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Amateur Radio

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**HAM
RADIO**



**CQ WW WPX CW Contest
Results Begin On Page 11**



THE RADIO AMATEUR'S JOURNAL

KENWOOD

Our new TS-850S just made the competition obsolete

No competition class transceiver is even in the same ballpark as the TS-850S.

You'll find a superior intermodulation dynamic range of 108 dB throughout the entire 100 kHz to 30 MHz range.

Kenwood's optional DSP-100 Digital Signal Processor (DSP) converts audio signals to digital information, where it is shaped and processed by a microprocessor. For SSB work, this means a cleaner signal, and for CW, it allows adjustment of the rise and fall times for optimum waveshape. The DSP-100 also works at the

receiver detector level for audio shaping, in all modes.

Other advanced technology in the TS-850S includes 10 Hz step dual VFOs, multi-mode scanning, full and semi break-in CW, superior interference reduction, keyer, dual noise blanker, and RIT/XIT. 100 memory channels store, transmit, and receive frequencies independently. High boost for SSB signal "punch." Microphone supplied.

The Kenwood TS-850S. All band. All mode. One year warranty. In a class by itself!

Key options.

DSP-100 Digital Signal Processor.

AT-300 160 - 10 m external antenna tuner.
AT-850 160 - 10 m internal antenna tuner.
DRU-2 Internal digital recording unit.
IF-232C Computer interface. PG-2X DC cable. PS-52 Power supply. SO-2 TCXO. SP-31 Matching external speaker. VS-2 Voice synthesizer. YG-455C-1 500 Hz CW filter for 455 kHz IF. YG-455CN-1 250 Hz CW filter for 455 kHz IF. YK-88C-1 500 Hz CW filter for 8.83 MHz IF. YK-88CN-1 270 Hz CW filter for 8.83 MHz IF. YK-88SN-1 1.8 kHz SSB filter for 8.83 MHz IF.

KENWOOD U.S.A. CORPORATION
COMMUNICATIONS & TEST EQUIPMENT GROUP
P.O. BOX 22745, 2201 E. Dominguez Street
Long Beach, CA 90801-5745
KENWOOD ELECTRONICS CANADA INC.
P.O. BOX 1075, 959 Gana Court
Mississauga, Ontario, Canada L4T 4C2



Kenwood meets or exceeds all specifications. Contact your dealer for a complete listing of specifications and accessories. Specifications are subject to change without notice. Complete service manuals are available for all Kenwood transceivers and most accessories. *One year warranty in the U.S.A. only.

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... pacesetter in Amateur Radio

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TM-731A/631A 144/450 and 144/220 MHz FM Dual Banders

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

- **Full duplex operation.**
- **Dimmer switch.**
- **16 key DTMF/control mic. included.**
- **Frequency (dial) lock.**

Optional Accessories:

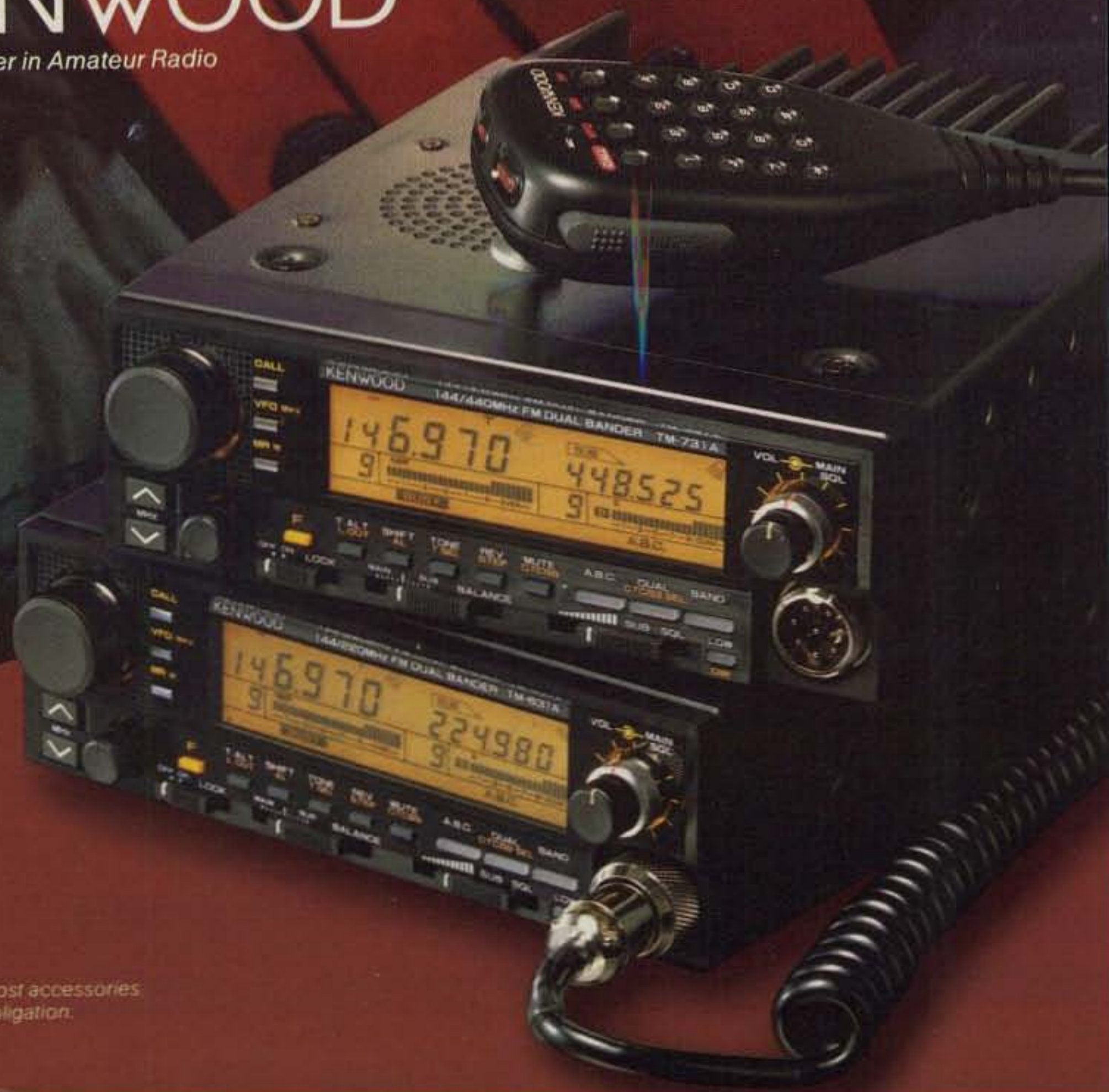
- **PG-4H** Extra interface cable for IF-20 (for three to four radios)
- **PG-4J** Extension cable kit for IF-20 DC and audio
- **PS-430** Power supply
- **TSU-6** CTCSS decode unit
- **SWT-1** 2 m antenna tuner
- **SWT-2** 70 cm antenna tuner
- **SP-41** Compact mobile speaker
- **SP-50B** Deluxe mobile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

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"Dynamic Duals"



KENWOOD



TS-950SD

"DX-clusive" HF Transceiver

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

• **Dual Frequency Receive Function.**

The TS-950SD can receive two frequencies simultaneously.

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

• **New high voltage final amplifier.**

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

• **New! Built-in microprocessor controlled automatic antenna tuner.**
• **Outstanding general coverage receiver performance and sensitivity.**

Kenwood's Dyna-Mix™ high sensitivity direct mixing system provides incredible performance from 100 kHz to 30 MHz. The intermodulation dynamic range is 105 dB.

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

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

The Ultimate Signal.



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

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

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

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

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

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

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

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The Radio Amateur's Journal



ON THE COVER: The hand that works the key belongs to con-
 tester John Goller, K9UWA, of Leo, Indiana. John is an active contester and DXer.
 And speaking of contesting, the results of the 1990 CQ WW WPX Contest begin on
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MAY 1991

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Everything is a matter of perspective. I'm sure everyone is happy that the war in the Middle East is over and pleased that it ended quickly. The ravage may take years to correct, but at least the carnage has stopped. In the last few decades technological sophistication has moved what was once considered science fiction into what is now accepted as scientific reality. If you can *think* of it, it's possible to *do* it. This appears to be true not only for weapons systems, but also for telecommunications.

Today it is commonplace to watch actions unfold as they happen, replete with video graphics and theme music. We have video-replay and analysis just as if it were a sporting event. In this latest conflict we had lists of frequencies published almost down to unit level whereby we could listen in on what was happening. People were being admonished not to divulge what they heard even though you could watch it on CNN. It's interesting how morbidly curious we can become when some threatening event occurs. We want to know, and know now.

When I was a kid, you got war news (you could see) every week or so by going to the movies and watching Movietone News® or Time Marches On®. Whenever they changed it, you could see what had happened in the last several weeks carefully edited and narrated. It really was an abstraction of events that had been covered earlier in newspapers. You accepted this as "immediate" even though considerable time had passed between when it happened and when you saw it.

In the early 1950s military surplus abounded, and amateur radio flourished on its availability and easy conversion. I can't remember anyone thinking it a potential problem for someone to buy an ARC-5 instead of converting it, sitting back, and listening in on the military (who was still using some of the very same equipment). Today that's not much of a problem, as very little if any convertible military electronic surplus shows up on the market. You don't really see conversion articles show up in the amateur press unless it's to answer a request for a "golden oldie." Primarily, there's no sinister plan to keep that equipment off the market. It's just that over the years we've pared down our ability to mass-produce and produce only what's needed plus a few. I don't know if that's good or bad, but it isn't likely, as with the ubiquitous ARC-5, to have a couple of hundred thousand of anything left over these days.

Today immediacy refers to something you can see as it happens, or generally within the same day. We're talking real reality. Well, the technology that we've come to accept, and as amateurs use, is

troublesome. The question that has been popping up more and more is "Who has a right to listen in on what?" It used to be you could listen in but couldn't divulge. Now it's more like you simply can't listen in. This immediacy which has won the hearts and minds of the American people is now in some form suspect. Perhaps there are some things we shouldn't listen in to (or perhaps watch). What is private or what is privileged information seems to ignore what is blatantly technologically here and now, and makes it strictly a philosophical argument for lawyers. It is becoming almost as silly as having a channel 2 on your TV set and being told that perhaps you shouldn't watch channel 2, and having some legal mandate passed to make you retrofit your TV set to remove the possibility and temptation.

Perhaps we should stop inventing or creating new technology. Perhaps this is "the best of all possible worlds" and the latitude offered by anything new is only threatening to society at large. Perhaps we should do away with CNN (sorry, Ted), as it tells too much. Well, the paranoia does exist, and there are moves afoot to further restrict scanner coverage and to have existing equipment retrofitted to eliminate certain frequency capabilities. Should the sacred frequencies of the moment be changed? Do we put them back in and remove the next segment now in vogue?

The simple invention (I'm not trying to be facetious in calling it simple) of the microprocessor chip is spawning a whole new area of employment for lawyers, politicians, and would-be censors. There will be the innocent slaughter of millions of acres of trees just to produce the paper needed to print all of the new laws, studies, and bureaucratic nonsense so that the frighteningly new can be contained and curtailed.

We as amateurs, along with SWL enthusiasts and anybody else who has the slightest interest in listening to something besides commercial broadcasting, are being systematically chipped away at "for the good" of something. If some information is so special, the simple and logical solution would be to encrypt it and therefore put the burden of value on the user. After all, a cellular telephone conversation is very special (cordless phone conversations and marine phone conversations somehow aren't)—so special that a ton of money was spent on laws to protect that quality.

The nature of being *special*, or privileged, or private simply denies reality. The technology to receive any signal by now is so rudimentary, cheap, and readily available that to put limits on it is purely insulting. The government and its (our)

lawyers think in grandiose, simplistic concepts of the way things perhaps *should* be (but never or seldom are) instead of facing the reality which says you should have locked the barn before the horse was gone. The horse is still gone, but now the government is willing to develop a \$12,000,000 titanium lock (which actually will cost \$247,000,000) should the horse ever return.

We all know that the spectrum is a very valuable piece of real estate. Imagination and technology make everything possible, including the ability to protect something someone thinks is secret. Restricting what a person can receive doesn't protect it. It just makes it more intriguing. However, I'm sure that in the case of cellular phone conversations, no one is listening in anymore.

I find it interesting that the government always has enough money to conduct studies and hearings and to hire countless people to study and report on why the horse left the barn (with concomitant social implications). Somehow (maybe it's coincidence) there's zip left over to go out and buy a \$5.00 padlock. The same logic prevails when countless new laws are introduced to presumably correct a situation or in this case to protect something, and the same zip-funding is provided for enforcement. Maybe it's more exciting and fun to create illogical laws than to try to enforce them. Maybe there was never any intention of enforcing these laws. It was just creating something that seemed to answer or give some vocal group a bit of pap.

We've all seen these types of laws promulgated with regard to drunk driving and guns. The premise there is that the government has reacted to a public outcry and for the greater good has created harsh, stringent measures to deal with the problem. The originating problem is never dealt with nor are these laws universally enforceable. People are rarely convicted for these "crimes."

People may feel that they have a reasonable right to electronic privacy, but that's all it is, a feeling. It is foolish and naive to believe that an RF device shares that feeling and like the government is here to help you. When pressured, the government may wish to proclaim what is private and what isn't (which can and will change), but even they must realize that anything transmitted in the clear is not now nor will ever be private. The concept that by virtue of a decree something becomes private can be likened to the government stating that from a certain Tuesday hence forth it will be illegal to think of a duck.

73, Alan, K2EEK

high-quality

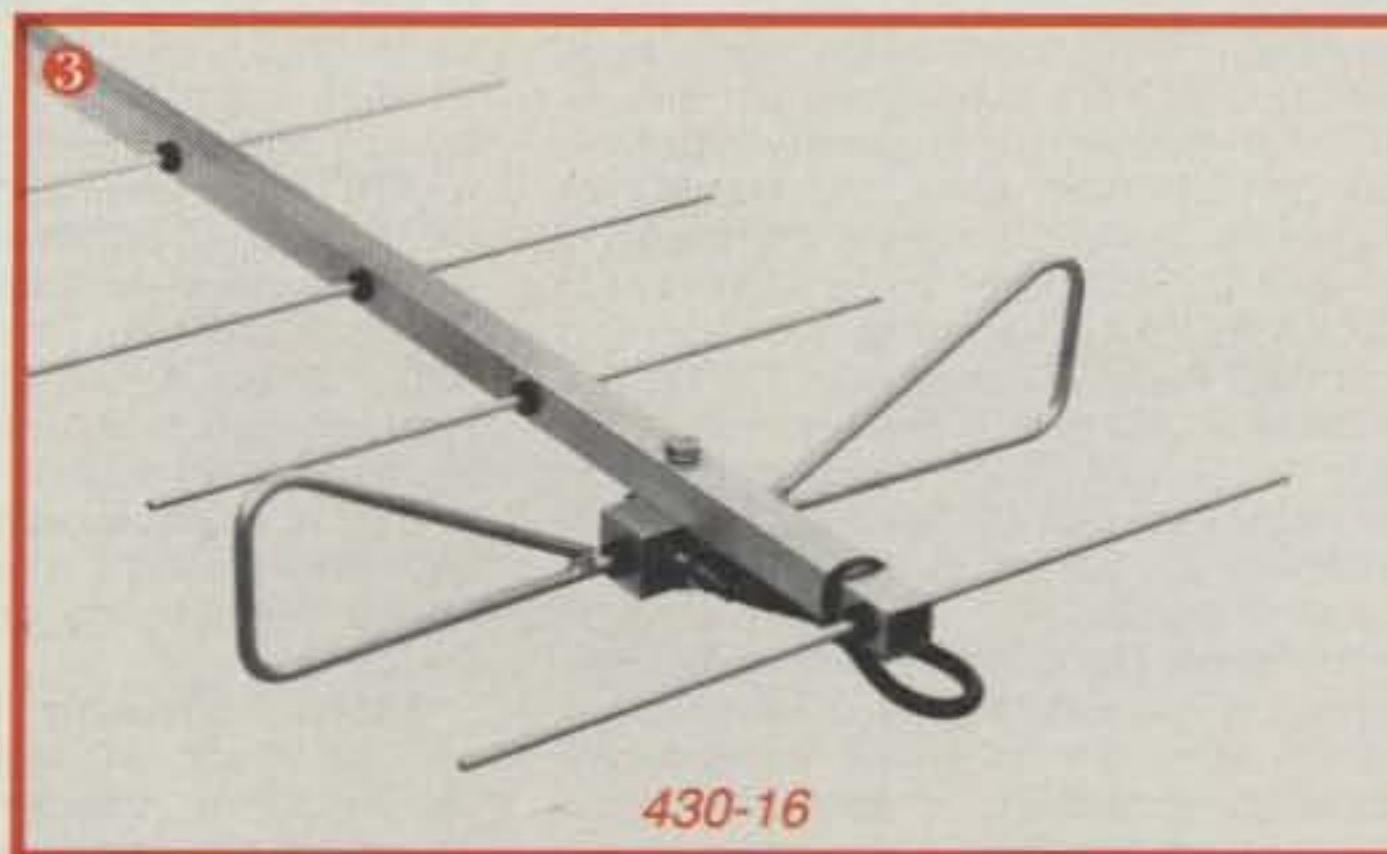


low-cost

Amateur Television Products



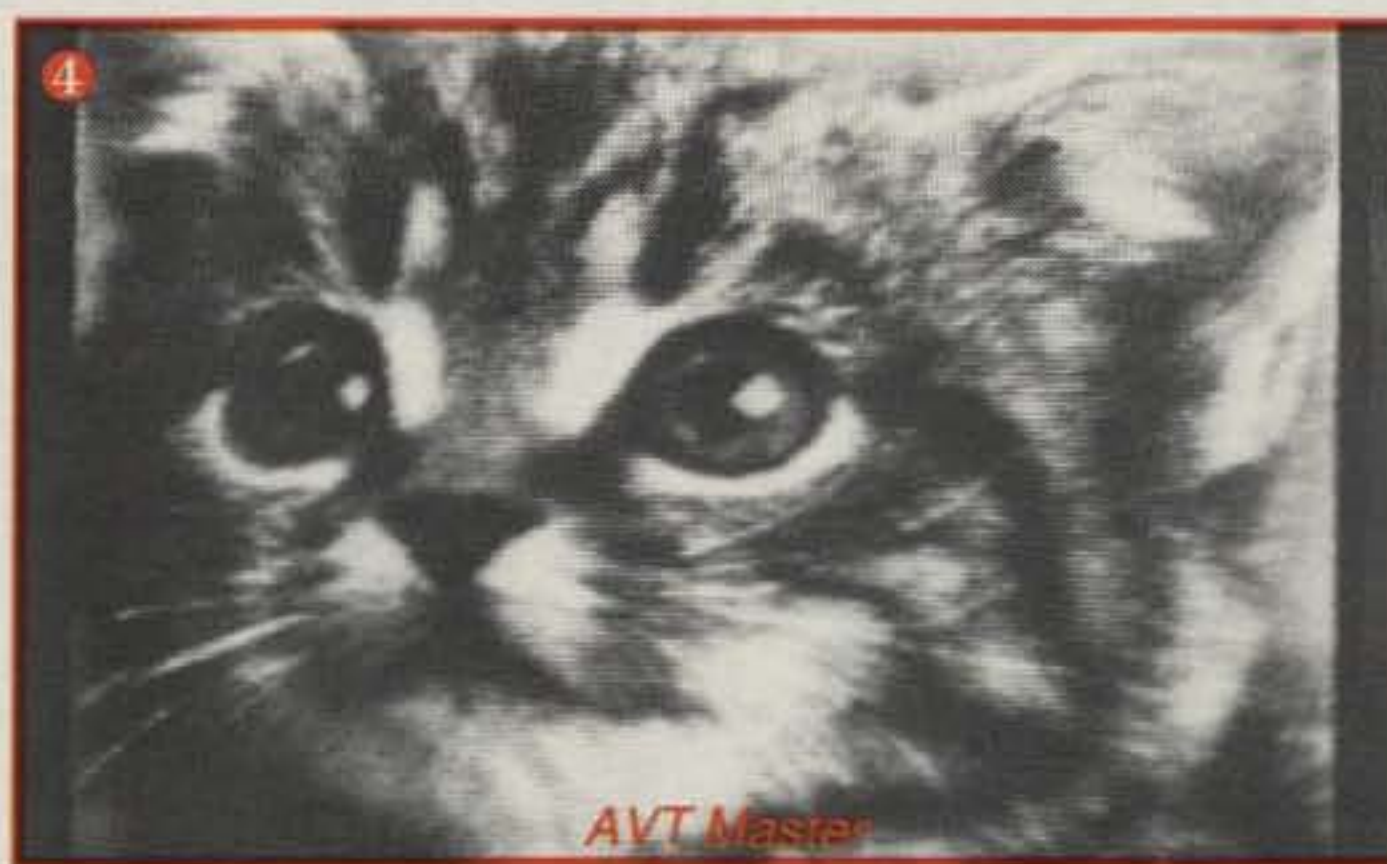
VSB-70



430-16



RLA-70 w/MPS-100



AVT Master

① **NEW! VSB-70 ATV Transceiver:** the only amateur television transceiver utilizing VSB (Vestigial Sideband) technology to minimize adjacent channel interference and preserve spectrum space; built-in UHF GaAsFET preamp to improve reception; covers the 70 cm band, 420 - 440 MHz; inter-modulation distortion less than -42 dBc; one watt PEP output; monitor transmitted and received signals on your standard TV receiver; audio and video input via front panel 10-pin camera jack or rear panel RCA audio and video inputs (switchable); crystal-controlled or variable-tuning down converter; crystals for 434 and 439.25 MHz are included; optional crystals for 421.25 and 426.25 are available; requires 13.6 VDC @ 1.5 amps **\$349.95**

② **NEW! RLA-70 Remote Linear Amplifier with Power Supply:** mast-mounted amplifier boosts your ATV signal up to 50 watts PEP; equivalent to a 100 watt amplifier in the ham shack with a 3 dB line loss; built-in GaAsFET preamp mounted at the antenna where it does the most good; power supplied through the coax; includes MPS-100 Multi-purpose Power Supply: provides a well-regulated 28V DC @ 6 amps for the RLA-70; also provides regulated 13.6V DC @ 2 amps for the VSB-70 **\$699.00**

③ **430-16 Antenna:** high-performance, computer optimized yagi specifically designed for ATV operation; broadband frequency

coverage from 420 to 440 MHz; 16 elements give you 14.3 dBd gain; O-ring sealed connectors; 28 degree E-plane beam width; 32 degree H-plane beam width; 10 foot boom **\$119.95**

④ **AVT Master Amiga Video Terminal:** SSTV and FAX system (hardware and software) for transmit and receive with your Commodore Amiga Computer; 55 SSTV modes in up to 4,096 simultaneous colors; Nine FAX modes in up to 16 grey levels; eight function "repair kit" vastly reduces damage caused by QRM or QRN; on-screen tuning scope; mode-to-mode conversions; interpolating zoom; image tinting, brightness and contrast control; text overlay using multiple fonts, boldface, italics and underlining in any combination or color; automatic CW and/or synthesized speech ID after transmit; custom color bar generation; user-defined FAX demodulation curves; image rotation and flipping; paint compatible; extensive ARexx language support; real-time software filtering for scope and receive operations; grab screens to transmit from any digitizer or operating program in real-time; automatic start and run at any time; image printing in both black-and-white and color on hundreds of printers **\$299.95**

Specifications subject to change without notice or obligation. Prices listed are suggested Amateur Net through participating dealers.

Technical support may be obtained through CompuServe's Hamnet forum. Messages should be sent to user ID #76702, 1013.

Advanced Electronic Applications, Inc.

P.O. Box C2160/2006 196th St. S.W. Lynnwood, WA 98036-0918
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ANNOUNCEMENTS

• **U.S. Auburns Award** - The Academy ARC is sponsoring this award for working at least five U.S. Auburns. Work (SWLs hear) amateur stations in at least five U.S. cities with Auburn as part of the official city name (there are about 22 of them). One must be Auburn, Washington. QSOs can be on any band or mode and must be during 1991. Send log extract showing call, date, time, frequency, and mode with \$1.00 to WA7QCC, 3513 Orchard Place SE, Auburn, WA 98002. QSLs not required. For more info or a list of Auburns send an SASE to the above address or to WA7QCC N7ENT.WA.USA on packet.

• **Nevada QSO Party** - Sponsored by the Frontier ARS, the Nevada QSO Party will be held from 0000Z May 11 to 0600Z May 12. Work stations once per band per mode. Exchange RS(T) and state/province/country (Nevada stations also give county). Frequencies: 6-160 meters CW, RTTY, SSTV, packet. Scoring: one point phone QSO, 2 points other modes. Non-Nevada stations multiply by number of Nevada counties. Nevada stations multiply by state/province/country total. Certificate to top scorer in each state, province, DXCC country, General and above, Novice and Tech. Mail entry by June 1, 1991 to Jim Frye, NW7O, 4120 Oakhill Ave., Las Vegas, NV 89121.

• **The following special events will take place during May:**

Two-land, BEMARC 50th Anniversary, Bayonne, New Jersey; Bayonne Emergency Management ARC; two 12 hour periods from 1200-2400Z on May 4 and 1200-2400 May 5; all bands 80 meters through 440 MHz, concentrated in Novice and General portions of bands. Each club member will sign his own call followed by "BEMARC Special Event Station"; plus W2ODV club station as multi station. For certificate send QSL and 9 x 12 SASE with one unit of postage or one IRC to BEMARC, c/o John Anzivino, 236 Pearsall Ave., Jersey City, NJ 07305.

WJ3J, from Fort Indian Town Gap Military Reservation, Annville, PA; Lebanon Valley Society of Radio Amateurs; May 27 from 1400-2330Z on 40, 20, 15, 10, and 2 meters. For certificate send QSL and SASE to LVSRA Special Event, P.O. Box 1587, Lebanon, PA 17042.

WA3PJK, from submarine *USS Torsk*, Maryland; Maryland Mobileers ARC; May 18 from 1400-2100Z on 7.240, 14.240, 21.340, 28.340, 146.805 MHz. For certificate send SASE to MMARC, P.O. Box 935, Severn, MD 21144.

N4WRR, from Ol' Country Fair, Pamlico Community College, Grantsboro, NC; May 4 from 1400-1900Z, 25 kHz up from General band edges and Novice 10 meter phone band. Send QSL, QSO number, and SASE to N4WRR, PCC, P.O. Box 185, Grantsboro, NC 28529-0185.

KC4SIT, from Johnson Farm, Hendersonville, NC; Henderson County ARC; May 4 from 1300-2200Z in Novice/Tech portion of 10 meters. For certificate send SASE to KC4SIT, Ernie Hollingsworth, 112 Felmet, Flat Rock, NC 28731.

NY4N, from Old Timers Day, Dickson, TN; Dickson County ARC; May 4 from 1400-2100Z; phone 7.235 and 28.335 MHz (plus or minus QRM) and 147.15 repeater. For certificate send QSL and SASE to Dickson County ARC, Old Timers Day, P.O. Box 74, Burns, TN 37029-0074.

K4AF, from Armed Forces Day, The Pentagon, Washington, DC; May 18 on 80-2 meters, phone, CW, and packet, 35 kHz above each lower band edge. For QSL send your QSL and SASE to P.O. Box 47063, Washington, DC 20050 (for certificate send \$1.00).

NM5Y, from Ralph Edwards Fiesta, Truth or Consequences, NM; Sierra ARC; May 4 from 1400-2300Z in General phone portions of either 40, 20, 15, 10 meters one band at a time. For certificate send QSL and legal-size SASE to Paul George, K2KIQ, P.O. Box 626, Elephant Butte, NM 87935.

K5GH, from Texas Star Party, Davis Mountains, west Texas; amateurs and astronomers of southwest region of Astronomical League; May 12-17; 28365, 21365, 14265, 7265 (plus or minus QRM), SSTV and

CW on request. For QSL send QSL and SASE to K5GH-TSP, 721 White Dr., Garland, TX 75040.

WB6RVR, from Central Pacific Depot, Old Sacramento, CA; California State Railroad Museum; May 3 to May 12 from 1600-2400Z; phone 7.270, 14.270, 21.370, 28.370 MHz. For QSL send your QSL and No. 10 SASE to California State Railroad Museum, Attn: Steam Trains, 111 I (eye) St., Sacramento, CA 95814.

W7STB, from driving of the Golden Spike, Promontory Summit, UT; Ogden ARC; May 10 from 0001-2100Z on one of the following 3.970, 7.270, 14.280, 21.375, 28.415 MHz. Send QSL and SASE to Ogden ARC, P.O. Box 3353, Ogden, UT 84409. Those stations working both W7STB and WB6RVR (above) during the concurrent operations on May 10 only will be entitled to a special certificate. Send log info from both contacts and 8 1/2 x 11 SASE to CS Railroad Museum, Attn: Steam Trains, 111 I St., Sacramento, CA 95814.

AA6GZ, from Hanford, California Centennial, Hanford, CA; Kings ARC; May 18 from 1600-2200Z on General 10, 15, 20 meter phone and Novice portion 10 meters. For certificate send SASE to KC6HVE, P.O. Box 548, Armona, CA 93202.

7-land, from Spring Paddlefish Season, Intake, MT; Lower Yellowstone ARS; 0000Z May 18 to 0000Z May 19 Novice 10 meters and General portion of other bands. For QSL send SASE to Paul McTee, KB7FGN, P.O. Box 613, Sidney, MT 59270.

K700, from Cultural Pride Festival, Long Beach, CA; Hollywood Chapter of Lambda ARC; May 18-19 in General portions of 40, 20, 15 meters and Novice 10 meters. For QSL send your QSL and SASE to LARC, P.O. Box 91299, Long Beach, CA 90809.

K8DAA, from Tulip Time, Holland, MI; Holland ARC; May 11-19 on low end of General bands 15 and 20 meters and 28400 on 10 meters. For certificate work 2 HARC members or club station K8DAA. Send QSL with calls worked and SASE (legal or 9 x 12) to Dave Lamer, WA8RSA, 2866 E. Chester Dr., Zeeland, MI 49464.

N8KTB, from Memorial Day Parade, Ironton, OH; River Cities ARA; 1400-2200Z May 25 on 7240, 14240, 21340, 28340 (plus or minus QRM). For certificate send QSL and No. 10 SASE to Ray Eicher, N8KTB, 1611 Karin St., Ironton, OH 45638.

W9DUP, from Armed Forces Day, U-505 submarine, Chicago Museum of Science and Industry, IL; DuPage ARC; 1600-2300Z May 18 and 19 on 7.250, 14.290, 28.400 SSB and 145.25 (-.600). For certificate send QSL and SASE to Jack Carr, NV9S, DARC, P.O. Box 71, Clarendon Hills, IL 60514.

KD0ZK & KE0LO, from Desert Storm Special Event, Junction City, KS; for 100 days beginning March 1, day and night, on 28.450, 14.250, 7.290, 3.920 (plus or minus QRM). Certificate for contacting either station, send SASE to Barry, KD0ZK/DS, 715 W. 5th St. Junction City, KS 66441; or to Phil, KE0LO/DS, 1322 Sunshine, Junction City, KS 66441.

W0HSI, from Lewis and Clark Rendezvous, St. Charles, MO; St. Charles ARC; May 18-19 from 1300-2100Z on 7250, 14250, 21350, 28410, 146.67. For 8 1/2 x 11 certificate send large SASE to St. Charles ARC, P.O. Box 1429, St. Charles, MO 63302-1429.

VO1ACS, from 50th anniversary of Army Airways Communications System, U.S. Air Corps, WW II, Gander, Newfoundland; May 1-5; CW 1700-1800Z on 14061 or 21061 and SSB 2000-2300Z on 14287 or 21397. Send QSL and SASE to W6YO, 1416 Seventh Ave., Delano, CA 93215.

• **The following hamfests, etc., are slated for May:**
Apr. 28, **ECARA Ham Radio & Computer Flea Market**, Point Breeze Restaurant, Webster, MA. Contact Roger, KA1LMN, 203-928-4883.

May 3-4, **Hamboree 13 & Iowa State Convention**, Marina Inn, South Sioux City, NE. Contact Dick

(continued on p. 113)

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Power Rating, Watts PEP	1800
Radiation Angle, Degrees	16
Frequency selection	Automatic
Horizontal Radiation Pattern	360°
Height, ft (m)	17 (5.2)
Mast Size Range, in (cm)	1.5-1.75 (3.8-4.4)
Wind Load, ft ² (m ²)	1.4 (.13)
Weight, lb (kg)	8.7 (4)
Counterpoise Radials Supplied	Yes

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Results of the 1990 CQ World-Wide WPX CW Contest

BY STEVE BOLIA*, N8BJQ

Terrible conditions, decent weather, and close competition were the high points and the low points of the 1990 running of the WPX CW Contest. Propagation, which had been favorable right up to the start of the contest, deteriorated rapidly after the contest started. There were several instances where all bands were completely dead for up to an hour at a time. This caused havoc with QSO rates, but gave race enthusiasts ample time to enjoy the Indianapolis 500 and still not miss too many QSOs.

DX

No records were broken in the single-op categories, but there was an extremely close battle for the top all-band spot. ZW5B operated by Willi, OH2MM, just edged out 5J0T operated by YU1RL. As often happens, 5J0T had slightly more QSOs and multipliers, but could not make up for the QSO point advantage enjoyed by ZW5B. Close behind was LR4F operated by LU8DQ and K3TW in his last contest from 5H0T. Fifth place went to AH3C, with IO4IND as number six.

Even with the terrible conditions, YV3A (YV5ANT op) still turned in a fine 1.6M point effort on 10 meters. RH0E was second, followed by CT1AHU and JY9SR. 4N3E (YT3AM op) had the highest single-band score with 3.2M points on 15 meters. Second on 15 went to ZM3GQ, followed by ZS6BCR and PQ4OD. PY2RN led the way on 20 meters, with 9J2AL second, YT3M third, and K1TO fourth. V73AS set a new Oceania record on his way to the top spot on 40 meters. 4N4A, OM7DX, and UA2FJ also put in strong efforts. 4N1A (YU1EA op) edged out UA9SP for the top spot on 80 meters, with OK5TOP edging out LZ6A for top-band honors.

In the QRP/p category N3RS made over 550 QSOs on his way to the world top spot. 4F3BAA was the 10 meter champ, ES1CR topped the 15 meter ops, and 4N4AE did likewise on 20 meters. OK2BOX, 4N7MOD, and UB5RHF were the champs on 40, 80, and 160, respec-



This was the operating QTH of Tom, 5H0T (K3TW). The WPX CW was Tom's last contest from 5H.

tively. Congratulations to all for the outstanding efforts and having the patience to battle the conditions during the weekend.

Tine, YT3AA, was the second winner of the European combined SSB/CW all-band trophy sponsored by the Les Nouvelles DX Group. Tine had a combined score of 8.7M points.

USA

KT3Y became a three-time champion with his 1990 victory. Phil had lots of competition with WW4T (KM9P op), K3ZO, KZ2S, and KY1H (KQ2M op) right on his heels. As in 1989, the top five were again very close, with less than 300K separating them.

K5RX was the USA 10 meter champ, with N3GB claiming the 15 meter title. K1TO turned in the top USA single-band score with his winning 20 meter effort. NQ2D captured the 40 meter title, and K1ZM took the top-band title.

As mentioned earlier, N3RS was the QRP all-band champ, with N5US, WA3LFY, K9OSH, and AA7XX winning 10, 15, 20, and 40 meters.

WPX SSB Contest Corrections

The following multi-single entries were inadvertently left out:

LT5F	2,860,578	2126	657
DL1SBR	1,310,065	1235	479
VY2CA	3,933,571	1955	659

The following errors occurred: WB4FTI should be WB4FTT; CE7ON should be CF7ON; and the op. of KA5W is KS1G.

Multis

The Hungarian/Turkish team at YM5KA was responsible for the only world record broken during the weekend. Their 13 million point multi-single effort just bettered KP2A's 1989 standard. Second in the world was P43GR, followed by LR5A and 4J5FV. The top multi-multi entrant was HG73DX with 11.7M points, followed by JE2YRD and JL1ZCG.

N4WW repeated as USA multi-single champ, with WZ6Z and WC4E second and third. The gang at AC6T claimed multi-multi honors, followed by NJ8G.

*4121 Gardenview, Beavercreek, OH 45431



Here is Jim Metcalf, NQ2D, the USA 40 meter champ.

Other Stuff

Congratulations to all the winners and thanks to all those who take part each year. A special thanks goes to the many who obtain special calls or go on expeditions for the contest. Among those for 1990 were 5J0T, YM5KA, LR4F, LR5A, 4F3AAL, 4F3BAA, PY0FF, VP2V DX, ZF2PF, EX9B, EX9S, RH0E, TW2C, TV6MHZ, HW0A, HY0P, JW9VDA, OH0/DL7CF, OP4KTK, EX1A, EX3A, LS7DX, OB4ZV, J49BDX, and TQ5A. We also may have had a first with six Vietnam stations submitting logs: 3W6PY, 3W9CZ, 3W1PZ, XV2AYL, 3W3RR, and XV2AA submitted logs for 10 through 160 meters. These were new prefixes for most of us and a new DXCC country for many. Welcome back to WPX contesting!

The 1991 WPX contest will be held on the 25th and 26th of May GMT. We (the WPX committee) will be consulting with the "Gods of Propagation" in the hopes that we may have better conditions for the contest this year. Tune in that weekend and see how we fared. Forms and rules can be obtained from *CQ* magazine or from N8BJQ for an SASE. Queries can be sent to N8BJQ or via packet to N8BJQ K9G.IN.U.S.A.NA.

Thanks to all those who sent in computer disks. They were greatly appreciated. If you are using "CT," please send the .bin or .res file. For any other program, an ASCII file with no headers or a dBASE file will be appreciated. These formats are the easiest for us to work with.

Again I must thank Scott, N9AG, for his assistance with the logs. His help is greatly appreciated and needed. 73 to all, and hope to work you in the 1991 contest.
73, Steve, N8BJQ

Random Comments Single Operator

Many thanks to W3FG for processing my logs with his computer . . . 5H0T. Murphy said, "MUF stays low . . .," and so it happened . . .

5J0T. Arrived in Japan only two days before the contest, so I was still jet-lagged . . . 7J1AAI. Thanks to K1EA for the program and the JAs for multiplier and points . . . 9M6HF. Having a Vietnam station answer my CQ! . . . AJ6V. I am a high-school student for practice . . . BY8AC. Was not able to show my new girlfriend that there is another thing in my life! . . . DL5XX. Thanks for all. I need a WPX every year! . . . EA1JO.

Very happy to participated in this famous contest happening. The next year to do more QSO . . . EA3DOK. Poor propagation, but always some exotic callsigns! I only operated answering the calls . . . F6GKQ. Really enjoyed my first entry in the WPX! . . . G4ZOB. DX condx atrocious, but superb propagation from Scotland to the Ukraine on all bands except 10 . . . GM4OBK. Have worked so many different new prefixes during the contest . . . HL5AP. Very pleased to QSO with T77C; he is first San Marino for me! . . . JA3ARM.

Condx good Saturday but poor on Sunday. This one is always an enjoyable contest . . . JY9SR. Condx made this a tough one from out here . . . K0RF. Condx were awful. Sure didn't take long to print the log! . . . K5ZD/3. This was a nice computer practice and training session if I could learn to type better . . . K6ZM. Even

during poor conditions you must keep at it . . . K9ZO. Major flare 2058Z turned off bands with a flick of the switch . . . KC7V. Poor conditions but lots of fun . . . KD1U.

Conditions were bad on 15 the first day and worse the second day! . . . KG6DX. Another year, another solar flare . . . KI6EZ. If I had a dollar for every multiplier, I'd be rich. Tnx to 9L1US for breaking last-minute rush . . . KI6ZH. The black hole reared its ugly head again! . . . KM9L. After 63 days that does not rain, there was an electrical storm this very weekend . . . LS7DX. Too bad this wasn't the VHF WPX. The sporadic-E and aurora were great . . . N0BSH/9. Finally made a contact with JA land on 40 meters . . . N4HEK. Thanks to condx, you get a nice skinny log from me this time. Sure saves on postage . . . N5RZ.

Contacts on 10 meters should have been worth 20 points . . . N7LOX. 48 hours of nothing but static . . . NL7DU. The noise on 40 made every contact a challenge in itself! . . . NQ2D. Awful conditions, terrible . . . NX7K. Great fun trying out the K1EA program! . . . OE1TKW. It was really poor during WPX. Anyway, I enjoyed much! . . . OH6YF. Very bad condx on higher bands. No Ws on 10 and 15, looking for another contest . . . OM6DXW. Poor condx on Saturday, much worse on Sunday! . . . OM6RZ. Only

TROPHY WINNERS

SINGLE OPERATOR—ALL BAND

WORLD: Terry Baxter, N6CW Trophy. Won by: **Station ZW5B operated by Vilho Hillesmaa, OH2MM.**

USA: Steve Bolia, N8BJQ Trophy. Won by: **Station WW4T operated by Bill Fisher, KM9P.**

***JAPAN:** The DX Family Foundation Trophy. Won by: **Shigeaki Furukawa, JG3KIV.**

OCEANIA: Tom Morton, KT6V Trophy. Won by: **Peter Grillo, AH3C.**

***CANADA:** Canadian Amateur Radio Federation (CARF) Trophy. Won by: **William Metcalfe, VE6BF.**

WORLD QRP/p: QRP Amateur Radio Club International Trophy. Won by: **Ronald Sigismonti, Sr., N3RS.**

EUROPE COMBINED SSB & CW: Les Nouvelles DX Group Trophy. Won by: **Tine Brajnik, YT3AA.**

SINGLE OPERATOR, SINGLE BAND

WORLD: Pedro Piza, Jr., NP4A (Pedro Piza, Sr., KP4ES Memorial) Trophy. Won by: **Station 4N3E operated by Srecko Svajgel, YT3AM.**

WORLD 3.5 MHz: Lance Johnson Engineering Trophy. Won by: **Station 4N1A operated by Ceho-Dule-Dusan, YU1EA.**

ASIA: Bruce Frahm, K0BJ Trophy. Won by: **Station JA1YFG operated by JJ3OLZ (14 MHz).**

USA: Kansas City DX Club Trophy. Won by: **Dan Street, K1TO (14 MHz).**

USA 21 MHz: Wayne Carroll, W4MPY Trophy. Won by: **George Baltz, N3GB.**

USA 14 MHz: Gene Walsh, N2AA Trophy. Won by: **Lynn Schriener, W5FO.**

USA 7 MHz: Dennis Younker, NE6I Trophy. Won by: **Jim Metcalf, NQ2D.**

MULTI-OPERATOR, SINGLE TRANSMITTER

WORLD: Ron Blake, N4KE Trophy. Won by: **Station YM5KA operated by: TA5B, TA5C, HA0DU, HA0LC, HA0NNN, HA0MM.**

USA: Austin Regal, N4WW Trophy. Won by: **Station WZ6Z operated by: K3EST and N6IG.**

CONTEST EXPEDITION

WORLD: Kansas City DX Club Trophy. Won by: **Station 5J0T operated by: Radivoje Lazarevic, YU1RL.**

CLUB (SSB & CW)

WORLD: *CQ* Magazine Trophy. Won by: **The Araucaria DX Group.**

USA: Northern Ohio Amateur Radio Society Trophy. Won by: **The Northern California Contest Club.**

**Trophy donor is responsible for this trophy.*

CW & SSB CLUB COMPETITION

ARAUCARIA DX GROUP	62,858,364	LYNX DX GROUP	1,664,445
NORTHERN CALIFORNIA CONTEST CLUB	35,881,513	PERUVIAN DX ASSOCIATION	1,480,832
LES NOUVELLES DX GROUP	34,268,251	CALGARY DX CLUB	1,425,291
MAD RIVER RADIO CLUB	25,843,581	MAUI AMATEUR RADIO CLUB	961,048
KAUNAS POLYTECHNIC INSTITUTE	23,870,507	GRAND MESA CONTESTERS	857,607
FRENCH DX FOUNDATION	21,990,005	WILLAMETTE VALLEY DX CLUB	849,599
POTOMAC VALLEY RADIO CLUB	19,305,242	LITHUANIAN CONTEST GROUP	791,586
NORTH TEXAS CONTEST CLUB	17,156,431	CENTRAL ARIZONA DX ASSOCIATION	774,287
YANKEE CLIPPER CONTEST CLUB	14,807,732	WESTERN NY DX ASSOCIATION	768,851
OSAKA UNIVERSITY RADIO CLUB	13,980,480	NORTHERN CORRIDOR RADIO GROUP	729,047
SOCIETY OF MIDWEST CONTESTERS	13,729,494	COLORADO CONTEST CONSPIRACY	672,364
FRANKFORD RADIO CLUB	13,315,548	COLUMBIA AMATEUR RADIO CLUB	626,164
SOUTHWEST OHIO DX ASSOCIATION	12,313,319	WARSAW DX CLUB	576,032
G.A.D.X. (ARGENTINA)	11,301,359	MAXWELLTOWN AMATEUR RADIO CLUB	394,060
WESTERN WASHINGTON DX CLUB	9,926,373	TARTU RADIOCLUB	378,120
BAVARIAN CONTEST CLUB	9,697,200	UTAH CONTEST CLUB	374,539
FRASER VALLEY DX CLUB	9,173,235	ARGENTINE DX GROUP	362,000
NORTHERN LITHUANIA DX GROUP	5,818,780	ASPEN CONTEST GROUP	339,448
CHILTERN DX CLUB	5,550,227	TYLER AMATEUR RADIO CLUB	228,960
TEXAS DX SOCIETY	4,994,851	METROCREST AMATEUR RADIO SOCIETY	202,653
NORTH COAST CONTESTERS	4,981,563	FOUR LAKES AMATEUR RADIO CLUB	161,884
RHEIN RUHR DX ASSOCIATION	4,737,556	NORTHERN CALIFORNIA DX CLUB	154,672
NEW MEXICO BIG RIVER CONTESTERS	4,187,013	SOUTH JERSEY RADIO ASSOCIATION	153,912
THE BULLMERTZ	3,527,404	SALT CITY DX ASSOCIATION	144,000
READING RADIO CLUB	3,005,856	WINNIPEG DX CLUB	140,693
DIXIE DXERS	2,971,748	NORTHERN OHIO DX ASSOCIATION	107,250
SOUTHERN CALIFORNIA CONTEST CLUB	2,846,536	DELTA DX ASSOCIATION	92,120
SAN DIEGO DX CLUB	2,832,213	NORTH JERSEY DX ASSOCIATION	75,604
DAUBERVILLE DX ASSOCIATION	2,747,483	DADE RADIO CLUB	75,072
SOUTH GERMAN DX GROUP	2,684,100	SOUTHERN CALIFORNIA DX CLUB	56,565
YU DX CLUB	2,605,109	REDWOOD EMPIRE DX ASSOCIATION	36,720
MINNESOTA WIRELESS ASSOCIATION	2,239,928	RADIO CENTRAL AMATEUR RADIO CLUB	12,282
SOUTHEASTERN DX CLUB	1,879,275	DAYTON AMATEUR RADIO ASSOCIATION	8,308
SP DX CLUB	1,860,736	POWAY AMATEUR RADIO SOCIETY	3,782
KANSAS CITY DX CLUB	1,687,968	MURPHY'S MARAUDERS	226
ARROWHEAD RADIO AMATEUR CLUB	1,674,585	CHENGDU CQ RADIO CLUB (CHINA)	144

half "W" multipliers from last year! . . . ON4XG.

Looking forward to last weekend of May and November. Sri I was sick this year . . . OZ8AE. Bad conditions, but worked a few nice DXCCs . . . PA2REH. I'd like to send my 73 to all ops in 1990 WPX test and especially to PY2SDA, who

helped with the log . . . PY2RN. Tnx for another fun one. Surprised to work J49 and ZC4 on 40 at this time of year! . . . V73AS. Never heard so many stns that couldn't hear me . . . VE6BMX. Condx so good I painted two rooms in my house during contest. Hi! . . . VO1MP. My first CW contest. Great fun. Now to get YL to trade

daughter for amplifier. Hi! . . . VO1SF.

At 79 years old and 59 years on the air, no more thrills. Had fun. Be there next year good Lord willing . . . W1CNU. Only a few signals got thru the polar absorption, major flares, magnetic storms, and proton events . . . W7QN. Could find mostly USA on the second day . . . WA4QMQ. Having MUF meet LUF and working EU again on 80 meters . . . WC5D. Point/QSO average dropping—an unfortunate indication of where we are and where we're going . . . XX9TDM. This was one of the worst condx I ever had . . . YV3A. Highlight of the contest was being called by V73AS on 7 MHz. Now all I need is the QSL route! . . . ZC4CZ.

Random Comments Multi-Ops

Beat LZ9A by 300 QSOs. Too many European QSOs to achieve top score, but it was fun anyway . . . J49BDX. We had have lots of troubles because broke down the linear . . . JA3YBF. Lousy conditions for me. No DX announced on packet even! . . . KB4GID. CW contest needs more ops who will QRS 20-25 wpm to avoid discouraging newer contesters . . . KC3YO. Conditions so bad, went golfing Sunday afternoon . . . NF8R. QSL via DL4RU . . . OK8AHE. Biggest distraction during contest were the topless sunbathers on the next roof! . . . SX5AA.

It was great to have Damir, UA3ABW, operating in Canada. Too bad condx were terrible



These are the ops at VE7WJ. From left to right are UA3ABW, VE7WJ, and KE7V.

ICOM

IC-735 HF Xcvr./Gen. Cov. Rcvr.	\$939.00
IC-751A HF Xcvr./Gen. Cov. Rcvr.	1379.00
IC-765 HF Xcvr./Gen. Cov. Rcvr.	2679.00
PS-55 AC Power Supply	196.00
AT-150 HF Automatic Antenna Tuner	369.00
AH-2A HF Automatic Antenna Tuner	479.00
SM-8 Desk Microphone	89.00
HP-2 Communication Headphones	43.50
IC-R7000 Communications Receiver	999.00
IC-28H 2-Meter, FM, 45 Watt Xcvr.	399.00
IC-228H 2-Meter, FM, 45 Watt Xcvr.	419.00
IC-229H 2-Meter, FM, 50 Watt Xcvr.	359.00
IC-2400A 2-Mtr./440-MHz., FM, 45W/35W	619.00
IC-2GAT 2-Mtr., FM, Handheld With T-T	364.50
IC-32AT 2-Mtr./440-MHz., FM, Handheld W/T-T	534.50
IC-2SAT 2-Mtr., FM, Mini Handheld W/T-T	309.50
IC-24AT 2-Mtr./440-MHz., FM, Mini H-H W/T-T	399.50
BP-4 Battery Case	16.00
BP-5 10.8 VDC, 425 mAh., Ni-Cad Batt. Pack	65.00
BP-7 13.2 VDC, 425 mAh., Ni-Cad Batt. Pack	79.00
BP-8 8.4 VDC, 800 mAh., Ni-Cad Batt. Pack	79.00
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BP-85 12.0 VDC, 340 mAh., Ni-Cad Batt. Pack	99.00
BP-90 Battery Case	16.00
BC-16U AC Wall Charger For BP-7, 8	21.25
BC-74A AC Wall Chg.; BP-81, 82, 83, 84, 85, Int.	21.25
BC-35 Drop-In Rapid Charger; BP-2, 5, 7, 8	79.00
BC-72A Drop-In Chg.; BP-81, 82, 83, 84, 85, Int.	99.00
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CP-11 Cigarette Lighter Cable W/Noise Filter	18.99
CP-12 Cigarette Lighter Cable W/Noise Filter	18.49
AD-12 External Power Adapter For IC-2GAT	24.50
AD-14 Bat. Chg. Adap.; IC-2SAT/24AT Series	16.99
BA-12 Bat. Chg. Adap.; IC-2SAT/Int. Bat./BC-72A ..	16.99
HM-46 Speaker/Microphone	31.99
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83-1AP UHF, Right Angle Adapter	\$3.65
83-1J UHF, Barrel Adapter	2.10
83-1SP UHF, Male, Silver-Plated PL-259	1.50
83-168 UHF, RG-59/U Reducer43
83-185 UHF, RG-58/U Reducer38
82-101 Type-N, Barrel Adapter	5.55
82-202 Type-N, Male, For RG-8/U	2.88
82-202-1006 Type-N, Male, For Belden 9913	3.65
31-3202 BNC, Male, For RG-58/U, 142/U, 223/U	2.37
31-4541 BNC, Male, For RG-59/U, 62/U	3.22

Other Amphenol Connectors And Adapters Are Available

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A3S 14, 21, 28-MHz., 3-Element Beam	\$312.00
AP8 3.5, 7, 10, 14, 18, 21, 24, 28-MHz. Vertical	179.00
APR18 Radial Kit For AP8	44.00
R5 14, 18, 21, 24, 28-MHz. Vertical	252.00
ARX-2B 2-Meter, Ringo Ranger II Vertical	46.00
ARX-450B 450-MHz., Ringo Ranger II Vertical	46.00
124WB 144 to 148-MHz., 4-Element Beam	46.00
215WB 144 to 148-MHz., 15-Element Beam	98.00
A147-11 146 to 148 MHz., 11 Element Beam	60.00
A449-11 440 to 450-MHz., 11-Element Beam	53.00

ASTRON

RS-7A 13.8 VDC, 7 Amp Int., 5 Amp Cont.	\$48.94
RS-12A 13.8 VDC, 12 Amp Int., 9 Amp Cont.	70.54
RS-20A 13.8 VDC, 20 Amp Int., 16 Amp Cont.	88.14
RS-35A 13.8 VDC, 35 Amp Int., 25 Amp Cont.	140.94
RS-12M Same As RS-12A, With Meters	81.34
RS-20M Same As RS-20A, With Meters	107.34
RS-35M Same As RS-35A, With Meters	158.94
RM-35M Rack Mount Version Of RS-35M	225.94
VS-35M Same As RS-35M, Adj. Volt./Curr.	170.74
VS-50M 13.8 VDC, 50A Int., 37A Cont., Adj.	234.34

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LaRue Electronics

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This one was entitled "Mutt and Jeff go to BVI for WPX CW." On the left is VP2VCW (N6CW), who did not operate, with VP2VDX (KT6V) who did. Tom did a fine job, finishing as the top North American entry on 15 meters.

... VE7WJ. Best contest 1990, many thanks Allah for your help ... YB0ZAA. What happened? During a 1 hour period, not a single signal on any band ... CZ7Z.

Random Comments QRP/p

Vy hard to crack pile-ups with 5 watts, but did have lots of fun! ... 4F3AAL. Pwr failure! My battery save me ... 4F3BAA. May 26 was my 16th birthday ... 4N7MOD. Few station on 160 meters! Heard only K1ZM from USA ... IO0KHP. QRP makes this contest even more exciting ... K9OSH. More short skip and less DX gave me more multipliers but fewer points than last year ... N5US. Conditions were not conducive to relaxed operation! ... N7IR. Almost no DX penetrated this far inland. I worked everything I heard ... W0NGB.

Never have much time, but got two new countries ... W2JEK. Worked all continents with this antique QRP rig in 30 minutes on 20 CW! ... W8QZA/6. Many QRM on freq.—very bad for QRP. I hope next contest is the best! ... YU4XA.

Station Operators Multi-Operator Single Transmitter

4J5FV: UB5I0K, RB5IJ, RB5II, UB5-073-1151, UB5-073-3775, UB5-073-3942. 4U5ITU: DF1SD, DF7TU, DJ0YI, HB9BUN, HB9BXQ, HB9BXR. 5B4ES: 5B4WN & 5B4XN. 8P9AQ: N5RM & WG5J. AA4GA: AA4GA & AB4RU. AA6OG: AA6OG & NF6H. DL0UM: DF5BM, DK7ZT. DX9HT: DU9AA, DU9AU, DU9BI, DU9XU. F6HSL: F6HSL, F6FLB, F6FLE, F6HHB. FV10: F6BBJ, F6CEL, F6GCP, F6HSV, FD1LMJ. GJ0LYP: F6IMS, F1NYQ, F6FYP, F6EEM, F6EMT, F6FYA. HA3KHC: Tamas, Miklos, Gabor, Tibor, Andras. HA3KNA: HA3OU, HA3OV, HA3NS, HA3NU. HG0X:

HA00B, HA0MK, HA0LM. HL9KL: Club Group. I2VXJ: I2VXJ & IK2EGL. J49BDX: DL5MAE, DL6RAI, DL7MAT. JA0YAK: JR0FQM, JS1PTU, JG7JMO. JA1YAD: JH7UCC, JH5GHM, JN1HYU, JS1MNF, JL1WQI, Shige. JA3YBF: JE1TND, JJ2ICA, JJ3IMX, JJ3KGS, JO3VUZ, JF4FUF, JG4CLV, T. Nishimoto. JA3YDS: JI2KKY, JG3QBJ, JI3GAB, JE4MHL. JA6YCL: JF4CZL, JE6EKC, JE6UWK, JF6KPD, JI6MYW. JA6YJS: JS1PWV & JF4ETK. JA7YAA: JJ3CNL, JE7HLZ, JE7JZC, JE0AWL, JH0ORW. JA8YBY: JO1DFG, JF9LPB, JH8PNE, JH8WBR, JR8DHA.

K3UA: K3UA & Packet. KB4GID: KB4GID & Packet. KC3YO: KC3YO & W3FTG. K13S: K13S & NF3P. KR0U: KR0U, N8UM, W0KEA. KS90: KS90, K9LJN, WE0B, NA9J, KA9DVY. LR5A: CX8BBH, CX5A0, LU5EW, LU7UAF, LU8DPM, LU5UL, LU3DWW. LY2WW: LY2BIJ, LY2BKW, Eimantas. LZ9A: LZ2HE, LZ2DF, LZ2CC, LZ2-E-41, LZ2-E-72. N3BB: N3BB, N5GM, WD5N. N4WW: N4WW, WA6DGX, K0LUZ, NX4N. N6XI: N6XI & Packet. N7TT: N7TT & KA2KRA. NB30: K3TM & NB30. NF8R: NF8R & WD8AUB.

NY5L: NY5L, N5EA, W5ASP. OH1AA: OH1ND/OH3RB, OH1JD, OH6LI. OH2AQ: OH2BQW, OH2BVF, OH2NRV, OH2BUQ, OH2MEF. OK10AW/P: Club Group. OK10FM: OK1DDR, OK1DRQ. OK1ONI: Club Group. OK2KDS: Club Group. OK2KHD: Club Group. OK2KYC: Club Group. OK3KFF: OK3TPG, OK3CZQ, OK3TRG, OK3TLU, OK3TMW. OK3KGQ: Club Group. OK3KTR: Club Group. OK3KUN: Club Group. OK3KYH: OK3CVI, OK3TLW. OK3RKA: OK3TDP, OK3YX, OK3CQR, OK3CPC, OK3TTZ, OK3-27548.

OK3RRC: Club Group. OK8AHE: DL4RU & OK1DIG. OK8BAF: DJ5CQ, Y21RM, OK2BDI. OP4MNS: ON7CC, ON5MT, ON4KFM. OZ10XZ: OZ4RS, OZ5DL. OZ7HAM: OZ7HAM & OZ1BIZ. P43GR: P43GR, K2SS, W2GD. PA3DQW: PA3DQW, PA3EYZ, PA0ERA. R6L: UA6LO, UA6LV, UA6-150-1060, UA6LFQ, UA6-150-1104, UV6LPL. RB4IYJ: Alex, Oleg, Gregory. RK4PC: UA4WAM, UA4WAD, RW4WO, UA4WAW. RQ9W: UQ2-037-83, UQ2-037-116, UQ2GWD, YL2AG, YL2OU, UQ2GUB, UQ2OC, YL3GG. RT1U: UT4UZ, UT5UGR, UT3UA.

RW1Q: Kokukhin, Antonov, Smirnov, Khaidin. RZ6AXO: RA6AX, UV6ADE, UV6AOW, UA6YP, UA6YJ, UA6YDN. SP4KTO: Club Group. SX5AA: SV0AA, N200. T77C: IK4DCS, IK4CIE, IK4HLO, IK4IDW, I4PNG, T77C. TQ5A: F5IN, F6ARC, F6IWW, F1LGE. UB4EYT: Sergej, Oleg, Igor. UB4EQZ: Alex, Arnold, Victor. UC1IWW: Radio Club Neman. UC10WE: Vlad, Juri, Mike. UL8BWO: UL7BQ, UL7-016-389, UL7-016-566. UL8CWW: UL7CC & UL7-028-0931. UL8LWF: Club Group. US1A: K3UOC, LZ2PO, UA1ALZ, UV1AA.

UV6HWI: UA6HPV, UA6HPR, UV6HPV. UZ0CWW: Pavel, Andre, Yuri. UZ0LWC: UA0-107-1025, UA0-107-696, UA0-103-454. UZ0SXF: UW0SN, UA0SLT, UA0-124-44, UA0-124-494. UZ1AWJ: Club Group. UZ1AWO: UA1AAF, UA1AQF, UA1-169-848. UZ3AYM: RA3DUU, UA3-170-210, UA3-170-126, UA3AQW. UZ3DWW: Club Group. UZ3QWU: Club Group. UZ9CZO: UV9CAZ, UA9-154-2044, UA9-154-2007. UZ9JWV: Sergey & Mussa. UZ9XWV: UA9-090-1085 & UA9-090-1058.

VE3SMA: VE3OSZ, VE3RMM, VE3SMA. VE7WJ: VE7WJ, KE7V, UA3ABW. W1FEA: W1FEA & K2BA. WB2YOF: WB2YOF, WB2R, W9FFC. WC4E: WC4E, K4XS, KD8NS. WZ6Z: K3EST & N6IG. Y35L: Y33TL, Y33UL, Y26BL. YB0ZAA: YB0ECT, YB0EMJ, YC0JAY, YC0JCT, YC0TSU, YD0XBO. YB0ZEA: YB0MKZ, YB0DPO, YB0BRX, YB0DBZ, YC0IPD, YD0UZA. YE2C: YD2HAX & HD2IHB. YM5KA: TA5B, HA0DU, HA0LC, TA5C, HA0NNN, HA0MM. Y08KOS: Y08AXP & Y08BFC. YU1PJ: YU1PJ & YU1QV. YU2CAH: Vujo, Drasko.

Station Operators Multi-Operator Multi-Transmitter

AC6T: AC6T, AD6C, K1PKL, KA6SAR, N6HC, N6IC, N6VR, N6NW, WA7ZTN. CZ7Z: VE6EZ, VE7ARS, VE7AV, VE7DP, VE7DRS, VE7DSN, VE7EME, VE7HRC, VE7RBL, VE7SK. HG73DX: HA1's TJ, TD, DAC, DAE, AH; HA5's GF, IW, WE, LN, AWH, MK, ML, BBC, JI, FM; HA6's WX, NF, OQ, NY, ON, ND, PX; HA7RY; HA8's IE, JV, LKE, LLK, HA8-806. JE2YRD: JE1JKL, JE3ERV, JK3GAD, JG3LZG, JR7OMD, JA9SSY, JA9-10148, JF2E0C. JL1ZCG: JK1JEO, JO1BMV, JO1RUR, JF2IWL, JI2GUT, JN3PYQ, JH0LFE, JH0NZN, JR0JFM. JR1ZTT: JM1UII, JN1MSD, JP1MWB, JL2ALL, JF3NRI, JE7PHNK, JR9FFO. LY2ZO: LYR346, LY1BC, LYR728, LYR1751, LY2BFN, LY2BMX, LY2BOA. NJ8G: W8FN, N9AG, KU8E, N8BJQ. OH3NE: OH3YM, OH3YN, OH3MEA, OH3NLP.

WORLD TOP SCORES

SINGLE OPERATOR ALL BAND

ZW5B	7,654,692
5J0T	7,597,954
LR4F	6,787,374
5H0T	5,175,211
AH3C	4,047,610
IO4IND	3,634,385
LY2BTA	3,033,172
YT3AA	3,002,076
GB8FX	2,994,498
EX9B	2,883,993
TW2C	2,828,908
EX9S	2,752,304
KE9A/DU3	2,664,014
KT3Y	2,592,512
WW4T	2,506,030
K3ZO	2,467,829
K3JXO/LU	2,428,794
OB4ZV	2,422,160
KZ2S	2,361,890
KY1H	2,353,568

28 MHz

YV3A	1,690,383
RH0E	799,032
CT1AHU	655,131
JY9SR	402,384
IR9ITU	387,686
PY1CE	362,872
LZ5Z	283,656
3W6PY	243,216
VK4XA	236,600
YU2MM	138,073

21 MHz

4N3E	3,239,453
ZM3GQ	3,192,588
ZS6BCR	2,882,554
PQ4OD	2,842,912
KG6DX	1,720,992
LU6EBY	1,683,350
VP2VDX	1,249,563
YZ3A	1,055,544
EX5I	1,048,800

14 MHz

PY2RN	1,751,430
9J2AL	1,333,724
YT3M	1,229,977
K1TO	1,208,858
JA1YFG	1,174,383
RB2SB	1,113,912
YT3T	1,092,212
UM8DX	1,021,140
W5FO	847,867
JE3ZFS	819,425

7 MHz

V73AS	1,793,840
4N4A	1,476,122
OM7DX	1,361,892
UA2FJ	1,324,568
YZ4Z	1,277,562
YT2R	1,146,780
NQ2D	1,012,780
LZ5W	987,126
GB0DX	881,832
HW0A	865,592

3.5 MHz

4N1A	385,890
UA9SP	345,600

ES5RY	268,370
LZ2WF	257,544
UL7CW	249,389
YU2WV	234,923
YT4T	205,282
VE6OU/3	153,912
UC2WJ	129,688
LZ5R	101,258

1.8 MHz

OK5TOP	68,730
LZ6A	62,380
UC2OHU	46,592
OL8CUT	31,200
OK1DRU	24,768
OK1DWJ	23,862
UA6JDQ	14,338
OL7BTG	8,640
Y33VL	7,100
PY0FF	5,900

QRP/p

N3RS	A	493,427
DL4YBM	A	303,104
LY2BFE	A	282,492
YU1LM	A	238,250
4F3AAL	A	216,871
4F3BAA	28	128,856
ZY2ORF	28	78,120
ES1CR	21	52,488
WA3LFY	21	43,952
4N4AE	14	75,855
K9OSH	14	30,800
OK2BOX	7	98,196
AA6XX	7	33,600
4N7MOD	3.5	141,075
OK2BXR	3.5	32,264
UB5RHF	1.8	26,820
IO0KHP	1.8	1,008

MULTI-OPERATOR SINGLE TRANSMITTER

YM5KA	13,098,790
P43GR	10,990,482
LR5A	8,716,291
4J5FV	8,352,096
LZ9A	8,023,800
8P9AQ	7,677,670
J49BDX	4,947,075
RT1U	4,929,290
R6L	4,596,615
TQ5A	4,530,765
RQ9W	4,158,745
T77C	3,668,760
YB0ZAA	3,561,495
GJ0LYP	3,440,535
I2VXJ	3,309,510
N4WW	3,263,337
US1A	3,050,910
OK3RKA	2,910,672
WZ6Z	2,855,602
WC4E	2,837,200

MULTI-OPERATOR MULTI-TRANSMITTER

HG73DX	11,740,872
JE2YRD	5,485,872
JL1ZCG	5,011,840
LY2ZO	3,794,610
AC6T	2,846,536
CZ7Z	2,255,386
NJ8G	1,690,024
JR1ZTT	123,102

MIRAGE/KLM

COMMUNICATIONS EQUIPMENT

We are pleased to continue serving the Amateur community with the best in high performance amplifiers and antennas.

For many years MIRAGE/klm has provided Amateurs throughout the world with the best equipment for their communications needs.

Whether you've needed an H-F tribander to chase DX or crossed YAGIs to bounce around the corner or around the world... we've answered the CQ.

When you asked for more UHF/VHF power in an amplifier and higher accuracy in a wattmeter, MIRAGE/klm came through.

Now we've got higher power on 6-Meters, pre-amps for all bands, and two new WARC tribanders... all with the power of MIRAGE/klm.

New Amplifier Power

A-1530G

50-54 MHz
5W - 25W input
15W in, 300W out
18 Amps @ 24vDC
Retail: \$586.00

A-1560G

50-54 MHz
5W - 25W input
15W in, 600W out
36 Amps @ 24vDC
Retail: \$ T B A

New Pre-Amp Power

KP-1 (In-Shack)

KP-2 (Mast-Mount)

Both models in 10M, 6M, 2M, 1-1/4M, 70cm
100W....Power Handling....165W
20dB....Gain....25dB
less than 0.6dB...Noise...less than 0.6dB
\$117.00....Retail....\$141.00

New Antenna Power

12-17-30-V

12M,17M,30M Vertical
Height: 21' 1 1/4"
VSWR: less than 1.5:1
Weight: 6.5 pounds
Retail: \$141.00

12-17-30-D

12M,17M,30M Dipole
Length: 39' 8 1/2"
VSWR: less than 1.5:1
Weight: 13 pounds
Retail: \$269.00

MIRAGE/KLM

COMMUNICATIONS EQUIPMENT

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FAX 408-779-8845 • TELEX 910-590-4460

USA TOP SCORES

SINGLE OPERATOR ALL BAND

KT3Y	2,592,512
WW4T	2,506,030
K3ZO	2,467,829
KZ2S	2,361,890
KY1H	2,353,568
NI6W	1,810,171
W2SC	1,703,365
KQ8M	1,549,978
K0RF	1,499,850
KE2PF	1,420,578
N6TV	1,346,834
K7UP	1,313,690
KW8N	1,308,104
K13V/7	1,109,676
K2PS	1,053,085
K4PQL	1,047,284
N5RZ	1,016,140
W0CG	975,244
NR2H	755,298
N6EK	736,404

28 MHz

K5RX	43,262
KM5R	22,940
WA6FGV	12,496
N7LOX	2,640
NV0P	2,160

21 MHz

N3GB	784,123
WB2Q	675,906
WN4KKN/5	655,939
NR5M	378,798
NM9H	321,597

14 MHz

K1TO	1,208,858
W5FO	847,867
KC2X	797,475
N0BSH/9	402,166
K16EZ	310,288

7 MHz

NQ2D	1,012,780
K1ZZI	719,280
NW6N	470,304
WU7Q	252,900
WA7FAB	201,042

1.8 MHz

K1ZM	4,784
------	-------

QRP/p

N3RS	A	493,427
KN1M	A	156,000
N7IR	A	144,675
AB4LX	A	116,812
KA1DWX	A	71,043
N5US	28	10,578
WA3LFY	21	43,952
K9OSH	14	30,800
W8QZA/6	14	20,328
AA6XX	7	33,600

MULTI-OPERATOR SINGLE TRANSMITTER

N4WW	3,263,337
WZ6Z	2,855,602
WC4E	2,837,200
N3BB	2,059,489
W1FEA	1,546,231
KS9O	1,148,805
N7TT	961,051
NF8R	655,018
KR0U	339,448
AA4GA	313,626

MULTI-OPERATOR MULTI-TRANSMITTER

AC6T	2,846,536
NJ8G	1,690,024



Here are the ops at T77C. In the front row are IK4IDW, IK4DCS, IK4CIE. Standing are I4PNG, IK4HLO, and T77C.



GM4OBK looks quite content after his fine 1.6M point effort.

Number groups after call letters denote following: Band (A=all), Final Score, Number of QSOs, and Prefixes. Certificate winners are listed in boldface.

QRP/p SECTION WORLDWIDE

N3RS	A	493,427	558	341
DL4YBM	A	303,104	535	296
LY2BFE	A	282,492	656	252
YU1LM	A	238,250	550	250
4F3AAL	A	216,871	510	137
SM5CCT	A	204,982	527	226
UB4IM	A	196,581	400	259
5Z4FO	A	191,600	325	200
F80X	A	184,050	510	225
SM5MX	"	166,135	477	223
KN1M	A	156,000	299	200
JA9RPU	A	154,368	304	192
N7IR	A	144,675	301	225
OH3JF	A	133,263	397	221
AB4LX	A	116,812	299	212
Y2SNA	A	96,248	277	212
PABPUR	A	95,418	284	186
KA1DWX	"	71,043	159	119
DL6SF	"	63,196	287	148
EA1GT	A	60,916	268	157
OK3TUM	A	56,914	236	143
NU4B	"	56,056	214	182
EA7AAW	"	55,400	234	200
UA4WFA	A	50,932	235	119
WB9HRO	A	47,817	203	161
OZ1JVN	A	47,399	221	139
VE3KP	A	46,482	163	122
UQ2GTW	A	43,750	184	125
SM8BYD	"	43,186	173	151

KR2Q	A	37,935	161	135
W2TZ	"	28,620	129	106
N05W	A	27,105	195	139
Y06ADW	A	9,088	73	64
PA0TA	"	6,969	80	69
W0NGB	A	5,723	100	97
Y25MO	"	5,124	55	42
UA3SET	"	4,692	52	51
N8CQA	A	4,596	71	68
JA1AA	"	3,276	38	36
DJ5OK	"	3,225	59	43
N6NF	A	2,870	44	41
SM4KL	"	1,742	31	26
W2JEK	"	1,620	31	30
Y04CXD	"	504	21	12
EA1DVY	"	60	7	6
4F3BAA	28	128,856	422	104
ZY2ORF	28	78,120	210	168
PP8WHL	"	23,254	106	77
JR3RWB	28	12,382	95	82
N5US	28	10,578	93	86
RA1JD	28	2,960	53	37
JA6VZB	"	2,850	42	38
JA1AAT	"	55	5	5
ES1CR	21	52,488	227	162
WA3LFY	21	43,952	182	164
DJ4SB	21	38,624	173	142
OK2SBL	21	27,492	131	116
NI9C	21	4,720	66	59
YU4XA	21	4,557	50	49
JH1BUB	21	2,220	36	30
UB5ZME	21	1,176	30	28
4N4AE	14	75,855	238	195
K9OSH	14	30,800	176	148
IK3JLU	14	25,560	150	120
JA3CCX	14	25,080	110	88
OK1HR	14	24,500	159	125

W8QZA/6	14	20,328	129	121
KF8T	14	12,969	135	131
SM1CNS	14	12,638	107	89
OK1AQW	"	9,990	82	74
KA1CZF	14	5,610	69	66
RV3E/JT18Y	14	4,176	57	36
HB9AYZ	14	1,764	45	36
OK2BOX	7	98,196	240	167
AA6XX	7	33,600	113	100
JAG6CE	7	26,700	105	89
PY4ZD	7	20,292	64	57
OZ1BIZ	7	16,280	94	74
Y23TL	7	13,662	85	69
JF2LTH	"	6,148	63	53
Y49ZL	"	30	3	3
4N7MOD	3.5	141,075	292	165
OK2BXR	3.5	32,264	167	109
Y21YT	3.5	19,635	122	85
SP4RUP	3.5	1,295	37	35
UB5RHF	1.8	26,820	143	90
I08KHP	1.8	1,008	24	21

SINGLE OPERATOR NORTH AMERICA

UNITED STATES

KY1H	A	2,353,568	1478	608
			(Op. KQ2M)	
W2SC	A	1,703,365	1175	505
W1CNU	"	182,500	277	250
N8RA	"	74,613	168	119
AA1M	"	32,421	120	107
K2SX/1	"	16,616	155	124
WA1FCN	21	18,419	136	113
K1TO	14	1,208,858	1077	553
K1ZM	1.8	4,784	63	46

KZ2S	A	2,361,890	1471	589
KE2PF	A	1,420,578	1155	486
K2PS	A	1,053,085	870	451
NR2H	"	755,298	776	394
AB2E	"	347,976	564	324
KT2D	"	123,327	289	213
KF2O	"	82,694	204	173
NE2W	"	29,127	189	133
W2HCA	"	21,120	104	96
AA2Y	"	18,955	106	85
WT2F	"	14,577	141	113
WB2Q	21	675,906	805	462
NS2K	14	278,168	577	319
NQ2D	7	1,012,780	723	395
KT3Y	A	2,592,512	1491	608
K3ZO	A	2,467,829	1384	577
AA3B	"	678,798	755	387
K5ZD/3	"	402,827	529	331
NW3Y	"	388,620	411	255
W3GG	"	299,624	431	268
KA3RRF	"	77,074	256	178
K3GWA	"	73,829	256	199
K3VW	"	24,750	117	99
NN3Q	"	11,832	157	116
N3GB	21	784,123	725	479
NJ3K	14	19,278	213	162
K3ND	"	7,650	55	50
NK3U	"	5,120	67	64
W3BGN	7	131,274	210	143
WW4T	A	2,506,030	1771	655
			(Op. KM9P)	
K4PQL	A	1,047,284	910	452
AA4XU	"	114,268	350	212
W4YN	"	75,072	181	138
K4LTA	"	63,874	326	218

AA4KD	"	56,295	155	135
WB4FOT	"	46,216	143	106
KD1U	"	40,750	257	163
WA4QMQ	21	54,943	181	167
KC2X	14	797,475	993	465
K4JPD	"	35,280	154	120
K4NNO	"	4,524	54	52
K1ZZI	7	719,280	593	370
N4HEK	"	15,936	89	83
K7UP	A	1,313,690	1119	490
			(Op. AA5B)	
N5RZ	A	1,016,140	958	470
WF5E	"	481,536	616	352
KA5W	"	266,724	403	279
NT5G	"	92,120	239	196
NJ1V/5	"	81,840	477	264
WA5GIK	"	54,120	164	123
N5NA	"	42,300	160	141
AA5CV	"	37,422	236	162
WC5D	"	34,580	119	91
WA5DTK	"	30,084	134	109
W5EIJ	"	14,112	114	96
KI3L/5	"	12,862	163	118
AA5PA	"	1,092	41	39
K5RX	28	43,262	266	194
KM5R	"	22,940	228	155
WN4KKN/5	21	655,939	936	521
NR5M	"	378,798	674	406
W5FO	14	847,867	1039	487
N5WA	"	85,332	223	156
NI6W	A	1,810,171	1294	473
N6TV	A	1,346,834	1004	437
N6EK	"	736,404	706	327
AD6E	"	369,297	544	333
AJ6V	"	333,801	600	317

CONTINENTAL LEADERS

AFRICA		OCEANIA	
AB 5H0T	5,175,211	AB AH3C	4,047,610
28 No Entrant		28 VK4XA	236,600
21 ZS6BCR	2,882,554	21 ZM3GO	3,192,588
14 9J2AL	1,333,724	14 No Entrant	
7 EA8BLC	118,080	7 V73AS	1,793,840
3.5 No Entrant		3.5 No Entrant	
1.8 No Entrant		1.8 No Entrant	
ASIA		SOUTH AMERICA	
AB EX9B	2,883,993	AB ZW5B	7,654,692
28 RH0E	799,032	28 YV3A	1,690,383
21 UL3BX	657,697	21 PQ4OD	2,842,912
14 JA1YFG	1,174,383	14 PY2RN	1,751,430
7 JH0ZHQ	265,780	7 LU1FTC	565,976
3.5 UA9SP	345,600	3.5 LS7DX	2,604
1.8 XV2AAA	48	1.8 PY0FF	5,900
EUROPE		MULTI-SINGLE	
AB IO4IND	3,634,385	AF No Entrant	
28 CT1AHU	655,131	AS YM5KA	13,098,790
21 4N3E	3,239,453	EU LZ9A	8,023,800
14 YT3M	1,229,977	NA 8P9AQ	7,677,670
7 4N4A	1,476,122	OC YB0ZAA	3,561,495
3.5 4N1A	385,890	SA P43GR	10,990,482
1.8 OK5TOP	68,730		
NORTH AMERICA		MULTI-MULTI	
AB 5J0T	7,597,954	AF No Entrant	
28 K5RX	43,262	AS JE2YRD	5,485,872
21 VP2VDX	1,249,563	EU HG73DX	11,740,872
14 K1TO	1,208,858	NA AC6T	2,846,536
7 NQ2D	1,012,780	OC No Entrant	
3.5 VE6OU/3	153,912	SA No Entrant	
1.8 K1ZM	4,784		

T.V.I. problems?

