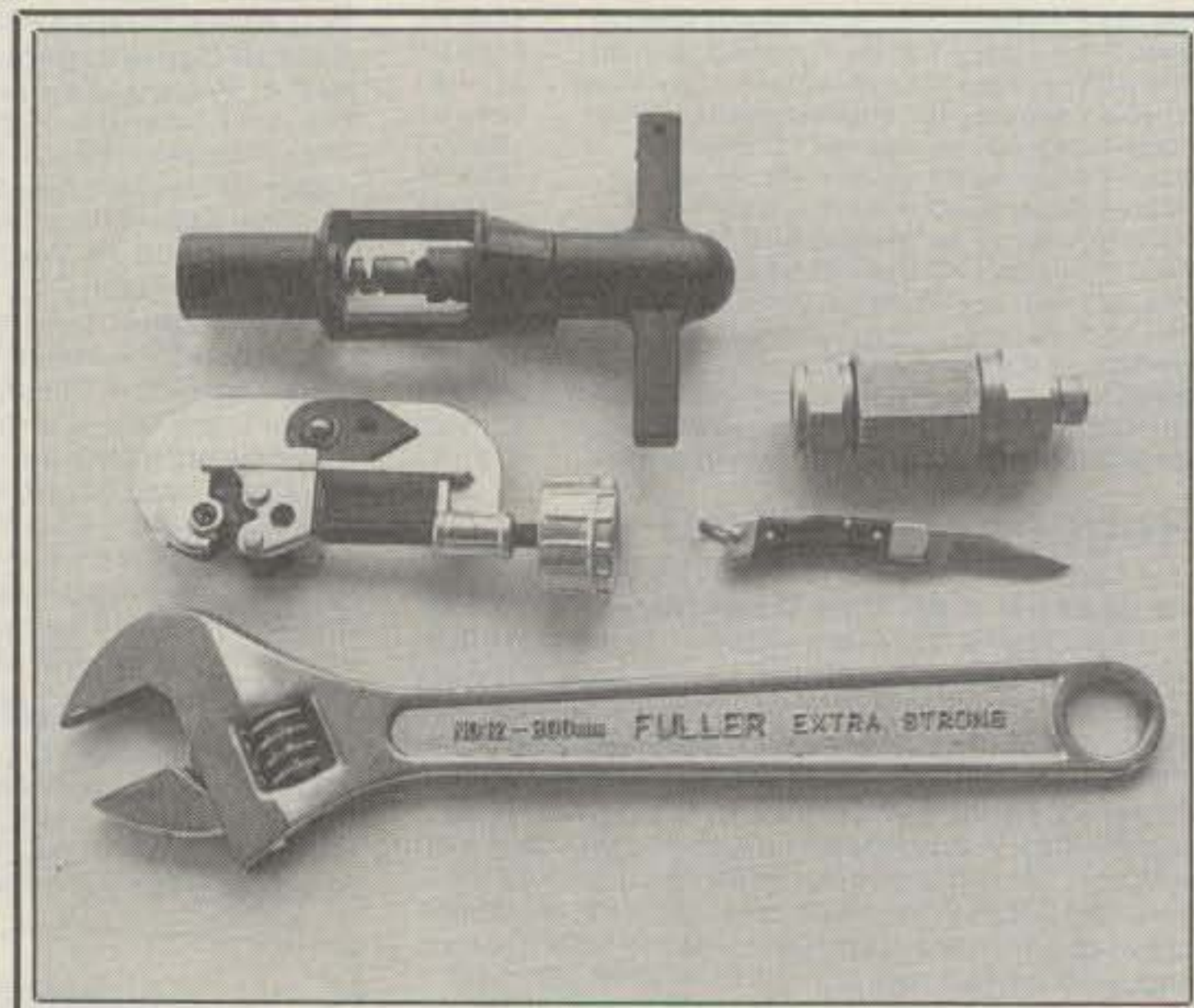
Cable Size	Frequency			
	50 MHz	144 MHz	216 MHz	440 MHz
.412	.7 dB	1.1 dB	1.3 dB	2.0 dB
.500	.6 dB	.9 dB	1.1 dB	1.7 dB
.750	.4 dB	.4 dB	.7 dB	1.2 dB

Table I—Losses in aluminum coax (typical). These losses are dB/100 feet, typical

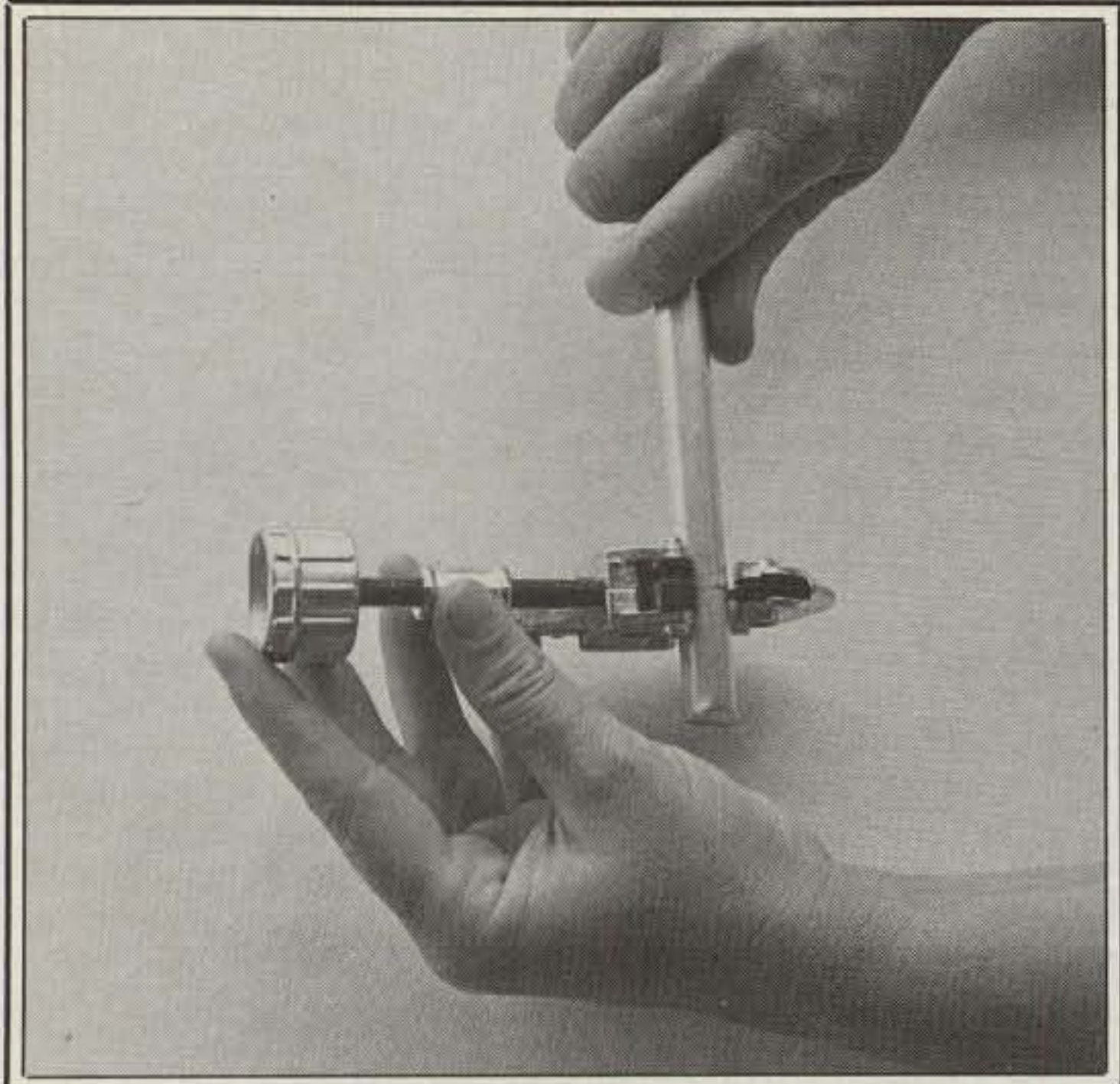
makes for very low losses. You might be able to get some older pieces of cable that are still good and have a solid copper center conductor. Be sure to test all cables, especially the older cables, before going to a lot of trouble installing them. If they have been stored outside for very



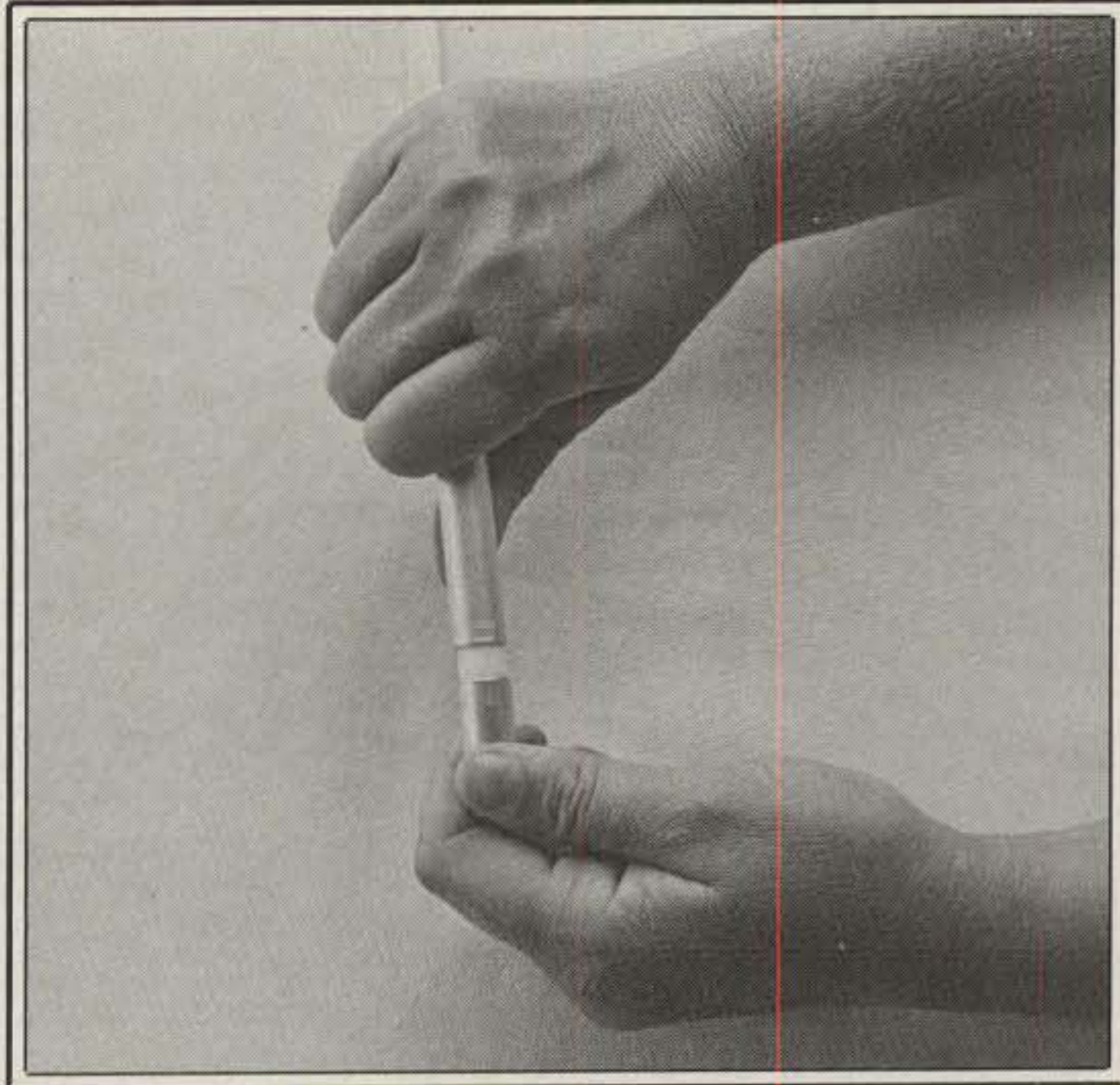
Many partial reels of cable go to waste around CATV companies because they are too short to be strung on poles.



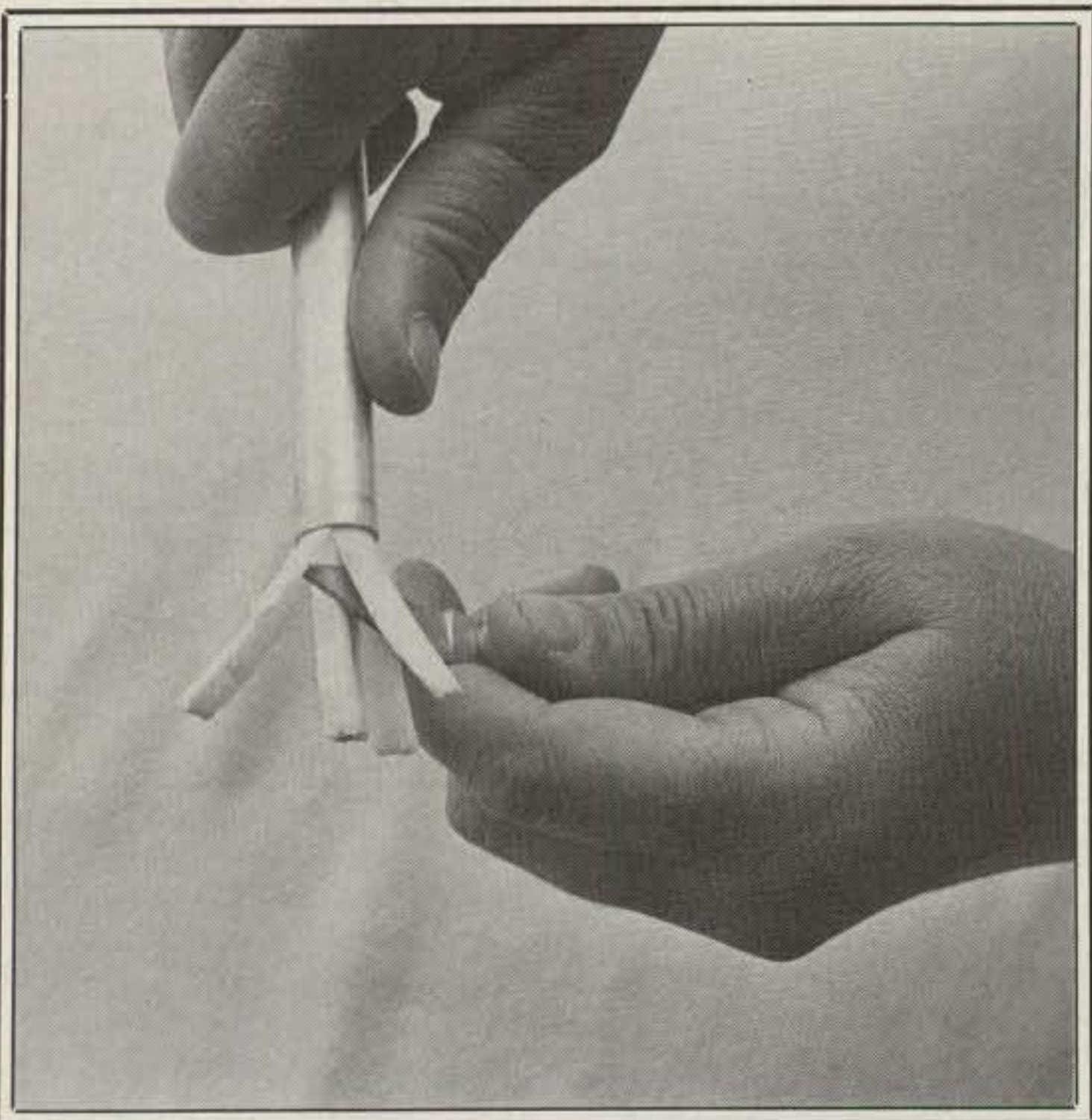
Connectors and tools needed to utilize this cable.



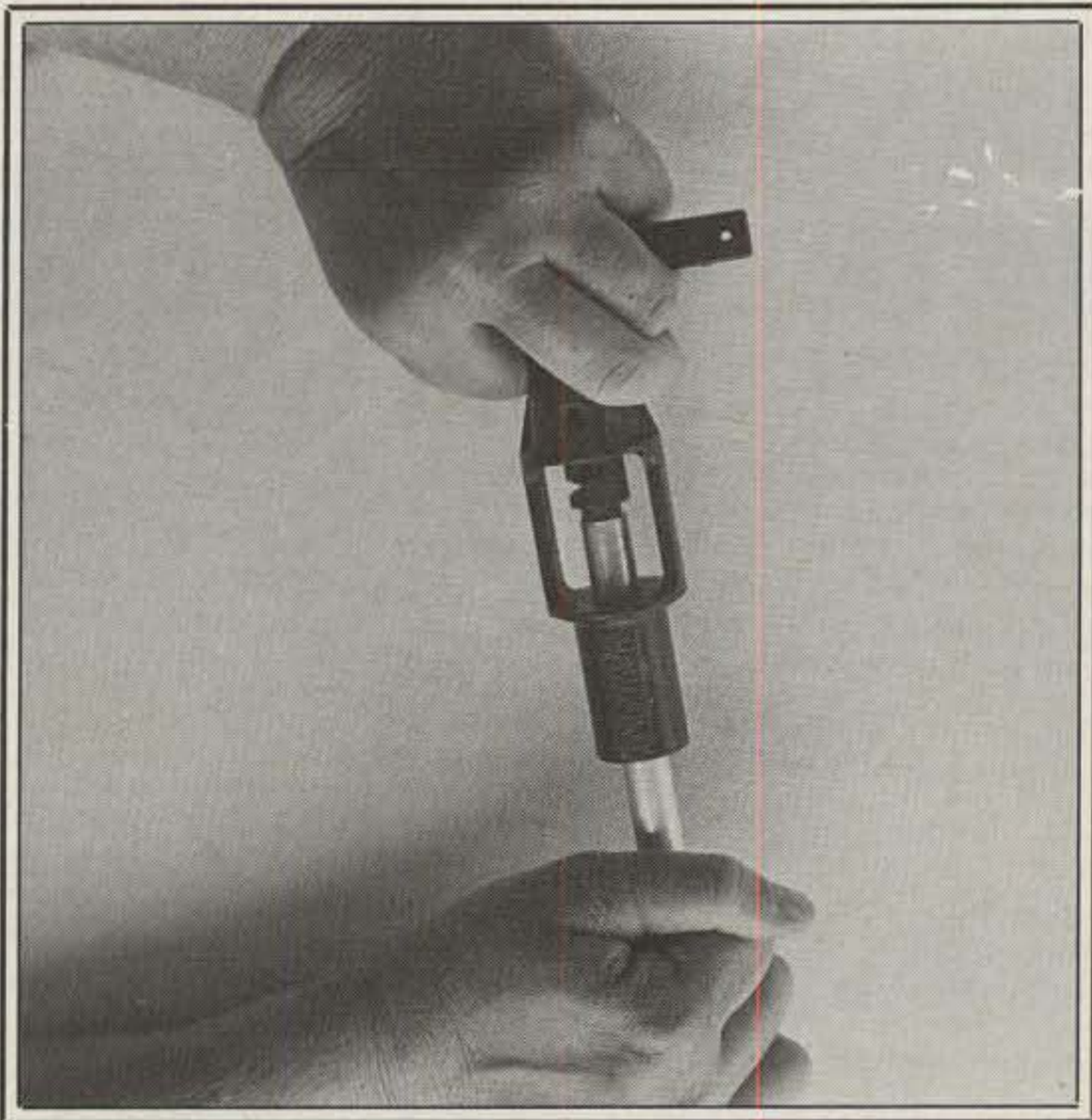
Score the aluminum half way through with a tubing cutter.



Break the aluminum sheath and pull it off the dielectric.



Remove the dielectric without scraping too much or scoring the center conductor.



Using the coring tool, clean out the end of the cable to the full depth of the tool.

long, there is a good chance that at least some moisture will have found its way into the ends of the cable.

Using this type of cable requires a few special techniques and tools not normally found in your typical ham shack. Most of the time, though, you can get help or loaner tools from a cable tech. You will need special connectors for each end of the cable and also a "coring" tool to install them. The connectors usually can be

purchased from the cable company or can be had from various mail-order firms. About \$10 to \$12 each is average. If you can borrow rather than buy the coring tool you will be quite a few dollars ahead, since it is rather expensive, especially considering its infrequent use.

The accompanying photos show the actual procedure for installing the connectors. These are "cable-to-F," but "cable-to-N" and "cable-to-SO239" are

also available. They all install basically the same way.

First score the aluminum sheath (after removing several inches of the PVC jacket if any) about half way through with a tubing cutter, and use pliers or hand break it the rest of the way and pull it off the dielectric. This gives clean edges and makes assembling the connector easier. Carve away the dielectric off the center conductor being careful not to nick it.

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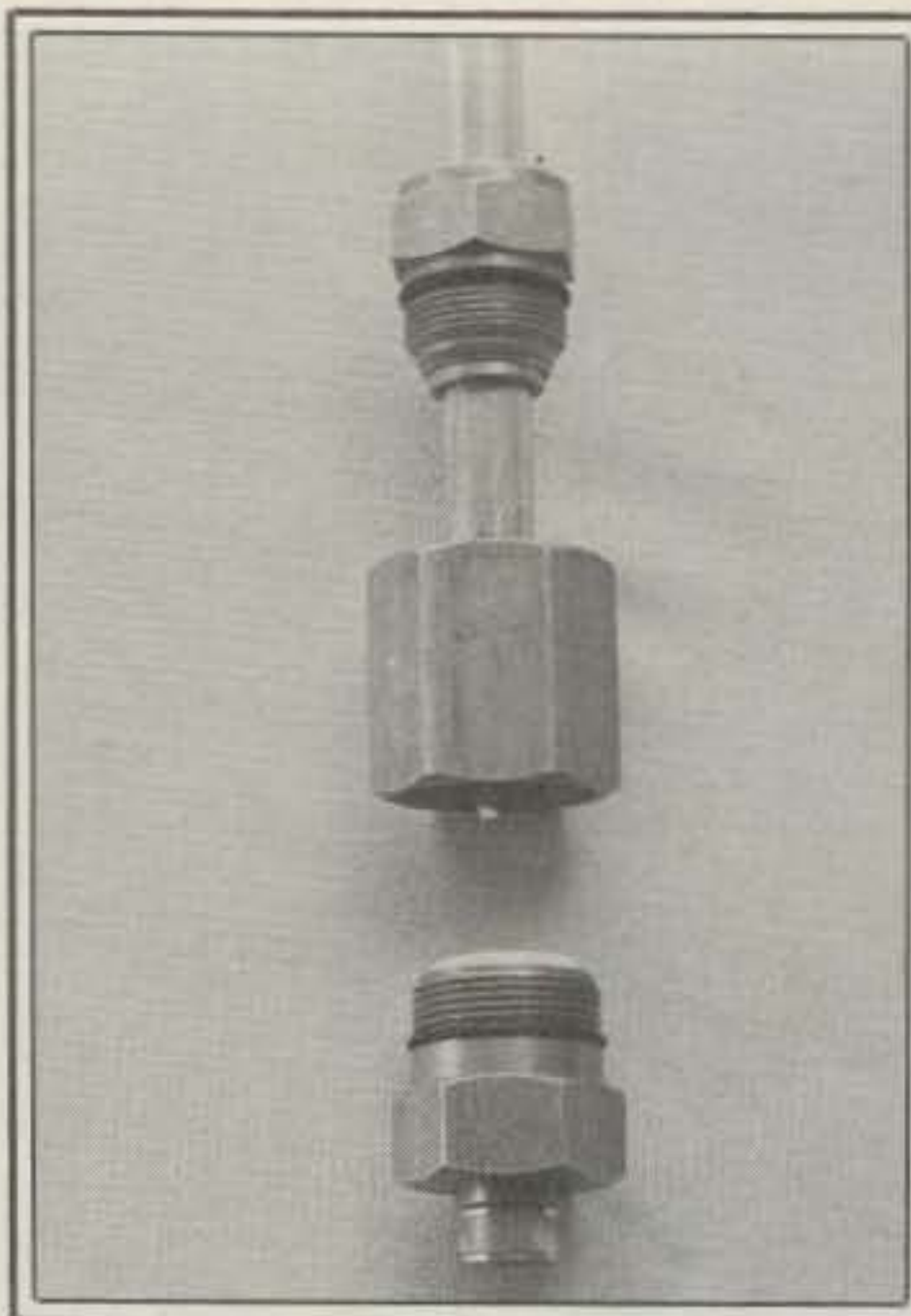
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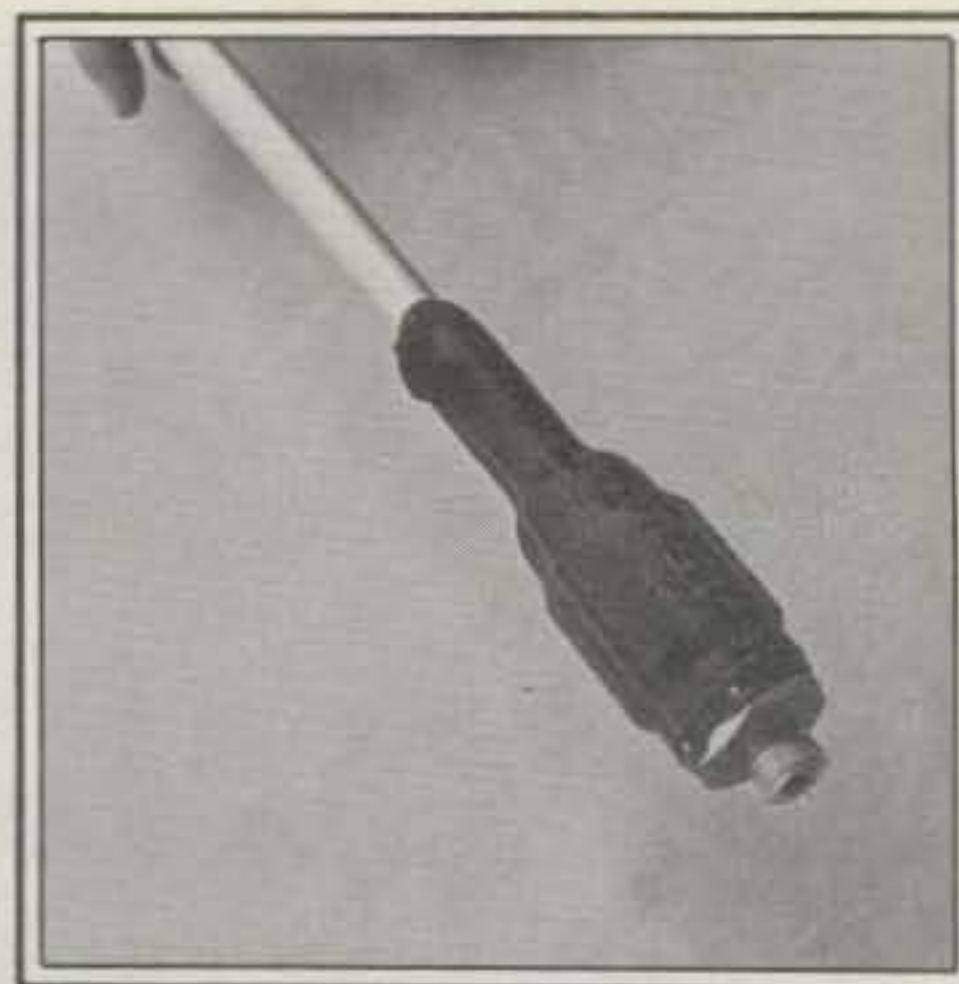
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Assemble the connector to the cable after measuring the center conductor to the correct length. Actual length is dependent on the style and manufacturer of the connector.

Clean the "fuzz" off the center conductor without scraping off the copper plating. Using the coring tool, remove the dielectric from the end of the cable as deep as the tool will go. This leaves room for part of the connector to slide inside. This integral shield is one sign of a quality connector. Don't use any connector without this shield or the results may be disappointing. Assemble the connector to the cable and tighten the center part first while holding the front to keep it from

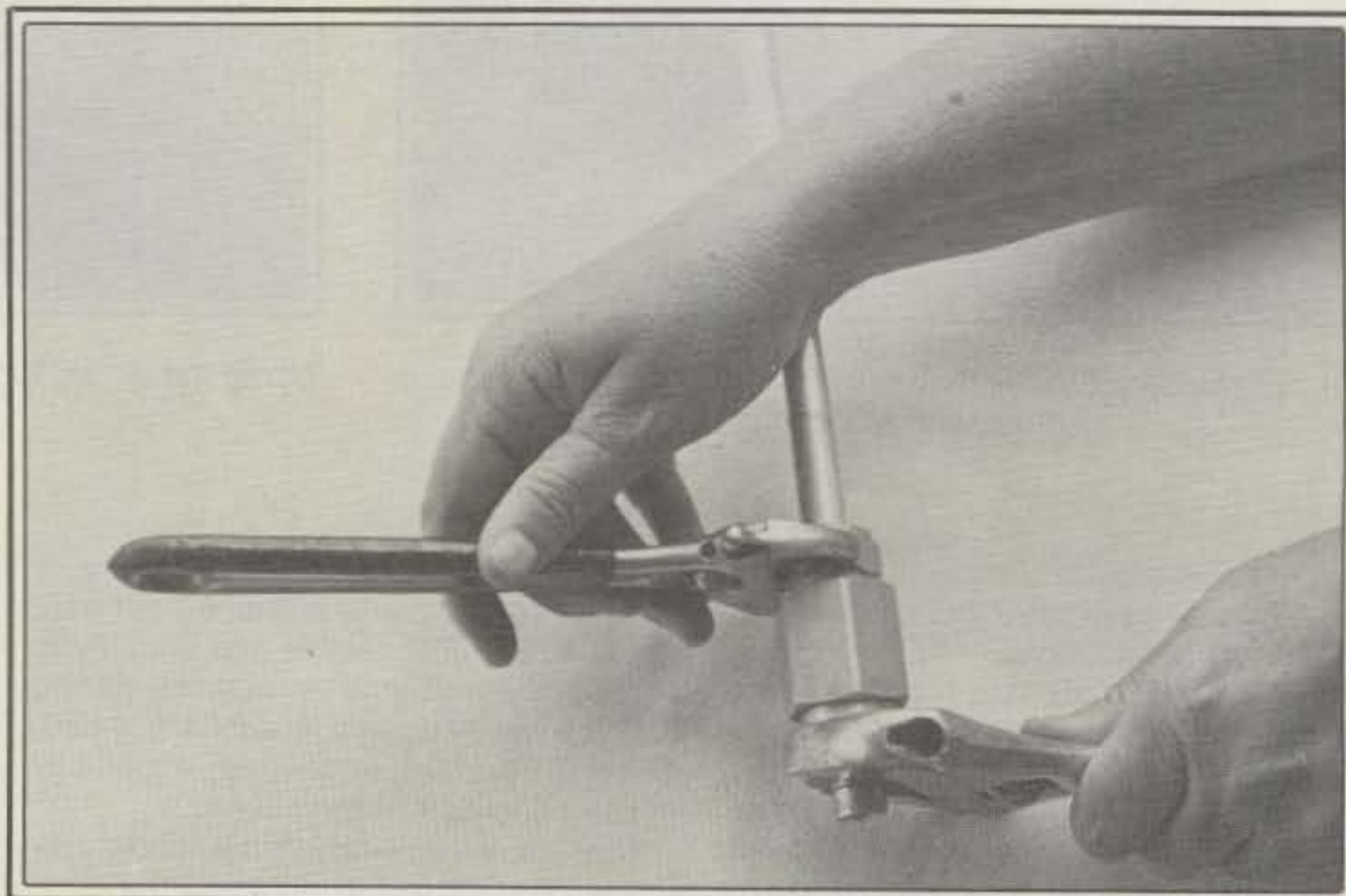


Shrink a piece of tubing over the connector to protect it from the weather.

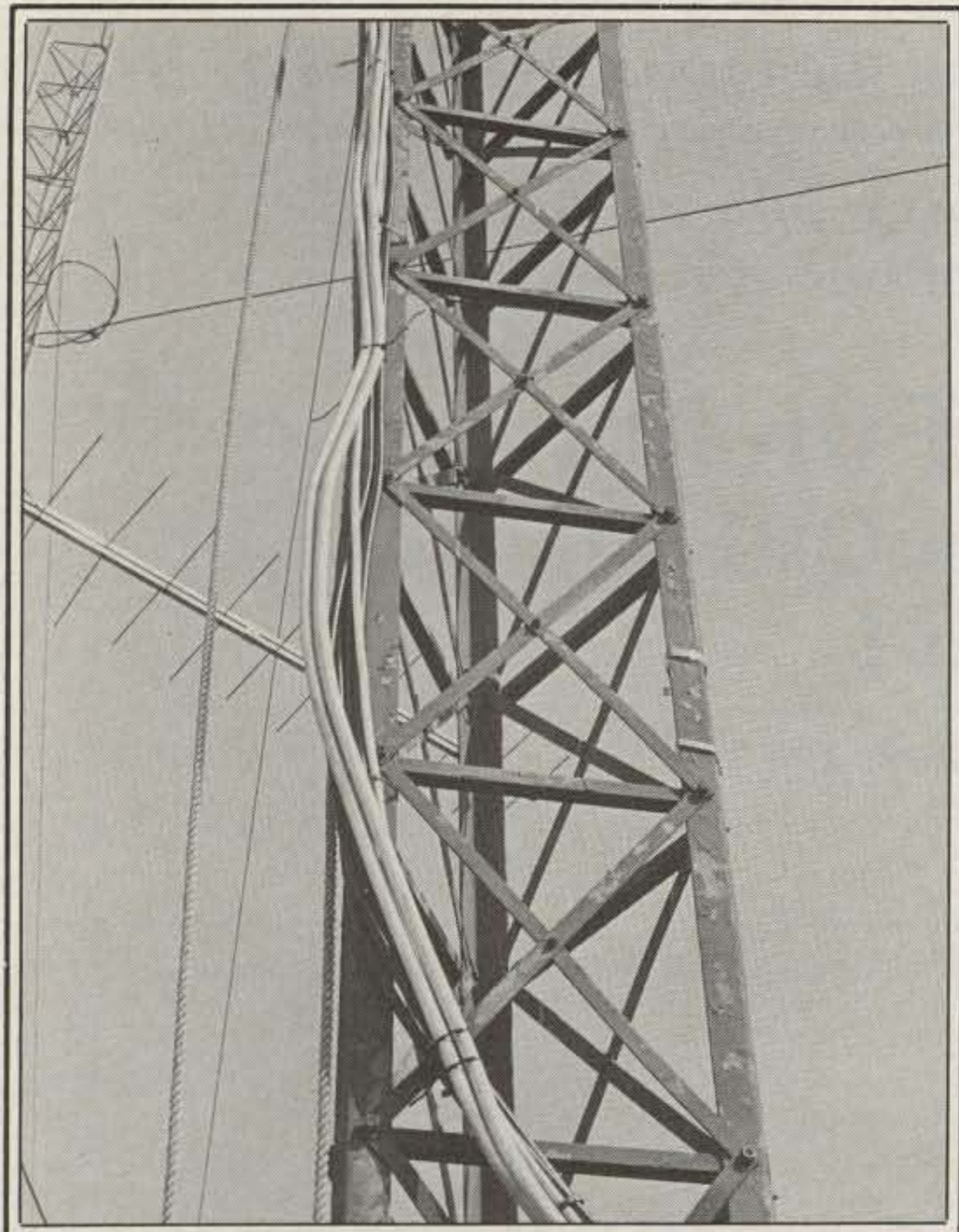
twisting the center conductor. This action clamps down with teeth on the center conductor. Tighten the back part of the connector last. This clamps the aluminum sheath. After testing for shorts or opens, shrink a piece of tubing over the connector and several inches of the aluminum to ensure that moisture never gets inside.

I recommend bringing the cable from the antenna to your outside wall and connecting to RG11 for the last few feet to the equipment. The same applies to the end connecting to your antenna. If you connect the aluminum coax directly to your equipment, sooner or later vibration and movement will kink it or break it.

If you can use 75 ohm cable and don't mind a little extra work to install it, you can have a very low-loss transmission line capable of working at frequencies through VHF and above.

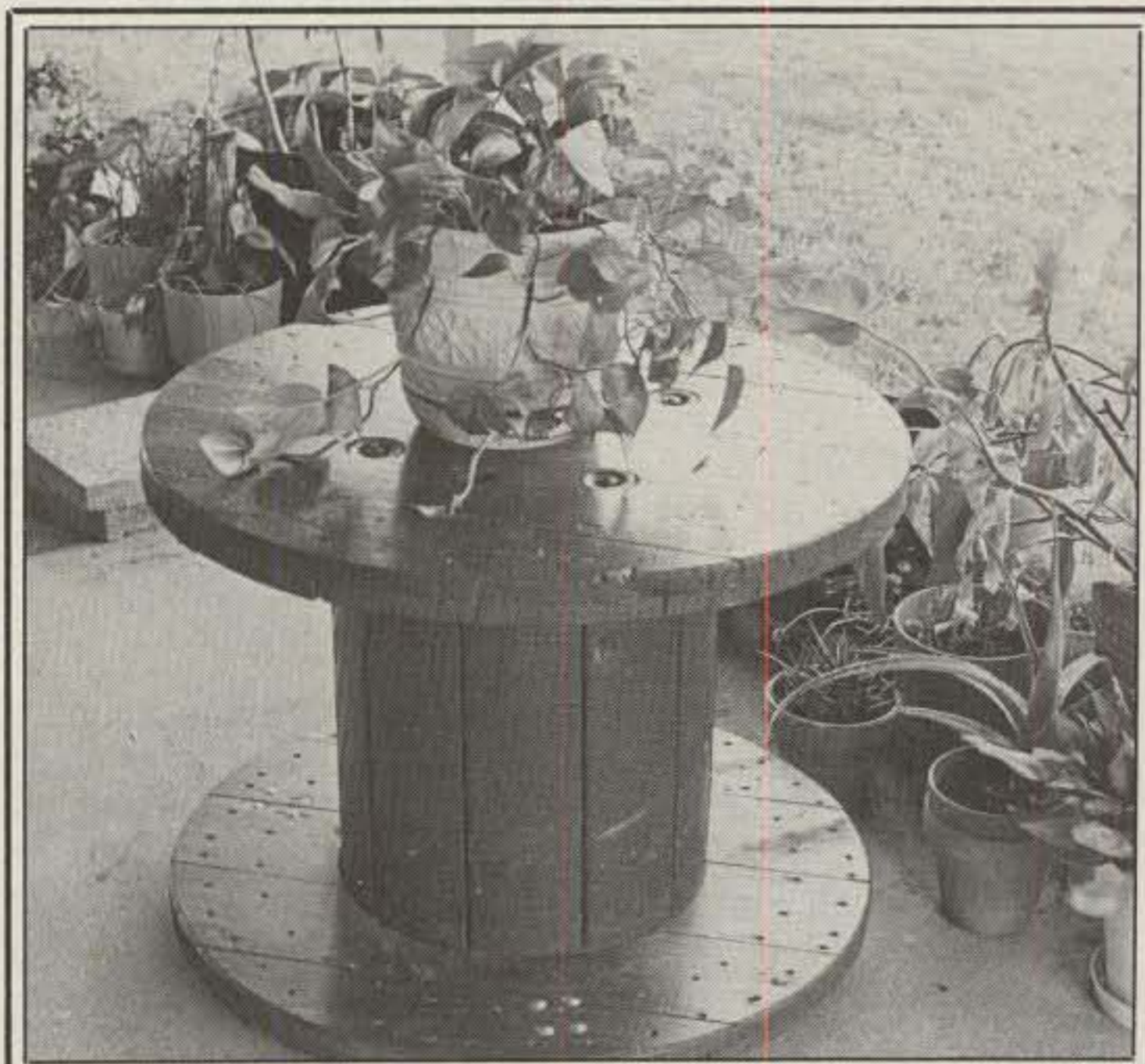


Hold the front of the connector while tightening first the middle then rear sections.



Use care in routing the cable up your tower. Any kinks will affect the impedance of the line.

Empty reels make pretty good patio or workshop furniture.

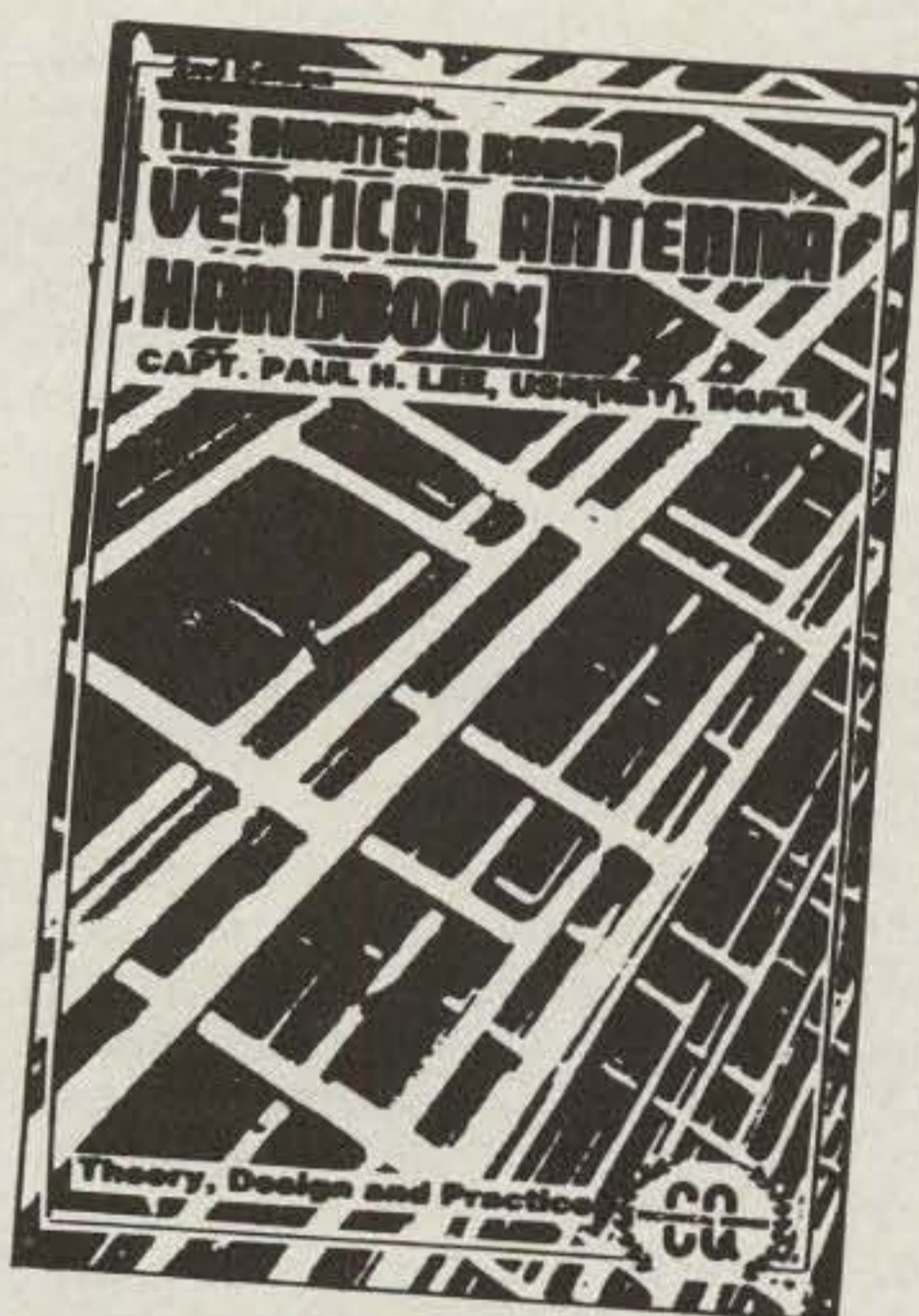


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The 30 Meter Fun Machine

A Superhet 30 Meter QRP Transceiver

Part I

BY PAUL D. CARR*, N4PC

QRP radio for me goes back to the days when I was a Novice. I became an amateur radio operator because of my interest in home brewing radio circuits. I knew that a license would allow me to test and use the transmitters I had built. It would also allow me to talk to people whom I had heard on my homebrew receivers. Well, in 1958 I was able to get (after multiple failures) a 12BY7 crystal-controlled rig on 3.707 MHz. I finally worked a station in Arkansas. I was hooked! I have been involved in QRP design, construction, and operation ever since.

QRP designs are favorite topics for the experimenting amateur. Many designs have been published in amateur radio literature through the years. These designs have ranged from single-band crystal-controlled transmitters to multi-band phone/CW rigs with their fair share of "bells and whistles." I have built and evaluated many of these circuits, and this series of articles is an outgrowth of my experience. Thirty meter designs are conspicuous by their absence. This is a shame, since the 10.1 MHz band has much to offer. The band seems to be open around the clock, and power restrictions keep the "front-end crunchers" at bay. Also, DX is possible with simple wire antennas (more about that later).

Design Philosophy

In order to reach a logical conclusion for equipment design, you must determine how the equipment will be used. This particular design filled my require-

ments. I wanted a rig for my home station, and small size was not a primary consideration (the rig is 9"L x 7"W x 6"H). This size allows more than enough room for the circuits that I chose. The design has the following characteristics: a superhet receiver with a 500 Hz crystal filter, full electronic break-in, clean and crisp keying, smooth transceiver operation, and 1½ watt output—enough for sport, but not so little as to dampen spirits.

Circuits were chosen which will allow ease of duplication. You should have no trouble finding the parts, which is a refreshing statement in today's amateur radio marketplace. (A list of parts suppliers appears at the end of this article.) There is only one printed circuit board used, and it is easy to duplicate. The remainder of the circuits are built on printed board material or by using a modified "ugly technique." The result is a rig that is easy and fun to build and certainly a blast to operate.

The Design Concept

I have tried many direct conversion techniques and some designs are good, but by their very nature there is twice as much QRM since signals appear on both sides of zero beat. Superhet designs (see fig. 1) do not have to be extremely complicated to be effective. I chose proven circuits (some left over from previous projects), and the results have been very rewarding.

The Receiver

The received signal is routed through a two-pole Butterworth filter to a dual-gate MOSFET mixer. Dual-gate MOSFET mixers are beginning to be displaced by other techniques, but under proper design these mixers still have a place in present-day rigs. Drain nonlinearity is the usual villain limiting the usefulness of these mixers. By using a low-value resistor in

the drain, most nonlinearity is avoided. This mixer has the additional advantage of providing a bit of gain.

The signal is routed to the crystal filter. Don't panic! I know what's going through your mind—either this 500 Hz crystal filter will cost an arm and a leg, or you'll need a fully equipped laboratory to duplicate it. Not so! How does \$15 or less sound for all new parts? Not bad. The design is not original. It was given to amateur radio by Wes Hayward, W7ZOI.¹ So many excellent designs have come from this gentleman that we owe him a lot. I purchased five 6.0 MHz microprocessor crystals and five capacitors. In less than 30 minutes I had a fully functioning crystal filter with excellent CW bandwidth, steep skirts, and great single-signal characteristics. You can do it, too. Don't let this part of the project stop you.

The output of the crystal filter is routed to a reliable and cheap MC1350P integrated circuit used as an IF amplifier. The only thing that may appear strange is there is no tuned input or output. The MC1305P has an input impedance of approximately 2000 ohms, and when shunted by a 220 ohm resistor, it provides a load of about 200 ohms for the crystal filter. The output of the IF amplifier is routed through a broadband transformer which matches its output impedance to the product detector.

I chose a "crunch-proof" double-balanced diode ring product detector. The Mini-circuits Lab SBL-1 is easy to use, and it has become my standard product detector. It requires a 8–10 dBm of signal injection from the BFO, and there is only one way to describe its output—clean.

Audio amplification is provided by a 2N3565/2N3904 preamp driving an LM386 audio output chip. The input to the preamp is via the emitter, providing a low-impedance termination for the product detector. Output from the preamp goes

97 West Point Rd., Jacksonville, AL 36265

¹W. Hayward, "Designing and Building Simple Crystal Filters," QST, July 1987, pp. 24–29.

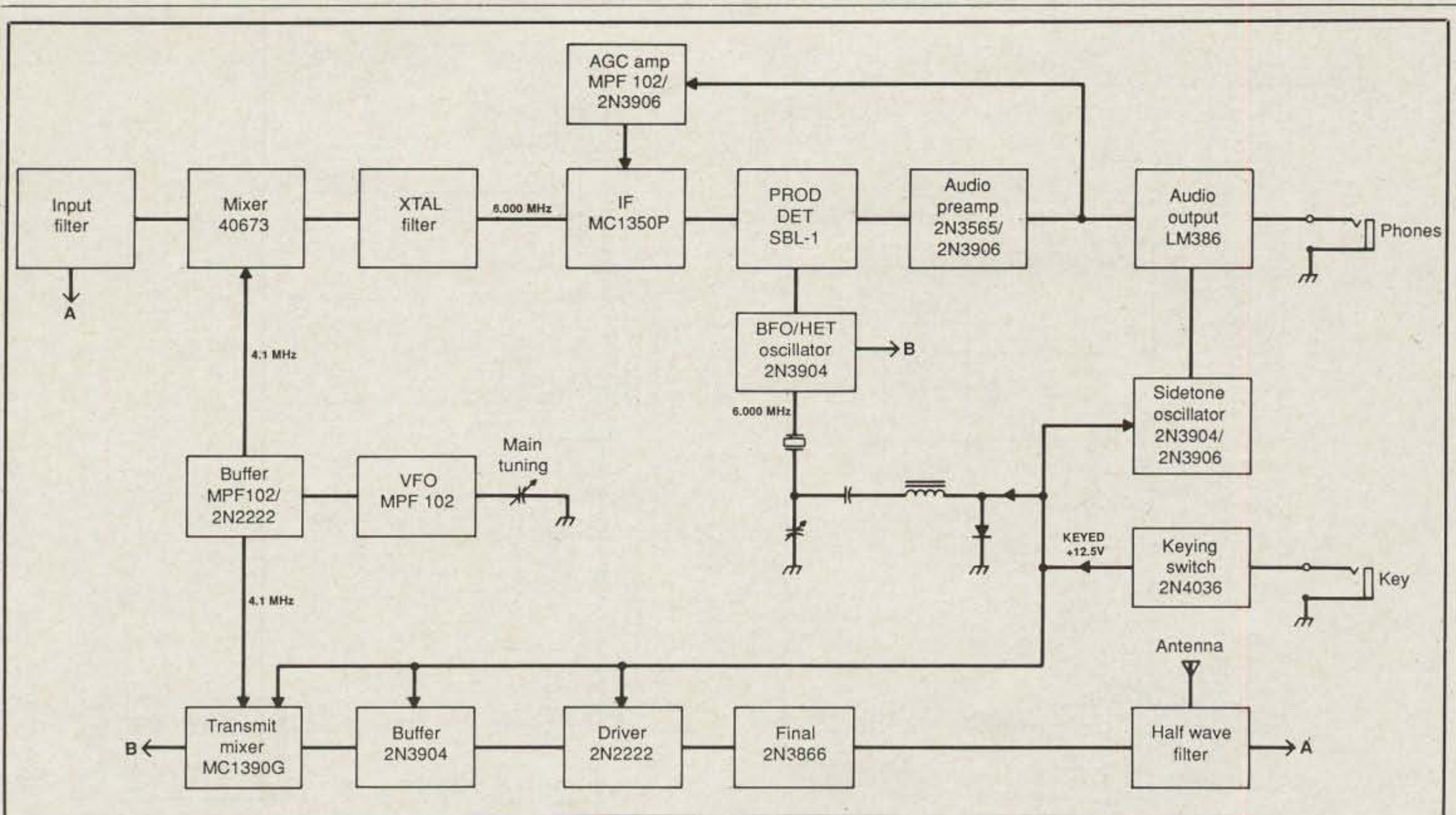


Fig. 1—A block diagram of the 30 meter fun machine.

through the AF gain control to the audio output amplifier. This is a very good audio circuit. Fuzziness and crossover distortion, characteristic of many audio chips, does not appear here. The audio output is clean and crisp. There is a built-in speaker for listening while working at my bench, but when I operate, the phones go on.

An audio-derived AGC is provided to keep the phones on your head when you encounter a "super" signal on the band. Although this circuit is not as good as an IF-derived system, its operation is adequate, and it was chosen for its simplicity. The .1 uF and 10 megohm resistor in parallel provides the time constant, and the values may be changed if you wish. Smaller values decrease the time constant and larger values increase the time constant.

The BFO/heterodyne oscillator does double duty. It consists of a crystal oscillator at approximately 6.0 MHz. During the receive mode, it provides the injection voltage at the proper frequency to produce the audio tone. During the transmit mode, an inductor is electronically switched into the circuit, lowering the frequency and providing the offset (750 Hz) for proper transmitter operation. Output from this circuit is routed to the product detector and transmit mixer.

A sidetone oscillator is included on the receiver board. Two transistors (2N3904 and 2N3906) are used to synthesize the effects of a programmable unijunction transistor, and a GE type D13-T could be substituted directly. With the values

shown, the frequency is about 750 Hz, the same as the transmit offset. This is an aid in tuning a signal. All that is required is to tune the incoming signal until the pitch is the same as the sidetone oscillator, and you are right on frequency. This oscillator is keyed directly from the keying transistor, and its output is routed to the audio output chip.

The remaining circuitry will be explained later, but if you are like me, let's heat up the soldering iron and get started. We can begin with the audio amplifier and sidetone oscillator. All parts for this part of the project are available from your local Radio Shack. Also, now is a good time to send away for catalogs if you do not already have them.

