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Amateur Radio

CQ

SERVING AMATEUR RADIO SINCE 1945
FEBRUARY 1998

In This Issue:

Bob Hatter, W7MAE, Vienna, VA.

U.S. $3

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THE RADIO AMATEUR'S JOURNAL

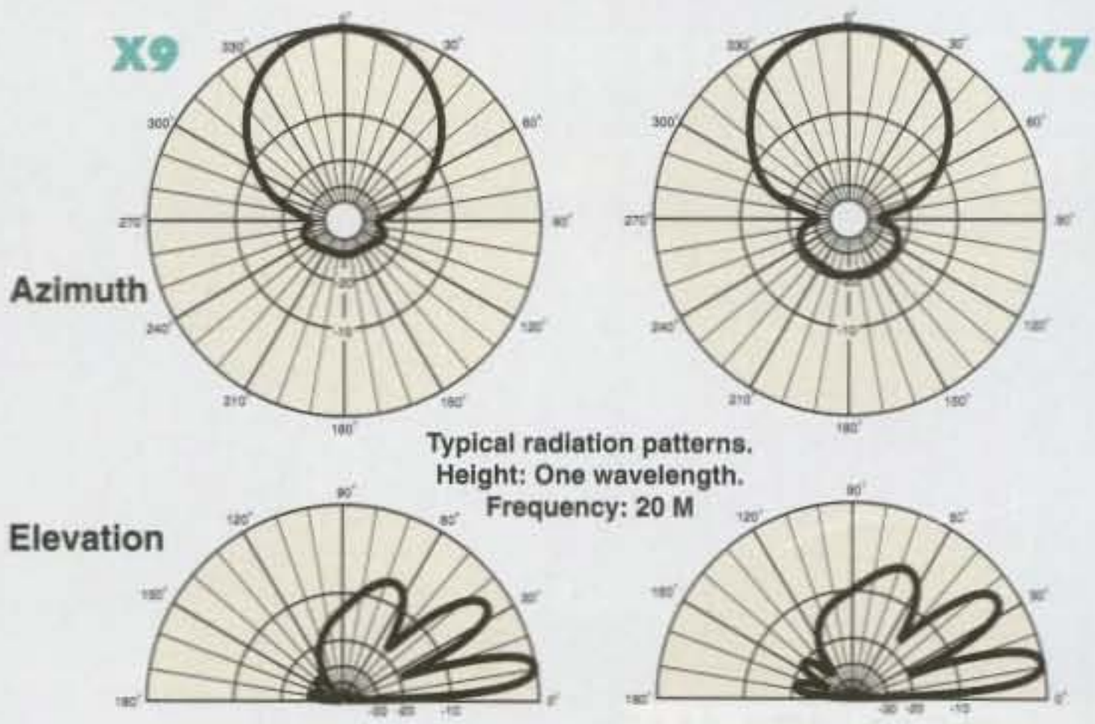
The Performance Tribander for the DX Years Just Ahead

- **New High Efficiency Computer Optimized Design for Maximum Gain and Ultra Clean Radiating Pattern**
- **100+ MPH Construction for Best Reliability and Long Life**
- **NEW *4L Log Cell* Driven Elements for better VSWR Bandwidth**
- **Trapless Driven Elements and Reflectors for Reliable Power Handling**
- **Interleaved Element Design for Mono-Band Performance**
- **Add-on kits available for 40 Meters**

The new X9 and X7 Triband Yagis are geared to set new standards in both radiating performance and mechanical reliability. Cushcraft's product development team has employed the latest computer modeling technology to achieve a superior electrical design as well as elegant new mechanical hardware and assembly techniques.

Each mechanical component was designed to 100+ MPH wind survival with a 1.25 safety factor. Traps were eliminated from the high current driven elements and reflectors using the new *4L Log Cell* design, which yields virtual monoband performance and maximum power handling capability. Traps are employed only in the lower current directors for increased gain and sharper pattern. The result is a truly high performance antenna family which will easily handle the legal limit.

SPECIFICATIONS		X9	X7
Frequency Coverage (Meters)		10, 15, 20	10, 15, 20
Total number of Elements		9	7
Maximum Gain (dB)	20M	13.0 @ 14 deg	12.5 @ 14 deg
@ One Wavelength	15M	13.9 @ 12 deg	13.0 @ 12 deg
	10M	14.0 @ 15 deg	12.9 @ 14 deg
Maximum Front to Back Ratio (dB)		30	30
Number of Elements per Band		4	3
VSWR Minimum		1.1:1	1.1:1
VSWR 1.5:1 Bandwidth (KHz)	20M	350	600
	15M	450	750
	10M	1500	1700
Longest Element, ft (m)		36.5 (11.12)	37.2 (11.33)
Turning Radius, ft (m)		21.7 (6.61)	20.0 (6.09)
Boom Length, ft (m)		28 (8.53)	18 (5.49)
Boom Diameter, in (cm)		2-1/2 (6.35)	2-1/2 (6.35)
Maximum Mast Diameter OD, in (cm)		2-1/2 (6.35)	2-1/2 (6.35)
Maximum Wind Survival, mph (kph)		>100 (>161)	>100 (>161)
Maximum Wind Surface Area, ft² (m²)		9.9 (.92)	7.9 (.73)
Windload @ 80 mph, lb (kg)		255 (116)	202 (92)
Maximum Power Handling (KW)		2	2
Weight, lb. (kg)		85 (38.5)	60 (27.2)
List Price		$995	$675



Typical radiation patterns.
Height: One wavelength.
Frequency: 20 M

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COMMUNICATIONS ANTENNAS

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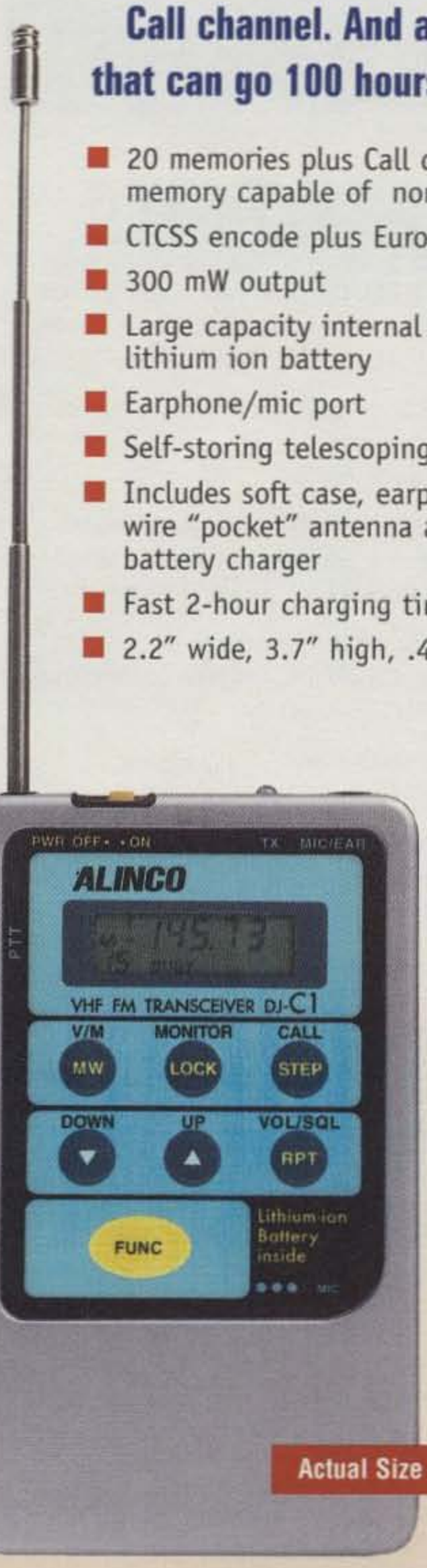
Email: hamsales@cushcraft.com

"Beyond Amazing"
Alinco Presents The Mini HT

So slim, *it hides in a shirt pocket.* Power to work repeaters many miles away. Clear, clean audio. 20 Memories plus a Call channel. And a Lithium ion battery that can go 100 hours between charges!

- 20 memories plus Call channel; each memory capable of non-standard splits
- CTCSS encode plus European tone burst
- 300 mW output
- Large capacity internal 500 mAh lithium ion battery
- Earphone/mic port
- Self-storing telescoping antenna
- Includes soft case, earphone, auxiliary wire "pocket" antenna and snap-in battery charger
- Fast 2-hour charging time
- 2.2" wide, 3.7" high, .41" deep



Alinco DJ-C1T 2 Meter (144 Mhz) Mini HT

- 144 ~ 147.995 MHz transmit range
- Extended receive 118 ~174 MHz including air band (AM)

Alinco DJ-C4T 70 cm (440 Mhz) Mini HT

- 420 ~ 449.995 MHz transmit range

The Alinco DJ-C1T and DJ-C4T represent breakthroughs in mini-radio technology. About the size of a credit card, one can be carried in pocket or purse. With it, you're ready to communicate anytime. Whether you're in business attire or running a marathon, these small, lightweight radios are easy to carry and easier to operate. You'll be amazed at the clean, crisp audio. The lithium ion battery is a revolution in power technology, going as long as 100 hours between charges. Be prepared to answer questions from other hams who see your DJ-C1T or DJ-C4T - even seasoned "veterans" have termed these radios "beyond amazing." The only thing we can add to that, is the low Alinco price!

Accessories Available

EDS-7 Adaptor Cable for use with speaker mics and headsets
EDC-36 Mobile charger
EMS-9Z speaker mic (requires EDS-7)
EMS-41 speaker mic (requires EDS-7)

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CQ Amateur Radio

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ON THE COVER: Here's Bob Hatter, currently W7MAE, ex-US Army Signal Corps, of Vienna, VA. We say "currently" because Bob has held 28 DX callsigns in his Ham career, not to mention a few US calls before securing the current one in 1996 as a vanity call (previously held by his father-in-law "Ken" Pond, SK). Same situation with Bob's wife Martha, W7KOY, which was the call of her mother "Gert" Pond, also SK. Bob's main Ham interests are 10 M DX, IOTA, and WAB (UK), collecting and restoring Collins and Gonset gear, and collecting Ham call letter license plates. (Photo by Larry Mulvehill, WB2ZPI)

DSP solution with easy operation.

Kenwood's TS-570D/S HF Transceiver gives you high-end digital performance in an easy-to-use package for any home, mobile or DX-pedition.

TS-570D HF TRANSCEIVER
TS-570S HF + 6M TRANSCEIVER

Cruise the upper reaches of elegant HF performance in a compact, affordable transceiver incorporating advanced **AF-stage DSP** for crystal-clear TX and RX audio, digital filtering for sophisticated signal isolation and extraction, **Central Frequency Control System** for high stability, and a full range of enhanced operator features.

The DSP filters and extracts signals utilizing computer algorithms that would be impossible to match with standard analog circuits. The DSP also provides **CD-class transmit and receive audio quality** that can be shaped at will, and two powerful noise reduction systems: **Line Enhancer Method** for SSB/AM modes, and **Speech Processing** by **Auto Correlation** (SPAC) for CW mode. DSP also enables the **CW-Auto Tune** feature that automatically zero-beats CW signals.

The **Extensive Memory Functions** provide a bank of 100 memory positions split into 90 standard channels for general operation and 10 for programmable VFO, programmable scan and long-term memory. You can scroll memory contents, copy from one memory to another, and lock out specific memory channels. In addition there are **5 quick memories** for storing frequencies and modes on the fly, perfect for the busy DX contester.

The new easy-to-use **Menu System** incorporates **46 menu features** plus an **on-line guide** so you'll never have to drag your owner's manual around again. The **large amber backlit LCD display** provides 4 light levels for clear, concise operational information display under any lighting conditions.

The TS-570D/S exhibits no compromises when it comes to construction and performance. The **continuous-duty 100 watt transmitter** features a large heavy-duty heat sink with integrated cooling fan for non-stop operation even in extreme environmental conditions. The **wide-band receiver** delivers stable coverage from 500 kHz through 30 MHz with dual **pre-amps** and **dual bandpass filters** for exceptional selectivity and sensitivity.

With the features and performance of a high-end radio integrated into an affordable mobile-size package, the TS-570D/S is the perfect choice for the field or to build a full station around at home.

- **Channel scan, program band scan, memory scan with channel lock-out and group channel scan, all with TO (time operated) or CO (carrier operated) resume modes**
- **Compact 10 5/8 inch by 3 3/4 inch front panel size for any mobile installation**
- **Preset auto antenna tuner with 18 sub-bands**
- **Variable electronic keyer with speed settings between 0 and 100 wpm**
- **Packet and FSK features**
- **RCP-2 software for PC-based display and memory configurations**
- **57.6 kbps PC control option via 9-pin D-SUB and RS-232C interface**
- **Memory data transfer between radios (optional IF-232C required)**
- **Full functionality on 6M (TS-570S) including DSP, 100 watts output and preset Auto Antenna Tuner**
- **CW message memories**
- **10-key direct frequency entry**
- **Optional VS-3 voice synthesizer**
- **Optional DRU-3A digital recording unit**

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ZERO BIAS

AN EDITORIAL

The other day I began to think about the oft-used term "median-age amateur." With over 700,000 licensed amateurs these days, I don't know what the median age really is anymore. Also, I wonder about any significant difference between the median age of those amateurs who are active on the air and those licensed amateurs who basically pursue more passive activities or who are inactive. It's obvious that not all 700,000-plus amateurs are actively on the air at all times. I became curious as to what is happening to amateur radio as a group.

What prompted my crude attempt to resurrect my days in Sociology 101 was a similarity to another hobby or pastime in which I'm involved. Here, too, a common thread is the advancing age of its participants, the search for new blood, the relative cost of "hardware," and various levels of apathy. Within that sphere, I belong to a club. In fact, I am its vice president. In the almost eight years that I've been a member and officer of the club, I've not met or seen over 60% of the dues-paying members at either meetings or functions. Most of these 60% never go to meetings or come to functions or take part in competitive events. They are, if the truth be known, the backbone of our club. They pay their dues each year, on time, and never ask for or expect anything in return. In large part they help finance our activities and goals, on which they never voted. I don't know why they belong and never show up, despite the fact that the group is fairly local, has a central, convenient meeting place, and meets once a month. As with most clubs of any kind, the same few people show up all the time, do all the work that has to be done, and go home.

While I don't belong to any local radio club, I do belong and pay dues to seven related organizations. These groups are smart enough to forego regular meetings, active participation by its members on a regular basis, and a centralized meeting place, but they still achieve their desired goals. With no real effort other than writing a check, a "member" can tacitly endorse and support the goals of these organizations (literally, just help pay for them) while still feeling connected and emotionally a part of this (or these) organization(s). One doesn't have to leave home, get dressed up, or do anything to belong. Just write a check. Of course, it's ideal if your interests and viewpoint coincide with the group's, too.

The last time anyone put an actual age to the median-age amateur it was somewhere around 50ish. Well, at age 50 most, if not all, of us suddenly receive information and an application to join AARP. Even though we may not be retired, we have reached the chronological age to become a full-fledged member of this group. The only requirement is to reach the age of 50, be carbon based, and be able to write a check. It's a fine group. They have a great magazine, an interesting newsletter, and a lot of benefits. Once you get over the psychological hump of being 50, it's interesting and fun to find out what other people in that age bracket are doing and are able to do. By the way, they have a lot of members, including me, and anyone 50 is "real." In amateur radio, if you've had your license (any class) for at least 25 years, you can join the QCWA and be a "real" member. If you've taken reasonably good care of yourself, come from a reasonably good gene pool, and have been licensed at least 40 years, you can join the OOTC and be a "real" member. These all are good groups and worthy of support.

It's amazing at times to think about all of the organizations we can belong to, feel part of, and yet never get personally involved with. Probably most organizations wouldn't know what to do if suddenly the overwhelming majority of members decided to voice an opinion or take part in the day-to-day activities. I would venture a guess that most of us do not attend our own town or village meetings on a regular basis. Well, maybe if we were involved with tower litigation we'd be there. It's not that we're indifferent, or that consciously we could care less. It's that this feeling of connection obviates the need either to do something or see something that has to be done. I belong, therefore I've done my part.

I can think of a number of activities that most of us do, including amateur radio, which are completely devoid of actual human contact. Each of these, however, produces an internal feeling of connection and participation in the human endeavor. Obviously, it is satisfying on several levels, but it does little to foster the growth or quality of growth that we claim to seek. We seem to want more people like us to participate, and the "us" in that equation has become harder to define, much less to provide anything substantial to emulate.

If we look at amateur radio specifically, the average median-age or median-age-plus amateur who's been around long enough to belong to QCWA had a lot of subtle help in permanently securing a place for amateur radio in his psyche. That help was not part of a formal education in amateur radio or a book or a picture of equipment. The help was in the form of human contact, the people we met hanging out in the hundreds of stores selling amateur radio gear. We met people who could answer questions, pass on amateur radio lore, offer suggestions, and even help put up that first antenna. We found out about local clubs where we could meet others who might do the same. It was almost tribal in that there was a community gathered to help us along, while infusing us with tradition. It was immediate reinforcement of things we were learning.

That was then; this is now. Now there aren't the number of stores around to start off new people. This is also true for a number of other activities and hobbies. The clubs specializing in and catering to those activities and hobbies generally don't think in terms of an outreach program and typically wait for someone to approach them or be invited in by a member. The chain of human contact breaks and thereby so does the link to tradition. This is not unique to amateur radio; it's what is happening in many activities.

Basically, we all have to do more than simply write a check to our respective organizations. Our presence is really required and needed to help not only with ongoing projects, but to interact with new people (the way someone did for you years ago). You don't need a special committee or approval to talk to someone and be his or her friend. Advertise your club in a local paper and invite people to attend a meeting. It's not easy to put yourself out and go to a meeting or event. You have to make the physical effort to take part in something that you already know you enjoy. Think about how hard it is for someone who knows little or nothing about the subject to get self-motivated enough to seek out a meeting. Yes, I know people do it all the time. So don't get upset when you notice who's running your club next time—when the name doesn't sound familiar and the club's goals are not the same as yours anymore. You may feel connected and feel that you belong, but the people who go to the meetings and vote don't know who you are. The club treasurer knows who you are, though, and still likes you.

Most of us can't hang out at the local amateur radio store anymore. They don't exist in many areas. The local radio club is in effect the only place for new people to find out about the hobby. What they find out, what they learn, and whom they can emulate depends largely on who shows up for meetings. We can make the experience worthwhile for everyone, providing we all pitch in. If you need an example of how this bonding works in real life, check out your local Home Depot home center. You can ask questions of those who work there, meet other do-it-yourselfers and contractors who can offer suggestions, and attend classes on specific projects. You can look at the material that's available, plus check out the tool department for things to make a job easier and more fun. Sounds sort of like a hamfest, doesn't it?

Take the chance, put out the effort, and actually get involved. You'll help the hobby, your club, and yourself.

73, Alan, K2EEK

TEST RECEIVERS

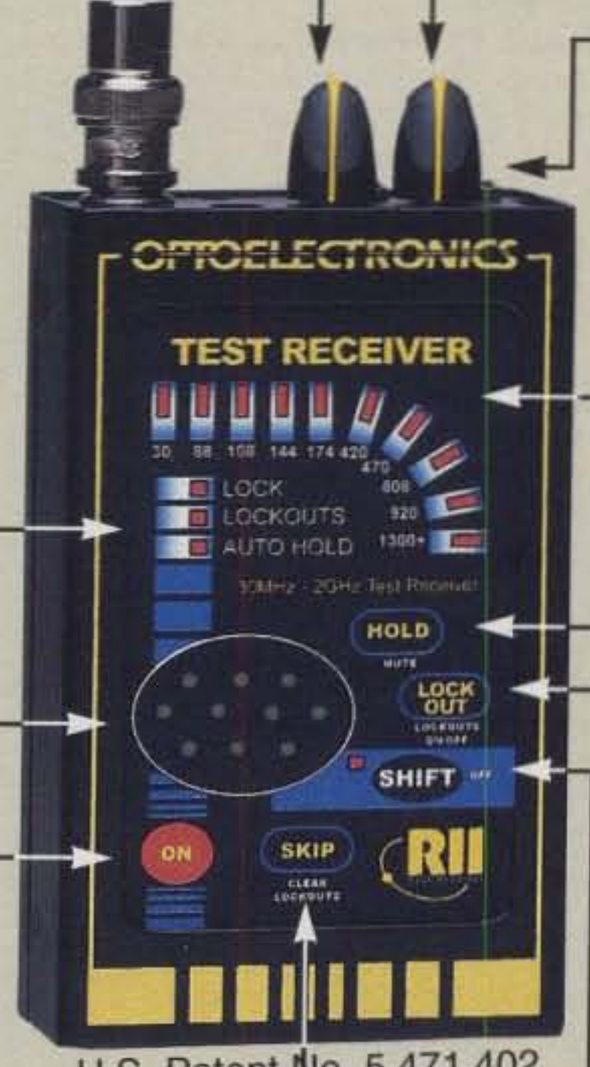
NEW PRODUCT SPOTLIGHT

R11 TEST RECEIVER

30MHz - 2GHz Handheld Receiver

NEW

Optoelectronics is pleased to introduce the all new R11 Nearfield FM Test Receiver. Capable of sweeping 30MHz - 2GHz in less than one second, the R11 can lock onto a 5 watt UHF signal as far away as 500 feet in less than one second, demodulate the signal through its built - in speaker, and display the general band the frequency is transmitting in on its LED indicator. The R11 Test Receiver presents all new performance, features, and capabilities.



Volume & Squelch Control Knobs

Instruction Indicators:
LED's will illuminate which mode the R11 is configured for.

CI-V and Headphone jacks:
CI-V jack allows for connection to the Scout for Reaction Tune. The Headphone jack connection also allows for external speaker.

Frequency Band Indication:
Displays what band the received frequency is transmitting on.