Low pass T.V.I. filters from
Barker & Williamson



Model	Power (Watts)	Cut Off Frequency	Frequency of Maximum Attenuation	Minimum Attenuation	Frequency Range	Price
FL10/1500	1000	34 MHz	52 MHz	70 db	1.8 - 30 MHz	\$41.50*
FL10/100	100	44 MHz	57 MHz	60 db	1.8 - 30 MHz	\$32.75*
FL6/1500	1000	55 MHz	63 MHz	70 db	6 meter	\$55.00*
FL6/100	100	55 MHz	63 MHz	50 db	6 meter	\$38.50*

All above to match 50 ohm transmitters and antennas.

*Add \$2 shipping and handling

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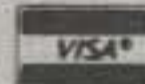
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<table border="0"> <tr><td>K6DR</td><td>118,064</td><td>291</td><td>188</td></tr> <tr><td>N6SUZ</td><td>81,663</td><td>224</td><td>167</td></tr> <tr><td>K6LRN</td><td>45,756</td><td>190</td><td>164</td></tr> <tr><td>K7JYE</td><td>42,570</td><td>234</td><td>165</td></tr> <tr><td>W6MVV</td><td>21,714</td><td>102</td><td>77</td></tr> <tr><td>N6JM</td><td>14,040</td><td>80</td><td>65</td></tr> <tr><td>AA6EE</td><td>3,782</td><td>70</td><td>61</td></tr> <tr><td>WA6FGV</td><td>12,496</td><td>107</td><td>88</td></tr> <tr><td>N6MU</td><td>223,776</td><td>430</td><td>296</td></tr> <tr><td>W6ISQ</td><td>25,707</td><td>134</td><td>123</td></tr> <tr><td>KI6EZ</td><td>310,288</td><td>593</td><td>328</td></tr> <tr><td>KI6ZH</td><td>154,840</td><td>382</td><td>280</td></tr> <tr><td>K6ZM</td><td>66,740</td><td>223</td><td>188</td></tr> <tr><td>NW6N</td><td>470,304</td><td>550</td><td>276</td></tr> <tr><td>WU7Q</td><td>252,900</td><td>435</td><td>225</td></tr> <tr><td>W7CB</td><td>113,364</td><td>233</td><td>141</td></tr> <tr><td>KJ6DL</td><td>368</td><td>23</td><td>23</td></tr> <tr><td>KI3V/7</td><td>1,109,676</td><td>974</td><td>471</td></tr> <tr><td>KC7V</td><td>629,612</td><td>800</td><td>394</td></tr> <tr><td>AI7B</td><td>323,845</td><td>459</td><td>271</td></tr> <tr><td>KS7T</td><td>199,330</td><td>510</td><td>310</td></tr> <tr><td>K6X0/7</td><td>197,501</td><td>375</td><td>277</td></tr> <tr><td>W7HS</td><td>151,439</td><td>281</td><td>199</td></tr> <tr><td>W7QN</td><td>36,660</td><td>182</td><td>156</td></tr> <tr><td>N7MMQ</td><td>36,144</td><td>183</td><td>144</td></tr> <tr><td>KA7FEF</td><td>8,132</td><td>81</td><td>76</td></tr> <tr><td>W7VIH</td><td>6,188</td><td>69</td><td>52</td></tr> <tr><td>N7LOX</td><td>2,640</td><td>48</td><td>44</td></tr> <tr><td>NX7K</td><td>185,949</td><td>468</td><td>291</td></tr> <tr><td>W7AYY</td><td>61,884</td><td>187</td><td>162</td></tr> <tr><td>WA7FAB</td><td>201,042</td><td>379</td><td>219</td></tr> <tr><td>K7SDW</td><td>11,430</td><td>55</td><td>45</td></tr> <tr><td>KQ8M</td><td>1,549,978</td><td>1241</td><td>538</td></tr> <tr><td>KW8N</td><td>1,308,104</td><td>1181</td><td>497</td></tr> <tr><td>W0CG</td><td>975,244</td><td>930</td><td>479</td></tr> <tr><td>WB3KXX/8</td><td>620,544</td><td>722</td><td>404</td></tr> <tr><td>W8IQ</td><td>499,369</td><td>549</td><td>359</td></tr> <tr><td>NG8D</td><td>278,726</td><td>444</td><td>301</td></tr> <tr><td>N8BC</td><td>107,250</td><td>252</td><td>195</td></tr> <tr><td>NS8D</td><td>95,568</td><td>243</td><td>181</td></tr> <tr><td>K8DD</td><td>93,400</td><td>245</td><td>200</td></tr> <tr><td>WB8OC</td><td>76,320</td><td>210</td><td>159</td></tr> <tr><td>K8CV</td><td>65,562</td><td>191</td><td>147</td></tr> <tr><td>WBUPH</td><td>63,008</td><td>202</td><td>176</td></tr> <tr><td>K8MR</td><td>25,116</td><td>112</td><td>92</td></tr> <tr><td>AC8W</td><td>15,580</td><td>84</td><td>82</td></tr> <tr><td>N8EA</td><td>37,128</td><td>121</td><td>119</td></tr> <tr><td>KV8Q</td><td>144,000</td><td>343</td><td>240</td></tr> <tr><td>WG8M</td><td>70,864</td><td>213</td><td>172</td></tr> </table>	K6DR	118,064	291	188	N6SUZ	81,663	224	167	K6LRN	45,756	190	164	K7JYE	42,570	234	165	W6MVV	21,714	102	77	N6JM	14,040	80	65	AA6EE	3,782	70	61	WA6FGV	12,496	107	88	N6MU	223,776	430	296	W6ISQ	25,707	134	123	KI6EZ	310,288	593	328	KI6ZH	154,840	382	280	K6ZM	66,740	223	188	NW6N	470,304	550	276	WU7Q	252,900	435	225	W7CB	113,364	233	141	KJ6DL	368	23	23	KI3V/7	1,109,676	974	471	KC7V	629,612	800	394	AI7B	323,845	459	271	KS7T	199,330	510	310	K6X0/7	197,501	375	277	W7HS	151,439	281	199	W7QN	36,660	182	156	N7MMQ	36,144	183	144	KA7FEF	8,132	81	76	W7VIH	6,188	69	52	N7LOX	2,640	48	44	NX7K	185,949	468	291	W7AYY	61,884	187	162	WA7FAB	201,042	379	219	K7SDW	11,430	55	45	KQ8M	1,549,978	1241	538	KW8N	1,308,104	1181	497	W0CG	975,244	930	479	WB3KXX/8	620,544	722	404	W8IQ	499,369	549	359	NG8D	278,726	444	301	N8BC	107,250	252	195	NS8D	95,568	243	181	K8DD	93,400	245	200	WB8OC	76,320	210	159	K8CV	65,562	191	147	WBUPH	63,008	202	176	K8MR	25,116	112	92	AC8W	15,580	84	82	N8EA	37,128	121	119	KV8Q	144,000	343	240	WG8M	70,864	213	172	<table border="0"> <tr><td>W9RE</td><td>A</td><td>383,600</td><td>550</td><td>350</td></tr> <tr><td>KM9L</td><td>A</td><td>346,212</td><td>519</td><td>326</td></tr> <tr><td></td><td></td><td>(Op. WB9JKI)</td><td></td><td></td></tr> <tr><td>NA1R</td><td></td><td>100,656</td><td>367</td><td>233</td></tr> <tr><td>W9HE</td><td></td><td>84,504</td><td>223</td><td>168</td></tr> <tr><td>K9UQN</td><td></td><td>36,576</td><td>143</td><td>127</td></tr> <tr><td>NM9H</td><td>21</td><td>321,597</td><td>587</td><td>387</td></tr> <tr><td>K9ZO</td><td></td><td>184,608</td><td>451</td><td>331</td></tr> <tr><td>N0BSH/9</td><td>14</td><td>402,166</td><td>694</td><td>422</td></tr> <tr><td>K0RF</td><td>A</td><td>1,499,850</td><td>1202</td><td>505</td></tr> <tr><td></td><td></td><td>(Op. W0UA)</td><td></td><td></td></tr> <tr><td>KM0L</td><td>A</td><td>479,576</td><td>719</td><td>397</td></tr> <tr><td>KJ0G</td><td></td><td>221,520</td><td>356</td><td>260</td></tr> <tr><td>N00F</td><td></td><td>160,064</td><td>609</td><td>328</td></tr> <tr><td>NS0B</td><td></td><td>86,856</td><td>239</td><td>188</td></tr> <tr><td>KA3DRR/0</td><td></td><td>83,634</td><td>484</td><td>263</td></tr> <tr><td>W50DD/0</td><td></td><td>54,450</td><td>172</td><td>150</td></tr> <tr><td>KE0UI</td><td></td><td>43,890</td><td>183</td><td>165</td></tr> <tr><td>N0AT</td><td></td><td>39,501</td><td>146</td><td>133</td></tr> <tr><td>WA4TWB/0</td><td></td><td>30,375</td><td>146</td><td>125</td></tr> <tr><td>N0ZA</td><td></td><td>23,214</td><td>106</td><td>106</td></tr> <tr><td>WD0AVV</td><td></td><td>10,812</td><td>138</td><td>102</td></tr> <tr><td>NV0P</td><td>28</td><td>2,160</td><td>136</td><td>80</td></tr> <tr><td colspan="5" style="text-align: center;">DOMINICAN REPUBLIC</td></tr> <tr><td>JP1DMX/H18</td><td>21</td><td>416,118</td><td>587</td><td>311</td></tr> <tr><td colspan="5" style="text-align: center;">SAN ANDRES IS.</td></tr> <tr><td>5J0T</td><td>A</td><td>7,597,954</td><td>2981</td><td>763</td></tr> <tr><td></td><td></td><td>(Op. YU1RL)</td><td></td><td></td></tr> <tr><td colspan="5" style="text-align: center;">PANAMA</td></tr> <tr><td>HP1AC</td><td>A</td><td>36,400</td><td>136</td><td>112</td></tr> <tr><td colspan="5" style="text-align: center;">HONDURAS</td></tr> <tr><td>YU400/HR1</td><td>A</td><td>730,004</td><td>867</td><td>353</td></tr> <tr><td colspan="5" style="text-align: center;">ALASKA</td></tr> <tr><td>AL7CO</td><td>A</td><td>51,483</td><td>174</td><td>131</td></tr> <tr><td>NL7DU</td><td></td><td>462</td><td>16</td><td>14</td></tr> <tr><td colspan="5" style="text-align: center;">PUERTO RICO</td></tr> <tr><td>WB2FFY/KP4</td><td>A</td><td>165,635</td><td>335</td><td>211</td></tr> <tr><td colspan="5" style="text-align: center;">COSTA RICA</td></tr> <tr><td>TE5T</td><td>21</td><td>943,290</td><td>1011</td><td>423</td></tr> </table>	W9RE	A	383,600	550	350	KM9L	A	346,212	519	326			(Op. WB9JKI)			NA1R		100,656	367	233	W9HE		84,504	223	168	K9UQN		36,576	143	127	NM9H	21	321,597	587	387	K9ZO		184,608	451	331	N0BSH/9	14	402,166	694	422	K0RF	A	1,499,850	1202	505			(Op. W0UA)			KM0L	A	479,576	719	397	KJ0G		221,520	356	260	N00F		160,064	609	328	NS0B		86,856	239	188	KA3DRR/0		83,634	484	263	W50DD/0		54,450	172	150	KE0UI		43,890	183	165	N0AT		39,501	146	133	WA4TWB/0		30,375	146	125	N0ZA		23,214	106	106	WD0AVV		10,812	138	102	NV0P	28	2,160	136	80	DOMINICAN REPUBLIC					JP1DMX/H18	21	416,118	587	311	SAN ANDRES IS.					5J0T	A	7,597,954	2981	763			(Op. YU1RL)			PANAMA					HP1AC	A	36,400	136	112	HONDURAS					YU400/HR1	A	730,004	867	353	ALASKA					AL7CO	A	51,483	174	131	NL7DU		462	16	14	PUERTO RICO					WB2FFY/KP4	A	165,635	335	211	COSTA RICA					TE5T	21	943,290	1011	423	<table border="0"> <tr><td>VO1MP</td><td>A</td><td>966,540</td><td>878</td><td>362</td></tr> <tr><td>VE6BF</td><td>A</td><td>100,448</td><td>263</td><td>172</td></tr> <tr><td>VO1AW</td><td>A</td><td>50,960</td><td>140</td><td>140</td></tr> <tr><td>VE3TEE</td><td>A</td><td>2,790</td><td>93</td><td>30</td></tr> <tr><td>VE3HX</td><td>28</td><td>17,301</td><td>100</td><td>79</td></tr> <tr><td>VD7C</td><td>14</td><td>786,210</td><td>943</td><td>365</td></tr> <tr><td></td><td></td><td>(Op. VE7CXR)</td><td></td><td></td></tr> <tr><td>VE7NTT</td><td></td><td>651,000</td><td>770</td><td>375</td></tr> <tr><td>VE6BMX</td><td>14</td><td>65,858</td><td>213</td><td>149</td></tr> <tr><td>VO1SF</td><td>7</td><td>50,960</td><td>110</td><td>91</td></tr> <tr><td>VE3NYT</td><td>7</td><td>25,950</td><td>75</td><td>75</td></tr> <tr><td>VE6OU/3</td><td>3.5</td><td>153,912</td><td>213</td><td>159</td></tr> <tr><td colspan="5" style="text-align: center;">CANADA</td></tr> <tr><td>3W1PZ</td><td>14</td><td>254,436</td><td>514</td><td>233</td></tr> <tr><td>XV2AYL</td><td>7</td><td>374</td><td>11</td><td>11</td></tr> <tr><td>3W3RR</td><td>3.5</td><td>12,444</td><td>88</td><td>51</td></tr> <tr><td>XV2AAA</td><td>1.8</td><td>48</td><td>4</td><td>4</td></tr> <tr><td colspan="5" style="text-align: center;">ISRAEL</td></tr> <tr><td>4X4VF</td><td>28</td><td>23,716</td><td>111</td><td>77</td></tr> <tr><td colspan="5" style="text-align: center;">SINGAPORE</td></tr> <tr><td>9V1YC</td><td>A</td><td>1,273,266</td><td>1016</td><td>513</td></tr> <tr><td></td><td></td><td>(Op. KB1CM)</td><td></td><td></td></tr> <tr><td colspan="5" style="text-align: center;">CHINA</td></tr> <tr><td>BY8AC</td><td>21</td><td>144</td><td>10</td><td>9</td></tr> <tr><td colspan="5" style="text-align: center;">KOREA</td></tr> <tr><td>HL5AP</td><td>A</td><td>121,173</td><td>295</td><td>239</td></tr> <tr><td colspan="5" style="text-align: center;">SAUDI ARABIA</td></tr> <tr><td>HZ1AB</td><td>A</td><td>783,941</td><td>840</td><td>317</td></tr> <tr><td></td><td></td><td>(Op. SM0CXU)</td><td></td><td></td></tr> <tr><td colspan="5" style="text-align: center;">JAPAN</td></tr> <tr><td>JH7WKO</td><td>A</td><td>1,260,042</td><td>1057</td><td>399</td></tr> <tr><td>JG3KIV</td><td>A</td><td>1,141,418</td><td>1069</td><td>394</td></tr> <tr><td>JR1IJV</td><td>A</td><td>1,111,755</td><td>994</td><td>411</td></tr> <tr><td>JH2UVL</td><td></td><td>1,104,354</td><td>982</td><td>401</td></tr> <tr><td>JH5FXP</td><td></td><td>922,720</td><td>854</td><td>365</td></tr> <tr><td>7J1AAI</td><td></td><td>577,346</td><td>722</td><td>322</td></tr> <tr><td></td><td></td><td>(Op. K8HVT)</td><td></td><td></td></tr> <tr><td>JH4NMT</td><td></td><td>505,076</td><td>635</td><td>286</td></tr> <tr><td>JM1NKT</td><td></td><td>450,808</td><td>558</td><td>296</td></tr> <tr><td>JE7WBI/1</td><td></td><td>295,427</td><td>457</td><td>251</td></tr> <tr><td>JH0DNX</td><td></td><td>199,540</td><td>367</td><td>220</td></tr> <tr><td>JA1BNW</td><td></td><td>139,698</td><td>271</td><td>199</td></tr> <tr><td>JA3VOV</td><td></td><td>119,259</td><td>261</td><td>189</td></tr> <tr><td>JK1GKG</td><td></td><td>106,400</td><td>295</td><td>175</td></tr> <tr><td>JA3ARM</td><td></td><td>87,828</td><td>220</td><td>156</td></tr> <tr><td>JABAJE</td><td></td><td>76,024</td><td>194</td><td>136</td></tr> <tr><td>JA6BWH</td><td></td><td>72,090</td><td>191</td><td>135</td></tr> <tr><td>JM1AQU</td><td></td><td>59,361</td><td>185</td><td>141</td></tr> <tr><td>JA5IP</td><td></td><td>57,218</td><td>164</td><td>134</td></tr> <tr><td>JA3UWB</td><td></td><td>47,268</td><td>159</td><td>117</td></tr> <tr><td>JR3XEX</td><td></td><td>46,464</td><td>150</td><td>121</td></tr> <tr><td>JA7ASD</td><td></td><td>44,576</td><td>157</td><td>112</td></tr> <tr><td>JH3JYS</td><td></td><td>44,125</td><td>164</td><td>125</td></tr> <tr><td>JA0HC</td><td></td><td>33,488</td><td>128</td><td>92</td></tr> <tr><td>JE0UXR</td><td></td><td>33,048</td><td>112</td><td>102</td></tr> <tr><td>JG1BPS</td><td></td><td>28,034</td><td>128</td><td>107</td></tr> <tr><td>JA2ESR</td><td></td><td>27,225</td><td>126</td><td>99</td></tr> <tr><td>JA1BUI</td><td></td><td>23,324</td><td>106</td><td>98</td></tr> <tr><td>JH8HBO</td><td></td><td>21,120</td><td>114</td><td>88</td></tr> <tr><td>JO1QZI</td><td></td><td>20,145</td><td>96</td><td>85</td></tr> <tr><td>JH1NSD</td><td></td><td>19,080</td><td>87</td><td>72</td></tr> <tr><td>JH1PXY</td><td></td><td>17,088</td><td>97</td><td>64</td></tr> <tr><td>JA0XQO</td><td></td><td>8,816</td><td>63</td><td>58</td></tr> <tr><td>JE1KDM</td><td></td><td>8,216</td><td>56</td><td>52</td></tr> <tr><td>JG3EHD</td><td></td><td>3,850</td><td>42</td><td>35</td></tr> <tr><td>JA9CWW</td><td></td><td>3,630</td><td>40</td><td>33</td></tr> <tr><td>JQ1BRW</td><td></td><td>2,604</td><td>35</td><td>31</td></tr> <tr><td>JM1QZV</td><td></td><td>1,518</td><td>25</td><td>23</td></tr> <tr><td>JE4ETG</td><td></td><td>1,350</td><td>27</td><td>21</td></tr> <tr><td>JG1RDV</td><td></td><td>1,278</td><td>28</td><td>27</td></tr> <tr><td>JH1NHU</td><td></td><td>780</td><td>25</td><td>12</td></tr> <tr><td>JG1LUD</td><td></td><td>475</td><td>26</td><td>25</td></tr> <tr><td>JJ2WCP</td><td></td><td>48</td><td>6</td><td>6</td></tr> <tr><td>JF2DQJ</td><td>28</td><td>23,532</td><td>138</td><td>106</td></tr> <tr><td>JA1KFX</td><td>28</td><td>17,654</td><td>113</td><td>91</td></tr> <tr><td>JH0USD</td><td></td><td>14,442</td><td>102</td><td>87</td></tr> <tr><td>JA6BIF</td><td></td><td>10,640</td><td>81</td><td>70</td></tr> <tr><td>JH4XKW</td><td></td><td>10,150</td><td>90</td><td>70</td></tr> <tr><td>JA1YWQ</td><td></td><td>6,160</td><td>61</td><td>55</td></tr> <tr><td>JA4ETH</td><td></td><td>2,988</td><td>39</td><td>36</td></tr> <tr><td>JH7XGN</td><td>21</td><td>340,987</td><td>484</td><td>277</td></tr> <tr><td>JR3NZC</td><td>21</td><td>323,750</td><td>511</td><td>259</td></tr> <tr><td>JN1AIF</td><td></td><td>295,612</td><td>496</td><td>263</td></tr> <tr><td>JE0UXR</td><td></td><td>208,800</td><td>383</td><td>225</td></tr> <tr><td>JJ1GQH</td><td></td><td>92,462</td><td>230</td><td>166</td></tr> <tr><td>JE4AVV</td><td></td><td>51,847</td><td>167</td><td>139</td></tr> <tr><td>JH7CJM</td><td></td><td>33,176</td><td>120</td><td>104</td></tr> <tr><td>JA6HJP</td><td></td><td>26,640</td><td>119</td><td>90</td></tr> <tr><td>JA0BJY</td><td></td><td>24,384</td><td>100</td><td>96</td></tr> <tr><td>JS1OSP</td><td></td><td>19,125</td><td>105</td><td>85</td></tr> <tr><td>JL1UCX</td><td></td><td>14,457</td><td>97</td><td>79</td></tr> <tr><td>JA1JGP</td><td></td><td>12,702</td><td>73</td><td>73</td></tr> <tr><td>JK1OEO</td><td></td><td>11,590</td><td>66</td><td>61</td></tr> <tr><td>JR1UJW</td><td></td><td>5,104</td><td>47</td><td>45</td></tr> <tr><td>JQ1HNZ</td><td></td><td>4,880</td><td>74</td><td>61</td></tr> <tr><td>JA2EJ</td><td></td><td>4,416</td><td>47</td><td>46</td></tr> <tr><td>JF6JQM</td><td></td><td>4,290</td><td>41</td><td>39</td></tr> <tr><td>JA1XPU</td><td></td><td>2,480</td><td>34</td><td>31</td></tr> <tr><td>JABEJO</td><td></td><td>988</td><td>20</td><td>19</td></tr> <tr><td>JA4AQR</td><td></td><td>828</td><td>18</td><td>18</td></tr> <tr><td>JI4ARB</td><td></td><td>629</td><td>18</td><td>17</td></tr> <tr><td>JI1LNR</td><td></td><td>220</td><td>10</td><td>10</td></tr> <tr><td>JA5DZY</td><td></td><td>176</td><td>8</td><td>8</td></tr> <tr><td>JA1YFG</td><td>14</td><td>1,174,383</td><td>958</td><td>441</td></tr> <tr><td>JE3ZFS</td><td>14</td><td>819,425</td><td>823</td><td>365</td></tr> <tr><td></td><td></td><td>(Op. JK3HZH)</td><td></td><td></td></tr> <tr><td>JA2DN</td><td></td><td>104,748</td><td>228</td><td>174</td></tr> <tr><td>JA1XCZ/4</td><td></td><td>30,780</td><td>128</td><td>114</td></tr> <tr><td>JA2QJ</td><td></td><td>25,774</td><td>104</td><td>98</td></tr> </table>	VO1MP	A	966,540	878	362	VE6BF	A	100,448	263	172	VO1AW	A	50,960	140	140	VE3TEE	A	2,790	93	30	VE3HX	28	17,301	100	79	VD7C	14	786,210	943	365			(Op. VE7CXR)			VE7NTT		651,000	770	375	VE6BMX	14	65,858	213	149	VO1SF	7	50,960	110	91	VE3NYT	7	25,950	75	75	VE6OU/3	3.5	153,912	213	159	CANADA					3W1PZ	14	254,436	514	233	XV2AYL	7	374	11	11	3W3RR	3.5	12,444	88	51	XV2AAA	1.8	48	4	4	ISRAEL					4X4VF	28	23,716	111	77	SINGAPORE					9V1YC	A	1,273,266	1016	513			(Op. KB1CM)			CHINA					BY8AC	21	144	10	9	KOREA					HL5AP	A	121,173	295	239	SAUDI ARABIA					HZ1AB	A	783,941	840	317			(Op. SM0CXU)			JAPAN					JH7WKO	A	1,260,042	1057	399	JG3KIV	A	1,141,418	1069	394	JR1IJV	A	1,111,755	994	411	JH2UVL		1,104,354	982	401	JH5FXP		922,720	854	365	7J1AAI		577,346	722	322			(Op. K8HVT)			JH4NMT		505,076	635	286	JM1NKT		450,808	558	296	JE7WBI/1		295,427	457	251	JH0DNX		199,540	367	220	JA1BNW		139,698	271	199	JA3VOV		119,259	261	189	JK1GKG		106,400	295	175	JA3ARM		87,828	220	156	JABAJE		76,024	194	136	JA6BWH		72,090	191	135	JM1AQU		59,361	185	141	JA5IP		57,218	164	134	JA3UWB		47,268	159	117	JR3XEX		46,464	150	121	JA7ASD		44,576	157	112	JH3JYS		44,125	164	125	JA0HC		33,488	128	92	JE0UXR		33,048	112	102	JG1BPS		28,034	128	107	JA2ESR		27,225	126	99	JA1BUI		23,324	106	98	JH8HBO		21,120	114	88	JO1QZI		20,145	96	85	JH1NSD		19,080	87	72	JH1PXY		17,088	97	64	JA0XQO		8,816	63	58	JE1KDM		8,216	56	52	JG3EHD		3,850	42	35	JA9CWW		3,630	40	33	JQ1BRW		2,604	35	31	JM1QZV		1,518	25	23	JE4ETG		1,350	27	21	JG1RDV		1,278	28	27	JH1NHU		780	25	12	JG1LUD		475	26	25	JJ2WCP		48	6	6	JF2DQJ	28	23,532	138	106	JA1KFX	28	17,654	113	91	JH0USD		14,442	102	87	JA6BIF		10,640	81	70	JH4XKW		10,150	90	70	JA1YWQ		6,160	61	55	JA4ETH		2,988	39	36	JH7XGN	21	340,987	484	277	JR3NZC	21	323,750	511	259	JN1AIF		295,612	496	263	JE0UXR		208,800	383	225	JJ1GQH		92,462	230	166	JE4AVV		51,847	167	139	JH7CJM		33,176	120	104	JA6HJP		26,640	119	90	JA0BJY		24,384	100	96	JS1OSP		19,125	105	85	JL1UCX		14,457	97	79	JA1JGP		12,702	73	73	JK1OEO		11,590	66	61	JR1UJW		5,104	47	45	JQ1HNZ		4,880	74	61	JA2EJ		4,416	47	46	JF6JQM		4,290	41	39	JA1XPU		2,480	34	31	JABEJO		988	20	19	JA4AQR		828	18	18	JI4ARB		629	18	17	JI1LNR		220	10	10	JA5DZY		176	8	8	JA1YFG	14	1,174,383	958	441	JE3ZFS	14	819,425	823	365			(Op. JK3HZH)			JA2DN		104,748	228	174	JA1XCZ/4		30,780	128	114	JA2QJ		25,774	104	98
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JG1BPS		28,034	128	107																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
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JA1BUI		23,324	106	98																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JH8HBO		21,120	114	88																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JO1QZI		20,145	96	85																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JH1NSD		19,080	87	72																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JH1PXY		17,088	97	64																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JA0XQO		8,816	63	58																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JE1KDM		8,216	56	52																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JG3EHD		3,850	42	35																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JA9CWW		3,630	40	33																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JQ1BRW		2,604	35	31																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JM1QZV		1,518	25	23																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JE4ETG		1,350	27	21																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JG1RDV		1,278	28	27																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JH1NHU		780	25	12																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JG1LUD		475	26	25																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JJ2WCP		48	6	6																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JF2DQJ	28	23,532	138	106																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JA1KFX	28	17,654	113	91																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JH0USD		14,442	102	87																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JA6BIF		10,640	81	70																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JH4XKW		10,150	90	70																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JA1YWQ		6,160	61	55																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JA4ETH		2,988	39	36																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JH7XGN	21	340,987	484	277																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JR3NZC	21	323,750	511	259																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JN1AIF		295,612	496	263																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JE0UXR		208,800	383	225																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JJ1GQH		92,462	230	166																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JE4AVV		51,847	167	139																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JH7CJM		33,176	120	104																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JA6HJP		26,640	119	90																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JA0BJY		24,384	100	96																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JS1OSP		19,125	105	85																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JL1UCX		14,457	97	79																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JA1JGP		12,702	73	73																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JK1OEO		11,590	66	61																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JR1UJW		5,104	47	45																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JQ1HNZ		4,880	74	61																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JA2EJ		4,416	47	46																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JF6JQM		4,290	41	39																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JA1XPU		2,480	34	31																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JABEJO		988	20	19																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JA4AQR		828	18	18																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JI4ARB		629	18	17																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JI1LNR		220	10	10																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JA5DZY		176	8	8																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JA1YFG	14	1,174,383	958	441																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JE3ZFS	14	819,425	823	365																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
		(Op. JK3HZH)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
JA2DN		104,748	228	174																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JA1XCZ/4		30,780	128	114																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
JA2QJ		25,774	104	98																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						



HF Equipment Regular SALE
IC-765 Xcvr/ps/keyer/auto tuner..... 3149.00 CALL



IC-781 Xcvr/Rcvr/ps/tuner/scope 6149 CALL



IC-751A 9-band xcvr/.1-30 MHz rcvr 1699.00 1399
PS-35 Internal power supply 219.00 199⁹⁵
FL-63A 250 Hz CW filter (1st IF)..... 59.00
FL-52A 500 Hz CW filter (2nd IF).... 115.00 109⁹⁵
FL-53A 250 Hz CW filter (2nd IF).... 115.00 109⁹⁵
FL-70 2.8 kHz wide SSB filter..... 59.00



IC-735 HF xcvr/SW rcvr/mic..... 1149.00 969⁹⁵
PS-55 External power supply 219.00 199⁹⁵
AT-150 Automatic antenna tuner 445.00 CALL
FL-32A 500 Hz CW filter..... 69.00
EX-243 Electronic keyer unit..... 64.50
UT-30 Tone encoder 18.50

IC-725 HF xcvr/SW rcvr..... 949.00 799⁹⁵
AH-3 Automatic antenna tuner 489.00 429⁹⁵
IC-726 10-band xcvr/6m..... 1299.00 1089

Accessories Regular SALE
IC-2KL HF solid state amp w/ps..... 1999.00 1699
IC-4KL HF 1KW out s/s amp w/ps..... 6995.00 CALL
EX-627 HF auto. ant. selector (Special) 315.00 269⁹⁵
PS-15 20A external power supply 175.00 159⁹⁵
PS-30 Systems p/s w/cord, 6-pin plug 349.00 319⁹⁵
SP-3 External speaker 65.00
SP-7 Small external speaker 51.99
SR-64 High stab. ref. xtal; 751A, etc ... 79.00
SM-6 Desk microphone 47.95
SM-8 Desk mic - two cables, scan 89.00
AT-500 500W 9-band auto. ant. tuner 589.00 519⁹⁵
AH-2 8-band tuner w/mount & whip... 758.00 689⁹⁵
AH-2A Ant tuner system, only (Special) 559.00 469⁹⁵

Accessories for IC-765/781/725 • Call for Prices



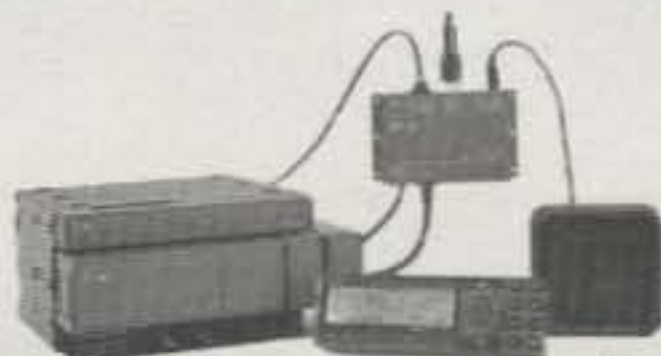
★ Large Stocks
★ Fast Service
★ Top Trades
at AES®

VHF/UHF Base Transceivers Regular SALE
IC-275A 25w 2m FM/SSB/CW w/ps... 1299.00 1129
IC-275H 100w 2m FM/SSB/CW..... 1399.00 1199
IC-475A 25w 440 FM/SSB/CW w/ps e/o 1399.00 1199
IC-475H 100w 440 FM/SSB/CW (Spec) 1599.00 1269
IC-575A 25w 6/10m xcvr/ps (Special) 1399.00 1099
IC-575H 25w 100w 6/10m xcvr..... 1699.00 1469



VHF/UHF Mobile Transceivers Regular Sale
IC-229A 25w 2m FM/TTP mic 449.00 CALL
IC-229H 50w 2m FM/TTP mic 479.00 CALL
IC-448A 25w 440 FM/TTP ... (Closeout) 599.00 499⁹⁵

Dual-band FM Transceivers Regular Sale
IC-3220A 25w 2m/440 FM/TTP mic... 659.00 569⁹⁵
IC-3220H 45w 2m/35w 440 FM/TTP 699.00 599⁹⁵
IC-2400A 2m/440 FM/TTP 899.00 CALL
IC-2500A 35w 440/1.2GHz FM..... 999.00 CALL



Multi-band FM Transceiver Regular Sale
IC-901 2m/440 Fiber opt. xcvr 1199.00 CALL
UX-R91A Broadband receiver unit... 389.00 CALL
UX-19A 10w 10m unit 299.00 269⁹⁵
UX-59A 10w 6m unit..... 349.00 319⁹⁵
UX-S92A 2m SSB/CW module..... 599.00 CALL
UX-39A 25w 220MHz unit (Special) 349.00 279⁹⁵
UX-S94A 430 SSB/CW module TBA
UX-129A 10w 1.2GHz unit 549.00 499⁹⁵

VHF/UHF Mobile Transceivers Regular Sale
IC-970A 25w 2m/430 MHz transceiver 2895.00 2499
IC-970H 45w 2m/430 MHz transceiver 3149 2699
UX-R96 50-905 Mhz receive unit... 389.00 349⁹⁵

Mobile Antenna Regular Sale
AH-32 2m/440 Dual Band mobile ant 39.00
AHB-32 Trunk-lip mount..... 35.00
Larsen PO-K Roof mount 23.00
Larsen PO-TLM Trunk-lip mount..... 24.70
Larsen PO-MM Magnetic mount 28.75

Repeaters Regular Sale
RP-1510 2m 25w repeater 1849.00 1649
RP-2210 220MHz 25w rptr ... (Special) 1649.00 1399
RP-4020 440MHz 25w repeater 2299.00 1999
RP-1220 1.2GHz 10w repeater..... 2599.00 2249



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Hand-helds Regular SALE
IC-02AT/High Power 409.00 349⁹⁵
IC-04AT 440 (Closeout) 449.00 329⁹⁵
IC-2SA 2m HT 419.00 CALL
IC-2SAT 2m/TP 439.00 CALL
IC-3SAT 220 HT/TTP 449.00 369⁹⁵
IC-4SAT 440 HT/TTP 449.00 CALL
IC-2GAT 2m HT/TTP 429.00 CALL
IC-4GAT 440MHz, TTP 449.00 CALL
IC-32AT 2m/440 e/o 629.00 549⁹⁵
IC-24AT 2m/440 HT 629.00 CALL

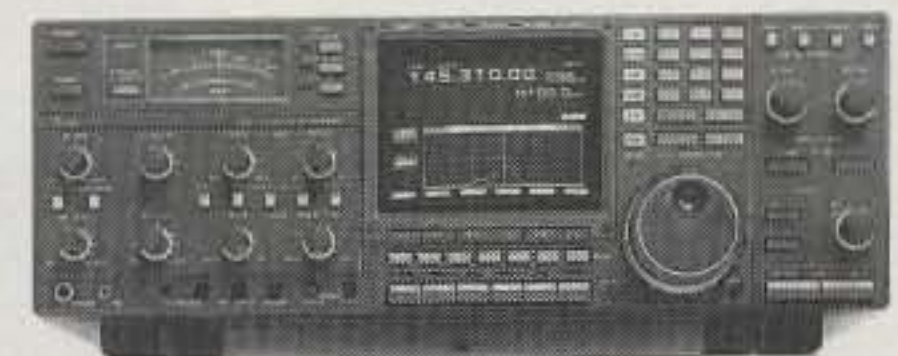
Limited Offer! .. FREE BP-82 external 7.2V @ 300ma. battery with IC-3SAT purchase.

Aircraft band hand-helds Regular SALE
A-2 5W PEP synth. aircraft HT..... 525.00 479⁹⁵
A-20 Synth. aircraft HT w/VOR (Spec.) 625.00 499⁹⁵
For HT Accessories • CALL for Prices

Receivers Regular SALE
R-71A 100kHz-30MHz rcvr..... \$999.00 CALL
RC-11 Infrared remote controller ... 70.99
FL-32A 500 Hz CW filter..... 69.00
FL-63A 250 Hz CW filter (1st IF)..... 59.00
FL-44A SSB filter (2nd IF)..... 178.00 159⁹⁵
EX-257 FM unit..... 49.00
EX-310 Voice synthesizer..... 59.00
CR-64 High stability oscillator xtal 79.00
SP-3 External speaker 65.00
CK-70 (EX-299) 12V DC option 12.99
MB-12 Mobile mount..... 25.99



R-7000 25MHz-2GHz receiver..... 1199.00 1029
RC-12 Infrared remote controller.... 70.99
EX-310 Voice synthesizer 59.00
TV-R7000 ATV unit..... 139.00 129⁹⁵



R-9000 100kHz-2GHz all-mode rcvr ... 5459.00 4699

Due to the size of the ICOM product line, some accessory items are not listed. If you have a question, please call. Prices subject to change without notice.

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UA1WFP	"	34,181	169	133
UA1TAF	14	298,530	620	321
RA6YA	14	284,229	604	319
UA6HSV	"	209,440	481	272
UA1AUA	"	131,976	368	234
UA6EDW	"	129,033	386	243
UA4CSV	"	46,818	242	153
UV6HEJ	"	44,523	227	159
RV1AO	"	7,137	75	61
RA6HF	"	888	25	24
UZ6LZL	7	632,596	739	334
(Op. UA6-150-820)				
UA6HRZ	7	422,772	550	294
UV3AFB	"	395,208	444	264
RA4HLL	"	224,808	402	228
UV3DFL	"	49,794	171	129
RA3DX	3.5	54,456	211	122
UA3UKQ	"	21,698	156	97
UA6JDD	1.8	14,338	75	67

KARELIA

UA1NDR	A	419,004	956	309
UA1NDY	"	127,232	405	224

KALININGRAD

UA2FJ	7	1,324,568	964	434
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UKRAINE

UT4UX	A	930,325	1161	425
UB5PAG	A	585,754	821	338
UB5MLP	"	548,332	802	326
UB5IAN	"	529,724	805	334
UY5TE	"	433,200	741	304
UB5CQM	"	343,043	516	289
RB5IOV	"	329,046	574	317
UB5EF	"	283,257	515	269
UB3MP	"	196,295	442	215
UB5CCP	"	184,725	403	225
UB5INT	"	99,960	278	210
UB5BCJ	"	61,308	215	156
RB5CL	"	54,385	220	149
RB4INR	"	52,592	177	152
UT3UZ	"	50,646	192	138
UT5HP	"	42,350	147	121
UB5XCU	"	34,272	161	136
RB5AT	"	20,060	102	85
UB5EIT	"	9,071	83	73
UB4JKX	"	8,107	74	67
UB4IBF	"	2,301	59	39
RB5ELX	"	2,030	36	35
UB4ET	28	29,680	145	112
UB5NU	"	16,016	105	88
EX5I	21	1,048,800	1325	480

(Op. RB5IM)

UB5LCV	21	283,081	496	317
RB4UPY	"	58,743	201	163
RB5VL	"	29,415	120	111
RB5VW	"	10,336	77	68
UB5VNF	"	8,928	68	62
RB5ERX	"	8,174	81	67
UB5LFG	"	4,522	66	38
UB5FBG	"	4,104	44	38
UB5KAG	"	1,886	25	23
RB2SB	14	1,113,912	1260	486
UY5EG	14	687,493	820	421
UB5ZFQ	"	253,421	444	287
RB5QW	"	201,062	400	229
UB5JS	"	134,912	326	248
UB5NBW	"	55,296	184	154
RB5FK	"	35,508	183	132
UB5IPN	"	31,408	116	104
UB5VK	"	10,640	81	76
UB7VA	7	551,684	647	323
UB5MNM	7	392,182	502	257
UB5IOJ	"	97,012	213	158
UB4GU	"	82,076	242	142
UY5WA	"	49,938	180	123
UT5RW	"	14,691	76	59
UT5JAJ	3.5	95,904	293	162
UB5FBN	"	36,808	181	107
UB5EEP	"	34,662	152	104

BYELORUSSIA

UC20L	A	1,303,875	1447	475
UC2AFQ	21	17,010	104	90
UC2WG	14	64,740	248	166
UC2CAF	"	5,562	69	54
UC20Z	7	330,708	454	254
UC2WJ	3.5	129,688	373	172
UC2CBB	"	4,425	73	59
UC20HU	1.8	46,592	193	112

MOLDAVIA

RO40A	A	685,290	745	530
UO5WU	"	320,827	591	299
UO50LW	14	318,600	630	300

LITHUANIA

LY2BTA	A	3,033,172	2162	617
LY3BP	A	1,892,080	1456	536
LY3BU	A	1,051,757	1127	433
LY3BX	"	932,292	1054	423
LY3BO	"	782,181	1009	373
LY2PAQ	"	365,680	626	280
LY2BKP	"	276,192	569	252
LY3BA	"	250,145	500	245
LY2BNC	"	235,708	562	242
LY2BZ	"	207,400	510	244

F2CW FRANCE



This is the QTH of Jacky, F2CW, who used TW2C during the contest.



This is the LR5A contest team which finished third in the world. In the front are LU8DPM and LU5EW. Standing left to right are CX5AQ, LU5UL, and CX8BBH.

LY2CY	"	199,082	452	247
LY2BKM	"	163,460	427	220
LY2BPO	"	90,825	272	173
LY2PBM	"	64,800	269	160
LY20Q	"	24,102	118	103
LY2BJA	"	8,008	64	56
LY2BRE	21	32,696	139	122
LY2BTX	"	24,864	140	111
LY2BLF	14	130,326	392	214
LY2BEI	"	115,368	368	209
LY2BRP	"	113,208	340	212
LY2BM	7	467,640	526	270
LY2BTD	7	242,592	1064	228
LY2BNZ	"	223,730	441	227
LY2SA	"	126,198	282	171

LATVIA

YL2PJ	A	197,635	415	235
UQ2GN	21	153,090	415	243
YL2MB	"	28,475	158	135
YL2HB	"	20,680	140	110
YL2PP	"	950	19	19

YL2TP	3.5	63,840	242	133
YL2GE	"	41,040	172	114
YL2QN	1.8	5,796	62	46

ESTONIA

ES2WX	A	1,980,954	1798	501
UR2RER	"	625,352	1032	364
RR2RO	7	27,720	128	90
ES1PW	"	9,720	61	60
ES5RY	3.5	268,370	502	235

OCEANIA

EAST MALAYSIA

9M6HF	A	572,949	656	249
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PHILIPPINES

KE9A/DU3	A	2,664,014	1707	482
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GUAM

KG6DX	21	1,720,992	1406	416
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JOHNSTON IS.

AH3C	A	4,047,610	2163	530
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HAWAII

AH6JF	A	144,460	256	155
KH6WT	21	48,180	148	110

MARSHALL IS.

V73AS	7	1,793,840	934	340
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AUSTRALIA

VK5AGX	A	165,042	279	173
VK2CDG	A	15,921	87	61
VK4XA	28	236,600	464	175
VK2FCA	21	24,192	105	84
(Op. JM1CAX)				

INDONESIA

YB2FEA	A	383,021	361	294
YC2UDH	28	15,142	80	67
YC2ESQ	21	328,510	452	247

Going on vacation? Give your "rubber ducky" a rest, too. Here's another simple portable antenna that you can make and take with you, and that will give you some gain.

Another Portable 2 Meter Antenna For The Traveler

BY JACK FALKENHOF*, K4BYF

This article describes a compact 2 meter antenna that I have used in hotel or motel rooms for the past six years. When the original model finally wore out from travel abuse, I decided to duplicate it and pass on the idea to anyone interested.

When I first started using an HT and "rubber ducky" antenna from motel or hotel rooms, I found that the performance generally left much to be desired. I determined that a full-size antenna was probably required and that a vertical-dipole arrangement, because of its bandwidth characteristics and simplicity, would be the best and easiest way to achieve what I needed. I also determined that if the elements were flexible instead of rigid, the antenna could easily be coiled up and put into my suitcase or briefcase.

To evaluate how well a dipole would

work, I constructed one from #22 teflon-insulated hookup wire with an SO-239 coaxial connector as the center termination, hung it vertically on the door of my basement workshop with a thumbtack, and connected the antenna to the HT with a 9 foot length of RG58/U borrowed from the HF station. A few tests showed that I could key up and make contacts on almost as many local repeaters as with my outside vertical ground-plane antenna. Switching back to the "rubber ducky" greatly reduced not only the number of repeaters that could be used successfully for a QSO, but also the number of repeaters that I could hear.

My final decision was on how to package the antenna to provide maximum protection from damage while traveling. I had considered using a small plastic container of the type available in the houseware section of most supermarkets, but I couldn't find anything small enough or

shallow enough. While sitting at my workbench one evening, I happened to glance at the container of a roll of Scotch 88™ electrical tape. It was exactly what I was looking for!

Construction consists merely of drilling or punching a hole in the center of the container and drilling holes for mounting the SO-239 connector and for feeding the wire elements through the sides of the container (I used a Greenlee $\frac{3}{8}$ inch chassis punch to make the hole for the connector). I used solder lugs crimped around the wire insulation and attached to the SO-239 mounting screws to provide strain relief to keep the wire elements from flexing and subsequently breaking at the connector.

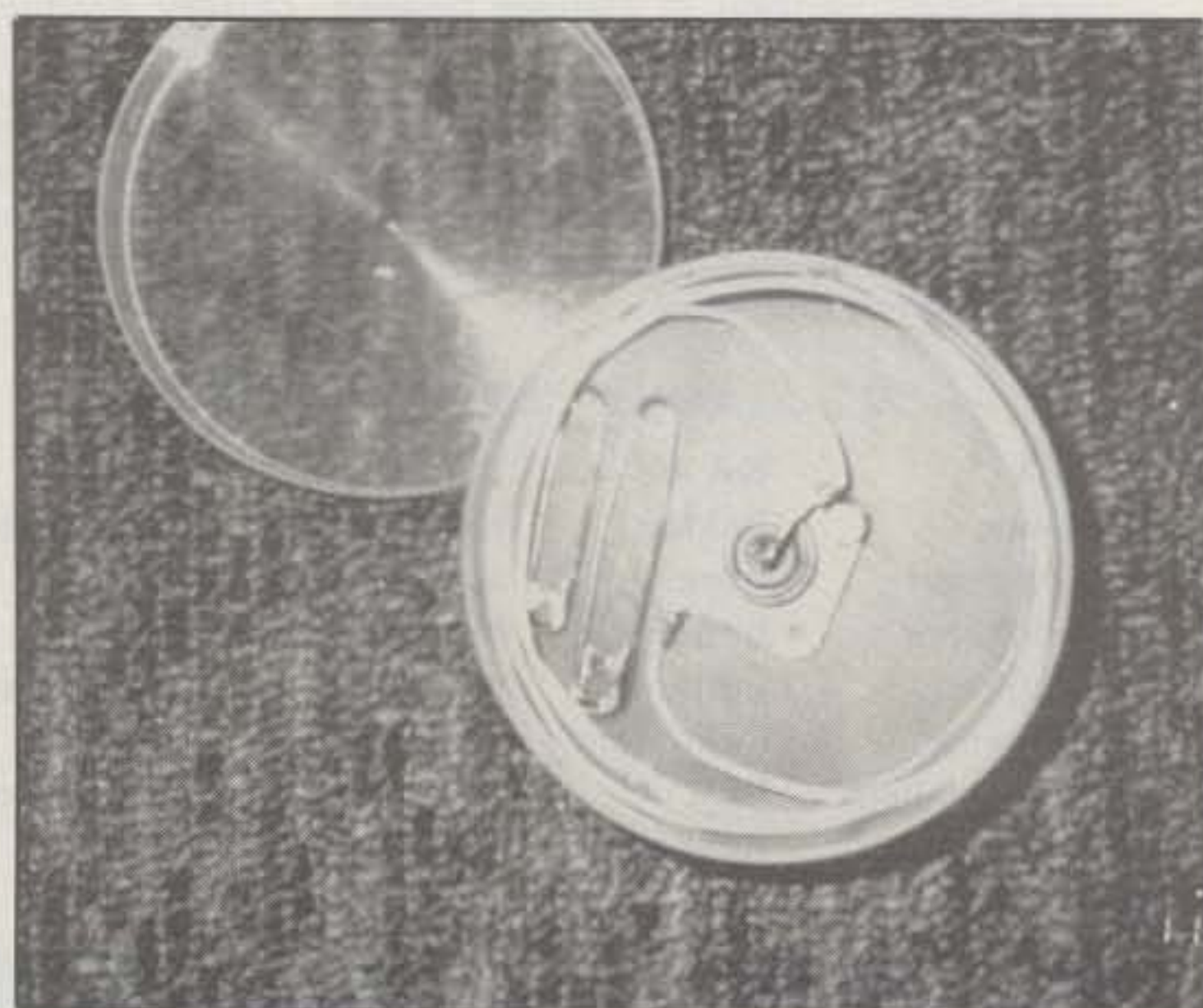
My first dipole was cut to frequency by using the formula $L = 468/f(\text{MHz})$. The present dipole was tuned by using a dipmeter coupled to a hairpin loop that was temporarily soldered to the SO-239 con-

*13116 Oriole Dr., Beltsville, MD 20705



The author's 2 meter antenna ready to be packed.

Dipole elements and safety pins stowed inside the container.



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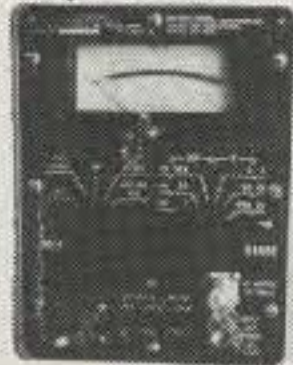
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- LINEAR dB
- MIRRORED SCALE



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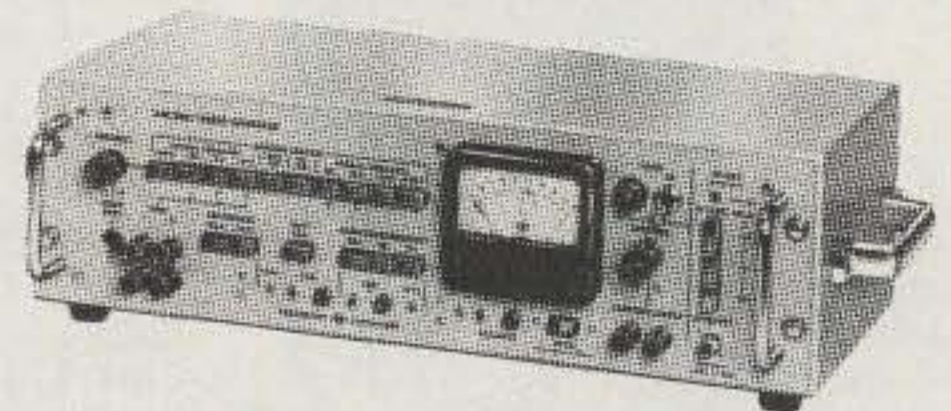
- FREQUENCY RANGE
 10 kHz TO 50 MHz IN
 9 BANDS
- 0.1 μ V TO 0.1 V
 INTO 50 Ω
- 2 V INTO OPEN
 CIRCUIT
- 0 TO 50% AM MOD.
- INTERNAL 400 Hz &
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This ruggedized unit is portable and lightweight (35 lbs). Contains a crystal calibrator for high accuracy applications. Complete with the lid; less accessories.

RADIOMETER ELECTRONICS SMG1 STEREO GENERATOR \$295.00

Solid-state unit for testing FM stereo equipment; equipped with built-in 100 MHz oscillator and step attenuator.



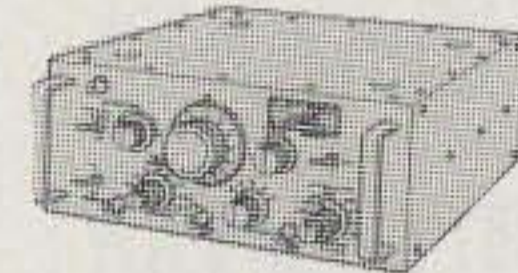
RESISTANCE DECADE MLT ZM16B* ~~\$74.95~~ \$49.95

- 9 FULL DECADES
- 0.1 TO 10 M Ω STEPS
- \pm 2% ACCURACY
- HIGH CURRENT HANDLING
 CAPABILITIES

The wide range makes this an excellent substitution box. It can also be used for loading power supplies with less than 2 A output.



10 MHz FUNCTION GENERATOR WAVETEK 142-S-527 \$279.00



- 0.0005 Hz TO 10 MHz IN 10 RANGES
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 NEGATIVE PULSE OUTPUT
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- 0 to \pm 15 V offset
- 0-30 VOLTS OPEN CIRCUIT. 0-15 V INTO 50 Ω
- 0 TO 70 dB STEP ATTENUATION;
 0-10 dB VARIABLE ATTENUATOR

With this instrument it is possible to simultaneously sweep the output frequency, select the output symmetry desired, and manually vary the offset. This full-function instrument is bargain-priced!

SIGNAL GENERATOR MARCONI TF1066B/1 \$395.00

Frequency range from 10 MHz to 470 MHz. Calibrated output from 0.2 μ V to 200 mV. Internal AM and FM modulation of 1 kHz and 5 kHz. AM modulated from 0 to 100%. FM deviation to 100 kHz.



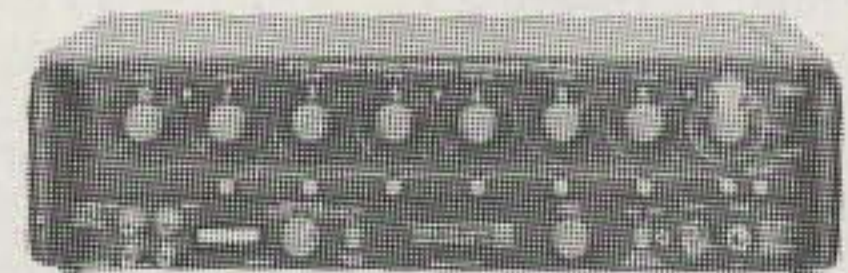
SWEEP/SIGNAL GENERATOR HEWLETT PACKARD 8601A/H10 \$795.00

- FREQUENCY: 100 kHz TO 110 MHz
- OUTPUT: +20 dBm TO -110 dBm
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- SWEEPS FROM 100 kHz TO 11 MHz OR 1 MHz TO
 110 MHz

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DECADE FREQUENCY SYNTHESIZER GR 1163A \$275.00

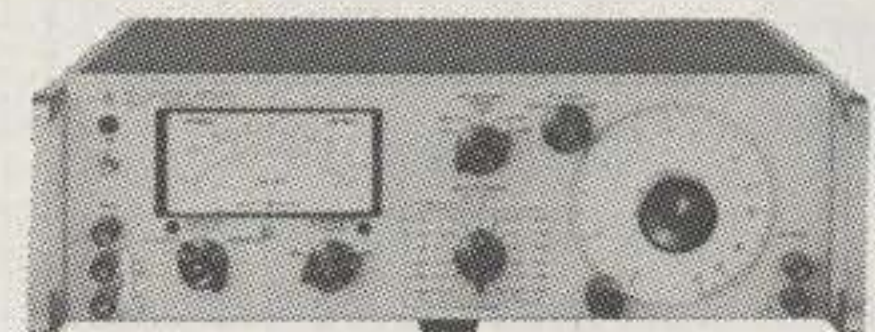


- FREQUENCY RANGE 30-12 MHz
 - SMALLEST DIGITAL STEP OF 1 Hz
- This highly accurate frequency synthesizer supplies frequencies from 0 to 1 MHz in 1 Hz increments. Frequencies are selected by means of a series of from three to seven stepped-digit units. This synthesizer works well in applications requiring stable, sine-wave signal sources capable of precise frequency adjustment through wide frequency regions.

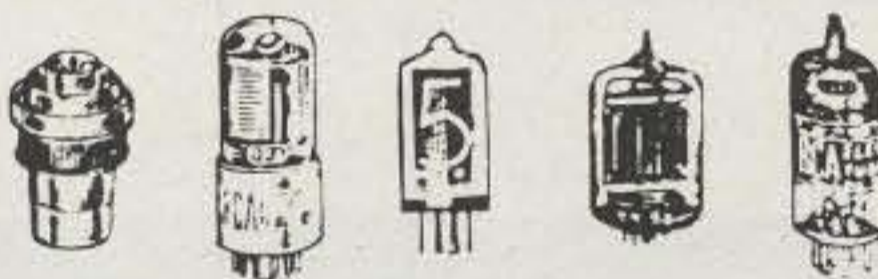
DISTORTION ANALYZER HEWLETT PACKARD 331A \$595.00

- FREQUENCY: 5 Hz TO 600 kHz
- DISTORTION MEASUREMENT: 0.03% TO 100%
- AC VOLTMETER: 30 μ V TO 300 V

An all solid state unit, the 331A will be a welcomed addition to your lab or shack.



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FT-23 R/TT Min	0	Call \$
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FT-470 2m/70cm	0	Call \$
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FT 690 R/H	0	Call \$
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IC-R71A 10	0	Call \$
IC-228A/H FM	630	Call \$
IC-28A/HT	99	Call \$
IC-2GAT 2m	0	Call \$
IC-900 Six	0	Call \$
IC-3S AT 22	0	Call \$
IC-2S AT 2M	9.00	Call \$
IC-4S AT	449.00	Call \$
IC-48A FM Mobile	509.00	Call \$
IC-4GAT New 6w HT	449.95	Call \$
IC-38A 25w FM Xcvr	489.00	Call \$
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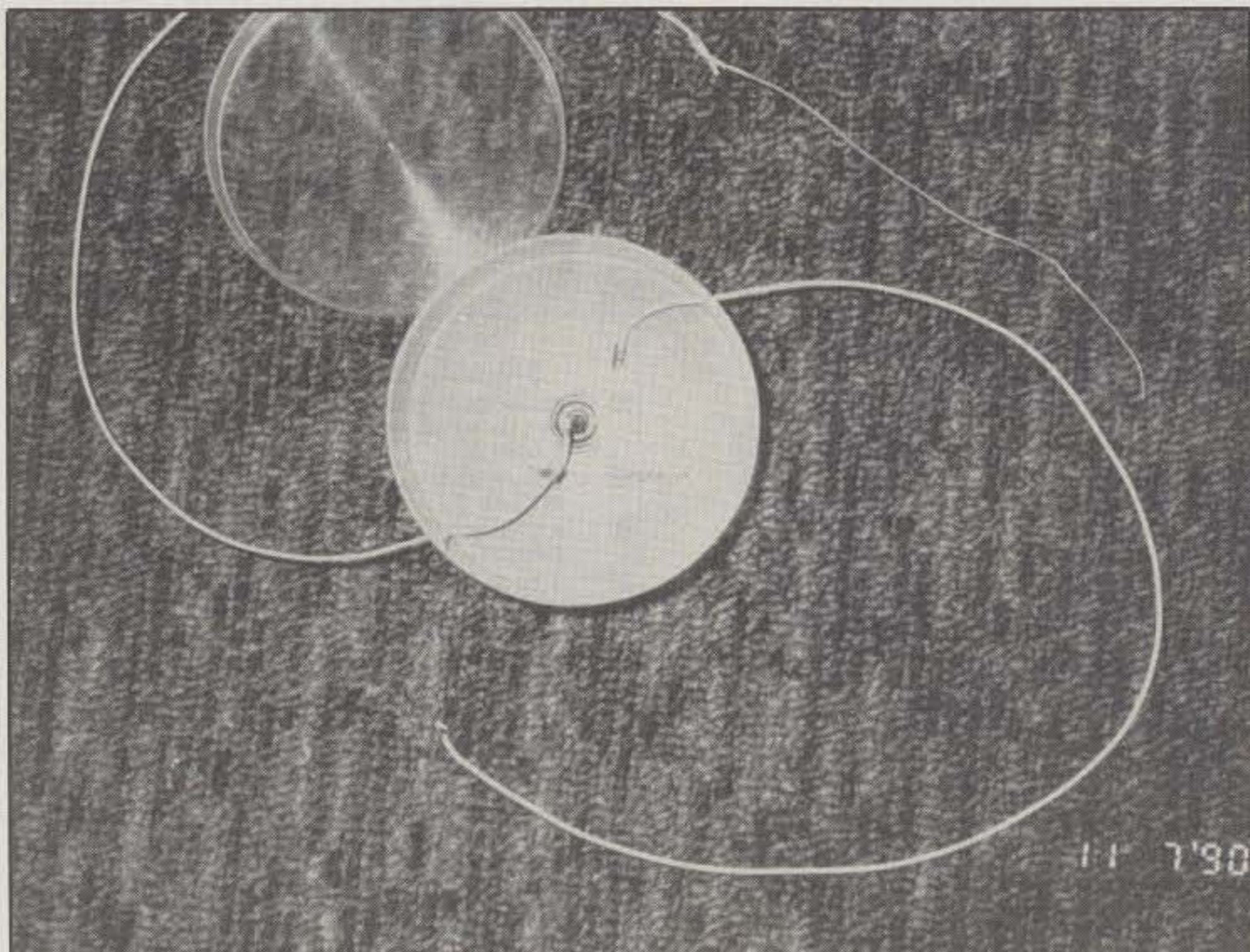
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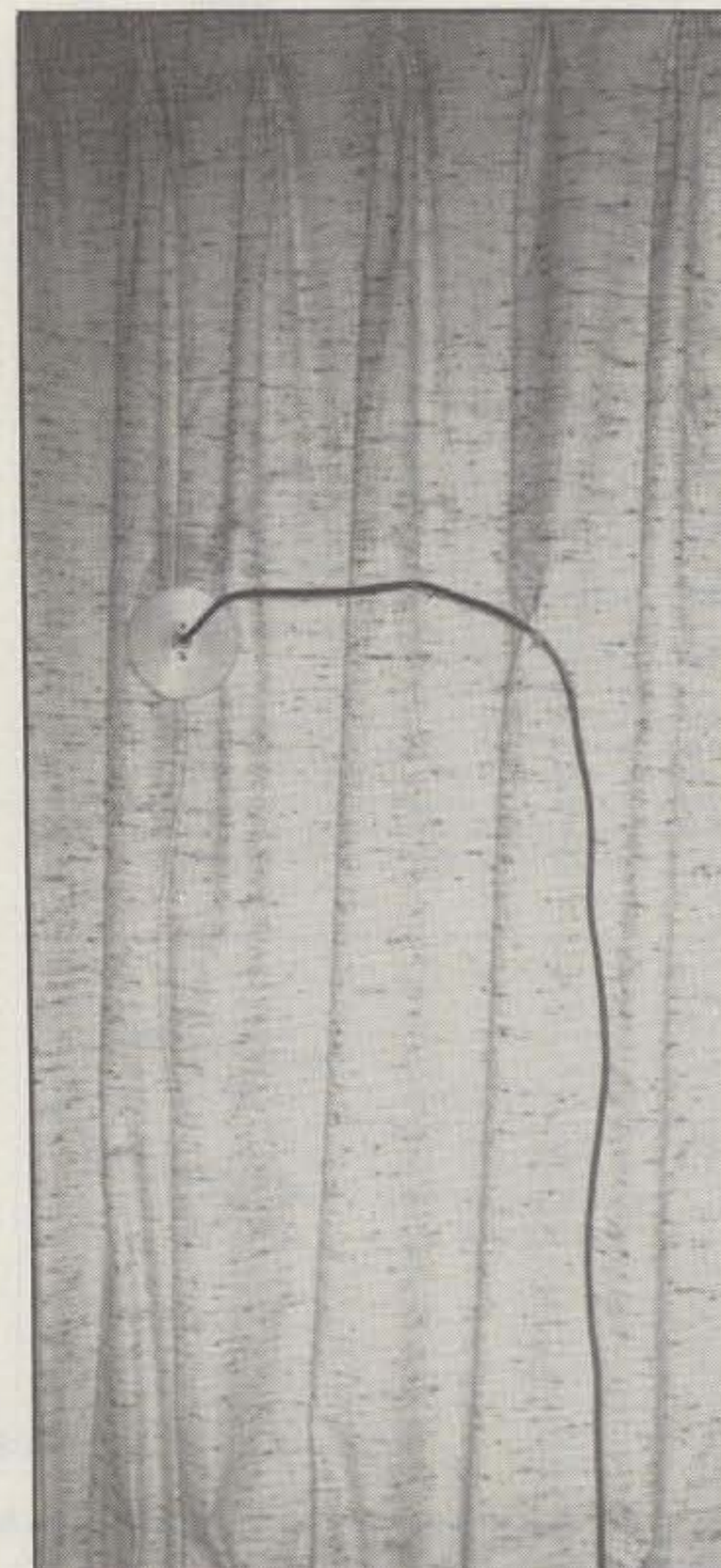
Dipole elements shown extended through the holes drilled in the container wall. Notice the lacing cord used as an insulator.

nector. I monitored the changes in resonant frequency on the HT receiver while I clipped and dipped.

I was concerned that the hairpin loop might be affecting the calibration, so I reduced the size from its original 2 inch overall length to 1 inch and was unable to detect any difference in the indicated frequency. Anyhow, the elements on this dipole are each 1 1/2 inches shorter than those of the original. I haven't made any field strength comparisons, but I still can work the local repeaters when I travel, and that is the reason for building the antenna in the first place.

The antenna is meant to be hung from a drapery and is normally attached with a large safety pin. I used a short piece of round lacing cord, permanently tied and cemented near the end of one element, as an insulator. The free end of the lacing cord is loosely tied to the safety pin. Another safety pin is used to lead the coax away from the antenna at a 90-degree angle. When packed for traveling, the antenna is coiled up inside the container with the two safety pins and the top cover snapped into place.

As indicated in the title, this is another of many articles that have been published about antennas for travelers. I have offered it in the hope that it may provide some ideas that can be incorporated into your own design, or if by chance you are looking for a simple construction project, this may be it.



Typical installation of the 2 meter vertical dipole.

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List price \$509.95/CE price \$239.95/SPECIAL **12-Band, 200 Channel • 800 MHz. Handheld Search • Limit • Hold • Priority • Lockout**
Frequency range: 29-54, 118-174, 406-512, 806-956 MHz. Excludes 823.9875-849.0125 and 868.9875-894.0125 MHz. The Bearcat 200XLT sets a new standard for handheld scanners in performance and dependability. This full featured unit has 200 programmable channels with 10 scanning banks and 12 band coverage. If you want a very similar model without the 800 MHz. band and 100 channels, order the BC 100XLT-A3 for only \$179.95. Includes antenna, carrying case with belt loop, ni-cad battery pack, AC adapter and earphone. Order your scanner now.

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List price \$549.95/CE price \$239.95/SPECIAL **12-Band, 40 Channel • No-crystal scanner Priority control • Search/Scan • AC/DC**
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List price \$549.95/CE price \$249.95/SPECIAL **10 Meter Mobile Transceiver • Digital VFO Full Band Coverage • All-Mode Operation Backlit liquid crystal display • Repeater Splits RIT • 10 Programmable Memory Positions**
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RELM LMV2548B Only \$289.95

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CQ REVIEWS:

The Yaesu FL-7000 Solid-State HF Automatic Linear Amplifier

BY JOHN J. SCHULTZ*, W4FA

Remember the old FL-7000 linear amplifier? The *old* FL-7000? Probably not too many readers will really remember the FL-7000 amplifier which Yaesu introduced in the late 1980s. At the time of its introduction it probably was both ahead of its time technically and considered too "pricey." However, times surely change, and it is fortunate that Yaesu continues to produce the FL-7000 at what is now a very competitive price. The FL-7000 seems to have been "rediscovered" both by amateurs and dealers.

The FL-7000 is a solid-state, HF, no-tune linear amplifier that runs 1200 watts input with less than 100 watts of drive. Several solid-state amplifiers currently available can do the same. So what is special about the FL-7000? I guess the one-word answer would be "packaging." The FL-7000 incorporates in one desktop enclosure not only a linear amplifier, but also a 110/220 volt power supply, a completely automatic antenna tuner, SWR and power output monitoring, and remote antenna selection switching (using an option). If you use the FL-7000 together with a modern transceiver providing a nominal 100 watts output, you can achieve a completely "no-tune" station operating at a very competitive power level in a very compact overall configuration.

The operating ease and frequency agility of such a setup is tremendous compared to a setup involving an amplifier and an antenna tuner requiring manual tuning adjustments. Of course, there are some trade-offs. The manually tuned amplifier/tuner combination can provide more power output per dollar if you demand a maximum legal power output setup, especially for modes requiring long key-down periods. It depends on what you want for an HF operating setup. I would suggest a careful look at the FL-7000 if you are content to run a desktop CW/SSB station at the 1.2 kW input level with pretty much the ultimate in operating convenience and with a minimum of station setup problems.



The FL-7000's front panel consists only of various fields of pushbutton controls, LEDs, and two analog meters. If the amplifier is fully set up for automatic operation, only the power on/off switch and the operate/standby switch have to be used.

Specifications

The overall specifications of the FL-7000 are shown in Table I. The amplifier covers all of the currently available HF bands, in-

cluding 12/10 meters with a slight modification. It can be bandswitched by toggling "up/down" switches on its front panel, or it can be bandswitched remotely by transceivers which provide the ne-

SPECIFICATIONS

General

Frequency coverage (MHz): 1.8-2, 3.5-4, 7-7.5, 10-10.5, 14-14.5, 18-18.5, 21-21.5 and 24.5-25, 28-30 except USA version.
Collector input power (final transistors): (SSB) 1200 W PEP, (CW/FSK) 1200 W DC.
Continuous full power transmission period: SSB 100% for 30 min., Full Carrier 100% for 1 min.
Case size: 390 W x 130 H x 400 D mm.
Weight: 30 kg (66 lb.).
Supply voltage: 100/110/117/200/220/234 VAC ($\pm 10\%$).
Power consumption: 1900 VA maximum (at 500 W RF output).

Linear Amplifier Section

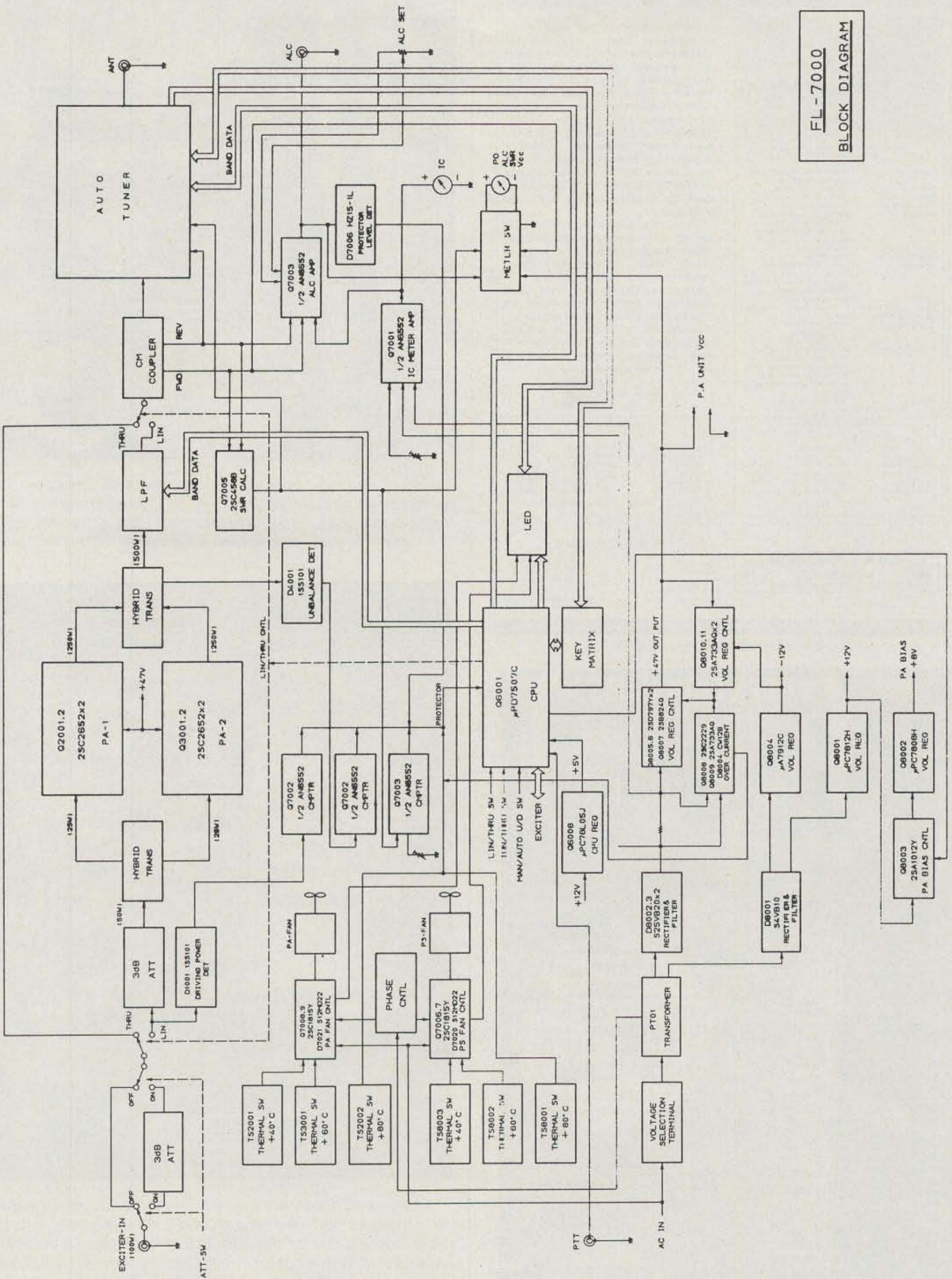
Excitation power: less than 100 W for 1200 W input.
ALC voltage range: 0 to -9 V.
Spurious radiation: less than -50 dB.
Third-order intermodulation distortion: less than -25 dB.
Input/Output impedance: 50 ohms, unbalanced.

Automatic Antenna Tuner Section

Impedance matching range: 1.8-2 MHz—25 to 100 ohms, unbalanced; other amateur bands—16 to 150 ohms, unbalanced.
Maximum feedthrough power: 600 watts.
Insertion loss: less than 0.5 dB when tuned to match.
VSWR after matching: 1:1 to 1.2:1.

*302 Glasgow Lane, Greenville, NC 27858

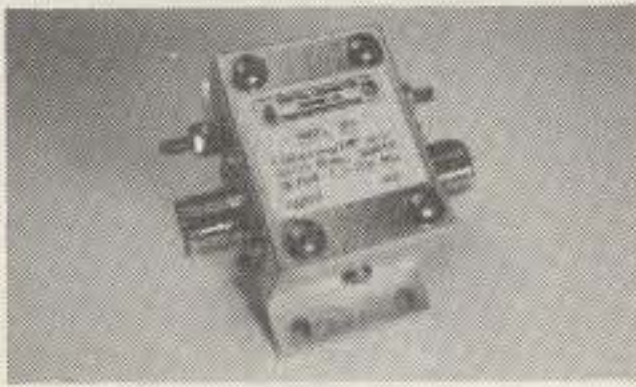
Table I—Specifications of the Yaesu FL-7000.



FL-7000
BLOCK DIAGRAM

Fig. 1-Block diagram of the FL-7000 excluding the power supply.

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SPECIFICATIONS

Attack time	Zero to 10ns, depending on induced waveform.
Surge current	8/20 us., 20,000 amps
Operating Temp.	-65 to 125 Celsius
Discharge Inductor	Toroidal, insulated.
Back-EMF GDU	600-1000V, ceramic body construction, G.I. Clare
VSWR	Less than 1.1:1 over rated spectrum
Insertion loss	Less than .1db
Impedance	50-75 ohms
Hardware	18-8 stainless hardware 8-32 stainless steel ground lug, 1/8" thick 5032-H32 case, 6-32 mounting hardware
Finish	Natural aluminum
DC resistance across	47K to 250K ohms, resistive
Capacitive effects	Less than 1pf
GDU specs.	Meets REA PE-80 IEEE 587 CCITT K12
Environmental	Recommended for indoor service at input bulkhead to station's grounding system. May be used outdoors if protected from direct rain exposure.
Warranty	One year standard

Unlike any other lightning protection device for coaxial transmission lines, I.C.E.'s Model 300 series requires no pre-determined voltage to develop between conductors before voltage suppression begins. Units are constant drain, capacitor-blocked, non-DC passive, and each relies on a heavy discharge inductor paralleled with a ceramic gas-discharge assembly to provide a lightning-fast trap system for induced voltages.

Virtually indestructible, 300 series arrestors are built in 1/8" thick standard chassis enclosures with dual stainless steel mounting/grounding screws.

Over a thousand satisfied customers have chosen from the numerous models & connector choices offered. Each is packed with mounting hardware, storage box, and 4-page owner's manual.

(PATENT APPLIED FOR.)