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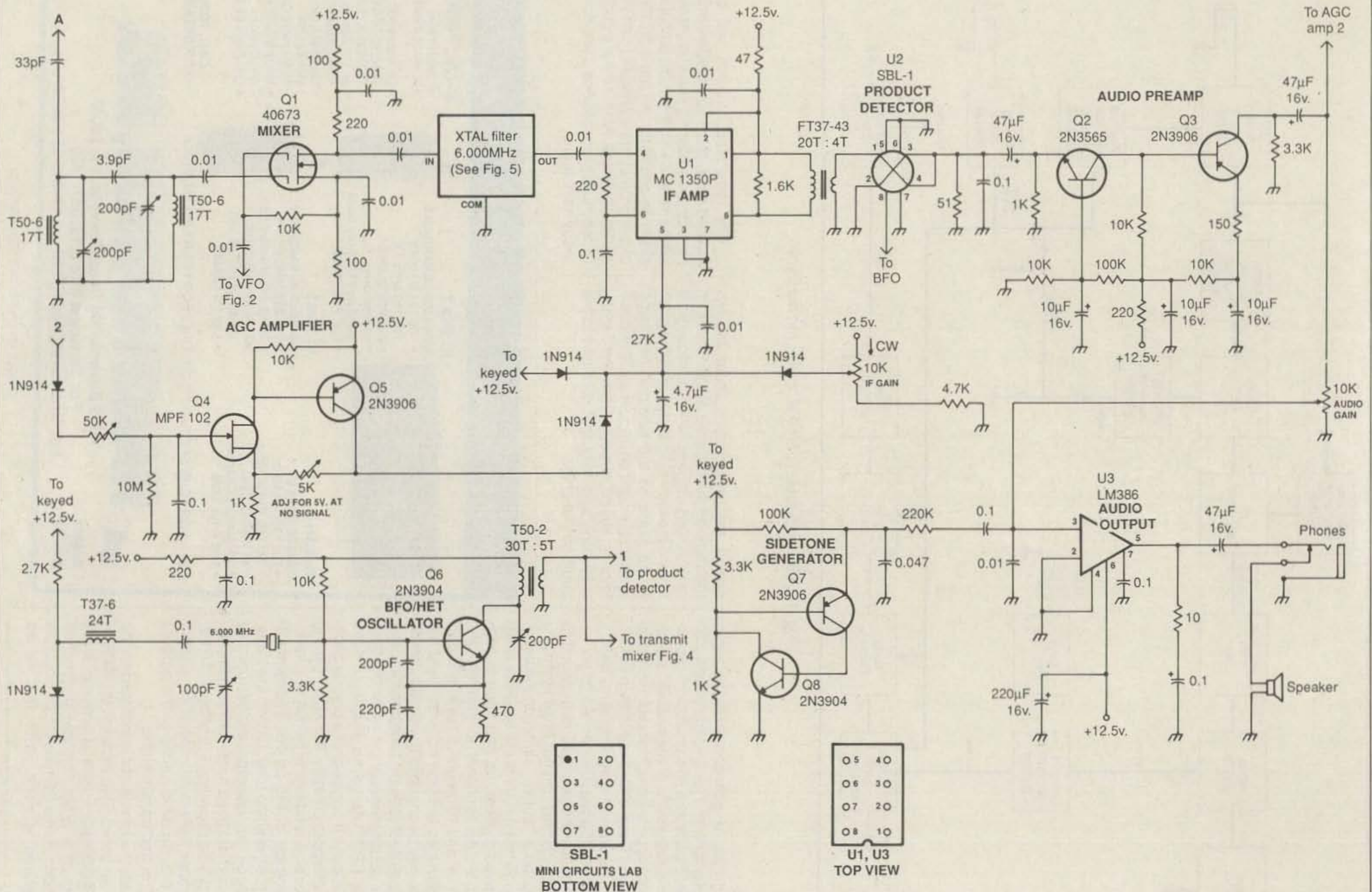


Fig. 2—The receiver portion of the 30 meter transceiver.

Construction

I chose a 9" x 7" x 2" chassis base for this project. The receiver and VFO are located on top, and the transmitter is located below the chassis. The only word of warning: Do not choose too small a chassis because crowded circuits have a way of producing unwanted coupling and subsequent instability. The receiver circuits are mounted on two pieces of printed circuit board material. The mixer (mounted behind the VFO) and other circuits are on the remaining board. If you use double-sided circuit board material, drill a small hole in each corner and solder a wire to both sides of the board; otherwise, you will have two capacitors to cause you grief.

Audio Amplifier Construction


The audio amplifier is built using the modified "ugly technique." Radio Shack sells a predrilled dual IC board (part No. 276-159). Break apart this board. One section will be used for the sidetone circuit. Start by cleaning the copper pads with very fine steel wool. Next cover the holes on the non-foil sides of the board with plastic electrical tape. This will prevent solder from running through the holes and causing short circuits. The board is now ready for the audio amplifier.

Mount an 8-pin mini DIP socket on the foil side of the board by carefully bending its leads flat and soldering to the board. Mount the socket so that pins 1 and 8 are at one end of the board. This will leave 12 pads free for the preamp and inner-stage coupling. Next, wire the output amplifier as indicated on the schematic. Check for solder bridges and remove any that may have crept in. When you are *sure* there are no wiring mistakes, install LM386 and apply +12 volts. With a speaker or low-impedance headphones connected, touch the high sides of the volume control with a metallic screwdriver. Varying the volume control should vary the output level. If not, stop and find out why.

With the audio output circuit working properly, build the audio preamp and interconnects. Again, check for wiring mistakes and solder bridges. If everything checks, again connect +12 volts and the headphones. Touching the input with a metallic screwdriver should produce a hum in the phones, the level of which can be controlled with the volume control. This hum may not be as loud as you might expect, since the input is low impedance. Does everything check? If not, find out why. Now on to the sidetone oscillator.

The second half of the Radio Shack circuit board is used as a platform for the sidetone. Preparation is much like before: Clean the copper pads and place electrical tape over the holes. Wire the circuit on the foil side of the board per the schematic. After checking for solder bridges and wiring errors, connect +12

volts (in series with a key) and the output to the LM386 as indicated on the schematic. Pressing the key should result in a nice, clear CW tone in the headphones or speaker. If not, find out why.

You should have a fully operational code practice oscillator. Remember, this is a CW transceiver, so a bit of practice may be in order. Next time, I will continue with the remaining receiver circuits. Get your catalogs on order and prepare for more fun. There's more to come. 

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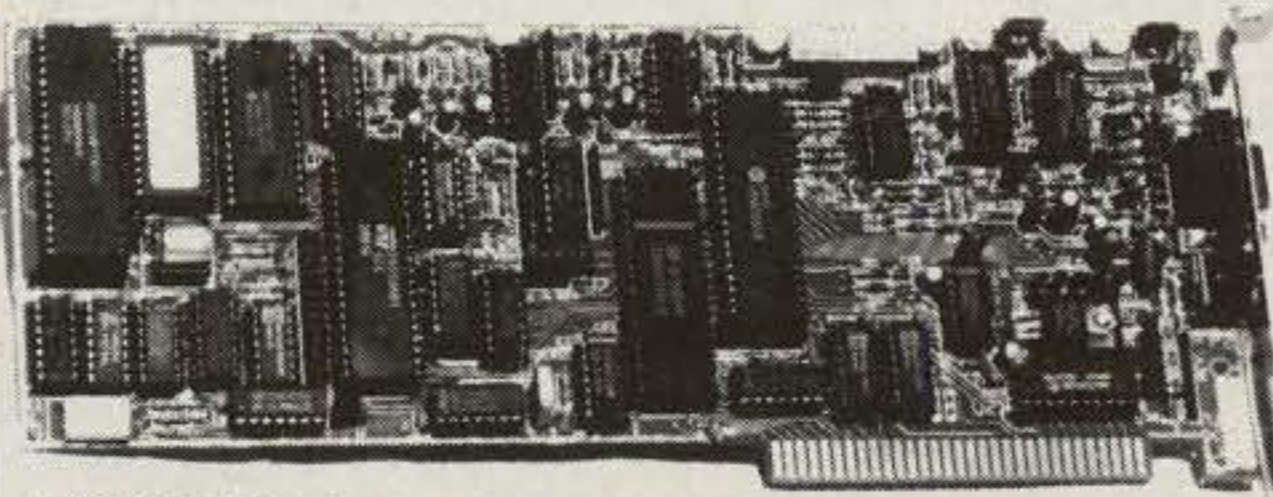
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An obscure footnote in the Part 97 rewrite opens up a new world of opportunities. Three numbers, 625, can mean a lot to digitally minded amateurs.

New AMTOR Mode!

BY BILL HENRY*, K9GWT

New? Yes, *new!* The recent re-write of our FCC part 97 of the Rules and Regulations now includes a *new* AMTOR specification. Part 97.309a(2) now says: "The 7-unit code specified in International Radio Consultative Committee Recommendation CCIR 476-1 (1978), 476-3 (1982), 476-4 (1986) or 625 (1986)." The "or 625 (1986)" part is new. The previous AMTOR specifications referenced CCIR 476. Now CCIR 625 has been added. Does this make obsolete all our old AMTOR equipment? No, not at all, but it *adds* some new features that will be useful to radio amateurs. CCIR 625 also clarifies a number of troubling technical points that have previously invited varying interpretations.

AMTOR, SITOR, and CCIR 476

AMTOR in commercial ship-to-shore service has many names: "SITOR," "TOR," "ARQ," or just plain "RTTY" are common. I will use "SITOR" to designate commercial AMTOR in this article. Regardless of what it is called, commercial SITOR came first, and amateur AMTOR is an adoption of most of the modes and features of its commercial parent. The credit for amateur adaptation goes to Peter Martinez, G3PLX, often called the "Father of AMTOR."

SITOR started in the late 1960s and early 1970s as a way to send error-corrected teleprinter data on HF radio. The first definition of the new RTTY mode was given by the International Radio Consultative Committee Recommendation CCIR 476. Various improvements and modifications have since been made and issued as CCIR 476-1, -2, -3, and -4 versions. Each modification of CCIR 476 was minor and dealt mainly with clarification of "gray areas" of the previous versions. AMTOR was developed first to CCIR 476-2 and then updated by most manufactur-

ers to the "-3" and "-4" versions as they were issued.

CCIR 625 and AMTOR Compatibility

CCIR 625 is a "downward-compatible" mode specification. A new CCIR 625 code converter *must* also be able to communicate with *all* other properly designed CCIR 476 devices. A CCIR 625 device must therefore be able to receive calls and communicate with *either* a '476- or a '625-equipped station. Using a new CCIR 625 AMTOR device simply expands our capability and **does not** prevent communications with stations having older AMTOR units.

CCIR 476 SEL-CAL

ARQ Mode (or "Mode A") of AMTOR includes a four-letter calling code. To start an ARQ QSO, you must first load in the other station's four-letter code and send it. The other station will then respond with his AMTOR "chirps" when he recognizes his own four-letter SEL-CAL. ARQ mode is therefore a "SElective CALI" mode—only the called station may respond. The four-letter SEL-CAL code used is slightly differently in AMTOR and SITOR stations. In AMTOR, by "gentlemen's agreement" (again courtesy of G3PLX), we make up a four-letter contraction of our amateur call signs. In commercial SITOR use, the marine stations use four-digit (shore stations) or five-digit (ship stations) *numbers* which are then converted to four letters using a table in CCIR 491. G3PLX wisely chose to *not* use this conversion business for amateurs. Regardless of AMTOR or SITOR use, what is actually sent on the air for CCIR 476 SEL-CAL is four letters.

As commercial usage of SITOR grew, one very basic limitation of the original specification became apparent. This is the maximum size of the SEL-CAL code used to identify each station (four letters). The CCIR 491 conversion table supports a maximum of 10,000 shore stations and 100,000 ship stations. SITOR has become very popular, and the number of active stations has out-grown the available

SEL-CAL list. A solution is to add additional letters to the SITOR SEL-CAL code.

As I mentioned above, we amateurs make up our own SEL-CAL code from a contraction of our amateur call signs. The "gentlemen's agreement" has been to use the four letters of a 1 x 3 call sign or double the first letter in a 1 x 2 or 2 x 1 call sign. For example, K9GWT uses "KGWT" and K4CZ uses "KKCZ." Note, however, that our system is *not* unique. K1GWT will have the same SEL-CAL as K9GWT; K4CZ, KC4Z, K1CZ, etc., will *all* use "KKCZ" for their SEL-CAL. This can cause confusion at times, especially in mailbox situations. An expanded SEL-CAL is therefore desirable for AMTOR.

NOTE: Amateur choice of a SEL-CAL code is strictly arbitrary and *not* dictated by FCC rules. We may use any four-letter combination we choose, and that is one way around the confusion. Note also that sending our AMTOR SEL-CAL code **does not** meet FCC identification requirements. We must still send our call signs periodically as part of our typed text.

CCIR 625 SEL-CAL

CCIR 625 is a new SITOR specification that expands the available SEL-CAL ID code from four to **seven letters**. Revised CCIR 491-1 includes a new number-to-letter ID conversion formula that converts *nine-digit numbers* to a seven-letter SEL-CAL code. Thus, there are now a total of 1,000,000,000 possible different SITOR SEL-CAL codes. This certainly fixes the commercial problem of "not enough codes" for the foreseeable future! We amateurs may also use it to resolve AMTOR SEL-CAL code confusion as well.

CCIR 625 adds another very important feature that may be even more useful to amateurs, particularly to those of us using automatic message forwarding (MSO, BBS, and APLink). This new feature is automatic identification of *both* stations when connected in ARQ mode.

In CCIR 476 AMTOR, we initiate an ARQ link by sending the *other station's* SEL-CAL code. We do this by sending a two-block set of characters over and over

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until the other station recognizes his code and responds. In "AMTOR-speak", we say the MASTER initiates the call and the SLAVE answers upon hearing his SEL-CAL code. The MASTER station equipment therefore "knows" with which station it is in communication. However, the SLAVE station equipment knows only that it has been called—not who has called.

In CCIR 625, establishment of an ARQ link involves exchange and confirmation of SEL-CAL codes by both stations. The calling and link procedure is therefore considerably more complicated in CCIR 625. In "short-form," the CCIR 625 ARQ MASTER sends the SLAVE's SEL-CAL and the SLAVE then requests the SEL-CAL of the MASTER. The exchange of SEL-CAL codes is further verified by a unique check-sum procedure to be certain that each station knows the call of the other. A CCIR 625 link connection is easily seen on our HAL ARQ system by the "LINKED WITH xxxxxxxx" message that appears on both terminals once the ARQ connection is made. This feature may be included in "mailbox" systems to obtain automatic identification of traffic to and from a given station. Packet radio has this feature and it is very convenient for traffic handling systems.

AMTOR Re-Linking

AMTOR (and SITOR) include an automatic error counting system that is used to detect if the link has "failed" and then follow an established procedure to reconnect both stations. The whole process of deciding when the link has failed and what to do about it is one of the "gray-areas" of CCIR 476 and one of the topics of each '476 revision. Basically, what happens in CCIR 476 is after so many sequential errors (HAL uses 32), the original MASTER restarts the SEL-CAL procedure and tries to re-connect the link. If the connection is again made and if flow-control and link direction rules are properly handled by both AMTOR units, traffic then continues with no apparent errors at either station. The business of flow-control and direction restoration is a big gray area and a source of numerous different interpretations, even in modern AMTOR equipment. CCIR 476, however, still allows a very big "hole" in the re-link procedure. An AMTOR MSO example best illustrates the problem:

K9GWT calls the K4CZ mailbox on 7095, establishes the link, and starts to load his traffic. After a while, the link starts to fail due to fading and/or interference. Since K9GWT started the AMTOR connection, he is the MASTER and he sends "KKCZ," K4CZ's SEL-CAL. K4CZ is using CCIR 476 equipment and therefore his equipment does not know that it is K9GWT who started the message. During the time that K9GWT is trying to re-link with K4CZ, a third station (say K1ABC) comes on frequency and also calls K4CZ. If he is stronger than K9GWT,

K1ABC may now link with K4CZ and K9GWT is "out in the cold." In this case, K1ABC winds up connected to the K4CZ MSO, but the MSO is still in the middle of storing K9GWT's traffic. The result is a hopelessly confused mess for all three stations, wasting time and cluttering the frequency.

CCIR 625 prevents this situation. The equipment at both stations has stored copies of the other station's SEL-CAL. If a re-link is required, it will only be to the original station. A third station (such as K1ABC in the example) will not be allowed to connect. Instead, he will receive a new special "busy" control signal—CS5. The CS5 is a signal recognized by CCIR 625 equipment as meaning "stand by—another link is in progress." CCIR 625 also has more rigidly defined specifications about how flow-control and re-linking should be handled; there is considerably less margin for "interpretative design error."

AMTOR and WRU

At this time it is appropriate to mention another station identification feature of AMTOR—WRU (Who aRe yoU). CCIR 476 and CCIR 625 both include WRU. To "trigger" automatic identification of the other station, the sending station sends a "FIGS-D" character ("S" in U.S. Baudot). If the receiving station has his WRU feature turned on, his equipment issues an "over" command, sends a special "ANSWER-BACK" message (also called HERE IS), and sends another "over" command. If both stations have the WRU feature enabled and if a standard format for the ANSWER-BACK message is followed, the WRU feature may be used for automatic identification of both stations. WRU is often used by commercial stations to identify the calling station. If the calling station does not respond or has an ANSWER-BACK message not listed in their current customer data base, the SITOR link may be terminated.

Amateurs have tried using WRU and find it loaded with problems. First of all, not all AMTOR equipment includes WRU. Also, some AMTOR equipment prints a dollar sign (\$) rather than interpreting it as a WRU call. At the minimum, this can be very confusing—both to the amateur who thought he sent a WRU, and to the guy who wanted to send a dollar sign. Even two stations who have a working WRU feature and have it turned on can have confusing results if their flow-control system is not properly set up. There are many confusing things that happen under these circumstances!

Further, although AMTOR is an error-correcting mode, it is not infallible. We can and do print errors—not often, but it does happen. If just one character is interpreted as a FIGS-D at the receiving station, the WRU ANSWER-BACK response will be triggered. This can be especially confusing if a noise hit causes

either a case change to FIGS case or if a hit causes our receiving terminal to miss a LTRS case change. In both situations you see a string of numbers and symbols on the screen and a valid "D" character from the sending station will be interpreted as FIGS-D, triggering the ANSWER-BACK response.

After much grief and pain, it has generally been agreed that the best use of WRU mode on AMTOR is to turn it off! AMTOR WRU will work only if both stations know exactly what they and their equipment are doing!

FEC, CCIR 476, and CCIR 625

How many times have you tuned to an FEC signal and watched in frustration as the screen remained blank? Impatient that we are, the amateur instinct is usually to try re-tuning the receiver—still no luck. If we are lucky, we may see characters appear after 10 or 20 seconds, and then only if we have been patient and not re-tuned. Frustrating, isn't it? What's going on?

The reason has to do with the way that FEC is sent and how our equipment interprets what we receive. First of all, AMTOR uses a synchronous serial code. This means that each character does not have start and stop pulses. In ASCII and Baudot RTTY each character has its own start and stop pulses, and our equipment must only look for a start pulse and then examine the following bits to determine what character is sent. RTTY synchronization starts over on each and every character received. In AMTOR each character has seven data bits followed immediately by the seven bits for the next character—no intermediate synchronizing bits. Your AMTOR equipment cannot synchronize, decode, and print just one character. Rather, it must first receive a special sequence of bits, called phasing signals. The phasing signals tell the FEC receiving equipment the time at which each new seven bit character will start. *Until you receive phasing characters, your equipment cannot decode FEC signals.*²

A very big "gray-area" in CCIR 476 has to do with how often the sending station sends FEC phasing signals. The original specification only required phasing signals at the start and end of a transmission, regardless of how long that transmission is. By this standard, you must be tuned to the sending station at the start of his transmission or miss the entire transmission! No version of CCIR 476 really makes a recommendation for additional phasing signals during an FEC message. However, any of us who have written code for AMTOR have soon discovered that we need some additional help or we may never print an FEC transmission. Each programmer had a different idea on this topic, and as a result we have a col-

lection of just about every combination imaginable in our AMTOR equipment. Note that the *other guy* determines how well (or not so well) you can copy FEC! If he doesn't send phasing signals, you may not copy his transmission!

CCIR 625 clarifies this point by requiring transmission of phasing signals at the minimum rate of once every 100 characters. This is a step in the right direction, but not enough in my opinion for amateur use on weak signals. One-hundred characters take approximately 17 seconds to send in FEC. That's a long time. Miss them or get a misprint and you get to wait another 17 seconds. Remember, for all its good points, AMTOR error correction is *not* infallible and we can still get "hits." Get enough of them and you will lose FEC synchronization.

At HAL we have adopted the following algorithm: Send FEC phasing signals every 40 characters *and* at the end of each line. A "new-line" (CR/LF) resets the 40-character counter. This *does* slow down the total "through-put" of the FEC data somewhat, but it is our opinion that "slightly slower" is better than "none at all"!

The number of phasing signals sent is also "optional" in the specifications. A minimum of four phasing signals should be sent. HAL equipment sends a minimum of eight phasing signals at each instance. Again, this means slightly slower "through-put," but it sure does reduce the time spent looking at a blank screen!

OK, It's Neat, But Do I Really Need CCIR 625?

Amateur radio is a hobby. We don't really *need* anything! CCIR 625 is a compatible improvement over CCIR 476. This means CCIR 625 equipment must also work with CCIR 476 equipment. Adopting the new standard does *not* make the old equipment unusable. However, amateur radio is also a "high-tech" hobby, and we all take great pride in using the latest and best techniques available, particularly if it improves our communications. CCIR 625 is not a cure-all, but it definitely improves our AMTOR communication system. If you don't have CCIR 625 equipment, you will still be able to talk on AMTOR. However, you also miss out on the improvements that amateurs having CCIR 625 equipment gain.

How Do I Get on CCIR 625?

First of all, you must have equipment that includes CCIR 625 *software*. There is *no* hardware difference between CCIR 476 and CCIR 625. However, the software differences are substantial for the programmer. If CCIR 625 is completely and correctly implemented, it is *not* a simple job of "patching a few lines of code." If you enjoy writing assembly-code (or you have a friend who does), writing soft-

ware for CCIR 625 will be a nice project for those winter evenings. You may also "get lucky" and find that your favorite manufacturer has a new product or software up-grade for CCIR 625. However, remember that writing software costs money (a lot), and a manufacturer will want to be sure that there is indeed an amateur market for the new features before he pays programmers to do the work.

What About CCIR 625 AMTOR SEL-CAL Codes?

Glad you asked! I have a suggestion. Let's *not* mess with the commercial number system of CCIR 491! Instead, let's just expand G3PLX's SEL-CAL format.

Remember, the SEL-CAL can use *only* letters. However, some of our present amateur SEL-CAL confusion comes from call area ambiguity (K9GWT and K1GWT both use "KGWT" for their SEL-CAL). I suggest that we add a *simple* number-to-letter conversion and then use *all* letters and numbers of our amateur callsigns. A very simple number-to-letter conversion is "A=1," "B=2," etc., to "J=0."³ Further, we "fill" any unused SEL-CAL positions with the letter "X." Some examples of typical amateur callsigns and SEL-CAL codes are shown in Table I.

Conclusion

The new FCC Rules and Regulations have expanded our AMTOR definitions to include both CCIR 476 and CCIR 625 specifications. CCIR 625 offers many operational improvements to CCIR 476. Among these improvements are (1) expanded SEL-CAL codes, (2) re-linking with *only* the previous station, (3) improved link recovery definitions, and (4) improved FEC reception synchronization. Equipment designed to use CCIR 625 must also communicate with older CCIR 476 equipment and is therefore "downward-compatible." CCIR 625 offers very great benefits to computer-based traffic-handling systems such as MSO, BBS, and APLink stations. Amateurs should take great pride in leading rather than following new technology. Why not "lead" and use CCIR 625? Your AMTOR will be better for it!

Footnotes

1. See "AMTOR Dictionary" box in this article.
2. Actually, Paul Newland, AD7I, has proposed a way to gain FEC synchronization *without* phasing signals in his article "Algorithms and methods for SITOR/AMTOR Systems" (July 1988 QEX). It is a very clever idea, but will require considerable programming skills to implement. To my knowledge, his idea is not currently used in any commercially available AMTOR equipment.
3. All you "digital thinkers" (1/0 types) are of course thinking we should have used "A=0." However, I do *not* have a "zeroth" finger, but I *can* visualize painting the letter "A" on my first finger, ending with "J" on the tenth finger (I also count thumbs as fingers—Hi!).

AMTOR Bibliography

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- CCIR 476-4 (1986): "Direct Printing Telegraph Equipment in the Maritime Mobile Service," XVth Plenary Assembly, Dubrovnik, 1986; Volume VIII-2, *Maritime Mobile Service*, CCIR, ITU; pp. 60-69. (Note: CCIR 476-3 is reprinted in *Computer Networking Conferences 1-4*, American Radio Relay League, Newington, CT; Appendix, p. 3.125-3.134.)
- CCIR 625 (1986): "Direct Printing Telegraph Equipment Employing Automatic Identification in the Maritime Mobile Service," XVth Plenary Assembly, Dubrovnik, 1986; Volume III-2, *Maritime Mobile Service*, CCIR, ITU; pp. 5-59.
- FCC (1989): PR Docket No. 88-139, "Reorganization and Deregulation of Part 97 of the rules Governing the Amateur Radio Service," Adopted May 31, 1989; Released June 9, 1989. Copies available from W5YI and will be included in *Code of Federal Regulations, CFR 47, Part 80 to End*, next revision, United States Government Printing Office, Washington, D.C.
- Newland, Paul, AD7I (1988): "Algorithms and Methods for SITOR/AMTOR

Callsign	CCIR 476	CCIR 625	Number Equiv.
K9GWT	KGWT	KIGWTXX	I=9
K1GWT	KGWT	KAGWTXX	A=1
WA9YLB	WYLB	WAIYLBX	I=9
K4CZ	KKCZ	KDCZXXX	D=4
KC9Z	KKCZ	KCIZXXX	I=9
W9WKC	WWKC	WIWKCXX	I=9
W9KC	WWKC	WIKCXXX	I=9
9L1VW	LLVW	ILAVWXX	I=9, A=1
P43ARC	PARC	PDCARCX	D=4, C=3
W100ABC	WABC	WAJJABC	A=1, J=0

Table I—Examples of typical amateur callsigns and SEL-CAL codes.

Systems," *QEX*, July 1988, American Radio Relay League, Newington, CT; pp. 9-12.

Newland, Paul, AD7I (1985): "A User's Guide to AMTOR Operation," *QST*, October 1985, American Radio Relay League, Newington, CT; pp. 31-34.

Newland, Paul, AD7I (1984): "Z-AMTOR: An Advanced AMTOR Code Converter," *QST*, February 1984, American Radio Relay League, Newington, CT; pp. 25-34.


Newland, Paul, AD7I (1983): "An Introduction to AMTOR," *QST*, July 1983, American Radio Relay League, Newington, CT; pp. 11-13.

Martinez, J.P., G3PLX (1981): "Amtor, an Improved Error-Free RTTY System," *QST*, June 1981, American Radio Relay League, Newington, CT; pp. 25-27.

Martinez, J.P., G3PLX (1980): "Amtor, the easy way," *Radio Communication*, June/July 1980, Radio Society of Great

Britain, Chelmsford, Essex, England; pp. 610-615.

Martinez, J.P., G3PLX (1979): "Amtor, an improved radioteletype system, using a microprocessor," *Radio Communication*, August 1979, Radio Society of Great Britain, Chelmsford, Essex, England; pp. 714-719.

Poor, Victor D., W5SMM and Paul Newland, AD7I (1989), *APLink AMTOR User's Guide* (available from authors). 

AMTOR Dictionary

AMTOR - An error-correcting RTTY mode. AMTOR includes both the "chirp" (pulsed) ARQ mode and "broadcast" FEC modes. A special seven-unit synchronous serial code is used. Errors may be detected for each character received. Conforms to CCIR 476 or CCIR 625 specifications.

SITOR (Also called TOR, ARQ, Marine RTTY, or Direct Printing Telegraph) - Commercial AMTOR; conforms to CCIR 476 and/or CCIR 625.

CCIR - International Radio Consultative Committee of the International Telecommunications Union (ITU); Geneva, Switzerland.

CCIR 476 - CCIR Recommendation 476, "Direct-Printing Telegraph Equipment in the Maritime Mobile Service." Five versions have been issued—CCIR 476 (1970), CCIR 476-1 (1974), CCIR 476-2 (1978), CCIR 476-3 (1982), CCIR 476-4 (1986); XVth Plenary Assembly, Dubrovnik, 1986, Volume VIII-2, *Maritime Mobile Service*, pp. 60-69; CCIR, ITU; Geneva, Switzerland.

CCIR 625 - CCIR Recommendation 625, "Direct-Printing Telegraph Equipment Employing Automatic Identification in the Maritime Mobile Service," XVth Plenary Assembly, Dubrovnik, 1986, Volume VIII-2, *Maritime Mobile Service*, pp. 5-59; CCIR, ITU; Geneva, Switzerland.

ARQ (Also called "Mode A") - The "chirp" or pulsed mode of AMTOR. The "sending" station (ISS) transmits a block of three characters, switches to receive, and listens for a one-character acknowledge or repeat signal from the "receiving" station (IRS). The length of one time "frame" of AMTOR ARQ data is 450 ms. Only two stations may communicate in an ARQ mode QSO.

FEC (Also called "Mode B" or "Collective Broadcast mode") - A one-way "RTTY-like" transmission of data from one station to others (may be more than one). Each character is sent twice (six-character separation).

SEL-FEC (Also called "Mode S" or "Selective Broadcast" mode) - A one-way FEC mode that also includes a Selective call code. Only stations with matching GROUP CALL codes will print this transmission; like FEC except polarity is reversed after phasing is complete.

MASTER - The AMTOR station that originates the ARQ QSO. An ARQ QSO is started by the MASTER sending the SEL-CAL code of the desired receiving station. The MASTER station always sets timing for the ARQ QSO.

SLAVE - The AMTOR station that responds to a call from a MASTER station in

ARQ mode. The SLAVE's SEL-CAL must match that sent by the MASTER. A SLAVE unit's timing is always synchronized to that of the MASTER station.

SEL-CAL - In CCIR 476, a four-letter sequence that identifies each AMTOR ARQ mode station; seven-letter sequence in CCIR 625.

GROUP CALL - A four-letter (CCIR 476) or seven-letter (CCIR 625) sequence used by all stations who wish to receive a SEL-FEC broadcast.

ISS - Information Sending Station. The station in an ARQ QSO that is presently sending text. The ISS may be either the MASTER or SLAVE station. The MASTER always starts an ARQ QSO as the ISS.

IRS - Information Receiving Station. The station in an ARQ QSO that is presently receiving text. The IRS may be either the MASTER or SLAVE station. The SLAVE always starts an ARQ QSO as the IRS.

OVER - In an ARQ QSO, the command that changes the direction of text transmission—exchanges ISS and IRS status of both stations. An "OVER" may be signaled by the ISS typing of (+ ?) ("?" on some terminals) or by the IRS responding with a "CS3" control signal.

FORCED OVER - An OVER (change of direction) forced by injection of a CS3 control signal by the IRS.

CS1/CS2 - In ARQ mode, the IRS responds to ISS text by sending either a CS1 or a CS2 control signal character. If the received three-character block includes an error, the previous CS1/CS2 is repeated. If no errors are detected, the IRS responds with the other CS code. If no errors are detected over several blocks of text, the IRS response alternates between CS1 and CS2.

CS3 - The signal from the IRS to the ISS that an "OVER" operation is to be made ("turn the channel around").

CS4 - A control signal only used in CCIR 625 for the SLAVE to signal to the MASTER that the SLAVE's SEL-CAL has been received. A CS4 then signals that the MASTER should send his CCIR 625 SEL-CAL code. *Not used in CCIR 476.*

CS5 - A control signal used in CCIR 625 when re-linking for the SLAVE to signal to the MASTER that the SLAVE's SEL-CAL code has been received. *Not used in CCIR 476.*

FRAME - The full ARQ mode data cycle, 450 msec. A complete ARQ data frame is made up of: (1) 210 ms of ISS data (3 characters), (2) a time delay proportional to propagation and internal equipment delays, and (3) 70 ms of IRS CS1/CS2/CS3 response (one 7-bit character).

BLOCK - The three-character group sent by the ISS to the IRS in ARQ mode.

B/Y - AMTOR "MARK" ("B") and "SPACE" ("Y") data states. "B" is the higher radio frequency and lower demodulator audio tone frequency. Commercial SITOR has the reverse polarity (MARK = Y, SPACE = B).

SHIFT - The frequency difference between the "B" and "Y" (MARK/SPACE) data conditions; always 170 Hz for AMTOR and SITOR.

WRU - Who aRe yoU feature used to identify the other station. If enabled, reception of a FIGS-D character causes the IRS to do the following: (1) issue an "OVER" command, (2) send the ANSWER-BACK text, (3) issue a second "OVER."

ANSWER BACK (Also called HERE IS) - The response message to a WRU inquiry, usually programmable.

PHASING SIGNALS (Also called "Idle-characters") - In FEC mode, the character sent to synchronize the decoding of receiving stations. Also, the character sent if FEC is transmitted but no text is available to be sent (i.e., the transmitter output has "caught-up" with any pre-type buffer).

END - A special sequence of signals sent at the end of ARQ and FEC QSOs to signal both stations that the QSO is complete. Usually, both AMTOR units are returned to "STANDBY" mode to be available for further calls by other stations.

STANDBY - An automatic mode of most AMTOR equipment. When in STANDBY, the AMTOR equipment continuously tests all input data for the following: (1) ARQ transmission and SEL-CAL match, (2) FEC transmission, and (3) SEL-FEC transmission and GROUP CALL match. If an ARQ SEL-CAL match is found, the AMTOR equipment automatically switches to ARQ mode and responds. If FEC is received, FEC mode is chosen and the received text is printed. If FEC and a GROUP CALL match is found, the equipment automatically switches to SEL-FEC mode and receive text is printed.

MONITOR (Also called "LISTEN" or "Mode L") - An AMTOR only mode (not SITOR or part of CCIR 476 or CCIR 625). Operates similar to STANDBY mode except that ARQ mode is also printed as it is received, regardless of SEL-CAL match. MONITOR is a receive-only mode and therefore does not have error-correcting features of ARQ mode. MONITOR may also include FEC and SEL-FEC reception in some AMTOR controllers; only ARQ in others.

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V-660 60MHz D.T., 2mV sens, Delayed Sweep, CRT Readout	\$1,295	\$1,145	\$150
V-1065 100MHz D.T., 2mV sens, Delayed Sweep, CRT Readout, Cursor Meas	\$1,895	\$1,670	\$225
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CQ REVIEWS:

The HAL ST-7000 Modem

BY BUCK ROGERS*, K4ABT

Do you want to improve your HF packet system or maybe even try a new "shift" for HF packet? HAL Communications Corporation has developed a modem that will add greater filtering and better selectivity to your present packet controller. It also adds a dimension to the tuning methods that was heretofore unavailable to us with conventional packet controllers.

The HAL ST-7000 is *not* a packet controller, nor does it include a packet controller with it. It connects between your present packet controller and the HF (or VHF) transceiver.

The ST-7000 is a high-performance modem that is designed especially for 300 baud HF packet use. The HAL ST-7000 is, in fact, three modems in one box. It includes a 200 Hz shift HF modem, 600 Hz shift HF modem, and 1000 Hz shift VHF modem.

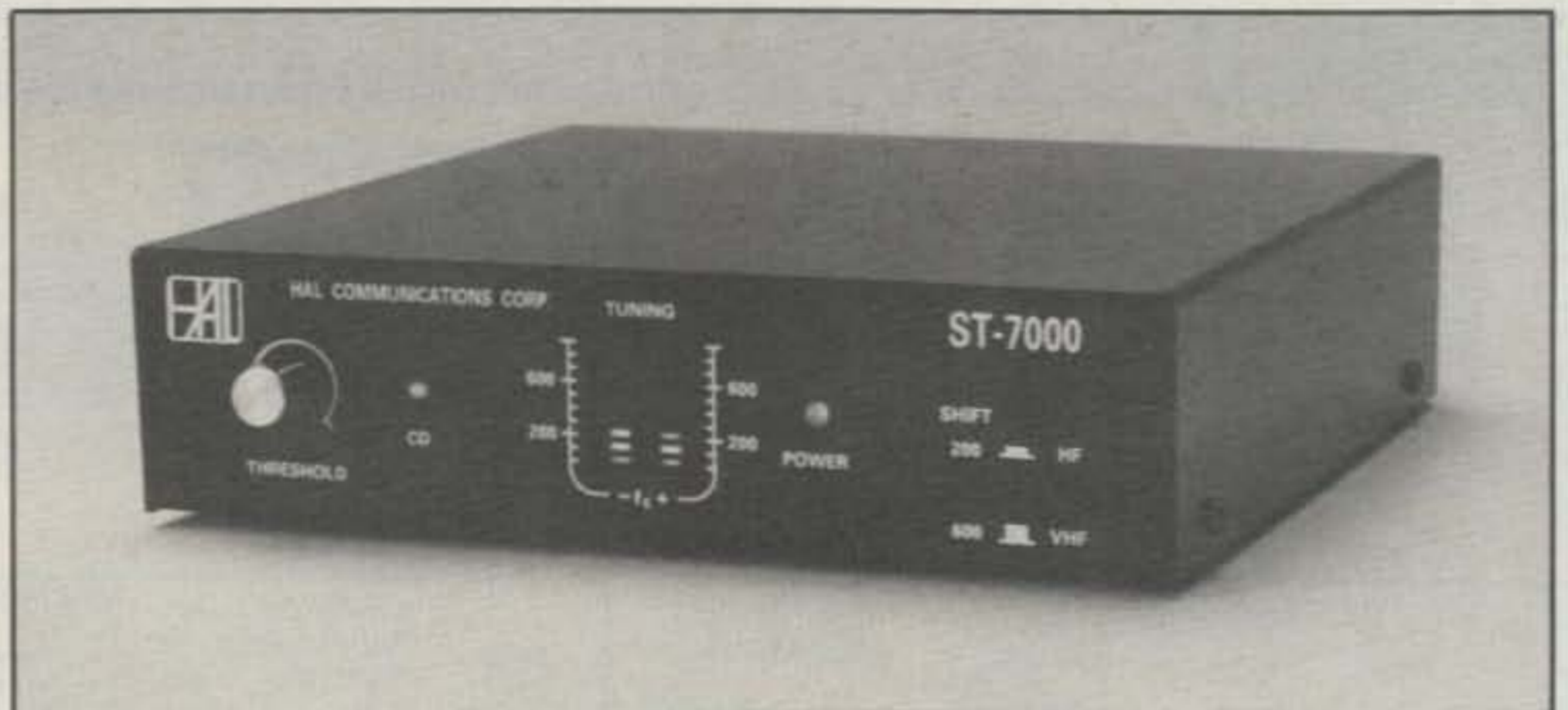
If you are acquainted with any of the other HAL modem products such as the ST-6000 or the ST-8000, you are aware of the outstanding performance of the very selective filtering used in their products. This is how this modem becomes the improved performance modifier for almost any TNC.

The ST-7000 does not contain any internal Terminal Node Controller (TNC) circuitry, and it doesn't perform any internal digital processing. It *does* receive and detect the signal; then the signal is filtered, conditioned, and processed through to the data terminal. Once it is in the TNC, it is then processed as any other signal, but with much more ease and stability.

Tuning HF Packet is A Treat

I cannot speak too highly of the unique tuning indicator of the ST-7000. I've had my bouts with the tuning indicators that are used on many TNCs. Just the error correction that I often had to add or take away was a bit trying. I'm sure many of us who are avid HF packeteers and packet DXers can relate to what I'm saying.

506 Pheasant Ridge Drive, Warner Robins, GA 31088



The HAL ST-7000 Modem.

This is no longer the case. I can dive into the pile-ups on 14.103 MHz or 14.105 MHz and use the very effective filters of the ST-7000 and the "U" balance tuning indicator to pick and choose as I please.

Here is how the tuning indicator works. HAL has added a tuning system to the ST-7000 that consists of 20 LEDs arranged in parallel, vertical columns. Each fully lit LED represents a 50 Hz change in the received audio tone. Tuning becomes much sharper and easier when the LEDs in each column are lit in a bottom to center, balanced display. The first thing you notice is the shift markings on the tuning indicator. The 200 Hz shift falls right on the 200 Hz index, and when you go to the 600 Hz shift, the same thing happens.

As you tune upward, increasing the tone frequency, the LEDs that are lit will move down the left bar and up the right bar. The highest frequency will "top out" of the right bar (approximately 3000 Hz). Center tuning of the two rows of LEDs (center LEDs lit) represents 1900 Hz or center frequency of the ST-7000 tuning. This means that when properly tuned the two rows will have the same number of LEDs lit in each column. In other words, to consider the standard 200 Hz shift signal properly tuned, there should be three LEDs of each vertical bar illuminated beginning at the bottom of each column, and peaking at the 200 Hz index.

Now if you are into HF packet, here is where this modem rivals the best of the HF packet systems.

An optional interconnect cable kit can be ordered along with the modem that will interface the ST-7000 to some of the more popular packet controllers. I used the HAL P/N 960-07232 cable to interface the ST-7000 and the PK-232.

As I mentioned earlier, the HAL ST-7000 connects between (interfaces) your HF transceiver and your packet controller. (See fig. 1.)

The ST-7000 consumes approximately 220 milliamps at +12 volts DC. Power to fill this requirement can be obtained from your station DC supply, provided the current is available. The use of battery power is easy enough to add if you wish to operate the system as a portable station. I use the HAL PM-1000 DC Power Module to power the ST-7000. Don't try to use one of the power supplies that comes with the other TNCs. The center (positive) pin of the power input connector on the HAL ST-7000 is larger than the regular 12 volt DC wall supply.

The reason I like to use the power supply designed for a device is because the manufacturer has usually built in the necessary safeguards. In the case of the ST-7000, the center pin of the power input is the positive post and the shell is the negative contact.

If you use another power source, *then proceed with extreme caution*, and be sure the polarity is correct. Finally, be sure you have purchased the correct connector. The Power Module is supplied with the HAL ST-7000.

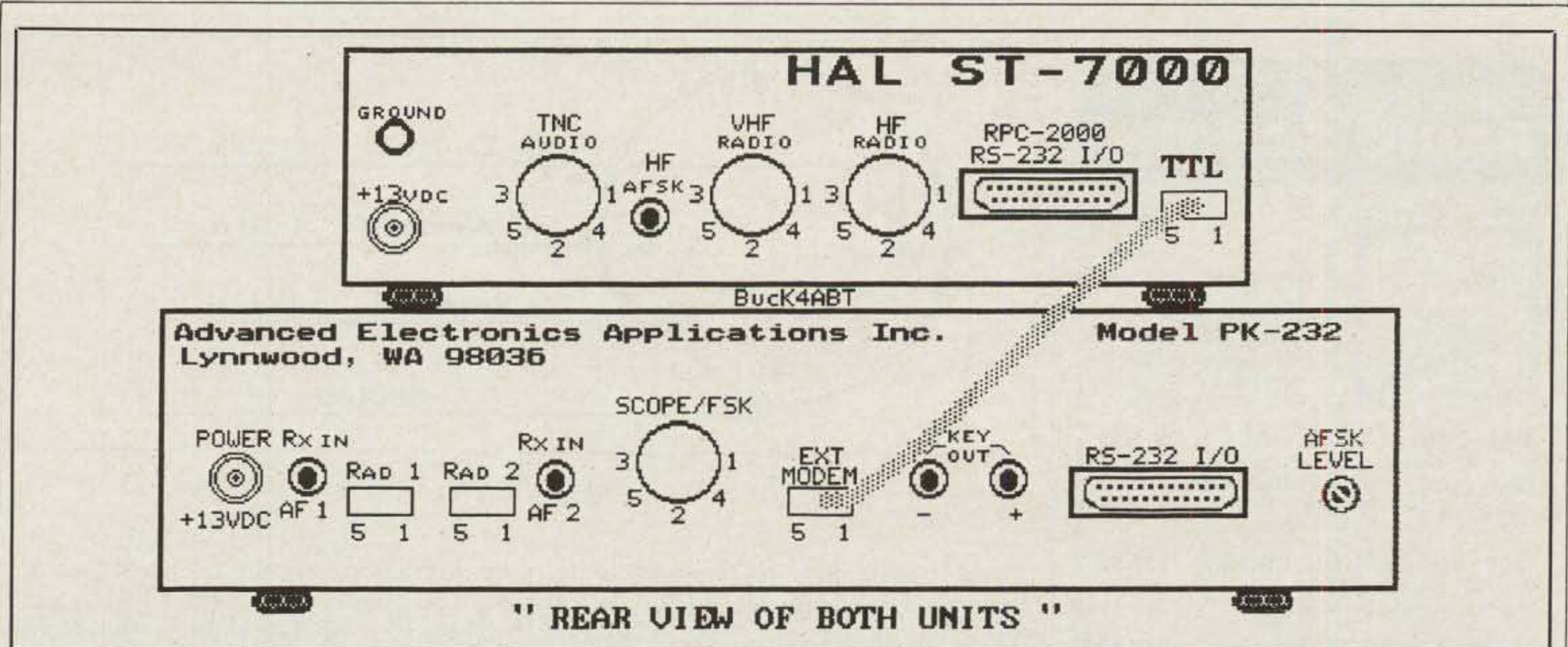


Fig. 1—By using TTL I/O to EXT/Modem interfacing, only one cable is necessary.

Interfacing The Modem And The Transceiver

There are three 5-pin DIN connectors located on the rear of the ST-7000 modem. Left to right they are TNC AUDIO, VHF RADIO, and HF RADIO.

The left, or first, of the 5-pin DIN connectors is the **TNC AUDIO** interface connection. The connections to this port are arranged in the same order as the TNC-2, MFJ-1274, KPC, and the AEA PK-232 controllers. (See fig. 2.)

There may be updates and changes to your controller, so it is advisable to check your manual and equipment before you make the connections. The connection to pin 5 of the TNC audio connector is not needed, since the ST-7000 does not require squelched receive audio.

Interfacing The HAL ST-7000 And The TNC

When using the **TNC AUDIO** interface, a separate modem comes into play within the ST-7000. This modem converts the processed HF packet data into the same tone standards as those used for VHF packet radio. The tones for VHF packet, as you recall, are 1200 Hz and 2200 Hz. By using this tone standard, just about any TNC that is currently available can be used with the ST-7000.

I interfaced the ST-7000 to the AEA PK-232, since I had the ST-7CAB complete cable kit (optional, #960-07000 from HAL). This made the hook-up to the PK-232 a piece of cake, and it wasn't long before I had the ST-7000 and the PK-232 on the air.

Interfacing to the PK-232 can be handled in two ways. One way is via the TTL TNC I/O port of the ST-7000 and the PK-

232, and the other is via **TNC AUDIO** interface connector to the PK-232 controller.

I elected to use the TTL I/O (ST-7000) to EXT/Modem (PK-232) interface scheme because I was able to achieve better performance using the TTL connections between the HAL ST-7000 and the AEA PK-232. Another good reason to use the TTL to EXT/Modem connection is because it requires only one cable from the ST-7000 to the TNC. (See fig. 1.)

The VHF radio connector works *only* if the **TNC AUDIO** interface port is also used. It has *no* effect if the TTL or RS-232 port is used.

The pin-outs of the connectors are the same as the layout of the TAPR TNC-2 connections. (See fig. 2.)

If you are using this kind of connector or TNC, there should be no problem when you unplug the cable from the TNC and plug it into the ST-7000 HF port. Always check your manual for any updates and/or changes to your TNC.

A "Gotcha"

Saturday morning had run smooth and without a hitch, and I was about ready to put the ST-7000 and the PK-232 on the air.

The HAL manual said that I should remove the four strapping options from J8 and place them on J11, if it is "factory fresh" and if I plan to use the TTL I/O. The instructions also told me to be sure that all jumpers are removed from J8, J9, and J10. Only one cable from the TTL I/O to the TNC is necessary.

No problem. I just followed easy the instructions. But what about the PK-232 EXT/Moem port? Earlier in this TTL to TNC I/O setup section of the ST-7000 manual, I read something that said the PK-232 TTL external modem "internal jumpers" *must* also be changed before the TTL I/O scheme would work.

I made the changes to the ST-7000, but when I went to the PK-232 manual, I couldn't find any reference to the external modem port in the table of contents. I searched the PK-232 manual for any information about which jumper did what with regard to the EXT/Modem port. My search was futile, or I had overlooked something. So I'll save you the time that I wasted trying to locate which jumpers HAL had referred to.

Without a lot of unnecessary text, refer to appendix 1 of the PK-232 manual and locate the "Main Board" parts layout. Note that J8 is the external modem connector, and it is located near the center of the PC board. You will also notice that it is at the rear of the TNC. Adjacent to J8 are three jumpers that are labeled JP4, JP5, and JP6 (some form of logic told me to look near the external modem connector for the jumpers). If the jumpers (all three) are on the two pins that are toward the front of the PK-232, then move each of the jumpers from the center and front pin, to the center and rear pin. Be sure all three jumpers are on the two pins nearest the rear of the PK-232.

Success!

Without sounding like an echo, the ST-7000 does such a good job that the operator begins to rely on the forgiving nature of the ST-7000, since it compensates for many of our small errors.

There was mention in the operations manual about a need to pay close attention to the setting of the **Threshold** control. Something about setting it too tight would require a strong signal, and too loose would cause the LEDs to illuminate more frequently. My personal observation was that this may have been overstated. But do try to keep it set just below the "no signal" (CD LED off). The idea of close

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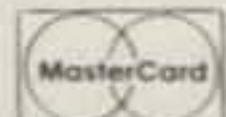
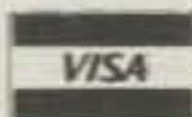
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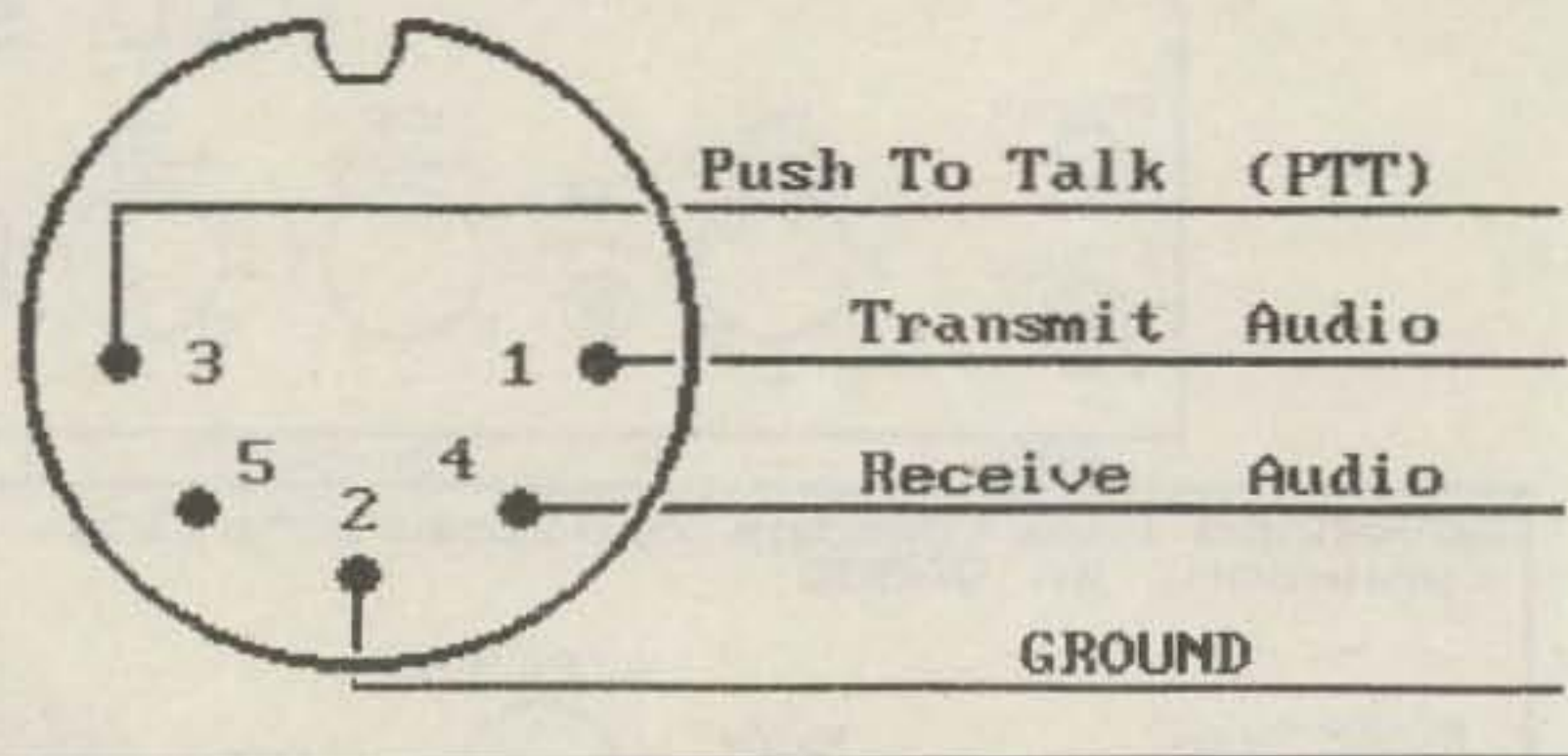


Fig. 2— Pin designation of J3, J4, and J5 on the HAL ST-7000.

operator attention to the **Threshold** control setting is a good one, since good packet operating "practices" need to become good operating "habits."

When using the PK-232 and connecting via the TTL to TNC I/O port, there will not be any interaction by the **CD** LED and the **Threshold** control of the PK-232 when operating in the HF mode. These operations will be controlled by the ST-7000 using the **Threshold** and **CD** LED of the modem. If the TNC AUDIO port is used, both the PK-232 **Threshold** and **CD** LED will function. In this latter case, they are responding to the regenerated TNC audio tones from the ST-7000 and not from the HF tones. Even though I was operating HF, with an HBAUD of 300, when I used the TNC AUDIO port to the PK-232, it was necessary for me to set the VHF ON.

Now For The "Good Stuff"

All input and output signal lines are filtered at the panel connectors to further reduce the influence of external interference from RF. Next comes the active filter stages at IC U4A and U4B, which provide filtering to limit harmonics that could cause aliasing if allowed to reach the following "Switched Capacitor Filters" (SCF) U7 and U8. This 6-pole Chebyshev SCF establishes the bandpass to the input of the receive section of the modem. The center of the bandpass is firmly bound by a 119.5 kHz signal that is derived from the internal 3825 kHz crystal oscillator. U7 and U8 filters are the selective filters for the 200 Hz (U8) shift and 600 Hz (U7) shift. The filters are controlled by U12A and selected by the front panel **Shift** switch.