Built - in Speaker :
Instantly demodulate any receiver frequency between 30MHz - 2GHz (Cellular Blocked).

Hold / Mute Button:
The Hold button allows the R11 to stay locked on the received signal.

Power

Lockout / Lockouts on-off:
The R11 allows for 1000 user activated lockouts.

U.S. Patent No. 5,471,402

Shift / Off:
The Shift button controls all of the R11's secondary functions.

Skip / Clear Lockouts:
Press the Skip button to continue sweeping. Clear Lockouts will empty the lockout memory.

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ANNOUNCEMENTS

• The following Special Events are scheduled for February:

K4PL, Edmonton, Kentucky; Southern Kentucky DX Assn.; Kentucky Headhunters Special Event; 1500–2100Z Feb. 28; General portion all bands and Novice 10 meters. QSL to David Welch, K4PL, 111 Pocahontas Trail, Glasgow, KY 42141.

K4US, Alexandria, Virginia; Mount Vernon ARC; George Washington's birthday; 1500–2200Z Feb. 14–15; ; lower General 80–15 meter phone subbands and 30–17 meter CW. Certificate: send QSL and 9×12 SASE to MVARC, P.O. Box 7234, Alexandria, VA 22307.

KM5LS, Slidell, Louisiana; Mecury ARA; a cajun Valentine's Day; 1400–2200Z Feb. 14; on 14.280 and 21.325. For certificate, send request to Michael White, 404 Holmes Drive, Slidell, LA 70460 (504-649-6650).

KJ7FG, Apache Junction, Arizona; Ocotillo Amateur Radio Group; 86th anniversary of Arizona's statehood; 1400–2400Z Feb. 14–15; 20 meters only 14.260–14.360. For certificate, send QSL and 9 × 12 SASE to K6RLS, 5228 N. Idaho Rd., Apache Junction, AZ 85219.

K8LOD, Marquette, Michigan; the Hiawatha ARA; Up 200 Sled Dog Championship; Feb. 20–22; General portion of 80, 40 and 20 meters. For certificate, send SASE to Rich Schwenke, N8GBA, 21 Smith Lane, Marquette, MI 49855.

KØZWG, from downtown Civic Center, Centennial Hall, Fargo, North Dakota; Red River RAC and Kiwanis Club of Fargo; 16th anniversary of cooperative Handi-Ham Project on the 40th Kiwanis Pancake Carnival; Feb. 14, 1400–2300Z; lower 25 kHz of General 20 and 15 meters, CW and SSB. For QSL, send QSL and SASE to Jim Mowery, KØZWG, Horizons Manor, 2500 Broadway #1006, Fargo, ND 58102.

• The following hamfests, auctions, etc., are scheduled for February:

Feb. 2, **West Valley ARC Radio Equipment Auction**, St. Clement of Rome Catholic Church Social Hall, Sun City, Arizona. For info contact WVARC, P.O. Box 1573, Sun City, AZ 85372 (602-933-0854; or e-mail <watgl@juno.com>).

Feb. 7, **Niagara Peninsula ARC Fleamarket**, CAW Hall, Catharines, Ontario, Canada. Call Ron, VE3RGD at 905-892-5312; or contact NPARC, P.O. Box 20036, Grantham Postal Outlet, St. Catharines, ON L2M 7W7, Canada.

Feb. 7, **25th Annual Charleston Hamfest & Computer Show**, Stall High School, North Charleston, South Carolina. Contact Jenny Myers, WA4NGV, 2630 Dellwood Ave., Charlston, SC 29405-6814; phone 803-747-2324; e-mail <brycemyers@ aol.com>. For exam information, contact Ed, KE2D, at 803-871-4368; e-mail <efrank@ charleston.net>. (Exams.)

Feb. 8, **Mansfield Mid-Winter Hamfest and Computer Show**, Richland County Fairgrounds, Mansfield, Ohio. For more information, send SASE to Pat Ackerman, N8YOB, 63 N. Illinois Ave., Mansfield, OH 44905 (419-589-7133 after 6 PM EST).

Feb. 8, **Chestnut Ridge ARC 4th Annual Winter Fest Hamfest & Computer Show**, Latrobe American Legion, Latrobe, Pennsylvania. Contact Chris Weiss, K3JDU, 412-537-6068; or Bill Demosky, K3AFS, 412-539-1552.

Feb. 13–14, **17th Annual Midwinter Madness Hobby Electronics Show**, National Sports Center, Blaine, Minnesota. For further information, call 612-537-1722. (Exams.)

Feb. 13–15, **Orlando HamCation**, Central Florida Fairgrounds, Orlando, Florida. Contact Tim Starr, AE4NJ, P.O. Box 547811, Orlando, FL 32854; or call 407-850-9258; or on the Web: <http://www.oarc.org/hamcat.html>.

Feb. 14, **Algonquin ARC Flea Market**, Marlborough Middle School, Marlborough, Massachusetts. Call Ann Weldon, KA1PON, at 508-481-4988 (before 9 PM EST); or write to AARC, Box 258, Marlborough, MA 01752.

Feb. 14, **Cherryland ARC 24th Annual Swap-n-Shop**, Immaculate Conception Middle School, Traverse City, Michigan. For more information, call Joe, W8TVT, 616-947-8555; or Chuck, W8SGR, 616-946-5312. (Exams.)

Feb. 15, **27th Annual Davenport ARC Hamfest and Computer Show**, QCCA Expo Center, Rock Island, Illinois. Send SASE to Kent Williams, K9UQI, 4245 10th St., E. Moline, IL 61244-4154; or call 309-796-0718 (4–9 PM only); fax 309-796-0629 (24-hour); or e-mail <k9uqi@arcsupport.com>. (Handicapped accessible; exams.)

Feb. 15, **Aurora Repeater Assn. Swapfest**, Adams County Fairgrounds, Brighton, Colorado. Contact Wayne Heinen, NØPOH, 303-699-6335, e-mail <nrclog@aol.com. (Exams.)

Feb. 21, **Salem Hamfair**, Polk County Fairgrounds, Rickreall, Oregon. Contact Evan Burroughs, N7IFJ, 503-585-5924; to download the flyer/pre-registration form, visit their Website at <http://www.teleport.com/~n7ifj/sraflyer.htm>. (Handicapped accessible.)

Feb. 21, **Dallas ARC (W5FC) Ham Radio Auction**, 9:30AM (preview 7:30AM), HMK Auctioneers, Carrollton, Texas. Contact Bob Peters, K1JNN/5, phone 972-288-0484; e-mail <soundimp@pobox.com>.

Feb. 21–22, **Great Lakes Division Communications & Computer Convention 1998**, Cincinnati Gardens Exhibition Center, Cincinnati, Ohio. For more information, call 513-661-0201; or fax 513-531-3834. (Exams.)

Feb. 22, **LIMARC Long Island Indoor Hamfair**, Freeport Armory, Freeport, New York. Call the LIMARC 24-hour infoline: 516-520-9311; or write LIMARC, P.O. Box 392, Levittown, NY 11756-0392; or LIMARC Website: <http://members.aol.com/RaySk/LIMARC1.html>.

Feb. 22, **Radio XXIX Antique Radio Fleamarket**, Westford Regency Inn, Westford, Massachusetts. Call 978-371-0512.

Feb. 22, **Cuyahoga Falls ARC 44th Annual Hamfest**, Emidio's Party Center, Cuyahoga Falls, Ohio. For more information, contact Dan Adkinson, KC8CFJ, P.O. Box 2222, Stow, OH 44224; telephone 330-923-9045; or e-mail <hamfest@neo.irun.com>. (Exams.)

Feb. 22, **Livonia ARC Swap-n-Shop**, Dearborn Civic Center, Dearborn, Michigan. Contact Neil Coffin, WA8GWL, Livonia ARC, P.O. Box 51532, Livonia, MI 48151(SASE); telephone 313-261-5486; or via the Web at <www.larc.mi.org>.

Feb. 28, **Northern Vermont Winter Hamfest**, Milton High School, Milton, Vermont. Contact W1SJ, phone 802-879-6589; or e-mail <wb2jsj@vbi. champlain.edu>; or via Website <http://www.ranv.together.com>. (Exams.)

Feb. 28, **LaPorte ARC Hamfest**, LaPorte Cevic Center, LaPorte, Indiana. Contact John, N9ROH, 219-326-7182 evenings.

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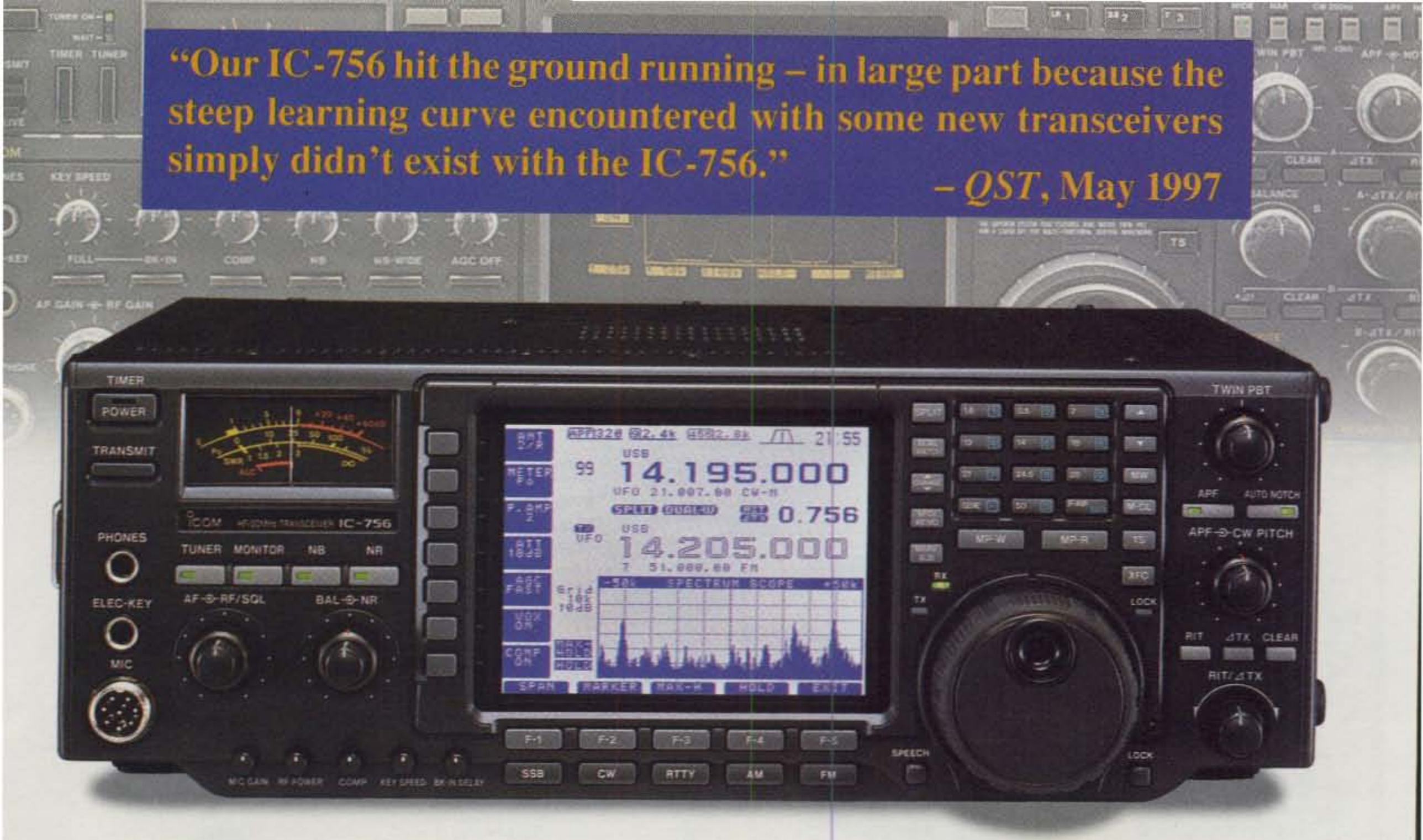
"Our IC-756 hit the ground running – in large part because the steep learning curve encountered with some new transceivers simply didn't exist with the IC-756."

– *QST*, May 1997

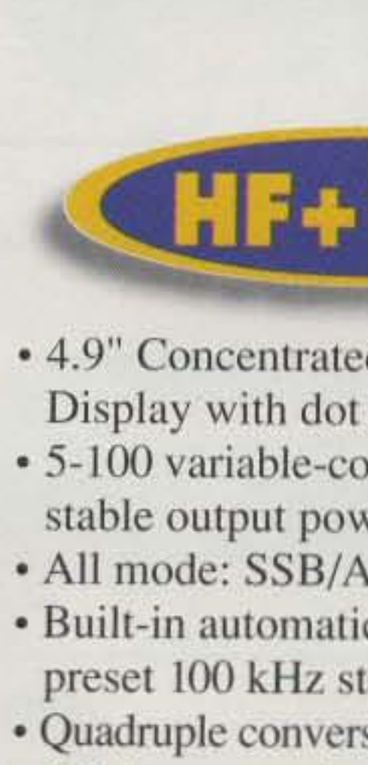


ICOM's IC-756: See and HEAR the Performance

Advanced features, in the spirit of the IC-781.
But at a real down-to-Earth price.

HF+6M!

- 4.9" Concentrated Information LCD Display with dot matrix characters
- 5-100 variable-control watts of 100% stable output power (5-40 W on AM)
- All mode: SSB/AM/FM/CW/RTTY
- Built-in automatic antenna tuner with preset 100 kHz steps – RX and TX
- Quadruple conversion superheterodyne (triple conversion on FM)



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– *QST*, May 1997

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While you're working on the 30 meter transceiver described by the author last month, keep this handy companion in mind. This matching amplifier makes a nice project by itself or an even better addition to your homebrew station.

How To Build A 30 Meter 100 Watt Amplifier

BY RICHARD W. STROUD*, W9SR

A while after I built and used the QRP rig described in the January 1998 issue, I decided that a nice addition would be an amplifier to give me a little more operating time when the band started to die out. This amplifier uses a Motorola MRF 172 FET and has a gain of 14 dB, developing 100 watts when driven from any 4 watt QRP transceiver. It, like the transceiver described earlier, is built in a 7 1/2" × 10" × 3 1/4" plastic cabinet (Dick Smith H-2507) presently available from surplus outlets.

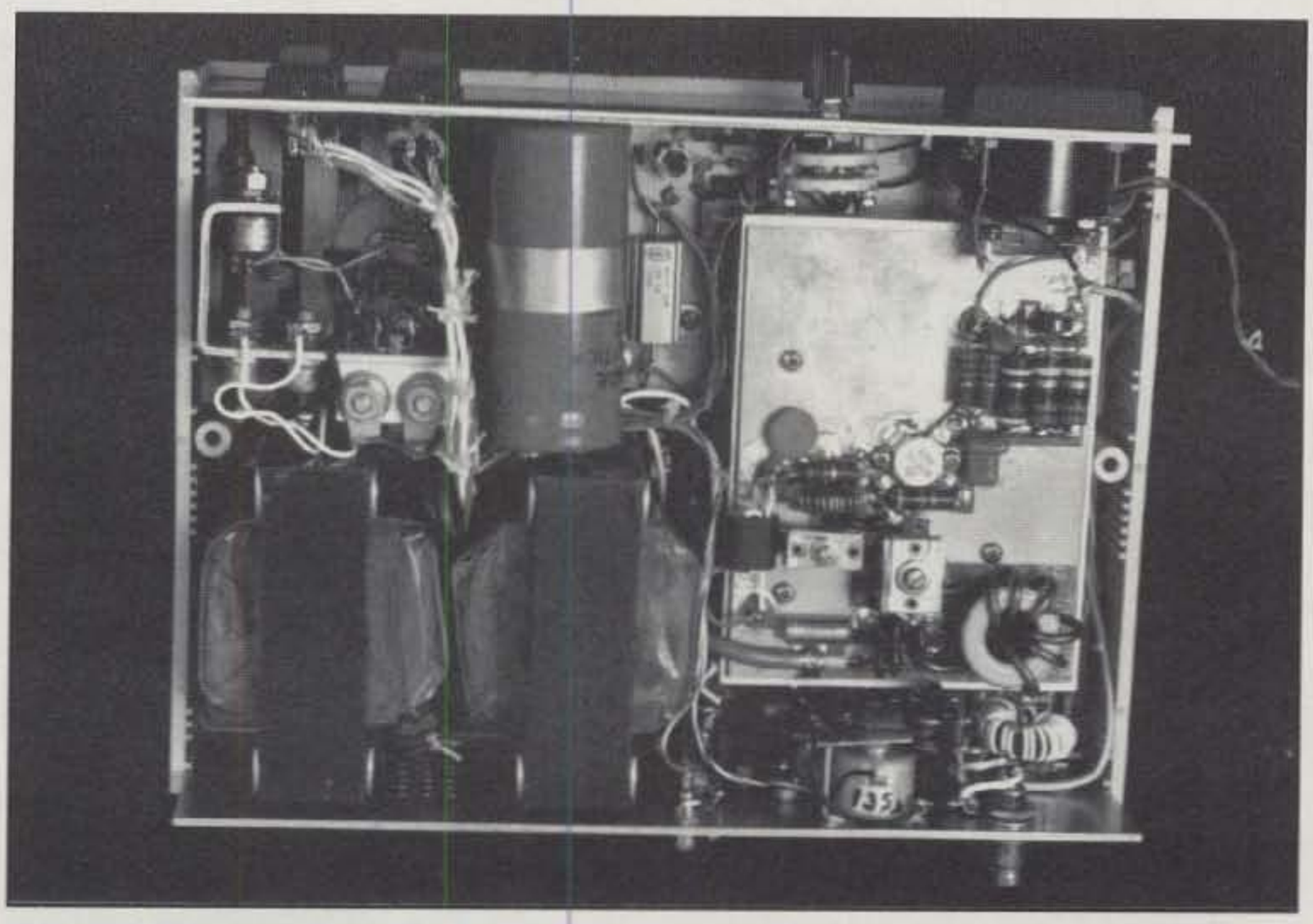
If following this layout directly, plan carefully before any holes are drilled, as there is very little clearance between components, panel controls, etc. Hole patterns are drilled in the top cover above the fan for air intake, and exhaust air holes are drilled in the side and rear panels. Do not overtighten the four fan mounting screws, as the cabinet can easily craze under pressure.

Plastic mounting bosses are built into the cabinet bottom, and these are used for mounting the copper board. Mounting screws are supplied with the cabinet. The bosses can easily be cut away in the area of the transformers and the regulator heat sink assembly to allow mounting of these parts directly on the cabinet base.

The original plastic panels are discarded and the back panel is replaced with a .087 thick aluminum panel. The front is replaced by a sheet of .032 aluminum covered by the engraved plastic panel, giving a total thickness of about .090 inches. These panels fit in the original groove around the front and rear perimeters of the cabinet. Engraved panels are available from L & C Engraving.[1]

A copper-clad board houses the bias

The front view of the completed 30 meter amplifier. It would make a handsome addition to any shack.



The top view shows the parts density of this project. The cooling fan is mounted to the top cover.