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MODEL 301/U	300W, SO239s	\$29.95
MODEL 301/N	300W, N CONNS.	\$31.95
MODEL 301/B	300W, BNC	\$29.95
MODEL 301/R	300W, RCA PIN	\$29.95
MODEL 303/U	5KWPEP, SO239s	\$34.95
MODEL 303/N	5KWPEP, N CONNS.	\$36.95
CATV, 75 OHMS		
MODEL 310, RCV. ONLY, "F" CONNS.		\$26.95

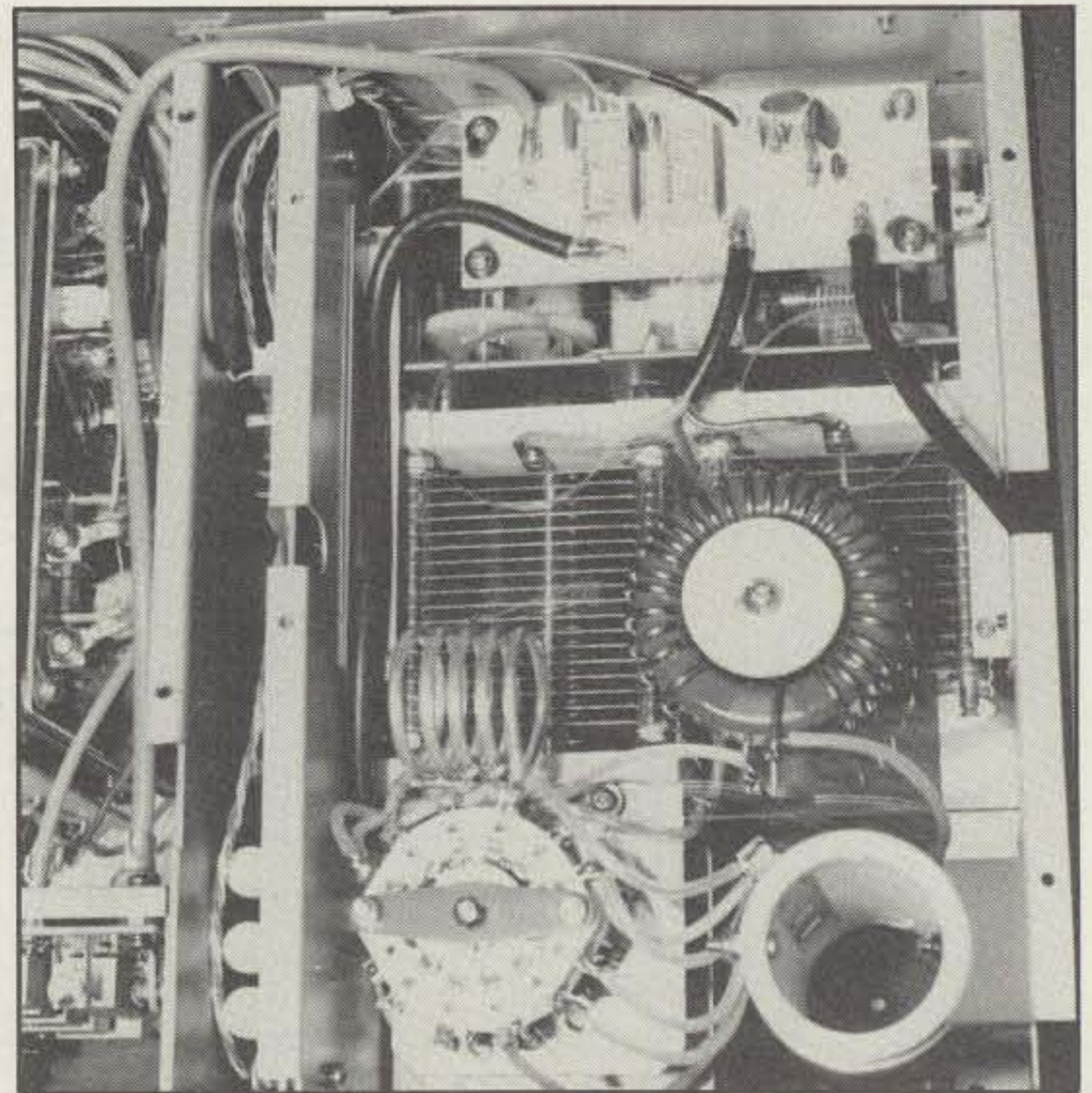
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MODEL 302/B	300W, BNC	\$29.95
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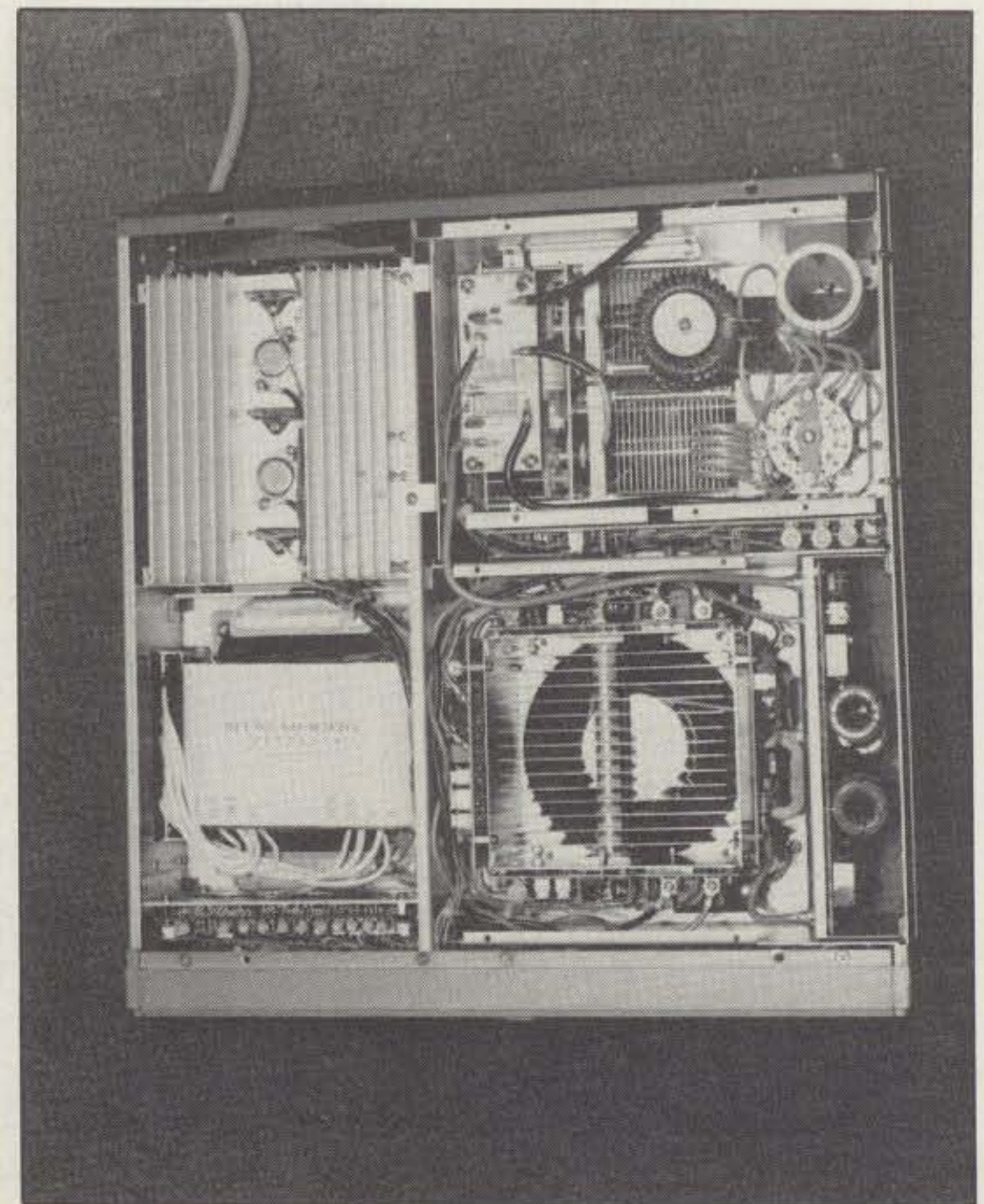
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CIRCLE 20 ON READER SERVICE CARD



Taking off the top cover, this is what you see. The power-supply/regulator circuitry is to the left. To the upper right is the automatic antenna tuner, and to the lower right is the unique power-amplifier assembly.



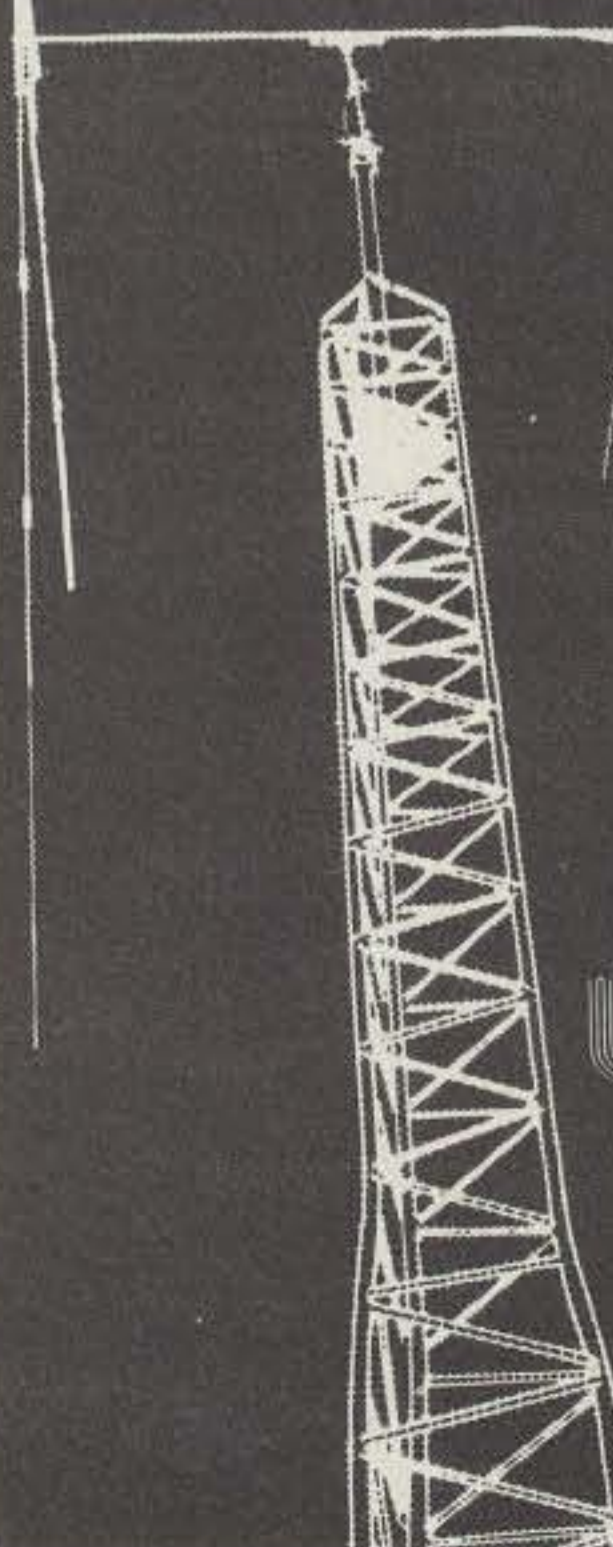
A close-up of the antenna tuner. The motor-driven bandswitch is to the lower left. Grouped around it are three coils: a horizontal air-wound coil for the 10/12/15 meter bands, a vertical coil wound on a form for other bands (except 160 meters), and a coil wound on a ferrite core for 160 meters. The two variable capacitors can be seen below the latter and are driven by motors and gearing hidden from view.


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CIRCLE 58 ON READER SERVICE CARD

cessary band-change information. Yaesu FT-747GX, FT-757GXII, FT-767GX, and FT-1000 transceivers provide the necessary data, but many other transceivers can be adapted to also do so by suitable interface circuitry.

The linear is microprocessor controlled and has a wide variety of memory functions with lithium-battery-backed memories. Even if band-change information from a transceiver is not available, the linear will still remember the tuner settings for each band and the antenna selected for a given band. If the tuner has to rematch a new or changed antenna load, the power amplifier is automatically shut down until an antenna match is achieved. The linear has very fast transmit/receive turn-around time and is suitable for QSK CW, packet, and AMTOR. Its key-down period, however, is limited (see Table I) unless a lower power RTTY mode is selected. The linear is really most suited for operators who enjoy casual SSB/CW operation with perhaps occasional ex-

cursions into key-down modes.

The unit has an extremely extensive array of protective circuitry which monitors parameters in the amplifier, power supply, and tuner sections. The parameters monitored range from the driving power to various temperatures to output SWR. Eight LEDs indicate various conditions. The amplifier will shut down if various parameters are exceeded. It will also not shut off if certain temperature conditions are exceeded, even if you turn off the AC power switch! The internal fans will continue to operate until internal temperature conditions have been stabilized. I'm sure you can do harm to a unit such as the FL-7000 if you are very careless, but its range of protective circuits is very impressive.

If you would like to do a little math using the figures shown in Table I, you'll notice something interesting. The FL-7000 has a volume of less than $\frac{1}{4}$ cubic foot, but weighs a very hefty 66 lbs. Considering all that it contains in one enclosure, it has to

rate as one of the most compact, modern linears on the market. Again, I refer back to one of my opening comments about the FL-7000 being "rediscovered."

Circuitry

A block diagram of the FL-7000, excluding the power supply section, is shown in fig. 1. Just a few highlights may be of interest. The 3 dB attenuator (upper left) accommodates driving transceivers having more than a nominal 100 watts output (e.g., the FT-1000). The drive power is split in a hybrid transformer to drive two identical power amplifiers, each of which contains two 2SC2656 transistors having a collector dissipation of 300 watts *each*. Therefore, a total of 1200 watts of heat-sinked power dissipation is available. The output of both power-amplifier units is combined, passed through a relay-switched low-pass filter unit, directive coupler, and then on to the automatic antenna tuner.

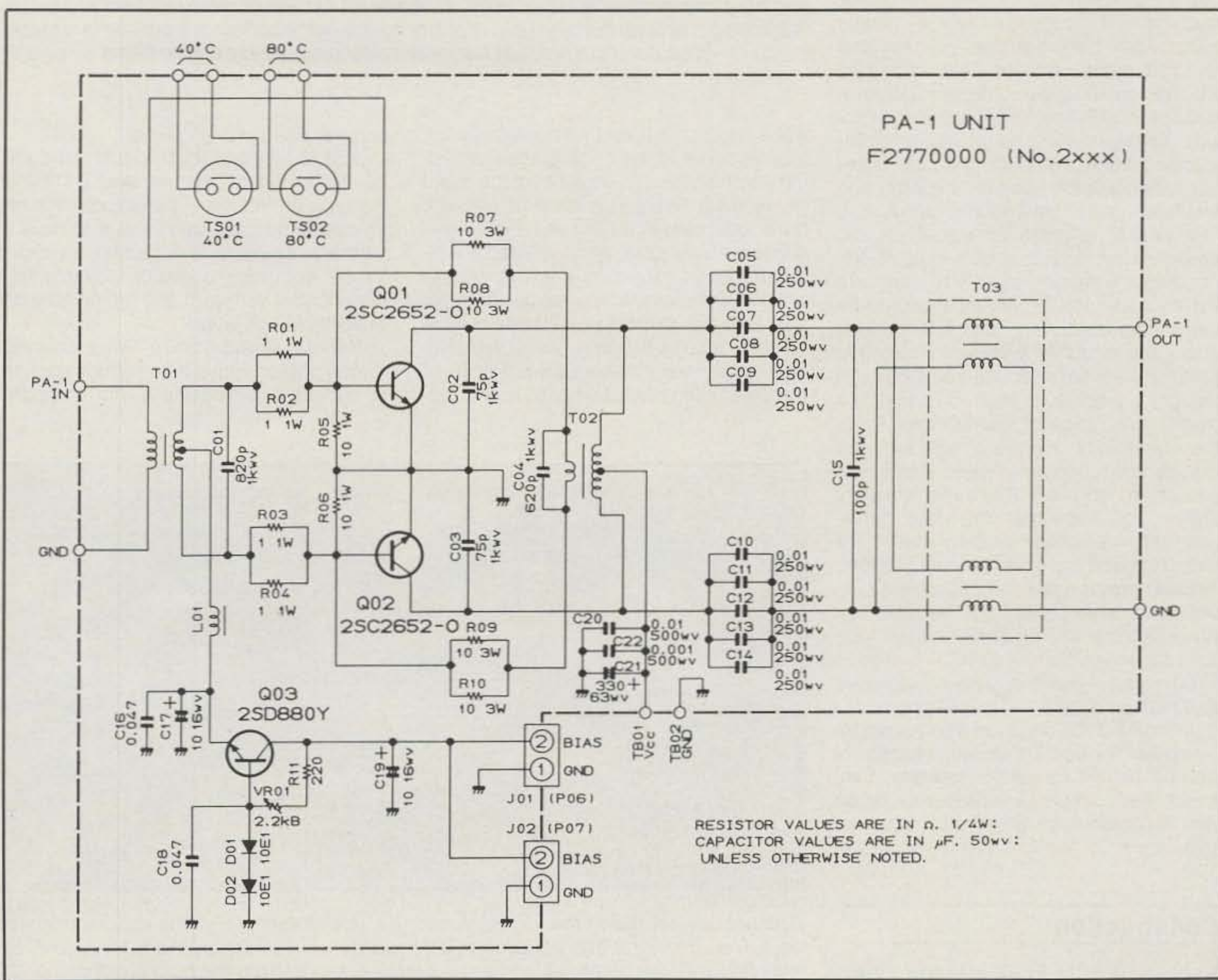


Fig. 2—One of the two power amplifier units in the FL-7000. Each 2SC2652 transistor as heatsinked can dissipate up to 300 watts.

Most of the rest of the blocks shown in fig. 1 have to be referenced to the CPU unit shown roughly in the middle. It processes data from the various sensory components, translates key commands, drives indicators, stores data, etc. A sophisticated solid-state linear certainly needs sophisticated control circuitry, and the FL-7000 has it.

Fig. 2 is a closer look at one of the two identical power-amplifier units. The circuitry is clean and basically straightforward. The 2SC2652 transistors are Toshiba units that are rated to develop 220 watts output at 28 MHz. Therefore, they certainly are not being stressed under the conditions under which they are being used. The overall IMD specification for the FL-7000 at -25 dB was found to be conservative, and the actual third-order distortion was closer to -30 dB. That is still not on the cutting edge of technology, but is certainly acceptable.

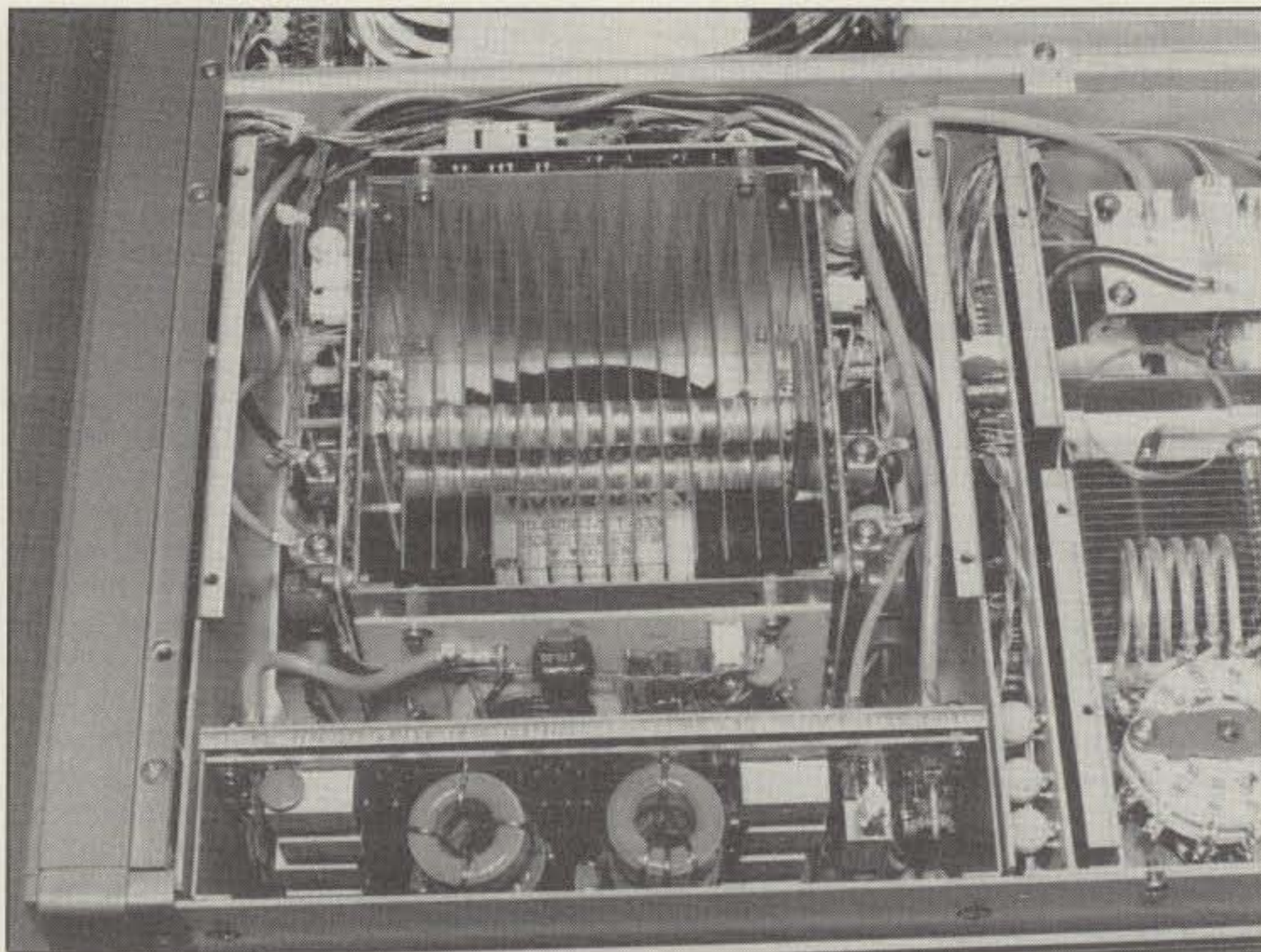
The two power-amplifier units are powered by a single 47 volt, 25 ampere power supply. The power-supply circuitry, although not shown, is rather massive. It consists of a single transformer having a dual primary and four secondary windings. Two secondary windings provide low voltages for control circuits, and the other two windings provide voltages for the power-amplifier stages. Here 30,000 mF of filter capacitance is involved for the latter and an elaborate series regulator circuit.

A partial diagram of the automatic antenna-tuner unit is shown in fig. 3. It's not that any reader is likely to duplicate the circuitry, but I think most amateurs can relate to tuners and are curious about the circuitry involved. Automatic tuners present a particular challenge to a designer, since it is desired to match a reasonable range of impedances, keep the component count low, use a circuit that can be tuned rapidly, etc. Anyway, if you try to sort out the basic circuitry shown, you'll see that one motor simultaneously steps switch taps on the series inductors and chooses input capacitors. Another motor tunes the 290 pF parallel-output variable capacitor. The third motor drives the 430 pF series-output variable capacitor. Similar circuitry has been used over the years in various automatic and manual tuners and is well-proven.

In the FL-7000 there are many other interesting circuits which involve control and protective circuitry. However, they are spread out over various PC boards, so it's impossible to present a succinct overview.

Construction

Mechanically, the FL-7000 is an amazing piece of equipment. To say that it is built



A closer look at the unique power-divider/dual-power-amplifier/power combiner assembly grouped around a very large, finned heatsink. The power amplifiers are to the left and right around the heatsink. The dark outline in the bottom is a cooling fan. In the foreground are some of the relay-switched low-pass output filters.

like a battleship is an understatement. A look at some of the photographs providing internal views gives a hint of the quality involved. The unit is densely packed, but almost every corner seems to be reasonably accessible. And included are all those nice little touches, such as lacquer around the main screwheads to make sure they don't work loose in spite of lock-washers also being used. Component ratings appear very conservative. It's one of the finest examples of amplifier construc-

tion I've seen in a long time.

Just to balance those deserved compliments a bit, let me say the FL-7000 is the type of amplifier you would place on an operating table and expect to have it sit there for years of dependable usage. You're not going to readily tuck this amplifier under your arm and run off for a bit of portable operation!

Various shield covers were removed for the photographs, but the construction is broken down basically into compart-



The back panel shows the cooling fan for the power supply plus the various connectors. The terminal strip in the lower middle supplies an operating voltage for up to three external antenna relays which can be switch-selected from the front panel of the FL-7000. Separate ALC-level adjustments are provided for SSB and RTTY (upper left).

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ments for the main blocks shown in fig. 1 plus a compartment for the power supply. Two independently controlled cooling fans are used—one mounted on the rear panel for the power supply and one mounted on the underside for the power-amplifier/power-divider/power-combiner units. Both are low-noise "muffin" (axial) types.

Metering, Controls, and Indicators

Two back-lighted front-panel meters are provided. One is dedicated to total collector current measurement. The other multimeter can be switched to measure power output, SWR, collector voltage, or ALC range. The SWR "compute" function is automatic, and both the power-output and SWR readings are active even if the amplifier is in a standby mode. Thus, you can easily evaluate the SWR of a potential antenna load to see if it is in a range likely to be accommodated by the automatic tuner in the FL-7000 before placing the FL-7000 into operation.

There are no rotary controls on the front panel. There are only various push-button controls. You may ask why an "automatic" unit should have any controls at all. Actually, if the FL-7000 is set up to take advantage of all of its features, you don't have to use any of them except the on/off rocker switch and operate/standby pushbutton. The FL-7000 will memorize tuner settings, antenna selection, etc., for each band as band-change data is received from a driving transceiver. Only initial antenna-selection data has to be given to the FL-7000.

In the real world most of us like to vary our operating habits a bit with regard to the band segments we use, antenna parameters, etc. The FL-7000 incorporates a nice combination of automatic features with manual overrides for when you want to do the antenna-coupler tuning, band selection, antenna selection, and so forth manually.

Interconnections

Basic interconnections between a transceiver and the FL-7000 are quite simple—the usual antenna line, a PTT line, and an ALC connection. An ALC adjustment potentiometer on the back panel of the unit allows an SSB ALC adjustment range of from 0 to -9 VDC. A separate interconnection line is provided if the transceiver can provide bandswitching data to the FL-7000. Full details are contained in the FL-7000 manual.

The antenna-selection feature of the FL-7000 was mentioned a few times, and it should be explained a bit. The FL-7000 has only one antenna output connector.

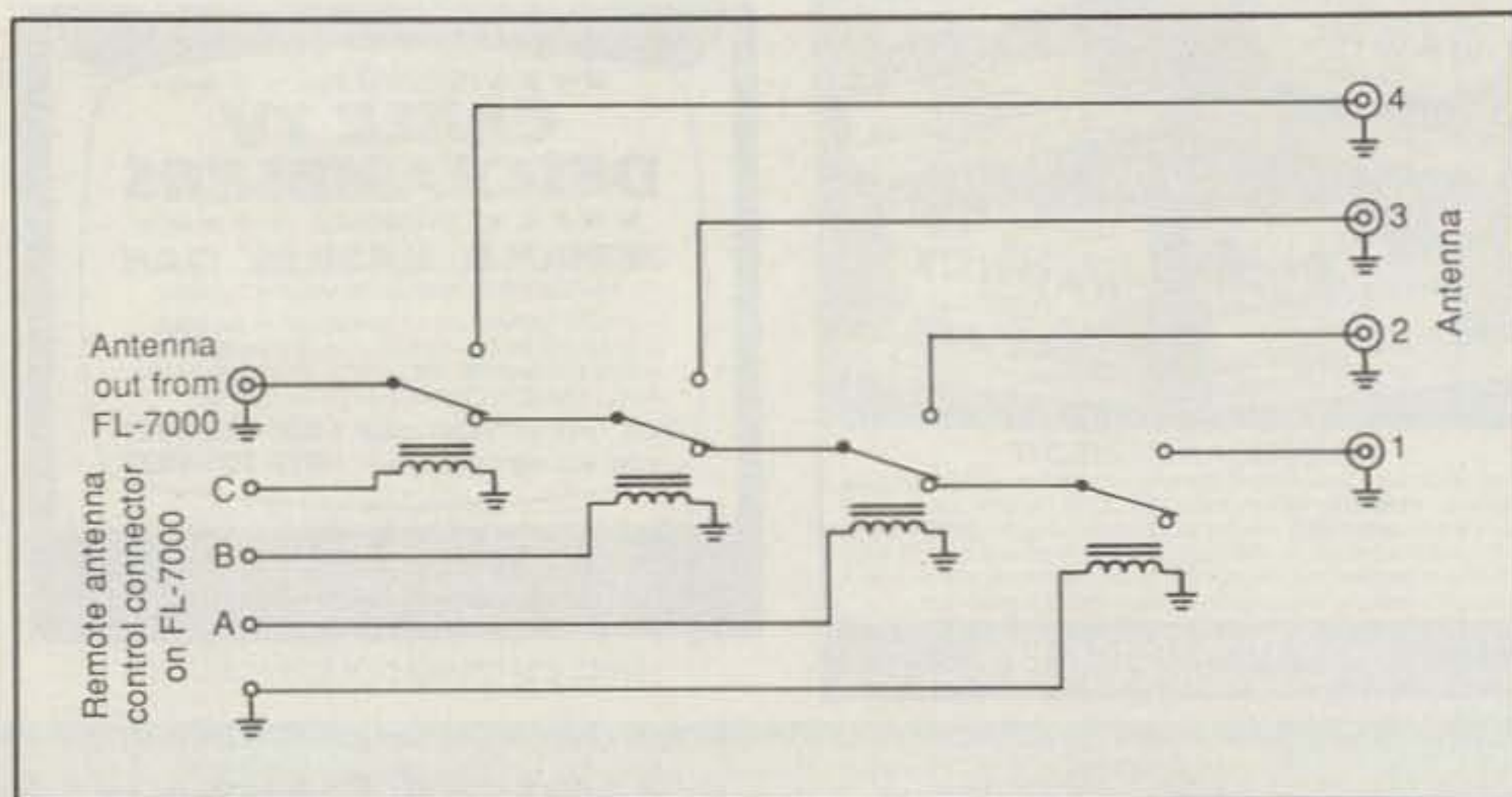


Fig. 4—Schematic of a remote antenna switching unit you might build to mate with the FL-7000. Any 12 VDC relay type having suitable RF insulation and a coil resistance of less than a few hundred ohms would be suitable (e.g., Radio Shack 275-218).

However, it does have three 13.5 VDC output terminals which are energized in turn by the Antenna 2, 3, and 4 pushbuttons and which can be used to switch three external 12 VDC antenna switching relays. The relays can be mounted at any reasonable distance from the amplifier depending upon the voltage drop in the interconnecting cable. Fig. 4 shows the idea involved. You can easily construct a homebrew antenna-relay selector "box," or the FAS-1-4R option can be purchased from Yaesu. You should not underestimate the versatility involved here if the basic idea involved is understood. There is no need to have all of the three relays shown in fig. 5 in one enclosure. They can be split up as desired to select, for instance, an in-shack dummy load, either of two dipoles, or a multiband beam.

Test and Operating Results

The FL-7000 I tested required less than 60 watts of drive to easily produce 500-550 watts of output. I never did talk long enough continuously on SSB to exceed the specified 30 minute time limitation. Testing the amplifier at full power output key-down, the fans switched to high speed after about a minute, but full power output continued for 2 minutes when, I guess, temperature sensors shut down the unit (actually, the power-amplifier units were bypassed and operation could still continue with a transceiver working through the FL-7000). Placing the unit in the RTTY mode produces about 200 watts output, but it would appear to have a continuous duty cycle. The fans will cycle into a high-speed mode every 90 seconds or so, remain in a high speed for 90 seconds, and then revert to their low-speed mode.

The fans, when operating normally,

are the quietest I have ever encountered. They are quieter than those found in most transceivers. During normal SSB contacts the fans never did switch to a high-speed mode. I suppose part of the quietness is due to the very robust construction of the unit. There are certainly no thin metal surfaces that are possibly going to vibrate as the fans operate.

Third-order IMD products measured close to -30 dB, and fifth-order products were about -45 dB. These figures are not outstanding, but are acceptable. In reality, I don't think you would notice any difference between the FL-7000 and an amplifier having a few more dB of better distortion figures unless two amateurs were neighbors on the same street.

The CW QSK operated perfectly, at least up to the 20-plus WPM speeds I can operate. The only problem with a long CW contact at full power output is that the fans will switch to high speed. That in itself is no problem, but you would probably prefer to be using headphones if you are working a weak DX station. Of course, licensed amateurs can obtain information on how to enable the 24 and 28 MHz bands on the amplifier. In fact, it amounts to nothing more than moving a slide switch. However, you do have to know where it is located and to which position to slide the switch!

The input SWR on all bands measured no more than 1:1.3. The automatic antenna tuner is rated to match SWRs of roughly 1:3 on all bands except 160 meters, where the matching range is 1:2. The matching range is limited because only one coil tap position is available per band, as can be seen in fig. 3. The matching range is sufficient to load into antennas such as tri-band beams, where the SWR may rise toward the edges of a band or a dipole where the same effect takes place. The tuner can be used with any antenna,

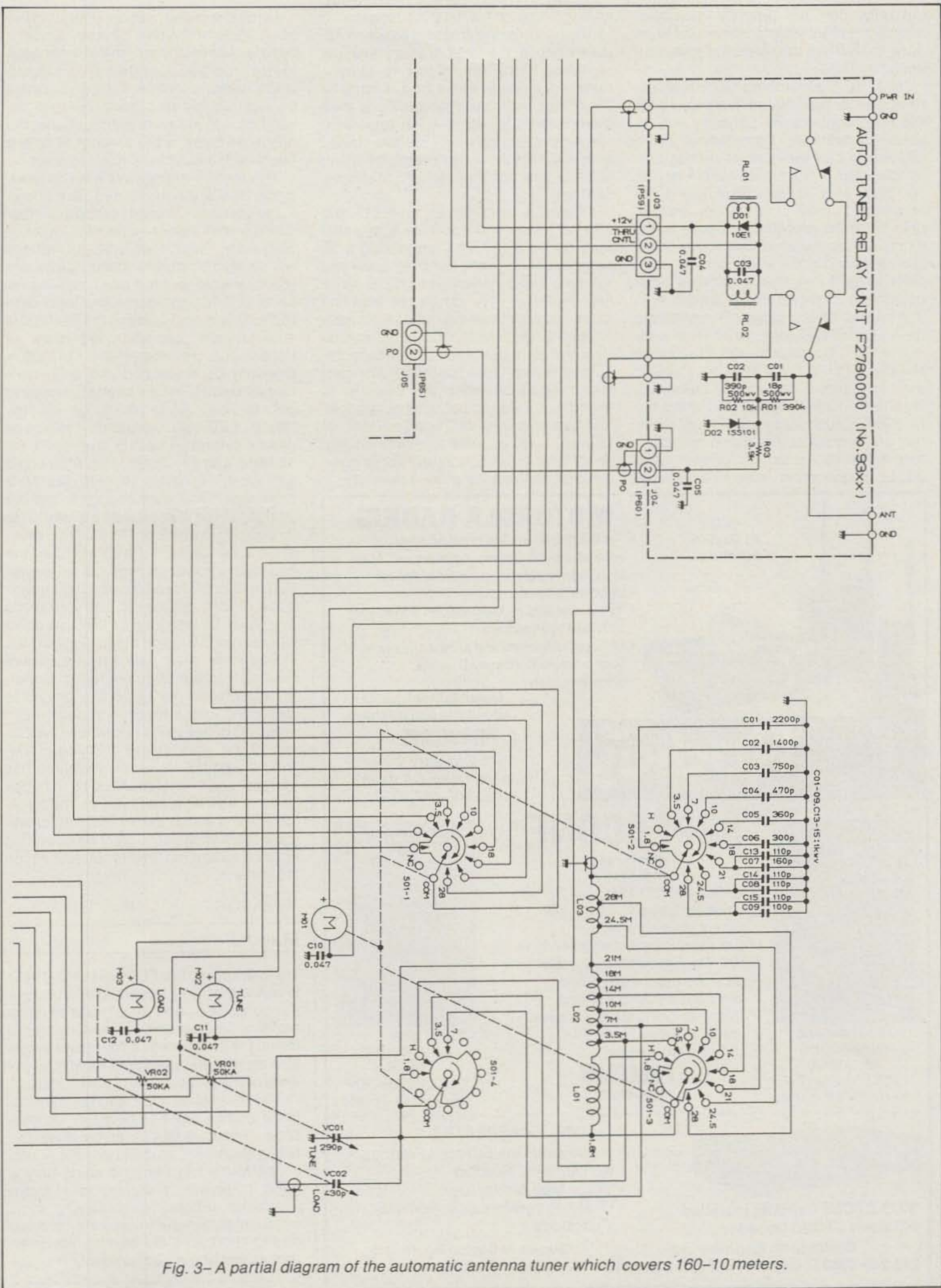


Fig. 3— A partial diagram of the automatic antenna tuner which covers 160–10 meters.

but only after the antenna has been trimmed or otherwise compensated to reduce the SWR to the range the tuner can accommodate.

In reality, the matching range is somewhat greater than stated, but I would not push the point. You can get away with various little operating discrepancies at the 100 watt output level using a manual tuner, but that is very inadvisable at the 500-plus watt output level using an automatic tuner. It's not that you are likely to harm the amplifier, because it has extensive protective circuitry. The more likely scenario is that an arc-over will take place in the tuner, thus creating a weak point that is even more likely to arc over in the future. Yaesu suggests measuring the antenna SWR using the SWR circuitry in the FL-7000 but with the FL-7000 in standby. Then if the SWR is much more than 1:3, correct the antenna before using the FL-7000. I agree, and using the FL-7000 in such a manner I have never had any problems. The automatic tuner memorizes its last setting for each band and takes only about 15 seconds to reset

when going over the extreme range of 10 to 160 minutes. When going between adjacent bands, the reset time is just a few seconds. If the tuning has to seek a match for a new antenna load, it can take 30-45 seconds, but that setting is then memorized. I found the tuner to be very responsive and only very seldom could I obtain a slightly better match by using manual override to "tweak" the tuner settings.

I tried the amplifier on both 117 and 230 VAC lines. It will operate quite satisfactorily on a 117 VAC line having a 20 ampere capacity and will even allow you to use a small transceiver on the same line. However, you could not load the same line with other equipment. It's easy enough to see if the FL-7000 is going to be "happy" on a given line. If the collector voltage (as monitored on the panel meter) loses regulation when the amplifier is keyed, full power output is not obtainable. The use of a 230 VAC line provides, of course, a lot of extra capacity so you don't have to be concerned about operating on the fringe of a line's capacity.

Once it is initially set up, operating the FL-7000 is extremely simple. Once a band is chosen, the automatic tuner goes to its memorized position and the memorized antenna selection. If you go back to a band previously used, the amplifier is "instant on." If you go to another band, the only time delay is the amount of time it takes for the automatic tuner to reset.

The meters are always easy to read, since they are back-lighted. The operational-status LEDs are easy to discern because of their colors—green for "ready," yellow for "wait," and red for various warnings. The green "band" LEDs are readily visible, but the band marking for each LED is unreadable in a semi-dark room. This is no problem if the FL-7000 is automatically bandswitched from a transceiver. However, if the FL-7000 is manually bandswitched, the only way I found to readily tell the band in use was to put vertical, white markings on the "band" LED field to separate it into three groups of three—1.8, 3.5, 7 MHz; 10, 14, 18 MHz; and 21, 24, 28 MHz. Although it still wasn't possible to read the MHz markings, it was easy enough to see the position of the illuminated LED relative to its position in a group. The FL-7000 delivers a solid signal. If driven with only the necessary power to produce full power output, it provides almost a 10 dB power boost. That's quite a bit, and as the ads say, you'll be less than an "S" unit down from stations running the full legal limit.

Everyone has to define the equipment needed for his own operating preferences. I found the FL-7000 a delight to use along with a modern transceiver. It was sort of like years ago when I was on top of the world using a Collins KWM-2/30L1 combo. However, that time has passed, and I'm not the least bit unhappy about it as I hit a band key on the transceiver and watch the FL-7000 automatically reset itself from a bit of DX operating time on 15 to a net time I want to meet on 40 meters.

Manual

The manual for the FL-7000 (circa 1986) is well written. The operating instructions are quite clear, and a multitude of interconnection diagrams for various transceivers is presented. A four-page large-size set of separate diagrams which cover all of the basic circuitry is included.

The manual is not a service manual, but it comes close to being so. A four-page section contains some quite detailed alignment procedures which can be performed in the field using only a good multimeter, a dummy load, and a wattmeter. Photographs clearly show which internal adjustments are involved during alignment. Be careful, however, that attempting an adjustment on a new



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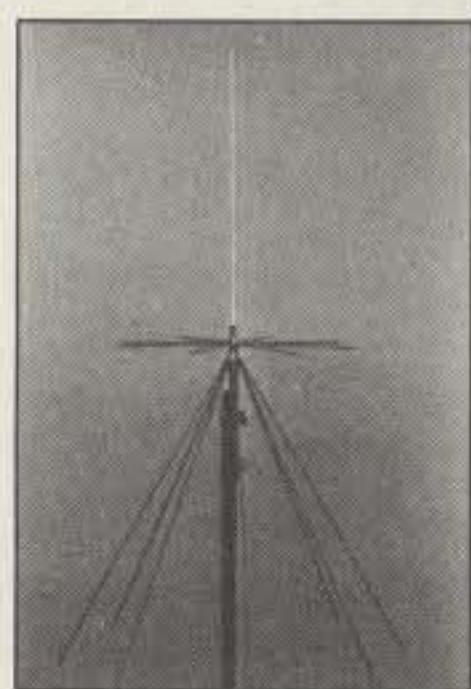
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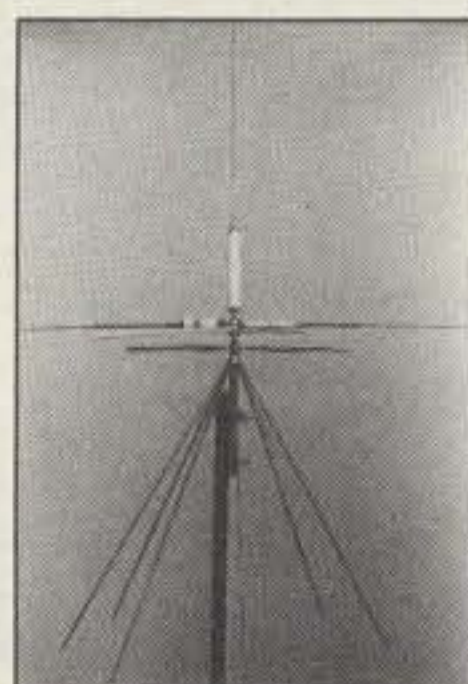
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FL-7000 does not invalidate the warranty. If a problem should develop, though, the manufacturer does present enough alignment data so that you probably could communicate intelligently back and forth to Yaesu to possibly avoid shipping out the FL-7000 for service. I really can't quite believe that a unit such as the FL-7000 is ever going to require service if operated properly, but . . .

Newer models of the FL-7000 incorporate a separate front-panel switch, next to the "operate/standby" switch for "SSB/RTTY" modes. Switching to the RTTY mode reduces the collector voltage from 47 to 36 volts to allow longer key-down periods, but no specific data is given in the manual. The models that have this switch also have a separate RTTY ALC level control on the rear panel.

Overall, the manual is quite adequate, but the hardware (the FL-7000) has progressed forward while the manual has not been updated. Yaesu should consider bringing the manual up to the standard that the hardware has now reached.

Summary

Why did I want to review the FL-7000? No one asked me to do so. I noticed the FL-7000 several years ago when it first came on the market, and I was quite impressed by its specifications and its price! The latter, of course, kept it out of my mind for a long time—until now.

Why now? Well, if you really look closely at the FL-7000, you will note that price-wise it is now very competitive with other solid-state amplifiers of the same general power level. You must remember that it is a "complete" package, including power supply and automatic antenna tuner. Compared to manually tuned, tube-type linears it is of course expensive. However, until you get into enjoying the convenience of solid-state automatic-tuned equipment, you don't know what you are missing—as long as you can comfortably afford it. I suspect the FL-7000 is going to become a classic as linear amplifiers progress more and more into the no-tube era.

The power boost provided by an amplifier such as the FL-7000 is significant. In most cases the FL-7000 can be operated along with a small transceiver from a regular 117 VAC line. And there are all those automatic, no-tune features! Yaesu apparently intends to keep the FL-7000 on the market, since their very latest production run of the unit included the new RTTY modifications previously mentioned. Otherwise they certainly would not have retooled for new front-panel, back-panel, and PC-board modifications.

FL-7000 sells for \$2,279.00, while the FAS-1-4R Remote Antenna Selector is \$120.00. They are available from Yaesu U.S.A., 17210 Edwards Road, Cerritos, CA 90701.



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How, why, when, and where are answered in this installment on how to adjust a Transmatch. W1ICP describes the process in clear, simple language.

How To Adjust A Transmatch Part II

BY LEW McCOY*, W1ICP

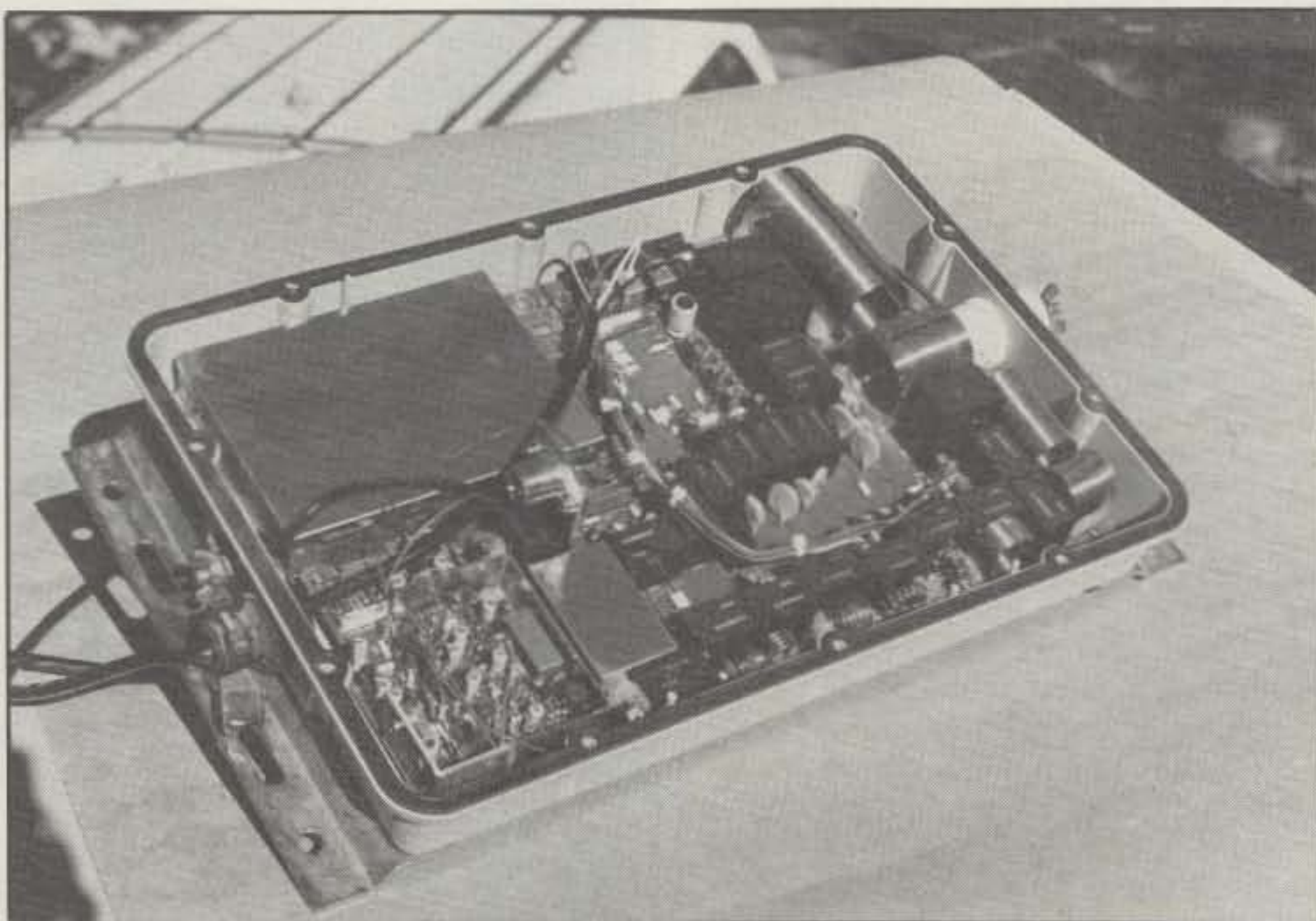
The logical answer to all the problems discussed in Part I of this article (see the March issue) is the use of a Transmatch. Exactly what is a Transmatch? The name was coined by George Grammer and myself in my article "The 50-Ohmer Transmatch."

The problem with the name *antenna tuner* is that it is not appropriate. You don't tune an antenna. In practice, the antenna system, which combines the antenna and feed line, is tuned from an unknown load to one which matches the transmitter output impedance.

One of the most difficult technical points for a newcomer to understand is the one of the load at the end of the feed line that is attached to the transmitter. Many amateurs think that when a 50 ohm impedance line is attached to the rig the load is going to be 50 ohms. About the only time such a condition can exist is when the antenna impedance is exactly 50 ohms and nonreactive. In truth, the load can vary from as low as a fraction of an ohm to several thousand ohms! Therefore, our problem becomes one of converting this unknown load to a pure 50 ohm load.

Essentially, a Transmatch could be called an adjustable RF transformer and reactance "tuner-outer." It takes the unknown load at the transmitter end of the coaxial line and transforms that load to 50 ohms—the desired output impedance of the transmitter. Note that I said "unknown load." The value of the load could be measured with the proper equipment, but that isn't necessary. What is necessary is that we can cancel any reactance present and step up or step down the mismatch as needed.

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



This is the heart of the ICOM AH-2, an automatic tuner. It is capable of handling 200 watts under widely varying loads. It is primarily designed for remotely tuning a multi-band whip such as in a mobile or TV installation. I thoroughly tested and reviewed this unit a while back and rated it very highly.

When Is A Transmatch Needed?

This is a good and frequently asked question. Naturally, if your transmitter is in a shut-down condition because of an SWR of 2 to 1 or more, you'll need to either match the antenna to the line or use a Transmatch. Matching the antenna to the line can be an impossible situation in many cases, particularly when we QSY, etc. Therefore, in this case a Transmatch is the answer.

Also, don't be misled by claims from makers of multiband trap dipoles that

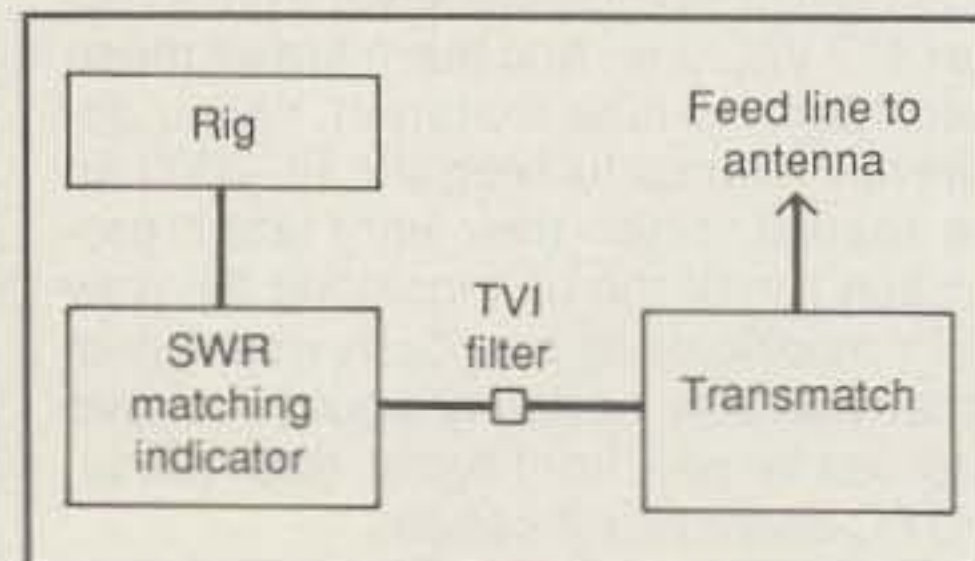
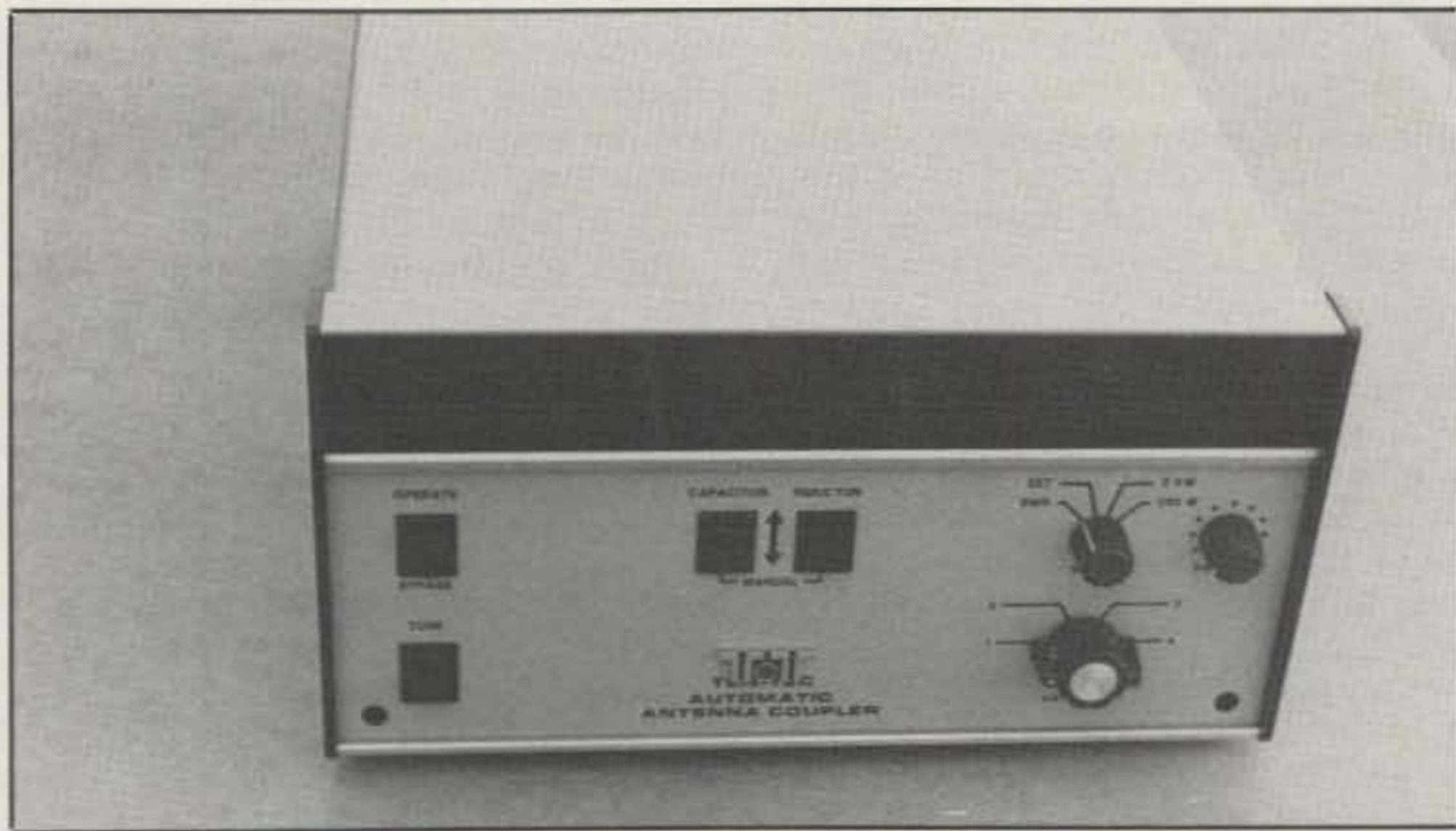


Fig. 1— The correct arrangement for a station setup using a Transmatch. Note the position of the low-pass filter. This is only important in weak TV signal areas.



Here is the Ten-Tec fully automatic tuner capable of matching virtually any load, covering both coax and open-wire or single-feed lines. It covers 160 through 10 meters. Power-handling capability is the full legal amateur limit (1500 watts). It has 21 memories that can be preset, so band changing is fully automatic to a 1 to 1 matched condition in seconds. This is an amazing product, and it will be reviewed fully in an upcoming issue of CQ.

state the antenna will stay below 2 to 1 on all amateur HF bands, 160 or 80 through 10. This cannot happen unless very lossy resistors are used. To reiterate, you don't need a Transmatch if your SWR stays below 2 to 1 (but frankly I prefer to use one anyway because my amplifier will always be working into a matched condition). On the other hand, I might add that the multiband trap dipoles and other antennas such as the off-center-fed models will present a "reasonable" antenna-system load for a coax-fed antenna to work with a Transmatch. (You will still need a Transmatch to use all frequencies.) In other

words, you don't want to use coax as a "tuned" line if the SWR is really high, as it can be with some antenna impedances. By using multiband coax-fed dipoles you can expect the SWR to be a reasonable figure with coax feed. You also should keep in mind that antenna efficiency will always suffer to some degree if traps are used.

This brings up a point that bears mentioning. Without using a Transmatch, what is an "ideal" SWR? An SWR of 2 to 1 is almost the limit simply because that is what the transceiver manufacturers set for their limits. Any losses in the transmis-



MFJ's differential capacitor Transmatch. This legal-limit unit does an outstanding job with both coax or tuned feeders.

sion line from a match of 1 to 1 up to 2 to 1 are insignificant and not worth considering as important. I would say then that if your antenna-system feed stays below 2 to 1 on the bands and frequencies you operate, you may not need a Transmatch. Because of the transceiver 2 to 1 limit, you do need a Transmatch if this figure is exceeded.

Another bonus when using a Transmatch is that it will offer a certain degree of selectivity to your station. For example, amateurs living close to broadcast stations or other high-power RF installations can get a lot of interference from cross-modulation generated by the overloading of your receiver by these high-power signals. In many instances a Transmatch will eliminate this problem. Because of the Transmatch selectivity, there is a certain amount of harmonic rejection. However, I don't intend to get into a discussion of harmonic suppression and which of the common Transmatch circuits—the "T," the "SPC," or the "Ultimate"—is best for harmonic reduction (see fig. 2 in Part I). Each has its advantages, and in any case, the argument about harmonics is academic simply because the FCC rules state you must have your harmonics down at least 40 dB from the final stage of your transmitter for the 160 through 10 meter bands, and as far as I know, all commercial-built rigs meet this standard.

Regardless of which of the above-mentioned circuits you use, all have the infinite beauty of matching any kind of antenna system you use. Think about that statement for a second. I said *any kind of antenna system* you use. This means random-length wires, rain gutters, guy lines on towers, or towers themselves. In fact, anything that is metal can be matched to a 1 to 1 ratio with the circuits mentioned above. I guess I should add that most of the commercial units using the above-mentioned circuits are usually for 80 through 10 meters (some include 160). To satisfy the statement of matching "anything" does mean having the three main components—input capacitor, inductor, and output capacitor—all variable. Many of the commercial circuits use a switched tapped inductor. While this is okay in most matching cases, there are some loads that are impossible to get to a perfect match. Usually, however, you can achieve a better than 2 to 1 match for any system.

Some amateurs are concerned that using a Transmatch introduces loss into the system. Some years back I made extensive tests and found that when using good RF connections on all components in a Transmatch, plus reasonable power-handling components, the average power lost was on the order of 3 to 5 percent, depending on the load being matched. On the other hand, this loss can be more than compensated for by using the Trans-

match so that your rig is always working into its design load. You have everything running cooler, with better efficiency, and so on.

Now I will get to what this article is supposed to be about—how to tune Transmatch. I know there are several methods available, and each of the commercial units give details for their units in their manuals. The system I used is one I developed over the years, and it works fine for me.

Before going into that, let's see where we should place the Transmatch. See fig. 1 for the basic setup of *where* a Transmatch should go in the station. If you are using a low-pass filter, it should be installed between the rig and the Transmatch, and also between the SWR bridge and the Transmatch. In extreme fringe areas of television reception there are diodes used in bridges. The diodes can generate harmonics, so the low-pass filter should have a chance to "kill" such harmonics. The SWR-bridge placement is not important to cable-TV areas or in strong-signal locations—just in fringe or weak-signal spots. Filters are designed to work into 50 ohms, and that point in your station setup is where you will have a 50 ohm impedance.

I should also point out that there are many "automatic" Transmatches available commercially. Many modern transceivers have the option of providing a built-in automatic Transmatch. I cannot get excited about most of these units simply because the matching range is limited. Amateurs purchase such transceivers expecting them to match any antenna load and are then disappointed when they don't. On the other hand, there are some automatic tuners that will handle practically any load. In the photographs are

shown two of the units that will handle just about any load an amateur will encounter. To be fair, there are other commercial units available, so study the ads in *CQ*. The question you should ask is simple enough: "What is the matching range of impedances and what is the power level they will handle?" But again, this article is about manually adjusted devices, and that is what I intend to discuss.

You are going to need an SWR-indicator bridge, and it must be placed between the rig and the Transmatch as shown. This is important because the bridge provides the visual indication of when one is correctly tuned. Many commercial units have an SWR bridge built in, so please note what I said about weak TV signal areas. Keep notes as you do your adjusting, because once you find the correct settings you will want to make a record of them so you can quickly return to the proper settings.

First, *and most important*, you must always adjust a Transmatch using the minimum amount of power that provides you with indications. If your SWR indicator has different power levels, use the lowest one for your adjustments. I am going to assume you are using a multiband Transmatch, 80 through 10 meters. Let's talk about 80 and 40 first. Before applying power, set the variable capacitors to maximum capacitance—plates fully meshed. In fact, you probably will find several different Transmatch settings which provide a perfect match. This is not unusual, but always use the match that provides the most capacitance in the circuit. I could go into the whys, but that would be a whole article in itself. Just take my word for it: Maximum capacitance is always best.


Next switch your bridge to read **Forward**, turn on your rig, and adjust your drive or gain control to put out enough power for a reading. Usually for me this is about 10 to 20 watts with a 100 watt rig. This level of power could be used all day without hurting anything. If you have a roller inductor for your inductance, start at minimum inductance and run the roller out, increasing the inductance while observing the bridge meter. At some point you likely will get an indication of more power output. Now you must switch to the **Reflected** reading and adjust both capacitors, looking for a drop toward zero. When you find those settings, you are starting to close in on a 50 ohm match. Carefully adjust the inductor and the capacitors looking for a zero reading on the meter. Once you achieve that setting, you have matched the antenna system—an unknown load—to 50 ohms, the design factor of your transmitter.

You now can bring up your power to the rated transmitter level. You may have to gently touch up your reflected reading with the Transmatch controls. If you are operating on 80, write down your frequen-

cy and then try QSYing to see how far you can move and still stay less than 2 to 1. Usually, with an 80 meter half-wave dipole fed with open-wire line you will only be able to go about 100 kHz without resetting the Transmatch.

The procedure for 20 through 10 meters is similar, except in this case set your capacitors at about half mesh or even one-quarter mesh. Also, you will find that you only need a few turns of inductance on these bands. In fact, on 10 meters matching some loads will be touchy, but it can be done. With switched, tapped inductor Transmatches you will have to try different switch settings. With some loads you may find that you cannot get 1 to 1, but usually you can get very close to a good match. Personally, I would accept a match of 1.5 to 1 or better.

By using a Transmatch here you now have a "tuned system." It is important to know that you *have not changed* the SWR on the transmission line nor the pattern of the antenna. You have taken the antenna and feed line, with its unknown load and reactances, and converted the load to one which the transmitter and receiver see as a "pure" 50 ohm load. Admittedly, this is over-simplifying, but it gets the job done. Also, and this is very important, any dipole of any overall length, fed with the twin lead or open-wire line, is a true multiband system—no trap, no baluns, just the feed line and the dipole. If you like, you can make the dipole portion 102 feet long, center fed, and tell everyone you are using a G5RV, because that essentially is what G5RV antenna is. Or if you have more room, you can make the dipole 150 feet long, or longer, and you will have an antenna with more gain than the G5RV.

You will often hear hams say they are using a "McCoy" antenna system. Frankly, such systems have been around longer than I have, but I try to emphasize the simplicity of such system. Any combination of a reasonable-length dipole fed with open-wire line and a Transmatch is this kind of system. How short should the dipole be? If you only have 60 feet or so, the dipole will still tune and work on all the bands the Transmatch will reach. A question frequently asked is "What is the minimum useful length of a center-fed dipole or inverted Vee?" Any short dipole will work, but I prefer a dipole that is at least $\frac{1}{4}$ wavelength long on the lowest band used—in other words, 60 feet or so on 80 meters, *but* this doesn't mean the antenna won't work if it is shorter. It just won't be as good a performer. With antennas the old saying "Make the antenna as big and as high as possible." Certainly is a sound statement. But also don't forget rain gutters, roof flashing, back stays on boats, or the barbed-wire fence. If they are metal or a conductor, they are also multiband antennas, and a Transmatch will make them that. Good luck! 

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AOP-1: OSCAR pack.

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AL-82:	1500W output.
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AL-1500:	1500W output.
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RS-20A	RS-35A	RS-50A
RS-20M	RS-35M	RS-50M
VS-20M	VS-35M	VS-50M

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Like to experiment with antennas? This little project can turn your backyard into a mini-test range and provide hours of fun as you learn about antennas.

Build Your Own Rotatable Antenna Mount For Measuring Antenna Field Patterns

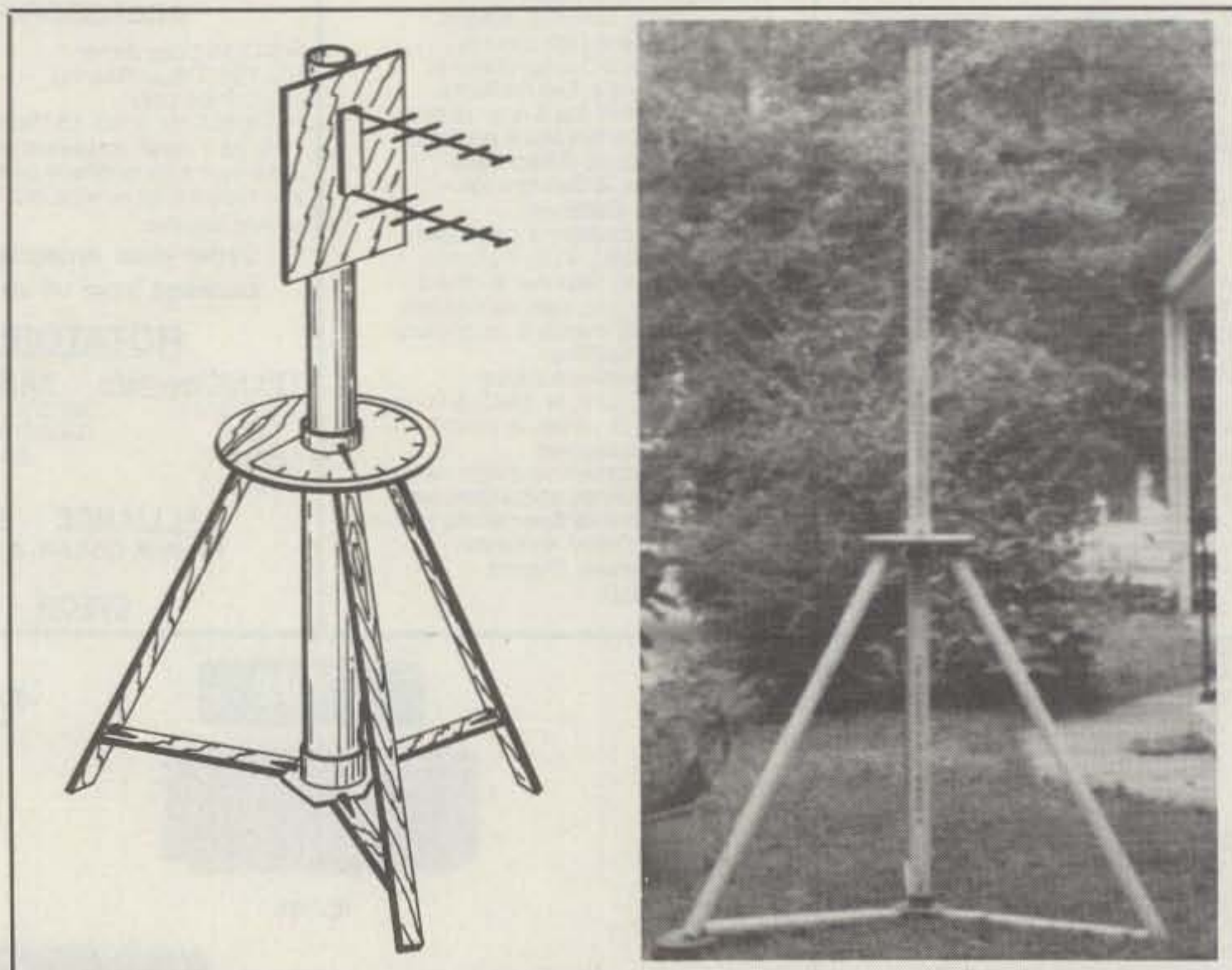
BY PROF. WILLIAM RYNONE*, Ph.D., P.E.

At one point I wanted a low-cost, rotatable antenna mount for measuring field patterns using a signal generator, RF amplifier, and field strength meter. Such a stand is desirable for anyone experimenting with small, high-frequency directional antennas. The mount described here costs approximately \$30 to build and was constructed in a few hours from parts that were purchased from a hardware store.

Construction

Two pieces of PVC pipe are used, one slightly larger (2½ inch) than the other (2 inch) to enable one pipe to rotate inside the other. The protractor mounted on the stationary bottom pipe enables the user to determine the azimuth angle between the antenna and the field strength meter.

Generally, PVC is available in either 10



The completed unit doesn't take up much room.

*Electrical Engineering Dept., U.S. Naval Academy, Annapolis, MD 21402



A plywood disc of any convenient dimension makes the top portion of the stand.



The protractor layout comes from a dime-store protractor enlarged on a copying machine. The pointer is discussed in the text.

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Covers 1.8-30 MHz . . . plus you get dummy load, peak reading meter, antenna switch, balun and one full year unconditional guarantee . . . for only \$149.95

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Special Inductor Switch

The inductor switch is the most likely tuner component to burn up.

The MFJ-949D gives you an inductor switch that's specially designed to withstand the extreme voltages and currents that are developed in your tuner.

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MFJ's Very Best 3 KW Tuner



MFJ-989C **\$349.95** The MFJ-989C is not for everyone. And not everyone can afford it. However, if you do make the investment, you get the finest 3 KW tuner money can buy.

The MFJ-989C is a compact 3KW PEP roller inductor tuner that covers 1.8-30 MHz. Exceptionally hefty tuning components include 2 massive capacitors that can withstand 6000 RF volts with ease and a big roller inductor. You can run high power without fear. A 3-digits turns counter lets you quickly re-tune to your favorite frequency. A giant 2-core balun lets you operate balanced feedlines without core saturation and voltage breakdown. Dummy load.

Peak and average cross-needle meter shows you forward/reflected power in two ranges (2000/500 and 200/50) and SWR. Lamp uses 12 VDC or 110 VAC with MFJ-1312, \$12.95. Flip stand, 6-position antenna switch. 10 3/4" x 4 1/2" x 15". Add \$10 s/h.

MFJ's smallest Versa Tuner

MFJ-901B **\$59.95**

The MFJ-901B is our smallest -- 5x2x6 inches -- (and most affordable) 200 watt PEP tuner -- when both your space and your budget is limited. Good for matching solid state rigs to linears.



MFJ'S Super Value Tuner



MFJ-941E **\$109.95** The new MFJ-941E gives you a 300 watt PEP tuner that covers everything from 1.8-30 MHz -- plus you get a cross-needle meter, antenna switch and balun . . . for an incredible \$109.95. Lamp uses 12 VDC or 110 VAC with MFJ-1312, \$12.95.

Antenna switch selects 2 coax lines (direct or through tuner), random wire, balanced line or external dummy load. 4:1 balun. 1000 volt capacitors. Measures 10-5/8" x 2-7/8" x 7".

2-Knob Differential-T™ Tuner



MFJ-986 **\$289.95** 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. Handles 3 KW PEP.

Roller inductor makes tuning smooth and easy. Turns counter lets you quickly re-tune to frequency.

MFJ's peak and average reading cross-needle meter 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. Current balun reduces feedline radiation and forces equal currents into antenna halves that are not perfectly balanced. It covers 1.8-30 MHz. Get yours today! Add \$10s/h.

MFJ's Random Wire Tuner

MFJ-16010 **\$39.95**

Operate all bands anywhere with any transceiver with the MFJ-16010. It lets you turn a random wire into a transmitting antenna. 1.8-30 MHz. 200 watts PEP. Ultra small 2"x3"x4".



MFJ's Mobile Tuner

MFJ-945C **\$89.95**



Don't leave home without this mobile

tuner! Have an uninterrupted trip as the MFJ-945C extends your antenna bandwidth so you don't have to stop, go outside and adjust your mobile whip.

Small 8 x 2 x 6 inches uses little room. SWR/Wattmeter and convenient placement of controls makes tuning easy in motion. Balun. Covers 1.8-30 MHz. 300 watts PEP. Mobile Mount, MFJ-20, \$3.00.

MFJ's Versatile 1.5 KW Tuner



MFJ-962C **\$229.95** MFJ-962C lets you use your barefoot rig now and have the capacity to add a 1.5 KW PEP amplifier later. It covers 1.8-30 MHz.

You get MFJ's peak and average reading Cross-needle SWR/Wattmeter. It reads forward/reflected power in 200/50 and 2000/500 watt ranges. Lamp uses 12 VDC or 110 VAC with MFJ-1312, \$12.95.

Plus . . . 6-position antenna switch and teflon wound balun with ceramic feedthru insulators for balanced lines. 10 3/4 x 4 1/2 x 14-7/8 in. \$10 s/h.

MFJ's VHF or UHF Tuners

MFJ-921 or MFJ-924 **\$69.95**



MFJ-921 VHF tuner covers both 2 Meters and the 220 MHz bands. MFJ-924 covers 440 MHz. Built-in SWR/Wattmeter. 8" x 2 1/2" x 3". 2-knob tuning convenient for mobile or base.