Active filtering hasn't stopped, as the output of U12A drives the active low-pass filter stage U17B. Any clock noise that may have been present on the signal is removed at this point.

At this point, the output of the active low-pass filter becomes very "active." It drives the input to the AGC circuit, the **Threshold** control circuit, and the **Tuning Indicator** circuits.

There are several stages of Automatic Gain Control (AGC) circuits. The AGC cir-

cuits produce a dynamic range of greater than 50 dB and a regulated audio output voltage of -10 dBm at the output. More filtering is done by D12, and the signal is again amplified by U17C.

If the filtering that we've just discussed tells you anything about the "perfectionist's" design effort that went into the HAL ST-7000 receive section, then let it be confirmed. The transmit section is just as defined. The proof is in the use and operation, and I can speak from actual on-the-air "in combat" experience. *It works great!*

I tried to find something "not so great" about the HAL ST-7000, but they did such a good job of engineering, designing, and fabricating the beast, that it was hard to do. Well, maybe they should have painted it "egg shell" white so it would match my PC. The manual is also well written, and it has a flow that begins with unpacking, then it gets into connecting to the other equipment, setup, and operating—all this in a smooth and orderly manner. A bonus addition to the manual would be to provide a few illustrations of the popular TNC connections, especially where the "external modem" inputs are concerned.

There is one other item that deserves mention. The modem is completely factory aligned and tested. For whatever reason, HAL has included a full step-by-step procedure for aligning and testing, should you ever need to "tweak it up."

The Proof of the Pudding

This modem made my little ICOM 735 perform as if it were a machine of twice the price, and three times the power. Seventy watts output and I was toe to toe with some very big guns. I was pulling them in, while the others were still trying to tune them in.

The specs for the HAL ST-7000 read like they were to conform to MIL standards. The ST-7000 is available direct from the factory, priced at \$299.00. The 12 volt, 250 ma/DC power supply is included. If you would like more information on the HAL ST-7000, contact HAL Communications Corporation, Box 365, 1201 W. Kenyon Road, Urbana, IL 61801.

The first step in finding out what's happening is to find out how to find out. KK4NM explains the how to find out, as well as how the system works.

How to Find the Latest FCC Rules

BY STEVEN B. PADGETT, PH.D.*, KK4NM

It does not happen often, but when it does, you need to know. Sometimes you need to see the latest Federal Communication Commission's (FCC) rule on a particular subject. License guides and rule books are helpful, but the material contained within these publications may be months old by the time you need to use them. When questions arise about the timeliness of a rule, you may find yourself scratching your head and wondering if it is possible to check a particular rule of the FCC and find out if it has recently changed.

It is not only possible but easy to find up-to-date regulations from the FCC (or any other federal agency, for that matter). This article discusses how you can find out about recent rule changes for yourself. If your local library subscribes to the *Code of Federal Regulations (CFR)*, the *List of CFR Sections Affected (LSA)*, and the *Federal Register*, you have all the resources needed to locate any rule of the FCC and to find out if that rule recently changed.

Finding these publications is not as hard as you might think. Every federal depository library carries all three. The library at a near-by junior college, college, or university probably has these volumes on their shelves. Most city, county, and regional libraries also carry federal publications. Call your local library and ask who in the area does. Chances are that the librarian will be able to point you in the right direction for these government documents.

Scan through the *LSA* until you locate the pages dealing with Title 47. All rules changed since the last *CFR* printing are listed in ascending order. For example, if a rule in Part 13 was changed, this rule would be listed before the Amateur Radio rules in Part 97. If you cannot find the rule number in question, chances are that it

has not changed. If the rule you are searching for is listed in the *LSA*, the text in the *CFR* is incorrect.

Rule numbers cited in the *LSA* are given with a page number referring to the *Federal Register*. The *Federal Register* starts with page number one every year and allows the page numbers to continue ascending with each issue.

When reading the *LSA*, one must pay attention to the type face used to indicate the *Federal Register*'s page number. The current *LSA* always spans two years of the *Federal Register*. **Boldface** is used to distinguish the current year from the previous.

The last pages in the *LSA* contain a table that translates *Federal Register* page numbers into specific *Federal Register* issues. Knowing a date in addition to the page number will make it easier to locate the specific issue you are seeking.

Are you safe to assume that rule numbers not listed in the *LSA* have not been changed since publication of the most recent *CFR*? No! Remember that the *LSA* is a monthly publication. Changes made after the current issue's publication cut-off date will have to wait until next month. There is one other place to check after consulting the latest *LSA*—the back pages of the latest *Federal Register*.

The last few pages of each *Federal Register* update the current *LSA*. The last day of the month contains all changes for that month. The updates printed in the *Federal Register* are probably the most difficult and time consuming ones to read. The back pages of the *Federal Register* do not indicate which specific rules changed since the last *LSA* was published, only the *Federal Register* page numbers of all rules changed. If the FCC changed a dozen rules since the last *LSA* was published, there will be 12 page numbers listed under the section for Title 47. In order to be sure that the rule you are interested in was not changed since the last *LSA* was printed, you will have to look up each listed page in the *Federal Register*. If the rule you are examining is not listed in the current *LSA* and was not contained on any page cited at the end of the

Federal Register, it has not changed since the latest *CFR* was issued—period.

As stated earlier, Congress mandates that all federal agencies must publish their rule changes in the *Federal Register* before the new rules may go into effect. Knowing how to use the *Federal Register* and *CFR* will help you become the local authority on FCC matters.

Do you want to check the status of a specific rule? You now know how. Was a recent rule discussion on the repeater accurate? You know how to check it. You can become the local "rules expert" by knowing how to use the *Federal Register*, *LSA*, and *CFR* to locate changing regulations. The combination of these three publications provides an accurate and frequently updated source of information on the status of the FCC's rules.

The *Code of Federal Regulations* is a series of publications that house the regulations of every federal agency. The *CFR* is updated and reprinted on an annual schedule. All rule changes prior to the closing date of that volume are included in the new printing. The FCC's rules and regulations are contained in Title 47 of the *CFR*. Title 47 is updated every October 1st.

Title 47 of the *CFR* consists of several volumes of text. One of these volumes contains Part 97. (Remember from your license exam that amateur radio's regulations are in Part 97 of the FCC's rules.) Fortunately for those in need of finding regulations in a timely manner, there is an index in the *CFR*. Use this index to find the rule covering your interest.

Once you find the specific rule in question in the *CFR*, you might feel that you have accomplished your goal of locating the latest FCC regulations. Do not start celebrating yet. It is important to realize that the federal government does not print a new *CFR* every time an agency changes another rule. Any rules revised after the current *CFR* is printed will be included in next year's copy. This means that you are never more than one year out of date when you subscribe to the *CFR*. On the other hand, this also means that the regulations printed in the current *CFR*

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may be out of date, since rules seem to change with regularity.

How do we find changes enacted after the last CFR printing? This is where the two other publications come into play.

The U.S. Congress requires that all changes in any federal agency's regulations be printed in the *Federal Register*. In fact, federal law mandates that new and modified federal agency rules may not take effect until the regulation's text is printed in the *Federal Register*. Since the FCC must use the *Federal Register* to publish rule changes, anyone needing to know if a specific rule has changed since the last CFR publication date could start with reading the *Register*.

If you have ever read the *Federal Register*, you know how impractical it is to read through the reams of pages looking for FCC rules changes. The *Federal Register* contains ten of thousands of pages every year. One would quickly lose interest in finding regulations if an index to rule changes printed in the *Federal Register* did not exist.

The LSA serves as a "rule change" index to the *Federal Register*. The LSA is printed monthly and informs readers of all rule changes printed in the *Federal Register* since the last CFR was printed. Thus, the September issue of the LSA would have all FCC rule changes from October (when the CFR volumes containing FCC rules are updated) until September.



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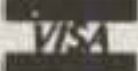


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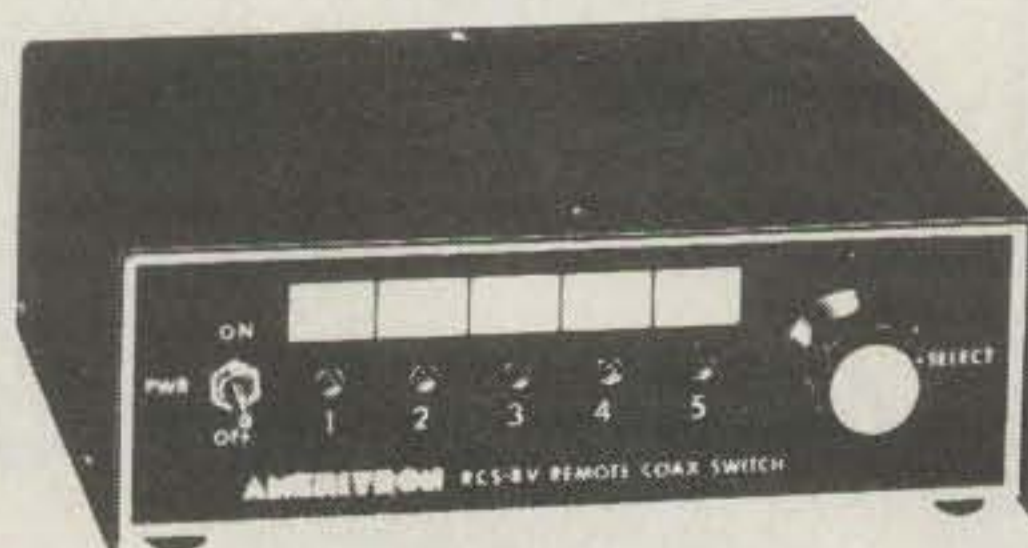
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Have you ever wondered what the AMTOR position means on your multi-mode controller? K4ABT takes us through the basics of AMTOR and shows us how to use it.

The Newcomer's Guide To AMTOR

BY BUCK ROGERS*, K4ABT

AMTOR is an acronym meaning *Amateur Teleprinting Over Radio*. This is another digital mode of communicating which uses microprocessors in its scheme of error checking and control. AMTOR is a mode of amateur digital communications that is derived from the commercial system called *SITOR*.

The use of AMTOR by the amateur radio community began in early 1982, at about the same time as the emergence of packet radio. Both systems of digital communications offered the amateur an error-free form of communicating. Within a short time packet proved to be more effective as the better form of error-free transfer of data and information. The speed of packet and the error-correction scheme were more defined. However, AMTOR found its place in the HF region, since it was not affected by atmospheric conditions as much as packet was. At the time packet was a 1200 baud medium and certain restrictions were placed on its use within the HF amateur radio spectrum.

In the same period, the commercial user found that commercial Teleprinting Over Radio (TOR) suited the communication requirements better than RTTY and CW, so a place was made for TOR in the commercial sector. Many enhancements to TOR have been made since its introduction to this country. The design refinements have added another level to its use as a dependable communications mode, too.

AMTOR is a synchronous mode of digital communications that is made up of a seven-bit code, with a system speed of 100 bauds, but with a throughput of less than half that speed, and this is under the most favorable conditions.

AMTOR has a slightly different format of character coding than other digital communication modes. The transmitting station encodes each of the AMTOR characters with a ratio of four marks and three spaces. This bit numbering is further defined as four ones and three zeros. With this format the receiving station can synchronize to the same format of 4 ones and 3 zeros. If the format is different, or reversed, then no synchronizing of bits will occur. Thus, no printing of characters.

In Table I you will see how the uppercase letters and characters relate to the seven-bit, four to three, Mark versus Space, ones versus zeros, ratio of characters that go together to make up the AMTOR code. The 26 letters will illustrate how the seven-bit code is applied to each character.

There are two modes of AMTOR. One is the ARQ, or Mode A, where the characters are transmitted in clusters, or "blocks," of three letters or characters, and the QSO is between two stations only. The FEC, or Mode B, is the second mode, and it allows communications with more than one station at a time. We will discuss the FEC/Mode B later. There is a third mode if you wish to include the "monitor," or Listen Mode L.

In the ARQ, or Mode A, the link, or SYNC, is established after a station (MASTER) sends the four-letter callsign of the target station (SLAVE) several times. To establish this link, the calling station must be in the AMTOR mode and issue the command in this manner: ARQ < 4 letter SELCALsign of the target station >. This four-letter callsign is called a *SELCAL*.

The station sending the call, or *SELCAL*, is called the MASTER station, and the receiving, or target, station is called the SLAVE. Either station can assume either role, MASTER or SLAVE. The callsign

is sent in 210 millisecond, three-letter blocks. As soon as the sending station sends the *SELCAL* in the three-letter block(s), it pauses to listen for a response from the target/SLAVE station. The receiving station upon hearing its *SELCAL* will respond with a LINK, or "ready," signal.

The ARQ or MODE A

Mode A, or ARQ, as related to AMTOR means "Automatic ReQuest for retransmit." This gives some rise to the thinking that AMTOR is somewhat similar to packet.

Since ARQ is the most used and most effective mode of AMTOR, we will discuss its attributes first. This mode is known as Mode A and is used when both stations are linked, or synchronized, with one another. When in ARQ (Mode A), a station (MASTER) will send the message or text in blocks of three characters, with a time length of 210 milliseconds per block. The transmitting station will stop sending after each block of three characters and listen for approximately one quarter of a second. During this period the receiving station (SLAVE) will respond to the block of three characters that it had just received. It responds with an acknowledgement or a code which tells the transmitting station that the three characters were correctly received, and that it may continue with the next block of three letters.

The MASTER station will display the text on its screen after the SLAVE station has acknowledged the receipt of a block of correct text. This is called an "echo" or acceptance display. If the receiving station detects a block which is incorrect, it will respond with a retransmit request. This could be related to the "RQ" of the ARQ designation of Mode A. Thus Mode "A" "RQ."

After all the sending and resending of text and characters, there will not be any

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You get a 50 ohm 300 watt dummy load for tuning your exciter, a tilt stand for easy viewing and a 3-digit turns counter plus a spinner knob for exact inductance control. Add \$10 s/h.

2-knob Differential-T™ Tuner



MFJ-986 The new MFJ-986 Differential-T™ 2-knob Tuner uses a differential capacitor to make tuning foolproof and easier than ever. It ends constant re-tuning with broadband coverage and gives you minimum SWR at only one best setting. Covers 1.8-30 MHz.

The roller inductor lets you tune your SWR down to absolute minimum. 3-digits turns counter lets you quickly return to your favorite frequency.

You get MFJ's new peak and average reading Cross-Needle SWR/Wattmeter with a new directional coupler for more accurate readings over a wider frequency range. It reads forward/reflected power in 200/50 and 2000/500 watt ranges. Meter lamp uses 12 VDC or 110 VAC with MFJ-1312, \$12.95.

A new current balun for balanced lines reduces feedline radiation and forces equal currents into antenna halves that are not perfectly balanced for a more concentrated, stronger signal. Add \$10 s/h.

MFJ's Fastest Selling Tuner



The MFJ-941D is MFJ's fastest selling **MFJ-941D** 300 watt PEP antenna tuner. Why? **\$109.95** Because it has more features than tuners costing much more and it matches everything continuously from 1.8-30 MHz.

It matches dipoles, vees, verticals, mobile whips, random wires, balanced and coax lines.

SWR/Wattmeter reads forward/reflected power in 30 and 300 watt ranges. Antenna switch selects 2 coax lines, direct or through tuner, random wire, balanced line or tuner bypass. Efficient airwound inductor gives lower losses and more watts out. Has 4:1 balun. 1000 V capacitors. 10x3x7 inches.

MFJ's Random Wire Tuner

MFJ-16010 \$39.95



You can operate all bands anywhere with any transceiver when you let the MFJ-16010 turn any random wire into a transmitting antenna. Great for apartment, motel, camping operation. Install a wire anywhere! Tunes 1.8-30 MHz. 200 watts PEP. Ultra small 2x3x4 in.

MFJ's Deluxe 300 Watt Tuner



MFJ-949D The MFJ-949D gives you lower SWR than any tuner that uses two tapped inductors. Why? Because you get two continuously variable capacitors that give you infinitely more positions than the limited number on switched coils.

This gives you the precise control you need to get your SWR down to a minimum. After all, isn't that why you need a tuner? Covers 1.8-30 MHz.

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With MFJ's deluxe 300 watt PEP tuner you get an MFJ tuner that has earned a reputation for being able to match just about anything - one that is highly perfected and has years of proven reliability.

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MFJ-921 \$69.95

MFJ's new VHF tuners cover both 2 Meters and the 220 MHz bands. They handle 300 watts PEP and match a wide range of impedances for coax fed antennas. SWR/Wattmeter. 8x2 1/2 x 3 in. **MFJ-920**, \$49.95. No meter. 4 1/2 x 2 1/2 x 3 inches.



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What the ham magazines say about the MFJ-1278:

QST Magazine: "I was especially impressed by the new '1278s DCD (data carrier detect) circuit performance. This function, vital to HF packet-radio operation, performs admirable . . . Refinements such as this go a long way toward improving the viability of HF packet-radio operation with a multimode!"

"FAX reception is so good that it is irresistible to tune around for interesting FAX transmissions. The current '1278 provides good copy on all seven supported FAX formats . . . I most enjoyed copying news-photo transmissions. Some of these were outstanding, with crisp, clean reproduction and a surprising amount of detail." September, 1989.

CQ Magazine: "I found the '1278 did an excellent job (copying CW), even with bad operators. I've checked lot of CW 'copiers' in

my time, and certainly this unit was as good or better than most."

"I switched the terminal mode to HF packet . . . I was very impressed, because with the tuning indicator I immediately received (good) packet copy . . . I (tried) a connect with an east coast station. Before I knew it I had a QSO going and even handled break-in stations anxious to log New Mexico." May, 1989.

73 Magazine: "If you think I enjoyed using (the MFJ-1278) you are right. It was easy and fun to use . . . Overall, I found the MFJ-1278 to be . . . a good multi-mode controller at a reasonable price. You won't be disappointed." April, 1989.

Worldradio Magazine: "Bottom line: Excellent value for the money. Solid performer. Easy to use. Easiest of the top three to get on line" September, 1989.

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Character/Letter	AMTOR 7-Bit Code
A	1000111
B	1110010
C	0011101
D	1010011
E	1010110
F	0011011
G	0110101
H	1101001
I	1001101
J	0010111
K	0011110
L	1100101
M	0111001
N	1011001
O	1110001
P	0101101
Q	0101110
R	1010101
S	1001011
T	1110100
U	1001110
V	0111100
W	0100111
X	0111010
Y	0101011
Z	1100011

Table 1- An example of the 7-bit, 4 to 3, Mark to Space ratio that makes up the characters in the AMTOR code.

display of text at the receiving station until all the above criteria are met, and the block is in fact sent error-free.

At the slave or receiving station, the role can be reversed and the receiver can become the transmitting station by issuing a "break" command. The transmitting station can signal the receiving station that it is finished with the text transmission by issuing a "+?". This command is used as the routine to reverse the transmit and receive role.

FEC or Mode B

Forward Error Correction, or FEC, is called Mode B. This is the mode that we use to call CQ. Unlike the ARQ/Mode A, Mode B does not require "handshaking," and therefore it can send an uninterrupted stream of text. This mode is also used for roundtable discussions, and to send messages to several stations at one time.

FEC sends each character twice, and the receiving station(s) check the character block for the correct 4 to 3 MARK/SPACE ratio. If the first character is invalid or incorrect in the MARK/SPACE ratio format, then the second character is examined for its validity. If the second character is correct, then it is printed. If neither character is valid, a null or replacement character is printed on the display to indicate the missed character.

Some multi-mode and all-mode controllers allow the operator to define this substitute character, and many users select the **SPACE** as the missing character replacement.

A word to the wise, or better yet, words of woe. When transmitting in FEC, the transceiver is in the transmit **ON** condition while sending. For this reason I recommend setting the transmitter power levels as you would set them for RTTY or AM operation. When in doubt, drop the power to one quarter or less of the CW power level.

The Listen, or Mode L

In this mode it is possible to monitor other stations who are sending or who are already linked or "in phase." The only shortcoming to Mode L (listen mode) is that when you have sync with stations who are linked via Mode A, you will receive the repeated tries of the sending station(s). Many times I can hear the other stations, but I will not have any print or display on my screen. Listen around 14.075 MHz for AMTOR communications, and after you have become acquainted with the sound of AMTOR you will find the AMTOR "chirps" in many other parts of the HF spectrum. Many times you will find them in the commercial frequencies.

If you are using the LISTEN, or Mode L, try using different settings of the notch filters and the AGC. By experimenting you will discover the most favorable parameters for receiving at your station. I have found that a bit of touch up of the tuning is necessary for my system to come into sync with the station(s) that I am monitoring.

Making a Contact Via AMTOR in Mode A (ARQ)

Automatic request for retransmission mode, known as Mode A, is similar to packet radio in a number of ways. The calling station must know exactly the ID of the called station in order for communications to occur.

The **ARQ** command causes a link attempt. This is similar to a packet **CONNECT** command. This is a one-on-one protocol, meaning that it is used mostly for two-party QSOs. For NET and roundtable discussions, the more appropriate AMTOR mode for broadcast is the FEC or Mode B. ARQ Mode A introduces a few new terms into our digital vocabulary.

"Information Sending Station" (ISS) and "Information Receiving Station" (IRS) are some of these new terms. In ARQ a station must be either the ISS or the IRS, and the station that is transmitting data is called the ISS. One becomes an ISS either by issuing a successful AMTOR call with the ARQ, or when the ISS relinquishes control of the link by issuing the "+?".

Mode A (ARQ) contacts are started in this manner. Type "ARQ <selcall>" and a carriage return. The <selcall> must be four characters long. Your transmitter will begin keying at the three-character send rate in an on and off repetitive

manner. If the other station responds, you can start sending text, or you can abort the call by returning to the command mode with the control code used with your particular make of controller.

When a link is established, you may begin typing text (with some types of controllers it will be necessary to type CONV to enter the keyboard send mode).

When you are through transmitting, always use the AMTOR ending signal "+?". DO NOT use a "K" or "SK" as you would do in the packet mode. This will not relinquish the ISS function, and the station you're working will not be able to transmit until the information sender executes the "+?".

If you wish to end the contact, go back to AMTOR command mode with a CTRL-C. With some controllers it may be necessary to input an additional command such as QRT to actually leave the AMTOR mode.

Another item of priority that we need to discuss is the terminal, with its associated hardware and software. Other than the AMTOR controller (many times it is controller that has several communication modes in it—e.g., all-mode, multi-mode, or data controllers which contain AMTOR, packet, WEFAX, etc.), there must be a terminal or a computer with software that will emulate a terminal. Most of the software that is used with the packet terminal will suffice. Interfacing is accomplished in much the same manner as you would when interfacing a packet controller. In most controllers the same port that is used for packet is used for AMTOR. This is as far as the similarities between packet and AMTOR go. From this point forward, the AMTOR technique takes a radically different path.

If you are one of the users of a controller with multiple modes, and AMTOR is one of them, you will never realize the full potential of your controller until you have experienced the joy of operating AMTOR at least one time.

Don't "Go For The Throat" The First Time

Instead of ARQ, or Mode A, for our first contact on AMTOR, let's not be too bold about it. Try the FEC, or Mode B, contact first. In this way we can get a feel for our mistakes and refine our AMTOR operating technique before we "dive so deep."

The SELCAL

We mentioned the SELCAL earlier, and now we will clarify the need of the SELCAL and its place in AMTOR. The SELCAL is your station's identification and consists of four letters taken from your amateur callsign. Note I said "letters." No numbers from your callsign are used. If your callsign has only three letters, then repeat the first letter twice (e.g., KB4T

SELCAL would be KKBT. In the case of my call, K4ABT would appear as KABT).

Be sure you have entered your SELCAL correctly. There are some station controllers which may only use the FEC Mode B. This is another reason I am recommending the Mode B as the way to make your first contact.

Place your controller into the FEC mode and call CQ a few times, remembering the caution earlier about the duty cycle of your transmitter. Keep the power dissipation of your final(s) within safe operating limits.

Send the CQ string in a similar manner to a CW CQ. Send your SELCAL a couple of times at the end of each string of CQs. After making the call, stop and listen and allow another station to phase or link to you.

If you plan to communicate via FEC AMTOR, say so before you stop sending the CQ. This tells the prospective contact that you are expecting contacts only in the FEC Mode B.

As soon as you have fine-tuned your AMTOR FEC communicating techniques, you may want to try an ARQ, AMTOR contact. The ARQ contact begins with the MASTER station initiating the call. The link is established to a known SELCAL, but more often than not, the first few times will be hit and miss until you fine-tune your AMTOR ARQ operating techniques. If you are the MASTER station who initiates the contact, then you may be required to "touch-up" the tuning on your transceiver's main-tuning or the RIT so that both stations are "handshaking" with few tries, or resends.

Once a good contact with few resends is in progress, it is better for both stations to rely on the use of the RIT or "clarifier" to maintain the integrity of the link. Only when one of the stations shows signs of serious drift, should you try correcting the frequency difference. This correction is usually done by the SLAVE station and with the main-tuning control rather than the "clarifier" control.

The reason for using the main-tune dial is to change the offset of the carrier frequency. Many single-sideband transceivers will exhibit an audio offset or frequency shifting of the FSK tones. Since the tones being transmitted are the result of an offset away from center frequency, it is necessary to tune off the suppressed carrier slightly so the correct tones can be received and decoded.

Warning!

I must warn those of you who have transceivers with large "clanking" relays inside them that are used for the antenna change-over switching. My first attempt at AMTOR took place in 1987, and being new to an even newer mode, I went at it with a trusty old FT-101D. (I now use a Ranger AR-3500.) Not having the benefit of good documentation and having even

less information about the AMTOR technique, I leaped into an ARQ QSO with a station in North Carolina. I issued the SELCAL of the North Carolina station that I had seen on the screen while in Mode L. Bingo! The darn thing LINKED! The first time! And to further shake me to my roots, that ole 101 started clicking, clanking, and clacking with all the finesse of a bull-dozer driving through the hen-house.

I remember how long (or how short) that first AMTOR QSO was, and believe me it never broke any ragchew records. Needless to say, I never tried any more AMTOR QSOs with the 101. This is not to say that the relay rigs won't work, but you should install enough DELAY to the controller to compensate for the relay pull up and for the transmitter to reach full power. This delay time can vary, but it normally takes about 25 to 35 milliseconds.

There is a way to reach a happy medium with the setup of your AMTOR controller delay, and that way is by trial and error. If you are able to make contacts via the FEC/Mode B method, but you are unable to make ARQ contacts, then you should experiment with the delay command for your controller.

Commands Vary

Command summaries for each controller will vary with each manufacturer, but the result will be the same. For instance, one controller may use the command DELAY " while another manufacturer will use TAXDelay or ADELAY.

To enter the AMTOR mode, most of the universal data controllers will use the AM-tor command to enter the AMTOR mode. The abbreviation AM will usually suffice to place your controller into the AMTOR command mode.

Do and Don't

Finally, I have two items that come under the "Do and Don't" heading.

Do put your SELCAL into your controller as soon as you are ready to try AMTOR.

Don't set your RETRY FOREVER command to ON.

Those are the only two command settings about which I will try to influence you. I feel the same about AMTOR command settings as I do about packet commands. Everyone will soon discover the parameters which work best with their system. The default settings of your controller will usually work okay to get you started. The fine-tuning of the parameters can be accomplished as you become more familiar with your controller, radio, and terminal behavior when operating in the AMTOR mode.

There is no substitute for actual "hand-to-hand combat," so go to it. Isn't this one of the reasons why you bought the Many-Mode controller in the first place? Go ahead and get your money's worth. You paid for it, and if you're licensed for it, don't waste it.

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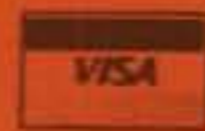
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CIRCLE 137 ON READER SERVICE CARD

WB2FWS presents some easy methods of recording packet information for future decoding and display.

Time-Shift Packet

BY WILLIAM R. SCHOPPE, JR. *, WB2FWS

One of the problems facing the active packeteer is the possibility that he may miss a message while his system is shut down. The usual solution is to leave the TNC, receiver, and computer on and assume that the buffer will not fill up. Of course, the buffer size is dictated by the RAM in your system. There are programs that permit storage of personal messages and files, but that is not the area that I am addressing.

You could leave just the receiver with the TNC on, but the TNC usually has limited memory and the mult-light will start blinking in short order.

The method I presently use is less sophisticated and still will do a creditable job. It requires only that the receiver be on and set for the frequency you wish to monitor. It entails the familiar "time shift" technique used by most VCR enthusiasts and is simple to do. I will try to describe some of the procedures to help enhance your enjoyment of the mode.

Items You Will Need

The first thing you should do is make sure you have the items on hand to facilitate the time shift. Receivers capable of operating on the frequencies of interest should be at the top of any list. If they have memory or memory scan, that would be an asset.

Other items required may be various types of special cables including, but not limited to, shielded audio cables with phono plugs on each end, miniature tip/sleeve plugs for earphone jacks of various sizes, and other formats which will give you the flexibility to handle any combination.

The Recording Medium and Method

Next would be the main part of this new situation—the method of accomplishing the time shift we have been talking about.

I would suggest, if you do not already have one, purchasing a "voice-activated" cassette recorder.

These neat little instruments have the facility, once set to the record function, to stay in paused or passive mode. When the mic circuitry senses any audio signal, it starts the recording process until the signal stops or gets below the preset sensitivity level.

The reason for using one of these devices should already be obvious to you: To not only initiate a recording medium, but also one which will not eat up the cassette tapes. It will only record when a signal is received and then sit and wait for the next one. This results in a great saving in tape. Bear in mind, however, that the cassette recorder cannot discriminate between a packet signal and any other signal or QRM on the band. It will activate and record if it senses information coming in, whatever the source.

The dilemma faced when using any other recorder is that it will do a good job, but will consume tape at an alarming rate in this type of usage. The appeal of voice-activated recording, in our case, is that if it hears nothing, it will just sit and wait. The bonus is that if it does record, you now have a method of transcribing it from your recorder to your TNC and computer. You will then have an archival copy useful for later retrieval, decoding, and review.

If you feel that an investment in this type of equipment would not be economically feasible (we are talking about a \$40 to \$60 unit from Radio Shack, for example), then permit me to mention a few alternatives.

Don't overlook the following audio recorders—any cassette deck, with or without an on/off timer. Their recording time is limited by the tape used—either a C60 or C90 minute tape. (I would not recommend the C120.) Or how about any VCR, using only the audio track. Most not only have timers, but are programmable for precise timings. The advantage of the VCR is the ability to run on for great lengths of time. Some of them permit 6 to 8 hours of recording. If it is an older model, and the video is not functional, the audio portion will probably last much longer than you think.

If you have no machine now, the Beta-format VCRs are not too expensive, and there may be people who are getting rid of their old Betas and converting to VHS. You could probably haunt the local TV repair shop to get a VCR they are dumping, due to unrepairable video problems, for next to nothing.

Another suggestion would be to use any recording medium with the type of timer generally available for electrical appliances. Setting an on/off cycle, at the times you would normally monitor, would work very nicely. In the true tradition of amateur radio, use your ingenuity to figure out ways to do it. The point is that what you want to accomplish is to record an audio signal for later replay and decoding.

The Output Connections

That should take care of the recording medium. Now to the cabling and other information to consider. Most amateur receivers, whether HTs or fixed stations, have some provision for either headphone feed or speaker/external speaker output. Those are the areas with which we will be concerned.

If you are using the earphone/headphone jack, the biggest difficulty is that you will typically no longer be able to monitor the incoming signal. That function will usually be disabled when you insert the phone plug. It is important only in the sense that you won't know the level at which your recorder will work best. Take a look at your schematic and see if you can pick off the audio from some other place, such as an accessory socket. You should still hear the audio from your speaker. It will probably be at a fixed level, and the volume control will no longer vary the signal to the recorder. Hopefully, it will be the right level for your use. Some recorders have a "record level" control while others are fixed, so be aware of that when using the accessory socket as the source.

The recorder's mic or line jack should be the point to insert the other end of the cable. These inputs will need different levels of audio. Some of the small recorders do not have a jack for a line input connection, so you will need to use the mic

31 Penny Drive, Huntington Station, NY 11746

jack. There should be adequate level from the receiver no matter where you obtain it.

I have found that if I place the voice-actuator switch in the "on" position and depress the record button, it then is a simple matter to advance the volume control on the receiver to a point where the tape starts to run with the incoming packet signal.

If your receiver has a meter or any other monitoring method, you may be able to judge if it is packet you are receiving. If you are operating on VHF, the problem is not as important as on HF. On HF, as you know, some of the packet signals are not always on the generally suggested frequencies, and tuning is sometimes necessary and critical. Make sure that you are tuning the channels you wish to save to tape.

Depending on what you choose to monitor, a C-60 or C-90 tape may provide enough time if you use the voice-actuator method. If you opt for the normal cassette recorder with a timer, then you will have to figure out just *when* you wish to monitor. That can be a bit confusing, but it is something over which only *you* can have control.

If you really wish to chance it, another technique I would suggest is to just place the recorder very close to the speaker. Set the receiver squelch "on," the recorder to "record," and let the machinery do its thing while you are away. You may get a lot of dog barks and auto horns instead of packet, but it will save a lot of cabling, and it does work.

Playing It All Back

Playing back is a rather simple matter since you can then use the playback functions of any cassette deck. Or, if you used the video machine's audio, just switch the phono cable from audio "in" to audio "out" and feed it to your TNC audio input for processing as packet. If your TNC has more than one audio input per channel, disable your receiver or you will get confused with the multiple signal being processed as you decode the old information on the tape. Many solutions will occur to you, and these few I have outlined are merely starters to get you thinking.

If you already have a recorder, you may wish to construct a simple switch box which will handle all your inputs and outputs.

The switch box should have three inputs: VHF, HF, and scanner or other receiver. Make them switchable, with earphone or other audio outputs going directly to the tape mic or line input. You will have to vary the signal level to the recorder, depending on what is required for the actuation of the recording circuits.

Your box should also have two outputs so that it can feed any TNC which has two

channels for audio input. Make it switchable also.

The box is a totally passive device and requires no power source. You may tailor it to any configuration that suits your station. The wiring is straightforward and only demands the usual care in wiring audio circuits—i.e., use shielded cable.

Anything you make up will have to be to your specifications, as will the devices you wish to use. I have not shown one here for that reason. Many other ways you can do it will no doubt come to mind.

Using A Scanner

As far as using a scanner or the scanning function on your HT or even your HF rig, the problem of just what you are monitoring arises. It becomes obvious when you set up to receive five or six frequencies and then record. When played back through the TNC and the computer, you

will see all sorts of stations, and unless you are familiar with some of the calls, you won't know what you were copying. The information on each cassette tape will have to be identified as to what frequency it was recorded on so that the baud rate and such may be reset, depending on what communications program you are presently using. It seems like a great idea at first, but then when you finally do it, it is quite frustrating.

In Summary

I have used many methods of monitoring and feel you are only limited by your own imagination as to techniques. I hope I have provided some food for thought. If you are as curious as I am, you will have a lot of fun and not miss many interesting items that appear on your favorite packet frequency after you have shut down the computer and the TNC for the day. **Q**

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CQ REVIEWS: The Cushcraft R45K

A 17 Meter Conversion Kit For The R4

BY LEW McCOY*, W1ICP

Some months back I did a review of the Cushcraft R4A vertical antenna.¹ This was an antenna that covered 10, 12, 15, and 20 meters and did so in excellent fashion. It wasn't long after the antenna was made available to the amateur fraternity that the 17 meter band came into amateur use. The logical step for Cushcraft was to make another trap available (17 meters) that could be added to the R4, making it a five-band antenna. The R45K conversion kit is just such an addition.

I installed the conversion kit and made SWR frequency runs on all bands to see if the curves had changed. I should point out that the R4 (and now the R5) is a ground-independent type of vertical. It is electrically a half wavelength on each of the bands with 4 foot radials (four) attached to the base feed point. These radials essentially divorce the antenna from ground effects. To put it another way, the R5 can be mounted as high as you desire without the problem of radials.

In these days of transceivers that shut off if they don't see an SWR of 2 to 1 or less, it is well nigh impossible to find an antenna that doesn't require a Transmatch. However, the R4, when I used it initially, was truly such an antenna—and I might add, one that really worked. On all bands tested the SWR stayed well below 2 to 1. I retested after adding the 17 meter modification, and it is a real credit to Cushcraft that they have designed an antenna that really does *not* need a tuner for the top five bands.

The modification is quite simple and the directions are very clear and to the point. It took me about 30 minutes to make the changes.

Performance of the R4/R5 as I pointed out in my original description was outstanding. I had used the antenna with my RV in Mexico and worked over 80 countries. Since that time I have doubled that total, and this was during what I call the dog days of the cycle. I would expect this winter to really add to the total when the sunspots peak.

The R45K modification kit costs \$45. It is manufactured by Cushcraft Corp., 48 Perimeter Road, Manchester, NH 03108.

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

¹April 1989 CQ, p. 28.

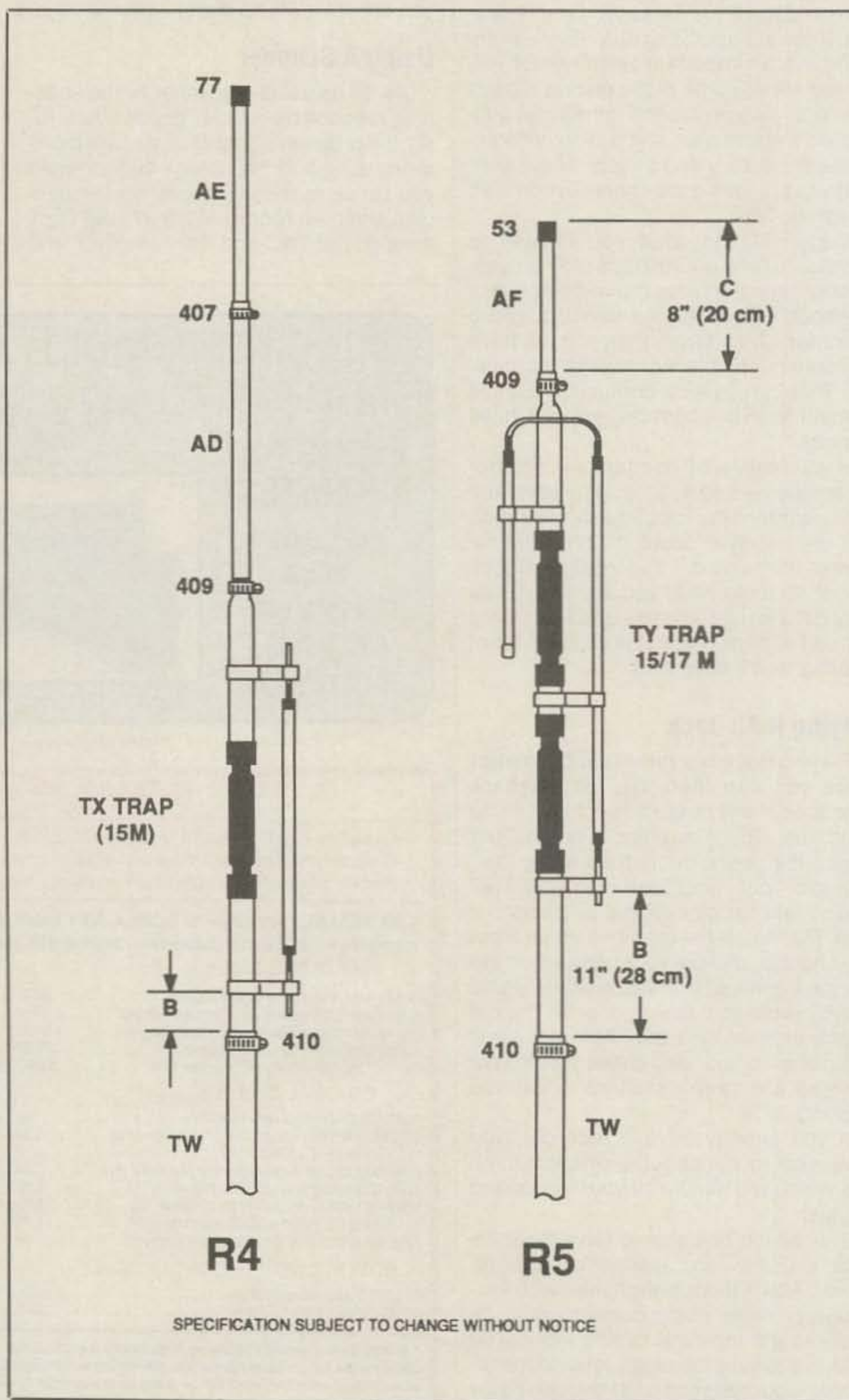


Fig. 1— This drawing is the one which comes with the R5 mod. Note the before and after views and how simple the mod is.



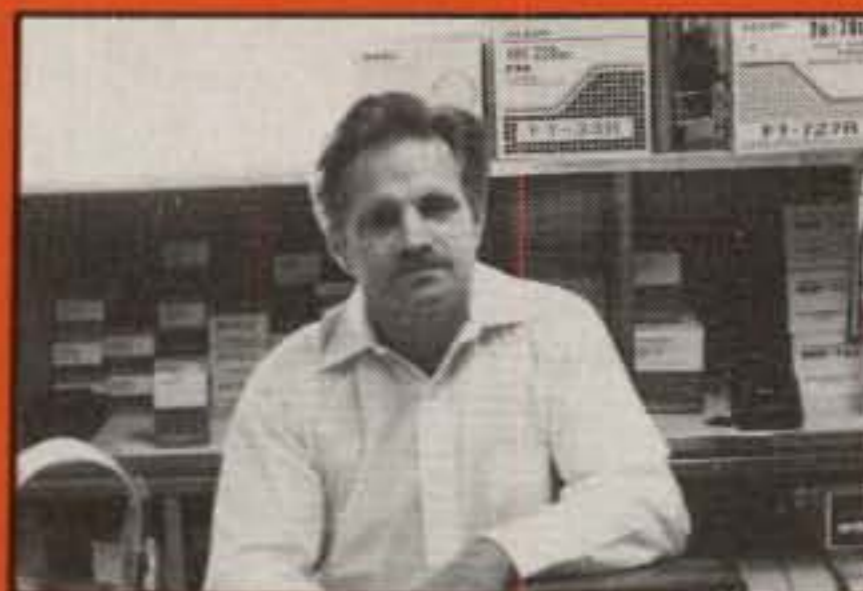
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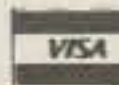
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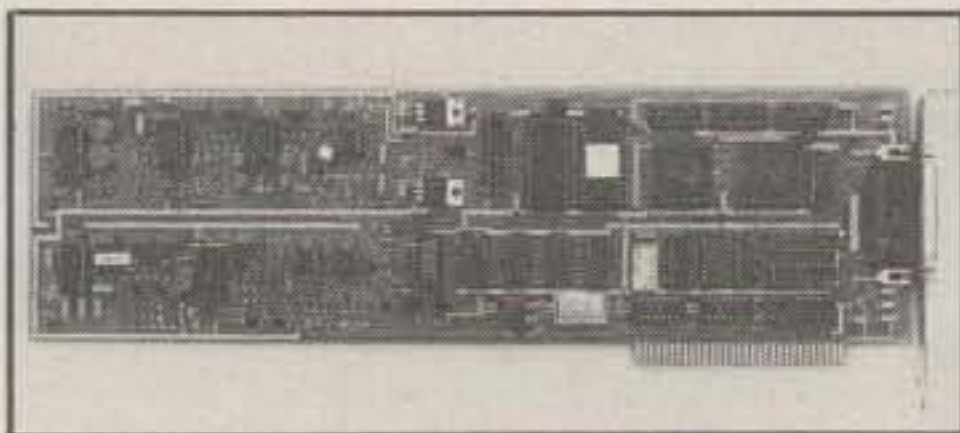


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PC-AMTOR is a full-length PC-compatible card and requires standard PC-XT or PC-AT with 640K of RAM and a minimum of one 360K floppy disk drive. Monochrome, CGA, and EGA video are also supported. The card will be available in December for \$395, including software. For more information, contact HAL Communications Corp., P.O. Box 365, Urbana, IL 61801, or circle number 102 on the reader service card.



Creative Electronics CE-1000 Amplifier System

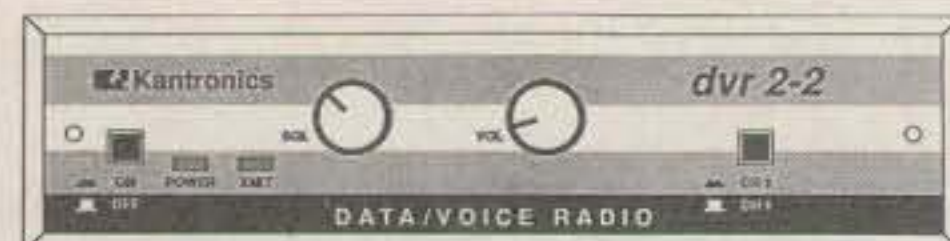
Covering the HF to UHF range, the CE-1000 series amplifier system incorporates three separate RF sections (50, 144, and 430 MHz band) with one power supply. Band selection is provided in the power supply. Special features include dual stripline design in the tank circuit, dual coaxial relay for antenna switching, variable input circuit, low noise high efficiency blower, solid aluminum rack-mountable cabinet with double shielded RF section.

The CE-1000-3A, B, and C RF decks for 50-54 MHz, 144-148 MHz, and 430-450 MHz, respectively are priced at \$1100 each. The CE-1000-PS power supply is \$900. For more information, contact Creative Electronics Inc., 12734 Branford St., #19, Arleta, CA 91331, or circle number 101 on the reader service card.

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Not only for packet, the dvr 2-2 has a microphone jack on the rear panel, allowing the user to connect the optional Kantronics mic and an external speaker for voice operation. Suggested retail is \$199. For more information, contact Kantronics, 1202 E. 23rd Street, Lawrence, KS 66046, or circle number 103 on the reader service card.



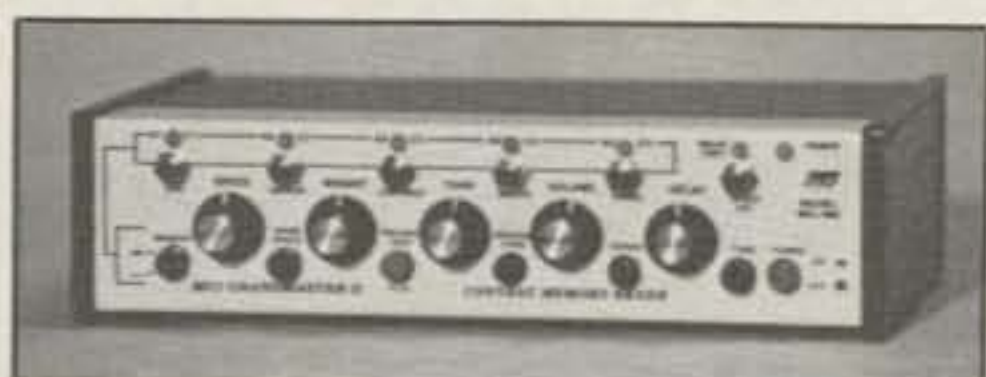
Optoelectronics Frequency Counter

Optoelectronics Inc. has announced their hand-held frequency counter with low frequency coverage down to 10 Hz and microwave coverage up over 2.2 GHz. Features such as a

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metal cabinet and precision quartz time base oscillators are included as well as internal nickel-cadmium batteries. A full line of accessories includes antennas, probes, and carry case. The 2210 features dual crystal oscillator and dual input amplifier design. Input sensitivity is less than 10 mv from 10 Hz to 2 GHz with 3 mv typical. Accuracy is 1 PPM with temperature compensated crystal oscillators. Size is 3.9"H x 3.5 "W x 1"D and weight is 9 oz.

The Model 2210 sells for \$189 complete with batteries and charger. The Model TA-100S telescoping whip antenna is \$12, and the vinyl carrying case is \$10. For more information contact Optoelectronics Inc., 5821 NE 14th Ave., Fort Lauderdale, FL 33334, or circle number 105 on the reader service card.



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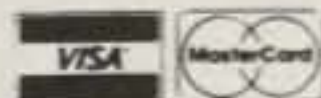
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K4BAI	1,553,832
AJ6V	1,348,490
NE8T	1,284,312
AD1C	1,215,672
WD8LLD	998,283
KV8Q	926,590
N6TV	912,939
K5NW	883,392
NC7K	741,375
K5ZD/3	691,200
KM0L	512,316

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N5RZ	162,134
N4ZC	153,081
N4VZ	118,534
KM2P	43,472
WA6FGV	18,042
WD9FTZ/0	15,566
N5MLL	12,416

21 MHz

K1XA	1,039,721
W2SC/1	970,827
N4ZZ	783,328
W5WMU	778,534
KA5W	557,437
NJ9C	349,979
W2HG	179,983
WJ7R	114,872

14 MHz

N2AA	1,690,032
NI6W	1,280,856
KD2SX/1	1,129,514
W5FO	1,094,930
N0BSH/9	1,069,430
K3IPK	673,638
KC0D	479,004

7 MHz	
KV0Q	501,424
NJ1T	478,134
W3BGN	474,144
W3UM	415,800
K1ZZI	257,700
AA1M	105,878

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K1RU	3,209,059
N7KA/5	1,995,456
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NA6A	1,705,041
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WA6IET	1,064,712
KS3F	1,046,220

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N3RS	A 615,624
N4KG	A 461,700
NX7K	A 436,044
N8BJQ	A 303,659
KE7X	A 254,012
K5MK	A 151,767
K9AY/0	A 123,190
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21 MHz	
FS5T	4,558,955
4M7A	4,214,485
VP2VDX	3,810,040
N7DF/WH2	3,243,450
ZY5ZBA	2,653,840
VK8XX	2,643,435

4Z9FDB	2,545,164
FV9NDX	1,990,450
YZ3A	1,881,282
FK/JH9KVF	1,171,472
JA4YJA	1,142,600
YU1SA	1,064,360

14 MHz	
LZ5A	3,085,794
XK1CYL	3,016,142
4M3A	2,325,090
SV1RP/SV2	1,711,385
YU7AV	1,633,840
4N2X	1,476,632
4U4ITU	1,417,944
CE6NOT	1,261,447
OH1ZAA	979,615
YT3M	917,575
TF3CW	855,897
SL4ZXE	840,019
LG5LG	735,262
F6DKV	556,920

7 MHz	
FS5R	2,853,144
YY1D	2,459,700
G3GJQ/5N	813,610
OH1AF	548,080
UT3UA	436,674
DL6HCC	263,544
YB3ASQ	242,592
OK3CGN	215,196

3.5 MHz	
YX3A	1,004,060
KX6DC	256,452
SP5GIQ/7	160,044
OK1JFF	89,544
OK2BWJ	71,298
OK3CNS	22,528

1.8 MHz	
OK1DFP	93,492
OL8CVU	29,800
OL9CUD	14,904
OL9CUH	11,534
OK1DWJ	8,710
OK1DRU	8,540

MULTI-OPERATOR SINGLE TRANSMITTER	
KP2A	12,858,516
LQ5A	8,290,016

5H1HK	7,010,392
4J1FS	6,179,859
YU3AI	5,831,436
OK7AA	5,191,200
EA3VY	4,997,116
ZF2NE/ZF8	4,652,604
F8UFT	4,247,748
HI3UD	4,235,825
JE2YRD	3,928,782
IR2ITU	3,707,394
HG6N	3,459,950
IK2EGL	3,401,320
CJ7SV	3,334,526
LX150L	3,272,472
AP2ZA	3,013,465
JA8YBY	2,882,352
JA1YFG	2,813,048
6D2A	2,507,820

MULTI-OPERATOR MULTI-TRANSMITTER	
WL7E	6,981,532
OH7AB	5,852,517
JA2YKA	4,917,740
VE7ZZZ	2,441,710
JR1ZTT	1,319,096

QRP/p	
4X1IF	A 603,194
J11CBF	A 437,955
SP4GFG	A 282,877
OK1DKS	A 264,516
JA9RPU	A 256,872
HB9ADD	A 114,444
IS0LYN	A 114,192
ZL0AAH	28 256,665
PY2ORF	28 71,300
I4KRF	21 33,625
JA0BMS/1	21 29,536
YO5BO	14 103,032
SM5MX	14 72,412
OK1AYQ	14 62,320
YV2BE	7 29,648
OK2BXR	1.8 9,648
OL8CWI	1.8 8,704

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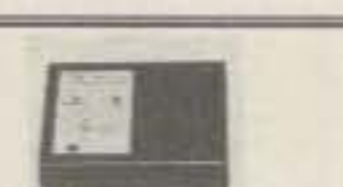
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NEWS OF CERTIFICATE AND AWARD COLLECTING

The Story of the Month for November is:

**Giuseppe Loreti, I0AOF
USA-CA 500/1000, All RTTY
12-1-83/4-24-89**

"I became interested in RTTY and started RTTY operating in 1975. In the following years I worked 249 countries in that mode and earned RTTY/DXCC No. 24 and RTTY/WAS No. 42. My application for RTTY/WAZ has been filed and is pending. RTTY is my great love.

"I am very happy and proud to have added USA-CA 500 and USA-CA 1000 to my collection of RTTY awards, and to be the first to have achieved those goals. It took me eight years to reach the 500-county level, and another six years to attain the 1000 level. My poor fingers—Hi!



Giuseppe Loreti, I0AOF, RTTY enthusiast/County Hunter, and gear.

"I am 62 years old and not retired, being involved in our family business. We operate a sugar-coated-almond factory which was founded by my great grandfather in 1852. I have been a widower since 1981 and live with my son, Roberto. Our home is in Rome atop a 450 foot hill called Montemario and overlooking the Eternal City—a very nice location for a ham.

"My father, Gioacchino, was a ham before me, having taken up the hobby in 1920 with the call EI1GL. EI was Italy in those days. As a matter of fact, I have a 1927 issue of the *Callbook* which contains his name. I still have the old home-made gear that my father used.