*Box 73, Liberty Center, IN 46766

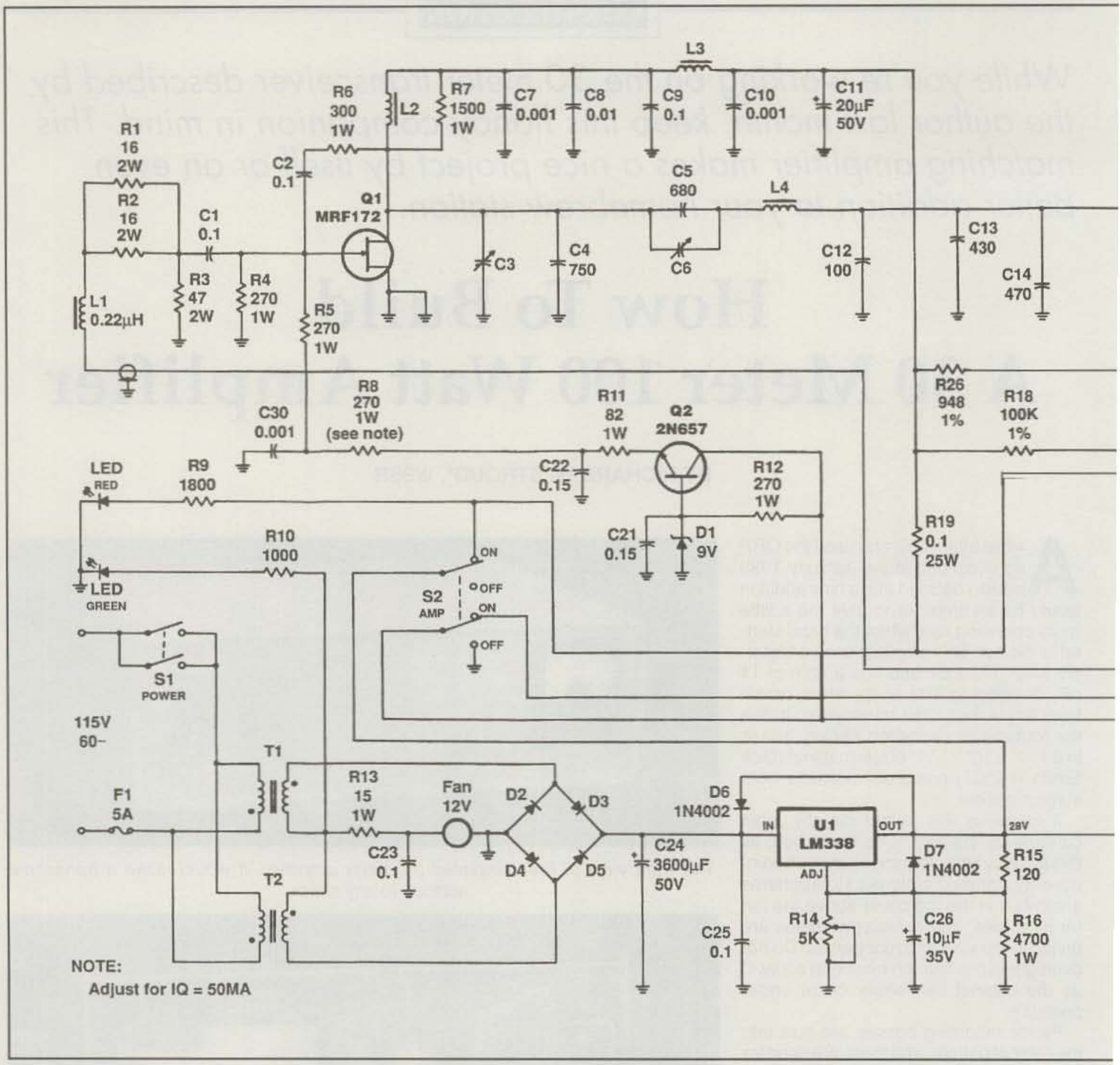


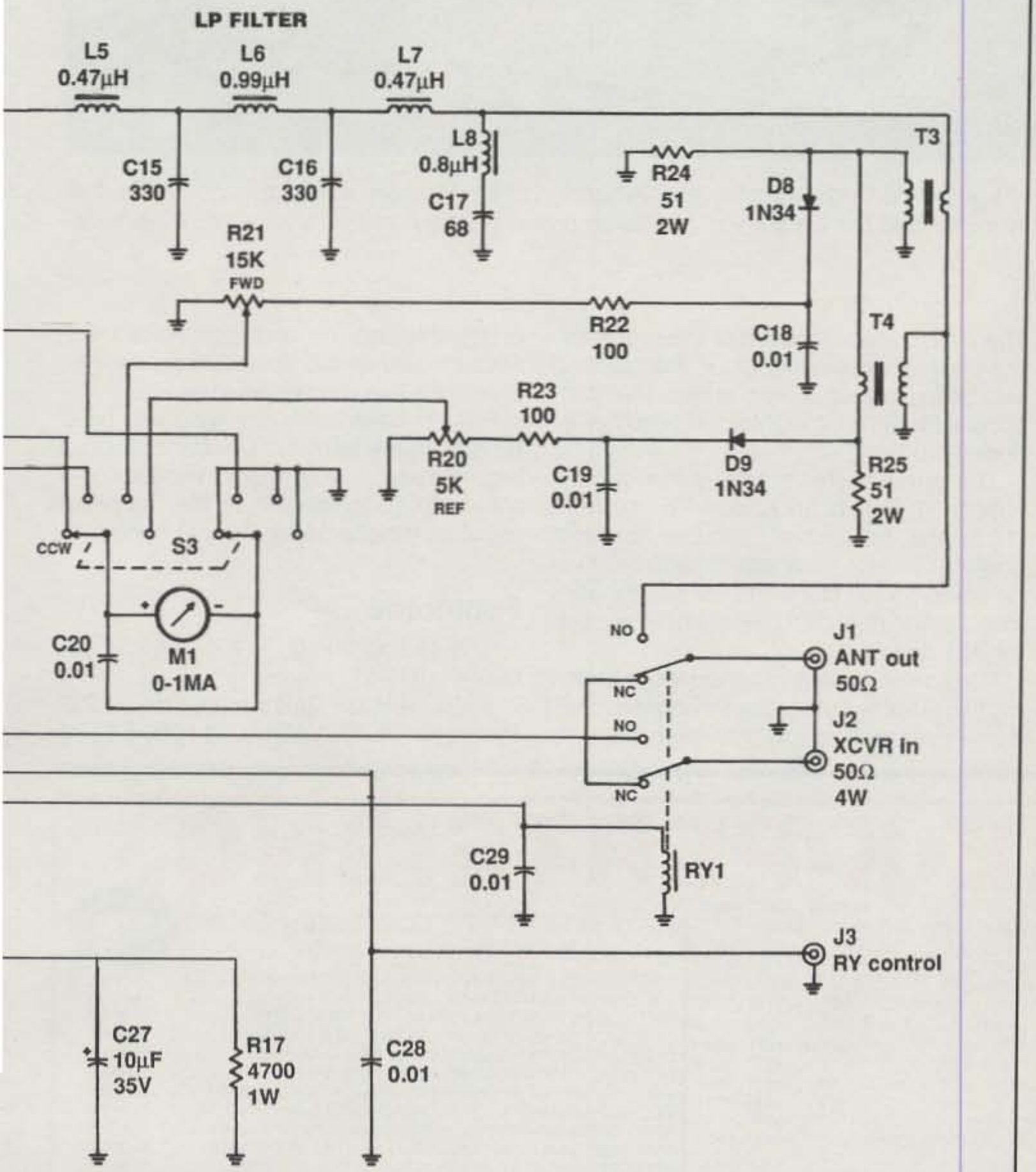
Fig. 1– The schematic diagram for the 100 watt 30 meter RF amplifier as described in the text. This is a companion amplifier to the 30 meter QRP project described last month.

regulator circuitry, low-pass filter, and directional coupler. Also the amplifier heat sink assembly is bolted to this board with the board area below the heat sink fins cut away to allow air flow.

The RF amplifier is built on a copper-clad board which is bolted to the 3 3/4" × 4 7/8" aluminum heat sink. The flat surface of the heat sink is drilled and tapped for mounting the board and transistor. The board is cut through so the transistor can be bolted (with heat-sink compound applied) to the top of the aluminum heat sink. The copper is also removed below the large inductor, L4, and under the meter terminal area. Air from the fan is blown over the transistor, down through the heat-sink fins, and out the side and rear of the cabinet.

Winding L4 with the large wire is somewhat of a challenge. Do not put excessive pressure on the powdered-iron core, as it can break. Use soft copper and form the wire slowly. It does not need to conform closely to the form. This coil was originally made using No. 16 wire. By going to No. 10, with the same inductance, the output increased by nearly 5 watts. Silver plating of the wire was not examined, but this would probably improve the efficiency still further.

Lead length in the RF circuits should be minimal. Pad areas were cut into the copper board for component junction points as necessary. After the unit is operational, the inductance of L8 should be adjusted



Component List (for fig. 1)

R1, R2: 16 ohm, 2 watt carbon
R3: 47 ohm, 2 watt carbon
R4, R5, R12: 270 ohm, 1 watt carbon
R6: 300 ohm, 1 watt carbon
R7: 1500 ohm, 1 watt carbon
R8: 510 ohm, 1 watt
R9: 1800 ohm, 1/4 watt
R10: 1000 ohm, 1/4 watt
R11: 82 ohm, 1 watt
R13: 15 ohm, 1 watt
R14: 5K potentiometer
R15: 120 ohm, 1/4 watt
R16, R17: 4700 ohm, 1 watt
R18: 100K, 1%
R19: .1 ohm, 3%, 25 watt, Dale RH25
R20: 5K potentiometer, 10 turn
R21: 15K potentiometer, 10 turn
R22, R23: 100 ohm, 1/4 watt
R24, R25: 51 ohm, 2 watt carbon
R26: 948 ohm 1% (parallel 1K, 1% and 18.2K, 1%)

C1, C9, C23, C25: .1 mF ceramic, 100V
C2: .1 mF ceramic, 250V
C3: variable mica, 250 pF, Arco 427
C4: 750 pF mica, 500V
C5: 680 pF mica, 500V
C6: variable mica, 470 pF, 43-3517
C7, C10, C30: .001 mF standoff, Allen Bradley FB
C8, C18, C19, C20, C28, C29: .01 mF ceramic, 100V
C11: 20 mF, 50 volt tantalum
C12: 100 pF, 500V mica
C13: 430 pF, 500V mica
C14: 470 pF, 500V mica
C15, C16: 330 pF, 500V mica
C17: 68 pF, 500V mica
C21, C22: .15 mF, 100V ceramic
C24: 3600 mF, 50V computer-type Sprague 36D
C26, C27: 10 mF, 35 volt tantalum

U1: LM338 IC regulator
Q1: MRF-172 FET, Motorola
Q2: 2N657 transistor

D1: zener diode, 9.1V, RadioShack 276- 562
D2, D3, D4, D5: diode, 12 amp, 100V PIV IN200A
D6, D7: diode IN4002
D8, D9: diode IN34

RY1: relay DPDT, 12V, 135 ohms

M1: meter, 0–1 mA, Simpson 1-3/4", 43 ohms

F: fan, 12V, 3", Panflo FBK-08A

S1, S2: switch, DPDT, RadioShack 275-691A

T1, T2: power transformer, 15V, 6 amp (see text)

T3: 30 turns #28E, closewound, F50-61 core primary 1/2 turn #18 teflon
T4: 26 turns #22 teflon, closewound, F82-61 core sec 1/2 turn #20 teflon
L1: .22 µH, 5t #26E, closewound T37-6 core
L2: 2.5 µH, 21t #22E on T68-6 core, space 3/4 of form
L3: 2-1/2 turns #20 teflon thru 1/2" ferrite binocular core
L4: .6 µH, 6t #10 soft copper on T106-6 core space over 5/8 of form
L5, L7: .47 µH, 5t #18E on T94-6 core, space wire dia.
L6: .99µH, 9t #18E on T94-6 core, space wire dia.
L8: .8µH, 12t #20E on T50-6 core, space wire dia.

with an insulated tool for a minimum second harmonic signal. This can be done by monitoring with a communications receiver while a very low drive signal is applied to the amplifier.

The primary winding of T3 is a half-turn loop of hookup wire through the core and between two isolated copper pads in the filter output line. T3 is mounted below the copper board and T4 is mounted above to give isolation between the directional coupler inductors.

Because of space constrictions, two 15 volt, 6 amp transformers are connected in series to develop the voltage required by the FET. The transformers used are marked "19A134324P1." There are probably others that will do the job. These and the plastic cabinets are available from Pembleton Electronics.[2] The transformers are bolted directly to the bottom of the cabinet as is the heat sink which houses the LM338 regulator and the rectifier diodes. The stud-mounted diodes are attached to

the heat sink with an aluminum bracket. R14, the regulator voltage set potentiometer, is also mounted on this bracket.

Heat-sink compound should be used under the mica insulators of the regulator and diodes.

Capacitor C24 is held in place by a formed aluminum strap that is bolted to the heat sink.

The LED indicators are RadioShack 276-208 (red) and 276-022A (green) mounted in 276-079 holders. A dot of RTV sealant on the rear holds the LEDs in place.

The change-over relay is mounted on the rear panel near the two coaxial connectors such that the input and output leads to the relay are short. Relay control from the transceiver is routed through an RCA-type panel connector, RadioShack p/n 274-346. When the amplifier is in the off position, the transceiver output is routed directly to the antenna.

R14 is adjusted for a supply voltage of 28 volts. With a 50 ohm load on the amplifier and no drive, adjust the value of R8 if necessary for a Q1 idling current of about 50 milliamperes. With drive applied, adjust C3 and C6 for maximum output, which should be 100 watts with an input of 4 watts. Do not exceed 5 watts input. Normal operating current is about 4.5 amps.

If you've been as careful and exacting as the author, when you complete the amplifier and the exciter you can be as proud of your handiwork as we're sure he is.

The over-current function of the regulator will shut down the supply if the current exceeds approximately 5 amps. This can occur if the SWR is high or the amplifier is over-driven.

The panel meter monitors the supply voltage (100 volts full scale), FET current (10 amps full scale), relative forward power (100 watts full scale), and relative reflected power (10 watts full scale). The forward and reflected power levels are set by R21 and R20.

No problems were experienced in building this amplifier other than trying to crowd it into the small space. Although the unit is not shielded, no problems have been encountered during operation over several months in a residential area.

Results have been gratifying with good reports received from DX stations on a regular basis. By changing the appropriate output components, the amplifier could be modified for other HF bands. ■

Footnotes

1. L & C Engraving, 111 W. Mill Street, Ossian, IN 46777.

2. Pembleton Electronics, Inc., 1222 Progress Rd., Ft. Wayne, IN 46808-1262.

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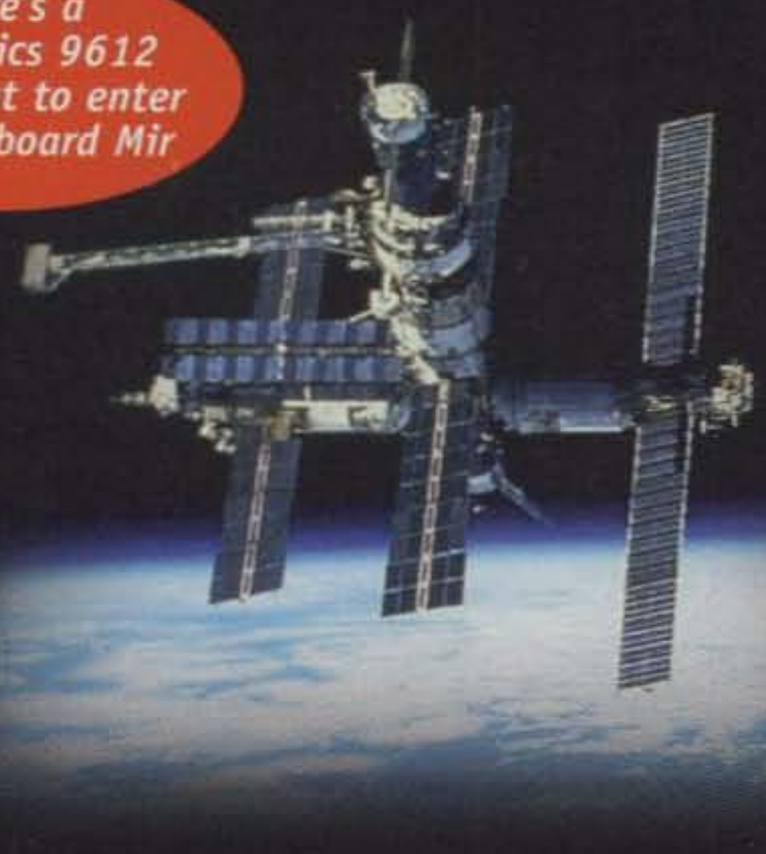

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The R. L. Drake TR270 2 Meter-Plus FM Transceiver

BY DAVE INGRAM*, K4TWJ

Right from the first view, you get the impression that R. L. Drake's new TR270 is more than an average 2 meter FM transceiver. The assumption is correct in a dozen different ways. Indeed, the TR270 is a full-blown FM communications system with every support item and asset imaginable in a neat desktop package. If you are serious about VHF and FM or appreciate going first class, you will love this multipurpose unit!

The TR270 contains an elaborate 2 meter FM transceiver plus a second independently-operating VHF/UHF FM receiver—each with separate volume and squelch controls, memory set, and antenna sockets. It also contains a continuous-duty AC power supply (with DC input capability), a hefty front-facing speaker; 400 memories; CTCSS encoder, decoder, and audio filter; a vast setup menu for configuring to personal needs; and much more. The TR270 is also a 2 meter or a 70cm-to-2 meter repeater, a packet system, a satellite rig, a WEather FAX receiver, and an ACARS monitor, and the unit can be computer controlled.

Front view of R.L. Drake's TR270 gives only a hint of its special features. Unit is comparable to a six foot rack of communications gear.

Overview

The TR270 is enclosed in a matte black cabinet measuring 4.75"H × 11.0"W × 13.5"D, and it weighs 13 pounds. The rig is well-ventilated and fitted with a large rear heatsink for cooling. A large and backlit multifunction display, full-size knobs, and hefty speaker grill grace the front panel. Inside is a 2 meter FM transceiver, a separate VHF/UHF FM receiver, a heavy-duty AC power supply, plus slots for adding Drake's optional TNC270 module for packeting and DEMOD270 for copying WEather FAX, RTTY, Morse, ACARS, etc. Rear sockets are provided for AC power or an external 13 volt DC source; an external TNC; audio from an HF shortwave receiver for copying RTTY, CW, FAX, etc.; and an RS-232 port for computer control of the TR270.

The unit's 2 meter transceiver covers 144.0 to 148.0 MHz (142 to 150 MHz for authorized MARS/CAP use), with output power selections of 1, 10, and 25 watts.

*4941 Scenic View Drive, Birmingham, AL 35210

The second receiver covers 136 to 174 MHz and 420 to 470 MHz. Separate antenna sockets for the transceiver and second receiver are included on the rear panel. Since both rigs operate simultaneously, volume and squelch controls on the front panel set their levels on the "double duty" speaker.

The TR270 is equipped with 400 memories which are assigned as follows: 100 to transceiver VFO A, 100 to transceiver VFO B, 100 to "second receiver" VFO A, and 100 to "second receiver" VFO B. All memories can store any frequency, repeater offset, CTCSS tone, and scan-related action. Additional features include CTCSS decoding, a CTCSS filter to eliminate low-frequency "rumble" when copying signals with tones, automatic or manual repeater offsetting, programmable "splits," several scan modes, and 10 DTMF autodialers, plus more. All of the TR270 features and functions are accessed via the front keypad, up/down buttons, and tuning control. Keypad buttons are also used to direct-enter frequencies, select DTMF tones, and select menu options. My explanation may seem complex, but the TR270 is actually quite user-friendly. In fact, I tried the "bozo test" of operating it before reading the manual and was quite successful. It's a neat rig!

Special Features and Functions

Defining where one group of features ends and another begins is nigh impossible in a "do everything" rig such as the TR270, as numerous functions are interrelated. An internal set of 60 menu-selectable operating parameters, for example, allows each owner to customize a TR270 according to personal preferences. The menu set includes everything from VFO steps, scan modes, satellite band scan ranges, and DTMF autodialer delays to precise low/medium/high power outputs, transmit time-outs, antenna/rig selections, activation of coax voltage for a preamp, and much more. For scanning, an operator can specify frequency ranges for VFO A and B, assemble special memory lists, and/or specify memories to be scanned or skipped as desired. Scanning can also be set to pause and continue, pause until a carrier drops, or pause and stop/cancel scanning. Other menu-selectable features of interest include using the TR270 as a crossband or inband repeater, specifying time between LOS of a satel-

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A fourth scale switches among peak reflected power (and SWR), high voltage, ALC threshold and ALC output voltage.

Multi-Voltage Power Transformer

Ameritron's *Multi-Voltage Power Transformer* has a unique buck-boost winding. It lets you select from 14 primary voltages centered on 115 and 230 VAC.

You can match your AL-572 to your AC line voltage so you'll get peak performance and long component life -- regardless of your line voltage.

QSK Compatible

For *lightning fast* QSK operation use the optional Ameritron *electronic PIN diode* QSK switch. Use the external QSK unit, QSK-5, $349, or install the internal QSK-5PC board. Contact Ameritron.

Plus More!

An Operate/Standby switch lets you run barefoot, but you can instantly switch to full power if you need it.

Transmit LED; 12 VDC, 200 mA accessory jack; 12 VDC keying relay for solid state/tube rigs; tough, nearly indestructable Lexan-over-aluminum front panel.

Shipped with transformer installed and wired for 120 VAC. Draws 16 amps at 120 VAC. Compact 8½"Hx15½"Dx14½"W.

Ameritron Warranty

In the unlikely event that there are defects in materials or workmanship, Ameritron will repair your AL-572 *free* for a full year. The Svetlana 572B tubes are covered by Svetlana's warranty.

Made in U.S.A.

Ameritron . . . we build quality in the U.S.A.

Call your dealer for your best price

Enjoy 1300 Watts of near legal limit power and the best value for your money.

Order your AL-572 today!

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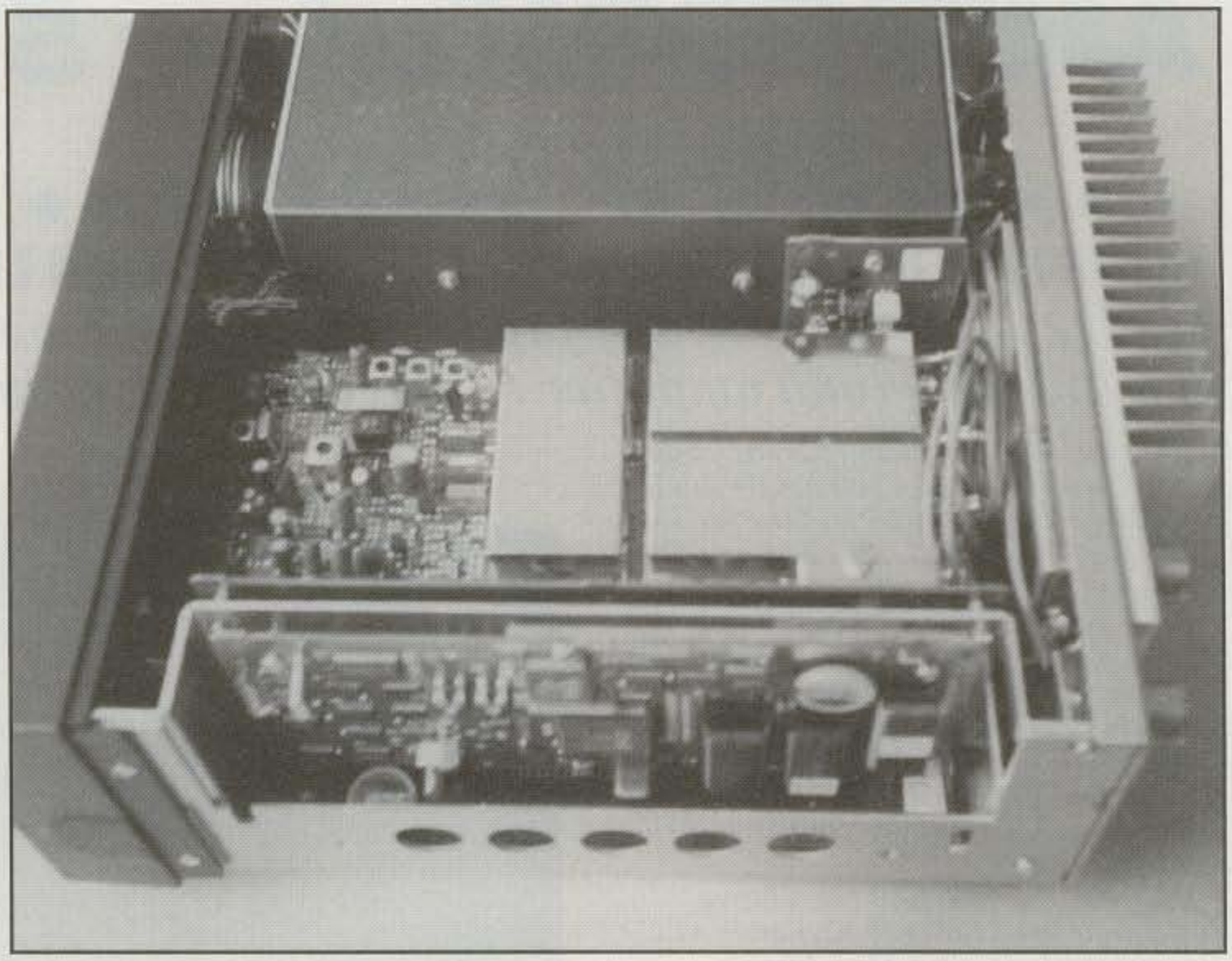
CIRCLE 133 ON READER SERVICE CARD



Interior view of the TR270 showing speaker (left top), power supply (behind it), and main circuit boards. Optional TNC and DEMOD/FAX cards plug into slots on main board.

lite signal and rescanning for another satellite, and data flow for computer control. The only thing the TR270 will not do is operate CW or SSB. It is a dedicated FM rig for the dedicated FM enthusiast who enjoys "having it all!"