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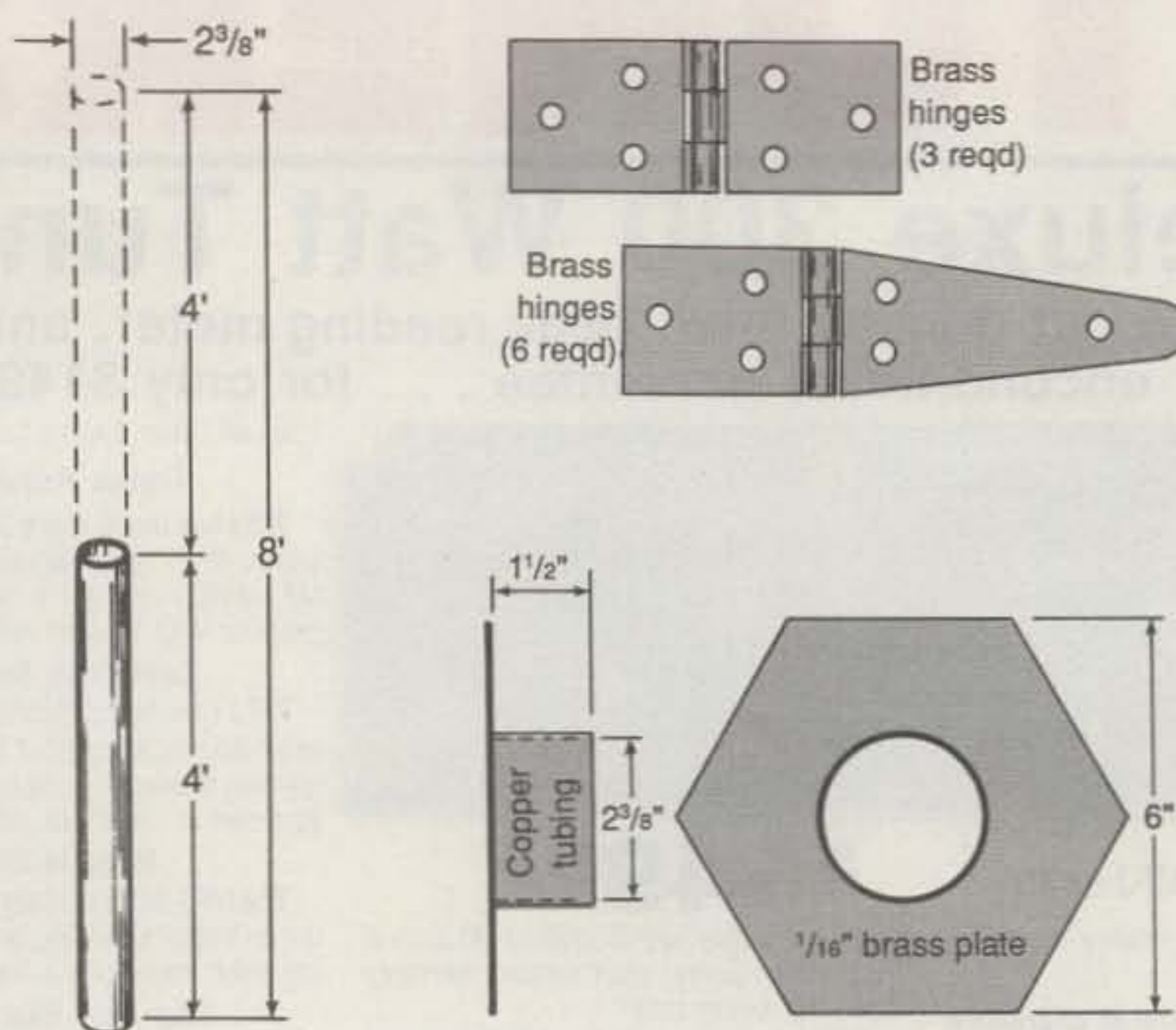
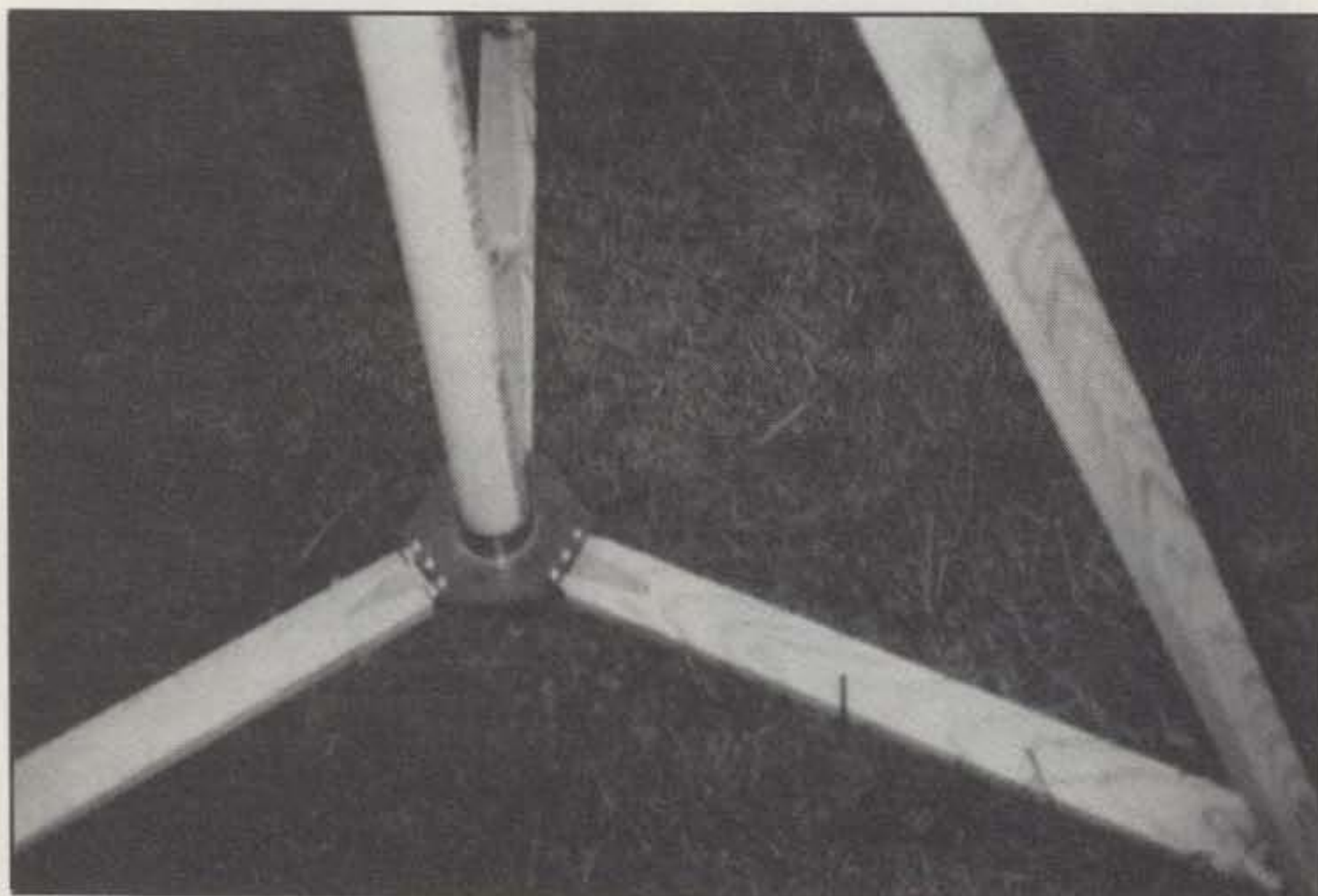
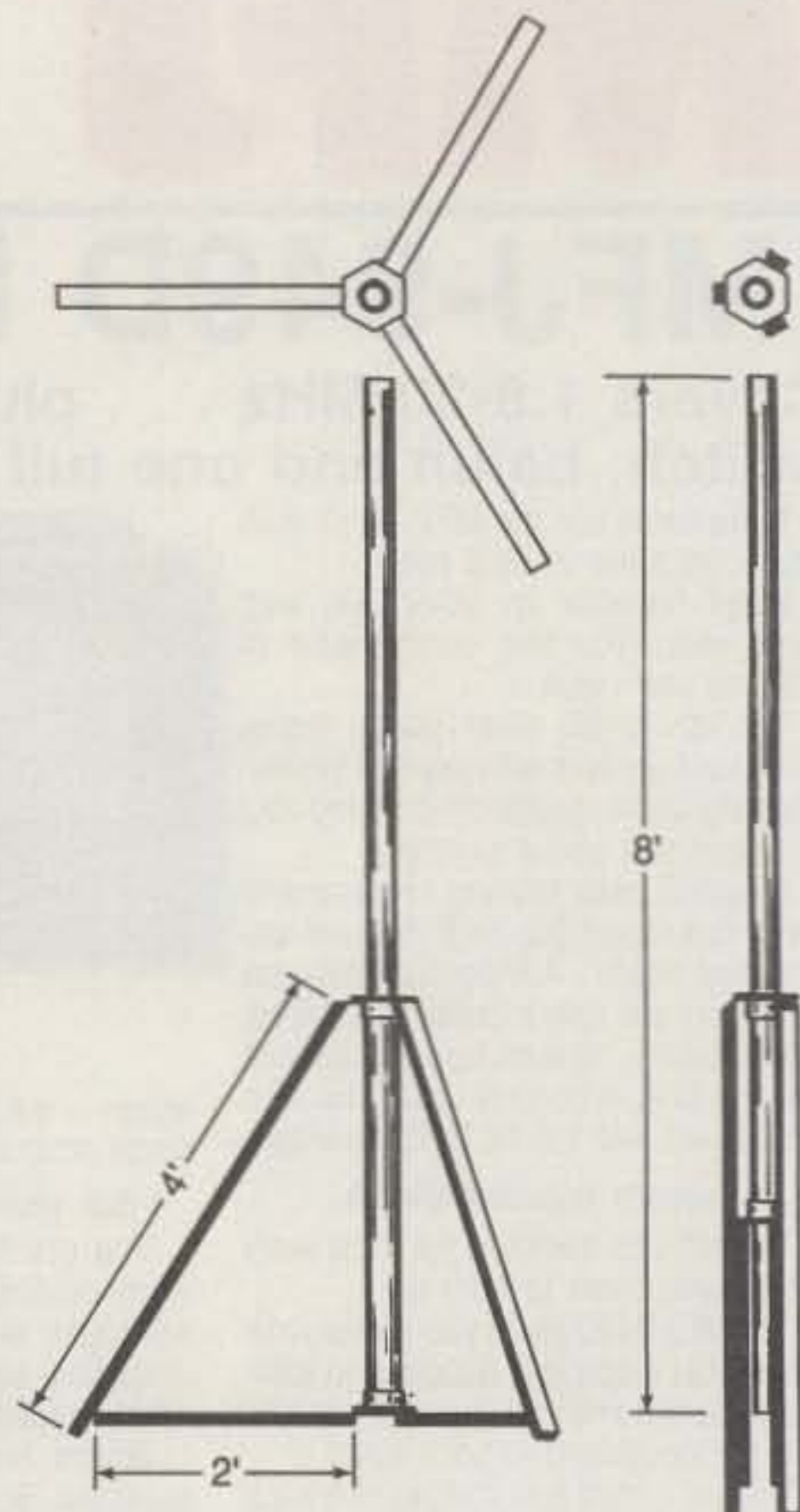


Fig. 1—The components that make up the test stand. The items are commonly available at hardware stores and lumber yards. The hinges and mounting plates should be made of a non-ferrous material such as copper or brass.



The bottom simply bolts together. The stand is designed to be assembled easily for use. It can be disassembled quickly for storage.

foot or 20 foot lengths. Both pipes are cut to a length of 8 feet. The outer pipe (2½ inch) is also cut in half (i.e., into two 4 foot lengths). However, if the pipe is cut slightly above the top support adapter (and protractor), then a pointer will pass close to the protractor. Close proximity between pointer and protractor will enable an accurate azimuth reading.

The one-by-two legs and supports are standard lumber, and the hinges used to "tie them together" are made of brass to minimize any interference that ferrous metal might cause to the field pattern. The support adapters may be constructed of brass or plywood, but if it is convenient, use brass for these adapters for reasons of strength and longevity. Brass is

preferable to ½ inch plywood. The top adapter should be attached permanently to the PVC pipe. However, the bottom adapter should be pinned temporarily when in use.

Antenna Mount Use

The mount is simple to use. It only requires that some ingenuity be demonstrated in mounting the various types of antennas that may be tested. To obtain the "true" radiation pattern for the antenna under test, it is important that the hardware used in mounting the antenna to the mast not interfere with the radiation pattern. Various types of hardware may be used. Generally, acceptable hardware is constructed of non-magnetic (preferably nonmetallic) materials—for example, nylon straps or plastic hardware. If the antenna weight or moment arm is such that metal hardware is indicated, then non-ferrous metals are preferable. The maximum weight that this antenna mount can safely support has not been tested. Therefore, proceed with caution if you are testing an antenna for the space station.

Acknowledgments

My thanks to Ron Ekstrom, who made useful suggestions during the mount development, and to my dad, William Ry-none, Sr., for construction of the unit.

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MFJ's innovative new SWR Analyzer gives you a *complete picture of your antenna SWR over an entire band — without a transmitter, SWR meter or any other equipment!*

All you do is plug your antenna into the coax connector, set your SWR Analyzer to the frequency you want and read your SWR.

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You can instantly find your antenna's true resonant frequency right at your feedline — that's something a noise bridge just can't do.

You can monitor SWR changes as you adjust your beam or vertical — you'll know right away which way to adjust it.

You can shorten or lengthen your dipole and see the effect immediately.

The MFJ SWR Analyzer is battery operated and handheld size so you can take it right to your antenna. It makes it soooooo easy to work on your antenna until it's just the way you want it.

Create your perfect multi-band antenna

You can instantly check multi-band dipoles and trap verticals to see if the low SWR points are where you want them and adjust your antenna until they're right.

Mobile Antennas made easy

You'll find the perfect adjustment for your mobile whip in seconds by actually seeing the SWR as you pull the whip in and out without transmitting

You can easily find the ideal place on the car for your mobile antenna by checking different spots with the SWR Analyzer.

All kinds of uses

You can see how the SWR varies over your entire band and quickly find your usable 2:1 SWR bandwidth.

You can see your SWR change as you drive under an overpass and see how mobile

MFJ Low Pass Filter



MFJ-704
\$39⁹⁵

Now you can eliminate or minimize TVI problems caused by harmonics with this new MFJ Low Pass Filter that connects between your transceiver and antenna. It's the best way to ensure that your transceiver does not cause harmonic interference to your neighbors' TVs -- you can operate in peace while your TV watching neighbors completely miss out on the fun of ham radio.

Handles full legal power from 0 to 30 MHz. SWR below 1.15:1 to 30 MHz. High harmonic attenuation. Low insertion loss. One year unconditional guarantee.

Prices and specifications subject to change without notice or obligation.



MFJ-207
\$99⁹⁵

W9INN Balun Box



MFJ-912
\$39⁹⁵

Permits using coax from your wide range T-network tuner to the MFJ-912 W9INN Balun Box mounted outside the building. The MFJ-912 then converts the unbalanced coax to the balanced transmission line (ladder line). Provides the same function as the internal balun except it is located remotely from the tuner.

With an adequate tuner will permit feeding any balanced transmission line this way.

Retains flexibility and efficiency of the ladder line feed without bringing the ladder line into the shack. One year unconditional guarantee.

whip flutter affects SWR.

You can see what happens as you swing your beam toward the power line or away from your tower.

You can see how rain or snow affects your beam.

You can tune up your antenna tuner without transmitting.

You can check the SWR of the input to your linear amplifier.

You'll find all kinds of uses for this totally self-contained handheld unit that'll revolutionize how SWR is measured.

Super Value: Several Instruments in One

You get a super value because several instruments are combined into a single portable handheld unit.

It has a low distortion RF generator that covers 10-160 meters, an SWR bridge that gives forward and reflected components and a computing circuit that automatically computes the SWR and displays it on the meter.

Everything is automatic. All you do is set the frequency and read SWR. It also has a frequency counter output so you can connect a frequency counter for precise digital readout.

Use 9 volt battery or 110 VAC with MFJ-1312, \$12.95. 7½" x 2½" x 2¼".

The best way ever to measure SWR

Here's the best way ever to measure SWR . . . so get yours today!

MFJ VHF SWR Analyzer

MFJ-208

\$89⁹⁵

If you operate 2 meters this new MFJ-208 VHF SWR Analyzer helps get your antennas in tip-top shape. Just plug in the coax to find the SWR of any antenna from 142-156 MHz. Use 9 volt battery (not included) or 110 VAC with MFJ-1312, \$12.95.



DC-650 MHz Dummy Load



MFJ-264
\$64⁹⁵

One dummy load that covers 160 Meters through 650 MHz and QRP through 1500 watts! SWR is below 1.1:1 to 30 MHz, below 1.3:1 to 650 MHz. Run 1500 watts for 10 seconds, 100 watts for 10 minutes. 3" x 3" x 7". Guarantee.

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CQ REVIEWS:

The ICOM IC-229A/H 2 Meter FM Transceiver

BY DAVE INGRAM*, K4TWJ

If you are really serious about big-time 2 meter FMing, check out ICOM's IC-229H. Fifty watts of power is only one of the IC-229H's many attractions. It also sports 20 memories that store any frequency, repeater offset and PL tones, NOAA weather coverage, aircraft band reception, programmable band or memory scanning, DTMF mike with 14 autodialing memories, and more. The most impressive aspect of this big performer, however, is its small size. The IC-229H's cabinet measures only 1½" H × 5½" W × 3¾" D. An open-air heat sink adds 2¼ more inches to the IC-229H's depth.

If there's limited under-dash clearance in your compact car, ICOM also manufactures the same transceiver in a 25 watt model. It is the IC-229A, and its rear heat sink is only ½ inch long. Those small dimensions open some intriguing possibilities for creative-minded amateurs. Visualize, for example, combining the IC-229H with a 12 volt/7 amp gel cell battery, homebrewed metal frame with felt-lined straps, top carrying handle and ⅝-wave antenna. Now that would really be a portable worth carrying to the beach!

Overview

The ultra-compact IC-229 is a very sharp-looking transceiver. It is enclosed in a matte-black case with similar-colored knobs and a large orange LCD readout. It has a top-mounted speaker that sounds surprisingly good for its size, and there is a rear mini phone jack for connecting an external speaker. The unit is supplied with a DTMF and autodialing mike, mobile bracket with universal mounting strap for quick installation, and a DC cable with standard six-pin connector that is great news. The IC-229's DC socket is exactly like those on ICOM's IC-751A, IC-735, IC-725, IC-730, and Kenwood's TS-120, TS-130, TS-140, and TS-440. Just



ICOM's IC-229H 2 meter FM transceiver is loaded for bear with features galore and plenty of power.

move your car's DC plug between rigs, change antenna connections, and you can go HF mobile one day and VHF mobile the next day. A "switch hitter"!

The IC-229 covers 136 to 174 MHz on receive (plus the aircraft band of 118 to 136 MHz on AM with a simple modification I will explain later). Tuning is selectable in steps of 5, 10, 15, 20, and 25 kHz. It is preprogrammed with the standard +600 kHz repeater offset, but can easily be changed to any desired split or offset. The "H" model draws approximately 10.5 amps for full 50 watts output, the "A" model draws 6.0 amps for 25 watts output, and receive current on both models is only 600 ma. Additional specs are shown in fig. 1.

The simplest and easiest way to explain this transceiver's functions and features is via the following front-panel tour. Starting at the left top is the **Power** on/off switch. Its adjacent **MONI** button is used to open the squelch and/or listen on a repeater's input frequency. Eight multi-function buttons are located below the LCD readout. Sequentially pressing the right **SET** button selects the RF attenuator, bass/treble audio response, one of three low power levels, scan pause time, and one of four LCD brightness levels.

This button also selects repeater offsets, PL tone frequencies, tuning steps, memory channels to be skipped, scan limits, and beep tones. Rotating the main tuning knob when a particular function is displayed in the readout changes its setting. The adjacent **H/L.O** button selects full RF output or your preselected low-power level for transmitting.

Directly below the tuning knob are separate buttons for selecting VFO or Memory operation. Pressing the **V/MHz** button once calls up the VFO. Press it again, and each click of the main tuning knob shifts frequency in 1 MHz steps. This feature is quite handy when moving between the 146 MHz amateur band and NOAA weather frequencies. One press of the **M/Call** button likewise selects memory mode, while a second punch accesses your favorite repeater via the **CALL** channel. The adjacent **PRIO** button is great for spot-monitoring one frequency or repeater while listening or chatting on another frequency. When activated, this function toggles reception between two channels every five seconds. Sequentially pressing the adjacent **DUP** button selects transmit offsets below, above, or on your receive frequency. The middle **TT/SQU** and **PGR/CS** buttons activate two neat

*4941 Scenic View Drive, Birmingham, AL 35210

■ GENERAL

- Frequency coverage :

Version	Frequency coverage
U.S.A., Asia	140 ~ 150 MHz* (Transmit) 136 ~ 174 MHz* (Receive)
Australia	144 ~ 148 MHz
Europe	144 ~ 146 MHz
Italy	136 ~ 174 MHz*
- Tuning steps : 5, 10, 12.5, 15, 20, 25 kHz or 1 MHz
- Number of memory channels : Memory channels 20
Call channel 1
Scan edge channels 2
- Mode : FM (F3)
- Antenna impedance : 50 Ω (unbalanced)
- Power supply requirement : 13.8 V DC ± 15% (negative ground)
- Output power and current drain :

		IC-229A/E	IC-229H
Transmit	High	6.0 A	10.5 A
	Low 3	4.2 A	7.5 A
	Low 2	3.2 A	5.0 A
	Low 1	2.0 A	4.0 A
Receive	Squeighed	500 mA	500 mA
	Max. audio output	800 mA	800 mA
- Usable temperature range : -10°C ~ +60°C;
+14°F ~ +140°F
- Frequency stability : ± 10 ppm
(-10°C ~ +60°C, +14°F ~ +140°F)
- Dimensions : IC-229A/E
140(W) x 40(H) x 105(D) mm
5.5(W) x 1.6(H) x 4.1(D) in
IC-229H
140(W) x 40(H) x 155(D) mm
5.5(W) x 1.6(H) x 6.1(D) in

* Specifications guaranteed 144 ~ 148 MHz.

- Weight : IC-229A/E 750 g; 1.7 lb
IC-229H 1.0 kg; 2.2 lb

■ TRANSMITTER

- Output power :

	IC-229A/E	IC-229H
High	25 W	50 W
Low 3	10 W	25 W
Low 2	5 W	10 W
Low 1	1 W	5 W
- Modulation system : Variable reactance frequency modulation
- Maximum frequency deviation : ± 5 kHz
- Spurious emissions : Less than -60 dB
- Microphone impedance : 600 Ω

■ RECEIVER

- Receive system : Double-conversion superheterodyne
- Intermediate frequencies : 1st 17.2 MHz 2nd 455 kHz
- Sensitivity : Less than 0.16 μV for 12 dB SINAD
- Squelch sensitivity : Less than 0.13 μV
- Spurious response rejection : More than 60 dB
- Audio output power : 2.4 W at 10% distortion with an 8 Ω load
- Audio output impedance : 8 Ω

All stated specifications are subject to change without notice or obligation.

Fig. 1- Technical specifications of the IC-229A/H.

tone paging systems we will discuss in the following section.

Special Functions

Inclusion of AM aircraft-band reception in the IC-229A/H was a great idea, and it works like a champ! A slight modification is necessary to enable air-band tuning, and it is not described in the IC-229's manual, so file the following details for future reference.

To enable aircraft reception, cut glass diode D5 on the logic board. This board is mounted right behind the front panel. You get to it by first removing the rig's top and bottom covers, then removing the four screws holding the front panel to the main frame (watch those small wires). Look inside after removing the front panel. There are five diodes or spaces for five diodes. **D5 is the middle one**, third from either end. Just cut it, then turn the IC-229 back on and air-band reception is added. If it does not appear, resetting the CPU will get things going. As outlined on page 42 of the IC-229's manual, hold the **SET** and **MW** buttons in and turn the power on to do a CPU reset.

Most of us like mobile rigs that can be

controlled from their microphone, and ICOM's IC-229 is a winner in this area. In addition to a rear-mounted and slightly recessed DTMF keypad, the mike also has 14 autodialing memories. Programming and using them is a cinch, and there is even an **RD** button for redialing your last-called number just like a modern electronic telephone! Yes, I can already hear you asking if the mike can be used with your older model IC-228, IC-3220, or other 2 meter transceiver. Yes, if it has ICOM's 8-pin mike connector with audio input on pin 1, +8 volts DC from the rig on pin 2, and ground on pin 7. Check your manual, then ask your ICOM dealer to order an HM-56 mike for you.

The IC-229's microphone **UP/DOWN** buttons are handy for tuning and scanning, plus you can program the **UP** button for some special functions. These include accessing the CALL channel, activating the PRIORITY watch, selecting repeater offset/simplex operation, switching power levels, and switching on/off the optional tone paging systems.

Two optional tone paging systems are available for the IC-229, and both of them are perfect for silent monitoring and receiving only calls directed to you. The first system uses subaudible, or PL tones.

You install a small UT-50 optional tone decoder in the IC-229, select a desired operating frequency and PL tone, and then press the front panel's **T/T SQL** button. Only signals with a mating PL tone will activate your IC-229. The rig's S meter will continue indicating on-frequency activity, but its speaker remains quiet until "PL toned." You can also set the IC-229 for one of two actions after being toned: beeping only until you "answer the phone" by pressing the PTT switch, or opening the squelch so you actually hear the caller's voice. This feature must be experienced first-hand to be fully appreciated, and the good point is it works with any PL-encoder-equipped rig or handheld. The other station only needs to know your PL frequency to page you.

The second tone paging system uses standard DTMF or "touchtones®." It also beeps or opens the squelch on your IC-229, plus it displays the caller's 3-digit code on the rig's readout. You set up this DTMF system by plugging ICOM's optional UT-55 DTMF encoder/decoder into an awaiting socket on the IC-229's main PC board, pressing the front panel's **PGR/CS** button, and setting up your own 3-digit code plan. This is a one-time step, incidentally. Afterwards, you merely press

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Made in the USA

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- **Display Hold Switch.**
- **Dual MMIC Amplifiers** for maximum possible sensitivity.
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- **600 mA Hr. Batteries.** Not the cheapest but the best!
- **17 years of quality and dependability to back our products.**

Model	8030	3000	2600H	2600HA	2210A	2300
Function	Freq, Period Ratio, Interval	Freq, Period Ratio, Interval	Frequency	Frequency	Frequency	Frequency
Range	10Hz-2.6GHz	10Hz-2.6GHz	1MHz-2.6GHz	1MHz-2.6GHz	10Hz-2.4GHz	1MHz-2.4GHz
Display	10 Digit LCD w/Function Annunciators	10 Digit LCD w/Function Annunciators	10 Digit LCD	10 Digit LCD	8 Digit LED	8 Digit LED
RF Signal Strength Indicator	16 Segment Adjustable Bargraph	16 Segment Adjustable Bargraph	16 Segment Adjustable Bargraph	.	.	.
Price	\$579.	\$375.	\$325.	\$225.	\$199.	*\$99.

Sensitivity: <1 to <10mV typical. Time Base: ± 1 ppm; ± .5ppm, add \$75 - LED Models; ±.2ppm add \$80. LCD Models. Nicads & AC charger/adaptor included except for 2300. *For 2300, NiCad installed, \$20. & AC charger/adaptor, \$9. Carry case and a full line of probes and antennas are available. One year parts & labor warranty on all products.



Model 2300 1MHz - 2.4GHz Frequency Counter..... **\$ 99.**
NiCad 23 Custom internal NiCad Pack (installed)..... **\$ 20.**
AC90 110VAC - 9VDC Charger/Adapter..... **\$ 9.**
Complete Package Model 2300, Internal NiCads & A/C Adapter..... **\$128.**

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COMET

ANTENNAS FOR THE PROFESSIONAL AMATEUR

MULTI-BAND ANTENNA SYSTEMS

146 MHz

446 MHz

DUAL-BAND

◀ CA-2 x 4MAX (Shown) **NEW**

Base/Repeater Antenna

GAIN: 146MHz 8.5dB 5/8 Wave x 5
446MHz 11.9dB 5/8 Wave x 12

IMPEDANCE: 50 Ohm

SWR: Less than 1.5:1

144-148 MHz

440-450 MHz

MAX POWER: 200 watts

LENGTH: 17'8"

WEIGHT: 5lbs. 12 oz.

MOUNTING MAST DIA.: 1 1/4-2 1/2"

CONNECTOR: UHF (50-239)

CONSTRUCTION: Heavy Duty Fiberglass
SCREW-TOGETHER ABS JOINTS

■ CA-2 x 4Z

Base/Repeater Antenna

GAIN: 146MHz 8.5dB 446MHz 11.9dB

POWER: 200 watts

LENGTH: 17'8"

CONNECTOR: UHF

■ CA-2 x 4FX

Base/Repeater Antenna

GAIN: 146MHz 8.5dB 446MHz 7.2dB

POWER: 200 watts

LENGTH: 5'7"

CONNECTOR: UHF type

■ CA-2 x 4MB

Mobile Antenna w/Fold-over feature

GAIN: 146MHz 4.5dB 446MHz 7.2dB

POWER: 150 watts

LENGTH: 5'

CONNECTOR: UHF type

■ CA-2 x 4SR

Mobile Antenna w/Fold-over feature

GAIN: 146MHz 3.8dB 446MHz 6.2dB

POWER: 150 watts FM

LENGTH: 3'4"

CONNECTOR: UHF type

■ CF-416

Duplexer w/Coax

POWER: 146MHz 800 watts

446MHz 500 watts

CONNECTOR OUTPUT: N-type

146MHz INPUT: UHF

446MHz INPUT: N-type

■ CF-41601 CF-4160K

Duplexer w/o Coax

POWER: Same as CF-416

CONNECTOR OUTPUT: UHF

146MHz INPUT: UHF

I MODEL 446 INPUT: N-type

K MODEL 446 INPUT: UHF

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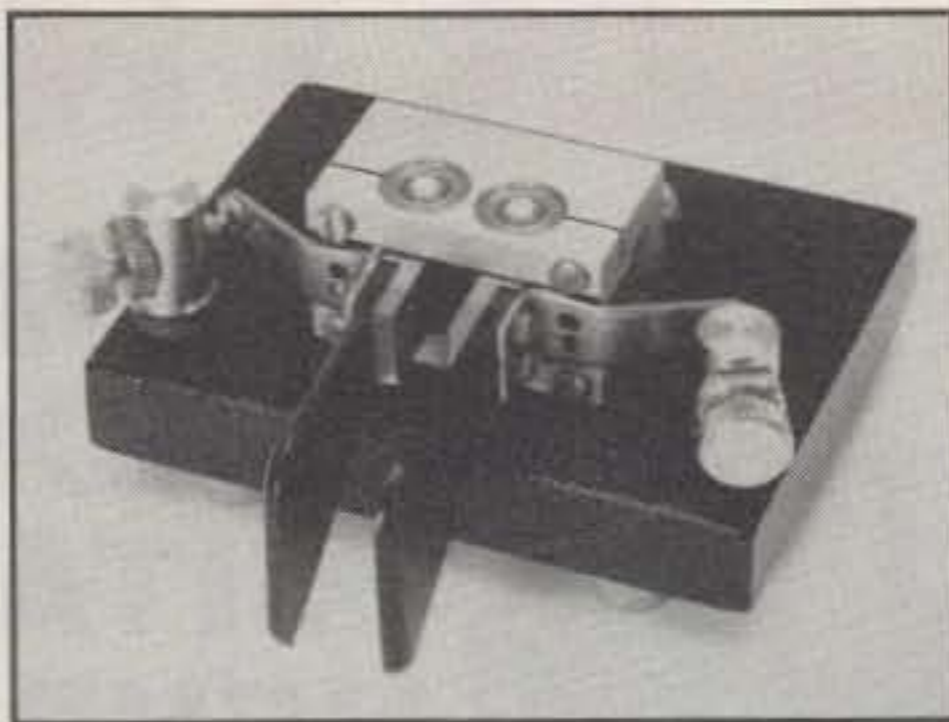
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CIRCLE 79 ON READER SERVICE CARD

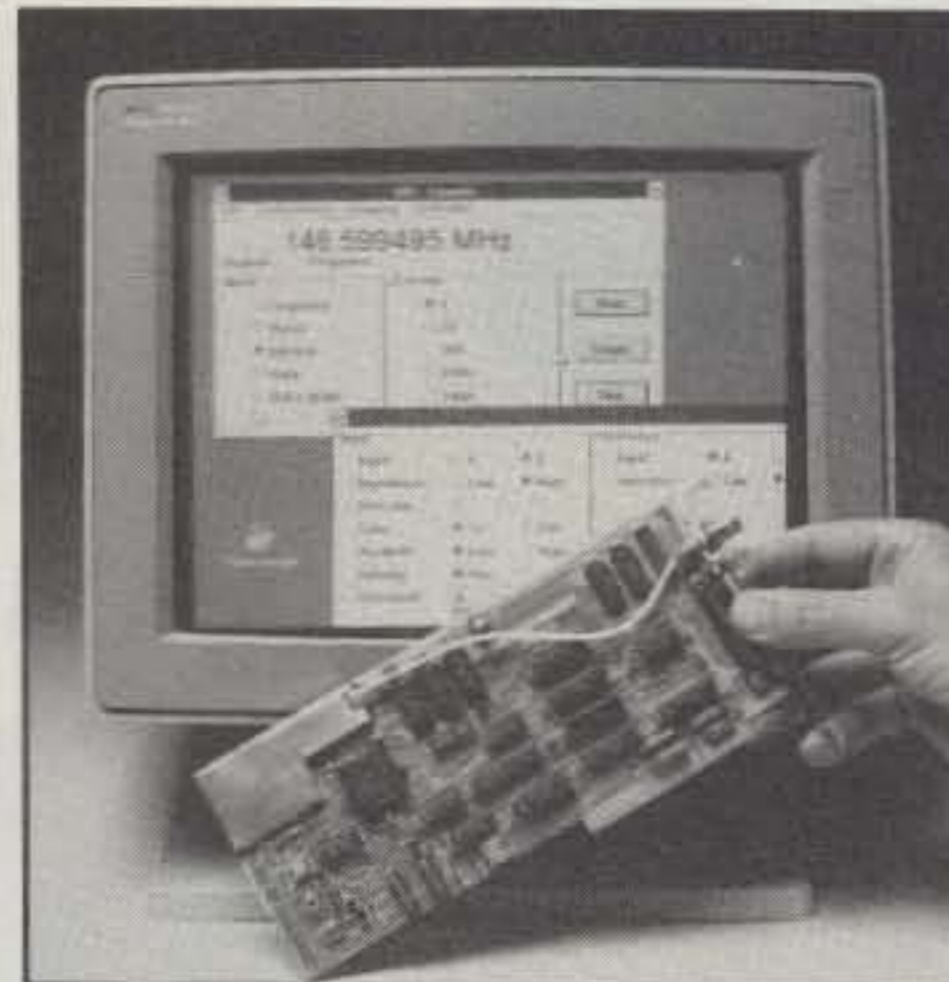
CQ SHOWCASE



Palomar Engineers Dual Paddle Key

The famous Kent key is now being assembled at Palomar Engineers in the U.S. The design and engineering of the precision brass mechanism is by R. A. Kent Engineers in England. The key features rotary ball bearings, fully enclosed springs, and individual knurled thumbscrews to adjust dot and dash contact spacing and spring tension.

The key has a smooth action with rounded paddles. The small footprint (3" x 4") steel base weighs over 2 pounds. Price is \$99.95 plus \$4.00 shipping in U.S./Canada. For more information, contact Palomar Engineers, P.O. Box 455, Escondido, CA 92033 (619-747-3343), or circle number 101 on the reader service card.



Frequency Counter From Optoelectronics

Optoelectronics has announced a new type of universal frequency counter in the form of a 9 inch drop-in card for personal and lap-top computers. It uses Window 3.0 as a control panel and display window, and it directly tunes radio receivers such as the ICOM R7000, resulting in a uniquely configured self-tuning radio.

The new Model PC-10 is a 10 Hz to 2.4 GHz radio instrument that measures, captures, and analyzes discrete and average frequency readings, pulse width, time interval, period, and the ratio between two frequencies. It provides a "reciprocal counting" feature for 8-digit resolution of low-frequency readings. The PC-10 is simple to install, and is priced at \$335 in unit quantities. The Model AP10H op-

tion (\$295) provides custom input amplifiers, signal conditioning, and frequency prescalers. For more information, contact Optoelectronics, Inc., 5821 NE 14th Ave., Fort Lauderdale, FL 33334 (800-327-5912), or circle number 104 on the reader service card.



QRZ Industries VB-8A Natural Voice Recorder

QRZ Industries has announced the availability of the VB-8A natural voice recorder as a fully assembled kit in a desktop enclosure with RFI/EMI protection. The VB-8A can digitize and store up to 16 dynamically-allocated messages or phrases in stand-alone mode, or 100 messages in a computer-controlled "template" mode. A message can be as long as the total message allocation of 100 seconds. The unit provides clean audio to both a 600 ohm balanced output and an 8 ohm monitor output. A built-in keypad controls the VB-8A in stand-alone mode, or a computer can optionally control the VB-8A via a built-in RS-232 serial port using simple ASCII character commands.

The VB-8A requires a 12 volt DC supply and can be powered directly from transceivers that have an auxiliary 12 volt DC output or a DC wall pack. Introductory price of the fully assembled desktop enclosure kit which is tested and burned-in is \$375, which includes full memory configuration and an audio/PTT output cable for any standard amateur transceiver (specify make and model). For more information, contact the Micro Shop Inc., 220 South Main St., Mauldin, SC 29662 (803-234-5371), or circle number 105 on the reader service card.

Resource Catalog From The Grapevine Group

A 34-page catalog of computer "add-ons," chips, and accessories for the Commodore, Amiga, and IBM computers is now available from The Grapevine Group. The premise of the catalog is not to sell systems or software, but rather is to maintain or upgrade the existing equipment that end users now have in their possession. Also featured are memory expansion modules for more than 15 popular computer companies. A full price list is included. A complete line of parts and chips to repair or upgrade any Amiga or Commodore computer is available to computer repair centers.

For a copy of the catalog, contact The Grapevine Group, 3 Chestnut St., Suffern, NY 10901 (914-357-2424), or circle number 108 on the reader service card.

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CIRCLE 120 ON READER SERVICE CARD

RADIO WORKS

PL-259	Nickel-Teflon, USA	69¢ or \$15/25
PL-259	Silver-Teflon, USA	\$1.29 or \$25/25
PL-259	Gold-Teflon, USA	\$1.49 or \$30/25
N Connector	For 9913, 9086, CQ-Flexi	\$3.15
Connectors	Full line of Connectors & Adapters	
RG-8X	95% Braid, premium quality	15¢
CQ-RG-8X	95%, Type II, Non-contaminating	23¢
CQ-RG-8XMM	95%, Solid Dielectric	27¢
CQ-RG-213	Certified-Quality, 95%+++ braid	40¢
9086	International (like 9913, but better)	46¢
CQ-Flexi	New! Flexible 9913-type, very low loss	
	For Crank-up tower, rotators, HF - UHF	62¢
R-1 Rotator	8 conductor (2x18, 6x24) up to 125' run	20¢
R-2 Rotator	8 conductor (2x16, 6x18) up to 200' run	37¢
R-4 Rotator	8 conductor (2x14, 6x18) up to 300' run	48¢
#14 Stranded	Hard-drawn (7x22) special antenna wire	8¢
#14 Stranded	Copper-clad (7x22) special antenna wire	9¢
#14 VariFlex	19 strand CuClad, flexible, tight strand	11¢
#13 Insulated	19 strand CuClad, jacket, flexible	15¢
450 Ohm	#18, Cu-Clad, poly, Windows	13¢
450 Ohm	New! #16 19 str, CuClad, Poly, Windows	Call
300 Ohm	New! #18 19 str, CuClad, Poly, Windows	13¢
300 Ohm Twin	#18 7 str, Cu, similar to orig. Belden	13¢
72 Ohm Twin	New! #13 7 str, CuClad, Poly Twin	29¢
RADIO WORKS	Center Insulator, best available	\$7.95
End Insulators	Dogbone 60¢ or 5" Universal	\$2.00
MilSpec 3/16" Dacron Line 100'		\$ 5.00
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1:1, 50 Ohm, 'CURRENT-TYPE' BALUNS

B1-2K	2KW High Isolation 80-10M, SO-239 in, WIRE out	\$17.95
B1-4K	4KW High Isolation 80-10M, SO-239 in, WIRE out	\$21.95
B1-5K	5KW Precision 160 - 10 M, SO-239 in, WIRE out	\$28.95
C1-2K	2KW 'Retro-Fit' Balun, PL-259 in & PL-259 out	\$18.95
4KRF-LI	4KW 'Retro-Fit' Balun, SO-239 in, PL-259 out	\$23.95
4K-LI	4KW RFI Line Isolator, SO-239 in & SO-239 out	\$19.95
4KV-LI	4KW Line Isolator for Verticals, SO-239 in, PL-259 out	\$23.95
Y1-4K	4KW 'Yagi Balun' 160-10M, for beams, SO-239 in, WIRE out	\$24.95
Y1-5K	5KW 'Yagi Balun' 160-10M, for beams, SO-239 in, WIRE out	\$29.95

4:1 BALUNS

B4-1.5K	80-10M 1.5 KW balun, SO-239 in, WIRE output	\$19.95
B4-2K	Precision 2 KW 80-10M balun, SO-239 in, WIRE output	\$27.95
B4-2KX	'Current-type' 160-10M 2KW+, SO-239 in, WIRE output	\$39.95
REMOTE BALUN,	'Current-type' coax-to-open-wire interface	\$28.98

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CIRCLE 125 ON READER SERVICE CARD

COMET

ANTENNAS FOR THE PROFESSIONAL AMATEUR

MULTI-BAND ANTENNA SYSTEMS

146 MHz

446 MHz

1200 MHz

TRI-BAND

◀ CX-902

Base/Repeater Antenna
GAIN: 146MHz 6.5dB 446MHz 9.0dB
1200MHz 9.0dB
POWER: 200 watts
LENGTH: 10'
CONNECTOR: N-type

■ CX-801

Mobile Antenna
GAIN: 146MHz 3dB 446MHz 6.8dB
1200MHz 9.6dB
POWER: 100 watts
LENGTH: 3'3"
CONNECTOR: N-type

■ CX-802

Mobile Antenna
GAIN: 146MHz 2.8dB 446MHz 6.0dB
1200MHz 8.5dB
POWER: 50 watts
LENGTH: 2'5"
CONNECTOR: N-type

■ CX-830TN

Mobile Fiberglass Antenna
GAIN: 146MHz 2.15dB 446MHz 2.15dB
1200MHz 5.5dB
POWER: 20 watts
LENGTH: 1'5"
CONNECTOR: N-type

■ CFX-431

Triplexer w/Coax
POWER: 146MHz 800 watts
446MHz 500 watts
1200MHz 200 watts
CONNECTOR OUTPUT: N-type
146MHz INPUT: UHF
446MHz INPUT: N-type
1200MHz INPUT: N-type



■ CFX-4310

Triplexer w/o Coax
POWER: Same as CFX-431
CONNECTOR OUTPUT: N-type
146MHz INPUT: UHF
446MHz INPUT: UHF
1200MHz INPUT: N-type



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CIRCLE 17 ON READER SERVICE CARD

CQ World-Wide WPX CW Contest All-Time Records

The contest is held each year on the last full weekend of May. The All-Time Records will be updated and published annually. Data following the calls below are: year of operation, total score, and number of prefix multipliers.

BY STEVE BOLIA, N8BJQ

WORLD RECORD HOLDERS

Single Operator

1.8	UP3BP/UF('85)	125,240	101
3.5	YX3A('89)	1,004,060	305
7.0	VP2VCW('86)	4,641,120	586
14	YY5A('88)	4,085,127	639
21	FS5T('89)	4,552,470	702
28	CE3DNP('89)	2,857,038	582
AB	V27T('89)	9,408,672	819

Multi-Operator Single Transmitter

YM5KA('90)	13,098,790	839
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Multi-Operator Multi-Transmitter

UP4A('88)	16,204,961	1013
-----------	------------	------

U.S.A. RECORD HOLDERS

Single Operator

1.8	K5UR('85)	13,668	102
3.5	K5NA/2('86)	197,856	216
7.0	N5RZ('85)	1,754,664	452
14	K2VV('86)	2,525,880	582
21	K6LL/7('88)	2,163,388	557
28	N5RZ('89)	162,134	259
AB	KT3Y('88)	4,079,036	611

Multi-Operator Single Transmitter

N4WW('88)	5,593,772	698
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Multi-Operator Multi-Transmitter

NS0Z('88)	10,870,380	922
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CLUB RECORD

Araucaria DX Group('90)	62,858,364
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WPX (Prefix) RECORD

UP4A('88)	1,013
-----------	-------

QRPP RECORD

4X4UH('82)	1,028,904
------------	-----------

CONTINENTAL RECORD HOLDERS

AFRICA

1.8	ZS6BCR('85)	20	5
3.5	EA8RL('84)	453,456	201
7.0	G3GJQ/5N('89)	813,610	295
14	9J2AL('90)	1,333,724	436
21	ZS6BCR('90)	2,882,554	569
28	ZS6BCR('89)	2,168,411	497
AB	5L7T('87)	8,619,225	679

ASIA

1.8	UP3BP/UF('85)	125,240	101
3.5	UP2NK/UF('85)	701,012	221
7.0	UP2NK/UF('86)	2,084,880	365
14	UZ9FWR('86)	2,570,940	540
21	4Z9FDB('89)	2,501,330	542
28	4X4UH('81)	1,081,262	338
AB	P3AA('89)	8,951,600	695

EUROPE

1.8	UA2FF('87)	117,424	134
3.5	CT5AT('86)	697,248	324
7.0	DF9ZP('85)	1,998,372	482
14	LZ5A('89)	3,066,120	680
21	4N3E('90)	3,239,453	721
28	9H1EL('88)	805,552	398
AB	IO4IND('90)	3,634,385	659

Multi-Operator Single Transmitter

AF	5H1HK('89)	7,010,392	646
AS	YM5KA('90)	13,098,790	839
EU	HG9R('89)	9,957,368	872
NA	KP2A('89)	12,843,135	835
OC	KH6XX('84)	4,646,859	553
SA	P43GR('90)	10,990,482	790

NORTH AMERICA

1.8	VE3BMV('86)	43,428	77
3.5	HK3MAE/HK0('87)	456,280	187
7.0	VP2VCW('86)	4,641,120	586
14	WC4E/KP4('86)	3,613,248	656
21	FS5T('89)	4,552,470	702
28	HI8JKA('89)	891,242	374
AB	V27T('89)	9,408,672	819

OCEANIA

1.8	KX6DC('88)	12,240	45
3.5	KX6DC('89)	258,258	143
7.0	V73AS('90)	1,793,840	340
14	ZL3GQ('89)	2,775,744	576
21	N7DF/WH2('89)	3,243,450	525
28	KG6DX('81)	1,238,806	334
AB	NH6J/NH0('88)	4,484,760	532

SOUTH AMERICA

1.8	YV1OB('86)	11,550	35
3.5	YX3A('89)	1,004,060	305
7.0	YX5A('87)	2,999,977	479
14	YY5A('88)	4,085,127	639
21	9Y4VU('89)	3,986,512	656
28	CE3DNP('89)	2,857,038	582
AB	ZW5B('90)	7,654,692	717

Multi-Operator Multi-Transmitter

AF	EA9CE('84)	4,383,308	482
AS	JA2YKA('88)	6,776,352	713
EU	UP4A('88)	16,204,961	1013
NA	WL7E('88)	12,826,296	952
OC	KH6XX('85)	8,551,399	647
SA	LQ5A('89)	8,290,016	784

QRPP

AF	CN8FC('88)	194,616	204
AS	4X4UH('82)	1,028,904	344
EU	YU3BC('89)	710,448	361

NA	KA2AEV('89)	625,504	352
OC	FO8JP('86)	572,131	259
SA	OA8V('81)	444,768	246

high-quality



low-cost

Digital Data Products



① **NEW! DSP-2232 (pictured) and DSP-1232:** state-of-the-art controllers utilizing digital signal processing technology with the Motorola 56001 processor; built-in software modems include all standard FSK modems, G3RUH/K9NG 9600 bps modem, 400 and 1200 bps PSK telemetry modems for PACSAT and OSCAR 13 & 15 satellites, AEA's V.26b 2400 bps DPSK modem and more; modems for SSTV, multi-level grey scale WEFAX and WEFAX APT coming soon; includes all features of the PK-232 and much more; dedicated parallel printer port; DSP-2232 has two simultaneous radio ports and a front panel LCD display; DSP-1232 has two switchable radio ports (no LCD display) and can be upgraded to the 2232 at any time DSP-1232 \$789.00
 DSP-2232 \$999.95
 DSP-1232 UPGRADE KIT \$299.95

② **PK-232MBX Multi-mode Data Controller:** most popular multi-mode controller ever made; RS-232 compatible controller for Packet, Baudot and ASCII RTTY, AMTOR/SITOR ARQ and FEC, Morse code and WEFAX; also receives NAVTEX/AMTEX and TDM; superior Chebyshev filter design for better copy; built-in 18K byte PakMail™ personal packet maildrop with auto forwarding; SIAM™ for automatic RTTY signal identification; KISS mode for TCP/IP compatibility; Host Mode for user-friendly software interface; cables and connectors included \$349.95

③ **PK-88 Packet Controller:** the easiest way to get started with amateur digital communications; same packet commands as the PK-232; includes Host Mode and 18K byte Packet maildrop; AX.25/L2/V2 compatible; requires 12 – 16V DC @ 500 mA (not included); advanced features such as KISS mode and NET/ROM compatibility for the advanced user, easy to learn for the new user \$119.95

④ **NEW! PCB-88 IBM Compatible Plug-In Packet Adapter:** full-featured Packet controller; plugs into 8-bit expansion slot in your IBM PC, XT, AT or compatible; includes all features of PK-88 controller and more; packet-only version of PC-Pakratt II (called PC-Pakratt-88) terminal control software included at no additional charge; external 12V DC input (power supply not included) so your unattended TNC and mailbox can operate with the computer turned off; true packet DCD sensing circuit included; built-in modem disconnect header \$169.95

Specifications are subject to change without notice or obligation. Prices listed are suggested Amateur Net through participating AEA authorized dealers (DSP upgrade kit available through the factory).

Technical support may be obtained through CompuServe's Hamnet forum. Messages should be addressed to user ID #76702.1013.

Advanced Electronic Applications, Inc.

P.O. Box C2160/2006 196th St. S.W. Lynnwood, WA 98036-0918
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REGULATORY HAPPENINGS FROM THE WORLD OF AMATEUR RADIO

About The Amateur Service . . .

We continue to get many letters from CQ readers who are excited about the new code-free entry into the amateur service. Many want to become amateur radio operators but are confused about where to start. They also want to know more about the radio privileges they will have once they are a full-fledged amateur.

Frankly, we like to hear from you because it tells us where your interests lie and the areas about which you need more information. Right now most of our mail seems to be coming from beginners interested in entering amateur radio. For example, Billy J. Pearson, Jr., of Lexington, North Carolina reminds us "... all your readers are not amateur license holders." He wants to see more information for newcomers and "... advice on becoming an Amateur radio operator." Joel Stengel of Steinhatchee, Florida writes, "... I enjoy listening to shortwave radio but do not know anything about ham radio. I don't even understand words like FM Dual banders, HF transceivers, or antenna tuners. Where can I start? I've checked out book stores in the mall, nothing. Please help!"

FCC Issues

Amateur Radio Details

Apparently, the Federal Communications Commission is also getting many inquiries, because they recently issued Fact Sheet No. 201 entitled "Information about the Amateur Service." They send the two-page leaflet to people who inquire about the hobby. What we will do this month is expand on the FCC information brochure, and hopefully it will answer many of your questions.

Fact Sheet No 201 starts out with the following statement: "The Amateur service provides an opportunity for self-training, intercommunication and technical investigation for qualified persons who are interested in radio technique solely with a personal aim and without pecuniary interest." Basically what this means is that amateur radio is a communications hobby. There are other addi-

tional Amateur services that you don't hear too much about, but they exist nonetheless.

The *Amateur-Satellite Service* is for amateurs who communicate through orbiting communications satellites. Yes, amateurs even have their own satellites! In fact, there have been more than 20 OSCAR's (Orbiting Satellites Carrying Amateur Radio) designed and built by amateurs and launched along with other commercial and government payloads. Even beginning amateurs can communicate through amateur satellites.

Initially, OSCAR satellites hitch-hiked into space for free, but now launching must be paid for. Due to the high cost of orbiting satellites, amateurs have been at the forefront of tiny (9 inch square) micro-satellite development. Now commercial satellite firms are beginning to use the inexpensive AMSAT technology. AMSAT is the Washington, DC based Radio-Amateur Satellite Corporation, the national association of amateur radio satellite buffs.

The Radio Amateur Civil Emergency Services, or RACES for short, specializes in emergency and disaster preparedness communications. You do not need a separate FCC license to participate in satellite or RACES communications, although RACES members are subject to acceptance by local civil defense authorities since they operate in a more formal capacity and usually have training sessions.

There are other important amateur efforts that appear to be "services," but they are not FCC-sanctioned like the Amateur Satellite Service and RACES. These are the Military Affiliate Radio System (MARS), the National Traffic System (NTS), and the Amateur Radio Emergency Service (ARES).

MARS is a military-supported communications service using FCC-licensed amateur radio operators who operate on government (non-amateur) frequencies to provide communications training and assistance to the US military. MARS members are issued special call signs by the armed forces. The National Traffic System and the Amateur Radio Emergency Service are the message-handling and emergency-preparedness divisions of the American Radio Relay League. The ARRL is the large amateur radio association.

The Ham Bands

"Twenty-seven frequency bands are allocated to the amateur service internationally, making it possible for amateur operators to communicate with all areas of the world, even in space. Over two million operators exchange messages by voice, teleprinting, telegraphy (Morse code), facsimile (transmission of still pictures), and television. Transmission of business communications, however, is prohibited."

Different bands have different characteristics. As a general rule, the lower HF (high-frequency) bands located below 30 megaHertz afford direct worldwide communication. The VHF (very high frequency) bands are used more for local communications. Repeaters, satellites, high-gain directional antennas, carrier-operated relay networks, and unusual atmospheric conditions can greatly extend communications range, however.

As a newcomer, you will undoubtedly begin your amateur radio hobby by operating on the 2 meter amateur band located between 144 and 148 MHz using a hand-held or mobile FM transceiver. A transceiver is a combination transmitter/receiver. The 2 meter "party line" is where you will find the local hams chatting and socializing.

FCC License Required

Fact Sheet No. 201 continues: "In areas where the amateur service is regulated by the Federal Communications Commission, an FCC issued amateur operator license, an FCC-reciprocal permit for alien amateur licensee, or an amateur service license issued by the Government of Canada is required in order to be the control operator of an amateur station.

"Control operators cooperate in selecting transmitting channels and in making the most effective use of frequencies. No frequency is assigned for the exclusive use of any amateur station. The licensee may design, construct, modify, and repair the station because the FCC equipment authorization program does not generally apply to amateur station transmitters. The control operator is responsible for the quality of the station's transmissions."

A few comments on the above. First, a

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reciprocal permit authorizes a foreign-licensed amateur to operate his amateur radio gear on US soil. Formal negotiations between the countries involved must take place before the United States will accept the amateur license of a foreign nation. There are probably a hundred different countries that have entered into reciprocal operating arrangements with the United States.

Foreign amateur radio operators use FCC Form 610-A to apply for a reciprocal operating permit. Licensed Canadian amateurs need not apply for this permit, however, since by treaty they are automatically licensed in the United States, and vice versa. Amateurs in Canada and the United States simply append their callsign with the callsign prefix of the neighboring country. For example, a US amateur from New England operating in eastern Canada would be W1NTK/VE1. (W1NTK was my first amateur call nearly 40 years ago.)

A control operator is the licensee of the amateur station—or any person designated by the licensee—to be responsible for the transmissions from that station. This person must, of course, be FCC-licensed to operate on the frequency used. An amateur may use any authorized frequency as long as he does not cause intentional interference. Unlike CB radio, non-FCC approved equipment may be used (or built from scratch) as long as it meets the technical standards spelled out in the FCC "Part 97" rules and regulations.

Examination Required

"An examination must be passed to qualify for a license. The degree of skill and knowledge in operating an amateur station the examinee can demonstrate to volunteer examiners (VEs) determines the class of operator license for which the applicant is qualified. Although a person may initially qualify for any of the five grades of operator class, either the Technician or the Novice operator class is the ideal way to become involved quickly in amateur radio. After gaining more skill and knowledge, the licensee can advance to a higher class of operator license.

"The requirement for the Technician class license is a 55 question written examination (Elements 2 and 3A). There is no telegraphy requirement. Its privileges include all emission types in the 6 meter and shorter wavelength bands. The station is assigned a Group C callsign, where available.

"Additionally, a Technician class operator license plus a Certificate of Successful Completion of Examination for passing a telegraphy examination authorizes privileges in the 10, 15, 40, and 80 meter bands.

"The Novice class is for persons who do not have the knowledge to pass the 25-question Element 3A, but who can pass the 30-question Element 2 and a telegraphy examination. The privileges include all emission types in a segment of the 23 centimeter band (1270–1295 MHz) and a segment of the 1.25 meter band (222.10–223.91 MHz.) Also included are teleprinting and voice emission privileges in the 10 meter band (28.1–28.5 MHz, 28.3–28.5 using the voice mode) and telegraphy (Morse code) privileges in the 10, 15, 40, and 80 meter bands. The station is assigned a Group D callsign."

A few comments are in order regarding the Novice and Technician classes. Up until February 14, 1991 the entry level into amateur radio was the Novice class, which required passing a 5 word-per-minute Morse code test and a 30-question written exam. Now there are two entry levels—the Novice and Codeless Technician classes. We believe that most people will elect to enter at the no-code Technician level.

You merely pass two multiple-choice written tests (Elements 2 and 3A) to pass the Technician class requirements. Element 2 consists of 30 questions (pass mark is 22 correct), and Element 3A is made up of 25 questions (19 correct). These two examinations need not be passed at the same time. You are issued an exam credit certificate if you pass Element 2 but fail 3A, and have a year to pass Element 3A before the credit slip expires.

The examinations are developed by the amateur testing community simply by selecting about 10% of the questions from a list of questions, multiple choices, and answers. There will be no surprises! Every question and answer is known and study material is widely published.

Your author, Fred Maia, W5YI, heads up a very large amateur testing operation. We have a license preparation division which distributes amateur radio operator license study material. You may reach this division by calling toll free 1-800-669-W5YI (9594). We also have all study material for the Codeless Technician (and all amateur classes for that matter) on computer software if you have an IBM-compatible PC. We can also tell you the location of the nearest amateur test session. We have hundreds of test teams around the nation. Simply call us and we will help.

Other Amateur Classes

"The next step up (from the Technician level) is General class operator. For the Technician class license holder, the requirements are passing a 13 words-per-minute telegraphy examination (Element 1B) and a 25-question written examination (Element 3B). Examination credit is given for Element 3B for a Technician

class operator license issued before March 21, 1987. For the Novice class license holder, the requirements [for upgrading] are passing Elements 1B, 3A, and 3B. The General class is authorized privileges in at least a segment of every amateur service frequency band.

"The next step is Advanced class operator. Another written examination (Element 4A) is required. This license authorizes additional frequency privileges in the 75, 40, 20, and 15 meter bands. The station is eligible for a Group B callsign.

"The final step is amateur Extra class operator. Another written examination (Element 4B) and 20 words-per-minute telegraphy skill (Element 1C) are required. This license authorizes additional frequency privileges in the 80, 75, 40, 20, and 15 meter bands. The station is eligible for a Group A callsign.

A word is probably in order about about callsign groups. Back in 1978 the FCC developed a callsign assignment system which generally authorizes shorter callsigns to amateurs with higher class licenses. Novices are issued 2-by-3 callsigns—a two-letter prefix beginning with the letter K, followed by a geographical numerical area designator and three sequentially issued letters. For example: KA1AAA would be a 2-by-3 Group D callsign format.

New Technician and General class operators are generally issued Group C 1-by-3 format callsigns beginning with the letter N. (N1ZZZ is a Group D callsign.) Advanced get the 2-by-2 format—i.e., KB5AA. Extra class amateurs are assigned 1-by-2, 2-by-1, and certain 2-by-2 callsigns with AA to AK prefixes.

Actually, the system is a little more complicated than this due to certain excluded prefixes and other callsign blocks reserved for amateur stations located outside of the continental United States, but this is basically how the system works. When all callsigns in a specific group are allocated, then the FCC begins assigning calls from the next lower callsign group. No amateur is ever required to change any callsign once it is assigned. Only one callsign may be assigned to an amateur.

Volunteer Examiners

"The VEs are amateur operators in the community who volunteer their services. The VEs provide information as to when and where examination sessions are held. Study aids are available from amateur service suppliers. The VEs may charge the examinee a fee for certain reimbursable expenses incurred in preparing, processing, or administering the examination.

"The VEs employ special accommodative procedures to assist handicapped

examinees. Persons who cannot pass a 13 or 20 words-per-minute examination because of a physician-certified severe handicap are excused from those examinations.

"The rules for the Amateur Service are codified in Part 97, Title 47, Code of Federal Regulations, Telecommunications." That is the end of FCC Fact Sheet No. 201.

You can usually locate a volunteer examining team by asking any amateur radio operator in your neighborhood or inquiring at your local amateur radio equipment outlet. The current fee for taking an examination is \$5.25, which is usually shared between the VE team and their coordinator to help defray expenses.

Telegraphy Examination Exemptions

While severely handicapped amateurs may be exempted from the 13 and 20 words-per-minute Morse code test, the 5 wpm test must still be passed. This is because international law requires Morse code proficiency for amateur operators of every nation.

You will find that the VEs will go to great lengths to accommodate any disabled person, however. The VEs may administer the examination at a place convenient and comfortable to the examinee (even bedside). For a deaf person, the dots and dashes may be sent to a vibrating surface or a flashing light. The VEs may read the questions to blind persons. The VEs also write for the examinee where the examinee is unable to do so. Where warranted, the VEs pause in sending the message after each sentence, each phrase, each word, or even each character to allow the applicant additional time to absorb and interpret what was sent. Also, the VEs are authorized to substitute a sending test for a receiving test where the examinee's particular handicap precludes a telegraphy receiving examination.

A doctor's "Certification of Disability" and patient's "Medical Information Release" form must be completed when an amateur applies for an exemption of the 13 and 20 words-per-minute telegraphy requirements.

No handicapped person is required to apply for an exemption from the higher speed telegraphy examination, nor is anyone denied the opportunity to take the telegraphy examination.

Interested in Becoming a Ham?

Give the W5YI Group a phone call at 1-800-669-W5YI during any business day if you need assistance. We have all sorts of license preparation material, and we'll speed you on your way toward participating in the world's greatest hobby—amateur radio.

73, Fred, W5YI

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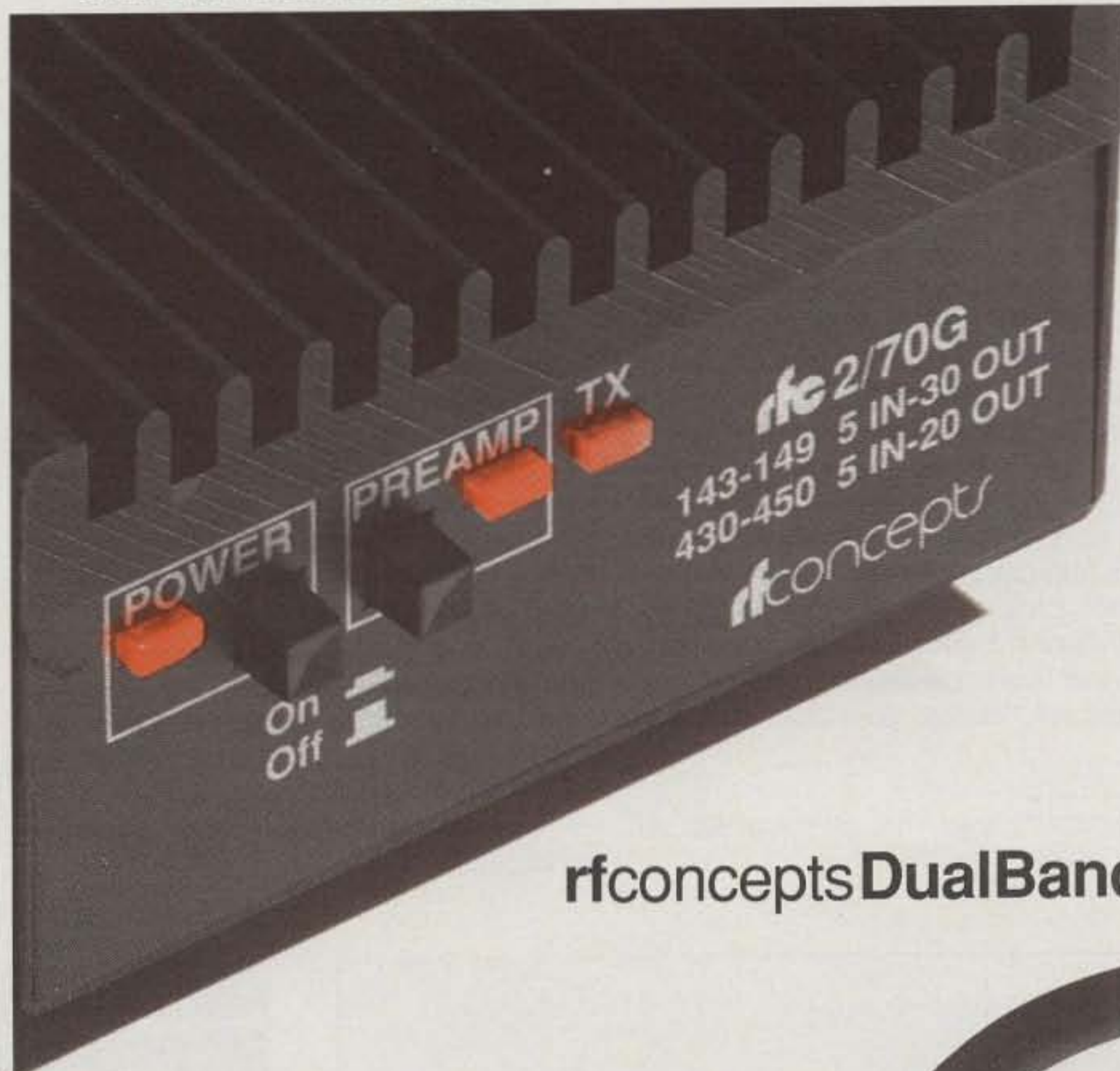
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A LOOK AT THE WORLD AROUND US

More Terrific Keys!

It happened again! Your response to our "Keys Bonanza" in November 1990 *CQ* was tremendous and requests for yet another sequel were overwhelming. Respecting your endless appreciation for these beautiful gems, I really kicked in the afterburners. In addition to this month's "Keys Special," I also recently completed a brand-new book every CW operator will find delightful—*Keys, Keys, Keys!* This blowout review of amateur radio's all-time favorite accessory contains over 100 views and tales of hand keys, bugs, miniatures, electronic paddles, and special fingerpieces. It covers everything from old-time bugs such as Vibroplex, McElroy, Speed-X, and Dow to the latest ready-to-purchase paddles from G4ZPY, DL7NS, and others. Also included are special sections on restoring, adjusting, and using bugs (with either hand, no less!), plus easy-to-build classic rigs you can assemble and use with your classic keys. If this book does not kindle your CW interest, check your pulse! *Keys,*

4941 Scenic View Drive, Birmingham, AL 35210

Keys, Keys! is being published right now by *CQ* Communications and first printed copies should be available shortly from the *CQ* Book Shop. Watch for it!

Our previous "Keys Specials" highlighted famous bugs and keys of eras past, and while everyone likes viewing these classic items, they also want to see a few modern keys they can buy and use on the air today. This month's column thus features a combination of paddles, miniatures, pump keys, and bugs to suit everyone's fancy. Our distinguished guests for this tour are Steve Nurkiewicz, N2DAN/4; Gordon Crowhurst, G4ZPY; Klaus Gramowski, DL7NS; Matt Jacobs, KA2YCZ; I. L. McNally, K6WX; and yours truly, K4TWJ. I am sure you will like our featured items, so let's get started with the views!

Photos 1 and 2

This ultra-deluxe "Mercury" paddle was featured briefly in our November 1990 *CQ* "Keys Bonanza," but its picture was slightly blurred and several proud owners demanded more coverage. Further investigation and acquisition of my own

Mercury revealed a long story that began with the introduction of a new-style magnetic paddle in April 1968 *QST* (and one we must streamline to fit available space).

This one-of-a-kind masterpiece is custom-made upon special request by Steve Nurkiewicz, N2DAN/4 (1385 Abner Street, Port Charlotte, Florida 33980). The key is so brilliant that photographing it is almost impossible (I fudged by using professional pictures from K2OZ and N2DAN). Steve is a retired machinist enjoying the good life, so he makes these paddles on a strictly spare-time and non-commercial basis in his home workshop. They are fairly expensive (\$350 to \$400 range) and production time is 4 or 5 weeks, depending on how the boat runs and fish bite, but such are the requirements for owning the best.

The Mercury is built like a Sherman tank (or better!), yet it handles like a nimble sports car. Its base is machined from a solid 4 pound block of brass, and upper parts are equally rugged. Precision bearings are included on both arms, and magnets are used in lieu of springs for tensioning. I have previously used two keys with magnets and both felt "flat," but the

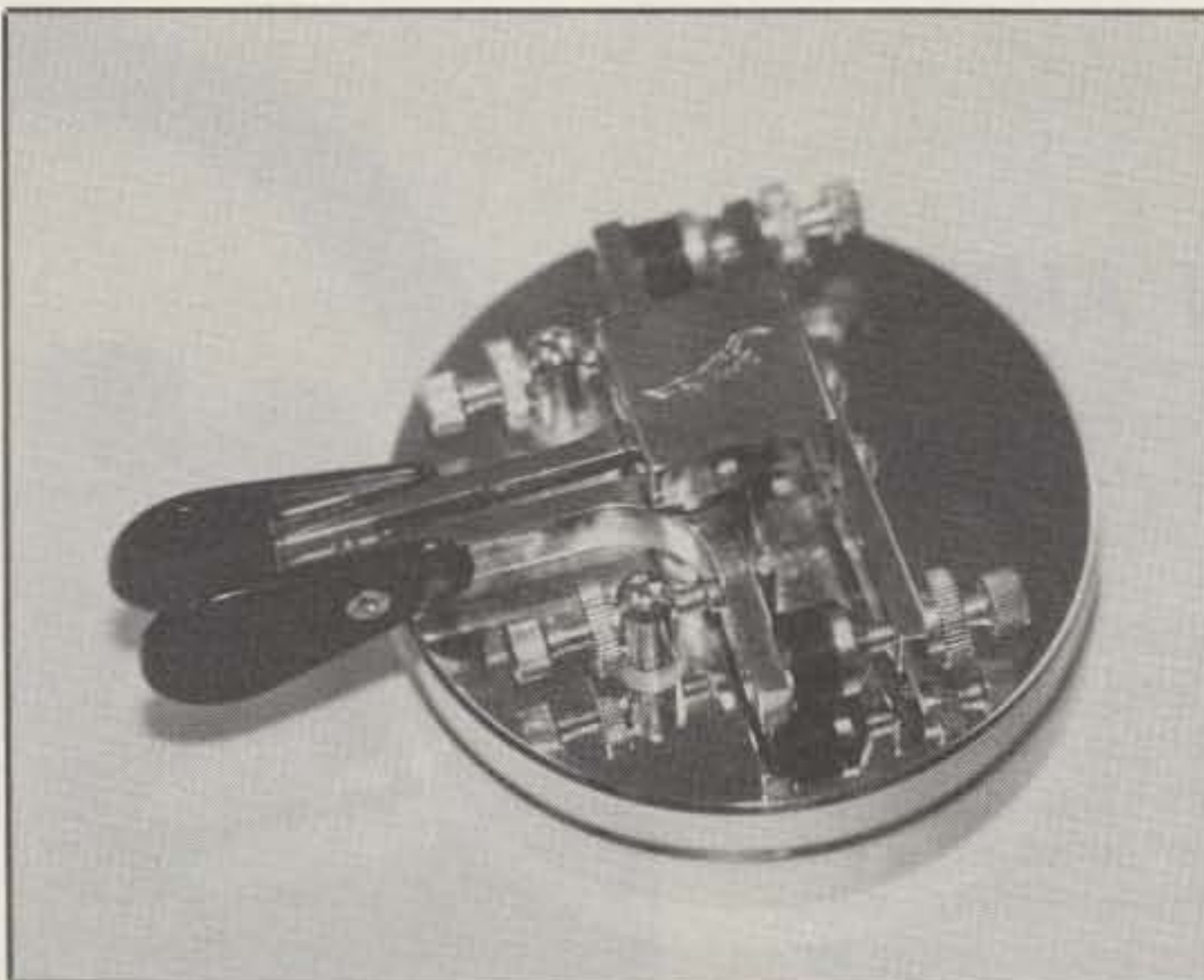
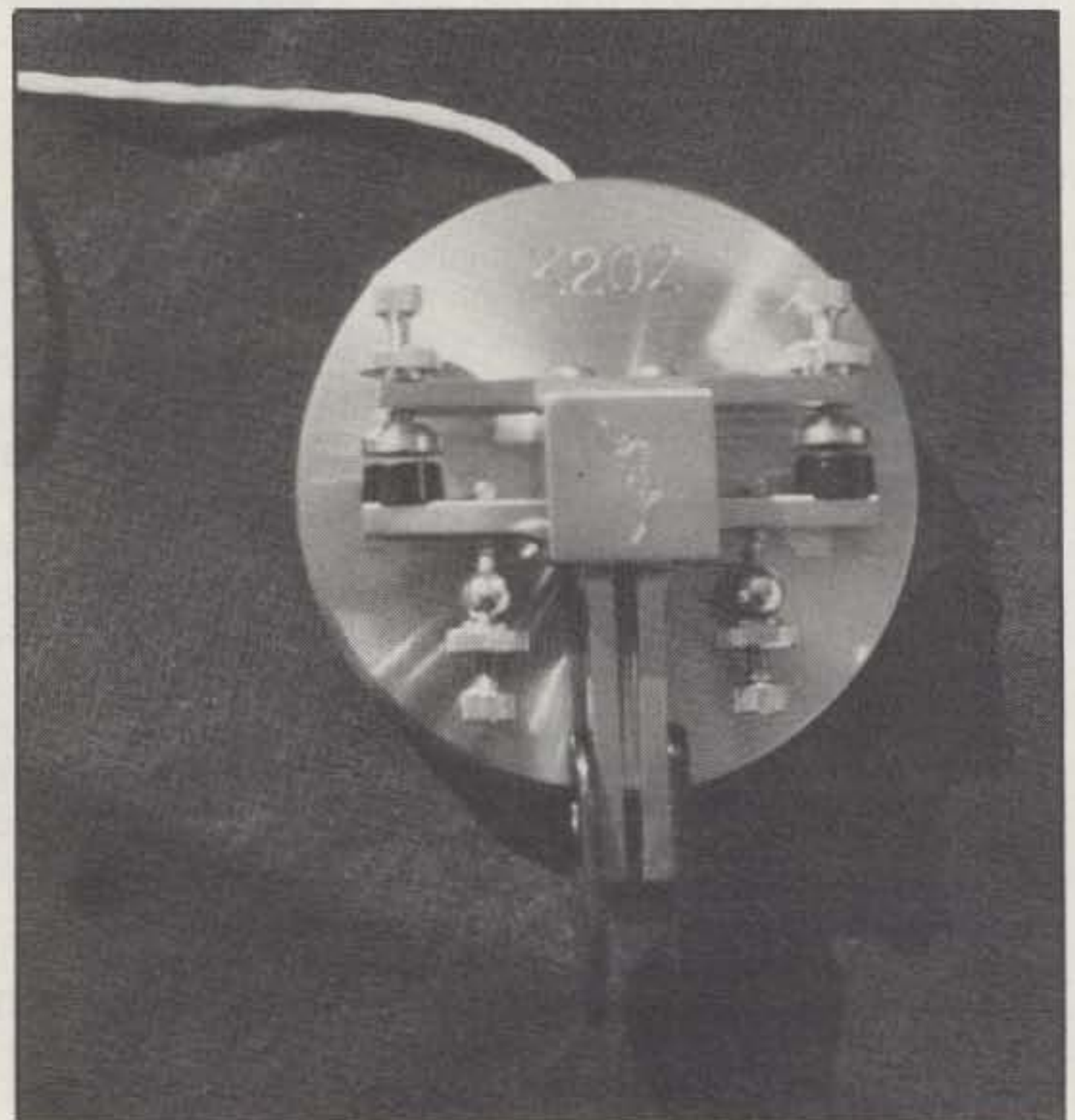


Photo 1—The phenomenal Mercury paddle. This modern classic is hand made on special request by N2DAN/4 in Florida.

Photo 2—Top view of N2DAN's famous Mercury paddle. Magnets are used for tensioning, and key weighs 4 pounds. Performance exceeds any other paddle I've seen or used.



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X-50A Dual-Band: 2m 6/8λ elements, 70cm 3-5/8λ elements
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F SERIES

F-22A 2m 2-7/8λ elements
●Power rating : 200W ●Weight : 5lbs. ●Length : 126In. ●Wind rating : 112.5MPH. ●Connector : UHF

F-23A 2m 3-5/8λ elements
●Power rating : 200W ●Weight : 8lbs. ●Length : 178In. ●Wind rating : 90MPH. ●Connector : UHF

F-718A 70cm 18-1/2λ elements
●Power rating : 250W ●Weight : 3.7lbs. ●Length : 178In. ●Wind rating : 90MPH. ●Connector : N

F-1230A 23cm 25-1/2λ elements
●Power rating : 100W ●Weight : 2.5lbs. ●Length : 120In. ●Wind rating : 90MPH. ●Connector : N

U SERIES

U-300A Dual-Band : 70cm 4-5/8λ elements, 23cm 10-5/8λ elements
●Power rating : 100W ●Weight : 2.4lbs. ●Length : 98In. ●Wind rating : 112.5MPH. ●Connector : N

U-5000A Tri-Band : 2m 6/8λ, 70cm 3-5/8λ elements, 23cm 7-5/8λ elements
●Power rating : 100W ●Weight : 2lbs. ●Length : 71In. ●Wind rating : 135MPH. ●Connector : N

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●Coaxial cable : 5D2VS 35cm.



MX-72D

Direct connection type Duplexer with PL-259 connectors for HF-2m and 70cm bands.
●Coaxial cable : None

MX-72H

Duplexer with PL-259 for HF-2m and 70cm bands.
●Coaxial cable : 5D2VS 35cm.

MX-72DN

Direct connection type Duplexer with PL-259 for HF-2m, N connector for 70cm bands.
●Coaxial cable : None



MX-3000N

Triplexer with PL-259 for HF-2m, N connectors for 70cm and 23cm. Input is N connector.
●Coaxial cable : 5D2VS 35cm.

MX-3000DN

Direct connection type Triplexer with PL-259 for HF-2m, N connectors 70cm and 23cm. Input is N connector.
●Coaxial cable : None



MX-3000

Triplexer with PL-259 for HF-2m and 70cm, and N connector for 23cm. Input is N connector.
●Coaxial cable : 5D2VS 35cm.

MX-3000D

Direct connection type Triplexer with PL-259 for HF-2m and 70cm, N connector for 23cm. Input is N connector.
●Coaxial cable : None

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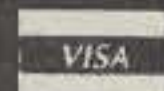


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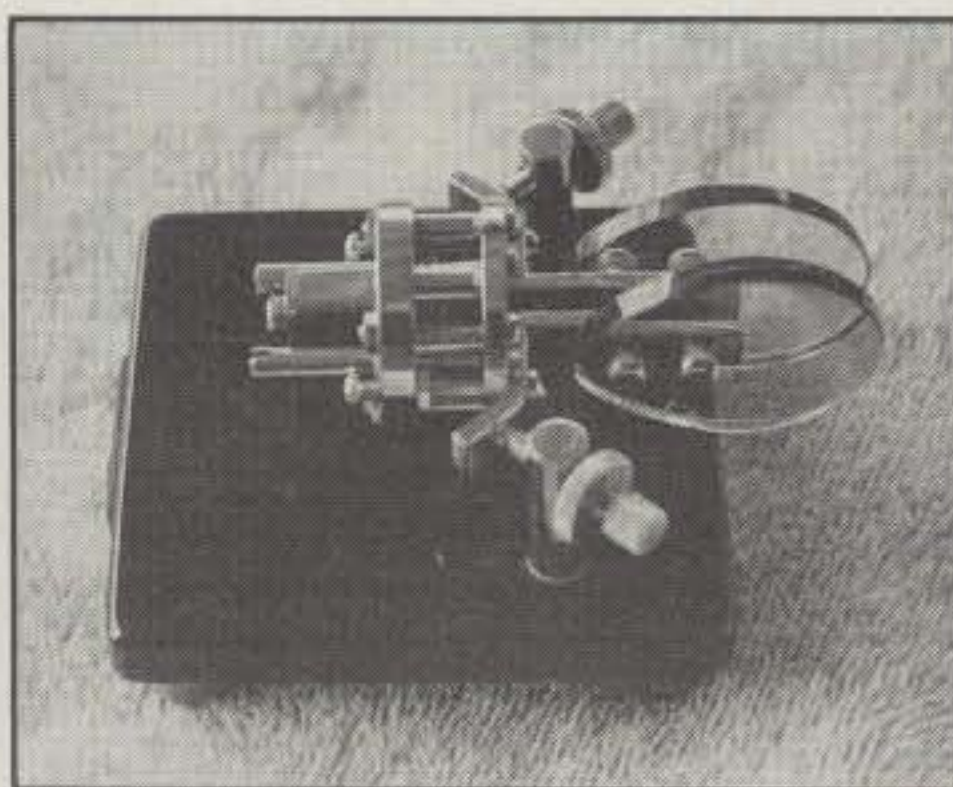


Photo 3- G4ZPY is making this glamorous "VHS Twin" right now. This iambic paddle is a true work of art, and it handles great!

Mercury feels like silk with just the right "snap action" on the arms' return. The contacts are rhodium-plated silver, and would easily key a microwave oven converted for EME work. Whew! The whole paddle is triple-chromed, with a Mercury insignia on the top and owner's call on the base.

Our congratulations to N2DAN/4 for producing a super paddle. His Mercury is not a quick-purchase item, but it is a genuine classic that will live forever!

Photo 3

A brief description and dull snapshot of this G4ZPY "VHS Twin" iambic paddle were included in my December "Christmas Gifts" column, but photos cannot do the key justice. Its glamour and performance are second only to N2DAN's limited-production Mercury. Upper parts are highly polished brass that look like fine gold jewelry. They are mounted on a glazed black steel base, and complemented with marvelous amethyst-colored fingerpieces. Contacts are silver-to-silver with adjustable spacing and no backlash or "play." If you are looking for

a beautiful new key to go with a super new rig or to rejuvenate your CW interest, this is it! G4ZPY makes these paddles in his home workshop with fiancée Brenda assisting in paperwork and shipping. He may still be backlogged, but rest assured the key is worth the wait. Check with Gordon Crowhurst, G4ZPY, at 41 Mill Dam Lane Burscough, Ormskirk, Lancs L407TG, England, for pricing and availability.