"We have two operating stations in Vatican City now, HV1CN and HV3SJ. A third station, for which I am QSL manager, HV2VO, is closed now because Father Edmund Benedetti is in Arizona

333 South Lincoln Ave., Mundelein, IL 60060



More of the well-equipped shack of I0AOF.



Giuseppe reflects nostalgically on "My dear old mechanical machines."

where he holds the call N7FUV. A few months ago we received a TONO 9000 keyboard from a friend in Japan, so HV3SJ is now QRV on RTTY. I operate HV3SJ on weekends and am also RTTY operator for SMOM, the Sovereign Military Order of Malta, where I have operated many times with the callsign 1A0KM.

"To my many friends and fellow RTTY enthusiasts around the world, best wishes and happy County Hunting!—73, Giuseppe, I0AOF."

USA-CA Special Honor Roll

- Louis Hubert, K8IXU
USA-CA All Counties #628, All SSB, 7-3-89
Endorsed All Mobiles 7-29-89
- John W. Luxford, ZL2BCX
USA-CA All Counties #629, ALL 20M SSB,
7-7-89
- H.R. "Bob" Beers, WB2HXZ
USA-CA All Counties #630, All SSB Mobiles,
7-20-89
- Jerry H. Drott, N5KGY
USA-CA All Counties #631, Mixed, 7-21-89
Ron Blake, N4KE
USA-CA All Counties #632, Mixed, 7-28-89
Mac Almond, KJ5W
USA-CA All Counties #633, All SSB Mobiles,
7-31-89

USA-CA Honor Roll

3000		1500	
K8IXU	658	K8IXU	886
ZL2BCX	659	WB2HXZ	887
WB2HXZ	660	N5KGY	888
N5KGY	661	N4KE	889
N4KE	662	KJ5W	890
KJ5W	663	1000	
2500		K8IXU	1076
K8IXU	732	WB2HXZ	1077
ZL2BCX	733	N5KGY	1078
WB2HXZ	734	N4KE	1079
N5KGY	735	KJ5W	1080
N4KE	736	500	
KJ5W	737	JG3RPL	2345
2000		GW4UZL	2346
K8IXU	799	OZ5KU	2347
ZL2BCX	800	WB2HXZ	2348
WB2HXZ	801	N5KGY	2349
N5KGY	802	KC2YW	2350
KA7OAI	803	N4KE	2351
N4KE	804	KJ5W	2352
KJ5W	805		

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, USA 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

Louis Hubert, K8IXU, filed his good application and received USA-CA All Counties #628, USA-CA 3000 #658, USA-CA 2500 #732, USA-CA 2000 #799, USA-CA 1500 #886, USA-CA 1000 #1076, All SSB, dated 7-3-89, along with an SSB endorsement to his USA-CA 500 #541, All 50MC A-3, issued 12-23-65. But Louis wasn't finished. He followed this up with qualifying documentation for an All Mobiles endorsement dated 7-29-89.

John W. Luxford, ZL2BCX, did his paperwork and received USA-CA All Counties #629, USA-CA 3000 #659, USA-CA 2500 #733, and USA-CA 2000 #800, All 20M SSB, dated 7-7-89.

H.R. "Bob" Beers, WB2HXZ, claimed a fully endorsed certificate and received USA-CA All Counties #630, USA-CA 3000 #660, USA-CA 2500 #734, USA-CA 2000 #801, USA-CA 1500 #887, USA-CA 1000 #1077 and USA-CA 500 #2348, All SSB Mobiles, dated 7-20-89.

Jerry H. Drott, N5KGY, did it all in one giant leap by claiming USA-CA All Counties #631, Mixed, USA-CA 3000 #661, All SSB Mobiles, USA-CA 2500 #735, USA-CA 2000 #802, USA-CA 1500 #888, USA-

CA 1000 #1078, and USA-CA 500 #2349, All 20M SSB Mobiles, all dated 7-21-89.

Ron Blake, N4KE, submitted his filled record book and received USA-CA All Counties #632, USA-CA 3000 #662, USA-CA 2500 #736, USA-CA 2000 #804, USA-CA 1500 #889, USA-CA 1000 #1079, and USA-CA 500 #2351, Mixed, dated 7-28-89.

Mac Almond, KJ5W, did all of his paperwork and claimed USA-CA All Counties #633, USA-CA 3000 #663, USA-CA 2500 #737, USA-CA 2000 #805, USA-CA 1500 #890, USA-CA 1000 #1080, and USA-CA 500 #2352, All SSB Mobiles, dated 7-31-89.

Alan E. Koch, KA7OAI, received USA-CA 2000 #803, All SSB Mobiles, dated 7-22-89.

USA-CA 500 certificates went to:

Kazumasa Kawase, JG3RPL, USA-CA 500 #2345, Mixed, 7-8-89.

Peter M. O'Neill, GW4UZL, USA-CA 500 #2346, All SSB, 7-12-89.

Kurt Jensen, OZ5KU, USA-CA 500 #2347, All CW, 7-19-89.

H.R. "Bob" Beers, WB2HXZ, USA-CA 500 #2348, All SSB Mobiles, 7-20-89.

Jerry H. Drott, N5KGY, USA-CA 500 #2349, All 20M SSB Mobiles, 7-21-89.

Douglas L. Cropper, KC2YW, USA-CA 500 #2350, All SSB, 4-10-89.

Ron Blake, N4KE, USA-CA 500 #2351, Mixed, 7-28-89.

Mac Almond, KJ5W, USA-CA 500 #2352, All SSB Mobiles, 7-31-89.

Awards Available

The Worked All Britain Awards (WAB). The Worked All Britain Awards (WAB) were founded in 1969 by the late John Morris, G3ABG. The WAB group aims to promote a greater amateur radio interest in Great Britain and Northern Ireland through an award scheme. This award scheme is based on the geography and administration of the United Kingdom. These awards are available on a worldwide basis to all radio amateurs and shortwave listeners. QSL cards are *not* required for any of the awards. The awards can be claimed on any band (including 10, 18, and 24 MHz) or by any mode open to radio amateurs.

WAB is an independent, self-financing organization. Life membership of the group is via the purchase of a WAB record book. The group makes, when possible, financial donations to groups helping disabled radio amateurs and shortwave listeners.

The WAB Award. This is the main WAB award and is based on working WAB areas. WAB areas are based on map references used on official (Ordnance Survey) maps of Great Britain and Northern Ireland. The system is also used in many low-priced road atlases. This map reference system is called the National Grid Reference system in Great Britain and the Irish Grid Reference system in Northern Ireland.

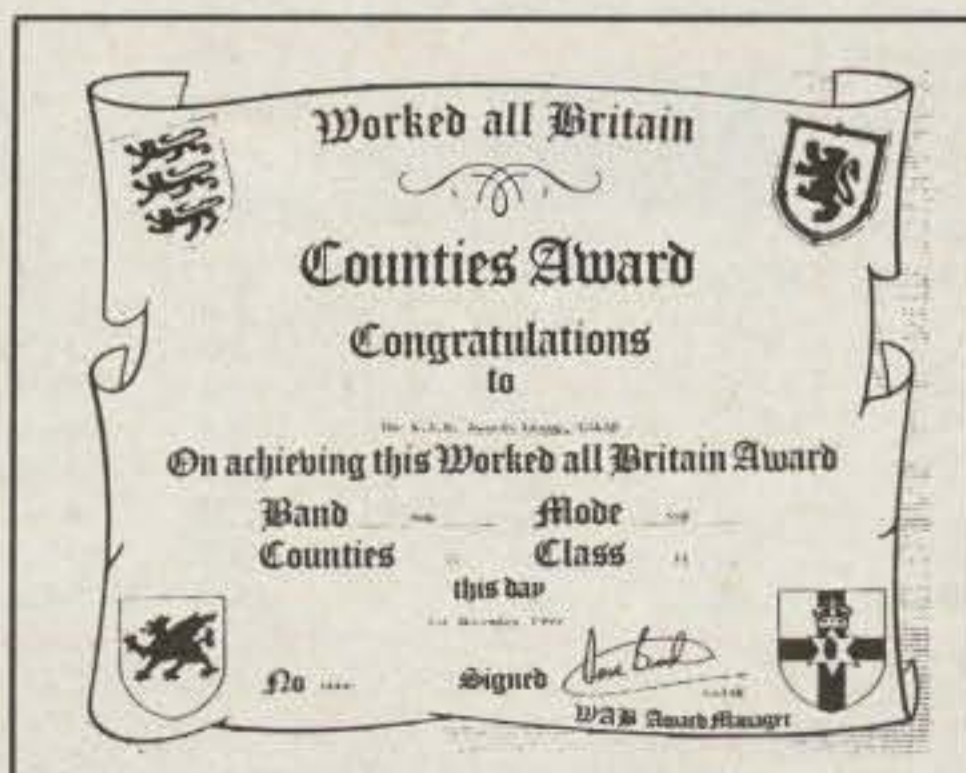


The Worked All Britain Large Squares Award offered by the WAB Group.

The map reference system divides the country into 100 km by 100 km grid squares. These are referred to as Large Squares. In Great Britain these are given a two-letter reference (e.g., SP, SS, NN, SC), while in Northern Ireland they are given a single letter reference (C, D, G, H, J). These Large Squares are then broken down into 10 km by 10 km squares. To the large square reference are added two digits which represent the position of a place within a 10 km by 10 km square. The first digit gives the position on a horizontal scale and the second digit the position on the vertical scale (e.g., SP38, SS99, NN72, SC47, J37). The final stage is to add the administrative county to the 10 km by 10 km square to give the WAB area (e.g., SP38 West Midlands, SS99 Mid Glamorgan, NN72 Tayside, SC47 Isle of Man, J37 Down).

There are over 4000 WAB areas. This award is given for working a certain number of areas. The requirements depend on the location of the station and the band on which the claim is made. The requirements for stations in the UK are greater than those for stations located both inside and outside Europe.

There are six classes of award: Basic, Bronze, Silver, Gold, Platinum, and Sapphire. A certificate is given for the Basic Award and endorsement stickers are



Worked All Britain Counties Award for working designated numbers of counties in Great Britain and Northern Ireland.

given for the higher classes of award. For example, stations outside Europe need to work 100, 200, 400, 600, 800, and 1000; stations in Europe must work 300, 500, 750, 1000, 1500, and 2000; and stations in the UK must work 400, 750, 1000, 1500, 2000, and 2500 areas for the various classes of awards on HF bands. Requirements for VHF bands are lower.

There are higher classes of award and an Honor Roll for working areas beyond the requirement of the Sapphire Award. Specially engraved trophies are given out for these classes of award.

WAB Large Squares Award. This award is given for working the 100 km by 100 km Large Squares. A certificate is awarded for working 30 Large Squares. Endorsements are awarded for 40, 55, and all 61 Large Squares worked.

WAB Counties Award. This award is offered for working counties in Great Britain and Northern Ireland. It has two classes: Class II for 55 counties and Class I for 76 counties worked.

WAB Islands Award. The WAB Islands Award is given for working off-shore islands. There are well over 2000 such islands around the country, although many of them are uninhabited. A certificate is awarded for working 25 islands. Endorsements are given for 40, 50, 60, etc., islands worked. On VHF the award is given for working 10 islands and endorsements are given for 25, 40, 50, 60, etc., islands.

WAB Bookholders Award. To keep track of WAB contacts, members are issued a sequentially numbered WAB record book (see later). A certificate is awarded for working 100 WAB bookholders. Endorsements are given for each additional 100 bookholders worked.

WAB Overseas Introductory Award. This award is for stations outside Europe as an introduction to WAB. A certificate is awarded for working 25 WAB areas and 10 counties.

WAB RECORD BOOKS. Life membership of WAB is obtained through the purchase of a sequentially numbered WAB Record Book. This book contains a list of all WAB areas county by county. Alongside each WAB area are listed the principal towns and villages that are located in that WAB area. Along with the record book are supplied claim sheets for most of the awards. The cost of the record book, which includes life membership, is just 7 pounds or 12 dollars US. Payment can be accepted in all major western currencies. The price is subject to change without notice.

The WAB Record Book and additional information can be obtained from The Membership Secretary, Brian Morris, G4KSQ, 22 Burdell Avenue, Sandhills Estate, Headington, Oxford OX3 8ED, England.

Hameenlinna 350-Years Award. Hameenlinna, the oldest inland town in Finland, is celebrating its 350th anniversary in 1989.

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RS20M	16	20	119
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RS35M	25	35	179
RS50A	37	50	229
RS50M	37	50	249

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2-417	2M	45-170W	\$299.00
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CRANKUP SALE!

All Models Shipped
Factory Direct—
Freight Paid*!
Check these features:
• All steel construction
• Hot dip galvanized after
fabrication
• Complete with base and
rotor plate
• Totally self-supporting—
no guys needed

Model	Height	Load	Sale Price
HG37SS	37 ft	9 sq ft	\$CALL
HG52SS	52 ft	9 sq ft	\$CALL
HG54HD	54 ft	16 sq ft	\$CALL
HG70HD	70 ft	16 sq ft	\$CALL

Masts—Thrust Bearings—
Other Accessories Available
—Call! Prices Shown Are
Your Total Delivered Price
In Continental U.S.A.!



ROHN Self Supporting Towers On SALE! FREIGHT PREPAID

- All Steel Construction—
Rugged
- Galvanized Finish—Long Life
- Totally Free Standing—No
Guy Wires
- America's Best Tower Buy—
Compare Save \$
- Complete With Base and
Rotor Plate
- In Stock Now—
Fast Delivery

Model	Height	Ant Load*	Weight	Delivered Price*
HBX40	40 ft	10 sq ft	226	\$449
HBX48	48 ft	10 sq ft	303	\$589
HBX56	56 ft	10 sq ft	385	\$699
HDBX40	40 ft	18 sq ft	281	\$569
HDBX48	48 ft	18 sq ft	363	\$689

*Your Total Delivered Price Anywhere in Con-
tinental 48 States. Antenna Load Based on 70 MPH
Wind.

ROHN Guyed Tower Packages

- World Famous Rohn
Quality and Dependability
 - Rugged high wind survival
provides safe installation
 - Multi purpose towers
satisfy a wide range of needs
 - Complete packages
include: guy hardware,
turnbuckles, guy assemblies,
concrete base, rotor plate
and top section per
manufacturers specs.
- Packages shown below are
rated for 70 mph wind zone.
90 mph wind zone packages
slightly higher. All tower packages
shipped freight collect from our
Plano, TX warehouse, in stock for
prompt delivery.

Model 25G	Model 45G	Model 55G
50'	\$849	\$1229
60'	939	1389
70'	999	1719
80'	1199	1869
90'	1289	2039
100'	1369	2199
110'	1449	2459
120'	1669	2619



These rugged crankup
towers and masts now avail-
able from Texas Towers!
Check these features:
✓ All steel construction
✓ Hot dipped galvanized
✓ Totally self-supporting—
✓ No guys needed

Coax arms, Thrustbearings
Masts, Motor drives, Re-
mote controls, Hinged
bases, Rotor bases, & Raising
fixtures also in stock-

CALL FOR SALE PRICES!

Model	Min.Ht.	Max.Ht.	Ant.load*	Sale price
MA40 mast	21'	40'	10 sq ft	\$629
MA550 mast	22'	50'	10 sq ft	999
TX438	22'	38'	18 sq ft	919
TX455	22'	55'	18 sq ft	1385
TX472	23'	72'	18 sq ft	2279
HDX555	22'	55'	30 sq ft	2079
HDX572	23'	72'	30 sq ft	3559

Note-US Towers Shipped Freight Collect From
Visalia, CA Factory
*Note-towers rated at 50 mph to EIA specifications

RG-213U

\$.39/ft \$379/1000 ft.
Up to 600 ft via UPS

- RG-213/U—95% Bare Copper Shield
- Mil-Spec Non-contaminating Jacket for longer
life than RG8 cables
- Our RG-213/U uses virgin materials.
- Guaranteed Highest Quality!

RG-8X

\$.22/ft \$209/1000 ft.

- RG8X—95% Bare Copper Shield • Low Loss
- Non-contaminating Vinyl Jacket Foam Dielectric

9086

\$.45/ft \$439/1000 ft.

- Same Specs as Beiden 9913
- Lower loss than RG8U
- 100% shielded-braid & foil

HANDLINE/HELIAX®

Lowest Loss
for VHF/UHF!

- 1/2" Alum. w/poly Jacket.....\$.79/ft.
- 1/2" LDF4-50 Andrew Heliax®.....\$1.99/ft.
- 3/4" LDF5-50 Andrew Heliax®.....\$4.99/ft.

Select connectors below
Heliax® is a Registered Trademark of the Andrew Corp.

Cable Type	Imped.	10MHz	30MHz	150MHz	450MHz
RG-213/U	50	.6	.9	2.3	5.2
RG8X	52	.8	1.2	3.5	5.8
9086	50	.4	.64	1.7	3.1
1/2" Alum	50	.3	.5	1.2	2.2
1/2" Heliax	50	.2	.4	.9	1.6
3/4" Heliax	50	.1	.2	.5	.9

HELIAX® CONNECTORS

Cable Type	UHF FML	UHF MALE	N FML	N MALE
1/2" Heliax®	\$29	\$29	\$29	\$29
3/4" Heliax®	\$55	\$55	\$55	\$55

Amphenol Silver PL259.....	\$1.50
UG21B N Male.....	\$3.50
9086/9913 N Male Connector.....	\$4.95

ANTENNA WIRE & ACCESSORIES

Stranded Copper 14ga.....	\$10/ft.
1/4 mile 18ga copper-clad steel wire.....	\$30
Dog bone end insulator.....	\$79 ea.

VAN GORDEN

1:1 Balun.....	\$15	Center Insulator.....	\$8
Dipole Kits.....	D80 \$31.95/D40 \$28.95		
Short Dipole Kits.....	SD80 \$35.95/SD40 \$33.95		
All-band Dipole w/ladder line.....	\$29.95		
G5RV all band antenna.....	\$49.95		

ALPHA DELTA

DX-A 160-80-40 Sloper.....\$49

CUSHCRAFT

A3 3-el Tribander.....	
A4S 4-el Tribander Beam w/S.S. Hdwre.....	
A743 & A744, 30/40 mtr KIT for the A3 & A4.....	
R4 20-10 mtr Vertical.....	
AP8 80-10 mtr Vertical.....	
AV5 80-10 mtr Vertical.....	
D40 40 mtr Dipole.....	
40-2CD 2-el 40 mtr Beam.....	
A50-5 5-el 6 mtr Beam.....	
215 WB NEW 15-el 2 mtr Beam.....	
230 WB NEW 30-el 2 mtr Beam.....	
4218 XL 18-el 2 mtr Beam.....	
3219 19-el 2 mtr Beam.....	
424B 24-el 432 MHz Beam.....	
ARX2B 2 mtr Vertical.....	



Discoverer 2-el 40-mtr Beam.....	
Discoverer 3-el Conversion KR.....	
EXPLORER-14 SUPER-SPECIAL.....	
OK710 30/40 mtr. Add-On-Kit.....	
V2S 2-mtr Base Vertical.....	
V4S 440MHz Base Vertical.....	
TH5MK2S Broad Band 5-el Triband Beam.....	
TH7DXS 7-el Triband Beam.....	
TH3JRS 3-el Triband Beam.....	
205BAS 5-el 20-mtr Beam.....	
155BAS 5-el 15-mtr Beam.....	
105BAS 5-el 10-mtr Beam.....	
204BAS 4-el 20-mtr Beam.....	
64BS 4-el 6-mtr Beam.....	
12 AVQ 20-10 mtr vertical.....	
14 AVQ 40-10 mtr vertical.....	
18 AVT/WB 80-10mtr Vertical.....	
18HTS 80-10 mtr Hy-Tower Vertical.....	
23BS 3-el 2 mtr Beam.....	
25BS 5-el 2 mtr Beam.....	
28BS 8-el 2 mtr Beam.....	
214BS 14-el 2-mtr Beam.....	
2BDQ 80/40 mtr Trap Dipole.....	
5BDQ 80-10 mtr Trap Dipole.....	
BN86 80-10 mtr KW Balun W/Coax Seal.....	

HUSTLER

6BTV 80-10 mtr Vert.....	\$149	5BTV 80-10 mtr Vert.....	\$129
4BTV 40-10 mtr Vert.....	\$99	G7-144 2-mtr Base.....	\$129
G6-144B 2-mtr Base.....	\$89		
Mobile Resonators 10m 15m 20m 40m 75m.....			
400W Standard.....	\$16	\$17	\$19
2KW Super.....	\$20	\$22	\$25
Bumper Mounts - Springs - Folding Masts in Stock!			

BUTTERNUT ELECTRONICS CO

- HF6VX 80-10m Vertical \$159.95 Delivered
 - Full Legal Power
 - Highest Q Tuning Circuits
 - HF2V 80-40m Vertical \$149.95 Delivered
 - Full Legal Power
 - Automatic Band Switching
- Accessories:
RMK II Roof Mtg. Kit.....\$59.95
STR II Stub-Tuned Radials.....\$39.95
TBR160 160m Coil Kit.....\$59.95
30m Add-on Kit.....\$39.95
17/12m Add-on Kit.....\$39.95

FREE UPS on ACCESSORIES when
purchased with antenna

HF5B "Butterfly" 20-10m Compact Beam \$259.95

- Unique Design
- Reduces Size
- No Lossy Traps
- Turns w/TV Rotor
- Boom Length 6 Feet
- Element Length 12.5 Feet

FREE UPS Shipping in Continental USA

MIRAGE/KLM

KT34A 4-el Broad Band Triband Beam.....	\$419
KT34XA 6-el Broad Band Triband Beam.....	\$619

ROTORS

Alliance HD73 (10.7 sq. ft. rating).....	\$129.95
Alliance U110 (3 sq. ft. rating).....	\$49
Telex CD 4511 (8.5 sq. ft. rating).....	\$Call
Telex HAM 4 (15 sq. ft. rating).....	\$Call
Telex Tailtwister (20 sq. ft. rating).....	\$Call
Telex HDR300 Heavy Duty (25 sq. ft. rating).....	\$Call

ROTOR CABLE

Standard 8 cord cables \$.25/ft.
(vinyl jacket 2-#18 & 6-#22 ga)

Heavy Duty 8 Cond cable \$.45/ft
(vinyl jacket 2-#16 & 6-#18 ga)

ROHN GUYED TOWER SECTIONS

10 FT. STACKED SECTIONS	
20G.....	\$54.50 45G.....\$153.50
25G.....	\$65.50 55G.....\$197.50

ALL ACCESSORIES IN STOCK—CALL

ROHN FOLDOVER TOWERS

Model	Height	Ant. Load*	Price
FK2548	48 ft.	15.4 sq. ft.	CALL FOR PRICES
FK2558	58 ft.	13.3 sq. ft.	
FK2568	68 ft.	11.7 sq. ft.	
FK4544	44 ft.	34.8 sq. ft.	
FK4554	54 ft.	29.1 sq. ft.	
FK4564	64 ft.	28.4 sq. ft.	

25G Double Guy Kit.....\$299.
45G Double Guy Kit.....\$319.

*Above antenna loads for 70 mph winds w/guys at hinge and
apex. All foldover towers shipped freight prepaid in 48 states.
Prices 10% higher west of Rockies.

TOWER/GUY 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 7 x 7 Aircraft Cable (2700 lb rating).....	\$.15/ft
3/16 CCM Cable Clamp (3/16" or 5/32").....	\$.45
1/4 CCM Cable Clamp (1/4" Cable).....	\$.55
1/4 TH Thimble (fits all sizes).....	\$.45
3/8EE (3/8" Eye & Eye Turnbuckle).....	\$6.95
3/8EJ (3/8" Eye & Jaw Turnbuckle).....	\$7.95
1/2 x 9EE (1/2" x 9" Eye to Eye Turnbuckle).....	\$9.95
1/2 x 9EJ (1/2" x 9" Eye & Jaw Turnbuckle).....	\$10.95
1/2 x 12EE (1/2" x 12" Eye & Eye Turnbuckle).....	\$12.95
1/2 x 12EJ (1/2" x 12" Eye & Jaw Turnbuckle).....	\$13.95
5/8 x 12EJ (5/8" x 12" Eye & Jaw Turnbuckle).....	\$16.95
3/16" Preformed Guy Grip.....	\$2.49
1/4" Preformed Guy Grip.....	\$2.99
6" Diam - 4 ft Long Earth Screw Anchor.....	\$19.95
500 D Guy Insulator (5/32" or 3/16" Cable).....	\$1.99
502 Guy Insulator (1/4" Cable).....	\$3.49
5/8" Diam - 8 ft Copper Clad Ground Rod.....	\$12.95

PHILLYSTRAN GUY CABLE

HPTG2100 Guy Cable (2100 lb rating).....	\$.32/ft
HPTG4000 Guy Cable (4000 lb rating).....	\$.52/ft
HPTG6700 Guy Cable (6700 lb rating).....	\$.72/ft
9901LD Cable End (for 2100/4000 cable).....	\$9.95
9902LD Cable End (for 6700 cable).....	\$11.95
Socketfast Potting Compound (does 6-8 ends).....	\$16.95

GALVANIZED STEEL MASTS

Length	5 FT	10 FT	15 FT	20 FT
Heavy Duty Steel Masts 2 in OD - Galvanized Finish				
.12 in Wall.....	\$29	\$49	\$69	\$89
.18 in Wall.....	\$49	\$89	\$129	\$149
.25 in Wall.....	\$69	\$129	\$189	\$249

ORDER TOLL FREE 1-800-272-3467

Texas, Alaska & for information 1 (214) 422-7306

TEXAS TOWERS

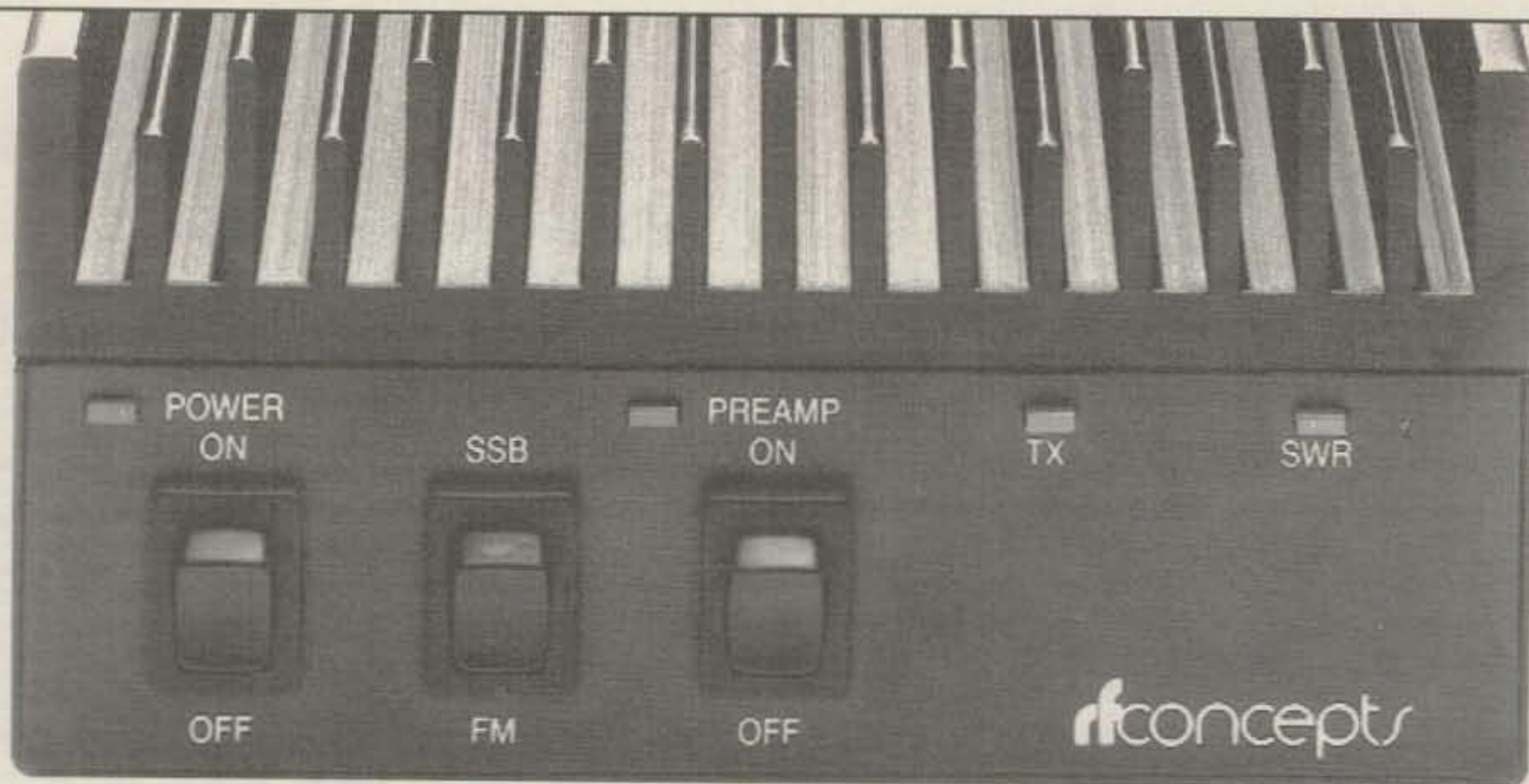
Mon-Fri: 9 am-5pm
Sat: 9 am-1pm



Div. of Texas RF Distributors Inc., 1108 Summit Ave., Suite 4 • Plano, Texas 75074

(Prices & Availability Subject To Change Without Notice)

(Antenna/tower product prices do not include shipping unless noted otherwise)



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If you're looking for powerful, rugged VHF and UHF amps, check the new line of 12 models from rfconcepts. Our solid state GaAsFET receiver/preamps capture weak signals. Our powerful RF stages deliver outputs from 30 to 170 watts.

Additional features include high SWR shutdown protection, and reliable U.S.A. manufacture and service. Includes full 5 year warranty, parts and labor and 6 months on RF final transistors. Contact your dealer or call for more information.

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UNADILLA ANTENNA MANUFACTURING CO.

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24 Hour FAX

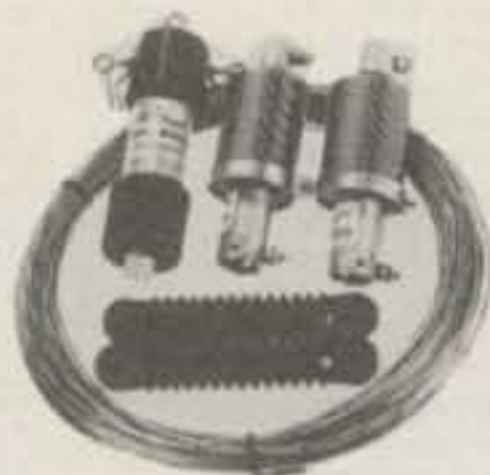
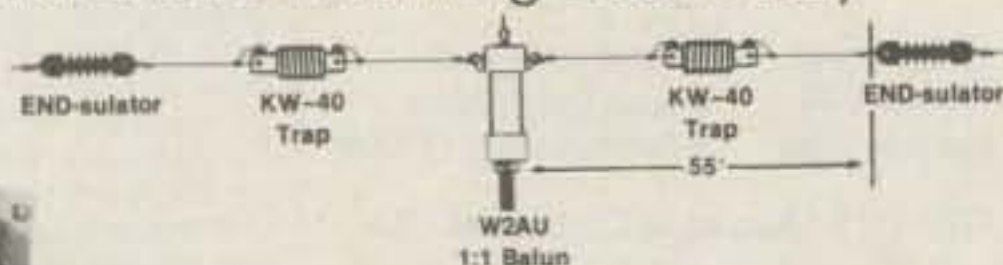
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(508)
475-7831
9-5 EST M-F

THE BIG SIGNAL™ Amateur Antenna Kit

40/80 Meter Antenna Kit For "Perfect Dipole" SWR

Quick Installation-Nothing Else to Buy



- A complete kit includes:
- W2AU 1:1 Balun (all stainless steel Hardware)
 - W2VS KW-40 Traps (pair)
 - End-sulators™ (pair)
 - #14-7 Copper Wire (125')
 - Installation & Pruning Instructions

Get "perfect dipole" (low SWR) operation on both bands, plus "second resonance" operation on 10, 15 and 20 meters. Complete instructions results in a quick, accurate installation and pruning to low operating SWR.

Every component in the 40/80 meter kit is an old line, reliable UNADILLA product, time tested with hams for over 20 years.

Contact Your Local Ham Dealer Today!!!

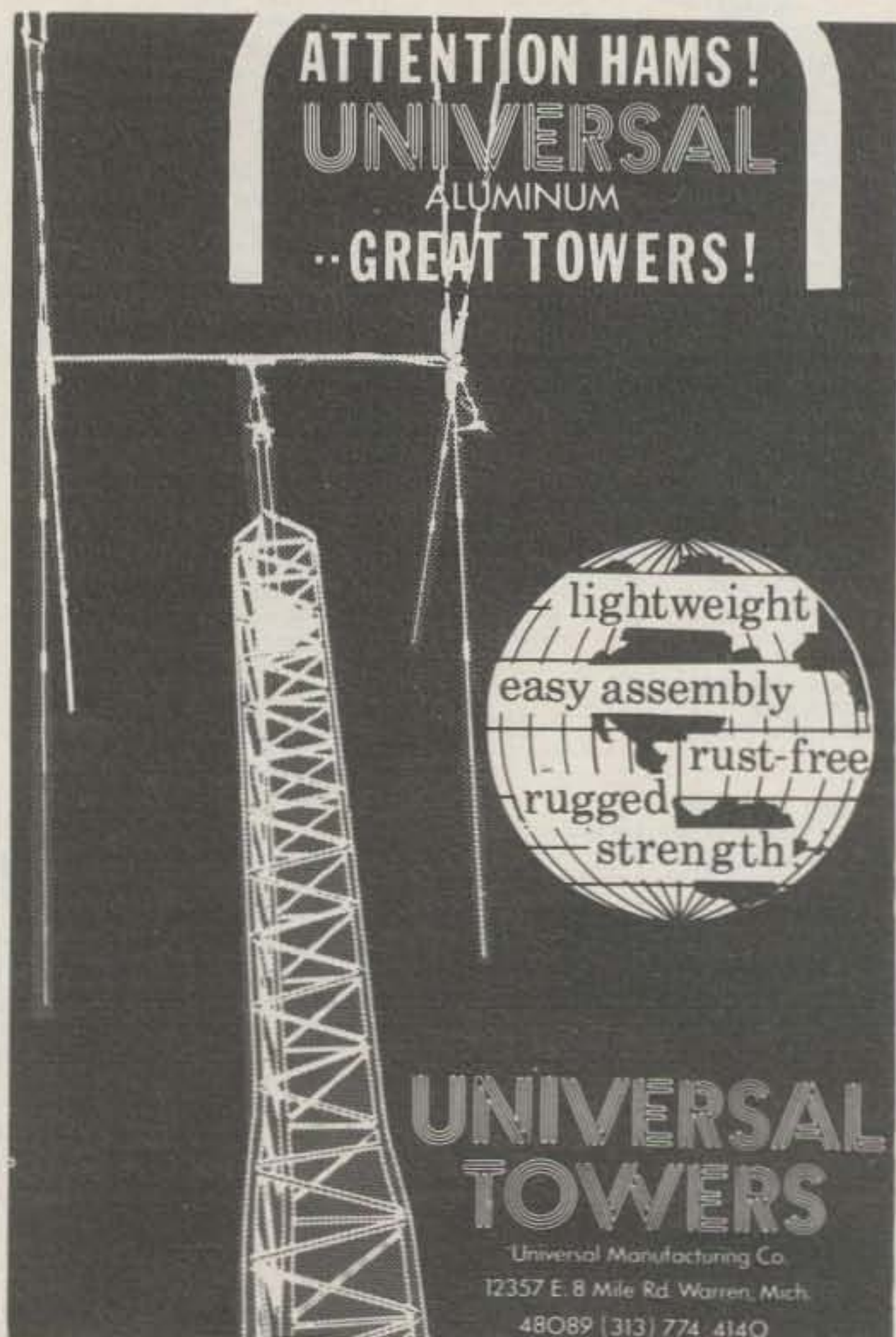
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Baluns-Antenna Kits-Filters-Center Insulators-ENDsulators™-Coaxial Relays
All products come with a 30 Day Warranty

-NOTICE-

We are the **NEW** manufacturers of the original
JAMES MILLEN™ Products
Grid Dip Meters (508) 975-2711 9am-5pm EST M-F Capacitors

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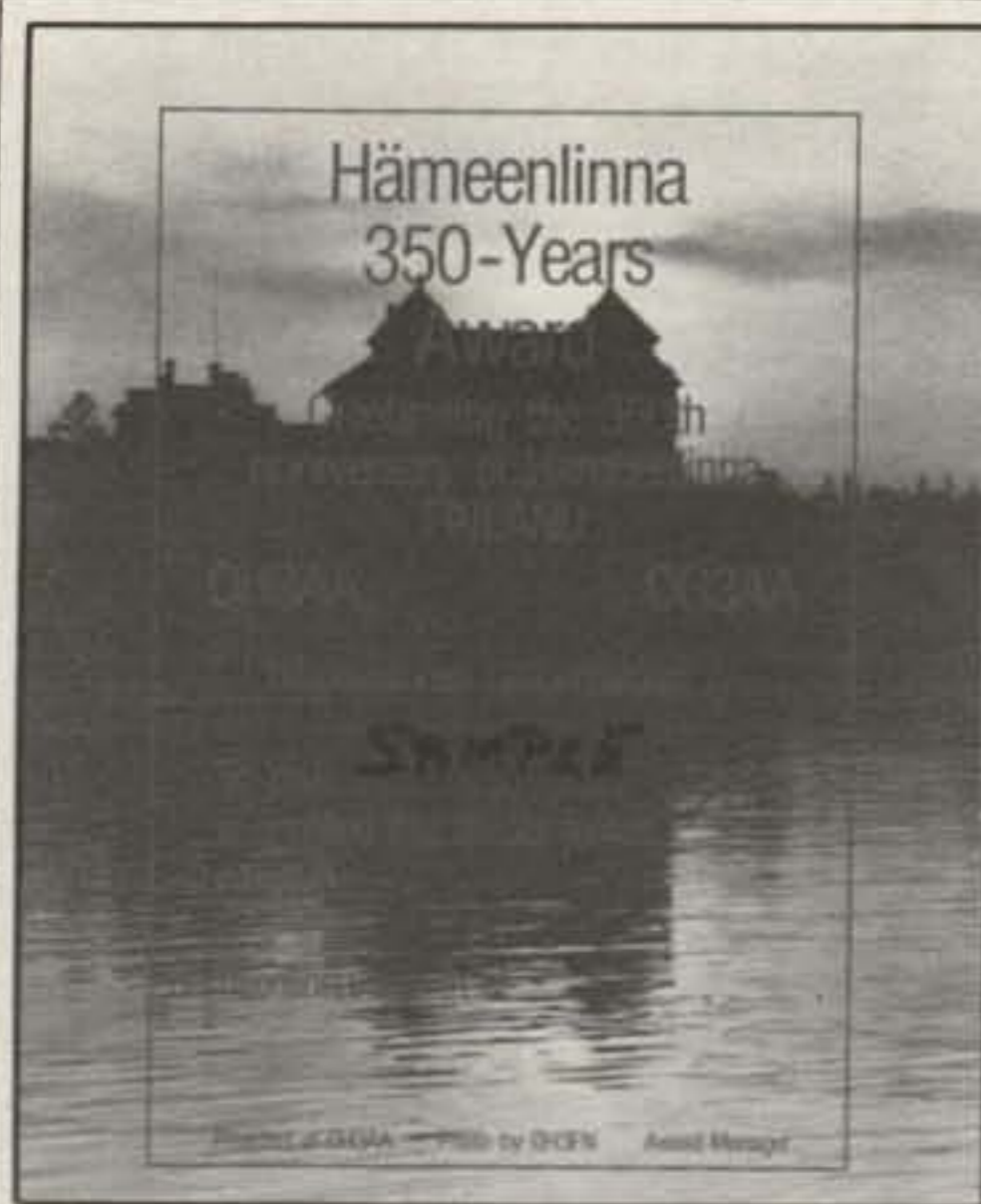
ATTENTION HAMS! UNIVERSAL ALUMINUM ..GREAT TOWERS!



UNIVERSAL TOWERS

Universal Manufacturing Co.
12357 E. 8 Mile Rd. Warren, Mich.
48089 (313) 774-4140

CIRCLE 153 ON READER SERVICE CARD



Hameenlinna 350-Years Award offered by the Hameenlinna Radio Club, Finland.

The Radio Club of Hameenlinna, OH3AA, is offering this special Hameenlinna 350-Years Award to commemorate the event.

To qualify for the award, amateur operators need to accumulate 350 points by working stations located in Hameenlinna County (OHC 309) during the period 1 January 1989 to 31 December 1989.

Points: OG3AA—200 points for EU Stations; 300 for DX.

OH3AA—100 points for EU Stations; 150 for DX.

OH3... (In OHC 309)—50 for EU Stations; 75 for DX.

(Note: The special station OG3AA was on the air 11-24 September 1989.)

Only one QSO per station per band is valid. The fee is 10 IRCs, or \$5 US, to be submitted along with GCR list (station, date, time, band, mode, received RST). Send application, no later than 31 December 1990, to Radio Club OH3AA, P.O. Box 7, SF-13101 Hameenlinna, Finland.

For more information, communicate with OH3AA or OH3GZ.

Of Interest To County Hunters

The Mobile QSL Bureau, operated by Gwen and Jerry Pollard, NØCOL and NØCKN, offers a very cost-effective QSLing service to amateurs working toward the USA-CA Award sponsored by CQ, as well as other county hunting awards sponsored by the Bureau, and by the Mobile Amateur Radio Awards Club. Additionally, Gwen and Jerry offer QSL and Mobile Reply Card printing and other aids. Interested county hunters may obtain a copy of the Bureau's "County Hunter Information" brochure by sending a request, along with two units of first-class postage, to Mobile QSL Bureau, P.O. Box 6436, Florence, SC 29502, USA. 73, Dorothy, WB9RCY

COMMANDER™ AMPLIFIERS

The Best Money Can Buy!

COMMANDER HF-2500 Linear Amplifier



Featuring Two Eimac 3CX800A7 Triodes

Built For High Duty Cycle Emissions

Master Of DX Pileups

Powerful Performance At a Moderate Price!

- **Band Coverage:** 160, 80, 40, 20, and 15 Meters
- **Modes:** SSB, FM, CW, AM, RTTY, SSTV, etc.
- **Drive Power:** 50 to 80 Watts Nom.
- **Output Power:** 1,500 Watts Continuous Carrier
- **Duty Cycle:** Full Output in Intermittent Amateur Service
- **Tuned Input:** Easy Rear Panel Adjustment
- **ALC:** Negative Going-Adjustable
- **Tubes:** Two EIMAC 3CX800A7 Ceramic-Metal Grounded Grid Triodes
- **Harmonic Suppression:** Exceeds All F.C.C. Requirements
- **Intermodulation Distortion:** Better Than 35 dB Down Below Rated Output
- **Cooling:** Full Cabinet Pressurized Forced Air Chassis
- **Power Requirement:** 220V-250V, 50/60 Hz, 20 Amperes
- **Shipping Weight:** 70 lbs.
- **Cabinet Size:** 17" x 16" x 7 1/4"
- **Limited Warranty:** Three Years Excluding Tubes
- **Maximum Plate Dissipation:** 1600 Watts

COMMANDER II VHF Linear Amplifier



Featuring One Eimac 3CX800A7 Triode

Master Of 2 Meter DX

Moonbounce, Tropo, Aurora, Meteor Scatter

Up to 1,000 Watts SSB!

SPECIFICATIONS

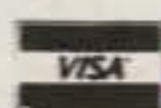
- **Frequency Range:** 144-148 MHz
- **Modes:** USB, LSB, RTTY, FM, CW
- **Power Requirements:** 117/234 VAC with 234 VAC recommended
- **RF Drive Power:** 10-15 Watts Nominal 25 Watts Maximum
- **RF Output:** Up to 1000 Watts SSB
- **Input Impedance:** 50 OHMS
- **Output Impedance:** 50 OHMS Nominal
- **Antenna Load:** 2:1 Maximum
- **Harmonic Suppression** Down 60DB @ Rated Output
- **Intermodulation Distortion** Down 30 DB Minimum
- **Weight:** 56 lbs.
- **Cabinet Size:** 14 3/4" x 14 3/4" x 6"
- **Tube:** 3CX800A7 Ceramic/Metal Triode
- **Pressurized Chassis Forced Air Cooling**
- **Optional Antenna Relay:** Dow Key® Model 260B, DPDT

Prices or specifications subject to change without notice.

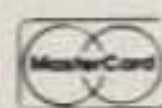
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WRITTEN TEST STUDY GUIDES

All word-for-word questions, multiple choices... answers. Choose Novice, Technician, General, Advanced or Extra Class Answer explanations supplied!

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All five manuals: \$22.95 postpaid.

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All 1,932 questions, multiple choices and answers found in every ham license exam, Novice through Extra Class.

\$9.95 Shipped postpaid.

MORSE CODE TEST PREPARATION

Set contains two 2-hr. cassette tapes

Code Teacher,	0-5 WPM	\$9.95
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Plus \$1.50 shipping per set.

All Manuals/Code Tapes: \$49.95
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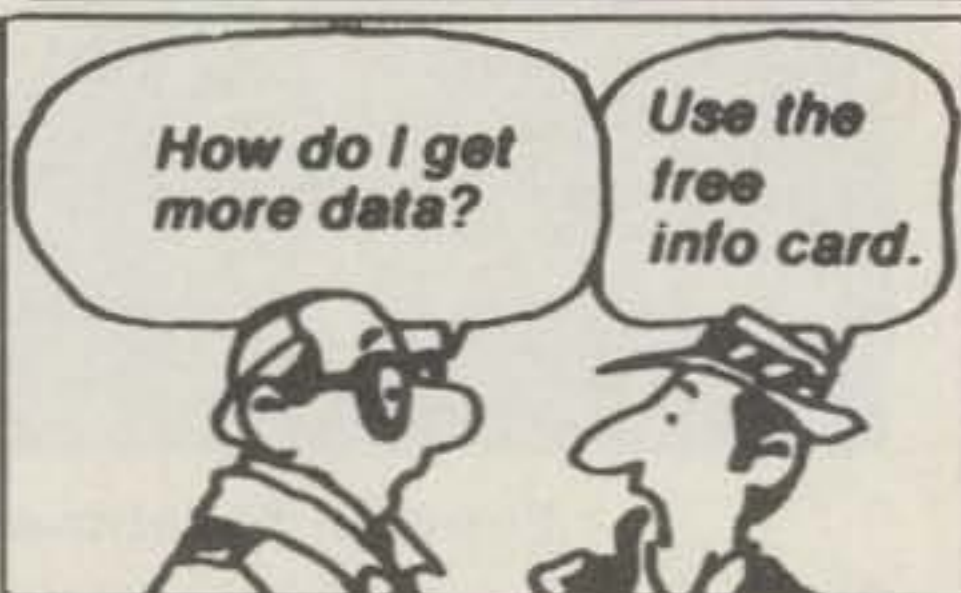
Announcing:

(from page 6)

48068. (VE Exams, contact WA8IZV, 1-294-4766.)

Nov. 5, **Rocky Mountain Radio League Swapfest**, Jeffco Senior Center, Arvada, CO. Contact Dan Duryee, KB0J, 303-458-5444 (days), Fred Brachle, NØFIK, 303-425-5791 (evenings). (Handicapped accessible.)

Nov. 11, **Sumter Hamfest**, Sumter County Exhibition Center, Sumter, SC. Contact SARA,



TNT The No-Tune Window Antenna

No pruning. No tuning. No knobs to twist. No worry about SWR as you work 75, 10, 20, 17, 15, 12 & 10. TNT is The No-Tune HF Antenna for Solid-State Rigs. Ready to Use Complete Includes 100 ft RG-8x feedline

Kink-Proof Wx-Sealed 3000 V Insul Rated 300W No Traps No Resistors No Pruning No Trouble

TNT \$89.95 Add \$7 P&H Infopack 51
Window 137 ft. long **Antennas West**
Box 50062-C, Provo, UT 84605 (801) 373-8425

CIRCLE 17 ON READER SERVICE CARD

P.O. Box 193, Sumter, SC 29151-0193, or call KB4FIQ at 803-773-5189.

Nov. 11-12, **Broward ARC Hamfest**, Omni Auditorium BCC North Campus, Pompano, FL. Contact Broward ARC, 9320 Sunrise Lakes Blvd., Sunrise, FL 33322.

Nov. 12, **South Central Connecticut ARA Fleamarket**, North Haven Park and Recreation Center, North Haven, CT. Contact SCARA Fleamarket, P.O. Box 81, North Haven, CT 06473 (SASE) or call WA1TAS, 203-265-6478 (7-10 PM). (VE exams; wheelchair accessible.)

Nov. 12, **Rockford Hamfest 89/Computer Fair**, Forest Hills Lodge, Rockford, IL. Contact Lonnie Miller, 815-623-7576, or SASE to Rockford Hamfest, P.O. Box 10003, Rockford, IL 61131.

Nov. 18, **Montgomery Hamfest**, South Alabama State Fairgrounds, Montgomery, AL. Contact Hamfest Committee, c/o 2141 Edinburgh Dr., Montgomery, AL 36116, or call Phil, 205-272-

7980 (after 5 PM CST and weekends). (VE exams.)

Nov. 19, **Auctionfest 89**, Massillon K of C Hall, Massillon, OH. Contact MARC, P.O. Box 73, Massillon, OH 44648 (SASE).

Nov. 19, **Tri-State Hamfest and Computer Fair**, The Meadows, Washington, PA. Contact Carl Stark, KD3KH, 412-225-5684.

Nov. 25-26, **Greater Greensboro Hamfest**, National Guard Armory, Greensboro, NC. Contact GGH, P.O. Box 8252, Greensboro, NC 27419, or call 919-292-6565 except Wednesdays. (VE exams.)

Nov. 26, **North Coast ARC Swapfest**, North Olmsted Community cabin, North Olmsted, OH. Contact North Coast ARC, P.O. Box 30529, Cleveland, OH 44130.

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You've bought our replacement batteries before...
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CM2, PB2 7.2v @ 500 MAH
CM5, PB5 10.8v @ 500 MAH

SUPER

7S 13.2v @ 1200 MAH—\$63.95
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(base charge only 1" longer)

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Rapid.Charger for all ICOM BATTERIES

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*FNB-10 7.2v @ 600 MAH
FNB-12 12v @ 500 MAH
*FNB-10(S) 7.2v @ 1000 MAH

NEW

FNB-12 12v @ 500 MAH
FNB-12(S) 12v @ 600 MAH
equivalent to FNB-11 (1/2" shorter)

*same size case as FNB-12

NOW

P4W 11v @ 500 MAH—\$20.95
FNB-2 11v @ 500 MAH—\$20.95



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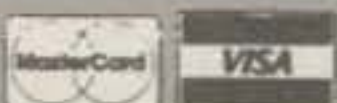
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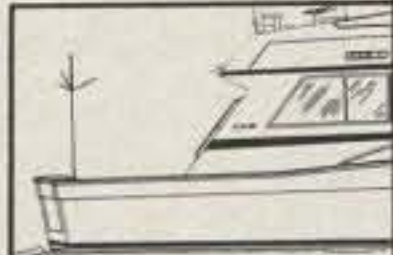


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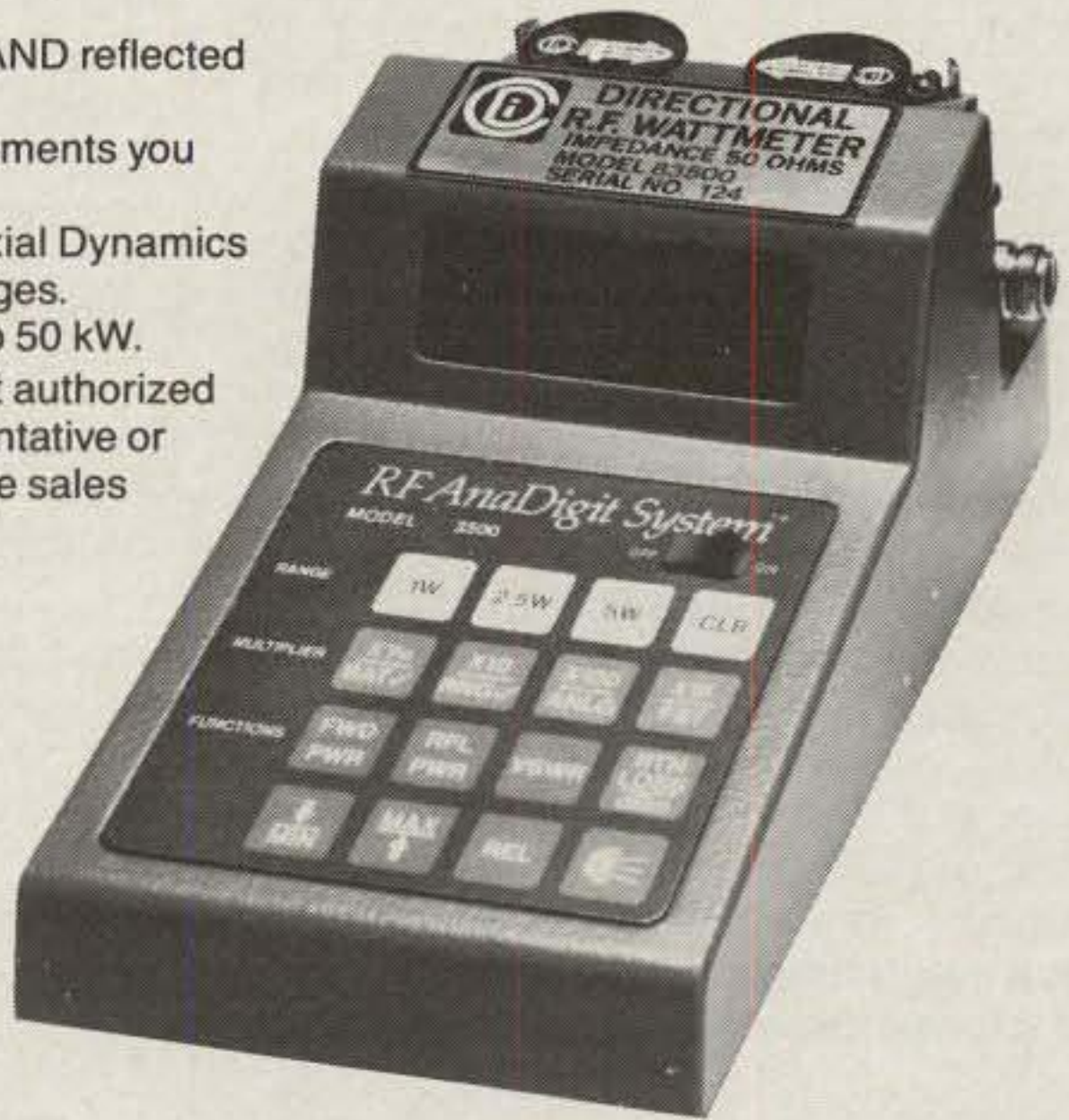
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Antennas and Digital RF Communications

This month's column deals with the specifics related to various types of antennas and their applications to packet and other digital modes. We will consider everything from an isotropic radiator (dipole) to a rhombic. Putting it another way, we will research antennas from the customary to the complex.