It's Also A Repeater!

Several dualband FM transceivers include a light-duty crossband repeat function. The TR270, however, goes several steps beyond that point. In addition to relaying signals from a 70 cm input frequency to 2 meters, this gem is also a 2 meter repeater. You simply select a desired 2 meter input frequency on the "second receiver," set a 2 meter output frequency on the transceiver, and menu-activate the inband repeat function. Needless to say, you should check with local area coordinators before blindly "setting up shop" on an assumed quiet channel! This is when some of the TR270's special features really shine.

First it can be set to recognize any CTCSS tone and use its CTCSS filter, plus even transmit a different CTCSS tone for security measures. Second, output power can be reduced to any level for limiting coverage range. Third, the internal power supply is rated at 140 watts, which, combined with the large heatsink, ensures cool, reliable operation on an unlimited basis. Taking a TR270 into a disaster area or emergency situation (and using it conscientiously!) could be a blessing.

It's Also A Packet System

If you like a neat, clean station for packeting, Drake's TR270 is the answer. Just plug in its optional TNC and connect the output to an IBM-compatible computer, and you're ready for 1200 or 9600 baud packeting in high style. The TNC270 is supplied with two software packs: PC PACKRATT for DOS and PC PACKRATT for Windows. The TNC contains 18K of battery-backed RAM for mailboxing, and operates in Command, Host, and KISS modes. It has an enhanced MHEARD function that identifies TCP/IP, NET/ROM, and <THE NET> stations. Also included is an easy-learn command set for starting and an "expert" command set for advanced packeting. Status indicators for the TNC are built right into the TR270's front display. If desired, an external TNC can also be connected to the TR270 via a rear socket.

It's Also A Satellite Rig

The TR270 may be an FM-only transceiver, but so are many of our presently active OSCAR satellites such as AO-27 plus MIR and the space shuttle. Furthermore, AO-27 and another upcoming satellite are FM units—orbiting FM repeaters with 2 meter uplinks/70cm downlinks and packet capabilities. These satellites are in low orbits and are often accessible with simple turnstile antennas. Additionally, commercial satellites such as NOAA APT transmit weather pictures/

maps that can be received directly on the TR270 and displayed or printed on a connected computer.

One of the TR270's special features for satellite operation is automatic doppler shift correction, which "locks on" a satellite's frequency at AOS and continuously corrects the receiver's frequency until LOS. The TR270 also incorporates a scan search for automatic acquisition of a downlink frequency, a scan pause setting to adjust its tuning rate, and a scan resume setting to restart scanning if or when a downlink signal is lost. Once the TR270 latches onto a signal, it holds onto it like a bulldog!

The TR270 is also preprogrammed with most of the popular uplink and downlink frequencies used by presently active OSCAR satellites.

Rear view of the TR270 reveals massive heatsink, dual antenna sockets, and ports for computer interfaces.

WEFAX and ACARS, Too

Assuming Drake's optional DEMOD270 is installed in the TR270, the rig is ready to copy WEather FAX pictures transmitted in the 137.0 to 137.500 MHz range. NOAA's APT weather satellite emits a relatively strong signal, and reception is often good when using a 45 degree-tilted 3-element 2 meter beam. Yes, and copying weather pictures is only one piece of the pie. Additional capabilities of the DEMOD270 include decoding facsimile, Morse code, RTTY and NAVTEX transmission on HF bands, plus monitoring ACARS (Aircraft Communications and Reporting Systems) within air bands. Each of those operations involves adding a cable between the TR270 and the earphone socket of an all-mode HF receiver and/or an AM aircraft-band receiver.

A complete package of PC software for FAX and ACARS is supplied with the DEMOD270, and it makes getting up and running quite easy.

On The Air

Getting behind the controls of a TR270 is like turning a kid loose in a candy store. It's difficult to choose what to pursue first! Let's scan some of the public-service and marine channels and try the orbiting 2 meter FM repeater satellite. Wait—let's set the TR270 scanning the 137 MHz range and cable its DEMOD out to our computer for viewing weather pictures. Shall we use the rig to chat with the local repeater gang, or set it up to be a repeater? How about packeting via OSCAR today and copying some HF fax tonight? Whoa, Dave—slow down! Okay, the TR270 is very easy to use and everyone complimented its terrific audio. Using the rig for local repeater chats, however, seems like driving a Rolls Royce to the corner store. There are enough features, frills, and special assets in this gem to captivate your interest for many years.

Conclusion

Are Drake's TR270, optional TNC270, and DEMOD270 worthy of their listed retail prices ($999, $249, and $99, respectively)? You bet! The combined setup is a killer! The TR270 is first class throughout, backed with a full one-year warranty, and knowing Drake, will not be upstaged or lose value due to introduction of another model in the near future. Check out the TR270, gang. It's an FMer's dream rig.

For more information on the TR270, contact the R. L. Drake Company, 230 Industrial Dr., Franklin, OH 45005 (515-746-4556). ■

With the sunspot cycle burgeoning and more and more DX being worked, getting that rare QSL card may get tougher. SM5MX shares with us his first-hand experience in helping the system along.

The Art of Getting QSL Cards From Rare Stations

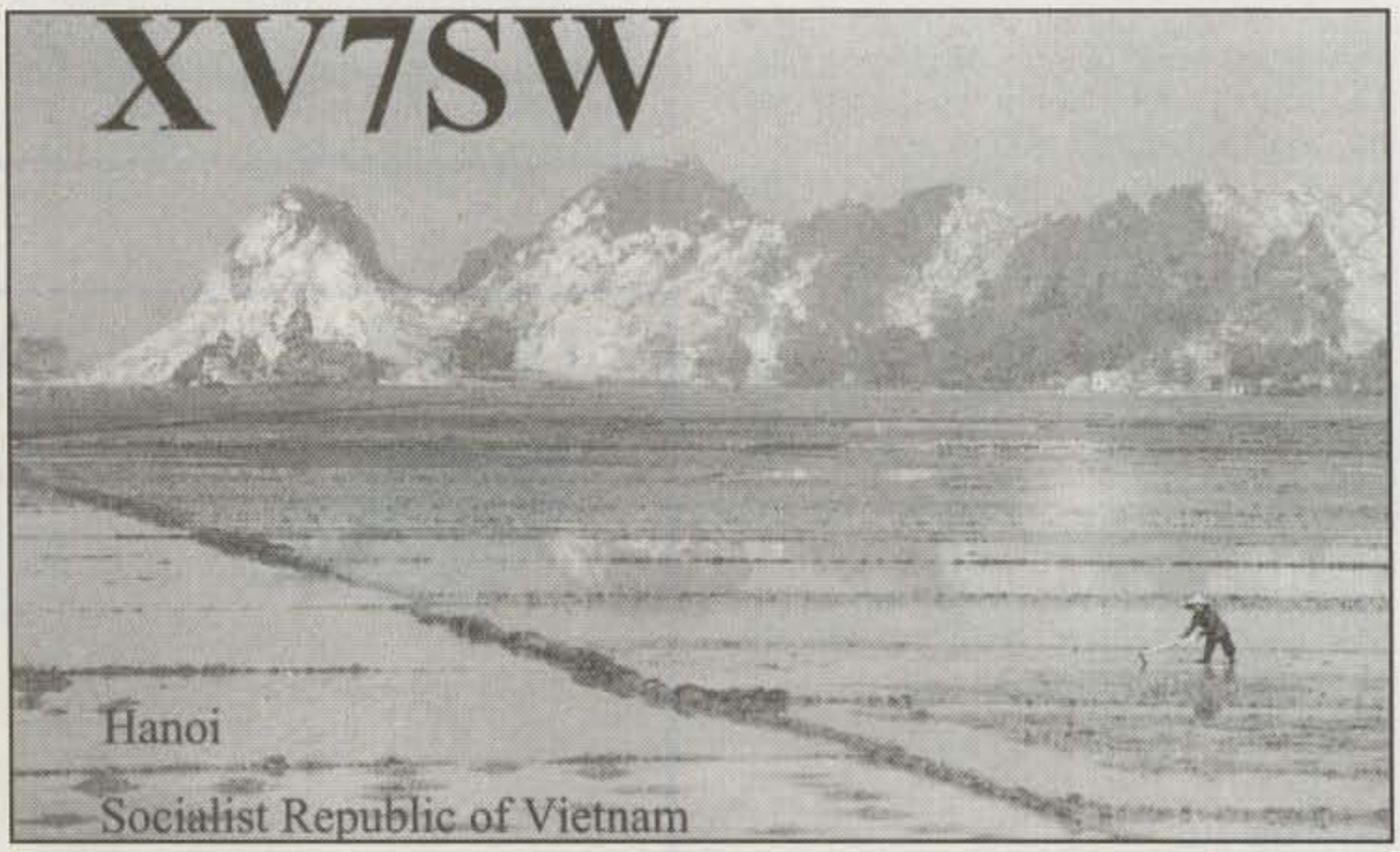
Why Don't I Get a Card?

BY ROLF T. SALME*, SM5MX
(ex. XV7SW, 5Z4MX, 4S7MX, SP5RX, 8Q7MX)

When I was a beginner in amateur radio, I sent all of my cards via the bureau. Later, when I started to pick up speed and managed to work a few DX stations, I found that sending cards via the QSL bureau was not sufficient, since many DXers lived in countries without bureaus.

My measure at that stage was to send my cards to the QSL manager of the DXer, either via the bureau or directly to his address. Finally, for DX stations without a manager, I was expected to send my cards directly.

But alas, there was still no reply. When I had recovered from my anger after gradually realizing that I could just forget about a certain card, I started to think about the reasons why. This is what I intend to write about here in the hope that it might be of some help to others. As a matter of fact, I've thought of more things you *shouldn't* do, rather than what you *ought* to do. This is after having been active as a DX myself from some more or less rare countries.



This is the latest QSL card used by the author. If you don't know the rules, written and unwritten, you may have a very long wait and a slimmer chance to get one.

The Standard Package

I am quite certain that you already know that to obtain a QSL card directly from the DX station or his manager, you have to supply your own address and return postage in one way or another. Thus, besides your own completed card, you should enclosethe following:

- a self-addressed return envelope
- return postage in the form of one or several International Reply Coupons (IRCs) or one or more dollar bills, called "Green Stamps"

*Korpstigen 5 B, S-135 53 Tyreso, Sweden

The big Issue, however, remains: Why don't I get a card,even though I have done all this?

Possible Pitfalls, Category I

Here I will maintain a merciful silence for those DX stations who simply cash in the enclosed return postage without replying. I will gladly pass on this subject to psychologists, ethnographers, and the like.

In my experience, the most common problem in developing countries is that mail either the incoming envelope or my reply, simply gets lost. I have received occasional angry reminders regarding unanswered pleas for cards, but it has always been easy to check to see if there has been any related incoming or outgoing mail.

Personally, I have always used the very simple and obvious method to reply to everything. It is considerably more difficult, however, to reply to letters you have never received. Not everyone seems to accept this bold theory of mine.

Another common phenomenon is that somebody has opened the envelope and pilfered the return postage. For a DX station in a developing country who is getting hundreds of letters a month, out of which

maybe 10 percent of the envelopes are plundered, it may not be entirely self-evident that you are supposed to sponsor the return postage. You don't have to make a profit on your hobby, but other people's pleasure should at least be self-financing, hopefully. In countries where monthly salaries are on the order of a few hundred dollars or less, I am afraid that people may not find it an overwhelming temptation to use their family savings to finance their outgoing QSL mail.

For this reason, many DX stations recommend you do not write anything on the outside of the envelope which may indicate its contents, such as "A.R.S. so-and-so." I'm sure just the name is sufficient!

In my case, I usually send cards which did not have any return postage enclosed to my manager, SM3CXS, to be forwarded via the Swedish QSL-bureau, SSA.

Possible Pitfalls, Category II: In the Head of an Old DXer

Now we come to the nitty-gritty and my actual thinking. Here I will try to stretch my imagination to guess why some people far away still put things aside for a reply later —or never. As I said above, I reply to all incoming mail, but I have to admit that I sighed at times when certain cards took a lot more work to handle due to some minor deviations from what I was expecting.

And now, here it comes—another bold theory of mine: Is it those small, trifling details that cause some QSL cases never to survive passage from the Inbox to the Outbox on the desk of an old, tired DXer?

Again, just imagine a station far away, which is quite active and is receiving mega-stacks of QSL mail every month. Maybe it doesn't take much before cards are "put aside"? Based on my own experience, I will try to guess a few trifling reasons, which are actually very easy to avoid:

• Don't send IRCs which are stamped in the right-hand box. Formally speaking, this means that they have already been cashed in. Hence, they have no value any longer, no matter how fresh they look or whatever you try to tell the cashier at the post office.

• Use U.S. dollars if you opt for cash. It is the most widely accepted currency.

• Never send dirty or torn notes or notes that have been patched together with Scotch™ brand tape and the like. In many developing countries considerable restrictions apply to the exchange of foreign currency, often combined with strong suspicions that notes may be forged. Each and every banknote is therefore subject to careful inspection, and a defective note is often routinely rejected after a mere glance from the bank cashier.

• It is not a very good idea to enclose stamps from the country of the DX. I have never found that the stamps I receive are sufficient for the return postage.

• Don't enclose too small return envelopes! A very easy-to-understand rule of thumb should be that the envelope you send should at least be large enough to hold your own card. It is time-consuming to cut and paste to make a usable envelope out of a too small one. Usually, I cut and paste the address from such envelopes onto a bigger one, but not everybody can be expected to do so.

• In many developing countries local stamps are quite large but of low denominations. So please leave plenty of space for stamps when you write your own address on the return envelope! Again, the old, tired DXer may not be in the mood for cutting and pasting.

• Write your address on the return envelope by yourself. It is better than enclosing a small address label (hard to find) or writing nothing at all, hoping that the DXer will dig out your address from somewhere on your QSL card and scribble it on the envelope.

• If you have a rubber stamp with your address, remember to include the name of your country or to add it on the envelope. Not all postmen in the world know where Sacramento or Sodertalje is located.

• Be careful to enter the correct time and date in your own log to start with. If you have worked a DX station in a pile-up and written the time or date incorrectly, your call may be pages away from the actual time in the log of the DXer. Flipping log pages plus minus several pages can take considerable time. With today's computerized logs this is not a problem, but not everybody has a computerized log.

And finally, please remember that all the extra time the DX station has to devote to such trifling clerical matters will take away his time on the air!

My QSL manager, Joe, SM3CXS, has read my comments herein and he agrees that it is such small matters that may reduce the speed considerably when handling cards.

I left Vietnam a few months ago, and I wouldn't be surprised if my colleagues in the office over there have noticed a miraculous decline in the consumption of glue.

Finally, Hats Off For . . .

. . .the International Postal System which managed to forward mail to me in Vietnam which was addressed to "Hanoi, Cambodge," "Hanoi, North Korea," and other novel destinations.

. . . our Japanese colleagues, who for some reason always seem to do practically everything absolutely right!

. . . SM3CXS, who very patiently has handled the lion's share of my and other DXers' cards for so many years! Joe is the only person I know who has gotten *two* letter-boxes at his gatepost. ■

"The VX-1R is smaller than most pagers!"

"Over 19 hours of use from the rechargable lithium ion battery!"*

"VHF, UHF, AM, FM, Air Band, Police,Fire–TV" too? Wow"

"Looks like Yaesu did it again!"

VX-1R
Ultra-Compact Dual-Band Handheld

The world's smallest HT with all the high-tech features you'd want in the world!

The ultra-compact size of the VX-1R Dual-Band is the first thing you notice as you cradle it in your palm. But the high-tech features make this radio one you must have now! Simple combinations, using seven buttons and one knob, control this marvel of engineering. One soft key touch, and wide receive VHF/ UHF--76~999 MHz RX (except cellular):144~148, 430~450 MHz TX, or AM/FM Broadcast, Aircraft, Police, Fire--even TV, spring to life! Touch again for Yaesu-exclusives, SmartSearch™ and ARTS™, or Priority Channel Alarm. Built-in CTCSS and DCS Encode/Decode for 2m/440 amateur bands, CTCSS/DCS Tone Search, and Dual Watch, are included along with 291 Memory Channels in 9 banks with 500 mW power output. Backlit LCD Display shows 6-character alphanumeric capability; backlit keypad makes operation easy in dim light. And, although the VX-1R is the world's smallest dual-band HT, you get over 19 hours* of use with just a 1 hour recharge from its long-lasting lithium ion battery! Big features, small size--the most satisfying combination in the world!

Features

- Frequency Coverage
  Wide Multi-Band Receive
  RX: 76~999 MHz**
  TX:144~148, 430~450 MHz
- AM/FM/TV Broadcast Receive
- AM Aircraft/Public Safety Receive
- CTCSS Encode/Decode
- DCS Encode/Decode
- CTCSS/DCS Tone Search
- Dual Watch
- SmartSearch™
- Auto Range Transpond System™ (ARTS™)
- Priority Channel Alarm
- ADMS-1D Windows™ Programmable
- 1 Watt External Power Supply
- 80 Minute Rapid Charger
- Flexible Antenna, Belt Clip, Hand Strap

**Cellular blocked

*Battery Life: 5-5-90 duty cycle.

FT-50RD
MIL-SPEC Heavy Duty Dual-Band Handheld

FT-51R
Dual-Band with Dual Receive and Help Menu Function

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"The quick-release remote front panel gives you so many installation options."

"And with dual receive you can talk on one band, and listen on another!"

"Plus, the high-tech Enhanced Smart Search™ is great for finding repeaters --and you can watch it all on the dual display."

"Looks like Yaesu did it again!"

FT-8100R

Compact Dual Band Mobile

Now a dual-bander that remotes and is easy-to-use, without sacrificing the features you want!

With its quick-release, remote front panel system, the FT-8100R combines high-performance dual-band features in a simple-to-operate rugged mobile built to the endurance standards of commercial radios. The result is installation flexibility and industry-first, "must-have" advantages!

Use dual receive (V+V, U+U or V+U), or talk on one band while listening on another. Watch Yaesu's exclusive Enhanced Smart Search™ automatically seek out and load active frequencies--great for finding new repeaters while traveling.

Get wide receive coverage--from 110 to 550 MHz and 750 to 1300 MHz* for public safety, marine, aircraft, and weather channels. Enjoy up to 50 Watts of VHF power output (35 Watts on UHF) with High/Medium/Low choice on each band, and "plug and play" 1200 or 9600 bps packet. Utilize 208 memory channels--the greatest available on any remote mobile--to store repeater offset, CTCSS tone, packet baud rate, and power level.

Yaesu's popular Omni-Glow™ display provides a wide field of view, and includes a DC voltage meter. Quickly program, or clone frequency memories with optional Windows™ PC programmable ADMS-2D.

"User-friendly" describes the streamlined front panel layout. Eight clearly-marked keys, and separate Volume/Squelch controls for each band, make operation easy. And the backlit DTMF microphone includes 3 user-programmable keys...but no awkward keypad cover!

Don't sacrifice high-performance features in your dual-band mobile installation Get the easy-to-use FT-8100R at your Yaesu dealer now!

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Features

- Frequency Coverage
  - RX: 110~550 MHz
  - 750~1300 MHz*
  - TX: 144~148 MHz
  - 430~450 MHz
- Detachable Front Panel (remotable w/optional YSK-8100)
- 3 Power Output Levels
  - 2m 50/20/5 Watt
  - 70cm 35/20/5 Watt
- 208 Memory Channels
- Enhanced Smart Search™
- CTCSS Encode
- Built-in Duplexer
- S-Meter Squelch
- Dual Receive (V+V,U+U,V+U)
- Crossband Repeat (bidirectional or one-way)
- PC Programmable w/optional ADMS-2D
- Digital Battery Voltage Display
- Auto Power Off (APO)
- Omni-Glow™ Display
- 1200/9600 bps Packet Compatible
- Alternating-Band Memory Selection (ABMS)
- DTMF Autodialer (6 Memories)
- Time Out Timer (TOT)
- Accessories: Consult your local Yaesu dealer.

*Cellular & 900 MHz Cordless Phone frequencies blocked.