Photo 4

Here is an exciting new item presently available from our good friend DL7NS. This Schurr "Mini Paddle" mounts on your base, and its trim size of 1½"H × 1½"W × 4"D opens some interesting possibilities. You can mount it inside a small case with your homebrew keyer, fabricate a strap and bolt it to the side of your portable rig, or add a base with belt loops for leg-strapped mobiling. The Mini Paddle is so small, in fact, you can slip it in a pocket (walking HF portable, anyone?).

The Mini is designed similar to Schurr's popular "Profi" model featured in a previous "Keys" column. It is very high quality with "Zapperung"-finished brass and arms that pivot on steel pins in tiny bearings. A knurled knob on the right side sets tension on both arms, and travel is adjusted by contact screws on each side. This little treat is available from Klaus Gramowski, DL7NS, Kaiserin Augusta Allee 91, D-1000, Berlin, 10 Germany. Check with him for cost and delivery.

Photos 5 and 6

Moving into the miniature category, your attention (and magnifying glass!) is now directed to the smallest key and sounder on record. Matt Jacobs of Kingspark, New York, is the proud owner of these little J. H. Bunnell gems, and they actually work. The key and sounder were placed on a towel and photographed with a close-

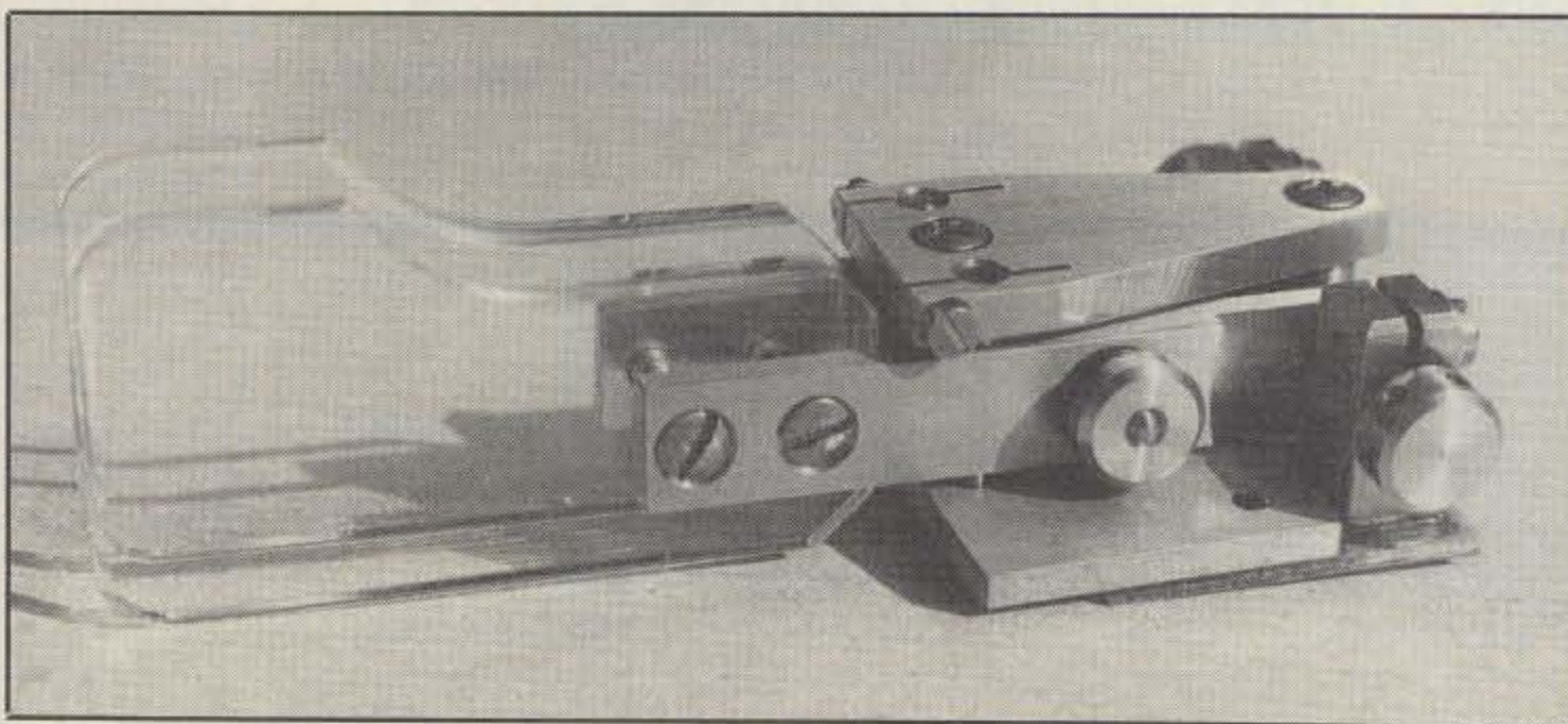


Photo 4- Schurr's new Mini Paddle. Impressive design key fits right in your hand or pocket, and it is available from DL7NS.



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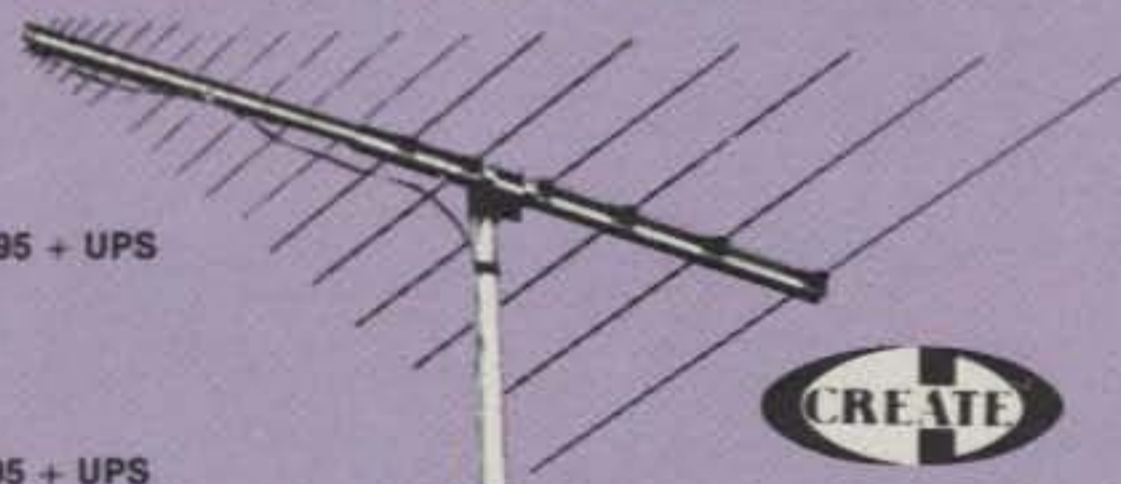
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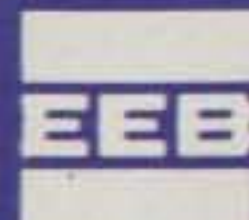
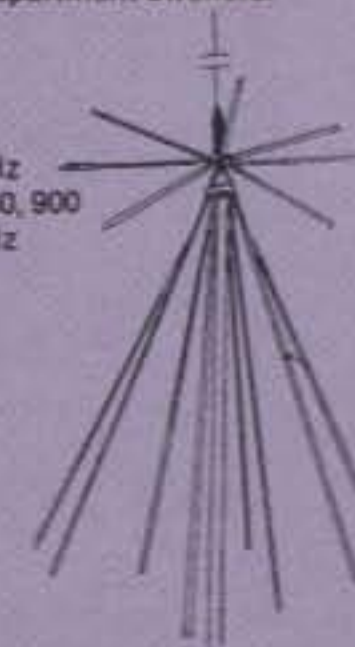
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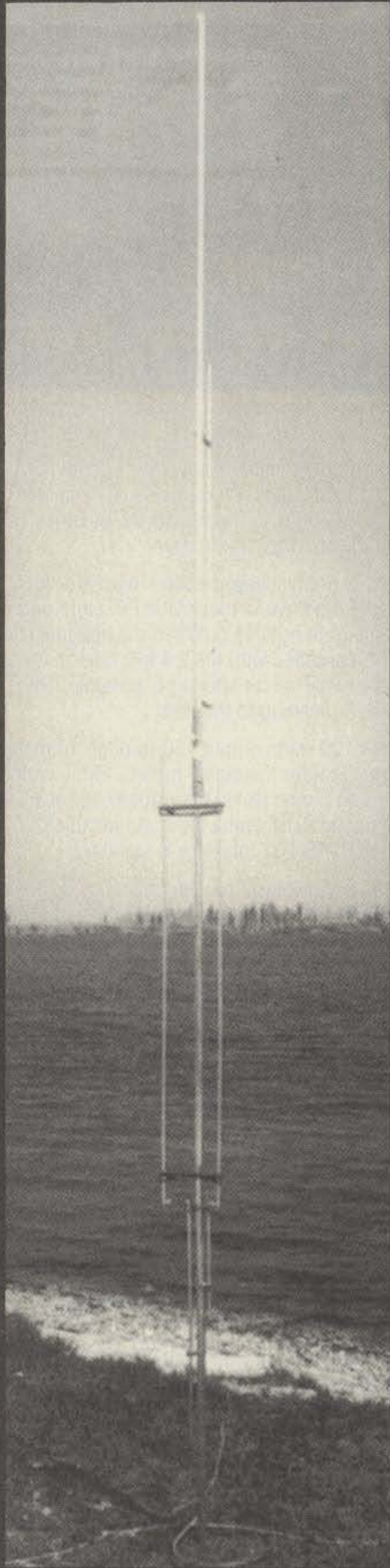
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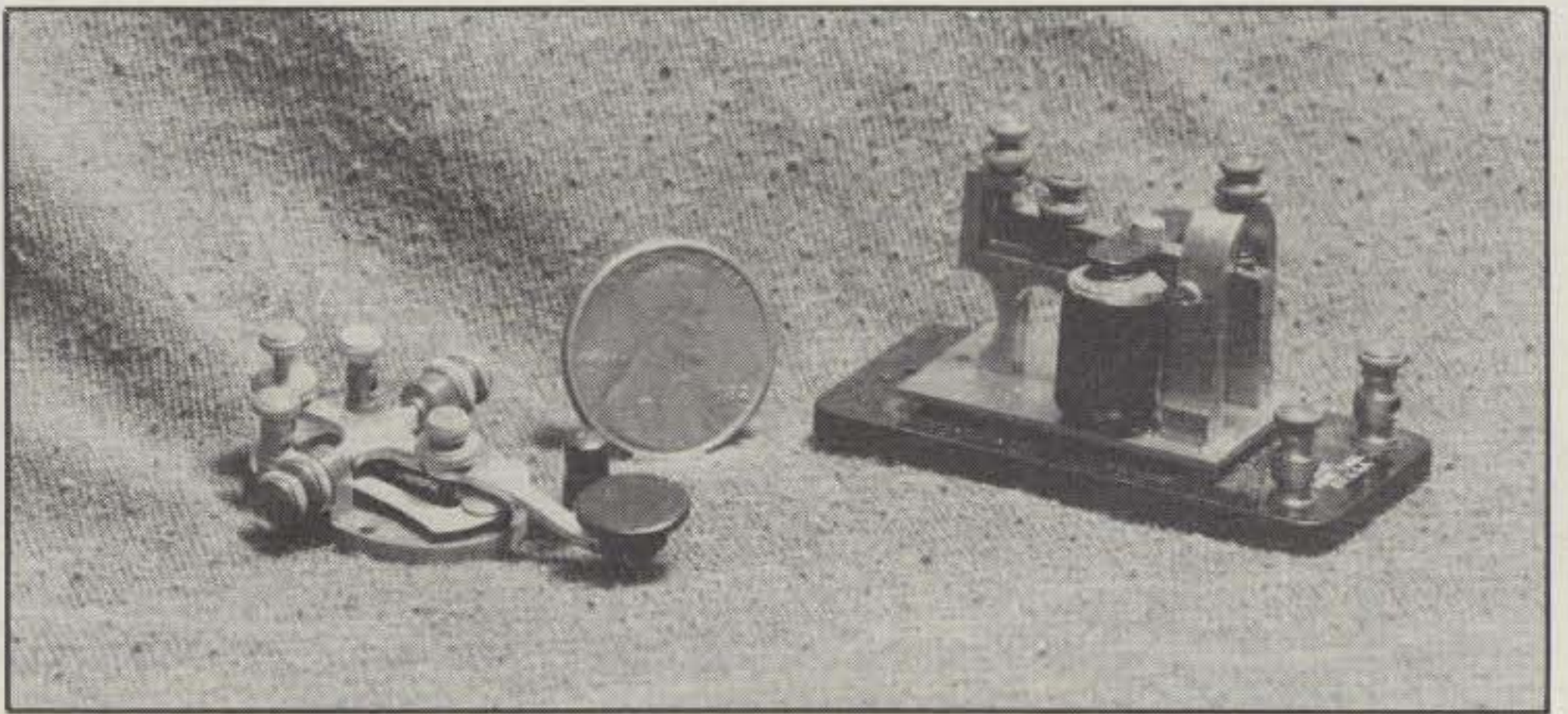


Photo 5- This unbelievably small J. H. Bunnell key and sounder belong to collector Matt Jacobs of Kings Park, New York. That is a regular-size penny between the miniatures for size comparison!

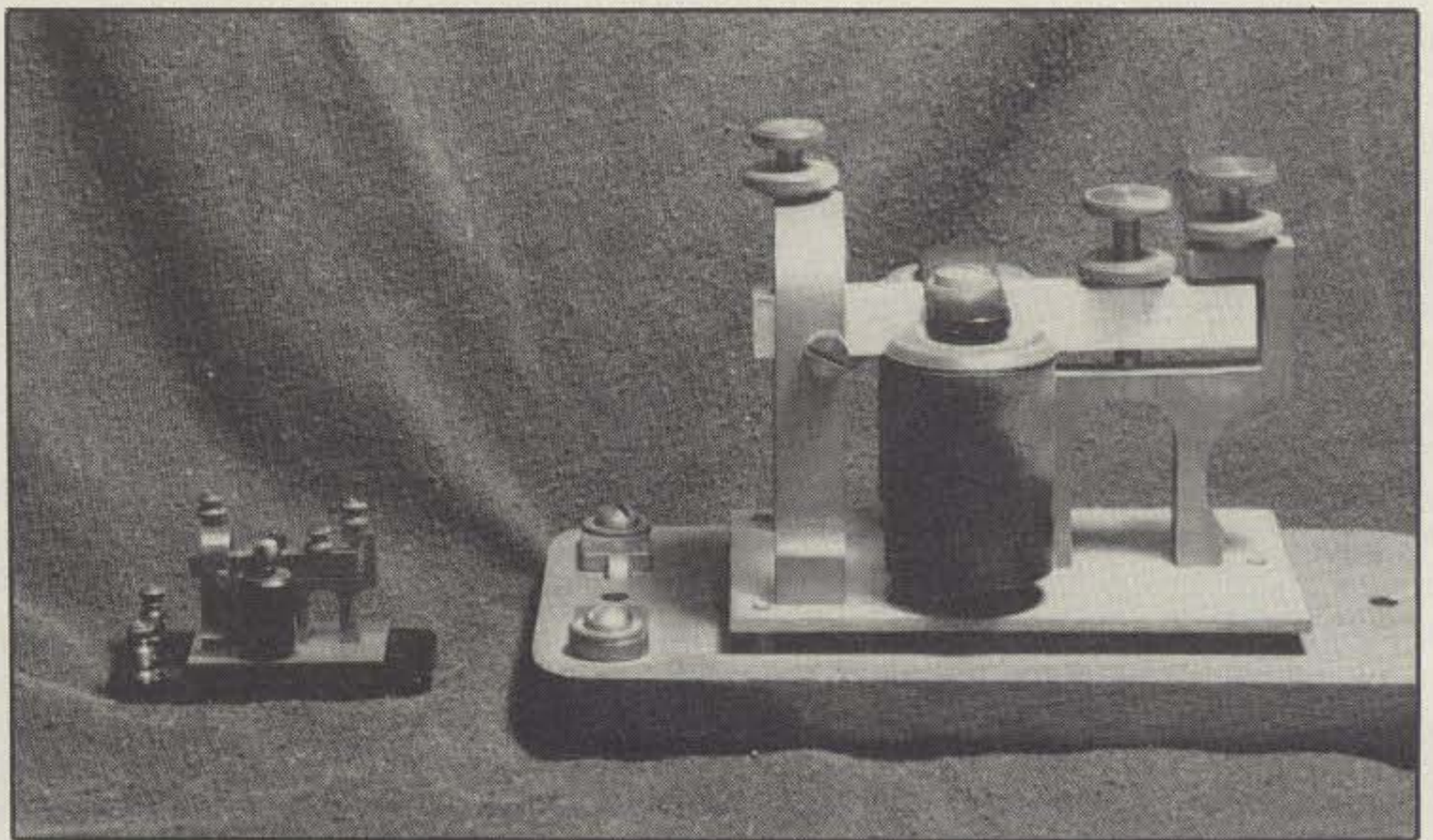


Photo 6- A standard-size Bunnell sounder beside its miniature brother for size comparison. Could these items be the "big gun" and "lil pistol" of landline telegraphy?

up lens. A regular 1982 penny was included in the picture for size comparison. After talking with Matt, he sent another photo of his miniature beside a standard Bunnell sounder. These incredible items are obviously quite rare and not for sale, but they are fascinating to study.

Photo 7

The upper miniature in this picture belongs to our good friend and key collector, Shige Kawasaki, JN1GAD. It is made by JRC (Japan Radio Company), marked model 410, and measures 20 × 20 × 50 mm (H,W,D). This key pivots from the rear. Its tension is adjustable on the top, and arm travel is set by a recessed screw. I recently saw this little critter advertised as an accessory for JRC's model JST-10 handheld 40/15 meter SSB/CW transceiver, so it may be available in Ja-

pan today. JN1GAD recently graced our QTH with a personal visit, and I must say his world-class key collection is equalled only by his outstanding CW fist. Shige can make a hand key sing like a bug, and copy signals barely above the noise level. Before leaving, Shige presented me with the lower key in Photo 7.

This little black-based key is precise to the finest detail, and could easily pass as a clothes-dryer-shrunk J-38. Pinpoint tips on its center pivoting arm fit into tiny holes on each side's screws. These screws, and the top-mounted tension and travel screws, are position-secured with tiny locknuts. The contacts are silver-tipped posts between the key's finger-piece and tensioning screw. Although this "spy key" is less than 2 inches long, it has a good feel and handles like a big pump key. My sincere thanks to Shige for this priceless gift!



Photo 7- Two miniature keys from Japan. Top item is made by JRC. Bottom item is a "spy key" without identifying marks. Discussion of JN1GAD/K4TWJ keys is in text.



Photo 8- G4ZPY's new Kit Key as received and before assembly. All the "tough work" is done, so assembly takes only a few minutes.

Photos 8 and 9

Shifting into the traditional "pumper" category, we begin with G4ZPY's new kit key now available at an economical cost. Photo 8 shows the key as received, and it is 80 percent assembled. You simply mount the mechanism, brass contact, and terminal blocks on the base, solder a couple of wires, and add the weighted bottom cover plus its felt pad. The full process takes less than 30 minutes, and results in an extremely attractive key (Photo 9). Upper parts are polished brass with fine thread screws for very precise adjustment. A sealed ball race assembly is mounted at the fulcrum, and the black, British-type knob sports a clear plastic skirt. The key's base is a real show stopper. It has a deep reddish luster like cherrywood that really glamorizes the upper brass assembly.

G4ZPY's kit key has a very good feel, and it is also fun to use. Audible clicks on "make" and "break" have a nostalgic ring, and truly sound like ham radio! Contact G4ZPY for pricing and delivery of this impressive key.

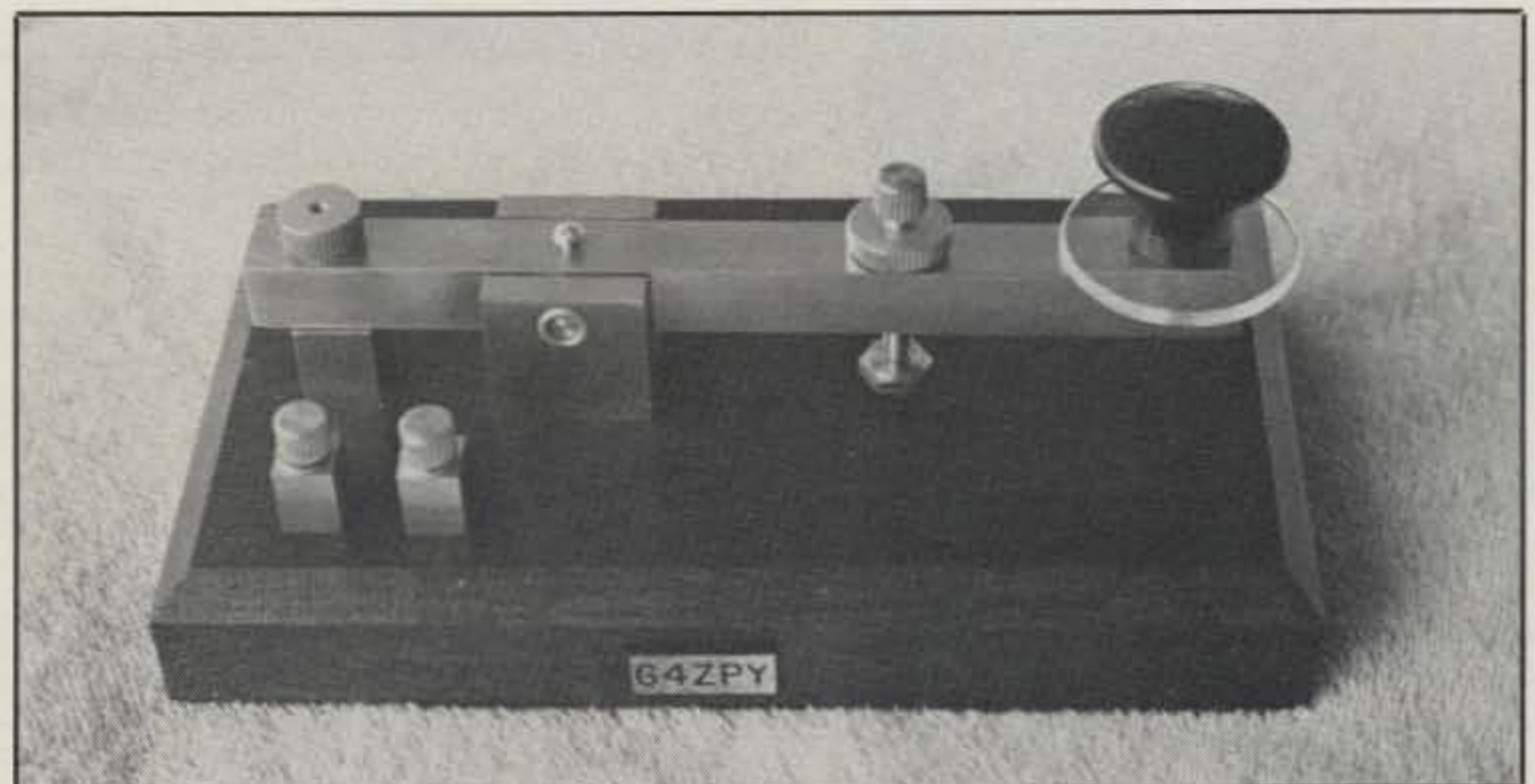


Photo 9- My assembled G4ZPY pump key. The gem looks and handles beautifully. See discussion in text.

Photo 10

Remember the massive Marconi 365 pump key K5RW showed us in this column in 1985? JN1GAD recently stepped forward to show us its little brother (upper key in photo). This little Marconi also has open ball race bearings and heavy-duty contacts, but sports a more narrow arm. Noticeably lacking on little buddy also is the thick marble base. These keys are true British classics, and influence of their designs like bearing assemblies and thick arms are still visible on English keys today.

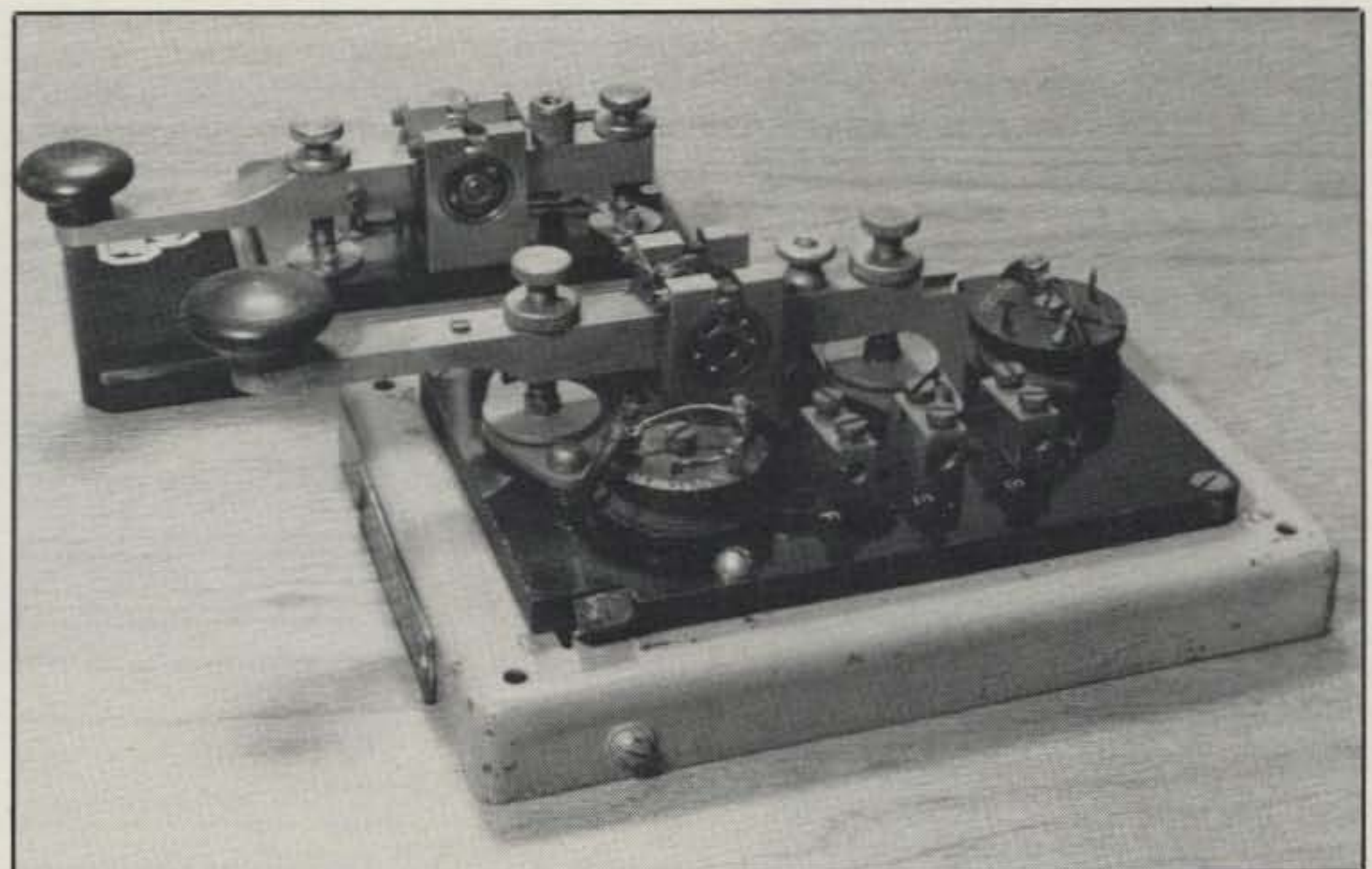


Photo 10- The lower (and larger) key in this photo is a classic Marconi 365. Upper key is its little brother. Notice British designs common to both items.

MY GAP CHALLENGER DX-VI

**Lew McCoy, W1ICP
CQ Technical Editor
(March 90 Review)**

... "could actually hear signals that were in the noise on the beam. In my comparisons between the base-fed vertical and the GAP, the GAP consistently outperformed the base-fed antenna. Most of my reports were approximately one s-unit better with the GAP. One other surprise was that the GAP vertical was quieter (less noise) than the two base-fed verticals. I would rate the GAP as a quality product, but even more important a good performer."

**Richard Morrow, K5CNF
73 Magazine
(October 90 Review)**

"another very good thing about the GAP antenna is that you don't have to tune it. Usually broadband antennas are not very efficient, but this one is. If I could have only one antenna, I would definitely rather have this one. The lack of lossy coils, and the coverage of a very wide part of 75 meters by an all band vertical, impressed me more than a little!"

**Kurt N. Sterba
Worldradio Magazine
(February 91 Review)**

"These guys have solved a problem associated with verticals. That is, an awful lot of RF is wallowing around and dropping into the dirt instead of going outward bound. How does it perform? Like a hot knife through butter. I was just a barefoot boy answering the CQ callers. They just kept coming back to me. POW! POW! POW! I am almost struck with disbelief myself. I mean, this is a vertical. But then, it's a vertical with a big difference. I was indeed pleased. If I were a whole lot younger and I had two of those GAPs phased, I'd tell those contest hotshots to . . . look out!"

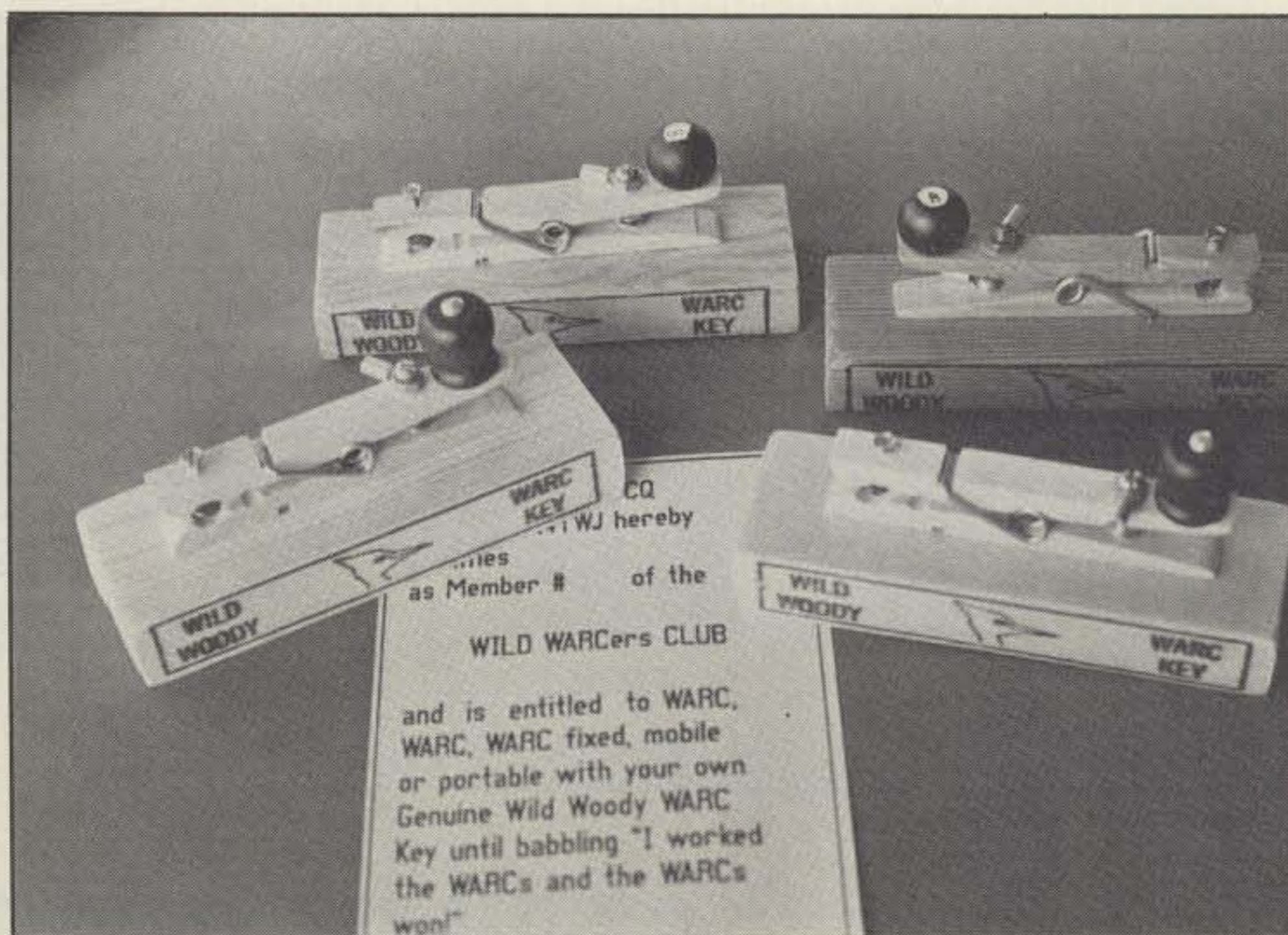


Photo 11— Here they are spruced (pined?) up and ready for action—K4TWJ's Wild Woody WARC Keys! I will be humorously giving away these "low-end reference" keys during the near future. See text for details.

Photo 11

My own contribution to the world of wooly-wooley CW: Wild Woody WARC Keys! They are wood, wacky, and really work, and I plan to award these little critters to friends and on-the-air contacts until my large supply is diminished. Look at this quality, gang—solid wimpwood base with spray Krylon clear glaze, brass screws for contacts, adjustable tension by bending the clothespin's spring, and a

genuine (almost!) black knob. Whew! There's even a classic click (snap?) rapport on "make" and "break" with keying. Each key is serial numbered (with my genuine black-felt pen!) and packed in its own box with an authentic Wild WARCers Club certificate (we believe in going first class!)

How can you become a genuine Wild Woody WARCer? Unautographed, my keys are 36 bits a throw (pun intended). Autographed, they are free to qualifying

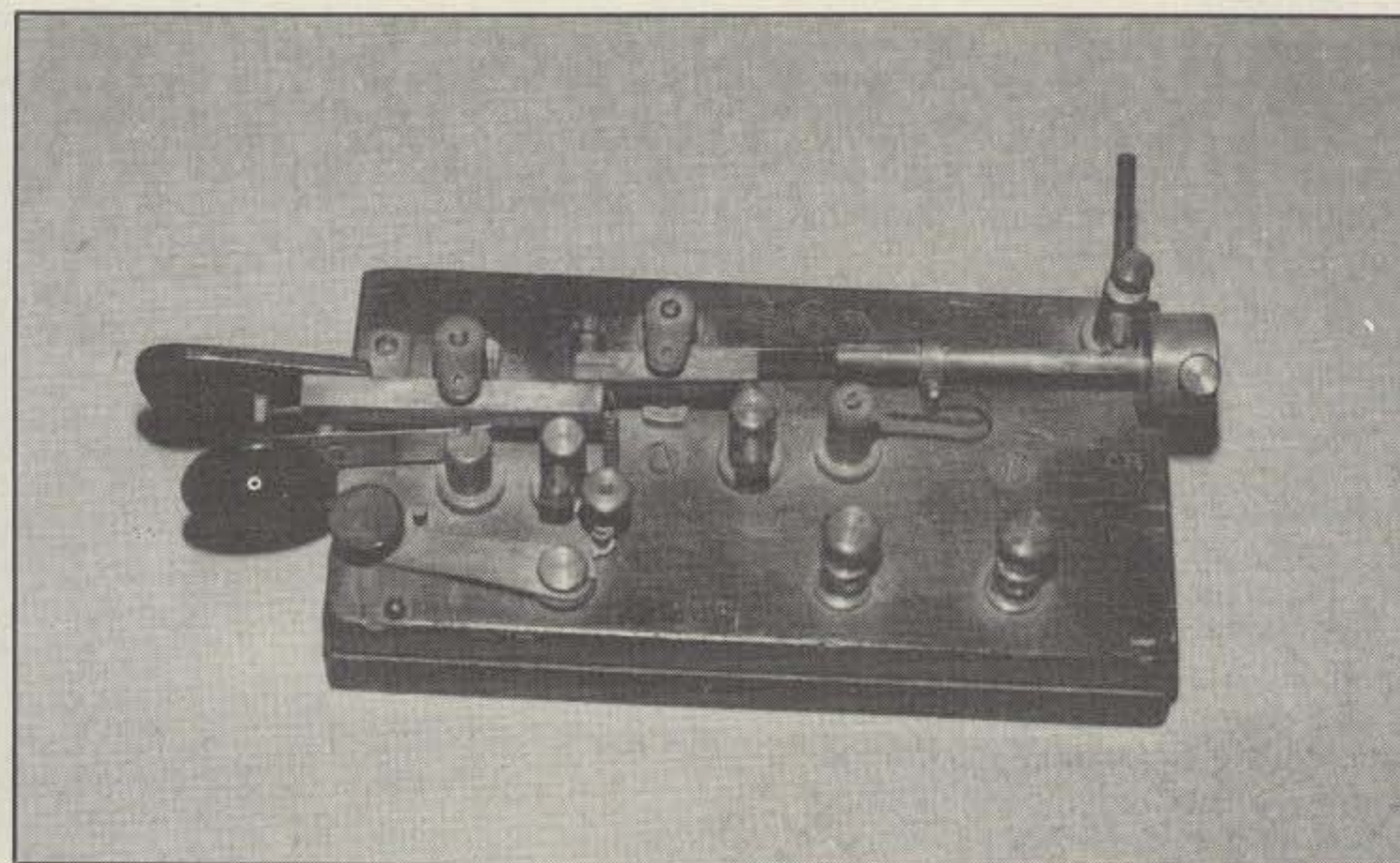


Photo 12— Might this unusual item be the first semi-automatic key ever made? It was used by professional telegrapher Schmidt in 1892, and later passed to its present owner, K6WX.

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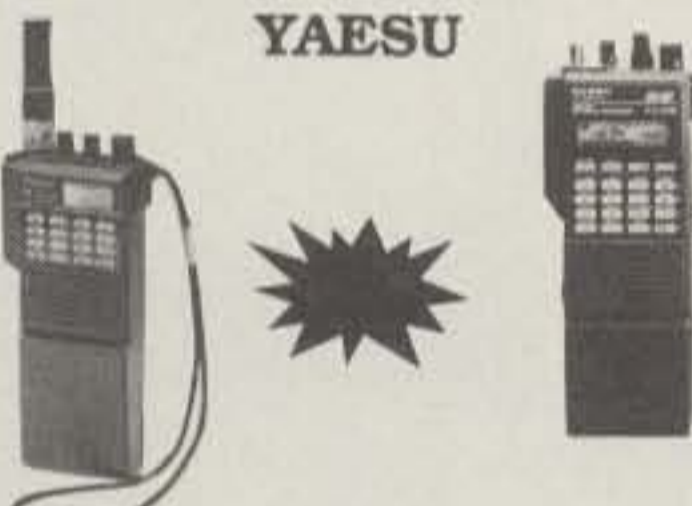
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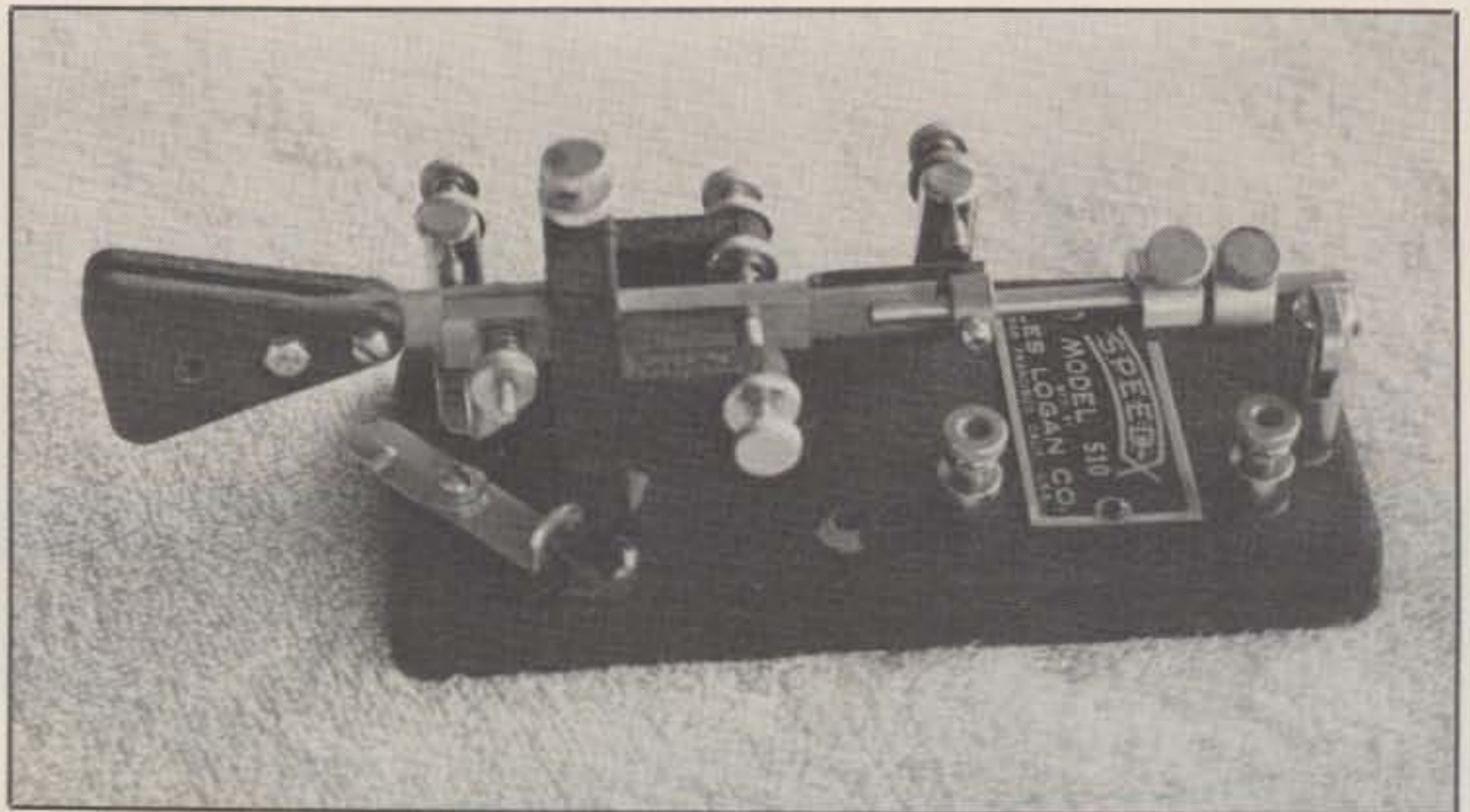


Photo 13- Author K4TWJ's ultra-small Speed-X 510 bug. Print on this little gem resembles black velvet. It is a fast key, but it is a real thrill to use during contests.

on-the-air contacts and appreciative friends met at hamfests. My mama didn't raise any fools! (?)

Photo 12

An article on classic keys is not complete without views of at least one bug, and thanks to I. L. McNally, K6WX, we have a dandy. Mac was a radio operator on the *USS Pennsylvania* during 1932, and his radio officer, Admiral John Schmidt, gave him this bug. It originally belonged to Schmidt's father, who was a telegrapher in 1892! A bug before the era of Vibroplex and Horace G. Martin is definitely a classic! Use your magnifying glass and study this key's unusual design.

Dashes are made by moving the knob against the thumbpiece (the metal strap simply bends and makes contact). The dots story is another matter. When the thumbpiece is moved to the right, it moves an intermediate arm that is travel-limited by a post right in the key's middle. A vibrating reed connects the arm to a long pendulum with a weight on its end. One dot contact on a post in front of the intermediate arm's travel limiting post then mates with the other contact on the pendulum. Big-time telegraphy for sure!

There is a unique cloverleaf logo with "patent applied for" and a weathered "540" on this key's wood base. Evidently it was professionally made, but there are no factual clues to its manufacturer. Our special thanks to K6WX for sharing views of this old-time key.

Photo 13

I recently acquired this little Speed-X 510 from Robert Mitchell of Pleasantville, New Jersey, and it almost qualifies as a miniature. The bug is smaller than a Blue

Racer or any of the Speed-X keys featured in our November "Keys Bonanza," and it handles very well. During initial cleanup I discovered the key was originally finished in a simulated velvet black paint that really made it stand out. If I can find a similar spray paint today and repair a small crack in the cast-iron base (any suggestions?), the bug should be a true heart-throb.

Conclusion

As this keys special winds down, yet another sequel is taking shape for next year. Clarence Smith, KA8PJM, is shooting photos of his tube-model Mon-Key made by the Electric Eye Co., and Jim Zimmerman, KG6VI, is preparing pictures of his Brown Brothers Keys. We also encourage owners of Brown Brothers bugs and other unique keys or paddles to step forward and share views of their classic items. Meanwhile, Ed Gribi, WB61ZF (51280 Pine Canyon Road, King City, CA 93930) continues looking for a classic sounder to perpetuate our telegraphic heritage. Ed and several volunteers recently moved a defunct SP railroad station to the San Lorenzo county park and restored it with a new roof and paint. Their recreation is almost complete, and its desk sports a single-lever key but lacks a sounder plus memorabilia. Any donors? (Remember me if there is a second sounder!)

We trust you enjoyed viewing this keys special as much as I enjoyed putting it together, and hope it re-inspired your interest in working CW. Please remember to include an SASE when writing to us and be patient for replies. Better yet, look for us on the WARC bands or 20 meters during these nice summer months!

73, Dave, K4TWJ

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FT-6200

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Trunk-Mountable High Power Dual Band VHF/UHF Transceiver

The FT-5200 (or FT-6200) Dual Band Mobile Transceiver is more than just another pretty face. The front panel can be easily removed without tools or fuss and put into your pocket when you leave your car. And for extra convenience, an optional remote cable kit is available so you can mount the control panel anywhere on the dash and the transceiver underneath a seat, in the glove box or in the trunk.

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Features and Options:

- **32 Memories:** 16 tunable memory channels for each band.
- **Channel Steps:** 5, 10, 12.5, 15, 20, 25kHz.
- **Removable Front Panel for quick and easy Installation**
- **CTCSS Encode Built-In:** 38 sub-tones selectable from the front panel.
- **Dual Receive:** With independent squelch and mixing balance.
- **Full Duplex Cross Band Operation:** Transmit on one band while listening on the other.
- **Independent TX/RX Frequencies:** Odd Splits ok on any memory channels.

- **Programmable Subband Limits:** For band scanning.
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- **Priority Monitoring**
- **Dual External Speaker Jacks:** One for each band.
- **Built-In Antenna Duplexer:** For one antenna operation.
- **8 Level Automatic Display/Key Lighting Dimmer**
- **Microphone:** Backlit DTMF display for night operation.
- **Accessories/Options:** FRC-4 (Pager Unit), DVS-3 (Voice Memory Unit), YSK-1L (6m Trunk Mounting), FTS-22 (CTCSS Decoder), SP-7 (External Speaker).

Specifications:

Frequency Range: FT-5200: 2m, 144-148MHz; 70cm, 430-450MHz and FT-6200: 70cm, 430-450MHz; 23cm, 1240-1300MHz

RF Output Power: 2m, 50/5 W (high/low); 70cm, 35/5 W (high/low); 23cm, 10/1 W (high/low)

Dimensions (WHD): 5¹/₈ x 1¹/₂ x 5¹¹/₁₆ in. (w/o knob)

Weight (approx.): 2 lbs. 3 oz.



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CIRCLE 148 ON READER SERVICE CARD

CONNECTING YOU AND PACKET RADIO IN THE REAL WORLD

Back To The Basics

This month we begin our fifth year of bringing packeteers the latest news and information about the fastest growing facet of the amateur radio hobby. I plan to maintain this policy throughout the 1990s, too. This installment of the "Packet User's Notebook" continues with that tradition, both in news and an informative section devoted to the packet radio beginner. The packet beginners section may well prove to be of interest to the old timer as well.

The Season Opener

Within minutes of the Miami Airport, and only a short distance from the Miami Airport Marriott Hotel, is the gate to the fairgrounds where the 1991 hamfest season was about to open.

Saturday morning, February 2nd, the opening of the 1991 Miami Hamfest began as amateurs amassed from all over Florida and North, Central, and South America. There were many attendees from other countries, too, but the numbers were too large and moving too fast to keep track of them all.

I saw lots of familiar faces and call-signs. Bob, WA4IIV, and his wife were keeping the Florida Amateur Digital Communications Association (FADCA) booth covered. There was a lot of "newcomer" interest in packet—actually, more than I've seen at other recent hamfests. Most of the newcomer packeteers were looking for information about their new-found interest. The packet dealers were having a heyday selling TNCs. All the packet TNC manufacturers except one had booths to display and demonstrate their new wares for the coming 1991 season. AEA was the exception.

DRSI—The Internal PC, RF, TNC

Don't dwell on the sub-topic line too long. There is a simple explanation for the "PC, RF, TNC." It is exactly as it appears. Not only is the TNC constructed around a sure-enough 2 meter data transceiver, but it also boasts speeds to 9600 bauds.

For one who is already using 9600

7275 Roswell Road NE, Suite 24-526,
Atlanta, GA 30328

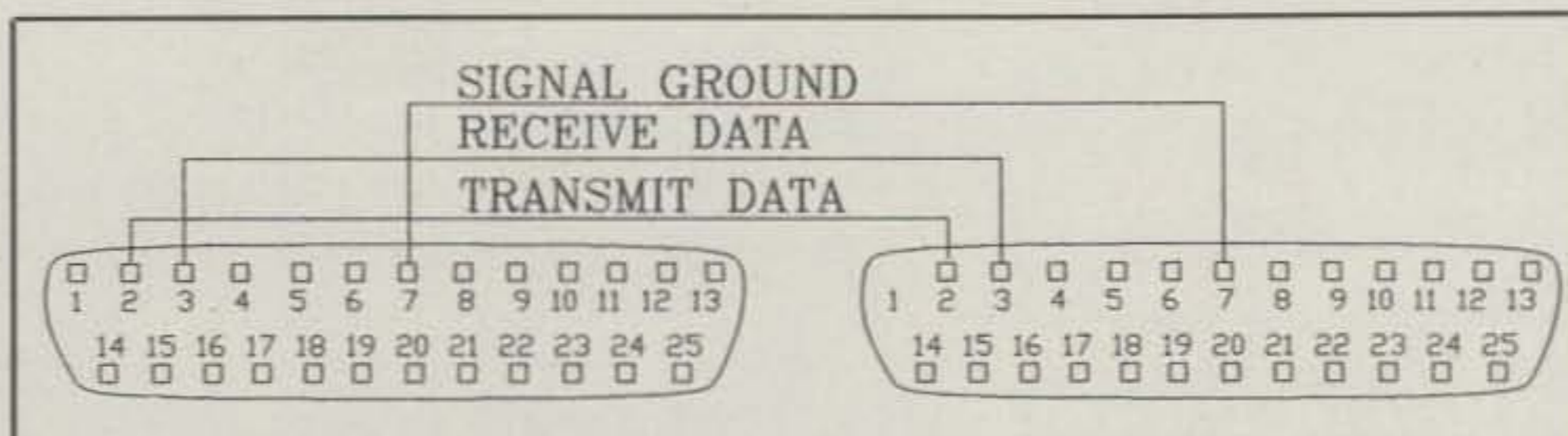


Fig. 1—Using only three pins, the dumb terminal enables the user to use the more expensive computer for contest data gathering. Set TNC "XFLOW" command to "ON."

bauds in a limited access environment, I'm still amazed when I watch the demonstrations of a file transfer at this speed. At 9600 bauds a file transfer can begin with a burst of "noise" and end just as quickly. Yes, 9600 bauds sounds more like something in the region of "white-noise" than it does the customary 1200 and 2400 bps to which we are accustomed.

Andy DeMartini and Travis Braun of DRSI were busy with regular show-and-tell demonstrations. The Internal PC, RF, TNC is constructed on a PC board similar to other internal PC hardware that uses one of the vacant slots of the IBM PC or compatible. To maintain low power drain on the internal power supply of the PC, the RF portion of the PC, RF, TNC is limited to about 2 watts output. The DRSI PC, RF, TNC can easily be interfaced to an external RF power amplifier via the quick-connect BNC RF I/O connector at the rear of the PC. Although it was not mentioned, another possible reason for the low power level of the Internal PC, RF, TNC might be to conserve the short TXDelay for the power "up-time." This allows the user to attach a bilateral, pin-diode switching linear externally. This could be the next accessory we see from DRSI.

Kantronics—Data Engine and 9600 Bauds

The 9600 baud Data Engines were part of the Kantronics demonstrations. However, 9600 is not new to the Kantronics packet line. There was another item that was attracting attention at the Big Blue "K" booth.

Kantronics CEO Phil Anderson, along with Karl Metcalf, was busy demonstrating a new device with little or no fanfare.

In a subtle manner they were opening our minds to some new ideas for use by those who are looking for new and useful applications within the packet hobby. The new device is called the Kantronics Weather-Node.

The Weather-Node gathers information relating to temperature, wind speed, wind direction, and rainfall. This system can interface to other TNCs, including a "TheNet" type node. From here, the data from the Weather-Node is accessible by the packet user. This can bring into play some interesting new uses and concepts for use with packet radio.

My first thought is how we might interface this kind of system to a switch or node at a central location or mountaintop so the users could easily connect to the host node, or switch and review the current weather data gathered by the Weather-Node.

The Kantronics Weather-Node is composed of three major parts. These include the Anemometer priced at \$110, the Rain Gauge at \$90.00, and the heart of the system, the KTU, at \$300. Total list price is \$500.

MFJ Attracts The Digital Video Enthusiast

No new packet controllers were displayed at the MFJ booth, but the MFJ-1278/Turbo and MFJ MultiCom.EXE were still gathering onlookers interested in the digital and packet video market.

There were some notable improvements in the MultiCom.EXE SSTV modes. One of the new additions to SSTV is in the ability to capture the 72 second high-resolution pictures. I also heard someone at the MFJ booth say the MultiCom now has an accompanying standalone program

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* **Digital Signal Display and Memory Function**

The DJ-F1T/F4T has special memory channels for transmitting, receiving, and store "Two Digit" DTMF Tones, for communication messages. This feature allows for the DJ-F1T/F4T to receive a "Two Digit" message and display it at any later time, at the convenience of the operator.

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F1T: 140-170MHz (AM Mode 118-136MHz after modification)
F4T: 430-460MHz

- * Battery Pack Lock
- * Pager and Code Squelch
- * Triple Stage Selective Power Output
- * 5W Output Power with Optional Battery Pack EBP-18N
- * 8 Scan Modes
- * Programmable VFO Range Function
- * Battery Save Function
- * Six Channel Steps - 5, 10, 12.5, 15, 20, and 25KHz
- * Priority Function (Dual Watch)
- * Automatic Power Off (Programmable Timed)
- * Automatic Dialer Function
- * Illuminated DTMF Keypad
- * Many Optional Accessories such as:
EMS-8: Remote Control
Speaker/Mic.
EME-11: Earphone/Mic. with PTT/VOX
EME-10: Headset with PTT/VOX
EJ-2U: Tone squelch Unit
EDC-33: Quick Charger (Compatible with standard battery pack)

and many more.

DJ-S1T/S4T is Simple Type and Low-Priced But Offers Features such as:

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- * Triple Stage Selective Power Output
- * Dry Cell Battery Case Lock
- * Programmable VFO Range Function
- * Frequency Lock, PTT Lock Function
- * One Touch Squelch De-Activation Function
- * 8 Scan Modes
- * Wide Band Receiving Range

Available Features with Optional DTMF Unit (DJ-10U) and DTMF Keypad (ESK-1) Include:

- * Pager and Code Squelch
- * Digital Signal Display and Memory Function
- * Automatic dialer Function
- * Many Optional Accessories Available

Specifications

Frequency Range:

DJ-F1T/S1T
TX: 144-148MHz
RX: 140-170MHz (AM Mode 118-136MHz after Modification)
DJ-F4T/S4T
TX: 440-450MHz
RX: 430-460MHz

Output Power:

* with Battery Pack EBP-16N (Standard for F1T/F4T)
Hi: 2W (F1T/S1T) 1.5W (F4T/S4T)
Mid: 1W Low: 0.1W
* with Optional Battery Pack EBP-18N
Hi: 5W Mid: 1W Low: 0.1W
* at 9V
Hi: 2.5W (F1T/S1T) 2W (F4T/S4T)
Mid: 1W Low: 0.1W

Weight:

DJ-F1T/F4T Approx.: 13.2 oz.:
with Standard Battery Pack
DJ-S1T/S4T Approx.: 13 oz.:
with Dry Battery case

Dimensions:

4.3(H) x 2.1(W) x 1.5(D) inch
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DJ-S4T

that enables the user to print FAX pictures to hardcopy on printers using the Epson codes. I personally do not have the latest version of MultiCom, but I hope to purchase it soon. For the present, if you have an interest you may want to contact MFJ to learn what the latest enhancements are and the cost of the upgrade.

With the increased activity from the Persian Gulf on the news-wire services, FAX has gained a new level of interest. The multi-level gray scales in the FAX mode of the MFJ-1278/Turbo have attracted the SWLers. Along with the other topics I listened to at the MFJ booth was the interest in the many new frequencies that are being devoted to the news-wire FAX pictures from the Middle East.

PacComm Looks Upward

There they were, PacComm, with the now improved 1200 BPSK Modem that is configured to be used in conjunction with the AmSat AO-16 "PacSat." They had plenty of support for the BPSK Modems at another booth. Mike Crisler, N4IFD, and several other PacSat users were conducting a very impressive demonstration that was something to behold, but I'm saving that topic for another place. The heavyweight of the compact controllers was catching the attention of the laptoppers. The PacComm HandiPacket Portable Packet Controller has a Personal Message system built-in that is supported by 32,000 bytes of RAM.

The 16k mailboxes were great in their day, but with the rapidly increasing use of packet and the new packeteers coming into the hobby of packet radio, we have a new demand on the Local Area Networks (LANs).

Finally, we have an answer for the Local Area Networks that are in remote areas away from the big blunderbuss BBSes. PacComm has introduced a packet controller that has 512,000 bytes of battery-backed RAM. One-half million bytes of RAM can allow a lot of local mail to be stored, including a few files of the document size.

With the built-in capability for "reverse forwarding" to the larger BBSes, the TINY-2 PLUS from PacComm may soon prove to be a better means to handle the NTS mail and point-to-point messages.

While On The Subject

Please keep in mind that some of the frequencies the node and switch SYSOPs are opening up are not intended for BBS forwarding. Instead these are for keyboard-to-keyboard use. Many times there are new keyboard-to-keyboard frequencies opened, and someone decides to plop another blunderbuss BBS on it; there goes the neighborhood! Have you ever

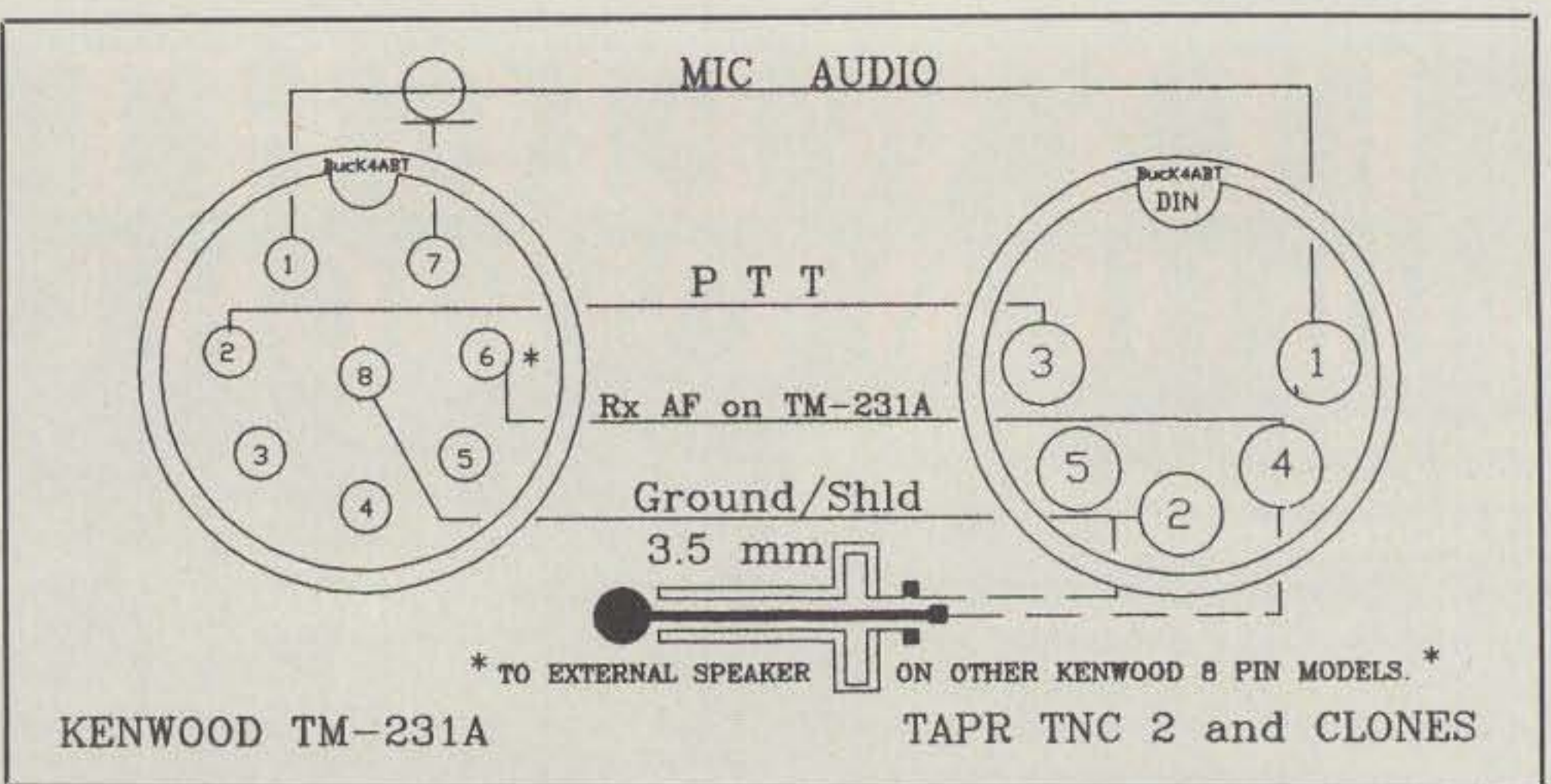


Fig. 2- Kenwood TM-231A to TAPR TNC-2 and clones.

tried to have a QSO with a friend while two BBSes are forwarding to each other on the keyboard-to-keyboard frequency?

Back To The Basics

While at the CQ booth I was approached by several readers of this column. They explained how they clipped and save the articles for a packet reference manual. One newcomer from Charlotte, North Carolina commented, "Buck, why not do a column for those of us who would like to get into packet but don't have anyone around to give us help." The question was echoed by Buzz, another packeteer from Nashville, Tennessee.

Well, guys, I listened! It was some four years ago as I recall when I had a conversation with Alan Dorhoffer about this same subject line. He pointed out how we should keep the newcomers to the packet hobby in mind while informing the seasoned veterans of the current packet direction.

Packeteers Come in All Types

There are a number of DXers who are looking for information that will help them connect into the "DX PacketCluster" (copyright Dick Newell) that is in use across the nation . . . and world! In this month's column we will look into ways that enable the DXer to interface a dumb-terminal to a TNC for use on the DX PacketCluster. A look at one of the simpler methods to interface the dumb-terminal to a TNC is shown in fig. 1.

Many times the DXer uses the computer to store text and data on disk. The large memory storage capacities enable the DXer to record contacts with rare DX stations, and eventually save to disk or print to hardcopy.

Keeping track of a large number of contacts during the CQ contests can demand a lot of memory. For this reason the DXer who uses the DX PacketCluster seeks to use the less expensive "dumb terminal" on the PacketCluster, in lieu of

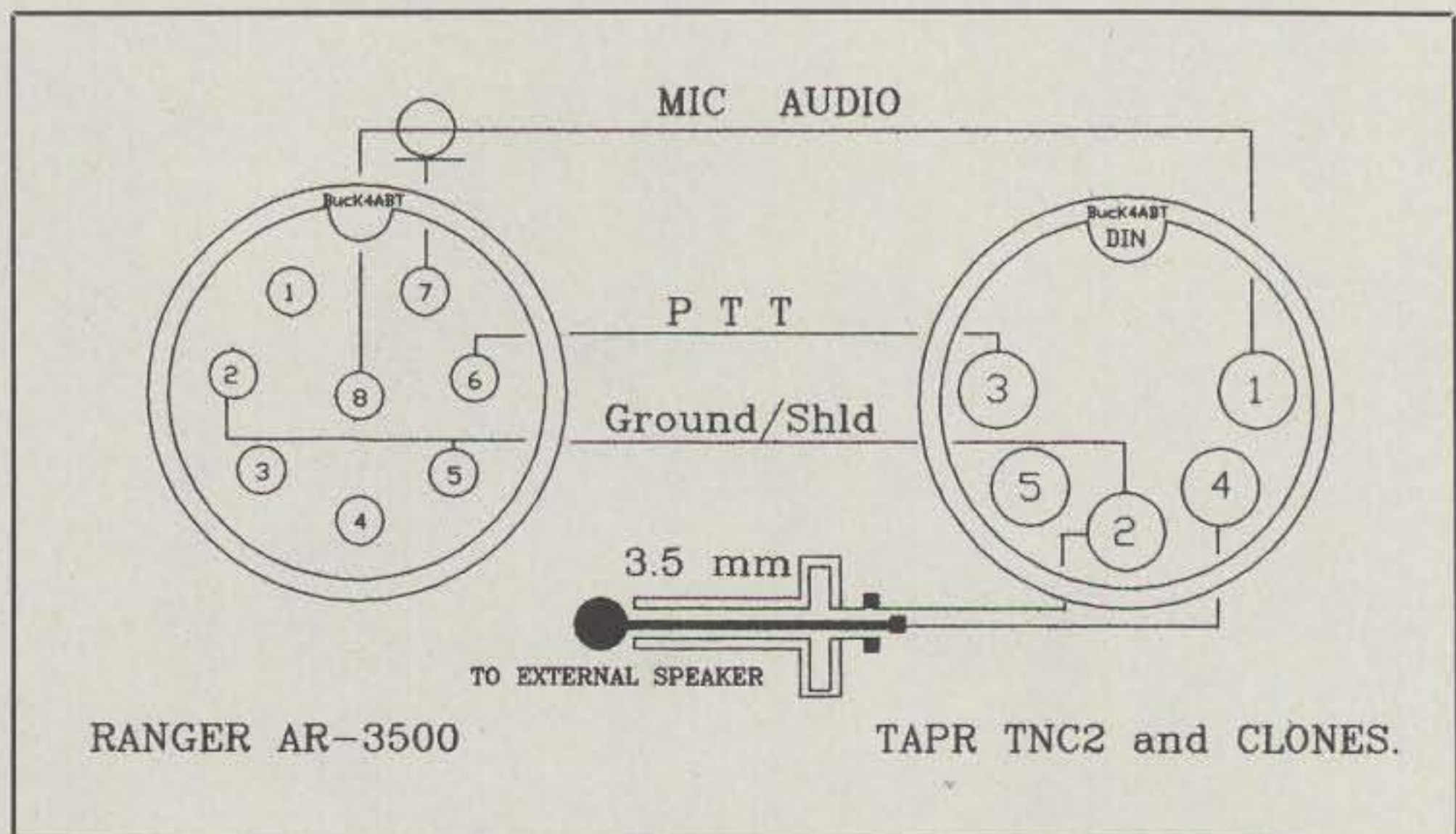


Fig. 3- Ranger AR-3500 to TAPR TNC-2 and clones.

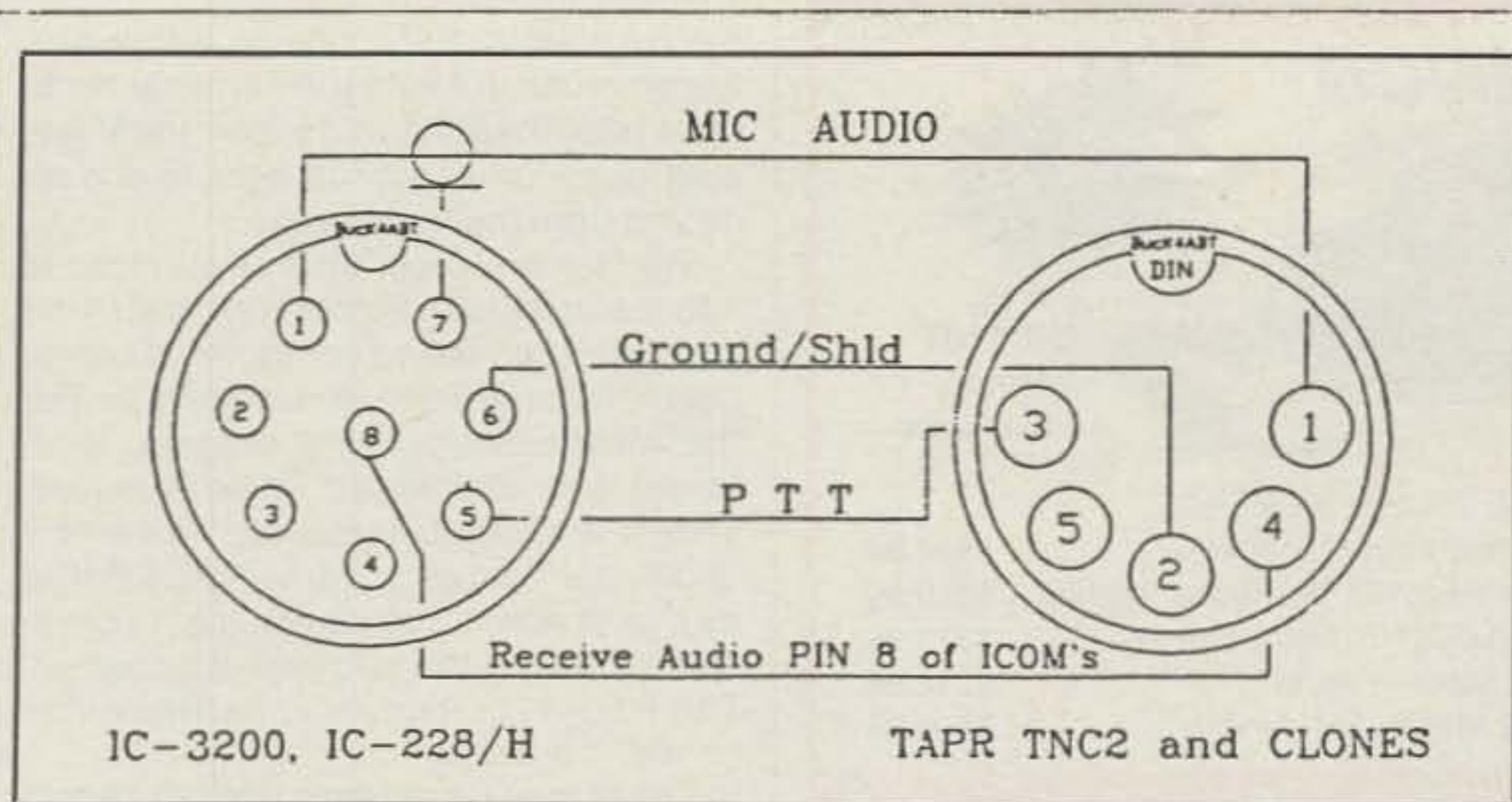


Fig. 4- ICOM IC-3200/IC-228H to TAPR TNC-2 and clones.

the more expensive computer with the logging program on it.

Building The Packet Station Is Fun and Easy

It may come as a surprize to many amateurs that packet radio is the least complicated facet of our hobby. If you own either a computer or a VHF FM amateur transceiver, then you are already equipped

with one third of a packet station. If you own both, then you have two thirds of the packet station. The only other requirement is the Terminal Node Controller (TNC). Simply put, the TNC is the catalyst or interface that enables communications between the transceiver and the computer, or vice versa. The TNC is the heart of the packet radio station.

The reason I use the VHF transceiver as a starting point is because nearly 85% of all packet users begin operating on the 2 meter band, and specifically on the na-

tionwide through-put frequency at 145.010 MHz.

The Terminal Node Controller (TNC) can be purchased from one of the leading TNC manufacturers, or from one of many amateur radio dealers or distributors throughout the world. Some TNCs represent more than just the packet modes. For the purpose of this document we will concentrate only on the controllers that support packet (AX.25) communications. There are several different models of packet controllers from which to choose. Some are even designed and constructed to fit inside the IBM PC or clone.

Most TNCs will operate HF and VHF modes (300, 1200, and 2400 bauds). The problem is not in the ability of the TNC to operate the multiple speeds (300 bauds HF, or 1200 bauds and higher on VHF), but in the methods that are used (or not used) to tune in HF packet stations.

The Terminal Program/Software

The terminal program is analogous to the switch or ignition key of an automobile. There is no combustion (ignition), no action from the radio, no wipers, no movement, nor communication function of any kind until the communications (software) terminal program is loaded (booted) into the computer. This link is important,

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CM5, BP5 10.8v @ 500 MAH

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7S 13.2v @ 1200 MAH—\$63.95

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(base charge only 1" longer)

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NEW PRICES FOR YAESU REPLACEMENT BATTERIES

FNB-3/3A 9.6V @ 1200 MAH (4" long) \$47.95

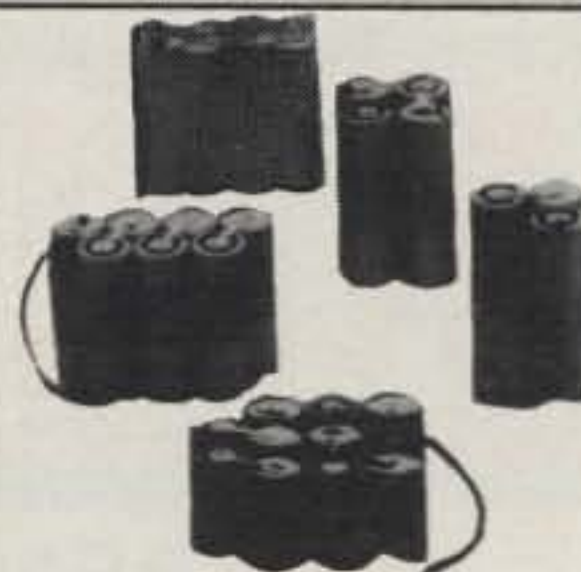
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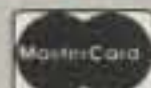
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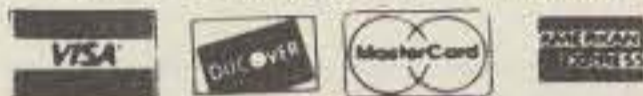
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since it enables the computer (hardware) to communicate with the Terminal Node Controller (hardware). In turn there are control and drive signals sent to and received from the transceiver.

The terminal program is usually loaded into the computer from a disk, and in the case of a tape-based computer, it can be loaded (booted) from a cassette tape. For this reason, the terminal program is referred to as "software." Some terminals, known as "dumb terminals" have this "software" set (burned) into an EPROM as a permanent application that boots itself each time the terminal is turned on. This kind of "burned in" software is often called "firmware."

The terminal programs used to access the telephone BBSs through the landline modems function well with packet radio. There are, however, many custom-written terminal programs that are written specifically for packet use and that perform much better than the telephone modem software.

Precognition

Packet controllers usually come supplied with connectors for the controller end of the interface cables. The connectors for the terminal and radio ends of the cables are important to the project now.

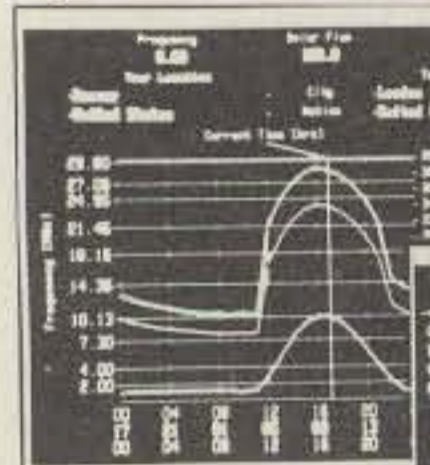
The TNC manufacturer has no idea which type of radio or computer terminal you might choose, or may already have chosen. There's no simple means to allow the manufacturer to know which connector to supply for your radio, transceiver, or computer. For this reason, the "user" ends of these cables are left free for your interface connections.

Some computers have what is known as an RS-232 port, and a few still rely on the transistor-to-transistor logic (TTL) port. The computer can have any number of connector types. An example is the communications port (commonly called "COM Port") of the 4-pin DIN connector of the TRS-80 Color Computer. The Commodore series uses another 4-pin type, and still others use connectors with 25 pins. In addition, some original equipment manufacturers (OEMs) of PCs and clones will use different genders on the comports of the computer. It now becomes clear as to why the TNC manufacturer cannot supply the correct connector for your RS-232 or COM port of your computer or the microphone connector for your transceiver.