I am not suggesting that any digital radio user should select one antenna over another. Use whatever you have, or choose the antenna that best favors your needs and environment.

Packet radio is one of those communications modes that will tell on the system operator if he or she fails to provide the antenna that has the best radiating and capture effect to it. In fact, if the antenna is not constructed and erected so that it will provide good capture to signals and have the lowest noise component with respect to terrestrial noise, then no one is to blame except the operator who is in charge of the installation.

I am as meticulous as A.J. the day before the race. Don't just walk the race track; look for the bumps and crevices. The antenna for your packet station is about to become your doorway to the world. Everyone who has spent any time around me will affirm that "Buck won't skimp when it comes to his antennas."

I am very particular where my antennas are concerned. The "wireman" is aware of my meticulous nature, and when I go to buy cable and connectors, he never asks what make or what kind of cable I want. When I go to buy cable or connectors, I specify silver flashed connectors and cable of the best quality. Over the years, that is the part of my station that will get the least attention after it is installed, so I want it to withstand the elements and provide dependable communications for a long time.

I am very picky about the antennas and associated components of my antenna system. With over 40 years as an amateur, and over 25 years as chief engineer for a group of radio and television stations, I learned a very valuable lesson early on. **Signal quality begins at the tip of the antenna, and it travels down through the transmission-**

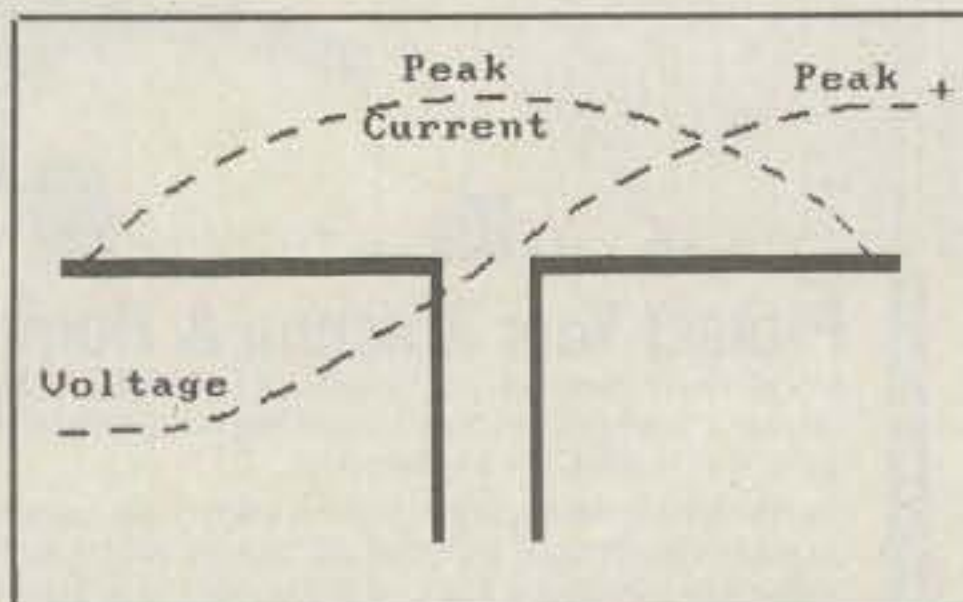


Fig. 1— The basic dipole consists of two charges, or elements, which receive signals of opposite polarity.

line and reflects off the operator at the other end. Let your reflection be a good one.

Radiation and Resonance

If we were to feed an RF signal to a piece of wire suspended in the air, the signal would radiate over a wide area. To obtain maximum coverage, the wire should be a resonant length at the transmitter frequency.

Antennas can be constructed to radiate with directional, omni-directional, and bi-directional patterns. The kind of pattern desired depends on the coverage area requirements. Likewise, the type of antenna selected will determine the kind of pattern you will have. Another major factor in antenna selection and installation is the distance above the ground at which an antenna is suspended.

Antenna theory as related to antennas suspended in free space states simply that the ground below will provide a reflecting, or mirror, effect. This *mirror ef-*

fect gives an antenna the appearance of having greater gain when the antenna is mounted at distances that are "in-phase," or a given wavelength above the earth. The greater the height, the greater the gain.

Radio waves travel at the velocity of light in free space. Therefore, radio waves travel at 300,000,000 meters per second, or close to 186,000 miles per second. A formula for determining the resonant length of an antenna for a given frequency is based on the speed of light theory. One of the first formulas that we learned when studying for our FCC license was the formula for computing the length of an antenna. The formula for the length of an antenna, expressed in meters, is:

$$\text{Wavelength (meters)} = \frac{300,000,000}{\text{Frequency (Hz)}}$$

Band Considerations

Up to this point we have discussed some simple, but general antenna theory. Now we go directly to the application of antennas and the frequency of operation. This is another way of looking at our "needs and requirements."

Almost all antenna basics can be analyzed in terms of the elementary dipole. A dipole consists of two charges of opposite polarity. In the case of a real antenna, the charges take the form of two elements which receive signals of opposite polarity. (See fig. 1.)

We have learned through theoretical as well as practical experience that any

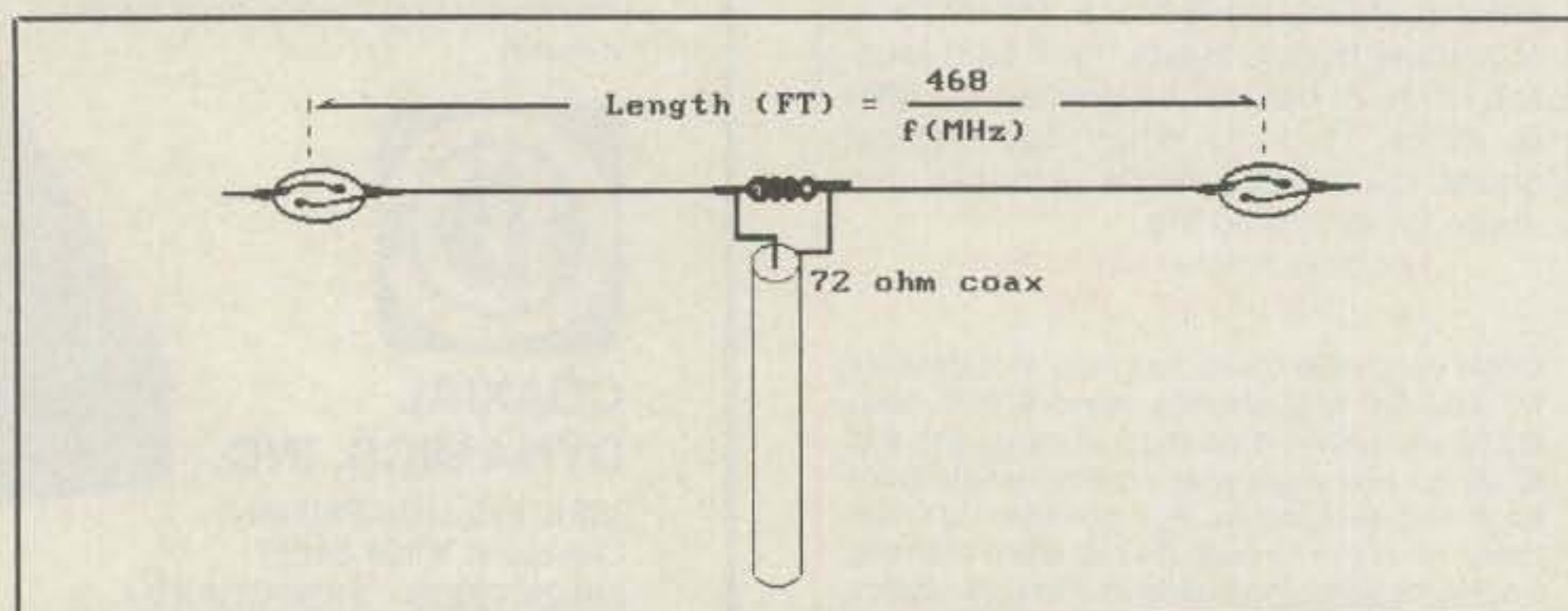


Fig. 2— A dipole is a half-wave antenna fed at the center. The impedance at the center is near 72 ohms.

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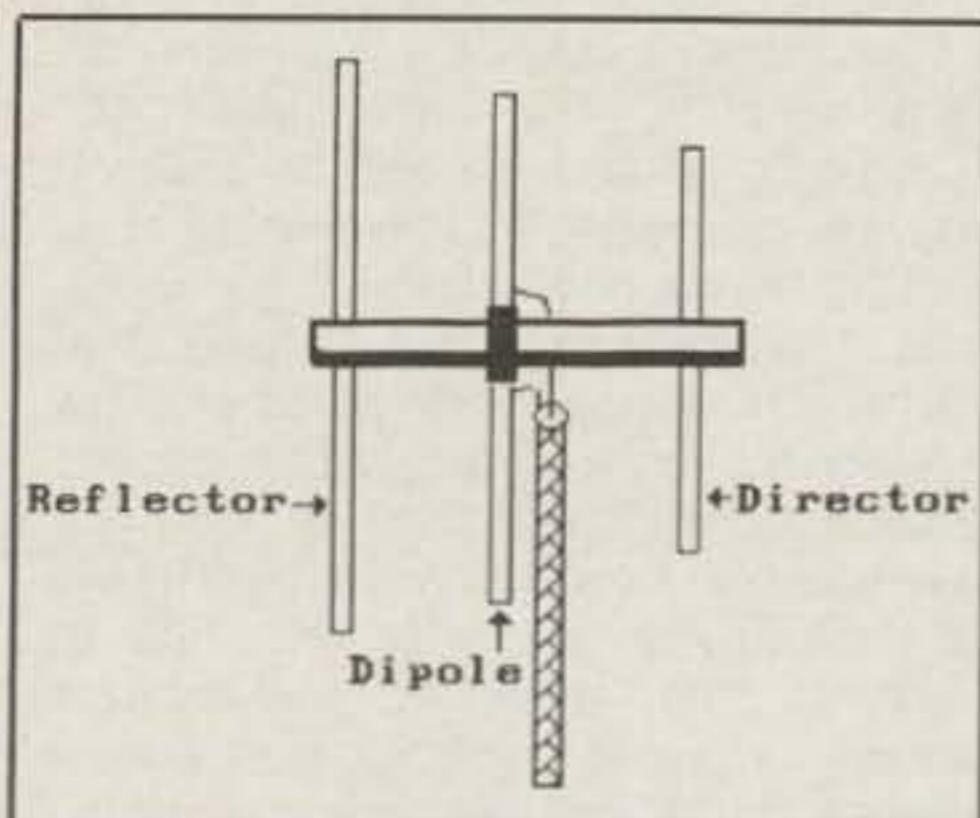


Fig. 3— Adding a reflector and a parasitic element (director) to the dipole greatly improves its gain and directivity. Thus, the dipole becomes a Yagi antenna.

antenna will exhibit the same characteristics whether it is used to receive or to transmit signals, provided the impedance of the feed system and the radiating elements are the same.

Several kinds of high-frequency (HF) antennas are simple in design and construction. The simplest is the end-fed or long-wire antenna. In most cases the long-wire is a one-half wavelength antenna cut for the frequency of operation. When designing or building an antenna, the size or diameter of the element (wire) should be taken into account.

A better known formula for determining an antenna of one-half wavelength, expressed in feet, is:

$$\text{Length (ft)} = \frac{492}{f(\text{MHz})}$$

Another consideration is to be added to the computations when we consider the influence of the ground on the antenna system. It is stated in the following manner:

$$\text{Length (ft)} = \frac{468}{f(\text{MHz})}$$

This ground influence is often referred to as the **K** factor. The **K** factor is a constant of 0.95 that is used to make the formula follow a more accurate standard with wire sizes close to number 16 gauge. For our purpose, the above formula is most accurate for determining antenna length between 1.8 and 30 MHz.

As we leave the HF spectrum and enter the VHF and UHF spectrum, the antenna design changes, too. Most antennas above 30 MHz are constructed of aluminum tubing or rod, and since the tubing can sometimes be much larger than the wire size mentioned earlier, it stands to reason that a new **K** factor must be considered. An antenna handbook will usually have a listing of **K** factors for different diameter-to-length ratios.

At HF frequencies I use everything from a doublet to a beam for my HF packet operation. If I want to get on the air quickly, then I go for an old tried and proven antenna called the dipole. (See fig. 2.)

The dipole by its nature is a center-fed antenna, and if we consider all the different factors related to this antenna, we will find that it has the closest impedance to the coax feed lines that are available to us nowadays. Theory says that the impedance of a wire antenna, measured at the center, is approximately 72 ohms when it is at a height of about one-half wavelength above ground. The dipole is usually suspended between two poles or trees and supported at each end by a nonconductive material (insulators).

Even as a coil and capacitor form a resonant circuit, so does an antenna. Depending on the ratio of inductance (coil) to capacitance, or **L to C**, these two have something in common. An antenna has **Q**, as does the coil and capacitor. This **Q** affects the gain versus bandwidth product of the circuit, whether it is the coil and capacitor or the antenna.

Where the **Q** is affected by the ratio of **L to C**, the **Q** of the antenna is affected by the size of the wire used in its construction. If the antenna is a VHF or UHF antenna, the **Q** is more pronounced as the size of the tubing is increased.

A lower **Q** will provide increased bandwidth. However, there is a tradeoff at this point, since we don't get something for nothing. We decrease the gain factor as we increase the bandwidth factor. Conversely, if we decrease the size of the tubing, the **Q** will increase. Thus the gain also increases, but the bandwidth decreases.

Horizontal vs Vertical Polarization

Short and to the point, a vertically polarized antenna can be good when used in a beam configuration at VHF to reduce absorption of atmospheric noise. It does require that reflector and parasitic ele-

ments be added to improve directivity and increase gain. (See fig. 3.)

On the other hand, if only a vertical driven element is used in a ground-plane design, then the resulting pattern, when viewed from above, will appear as if it were a doughnut with a small hole.

It goes without saying (but I will anyway), HF beam antennas with long elements and towers with guy-wires affixed near the top don't work well together when the beam is vertically polarized. Something will have to bend or break, either the guy-wire or the element, which are in each other's path. For this and other reasons most HF beams are horizontally polarized.

Voice vs Digital

Don't be misled by the topic of this section. I am not about to begin an argument over these two modes. My intention is to look into the types of antennas that are best suited for digital communications, as opposed to antennas commonly used for voice communications. From the beginning of this month's column we've moved in this direction.

If it is distance you want, then the beam antenna that we use for voice will be sufficient. If it is coverage you prefer, again I prefer the beam antenna as a power booster. I tend to try for a happy medium with respect to the digital and/or packet modes. The Yagi-type antenna, in a horizontal configuration, is one way to go if you want coverage and reduced wind resistance.

The happy medium I spoke of takes the form of a vertically polarized Yagi or a cubical quad. The reason I chose the latter is because the "quad" is well known for its favorable gain/bandwidth characteristics. Second, the quad offers a better signal-to-noise ratio because influences from terrestrial noise are greatly reduced when receiving with a cubical quad antenna. This inherent rejection to terres-

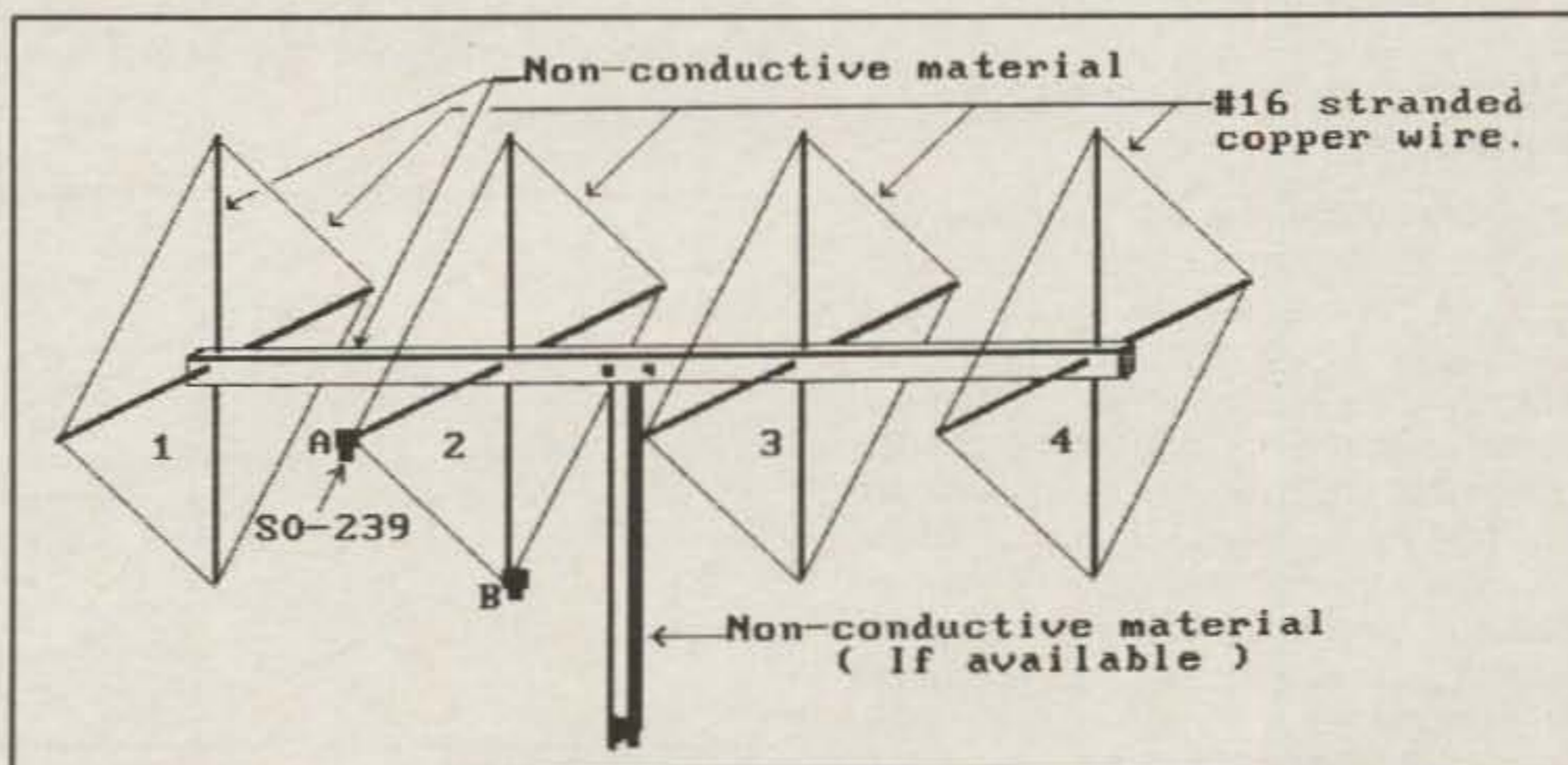


Fig. 4— The quad, feed point "A" for vertical polarization. Feed point "B" for horizontal polarization. Element (1) is reflector, (2) is driven element, (3) and (4) are directors.

trial noise is one of the reasons we might consider the quad for use in a digital data medium.

I have experienced this inherent feature of the quad with a 6 element, 2 meter, Bandmaster Quad manufactured by Alabama Amateur Electronics, in Birmingham, Alabama. This quad is slightly different from the quads I used to build using bamboo poles or wooden dowels. It can be configured for either horizontal or vertical polarization. Another nice feature is that the mainframe is constructed totally of very light, but durable fiberglass. (See fig. 4.)

Omni-Directional Antennas

Turning to the omni-directional antenna, I've observed a low-noise figure to high-gain ratio with respect to terrestrial interference when using the Isopole™ antenna. For this and other reasons I've begun to use these antennas for my digipeater and node installations. Since most nodes and digipeaters are located on high mountains and hills, these Isopoles work well because they offer minimal wind-capture surfaces to high winds.

The Isopole is vertically polarized, and it exhibits an omni-directional pattern. While taking RF field intensity power measurements from my station, I've discovered that a more circular pattern is presented by this antenna than with other popular vertical or omni-directional antennas.

This circularity may be a product of the two inverted cones that serve as decoupling elements, since they exhibit smooth and even circular surfaces. The Isopole is manufactured by AEA and distributed by most amateur radio supply houses.

The reason I favor an antenna that exhibits a rejection to terrestrial noise influence is because the nature of packet tells us that we should encourage a less noisy signal environment.

Over and over again, we who have enjoyed good packet communications know what it is to have high ambient noise levels causing retries and even destroying the transfer of a vital binary file.

Field Intensity Measurements (VHF/UHF)

If you would like to discover how well your packet station or node is performing, you can do relative field intensity measurements with a system that I use. Put the packet station on an unused frequency for your area, and set the beacon time so that it will identify every five minutes. Add some extra TXDelay so that the beacon will be a little longer in power-on time than it normally would be. Use low power if you have that facility, and begin the measurement.

Pinpoint and number several (minimum of ten) locations on a map of your locality. Maintain as much circularity to

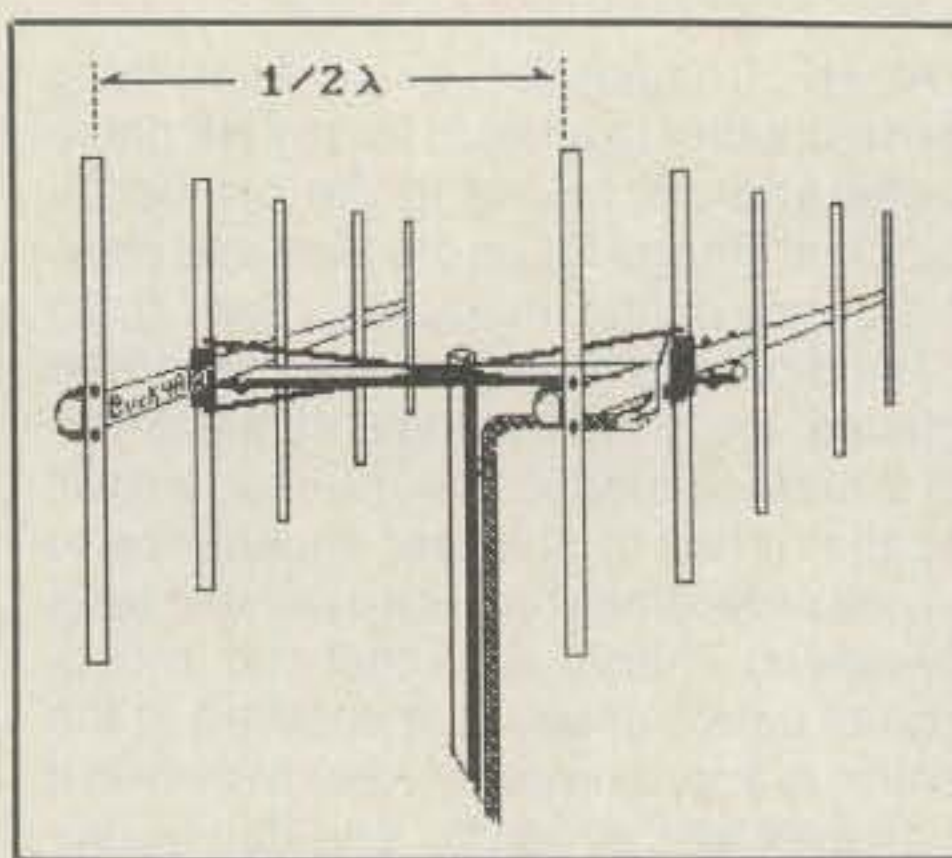


Fig. 5—Two Yagis stacked one-half wavelength apart will render another 3 dB gain.

your route and locations as possible. Be sure your mobile unit (1) will receive the frequency of the beacon and (2) that it has a dependable S-meter.

Use an omni-directional mobile antenna, preferably a magnetic roof-top antenna. Drive as near as possible to the locations that you pinpointed on the map and park until you receive one of your beacons. Record the relative signal strength (S-meter reading) and the location number, and continue to the next location for another measurement.

By making these measurements, you will arrive at a relative field pattern for your antenna and a representation of its performance. When you plot the curve of the field intensity measurements, you can quickly observe any "holes" (nulls) in the signal as well as any unusual pattern anomaly.

When you have completed the field measurements, turn the beacon off, and return the TXDelay to its normal setting.

Point-to-Point Communications

There are fewer repeaters (digipeaters) for VHF packet than there are repeaters for VHF voice operations. This condition alone makes it favorable for the packeteer to choose a beam or other type of directional antenna. This way you can reach those far-off nodes that are just out

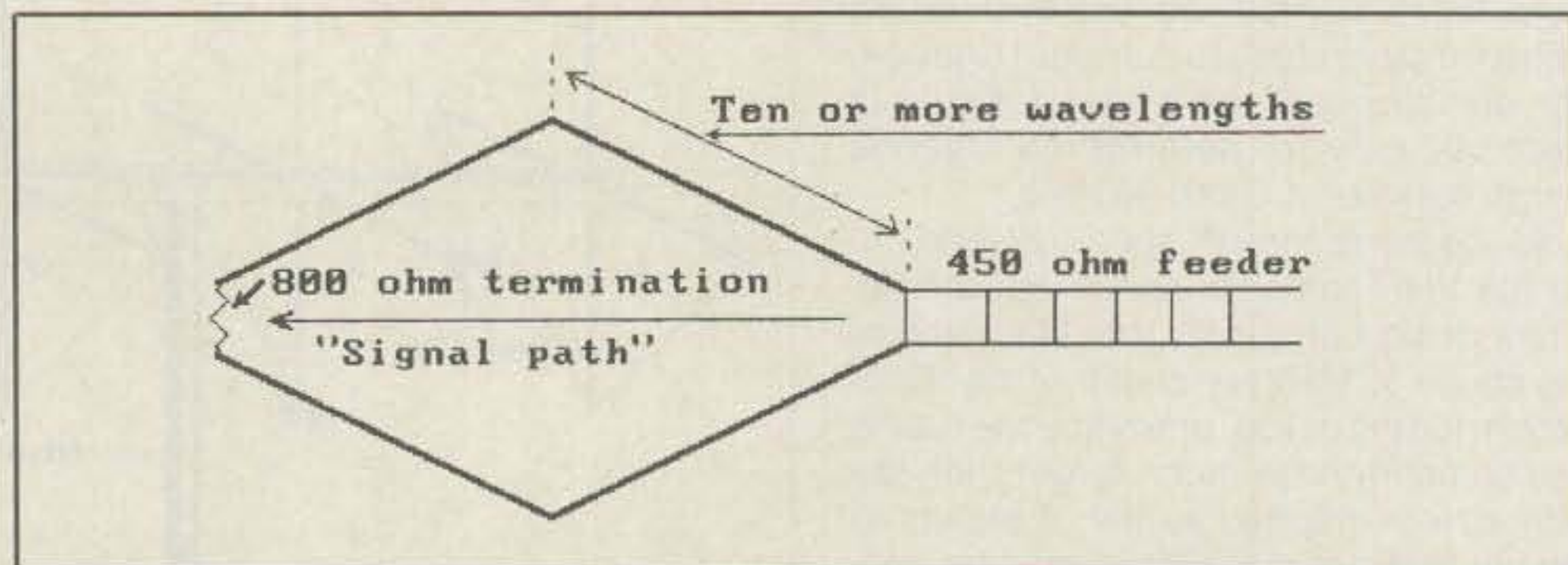


Fig. 6—The rhombic is a highly directional and very high gain antenna. It also requires a large parcel of real estate.

of range for your omni-directional antenna.

Even though packet is a "store and forward" medium, the ardent packeteer and digital ham should choose an antenna wisely because packet is a point-to-point medium that is based on simplex operations. "The most reliable path is one that can be regarded as a 95% path by the user, since the most perfect path is considered less than 100%." If you find you have reached a point where your VHF signal is marginal, and you would like to make it a "95%" path between two beam headings, maybe you should try stacking another antenna of the type you are using. If your beam is a Yagi, you can achieve another 3 dB of gain by stacking another similar Yagi one-half wavelength away. (See fig. 5.)

The Thoroughbred

As with any hobby, the thoroughbred does not come cheap. Specifically, the rhombic antenna is the best of all worlds, but it requires its owner to have plenty of running space. A rhombic is a four-sided antenna with two of the sides slightly compressed towards the center forming a diamond shape. (See fig. 6.)

Each one of the four sides of a rhombic will have a length in excess of ten wavelengths per side. The feed-point shown in the illustration is fed with 450 to 750 ohm open-wire feeder. The end of the rhombic that is opposite the feed-point is the direction in which the rhombic is pointed. This point is normally terminated with a resistor of 500 to 800 ohms. The rhombic is not a movable antenna, and it does need many wavelengths per side to be effective. Twenty wavelengths per side could render forward gains in excess of 15 dB at VHF.

The Care and "Feeding" Of The Antenna

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Type	Impedance	Velocity of Propagation	MHz	Loss/100 ft
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RG-8U	50 ohm	Foam Polyethylene 78%	100	1.8 dB
9913	50 ohm	Semi-Solid Polyethylene 84%	100	1.4 dB

Table 1 - List of some often-used coaxial cables and their specifications.

the manufacturers' printed specifications for a given type of feedline or coax. The main points of interest are the specs regarding the loss factor (expressed in dB) per hundred feet, the velocity factor, and the frequency at which the measurement was taken. Over the long haul, the "hard-lines" or multiple shielded coax cables will prove to be the better value.

Assuming that your next question is "Why are we interested in the velocity factor of the feedline or coax?" read on.

The coaxial (coax) cable or the transmission line plays a major role in antenna performance. The coax is a very vital part of the overall antenna system, but the coax has a personality of its own and can wreak havoc if it is not cut to or "tuned" for optimum performance along with the antenna. It is even more important to say that antenna performance will depend on the behavior of the transmission line at the time of antenna tuning or setup. In other words, if the coax is not prepared before the antenna is tuned, then tuning of the antenna will not render optimum performance.

The coax is the "life-line" that delivers the energy to the antenna. Since the energy is handled by the coax, this means that the coax is either an external extension of the "tank circuit" or it is part of the antenna, but which is true?

That was not a trick question, but a way to make a statement that can easily be remembered. The antenna feed line is *both*,

because the complete antenna system is part of the tank circuit.

Wow! Now we are beginning to understand why the antenna should be tuned. This is where we discover that tuning the antenna is another way of achieving "maximum transfer of energy."

A crude analogy is drawn if we imagine a pump with a capacity to deliver 100 gallons (watts) of water/pressure per second. This would mean that a pipe of ample size would be needed to deliver the water to the distribution tank. This pipe should be the exact size to handle the pressure. If the pipe is too small, a "back pressure" occurs; if the pipe is too large, a loss of pressure occurs. The "back pressure" could represent standing waves, and the loss of pressure could represent a mismatch of impedance at the antenna. As I stated, the analogy is crude, but it helps us to understand why the coax (pipe) size and length are important.

The Velocity Factor Must Be Considered

Now we understand why tuning our coax should be the first item we consider, but how do we tune a piece of coax? A feed line that is measured and cut in exact multiples of one-half (electrical) wavelength at the operating frequency will display the same impedance at each end when connected to an antenna that is cut and tuned to a given frequency.

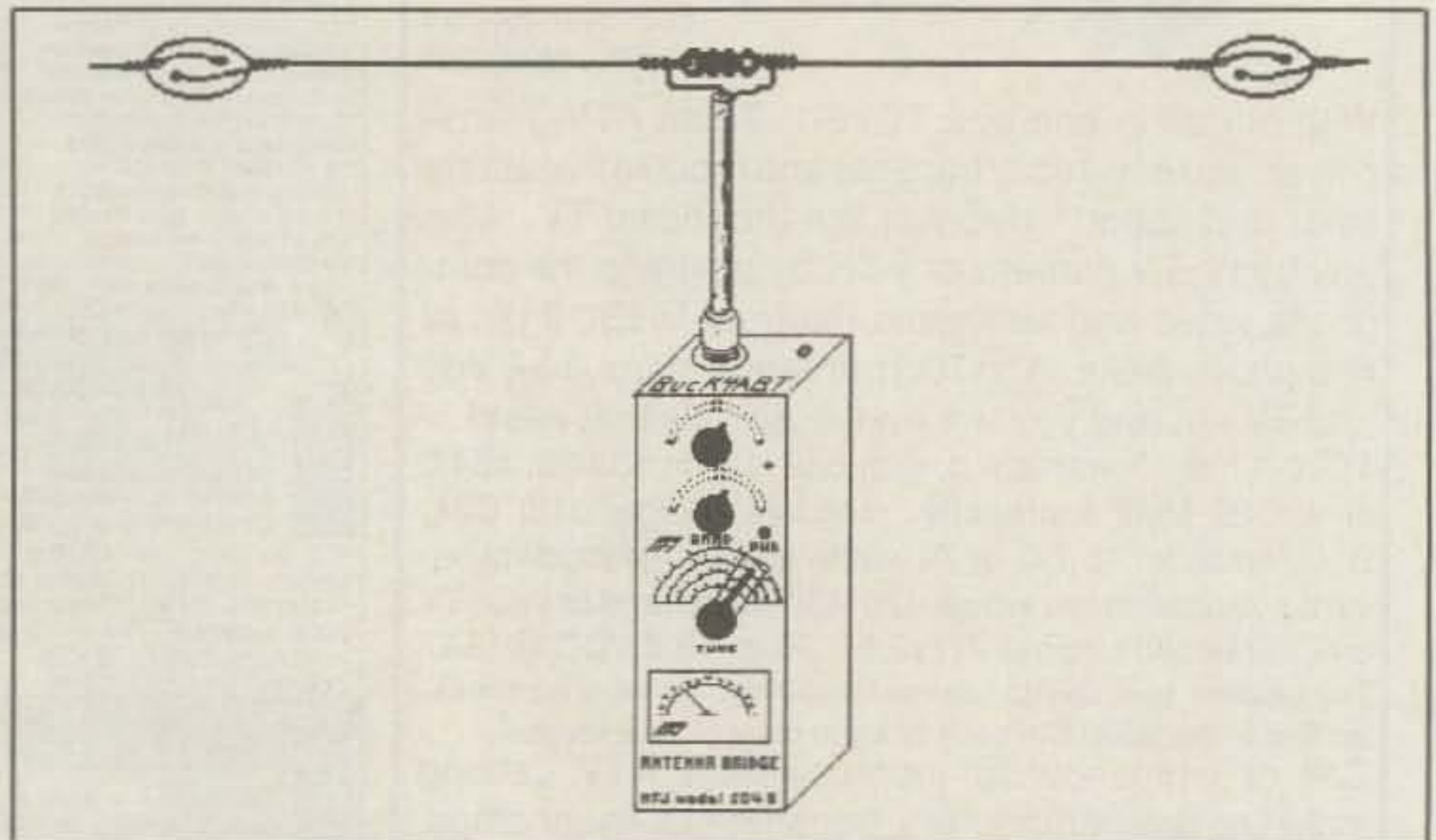


Fig. 7 - By using the Antenna Bridge the guess-work is removed and the correct cable length and impedance are sooner realized.

There is one small caveat, and that is the "electrical" wavelength. To determine the "electrical" one-half wavelength for our operating frequency, we must know the "velocity factor" of the coax that we plan to use.

Table I is a short list of some often-used coaxial cables and their specifications. These specs include the velocity factors as stated from the manufacturers' printed specs. However, the list or column specifications are not complete. This list is for illustration only. Further information is available from most coaxial cable manufacturers' master catalogs.

By using a modified version of the one-half wave antenna formula that we discussed earlier, we can now determine the required length of our coax in multiples of a one-half wavelength from this formula, where V is velocity factor, L is length in feet, and f is frequency in MHz.

$$\text{Length (ft)} = \frac{492 V}{f \text{ (MHz)}}$$

Let's assume that we have assembled our antenna and adjusted it for 145.050 MHz. We plan to feed the antenna with RG-8U polyethylene (foam) cable. We find the velocity factor of the RG-8U (foam) coaxial cable to be 78%. Our goal is to determine the L length in feet of the coax feedline, but first we need to know the length of one-half wavelength of the RG-8U cable for the frequency of 145.050. We calculate in the following manner.

$$\begin{aligned} \text{Length (ft)} &= \frac{492 \times .78}{145.050 \text{ MHz}} \\ &= \frac{383.76}{145.050} = 2.64 \text{ feet} \end{aligned}$$

If we care to go a step further, we can convert the feet to inches and arrive at a half wavelength of RG-8U foam coax for 145.050 MHz. The length is approximately 31 3/4 inches.

The distance to our antenna is about 48 feet. To be on the safe side, we want the cable to be the next one-half wave longer than the distance to the antenna.

By dividing the 2.64 feet of the one-half wave of cable into the 48 foot length of cable we need to feed our antenna, we arrive at 18.18 times the 2.64 feet. Let's go to the nearest greater length and call it 19 times.

$$19 \times 2.64 \text{ ft} = 50 \text{ ft. 2 in. (approx.)}$$

I Used A Shortcut

The easy way to make this measurement is to use an antenna bridge. There are several of these units around, but I used one that is designed for use between 1.8 and 30 MHz. It is manufactured by

MFJ and the model number is MFJ-204B.

If you have one of these antenna bridges, then follow procedure number II in the instruction manual. By using the antenna bridge method, there is no guess-work involved, and the results are realized sooner. (See fig. 7.)

The Antenna is The Key "Element"

Some of our explanations may seem a bit long, but the final measure of the radiating elements of the packet station will manifest itself in the proof-of-perfor-

mance when we put it on the air. More than once I've responded to a call for help from a fellow packeteer who tried to make do with a piece of wire and a random length of feed line.

Only after we have rebuilt the antenna system as I've just described, does the packeteer really understand the full importance of the antenna system to a packet station. *Consider the radiating element of the packet station as if it were a long-term investment, because it surely is!*

Happy Packeting, de Buck4ABT

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A LOOK AT THE SHACK FROM BOTH ENDS OF THE COAX

Of This and That

This month we turn to a variety of Antennas & Accessories topics ranging from antennas to magazines to software. Let's dig in.

Antenna Potpourri

Yet Another G5RV Variation? We've described so many types of HF multiband antennas, especially the G5RV and Windom, that we might have to rename *CQ* to be the *Multiband Antenna Gazette*. We're therefore reluctant to describe yet another variant of the antenna that Louis Varney, G5RV, developed some years back. But another version of the venerable antenna caught my eye, so I'll just *tell* you about it rather than describe it in intimate detail.

This is the NO5H All-Band Dipole, which was described in a construction article in *Ham Radio* magazine this past June. In his article, Gary L. Elliott, NO5H, described an antenna that looks very much like one version of the G5RV, using a horizontal flattop and twinlead matching section to coax. The main difference is that Gary's version is about double-size. The flattop is 203 feet long, and the 300 ohm twinlead matching section is 53 feet 6 inches; 75 ohm coax is used from the matching section to the hamshack. No balun is used in his design.

The result is an antenna that adds practical 160 meter operation to the G5RV, where it functions as a shortened half-wave dipole. On all of the bands from 75/80 to 10 meters—including the 30 and 12 meter WARC bands—there is some logical relationship of antenna length to the particular band. For example, the antenna is two full waves in phase on 30 meters and two long wires, each three full wavelengths, on 10 meters.

Gary reports in his article that the antenna shows excellent promise, with signal comparisons with his G5RV favoring his double-size design, especially on 30-10 meters. Of course, like most compromise multiband designs, this one needs an antenna tuner on the hamshack end of the feeder because of the complex loads presented by the antenna.

We should remind our readers that despite our promotion of the G5RV and its derivatives in the column, there is certainly nothing magical about the antenna. While there is some significance to the regular G5RV's length of 102 feet and the function of the matching section used in some versions, at heart the antenna is really just a shortened dipole on the lowest band, 75/80 meters, and a generic, centered, multiband dipole on the other bands—an antenna idea that's been around for at least 50 years or more, from the days when coax was unheard of in amateur circles.

In fact, looking back through some "oldie but goodie" 1950s and 1960s *ARRL Antenna Books*, you'll find the plain-vanilla centered dipole promoted as the simplest, most flexible,

and most inexpensive all-band antenna you could erect, when fed with parallel-conductor feedline and a transmatch. With characteristically low-loss openwire line, in particular, the length of the antenna is not at all critical, nor is the length of the feedline. In fact, the length of the flattop can be a good deal shorter than a half wavelength and still be useful. The rule of thumb is that the flattop should be at least $\frac{1}{4}$ wavelength (some say $\frac{3}{8}$ wavelength) at the lowest operating frequency to be fully effective. The only real problem comes into play in coupling the antenna system to the transmitter or transceiver, though a good wide-range transmatch should take care of that problem.

The classic G5RV design used a 102 foot flattop for a simple reason: to make the antenna a resonant three half-wavelengths on 20 meters with a nice four-lobe radiation pattern. This length resulted in a low feedpoint impedance that could be line-transformer-matched (using a parallel-conductor matching section) to coaxial cable, if one wished to use that type of transmission line.

We would be interested in learning of readers' experiences with the double-length G5RV "cousin," especially from those who experimentally replace their regular-size G5RV and can make on-the-air comparisons between the two antennas' performances.

Is There a Ginpole in Your Future? Rarely do we see Ginpoles offered for sale by the major amateur equipment dealers and distributors. This is surprising since the Ginpole is an important safety device, and the primary consideration when doing tower and antenna work is personal safety. The Ginpole, a "raising fixture," affords this safety by giving the tower climber the heavy lifting ability the ground person provides. Two people using a Ginpole can make tower and antenna assembly and disassembly a simple, fast, and safe procedure.

The Ginpole is made up of three basic components. These are the pulley assembly, which provides a mechanical advantage while lifting; a pole, used to gain the height needed for the lift; and a clamp assembly, used to attach everything to the tower. Usually, the ground-based person does the heavy lifting, while the person on the tower has the freedom needed to guide in and fasten together the tower and antenna components.

The latest IIX Equipment Ltd. communications accessories catalog describes their Ginpoles. They offer three types of steel Ginpole kits of varying construction to use with stamped open-leg towers, towers using legs of tubing from 1 to 1½ inch O.D., and towers with close-spaced "W"-bracing. The complete pulley-and-clamp kits range in price from about \$140 to \$200. While perhaps a little dear for occasional use, they could make an excellent investment for a ham club or DX group.

The IIX catalog even describes how to use the Ginpole, which I think is useful to share with readers. First, you assemble the clamp

and pulley on a 2 inch O.D. pipe that's 10-15 feet long. To erect the tower, you install a tower section on the concrete pad and attach the Ginpole on the upper part of this section. Then you feed the rope through the pulley and the pipe, attach the rope to the next section of the tower, pull this section up and over the bottom section, and install and secure it with bolts. This iterative process is repeated until you erect the tower to its full height. Once that's done, you then use the Ginpole to lift your mast, rotor, and antenna into place.

I notice that the IIX catalog is replete with lots of antenna and tower hardware of the "plumber's delight" variety. Included are hard-to-find goodies such as mast adapters, beam mount and boom-mast plates, standoff brackets, mast climbing steps, rotor mounts, rotating antenna mounts, roof "quad pods," multiple tower antenna mounts, and a variety of mobile mounts.

The catalog is free from IIX Equipment, Ltd., P.O. Box 9, Oak Lawn, IL 60454.

Wilmanco Microwave Goodies. Wilmanco, which offers a broad line of microwave products, now offers some products of interest to the amateur microwave user.

They offer 1.2 and 1.5 meter parabolic dish antennas, feed assemblies, and downconverters to 2 meters that are of special interest to 2.4 GHz OSCAR Mode S and 1.269-1.691 GHz GOES WX satellite users. The dishes, which offer very high-claimed gains, are sold by Wilmanco for as little as \$295; complete dish/feed/downconverter assemblies are priced from \$955.

For more information, contact Deke Williams (ex-K2DLW) at Wilmanco, 19529 Business Center Drive, Northridge, CA 91324.

W9INN Antenna Catalog. Good grief! It seems that Bill Fanckboner, W9INN, has been selling antennas for over 7 years but *making* antennas for more than 50 years, which is two years longer than the number of years I've walked this earth!

Anyway, Bill's bag of antenna tricks focuses on multiband slopers (10 versions) and multiband dipoles (21 versions) which feature various coverage combinations from 160 through 10 meters, including the 30, 17, and 12 x meter WARC bands. Bill also offers the popular 43 foot, 9 band "Eavesdropper" shortwave receiving antenna. The W9INN antennas are furnished custom assembled complete with center connector, Dacron line, spreaders, and other needed accessories except for the coax, which you supply.

Incidentally, "custom assembled" means that Bill individually tailors each antenna for your operating environment, for a minimum of post-installation tweaking. Thus, when ordering, you're asked to state the center frequency for each band, and how high you'll hang the center and each end of a dipole. For slopers, he asks whether you'll tower-feed or ground-feed the antenna, and if it's to be tower fed,

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For a complete catalog, which includes a number of sketches and configuration suggestions that are useful even if you "roll your own," send a #10 SASE with 45 cents postage to W9INN Antennas, P.O. Box 393, Mt. Prospect, IL 60056.

Bencher Balun. Bencher, Inc., which is perhaps better known in the amateur community for its single-lever and Iambic keyer paddles, also offers the ZA-1A balun for 3.5-30 MHz use.

The heavy-duty, no-ferrite balun is rated at 5 KW peak power and is said to accept substantial mismatch and high SWR; the interwinding insulation is rated at more than 6000 volts. The balun accepts 1/4 inch nylon support rope for inverted Vees and it has heavy #8 brass studs for RF connections. A high-impact Cyclocac® case with anti-UV protection is designed for long life outdoors. Intended primarily for use with dipoles, Vees, and Quads, an aluminum mounting kit for 2 inch Yagi booms is also available.

For specs on the ZA-1A, which is priced at \$34.95, contact Bencher, Inc., 333 West Lake St., Chicago, IL 60606.

NCG Antennas. In a mailing from Bruce B. Stwertnik of NCG, we note that NCG is the national import distributor for the Japanese Comet Antenna Co., Ltd., manufacturers of VHF and UHF monoband, dual-band, and tri-band antennas.

According to Bruce, the Comet antennas boast superb dual-band and tri-band characteristics using the so-called "Super Linear Converter" (SLC) system for "maximum gain and minimum loss"—along with low SWR and wideband operating characteristics—without tuning adjustments being required. He also advises that the fixed station imports are centered on the customary U.S. in-band operating frequencies, rather than on Japanese-based subbands.

A variety of base/repeater verticals, vertical and horizontal beams, and mobile antennas are offered in various monoband and dual/tri-band combinations in the 50, 146, 220-250, 446, and 1260-1300 MHz bands; the antennas are typified by heavy-duty fiberglass construction and built-in lightning protection. In addition, a number of low-input-loss, high isolation duplexers and triplexers are offered to allow you to interconnect multiple antennas and transceivers through a single coaxial cable. NCG also offers Discone base station antennas covering 25-1300 or 50-1300 MHz and other equipment and accessories.

A free catalog is available from NCG at 1275 North Grove St., Anaheim, CA 92806.

Spi-Ro SWL Antennas. Spi-Ro Manufacturing offers two fully assembled SWL antennas for HF use. Top of the line is the SWL-1, an end-fed trap design using traps and resonators to cover 120 through 11 meters (2-25 MHz). The 47 foot antenna is designed to be worked against ground; the flattop portion is made of 14-gauge CopperClad antenna wire. The kit includes feedline, support rope, ground wire, and complete instructions; it's priced at \$69.95.

Spi-Ro also offers a "no frills" SWL 100 foot end-fed longwire at \$24.95; lead-in, support rope, insulators, and instructions are provided. It's designed to be run from a house or apartment out to a high tree, pole, or other support. Lightning protectors that use gas-filled discharge elements are sold separately.

For more details, contact Spi-Ro Manufacturing Inc., P.O. Box 1538, Hendersonville, NC 28793.

Software Snapshots

Computer Nets. We're aware of at least three computer-specific on-the-air nets. One is the Amigan Amateur Radio Group's AmigaNet, which meets on Sundays at 2300Z on 14.345 MHz, Tuesdays at 0000Z on 3882 kHz, and Saturdays at 1600Z on 7170 kHz. The group also publishes a newsletter, the "Amigan Beacon." Contact point is Kathy Wehr, WB3KRN, RD #1, Box 193, Watsonstown, PA 17777.

Another net is the Atari Microcomputer Net, which is associated with *Ad Astra*, an Atari-based amateur and SWL-oriented users' publication. The net meets on Sundays at 1600Z on 14.325 MHz; regional nets follow the national net, from 1830Z, on or about 7235 kHz. Net coordinator is Dave Byrd, KD7VA. *Ad Astra* contact is Gil Frederick, VE4AG, 130 Maureen St., Winnipeg MB, Canada R3K 1M2.

A third group we've recently learned of is the Tandy Radio Amateur Club (TRAC) Net, which meets on Sundays at 1500Z on 28.320 MHz and also on Mondays at 0200Z on 7294 kHz.

Undoubtedly, there are other computer-specific on-the-air nets. We would be interested in learning of other computer-oriented radio nets, including packet operations, and nets devoted to so-called "orphan" computers such as the TI-99/4A and Timex-Sinclair. We would also appreciate updates to the above information if net frequencies and times change.

LOGWRITE™. LOGWRITE is a menu-driven logger by Ed Troy, NG3V, designed for the IBM PC and compatibles. One of the program's major features is a unique split-screen display which allows for simultaneous logging and text processing. A portion of the screen display is reserved for use as a five-line text buffer, and a 400-line buffer can be used as well.

Some of the program's major features include instant callsign or prefix search; optional automatic time and date stamping that automatically records the date of the contact as well as start and ending times; the capability to print, edit, or view records; and plenty of room for notes and station addresses. The built-in text processor features automatic word wrap, backspace correction, and scrolling.

The program is \$24.95 from Aerospace Consulting, P.O. Box 536, Buckingham, PA 18912-0536.

Two from Applied Solutions. Two programs are offered to enable owners of Yaesu "CAT-System" transceivers and receivers to harness and enhance their radio's capabilities. These programs are SUPER and CATPACK.

SUPER is a radio operating system software package that acts as a link between the CAT-System radio and your personal computer. The operating system places the transceiver under computer control, automating and simplifying operations. The program lets you set and change VFO and memory frequencies quickly and easily, and also perform many front-panel operations (such as clarifier, split, etc.) from your keyboard. Major features include on-screen verification of transceiver status, including frequency data; creation of 100 extended memory channels that can be saved to disk for later retrieval; a built-in scratch-pad log that can be edited by your wordprocessor or text editor; and the ability to take an electronic "snapshot" of the transceiver's operating status (including its built-in memory channels and VFOs), saving this snapshot to disk. There also are built-in help

and reference screens; the latter contain Q-codes, world time conversions, Morse characters, and other useful information.

The program is available for \$89.95 for the IBM PC, Apple II series, and Commodore 64/128. Various interfaces are available, priced at \$25 to \$69.95 depending on the specific computer used. Radios supported include the FT-747GX, FT-757GX, FT-757GXII, FT-767GX, FT-736R, and FT-980.

CATPACK is a utility system package, a collection of programs and software tools, including device drivers, that extend and enhance the capabilities of CAT-System radios. The idea is to let you flexibly add transceiver and receiver control features to your own programs.

At the heart of the CATPACK package is the CATCALLS program, which acts as a "software bridge" between your programs (as well as those provided on the CATPACK disk) and your receiver or transceiver. Included in the package are several programs that incorporate "CATCALLS" (in BASIC on the Apple and Commodore; and in BASIC, Pascal, C and other languages on the IBM PC); these programs may be used as-is or modified to customize your radio's operating and monitoring patterns. The CATPACK package also contains various stand-alone CAT-System programs, including a "pop-in" utility for the IBM PC that you can use while running another program, and a frequency searching program for the FRG-9600 receiver.

The CATPACK package is available at \$69.95 for the IBM PC, Apple II series, and C-64/C-128. Various interfaces are required. Supported radios include the FT-747GX, FT-757GX, FT-757GXII, FT-767GX, FT-736, FT-980, FT-212/312/712RH, FT-727, FRG-8800, and FRG-9600.

For additional details, write Applied Solutions, P.O. Box 188, Garden Grove, CA 92640.

AMSAT Program Update. A recent "program availability notice" I received from the AMSAT North America Software Exchange shows growth in the number of satellite tracking programs offered for a variety of personal computers. Computers supported include the IBM PC, C-64 and C-128, Apple, Macintosh, Amiga, TRS-80 (various models), TI-99/4A, Atari 400 and 800, and Heathkit H-89, as well as the HP-41 programmable calculator.

About 20 different programs are offered, all at reasonable prices. The prices, however, are lower for AMSAT members, so you might want to consider regular AMSAT membership, which is \$30 per year in the U.S.

For a current program listing, write to AMSAT, P.O. Box 27, Washington, DC 20044. (The program availability notice I received contained a very handy one-page summary of all active amateur radio satellites, with mode, uplink, and downlink information being provided for each satellite.)

C-64 Software Catalog. In recent months it seems that the bottom has dropped out of the Commodore 64 software market, especially for amateur radio programs. Apparently, most of the action has moved to the IBM PC and its many clones and compatibles. However, Hardsoft Products of Italy is still going strong with custom software for the C-64 and C-128 computers.