50W/VHF
35W/UHF

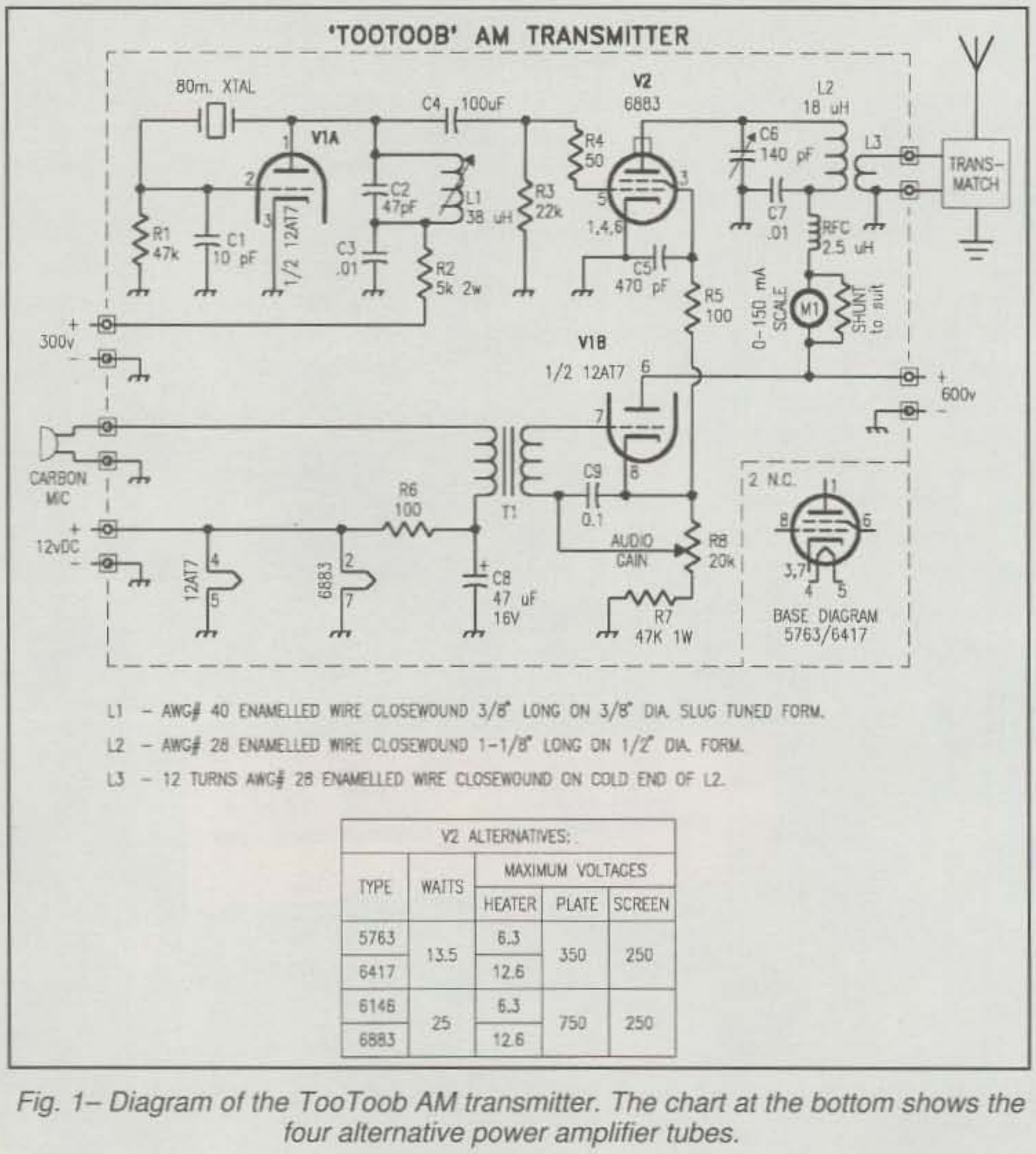
This project should bring back some great memories and perhaps create new ones for those tempted to build it.

The TooToob

A QRP High-Power AM Transmitter for 75 Meters (80 Meters if You're Canadian)

BY GEORGE MURPHY*, VE3ERP

The circuit for this transmitter wafted out of the past on a nostalgic zephyr emanating from the musty interior of a decrepit carton recently exhumed after eons of ignominious incarceration. *Translation:* I found it in a box of junk banished to the attic in 1962. I call it a QRP rig because current state-of-the-art technology makes it practically impossible for any amateur except a dedicated QRP buff to build anything useful for the ham shack. As QRP rigs go, this one is a real powerhouse blasting out 10 watts or more, depending on what kind of power amplifier tube is used, and is simple to build if you can find the parts. What's more important, it works!



L1 – AWG# 40 ENAMELLED WIRE CLOSEWOUND 3/8" LONG ON 3/8" DIA. SLUG TUNED FORM.

L2 – AWG# 28 ENAMELLED WIRE CLOSEWOUND 1-1/8" LONG ON 1/2" DIA. FORM.

L3 – 12 TURNS AWG# 28 ENAMELLED WIRE CLOSEWOUND ON COLD END OF L2.

V2 ALTERNATIVES:				
TYPE	WATTS	MAXIMUM VOLTAGES		
		HEATER	PLATE	SCREEN
5763	13.5	6.3	350	250
6417		12.6		
6146	25	6.3	750	250
6883		12.6		

Fig. 1– Diagram of the TooToob AM transmitter. The chart at the bottom shows the four alternative power amplifier tubes.

The Circuit

It couldn't get much simpler. V1A is a crystal oscillator driving power amplifier output tube V2. V1B is a modulator that titillates the screen of V2, thus modulating its amplitude. That's it. If you have a computer and *HAMCALC*[1] software, you can calculate the meter shunt[2], change tuned circuit component values to suit your junk box, redesign the rig for other bands, etc. If you are a real addict, you probably can even replace the tubes with transistors!

Tubes

I have built many of these transmitters using one of the four alternative power amplifier tubes shown in the chart in fig. 1. The choice of tube usually depended on what was available at the time in the way of tubes and power supplies. The only difference between the 6146 and 6883 is the filament voltage. The same difference applies to the 5763 and 6417. Fleamarkets still yield 12AT7 and 6146 tubes, so if you want to have some fun, try your hand at building one of these rigs.

Metering

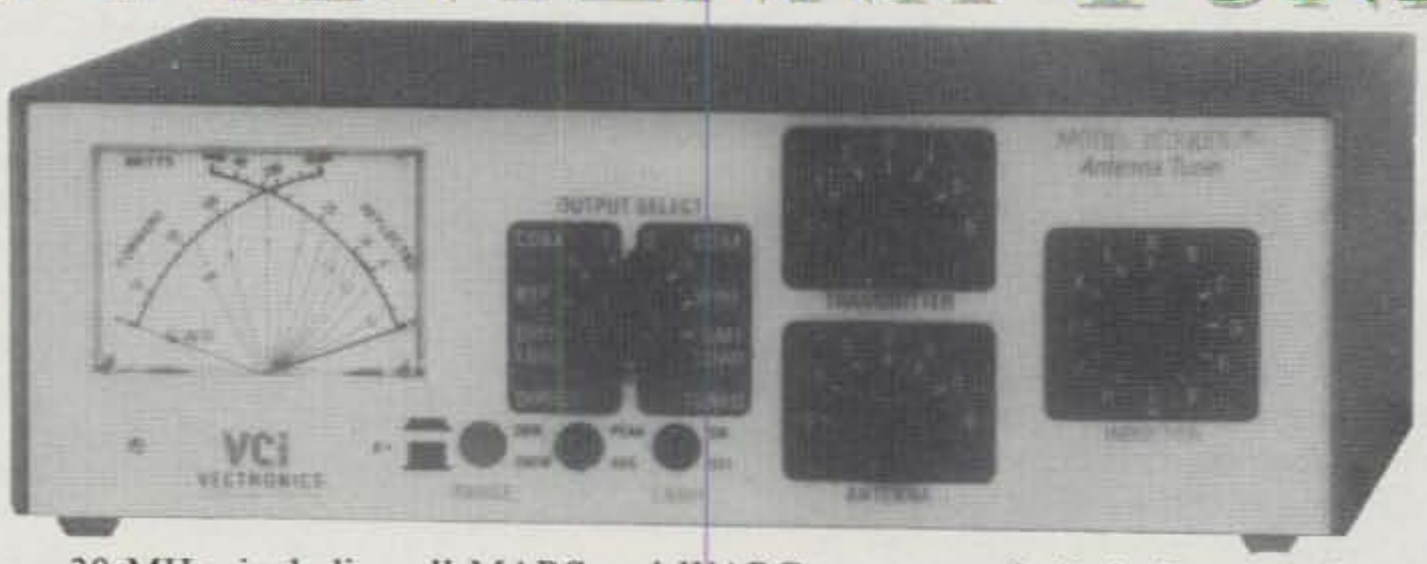
All tube transmitter finals require monitoring, usually by a meter displaying the plate current. On CW where the on/off cycle is about 50%, you get a fair warning before trouble starts. On SSB the on/off cycle depends on the gargle rate of the transmitting operator. On AM, however, where the final is operating full blast all the time, the monitoring is more critical. You will have to consult tube data sheets or old handbooks to find what the

*77 McKenzie St., Orillia ON L3V 6A6, Canada

THE VECTRONICS VC-300DLP . . .
300 WATT ANTENNA TUNER

- *Multi48™ Inductor*
- *Cross-Needle Meter*
- *8 Position Antenna Switch*
- *Built-in Dummy Load*
- *1.8 to 30 MHz Coverage*

VC-300DLP
$159.95



The VECTRONICS VC-300DLP is the world's most versatile 300 Watt antenna tuner!

You'll get everything you've ever wanted . . . precise inductance control that rivals roller inductors . . . the ability to match any real antenna . . . full 1.8-30 MHz coverage . . . peak reading backlit Cross-Needle Meter . . . 8 position antenna switch . . . built-in 50 Ohm dummy load . . . finest components available and world class quality.

Precise Inductance Control

VECTRONICS' exclusive *Multi48™* inductor gives you *forty-eight* inductance values -- you'll get precision tuning that rivals the most expensive roller inductors.

Tune any antenna 1.8-30 MHz

You can tune any real antenna from 1.8 to 30 MHz, including all MARS and WARC bands. Use verticals, dipoles, inverted vees, yagis, quads, long-wires, whips, G5RVs, etc.

Has 4:1 balun for balanced line antennas.

Handles up to 300 Watts SSB PEP, 200 watts continuous (150 Watts on 1.8 MHz).

Peak Reading Cross-Needle Meter

The VC-300DLP backlit Cross-Needle meter displays SWR, forward and reflected power simultaneously. Reads both peak and average power on 30/300 watt scales. Meter lamp has front panel switch and uses 12 VDC or 110 VAC with AC-12 adaptor, $12.95.

Versatile Antenna Switch

The VC-300DLP eight position antenna switch lets you select two coax fed antennas, random wire/balanced line or built-in dummy load for use through your tuner or direct to your transceiver. Bypass position bypasses your tuner but keeps your SWR Power meter in line.

Built-in Dummy Load

A built-in 50 Ohm dummy load makes tuning up your rig easy! Use it for testing and repairing your rig, setting power level, adjusting your mic gain and more.

World Class Quality

The finest components available and the highest quality construction gives you the *best* 300 Watt antenna tuner that you can buy.

A chemically treated aluminum case with durable baked-on paint and scratch-proof multi-color Lexan front panel looks great for years of dependable service.

Try any product for 30 days

Call toll-free 800-363-2922 and order any product from VECTRONICS. Try it for 30 days. If you're not completely satisfied return it for a full refund, less shipping and handling -- no hassles. All VECTRONICS products come with a one year warranty.

2 kW Antenna Tuner

HFT-1500
$459.95

You can tune any real antenna from 1.8 to 30 MHz for absolute minimum SWR.

The HFT-1500 is crafted of the finest components available . . . two *heavy duty* 4.5 kV transmitting variable capacitors and a *high current* roller inductor with a precision 5 digit *gear* driven turns counter. Gives you arc-free operation up to 2 kW PEP SSB.

Has backlit, peak-reading Cross-Needle SWR/Power meter, *SSB✻Analyzer Bargraph™*, 6 position *ceramic* antenna switch, 4:1 Ruthroff balun for balanced line. Scratch-proof Lexan front panel. 5.5x12.5x12 inches.

300 Watt *Mobile* Tuner

VC-300M
$109.95

The VC-300M *Mobile* Antenna Tuner is compact, lightweight, easy-to-operate and is our most economical tuner.

It's compatible with *any* mobile antenna and *any* mobile HF transceiver and is compact enough to fit in the most compact car.

It can also be used at home with dipoles, vees, verticals, beams or quads fed by coax.

Backlit dual movement meter simultaneously monitors Power and SWR. Covers 1.8-30 MHz. Handles 300 Watts SSB PEP, 200 Watts continuous, (150 Watts on 1.8 MHz.). 7.25x8.75x3.6 in. Weighs 3.4 lbs.

SWR/Power Meters

PM-30
$79.95
PM-30UV
$89.95

PM-30, $79.95, for 1.8 to 60 MHz. Displays forward and reflected power and SWR simultaneously on dual movement Cross-Needle Meter. True *shielded* directional coupler assures accuracy. Backlit meter displays peak or average power in 300/3000 Watt ranges. First-rate construction includes scratch-proof case/front panel. 5.3x5.75x3.5 inches. SO-239 connectors.

For 144/220/440 MHz, 30/300 Watt ranges. PM-30UV, $89.95, has SO-239 connectors. PM-30UVN, $89.95, has N connectors. PM-30UVB, $89.95, has BNC connectors.

1500 Watt *dry* Dummy Load

DL-650M, $64.95. Handles 100 watts continuous, 1500 Watts for 10 seconds to 650 MHz. Ceramic resistor. SWR < 1.3. SO-239 connector. **DL-650MN, $69.95** has N connector.

Low Pass TVI Filter

LP-30, $69.95. Eliminates TVI by attenuating harmonics at the source. Plugs between transmitter and antenna or tuner. Handles 1500 watts.

High Pass TVI Filter

HPF-2, $24.95. Installs between VCR/TV and cable TV or antenna lead-in cable. Eliminates or reduces interference caused by nearby HF transmitters.

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plate current should be for the tube you are using and the plate voltage applied to it in your *rig*. A runaway final usually results in brilliantly red and fiercely hot power amplifier tubes. If you are mobile with a "TooToob" clamped between your knees, this could significantly affect your night vision, among other things.

Power Supplies

Back in the 1960s most power supplies had center-tapped 12.6 volt filament transformers to fire up the various 6 and 12 volt tubes in general use at the time. The plate transformers had taps for several high voltages which were rectified to provide the B+ plate and screen voltages[3] required by the tubes. B+ voltages for mobile rigs were usually supplied by surplus dynamotors from two-way radio equipped taxi, police, or public service vehicles. The filaments were powered directly by the car battery. Many cars had 6 volt batteries, but newer cars equipped with 12 volt batteries were appearing on the market, adding to the general confusion.

Small AC household radios of the period frequently had no transformers at all, because they had five or so tubes the filament voltages of which when connected in series approximately totalled the household AC line voltage and were run directly from it. The DC plate voltages of these tubes were usually about the same as the AC line voltage and were obtained by simply rectifying the line voltage. There were several popular tubes available—especially diode rectifiers and power amplifiers—with filaments in the 25–50 volt range which made all this possible.

Power supplies for more sophisticated equipment had to be versatile to accommodate the variety of voltages required, and they were huge, heavy, and expensive. In those days often the general rule was to find a power supply first, then design the rig around it. If you don't have or can't find a power supply for a TooToob, you can always design one using *HAMCALC*. You will need an old TV power transformer with a tapped high-voltage winding, or something similar. For the filaments you can use a modern transformer with a center-tapped 12.6 volt secondary.

Notes and Comments

Mobile rigs in the 1960s often consisted of a simple transmitter such as the TooToob, and a converter for the band of choice installed between a mobile antenna and the car's AM broadcast receiver. This required manual switching from AM to amateur operation, and between transmitting and receiving. Many amateurs installed a push-to-talk switch in the microphone circuit to operate a changeover relay. If the amateur antenna was also used for the broadcast bands, it sometimes actually improved broadcast reception!

The circuit shown was for a mobile rig on 80 meters in a vehicle with a 12 volt battery. It had a carbon microphone salvaged from a surplus telephone handset, sometimes with the earpiece wired into the receiver audio output. T1 was any low Z primary, high Z secondary miniature audio transformer. If your TooToob is to run from an AC power supply, a carbon microphone requires DC voltage to operate. Therefore, if your power supply lacks low-voltage DC and you are using AC to heat the filaments, you can omit R6 and C8 and replace them with a 9 volt battery.

I forget where the original circuit came from, but I do remember it was intended as a simple stop-gap transmitter just to tide us over until we could remove all the tubes in all our electronic devices in the promised immediate future and simply replace them with cheap plug-in solid-state modules that would make all tubes obsolete forever. That was in 1960, and I'm still waiting. Until that time, there's a lot of fun to be had with tubes and building small rigs using them.

Footnotes

1. *HAMCALC* contains over 175 programs of interest to radio amateurs. For a free MS-DOS/Windows 3 1/2 inch 1.44 MB *HAMCALC* disk (over 175 ham-related programs) send US$5 (check or money order) to cover cost of materials and airmail postage anywhere in the world, to George Murphy, 77 McKenzie St., Orillia ON L3V 6A6, Canada.

2. RadioShack's 0–15 VDC voltmeter (cat. #270-1754) is actually a 0–1 ma ammeter with an internal resistance of 85 ohms and a scale calibration of 1–15. If you throw out the 15k series resistor that comes with it to turn it into a voltmeter, then add a 0.57 ohm shunt across it and multiply the scale reading by 10, you have a 0–150 ma ammeter. A 666 mm (26 1/4 inch) length of 0.16 mm (#34 AWG) copper wire (approx. 17 turns on a 1/2 inch coil form) has a resistance of 0.57 ohms.

3. When I was a boy, all radios were battery operated. They used three types of batteries—"A" batteries for filaments, "B" batteries for plates and screens, and "C" batteries for bias voltages. "A" batteries were monsters about 2 1/2 inches in diameter and 6 inches high, primarily intended for powering the new-fangled electric doorbells. "B" batteries were chunky jobs delivering voltages often as high as 90 volts. Some radios used more than one "B" battery, connected in series. "C" batteries were not called upon to deliver much current, so small flashlight batteries were used. As radios became smaller and more portable, "A" batteries were replaced by size "D" flashlight batteries. You can still buy size "C" and "D" batteries, but don't go looking for size "A" or "B"! The modern 9 volt battery is too puny to qualify as a "B" battery and was probably never given a letter designation so as not to befuddle old radio chaps like me. ■

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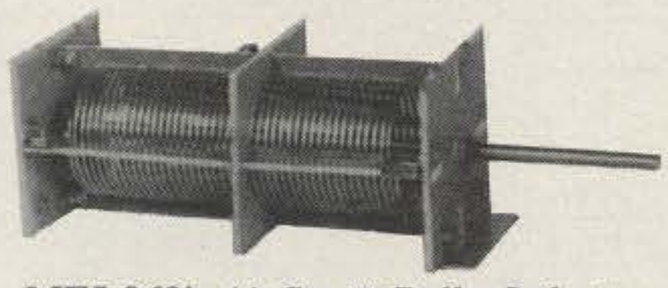

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CQ REVIEWS

The ADI AR-146 Mobile Transceiver

BY LEW McCOY*, W1ICP

The AR-146 (bottom) and the AR-446 (top). All you need is an antenna and 12+ volts of power.

A new base/mobile transceiver designated the AR-146 is being marketed by ADI/Premier Communications. This unit has many very nice features for a relatively low cost. As for the basics, the transceiver measures 5 1/2"W × 1 1/2"H × 6 1/2"D. Frequency coverage is 144 to 148 MHz, and the mode is frequency modulation (F3F-FM). The unit is capable of generating three power levels: 50 watts on HI, 10 watts on ID, and 5 watts on LOW. The AR-146 comes with a DTMF microphone, a stacking or mounting plate (for mobile), DC power cable, and spare fuses (plus a very detailed instruction manual). Power requirement is 13.8 volts DC at 11 amperes.

The front-panel display is very clear and easy to read and includes a DIM switch if you want to turn down the brightness of the display. The front-panel controls are POWER switch, TUNING control (which is used to set the desired frequencies), MHz step, memory channel, frequency step, tone frequency, and SCAN direction.

There are three switches grouped near the top left side of the panel. The VFO key is used to return to VFO operation after operating in the MEM mode or CALL channel mode. Also, pressing this key permits varying the microphone UP/ DOWN keys to increase or decrease the operating frequency. If you press and hold this key for more than one second, it initiates a VFO SCAN. In addition, there are a few other functions, such as setting a memory channel or top set and offset frequency.

The second key is the MR/M key, which is used to select Memory Recall mode from the VFO mode. The next key is the MHz lock key. This key is used to tell the microprocessor that you want to increase your frequency in 1 MHz increments.