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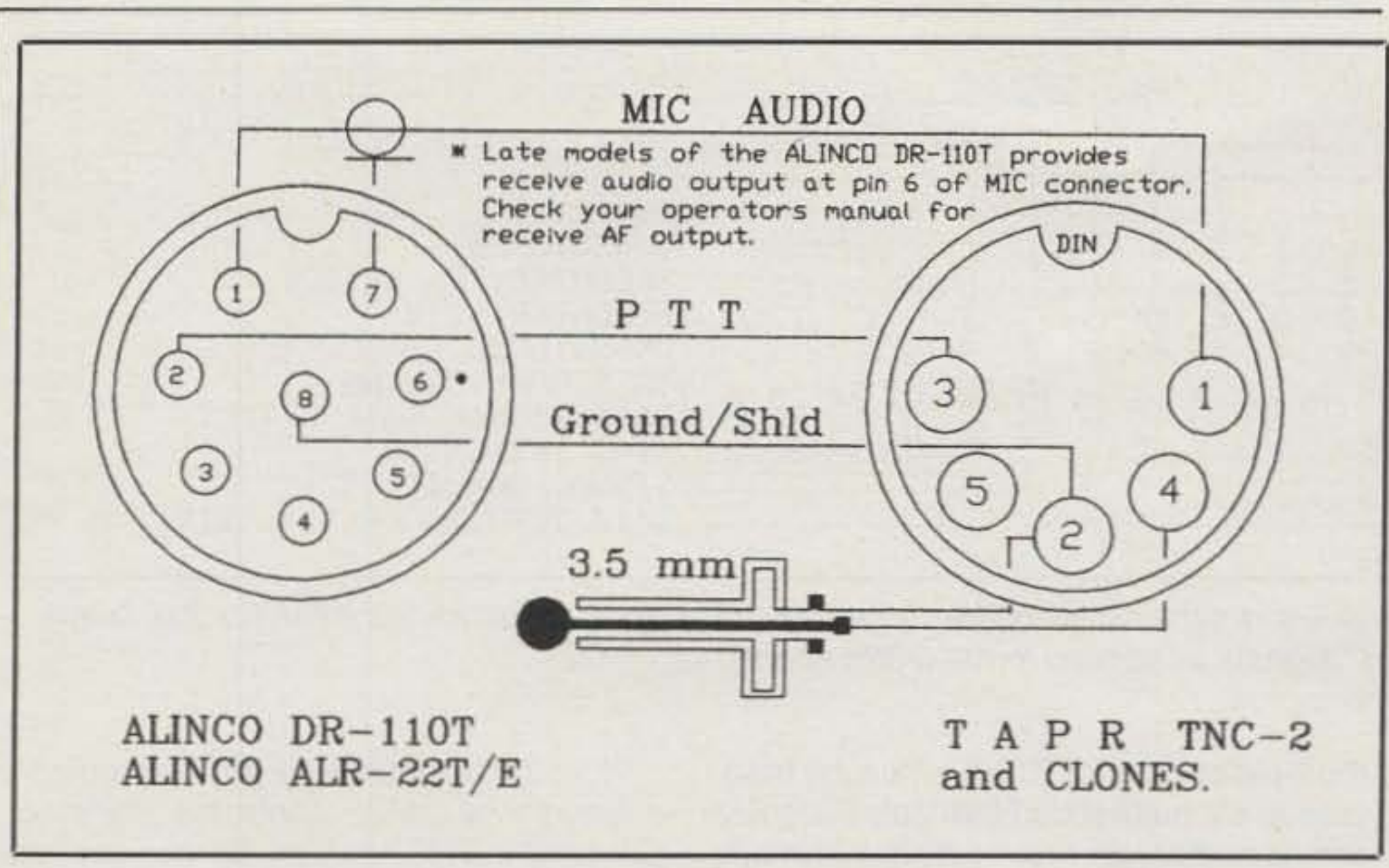


Fig. 5- Alinco DR-110T/ALR-22T-E to TAPR TNC-2 and clones.

items. They can supply connectors for both the computer and the transceivers.

Some of the popular supply houses even have the now popular 8-pin mic connector that is used with late-model amateur transceivers. The 8-pin mic connector I'm referring to could carry part number 274-025. I've outlined some of the TNC to mic input connections in fig. 2, 3, 4, and 5.

Receive audio to the TNC is normally taken from the 3.5 mm external speaker jack for the TNC receive audio. 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 floating shields with the audio input separate from the system, PTT ground.

COMPORT Communications: 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 which 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 TNC 2 and clones support both kinds of interface hardware (see fig. 6).

Let's assume you plan to interface your TNC to the standard RS-232 port. All

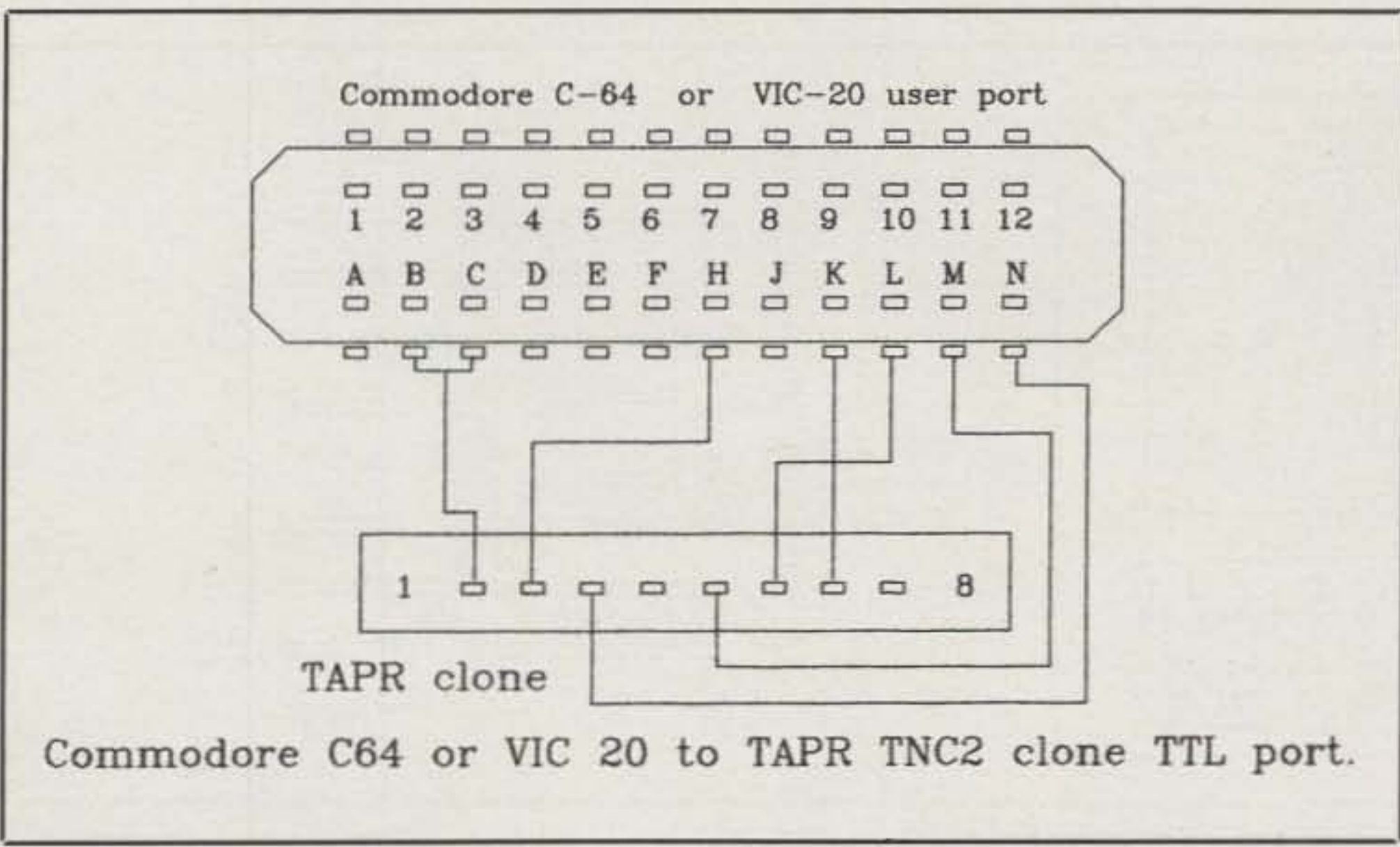


Fig. 6- Commodore C64 or VIC-20 to TAPR TNC-2 clone TTL port.

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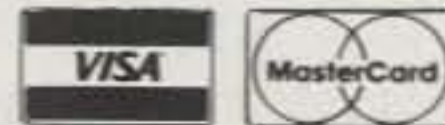
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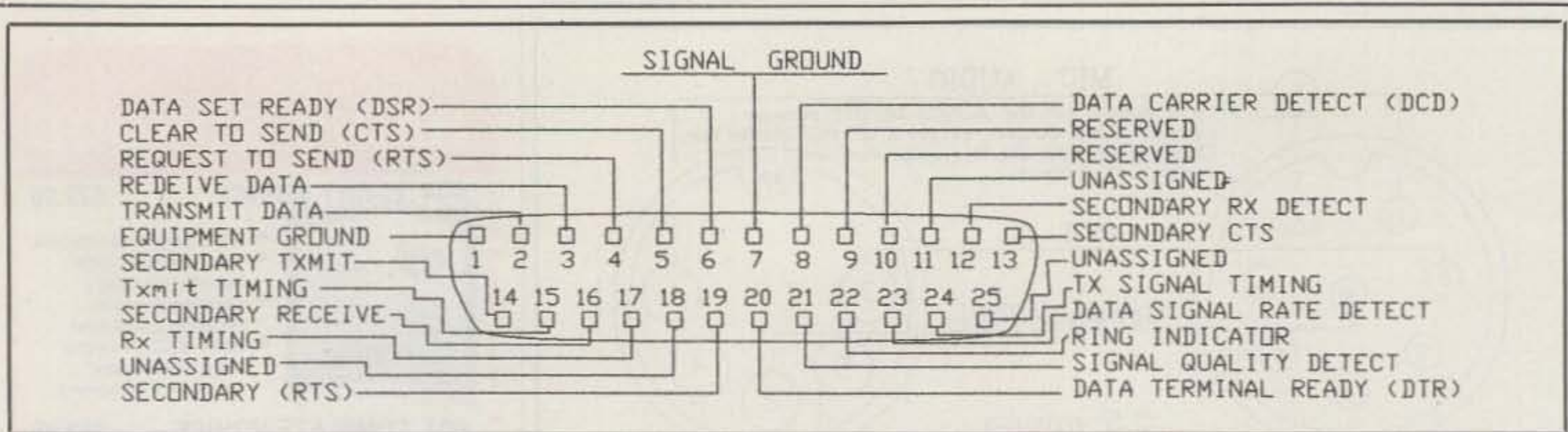


Fig. 7- The RS-232 labels are designated signals, not the name of the connector. Here we are illustrating the EIA RS-232 "standard" signals as applied to the DB25 connector.

TNCs support the RS-232 standard in one form or another. I have illustrated the EIA RS-232 standard functions in fig. 7.

Typically, we might use a ready-made cable, but this time we need to stay within the rules and build our cable with the one furnished, or use the one described in the packet controller manual. If the computer is a PC and it supports the DB-25 connector on the RS-232 COMPORT, you may consider using 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 comport connector, and above all **don't** make the mistake of plugging your TNC cable into 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 DB25.

To add some fun to our plight, some computer makers have adopted connectors of their own design, and you may soon discover that this connector is *not* easy to find. If you are an Apple or Macintosh user, you may want to review the April 1991 "Packet User's Notebook" column.

Some of the new computers are using

the 9-pin connector (DB9), since the manufacturers have found that only 5 signals are necessary in most communications applications (see fig. 8).

If all works in the manner in which the TNC instruction manual says it should, then "boot" your terminal program and set the parameters to the default parameters of the TNC. These settings should be defined in the TNC manual.

We should now be in the terminal or communications mode. Next we turn on the TNC. Some characters, which can vary from garbage to plain text, should appear on the screen.

If the first thing you see is a sign-on message and the prompt **CMD:**, you have scored high on the first call of duty. The sign-on message may resemble the following:

[Manufacturer] [Model]

Packet Controller

AX.25 Level 2 Version 2.0

Features:

Release #.#.#.# (Year, Month, Day)

32K RAM

Checksum \$##

(etc...)

If you are unable to get the sign-on message at 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 callsign by typing **MYCALL [your call]**. If you are seeing *double letters* displayed to the screen, set **ECHO OFF**.

Record the TNC configuration, and finally, recycle the system off for a few seconds then on again.

Setting The Transmit Audio Level

If you are fortunate enough to have access to an FM deviation meter, set the transmit audio level of the transceiver and TNC to 4 kHz ± .5 kHz. **Do not exceed 4.5 kHz.** You will soon discover that packet radio will work much better with 3 to 4 kHz deviation than it will with 5 kHz deviation.

TAPR TNC-2 and clones have an adjustable pot on the printed circuit board that enables fine adjustment of the transmit audio. Other TNCs have fixed output levels that are selected with various jumper

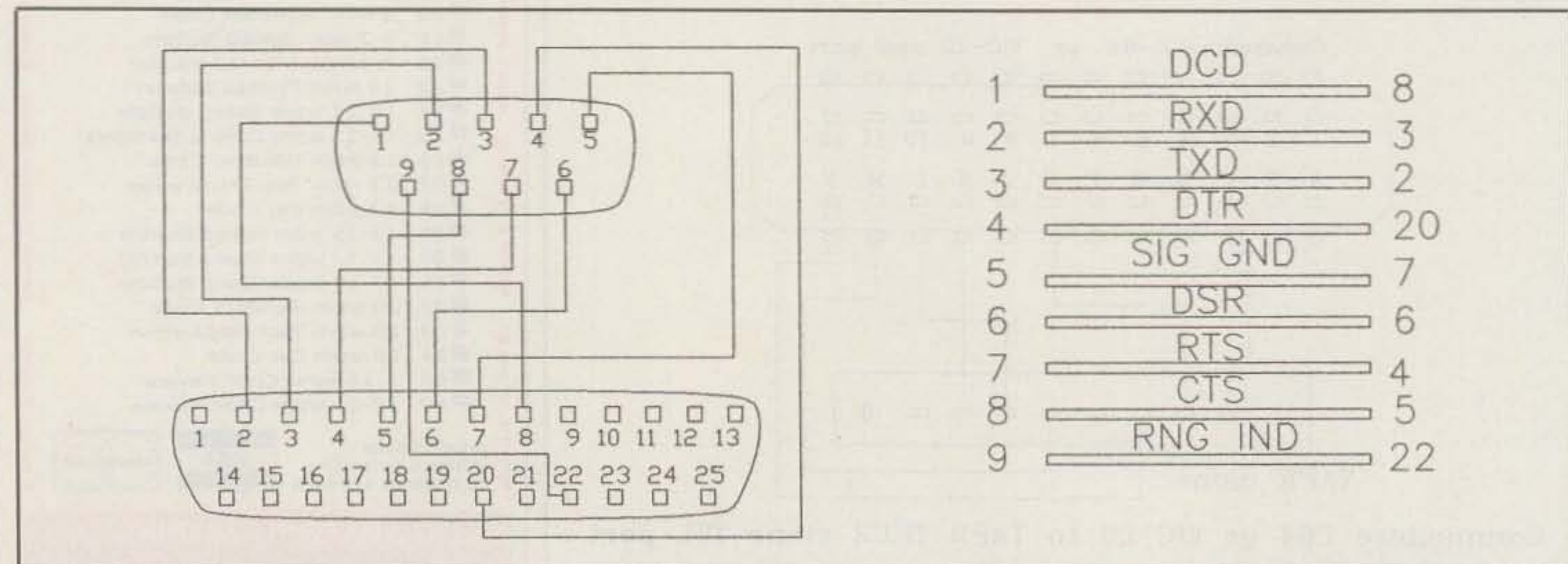


Fig. 8- Late-model compatibles are adopting the DB9 connector for the RS-232 serial comport. The illustration shown here performs as an adapter between the DB25 and the DB9 cable/connector.

positions. You may have to set the mic level control inside the rig as 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.

Setting The Receive Audio

Set the receive audio level of the radio to TNC so that incoming data is properly read, decoded, and displayed by the TNC and terminal.

To set the receive audio, open the squelch so that signals and noise are not retarded by the squelch silencing action. It may be necessary to unplug the TNC receive audio line from the **EXT SPKR** jack. Turn up the volume until you can hear the steady hiss from the speaker. Insert the **EXT SPKR** plug into the jack.

At this point the **DCD** LED on the front of the TNC should have a slight, but visible, flicker to it. If packet signals are present, the DCD LED will have a steady glow, without flicker, each time a packet is heard by the transceiver. If no glow, or flicker, is noted, then raise the volume until the DCD LED shows some activity. Most transceiver-to-TNC audio-level settings are optimum with the receive volume set near a 9 or 10 o'clock position. When you are satisfied with the setting of the volume, move the squelch control until the LED flicker is extinguished.

Do not set the squelch too tight (fully closed), or some packet signals could be lost. In addition, don't set the volume too high. Many TNCs will shut down if too much receive audio is applied to their input circuits. The DCD LEDs may glow, but the AGC circuits will cause clamping to occur inside the TNC, and no data will be decoded or displayed.

Making The First Packet Contact

It is a good idea to plan your first connect with a local packeteer who is within the coverage or range of your station. The default parameters of the TNC should be sufficient to begin operating on packet. As you become more acquainted with the configuration of the controller, and the manner in which it interacts with other stations in your area, you can set the TNC parameters to conform to those of the stations in your Local Area Network (LAN).

Determine the exact callsign of the other packeteer's station. This is necessary, since some stations use SSIDs added to their callsign. The SSID is equivalent to a unit one, two, three . . . , etc., up to a - 15. SSIDs are used mostly to identify the digital repeaters, or digipeaters.

Ascertain that you are on a packet frequency (145.010 MHz or the local packet frequency). Confirm that your transceiver

is in the "simplex" mode. Let's assume the callsign of the local packeteer is N4XZV.

Making sure the **CMD:** prompt is present on the display, issue the connect request to N4XZV in the following manner:

C N4XZV [press enter]

If N4XZV is on the same frequency and your station is connected and correctly adjusted, you should see the following message on your display:

***** CONNECTED to: N4XZV**

With both stations now "connected" to one another, each should automatically switch to the "Converse" mode. You can now freely exchange packets (typed-in messages and/or sentences) with one another.

It might be wise to note that each time you enter a line of text or a sentence, the **STA** (status) LED on the TNC will illuminate. This indicates that a data or information packet has been sent, but no **ACK**nowledgment packet has yet been received. Observe the **STA** LED, and when it is extinguished, this will indicate the packet you sent has been received by the other station. The **STA** LED will re-

main lit until the distant station returns an **ACK** packet. Use the status LED to pace your sending during the packet QSO until you have established a comfortable packet operating procedure.

Disconnecting (Signing Off)

When you've completed your session, or QSO, with the other station, you or the distant station will need to perform a "Disconnect." This is easily accomplished by returning the command mode (**CMD:**) and sending a **D** to your TNC.

To return to the command mode, hold the control (**CTRL**) key down and press the **C** key. The **CMD:** should appear on the display. Now press the **D** key and release, and then press [enter]. This sends the **DISC**connect command to your TNC. Your TNC will send the disconnect command to the target station.

In a few seconds the distant, or target, station will acknowledge with:

***** DISCONNECTED:**

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THINGS TO LEARN, PROJECTS TO BUILD, AND GEAR TO USE

Loose Filament Pins on the 3-500Z

Quite a discussion has been going on concerning loose 3-500Z filament pins and how to "cure" the problem. Unfortunately, the suggestions given cure the symptoms, but not the problem!

In brief, some amateurs have encountered loose filament pins on their 3-500Z power tubes after many hours of operation—or to put it more accurately, loose pin sleeves on the filament pins (fig. 1). This seems to be a problem common only to the amateur world, as it is virtually unknown in the realm of commercial and broadcast equipment. Why do amateurs have this problem while others do not? A good question.

In order to understand what is happening, it is helpful to look at the construction of the base structure of the 3-500Z envelope.

The 3-500Z Base Structure

The 3-500Z base is made of glass, which has a low but specific coefficient of expansion. When it is heated or cooled, tensile stresses are introduced into the material. The stresses are temporary and disappear on attainment of temperature uniformity. Glass is a good insulator and lends itself readily to forming. These factors make glass an ideal envelope for a power tube.

Connections to the internal tube elements are brought out of the glass envelope by means of glass-to-metal seals. A seal requires that the glass and metal have somewhat similar expansion coefficients and rates of expansion to prevent excessive mechanical stress from being set up in the glass envelope. The filament leads of the 3-500Z are tungsten rods of sufficient diameter to carry the filament current (14.5 amperes) without undue heating of the glass seal. Tungsten is chosen for the leads, as it has approximately the same expansion coefficient as the glass. The "feed-through" seal is made by forming a metal oxide on the tungsten surface at a high temperature. The plastic glass (also at a high temperature) is fused to the rod to form a glass oxide/metal transition area. Once the seal is made, the union is slowly brought down to room temperature.

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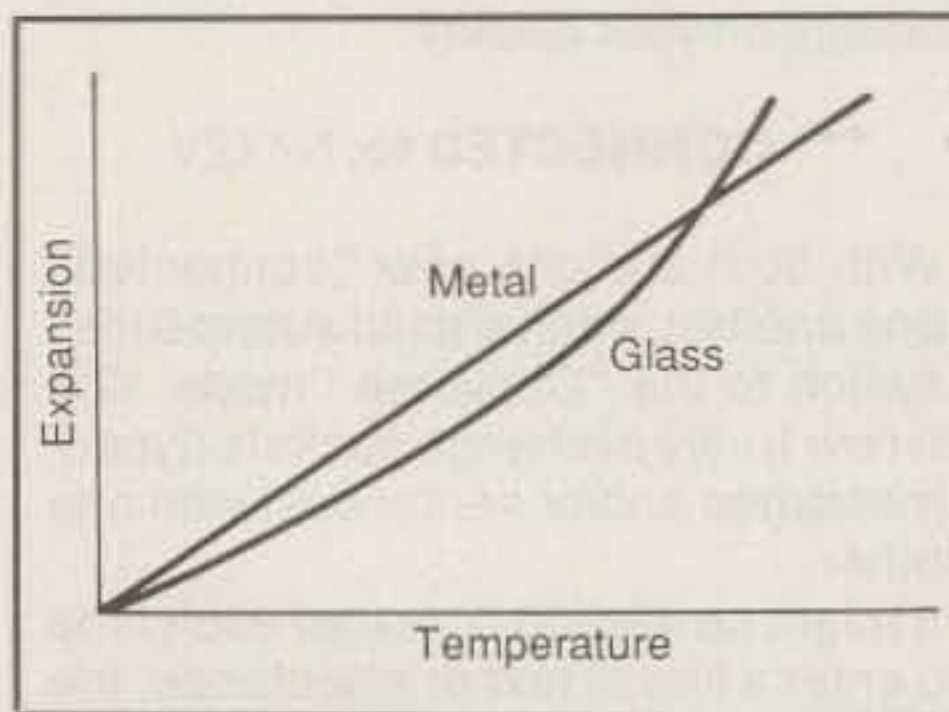


Fig. 1— Typical example of glass and metal expansion. From Roseburg, Handbook of Electron Tube and Vacuum Techniques, 1965, Addison-Wesley Publishing Co., Reading, Massachusetts.

In making a glass-to-metal seal it is important to remember that a perfect expansion match is not possible, because while the expansion of metal is a linear function of temperature, that of glass is not (fig. 2). The useful life of a seal is greatest when the seal is heated and cooled slowly and when the temperature difference between the hot and cold seal is the least. It is a good idea, therefore, to closely control the operating temperature of the seal.

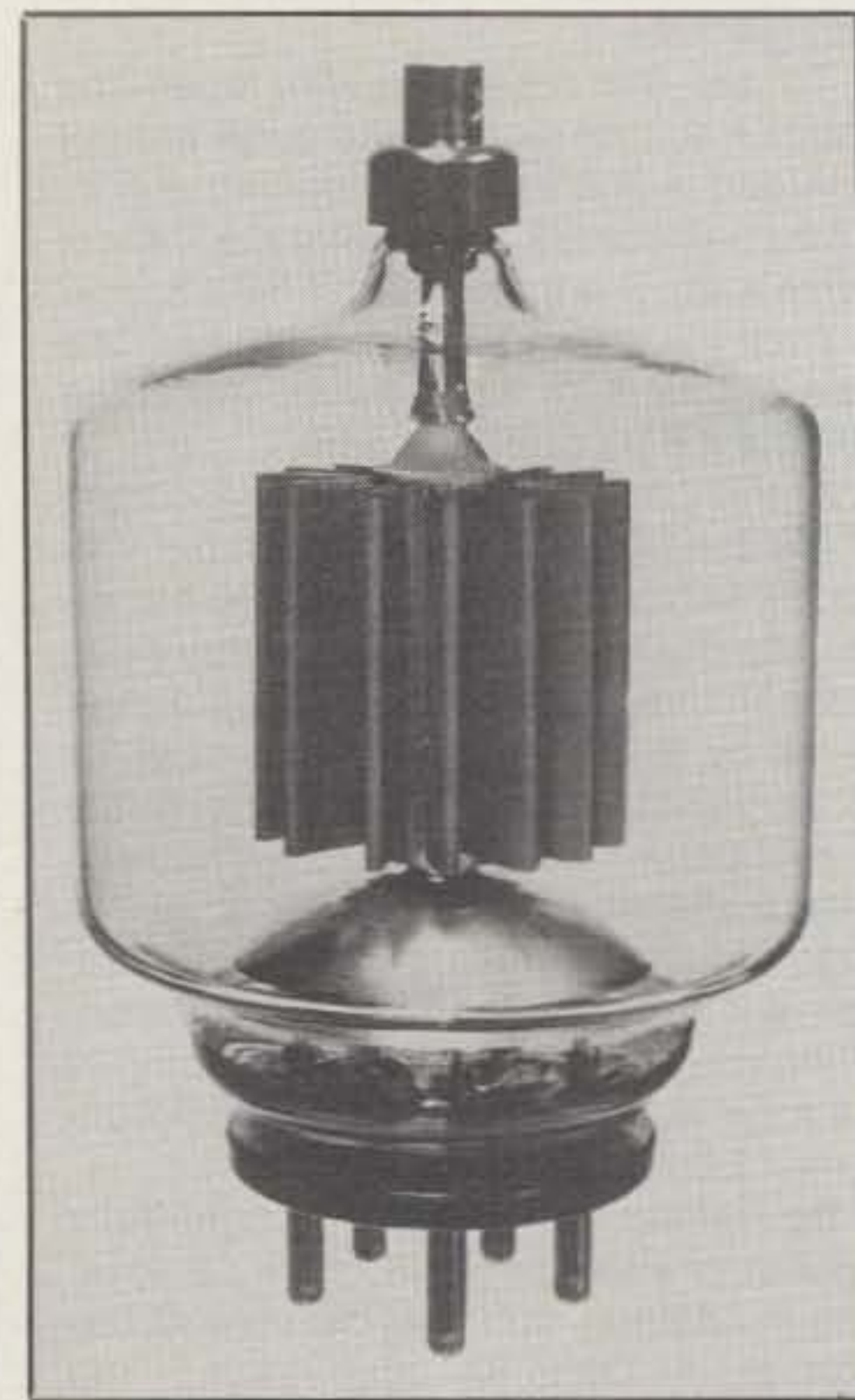
These restrictions are well-known to the tube engineer, and that is why maximum seal temperature is specified in the tube data sheet.

In the case of the 3-500Z, maximum temperature rating of the filament seals is 200 degrees Centigrade. In order to hold this limit, cooling air must be applied to the seals.

Filament Operation

For maximum filament (and seal) life of the 3-500Z, the following rules should be observed.

1. Filament voltage should be held within specified limits. A thoriated-tungsten filament operates at a temperature in the range of 1800 to 2200 degrees Kelvin (1527 to 1927 degrees Centigrade—very, very hot!). For typical amateur linear service I suggest the filament be operated near the lower limit of this range. In practical terms this means running the nominal 5 volt filament of the 3-500Z at



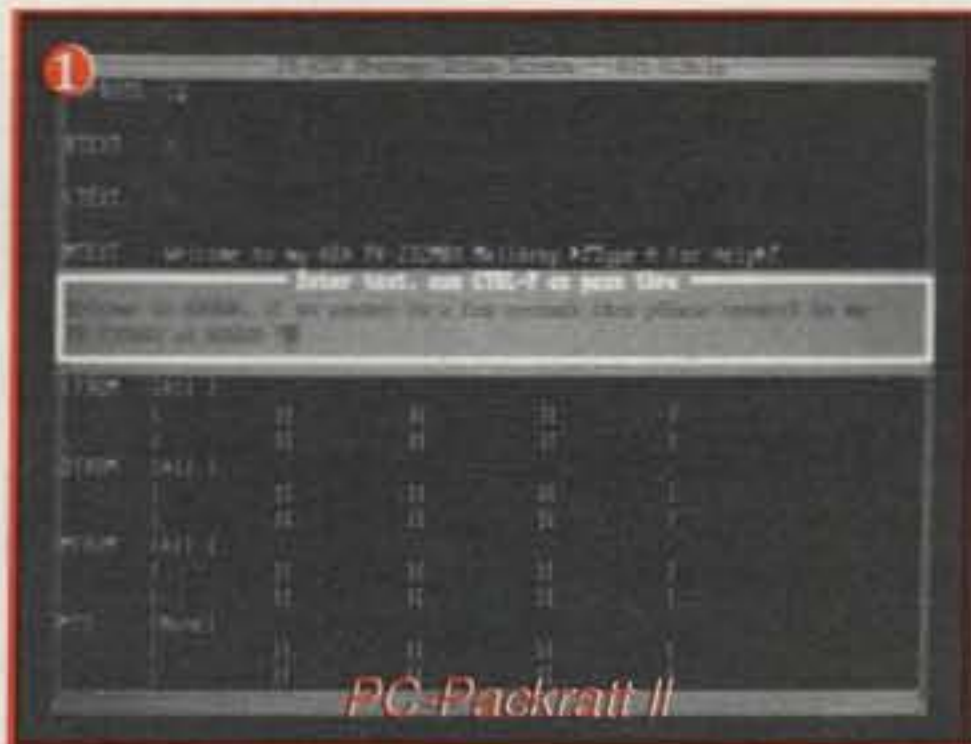
The 3-500Z power triode. Tungsten leads pass through glass-to-metal seals in bottom of envelope. Base consists of nickel-plated pins swagged into a phenolic ring. Leads are dip-soldered to pins.

about 4.9 volts. This enhances filament life and also permits the filament seals to run cooler than if the filament is run at or above the nominal voltage.

2. Electrical connection to the filament pins must be accomplished with minimum contact resistance. Any voltage drop across the contacts represents an "I-squared R" loss, which shows up as additional heating at the filament pins.

3. Sufficient cooling air must be passed across the filament pins and seals to hold pin and seal temperature below 200 degrees Centigrade. The temperature can be checked by means of temperature-sensitive paint or decals applied to the base of the tube directly at the filament seals.²

All of these requirements can be met by carefully measuring the filament voltage, using the proper tube socket, and applying an adequate amount of cooling air.



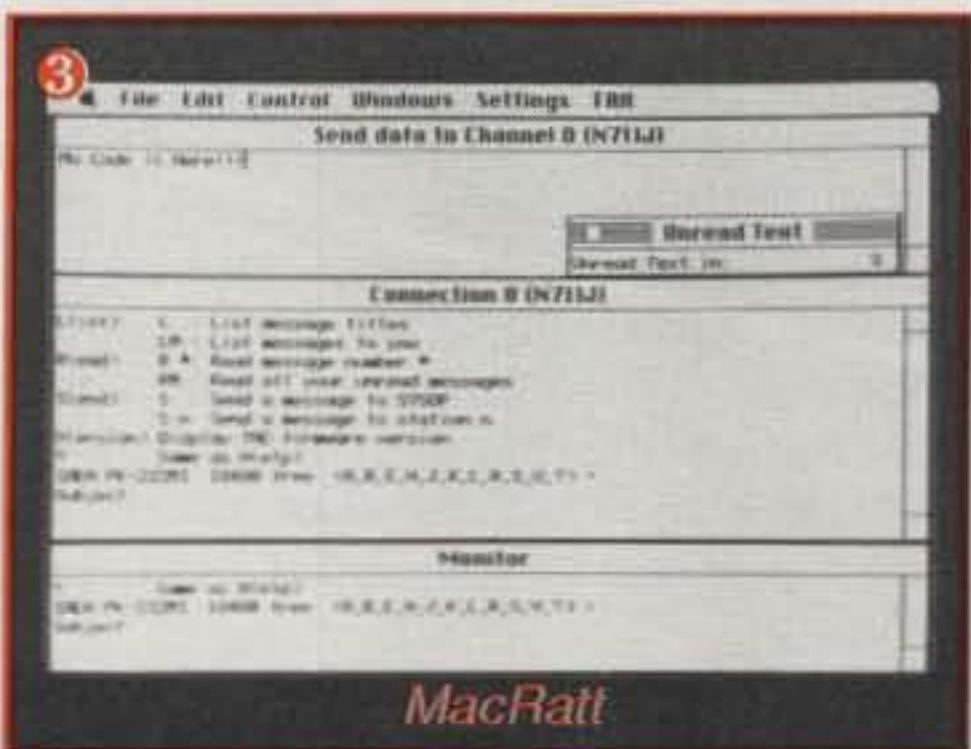
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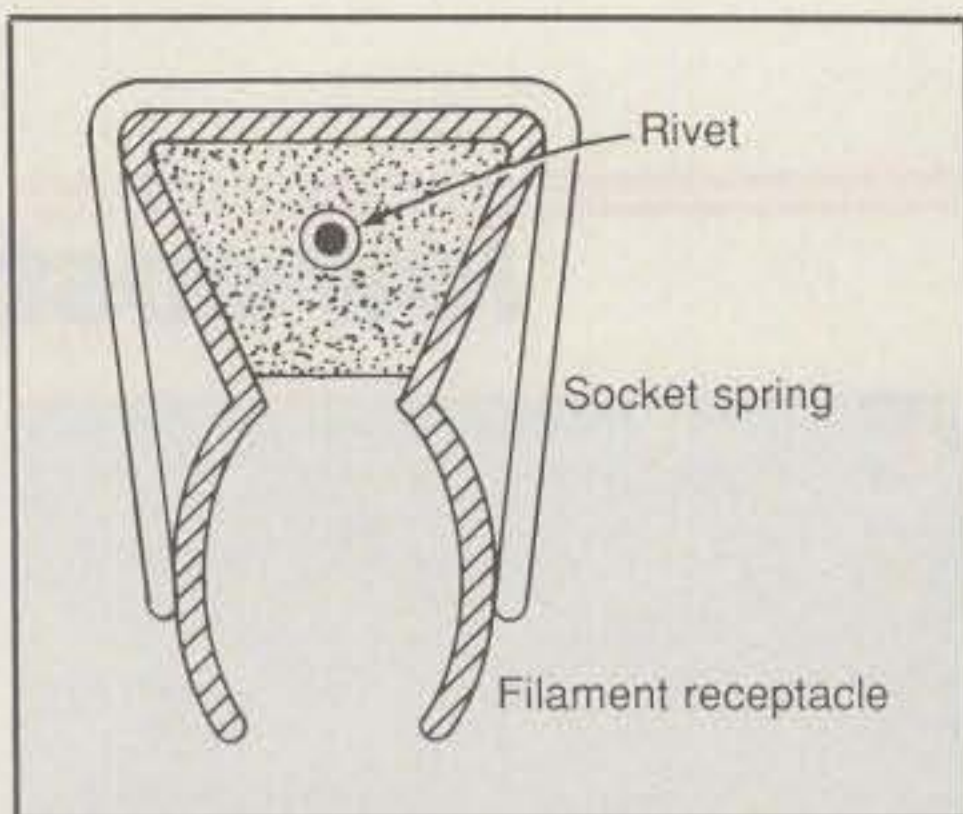


Fig. 2— Example of filament receptacles and tension spring in ceramic socket.

The EIMAC Air-System Socket

The nickel-plated brass filament sleeve is soldered to the tungsten filament rod using 60-40 solder (60 percent tin, 40 percent lead). The melting temperature of the solder is about 268 degrees Centigrade. This allows only a 68 degree margin of safety between maximum rated pin/seal temperature and the solder melting point. It is a good idea, therefore, to hold base temperature below 200 degrees, if possible. Lower seal temperatures will prolong tube life. Too much air cannot be applied; the maximum limit is reached when the tube is blown out of the socket!

A special EIMAC SK-410 Air System socket is available and recommended for the 3-500Z tube. This socket is constructed so that cooling air can be passed easily up around the tube pins, making temperature control a relatively simple matter. Unfortunately, the socket is expensive, and many home builders prefer to use a cheaper ceramic socket which inhibits air flow to the tube base. Even so, the ceramic socket can be used successfully, holding the filament seals below maximum allowable temperature, provided extra cooling air is passed through the socket holes.

Temperature Runaway

If filament pin temperature climbs much above 260 degrees, the pin solder starts to melt, first turning to a sludge and finally to a liquid. The tube can continue to operate when the solder has turned to sludge, but the resistance of the solder rises rapidly under these conditions and the "I-squared R" heating loss increases accordingly. If the solder has not turned to liquid and dropped out of the pin, it will crystallize when the tube is turned off. Only close examination of the filament pin will disclose that the solder is now "grainy" in appearance and there is a

small but measurable voltage drop between the pin sleeve and the pin.

A runaway condition now exists. Because of the change in the solder, the pin now runs hotter than normal. This means that melt-down will happen sooner rather than later. The filament pin temperature rises quickly and reaches a level that can take the temper out of the tension spring on the socket receptacle. In addition to tube damage, the socket is now slowly being destroyed. This causes additional voltage drop across the socket/tube interface. Soon the sleeve will drop off the pin and the solder will disappear into the innards of the amplifier!

Proper Cooling for the 3-500Z

The Rotary Blower. The solution is to cure the problem, not relieve the symptoms. It is possible to resolder a loose filament sleeve (exerting due caution), but the problem remains unless the base of the tube is cooled properly. It may also be necessary to replace the socket filament receptacles if they have been discolored by the excessive heat, and the socket spring, if it has lost its tension (fig. 3). But this is only a temporary fix, as filament pin temperature is not under control.

It has been my personal observation that a lot of blowers and cooling fans in ham amplifiers are marginal at best. That is, they do not supply sufficient cooling air to the tube. Operators don't like blower noise, and the temptation is to use a low-noise blower. Since moving air creates noise, the only way to reduce the noise is to use a blower which moves less air! Right? Wrong!

In a home-built two-tube amplifier with a pressurized chassis and a "squirrel cage" rotary blower, at least 26 cubic feet-per-minute (CFM) air flow at a back (static) pressure of about 0.1 inch of water is required.³ This can be accomplished by a 3 inch diameter rotary blower having a speed of 1600 RPM if EIMAC Air System sockets are used and the air path is unimpeded. A smaller diameter blower won't do the job, even at a rotational speed of 2800 RPM.

If, however, ceramic sockets are used, the air path is impeded by the socket and more blower power is required. In this case, a 3 inch diameter blower with a speed of 3100 RPM is suggested. About 11 percent more blower speed is required to do the job when the ceramic sockets are used!

In either case, the determining factor is seal temperature. Basing temperature on blower speed is tricky, as the force of the air flow may be impeded by air turbulence or restrictions in the air passage. It is a difficult task, too, to make the chassis air-tight so that the air flow passes only through the sockets and does not escape

via other miscellaneous chassis holes.

The Rotary Fan. Some amplifier builders use a rotary fan instead of a blower (fig. 4). This is satisfactory, provided the air actually reaches the filament seals. The air is blown across the socket pins and conducted up around the tube base. Small ducting plates may be placed under the amplifier to direct the air in the right direction. If the fan is big enough and properly placed, it may not be necessary to pressurize the entire chassis. A cleverly placed fan can cool both the filament and plate seals of a pair of tubes.

Under-chassis obstacles can impede an otherwise direct air flow. The old Heath SB-220 amplifier, for example, uses a rotary fan which is big enough to do the job, except a chassis flange creates turbulence in the under-chassis air flow, thus preventing the cooling air from doing an efficient job. It is possible, therefore, to overheat the filament pins in this amplifier under severe operating conditions, high filament voltage, or high outside air temperature, with resultant pin problems. When properly mounted so that air reaches the filament pins, a fan such as the "Rotron Sentinel" or "Ripley 425" is suggested for your home-built amplifier.

The operator usually finds that filament pin problems occur with only one of a pair of tubes. This indicates the tube socket is not receiving sufficient cooling air, while the other tube socket is doing okay. It may be necessary to replace the socket, or at least the socket pins, when a good 3-500Z is placed in the amplifier, or the problem will start up over again when filament seal temperature is excessive.

Extended operation in a DX contest with plenty of speech processing can make an otherwise adequate air flow suddenly become insufficient. Style of operation has a lot to do with filament pin problems.

Resolder Your Base Pins?

Some fellows have done it (see the *QST* references). If you want to try it, make sure the tube and base seal are heat-sunk from the soldering area to avoid overheating the tube seal. A non-caustic soldering paste (Kester) can be used. Rosin-core solder is effective (60-40 alloy). The trick is to do the job without overheating the tube seal!

The tungsten filament rod is carefully cleaned with emery cloth and the inside of the sleeve is cleaned by running a close-fit drill through it. Using a high-wattage soldering iron, gun, or jeweller's torch (so as to get the job done quickly), the rod is tinned. The sleeve is then slipped over the rod and quickly soldered in place. While it is still warm, the sleeve is wiped clean with a rag moistened with solvent. I have not tried this process my-

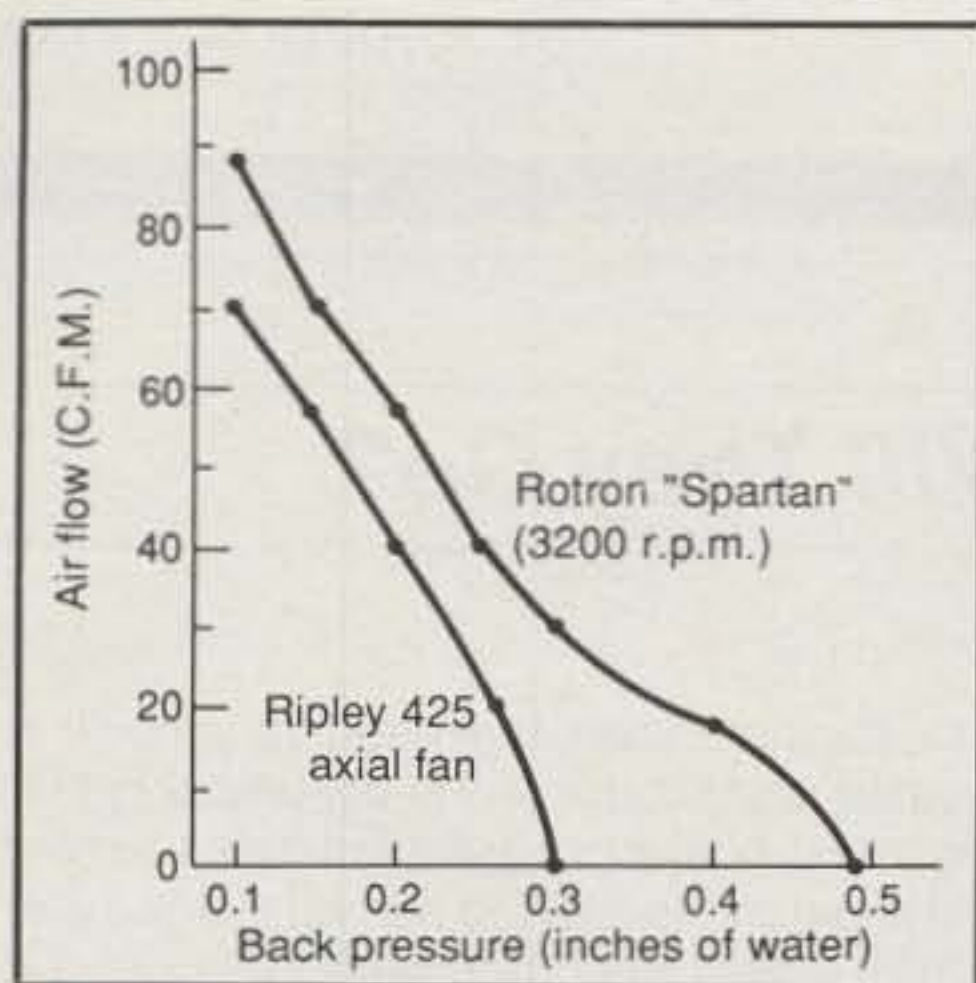


Fig. 3—Plot of small rotary (axial) fan as a function of back pressure and air flow. Rotary fan is satisfactory if air actually reaches filament pins.

self, so what I recount to you is heresay and not guaranteed in any way!

As for me, I prefer to send the tube back to the manufacturer and let him do the job under the right conditions, using the proper tools and techniques. To do this, write to Customer Service Department, Varian-EIMAC, 1678 South Pioneer Road, Salt Lake City, UT 84104 and ask for permission to return the tube for resoldering. When last I checked, this was done at no cost for licensed radio amateurs (be sure to include your callsign in your letter).

Will It Happen Again?

You bet! If a filament pin becomes unsoldered, it is a sure sign that the tube base is running hot. Contest operation or extended QSOs will build up heat in the tube base that must be removed. Resoldering the pin doesn't cure the basic problem, which is too little cooling air.

Proper base cooling is a complex problem. One doesn't just mount a surplus fan or blower of unknown characteristics in the vicinity of the tube and hope for the best. The capability of the fan or blower, the air path, and the duty-cycle of tube operation must be taken into account. In addition, if the operator lives above sea level, the air is thinner and more air must be passed over the tube to do the job. The wise amplifier builder imagines he always works in a DX contest, lives in mile-high Denver, Colorado, and builds his air system accordingly!

If you experience base heating, the logical step is to improve the air flow. Make sure that SWR meters, rotor control boxes, books, or other objects placed atop or beside the amplifier don't impede air flow. Check your filament voltage. If you suspect your blower or fan isn't big enough to do the job, install a bigger one. And don't let your buddy down the street

talk you into placing a smaller fan or blower on your amplifier in order to reduce blower noise! Buy ear-muffs instead!

What About Commercially-Built Amplifiers?

As far as I know, no equipment reviews check out the amplifier air system, or run the equipment under tough operating conditions to check tube seal heating. The use of temperature-sensitive paint or decals on the tube seals can quickly provide temperature information. I suggest that future equipment reviews cover this important subject.

I know of no particular commercially-built amplifier that has a history of socket/base overheating. The problem seems to occur in isolated cases among many brands. More investigation into this problem is required. I suspect it may not be the fault of amplifier design, although it is logical to suppose that temperature tolerance level varies from design to design, and possibly varies between individual amplifiers of the same design.

As I have said, the mode of operation and operator usage can make tube temperature vary between wide limits. If you have experienced pin problems, ask yourself these questions:

- Do I run my filament voltage at or slightly below the nominal value?
- Do I operate for long periods with a lot of speech compression?
- Do I carefully retune my amplifier for proper loading when I change bands, or frequencies within a band?
- Do I take care not to overdrive my amplifier tubes?
- Do I regularly oil my blower or fan and clean the air passages of the amplifier?
- Do I examine the socket pins at intervals for signs of overheating?
- Finally, do I know the characteristics and air-flow capability of my cooling fan or blower? Is it big enough to do the job?

Good luck and may the (air) force be with you!

The Dead Band Quiz

I'm pleased to see so much interest in these little brain teasers. Thank you for your comments. Now to catch up to date, the January quiz concerned a quote "Love to Ann, mind." This remark was made to George Smiley by Roddy Martindale in the TV-movie *Tinker, Tailor, Soldier, Spy*. Additional readers who wrote to me about it include Nels, W0PEC; Quentin, N5ROE; Ed, WB2EAV; and Alp, VE6ALP. Many thanks for your kind remarks!

The February quiz concerned the remark made by Richard Blaine (Rick) about Ilsa Lund Lazlo. The movie was *Casablanca* starring Humphrey Bogart,

Ingrid Bergman, Peter Lorre, and Paul Henried.

Lew, K4VX, wraps it all up: "During a trip to Casablanca during World War II, I was sitting in Rick's Cafe American sipping a champagne cocktail when who should walk in but Victor Lazslo and his wife, Ilsa. Although one's memory fades as time goes by, she was such an astonishing beauty that even in that gin joint I can still recall the electricity she generated walking by my table. Sam, the piano player, even missed a beat as I recall. I had hopes that would be the beginning of a beautiful friendship, but those things never work out, even in the movies!"

Congratulations, Lew!

I have rounded up the usual suspects. They are: Marvin, W2AH; Howard, KA1UOK; Dan, WA4JTI; Agnes, N4VPN; Fred, AA4NG; Arnold, W7ZT; Jim, AA4UA; and Geoff, WB5MTV. Congratulations to all!

Footnotes

1. "Hints and Kinks," *QST*, February 1991, pp. 37-38.
2. Temperature-sensitive paint and decals are made by the Tempil Division, Big Three Industrial Gas and Equipment Co., Hamilton Blvd., So. Plainfield, New Jersey 07080.
3. Ripley Type 3, Model 8453. Ripley Co., Middletown, Connecticut. Use Dayton 4C-012 (3 inch, 3340 RPM) for ceramic sockets.

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CIRCLE 122 ON READER SERVICE CARD

NEWS/VIEWS OF ON-THE-AIR COMPETITION

The Rules of Contesting—Where Will They Go?

The sport of contesting has grown continually more competitive in recent years. Not unlike the founding fathers of any sport, the originators of contesting had no idea of the extent that contests would drive a "hobby" into near professionalism in its extreme. Although some critics view this fanaticism to be detrimental to the hobby, contesting's professionals have contributed immeasurable benefits to a standard that most of us now take for granted.

As the years have passed, so have rules changed to reflect our changing environment. As you can see in fig. 1, the rules and regulations by which we judge each other have undergone substantial modifications since the first CQ WW Contest in 1948. Those amateurs implementing most of these changes have taken in-

2 Baldwin Street, Windham, NH 03087

Calendar of Events

Apr.	27-28	Swiss Helvetia Contest
May	4-5	ARI International DX Contest
May	4-5	MARAC County Hunters CW
May	11-12	"CQ M" DX Contest
May	11-12	ARI A. Volta RTTY DX Contest
May	18-19	Michigan QSO Party
May	18-19	Florida QSO Party
May	19	OMARC Spr. Midnight Spec.
May	25-26	CQ WW WPX CW Contest
June	1-2	RSGB Field Day
June	8-10	ARRL June VHF QSO Party
June	9	Portugal Day Contest
June	15-16	All Asian CW Contest
June	22-23	ARRL Field Day
July	1	Canada Day Contest
July	6-7	Venezuela SSB DX Contest
July	13-14	IARU Championship Contest
July	27-28	Venezuela SSB DX Contest
Aug.	3-4	YO DX Contest
Aug.	10-11	Worked All Europe CW
Aug.	17-18	SARTG RTTY Contest
Aug.	17-18	Maryland-D.C. QSO Party
Sept.	15-16	All Asian SSB Contest

to consideration the need to employ a basic assumption—the assumption that contest operators are essentially honest and can be trusted to submit results that truly reflect the outcome of their efforts. Fortunately, the conclusions from many years of log checking have proven this to be fundamentally true.

Nonetheless, there is one area in which contest administrators have struggled over the years: Where should the development process for contest rules draw the line in enforcing the gray areas of interpretation? Furthermore, how do we manage the incredible growth of contesting's new ally—the computer? For the most part, contest rules are fairly explicit about the standards of measurement. For example, you will always find a definition of the operating classes, exchange, scoring method, log deadline, and other black-and-white details.

I've tried this month (see fig. 2) to take a lighter look at the contest rules of the fu-

Rules For The 1948 CQ WW DX Contest

1. Contest Period: 0200 GMT October 30 to 0200 GMT November 1 for phone, and 0200 GMT November 6 to 0200 GMT November 8 for cw.

2. Bands: The contest activity will be confined to four bands: 3.5, 7, 14, and 27-28 mc amateur bands.

3. Divisions and Sections: The competition will be divided into two divisions: cw and phone. Each of these two divisions will be divided into two sections: the one-operator and more-than-one-operator section. Thus, there will be: (1) one-operator cw section, and (2) more-than-one-operator cw section; (3) one-operator phone section, and (4) more-than-one-operator phone section. Stations in each section will compete for awards only with others in the same section. Cw stations must work cw stations, and phone stations must work phone stations only; however, stations in the more-than-one-operator section of both phone and cw divisions may contact each other. Stations may enter in more than one section, but logs must be submitted for each section.

4. Equipment: There will be no limit to the number of transmitters and receivers allowed and competitors may use the maximum transmitter power permitted under the terms of their licenses.

5. Serial Numbers: CW stations will exchange serial numbers consisting of five numerals, the first three being the RST report, and the last two being their own zone number. Stations in Zones 1 through 9 will prefix their zone number with zero (01, 02, 03, etc.). Phone stations will exchange serial numbers consisting of four numerals, the first two being the readability and strength report and the last two being their own zone number. Phone stations in Zones 1 through 9 will prefix their zone number with zero (01, 02, 03, etc.).

6. Contacts: Contacts between amateur stations on different continents shall count three points; contacts between amateur stations on the same continent but not in the same country shall count one point; contacts between stations in the same country, for the purpose of obtaining zone and/or country multipliers shall be permitted but no points will be allowed for these contacts.

7. Multipliers: Two types of multipliers will be used: (1) a multiplier of 1 for each zone contacted on each band, (2) a multiplier of one for each country worked on each band.

8. Scoring: The contest score will be the sum of all contact points multiplied by the sum of the zones and country multipliers.

9. Awards: Certificates will be awarded to

section winners in each division of:

- (1) Each USA call area
- (2) Each licensing area of Canada and Australia
- (3) All other countries

Certificates will also be awarded to each operator of each winning station in the more-than-one-operator section.

10. Zones and Continents: The WAZ boundaries as defined in "CQ-DX" and in CQ, January 1947, and the recognized continental boundaries as used for WAC will determine zone and continent boundaries. The WAZ maps are reasonably accurate, but should any question arise as to the positive location of a station, the official definitions will be final. The latest official country list as published in CQ for May 1948, with any revisions announced since then, will be used to determine country multipliers. Copies of the country list are also available from the CQ Editorial Office upon receipt of a self-addressed envelope.

11. Eligibility: The contest is open to all amateurs but CQ staff members are not eligible for awards.

12. Disqualifications: Falsification of logs or illegal operation in any manner will be cause for disqualification. The decision of the judges will be final in all cases.

Figure 1—The 1948 CQ World-Wide DX Contest rules (as printed in August 1948 CQ magazine).

Announcing:

The 2001 CQ World-Wide DX Contest

Phone: October 28-29

CW: November 25-26

Starts: 00:00:00:00 GMT Saturday

Ends: 24:00:00:00 GMT Sunday

I. Objective: For amateurs around the world to contact other amateurs in as many zones and countries as possible using state-of-the-art technology to assist in score-making and accuracy.

II. Bands: All bands, 1.8 through 28 MHz. (Note: 7 MHz operation is ineligible due to recent IARU reallocation of amateur frequency band to optical transport system use.)

III. Types of Competition:

1. No Operator
2. Single Operator (single band, multiple bands, all bands)
3. Single Operator, Multi-Transmitter
4. Single Operator, Unlimited
5. Multi-Operator, Single Transmitter
6. Multi-Operator, Multi-Transmitter
7. Computer Assisted Category:
 - a) < 10 MIPS total computational support
 - b) 10-50 MIPS total computational support
 - c) 50-250 MIPS total computational support
 - d) Networked Mainframes
 - e) Mental Telepathy Assisted
8. Special Station Category
 - a) < 20 dB Total Antenna System Gain
 - b) 20-50 dB Total Antenna System Gain
 - c) > 50 dB Total Antenna System Gain
9. Special Age Groups Category
 - a) < 18 years old
 - b) > 50 years old
 - c) Can't remember how old
10. Contest Experience Category
 - a) Never operated a contest
 - b) Winner > 10 Contests
 - c) Never lost a contest
11. Contest Fame Category
 - a) Most famous operator
 - b) Living Legend
 - c) Never heard of
12. QRP
13. Team Contesting (test category pending analysis of participation level).

IIIa. Multi-Operator, Single Transmitter:

One and only one transmitter and one band permitted during the same 10 minute period. This period includes both listening or even thinking about listening times.

IIIb. Multi-Operator, Multi-Transmitter: No limit to number of transmitters but only one signal per band is permitted. Note: Frequency domain switching across individual band spectrums is not permitted.

IIIc. QRP: Power must not exceed 5 watts output. A strip tape showing power output during your operating times must be supplied with your hard-disk entry.

IV. Number Exchange: Phone—RS report plus CQ Zone (e.g., 5905). CW—RST report plus CQ Zone (e.g., 59905).

IVa. Valid QSO: In addition to the number exchange, a high-speed data stream detailing your call, name and address, and entry class is required before terminating your QSO data link between other competitors.

V. Multiplier: Two types of multipliers will be used.

1. A multiplier of (1) for each CQ Zone (total of 40).
2. A multiplier of (1) for each DXCC Country (total of 476).

Stations are eligible to work their own country for multiplier credit. Note: Entrants may not use the new DXCC "Quick-Country" program to create a new country that increases their score after the contest begins.

VI. Scoring: All stations compute their final score by multiplying total QSO points time total multipliers. Note: Use of the CT "geo-equalizer" utility is required to calculate the appropriate total QSO points for your location.

VII. Awards: Certificates will be awarded via FAX to the QTH indicated in your QSO data stream. Space does not permit the printing of the contest's comprehensive plaque program. If required, send \$49.95 for an inclusive list. Note: Current number of trophies available is 597.

VIII. Club Competition: The club must be a local group and not a national organization. Participation is limited to a 275 KM radius. A computer-generated satellite image, including club station locations, of the club territory is required to be eligible.

IX. Log Instructions: All logs must be entered on CT Version 21.00 or greater. Logs may be submitted via hard disk. However, direct data transfer to the committee's CRAY multi-processor is desirable. Contact the committee director for further information.

X. Disqualification: Violation of the operating rules of your country will be grounds for disqualification. Further discrepancies include:

1. Not signing your complete callsign at all times.
2. Not repeating the callsign of the station you are working.
3. Use of paper logs.
4. Use of power in excess of .0005% of your local legal power limit.
5. Duplicates found in any portion of your log.
6. Use of telephones, satellite, artificial intelligence techniques, or other non-human assistance to solicit contest QSOs.
7. Real-time access of foreign callsign allocations through individual country PTT databases.
8. Short-cut software logging implementations that do not verify calling station's complete callsign when operating station in autopilot mode during participant off-times.
9. Inclusion of virus or other destructive software to alter committee's log-checking capabilities after logs are submitted.

XI. Deadline: Contest entries are to be submitted no later than 60 seconds after the contest has concluded. The committee will consider extensions of no more than 15 minutes beyond this requirement for extenuating circumstances.

ture by expanding the current CQ WW rules into the 21st century. While a bit far-fetched, included in the parody are many examples of where contest rulemaking could go.

The bottom line of this discussion is simple. Do I think that crossing the unwritten ethical line is a problem for contesting today? The answer is NO! Do I think it is a subject we need to be cognizant of for ourselves and peers? Absolutely YES! The reason contesting works is that we are inherently honest in our endeavor. No set of contest rules will ever offer a solution if that basic ethic changes. Nor will we be able to completely equalize our varied circumstances of age, location, station, etc. Through all of this, the thing to remember is to have fun at what you do. When we stop having fun as contesters, there's little other reason to keep participating!

Closing Remarks

Do you have trouble staying awake during contests? I know that I certainly do. Next month I'll take a look at some techniques that might help you fight nature's demands.

As always, the deadline for the August column is June 1.

73, John, K1AR

ARI International Contest

2000Z Sat. May 4 to 2000Z Sun., May 5

This is the annual operating event sponsored by the Associazione Radioamatori Italiani. The ARI DX Contest is managed by veteran contesteer I2UIY and should offer a significant amount of activity. Stations are allowed to work each other worldwide.

Classes: Single Operator SSB or CW, Single Operator Mixed, Multi-Single Mixed and SWL Mixed.

Frequencies: 160 through 10 meters (no WARC bands) according to the IARU band plans. All stations (including single operator) must adhere to the standard 10-minute rule.

Exchange: Italians send RS(T) and province; all others send RS(T) and serial number.

Points: QSOs within your own country count only for multiplier credit. Count 1 point for QSOs within your own continent, 3 points for QSOs outside your continent, and 10 points for Italian QSOs. Stations can be worked once per band and mode (e.g., 15 CW and SSB).

Multiplier: Italian provinces (95) and DXCC countries (not I or IS0). Credit multipliers once per band.

Scoring: Final score is sum of QSO points times sum of multipliers.

Awards: A plaque will be offered to the highest scoring station in each class. In

Figure 2- Can contest rules go to this extreme?

addition, a certificate will be awarded to the top two to five placing stations as well as the leading scorers in each DXCC country. QSOs made during the contest are eligible for other existing Italian awards (CdM, WAIP, ITA, etc.). A free T-shirt will be provided to any entry working 250 Italian (for Europe) or 100 Italian (non-Europe) stations. Be sure to include your size on the summary sheet.

Logs must be mailed 30 days from the end of the contest and addressed to ARI Contest, Via Scarlatti 31, 20124 Milano, Italy.

MARAC County Hunters CW Contest

0000Z Sat., May 4 to 2400Z Sun., May 5

The Mobile Amateur Radio Awards Club is pleased to sponsor the 23rd annual County Hunters CW Contest. Mobile and fixed stations from every county in the U.S. are invited to participate. Mobiles may be worked each time they change counties and must identify by signing /M after their callsign.

Exchange: QSO number, category (mobiles), RST, county, and state for US (Province/DXCC country for others).

Scoring: Fixed station QSOs are worth 1 point. Mobiles and DX QSOs are worth 3 points. Final score is total QSO points

times the total number of U.S. counties worked.

Frequencies: 3575, 7055, 14060, 21060, 28060.

Awards: Certificates will be awarded to the winning fixed stations in each state, province, and DXCC country (1000 points minimum). Other certificates are available to the winning mobile in each state operating from 3 or more counties (10 QSOs/county minimum). Plaques will be awarded to the highest scoring mobile stations, North American fixed station, and DX station.

Completed logs, summary sheets, and county lists (required for entries with over 100 counties) must be received by June 3, 1991. Send your logs to: Jerry Burkhead, N6QA, 7525 Baltic Street, San Diego, CA 92111. Include a #10 SASE for contest results.

CQ-M DX Contest

2100Z Sat., May 11 to 2100Z Sun., May 12

This contest is a long running SSB and CW event sponsored by the Krenkel Radio Club of the USSR. Stations may only be worked once per band, regardless of mode. Amateur satellite QSOs are valid. Stations may work each other worldwide.

Classes: Single operator (all bands/single bands), Multi-Single, and SWL.

Exchange: RS(T) and serial number.

Scoring: Credit one QSO point within your continent and three points outside your continent. QSOs with your own country count for multiplier credit but no QSO points. Multipliers are derived from the Soviet R-150 list (essentially the same as DXCC minus the USSR countries). Final score is computed by multiplying total QSO points times multiplier per band.

Frequencies: All amateur bands 80-10 (excluding WARC frequencies). Avoid the bottom 5 kHz of 80/40 meters and the bottom 10 kHz of 20/15/10 meters.

The mailing deadline for logs is July 1, 1991. Logs can be sent to: CQ-M Contest Committee, Box 88, Moscow, USSR.

A.R.I. Alessandro Volta RTTY DX Contest

1200Z Sat., May 11 to 1200Z Sun., May 12

The SSB and RTTY Club of COMO and the Italian Amateur Radio Association (A.R.I.) announce the 25th A. Volta RTTY DX Contest. This event is designed to promote interest in the field of RTTY and to honor the Italian discoverer of electricity, Alessandro Volta.

Classes: Operating categories include Single operator (all bands/single bands), Multi-Single, and SWL.

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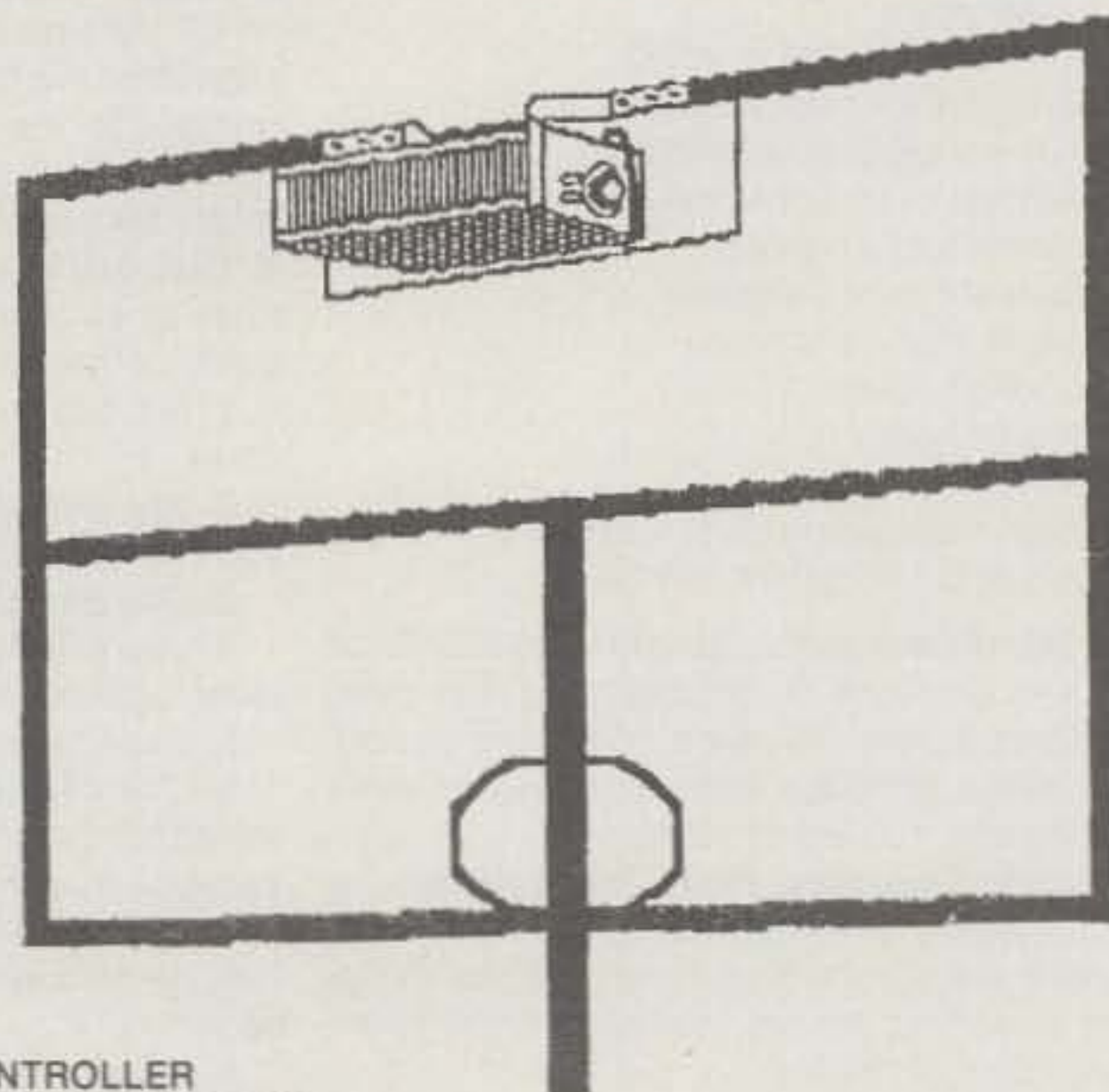
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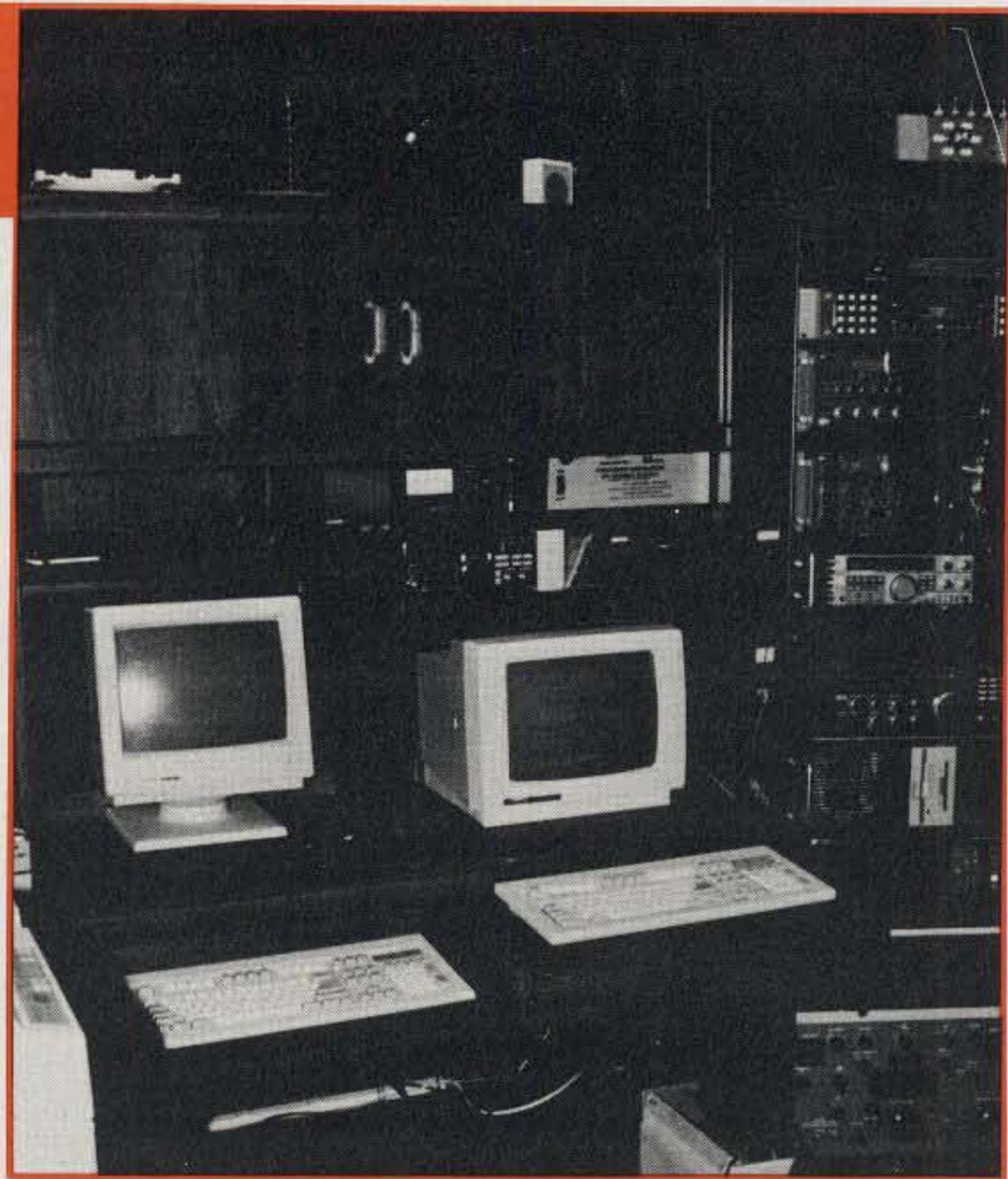
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Scoring: There is a complicated exchange points table used for calculating QSO points. Contact A.R.I. via the address below for more details. A multiplier is defined as a DXCC country. Credit one additional multiplier for every country that is worked on at least four bands. Final score is total QSO points times multiplier times total QSOs.

Frequencies: All amateur bands 160-10 (excluding WARC frequencies).

Awards: A special trophy will be awarded to the top stations in each class. Certificates with category stickers will also be made available.

The mailing deadline for logs is July 30, 1991. Logs can be sent to: Francesco Di Mechele, I2DMI, P.O. Box 55, 22063 Cantu, Italy.

Florida QSO Party

1400-1900Z Sat., May 18
0001-0500Z & 1500-2300Z Sun., May 19

This is the 25th annual Florida QSO Party sponsored by the East Pasco Amateur Society. Stations may be worked on each band and mode. Phone and CW contacts are combined and are not considered as separate contests. QSOs with Florida mobile stations are valid each time they change counties. Stations operating on county lines will be counted as only one QSO. Florida stations may work each other for QSO and multiplier credit. Stations outside of Florida may only work Florida stations.

Classes: Operating categories are broken into Class A: Those Florida stations using Field Day rules and using less than 100 watts while operating from outside their home county, and Class B: All other stations operating in Florida. Entrants may be single or multi-operator.

Exchange: Signal report and QTH (county for Florida stations; state, prov-

ince, or DXCC country for others).

Scoring: 1 point for each SSB QSO; 2 points for each CW QSO. Multiplier is total number of states, provinces, and DXCC countries (27 maximum). Class A stations multiply their final score by 1.5. Out-of-state stations count 2 points/Florida QSO. The multiplier for these entrants is total number of Florida counties worked (maximum 67). Final score is total QSOs times multiplier.

Frequencies: CW—55 kHz from bottom of band; SSB—3945, 7279, 14279, 21279, 28379, 28325, 28645 kHz.

Awards: Certificates will be awarded to high scores in each state, province, territory, and DX country. The top category scorer in each Florida county will be awarded a certificate. Four plaques will be awarded: High Single Operator Florida, High Single Operator Out-of-State, High Aggregate Club Score, and High Novice/Technician Single Operator.

The mailing deadline is June 29, 1991. Mail all entries to: Florida QSO Party Contest Committee, c/o East Pasco Amateur Society, P.O. Box 942, Dade City, FL 33526-0942. Include the usual signed summary sheet (including contest club affiliation) and a large #10 SASE for your certificate and contest results.

Michigan QSO Party

1800Z Sat., May 18 to 0300Z Sun., May 19
1100Z Sun., May 19 to 0200Z Mon., May 20

This year's Michigan QSO Party will be sponsored by the Oak Park Amateur Radio Club. As usual, stations are allowed to be worked once on each band/mode. Portables and mobiles may be counted as new contacts each time they operate from a new county.

Exchange: RS(T), QSO number, QTH (county for Michigan stations, state/country for others).

Scoring: Michigan stations—1 point/QSO times (states + countries + Michi-

gan counties). Each CW contact is 2 points/QSO. KL7/KH6 count as states and VE is considered a country. Credit 5 bonus points for each contact with the W8MB club station. Non-Michigan stations use similar scoring except multipliers/QSOs are limited to Michigan counties. Maximum multiplier is 85.

Frequencies: CW—1810, 3540, 3725, 7035, 7125, 14035, 21035, 21125, 28035, 28125, SSB/VHF—1855, 3905, 7280, 14280, 21380, 28580, 50125, 144025, 146520.

Awards: Michigan—plaques are available to the high multi-operator/single transmitter score, high Michigan (Upper Peninsula), high Michigan, high aggregate club score, and high VHF entry (minimum 100 QSOs). Certificates will be awarded to the high score in each Michigan county. Non-Michigan—high out-of-state plaques will be awarded and certificates for the high score in each state and country.

Mailing deadline for logs is July 1, 1991. Send your logs to: Mark Shaw, K8ED, 27600 Franklin Road, Apartment 516, Southfield, MI 48034. Members of the Michigan QSO Party committee are not eligible for awards. Include an SASE for a copy of the final results.

OMARC Spring 1991 Midnight Special

0300-0500Z Sun., May 19

This is only a 2 hour quickie sponsored by the Overlook Mountain Amateur Radio Club (OMARC). The intent is to devise a short but fast operating period for entrants to have some exciting contest operating. Be sure to note that the first hour of the contest is limited to 20 SSB and the second to 20 CW.

Exchange: Your name and rig (use "homebrew" as appropriate).

Scoring: Final score is total QSOs. There are no multipliers.

Club Competition: Include your club name on your summary sheet (you must be a member in good standing).

The deadline for reporting results is June 30, 1991. Send your logs, dupe sheets, summary forms to: Bob Schwenk, W2XL, 133 Clifton Avenue, Kingston, NY 12401. Final results will be published in the ARRL National Contest Journal.

CQ WPX CW Contest

0000Z May 25 to 2400Z May 26

Complete rules were in the January issue of CQ. Rules and summary/log sheets can be obtained from CQ Magazine, 76 N. Broadway, Hicksville, NY 11801. Check the current rules for the current trophy list. Results of the 1990 contest can be found elsewhere in this issue.

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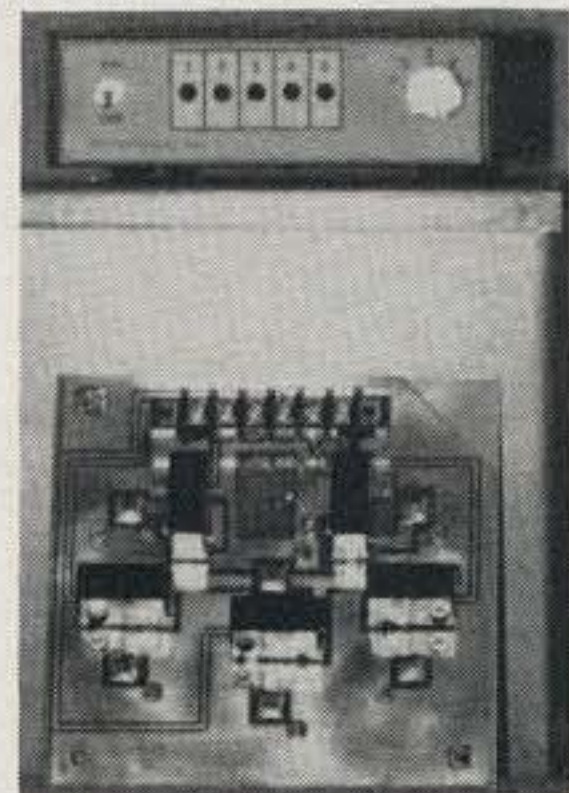
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May 1991 • CQ • 87

ANTENNAS & ACCESSORIES

A LOOK AT THE SHACK FROM BOTH ENDS OF THE COAX

BY KARL T. THURBER, JR., W8FX

From the Bookshelf

Last month it was our turn to "Swing into Spring" with some seasonal antenna thoughts and views. This month we return to some more sedentary pursuits, focusing mainly on new radio and computer books and other publications. Let's hit the books first.

From the Bookshelf

Antennas by Kraus. This comprehensive McGraw-Hill text and reference book by John D. Kraus, appropriately named *Antennas*, is into its second edition (1988). The 917-page, 18-chapter hardcover covers theory and its application to practical systems and includes design formulas, tables, and references. The book has over 1000 illustration and spans some 300 topics.

Topics covered include loop and helical antennas, dipole arrays, slots and horns, broadband and frequency-independent antennas, biconical and cylindrical antennas, antennas for special applications, and measurements, among many others. Also included are appendices covering reference tables, computer programs, books and videotapes, and problems (there are 600 worked examples and problems in the book).

Antennas is available for \$51.95 plus \$2.50 shipping from Cygnus-Quasar Books, P.O. Box 85, Powell, OH 43065. The same firm also sells Kraus's *Electromagnetics* (1984, \$52.95) and *Radio Astronomy* (1986, \$39.95).

Computer Toolkit. Frank A. Vacanti sent us a copy of his new book, *Radio Log-Master Resource and Computer Toolkit*. His belief is that he has produced not just a book in the conventional sense, but also a "toolkit"—a collection of resources, tools, and other items to help amateurs and shortwave listeners maximize their station operation. His central theme is one of radio monitoring and logging, which he covers in several different aspects, providing program listings, charts, and tips for various applications.

Some of the highlights of Frank's 8½" × 11" scrapbook-format work are BASIC program listings for database, logging, and statistical programs; methods for using a computer's wordprocessor for logging; use of various sort programs; customized logging maps and map overlays; information on tape-recorded logging; and the production of a variety of custom log sheets and log books. Also included are templates for charting frequency usage, MUF/LUF graphs, directional antenna patterns, and statistical displays and charts.

The book is available for \$12.50 plus \$2.50 handling and is available from FRANK-ART Radio Products, Dept. T, Box 12282, Boulder, CO 80303-2697.