We first mentioned Hardsoft in the June 1988 column, describing some of the products offered for Commodore, Apple IIe, and IBM computers. Hardsoft now has an English-language catalog describing their Commodore offerings, including a packet radio terminal emu-

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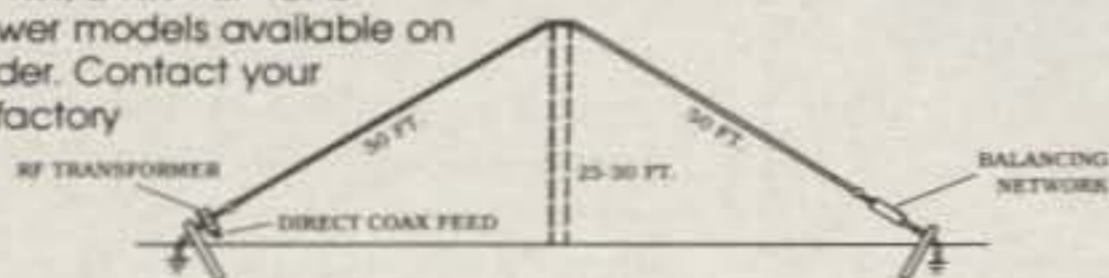
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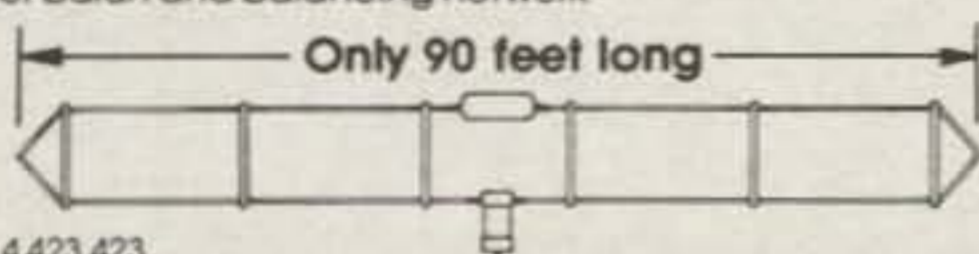
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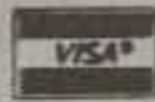
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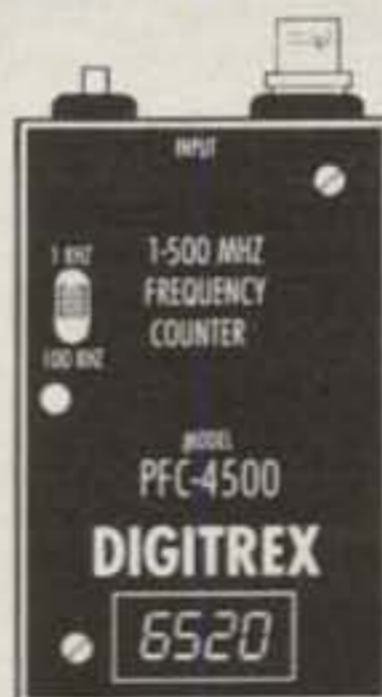
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lator; RX-64 for RTTY, CW, ASCII, and AMTOR reception; and RX-TX which offers SSTV and FAX reception and FAX transmission.

The catalog is available from Hardsoft Products, P.O. Box 90, Chieti 66100, Italy. (While there is no mention of IRCs, I suspect that Hardsoft would appreciate a couple of IRCs to help defray some of the steep costs of international mailing.)

New BSoft Software. Bob Blackburn at BSoft sent me a new catalog of his line of "engineering tools" IBM PC software, which is targeted at electronic hobbyists, students, and engineers. We've mentioned some of his circuit design, mathematics, logic simulation, and other products previously in the column.

One new engineering-oriented product is WaveGen Version 1.0, a \$49 menu-driven program for generating waveforms (signals); it produces many waveform functions of periodic, transient, and modulated waves to examine and modify. A newly upgraded product is CompView Version 1.5, a computer-aided waveform viewer. This is a practical, low-cost (\$49) menu-driven engineering tool.

For a catalog, contact Bob Blackburn at Bsoft Software, 444 Colton Road, Columbus, OH 43207.

PC Librarian. In the three years that I've owned an IBM PC compatible computer, I've managed to fill up my PC's 30 megabyte (MB) hard disk (HD) several times, requiring that I download various programs from the HD in order to install new programs. Basically, what my HD has needed for some time is an electronic version of a "Spring cleaning." I knew that lots of files on my HD (perhaps as many as 75 or 80% of them) were inactive, thus cluttering the HD. Simply backing-up the HD was no solution;



PC Librarian is a menu-driven software package that lets you unclutter your hard disk using an archiving process, while maintaining online information about archived data. The program removes the files you select from your hard disk drive but retains important information about them in a catalog that remains on your drive. The program can be especially useful in hamshack applications such as archiving operating and contest logs for easy retrieval.

though I systematically back it up for safety's sake, doing so simply duplicates old files, leaving the HD as cluttered as before.

Thus, I was intrigued when I saw the ads for PC Librarian and was able to obtain a review copy of this intriguing software. Basically, the program is a sophisticated utility that automatically archives, catalogs, and retrieves inactive HD files. It provides an easy-to-use, menu driven system that allows you to easily "unclutter" your HD by means of an archiving process, while maintaining online information about the archived data. In operation, you specify which infrequently used files you want to archive to an alternative medium, such as floppies. The program then removes the files you've selected while retaining information about them in a catalog that remains on your HD. During retrieval, the files you select are transferred back to your HD.

The online catalog has a particularly neat feature. Recognizing that it can be very hard to recall the contents or function of a file based only on the short file name that DOS allows, the program lets you describe the contents of a file with a note of up to 59 characters. With this feature you can preview the file before retrieval to confirm that it's the one you want to restore to your HD.

Other useful program features include a graphic tree structure of both archived and active files; sophisticated searching of archives for files; automatic archive recommendations on files that have not been used for a specific length of time; optional file compression, to save media space required for archived files; generation of several archive reports; and context sensitive online help.

I liked PC Librarian. Of course, if you have but a few files to archive, such as a couple of operating or contest logs, you can manually do the archiving yourself without the need for any special software, particularly if you have a good knowledge of DOS, including the COPY or XCOPY commands.

Nevertheless, the program represents a rather elegant and disciplined way to archive; it is particularly useful if you want to move multi-megabyte directories off of the HD. I find the program to be especially useful in moving old

versions of programs off of the HD while installing new versions. Using PC Librarian lets me retain any customization of the old program so that if I have any problems with the new version, I can readily move the old version back onto the HD exactly the way it was, without the need to reinstall or reconfigure the program.

What didn't I like about PC Librarian? I received a very early version for review, and some of the features operated erratically on my PC compatible. A call to the company's toll-free support line brought me an updated version that worked fine. However, I would like to be able to delete archived files. At present, once you've archived a file, there's no way to remove it from the archive. Hopefully, a future version will correct this omission.

PC Librarian, priced at \$99, is designed for the IBM PC series with DOS 2.1 or higher; 512K minimum memory is required. For information, write United Software Security, 8133 Leesburg Pike, Vienna, VA 22182-2706.

TC!Power. In last February's column we featured TAKE CHARGE! This is definitely one of the better integrated utility programs for the IBM PC. As I noted in that column, the program offers a broad selection of program tools ranging from desktop accessories, to file and directory services, to computer diagnostics.

A few months ago Departmental Technologies introduced a novel add-on utility called TC!Power. The new product lets you gain more usable memory on your PC or portable computer in order to successfully use today's large, memory-hungry programs. The program lets you tap unused "extended memory" or free hard disk (HD) space, or both, allowing you to effectively add enormous amounts of memory to your system.

TC!Power effectively breaks the old 640K DOS barrier, eliminating out of memory and memory full messages when running programs that use the Lotus/Intel/Microsoft Expanded Memory Specification (EMS), such as Lotus 123 and SideKick Plus. The program accomplishes the task of building EMS memory for computers with only 640K of RAM by turning free HD space into expanded memory that DOS can use. The program also senses unused extended memory on AT-class computers and converts this extended memory into expanded memory—memory that you can make use of.

This neat little utility works as advertised, being a very cost-effective alternative to expensive expanded memory boards. Of course, TC!Power should work best with fast PCs and fast HDs; also, you need to bear in mind that the program is primarily for program data, not for the programs themselves, which must operate in the "conventional memory" area.

TC!Power is priced at \$79.95 and is available from Departmental Technologies, Inc., P.O. Box 645, Andover, NJ 07821. Incidentally, the user's manual has a brief history of the memory limitations of DOS; the manual also clearly explains both expanded memory and extended memory and their differences—technical terms that are quite easily confused, even among experienced computerists.

Wrapping It Up

That's about all there is for this time, gang. Next month, more Antennas & Accessories topics of current interest. See you then.

Overheard: Reasons that sound good aren't always good, sound reasons.

73, Karl, W8FX



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"HOW TO" FOR THE NEWCOMER TO AMATEUR RADIO

Code and Code Receiving Practice

Prior issues of *CQ* can be purchased from *CQ* (76 N. Broadway, Hicksville, NY 11801) for \$2.50 each. The June and July 1979 columns provided a two-part article about code. I have a seven-page (four-sheet) reprint of that article; it is available at no charge to anyone who requests it and provides a self-addressed stamped envelope (SASE). That article covers the advantages of code operation, types of code, word count system (wpm), code tests, learning code, International Morse Code symbols, taped code sending checks, code operating tips, sending tips, correcting sending errors, headphones, handkeys, semi-automatic keys (bugs), fully-automatic keyers (and paddles), code practice oscillators, and dit-to-dah length relationships at various speeds.

"Worldwide Sources of Code Practice" was printed in the October and November 1980 issues of *CQ*. I have a seven-page (four-sheet) reprint of the article available at no charge for an SASE. This is a very detailed listing of many sources of on-the-air code receiving practice.

Worldwide codes are covered in the December 1980 issue of *CQ*. It is legal to use codes other than the International (English alphabet) Morse Code as long as everyone involved in the contact agrees to the use of such codes and all identification is made using the International Morse Code. Symbols for nine Morse Codes are shown in the article. These codes are American, Arabic, Continental, Greek, Hebrew, International (English), Japanese, Russian, and Turkish. A copy of this article is also available for an SASE.

The January 1981 issue of *CQ* includes a column on code operating tips. I have no reprint of that article. The June 1981 *CQ* includes two items related to code. One item is about on-the-air code practice. As before, the supply of reprints has been exhausted. The June 1981 *CQ* also includes an article which explains that code is not CW (available for the usual SASE).

Code practice is the subject of my column in the January 1982 *CQ*. The March 1982 *CQ* details USAF MARS Bulletins.

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Jerry Janco, KB9ALG, reported the success of a six-week amateur radio licensing course offered by the Hammond, Indiana Public School System. Ten- to 12-year-old students (grades 4-5) earned a total of 9 Novice tickets by the end of the course, and several others were almost ready to become Novices. The Lake County Amateur Radio Club provided some required books, and several local amateurs helped these students enjoy this learning experience. The success of this initial program has resulted in a growing list of candidates for future courses. There is a possibility of offering a similar program to students in grades 9 through 12. The picture shows a few of these new Novices you may contact on the air. From left to right, they are Omar Porras; Eric Osborne, KB9DGH; Nate Mahns, KB9DGV; Kellie Myers, KB9DGW; and Keith Pieniazek, KB9DGF. Keith already has a station operable at his home.

That information is partially updated in this month's column. I have no reprint of these 1982 articles. Code test requirements are detailed in the February 1984 *CQ*; again, I have no reprint of the article.

Slow-speed code nets are the subject of my column in the December 1987 *CQ* (available for an SASE).

I have a few more printed aids which I distribute to licensing course students. As usual, single copies are available free to those who supply an SASE with their requests. One item is a one-sheet list of the entire International Morse Code, including many prosigns and signals one is unlikely to hear on any amateur band. A single sheet shows a quick and easy system for use in printing letters and numbers when copying code.

On-The-Air USAF MARS Code Receiving Practice

Previous issues of this column have provided a lot of information about code.

Availability of those prior items is covered throughout this article.

Louis Skipper, W6KF, is the national manager of U.S. Air Force MARS (Military Affiliate Radio System) code activity. His USAF MARS callsigns are AFN6CW and AFA6VV. He provided the USAF MARS code practice information detailed in this article.

AIR is the main USAF station. It is located at Andrews Air Force Base in Maryland. Its transmitters are in Brandywine, Maryland. The transmitters put out 2 kilowatts on each frequency being used. The antennas provide maximum signal in the east-west direction. The AIR signal should be strong everywhere in the country. Simply use the frequency that is best in your area.

Code practice consists of three 30-minute segments each Saturday. Simultaneous transmissions are made on 4876.5, 14528.5, and 20961.5 kHz. A tune-in transmission is made from 2055 to 2100 UTC. The 8 wpm transmission is

made from 2100 to 2130 UTC. It consists of an informative header, followed by text taken from the previous (Wednesday) USAF MARS bulletin. The 15 and 30 wpm transmissions follow the same format; they occur at 2130 to 2200 and 2200 to 2230 UTC, respectively. If you do not know how many hours UTC (Universal Time Coordinated) is ahead of your local time, tune in WWV at 5 or 10 MHz and listen to the time announcement, which is stated in UTC.

Additional code practice can be obtained by copying the 15 wpm Wednesday evening USAF MARS bulletins on 6995.5 or 13997.5 kHz. A 5 minute tune-in signal is sent immediately prior to the transmission. The header and bulletin involve a total transmission time of about 20 to 25 minutes.

If you would like to know more about the Military Affiliate Radio System (MARS), the April and May 1986 issues of *CQ* contain an in-depth explanation of the Air Force, Army, and Navy MARS programs. It covers MARS history, callsigns, objectives, operating modes, frequencies, nets, repeaters, message handling, benefits, membership eligibility (including Novices), how to join the selected MARS organization (Air Force, Army, or Navy), and participating in MARS activities. Your SASE and request brings a free copy of this informative five-page (three-sheet) article. MARS provides good training and many benefits, without obligating one to direct military service. As can be assumed from this month's article, USAF MARS has a strong interest in promoting code proficiency. If you want information about USAF MARS, you could request it from Louis Skipper, W6KF, 725 North "O" Street, Livermore, CA 94550-2059.

USCG Code Training

The US Coast Guard provides International Morse Code training as part of the curriculum at the Radioman School, USCG Training Center, Petaluma, CA 94952-5000. If any young women and young men are interested in USCG radioman training, they could request information from A. C. Stevens, the code department chief.

POW/MIA

The August 1989 issue of *CQ* contains an item about Southeast Asia POW/MIA false information. If you know someone who is concerned about a person who has not returned from Southeast Asia, you could inform them about two publications they may want to read. The first one is the "POW-MIA Fact Book," which the Department of Defense (DOD) issued during July 1988. The second document is the "Final Interagency Report of the Reagan Administration on the POW/MIA Issue in Southeast Asia." This latter booklet was issued 19 January 1989 by DOD and the State Department. Both

publications are available from the Defense Intelligence Agency, Washington, DC 20340.

W1AW Code Receiving Practice

The ARRL headquarters station (W1AW) has long provided an excellent code practice program. Their transmitting frequencies are 1818, 3580, 7080, 14070, 21080, and 28080 kHz, plus 50.08 and 147.555 MHz. Slow-speed runs are made at 5, 7.5, 10, 13, and 15 wpm, in increasing speed sequence. High-speed runs are made at 35, 30, 25, 20, 15, 13, and 10 wpm, in decreasing speed sequence. Slow (S) and fast (F) speed transmissions are as follows:

UTC	Sun.	M	T	W	Th	F	S
0000	F	F	S	F	S	F	S
0300	S	S	F	S	F	S	F
1400		S	F	S	F	S	
2100	S	F	S	F	S	F	S

If you are unfamiliar with the difference between UTC (Universal Time Coordinated) and your local time, simply tune in WWV (Fort Collins, Colorado) on 5 or 10 MHz. This USA time and frequency standards station announces the time (in UTC) every 5 minutes. Remember that it is the next day in UTC when time passes 0000 UTC. In other words, when it is Tuesday evening local time, it is Wednesday morning UTC.

The winter and spring schedule is shown in the table, reflecting standard time difference. When daylight savings time is in effect (summer and fall), subtract 1 hour from the UTC times shown in the table.

W1AW code practice text is taken from recent issues of *QST* magazine. The issue and pages are stated (in code) at the start of each code practice session, and before each speed run.

Ten to 35 wpm qualifying runs are transmitted regularly. Successful applicants receive a nice certificate, to which increased speed stickers can be attached.

A detailed schedule of W1AW operating activities (form MCS-5) can be requested from the ARRL, 225 Main Street, Newington, CT 06111. As always, an SASE helps expedite a response.

Code Course For Beginners

Do you know someone who wants to learn the International (English language alphabet) Morse Code? A beginner's code course starts the first Monday of each month. No previous knowledge of code is required or assumed. These month-long courses can take a person from zero to a code receiving speed of about 5 words (25 letters) per minute.

The 30 minute daily (Monday through Friday) code practice runs start at 1430 UTC during the winter and 1330 UTC during the summer. In other words, at 0630 local California time. Fred/K6RAU transmits code practice on 3760 kHz, which is

10 kHz above the top end of the 80 meter Novice segment. If 3760 is already in use by other amateurs, listen for K6RAU a couple of kHz above or below 3760.

Each code lesson (except the last one) is repeated on two consecutive days. Please let people know about this opportunity to learn the code.

Radio Officer Training

If you are interested in a job that pays more than \$4000 per month while you serve as a radio officer aboard US merchant vessels, you should request information from William R. Eney, the Director of the ROU (Radio-Electronics Officers' Union) Maritime Electronics Training School (METS). You must be a US citizen in good health, holding a valid first- or second-class radiotelegraph license, and must not have been convicted of a felony. A competitive entrance examination can be taken in your home area. The first phase of the training consists of a 30-day residence program in Florida (shipboard equipment familiarity) and at least six months at sea as an Assistant Radio Officer. The second training phase consists of at least one year of shipboard service as sole Radio Officer. Details can be requested by writing to ROU METS, 1415 Moylan Road, Panama City Beach, FL 32407.

WB3IVO Code Practice

The Brass Pounders Amateur Radio Club (WB3IVO) has consistently provided a good code-receiving practice program. Their 20 to 60 wpm code transmissions start at 2000 UTC. Sunday, Monday, Thursday, and Saturday 7060 kHz is used. Tuesday and Friday 14060 kHz is used. If you do not know the time difference between UTC (Universal Time Coordinated) and your local time, tune to WWV on 5 or 10 MHz; they state the time (AM voice) in UTC every 5 minutes. Remember that most code practice schedules are really against local times. If you do not hear a code practice station at the indicated UTC time, listen 1 hour earlier (summer) or one hour later (winter).

W6QIE Code Receiving Practice

Code receiving practice is available six nights per week on 3590 kHz. W6QIE code practice runs start at 0400 UTC (0300 UTC, summer), Tuesday through Saturday, and they continue 90 minutes. The first 5 minutes are tune-in time to let students get set to copy the runs. The first actual practice run (0405-0420 UTC) is 15 minutes long at 5 wpm. Following the 5 wpm run, there are 10 minute runs at 8, 11, 14, 17, 20, 25, and 30 wpm.

UTC (Universal Time Coordinated) is 4 to 8 hours ahead of local time, depending on the time zone in which we live, and whether we are on Standard or Daylight Savings Time. In this case, the local start-

ing times are 8, 9, 10, and 11 PM for Pacific, Mountain, Central, and Eastern Standard Times, respectively.

Don, W6QIE, expects to also transmit on 7129 kHz. If his 80 meter transmissions are not good copy in your area, listen for him on 40 meters.

All-Schools Code Practice Net

Students are invited to participate in a code receiving practice net on 10 meters. This net is in operation every Tuesday and Thursday on 28,203 kHz. The net starts at 1730 UTC. If you are not sure how many hours UTC precedes your local time, you can ascertain this difference by listening to WWV/WWVH (the United States time and frequency standards stations) on 10 MHz. The time is announced every 5 minutes in Universal Time Coordinated (UTC). Instructors are urged to oversee their students' initial participation in this net.

Code Tape

Applied Subliminals, Inc. offers a cassette

sette tape to help one learn the International Morse Code. One side of the tape uses a hypnotic message, whereas the subliminal approach is used on the other side of the cassette.

These tapes work on the subconscious mind, which accepts information without question, according to the advertisement. Since I know the code, there is no way I can check the effectiveness of this tape. However, I would like to receive evaluation comments from those who try to learn code by using it. The stock number is R182 and the tape costs \$13.95 ppd. The address is P.O.B. 135, Cresskill, NJ 07626.

WW II Ship Restoration

My column in the April 1988 issue of CQ discusses the restoration of two WW II Liberty ships; these are the S.S. *Jeremiah O'Brien* (west coast) and the S.S. *John W. Brown* (east coast). Amateur radio operators are involved in both ship restorations. The *O'Brien* program has pro-

gressed to the point that the ship is in frequent use as a meeting place, and it makes regular cruises in the San Francisco Bay. The *Brown* program is also making good progress. Ralph Albers, W4ER, Don Friedman, W3QYL, Tom Gibson W3DJ, and Jack Rogers, W3TFR, are restoring the ship's radio station. They need a cat's whisker and a WW II telegraph mill (typewriter) for the radio shack. If you can provide either (or both) of these items, please write to Project Liberty Ship, P.O.B. 8, Long Green, MD 21092.

Sign-On Plastic Signs

In the September column on page 98 mention was made of "Plastic Signs from Sign-On." Although the company does have an answering machine on-line, they do prefer orders by mail. They also request that any payments be made out to the company name, Sign-On.

Printed Aids

Previous Novice columns contain information that is useful to new and aspiring amateurs. Many of these items have been reprinted for distribution to students of licensing courses I instruct. For ease of use, these printed aids have been separated into six categories. These categories are introduction, code, theory, station, operating, and miscellaneous. Outdated items are continually replaced with newer material. Fifteen dollars brings a complete set of current printed aids, including shipping costs. A list of these printed aids will be sent to anyone who requests it and sends a business size (#10) self-addressed and stamped envelope to my California address. Licensing-course instructors are welcome to revise and/or duplicate these items to suit their requirements.

Photographs Wanted

Photographs of new amateurs in their shacks provide introductions to a few of the newer amateurs. Photograph size is unimportant, but good definition, contrast, and subject matter are important. Color pictures can be used, but black-and-white photographs are preferred. Operating activities and achievements, plus a self-introduction, are needed with each picture. Send an SASE if a picture must be returned. A free one-year CQ subscription (or renewal) is awarded to the one amateur whose picture I select as the winner for the month. If you are a subscriber, please enclose the mailing label (or copy) from your latest CQ issue. One award is made each month, no matter how many photographs are printed. DX amateurs, who frequently work the American Novice bands, are also urged to submit photographs.

73, Bill, W6DDB

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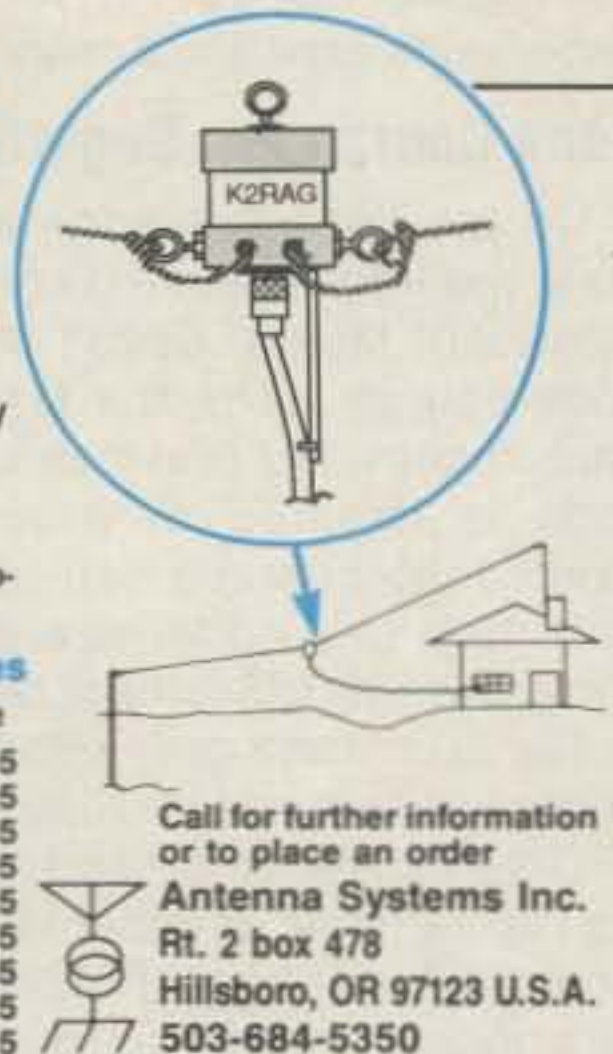
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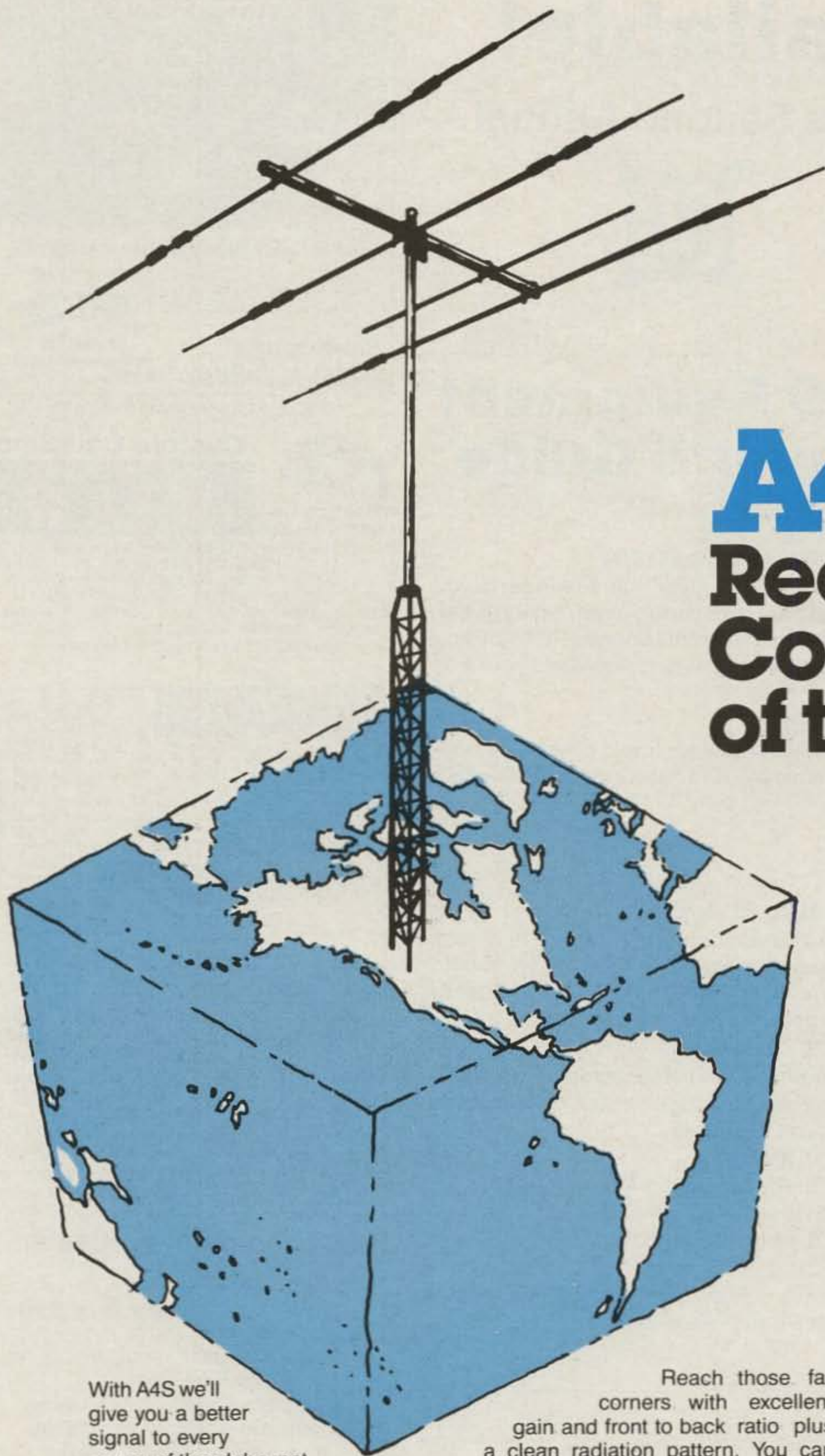
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RAG-D17	17	26'	\$43.95
RAG-D15	15	22'	\$43.95
RAG-D12	12	19'	\$43.95
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Say You Saw It In CQ

Contest Calendar

a monthly feature by
JOHN DORR, K1AR

NEWS/VIEWS OF ON-THE-AIR COMPETITION

Although August 4-6, 1989 may have been uneventful for many amateurs, a momentous milestone took place—the very first Western/USSR Hamvention. Situated in the Palace of Culture and Technic "Niva" in Leningrad, the USSR/Finnish International Hamvention was jointly sanctioned by the Finnish Amateur Radio League (SRAL) and the Radio Sport Federation (RSF) of the Soviet Union.

The meeting initiated an unprecedented opportunity to exchange ideas, meet USSR contesters/DXers, and make new friends. The participation was unequalled as over 350 amateurs, mostly from the Soviet Union (all republics) and Finland, were present.

Recognizing the historic significance of the event, two members of your *CQ* WW Contest Committee were in attendance—Director Bob Cox, K3EST, and long-time committee member, Gene Walsh, N2AA. Bob, K3EST, was bestowed the additional honor of speaking to the attendees about *CQ* contests. Each respective organizing country should be congratulated for a very successful meeting. You can look forward to a more detailed report on this important milestone by Bob and Gene in a series of *CQ* magazine articles that will appear in the next few months. Be sure to stay tuned!

Next Month's Column

The response to the August Contest Ethics Survey has exceeded my wildest expectations. Next month's column will feature the final results and analysis. Of course, November is a big contest month with major events scheduled for nearly every weekend, culminating with the *CQ* WW CW DX Contest on November 25-26. This part of the sunspot cycle makes contesting more fun than ever. Be sure you don't miss it!

Bernie Welch, W8IMZ, Silent Key

It's not very often that I can think of an individual who has profoundly impacted our amateur radio hobby and contesting in particular. Bernie Welch, W8IMZ, was one such person. It's with deep regret that I share the news that Bernie recently became a silent key.

Bernie had been involved with *CQ* contests since the late 1940s and was especially influential in designing and directing the *CQ* WPX into one of the premier

2 Baldwin Street, Windham, NH 03087

Calendar of Events

Nov. 4-5	Int. Police Assn. Contest
Nov. 4-6	ARRL CW Sweepstakes
Nov. 10-12	Japan Int'l. SSB DX Contest
Nov. 11	Australian Ladies ARA Contest
Nov. 11-12	European RTTY Contest
Nov. 11-12	Montana QSO Party
Nov. 18-19	ARRL Int'l. EME Competition
Nov. 18-20	ARRL SSB Sweepstakes
Nov. 25-26	CQ WW DX CW Contest
Dec. 1-3	ARRL 160 Meter Contest
Dec. 2-3	Texas QSO Party
Dec. 9-10	ARRL 10 Meter Contest
Dec. 10	ARCI QRP CW Sprint
Dec. 17	CARF Winter Contest
Jan. 6-7	Hunting Lions CW Contest
Jan. 6-7	ARRL RTTY Roundup
Jan. 13-14	Hunting Lions SSB Contest
Jan. 13-15	ARRL Jan. VHF Sweepstakes
Jan. 26-28	CQ WW 160 Meter CW Contest
Jan. 27-28	YL-ISSB YL/OM CW Contest
Jn.27 -Feb.4	ARRL Novice Roundup
Feb. 10-11	QCWA CW Party
Feb. 17-18	ARRL DX CW Contest
Feb. 23-25	CQ WW 160 Meter SSB Contest
Mar. 3-4	ARRL DX SSB Contest
Mar. 9-11	Japan Int'l. CW DX Contest
Mar. 10-11	QCWA SSB Party
Mar. 24-25	YL-ISSB YL/OM SSB Contest
Mar. 24-25	CQ WPX SSB Contest

contest competitions of our time. Bernie's recent nomination into the *CQ* Contest Hall of Fame is just one small measure of the respect we gave to our fellow contester. His contributions to contesting will be sorely missed.

The Ten-Minute Rule Has It Outlived Its Usefulness?

One of the keys to the future success of contests is our ability to change and improve the rules by which we play. For many years the 10-minute rule has been a standard for multi-single contest entries. In fact, some contests have even invoked a version of the rule for single operators. While each contest has a slightly different flavor, the basic rule structure remains fairly consistent from one sponsor to the next (see Table I).

The 10-minute rule was created for the *CQ* WW Contest in 1972. Like other contests at that time, there was concern about enforcing the "single" aspect of multi-single operations. In other words, contests needed a method to eliminate the potential for multi-single stations to operate essentially as a multi-multi. Starting in the late 60s, there were many stations using the so-called "contest octo-

pus" station design that permitted two (or more) stations to legally operate on different bands by limiting actual transmissions to one band at a time. This frequently created interesting scenarios, for example, as both operators were often ready to transmit at the same time during their respective runs. Using the octopus, run rates often improved by as much as 50%. As you may remember, there was (and still continues to be) much heated debate over this style of operating. Contesters were clearly divided when considering whether or not the octopus architecture fell outside of the spirit of the multi-single rule.

Several years after *CQ* implemented the new 10-minute rule, other organizations, including the ARRL, followed with a similar version for their DX contests. As such, it has become a standard for operating today. Unfortunately, the 10-minute rule left many multi-operator station owners frustrated. In essence, the only contest class into which they could grow was the "land of the giants"—multi-multi. The organizers of the ARRL DX Contest helped alleviate the problem by creating the Multi-2 category, which created space for the small multi-multi station while still maintaining the 10-minute rule.

As I've said before, technology has had a profound impact on contests in recent years. It is for this reason (and potentially others) that we need the 10-minute rule. The relay-dominated octopus designs of the 60s and 70s could easily be replaced by digital multiplexing and other

CQ World-Wide DX Contest

Only one transmitter and one band permitted during the same time period (defined as 10 minutes). 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.

CQ WPX DX Contest

Only one transmitter and one band permitted during the same time period, defined as 10 minutes, no exception.

ARRL DX Contest

One transmitted signal at any given time. Once the station has begun operation on a given band, it must remain on that band for at least 10 minutes; listening time counts as operating time.

Table I—The major contest multi-single rules.

high-speed control techniques that would technically satisfy the former requirement of "one signal per band." This is especially realistic for CW operations that could potentially be controlled at the dot/dash level with some creative station planning and design. The 10-minute rule is a good contest policy and should remain.

CQ Profiles

Bill Kollenbaum, K4XS

Originally licensed in 1962 as WV2ZPK (no, that's not the Virgin Islands), Bill Kollenbaum, K4XS, has channeled his contest enthusiasm into an impressive array of contest achievements and station designs. Like most of us, Bill's amateur radio career had a modest beginning as he proudly chased DX and contests with 20



An inside view of the impressive station built by Bill Kollenbaum, K4XS.

foot high dipoles and a 90 watt EICO 720. Bill recalls the first time he heard someone calling "CQ FD" and wondered why so many amateurs were on the band that day looking for an exotic African country (CQ FD, of course, is the standard declaration for the ARRL Field Day).

Being an "old-timer," Bill casually participated in contests during the 60s and early 70s until he relocated to Florida as WA4TYL. It was in Florida where his rebirth into contesting occurred when he entered the ARRL Bicentennial Contest. Bill credits his association with Jeff, WC4E, as the final catalyst that has made his passion for contesting seem endless. His recent contest achievements are impressive, as he has placed first in several categories of the major contests including CQ WPX, ARRL SS, IARU RadioSport, and the ARRL 10 Meter Contest.

Today, Bill prefers contests that offer a cross-section of DX/USA QSOs, such as the CQ WPX, ARRL 10 Meter, CQ WW, ARRL DX, and others which maintain "high rates." While Bill has been known to cross the 14150 boundary, he prefers operating SSB.

One of the most interesting facets of Bill's involvement with amateur radio is his station. K4XS proudly claims to be one of the few stations that has 13 active rotators! His antenna farm is extraordinary, and all antennas are stacked and fully switchable/rotatable.

10 Meters: 6-el KLMs at 110', 81', 55', 27'.

15 Meters: 6-el KLMs at 136', 95', 74', 35'.

20 Meters: 5-el KLMs at 126', 65'.

40 Meters: 4-el KLMs at 177', 85'.

80 Meters: inverted Vees at 170'.

160 Meters: inverted Vees at 140'.

Other: KT34XA at 65', KT34 at 95', TH4 fixed SE at 56'.

The shack employs a TS-930/830 combination and an ICOM 765. All of the antenna work at K4XS has been done exclusively by Bill and Jeff, WC4E (think about that when your tribander project looks like an insurmountable job).

Contesting in Florida is unique. Even though there are over 12,000,000 people living in Florida, Bill believes there are less than 15 active contesters in the state and only 2 in his local Tampa metropolitan area. Stateside contests are interesting because you only need to beam 290 through 20 degrees to cover the entire United States. There can also be extreme propagation advantages on 10 and 15 meters (as evidenced by the WAE SSB Contest this past September). However, Bill does concede that working the Caribbean is a challenge!

When asked about the current state of contesting, Bill feels that there is greater acceptance of contesting today than in the past. He credits this to greater publicity, a growing number of smaller contests for the "little pistol," and increased attention to improved operating practices.

Bill, 42, is employed as an 8th grade middle school mathematics teacher and is married with one child. In addition to an already overwhelming personal schedule, he finds time to enjoy traveling, reading, woodworking, horticulture, and music.

Int. Police Assn. Contest

CW: Sat., Nov. 4 SSB: Sun., Nov. 5
0700Z-0900Z & 1500Z-1700Z

The International Police Association Radio Club Contest is sponsored by the German Section, IPA. Phone and CW are separate contests.

Classes: Single operator all bands, multi-operator single transmitter, and SWL.

Exchange: Signal report and serial number with 001 each day. IPA stations will add "IPA" or "IPA MICH" to their report.

Scoring: Count 5 points for each IPA station worked per band, and one point

for all other contacts. Multiply QSO points times IPA countries and US states worked per band. Add bands worked for total score.

Frequencies: CW—3525, 7025, 14060, 21075, 28075. SSB—3775, 7075 (DX), 14275, 21275, 28600. After a band change, you must operate on the new band for at least 15 minutes.

This contest also makes it possible to earn IPA awards from around the world. For further information on the contest or awards, or for log forms, send an SASE to Thomas Jenkins, WA8VDC, 4828 Elm, Newport, MI 48166.

Send completed contest logs to the contest manager, Dietmar Czirr, Schenkendorfstr. 69a, D-4950 Minden, West Germany before December 31, 1989. (Include one IRC for a copy of the results.)

ARRL Sweepstakes

CW: Nov. 4-6 Phone: Nov. 18-20
Starts: 2100Z Sat. Ends: 0300Z Mon.

This is the 56th running of the Sweepstakes, making it the oldest domestic competition going, and it really stirs up a lot of activity.

Operation is limited to stations in ARRL sections. Operating periods are restricted to a maximum of 24 out of the 30 hour contest period. Times off may not be less than 30 minutes and must be clearly indicated in your log.

In order to minimize QRM to non-contesters it is recommended that operation be confined to certain portions of the bands. It is recommended that you check QST for details.

There are several other regulations, including a cross-check sheet if you make 200 or more contacts. A large SASE (45¢ in postage) will get you the "SS Package" and Operating Aid #6 with enough log and summary sheets for an average outing.

Exchange: QSO no., power class, call, last two digits of year first licensed, and your ARRL section.

Stations using 150 watts or less are classed "A," over 150 watts "B," and QRP "Q." The same station may be worked only once regardless of the band.

Scoring: Each completed QSO is worth 2 points. The multiplier is derived from the number of ARRL sections.

Awards: The usual certificates in each class and mode for single operator stations in each section and multi-operator stations in each division.

Logs must be received no later than December 31st and go to: ARRL Communications Dept., 225 Main Street, Newington, CT 06111.

Japan International DX Contest

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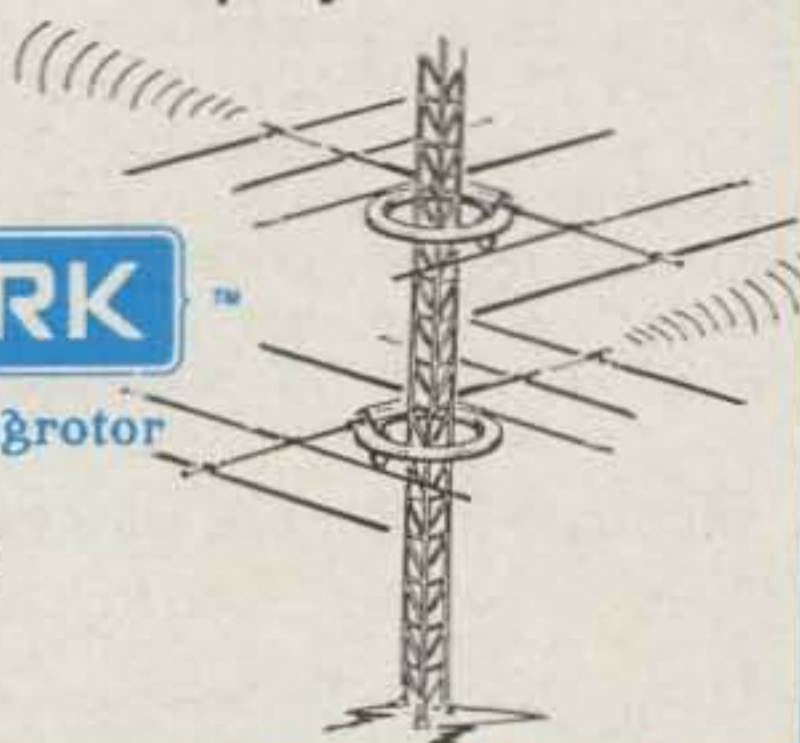
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the Japanese *Five Nine* Magazine. It's the JAs working the world on SSB only, all five bands, 10-80 meters (no WARC bands).

Classes: Single operator, single and all band, multi-operator all band only. Single operators are limited to 30 hours out of the 48-hour contest period. Off periods of at least 60 minutes must be clearly indicated in the log. Multi-operators can operate the full 48 hours. Stations must remain on the same band for at least 10 minutes before changing bands.

Exchange: RS plus a Prefecture number (1-50) for JAs, RS plus a progressive 3-digit QSO number for non-JAs.

Points: Two points for 80 meter QSOs, 1 point for 40-15 meters, 2 points for 10 meters.

Multiplier: Total number of JA Prefectures, plus #48 JD1 Ogasawara Is., #49 JD1 Okino-Torishima Is., and #50 JD1 Minami-Torishima Is. (maximum of 50 per band).

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 class in proportion to the number of entries from each country and each call area in the U.S. and Japan. Plaques to the continental winners in each class, single and multi-operators, and to the three U.S. CQ zones. And a special award to the U.S. single operator, all band winner of a round-trip ticket to Japan (*LA or SF to Tokyo*). Stations working all JA Prefectures (1-47) during the contest can request a special award with their entry.

Logs: Use a separate sheet for each band. Indicate the multiplier in a separate column only the first time it is worked on each band. Entries with more than 500 contacts must include a cross-check dupe sheet. There are the usual penalties for taking credit for duplicate contacts; more than 2% means disqualification.

Mailing deadline is December 31st to *Five Nine* Magazine, Japan International DX Contest, P.O. Box 8, Kamata, Tokyo 144, Japan. Entrants may receive the final results by enclosing one IRC and an SAE.

ALARA YL/OM Contest

0001Z to 2359Z Sat., Nov. 11

Organized by the Australian Ladies Amateur Assn., this activity is open to all YLs, OMs, and SWLs worldwide. YLs work everyone, OMs work YLs only, and SWLs log YLs only.

Use all five bands, 3.5 through 28 MHz (no WARC bands). Each station may be worked once on each band and each mode for point credit.

Exchange: RS(T), QSO number starting with 001, and name. ALARA members will identify.

Scoring: Phone—Contacts with ALARA members 5 points, with non-member YLs

4 points, with OMs 3 points. Double above points for CW contacts. SWL—5 points for ALARA YLs logged, 4 points for non-member YLs logged. Total QSO points from all bands for final score. There is no multiplier.

Frequencies: Tune up band from following frequencies: 3525, 7100, 14060, 21100, 21350, 28100, 28500 kHz.

Awards: A wide selection of certificates to YL, OM, and SWL winners, both CW and phone, in each VK call area, each country, and each continent. And the Florence McKenzie CW Trophy to the top-scoring VK YL Novice operator.

Only original logs are acceptable and must be received by December 31st. They go to: Mrs. Marilyn Syme, VK3DMS, P.O. Box 91, Irymple, 3498 Vic. Australia.

Montana Centennial QSO Party

0000Z Sat. to 2400Z Sun., Nov. 11-12

Sponsored by the Butte Amateur Radio Club, this year's party celebrates the Montana Centennial. Stations can be worked once per band and mode. Montana stations can work each other or out-of-state QSOs.

Exchange: RS(T), Serial Number, and state/province/county (county for Montana stations only).

Scoring: Two points for CW QSO and one point for SSB. Multipliers are MT counties, states, provinces, and DX (DX QSOs count as only one multiplier). Stations that QSO the Montana Registered Centennial Station, W7FO, can add 100 points per band/mode.

Frequencies: SSB—3890, 7280, 14280, 21370, 28470. CW—40 kHz up from band edge; 25 kHz up from Novice band edge.

Awards: Certificates suitable for framing will be distributed to winners in each state/province and highest scoring DXCC country.

Send summary sheet, logs, and dupe sheets (if more than 200 QSOs) to: Butte ARC, W7FO, P.O. Box 4036, Butte, MT 59701. Deadline is December 12th and enclose a legal-size SASE for final results.

European RTTY Contest

1200Z Sat. to 2400Z Sun., Nov. 11-12

Rules for the WAEDC RTTY contest are the same as for the CW and Phone sections held in August and September.

There is one main difference, however. To generate more activity in Europe and increase the QSO points, contacts between European stations are also permitted. QTC traffic, however, is only permitted between Europeans and non-Europeans, same as in the CW and Phone contests. The multiplier regulations remain the same.

The above will have no affect on the US and other non-European stations.

Check the August Calendar for all the

1988 CQ WW SSB DX Contest Corrections

The following call signs and scores were erroneously listed or missing from the contest results. Please accept our sincere apologies.

NI0E, 15 Meter Single Band, USA, 710,976 points, #5 USA.

KA1RX, Multi-Single USA, should be listed as K1RX with a corrected score of 4,829,216.

G3FXB should be listed as the winner of the A.G. Anderson, GM3BCL Trophy—Europe, 28 MHz, Zone 14.

W9DUB should be listed as the winner of the Stanley Cohen, WD8QDQ Trophy—USA, 7 MHz.

W2HFP, USA Single Operator 21 MHz (score 683,388), should be listed as W2HPF.

KA1RWX, USA Single Operator 28 MHz (score 16,016), should be listed as KA1RRX.

other detailed rules and regulations.

Exchange: RST plus a progressive QSO number.

Points: Each QSO and each QTC exchanged are worth one point.

Multiplier: For non-Europeans is determined by the number of European countries worked on each band. (See the European country list in August Calendar.)

Bonus Multiplier: Multiply your multiplier on 80 meters by 4, on 40 meters by 3, and on 10/15/20 meters by 2.

Awards: Certificates will be awarded to the highest scorers in each class in each country with a reasonable score. Continental leaders will receive a plaque. Certificates will also be awarded to stations with at least half the score of the continental leader.

It is suggested that you use the official DARC log forms. A large SASE (IRCs) to the address below will get you a supply.

Mailing deadline for all entries is December 15th to: WAEDC Contest Committee, Postbox 1328, D-8950 Kaufbeuren, West Germany.

Czechoslovakian Contest

1200Z Sat. to 1200Z Sun., Nov. 11-12

Some changes in the format of this year's OK-DX Contest were expected. However, no word has been received. Following are the rules that were used last year. In the past it was a worldwide-type contest, so do not limit your activity to working Czechs only.

Use all six bands, 1.8 to 28 MHz. The same station may be worked once per band, either phone or CW, for QSO and multiplier credit.

Classes: Single operator, both single and all band, multi-operator all band only, and SWL. (Club stations will be considered multi-operator.)

Only one transmitter and one band permitted during the same 10-minute period, no QSYing to another band.

Exchange: RS(T) and number of your ITU zone.

Scoring: One point per QSO; 3 points if it's with a Czech (OK4/mm 1 point only). Own country may be worked, but for multiplier credit only.

Multiplier: Sum of different ITU zones worked on each band.

Final Score: Total QSO points from all bands times the sum of the zone multipliers from each band.

A penalty of three additional contacts of the same point value will be deducted for each duplicate QSO or multiplier removed by the committee. Taking credit for excessive duplicates and other violations (regulations, unsportsmanlike conduct, etc.) will be deemed cause for disqualification.

Awards: Certificates in each class to the top-scoring station in each country. Additional awards will be made if returns justify. The "100 OK," "OK SSB," "Slovensko," and other Czech awards will be issued for contacts in the contest if a written application is submitted with your log.

Use a separate log for each band, indicate the zone multiplier only the first time it is worked on each band, and include a cross-check list for each band with 200 or more QSO's.

A summary sheet showing the scoring and the usual signed declaration that all rules have been observed is also requested.

All entries must be postmarked no later than December 15th and go to: Central Radio Club, P.O. Box 69, 11327 PRAHA 1, Czechoslovakia.

CQ WW DX CW Contest

0000Z Sat. to 2400Z Sun., Nov. 25-26

Just a reminder, as if you needed one, that the CW section of our WW DX Contest is coming up the last weekend of this month. The phone section of course is past history. Complete rules were published in the September issue. Be sure to take special note of the new Single Operator Unlimited Category. The contest trophies list has been updated and well covered in the rules.

All logs, both Phone and CW, must be sent to the CQ office: CQ World-Wide DX Contest, 76 North Broadway, Hicksville, NY 11801 USA.

Deadline for logs for the Phone section is December 1st, and January 15th for the CW section coming up. Be sure to indicate Phone or CW on your envelope. This will avoid your log from being entered in the wrong section.

ARRL 160 Meter CW Contest

2200Z Fri. to 1600Z Sun, Dec. 1-3

This is the 20th year for this "Top

Band" activity. Exchange is between US stateside, VE, and DX stations. DX to DX not permitted for contest credit.

Classes: Single operator, and multi-operator single transmitter.

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

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

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

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

Awards: Certificates to the top-scoring single operator station in each ARRL sec-

tion and DXCC country. And to top-scoring multi-operator station in each ARRL Division and continent.

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

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

Mailing deadline for logs is January 6th to: ARRL Communications Dept., 160 Contest, 225 Main Street, Newington, CT 06111.

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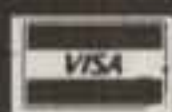
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CIRCLE 175 ON READER SERVICE CARD



Administering The Novice Examination

Effective November 1, there are many changes you should be aware of in the volunteer examination program for the beginning Novice amateur radio operator license. First of all, there is a new question pool from which to select the questions. These were released into the public domain by the VEC's Question Pool Committee in April and must be used in all Novice-level examinations administered after October 31. On June 9 the FCC released a new Part 97, Rules and Regulations affecting the Amateur Radio Service. Many of the new rules impact the Novice (and other) examinations. Let's try and sort out all this in this column.

Unlike CB radio, you must be licensed by the government to operate an amateur radio station. All amateur radio operator examining functions—including test development—are now completely handled by the amateur community itself. Although the FCC does have the responsibility of overseeing amateur testing, the Commission no longer administers amateur radio operator examinations of any kind.

There are actually two examining programs for amateur licenses: the *Novice program* and the *VEC System*. The more formal VEC System requires three volunteer examiners (VEs) who conduct test sessions for the Technician and higher class tickets. VEs under this program must be approved or *accredited* by their VEC (Volunteer Examiner Coordinator). A VEC acts as the administrative liaison between the VE and the FCC. Although there are nearly two dozen VEC organizations, 80% of all examinations are coordinated by only two: our group (the W5YI-VEC) and the ARRL-VEC.

The Novice testing program is less formal. VEs for the Novice examination do not have to be associated with any VEC organization, and only two examiners are required to conduct a test session. In years past only one examiner was necessary, but in the interest of maintaining examination integrity, the FCC now requires a second VE. Unlike the VEC System, no fees are associated with Novice exams. They are—and always have been

—free to the applicant. The VE team selects the test session site.

While Novice and VEC System testing are two separate programs, they are also somewhat combined. It is a committee made up of VECs who develop the exam questions to be asked under the Novice testing program. Novice examinations are also administered under the VEC System—especially when an unlicensed applicant applies for the Technician (or higher class) license.

VE Qualifications

The Novice-level examiner must meet certain criteria spelled out in the new §Part 97. The VE must be 18 years old, hold at least a General class amateur operator license, not be in the amateur radio equipment or publishing business, not be related to the applicant, and have a clean enforcement record. The latter means no suspended or revoked licenses.

The previous FCC rules were not specific as to what constituted a relative. The Commission now defines relatives to include in-laws, step children, step brothers/sisters, and step parents, as well as blood relatives (see the new §Part 97.515).

The following is basically the procedure for administering a Novice examination to an examinee.

Application for Amateur Radio License

The examinee must submit a Form 610, application for an amateur radio license, to the examiners. In practice, the examiners usually have these available for applicants to complete. The examinee completes only Section I and checks 2C, examination for new license.

The Novice Written Examination

The two volunteer examiners then administer a 30-question written examination. The minimum passing score is 22 questions answered correctly.

The questions are selected according to a formula from the Element 2/Novice question pool. A question pool is a list of questions that may be asked of an applicant. The distractors (wrong answers) and correct answer also are known and widely published. All VEs are required to use the same word-for-word question set. You won't get questions, distractors, or answers that are not publicly known.