There are several keys along the bot-

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mccoy@zianet.com

SPECIFICATIONS OF THE AR-146/446

		AR-146 (USA)	AR-146	AR-446
GENERAL				
Frequency range MHz		144 to 148	144 to 146	430 to 440
Mode		F3E (FM)		
Antenna impedance		50 ohms		
Operating temperature		–20 C to +60 C (–4 F to +140 F)		
Power requirements		13.8V DC ±15% (11.7 ~15.8V)		
Ground		Negative		
Current drain	Transmit mode	Less than 11A		Less than 10A
	Receiver mode	Less than 0.6A		
Frequency stability		Less than ±10 ppm		
Dimensions (W×H×D) (Projections included)		140 × 40 × 166 mm (5-1/2" × 1-37/64" × 6-17/32")		
Weight (kg)		1.2 (2.65 lb.)		
TRANSMITTER				
Output power*	HI	50W		35W
	MID	Approx. 10W		Approx. 10W
	LOW	Approx. 5W		Approx. 5W
Modulation		Reactance modulation		
Spurious radiation		Less than –60 dB		
Maximum frequency deviation		±5 kHz		
Audio distortion (at 50% mod.)		Less than 3% (300 to 3000 Hz)		
Microphone impedance		600 ohms		
RECEIVER				
Circuitry		Double conversion superheterodyne		
Intermediate frequency (1st/2nd)		10.7 MHz/455 kHz		30.85 MHz/455 kHz
Sensitivity (12 dB SINAD)		Less than 0.18 uV		
Selectivity		–6 dB: More than 12 kHz –60 dB: Less than 24 kHz		
Squelch sensitivity		Less than 0.1 µV		Less than 0.177 µV
Output (5% distortion)		More than 2W across 8 ohm loads		
External speaker impedance		8 ohms		

Notes:
1. Circuit and ratings are subject to change without dotice due to advancement in technology.
2. *Recommended duty cycle: 1 minute Transmit; 3 minutes Reception

Table I– Specification information taken from the instruction manual of the AR-146.

tom of the panel. The first is the F, or function, key. One of the functions it serves is to activate the DUAL function when this key is pressed with the TONE/DUAL. This permits you to watch and listen to two different frequencies. I found this to be a very handy feature. For example, you can listen to the dial frequency and either the memory frequency under M1, or one of the memory channels, or memory channels under scanning.

The next switch activates the CALL channel. The SHIFT key shifts the repeater transmit/receive frequencies. The TONE switch when pressed activates the tone selection (the unit comes with built-in tone functions). Last is the DTMF key, which operates PAG, CSQ, and DTMF if the optional DTMF board is installed. I didn't have one in the unit tested, so I didn't test this function.

As I mentioned, the LCD panel is clear and very easy to read. Its many indicators include TOT, which is on when the time-out timer function has been activated; SCAN, which is on when the VFO/MR SCAN function is activated; B, which is on when the BUSY SCAN flag is active; PAG, which is on when the DTMF PAGING function is on; and C.SQ, which is on when the code squelch is active. The rest of the indicators include HML (indicates power output being used); BUSY (squelch open); TX, on during transmit; F, on whenever the F key is depressed; LOCK, on when the function has been activated; MN 88, indicating the active Memory channel; T.SQ, on when the Tone Decode and Encode functions have been activated; REV, on when the Reverse function is used; – or + showing the transmitter offset being used (a handy feature, right?); APO (not what you think), indicating Automatic POWER off function being activated; and DUAL, showing when the dual watch function is activated.

The microphone (included) has seven switches. The two switches on top of the mic are used as UP and DOWN controls; they increase or decrease the VFO frequency, the memory channel, or the tone frequency. The Push-To-Talk switch is on the side of the microphone, and there are four switches on the back of the microphone. The first of the four switches is a CALL key, which has the same functions as the one on the panel. Next are the VFO, MR, and MHz keys, all of which have the same functions as those on the front panel. Below these four switches are the typical 16 touch-tone switches for phone or other access dialing.

My on-the-air test elicited many positive remarks from those I worked. They all said the unit had clean, crisp transmitted audio quality. The receiver is a very good performer. I made my usual intermodulation field tests, taking the unit to Phoenix and up near South Mountain, where there are zillions of transmitters operating. I experienced no overload worth noting. Sensitivity of the unit is rated at 0.18 µV (12 dB SINAD), and it checked out to be at least that good.

The transceiver comes with a one-year limited warranty, which means—and I read the fine print—that in the unlikely event of any failure due to defect in material or workmanship occurring within one year of purchase, this product will be repaired or replaced at the discretion of the manufacturer.

One thing I particularly liked about the ADI AR-146 transceiver is the brightness of the display. Here in New Mexico we are accustomed to bright, sunny days, and some of the units I have tested are hard to read in bright light. That's not the case with this unit.

The manual that comes with the base station is exceptionally well detailed and clear, plus easy to read and follow. The book is 45 pages and is well illustrated. The AR-146 is in the $250 price class and is manufactured by ADI/Premier Communications, 20277 Valley Blvd. #J, Walnut, CA 91789 (909-869-5711). ■

G4BXD presents a prime example of cooperation and joint engineering that helped further the allied war effort during WW II.

The Wireless Set No. 48

An Incredible Pack-Set That Still Works Today

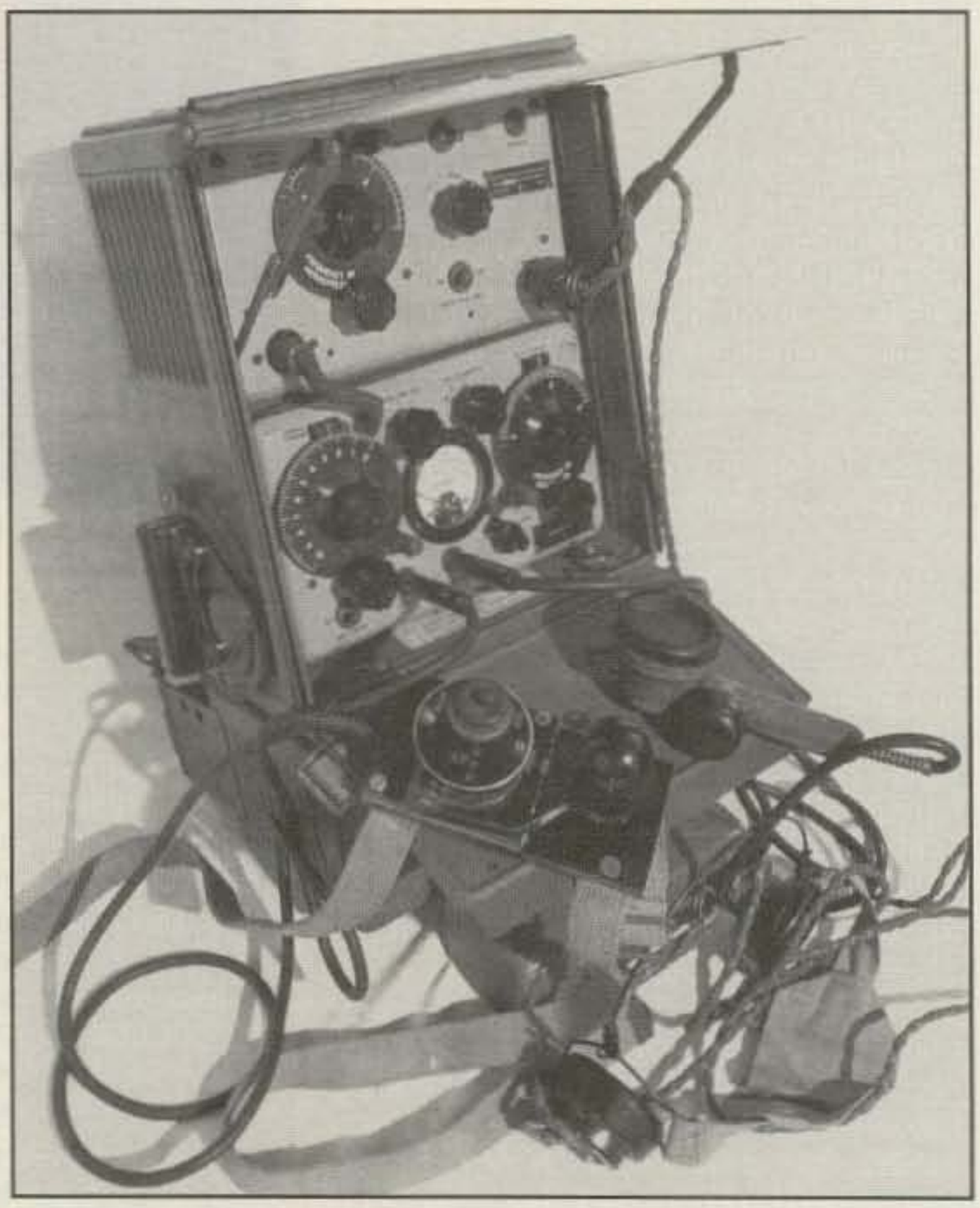
BY BEN NOCK*, G4BXD

The nature of war relies heavily on communication. That was particularly true leading up to and during WW II, when radio communication was accelerated. One of the nicest little units to be produced for the war effort was the U.S. designed Wireless Set No. 48.

The British army already had the WS No. 18, well known by many a schoolboy after the war, when it was taken to bits, modified, and then discarded. Nowadays a good, complete example of the Wireless Set No. 18 is hard to find, and a good No. 48 is even more scarce.

During WW II the demand for the No. 18 set outstripped the production facilities available in the UK. In addition, we were being bombed day and night. Therefore, early in 1940 several No. 18 sets were shipped to the U.S. to serve as the example for an American designed and produced equivalent.

The U.S. company Emerson Radio & Phonograph Corp[1] conducted extensive tests on the No. 18 set and drew up the final specifications for the U.S. equivalent, the WS No. 48. The new 48 set was to be at least as good as the No. 18 set. It was to be of similar size, run from the same batteries as the No. 18 set, and operate on the same frequencies and modes.



A complete Wireless Set No. 48, including all of its accessories. Notice the very familiar U.S. T-17 microphone on the lid.

The No. 48 Receiver

While looking very similar to a No. 18 set, the finished wireless No. 48 is very different electrically. The receiver is a standard single-conversion superhet; tunes 6 to 9 MHz; and uses one stage of RF amplification, a combined mixer oscillator stage, a single 455 kHz IF stage with two double-tuned transformers, two stages of audio amplification, and a separate BFO circuit. The receiver uses six tubes as compared to the four tubes in the No. 18 receiver. In the No. 18 set the last tube is used as the audio amp, audio detector, AGC detector, and BFO! The No. 48 set has the luxury of a separate BFO tube. A 1LN5 serves as RF and IF amplifier; a 1LA6 as oscillator/mixer; a 1LD5 as BFO and audio pre-amp; and a 1A5GT as audio output stage.

The No. 48 Transmitter

An increase in the tube count from two in the No. 18 set to four in the No. 48 set highlights the U.S. need to over-engineer. Whereas the No. 18 set employed an oscillator and PA tube, the grid of the PA being modulated from the microphone via a transformer, the No. 48 set employs a similar oscillator, but now with two tubes in parallel for the PA stage. Further, an additional tube is used as the modulator supplying screen grid modulation to the PA stage.

The VFO uses a 1A5GT, a 1LD5 is used as the modulator, and a pair of 1299 tubes are used as the PA stage.

TX/RX Switching

The clever use of a 4-pin plug on the microphone meant that the No. 18 set could switch from receive to transmit simply by switching the filament voltage from the receiver tubes to the transmitter tubes. A common tuned circuit acted as a PA output tank and receiver input coil, which could—and did—give rise to a loss in the signal path to the receiver.

The No. 48 set overcame this problem by using a relay which switches the antenna directly from the RX to the TX, and at the same time switches the filament voltage between RX and TX.

**62 Cobden Street, Kidderminster, Worcs DY11 6RP, England*

The drawback to this is that the relay needs a voltage and draws an amount of current. On my No. 48 set, with a 12 volt supply to the relay, this amounts to 35 ma, or some 0.42 watt of power. Considering that the transmitter RF output is quoted as 0.25 watt on phone or 1.15 watts on CW, the relay current is quite appreciable.

Power Supplies

The other battery supplies for the set are 3 volts for the filaments and 160 volts for the B+. The current drain on the filaments is 320 ma on phone transmit, 250 ma on CW transmit, and 150 ma on receive. Plate current is 20 ma on phone transmit, 50 ma on CW transmit, and 8 ma on receive.

In addition to battery power, Emerson designed a lightweight, hand-cranked generator, the 10 watt Mk II. When cranked at around 50 to 70 revolutions a minute, it would supply all the power needed by the No. 48 set and even the No. 18 set, with which it would also connect. A small tripod arrangement held the generator and provided a seat for the poor fool who had to turn the handles.

An additional feature on the No. 48 set is the provision of a crystal calibrator located in the transmitter. A 1 MHz crystal in the transmitter unit can be switched into circuit with the modulator tube, giving strong harmonics which can be heard in the receiver. In addition, the transmitter VFO is switched on at the same time, and when the transmitter VFO is tuned to a MHz spot, the two signals can be heard beating in the receiver. This way both the receiver oscillator and the transmitter VFO can be adjusted for calibration.

The Antenna System

Like the No. 18 set, the No. 48 is operated with short, about 12 inch rods, which can be joined to form different lengths of a whip. As little as two sections can be used when on the move, extending to six or even ten sections to increase range. Like the No. 18 set, the No. 48 was also designed to use the standard British Army 25 ft. wire antenna, which was simply thrown on the ground or placed over low bushes or trees.

An arrangement similar to the No. 18 antenna mount is used on the side of the No. 48 set, which means the whip antenna can be angled to maintain a vertical nature, even if the operator is lying prone on the ground.

When not in use, the antenna rod sections, 11 in all,[2] are carried in holders on the side of the main case. In addition, the hinged lower section of the carrying case houses the batteries. The hinged case idea is a great improvement over that of the No. 18 set, where the transmitter had to be removed every time the batteries needed changing.

Key, Microphone, And Headphones

Like the No. 18 set, the key used with the No. 48 is special in that it has a built-in switch for receive or transmit. Unlike the No. 18 key, which has two leads (one plugging into the key jack, the other plugging into the microphone socket), the No. 48 key has a single lead with a standard three-pole jack plug, although of a smaller diameter than the British types.

The microphone for the No. 48 set is the American T-17 carbon type, replacing the No. 7 British type. Again, a small-diameter three-pole jack plug is fitted as standard to these microphones.

The headphone socket on the receiver—there are actually two of them—can be used with either the British or American headphones. Although of different impedances, the different lengths of jack used by the the two nations are taken into account, and inserting either into the socket will connect it to the right impedance tap on the audio output transformer.

Size and Weight

The No. 48 set is slightly smaller than the No. 18 at 11" × 10" × 17". It weighs 29 lbs. A Signals Satchel No. 1—which would hold two sets of headphones, a microphone, the key, and the ground antenna—weighs 5 lbs.

When stationary, the battery in the set, or "battle battery," could be replaced with a bigger external battery supply. This external battery and case weighs 23 lbs., making the whole kit some 56 lbs., or quite a load for the foot solder to carry.

If the hand-cranked generator kit, which weighs 26 lbs., were to be used, then obviously a two-man team would be needed.

Operation

The No. 48 set is very easy to use. Setting up on frequency is made a little easier with the calibrator, and the netting of the transmitter onto the receiver frequency is a simple task.

The performance of the receiver, considering the age of the tubes and components, is what one would expect. New, the set had a quoted sensitivity of 3 to 5 µV. Obviously, though, the aging process may well have reduced that. The strong broadcast stations on the 41 meter band are easily copied, and with the BFO switched on, even the SSB signals on the 40 meter amateur band can be read, although the bandwidth of the IF is a little wide.

Tuning the transmitter is simply a matter of watching for a peak on the built-in meter, switched to "ae" setting. The meter also allows monitoring of the low and high voltage supplies, of real importance when operating off batteries.

The note produced from the transmitter does have a slight chirp, which is to be expected, as the PA pulls the oscillator when keyed. Modulation was rather low on my example. It may have been the set or it may have been the microphone. Either way it is likely that an adjustment or repair would have increased it.

It is surprising just how far a small signal can go. Using a No. 18 set the other day produced CW contacts into Poland and Germany. Bad band conditions and lack of time stopped me from trying a similar feat with the No. 48, but similar results would be expected.

The Canadian-made No. 58 set was also seen as an addition to the No. 18 set group, but it was of a totally different layout and construction. Not as pleasing to the eye and a great deal more difficult to carry, the No. 58 set has never achieved the popularity of the No. 18 or 48 set.

Along with other sets of that era—the No. 18, 46, and 38, for example—the No. 48 is an engineering success. It is compact, rugged, and, one would imagine, fairly reliable. It was used in many theaters of operation from Europe to the Far East, and the fact that they still work today must be a testament to their success.

References

1. Electronic Industries, October 1945.
2. Operating Instructions, Wireless Set No. 48, 11623 Phila-44. ■

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Here's one of those handy reference articles you should save, especially if you intend to do some serious antenna construction. What something is called may not indicate what or how big it really is.

Pipe or Tube Which is Which?

BY GEORGE MURPHY*, VE3ERP

The words *pipe* and *tube* mean different things and are not interchangeable in the technical language of engineering. The literature of amateur radio is filled with "Plumber's Delight" construction projects that sometimes are a little ambiguous when specifying the diameter of the cylindrical members of the structure. The problem is not with tubing, where "3/4 inch tube" means a tube 0.75 inch in diameter, but with the weird world of pipe sizes where the trade designation of pipe size (e.g., "3/4 inch pipe") has absolutely no correlation with either the outside or inside diameter of the pipe. The accompanying charts should help clear up some of this confusion. They all are hard-copy printouts of screen displays of some *HAMCALC*[1] programs dealing with pipe or tubing.

Let the reader beware when reading about "Plumber's Delight" construction. There is often a difference between what the author or illustrator says, what he thinks he says, what he means, and what really is. If the contraption is a beam an-

**77 McKenzie St., Orillia ON L3V 6A6, Canada*

PIPE SIZES (ANSI Standard) by George Murphy VE3ERP

STANDARD SIZES of WROUGHT IRON, COPPER and PLASTIC PIPE

Nom. Size	Outside Diameter	
1/8"	0.405"	1.03 cm
1/4"	0.540"	1.37 cm
3/8"	0.675"	1.71 cm
1/2"	0.840"	2.13 cm
3/4"	1.050"	2.67 cm
1"	1.315"	3.34 cm
1-1/4"	1.660"	4.22 cm
1-1/2"	1.900"	4.83 cm
2"	2.375"	6.03 cm
2-1/2"	2.875"	7.30 cm
3"	3.500"	8.89 cm
3-1/2"	4.000"	10.16 cm
4"	4.500"	11.43 cm
5"	5.563"	14.13 cm
6"	6.625"	16.83 cm
8"	8.625"	21.91 cm
10"	10.750"	27.31 cm

The word 'pipe' as distinguished from 'tube' is used to apply to tubular products of dimensions commonly used for pipelines and piping systems. Pipe outside diameters are larger than corresponding nominal sizes whereas outside diameters of tubes are identical to nominal sizes.

The size of all pipe is identified by the nominal pipe size, and is based on a standard outside diameter. This OD was originally selected so that pipe with a standard OD and having a wall thickness typical of the period would have an inside diameter approximately equal to the nominal size. Although there is now no such relation between existing standard thicknesses, OD's and nominal sizes, these nominal sizes and OD's continue in use as "standard."

(Machinery's Handbook, Revised 21st Edition, pages 2323-2324)

TELESCOPING ALUMINUM TUBING ANTENNA ELEMENTS — by George Murphy VE3ERP

STANDARD TELESCOPING TUBING SIZES
Alloy #6061-T6 Round Aluminum Tube in standard 12 ft. lengths.

O.D.	I.D.	Wall	Gauge	Weight
1/4"	0.134"	.058"	#17	0.041 lb./ft.
3/8"	0.259"	.058"	#17	0.068 lb./ft.
1/2"	0.384"	.058"	#17	0.095 lb./ft.
5/8"	0.509"	.058"	#17	0.121 lb./ft.
3/4"	0.634"	.058"	#17	0.148 lb./ft.
7/8"	0.759"	.058"	#17	0.175 lb./ft.
1"	0.884"	.058"	#17	0.202 lb./ft.
1-1/8"	1.009"	.058"	#17	0.229 lb./ft.
1-1/4"	1.134"	.058"	#17	0.255 lb./ft.
1-3/8"	1.259"	.058"	#17	0.282 lb./ft.
1-1/2"	1.384"	.058"	#17	0.309 lb./ft.
1-5/8"	1.509"	.058"	#17	0.336 lb./ft.
1-3/4"	1.634"	.058"	#17	0.363 lb./ft.
1-7/8"	1.759"	.058"	#17	0.389 lb./ft.

Note: Each of the above sizes fits snugly inside the next larger size.

tenna, it is probably made of *tube*. If it is assembled with fittings that would look at home running along a basement ceiling, it is probably made of *pipe*. Otherwise, you are on your own!

For a free MS-DOS/Windows 3½ inch 1.44 MB *HAMCALC* disk (over 175 ham-related programs) send US$5 (check or money order) to cover cost of materials and airmail postage anywhere in the world, to George Murphy, 77 McKenzie St., Orillia ON L3V 6A6, Canada.

CAPACITOR, Telescoping Variable — by George Murphy VE3ERP

Standard Sizes of 6061-T6 (61S-T6) Round Aluminum Tube.
(All dimensions are in inches)
Order tube by O.D. and wall thickness (e.g. 1/2" x .049" wall).

	Nominal size	O.D.	Wall	I.D.	fits into tube size	with air gap of	Capacity per inch	Maximum Volts
(a)	3/16"	0.188	0.049	0.090	5/16"	0.013	10.655 pF	283
(b)	1/4"	0.250	0.049	0.152	3/8"	0.014	13.976 pF	284
(c)	5/16"	0.313	0.049	0.215	7/16"	0.014	17.297 pF	284
(d)	3/8"	0.375	0.049	0.277	1/2"	0.014	20.616 pF	284
(e)	7/16"	0.438	0.049	0.340	5/8"	0.045	7.701 pF	940
(f)	1/2"	0.500	0.049	0.402	5/8"	0.014	27.254 pF	284
(g)	5/8"	0.625	0.049	0.527	3/4"	0.014	33.891 pF	284
(h)	3/4"	0.750	0.049	0.652	7/8"	0.014	40.528 pF	284
(i)	7/8"	0.875	0.049	0.777	1"	0.014	47.164 pF	284
(j)	1"	1.000	0.049	0.902	1-1/4"	0.076	10.130 pF	1596
(k)	List tube combinations with HIGHER VOLTAGE RATINGS							
(l)	RETURN TO MENU							

Press a letter in ( ) to choose one of the above . . .