Personalized Beam Heading List. These days it seems that many if not most HF DXers use real-time, computer-based beam headings produced by their propagation or logging program. However, many amateurs are not computer equipped, and many of these programs don't have an option to simply print out on paper the full list of customized beam headings—a form many amateurs prefer to work with when twisting their rotor dial.

Harry A. Tracy, Jr., WB5YLT, has developed a set of computer-generated Great Circle beam headings tailored for your own QTH. The list provides short- and long-path headings and distances and is based on the latest ARRL DXCC countries list. It also includes U.S. states and Canadian provinces, as well as other points of interest.

Individual personalized listings are \$5 and updates are \$3. Special club order prices also are available and include a free copy customized for the club station's location. For more information, contact Harry A. Tracy, Jr., WB5YLT, 6103 Royal Point Dr., San Antonio, TX 78239-1540.

Radio Frequency User's Guide. A new publication is offered by the National Oceanic and Atmospheric Administration. It is a handy user's guide to the 45 second WWV and WWVH Geophysical Alert Broadcasts heard at 18 and 45 minutes past each hour.

The publication's title is a mouthful: *A Radio Frequency User's Guide to the Space Environment Services Center Geophysical Alert Broadcasts*, also known as NOAA Technical Memorandum ERL SEL-80. The guide is by David A. Rosenthal, N6TST, and Joseph W. Hirman.

The *Guide* not only provides what you need to extract the considerable information that each broadcast bulletin contains, but it also can help you develop insight into what changing propagation conditions are all about. Especially useful is the *Guide's* introduction, which discusses electromagnetic radiation, geomagnetic activity, solar energetic particles, solar flux, and the A and K indices. Another section describes the specific content and interpretation of the twice-hourly broadcasts. Still another section discusses additional information sources, including the Center's free computer bulletin board (BBS). Two appendices are provided.

The 19-page *Guide* is free for the asking from the Space Environment Services Center, NOAA/ERL/SEL-R/E/SE, 325 Broadway, Boulder, CO 80303. When writing, request NOAA Technical Memorandum ERL SEL-80.

Fine Tuning's Proceedings. Fine Tuning (FT) is a nonprofit organization dedicated to supporting shortwave broadcast DXing; they've published a weekly newsletter of DX loggings since 1976. In 1986 FT set up its special publications branch to publish a number of hobby aids and DXing handbooks. Their major effort is publishing the annual *Proceedings*.

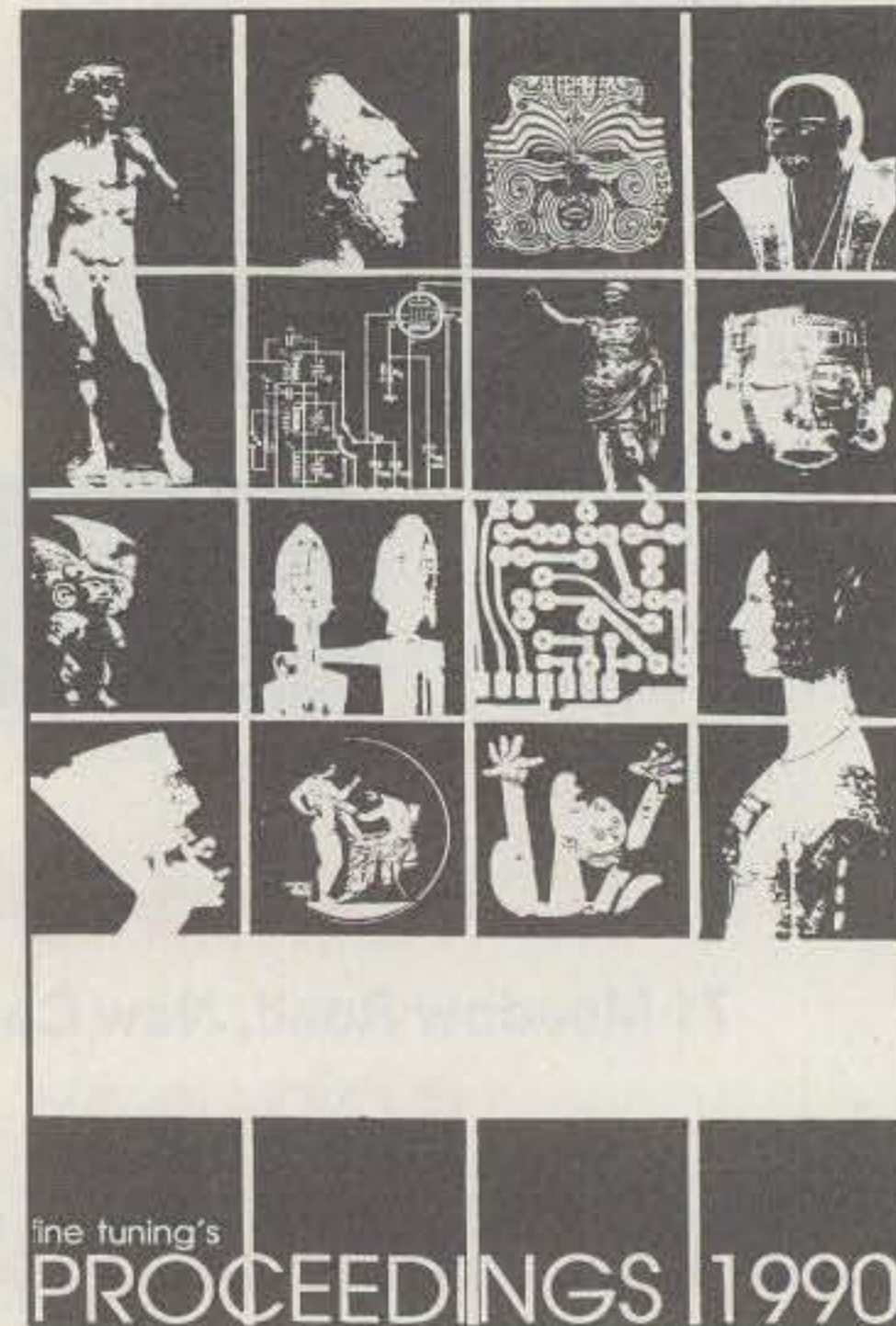


Fig. 1—Here's the cover from *Proceedings 1990*, a professionally produced compendium of shortwave DX and technical topics. It is offered by Fine Tuning, a nonprofit organization of serious radio hobbyists who specialize in shortwave broadcast DXing.

This compendium is designed to fill the need for indepth articles that neither radio club bulletins nor the commercial hobbyist press offers. Each article in *Proceedings* is designed to provide a forum for "cutting edge" ideas that may hopefully advance the radio state of the art.

Definitely a cut above most SWL-oriented compendiums we've seen, *Proceedings 1990* is modeled after the collections of scholarly articles published by professional societies; careful attention is paid to article selection and technical accuracy by a formal review panel. Each article is thoroughly edited for clarity of expression and understandability.

The 1990 collection, the third edition, has the equivalent of over 300 pages of information crammed into 200 pages of text by photo-reduction. The compendium is divided into several sections; about 50% of the material is technical in nature. Topics covered include receiver reviews, propagation, receiver modification, DXpeditions, antennas, accessories, medium-wave DXing, and more. I counted 17 major articles.

The 1990 publication is \$19.50 plus \$2.00 postage. It is available from Fine Tuning Special Publications, c/o John Bryant, RRT #5, Box 14, Stillwater, OK 74074. Fig. 1 shows this interesting publication's cover.

317 Poplar Drive, Millbrook, AL 36054

The DXer's Directory. Fred Osterman has compiled the new 1990-91 edition of *The DXer's Directory*. It is a "who's who" of more than 1800 shortwave listeners (SWLs) and DXers in 75 countries. The 88-page, 5½" x 8½" softcover contains listener entries that include address, monitor or amateur callsign, radio interests, and club affiliations—information useful in contacting other hobbyists with similar interests and for starting local DX clubs. Also included are details on over 125 radio clubs worldwide. Club listings include address, coverage, publication name, dues, and any restrictions.

The *Directory* is \$4.95 plus \$1 shipping from Universal Radio, 1280 Aida Drive, Reynoldsburg, OH 43068.

Top Secret Registry. Tom Kneitel, K2AES, has updated to the 7th Edition his popular *Top Secret Registry of U.S. Government Radio Frequencies*. Since it was first published in 1978, this federal frequency guide has become a standard reference source for scanner monitors. The 240-page book includes frequency information on about 80 agencies, including the military services. While VHF and UHF (25 to 470 MHz) are of primary interest, many 2 to 25 MHz HF frequencies also are listed. The laminated-softcover book is \$19.95 plus \$2 for book-rate shipping. For more information or a catalog of other publications, contact CRB Research Books, Inc., P.O. Box 56, Commack, NY 11725.

Communications Quarterly. When *Ham Radio* magazine ceased publication last June, it left a void in the amateur radio press among those seeking a technical challenge in delving into state-of-the-art communications and technical concepts. The folks at CQ Communications are trying to plug the gap with the introduction of a new publication, *Communications Quarterly*, edited by old-hand *Ham Radio* staffers J. Craig Clark, Jr., NX1G, and Terry Northup, KA1STC. The new publication contains about 100 pages of technical material, and advertising is limited. Its format is designed to push the technical envelope to the limit and allow the indepth exploration of areas that no amateur radio magazine currently is covering. Special emphasis is on digital techniques, high-speed data communications, computer-based antenna design, and the like.

An annual subscription (4 issues) is \$29.95 and is available from *Communications Quarterly*, Main Street, Greenville, NH 03048.

Three from Osborne McGraw-Hill. We're impressed with the high quality and interesting character of the computer books coming from this publisher. Following an increasingly popular trend, the publisher has issued several thick "how to" treatises sold as combination book and software packages. In last August's issue, for example, we described *Dvorak's Guide to PC Telecommunications* by John C. Dvorak and Nick Annis, an excellent and hefty 1136-page, 2-disk, \$49.95 opus.

Recognizing that perhaps not everyone is in need of the accompanying software, Osborne McGraw-Hill has issued a trimmed down, no-disk version, *Dvorak's Guide to Desktop Telecommunications*. While there's no software in the package, you can still learn just about everything you need to successfully go online. The authors provide complete coverage of commercial services such as CompuServe and bulletin boards. The authors also discuss how modems work and how to best use them, and they review the most popular telecommu-



Here is the Palomar Engineers PT-340 Tuner-Tuner. It derives its name from the fact that the device allows you to "tune your tuner" without actually transmitting and causing unnecessary QRM. The Tuner-Tuner covers 1.7 to 30 MHz. (Photo courtesy Palomar Engineers)

nications packages and online services. The 778-page book is priced at \$34.95.

Another new package I'm enthusiastic about is the *Complete Hard Disk Handbook*. This book/disk package includes two 5.25 inch disks that contain many excellent tutorials, software tools, and utilities for hard-disk users. The book also includes many coupons with special offers, some of which are free or nearly so.

Written by Alfred Glossbrenner, well-known computer expert and author, and programmer Nick Anis, the 787-page book is a comprehensive reference and guide to selecting, buying, and installing a hard disk; using the disk with maximum efficiency; restoration and recovery procedures; formatting techniques; and networking. The package is \$39.95; with the included software, it's a bargain at the price.

A third Osborne McGraw-Hill computer book/disk package from the same publisher is intriguingly named *Dr. File Finder's Guide to Shareware*, authored by Michael Callahan and Nick Anis. The book is all about shareware. It attempts to cover every facet of shareware, from interviews with prominent shareware developers to explanations, reviews, and discussions of the best programs in selected categories, including communications, utilities, communications, databases, games, wordprocessing, business, and more. The book also contains helpful information on operating online with commercial services and bulletin boards, including some so-called "techno-hints from the doctor's black bag." Stacking up at a whopping 1019 pages, *Dr. File Finder* makes for good reading, although it's in need of better organization. Also, in my opinion, the supplied disk of software programs and the two additional disks you can obtain free by sending in a coupon were somewhat disappointing. It's \$39.95.

These books should be available from major booksellers, or contact Osborne McGraw-Hill, 2600 Tenth St., Berkeley, CA 94710.

Antenna Notes

Navy Special Antennas. From Wales, Tony Allen, GW4YY, offers a series of what he calls "Navy Special" tri-band mobile whips. The Model A whip is for use on 40, 30, and 20 meters, while the Model B is for 17, 15, and 12 meters; the two versions are identical in size, being 47 inches in overall length. Installation can

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↑ ↓ ← →	Rotate
Home End	Shift X
Ins Del	Shift Y
PgUp PgDn	Shift Z
+ -	Scale
X Y Z	Sight Axis
W	Sight Wire
Q	Quick Spin
S	Save View
Space	Viewpoint
F10	Print
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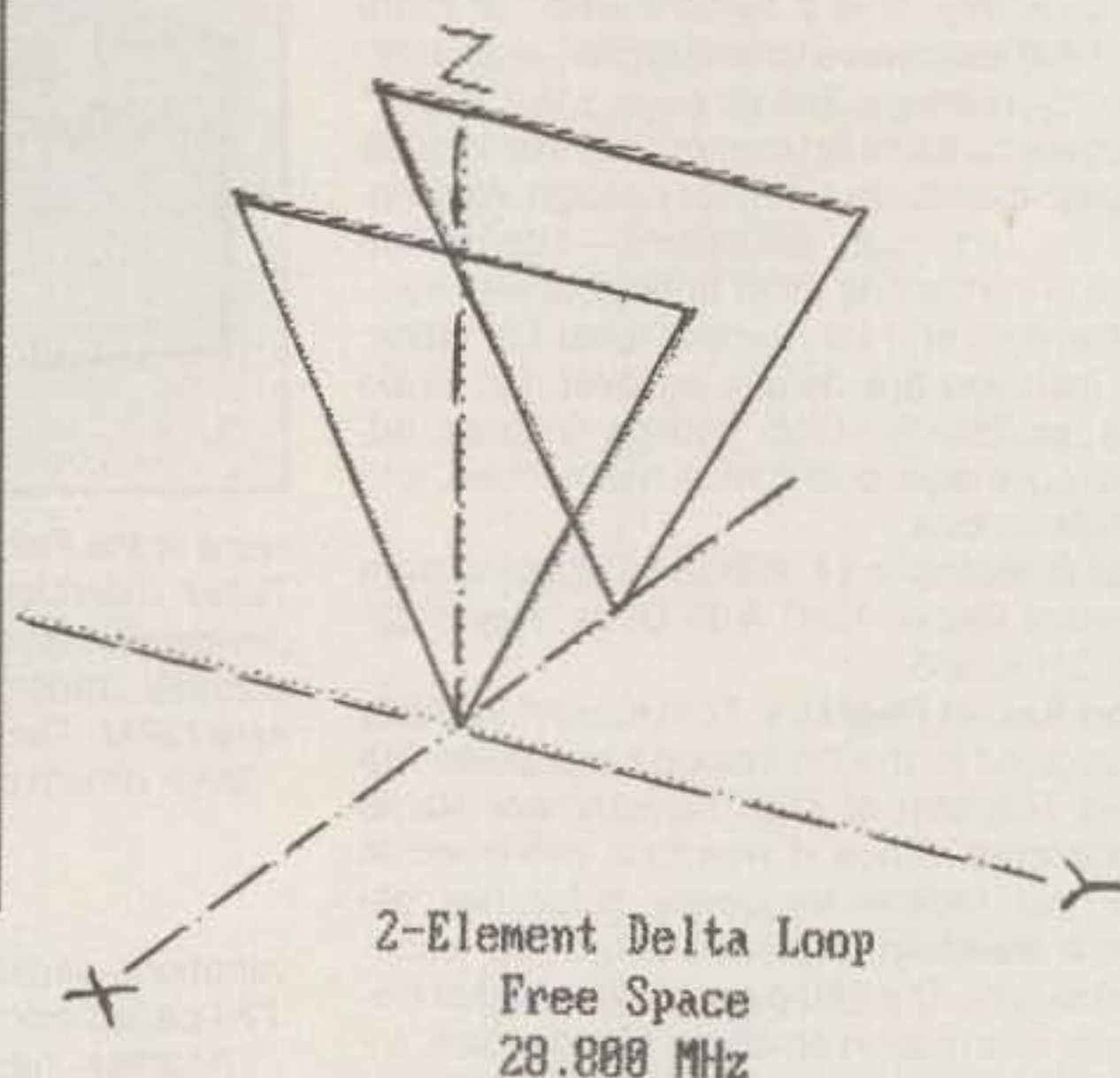


Fig. 2- Shown here is a three-dimensional view of a two-element Delta Loop produced by Lew McCoy, W1ICP, using MN 3.5. When the file is run and plotted, it is also possible to view the relative current amplitudes visually.

be via any of the usual methods, such as gutter mount, trunk lid, or roof magnet. Connection is direct to coax using an SO-239 connector, and no springs or guys are used. Use of an antenna tuning unit is required.

For more information, contact Navy Special Co., 73 Crogen, Chirk, Clwyd, Wales, United Kingdom.

Palomar Tuner-Tuner. An interesting product from Palomar Engineers is their PT-340 Tuner-Tuner, especially designed for those who seek to avoid polluting the airwaves when tuning up their rigs and adjusting their antenna tuners.

The Tuner-Tuner is an active RF device that literally tunes your antenna tuner. In practice, you connect the device between your rig and the tuner. You then tune the receiver to the frequency on which you want to operate and turn on the Tuner-Tuner. You'll hear a loud S9-plus noise when you do. Adjust the tuner until the noise drops out completely; tune off the device and you're ready to transmit with an SWR that should approach 1:1. The device must be switched off before transmitting, but is fuse-protected if you forget to do so.

For more details, contact Palomar Engineers, 1924-F West Mission Road, Escondido, CA 92029.

Rutland Arrays. We've mentioned Rutland Arrays several times previously in the column. Their mainstays are high-performance VHF and UHF Yagis for 144 to 450 MHz.

Recently the firm expanded its product line to include K3IPW-based 10 and 50 MHz arrays. These include the RA4-50, a four-element design for 50 MHz; the RA7-50, seven elements on 50 MHz; and the RA5-281, a full-band five-element array for 10 meters. Claimed forward gain on the three new antennas is 8.25, 10.5, and 8 dBd, respectively.

For more details and pricing, contact Rutland Arrays, 1703 Warren Street, New Cumberland, PA 17070.

Software Topix

MN Notes de W1ICP. We've discussed Brian Beezley, K6STI's excellent antenna analysis software in several previous columns (September 1988, June and August 1989, and April 1990). We also summarized the array of analysis programs he offers last month.

To briefly recap, the \$85 MN is a fast and powerful, MININEC-based program. It displays three-dimensional views of antenna geometry and wire currents, does sophisticated polar and rectangular plots, calculates near-fields for TVI and RF hazard analysis and far-fields for repeater coverage, does current feed for phased arrays, has automatic frequency sweep, and provides simple definition of feeds and loads, to name but a few features.

We've not done a hands-on analysis of MN 3.5, but colleague Lew McCoy, W1ICP, CQ's Technical Representative, has done so. Rather than duplicate his observations, he asked me to share some of his thoughts on MN with my readers, and I'm happy to do so.

Lew notes that Brian, K6STI, has added several new features to his already popular program, the primary feature being a three-dimensional view of the antenna file. Fig. 2 illustrates this feature showing a two-element Delta Loop. For those familiar with MN, note that the X, Y, and Z axes are shown so that it becomes quite simple to correct a file if an error occurs in placing the wires in a program.

Also, the maximum number of pulses has been increased to 127 from the earlier versions. In addition, a special analysis mode is available for symmetrical free-space antennas. Up to 254 pulses may be used in this mode, and the analysis runs up to three times faster than in earlier versions. This permits the practical modeling of complex antennas, such as quads.

While Lew finds that MN is very good, it's not

perfect. Lew observes, "One drawback that I found in MN is simply that it is copy protected by a 'transfer key.' I happen to use two IBM computers, one in my office and another in the station, so I have to transfer the program back and forth. I consider this a waste of time. As it happened, I had a power outage and lost my hard-disk contents. Even though I back up daily, when I tried to restore MN, it wouldn't restore because the transfer key was lost. To say this is frustrating is putting it mildly. . . . I realize that software writers wish to protect their software, but I believe strongly that in a product review a potential user should be warned of the problems he may encounter."

For more information on MN, contact Brian Beezley, K6STI, 507 1/2 Taylor, Vista, CA 92084.

QEdit Advanced and QEdit TSR. We recently were exposed to QEdit V2.1 and were very impressed with its host of features. We were even more impressed when we saw that QEdit is now available in a RAM resident TSR version, QEdit TSR, that you can pop up over most programs. Upon our request, Bobbi Mitchell at SemWare™ sent us evaluation copies of both software packages.

QEdit is one of the most advanced, full-featured text editors for entering simple documents, letters, and program code. Its pop-down style menus make editing quick and simple, the help screen can easily be modified, and the keyboard is completely reconfigurable. You can assign QEdit commands to almost any key, or you can set up the keyboard to look like the editor or wordprocessor with which you're already familiar. The program is quite fast in all its functions, including loading and saving files, scrolling, searching and replacing, and block operations.

If you're a programmer, QEdit has number of specialized features that make programming less frustrating. These encompass locating matching braces and parentheses, auto-

matic indentation for "C" language programming, and the ability to execute command line compilers from within QEdit. Other features include shelling to DOS, complete color and keyboard configuration, editing of dozens of files simultaneously, opening up to eight windows, recovery of deleted text, macro capability with keyboard recording, ability to import files and export blocks, and much more. The Advanced version allows swapping to disk or expanded memory on DOS/shell commands and occupies less than 50K of disk space. It's priced at \$54.95.

QEdit TSR is an even neater program. It's a separate memory resident version of QEdit Advanced that contains all of its features. It resides in the background until you call it up with a single keystroke, without having to exit the application you're working in—an extremely useful feature, to say the least.

The memory resident version uses a unique swapping feature to give you the benefits of a TSR without draining precious memory. The program can use less than 10K of conventional memory, and when popped up swaps your current application out of memory and into extended or expanded memory, or to disk. This feature lets you edit files up to 400K in size. QEdit TSR is \$99 and includes a copy of QEdit Advanced. Special upgrade pricing is available to registered users.

For more information, contact Sem-Ware, 4343 Shallowford Rd., Suite C-3, Marietta, GA 30062-5003. Fig. 3 shows the QEdit TSR main menu.

Short Bursts

Revisiting Murphy's Laws. We still hold onto a highly entertaining printed sheet containing various versions of Murphy's Laws that was

File	Description
QTSR.EXE	The TSR version of QEdit Advanced. This is the only file required to run QEdit TSR.
QTCONFIG.EXE	The QEdit TSR configuration program.
QTCONFIG.DAT	The default Keyboard Definition File for QEdit TSR.

Fig. 3— Here is the Main Menu of QEdit TSR, overlaid on a file being viewed. The new program is a slick RAM-resident Terminate-and-Stay-Resident (TSR) version of QEdit, one of the top file editors currently available for the IBM PC. The two programs are essentially identical in function.

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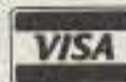
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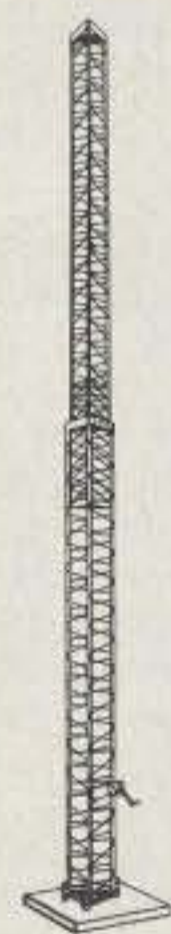
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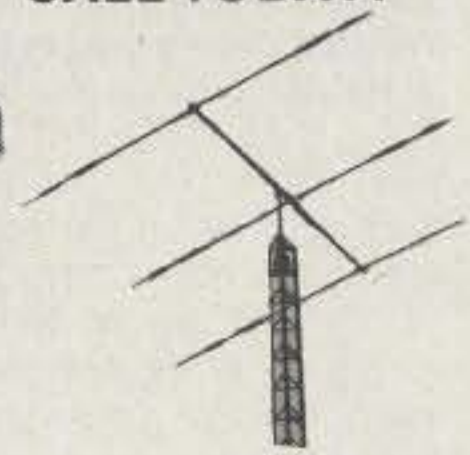
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CIRCLE 37 ON READER SERVICE CARD

packed in with a QSL card order from Wayne and Lois Carroll ("QSLs by W4MPY") several years ago. One of the most amusing versions is Murphy's Engineering Laws, a baker's dozen of which we've modified slightly and share with you here.

1. Always draw your curves, then plot your reading.
 2. Do not believe in miracles. Rely on them.
 3. Firmness of delivery dates is inversely proportional to the tightness of the schedule.
 4. Dimensions will always be expressed in the least usable term. Velocity, for example, will be expressed in furlongs per fortnight.
 5. Any wire cut to length will be too short.
 6. Tolerances will accumulate unidirectionally toward maximum difficulty to assemble.
 7. A failsafe circuit will destroy others.
 8. A transistor protected by a fast-acting fuse will protect the fuse by blowing first.
 9. Any error in any calculation will be in the direction of most harm.
 10. If a safety factor is set through service experience at an ultimate value, an ingenious idiot will promptly calculate a method to exceed said safety factor.
 11. In specifications, Murphy's Law supersedes Ohm's.
 12. Given any problem containing "n" equations, there will always be "n plus 1" unknowns.
 13. Any sufficient advanced technology is indistinguishable from magic.
- If the engineering set of laws doesn't send you, there's always Murphy's Basic Laws, his

Computer Programming Laws, and his Business Laws. The Business Laws seem to fit both small and large businesses equally well:

1. If more than one person is responsible for a miscalculation, no one will be at fault.
2. The organization of any business is very much like a septic tank—the really big chunks always rise to the top.
3. The man who can smile when things go wrong has thought of someone he can blame it on.
4. "N plus 1" trivial tasks are expected to be accomplished in the same time as "n" tasks.
5. "N plus 1" trivial tasks take twice as long as "n" trivial tasks.
6. Nothing is impossible for the man who doesn't have to do it himself.
7. The sum of the intelligence of a company is a constant, especially when the company is growing.

Good grief, Wayne, where did you get all these "laws" from?

Eliminating CATV RFI. When cable TV became popular, many amateurs thought that its advent would mean the demise of television interference (TVI), with the shielded cable bringing in nice, strong, interference-proof signals. As we now know, things haven't quite worked out that way.

Writing in the June 1990 issue of "Zero Beat," the Montgomery (AL) Amateur Radio Club newsletter, Fred Springall, KB4EGH, offered some helpful tips for eliminating Cable TV RF Interference (CATVI). We'll summarize them here.

To start off, make sure that your own gear is in good condition, properly tuned, and connected to a good ground. Also ensure that all of the F-type connectors on the CATV cable are crimped properly and screwed down securely. Check that the CATV ground block is connected to a good ground, one that is as close as possible to the TV set. See to it that all splitters and couplers are shielded and that the coax itself isn't damaged.

If you're experiencing CATVI, take the converter box out of the circuit and connect the coax directly to the TV set to make sure that the converter isn't causing the problem. Also check the cable running from the converter to the TV. Try swapping the 300/75 ohm matching transformer, or use the built-in F-connector found on most console TVs, making sure that any jumpers on the set are in the correct place.

You also can try disconnecting all antennas and the cable to see if you have a picture and sound on a local "off the air" station. If you get good reception, the set itself may be admitting RFI through its lack of shielding.

If all else fails, enlist the assistance of your cable company; they can and frequently do have problems with their systems. Some of these problems include damaged hardline coax, loose F connectors on the drop to your house or on taps or amplifiers, a bad coax drop or wiring within the house, or even a line amplifier running with too much gain.

Keep in mind that any place that allows CATV signals to escape will also allow signals (RFI) to enter. All CATV systems are required by the FCC to hold leakage to certain minimums. Systems that the FCC finds in violation of its standards can be fined or otherwise disciplined. Thanks, Fred, for these useful tips.

A Note About Lightning. Is lightning the same everywhere? The answer to this question is no, according to Richard Orville. He is an atmospheric scientist at the Albany campus of the State University of New York who used a satellite network of detectors to analyze lightning along the east coast in 1988. His study results were reported or reprinted in several publications, including *Nature* magazine, the "Horizons" newsletter from Best Power Technology, and *73 Amateur Radio Today*.

In his study of some five million lightning strikes, he found that in New England, lightning bolts averaged a "mere" 25,000 amperes, whereas in Florida the average current was a whopping 45,000 amperes. By comparison, the typical home has a 200 ampere service to run everything in the house! The report names Tampa, Florida as the "lightning capital of the world." The US Weather Service reports that storms produce an almost unbelievable average of 1300 strikes a day during the summer thunderstorm season.

So while you can't do much about lightning and the punch it packs, learn something of its properties and how to protect yourself and your equipment from its destructive potential.

Wrapping It Up

We could go on for several pages more, but that's all the space in *CQ* that we can take up this month, gang. Next time more Antennas & Accessories topics of interest. See you then.

Overheard: Don't talk about your good intentions. Instead, carry them out and others will do the talking.

73, Karl, W8FX

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Base plates, flat roof mounts, hinged bases, hinged sections, etc., are not intended to support the weight of a single man. Accidents have occurred because individuals assume situations are safe when they are not.

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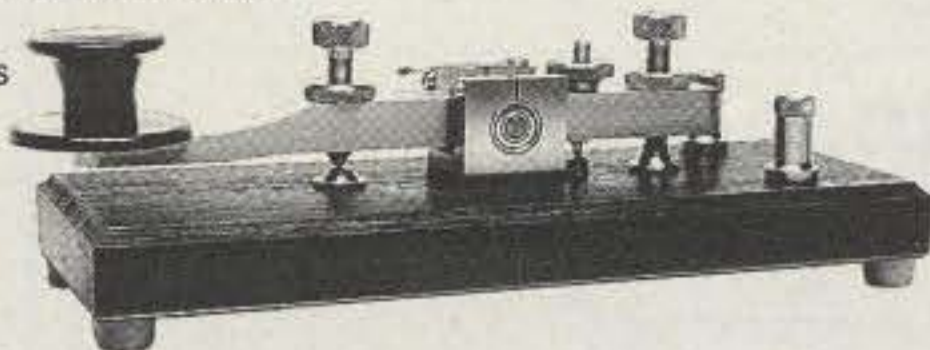
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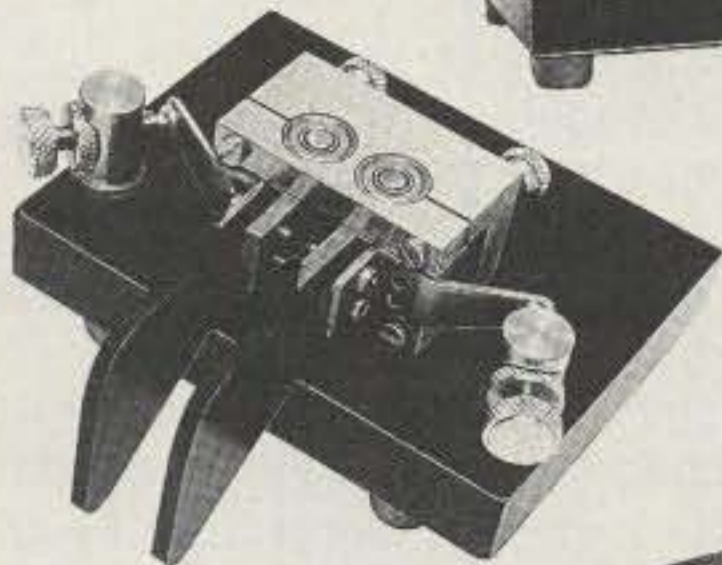
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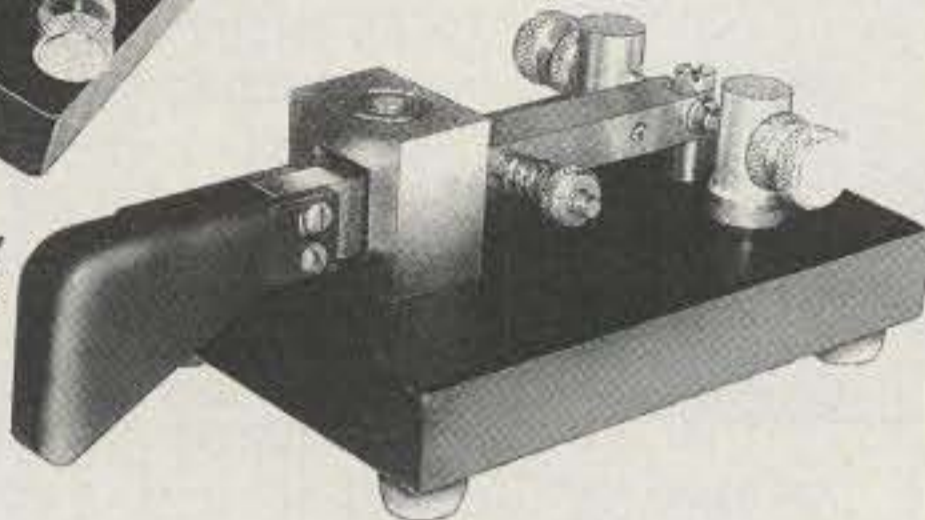
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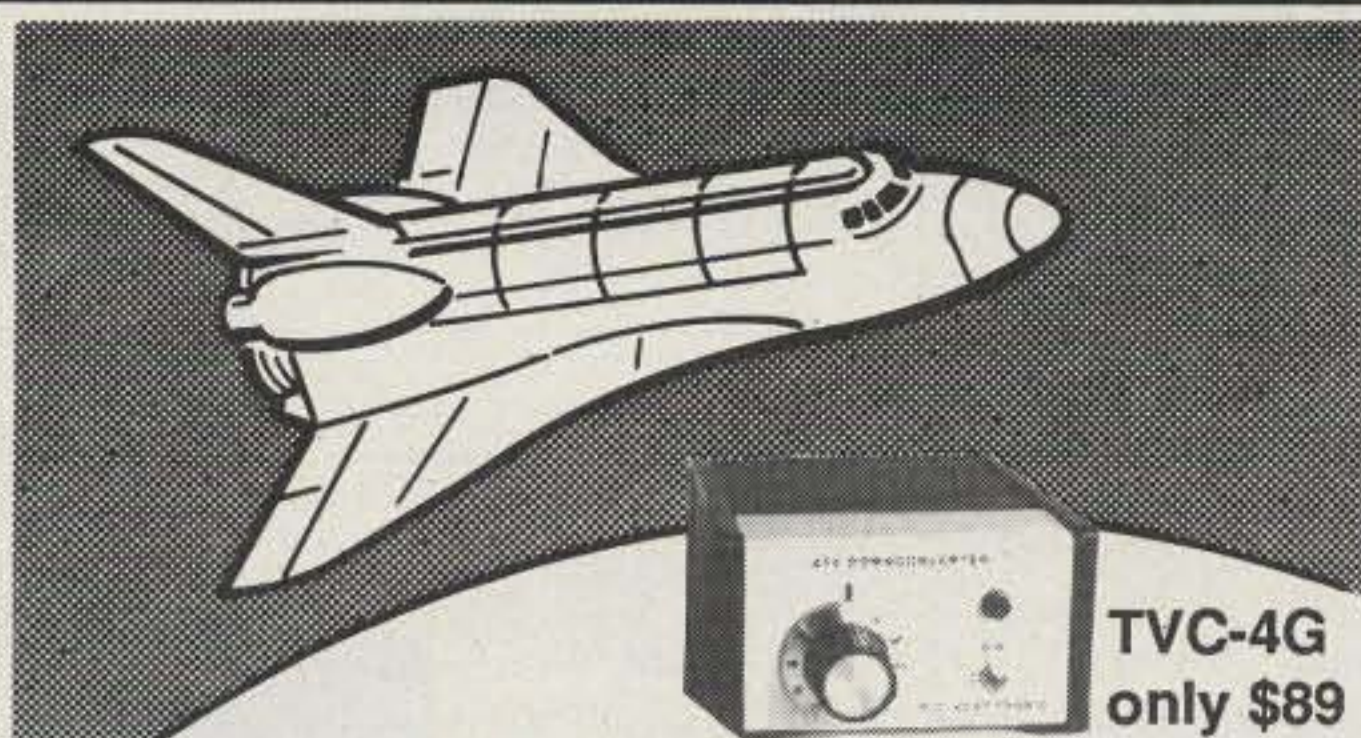
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Band Plans

As of 16 March 1991 the 80 meter Novice spectrum became 3675 to 3725 instead of 3700 to 3750 kiloHertz. The FCC made this change to eliminate interference between United States Novice code operation and Canadian voice operation. However, the Canadians eliminated all 80 meter mode subband regulations last October, so this change may prove to be ineffective. The 80 meter Novice subband was the last remaining original Novice spectrum. All other Novice subbands



George Grecos, SV1NA, of Athens, Greece provided this photograph of his five-year-old son.

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had been changed since U.S. Novice operation began during 1951.

Novice 2 meter (145-147 MHz) and 11 meter (26.96-27.23 MHz) privileges were eliminated.

The original 7175-7200 kHz Novice 40 meter subband was initially expanded to 7150-7200 and later shifted to 7100-7150 kHz.

The 15 meter Novice subband was established at 21.10-21.25 MHz several years after American Novice operation was initiated. This band was later reduced to 21.1-21.2 MHz to minimize Novice code interference with DX voice operation. I believe we will lose more of

80 METERS

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3500-3800

is amateur, fixed, and mobile (except aeronautical)

ITU Region II

3500-3750

is amateur

ITU Region III

3500-3900

is amateur, fixed, and mobile

FCC Region I Band Plan

3500-3510

DX code

3510-3560

preferred code contest segment

3560-3580

code

3580-3600

code and radioteletype

3600-3620

preferred code/radioteletype/voice contest segment

3620-3650

preferred code and voice contest segment

3650-3700

code and voice

3700-3730

preferred code/voice contest segment

3730-3740

preferred code/voice/SSTV contest segment

3740-3775

preferred code/voice contest segment

3775-3800

DX voice

FCC Region II Band Plan

3500-3510

DX code

3510-3525

code

3525-3605

code (voice permitted)

3605-3645

code/radioteletype (voice permitted)

3645-3750

code

3750-3775

voice (code permitted)

3775-3800

DX voice (code permitted)

3800-3840

voice (code permitted)

3840-3850

voice/SSTV (code permitted)

3850-4000

voice (code permitted)

FCC Region III

No band plan stated

ARRL Band Plan

3500-3605

code

3590

DX radioteletype

3605-3645

radioteletype

3645-3750

code

3750-3790

voice

3790-3800

DX voice

3800-4000

voice

3845

SSTV

40 METERS

ITU Regions I and III

7000-7100

amateur/amateur satellite

7100-7300

broadcasting

ITU Region II

7000-7100

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7100-7300

amateur

FCC Region I Band Plan

7000-7035

code

7035-7045

code/radioteletype/SSTV

7045-7100

code/voice

FCC Region II Band Plan

7000-7035

code

7035-7040

DX code/radioteletype

7040-7080

voice (code permitted)

7080-7100

DX voice (code permitted)

7100-7166

voice (code permitted)

7166-7175

voice/slow-scan TV (code permitted)

7175-7300

voice (code permitted)

FCC Region III Band Plan

7000-7025

code

7025-7030

NB/code

7030-7035

code/NB/voice

7035-7100

code/voice

7100-7300

code/voice (secondary operation)

ARRL Band Plan

7000-7080

code

7040

DX radioteletype

7080-7100

radioteletype

7100-7150

code

7150-7300

voice

7171

slow-scan television

15 METERS

ITU—All Regions

21000-21450

amateur/amateur satellite

Table I—ITU/FCC/ARRL band plans for 80, 40, 15, and 10 meters. ITU Region II has a confusing array of mode segmentations.

this Novice subband if U.S. Novices continue to use 21.15–21.20 sparingly.

The 10 meter Novice subband was established as 28.1–28.2 MHz fairly recently. Implementation of "Novice Enhancement" expanded this subband to 28.1–28.5 MHz.

ITU/FCC/ARRL

ITU. The International Telecommunication Union (ITU) lists segments of frequency spectrum for specific services. The ITU regulations show our world split into three regions. ITU Region I is basically Europe and Africa. Region II is North, Central, and South Americas. Region III is Australasia and the rest of the Southern Hemisphere that is not in Region I or Region II. Radio waves do not stop when they reach the edge of an ITU region. This

would not present much of a problem if the same radio services occupied identical frequency spectrum in all three ITU regions; however, spectrum usage is frequently different in the three ITU regions. The failure to standardize spectrum usage throughout the world directly contributes to long-standing problems such as international shortwave broadcasts making the US 40 meter Novice subband almost unusable when propagation conditions are good between America and ITU Region I and/or ITU Region III. At those times foreign broadcast stations boom in at every 5 kHz point (7105, 7110, 7115 kHz, etc.) throughout the band.

FCC. The Federal Communications Commission regulates civilian radio matters in the U.S. The FCC has the authority to assign frequency spectrum to radio services as it deems appropriate. Typical

radio services include aeronautical, maritime, broadcasting, utility, and amateur radio.

ARRL. The American Radio Relay League has established plans which are intended to maximize communications effectiveness within each of our amateur bands. These ARRL band plans often differ from other stated Region II (including North America) radio band plans. Typical differences are detailed in Table I. These differences contribute to the confusion and problems which exist.

Examples. Since the majority of the newer U.S. amateurs are Novices and Technicians, their high frequency (3 to 30 MHz) bands are covered in this article. However, the problems and differences related to the 80, 40, 15, and 10 meter bands are pretty much the same as those which exist on most of the other bands.

FCC Region I Band Plan

21000–21080	code
21080–21120	code/radioteletype
21120–21149	code
21149–21151	beacons
21151–21335	code/voice
21335–21345	code/SSTV
21345–21450	code/voice

FCC Region II Band Plan

21000–21070	code
21070–21100	code/radioteletype
21100–21149.5	code
21149.5–21150.5	beacons
21150.5–21200	voice international traffic (code permitted)
21200–21300	voice (code permitted)
21300–21335	voice international traffic (code permitted)
21335–21345	voice/SSTV (code permitted)
21345–21440	voice (code permitted)
21440–21450	emergency voice (code permitted)

FCC Region III Band Plan

21000–21070	code
21070–21125	NB/code
21125–21149.5	code
21149.5–21150.5	beacons
21150.5–21335	code/voice
21335–21345	code/SSTV
21345–21450	code/voice

ARRL Band Plan

21000–21070	code
21070–21100	radioteletype
21100–21149.5	code
21149.5–21150.5	beacons
21150.5–21200	code
21200–21450	voice
21340	slow-scan television

10 METERS

ITU—All Regions

28000–29700	amateur/amateur satellite
-------------	---------------------------

FCC Region I Band Plan

28000–28050	code
-------------	------

28050–28150	code/radioteletype
28150–28200	code
28200–28300	beacons, until 1992
28300–28675	code/voice
28675–28685	code/slow-scan television
28685–29300	code/voice
29300–29550	satellites
29550–29700	code/voice

FCC Region II Band Plan

28000–28070	code
28070–28150	radioteletype
28150–28190	code
28190–28200	code/new beacon band
28200–28300	code/beacons, until 1992
28300–28670	voice (code permitted)
28670–28690	voice/SSTV (code permitted)
28690–29300	voice (code permitted)
29300–29510	satellites
29510–29700	FM voice/repeaters

FCC Region III Band Plan

28000–28050	code
28050–28150	NB/code
28150–28190	code
28190–28200	code/new beacon band
28200–28300	code/beacons, until 1992
28300–28675	code/voice
28675–28685	code/slow-scan television
28685–29300	code/voice
29300–29510	satellites
29510–29700	5 kHz (WB) code

ARRL Band Plan

28000–28070	code
28070–28150	radioteletype
28150–28190	code
28190–28200	code/new beacon band
28200–28300	code/beacons, until 1992
28300–29300	voice
29300–29510	satellites
29510–29590	repeater inputs
29600	FM simplex calling frequency
29610–29700	repeater outputs

Summary. Table I shows that those of us who operate in ITU Region II (which includes North America) are subject to the most confusing assortment of mode segmentations. I feel sorry for the new operator who is making a sincere effort to abide by all recommendations. I hope this article helps many new amateurs gain a better understanding of the existing situation.

Hoffman Island Radio School

Many radio officers who served aboard our merchant ships during WW II received training at the U.S. Maritime Service base on Hoffman Island, New York. Many of us are now amateur radio operators. If you trained at Hoffman Island, please contact Richard Waechter, 104 Canterbury Commons, Indiana, PA 15701. He is

forming a group similar to the Gallups Island Radio Association covered in a previous issue of this magazine. All former Hoffman Island trainees and staff are urged to contact Richard.

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




Thirteen-year-old Scott Perry, KC4REC, of Speedwell, Tennessee was licensed as a Novice during June 1990. Scott upgraded to Technician and General in August and September of 1990. He has worked all continents except Africa. His other interests include playing baseball, basketball, and football, plus collecting baseball cards. Scott is an ARRL member. He thanks Harold Johnson, WD8OBG, and Vic King, N4RFV, for helping him get a good start in amateur radio.

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.

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. Any single item is available at no charge to anyone who supplies a self-addressed and stamped envelope. When a single item is being requested, it is advisable to supply a large (at least 9" x 12") envelope and to include a couple of extra stamps (loose in your envelope) in case extra postage is required. Some items are long. Licensing-course instructors are welcome to revise and/or duplicate these items to suit their requirements.

73, Bill, W6DDB





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18M3	3 ELE	18"	6.3	\$ 249.00
15M4	4 ELE	33'8"	9.0	\$ 369.00
10M4	4 ELE	23'	9.0	\$ 169.00
10M7	7 ELE	45'	10.5	\$ 499.00
6 METERS				
6M5	5 ELE	15' 10"	9.3	\$ 149.00
6M7	7 ELE	25'6"	10.5	\$ 229.00
6M2WL	9 ELE	39'6"	12.4	\$ 379.00
6M2.5WL	11 ELE	50'2"	13.0	\$ 449.00
2 METERS				
EB-144	HORIZ OMNI	NA	1.0	\$ 119.00
2M7	7 ELE	8'10"	10.5	\$ 105.00
2M12	12 ELE	19'6"	13.0	\$ 129.00
2M5WL	17 ELE	33"	15.0	\$ 169.00
2M18XXX	18 ELE	36'3"	15.3	\$ 219.00
18XXXKIT	KLM Conv KIT	36'3"	15.3	\$ 69.00
2MCP14	14 ELE CIR	10'6"	10.3	\$ 149.00
2MCP22	22 ELE	18' 7"	12.5	\$ 225.00
2M6WLHD	19 ELE HD	41'8"	15.8	\$ 379.00
2M5-440XP	5 ELE / 10 ELE ON 440	5'	9'12"	\$ 149.00
220				
220-7WL	23 ELE	32'6"	16.5	\$ 189.00
70 CM				
EB-432	HORIZ OMNI	NA	1.0	\$ 109.00
420-50-11	11 ELE FULL BAND	5'	11.3	\$ 99.00
440-18	MULTI-USE	11'4"	14.6	\$ 109.00
436-30CP	30 ELE OSCAR	9'9"	14.5	\$ 229.00
432-9WL	28 ELE	21'2"	17.3	\$ 149.00
432-13WL	39 ELE	30'8"	18.0	\$ 229.00

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CIRCLE 71 ON READER SERVICE CARD

NEWS OF CERTIFICATE AND AWARD COLLECTING

The Story of the Month for May is:

**John A. Robson, WB9STT
USA-CA All Counties #652
All SSB Mobile, 1-18-90**

"First, I wish to thank the many mobiles and net controls who made it possible for me to complete USA-CA All Counties. Also thanks for the phone calls, other assistance, and special runs made. Thank you all.

"I was born and raised in Chicago on the far south side, and as dad was a construction worker, I followed in his footsteps after graduating from high school. Dad loved radio and built several AM sets. They were all battery operated, and he had control of the headsets, giving each one a turn. I was not impressed, as my interests were in music, and this was my major in high school. I wanted to teach, but at that time, with the depression in full swing, college was out of the question, and thus to the construction ranks.

"In 1942 Jean and I were married. We had met at the park tennis courts, where I could never come close to matching her. Anyway, after a short time the U.S. Air Force found my presence was necessary and sent me to Sioux Falls, South Dakota radio school after basic training. After graduation as a Mechanic and Operator of aircraft equipment I was sent to Casper, Wyoming for further training, and finally to India by way of Tasmania and Australia. While in India I first did maintenance work, but later moved into flight status, where operating both CW and phone got me hooked on radio. After discharge from military service I returned to construction work and raising our son, Michael, and also resumed my hobbies of hunting and fishing.

"Neighbors and relatives brought me their radios when repairs were needed, and more study on that new phenomenon called TV kept me up to date on electronics. When I heard about CB (already in full swing), I picked up a mobile rig and later a base station so Jean and I could chat while I was on the way home from work. It sure was a pleasure, but as you know, not a long-lived hobby. I gave it up and sold all the equipment, becoming pretty discouraged.

333 South Lincoln Ave., Mundelein, IL 60060



John Robson, WB9STT, USA-CA All Counties #652, with mobile station ready to go.

"Jean knew that a couple of my army buddies were hams, so she suggested that I go and take the test. Not being an electrical engineer, I declined, letting her know that I could never pass an exam as tough as that. Knowing how I missed the radio, she kept on, and after about a year she told me about a radio club that met at Marquette Park, not far from our home. It turned out to be the Hamfesters Club, and the members made me feel as welcome as rare DX. A class was forming, so I enrolled, meeting Bob Hayes, K9KXW. He was the instructor, and believe me he was a wonder. Everything fell into place, and some old Air Force theory even came back. The code was not a problem, since while I was at Long Beach Army Air Base I had been a code instructor. Needless to say, I became a Novice, and although I could have no antenna outdoors, a slinky stretched around the apartment got me out on 40 meters.

"After upgrading my license, SSB seemed interesting so I joined the ISSB System, upgrading the antenna to a dipole which is still in use in the attic. Then came county hunters! Boy, what a pile-up! 'What's going on?' I wondered. 'I'll put my call in and see what happens: WB9STT 44.' I returned a 33. That was May 20, 1986 at 1644Z, and all you poor souls have had to put up with that call since.

"County hunters are the greatest bunch of operators I've ever met. Pat, KA5VWD, and Al, W5RJH, made a special run to Brewster, Texas for the next to last county, and Owen, KY9Y, gave me Pulaski, Illinois for my very last on December 20, 1989. It took 2 years and 7 months to the day to collect all of the 3076 counties. What a Christmas gift! It took a couple of reworks to make it all mo-

bile, and then on January 18, 1990 I received USA-CA All Counties #652. What next? Well, it looks like Bingo (AKA the Master County Hunters Award), and the second time for all counties.

"Before closing I must say a special thank you to Carl, W9ABM, and Ace, N9CHU, for their time and patience in going over the logs and MRCs. They found my bookkeeping left much to be desired. And to my wife, Jean, goes a *special* thank you. Without her insistence and patience I would never have entered the radio amateur ranks. This may be a first, to be nagged into a hobby by someone who has no interest in it. Best 73, John, WB9STT."

Awards Issued

Roger J. LaMothe, K8MDU, completed all of his paperwork and received USA-CA All Counties #690, USA-CA 3000 #717, and USA-CA 2500 #795, All SSB, dated 1-8-91.

Eugene K. Eggebraten, W7GVF, filed his completely filled record book and received USA-CA All Counties #691, USA-CA 3000 #718, USA-CA 2500 #796, USA-CA 2000 #866, USA-CA 1500 #954, USA-CA 1000 #1148, and USA-CA 500 #2483,

USA-CA Special Honor Roll

Roger J. Lamothe, K8MDU
USA-CA All Counties #690
All SSB, 1-8-91

Eugene K. Eggebraten, W7GVF
USA-CA All Counties #691
All 20M SSB, Mobile-to-Mobile, 1-24-91

Harold E. Keller, W3SQA
USA-CA All Counties #692
All 20M SSB Mobile, 1-25-91

William "Bill" Moore, K7IOO
USA-CA All Counties #693
Mixed, 1-26-91

Bob Matthews, KG8I
USA-CA All Counties #694
Mixed, 1-31-91

Richard J. Obrecht, N8CIJ
USA-CA All Counties #483, 9-28-84
Endorsed All 20 Meters, 1-22-91

F. Alan Fischer, K8CW
USA-CA All Counties #539, 4-15-87
Endorsed All CW, All SSB, and All Mobiles,
1-24-91

USA-CA Honor Roll

3000			
NV6L	716	W7GVF	954
K8MDU	717	W3SQA	955
W7GVF	718	K7IOO	956
W3SQA	719	OE5CA	957
K7IOO	720	KB1AF	958
		KC4DUP	959
2500			
K8MDU	795	UW9LA	1146
W7GVF	796	K7DZE	1147
W3SQA	797	W7GVF	1148
K7IOO	798	KB0FQC	1149
		W3SQA	1150
		K7IOO	1151
2000			
KF7RU	865	OE5CA	1152
W7GVF	866	KC4DUP	1153
JA8ZO	867		
W3SQA	868		
K7IOO	869	G3WRD	2478
WA2CNJ	870	HR1KAS	2479
		KA8EBE	2480
		HA0NAR	2481
1500			
KF7RU	951	K7DZE	2482
WB8RFN	952	W7GVF	2483
K1CLN	953	W3SQA	2484
		K7IOO	2485

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.

All 20M SSB Mobile-to-Mobile, dated 1-24-91.

Harold E. Keller, W3SQA, filed his good application and received a fully endorsed certificate for USA-CA All Counties #692, USA-CA 3000 #719, USA-CA 2500 #797, USA-CA 2000 #868, USA-CA 1500 #955, USA-CA 1000 #1150, and USA-CA 500 #2484, All 20M SSB Mobile, dated 1-25-91.

William "Bill" Moore, K7IOO, submitted his completely filled and certified record book and received USA-CA All Counties #693, USA-CA 3000 #720, USA-CA 2500 #798, USA-CA 2000 #869, USA-CA 1500 #956, USA-CA 1000 #1151, and USA-CA 500 #2485, Mixed, dated 1-26-91.

Bob Matthews, KG8I, put the finishing touches on his good record and claimed USA-CA All Counties #694, Mixed, dated 1-31-91.

Richard J. Obrecht, N8CIJ, USA-CA All Counties #483, 9-28-84, added the All 20 Meter endorsement, dated 1-22-91.

F. Alan Fischer, K8CW, added three endorsements to his USA-CA All Counties #539, 4-15-87. He received endorsements for All CW, All SSB, and All Mobiles, all dated 1-24-91.

Ada "Jan" J. McLernon, NV6L, enhanced her record by qualifying for USA-CA 3000 #716, Mixed, dated 1-7-91.

Jerold A. Goetsch, KF7RU, took another step in his quest by claiming USA-CA 2000 #865 and USA-CA 1500 #951, All 20M SSB Mobile, dated 1-10-91.

Sadatoshi Shiokido, JA8ZO, filed his good application for USA-CA 2000 #867, Mixed, dated 1-24-91.

Ray E. Skrabut, WA2CNJ, received USA-CA 2000 #870, All 20M SSB, dated 1-30-91.

Lawrence E. Mitchell, WB8RFN, received USA-CA 1500 #952, All SSB, dated 1-22-91.

William R. Welch, M.D., K1CLN, received USA-CA 1500 #953, Mixed, dated 1-22-91.

Karl Kneidinger, OE5CA, submitted another group of confirmed contacts and qualified for USA-CA 1500 #957 and USA-CA 1000 #1152, Mixed, dated 1-28-91.

Wendy D. Kincaid, KB1AF, extended her good record by claiming USA-CA 1500 #958, Mixed, dated 1-28-91.

Peter H. Salvage, KC4DUP, qualified for USA-CA 1500 #959, and USA-CA 1000 #1153, All SSB, dated 1-30-91.

Eugene V. Pimenov, UW9LA, received USA-CA 1000 #1146, Mixed, dated 1-4-91.

Jack W. DeLorme, K7DZE, qualified for USA-CA 1000 #1147 and USA-CA 500 #2482, All 20M SSB, dated 1-22-91.

Jack W. Crutchfield, KB0FQC, enhanced his record by claiming USA-CA 1000 #1149, Mixed, dated 1-24-91.

USA-CA 500 certificates went to:

R. J. Richardson, G3WRD, USA-CA 500 #2478, All SSB, 1-7-91.

Kenneth A. See, HR1KAS, USA-CA 500 #2479, All SSB, 1-7-91.

Lloyd R. Hansen, KA8EBE, USA-CA 500 #2480, All CW, 1-9-91.

Laszlo Radocz, HA0NAR, USA-CA 500 #2481, Mixed, 1-11-91.

Jack W. DeLorme, K7DZE, USA-CA 500 #2482, All 20M SSB, 1-22-91.

Eugene K. Eggebraten, W7GVF, USA-CA 500 #2483, All 20M SSB Mobile-to-Mobile, 1-24-91.

Harold E. Keller, W3SQA, USA-CA 500 #2484, All 20M SSB Mobile, 1-25-91.

William "Bill" Moore, K7IOO, USA-CA 500 #2485, Mixed, 1-26-91.

Awards Available

ZP Awards Program. The Radio Club Paraguayo issues the following awards to any radio amateur, CB operator, or SWL. Contacts must be made after May 15, 1952. A certified list (no QSLs) of contacts should be sent, with 5 IRCs for each award, to Radio Club Paraguayo, Award Manager, P.O. Box 512, Asuncion, Paraguay. A ZP contact is obligatory in any class.

The *All Mediterranean Countries Award (AMCA)* is given for confirmed

contacts with Mediterranean countries (inland) as follows: A2, A5, AC3, C31, CP, HA, HB, HB0, HV, JT, LX, OE, OK, TL, TT, TZ, UC2, UD6, UG6, UH8, UI8, UJ8, UL7, UM8, UO5, XT, XW8, YA, ZE, ZP, 3D6, 4U1, 5U7, 5X5, 7P8, 7Q7, M1, 9J2, 9N1, 9U5, 9X5. Class A: 41 countries. Class B: 30 countries. Class C: 20 countries.

The *Tropic of Cancer and Capricorn Award (TCCA)* is given for confirmed contacts with countries touched by the Tropics of Cancer and Capricorn as follows. Tropic of Cancer: S2, S3, BV, BY, EA9 (Sahara), KH6, A4, A6, SU, TZ, C6, VU, XE, XZ, 5A, 5T5, 5U7, 7X, 7Z. Tropic of Capricorn: A2, CE, C9, LU, PY, VK, ZP, ZS, ZS3, 5R8. Class A: 28 countries. Class B: 20 countries. Class C: 12 countries.

The *All Zone 11 Prefixes (AZ 11 PX)* is given for confirmed contacts with prefixes in CQ WAZ Zone 11 as follows: ZP1 to ZP9, PY1 to PY0, and all Brazilian authorized prefixes. Class A: 30 prefixes. Class B: 19 prefixes. Class C: 12 prefixes.

The *Diploma Sud-America (DSA)* is given for confirmed contacts with countries located in ITU zones 12, 13, 14, 15, 16, and 73 as follows. Zone 12: FY, HC, HC8, HK, HK0 (Malpelo Is.), OA, PZ, 8R, YV, CP1, 8, 9. Zone 13: PY6, 7, 8, PY0 (Fernando de Noronha), PY0 (St. Peter and St. Paul). Zone 14: CE1, 2, 3, 4, CE0X, CE0Z, CP2, 3, 4, 5, 6, 7, ZP, CX, LU/A/U/Y. Zone 15: PY1, 2, 3, 4, 5, 9, PY0 (Trinidad Is.). Zone 16: CE6, 7, 8, VP8 (Falkland Is.), LU/V/W/X. Zone 73: KC4USP (Palmar Station); LU/Z; CE9AA, AM; VP8 Graham Land, Georgia, Orkney, Sandwich, Shetland. Class A: 33 countries and 6 zones. Class B: 25 countries and 6 zones. Class C: 18 countries and 5 zones.

The *Diploma Paraguay (DP)* is given for confirmed contacts with 5 different ZP stations. South American stations need to contact 15 ZP stations.

The *Worked All ZP (WAZP)* is given for confirmed contacts with one station in each of the nine call areas.

The *Certificado Radio Club Paraguayo (CRCP)* is given for confirmed contacts with 15 different ZP stations. South American stations need to contact 50 ZP stations.

The *ZP100, ZP150, ZP250, and ZP300 Awards* are given for confirmed contacts with 100, 150, and 200 different ZP stations.

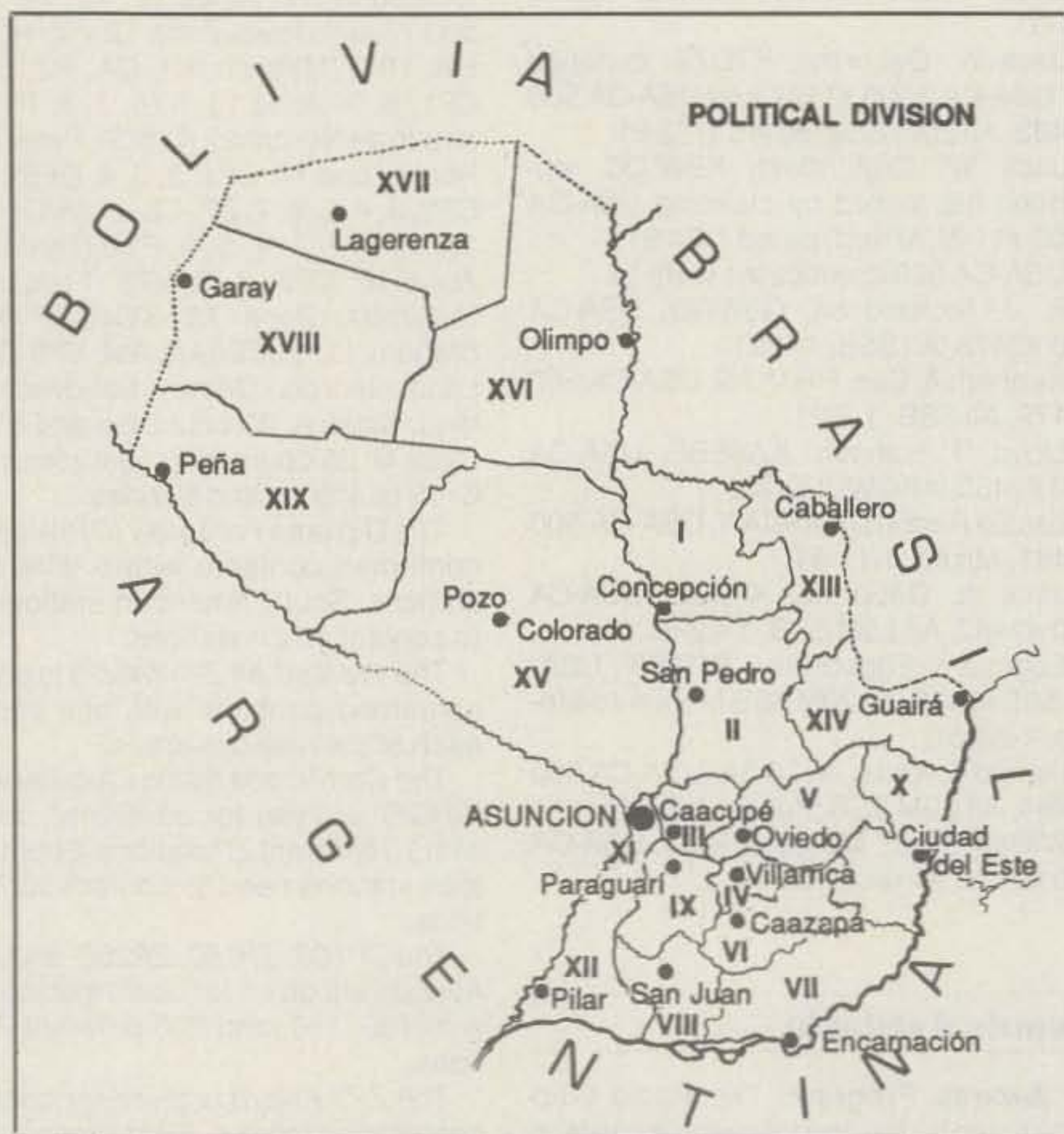
The *ZP3 Award* is given for confirmed contacts as follows. ZP stations: ten ZP3 stations. CE, CP, CX, LU, PY stations: five ZP3 stations. Rest of world: two ZP3 stations.

The *Diploma Departamentos del Paraguay* is given for confirmed contacts with the Nation's Capital and different Departments in which Paraguay is divided as listed in Table I. Class A: 20 contacts. Class B: 16 contacts. Class C: 12 contacts.

Prefixes By Departments—ZP Zones

Zone	Department	Capital
ZP1	XVII Chaco	Mayor Pablo Lagerenza
	XVIII Nueva Asuncion	Garay
	XIX Boqueron	Dr. Pedro P. Pena
ZP2	XV Pte. Hayes	Pozo Colorado
	XVI Alto Paraguay	Fuerte Olimpo
ZP3	I Concepcion	Concepcion
	XIII Amambay	Pedro J. Caballero
ZP4	II San Pedro	San Pedro del Ycuamandyyu
	XIV Canindeyu	Salto del Guaira
ZP5	Central	Asuncion
ZP6	III Cordillera	con gran Asuncion
	IX Paraguari	Caacupe
	XI Central	Paraguari
ZP7	IV Guaira	Asuncion
	V Caaguazu	Villarrica
	VI Caazapa	Coronel Oviedo
ZP8	VIII Misiones	Caazapa
	XII Neembucu	San Juan Bautista
	VII Itapua	Pilar
ZP9	X Alto Parana	Encarnacion
		Ciudad del Este

Table I—Prefixes by department—ZP zones, for the Diploma Departamentos del Paraguay issued by the Radio Club Paraguayo.



Political divisions of Paraguay, defining the 20 Departments.

Mongolian Radio Sports Federation Awards. The Mongolian Radio Sports Federation (MRSF) sponsors three awards that are available to licensed radio amateurs and SWLs. These awards are issued for different modes, bands,

plus mixed. Send GCR list and \$5 US (or 15 IRCs) to cover postage. Contacts (SWLs) after January 1, 1959 are valid.

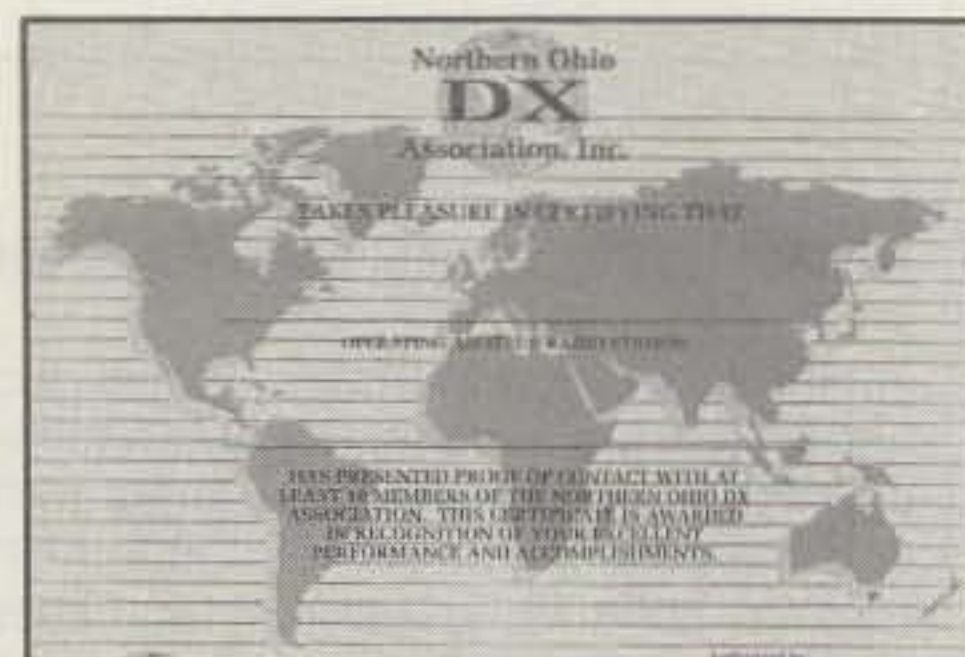
The *Mongolia Award* has three classes, classes 1, 2, 3, according 10, 6, 3 QSOs, respectively, with different Mon-

golian prefixes (JT1KAA, JT9C, JU1DX, etc.).

The Ulaanbaatar Award. For Asian stations 5 QSOs with JT stations including 3 QSOs with JT1 (Ulaanbaatar). For DX stations 3 QSOs with JT stations including 1 QSO with JT1 (Ulaanbaatar).

The Chinghis Khan Award. Applicants must submit proof of confirmations of contacts (SWLs) with 12 stations whose suffix letters spell CHINGHIS KHAN (e.g., SM6DEC for the letter C; JE8EHO for the letter H; W8IQ for the letter I; etc.). The 12 stations should be in 12 different DXCC countries, and one should be a Mongolian station. Applications must be sent to MRSF Awards Manager, P.O. Box 639, Ulaanbaatar-13, Mongolia, Asia.

NODXA Award. The very active members of the Northern Ohio DX Association of Cleveland, Ohio have issued this very attractive certificate to all DX operators and award hunters of the world. Contacts made after January 1, 1945 on any band, in any mode, are valid (no repeater QSOs). To qualify, USA amateurs must contact 10 NODXA members (except KH and KL need only 5). All other countries need contact only 5 members. Submit GCR list (or logs signed by two amateur radio club members), your own QSL, \$4 (US) or 10 IRCs to NODXA Awards Man-



Northern Ohio DX Association Award for working association members.

ager, Dwaine Modock, WA8MEM, 28265 Gardenia Drive, North Olmsted, OH 44070 USA.

Member List: AD8O, AI8S, K8AI, K8AZ, K8CW, K8DJC, K8MR, K8NI, K8QXB, K8WW, K8YSE, K8ZH, K8ZM, KB8NW, KB8SX, KB8ZW, KC8E, KN8COQ, N8AHK, H8ARA, N8ATR, N8BC, N8CJR, N8DCJ, N8DMM, N8HHE, N8HUR, N8LGE, NQ8S, NW8X, W7IJ, W8BIP, W8CAR, W8CY, W8CZN, W8GMH, W8HFY, W8IMF, W8JGU, W8MMC, W8OAZ, W8UNB, W8VLK, W8XD, W8ZET, W8ZSD, WA8BIN, WA8DXB, WA8IMO, WA8MEM, WA8MLV, WA8ZOZ, WB8K, WB8LFO, WB8VPA, WD8IOU, WD8LTM, WG8H, WI8P, WX8D.

TV-FV Award. This new award is based on the special French prefixes TV and FV.

DIPLOME TV-FV

LE PRESENT DIPLOME
N° EST DECERNE T COMMÉMORATION F

A M P

INDICAT :

SSB
 CW
 MUXTE
 RTTY

MHz V EXPÉDITION V

Date Le Manager

**TV 6
FV 7
8**

6
7
8

TV-FV Award for working French stations with special prefixes TV and FV.

These calls can be assigned for special events such as commemorations, contests, DXpeditions on French Islands, etc.

The TV-FV award is available to all licensed amateurs and SWL stations worldwide. French amateurs must receive QSL cards from six different TV or FV stations; DX stations have to receive only three QSLs. If a TV/FV card is missing, you can use a QSL from an HW, HX, HY, TH, TM, TQ, TW or TX station.

Handprinted endorsements will be added to the award for phone, RTTY, CW, single band, and any other special operating achievement. Separate awards can be requested for each proven operating achievement. There is no date restriction for the award. The application must be accompanied by \$5 or FF 30 or 10 IRCs.

The validation is the QSL cards, but verified lists are preferred instead of cards. The list must show all pertinent information including callsigns, date, time, mode and band. This list must be verified by two other licensed amateurs or a radio club official. This validation simply indicates that you have actually received the cards for claimed contacts.

The whole application should be sent to Monsieur Pierre Fournier, F11ADB, 3 Bis rue Pasteur, F-78000 Versailles, France.

Of Interest to County Hunters

The 1991 Mobile QSL Bureau Directory is now available. It contains listings of about 4800 county hunters including call, name, address, county, phone number, prior calls, notes of interest, and information about county hunting awards held. Also included are about 1000 old-call/new-call listings.

This new book is 8½ x 11 inches, printed on quality paper, and is plastic ring bound to lie flat when in use. It is priced at \$7.50 including shipping and handling in the US. Outside the US the cost is \$9 US funds for shipping via sur-

face small packet. For more information or to order contact the Mobile QSL Bureau, P.O. Box 6436, Florence, SC 29502 USA.

Cuba DX Group News

Word received from the Federacion de Radioaficionados de Cuba indicates that problems experienced late last year with timely delivery of awards have been overcome. All the "Cuba," "Caribbean," "America," and "Cuba DX" award appli-

cations were processed up to date by year's end.

Also, new appointments were made within the Cuba DX Group as follows: Director Efren Alvarez Pou, CO3JA; Secretary Ramon Perez Ortiz, CO2CL; FRC Award Manager Reynaldo Marrero, CO2HQ.

The president of FRC, CO2DV, expressed his appreciation for everyone's patience and understanding, and especially their notes of constructive criticism. Until next month...

73, Dorothy, WB9RCY

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NEWS OF COMMUNICATION AROUND THE WORLD

Field Checking of DXCC QSL Cards

Field checking of QSL cards for new DXCC applications is coming! At the ARRL Board of Directors meeting in January the board approved a plan to begin checking cards for initial DXCC applications *without* having to send the cards to Newington.

Field checking of DXCC QSL cards has been under consideration for a long time. The problem has been to maintain the excellent, worldwide reputation of the DXCC program, while reducing ARRL headquarters' workload and eliminating the (slight) risk of sending the cards to Connecticut.

Three West Coast amateurs put together a proposal of how field checking might be handled. Jim Maxwell, W6CF, Knock Knochenhauer, K6ITL, and ARRL Vice-President Rod Stafford, KB6ZV, formed the committee that worked out the details of the process. Their recommendations (with one change) were accepted by the ARRL Board, which then turned over the matter to the Headquarters' Membership Communications Services (MCS) department for implementation.

Although the final details (and timetable for starting) have not yet been worked out, the outline of the process that the ARRL board approved is as follows.

New DXCC applicants will complete the standard DXCC application form and deliver QSL cards from at least 100 current DXCC countries to a pair of authorized Field Checkers. These checkers will be members of DXCC with at least 300 countries on their DXCC record. To become a field checker, a DXer must be nominated by a DX club and approved by the appropriate ARRL Division Director. The actual appointment will be made by the President of the ARRL.

To prevent two amateurs from forming a DX club and nominating themselves as field checkers, the proposal includes a definition of a DX club. To nominate field checkers, a DX club must be an ARRL-affiliated club with at least 25 members who are DXCC members and have DX as its primary activity.

There is one other restriction: the 100 (or more) QSL cards must come from a list of 250 or so selected countries on the



Bob Peterson, N4VZ, earned the first 17 and 12 meter Worked All Zones awards from this well-appointed station.

DXCC list. For example, the potential DXCC applicant may submit a card from Montserrat for field checking, but not a card from Burma. The MCS department will pick the countries whose cards are eligible for field checking and identify these on the DXCC countries list. (A starting point for picking those countries whose cards will *not* be eligible for field checking will be the Most Wanted Countries list from *The DX Magazine!*)

The original proposal to the ARRL Board recommended a core list of only about 150 DXCC countries for field checking. This number was increased at the suggestion of the ARRL staff. The reason for the increase is to increase the number of DXers who can take advantage of the field-checking program. Most DXers first apply for DXCC membership with QSL cards from just over 100 DXCC countries. (A few extra cards help prevent the application from being rejected, in case the DXCC desk finds some cards unacceptable.) While most of those 100 cards will be from common, easy-to-work countries, odds are that an aspiring DXer has worked at least a few major DXpeditions from relatively rare countries. Many of these countries would not be on a list of only 150 possible DXCC countries. Thus, a DXer may have to obtain QSL cards from 120 or more countries before amassing more than 100 from the "core" list. By increasing the number of DXCC countries on the "core" list to about 250, many more DXers will be able to have their cards checked in the field. "The point of field checking is to better serve the members," explains MCS manager Chuck Hutchinson, K8CH, "and increas-

ing the number of core countries to 250 will improve that service."

Completing the process, the field checkers will review the submitted QSL cards, following a set of guidelines from the MCS department. After comparing the cards to the standard DXCC application form, they will both sign a form saying they have reviewed the cards, and then the field checkers will forward that form and the DXCC application to ARRL headquarters. There the DXCC staff will enter the information from the application into the DXCC computer database and issue the DXCC credits and membership certificate.

The ARRL retains the right to random review field-checked DXCC applications, and may request that the actual QSL cards be sent to ARRL headquarters for evaluation. This process will help ensure that the field checkers are doing their job properly and help eliminate any potential "cheating."

One question not yet resolved involves a "baddie" list. There are some operations, including a handful from relatively commonplace countries, that are not acceptable for DXCC credit. Either the operator was unable to provide appropriate documentation to the ARRL, the operation was from aboard ship, or the operation was otherwise inadmissible. For example, cards from a recent Gibraltar ZB2 operation were turned down for DXCC credit because the operation was from a ship. The DXCC desk has never published



Eugene Goffriller, OE2EGL, has worked 316 of the 322 possible countries for the CQ 2xSSB DX award.

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SSB

2223	SV2AHM	2227	N5MBD
2224	WB4TGB	2228	VE3FXR
2225	AA4QE	2229	K4XI
2226	TY2FG	2230	BV2WA

CW

2670	W6BKY	2676	PY5FB
2671	KV1M	2677	RA6YJ
2672	AK0G	2678	VE5XM
2673	VE3FXR	2679	JH4FBV
2674	YU3NR	2680	K4XI
2675	SM5HV/KH7		

VPX

267 OE1-1001007

WPNX

261 WD4OJY

Endorsements

Mixed: 450 N5MBD, VE3FXR, WB8OGM, K4XI. 500 VE3FXR, WB8OGM, K4XI, KA1NCN. 550 VE3FXR, WB8OGM, K4XI, KA1NCN. 600 VE3FXR, WB8OGM, K4XI, KA1NCN. 650 VE3FXR, K4XI. 700 VE3FXR, K4XI. 750 VE3FXR, K4XI. 800 VE3FXR, K4XI. 850 VE3FXR, K4XI. 900 VE3FXR, W3FDU, K4XI. 950 AK0G, VE3FXR, KU0A, K4XI. 1000 AK0G, VE3FXR, KU0A, K4XI. 1050 AK0G VE3FXR, K9BQL, KU0A. 1100 AK0G, VE3FXR, KU0A. 1150 AK0G, DK5AD, VE3FXR, KU0A. 1200 AK0G, DK5AD, WB3DNA, VE3FXR, KU0A. 1250 VE3FXR, KU0A. 1300 VE3FXR. 1350 VE3FXR, VE1RJ, JH8BOE. 1400 VE3FXR, VE1RJ, JH8BOE. 1450 VE3FXR, W9IL, VE1RJ, JH8BOE. 1500 VE3FXR, JH8BOE. 1550 WB8ZRL, JH8BOE. 1600 JH8BOE. 1950 KL7AF. 2150 I8RFD. 2500 SM3EVR, N2AC.