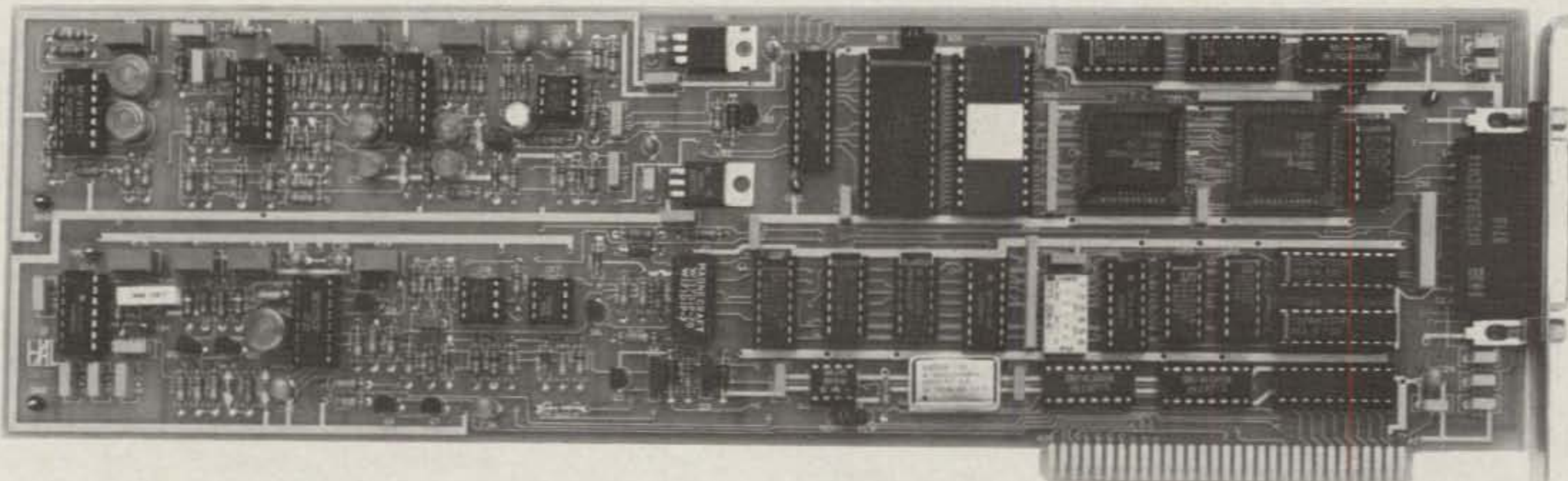
The only difference in Novice tests is in the questions that are selected. There are more than ten times as many questions in the pool as will appear in any one examination. Thus, taking a Novice amateur test is similar to being administered the written portion of an automobile driving exam. You study the questions and

Subtopic Letter & Description	NEW POOL Questions		OLD POOL Questions	
	in Pool	to Select	in Pool	to Select
(A) FCC Rules: Amateur Radio Services	114	10	95	9
(B) Amateur Station Operating Procedures	48	2	34	2
(C) Radio Wave Propagation Characteristics	18	1	17	2
(D) Amateur Radio Practices	45	4	42	4
(E) Electrical Principles/Station Equipment	44	4	33	4
(F) Station Equipment Circuit Components	21	2	10	2
(G) Practical Circuits/Station Equipment	20	2	17	2
(H) Signals & Emissions/Amateur Stations	23	2	26	2
(I) Amateur Station/Antennas & Feedlines	39	3	28	3
Total questions:	372	30	302	30
Increase in questions: 23.2% more!				

Table I- Questions in new Novice Question Pool versus previous question set. Note there are 70 more questions in the new Element 2 question pool that must be used effective November 1, 1989. Use of old question pool MUST be discontinued effective October 31, 1989.

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then take the test. The question pools are revised on a three-year cycle by the VEC's Question Pool Committee (QPC).

A brand new Novice-level (Element 2) question set goes into effect on November 1, 1989, and no Novice examination may be administered after October 31 using the previous question bank. You can easily tell the difference between the two pools, since the new Novice bank now has 372 questions versus 302 in the old question set. Table I indicates the topics and number of questions in both the new and old Element 2 question pools.

Note that the biggest increase is in the questions relating to the FCC rules. Your author (Fred, W5YI) is a member of the VEC's Question Pool Committee (QPC),

which develops all of the question pools. We worked on the Element 2 pool during Fall 1988 and Spring 1989 but had no way of knowing exactly when the FCC would be releasing new Part 97 rules—or even if they would ever release them.

The QPC distributed the new question pools to the public and amateur radio license preparation publishers three months prior to the time the FCC released the new Part 97. As a result, several of the questions in the brand new pool—particularly those in the "A" subtopic covering FCC rules—must again be revised by the QPC. There are many changes in the new rules, although most are rewording. All question pools are impacted.

VECs can easily supply the teams they

coordinate under the VEC System with appropriate examinations. Making sure that Novice-level VEs are aware of changes in the question pools is a little bit harder. The QPC has no record of Novice examiners, and we can only hope that the publicity we put out somehow finds its way to them.

A new policy change may have to be recommended to the FCC on this matter. Possibly Novice-level examiners could be registered with the QPC so we can advise them of information that affects their testing activities. How do they find out when the QPC changes a question, answer, distractor? How many Novice-level VEs are there? What would be the cost of notifying them? How would this be funded, since the Novice program does not provide for expense reimbursement?

We are really concerned that Novice examinations administered after November 1 may not be handled properly simply due to lack of correct information. The VECs develop and revise the question pools, but we don't have a good way to notify Novice examiners of these changes. One suggested answer has been to put the Novice program under the VEC System.

The QPC is now in the process of another revision of the Novice question pool. It is anticipated that another new Element 2 question pool that will reflect the new Part 97 rules recently adopted will be released during early 1990 (probably in January). Implementation of the next new Novice pool is scheduled for July 1, 1990.

In the meantime, the QPC has decided to go ahead and implement the Element 2 pool originally scheduled for November 1, 1989. The Question Pool Committee has published what they term a "discretion list"—a list of those questions that we recommend volunteer examiners use their judgment on when preparing or grading Novice examinations. Table II lists the questions that will not be changed as a result of the new Part 97 Rules. We recommend these (only) be used when selecting the ten required questions for the "A" FCC Rules sub-element.

Admittedly, this is confusing, but there were no good alternatives. The QPC needs time to revise all of the question pools—a massive job! License preparation publishers also require sufficient time to write and publish their study material based on the new Part 97 and get it into the marketplace.

The Novice Telegraphy Examination

The two VEs will also administer a 5 words-per-minute telegraphy examination, although it could be administered before the written exam. The test may be longer than 5 minutes—a new rule. Previously the rules required a 5 minute test.

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ELEMENT 2

NOVICE CLASS

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All Volunteer Examiners (VEs) and Volunteer Examiner Coordinator (VEC) organizations are required to use these Novice Class questions verbatim in preparing their Element 2 examinations. These test questions must be used beginning November 1, 1989 through October 31, 1992. The purpose of this test manual is to alert the public to the content of the Element 2 question pool. Element 2 is common to both the older Novice testing program and the newer VE/VEC System since passing the Novice level is a requirement for the Technician Class.

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The transmitted Morse code text and answer format is the responsibility of the administering VEs. The answer format may be in any form, including fill-in-the-blank, multiple choice, answer seven out of ten questions, one minute solid copy, ... even true/false. The rules simply state that an applicant must prove to the examiners that he or she is able to copy the International Morse code *by ear*.

Some VEs give the applicant two chances to pass the code test by asking questions about the text if the applicant fails to copy 25 characters in a row. Each five letters of the alphabet are counted as one word. Each numeral, punctuation mark, and prosign must be counted as two letters of the alphabet. (Prior to September 1, 1989 prosigns only counted as one character.)

The FCC does not require VEs to administer a hand sending examination since it is their experience that applicants who can copy the code at a particular speed can also send the code by hand at that speed. Examiners may require the sending portion of the code test if they deem it important, however.

The new rules now permit VEs to obtain Novice testing material from a supplier (Part 97.507). The code test must contain all 43 different characters. That is the 26 alphabet letters, numerals 1-0, certain punctuation marks (period, comma, question mark, slant bar), and CW operating procedure signs (AR, SK, and BT). As a general rule, the VE will make up the code test themselves. Some VEs send the code test by hand, while some generate the code test text using a personal



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AT-150 HF Automatic Antenna Tuner	369.00
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TV-R7000 TV/FM Rcv. Adapt. For IC-R7000	139.00
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IC-228H 2-Meter, FM, 45 Watt Xcvr.	459.00
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IC-4GAT 440-MHz, FM, Handheld With T-T	384.50
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IC-3SAT 220-MHz, FM, Mini Handheld W/T-T	384.50
IC-4SAT 440-MHz, FM, Mini Handheld W/T-T	384.50
IC-BP3 8.4 VDC, 250 mA, Ni-Cad Batt. Pack	39.50
IC-BP4 Battery Case	16.00
IC-BP5 10.8 VDC, 425 mA, Ni-Cad Batt. Pack	65.00
IC-BP7 13.2 VDC, 425 mA, Ni-Cad Batt. Pack	79.00
IC-BP8 8.4 VDC, 800 mA, Ni-Cad Batt. Pack	79.00
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BC-25U AC Wall Charger For IC-BP3, 21, 22	16.99
BC-35 Drop-In Rapid Charger; IC-BP2, 5, 7, 8	79.00
IC-CP1 Mobile Charging Cord	13.65
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AD-12 DC Converter For IC-2GAT, 4GAT	24.50
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HS-10SA VOX Unit For HS-10	24.50
HS-10SB PTT Unit For HS-10	24.50
LC-39 Case, IC-2GAT/4GAT W/IC-BP5/BP70	19.50
LC-40 Case, IC-2GAT/4GAT W/IC-BP7/BP8	19.50
LC-42 Case, IC-32AT W/IC-BP5/BP70	19.50
LC-43 Case, IC-32AT W/IC-BP7/BP8	19.50

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R5 14, 18, 21, 24, 28-MHz Vertical	234.00
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ARX-450B 450-MHz, Ringo Ranger II Vertical	42.00
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215WB 144 to 148-MHz, 15-Element Beam	90.00
A147-11 146 to 148-MHz, 11-Element Beam	52.00
A449-11 440 to 450-MHz, 11-Element Beam	46.00

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RS-20A 13.8 VDC, 20 Amp Int., 16 Amp Cont.	86.14
RS-35A 13.8 VDC, 35 Amp Int., 25 Amp Cont.	138.94
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RS-20M Same As RS-20A, With Meter	105.34
RS-35M Same As RS-35A, With Meter	156.94
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RM-50M Rack Mount Version Of RS-50M	249.14
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CIRCLE 135 ON READER SERVICE CARD
November 1989 • CQ • 99

2A-1.1	2A-5.1	2A-9.1	2A-9.2	2A-9.3	2A-10.7
2A-10.8	2A-10.9	2A-10.10	2A-15.1	2A-15.2	2A-15.3
2A-15.4	2A-15.5	2A-17.1	2A-18.2	2A-18.3	2A-18.4
2A-18.5	2A-19.1	2A-19.2	2A-19.3	2A-19.4	2A-19.5
2A-21.1	2A-21.3	2A-25.1	2A-27.1	2A-27.6	2A-27.7
2A-28.1	2A-28.2	2A-29.1	2A-29.2	2A-32.1	2A-37.1
2A-37.2	2A-39.2	2A-39.3			

Table II— Questions covering FCC Rules Subelement "A" that may be used in Novice examinations until the Element 2 question pool is once again revised to conform to newly released Part 97 Rules. In addition, do not use the following questions from the Signals & Emissions Subelement "H," since these questions do not refer to the new plain-language emission designators (2H-1-1.1, 2H-1-1.2, 2H-1-2.1, 2H-1-2.2, 2H-1-3.1, and 2H-1-4.1).

computer. (We have correctly constructed code test cassette tapes available at \$3.95. Pre-made 30-question Novice written examinations are free for a self-addressed, stamped envelope to General and higher class VEs. Send along a copy of your license.)

Either Paris or Farnsworth code spacing may be transmitted. Both the Paris and Farnsworth methods provide "dit" length of one increment and "dahs" of three. The difference is in the spacing between the code elements, characters, and words. Paris spacing allows one duration between elements, three between characters, and seven between words. Farnsworth code is sent faster to allow longer spacing between characters and

words. The net result is still five words per minute, however.

It is generally agreed that the Farnsworth method is preferred, especially at the slower speeds. Farnsworth characters have a better sound pattern, and the plateau that exists above 10 words per minute is generally eliminated. We feel a good Novice-level code transmission speed is around 15-18 words-per-minute with the spacing increased to net out at 5. Our 5 wpm code tests are Farnsworth spacing with 15 wpm character speed.

Applicants who are examined at a VEC System session may attempt any code speed they feel they can pass. If they fail, they can try the next slower speed. The written examinations must be taken in or-

der. That is, you must pass the Novice Element 2 before taking the Technician Element 3A written test. Failed examinations may be immediately readministered without a waiting period—even at the same test session. FCC rules require, however, that no examinee may be readministered the same previously failed examination.

Administering VEs must accommodate an examinee whose physical disabilities require a special examination procedure. Any special needed equipment must be supplied by the examinee. Volunteer examiners may not eliminate any test requirements because of a disability, such as a code test for those with a hearing impairment. VEs may require a physician's certification indicating the nature of the disability before determining which, if any, special procedures must be used, such as a reader for a blind applicant.

Mailing The Application To The FCC

The two VEs complete the Administering VE's Report on the front of the Form 610, and Section II on the back. The VE team must check line D of the Administering VE's Report indicating that the examinee has passed both Element 1A (5 wpm code) and Element 2, the Novice written test. In addition, the VE team must check box number E1 indicating that the appli-

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CIRCLE 133 ON READER SERVICE CARD

cant is qualified for the Novice amateur radio operator license.

The VE team certifies in Section II that (a) the Novice requirements have been administered to the applicant; (b) the applicant has passed these requirements; or (c) the applicant has provided documentation that he/she has previously passed one of the two required examinations.

The completed application must be mailed by the VE team to the FCC (P.O. Box 1020, Gettysburg, PA 17326) within ten days of test administration. Any Form 610 submitted more than ten days after the examination must be accompanied by a written explanation from the examiners.

All other test papers must be retained in the records of one of the two examiners. The only time more than one piece of paper (the 610) is sent to the FCC is when the applicant has documentation indicating that he/she has credit for previously passing one of the two required examinations.

The credit documentation, technically called a *Certificate of Successful Completion (CSCE)*, may take one of two forms. It usually will be an original Form 610 from a previous session indicating that one (but not both) of the required examinations were passed. It also could be a credit certificate given to the applicant at a VEC-coordinated session. Applicants

retain code or written test credit for 365 days after they pass an exam which does not result in a license. The examinee must retake the test after the 365-day period expires.

If an applicant passes only one examination, be sure to draw a horizontal line on his 610 through all other elements on line D so the application cannot be altered. Also check the box (line E) that the applicant is qualified for "None"—that is, no operator license. Return applications to examinees who are not to be issued an operator license by the FCC.

Do not give successful candidates their original completed FCC 610 to take to a VEC-coordinated examination session if they qualify for the Novice examination. VEs are required to immediately mail all successful Form 610 applications directly to the FCC for processing. You should give successful examinees a photocopy of their 610 to use as evidence of passing Element 1(A) and Element 2 should they decide to upgrade to a higher class license at a VEC-coordinated examination session before their Novice license arrives in the mail.

New Question Pools, Part 97 Rules Available

We have had the new Novice question pool which was used for the first time on

November 1 printed up into booklets. All 372 questions, distractors, and answers are listed. Also available is the new Technician/Element 3A pool if you need it. Both the Novice and Technician question sets were revised at the same time by the QPC and must be used in examinations after October 31st. The new Technician/Element 3A pool now has 326 questions instead of 288.

The cost of the Novice and/or Technician Question Pool booklets is \$2.00 each postpaid, \$4.00 for both. These can be purchased by anyone—examiners or applicants. We will send along our new publication "How to Administer Novice Examinations in the Amateur Radio Service" at no additional cost if you plan to administer Novice exams. FCC form 610 amateur radio applications are also free, although a self-addressed, stamped envelope will be appreciated.

The new FCC Part 97 Rules and Regulations, effective September 1, 1989, is just off the press. This book covers all amateur operator responsibilities and restrictions, frequencies and privileges available to licensees, amateur technical and equipment standards, emergency communications guidelines, how to qualify for the various amateur radio licenses, and much more. Cost of the *Part 97 Rule Book* is \$2.95 postpaid. All are available from W5YI, P.O. Box 565101, Dallas, TX 75356. See you next month.

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NS-663BM*	140-525 MHz	30/300 W	SO-239
NS-663BN*	140-525 MHz	30/300 W	N-Type

*Back lit with remote sensors available.
**NS-660PA-Peak power reading

CN-460M

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CN-410M*	3.5-150 MHz	15/150 W	SO-239
CN-460M*	140-450 MHz	15/150 W	SO-239
CN-465M*	140-450 MHz	15/75 W	SO-239
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CIRCLE 132 ON READER SERVICE CARD

CIRCLE 131 ON READER SERVICE CARD

THE SCIENCE OF PREDICTING RADIO CONDITIONS

CW Contest Weekend Special

Bulletin

Since this issue of *CQ* should reach most subscribers prior to the start of the *CQ* World-Wide DX Phone Contest weekend of October 28-29, here is an updated forecast made at press time of general propagation conditions expected for the contest weekend. Conditions for the first day, October 28, are expected to be considerably better than the Low Normal rating in last month's column. There is better than a 75% chance that conditions will rise to High Normal, and at times could reach Above Normal. A forecast for Sunday, October 28 is a bit more difficult to make. A major radio storm is likely to begin on October 30th. If it doesn't arrive a day early, the 29th should experience much the same conditions as forecast for October 28th—mainly High Normal. If the storm should start earlier than expected, conditions may drop to Below Normal towards the end of the contest weekend. All in all, it looks like a great weekend coming up for the phone contest period.

The initial forecast for the CW contest weekend of November 25-26 is about the same as the above forecast for the phone weekend. At least High Normal conditions are expected on Saturday, November 25th. High Normal conditions are likely to continue into Sunday, the 26th, possibly dropping to Below Normal towards the end of the day if a recurring radio storm should begin a day or so earlier than expected. There will be a fine-tuned update for the CW contest weekend as a bulletin in next month's column.

The *CQ* World-Wide DX Contest weekend is November 25-26. Last month's column contained comprehensive HF band-opening predictions to all areas of the world from North America for use during both the Phone and CW weekends. In addition, a sample 20 meter operating schedule for the CW weekend is included in this month's column.

11307 Clara Street, Silver Spring, MD 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for November 1989

Propagation Index.....	Expected Signal Quality			
	(4)	(3)	(2)	(1)
Above Normal: 13-14, 17, 21-22	A	A	B	C
High Normal: 1-2, 8, 12, 15, 18-20, 23-26	A	B	C	C-D
Low Normal: 6-7, 9-11, 16, 29	A-B	B-C	C-D	D-E
Below Normal: 3, 5, 27-28	B-C	C-D	D-E	E
Disturbed: 4, 30	C-E	D-E	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.
3dB 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 good (B) on November 1st and 2nd, fair-to-poor (C-D) on the 3rd, poor (D-E) on the 4th, fair-to-poor (B-C) on the 5th, etc. Good conditions (B) are forecast for November 25 and 26 during the *CQ* WW DX CW Contest weekend.

This year's World-Wide DX Contest is being held during a period of near record high solar activity. The *Royal Observatory of Belgium*, the world's official keeper of sunspot records, reports a monthly mean sunspot number of 127 for July 1989. This results in a 12-month running

smoothed sunspot number of 142 centered on January 1989. A smoothed sunspot number of 189 is forecast for November 1989. As discussed last month, this would be the second highest level of solar activity ever to occur during a *CQ* WW Contest period. Barring any radio storms developing, the 1989 WW Contest may well be the greatest of them all!

There was a corresponding increase in the 10.7 cm solar flux level during July. The *Algonquin Radio Observatory* at Ottawa, Ontario reported a mean level of 183 for the month. This results in a smoothed level of 190 centered on January 1989. The 10.7 cm solar flux level is expected to rise close to, or exceed, the 200 mark during most of November.

Check the *Last-Minute Forecast* appearing in this month's column for day-to-day conditions expected during the entire month of November.

CW Contest Tips

During the daylight hours, from shortly after sunrise through sunset, look for excellent DX conditions on the 10, 15, and 20 meter bands.

From sundown to midnight best DX honors should be shared between the 20 and 40 meter bands, with some good openings possible to southerly and westerly directions on 15 meters. Also check the 80 and 160 meter bands during this time period.

From midnight to sunrise the best DX bands should be 40 and 80 meters, with good openings also possible on 20 meters towards southern and western areas. Also check for 160 meter DX during this period.

00-03	Far East, South Pacific & New Zealand, Australasia, Caribbean, Central & South America, Antarctica, Africa
03-08	Africa, South Pacific & New Zealand, Australasia, Caribbean, Central & South America
06-09	Europe, Central & South Asia, Southeast Asia, Far East, South Pacific & New Zealand, Australasia, Caribbean, Central & South America
09-12	Europe, Central & South Asia, Caribbean & Central America
12-15	Europe, Africa, Caribbean and Central America
15-18	Europe, Africa, Caribbean and Central America
18-21	Europe, Eastern Mediterranean, Middle East, Africa, Southeast Asia, Caribbean, Central & South America
21-00	Southern Europe, Eastern Mediterranean, Middle East, Africa, Central and South Asia, Far East, South Pacific & New Zealand, Australasia, Caribbean, Central & South America, Antarctica

Table 1—Sample single-band operating plan 20 meters, Eastern USA QTH.

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CIRCLE 159 ON READER SERVICE CARD







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<p>RM-A SERIES</p>  <p>MODEL RM-35M</p>	<p>19" X 5 1/4" RACK MOUNT POWER SUPPLIES</p> <table border="1"> <thead> <tr> <th>MODEL</th> <th>Continuous Duty (Amps)</th> <th>ICS* (Amps)</th> <th>Size (IN) H x W x D</th> <th>Shipping Wt. (lbs.)</th> </tr> </thead> <tbody> <tr> <td>RM12A</td> <td>9</td> <td>12</td> <td>5 1/4 x 19 x 8 1/4</td> <td>16</td> </tr> <tr> <td>RM-35A</td> <td>25</td> <td>35</td> <td>5 1/4 x 19 x 12 1/2</td> <td>38</td> </tr> <tr> <td>RM-50A</td> <td>37</td> <td>50</td> <td>5 1/4 x 19 x 12 1/2</td> <td>50</td> </tr> </tbody> </table> <p>• Separate Volt and Amp Meters</p> <table border="1"> <tbody> <tr> <td>RM-35 M</td> <td>25</td> <td>35</td> <td>5 1/4 x 19 x 12 1/2</td> <td>38</td> </tr> <tr> <td>RM-50 M</td> <td>37</td> <td>50</td> <td>5 1/4 x 19 x 12 1/2</td> <td>50</td> </tr> </tbody> </table>	MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)	RM12A	9	12	5 1/4 x 19 x 8 1/4	16	RM-35A	25	35	5 1/4 x 19 x 12 1/2	38	RM-50A	37	50	5 1/4 x 19 x 12 1/2	50	RM-35 M	25	35	5 1/4 x 19 x 12 1/2	38	RM-50 M	37	50	5 1/4 x 19 x 12 1/2	50											
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<p>RS-A SERIES</p>  <p>MODEL RS-7A</p>	<table border="1"> <tbody> <tr> <td>RS-4A</td> <td>3</td> <td>4</td> <td>3 3/4 x 6 1/2 x 9</td> <td>5</td> </tr> <tr> <td>RS-5A</td> <td>4</td> <td>5</td> <td>3 1/2 x 6 1/8 x 7 1/4</td> <td>7</td> </tr> <tr> <td>RS-7A</td> <td>5</td> <td>7</td> <td>3 3/4 x 6 1/2 x 9</td> <td>9</td> </tr> <tr> <td>RS-10A</td> <td>7.5</td> <td>10</td> <td>4 x 7 1/2 x 10 3/4</td> <td>11</td> </tr> <tr> <td>RS-12A</td> <td>9</td> <td>12</td> <td>4 1/2 x 8 x 9</td> <td>13</td> </tr> <tr> <td>RS-20A</td> <td>16</td> <td>20</td> <td>5 x 9 x 10 1/2</td> <td>18</td> </tr> <tr> <td>RS-35A</td> <td>25</td> <td>35</td> <td>5 x 11 x 11</td> <td>27</td> </tr> <tr> <td>RS-50A</td> <td>37</td> <td>50</td> <td>6 x 13 3/4 x 11</td> <td>46</td> </tr> </tbody> </table>	RS-4A	3	4	3 3/4 x 6 1/2 x 9	5	RS-5A	4	5	3 1/2 x 6 1/8 x 7 1/4	7	RS-7A	5	7	3 3/4 x 6 1/2 x 9	9	RS-10A	7.5	10	4 x 7 1/2 x 10 3/4	11	RS-12A	9	12	4 1/2 x 8 x 9	13	RS-20A	16	20	5 x 9 x 10 1/2	18	RS-35A	25	35	5 x 11 x 11	27	RS-50A	37	50	6 x 13 3/4 x 11	46	
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<p>RS-M SERIES</p>  <p>MODEL RS-35M</p>	<ul style="list-style-type: none"> • Switchable volt and Amp meter <table border="1"> <tbody> <tr> <td>RS-12M</td> <td>9</td> <td>12</td> <td>4 1/2 x 8 x 9</td> <td>13</td> </tr> </tbody> </table> <ul style="list-style-type: none"> • Separate volt Amp meters <table border="1"> <tbody> <tr> <td>RS-20M</td> <td>16</td> <td>20</td> <td>5 x 9 x 10 1/2</td> <td>18</td> </tr> <tr> <td>RS-35M</td> <td>25</td> <td>35</td> <td>5 x 11 x 11</td> <td>27</td> </tr> <tr> <td>RS-50M</td> <td>37</td> <td>50</td> <td>6 x 13 3/4 x 11</td> <td>46</td> </tr> </tbody> </table>	RS-12M	9	12	4 1/2 x 8 x 9	13	RS-20M	16	20	5 x 9 x 10 1/2	18	RS-35M	25	35	5 x 11 x 11	27	RS-50M	37	50	6 x 13 3/4 x 11	46																					
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<p>RS-S SERIES</p>  <p>MODEL RS-12S</p>	<ul style="list-style-type: none"> • Built in speaker <table border="1"> <tbody> <tr> <td>RS-7S</td> <td>5</td> <td>7</td> <td>4 x 7 1/2 x 10 3/4</td> <td>10</td> </tr> <tr> <td>RS-10S</td> <td>7.5</td> <td>10</td> <td>4 x 7 1/2 x 10 3/4</td> <td>12</td> </tr> <tr> <td>RS-12S</td> <td>9</td> <td>12</td> <td>4 1/2 x 8 x 9</td> <td>13</td> </tr> <tr> <td>RS-20S</td> <td>16</td> <td>20</td> <td>5 x 9 x 10 1/2</td> <td>18</td> </tr> </tbody> </table>	RS-7S	5	7	4 x 7 1/2 x 10 3/4	10	RS-10S	7.5	10	4 x 7 1/2 x 10 3/4	12	RS-12S	9	12	4 1/2 x 8 x 9	13	RS-20S	16	20	5 x 9 x 10 1/2	18																					
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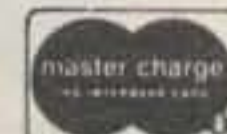
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Table I is a sample work chart for the CW Contest section devised from the *DX Propagation Charts* which appeared in last month's column. This particular example is for the 20 meter band, and for QTHs in the EST zone. Similar charts can be devised for other bands, for multi-band operation, and for other time zones.

VHF Openings

The big VHF news this month should be the expected DX openings on 6 meters. Solar activity is now high enough to permit regular F-2 layer openings to many areas of the world on this band. Don't be surprised if on a really good day it may be possible to work stations on all continents on 6 meters! Conditions should peak for openings towards Europe and in a generally easterly direction before noon. Shortly after noon openings should pick up towards Africa, and continue swinging in a more southerly direction during the early afternoon hours. During the late afternoon hours start looking for openings more towards the southwest and west. Many of these expected 6 meter F-2 layer openings will be characterized by relatively strong signal levels.

Some TE-scatter-type 6 meter openings should be possible during November towards South America. Evenings between approximately 8 and 11 PM local standard time are the best times to check for TE openings, and conditions favor the southern tier states. Peak seasonal conditions for TE openings have already passed, and openings this month should at best be erratic with weak signal levels and considerable flutter-fading.

The short, but significant meteor showers should occur during November, making possible some meteor-scatter-type openings on the VHF bands. The *Taurids* shower, which should last for a day or two, is expected to reach peak intensity on November 4, with approximately 15 meteors entering the earth's atmosphere each hour. A second shower of about the same duration and intensity, called the *Leonids*, should peak at about 11 AM EST on November 17.

Some fairly intense auroral activity can occur during November, bringing with it conditions for auroral-type openings on the VHF bands. Such activity is usually associated with periods of radio storminess, and is most likely to occur on those days shown as Below Normal or Disturbed in the Last-Minute Forecast appearing at the beginning of this column.

This month's column contains Short-Skip propagation data for use between distances of approximately 50 and 2300 miles, and between the states of Hawaii and Alaska and the Continental areas of the USA.

Good luck in the CW section of the CQ World-Wide DX Contest, and please let me know how the special contest propagation forecasts work out.

73, George, W3ASK

HOW TO USE THE SHORT-SKIP CHARTS

1. In the Short-Skip Chart, the predicted times of openings can be found under the appropriate distance column of a particular meter band (10 through 160 meters) as shown in the left-hand column of the chart. For the Alaska and Hawaii Charts the predicted times of openings are found under the appropriate meter band column (15 through 80 meters) for a particular geographical region of the continental USA as shown in the left-hand column of the charts. An * indicates the best time to listen for 80 meter openings.

2. The propagation index is the number that appears in () after the time of each predicted opening. On the Short-Skip Chart, where two numerals are shown within a single set of parentheses, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. The index indicates the number of days during the month on which the opening is expected to take place, as follows:

- (4) Opening should occur on more than 22 days
- (3) Opening should occur between 14 and 22 days
- (2) Opening should occur between 7 and 13 days
- (1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual dates on which an opening with a specific propagation index is likely to occur, and the signal quality that can be expected.

3. Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. On the Short-Skip Chart appropriate standard time is used at the path midpoint. For example on a circuit between Maine and Florida, the time shown would be EST, on a circuit between N.Y. and Texas, the time at the midpoint would be CST, etc. Times shown in the Hawaii Chart are in HST. To convert to standard time in other USA time zones add 2 hours in the PST zone; 3 hours in the MST zone; 4 hours in the CST zone; and 5 hours in the EST zone. Add 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 14 or 2 P.M. in Los Angeles; 17 or 5 P.M. in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to standard time in other areas of the USA subtract 8 hours in the PST zone; 7 hours in the MST zone; 6 hours in the CST zone; and 5 hours in the EST zone. For example, at 20 GMT it is 15 or 3 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 above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 dB gain above these reference levels, the propagation index will increase by one level for each 10 dB loss, it will lower by one level.

5. Propagation data contained in the Charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado 80302.

CQ Short-Skip Propagation Charts November & December 1989 Local Standard Time at Path Mid-Point (24-Hour Time System)

Band (Meters)	Distance From Transmitter (Miles)			
	50-250	250-750	750-1300	1300-2300
10	Nil	Nil	07-09 (0-1) 09-11 (0-2) 11-15 (0-3) 15-16 (0-2) 16-18 (0-1)	07-08 (1) 08-09 (1-2) 09-11 (2-3) 11-15 (3-4) 15-15 (2-4) 16-18 (1-4) 18-19 (0-3) 19-20 (0-2) 20-21 (0-1)
15	Nil	08-10 (0-1) 10-16 (0-3) 16-17 (0-2) 17-18 (0-1)	07-08 (0-1) 08-09 (1-3) 09-10 (1-4) 10-16 (3-4) 16-17 (2-4) 17-19 (1-4) 19-20 (0-3) 20-21 (0-1)	07-08 (1) 08-09 (3-2) 09-19 (4) 09-19 (4) 19-20 (3) 20-21 (1-2) 21-00 (0-1)
20	09-11 (0-1) 11-15 (1-2) 15-17 (0-1)	07-09 (0-2) 09-11 (1-4) 11-15 (2-4) 15-17 (1-4) 17-18 (0-4) 18-19 (0-3) 19-20 (0-2) 20-07 (0-1)	07-09 (2-3) 09-18 (4) 18-19 (3-4) 19-20 (2-4) 20-21 (1-4) 21-23 (3-4) 23-02 (2-3) 23-02 (1-2) 02-07 (1)	07-09 (3) 09-12 (4) 12-15 (4-3) 15-21 (4) 21-23 (3-4) 23-02 (2-3) 02-06 (1-2) 06-07 (1)
40	07-08 (0-2) 08-09 (1-3) 09-19 (4) 19-21 (2-3) 21-00 (1-2) 00-07 (0-1)	07-08 (2-4) 08-09 (3) 09-15 (4-3) 15-19 (4) 19-21 (3-4) 21-00 (2-4) 00-02 (1-3) 02-06 (1-2) 06-07 (1-3)	07-08 (4) 08-09 (3-2) 09-15 (3-1) 15-17 (4-2) 17-00 (4) 00-02 (3-4) 02-06 (2-4) 06-07 (3-4)	06-07 (4-3) 07-08 (4-2) 08-09 (2-1) 09-15 (1-0) 15-17 (2-0) 17-19 (4-3) 19-06 (4)

80	08-15 (4-3) 15-02 (4) 02-04 (3-4) 04-07 (2-3) 07-08 (3-4)	08-09 (3-2) 09-15 (3-1) 15-18 (4-3) 18-04 (4) 04-07 (3-4) 07-08 (4-3)	08-09 (2-1) 09-15 (1-0) 15-18 (3-1) 18-06 (4) 06-07 (4-3) 07-08 (3-1)	08-09 (1-0) 09-15 (0) 15-18 (1-0) 18-20 (4-1) 20-05 (4) 05-06 (4-3) 06-07 (3-1) 07-08 (1)
160	07-09 (3-2) 09-11 (2-0) 11-17 (1-0) 17-19 (3-2) 19-07 (4)	07-09 (2-1) 09-17 (0) 17-19 (2-1) 19-04 (4) 04-07 (3-2)	07-09 (1-0) 09-17 (0) 17-19 (1-0) 19-21 (4-2) 21-04 (4) 04-06 (2) 06-07 (2-1)	07-19 (0) 19-21 (2-1) 21-04 (4-3) 04-06 (2-1) 06-07 (1-0)

ALASKA November & December 1989 Opening Given in GMT#

TO:	10 Meters	15 Meters	20 Meters	40/80 Meters
Eastern USA	17-18 (1) 18-20 (2) 20-22 (3) 22-00 (2) 00-01 (1)	15-16 (1) 16-17 (2) 17-21 (3) 21-23 (4) 23-00 (3) 00-01 (2)	12-16 (1) 16-18 (2) 18-21 (1) 21-23 (2) 23-02 (3) 02-03 (2) 03-05 (1)	06-12 (1) 07-11 (1)*
Central USA	17-18 (1) 18-20 (2) 20-00 (3) 00-01 (2) 01-02 (1)	15-16 (1) 16-17 (2) 17-20 (3) 20-23 (4) 23-01 (3) 01-02 (2) 02-03 (1)	12-16 (1) 16-18 (2) 18-20 (1) 20-22 (2) 22-00 (3) 00-02 (4) 02-03 (3) 03-04 (2) 04-06 (1)	06-08 (1) 08-13 (2) 13-14 (1) 07-12 (1)*
Western USA	18-19 (1) 19-20 (2) 20-21 (3) 21-23 (4) 23-00 (3) 00-01 (2) 01-02 (1)	16-17 (1) 17-18 (2) 18-20 (3) 20-01 (4) 01-02 (3) 02-03 (2) 03-04 (1)	12-16 (1) 16-18 (2) 18-22 (3) 22-02 (4) 02-04 (3) 04-05 (2) 05-07 (1)	02-03 (1) 03-05 (2) 05-14 (3) 14-15 (2) 15-16 (1) 04-06 (1)* 06-14 (2)* 14-16 (1)*

HAWAII November & December 1989 Openings Given in Hawaiian Standard Time#

TO:	10 Meters	15 Meters	20 Meters	40/80 Meters
Eastern USA	06-07 (1) 07-08 (2) 08-13 (4) 13-14 (3) 14-15 (2) 15-16 (1)	06-07 (1) 07-09 (4) 09-12 (3) 12-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	12-14 (2) 14-17 (4) 17-21 (3) 21-00 (2) 00-06 (1) 06-08 (3) 08-09 (2) 09-12 (1)	17-18 (1) 18-20 (2) 20-02 (3) 02-03 (2) 03-04 (1) 19-20 (1)* 20-01 (2)* 01-03 (1)*
Central USA	06-07 (1) 07-08 (3) 08-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	06-07 (1) 07-09 (4) 09-13 (3) 13-17 (4) 17-19 (3) 19-20 (2)	08-13 (2) 13-14 (3) 14-20 (4) 20-00 (3) 00-02 (2) 02-05 (1) 05-06 (2) 06-08 (3)	17-18 (1) 18-20 (2) 20-21 (3) 21-01 (4) 01-03 (3) 03-04 (2) 04-05 (1) 19-20 (1)* 20-22 (2)* 22-01 (3)* 01-03 (2)* 03-04 (1)*
Western USA	07-08 (1) 08-09 (2) 09-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	06-07 (1) 07-08 (2) 08-12 (3) 12-18 (4) 18-20 (3) 20-21 (2) 21-22 (1)	08-10 (4) 10-15 (3) 15-22 (4) 22-01 (3) 01-04 (2) 04-06 (1) 06-08 (3)	17-18 (1) 18-19 (2) 19-20 (3) 20-03 (4) 03-05 (3) 05-06 (2) 06-07 (1) 19-20 (1)* 20-21 (2)* 21-04 (3)* 04-05 (2)* 05-06 (1)*

#See explanation in "How To Use Short-Skip Charts" in the box at the beginning of this column.

*Indicates best time to listen for 80 Meter openings. Openings on 160 Meters are also likely to occur during those times when 80 Meter openings are shown with a forecast rating of (2), or higher.

Check for 6 Meter openings at times when the 10 Meter forecast rating is shown as (4).

Note: The Alaska and Hawaii Propagation Charts are intended for distance greater than 1300 miles. For openings over shorter distances, use the preceding Short-Skip Propagation Chart.

NEWS OF COMMUNICATION AROUND THE WORLD

DXCC Country Criteria Rule 3 (b)

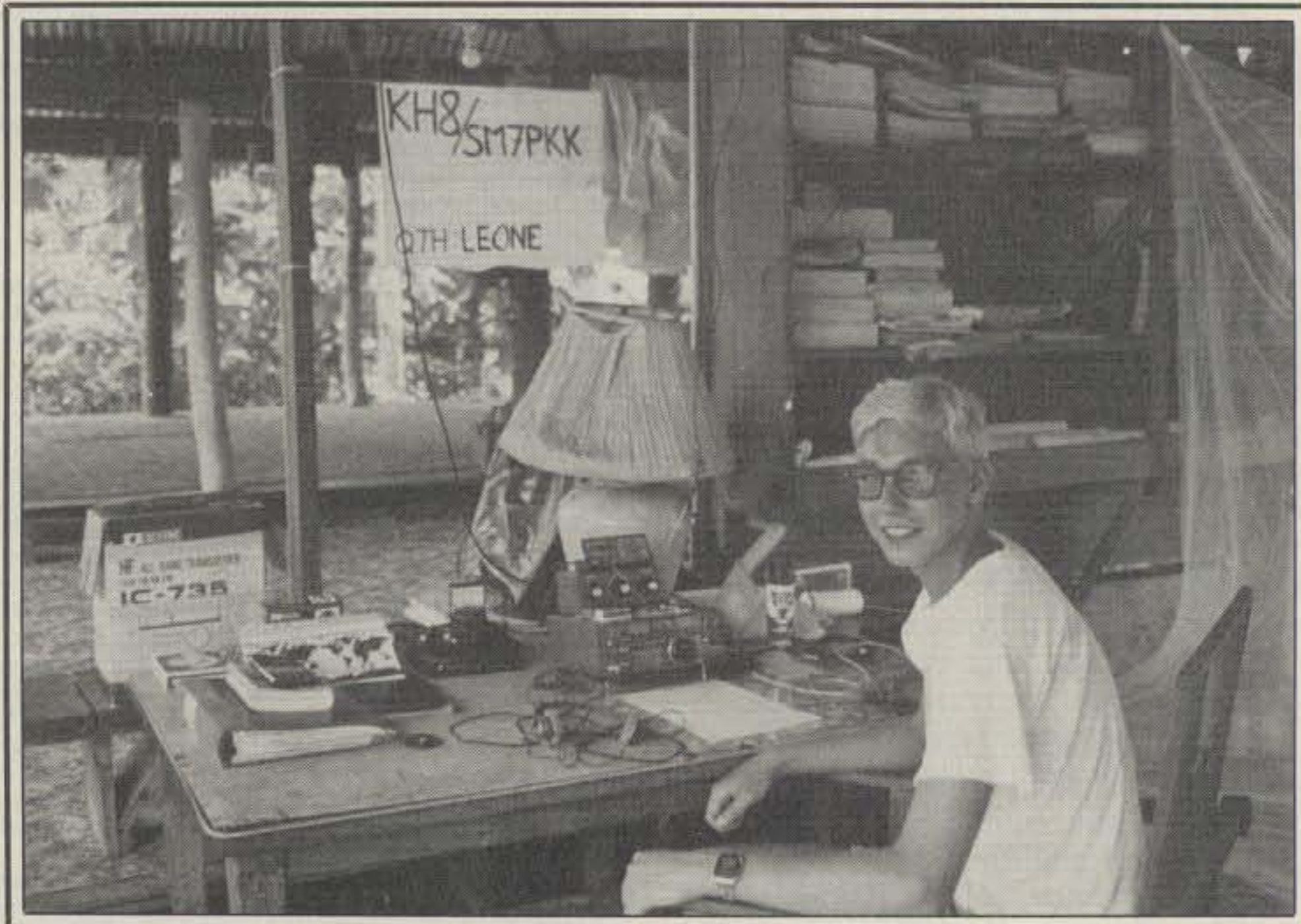
The ARRL DX Advisory Committee (DXAC), under the leadership of then-chairman John Parrott, W4FRU, did an excellent job of rewriting the DXCC rules two years ago. They cleaned up a lot of ambiguous language, and incorporated some of the "secret" country criteria into the published rules, so that DXers around the world would have a better idea of what constitutes, or doesn't constitute, a potential new DXCC country.

In this rewrite, however, the DXAC made one rather serious error—Country Criteria Rule 3 (b). Rule 3 refers to the formation of new DXCC countries by separation of another DXCC country. The previous Rule 3 referred to separation by "foreign land." The new rule substituted "intervening DXCC country" for foreign land, a change that may affect the DXCC status of Walvis Bay.

So far, so good. However, the DXAC added a new section on islands. The previous rule stated that the 75-mile minimum separation pertained to land areas only. "In cases of areas made up of a chain of islands, there is no minimum requirement concerned with separation by foreign land." This is the rule that makes Kure Island in the Hawaiian chain a separate DXCC country, as Midway lies between Kure and the rest of Hawaii.

In the rewrite the phrase "chain of islands" disappeared. The new Rule 3 (b), as written, states that "Where two islands, of the government under Point 1, are totally separated by an intervening DXCC country (also under Point 1), each island counts as a separate DXCC country. No minimum distance is required." The rule goes on to define total separation.

While the rule may appear on the surface to be very similar to the previous wording, the dropping of the "chain of islands" in the new rule has led to an interesting situation. In northwestern Washington state, Tatoosh Island lies off Cape Flattery. Guemes Island, one of the San Juan archipelago that lies between Vancouver Island and mainland Washington, is totally separated from Tatoosh by the southern tip of Vancouver island. Since both the United States and Canada are clearly Point 1 DXCC countries (i.e., have their own independent government), then a literal reading of Rule 3 (b) would sug-



Mats, KH8/SM7PKK, in American Samoa. Note the neat operating table and a very fat logbook on the left.



Mats, SM7PKK's operation hut in Leone, American Samoa. The vertical is suspended over the water at the left.

P.O. Box 50, Fulton, CA 95439



Mats, SM7PKK/ZK1XI, with his portable DXpedition station that he hauled around the Pacific last fall. He's added an amplifier this year.

gest that both Tatoosh and Guemes should be new DXCC countries. Since it is possible to drive to Guemes from the mainland, Tad Cook, KT7H, fired up KT7H/GUE from Guemes on Labor Day weekend, and asked the DXAC to grant separate country status to the island.

Unfortunately for Tad, but probably in the best interests of the DXCC program, current DXAC chairman Rick Roderick, K5UR, had spotted that loophole in Rule 3 (b). At the DX Forum at the Dayton Hamvention Rick announced that the DXAC would not honor any new country applications based on the flawed rule. This announcement was printed in the May 12, 1989 issue of *The DX Bulletin*. Rick subsequently appointed a DXAC subcommittee consisting of Jim Spencer, W0SR, and Bob Beatty, W4VQ (two of the original drafters of the new rules), and Jim Maxwell, W6CF, to suggest a modification of Rule 3 (b) to retain the restriction limiting the rule to island chains.

Without that restriction a host of potential new DXCC countries could emerge. In addition to a handful in the San Juan islands, there are several possibilities in the Great Lakes, such as the Canadian Duck Island and St. Joseph Island, separated by Drummond Island, which is part of Michigan. Some islands in the St. Lawrence Seaway between New York State and Ontario, Canada would also appear to qualify. Even more absurd, however, would be islands off the coast of Maine, and the San Juan islands off Washington. These groups are clearly separated by the part of Ontario province that stretches down to Windsor. Under a strict reading of Rule 3 (b) as written, any pair of islands in these groups would be separate DXCC countries. And these are only some of the

possibilities between the US and Canada. If enterprising DXers armed with maps and rulers can find a half-dozen potential new DXCC countries under the new Rule 2 (separation by water), think what they could do with Rule 3 (b) as written!

Even someone who supports new DXCC countries as much as this writer finds this situation ridiculous. Rick Roderick acted properly in cutting off consideration of any new country applications under Rule 3 (b), and in working toward a modified rule that will prevent a flood of absurd "countries."

Any readers with suggestions on the wording of the modified Rule 3 (b) should send their ideas and explanations to the DXAC c/o ARRL Headquarters.

Mats Persson, SM7PKK Dedicated DXpeditioner

Although the putting a new DXCC country on the air for the first time is the ultimate DX adventure, most DXpeditioners don't start their DX careers at this level. They start small, perhaps with a trip to one of the rental QTHs, such as The Last Resort on Montserrat. Or they join a group for a contest DXpedition to the Caribbean (see below). One young DXer who is starting small, but in a big way, is Mats Persson, SM7PKK.

Last fall, after spending a year in the Swedish army, freezing in the cold Swedish winter, 21-year-old Mats decided he wanted to spend the next winter in a warmer climate—the South Pacific, for example. After writing more than 100 letters to amateurs and other people in Australia and the Pacific, he made plans for an extended, but extremely low-budget, DXpedition. Lacking funds to buy a rig or

The WPX Program

Mixed

1407 YU7FT 1410 IK2LEY
1408 NJ1T 1411 W4USW
1409 OK3CDZ

SSB

2077 KB8DAE 2080 WA6ARG
2078 N4SRK 2081 KB4HBH
2079 I1BRB 2082 K8MDU

CW

2590 JF6TUU 2591 I6DOE

Endorsements

Mixed: 450 YU7FT, W4USW. 500 NX9H, YU7FT, W4USW. 550 NX9H, YU7FT, W4USW. 600 NX9H, YU7FT, W4USW. 650 NX9H, IK2ILH, W4USW. 700 NX9H, W4USW. 750 W4USW. 850 NX0I, 900 NX0I, W9IAL. 1150 KS0Z. 1250 KS3F. 1550 IT9TQH. 1600 IT9TQH, W4UW. 1650 IT9TQH. 1700 IT9TQH, I1EEW. 1750 IT9TQH, I1EEW. 1800 IT9TQH. 1850 IT9TQH, KF2O. 2600 N4NO. 2650 N4NO. 2700 N4NO. 2750 N4NO.

SSB: 350 NJ1T, KB8DAE, I1BRB, KB4HBH, K8MDU. 400 NJ1T, JJ1SBO, I1BRB, KB4HBH, K8MDU. 450 NJ1T, DE0DAQ, I1BRB, K8MDU. 500 K8YVI, NJ1T, K8MDU. 550 NJ1T, K8MDU. 600 NJ1T, K8MDU. 650 IK2AEQ, NJ1T, K8MDU. 700 NX0I. 1000 IK8GCS. 1050 IK8GCS. 1200 KE6KT. 1250 I1HAG, KD9OT. 1300 I1HAG. 1350 IT9TQH. 1400 IT9TQH. 1450 IT9TQH. 1500 IT9TQH. 1550 IT9TQH, I1EEW, W4UW. 1600 IT9TQH, I1EEW, KF2O. 1950 N4NO. 2000 N4NO. 2050 N4NO.

CW: 350 NX0I, KS8W, W4UW, I6DOE, IK0ADY. 400 NX0I, I6DOE. 450 NX0I, DE0DAQ, I6DOE, K0OST. 500 NX0I, I6DOE, K0OST. 550 IK2ECP, I6DOE, K0OST. 600 NJ1T, IK2ECP, I6DOE, K0OST. 650 NJ1T. 950 OZ5UR. 1100 LA9XG. 1150 IT9TQH, LA9XG. 1200 IT9TQH. 1250 IT9TQH, KL7AF, KF2O, 1300 IT9TQH. 1350 IT9TQH. 1400 IT9TQH. 1450 IT9TQH. 1500 IT9TQH. 1750 ZP5JCY. 1800 ZP5JCY. 1850 ZP5JCY. 1900 ZP5JCY. 2300 N4NO. 2350 N4NO. 2650 WA2HZR.

10 Meters: NX0I, KA5RNH, OZ5UR, KB8DAE
15 Meters: NX0I, KA5RNH, K0OST
20 Meters: NX0I, KA5RNH, KA9MOM
40 Meters: NX0I, KA5RNH
80 Meters: KA5RNH
160 Meters: KA5RNH, K0OST

Asia: G4OBK, NX0I, KA5RNH, JF6TUU, K0OST
Africa: G4OBK, KA5RNH, NX0I
No. America: G4OBK, KA5RNH, OZ5UR, K0OST, KA9MOM
So. America: NX0I, KA5RNH
Europe: G4OBK, NX0I, KA5RNH, K0OST, KA9MOM
Oceania: KA5RNH, K16PG

Award of Excellence: YU7SF

Award of Excellence with 160 Meter Endorsement: YU7SF

Award of Excellence Plaque Holders: N3ED, LU3YL/W4, NN4Q, KA3A, VE7WJ, VE7IG, N2AC, 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, W8YTM, YU2DX, OK3EA, I4EAT, OK1MP, N4NO, ZL3GQ, VK9NS, DE0DXM, DK4SY, UR2**, AB9O, FM5WD, I2DMK, W4BOY, I0JX, SM6CST, VE1NG, I1JQJ, WA1JMP, PY2DBU, H18LC, KA5W, K0JN, W4VQ, KF2O, K3UA, HA8XX, HA8UB, W8CNL, K7LJ, W1JR, F9RM, W5UR, WB8ZRL, SM3EVR, CT1FL, K2SHZ, UP1BZZ, W8RSW, WA4QMO, EA7OH, K2POF, DJ4XA, IT9TQH, W8ILC, K2POA, N6JV, W2HG, ONL-4003, VE7DP, K9BG, W5AWT, KB0G, HB9CSA, F6BVB, W1BWS, YU7SF, G4BUE.

Award of Excellence Plaque Holders with 160 Meter Endorsement: N4NO, W8RSW, N4KE, I2UIY, W8ILC, W1BWS, NN4Q, G4BUE, LU3YL/W4, I4EAT, VE7WJ, W9NUF, N4NX, VK9NS, DE0DXM, VE7IG, K9BG, AB9O, FM5UD, SM0DJZ, DK5AD, SM6CST, I1JQJ, W3ARK, H18LC, 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, W4BOY, YU7SF, W5UR.

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.

pay for thousands of QSLs cards, he found help from the European DX Foundation for the cards, and Swedish Radio Supply AB, who loaned him an ICOM 735 transceiver.

With this start, and a vague itinerary, Mats shouldered a 50-pound pack with everything a DXpeditioner could need, and a single change of clothing, and set out on a six-month, multi-country tour.

Mats operated from Hawaii (KH6/SM7PKK), Western Samoa (5W1HK), Tonga (A35KK), Fiji, (3D2KK), American Samoa (KH8/SM7PKK), and the South Cook Islands (ZK1XI). During the trip, Mats made 20,000 contacts, delighting DXers around the world. Most of his operations were from primitive guest houses

and loaned extra rooms in native homes. No high-rise hotels or Club Meds on his budget!

The DXpedition bug bit hard; not long after he returned to Sweden, he started planning his 1989-90 trip. His trip is scheduled to start on October 19, in Fiji, where he will reactivate his 3D2KK call-sign. His itinerary is not fixed; he plans each leg of the trip based on local accommodations and travel possibilities. However, he has his sights on countries such as West Kiribati T30, Western Samoa 5W, South Cooks ZK1, Tokelau ZK3, and American Samoa KH8. Here's what he has to say about his plans.