CAPACITOR, Telescoping Variable — by George Murphy VE3ERP

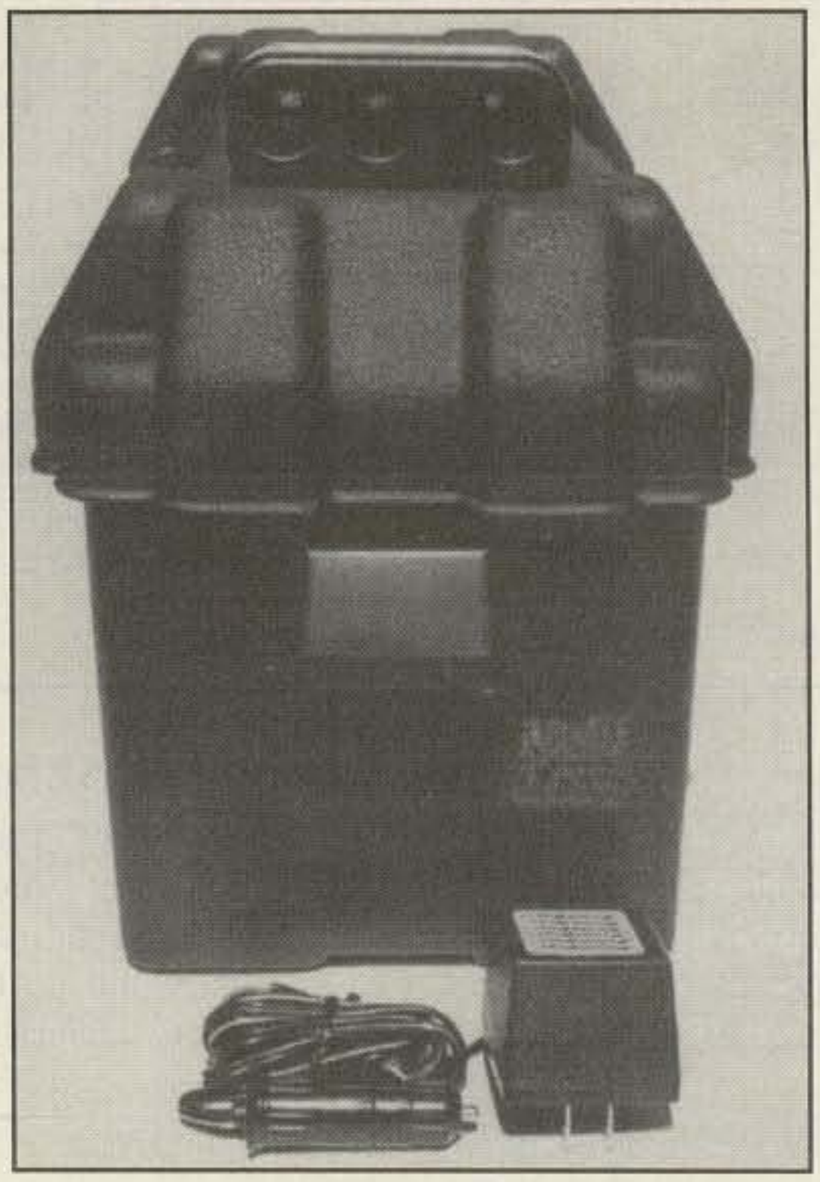
American ANSI Standard Schedule 40 Copper Pipe (all dimensions are in inches)

ANSI Standard nominal pipe sizes bear no relation to actual pipe dimensions. They are an anomalous holdover from obsolete standards long since abandoned, but nevertheless still remain in use.

	Nominal size	O.D.	Wall	I.D.	fits into pipe size	with air gap of	Capacity per inch	Maximum Volts
(a)	1/8"	0.405	0.068	0.269	3/8"	0.044	7.290 pF	924
(b)	1/4"	0.540	0.088	0.364	1/2"	0.041	10.139 PF	861
(c)	3/8"	0.675	0.091	0.493	3/4"	0.074	7.186 pF	1564
(d)	1/2"	0.840	0.109	0.622	1"	0.105	6.451 pF	2195
(e)	3/4"	1.050	0.113	0.824	1-1/4"	0.165	5.245 pF	3465
(f)	1"	1.315	0.133	1.049	1-1/4"	0.032	29.709 pF	682
(g)	1-1/4"	1.660	0.140	1.380	2"	0.203	6.537 pF	4273
(h)	1-1/2"	1.900	0.145	1.610	2"	0.083	17.014 pF	1753
(i)	2"	2.375	0.154	2.067	2-1/2"	0.047	36.927 pF	987
(j)	2-1/2"	2.875	0.203	2.469	3"	0.097	22.061 pF	2027
(k)	List pipe combinations with HIGHER VOLTAGE RATINGS							
(l)	RETURN TO MENU							

Press a letter in ( ) to choose one of the above . . .

CQ SHOWCASE



PowerPort PowerSafe From Cutting Edge

The PowerPort PowerSafe by Cutting Edge Enterprises is all the control circuitry, less the battery, for a 75–200 amp uninterrupted power supply. Three DC models designed for light, medium, or heavy use are offered. All models come with a heavy-duty, vented battery enclosure suited for use in the home, triple port automotive cigarette outlets for DC use, and fully automatic chargers. The deluxe model also provides 500 watts peak AC power (300 watts continuous). Its dimensions are 18" × 9.5" × 10.5"—big enough to fit a 125 amp hour battery, but small enough to fit under a desk or transport in a car.

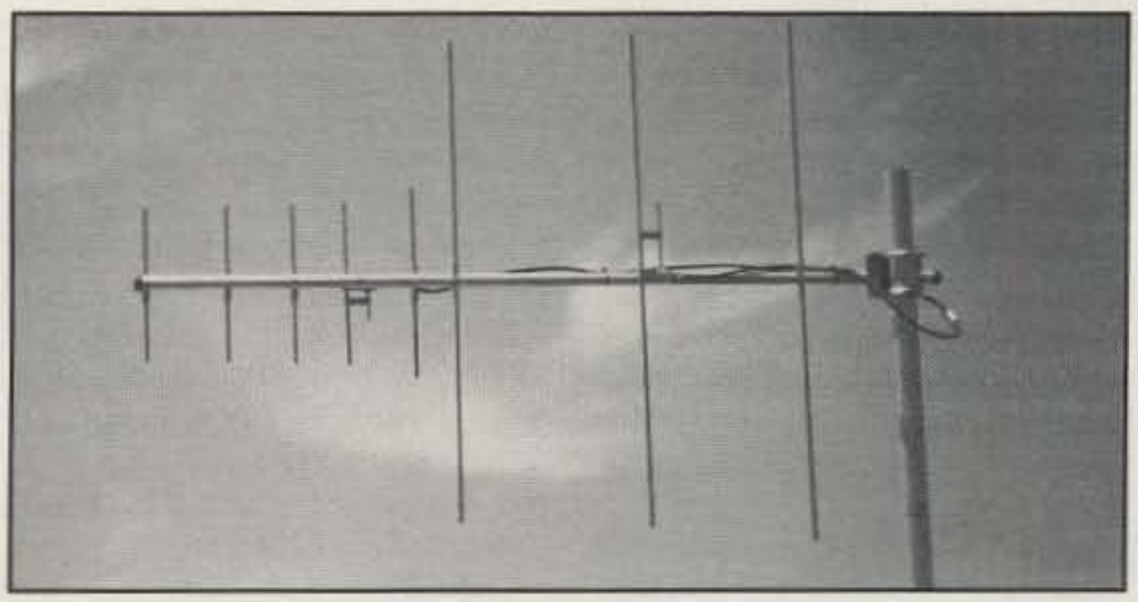
DC models range in price from $66 to $168. The deluxe AC/DC model is $230. For extended operations in the field, Cutting Edge also has a full line of accessories, including solar cells, lights, DC extension cords, and more. For more information, contact Roger Hall at Cutting Edge Enterprises, 1803 Mission St., Suite #546, Santa Cruz, CA 95060 (800-206-0115; e-mail <cutedgent@aol.com>), or circle 100 on the reader service card.

ICOM IC-PCR1000 "Black Box" Receiver

The IC-PCR1000 from ICOM is a "black box" communications device that transforms a computer screen into a high-quality wide-band receiver. It connects to computers externally, providing compatibility with many different PC models (even laptops) and offers both band scope and receiver/scanner functions. It covers a frequency range from 0.01 to 1300 MHz (cellular blocked; unblocked versions available only to FCC approved users) with all-mode receive capability, including WFM, FM, AM, SSB, and CW. The unit receives local radio and television broadcasts, as well as high-frequency/shortwave broadcasts that carry data transmissions, news, music, and events from other countries. It also enables the PC user to scan public-safety services, and commercial, military, aircraft, and marine communications.

With a good antenna, reception covers the globe, enabling a

computer with Microsoft Windows® 3.1X or Windows® 95 to become an HF shortwave receiver. It may also be used in a car by connecting it to a laptop and using the power from a 12 volt cigarette lighter. Also featured are three receiver interface screens, unlimited number of memory channels, and more. Suggested retail price is $599. For more information, contact ICOM America, Inc., 2380 116th Ave. NE, Bellevue, WA 98004 (425-454-8155, or on the Web at <http://www.icomamerica.com>, or circle number 101 on the reader service card.



Comet CYA-240 Dual-Band Yagi

Comet's new dual-band Yagi for 2 meters and 70 cm places the five UHF elements in front of the three VHF elements, thereby keeping the Yagis separate from each other and providing the best radiation pattern. The antenna is made of high-grade aluminum and stainless-steel hardware, with wing nuts holding the elements in place for quick and portable use. Designed for vertical or horizontal polarization, maximum power is 300 watts SSB and 150 watts FM.

Suggested retail price of the CYA-240 is $109.95. For more information, contact NCG Company, 1275 North Grove St., Anaheim, CA 92806 (phone 714-630-4541; fax 714-630-7024; on the web: <www.cometantenna.com>); or circle number 107 on the reader service card.

Elenco Electronics Handheld Frequency Counters

Elenco Electronics has two new handheld frequency counters, Model F-2800 and Model F-2850. Both counters offer wide input ranges. The F-2800 displays frequencies from 1 MHz to 2.8 GHz and the F-2850 range is 10 MHz to 2.8 GHz. Each unit has a 250 MHz direct count range for high resolution. The F-2850 also reads period and has auto triggering. Both units have data hold and 16-segment signal strength bargraph.

For more information, including complete specifications, contact Elenco Electronics, 150 W. Carpenter Ave., Wheeling, IL 60090 (phone 847-541-3800; fax 847-520-0085); or circle number 104 on the reader service card.

MFJ-270 GuardianAngel™ Lightning Surge Protector

The MFJ-270 GuardianAngel™ lightning surge protector for 50 ohm coax safeguards radio equipment from damaging static electricity and lightning-induced surges. MFJ's ultra-fast gas discharge tube safely shunts up to 5000 amps of peak impulse current harmlessly to an independent ground connection. It presents a constant 50 ohm impedance to the transmission and has an SWR less than 1.1:1 and an insertion loss of less than 0.1 dB. The MFJ-270 can be used up to 1000 MHz and handles up to 400 watts PEP.

The MFJ-270 has SO-239 connectors and works with all types of coax-fed antennas. It is made of heavy-duty steel. The gas discharge tube is replaceable. It is priced at $29.95 and comes with MFJ's "No Matter What" one-year limited warranty. For more information, contact MFJ Enterprises, Inc., 300 Industrial Park Rd., Starkville, MS 3979 (telephone 601-323-5869; fax 601-323-6551; or on the web: <http://www.mfjenterprises.com>), or circle 108 on the reader service card.

K6STI RITTY 2.0

Brian Beezley, K6STI, has announced the release of RITTY 2.0, a DSP data-communications system that includes PACTOR. RITTY provides state-of-the-art RTTY and PACTOR transmission and reception using digital signal processing. RITTY is software that runs in your PC and uses your sound card for analog I/O. No specialized hardware is required. RITTY's RTTY demodulator uses a limiterless front-end and optimal channel filters with the SIN(x)/x matched-filter response that maximizes receive sensitivity. The filters automatically tune to the incoming mark and space tone frequencies. An automatic threshold correction algorithm maximizes text recovery during selective fades. A special wideband detector minimizes polar flutter, while a narrow input bandpass filter fights QRM. A squelch suppresses noise print. Data-presentation modes allow text recovery and signal analysis under difficult conditions. RITTY can act as a modem for RTTY by WF1B contest-logging program.

RITTY's licensed PACTOR implementation features sharp input BPF, concurrent 100- and 200-baud optimal SIN(x)/x channel filters, gated, synchronous ATC for selective fading, 21-bit memory-ARQ with optimal combinatorial weighting coefficient, single-bit error correction without ARQ, recognition of noisy control signals, fast callsign detection for quick linking, and tolerance for partially compatible, unlicensed PACTOR implementations. The program also offers an FFT-based spectral tuning indicator, a demodulated-waveform display that provides detailed signal and propagation analysis, AFSK and FSK transmit output, adjustable mark/space frequencies, selectable Baudot punctuation, and fine control of protocol timing and detail. RITTY automatically records all received text to a file and can transmit text files.

For more information, contact Brian Beezley, K6STI, 3532 Linda Vista, San Marcos, CA 92069 (phone 760-599-4962; e-mail <k6sti@n2.net>); or circle number 105 on the reader service card.

There are bargains galore in the radio spectrum's "sub-basement" of frequency values. W8FX concludes this two-part article by looking at areas that most of us never dreamed of or knew existed.

Longer Than Longwave

Part II—What's There and How To Find It

BY KARL T. THURBER, JR.*, W8FX

In this concluding part we begin with the topic of phenomena monitoring and early storm warning.

Phenomena Monitoring and Early Storm Warning

Solar Flare Monitoring. We've hinted at the profound effect the Sun has on the Earth, especially on its magnetosphere and ionosphere. The use of low frequencies (ULF through LF) for monitoring solar flares and their effects on propagation is a field wide open for experimentation. By monitoring these frequencies, you may observe important phenomena such as SIDs (Sudden Ionospheric Disturbances), SESs (Sudden Enhancement of Signals), and SEAs (Sudden Enhancement of Atmospherics), all of which are of interest to propagation buffs and researchers alike.

Earthquake Monitoring. Can sub-basement "rumblings" scientifically predict earthquakes? An interesting and speculative field involves monitoring the lowest bands to investigate EM radiation caused by "earthquake precursors." Both professionals and amateur experimenters alike are heavily involved with intriguing activities along these lines.

Reportedly, a west coast experimenter who operated an earthquake detection network noted radio and magnetic anomalies on January 15, 1994, two days prior to the big quake that caused so much damage in southern California. The experimenter was said to have predicted a quake exceeding 6 on the Richter scale.

If you're interested in scientific earthquake prediction and amateur geophysical experiments, the monthly publication *Geo-Monitor* offers earthquake prediction news and information on electronic equipment for earthquake precursors.

*289 Poplar Drive, Millbrook, AL 36054-1674

The Stormwise Lightning and Supercell Thunderstorm Detector and Recorder includes a LSU-2001 Lightning Sensor Unit to detect emissions associated with thunderstorms. Its output is coupled optically to your PC's serial port, where the software lets you plot, graph, and analyze the activity on your PC screen. (Photo courtesy McCallie Mfg. Corp./Stormwise)

Lightning Stroke Static and Storm Early Warning. The more than 1 million lightning strokes (flashes) each day, from the 1500–2000 storms at any given time, make for wide-spectrum noise. Much of this noise is ominously close to home. Several firms, such as McCallie Mfg. Co., make storm sensors to warn you of approaching thunderstorms, some claiming several hours' warning that thunderstorms are approaching. The warning the sensors provide gives you time to shut down and/or disconnect your radio equipment and take other precautions (fig. 2).

In McCallie's Stormwise® designs, which use an ELF/VLF impulse detection sensor, when storms are far away, the sensor sounds a buzzer for less than one second. As the storms draw closer, the buzzer sounds up to three or four seconds or more for each discharge. If the storms are severe, the alarm sounds almost continually until the activity dissipates. The sensor, which can register over 1000 detections per second, resets automatically.

The same firm recently began offering a software/hardware system to graph severe thunderstorms on your PC. This system detects the dangerous "supercell" type of thunderstorm and may even give an indication of hail and tornadic activity.

Some Mysterious Anomalies

Crop Circles. We don't want to get mixed up in the raging controversies regarding the authenticity of the "wheat field phenomena" called crop circles. Various theories regarding the causes have been advanced, from elaborate UFO theories to military exercises and underground EM forces. On the other hand, many observers suspect that the crop circles are no more than ingenious, artistic hoaxes. We just don't know the answer.

Some Natural Radio enthusiasts speculate that the energy to produce the crop circles in England could be caused by some powerful magnetospherically ducted, lightning-induced energy from storms originating in the Indian Ocean. It's conjectured that the energy from the storms, detectable as strong whistlers, might travel through the magnetosphere to cause a land disturbance on impact. It's a bit farfetched, but one of the many possible explanations.

Red Sprites and Blue Blobs. For years high-altitude flight crews and astronauts have reported apparent cloud-to-space, upward-directed lightning and unusual

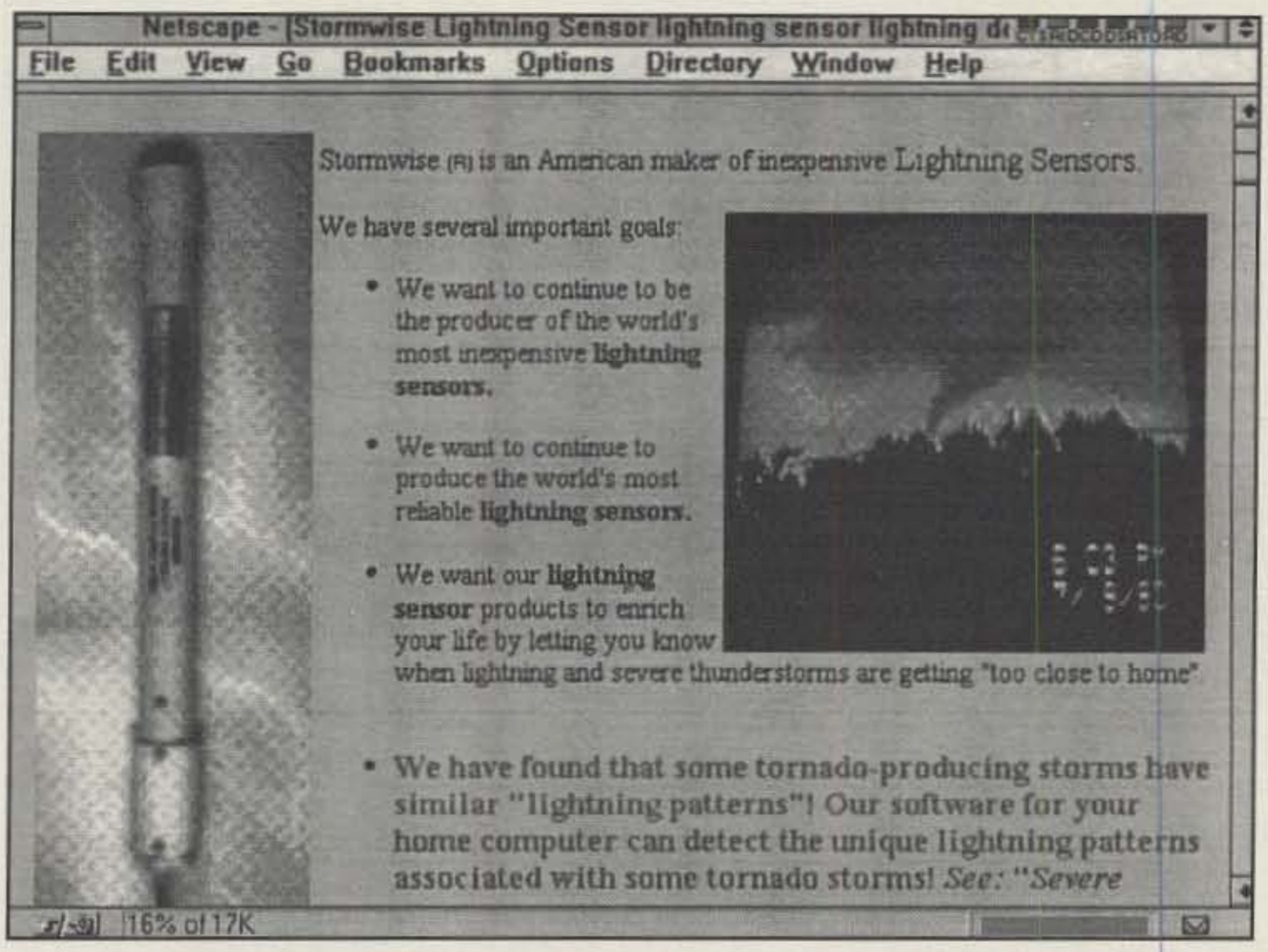


Fig. 2– Stormwise® makes lightning sensors that detect approaching thunderstorms. Recently the firm developed software to let you plot and analyze lightning data on your PC. Check out their Web page at <http://www.stormwise.com>.

blue and red lights above thunderstorm clouds, at about the same time lightning flashes were seen in the clouds below. Recent videotapes show that there often are massive red and blue bursts of lights, having durations of about 0.1 second, that occur some 20–30 miles above storms. There also are reports of intense, short-duration gamma ray flashes emanating upward from the thunderstorms.

The "sprites and blobs" are intriguing to Natural Radio listeners, especially since the signals associated with these phenomena, when played through an audio system, sound much like the crackling noises with which Natural Radio listeners are familiar. There's also some indication that sprites and blobs may be seen at about the same time as whistlers are noted.