SSB: 350 KV1M, N5MBD, VE3FXR, N3BGA, K4XI, BV2WA. 400 N5MBD, VE3FXR, K4XI, BV2WA. 450 N5MBD, VE3FXR, DU1JZ, K4XI. 500 VE3FXR, DU1JZ, K4XI. 550 VE3FXR, K4XI. 600 WB8RFN, VE3FXR, N9ICH, K4XI. 650 WB8RFN, VE3FXR. 700 WB8RFN, VE3FXR, K2EEK, KA9MOM. 750 WB8RFN, VE3FXR, K2EEK. 800 WB8RFN, VE3FXR, NG9L. 850 VE3FXR, NG9L. 900 VE3FXR, NG9L. 950 I3ZSX. 1000 I3ZSX. 1050 KC9DS, IK7DBB. 1100 IK7DBB. 1200 KS3F. 1250 WB8ZRL. 1300 KE6KT, NF0X. 1350 NF0X. 1400 NF0X. 1450 NF0X. 2500 WD9MGQ. 2550 I0AMU. 2600 I0AMU.

CW: 350 AK0G, VE3FXR, YU3NR, SM5HV/HK7, PY5FB, RA6YJ, VE5XM, K4XI. 400 KV1M, AK0G, VE3FXR, YU3NR, SM5HV/HK7, RA6XJ, VE5XM, K4XI. 450 AK0G, VE3FXR, YU3NR, SM5HV/HK7,

RA6XJ, VE5XM, K9BQL, W4TYU, K4XI. 500 AK0G, N5GFX, VE3FXR, YU3NR, SM5HV/HK7, RA6YJ, VE5XM, K4XI. 550 AK0G, VE3FXR, YU3NR, SM5HV/HK7, RA6XJ, VE5XM, I2MQP, K4XI. 600 AK0G, VE3FXR, YU3NR, RA6YJ, VE5XM, K4XI. 650 VE3FXR, YU3NR, RA6YJ. 700 NF0X, VE3FXR, YU3NR, RA6YJ. 750 AH6JF, NF0X, VE3FXR, YU3NR. 800 NF0X, VE3FXR, YU3NR. 850 NF0X, VE3FXR, YU3NR. 900 NF0X, VE3FXR, YU3NR, WB8ZRL. 950 NF0X, VE3FXR, YU3NR, WB8ZRL. 1000 VE3FXR, YU3NR, IK3GER. 1050 VE3FXR, YU3NR. 1100 VE3FXR, YU3NR. 1150 VE3FXR, YU3NR, HP1AC. 1200 VE3FXR, YU3NR, HP1AC. 1250 YU3NR, HP1AC. 1300 YU3NR, HP1AC. 1350 YU3NR, VE1RJ, HP1AC. 1400 YU3NR, VE1RJ. 1450 YU3NR. 1500 YU3NR. 2300 W4VQ. 2350 W4VQ. 2400 W4VQ. 2950 WA2HZR. 3000 WA2HZR.

10 Meters: VE3FXR, I8RFD, K4XI
 15 Meters: VE3FXR, I8RFD, K4XI, I8KCI
 20 Meters: VE3FXR, I8RFD, PY5FB, K4XI, I8KCI
 40 Meters: VE3FXR, I8RFD, K4XI
 80 Meters: VE3FXR, I8RFD, K4XI
 160 Meters: KV1M, K4XI

Asia: VE3FXR, K4XI, JH8BOE, KC9DS
 Africa: K4XI, JH8BOE
 No. Amer.: VE3FXR, K4XI, JH8BOE
 So. Amer.: VE3FXR, K4XI, JH8BOE
 Europe: KA0ZFX, VE3FXR, K4XI, JH8BOE, KC9DS
 Oceania: K4XI, JH8BOE, WB4UBD

Award of Excellence Plaque Holders: N4MM, I8YRK, W4CRW, SM0AJU, K5UR, K6XP, N5TV, K2VV, VE3XN, W6OUL, DL1MD, DJ7CX, DL3RK, WB4SIJ, SM6DHU, N4KE, I2UIY, DL7AA, ON4QX, WA8YTM, YU2DX, OK3EA, I4EAT, OK1MP, N4NO, ZL3GQ, VK9NS, DE0DXM, DK4SY, UR2**, AB9O, FM5WD, I2DMK, W4BQY, I0JX, SM6CST, VE1NG, I1JQJ, WA1JMP, PY2DBU, HI8LC, KA5W, K0JN, W4VQ, KF2O, K3UA, HA8XX, HA8UB, W8CNL, K7LJ, W1JR, F9RM, W5UR, WB8ZRL, SM3EVR, CT1FL, K2SHZ, UP1BZZ, W8RSW, WA4QMO, EA7OH, K2POF, DJ4XA, IT9TQH, W8ILC, K2POA, N6JV, W2HG, ONL-4003, VE7DP, K9BG, W5AWT, KB0G, HB9CSA, F6BVB, W1BWS, YU7SF, G4BUE, N3ED, DF1SD, K7CU, I1POR, LU3YL/W4, NN4Q, KA3A, VED7WJ, YB0TK, VE7WJ, VE7IG, K9QFR, YU2NA, N2AC, W4UW, NX0I, W9NUF, N4NX, SM0DJZ, DK5AD, WB4RUA, DK5AD, WD9IIC, W3ARK, I6DQE, LA7JO, VK4SS, K6JG.

Award of Excellence Plaque Holders with 160 Meter Endorsement: AB9O, FM5WD, SM0DJZ, DK5AD, SM6CST, I1JQJ, PY2DBU, W3ARK, HI8LC, KA5W, UR2**, VE3XN, K6XP, LA7JO, W4VQ, K6JG, K3UA, HA8UB, W4CRW, N4MM, K7LJ, SM0AJU, KF2O, SM3EVR, K5UR, UP1BZZ, OK1MP, N5TV, K2POF, W8CNL, DJ4XA, IT9TQH, DL9RK, N6JV, ONL-4003, W1JR, W6OUL, W5AWT, KB0G, F6BVB, W4BQY, YU7SF, W5UR, N4NO, DF1SD, K7CU, I1POR, W8RSW, N4KE, I2UIY, YB0TK, W8ILC, W1BWS, VE7WJ, K9QFR, NN4Q, W4UW, K9QFR, NN4Q, W4UW, NX0I, G4BUE, LU3YL/W4, I4EAT, WB4RUA, VE7WJ, N4NX, DE0DXM, VE7IG, K9BG.

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.

The WAZ Program

Single Band WAZ

10 Meter SSB

378 VE3XO 380 KA0IQR
 379 G0DQS

15 Meter SSB

370 JA8CYV 372 KA9PJZ
 371 Y41JH

20 Meter SSB

831 IV3ZCS 832 WN6J

40 Meter SSB

68 IK0AGU

80 Meter SSB

55 DK5AD 56 IK0AGU

10 Meter CW

101 W9VA 104 K8CX
 102 I3ZRL 105 KU0S
 103 G4MVA

12 Meter CW

1 N4VZ

15 Meter CW

199 W7QDM 201 G4MVA
 200 WA8YTM

17 Meter CW

1 N4VZ

20 Meter CW

391 JA7HMZ 393 G4BWP
 392 G3LPS

40 Meter CW

131 G4BWP 132 KA7T

12 Meter Mixed

1 N4VZ 2 K2TQC

17 Meter Mixed

1 N4VZ

RTTY WAZ Mixed

59 CT1AUR

All Band WAZ SSB

3691 WA7SYV 3699 KE5YU
 3692 YV1CLM 3700 K2BQW
 3693 W0ZX 3701 DL9SC
 3694 K5PC 3702 N1WR
 3695 DL7ZR 3703 W7IMP
 3696 IT9HLR 3704 KI6UT
 3697 KB1CQ 3705 JA4OSF
 3698 W0GLG

CW/Phone

6939 N0HRK (CW) 6949 W8FN (CW)
 6940 WB8OGM 6950 K5IG
 6941 AH6JF (CW) 6951 N6WQG
 6942 WP4ACE (CW) 6952 IK2FIQ (CW)
 6943 WB0YJT 6953 LA9JD
 6944 W5QZ 6954 K2QPR
 6945 I8NHJ 6955 N1WR (CW)
 6946 NY8E 6956 WD4KMW
 6947 KE5YU 6957 NF6S
 6948 WA2UZI 6958 K1GVV

Applications and reprints of the latest rules may be obtained by sending a self-addressed stamped envelope (75 cents) size 4 1/2 x 9 1/2 to the WAZ Manager, Jim Dionne, K1MEM, 31 DeMarco Rd., Sudbury, MA 01776. Applicants forwarding QSL cards either direct to the WAZ manager or to a check point should include sufficient postage for safe return of their QSL cards. The processing fee for all CQ awards is \$4.00 for subscribers and \$10 for non-subscribers. Please make all checks payable to the Awards Manager. In order to qualify for the subscriber rate, please enclose your latest CQ mailing label with your application. Send any questions to K1MEM by mail and include an SASE (please do not telephone).

their list of such unacceptable cards, but they may have to, to maintain the high standard of the DXCC program.

Note that this procedure applies only to new DXCC applications. Endorsements, even those involving "core" countries, will still go to Newington for direct DXCC desk review. Also, any QSL cards from countries not on the core list will also have to go to Newington for DXCC credit. Also, there are as yet no plans to authorize field checking outside the US and Canada. Overseas DXers will still have to send their cards to the US.

The Next Step

While not part of the field-checking proposal, an obvious next step in the proce-

cedure is to computerize the process. As more DXers use computer logging programs to maintain their DXCC records and to prepare the DXCC applications, field checking can be streamlined. Here's how it might work.

The companies producing the various logging programs can easily "flag" those 250 or so countries on the "core" list. At any time the DXer can determine exactly how many core countries he or she has confirmed. Then the computer can produce a file that is compatible with the DXCC database at the ARRL. The new DXCC applicant submits the disc, along with the application and fee, to the field checkers. The checkers review the cards, make any deletions or changes on the disc as well as on the paper applica-

5 Band WAZ

As of January 30, 1991, 305 stations have attained the 200 zone level.

New recipients of 5 Band WAZ Award with all 200 zones confirmed:

W7OM
KB8DB
VE6OU/3

The top contenders for 5 Band WAZ are:

N4WW, 199	RT5UY, 199
SP9PT, 199	NA0Y, 198
K6YRA, 199	K7UR, 198
LA4HW, 199	I8IGS, 198
PY7ZZ, 199	VE7DX, 198
DL9WW, 199	W0PGI, 198
K0CS, 199	VE7AHA, 198
KB0G, 199	SM6AHS, 198
ZS6BCR, 199	K1ST, 198
HA8XX, 199	ZS6BCR, 198
UA4RZ, 199	WB9Z, 198
AA4KT, 199	W1JR, 198

697 Stations have attained the 150 zone level as of January 30, 1991.

Correction: To the list of 5Band WAZ holders in December 1990 CQ add: number 125A, HA0DU.

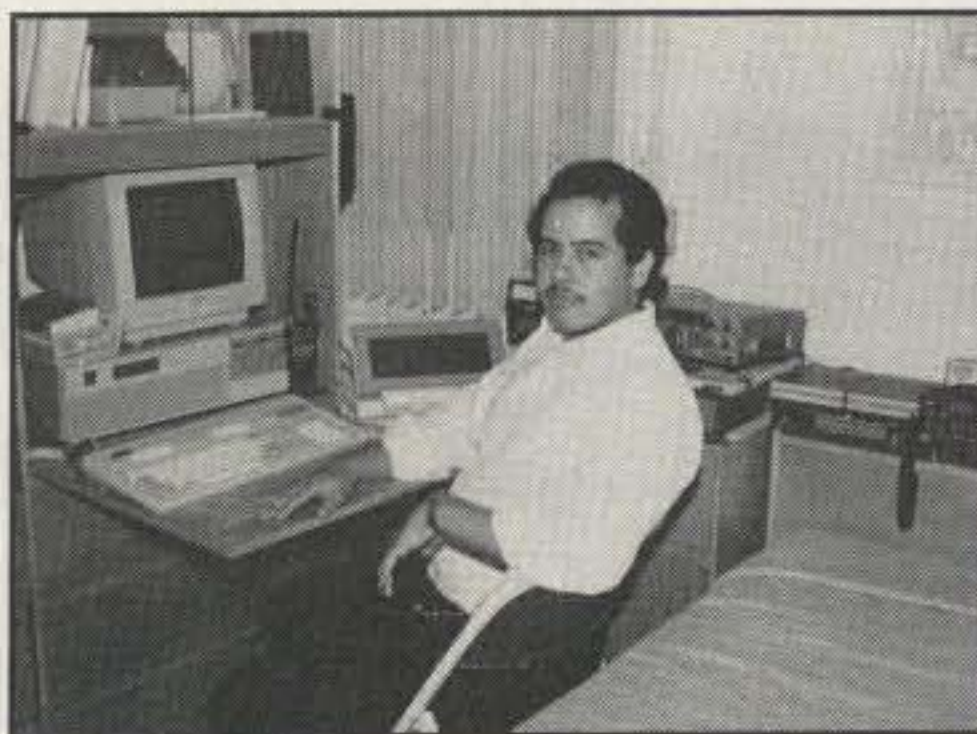
Applications and reprints of the latest rules may be obtained by sending a self-addressed stamped envelope (75 cents) size 4 1/2 x 9 1/2 to the WAZ Manager, Jim Dionne, K1MEM, 31 De Marco Rd., Sudbury, MA 01776. Applicants should include sufficient postage for safe return of their QSL cards. The processing fee for all CQ awards is \$4.00 for subscribers and \$10 for non-subscribers. Please make all checks payable to the Awards Manager. In order to qualify for the subscriber rate, please enclose your latest CQ mailing label with your application. Send any questions to K1MEM by mail and include an SASE (please do not telephone).

tion, and forward the package to ARRL headquarters. There the staff can simply upload the file directly into the DXCC database, eliminating the time-consuming (and potentially error-prone) process of typing in all the 100-plus credits.

The ARRL already accepts contest logs on disk; look for them to begin accepting DXCC applications on disk soon. When this happens, the DXCC program is just a small step from the elimination of the paper QSL card all together! Many DXpeditions use computers for QSLing, either during or after the DXpedition. Since the QSO data is already on disk, they can send a computer file of everyone they work to the ARRL. This information can be merged with the DXCC database, and automatically add appropriate DXCC credit to everyone who needs it! No QSL cards, no DXCC endorsement mailings, no hassle. But that is the subject of a future column.

DX Club Officers

DX clubs will pay a major role in the DXCC field-checking program, since all authorized checkers must be nominated by



Another first is Ramon Gonzalez, WP4XQ, who logged contact number one with WA4SIR's packet station aboard the Space Shuttle Columbia.

such a club. This increases the responsibility of the following new club officers.

The 1991 officers of the North Jersey DX Association are: President Stan Owens, W2MT; Vice-President Harry Westervelt, NA2K; Secretary Bill Hudzik, WA2UDT; and Treasurer Gene Ingraham, N2BIM.

New 1991 Officers of the Southern California DX Club are: President Carl, WU6D; Vice-President Pete, N0AFW; Secretary Steve Locks, W6FRZ; Treasurer Charles, N7QQ; Director Bob, N6BIC; Director John Alexander, K6SVL; Director Rick Samoian, WB6OKK; Membership Gary Pesselt, WB6PSY; Contest Edgar Brown, N6OU; Awards Carl, WU6D; and Bulletin Editor Gary Pesselt, WB6PSY.

The following officers of the Kansas City DX Association were recently elected unanimously: President Bill, K0VBU; Vice-President Joe, WK0G; Secretary Denise, AJ0E; and Treasurer Rick, KB0U. Mike Crabtree, AB0X, will continue as Newsletter Editor.

The officers for 1991 of the Western Washington DX Club Inc. are: President Adam Kerner, AA7FT; Vice-President Jack Fleming, WA0RJY; Secretary Marina Zuetell, N7LSL; Treasurer Doug Miller, WE7E; Trustees Danny Eskenazi, K7SS, John Gohndrone, N7TT, Joe Gregory, W7QN, George Ockwell, K7HBN, Bill Peck, N7FSW, Morris Shepard, W7LVI/W7FR, and Frank Tate, NA7O.

New officers of the Lone Star DX Association are: Chief Director Mike Krzystyniak, K9MK; Treasury Director Judi Jaksas, N0IDR; Program Director Donald Simmonds, K5BDX; and Information Director Paul Godwin, KF5PE.

Upcoming DX Events

A joint US-USSR team will operate from the Dombay Valley UA6E (Oblast 109) for about three weeks in the next month or so. Operators include RW6AC, RV6AB, UV6AY, WF2S, KA2OVA, K1ZZI, and KP4DQ. They intend to hang out around

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- 16 Search Banks.
- RS232 port built in.
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Wherever you roam, on Land
or Sea . . . or even at Home



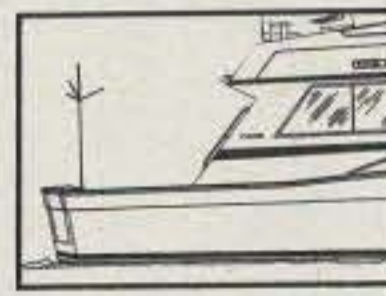
On Land

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Or Sea

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CANOGA PARK, CALIFORNIA 91303
TELEPHONE: (818) 341-5460

CIRCLE 40 ON READER SERVICE CARD

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 322. 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	322	W0IZ	317	DJ1XP	310	AB4H	303	WA4DAN	296	W9SC	286
K2FL	322	K3UA	317	W6ID	310	N7RO	303	W8YTM	296	G3KMO	286
K2TQC	322	W7ULC	317	K9QVB	310	N8MC	303	WD9IIX	295	K4JLD	286
N4JF	322	AA4KT	317	IT9ZGY	310	I4EAT	302	KD8V	295	K2JLA	285
K4CEB	322	N6AR	316	W7CNL	310	K9TI	302	W6YQ	295	KP4P	283
K9MM	322	W0SR	316	WD9IIC	310	WA8DXA	301	NY5L	294	AG9S	282
SM6CST	322	N2KW	316	W0HZ	310	KZ4V	301	K9DDO	294	JH1VRO	281
ON4QX	322	W6PT	315	K8PYD	309	YU2TW	300	N5FW	293	K7ZR	279
DL1PM	321	K4XO	315	WB4RUA	309	I3OBO	300	IT9VDQ	293	I5XIM	279
K6JG	321	K9IW	315	W6SN	309	W0JLC	300	W3BBL	293	W2LZX	279
W2FXA	321	N4PN	314	W1WAI	309	WA4IUM	300	VE7DX	292	KB9XG	279
K9AB	321	DL7AA	314	AA6AA	308	DL6QW	299	N5DX	290	W9NUF	279
YU1HA	321	W1NG	314	W9RY	307	NN4O	299	KB0G	290	KB8DB	279
N4KG	320	DL8CM	313	W4OEL	306	F3TH	299	N4AH	289	HB9AFI	278
OK1MP	320	EA2IA	313	KQ9W	306	DJ2PJ	299	W1WLW	288	KA2DIV	278
N6AV	319	N6CW	312	SM6CTQ	305	W6DN	299	W4BV	288	KA3R	277
N4MM	319	WA2HZR	312	K4CXY	304	I2QMU	299	K1VHS	288	KA7T	277
SM3EVR	319	K2OWE	312	W2UE	304	N4AH	299	G2GM	288	DL1QT	276
K1MEM	318	W9WAQ	311	WA4JTI	304	K3FN	297	K2JF	288	KU0S	276
W4BQY	318	K6EC	311	IT9QDS	304	DJ7CX	296	K8NA	287	YV5ANT	276
K6LEB	317	K9BWQ	311	I8WY	304	K8LJG	296	G2FFO	286	K4SE	275
DL3RK	317	IT9TQH	311	AA5NK	304						

SSB

K2FL	322	W7OM	319	AA5NK	314	N6AV	307	SV8CS	299	LU7HJM	288
W6EUF	322	K1UO	319	IK8CNT	314	A18M	307	I2ZGC	299	OK1AWZ	287
VE1YX	322	KB5FU	319	HR1KAS	314	KZ4V	307	NW5K	299	EA3KW	286
F9RM	322	W2CC	319	I2LLD	313	KC2FC	307	WB6GFJ	299	AB9E	286
N4JF	322	I4ZSQ	318	W1NG	313	I0MBX	306	JH1VRO	299	W9SC	286
VE3MR	322	W2FXA	318	W1LOQ	313	KV2S	306	K1VHS	299	PA0XPQ	286
DJ9ZB	322	IT9ZGY	318	SM4CTT	313	VK3JF	306	I8IGS	299	N8BJQ	285
4Z4DX	322	ZS6LW	318	KE4VU	313	VE4SK	306	ZL1BOQ	299	N9CPW	285
W4EEE	322	W0SFL	318	EA4LH	313	KA9ABC	306	K8YVI	299	K9MNT	285
W9DWO	322	W6DN	318	WB6OKK	313	WA2MID	306	K5DUT	299	KB5RF	284
W4DPS	322	K52I	318	WB6PSY	313	WB4PUD	306	WA0TKJ	298	KF5AR	284
W0YDB	322	PY1APS	318	W8PCA	312	XE1MDX	306	I6PLN	298	IK8BMW	284
EA4DO	322	G4CHP	318	N2SS	312	WB5TED	306	KA8T	298	G4SZD	284
DL9OH	322	WA4ECA	318	OE2EGL	312	N4KE	305	KB2FC	298	NZ7D	284
VE3XN	322	W7FP	318	K0GT	312	KE3A	305	DJ7CX	298	KC7EM	283
W3AZD	322	KR9O	318	W2FGY	312	K3LUE	305	KB9LN	298	KR9F	283
YV1KZ	322	N2KW	318	G3VOF	312	CX4HS	305	WD9BNC	298	WB3HAZ	282
OK1MP	322	I2QMU	318	WB3DNA	312	W5LLU	305	K9SM	297	VE3MV	282
VE3GMT	322	W4UNP	318	KQ9W	312	WA6DTG	305	JH4PRU	297	ZP5JCY	282
ZL1AGO	322	ZL1BIL	318	KB3OQ	312	KZ8Y	304	EA9IE	297	IDBVJ	282
ZL3NS	322	K2JLA	318	K8CMO	312	K8VFX	304	XE1HI	297	YB3CEV	282
K6WR	322	YV5AIP	317	KI3L	312	EA1OF	304	KF5DX	297	K3NEE	282
I4LCK	322	W8ILC	317	TI2KD	312	K4RIG	304	TI2JJP	297	W3SOH	282
K2TQC	322	N6AR	317	F2MO	311	I4WZK	304	N4KELM	297	WA9BXX	282
W2SUA	322	KM2P	317	W0SD	311	K4JLD	304	HP1JC	296	AE2B	281
K8LJG	322	VE7WJ	317	K9RF	311	KD5ZM	304	YU7KV	296	A19R	281
W9OKL	322	WA4DAN	317	K9HDZ	311	KD8V	303	XE1OW	296	TG9EP	281
EA2IA	322	YV5GWO	317	LA7JO	311	KC8YM	303	WD9GQV	296	VE3NUP	281
K9MM	322	K4CXY	317	LU3YL	311	K4LR	303	F6BFI	296	N1ALR	281
K4MQG	322	YV1AJ	317	N6OC	311	KB0SY	303	WB3GPR	295	EA8TE	281
OZ5EV	322	N4CRU	317	NA5W	311	KB7VD	303	KB3KV	295	VU2DVP	281
W9SS	321	I8KCI	317	W8ILC/QRPp	311	W7ULC	303	I0SGF	295	PY2DBU	280
YU1HA	321	WA4WTG	317	I2MQP	311	KA9TNZ	303	K8NWD	295	NP4CC	280
I0ZV	321	DJ1XP	316	NN4O	311	WA2FKF	303	KB0G	295	NX0I	280
I8YRK	321	KD8VM	316	KS0Z	311	IK1GPG	303	EA4KK	295	YU1TR	280
VE2WY	321	N4WF	316	IK2GNW	311	WA8YTM	302	W01YR	294	G4FAM	279
K9BWQ	321	K4PQV	316	KA6V	311	XE1KS	302	KK0C	294	W9VA	279
K6JG	321	NY5L	316	AA6BB	311	W2LZX	302	G3XTT	294	WB8TLI	279
K6YRA	321	KR9O	316	SM6CST	311	KB0U	302	VE3XO	294	WBURM	279
N7RO	321	I8LEL	316	AA4AH	311	W0ULU	302	I7UNX	294	W5XO	279
ON5KL	321	KC8EU	316	W4SSU	310	WD5P	302	I5BDE	293	K5AOL	279
YU1AB	321	WA4JTI	316	K6EC	310	W4BQY	302	WB3CQN	293	KB5DN	278
K5OVC	321	K9HQM	316	K8NA	310	XE1XM	302	KB8O	293	EA6DE	278
TI2HP	321	W6SN	316	NJ0C	310	K7EHI	302	VE5FX	293	JH8NYK	278
W4NKI	321	K3UA	316	I8XTX	310	K1MEM	301	IT9VDQ	293	KX5V	278
N4MM	321	AG9S	316	KB4HU	310	N5FG	301	WD9IIC	293	WN5K	278
I8ACB	321	K8ZJU	316	G4ADD	310	I3OBO	301	K4SE	292	K4BYK	277
K9AB	321	K2JF	316	WD8PUG	310	K9UAA	301	KC8JH	292	VE3IUE	277
KZ2P	321	K8PYD	315	XE1OX	310	KP4EOF	301	A15I	292	DF6EX	277
CT1FL	321	K4XO	315	WE2L	310	N5FW	301	W9NUF	292	KG9N	277
OA4OS	320	A18S	315	W6MFC	310	VE2PJ	301	KD5ZM	292	I8WYD	277
I8AMU	320	W0SR	315	KA5RNH	310	IK8GCS	301	VE6PW	292	CE7ZK	277
OE3WWB	320	WB1DOC	315	K9TI	310	K0HOW	301	TI2LTA	292	KA9I	277
VE3MRS	320	VK4LC	315	DK2BL	309	KB1JU	301	YV1CLM	292	WA9BDX	277
VE7DX	320	9H4G	315	AA6AA	309	VE3DLR	301	WA4LOF	291	WA5HWB	277
SV1ADG	320	IK8BOE	315	AB9O	309	N6CGB	301	AC0A	291	WB0UFL	276
WD8MGO	320	W6NLG	315	KU9I	309	VE6PW	301	VE3FEA	291	W4PTT	276
IT9TGO	320	WZ4I	315	N6AHV	309	IK7DBB	301	VP9CP	291	WD0DMN	276
W3GG	320	KE4HX	315	KB9OC	309	WA3HUP	300	W8LKG	291	HK6BER	276
N4KG	320	XE1AE	315	K1MIZ	309	VE3FJE	300	SV1JG	291	NC9T	276
W4UW	320	KA3HXO	315	IV3YRN	309	WB4NDX	300	KE7UL	291	I8IYW	276
AA4KT	320	WA4IUM	314	I5EFO	309	YU2TW	300	VE2GHZ	291	XE1DU	276
WB4UBD	320	I8KDB	314	I1POR	309	N4CRU	300	VE3IPR	290	WB4TGB	276
TI2CC	320	K9LKA	314	G4GED	309	KZ0C	300	W4JFE	290	N0AMI	275
I4EAT	320	OH5KL	314	KP4P	309	N8BKF	300	DU9RG	290	N7ASL	275
N6AHU	320	OZ8BZ	314	WA9RCQ	309	WT4T	300	XE1CI	290	WA4OPW	275
I8AA	319	YV5DFI	314	N4PN	308	KB2HK	300	K1HDO	290	KC2RS	275
OZ3SK	319	W9RY	314	WD9IIX	308	K7LAY	300	VE3CKP	289	NO4J	275
DL6KG	319	NJ2C	314	K9QVB	308	KB9KD	300	I4UFH	289	KC4MJ	275
K9IW	319	K8CSG	314	N3ARK	308	KB2MY	300	W9TA	288	KA5YCM	275
KB8DB	319	KU9Z	314	W4BQY	308	IN3ANE	300	JA5PUL	288	KI4FW	275
IT9TQH	319	W6BCQ	314	OA4ED	308	KF7SH	300	A19U	288	NX4Y	275
YS1GMV	319	PY4OY	314	VK7VC	307	I2EOW	300	YV2EJU	288	WA4PGM	275
						VE4AT	299	I4CSP	288	KE5PO	275

14250, 21250, and 28450 kHz, as well as on the SSB DX nets. QSL the US operators by the home call signs, and the Soviets via Jack Tatashvili, RW6AC, Box 16, Armavir 352900 USSR.

Joe Hypnarowski, WA6VNR, and his wife Nancy, N6RLE, will operate from the Cayman Islands as ZF2AH and ZF2JT, respectively from June 28 to July 12. Joe will concentrate on CW, 25 kHz up from the bottom of the bands, and Nancy will frequent 28495 kHz. QSL to their home calls. The couple is planning an operation from Kiribati T3 for the CQ WW SSB test in October. Contact them for details about joining the trip.

And the Natal DX Group of Brazil continues to solicit funds for a possible return to St. Peter and St. Paul Rocks PY0 in May. They have five operators, including CQ Hall of Famer Franz Langer, DJ9ZB, but still need to raise several thousand dollars to make the trip a reality. DXers and clubs can send their donations via registered mail to the Group at Box 597, 59022 Natal RN, Brazil.

CQ Award News

Robert Peterson, N4VZ, has earned the first three Worked All Zones awards for 12 and 17 meters. Specifically, Bob has certificate number 1 for 12 meter mixed-mode, 17 meter mixed mode, and 17 meter CW. He is working on the 30 meter award. Bob attributes his success to an early start on the bands, and his Sommer multiband Yagi antenna.

Several DXers finally managed to catch PA0GAM/ST2 on CW for their last zone for the new CW WAZ award. The first DXer to report working all 40 zones on CW in 1991 was Bob Farkaly, K9RHY. He beat out Dennis Sullivan, NS6C, by 57 minutes, snagging Zone 34 on February 18.

Also, CQ has started an RTTY DX Award. Rules are the same as the regular 2xSSB and 2xCW awards (there is no



Members of the Natal DX Group from Brazil plan a return trip to St. Peter and St. Paul Rocks this month. This photo from their 1989 trip shows how difficult the unloading can be.

CQ DX Awards Program

SSB

1841	HR1KAS	1844	WA9BDX
1842	SM5SVL	1845	VU2DVP
1843	K2AJY	1846	WN4DXL

CW

820 RA6YJ

SSB Endorsements

320	OZ5EV/322	310	HR1KAS/314
320	F9RM/322	310	IK8CNT/314
320	CT1FL/321	310	WA4IUM/314
320	W9OKL/321	310	WB6PSY/313
320	KZ2P/321	310	W6MFC/310
320	VE7DX/320	300	IC2FC/307
320	N6AHU/320	300	IK7DBB/301
310	K2JLA/318	275	VU2DVP/281
310	ZL1BIL/318	275	WA9BDX/277
310	YV5AIP/317	275	WA5HWB/277
310	WA4WTG/317	150	WN4DXL/175
310	IK8BQE/315	28 MHz	WN4DXL
310	W6NLG/315		

CW Endorsements

320	ON4QX/322	275	W6YQ/295
300	AA5NK/304	275	VE7DX/292
300	I8WY/304	275	K2JLA/285
300	WA4IUM/300	275	RA6YJ/212
275	N4AH/299		

Total number of active countries is 322. 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.

"mixed" award). The country count is 322 (the CQ award does not recognize deleted countries). Either West or East Germany will count for the "new" combined Germany, and likewise either North or South Yemen will count for the new Republic of Yemen.

73, Chod, VP2ML

QSL Notes

Javier Campos, KJ6BK, says to QSL his Cayman Islands operations as **ZF2PP** on August 23 and September 7-8, 1990 to him at 1061 York Street, San Francisco, CA 94110.

The direct **V73AZ** QSL cards for the CQ WW SSB Contest have all been mailed.

QSLs for **A22AA** should all go to Charles Lewis, Private Bag 38, Selebi-Phikwe, Botswana, Africa. Don't use the US address published elsewhere.

Jack Sproat, W4LCL, reports that his former call **JY9LC** was pirated on 40 meters in December. Don't try to confirm these contacts. He also says that any cards sent to him via the Jordan bureau never reached him. Jack is presently in Indonesia as **YB0ACL**.

Frank Turek, **DL7FT**, reports that his address in the 1991 Callbook is incorrect. QSL **S79FT**, **DL7FT/FH**, and **DL7FT/C56** to W-1000, Berlin 19, Germany. Frank expects separate return envelopes, and separate US \$1, for each QSL card.

AK1E reports that he has not received logs from either **TR8JLD** or **3DA0AY** for

more than six months; hence his delay in confirming contacts. He'll catch up as soon as he receives the logs. Meanwhile, please don't send second requests.

Pete Hoover, W6ZH, reports that his former callsign of **ZL0AAD** was reissued at the end of 1990. Pete can confirm contacts from February 1990 **only**. QSL the December **ZL0AAD** operation to DJ1ND.

Roy Gould, KT1N, reports getting cards for **4W1AC**; he is **not** the manager.

John Fung Loy reports that **PA3CXC/ST0** direct cards were all mailed. If you haven't received yours, try again to his home call.

QSL the ARRL CW contest operation of **PJ2J** to K1CPJ. QSL John Thompson, PJ9JT's operations to W1AX.

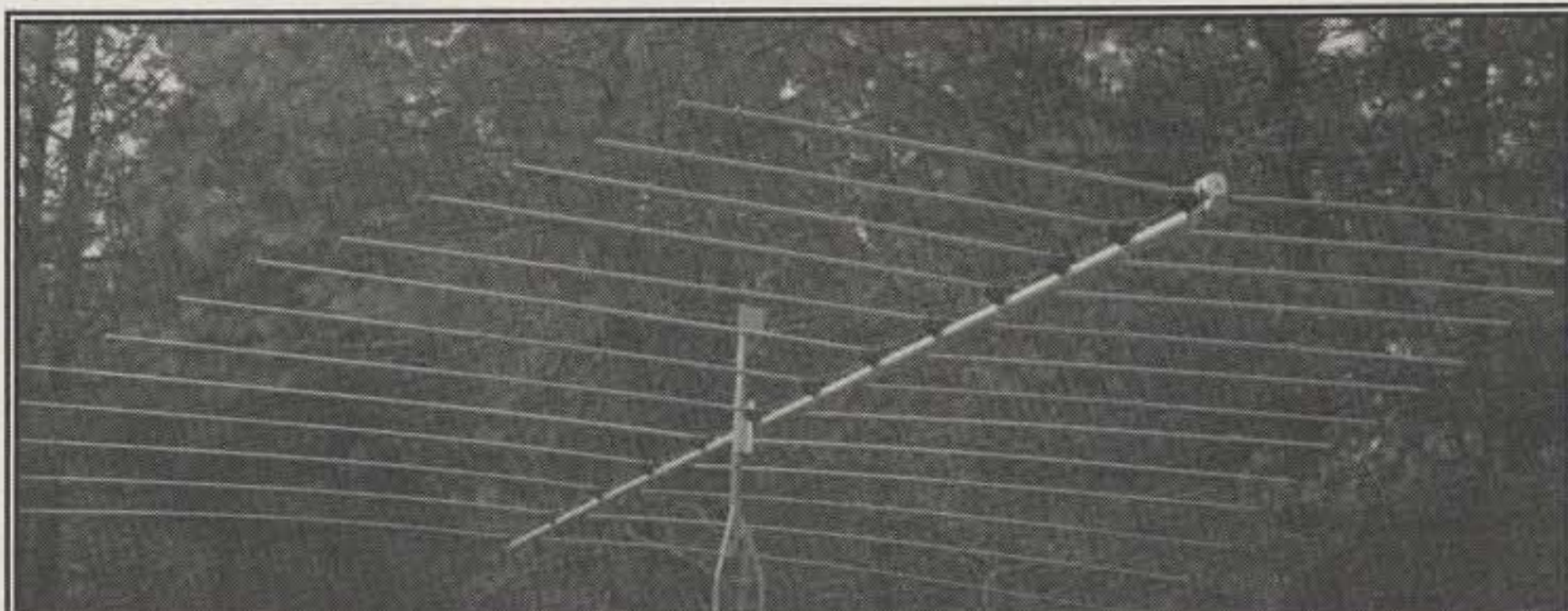
Take Yokoyama, JL1BLW, reports that

he has the **YI1BGD** logs for January 1 to October 13, 1990 **only**; he cannot confirm earlier QSOs. He says that the best YI1BGD QSL routes are as follows: Operator Ali via JR1AIB up to October 13, 1990; Operator Samy via ON7LX up to October 13, 1990; and other operators, January 1 to October 13, 1990 **only** via JL1BLW.

Bernie van der Walt, ZS4TX, says that he handles his own cards for operation under his Lesotho call, **7P8EN**, either direct or via the bureau.

QSL Steve Dubberstein, NA9D's operation as **VS6WO** to K9EC.

Ray Husher, W5EW, wants to close out the logs for **J79T**, **VK9EW**, and **VK9WB** on June 1, 1991. If you have not yet sent a card for contacts with these stations,



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Th, F (9-8)
Sat (9-3)

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1Z9D to KA6V	CN2JF to WA0RJY	K5MK/Port 4 to K5MK	UBZ/MM to UA0ZDD	ZD8DX to WB2K	JT2AB to P.O. Box 119, Chojbalsan, Mongolia
3D2WZ to G3WZ	CN8SX to W5SX	K85NIV/DU4 to WA5ADH	UA0HAE/UA0K to UB4MM	ZD8S to AK0M	JT8AA to P.O. Box 22, Altaj, Mongolia
3X1SG to ON6BV	CN8YP to F6FYP	KC6CQ to VE3JDO	UA0KBA to RA3YG	ZD8VJ to G42VJ	JU1DX to P.O. Box 676, Ulan Baator 13 Mongolia
4K1A to UZ1PWA	C06CD to N4THW	KC6MM to VE3JDO	UA9KCC/A to UA9KAA	ZD8Z to W6CF	KH3/K8CRM to P.O. Box 764, APO San Francisco, CA 96305
4K2BDU to UA9MA	C04DX to CT4DX	KE9A/DU3 to WB9YXY	UB4JJR to KB8RJ	ZD9CO to W4FRU	KH4AE to Art Edmonds, Jr., Box 19 NAF, FPO San Francisco, CA
4K20IL to UA9MA	C06RB to CT1RB	KH8AM to JH0KVA	UC5A/UA6ED to UC2AHZ	ZD9CS to KA1DE	OD5ZZ to P.O. Box 782, Tripoli, Lebanon
4K2PG0 to RA9LA	C09M to G3PFS	KL7/DF3CB to DF3CB	UF80/UF6DZ to UB5PS	ZF2G0 to KA9DZM	P29KIH to P.O. Box 997, Mandang, Papua New Guinea
4K3BB to RB5CB	CR7DNP to DJ0MW	LZ5P to LZ1KTU	UF6DZ to UB5PS	ZF2MZ/ZF8 to K3IPK	P29PA to P.O. Box 11, Tari, New Guinea
4K4/UA6WCG to I8YRK	CT3/EA7GGU to EC7DEB	N4YDU/4 to N4PY	UG1700GAW to UG6GAW	ZF2NJ to K0BJ	P29PA to P.O. Box 11, Tari, New Guinea
4K4QQ to RA1QQ	CT3BH to OH2BH	NL7GP/PJ4 to NL7GP	UG1700JJ to UG6JJ	ZF2NM to K1MD	
4S7CF to 9V1JY	CU2DX to CU2AA	NP4Z to WC4E	UH1E/RA3QJ to RA3QK	ZF2PP to NE4L	
4U/OH7XE to OH7XE	CU3LF to KB3RG	OH8MM to OH2MM	UH3E/UA3DAT to UH8EA	ZF2PM to KJ6BK	
4U/VE4ANM to VE4ANM	CW8W to CX4CR	OM7CQR to OK3CQR	UH7E/UZ9CWA to UZ9CWA	ZF2QC to KA4KDE	
4U1UN to NA2K	CY9CF to FP5DX	OT4ZD to ON4ZD	UH8EA to W5BWA	ZK1X0 to VE3CPU	
4X4POL to UA0KKL	CY9DX to FP5DX	OX3EW to KB5LRO	UH8WZ to UM8MCW	ZK2XA to DJ1ND	
4Z80TA to 4X6LV	D68GA to N6ZV	OX3JF to OZ1JFC	UI8IF to UI8IAJ	ZK2XB to DJ1ND	
5H30H to OH2BAA	D68VT to K5VT	OX3KR to OZ3PZ	UI8IF/UI8Q to UI8IAJ	ZK3KM to JR3OIB	
5N4BFD to DJ9FH	EA8/DJ9RB/P to DJ9RB	P29AC to VK8AC	UI8QD to K9FD	ZL7/ZL8AAD to DF1ND	
5T5/N5JRC to WA5ZIJ	EA8/G0KPW to G0KPW	P29DK to KE4EW	UI9BWF to UA3TT	ZL7/ZL8ADN to DJ1ND	
5U7NU to F6FNU	EA9FT to EA9IB	P29SR to WB6IOQ	UL8PA to UL8PA	ZS9A to ZS1IS	
5W1JJ to K6VNX	ED0B0D to EA4B0D	PJ2/OH2BGD to OH2BGD	UL7NW to WA2CBU	ZS9Z to ZS6BCR	
5Z4DU to KE4DA	EJ8GP to EI8GP	PJ2/OH3NJZ to OH3NJZ	UM2Q/ES1RA to ES1RA	ZW0MI to PY5TT	
6W1QB to DK3NP	EK0AC to UA9OBA	PJ2/OJ9RP to OJ9RP	UM3Q/UA90F to UA90F	ZY7EK to PS7AB	
7Q7EC to DF3EC	E05BQM to UY5YY	PJ5/N4X0 to N4X0	UM8TBE to UM9TWA	3DA0BK to P.O. Box 122, Eveni	
7Q7KG to YASME	EX7M to UL7MW	PJ8MM to K1MM	U00A to YL1ZW	4K2/UV3CC to P.O. Box 24, Moscow, 127349, USSR	
7Q7KM to NK2T	F2JD/CE6 to F6AJA	PY0FF to W9VA	UW0CW to KA6V	4L4F to P.O. Box 2345, Penza, 440028 USSR	
7X0NU to F6FNU	FG4DM to FG3DM	PY1QN/PQ8 to PY1QN	V2/KJ4VH to KJ4VH	4S7WP to P.O. Box 80, Colombo, Sri Lanka	
7X2CR to IS0LYN	FJ/FG5ED to FG5ED	R5WRP to UB5WZA	V29A to W4FRU	5H3GM to P.O. Box 9212, Dar Es Salaam Tanzania	
7X2DB to IK8KPL	FK8FU to NA5U	R88GWG to RB7GG	V31DX to KA6V	5N30BRC to P.O. Box, 13904 Kano Nigeria	
7Z1AB (op. Richard) to WB2WOW	FK8GJ to F6CXJ	RJ7R to UF8JQC	V31KF to W5ASP	5N6ZHM to G0MOK, Box 11, Horwich, Lancashire BL6 5UN, England	
8P6NX to W0SA	FM5BH to W3HNC	RL8L to UL8LYA	V63NW to DF6DK	7P8EP to P.O. Box 1668, Maseru Lesotho	
8P9FC to GM3AVA	FM5WD to W3HNC	RL8MU to UL7MU	V73AS to KK4QY	7Z1AB (op. Ken) to P.O. Box 9041, Riyadh, Saudi Arabia 11413	
8P9HR to K4BAI	F08CC to K1CC	RL8O to UL7AB	V73AT to K2CL	BV2AL to P.O. Box 8-30, Danchiao, Taipei, Taiwan 22076	
8Q78X to I4ALU	F08IGS to F6EEM	RQ9W to UQ1GWW	V73BN to KX6DC	BY5RA to P.O. Box 730, Fuzhou, PRC	
8Q7CR to DF5JR	F04NR to F6ELE	RT0U to W3HNC	VG2AC to VY2AC	BY7HL to P.O. Box 105, Changsha, PRC	
9H1EL to LA2TO	F05FO to F2BS	RT4UA to UJ8JCC	VG2EA to VY2EA	BZ4WAB to Op. Huang, P.O. Box 413, Zhenjiang City, PRC	
9H1EU to WA4JTK	F08AA to N6VO	RV9CBF/UA0K to UA0KCL	VK7JH to W3UM	BZ4WH to P.O. Box 413, Zhenjiang, PRC	
9H1XX to DL2GBT	FS/KC1F to KC1F	RW4F/UI8UAC to UZ4FWD	VK9LA to DJ5CQ	CEBZZZ to P.O. Box 133312, Santiago, Chile	
9J2B0 to W6ORD	FT4XG to FD1AAS	RW9G/UA9XC to UA9XC	VK9NX to VK2FCA	CN15AMV to P.O. Box 299, Rabat, Morocco	
9J2HS to J4MTI	FT4YD to FD1NZD	RY3D/RB5GW to RB5GW	VP2E/NR1R to NR1R	CX4PA to P.O. Box 64145, Rivera, Uruguay	
9J2SZ to SP8DIP	FT5XH to F6GYV	RZ4F/UI9UWG to UZ4FWD	VP2EXX to KC8JH	DU3/WA6VRS to Teerrell Cohen, PSC-3, P.O. Box 15556, APO San Francisco, CA 96432	
9L/HB9AUZ to HB9AUZ	FW0DD to FK8DD	ST0DX to WB2WOW	VP2V/W2GUP to W2GUP	DU9BKD to J. Barken, P.O. Box 7982, Koronadal, S. Cotabato 9506 Philippines	
9L/HB9BEI to HB9BEI	FW0ET to FK8DD	SV0DV to WB4TDB	VP5JM to W3HNC	EK0RR/AM to P.O. Box 308, Moscow 103009	
9L3GB to W3HCW	FY5EW to F6BFH	SV0HM to DK8MT	VP5P to WN5A		
9M8AJ to AA5AZ	FY5FO to F6BYZ	SV0HS to DJ8MT	VP8CEL to G4PVM		
9Q5TE to SM0BFJ	FY5FP to ON4ZD	SV2ASP/A to SV2UA	VP8CFM to GM4KLO		
9Q5UN to OH3GZ	GU4ENK to ON7WH	T21CE to DJ9ZB	VP8GAV to GM0LVI		
9U5QL to YASME	H71A to SM0KCR	T22YL to DL5UF	VP9HE to KD8IW		
9X5NH to DJ6EA	HE7BQP to HB9BQP	T23XX to DL2GBT	VQ9AB to WB4ECR		
A35XK to WA6ZEF	HE7COX to HB9COX	T30CE to DJ9ZB	VQ9RB to WA4DPU		
A41JV to KJ4GK	HF0POL to KB6GWX	T30DQ to DL5UF	VQ9SS to KA6V		
A47RS to KD2OM	HF0POL to KB6GWX	T30DR to DL2GBT	VS6CT to KA6V		
A71CD to WA4JTK	H18A to JA5DQH	T30NAD to JO1CRA	VS6DV to G3GAF		
A92FL to WD4DCY	HK0/K1WGM to K1WGM	T32Z to N7YL	VU2ZAP to W3HNC		
AH0F to JA2NOG	HK0TU to HK3DDD	T77V to IS0QDV	WE6C/BV2 to WV6X		
AY9F to LU9FHF	HL9JLN to KC6MXD	TA7/RF6R0 to WA2NHA	XF0C to XE1BEF		
BV2A to K2CM	HR1LW to JA1LW	TF3EJ to TF3IRA	XQ0X to CE3ESS		
BV2BV to WU6X	HV3SJ to I0DUD	TI75S to TI4SU	XT2BW to WB2YQH		
BV2DA to DL7FT	HZ1HZ to N7RO	TJ1BJ to K4UTE	XW8KPL to JASAHH		
C53GB to FD1MXH	IN0G to IK0GPP	TK/DL7HZ to DL7HZ	XX9TT to KC9V		
C56/G3VPW to G3VPW	J28NU to F6FNU	TK/DE1GAS to OE1GAS	Y53CD to Y27FD		
C56/G3YJH to G3YJH	J37A to W3HNC	TK9LAV to F6ATQ	Y90ANT to Y21RO		
C9EC to DF3EC	J5CVF to CT1DIZ	TL8HW to WB4LFM	YC0IPD to YC0TSU		
C9QL to YASME	J8/FG5ED to FG5ED	TR8GL to F6IXI	YL3GG to RQ2GG		
CE0/F2JD to F6AJA	JD1/7JADJ to KB1BE	TR8JLD to AK1E	YN/SM0IG to SM0KCR		
CG1DX to VE1ASJ	JW0GB to WB4ZBI	TU2PA to KE0LS	YQ3R to YO3CD		
CG3NXQ to VE3NXQ	JW5QFA to LA1MFA	TU2UI to WA8ZWR	ZD7XY to W4FRU		
	JX7DFA to LA7DFA	TZ6VV to N0BLD	ZD8CUE to G42VJ		

please do so as soon as possible. Ray will also replace VK9EW/VK9WB QSLs cards that were accidentally smudged when the envelopes were sealed. Ray's address is P.O. Box 73, Bernice, LA 71222.

Marcelo Bornscheuer, CE6MBQ, can confirm contacts with **3G3MBQ** from 1986 to 1990.

Al, WD0HHM, reports that his **9J2AL** logs and cards have not yet arrived from Lusaka. He has a backlog of about 1000 cards.

Doug Donley, **KG4DD**, in Guantanamo Bay says the only QSL route for contacts with his station is Box 692, FPO New York NY 09593-0055, with a self-addressed envelope and US \$1. Doug has a list of some of the former Gitmo Bay operators

and their current addresses; write to him for a copy. Finally, he reminds DXers that only two-letter suffix KG4 stations are in Guantanamo Bay. One- and three-letter suffix KG4 stations are in the US.

KP4NL reports that he is *not* the QSL manager for **HH4TD**.

Ross Tanaka, **9M2AX/9M8AX**, has a new address: F7 Menara Impian, Taman Tun Abdul Razak, 68000 Ampang, Kuala Lumpur, Malaysia.

Kevin Walton, N4RMF, reports that cards for his 1988-90 **9M2ZZ** operation should go to his new address: Box 316, Culpeper, VA 22701.

G3PRI can confirm contacts with **VS9ADQ** and **MP4TBK**.

Corrections. **V31YZ** should be con-

firmed via W5YZ, not W5YX. The correct address for **UI4L/UA4AO** is Igor Grishin, Mira 10, K. 16, Volgograd 400066 USSR. And **4S7EF** writes to us that N1HBF is *not* his QSL Manager. All cards for 4S7EF should go direct to him via the Callbook address (Ekendra, P.O. Box 70, Colombo, Sri Lanka). Cards sent to N1HBF in error will not be forwarded and must be resubmitted to 4S7EF via the correct address.

USSR QSL Information. Valery Pristavko, UC1AWG, offers to help with QSL cards to Byelorussia (UC1, UC2, and RC2). Contact Valery at Box 17, 220012 Minsk USSR. **UM8MTA** is Vlad Udovin, P.O. Box 745, Frunze, Kirghizia 720017 USSR. Cards for the club station **UM9MZA** can be sent to the same address.



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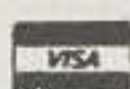
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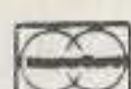
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May 4, **Paul Bunyan ARC Hamfest**, Moose Lodge, Bemidji, MN. Contact Don Illies, N0MAZ, RR 2 Box 187AA, Bemidji, MN 56601 (218-751-9254). (Exams.)

May 4, **Southern Tier Hamfest**, Marvin Park Fairgrounds, Owego, NY. Contact Southern Tier ARC, P.O. Box 7082, Endicott, NY 13760.

May 4, **Cedarburg Swapfest**, Circle-B Recreation Center, Highway 60 and County I, 20 miles north of Milwaukee, WI. Contact Ozaukee Radio Club Swapfest, 11448 Laguna Dr., Mequon, WI 53092 (414-242-4995). (Exams 9 AM.)

May 4, **Spirit Valley Hamfest & Microwave DX Expo**, First United Methodist Church, Duluth, MN. Contact Duane Flynn, KB0LC, 4907 Peabody St., Duluth, MN 55804 (218-525-4580).

May 4-5, **Cochise ARA Hamfest**, Sierra Vista, AZ. Contact N7INK, 602-378-3155 after 6 PM, or write to CARA, P.O. Box 1855, Sierra Vista, AZ 85636.

May 4-5, **Greenville Hamfest**, Anderson County Fairgrounds, Anderson, SC. Contact Blue Ridge ARS, P.O. Box 6751, Greenville, SC 29606. (Walk-in exams.)

May 5, **Lake Maggiore Park Hamfest**, Lake Maggiore Park, St. Petersburg, FL. Contact Bob Burke, KC4SXO, 813-527-7096.

May 5, **Metro 70cm Network's Electronic Flea-market**, Lincoln High School, Yonkers, NY. Contact Otto Supliski, WB2SLQ, 53 Hayward St., Yonkers, NY 10704 (914-969-1053). (Exams.)

May 5, **NOBARC-Dalton FleaMarket**, Dalton American Legion, Dalton, MA. Call 413-458-8452.

May 11, **Tri-County ARC Swapfest**, Jefferson County Fairgrounds, Jefferson, WI. Contact TCARC, W9MQB, P.O. Box 112, Jefferson, WI 53549. (Handicap accessible.)

May 11, **Hamfest 91**, Community Bldg., Rodeo Grounds, Springdale, Arkansas. Contact Jim Henington, KB5ITL, P.O. Box 278, West Fork, AR 72774 (501-839-2488 after 4:30 PM).

May 11, **Moncorad RC Hamfest**, Manitowoc County Expo Center, Manitowoc, WI. Contact Man-corad RC, P.O. Box 204, Manitowoc, WI 54220 (SASE). (Exams.)

May 12, **ACARA Hamfest**, City Recreation Center, Athens, OH. Contact Carl J. Denbow, KA8JXG, 63 Morris Ave., Athens, OH 45701.

May 17-19, **Eastern VHF/UHF/SHF Conference**, Rivier College, Nashua, NH. Contact David Knight, KA1DT, 15 Oakdale Ave., Nashua, NH 03062.

May 17-19, **Green Country/Oklahoma State ARRL Convention**, Expo Square Pavillion, Tulsa, OK. Contact Jim Gooch, N5QAG, 918-250-8233. (Exam info Georgia, KA5VIL, 918-272-3081.)

May 18, **Lancaster County Hamfest**, Ephrata Senior High School, Ephrata, PA. Contact Tom Youngberg, K3RZF, 215-267-2514 after 6 PM. (Handicap accessible.)

May 18, **Wexauke ARA Swap & Shop**, Cadillac Middle School, Cadillac, MI. Contact Dan Schmidt, KE8KU, 616-775-0998.

May 18, **Clinton ARC Hamfest 91**, 4-H County Fairgrounds, Dewitt, IA. Contact Darryl Petersen, KD0PY, RR1 Box 84, Bryant, IA 52727. (Exams.)

May 18, **Pikes Peak RAA Swapfest**, "Shops at the Bluffs," Colorado Springs, CO. Contact Jeff, N0JLH, 719-591-6438. (Exams.)

May 19, **MIT Tailgate FleaMarket**, Albany and Main St., Cambridge, MA. Call 617-253-3776.

May 19, **TSRAC Wheeling Hamfest/Computer Fair**, Wheeling Park, Wheeling, WV. Contact TSRAC, Box 240, RD 1, Adena, OH 43901 (614-546-3930).

May 19, **Kankakee Area Radio Society Hamfest**, Will County Fairgrounds, Peotone, IL. Contact Kankakee ARS, 117 Kristina Dr., Bourbonnais, IL 60914, or call Frank, KA9PWW, 815-932-5950 after 7 PM.

May 19, **Warminster ARC Hamfest**, Middletown Grange Fairgrounds, Penns Park Road, Wrightstown, PA. Contact Bill Cusick, W3GJC, 215-441-8048.

May 24-26, **Edmonton Hamfest**, Namao School, Edmonton, Alberta, Canada. Contact Northern Alberta Radio Club, P.O. Box 163, Edmonton, Alberta, Canada T5L 2J1.

May 25, **DUR-HAM-FEST**, South Square Mall, Durham, NC. Contact Sid Edwards, W4QWM, 1700 High St., Durham, NC 27712 (919-489-2933). (Handicap accessible, exams.)

May 25-26, **Wyoming State Hamfest**, Casper Hilton Inn, Casper, WY. Contact Rev Morton, WS7W, P.O. Box 2602, Casper, WY 82602. (Exams.)

May 26, **Chicago ARC Hamfest**, De Vry Institute of Technology, Chicago, IL. Contact CARC, 5631 W. Irving Pk. Rd., Chicago, IL 60634, or call 312-545-3622.

May 26, **Maryland FM Assn. Memorial Day Hamfest**, Howard County Fairgrounds, West Friendship, MD. Contact Melvin Seyle, WA3KZR, 301-249-6147.

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THE SCIENCE OF PREDICTING RADIO CONDITIONS

Solar Cycle Progress

Sunspot Cycle 22 is now in its 57th month. It began in September 1986 with a smoothed sunspot count of 12, and it reached peak intensity during July 1989 with a smoothed count of 159. Cycle 22 is the third most intense recorded in the more than 200 years that sunspot records have been kept.

Since July 1989 Cycle 22 has been slowly declining. The Royal Observatory of Belgium reports a monthly mean sunspot level of 140 for January 1991. This results in a 12-month running smoothed sunspot number of 140 centered on July 1990. This is a decline of three from the previous month's level. During January daily levels of solar activity varied widely, with a low of 79 recorded on the 2nd and a high of 256 on January 31st.

According to daily observations made in Ottawa, Ontario by the Algonquin Radio Observatory, an adjusted mean level of 221 was reported for 10.7 cm solar flux during January 1991. This results in a 12-month running number of 190 centered on July 1990. The level of 10.7 cm flux is paralleling very closely the decline in the sunspot count.

A smoothed sunspot number on the order of 124 is forecast for May 1991.

May Conditions

During the daytime hours, from just after sunrise and continuing through sunset, expect DX conditions to most areas of the world on the 10, 12, 15, 17, and 20 meter bands. Twenty meters should be optimum for a two to three hour period following sunrise. Fifteen and 17 meters should take over as best DX bands during the late morning and early afternoon hours. During the late afternoon all five bands should be at their best for DX propagation.

From sundown to midnight 20 meters is expected to be the optimum band for DX, with strong signal openings possible to most areas of the world. Good DX conditions are also expected on 15 and 17 meters for openings towards Latin America, the South Pacific, Asia, and the Far East, and on 30, 40, and 80 meters towards Europe, Africa, and Latin America.

11307 Clara Street, Silver Spring, MD 20902

LAST MINUTE FORECAST

Day-to-Day Conditions Expected for May 1991

Propagation Index	Expected Signal Quality			
	(4)	(3)	(2)	(1)
Above Normal: 5, 11, 17, 23, 26-27	A	A	B	C
High Normal: 3-4, 6, 10, 12, 18, 22, 30-31	A	B	C	C-D
Low Normal: 1-2, 7, 9, 13-14, 16, 19-21, 24-25, 28	B	C	D	D-E
Below Normal: 8, 15, 29	C	C-D	D-E	E
Disturbed: None	C-D	D	E	E

Where expected signal quality is: A—Excellent opening, exceptionally strong, steady signals greater than S9.

B—Good opening, moderately strong signals varying between S6 and S9 +, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S6, with some fading and noise.

D—Poor opening, with weak signals varying between S0 and S3, and with considerable fading and noise.

E—No opening expected.
3 dB per S-Unit.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.
2. With the *propagation index*, use the above table to find the expected signal quality associated with the band opening for any day of the month. For example, an opening shown in the charts with a *propagation index* of 3 will be good-to-fair (B-C) on May 1 and 2, good (B) on the 3rd and 4th; excellent (A) on the 5th, good (B) on the 6th, etc.

From midnight to sunrise DX honors are expected to be shared among 20, 30, and 40 meters, with some good openings also possible on 80 meters. Seasonally higher static levels and the longer hours of daylight are expected to reduce considerably chances for DX openings on the 160 meter band, but some may be possible during the hours of darkness towards the Caribbean and Central American areas.

For specific times of DX openings refer to the *DX Propagation Charts* which appeared in last month's column. This month's column contains a *Short-Skip Propagation Chart* valid for both May and June, as well as charts centered on Alaska and Hawaii. The Short-Skip Chart contains propagation forecasts for openings varying in distance between approximately 50 and 2300 miles. For day-to-day variations expected in propagation conditions during May, see the Last Minute Forecast which appears at the beginning of this column.

VHF Ionospheric Openings

Solar activity is still high enough that some F-layer DX openings should be possible on the 6 meter band during the daylight hours. Conditions are best for transcontinental openings, openings between the western states and Hawaii, and openings towards the Caribbean and Central and South America. The best time to look for these openings is from 10 AM local time, through the afternoon hours, particularly when conditions are expected to be High Normal or better.

HOW TO USE THE SHORT-SKIP CHARTS

1. In the Short-Skip Chart, the predicted times of openings can be found under the appropriate distances column of a particular Meter band (10 through 160 Meters) as shown in the left hand column of the Chart. For the Alaska and Hawaii Charts the predicted times of openings are found under the appropriate Meter band column (10 through 40 Meters) for a particular geographical region of the continental USA as shown in the left hand column of the Charts. An * indicates the best time to listen for 80 meter openings.

2. The *propagation index* is the number that appears in () after the time of each predicted opening. On the Short-Skip Chart, where two numerals are shown within a single set of parenthesis, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. The index indicates the number of days during the month on which the opening is expected to take place, as follows:

- (4) Opening should occur on more than 22 days
- (3) " " " between 14 and 22 days
- (2) " " " between 7 and 13 days
- (1) " " " on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual dates on which an opening with a specific *propagation index* is likely to occur, and the signal quality that can be expected.

3. Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M. etc. On the Short-Skip Chart appropriate *daylight time* is used at the *path midpoint*. For example, on a circuit between Maine and Florida, the time shown would be EDT; on a circuit between N.Y. and Texas, the time at the midpoint would be CDT, etc. Times shown in the Hawaii Chart are HST. To convert to daylight time in other USA time zones, add 3 hours in the PDT zone; 4 hours in the MDT zone; 5 hours in the CDT zone, and 6 hours in the EDT zone. Add 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 15 or 3 P.M. in Los Angeles; 18 or 6 P.M. in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *daylight time* in other areas of the USA subtract 7 hours in the PDT zone; 6 hours in the MDT zone, 5 hours in the CDT zone and 4 hours in the EDT zone. For example, at 20 GMT it is 16 or 4 P.M. in N.Y.C.

4. The Short-Skip Chart is based upon a transmitted power of 75 watts c.w. or 300 watts p.e.p. on sideband; the Alaska and Hawaii Charts are based upon a transmitter power of 250 watts c.w. or 1 kw p.e.p. on sideband. A dipole antenna a quarter-wavelength above ground is assumed for 160 and 80 meters, a half-wave length above ground on 40 and 20 meters, and a wave-length above ground on 15 and 10 meters. For each 10 db gain above these reference levels, the *propagation index* will increase by one level for each 10dB loss, it will lower by one level.

5. Propagation data contained in the Charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Department of Commerce, Boulder, Colorado, 80302.

CQ Short-Skip Propagation Chart
May & June 1991
Local Daylight Time at Path Mid-Point
(24-Hour Time System)

Band (Meters)	Distance Between Stations (Miles)			
	50-250	250-750	750-1300	1300-2300
10	Nil	08-10 (0-1) 10-14 (0-2) 14-18 (0-1) 18-22 (0-2) 22-00 (0-1)	08-10 (1-2) 10-14 (2-3) 14-18 (1-2) 18-22 (2) 22-00 (1) 00-08 (0-1)	08-10 (2-0) 10-14 (3-1) 14-16 (2-1) 16-19 (2) 19-22 (2-0) 22-08 (1-0)
15	Nil	07-10 (0-2) 10-14 (0-3) 14-18 (0-2) 18-20 (0-3) 20-00 (0-2) 00-07 (0-1)	07-10 (2) 10-14 (3) 14-18 (2-4) 18-20 (3-4) 20-22 (2-3) 22-00 (2) 00-07 (1)	07-10 (2-1) 10-14 (3-2) 14-16 (4-3) 16-20 (4) 20-22 (3-2) 22-00 (2) 00-07 (1-0)
20	10-13 (0-1) 13-19 (0-2) 19-01 (0-1)	07-10 (0-2) 10-13 (1-3) 13-19 (2-4) 19-21 (1-3) 21-01 (1-2) 01-07 (0-2)	07-10 (2-3) 10-13 (3-4) 13-19 (4) 19-21 (3-4) 21-23 (2-4) 23-01 (2-3) 01-07 (2)	07-10 (3) 10-16 (4-3) 16-23 (4) 23-01 (3-4) 01-03 (2-3) 03-07 (2)
40	07-09 (1-2) 09-12 (2-4) 12-20 (3-4) 20-22 (2-3) 22-01 (1-2) 01-07 (0-1)	07-09 (2-4) 09-10 (4-3) 10-16 (4-2) 16-18 (4-3) 18-22 (4) 22-01 (2-3) 01-07 (1-3)	07-09 (4-3) 09-10 (3) 10-16 (2-1) 16-18 (3-1) 18-20 (4-2) 20-22 (4) 22-07 (3-4)	08-10 (3-1) 10-18 (1-0) 18-20 (2-1) 20-22 (4-3) 22-06 (4) 06-07 (4-3) 07-08 (3)
80	08-11 (4) 11-19 (4-3) 19-23 (4) 23-08 (3-4)	08-11 (4-1) 11-17 (3-0) 17-19 (3-1) 19-21 (4-2) 21-06 (4) 06-08 (4-3)	08-09 (1) 09-11 (1-0) 11-17 (0) 17-19 (1-0) 19-21 (2-1) 21-23 (4-3) 23-06 (4) 06-08 (3-2)	08-09 (1-0) 09-19 (0) 19-21 (1-0) 21-23 (3-2) 23-04 (4-3) 04-06 (4-2) 06-08 (2-1)
160	06-09 (4-1) 09-10 (2-0) 10-19 (1-0) 19-21 (3-1) 21-23 (4-2) 23-06 (4-3)	06-09 (1) 09-19 (0) 19-21 (1-0) 21-23 (2-1) 23-01 (3-2) 01-04 (3) 04-06 (3-2)	08-09 (1-0) 09-21 (0) 21-23 (1) 23-01 (2-1) 01-04 (3-2) 04-06 (2) 06-08 (1)	08-21 (0) 21-01 (1) 01-04 (2) 04-06 (2-1) 06-07 (1) 07-08 (1-0)

HAWAII
May & June 1991
Openings Given in Hawaiian
Standard Time #

TO:	10 Meters	15 Meters	20 Meters	40/80 Meters
Eastern USA	15-17 (1)	07-12 (1) 12-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	07-15 (1) 15-18 (2) 18-20 (3) 20-22 (4) 22-00 (3) 00-02 (2) 02-04 (3) 04-07 (2)	19-20 (1) 20-23 (3) 23-02 (1) 20-21 (1)* 21-23 (2)* 23-01 (1)*
Central USA	12-15 (1) 15-17 (2) 17-18 (1)	05-07 (1) 07-12 (2) 12-16 (3) 16-18 (4) 18-20 (3) 20-22 (2) 22-00 (1)	08-12 (1) 12-16 (2) 16-18 (2) 18-22 (4) 22-00 (3) 00-02 (2) 02-06 (3) 06-08 (2)	19-20 (1) 20-21 (2) 21-01 (4) 01-02 (2) 02-04 (1) 20-21 (1)* 21-00 (2)* 00-03 (1)*
Western USA	09-12 (1) 12-17 (2) 17-19 (1)	06-08 (1) 08-10 (2) 10-12 (3) 12-17 (4) 17-19 (3) 19-22 (2) 22-00 (1)	06-08 (4) 08-16 (3) 16-22 (4) 22-02 (3) 02-06 (2)	18-19 (1) 19-20 (2) 20-02 (4) 02-04 (3) 04-05 (2) 05-07 (1) 19-20 (1)* 20-21 (2)* 21-03 (3)* 03-04 (2)* 04-05 (1)*

Sporadic-E ionization is expected to increase considerably during May, and fairly frequent 6 meter short-skip openings should be possible. These are most likely to occur over distances of approximately 1000 to 1400 miles. Although, as

ALASKA
May & June 1991
Openings Given in GMT #

TO:	10 Meters	15 Meters	20 Meters	40/80 Meters
Eastern USA	Nil	18-20 (1) 20-22 (2) 22-01 (1) 01-03 (2) 03-05 (1)	20-22 (1) 22-02 (2) 02-06 (3) 06-08 (2) 08-10 (1) 10-14 (2) 14-16 (1)	05-10 (1)
Central USA	Nil	18-21 (1) 21-23 (2) 23-01 (1) 01-04 (2)	02-08 (3) 08-14 (2) 14-22 (1) 22-02 (2)	05-07 (1) 07-10 (2) 10-12 (1)
Western USA	00-03 (1)	18-20 (1) 20-23 (2) 23-02 (3) 02-05 (2) 05-07 (1)	02-04 (3) 04-08 (4) 08-14 (3) 14-18 (4) 18-20 (3) 20-02 (2)	04-06 (1) 06-08 (2) 08-12 (3) 12-15 (2) 15-16 (1) 08-12 (1)*

For 12 meter openings interpolate between 10 and 15 meter openings.
 For 17 meter openings interpolate between 15 and 20 meter openings.
 For 30 meter openings interpolate between 40 and 20 meter openings.

its name implies, sporadic-E propagation can take place at just about any time of the day or night, the best time to check is between 10 AM and 2 PM, and again between 6 and 10 PM, local daylight time.

During periods of intense and widespread sporadic-E ionization, two-hop openings considerably beyond 1400 miles may be possible on 6 meters, and short-skip openings between approximately 1200 and 1400 miles may also be possible on 2 meters.

Some trans-equatorial propagation (TE) may be possible during the month on 6 meters, and perhaps on 2 meters as well. TE openings are most likely to occur between 9 and 11 PM, local daylight time, on long north-south paths that cross the geomagnetic equator at approximately a right angle. TE openings are at best difficult, often accompanied by very weak signals and rapid flutter fading. Such openings favor locations in the southern tier states, but may occasionally be possible farther to the north.

The *Eta Aquarids*, a major meteor shower, is expected between May 4 and 6. It should peak on May 5 with a meteor count of approximately 20 an hour. Meteor activity is expected to be intense enough during this shower to support meteor burst short-skip openings on the 6 and 2 meter bands.

Some auroral activity is possible during May, which could produce auroral displays and auroral-type short-skip openings on the VHF bands over relatively widespread areas. Check the Last Minute Forecast appearing at the beginning of this column for those days during May that are expected to be Below Normal or Disturbed on the HF bands. These are the best days to check for auroral activity on the VHF bands.

73, George, W3ASK



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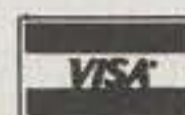
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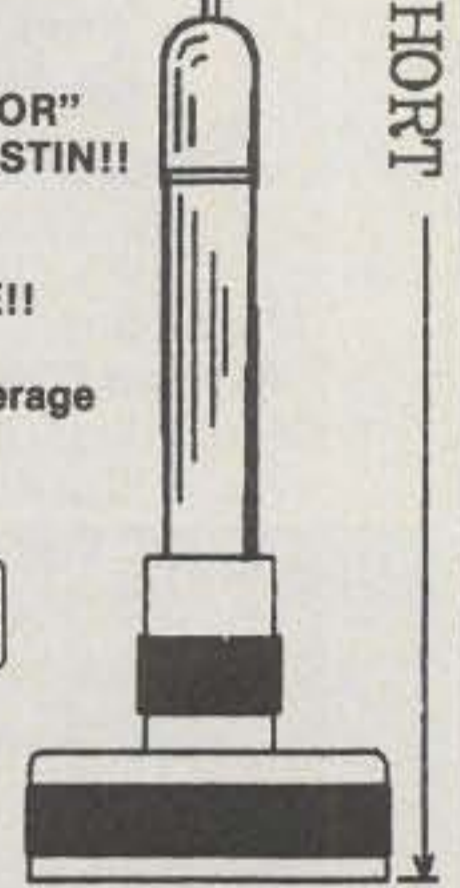
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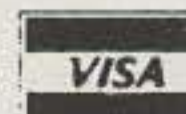
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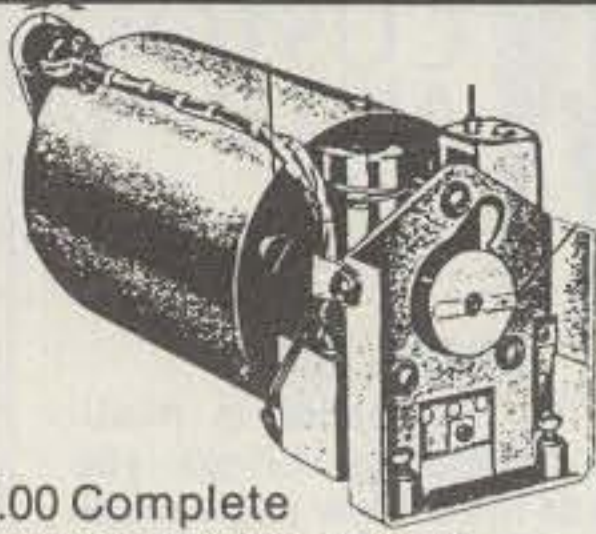


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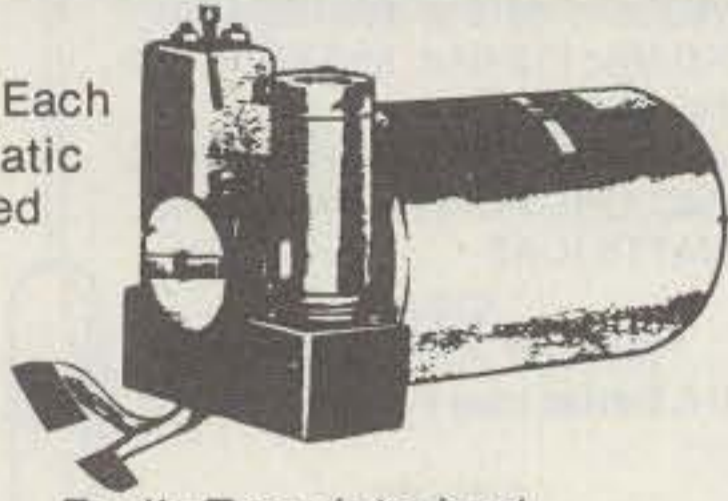
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RM-35A	25	35	5 1/4 x 19 x 12 1/2	38		
RM-50A	37	50	5 1/4 x 19 x 12 1/2	50		
• Separate Volt and Amp Meters						
RM-35 M	25	35	5 1/4 x 19 x 12 1/2	38		
RM-50 M	37	50	5 1/4 x 19 x 12 1/2	50		
RS-4A	3	4	3 3/4 x 6 1/2 x 9	5		
RS-5A	4	5	3 1/2 x 6 1/8 x 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		
• Switchable volt and Amp meter						
RS-12M	9	12	4 1/2 x 8 x 9	13		
• Separate volt Amp meters						
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		
• Built in speaker						
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		
• Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts						
• Current limit adjustable from 1.5 amps to Full Load						
@ 13.8VDC @ 10VDC @ 5VDC @ 13.8V						
VS-20M	16	9	4	20	5 x 9 x 10 1/2	20
VS-35M	25	15	7	35	5 x 11 x 11	29
VS-50M	37	22	10	50	6 x 13 3/4 x 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5 1/4 x 19 x 12 1/2	38
VRM-50M	37	22	10	50	5 1/4 x 19 x 12 1/2	50

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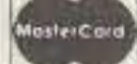
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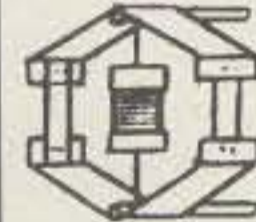
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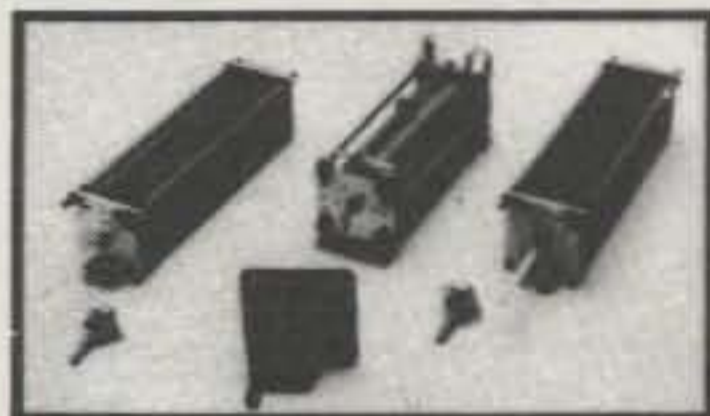
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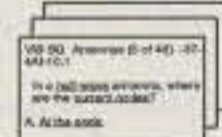



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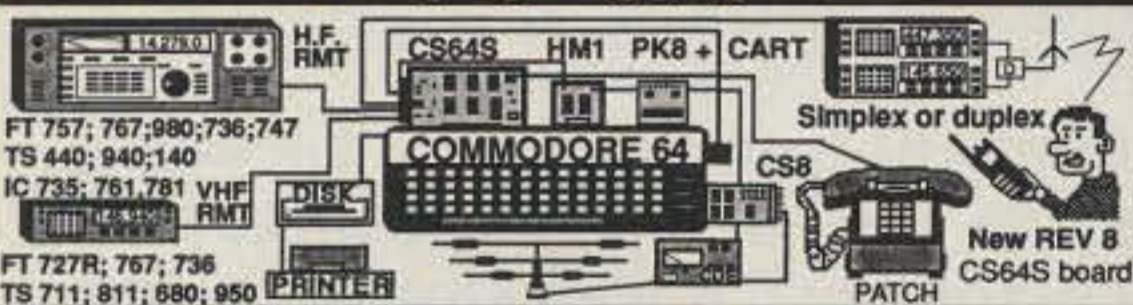
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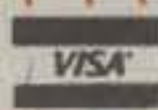
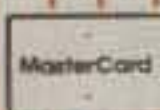
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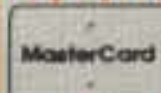
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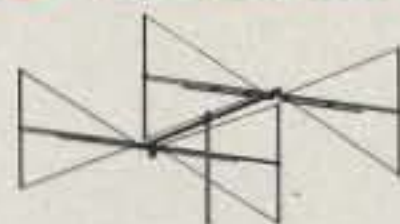
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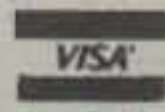
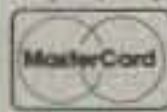
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