"Bands: I will try to activate all the regular bands. I will bring additional wires for

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The WAZ Program

10 Meter Phone

338 SV1ADG 339 KF2O

15 Meter Phone

289 SV1ADG 292 TG9VT
290 JR4NUN 293 WA2UUK
291 YC0HET 294 KE4VU

20 Meter Phone

760 SV1ADG 762 JA2URF
761 KC7V 763 N7ER

40 Meter Phone

58 SV0ADG

80 Meter Phone

54 SV1ADC

10 Meter CW

68 N6AV

15 Meter CW

154 K4PR

20 Meter CW

330 WB6APX 333 KC7V
331 WA5TOS 334 WB4TDH
332 WE2P

All Band WAZ

SSB

3380 5Z4BP 3387 IK8EUX
3381 NZ6T 3388 WD0CNU
3382 KF4GW 3389 N9ELY
3383 N4PYD 3390 W0EJ
3384 JH3HTD 3391 YB3ASQ
3385 N4NTQ 3392 KC7V
3386 I2TYM

Phone/CW

6596 VS6UW 6605 W8URM
6597 WY5Q 6606 JA1KWC
6598 SP8EMO 6607 DL6AAP
6599 N7OT 6608 WE6V
6600 PA3CWL 6609 W0EJ
6601 JA2AJA 6610 W0EJ(CW)
6602 PA3DUA 6511 OZ1KWG
6603 KC7V 6512 DK8NB
6604 SP2BKF

Applications and reprints of the latest rules may be obtained by sending a self-addressed stamped envelope (65 cents) size 4 1/2 x 9 1/2 to the WAZ Manager, Leo Hallsman, W4KA, 1044 S.E. 43 Street, Cape Coral, Florida 33904. 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 C.O. awards is \$4.00 for subscribers and \$10 for non-subscribers. In order to qualify for the subscriber rate, please enclose your latest CO mailing label with your application.

WARC-bands and will try to activate some of them; don't expect too much, though.

"Favorite frequencies: I will avoid all kind of nets and lists (one exception, though, on lists: SM7EQL will be QRV every sunrise/sunset to help get Europeans through on 40M, so if you hear me call him or he calls me, don't break in! This is of most concern for European DXers, but we appreciate the cooperation from stateside not to call me during those times.)

"Operating preferences: On CW I will listen at least 5 kHz up from my transmitting frequency. Spread out! I often listen on the edge of a pileup. I prefer if all stations who want to work me give their *whole call sign once!* No more. I write down what I get of one call sign and then say all letters I have noted, then the station with those letters in his call can QSO me, no-

CIRCLE 127 ON READER SERVICE CARD

5 Band WAZ

As of August 1, 1989, 237 stations have attained the 200 zone level.

New recipients of 5 Band WAZ with all 200 Zones worked:

SP8EMO
PY1OL
JR3HZW
I8GS

The top 20 contenders for 5 Band WAZ are:

- | | |
|-----------------|----------------|
| 1. N4WW, 199 | 11. KB0U, 199 |
| 2. W0JLC, 199 | 12. NS7Z, 198 |
| 3. SP9PT, 199 | 13. HA8XX, 198 |
| 4. K6YRA, 199 | 14. K7UR, 198 |
| 5. K9TSQ, 199 | 15. PY7ZZ, 198 |
| 6. SP6CZ, 199 | 16. K6SIK, 198 |
| 7. K9GX, 199 | 17. VE7DX, 198 |
| 8. AA4V, 199 | 18. W0PGI, 198 |
| 9. K2UU, 199 | 19. NY2E, 198 |
| 10. YU2CBM, 199 | 20. K1VKO, 198 |

593 Stations have attained the 150 Zone level, as of August 1st, 1989.

Applications and reprints of the latest rules may be obtained by sending a self-addressed stamped envelope (65 cents) size 4 1/2 x 9 1/2 to the W A Z Manager, Leo Haijsman, W4KA, 1044 S.E. 43 Street, Cape Coral, Florida 33904. 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. In order to qualify for the subscriber rate, please enclose your latest CQ mailing label with your application.



Tack's performance as KH0/JE1CKA in the 1988 CQ WW DX CW Contest was aided by this 15th story, roof-mounted TA33 looking out over the beautiful Pacific.

one else. This goes for SSB also. On SSB I will listen on fixed frequencies which I will announce. If it gets crowded, I will add another listening frequency. Whatever mode you work me on, I will always send your whole callsign once during a QSO. I don't work tailenders, if I can avoid them. If you all follow this, I can work up to six of you per minute according to my old logs. So be quick and no name, state, or shoe size, please.

"QSLs: All QSLs should go to my home call. I am in the callbook since 1986 and the address there is ok. I do not take care

of all cards myself (I have different managers), but for your convenience all QSLs should be sent to me. Please direct with SASE. I prefer Greenstamps (US \$1) over IRCs. All money I receive will go to my DXpedition and there is no way I can pay any expenses for sending QSLs [without return postage]. EUDX-Foundation will print the cards for me. Bureau cards are ok, but it takes a long time before I can deal with them. You can send cards while I am out on my DXpedition. QSLing will be quicker this time.

"Financing: I am sponsored by the European DX Foundation (QSL cards), Swedish Radio Supply (who lent me an ICOM 735, HL-1KGX amp, and a memory keyer), and Naval Electronics AB, who has donated my plane ticket to the Pacific.

"I am, as some who worked me know, 22 years old and at the moment I live for Ham Radio! I live with my parents and I live on a minimum budget with one purpose in mind only: To be able to stay in the Pacific and activate as many countries as possible. I intend to travel as long as I have money to go on. I do not have a high paying job but I can tell my boss that I want to quit and then he will hire me again when I come back. That is the way I want it.

"This time I will work for about six months and all my money goes to my DX account except some for food. By doing that I will be able to stay in Pacific for

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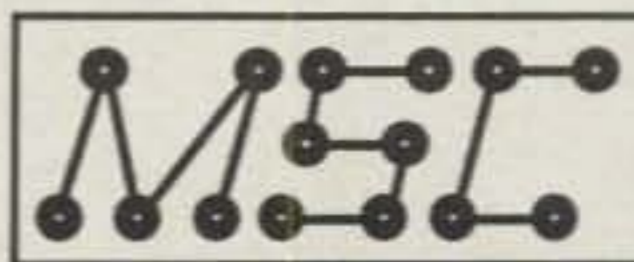


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CQ DX Honor Roll

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 321. 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

W9DWQ	321	K1MEM	316	K8PYD	310	K2OWE	301	N5DX	291	K2JF	283
K2FL	321	N4PN	315	K3UA	310	WB4RUA	300	I8WY	291	JH1VRQ	282
K4CEB	321	DL7AA	315	EA2IA	310	W0SR	300	WA4DAN	291	I2QMU	281
K2TOC	321	N6AV	315	AA6AA	309	DL6QW	300	WA4JTI	290	K7ZR	280
N4JF	320	W1NG	315	K9IW	309	W0HZ	300	KQ9W	290	I5XIM	280
ON4QX	320	N4KG	315	W9RY	308	NN4Q	300	IT9QDS	290	W2LZX	280
K9MM	320	W8KPL	314	IT9ZGY	308	K3FN	298	N4AH	290	W9NUF	280
K6JG	320	K9AB	314	W4OEL	307	DJ7CX	297	W1WAI	290	HB9AFI	279
DL1PM	320	DL8CM	314	N2KW	307	K8LJG	297	W1WLW	289	KA2DIV	279
SM6CST	320	OK1MP	314	SM6CTQ	306	WD9IIX	296	W4BV	289	DL1QT	277
W4BQY	318	N6CW	313	AB4H	304	KD8V	296	K1VHS	289	KA3R	276
SM3EVR	317	W2FXA	312	W6SN	304	N8MC	295	G2GM	289	W6DN	276
K6LEB	317	K6EC	312	K9BWQ	304	W9WAQ	295	K8NA	288	N57Z	276
N6AR	317	YU1HA	312	WA8DXA	302	N5FW	294	W6YQ	287	K4SE	275
W6PT	316	W0IZ	312	W7CNL	302	IT9TQH	294	G2FFO	287	W3BBL	275
K4XO	316	DJ1XP	311	YU2TW	301	WD9IIC	292	W9SC	287	G3KMQ	275
N4MM	316	W6ID	311	I3OBO	301	K4CXY	292	DJ2PJ	286	F3TH	275
DL3RK	316	K9QVB	311								

SSB

K2FL	321	N4KG	316	K8NA	311	I4WZK	305	I8LEL	298	I2EOW	287
W6EUF	321	A18S	316	NJ0C	311	SM6CST	305	JH4PRU	298	N8BJQ	286
W4UG	321	N6AHU	316	N2KW	311	KB4HU	304	EA9IE	298	N3ARK	286
VE1YX	321	VE3MRS	316	W2CC	311	KD8V	304	XE1HI	298	N9CPW	286
K6WR	321	XE1AE	315	A18S	311	KC8YM	304	K5DUT	297	K9MNT	286
EA4DO	321	I8YRK	315	W9OKL	311	I1POR	304	HP1JC	297	KB5RF	285
VE3MR	321	I4ZSQ	315	I8XTX	311	W6MFC	304	YU7KV	297	I8IGS	285
DL9OH	321	I8KDB	315	WB3DNA	311	XE1KS	303	XE1OW	297	KF5AR	285
I8AA	321	K9LKA	315	WA4WTG	311	W2LZX	303	WD9GQV	297	KC7EM	284
YU1HA	321	ON5KL	315	K9HQM	311	KB0U	303	WB3GPR	296	WB3HAZ	283
N4JF	320	OZ8BZ	315	DK2BL	310	K0GT	303	KB3KV	296	VE3MV	283
F9RM	320	K9AB	315	AA6AA	310	G4ADD	303	I0SGF	296	ZP5JCY	283
W9DWQ	320	N6AW	315	WA4JTI	310	KS0Z	303	K8NWD	296	CX4HS	283
TI2HP	320	K1UO	315	AB9O	310	W0ULU	303	W0IYR	295	I4CSP	283
W4DPS	320	W7OM	315	WDBMGQ	310	W4BQY	303	KK0C	295	I8DVJ	283
W0YDB	320	G4CHP	315	KU9I	310	K1MEM	302	G3XTT	295	AE2B	282
K6YRA	320	YV5DFI	315	N6AHV	310	N5FG	302	VE3XO	295	A19R	282
I4LCK	320	KB8DB	315	KB9OC	310	W6FET	302	KI3L	295	TG9EP	282
ZL3NS	320	VE7DX	315	W8IMZ	310	I3OBO	302	IN3ANE	295	N1ALR	282
4Z4DX	320	I4EAT	315	K1MIZ	310	K9UAA	302	WB4PUD	295	WA8YTM	282
OK1MP	320	VE3XN	314	I2QMU	310	KP4EQF	302	I7UNX	295	PY2DBU	281
DJ9ZB	320	YS1RRD	314	NY5L	310	N5FW	302	VE3DLR	295	NP4CC	281
KS2I	320	K8LJG	314	IV3YRN	310	I5EFO	302	WD0BNC	294	NX0I	281
YU1AB	320	K3UA	314	I8KCI	310	KQ9W	302	I5BDE	294	T12LA	281
OZ3SK	319	W3GG	314	N4PN	309	I2MQP	302	WB3CQN	294	K9TI	280
ZS6LW	319	I2LLD	314	WD9IIX	309	XE1MDX	302	KB8O	294	G4FAM	280
W3AZD	319	W1NG	314	K9QVB	309	KE4HX	302	K4JLD	293	KU9Z	280
N4MM	319	W1LQQ	314	K4CXY	309	WA3HUP	301	K4SE	293	XE1XM	280
W4EEE	319	SM4CTT	314	W2FGY	309	VE3FJE	301	KC8JH	293	WD9IIC	280
ZL1AGO	319	W6SN	314	KR9O	309	WB4NDX	301	A15I	293	W9VA	280
K9MM	319	WB4UBD	314	W6NLG	309	YU2TW	301	W9NUF	293	KB5DN	279
N7RO	319	KZ2P	314	W4UW	309	N4CRU	301	KD5ZM	293	EA6DE	279
I0ZV	319	K9IW	314	VK4VC	308	KZ0C	301	WB6OKK	293	JH8NYK	279
W0SFU	319	W7FP	313	YV5AIP	308	N8BKF	301	W5LLU	293	KX5V	279
K6JG	319	EA4LH	313	N6AV	308	WT4T	301	VE6PW	293	N6CGB	279
OZ5EV	319	W8PCA	313	A18M	308	KB2HK	301	WA4LOF	292	WN5K	279
IT9ZGY	319	N2SS	313	NS7Z	308	K7LAY	301	AC0A	292	K4BYK	278
VE3GMT	318	VE7WJ	313	YV1AJ	308	AG9S	301	VE3FEA	292	VE3IUE	278
W9JT	318	OE2EGL	313	WA4DAN	308	KB9KD	301	VP9CP	292	WA8IUM	278
PY1APS	318	ZL1BIL	313	XE1OX	308	K2JF	301	W8LKG	292	DF6EX	278
YV1KZ	318	K2JLA	313	K8CMO	308	WE2L	301	SV1JG	292	KG9N	278
VE2WY	318	WZ4I	313	WB1DQC	307	KE4VU	301	VE3IPR	291	I8WYD	278
W9SS	318	IT9TGO	313	I0MBX	307	VE4AT	300	W4JFE	291	WB0UFL	277
W4NKI	318	K0GT	313	KV2S	307	SV8CS	300	DU9RG	291	W4PTT	277
DL6KG	318	F2MO	312	VK3JF	307	G4GED	300	XE1CI	291	KB0SY	277
OE3WWB	318	W0SD	312	NJ2C	307	WB5TED	300	KB2MY	291	WD0DMN	277
K5OVC	318	K9RF	312	VE4SK	307	I2ZGC	300	ZL1BOQ	291	K8YVI	277
YS1GMV	318	K4MQG	312	KB3OQ	307	NW5K	300	KB7VD	291	N0AMI	276
W8ILC	318	K9HDZ	312	KA9ABC	307	WB6GFJ	300	KB1JU	291	N7ASL	276
N6AR	318	LA7JO	312	W4UNP	307	JH1VRQ	300	KF5DX	291	WA4OPW	276
DJ1XP	317	LU3YL	312	WA2MID	307	WB6PSY	300	VE3CKP	290	KC2RS	276
KD8VM	317	N6OC	312	WA4ECA	307	IT9TQH	300	KC2FC	290	WA9IVU	276
W2SUA	317	W6DN	312	N4KE	306	K4LR	300	F6BFI	290	WA9RCQ	276
CT1FL	317	9H4G	312	KB5FU	306	KA3HXO	300	JA5PUL	289	K0HQW	276
N4WF	317	W4UNP	312	KE3A	306	IK8BQE	300	W9TA	289	I2WZX	276
K9BWQ	317	KC8EU	312	K3LUE	306	WA2FKF	300	A19U	289	KA5YCM	276
EA2IA	317	SV1ADG	312	W6BCQ	306	K1VHS	300	OK1AWZ	288	WB1EAZ	275
I0AMU	316	NA5W	312	WD8PUG	306	IK8CNT	300	WA6DTG	288	VE7BSM	275
IBACB	316	W8ILC/QRPP	312	KZ8Y	305	WA0TKJ	299	KA9TNZ	288	VE5FX	275
K8PYD	316	NN4Q	312	K8VJV	305	I6PLN	299	EA3KW	287	W0FF	275
K4XO	316	W4SSU	311	EA1QF	305	KA8T	299	AB9E	287	I8INW	275
OA4OS	316	K6EC	311	K4RIG	305	DJ7CX	298	W9SC	287	WB8TLI	275
W8JXM	316	W0SR	311	K8ZZU	305	K9SM	298	PA0XPQ	287		



Mike Smedal, 5B4TI, his wife, Maryam, 5B4WW, and his daughter, Annahita in his Nicosia, Cyprus shack. Mike is the only DXer to earn the difficult 5-Band WAZ award from two separate countries. He also earned the award as A71AD.

about six months. Less if I get to places like Canton. When my money is exhausted, I have to go home and work up more money for another DXpedition. At least one more will come after this one. If anyone likes my DXpeditions and wants to contribute, I would greatly appreciate any financial support from any person or DX organization, as long as I and I alone decide what or where to go. I can guarantee, though, that any contribution would not be wasted. They would come back in terms of more QSOs and activated places.

Equipment: I will use an IC-735 with special made CW filters, and a ETM-8c memory-keyer. Amplifier is a Tokyo Hi-Power HL-1KGX Power Amp with 500 watts output on all bands. Main antenna

CQ DX Awards Program

SSB

1700	EA7GFG	1703	EA7HO
1701	KV1M	1704	CE7ZK
1702	EA3EJI	1705	I2QMU

CW

756	EA3FAG	758	I2QMU
757	NJ1T	759	K14FW

SSB Endorsements

320	EA4DO/321	310	IT9TGO/313
320	VE3MR/321	310	NN4Q/312
320	YU1HA/321	310	I2QMU/310
320	KS2I/320	300	W4UW/309
320	YU1AB/320	300	WA4ECA/307
310	IT9ZGY/319	300	KB0SY/304
310	EA2IA/317	275	VE3DLR/295
310	VE3MRS/316	275	KF5DX/291
310	G4CHP/315	275	K8YVI/277
310	W6SN/314	250	KC4MJ/267
310	KZ2P/314	250	K14FW/250
310	WB4UBD/314	150	N8HUR/160
310	ZL1BIL/313	150	K2EEK/150

CW Endorsements

310	EA2IA/310	300	W0HZ/300
300	NN4Q/309	275	I2QMU/281
300	IT9ZGY/308	200	NJ1T/215
300	K2OWE/301		

Total number of active countries is 321. 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.

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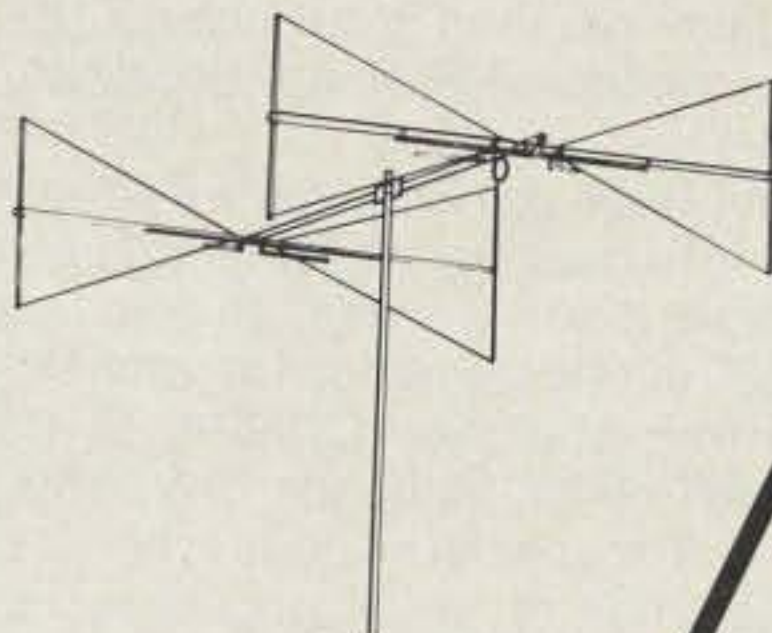
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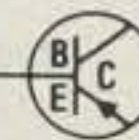
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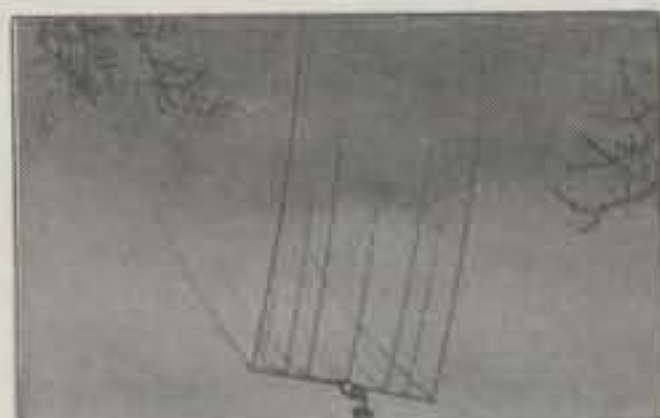
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Mats is a fine example of the next generation of DXpeditions. His dedication and enthusiasm for his travels, and his skills on the air, will be of great benefit to the DX community for years to come. For example, Mats logs with his left hand while sending CW with his right, a most efficient arrangement. He is very resourceful, and can make the most of minimal operating conditions. (For a more complete story of Mats first Pacific DXpedition, see the October, 1989, issue of *The DX Magazine*.)

Mats' QSL managers use a computer program to find contacts by callsign. This means if you send Mats a QSL card for one contact from each different country, he will confirm all contacts for that callsign with your station. More DXpeditions should look into the use of computers for speeding the QSL chores.

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November DX Events

The New England DX Convention will be held at the Sturbridge-Sheraton Hotel in Sturbridge, Massachusetts on Saturday, November 18. The afternoon session of DX presentations begins at 1 PM, and the dinner sessions begin at 6 PM. For more information or reservations, contact Chairman Fred Lucas, K1EFI, 72 Long Meadow Hill Road, Brookfield, CT 06804.

The Rede dos Emissores Portugueses (the IARU society of Portugal) will offer an award for working all four special CT500 during the period December 1-12. The four stations—CT500A, B, C, and D—will be on all bands, CW, SSB, and RTTY. The special prefix is in honor of the discoveries of the Portugueses navigators five centuries ago. (With the change in the Worked All Prefix rules this year, CT500 is a separate prefix from CT5.) Stations that work all four CT500 stations (or SWLs who hear all four) can send their log data and US \$5 or 8 IRCs to REP Award Manager, P.O. Box 2483, 1112 Lisboa, Portugal.

CQ WW CW DXpeditions

Here are some of the planned DXpeditions for the CQ WW CW Contest November 25-26.

4U1ITU in the multi-multi category, with operators N7BG, KC7V, K5VT, W7CB, W6OUL, W6MSG, WZ6Z, W6RGG, N2IC, N6VI, G3SXW, and ON4UN. QSL this operation to KC7V.

EA1AK will be on as **EA9EA** in the single-op category.

Lars, SM5GMG, will make a serious effort to break the single-op, all-band record in CQ WW CW from Madeira CT3. He'll be on from the Atlantis Hotel November 20-29. QSL home call.

Meanwhile, a very large, multi-national group will also be on from Madeira as **CR3A**. The group includes operators from Switzerland, Germany, Finland, USSR, Portugal, Spain, Sweden, and Madeira. QSL to Luis Camacho, CT3EE, P.O. Box 4055, P-9051 Funchul Codex, Madeira Island. (Anyone who misses the CT3 multiplier this year didn't turn on his rig.)

CQ WPX Director Steve Bolia and other members of the Southwest Ohio DX Association will be on from St. Lucia in a multi-multi operation as **J6DX**. QSL to W8UMD.

Other operations include **KC6MX** from Palau (formerly Western Carolines) by Charlotte Richardson, KQ1F, and Paul Young, K1XM; **VP2MU** from The Last Resort by Chuck Word, NF6S; and **8P9HT** by John Laney, K4BAI. QSL each of these to the operators' home callsigns. For the last word on contest operations, see the November 17th issue of *The DX Bulletin*.

Shortly Noted

The American Amateur Radio Club of

Korea recently came across 55 pounds of QSL cards for HL9 amateurs dating back as long as 10 years. They would like to forward these cards to the long-gone operators. If you held an HL9 callsign in the past ten years, or known someone who did, send the callsign and valid dates to the club at P.O. Box 153, APO San Francisco 96206.

The struggle of independence of the Russian republics has spilled over into amateur radio. A delegation from the Worldwide Lithuanian Amateur Radio Net met with International Amateur Radio Union officials at ARRL Headquarters in June. They discussed possible IARU membership for the Lietuvos Radijo Megeju Draugija, the Lithuanian Amateur Radio Society. Sakalas Uzdavinys, UP2BO, said that the LRMD will apply for membership in the IARU soon. The Lithuanians are also trying to regain their LY prefix. They have obtained permission to use that prefix for one month in each of the past two years.

QSL Information

08T6C to T10RC	JY9SR to W3FYT
3A/K8CD to K8CD	KN8E/KH3 to K9IUY
3B9FR to F6FNU	LX1RQ to SP5SJD
3D2AK to VE7YL	N2HNO/KH8 to JH4IFF
3D2HL to DJ6JC	OHBAC to OH2NM
3D2RJ to ZL1BQD	OX/OZ1LQH to OZ1LLC
3D2SI to DJ6SI	OX/OZ3AC to OZ1LLC
3D2VT to DJ6SI	P29RE to KE0KR
3D2WV to DK2WV	PABGAM/9L to PA0GIN
3D2XV to VK2BCH	PABGAM/ST2 to PA0GIN
4L8X to UA0IAP	PY0FF to W9VA
4L1FS to UA1DJ	R1Z to UA1ZX
4L1ORQ to UW3AA	RAABAD/JJ to RA9YD
4Z4AB to K3STM	RF6FO to UF6FFF
5H3TW to K3ZO	RI10A to U18OAA
5N8UD8 to DL3VD	RT6U/UJ8JW to RT4UA
5R8JD to F6FNU	S79EHT to G4IRG
5V4DP to KA1DE	S79MX to HB9MX
5W1IG to JA3RCT	SU1EE to WA9INK
5Z4FO to KB4EKY	SV8EK to N1DSC
6Z2WK to G3OCA	T38BC to ZL2QW
7X4AN to DJ2BW	T38XDK to GM4CKM
9H3IN to HB9DLE	T32AB to N7YL
9M2AX to JA5DQH	T32IO to AH6IO
9M2SG to DL1DA	T32PO to NH6PO
9M2ZZ to N4RMF	T5YD to F6AJA
9M8STA to 9M2AX	TA1A0 to TA1AZ
9Q58G to F5JT	TF1/DK2SCQ to DL6DK
9Q5DX to KQ3S	TF9CW to TF3CW
9V8WW to 9V1WW	TJ1MW to N4MUJ
9V8YB to OH1NYP	TL8HB to WB8TGP
9V8YC to K9EL	TL8JL to K4UTE
9V1YB to OH1NYP	TL8RM to F6FNU
9X5AA to W4FRU	TW6XGA to LA6XGA
9X5KP to W4IEN	TZ8MAR to DJ5RT
A61AC to ON7LX	UA10T to UB5KW
BV2A to K2CM	UA6WCG/UA88 to UA6WAW
BV2FA to DJ9ZB	UB5MAL/UA10 to UZ1PWA
C38LBS to IK1CJT	UD6DKW to W3HNK
CG5ZX to VE5ZX	VE8VFC to VE7HQ
CL7CW to CO2AA	VK8AE to VK2DEJ
CN8ST to F2CW	VK8GC to VK9NS
CY8DXX to VE1AL	VP2VM to KW1K
D68JL to AK1E	VP5JM to W3HNK
EAB/OH2BH to OH2RF	VQ9MC to K8QMC
EC9JB to EA9IB	VQ9RF to WB9NYG
F89/FR4FD to F6FYA	VQ9TC to N0JCV
FH5EF to F6EZV	VR6ID to KB6ISL
FK8BM to F6BHX	VR6TC to W6HS
FR4FD to F6FYA	VU2GI to N2HOS
FT4ZE to F2CW	XE2MX to K6UNX
FY5YE to W5JLU	XT2CW to DK7PE
H13JH to F6FNU	XX9JH to KU9C
HL58DS to HL1ASS	YJ8JS to N4EVS
HL9JT to WX4O	YK1AA to DJ9ZB
HSBYDY to JH7FQK	YN3ACZ to NT7S
HV3SJ to I0DUD	YY5LB to YV5AJ
HZ1AB to K8PYD	ZA/SV3MD to SV3MD
J52US to WA8JOC	ZD8SE to G3XKR
JW6XGA to LA6XGA	ZD8XX to W4FRU
JX7DFA to LA2KD	ZS8MI to ZS6PT
JY8GI to ND0F	ZV7AA to PT7AA

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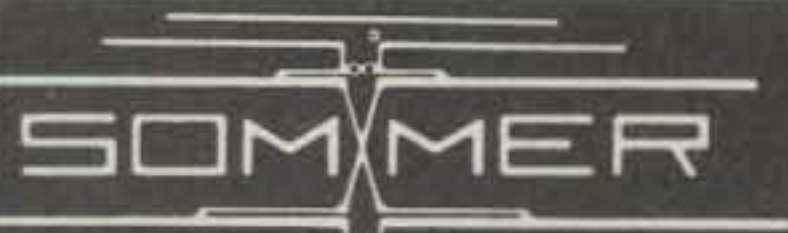
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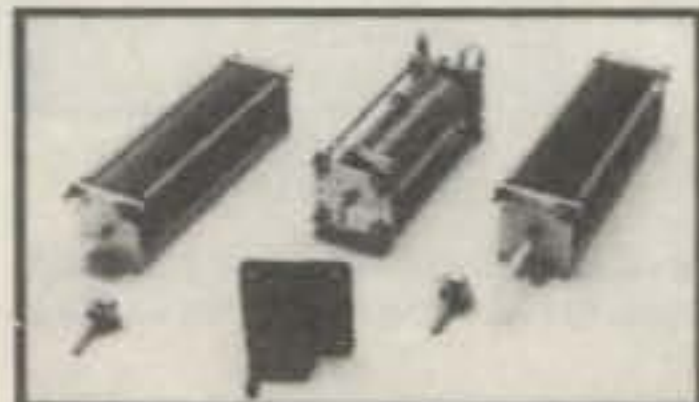
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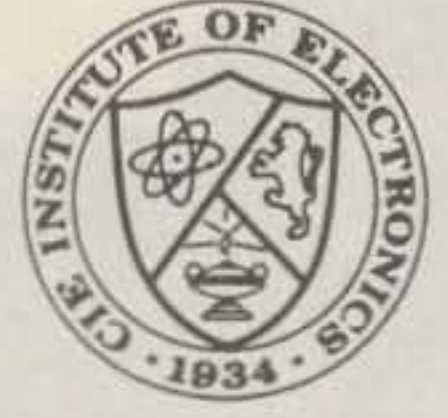
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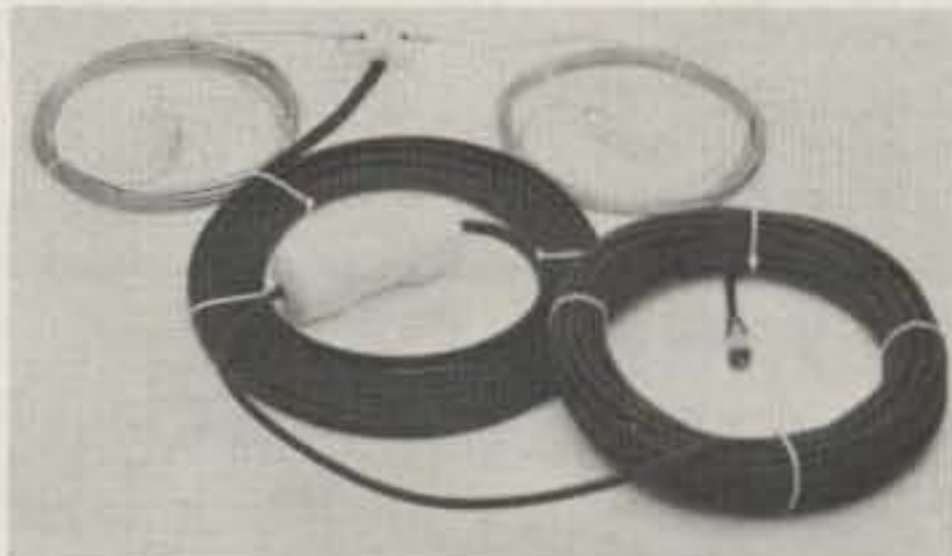
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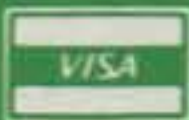
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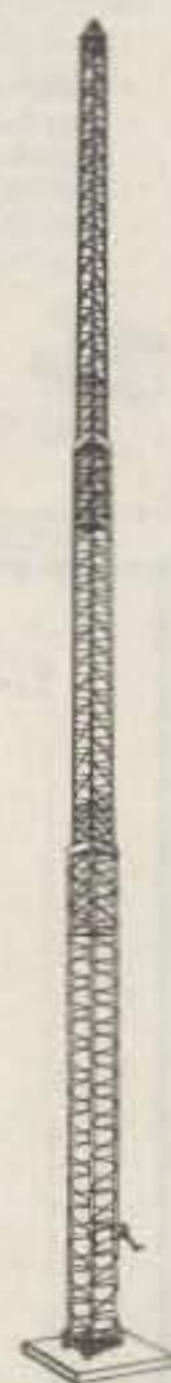
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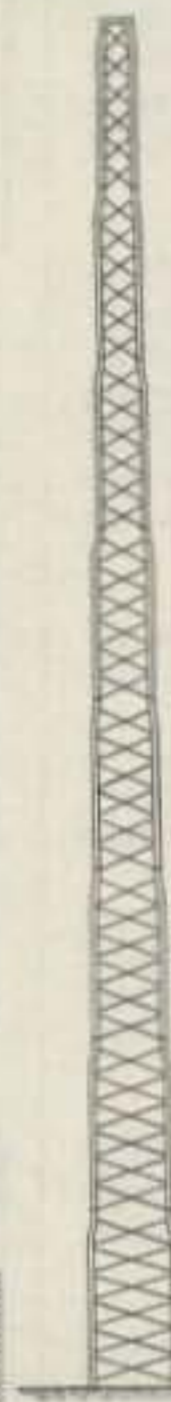
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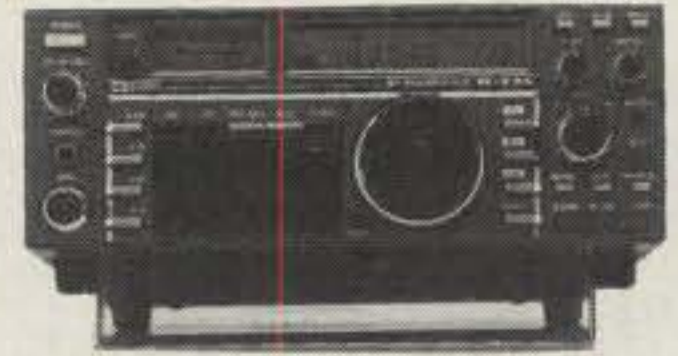
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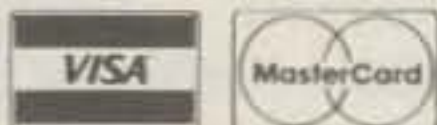
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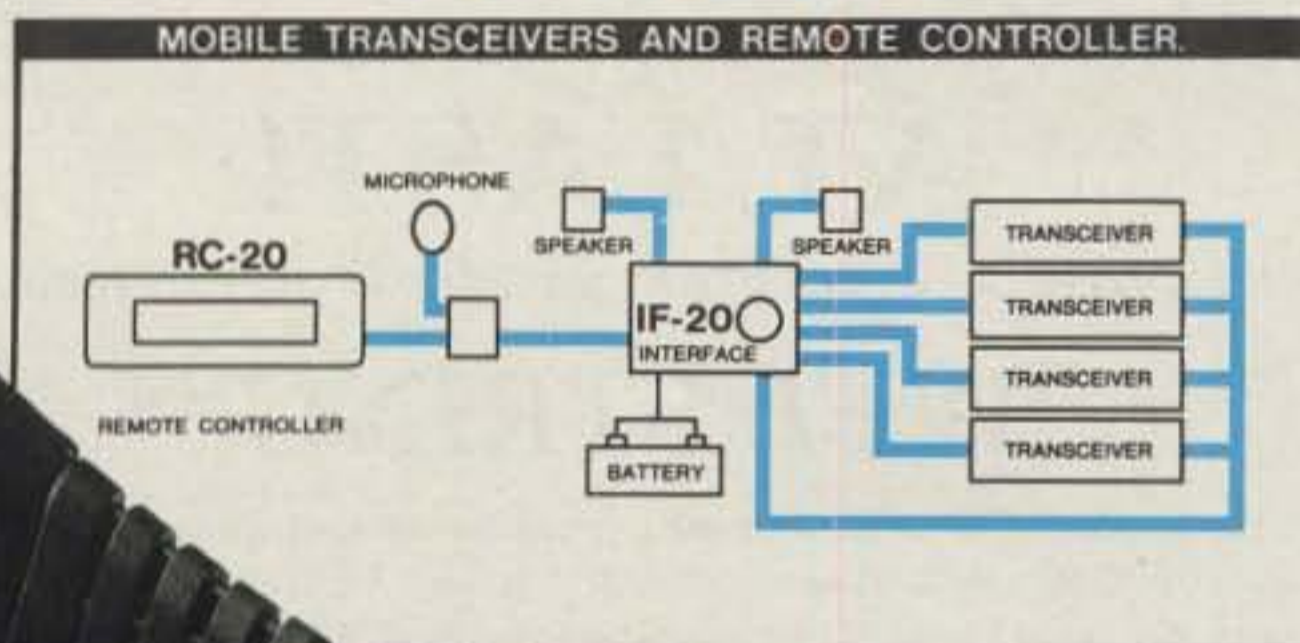
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- **High performance—high power!** 50W (TM-231A), 35W (TM-431A) with a 3 position power switch (high, medium, low).
- **Optional full-function remote controller (RC-20).**

A full-function remote controller using the Kenwood bus line, model RC-20, may be easily connected to the TM-231A/431A/531A and can be mounted in any convenient location. Using the IF-20 interface the RC-20 may be connected to four mobile transceivers. (TM-231A/431A/531A or the TM-701A)

- **Multi-function DTMF mic. supplied.** Controls are provided on the microphone for CALL (Call Channel), VFO, MR (Memory Call or to change the memory channel) and a programmable function key. The programmable key can be used to control one of the following on the radio: MHz, T.ALT. TONE, REV, DRS, LOW or MONITOR.
- **Easy-to-operate illuminated keys.** A functionally designed control panel with backlit keys increases the convenience and ease of operation during night-time use.
- **Auto repeater offset on 144 and 220 MHz.**
- **Built-in digital VFO.**
 - a) **Selection of the frequency step (5, 10, 15, 20, 12.5, 25kHz)**
*TM-531A: 10, 20, 12.5 25kHz
 - b) **Programmable VFO**
The user friendly programmable VFO allows the operator to select and program variable tuning ranges in 1 MHz band increments.

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Optional Accessories

- **RC-20** Full-function remote controller
- **RC-10** Multi-function remote controller
- **IF-20** Interface unit handset
- **DRU-1** Digital recording unit
- **MC-44** Multi-function hand mic.
- **MC-44DM** Multi-function hand mic. with auto-patch
- **MC-48B** 16-key DTMF hand mic.
- **MC-55** 8-pin mobile mic.
- **MC-60A/80/85** Desk-top mics.
- **MA-700**

- Dual band (2m/70cm) mobile antenna (mount not supplied)
- **SP-41** Compact mobile speaker
- **SP-50B** Mobile speaker
- **PS-430** Power supply
- **PS-50** Heavy-duty power supply
- **MB-201** Mobile mount
- **PG-2N** Power cable
- **PG-3B** DC line noise filter
- **PG-4H** Interface connecting cable
- **PG-4J** Extension cable kit
- **TSU-6** CTCSS unit

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WANTED: Collins Speaker, F455B-60 filter, and 148C-1 FM unit for 75A-3. Also HP606A manual. Don, KC9PO, 809 Spear Dr., Normal, IL 61761.

TRADE: ICOM AT-100 auto tuner for TR-7950, TM-201, IC-27A, etc. K1LEC, N. Springfield, VT 05150-0073 (802-886-8121).

COLLECTORS: 1936-40 Radio Handbooks. 1932, 39, 40, 41, 62 ARRL Handbooks. 1939, 1940, 1949, 1955 ARRL Ant Books (1944 without cover). W3CJL, 2705 Andrea Drive, Allentown, PA 18103 (215-433-4485).

WANTED: Circuit for R.I.T. mod. for Heath HW101. D.C. Pugh, 4660-125 N. River Road, Oceanside, CA 92056.

WANTED: Schematic for Hallicrafter SR 2000 Hurricane receiver. Will pay costs. B. Phegley, 3940 NW 4 Ct., Coconut Creek, FL 33066.

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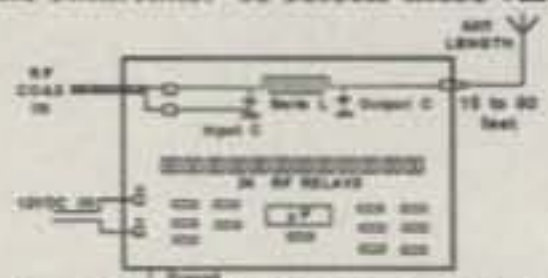


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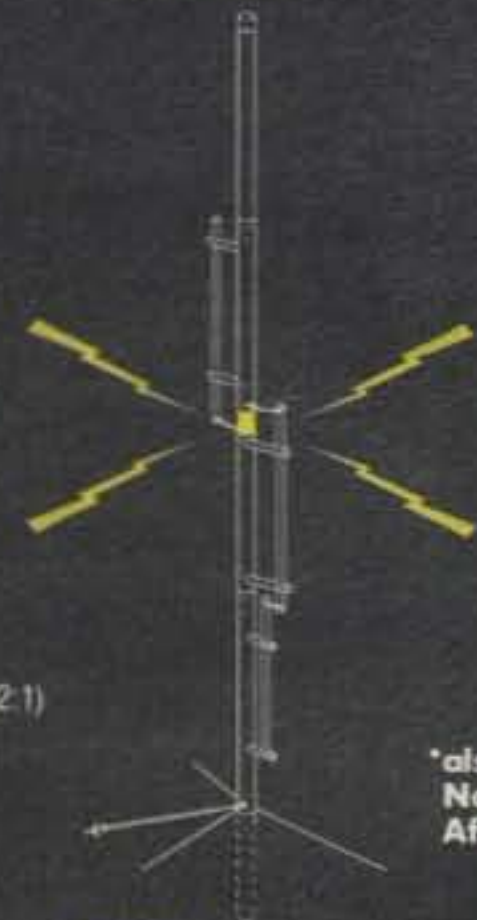
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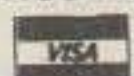
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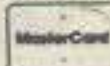
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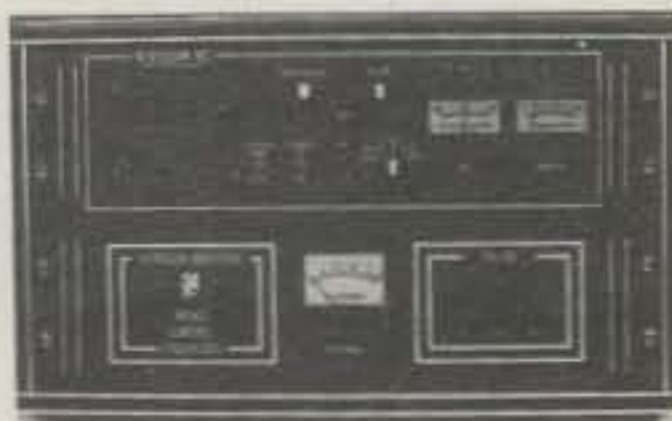
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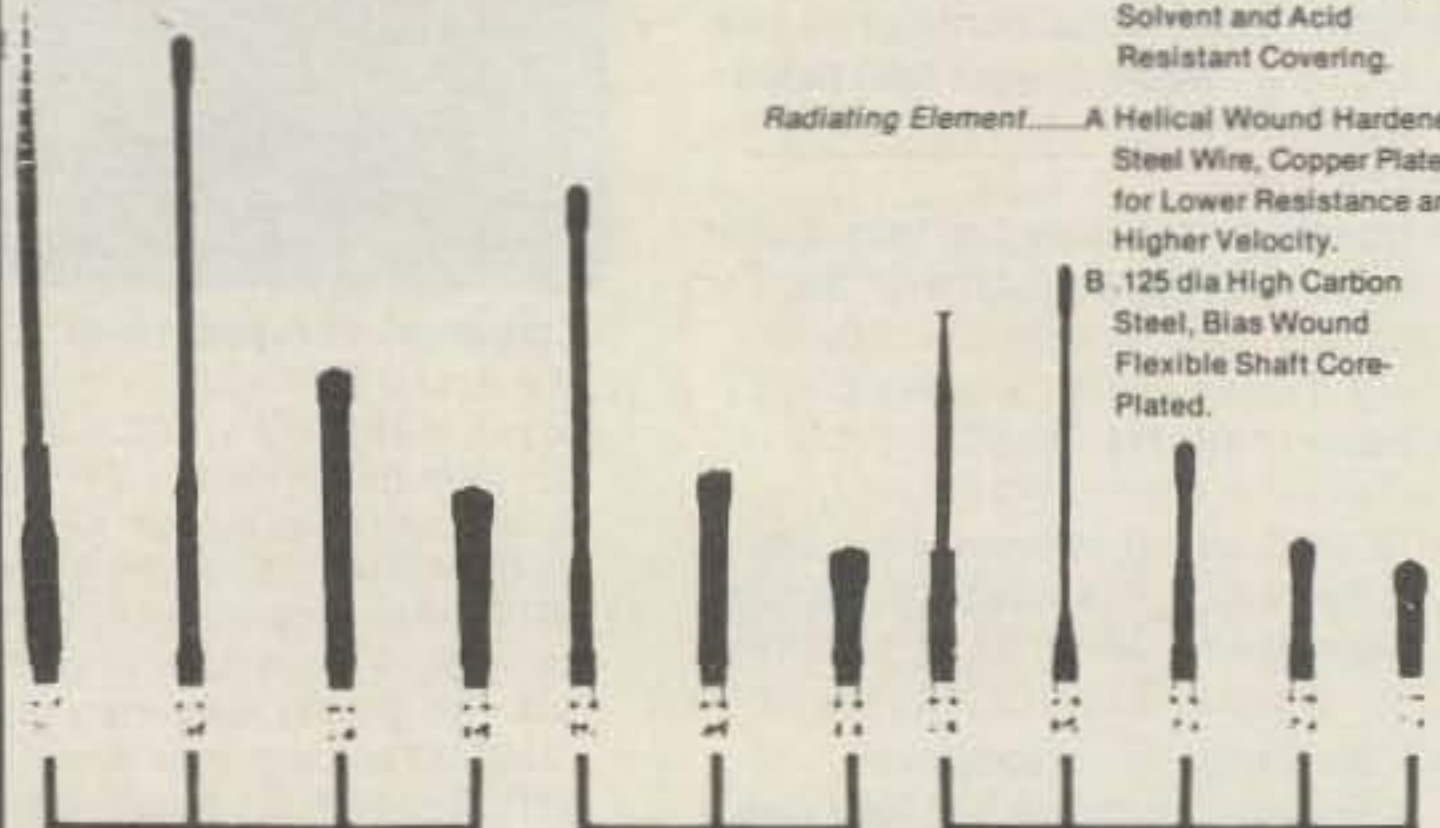
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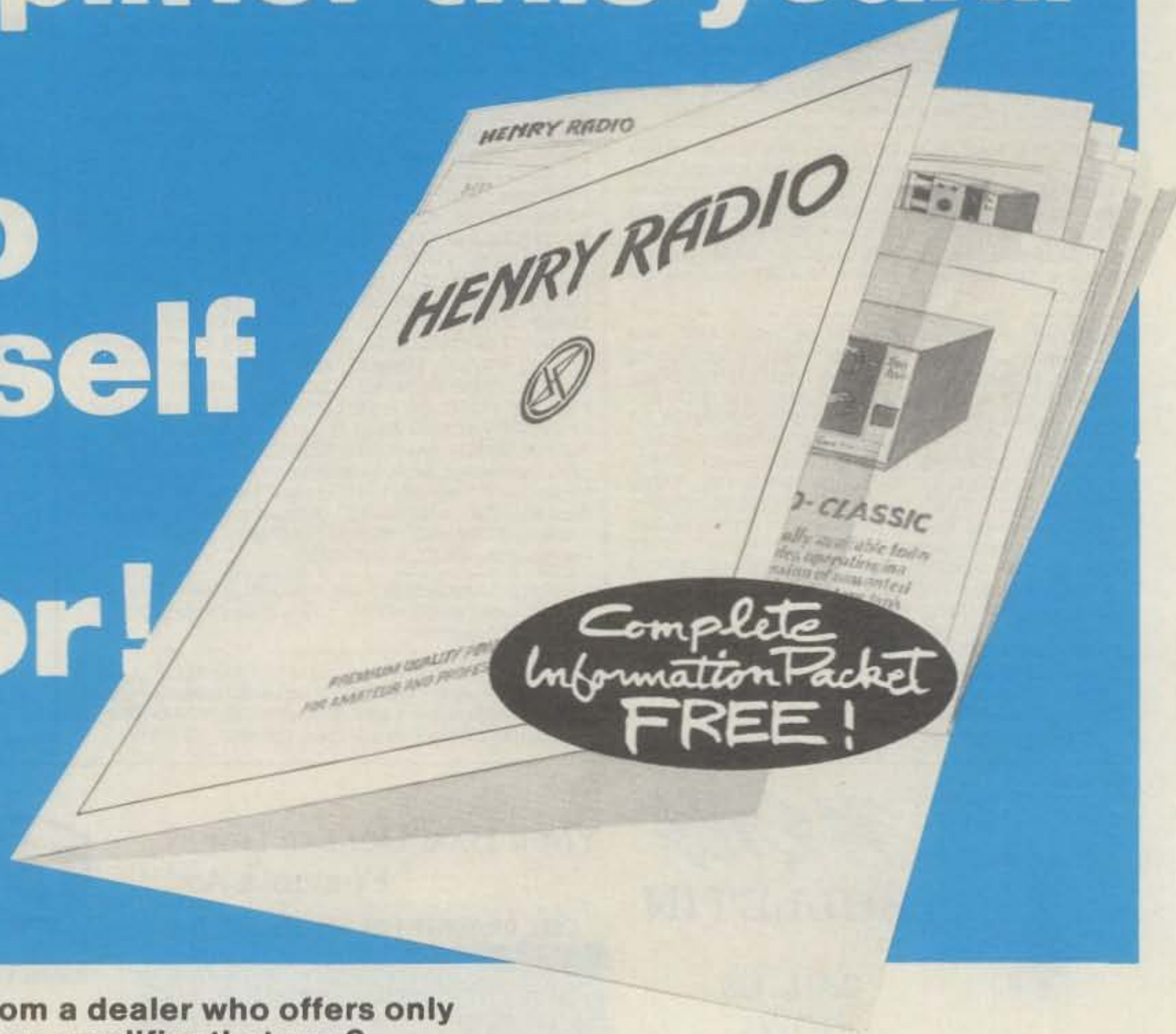
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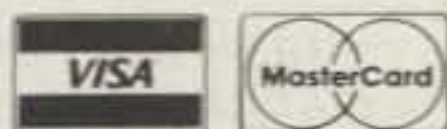
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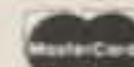
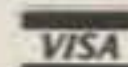


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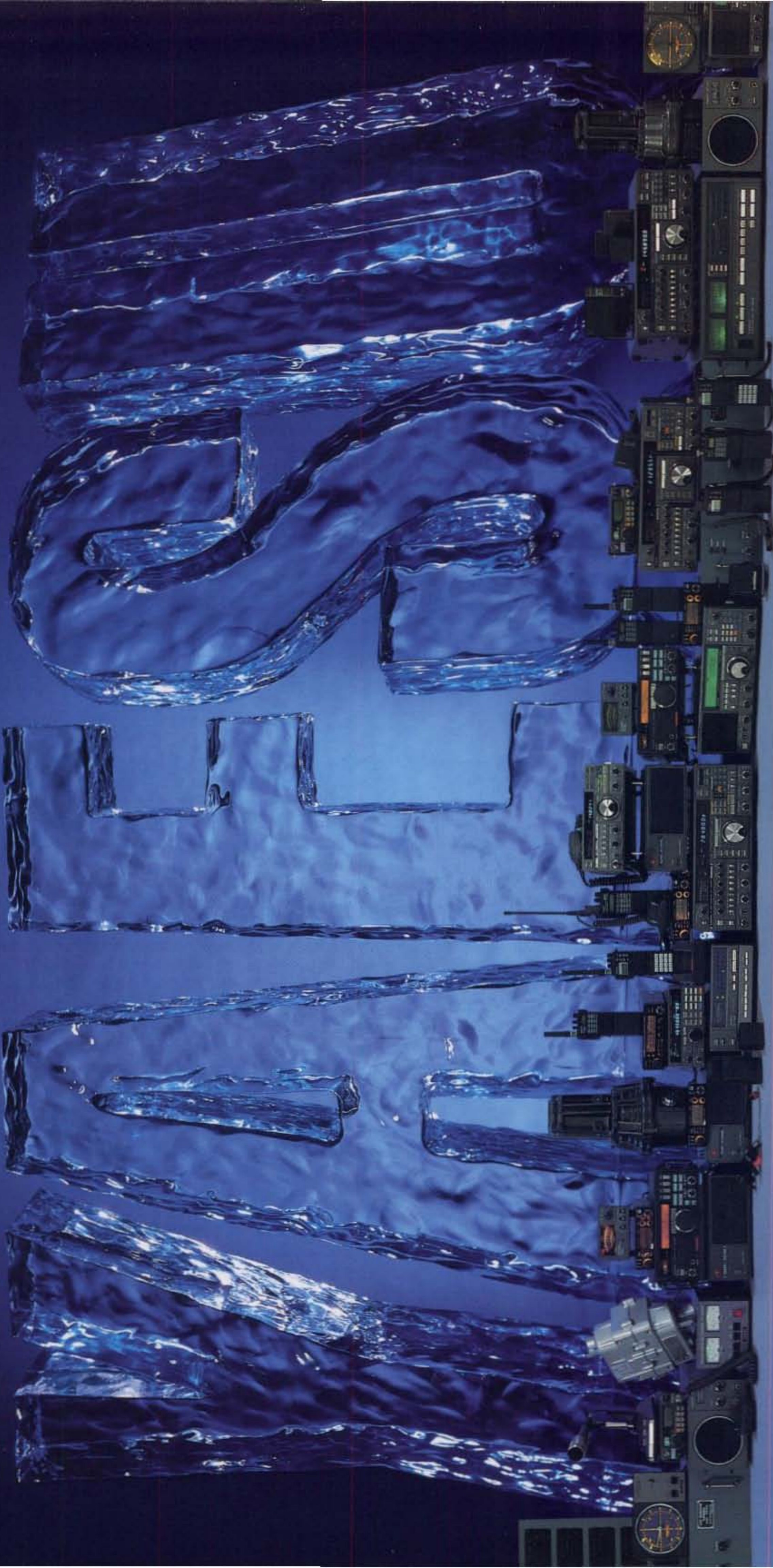
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