There seems to be a direct coupling between the lower ionosphere and the fields associated with nearby lightning flashes. This realization, along with the observations of lightning extending upward from thunderclouds, has led to the identification of ionospheric heating caused by VLF transmitters and natural lightning. These discoveries are producing a new understanding of how the ionosphere may be modified by lightning.

The Brain Bands. We're just now beginning to understand how the human brain works, and we're finding out that it operates within a fairly narrow band of ULF/ELF frequencies. The predominate brain wave sub-basement frequencies tend to indicate the particular type of activity taking place in the brain.

There are four groups of waves associated with the brain's activities. Beginning with the lowest frequencies, these are: (1) Delta waves (0.5–3 Hz), the very slow waves that occur when a person is in deep sleep; (2) Theta waves (4–7 Hz), which are associated with mental imagery and focus; (3) Alpha waves (8–12 Hz), which indicate relaxation; and (4) Beta waves (13–35 Hz), associated with most "normal" daily mental activities.

It's possible for ULF/ELF signals to stimulate or manipulate the brain, driving it to new patterns of brain "outputs"—a person's emotions and thought patterns, for example. Some critics of HAARP (the High Frequency Active Auroral Research Program) are concerned with the possible effects of the project's VLF/ELF signals on people living in affected regions, especially since some signals reportedly may be pulsed in the range 1–20 Hz. Government scientists say that the signal levels used in the project are too low to be dangerous. More on HAARP later.

Sub-Basement Propagation

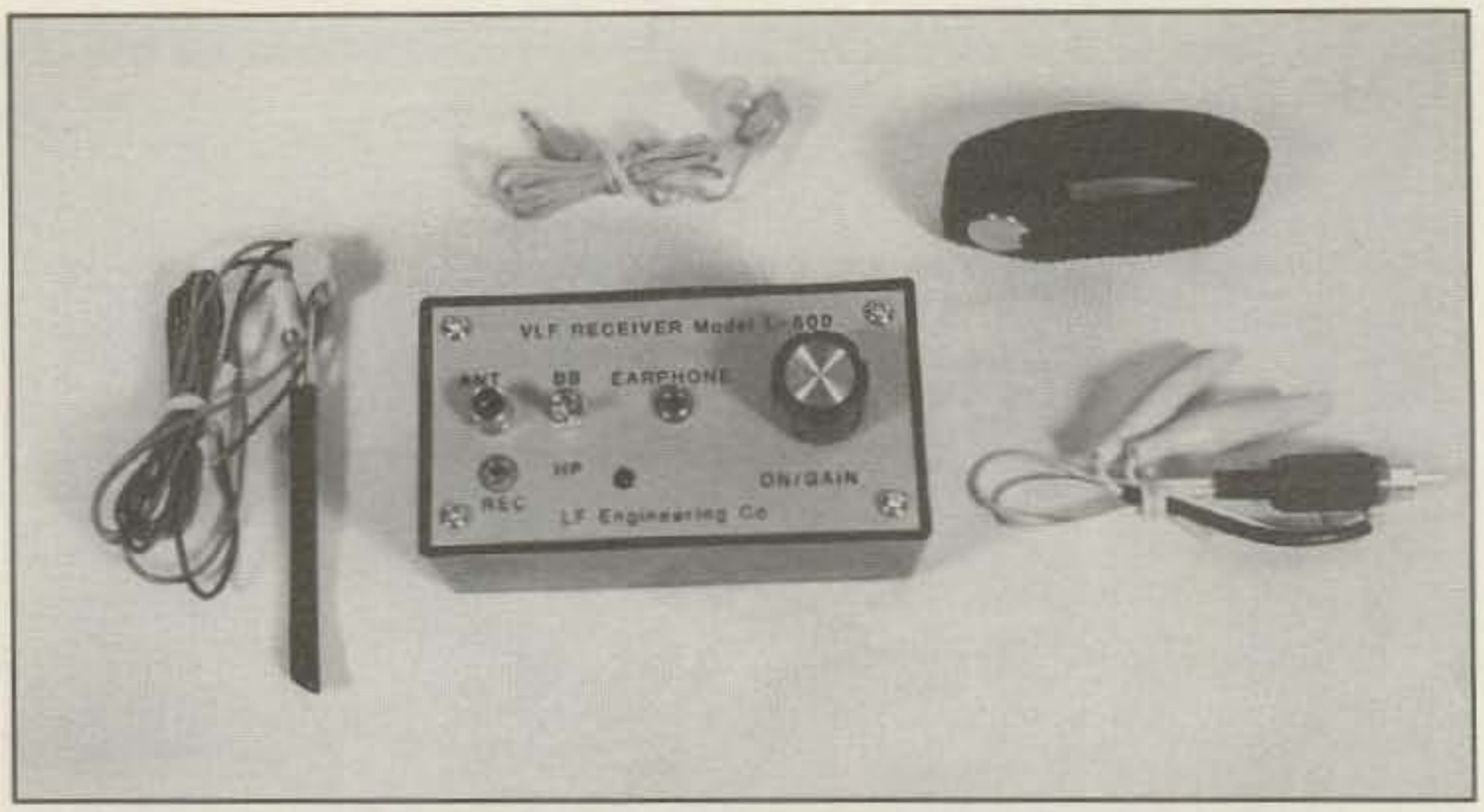
Groundwave Dominance. How do signals propagate here? Much depends on just how low the frequencies are. Groundwave normally is the dominant mode as you go lower and lower in frequency.

Generally, LW signals follow the Earth's curvature, the ionosphere acting as a waveguide and duct. These and other characteristics make LW well suited for

the ultrareliable, fail-safe worldwide communications that the military and government often require. However, power must be high and antennas large. At the very lowest frequencies very long antennas may be run between mountains or even buried in the earth itself. The lowest frequencies easily can travel halfway around the world and even penetrate a short distance beneath the surface of the ocean.

Natural Radio Propagation. The behavior of Natural Radio-associated signals can tell us a great deal about how ULF, ELF, and VLF signals propagate. It's generally assumed that some of the energy from lightning strokes in the "right" location gets ducted into channels formed along the lines of the Earth's magnetic field, traveling into near space and to the opposite hemisphere, where they are heard as short, fast whistlers.

At about 50–55 miles (80–88 km) in altitude, the ionospheric *E*-layer acts like a mirror to sub-basement radio waves. The Earth's surface and the two "sides" form a pipeline which channels VLF signals. Impulses from distant storms travel better at night in this pipeline, but below a certain frequency there's an abrupt cutoff where the pipeline effect ceases. This occurs at about 1700 Hz, which also happens to be the frequency at which most of the ringing and pinging sounds of tweeks take place.



The LF Engineering L-500 ELF/VLF longwire receiving system lets you explore Natural Radio and other sub-basement phenomena. The system is used with earphones and is connected to a 10 foot or longer wire antenna. The system's frequency response is 300 Hz to 5 kHz; it's $79. (Photo via LF Engineering Co., Inc.)

The energy of the original lightning stroke may make several hops between the hemispheres in its travel along the Earth's magnetic field lines-of-force, creating audibly long whistler "echo trains." Each echo is proportionally longer and slower in its downward sweeping pitch and also is progressively weaker.

HAARP. HAARP, the High Frequency Active Auroral Research Program, is a government-military project to study the ionosphere. It's gearing up to use multimegawatt transmitters and large antennas in Alaska. Although mainly an HF program, pulsed VLF and ELF signals also are part of the program and will be coor-

dinated closely with the Navy ELF communications system.

The experimental program has highly ambitious civilian and military purposes. The VLF/ELF frequencies involved are important to HAARP, since these waves can travel around the world with little loss. The potential to heat and alter the ionosphere using EM pulses through "coherent interaction" with particles in the Earth's radiation belts suggests possible unknown effects on the environment and humans. A campaign is being waged against the program by environmentalists, who see great potential for harm.

Equipment for ULF/ELF/VLF

Communications equipment capable of tuning the sub-basement is a prerequisite to low-band exploration. But while many radios tune LW, relatively few actually tune to the ULF/ELF/VLF sub-basement. Let's look at some of the possibilities.

The Palomar Engineers VLF Converter lets you enter the world of VLF radio for about $80; all you need is a communications receiver and an antenna. Covering 10 to 500 kHz, the Model VLF-A converts VLF signals to the 80 meter amateur band, while the Model VLF-S converts signals to 4010–4500 kHz for general-coverage shortwave receivers. (Photo courtesy Palomar Engineers)

Surplus and Older Commercial LW Receivers. Many surplus receivers popular with amateurs tune down to 100 or 150 kHz or so, but few reach into the tens of kHz. Many surplus radios require restoration, and most need modification to be compatible with 120 volt, 60 cycle AC. Also, most tube-type surplus sets are pretty old and tired now. Most sets just aren't suitable.

However, the R-389 URR, made for the government by Collins Radio in the 1950s, is an excellent receiver the coverage of which extends to VLF. And the Hammarlund VLF Super Pro, also known as the SP-600-VLF, tunes as low as 10 kHz.

New Sub-Basement Receivers. Typically, most solid-state communications receivers tune down to 100 kHz, some to 30 kHz. There also are recent sets that tune to the sub-basement, although they're expensive. These include the Watkins-Johnson HF1000 and WJ-8711, the AOR AR-5000 and AR-7030, and the Bearcat DX-1000. Most of these sets tune as low as 10 kHz, although the Watkins-Johnson receivers nosedive to 5 kHz and the AR-7030 reportedly tunes all the way down to 0 (zero) Hz. For these deluxe sets get out your checkbook.

Receivers for Natural Radio. The

RESOURCES: BOOKS, NEWSLETTERS, AND OTHER PUBLICATIONS

Are you interested in learning more about sub-basement radio? Check out these interesting sub-basement resources.

Books

The World Below 500 Kilohertz. A good, one-stop tutorial on LW is "The World Below 500 Kilohertz," by L. Peter Carron, Jr., W3DKV. The 64-page, 1985 booklet, probably the only available beginner's book on LW, offers a good (though somewhat dated) overview of the longwaves and introduces its inhabitants and users. It's published by Universal Radio for $4.95 plus $2 s/h.

Communications Receivers, 3rd Edition. Raymond S. Moore has a great deal of data on general-coverage receivers from 1932 to 1981. He covers National, Hallicrafters, Hammarlund, Collins, and others. Including variations on the 400 receivers profiled, over 700 sets are covered, including military surplus. The 125-page book is published by RSM Communications at $19.95 plus $2.50 s/h.

Shortwave Receivers Past and Present. Don't let the word "shortwave" in the title fool you. This 1997 book, by Fred J. Osterman, N8EKU, includes several excellent receivers suitable for sub-basement monitoring. The 350-page publication covers tube and solid-state communications receivers from 1945 to 1996. Over 500 receivers are featured, along with commentary on some 400 variants. It's $19.95 plus $2 s/h from Universal Radio.

Angels Don't Play This HAARP. This 1995 book by Nick Begich describes the High Frequency Active Auroral Research Program (HAARP), which involves HF and VLF/ELF studies. The 215-page book, which says that HAARP is up to no good, explains the program and gives information on the potential to manipulate the environment. The speculative book is by Earthpulse Press and is distributed by CRB Research Books ($14.95 plus $2 s/h).

Underground Bases and Tunnels. This book by Richard Sauder digs into America's "secret" underground installations. The conjectural work, which says the government has something to hide, includes chapters on base locations, tunneling technology, military designs, nuclear testing facilities, and more. There is info on underground communications using sub-basement frequencies. It's from Adventures Unlimited Press and is distributed by CRB Research Books ($15.95 plus $2 s/h).

Journals and Magazine Columns

Popular Communications. *Popular Communications* serves an eclectic mix of radio monitoring interests including shortwave radio, VHF/UHF scanning, mediumwave DXing, pirate radio, amateur radio, and radio resources. There's no dedicated column for LW or sub-basement interests, but they're served by the magazine's more than 15 monthly columns. One-year domestic subscriptions are $25.95 from CQ Communications.

Below 500 kHz Column in Monitoring Times. For over five years Kevin Carey, WB2QMY, has conducted a LW-related column in *Monitoring Times.* Kevin's column is called "Below 500 kHz" and is subtitled "DXing the Basement Band." Check it out, or contact Kevin at <kevinc@mdsroc.com>. Domestic subs to *Monitoring Times,* which covers radio listener and hobbyist interests across almost the entire spectrum, are $23.95 from Grove Enterprises.

Speleonics. The Communications and Electronics Section of the National Speleological Society publishes *Speleonics* several times a year; it's especially useful to cave explorers interested in practical alternative methods of cave communications. Information on *Speleonics* is available from Frank Reid, W9MKV.

Geo-Monitor. A monthly publication, *Geo-Monitor* offers information on the science of earthquake prediction, provides a forum for discussion, and assists amateur scientists in geophysical monitoring and experiments. The publication also has covered speleological (cave exploring) and some "borderland" theories. One-year domestic subs (12 issues) are $20.

Audio Resources

McGreevy Natural VLF Radio Recordings. Want to hear what whistlers and other Natural Radio emissions actually sound like before buying or building a receiver to hear them? You can download a wide variety of sound files from a University of Iowa Web server at <http://www-pw.physics.uiowa.edu/mcgreevy>. Several audiotape cassettes also are available; these can be ordered from Steve McGreevy, N6NKS's Radio Receiver and Recording Info Page, which you'll find at <http://www.triax.com/vlfradio/wr3e.htm>.

Double CD Album of Natural Radio Recordings (UK). The British firm Irdial Discs has a double CD set of McGreevy's Natural Radio VLF recordings entitled "Electric Enigma." You can order the CD set directly from These Records, a British company; they cost £18.50 (about $28.35), plus £1.50 shipping. Major credit cards can be used. (More information is available from McGreevy's Radio Receiver and Recording Info Page at the same <http://www.triax.com/vlfradio/wr3e.htm>.)

Internet Resources

There are a significant number of ULF/ELF/VLF oriented Web pages for you to explore. Here are just a few to feed to your browser in search of more information on the sub-basement.

The Art Bell Web Page. This Web page supplements W6OBB's popular and entertaining, but often eccentric late-night radio talk shows. It's found at <http://www.artbell.com>.

Cave Radio & Electronics Group (U.K.). This British site is found at <http://www.sat.dundee.ac.uk/~arb/creg>.

Crop Circle Connector. This British site is the home for the International Crop Circle Database. You'll find it on the Web at <http://alpha.mic.dundee.ac.uk/ft/crop_circles/anasazi/connect.html>.

Electric Enigma: The VLF Recordings of Stephen P. McGreevy. It's found at <http://www.ibmpcug.co.uk/~irdial/vlf.htm>.

ELF Band Designators/Navy's ELF Communications System. Go to <http://server5550.itd.nrl.navy.mil/projects/haarp/elf/elf.html>.

HAARP Main Page. You'll find this military Web site at <http://server5550.itd.nrl.navy.mil/projects/haarp/index.html>.

LWCA Home Page. The Long Wave Club of America is found at <http://users.aol.com/lwcanews/index.html>.

McGreevy's Natural VLF Radio Home Page. You'll find it at <http://www.triax.com/vlfradio/natradio.htm> (see fig. 2).

Sounds of the Aurora. You'll find these sounds of the aurora at <http://www.tp.umu.se/Space/AuroralSounds.html>.

STARLab VLF Group Home Page. You'll find this VLF site at <http://www-star.stanford.edu/~vlf/Welcome.html>.

Swedish Radio Station Grimeton. Check out this Web page at <http://www.telemuseum.se/Grimeton/Grimeen.HTML>.

University of Iowa VLF Site. You'll find this Web page at <http://www-pw.physics.uiowa.edu/mcgreevy>.

Very Low Frequency Radio Project. The VLF Page is found at <http://ananke.advanced.org/2784>.

Other Resources

McGreevy VLF Guides. The "WR-3 and WR-3E VLF Receiver Listening Guide" is an excellent source of detailed information on how to receive and listen to Natural Radio sounds. You can download Stephen P. McGreevy, N6NKS's "Guide" from the Internet at <http://www.triax.com/vlfradio/wr3gde.htm>. Also available for download is McGreevy's "The VLF Story"—a lengthy, three-part, comprehensive treatise on most aspects of ELF/VLF Natural Radio emissions—at <http://www.triax.com/vlfradio/vlfstory.htm>.

The Longwave Club of America. Since 1974 longwave listeners have had a forum in the LWCA. It promotes DXing, experimenting on frequencies below 530 kHz, and 1750 meter band experimenter activity. The LWCA publishes "The LOWDOWN" newsletter monthly. The several active columns and features are devoted to beacons, LW loggings, the 1750 meter band, and special-interest pursuits such as scientific earthquake precursors and sub-basement happenings. Membership information is available from LWCA.

Palomar Engineers offers an amplified loop antenna system that lets you DX from your kitchen table. The LA-1 Loop Amplifier ($99.95) can be used with any of six plug-in loops, each costing $89.95; three of these cover LW. One covers 10–40 kHz (for Omega); a second covers 40–150 kHz (for WWVB); and a third covers 150– 550 kHz. Other loops encompass the AM broadcast band, 160 and 80 meters, and HF to 16 MHz. (Photo courtesy Palomar Engineers)

most basic "receiver" required to pick up Natural Radio signals is an audio amplifier connected to a very long wire antenna. In practice, this crude radio will likely also intercept local AM Broadcast Band and other signals, and it probably won't have adequate sensitivity.

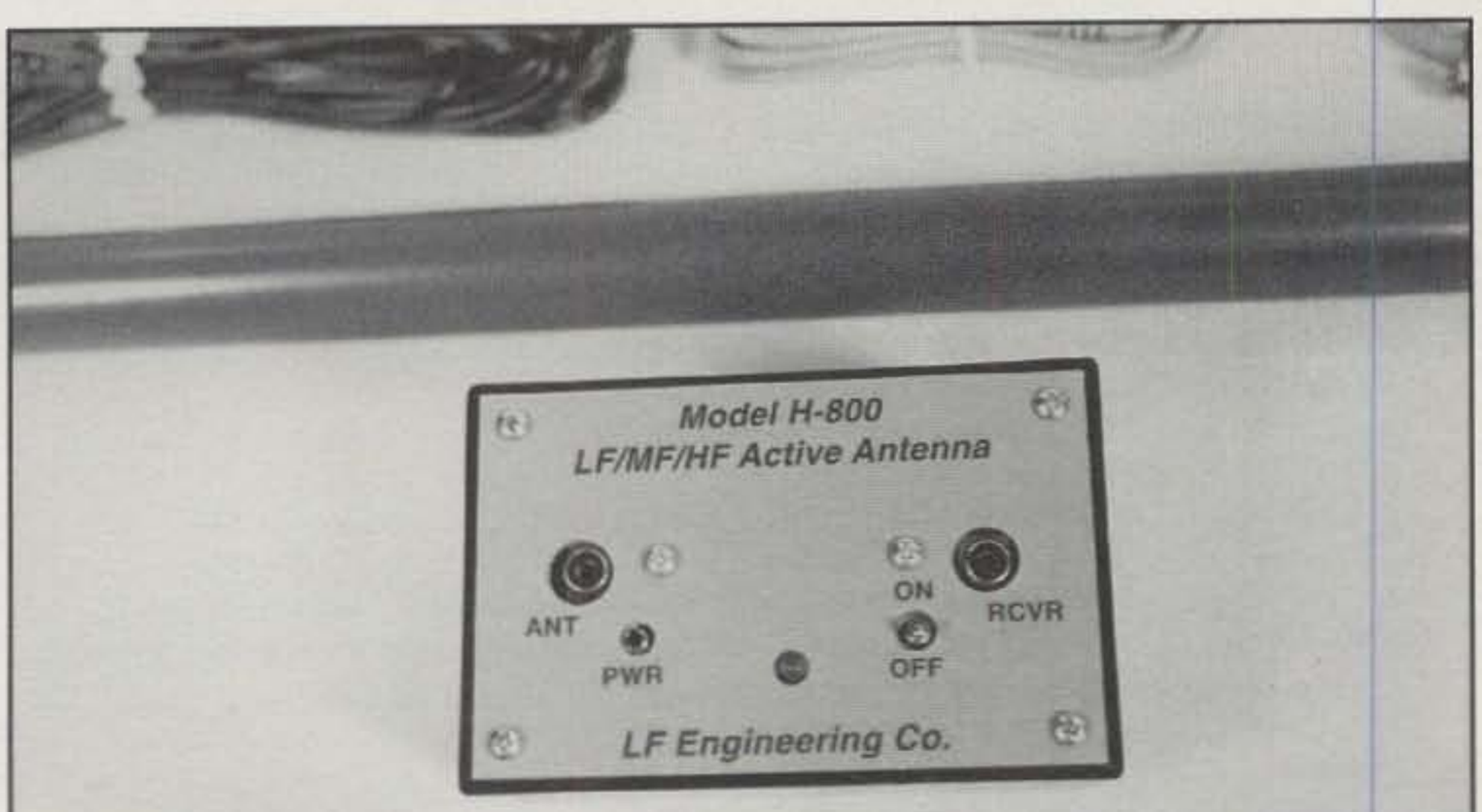
Despite the specialized and esoteric nature of Natural Radio listening, there are radios designed for that purpose. S.P. McGreevy Productions manufactures and distributes two handheld portable radios, the WR-3 basic VLF receiver ($59.95) and the enhanced WR-3E receiver ($95). Both sets are designed for listening to whistlers and other Natural Radio sounds. Both sets come with the comprehensive *WR-3 and WR-3E VLF Receiver Listening Guide* (you can download it and save $5, and several cassettes of Natural Radio sounds are available from McGreevy's Web pages). Also, the "ELF/VLF longwire receiving system," the L-500, is offered by LF Engineering Co.

Frequency Converters. There's another way to get started listening to basement-band signals: Buy a VLF frequency converter and hook it up to your present amateur band or general-coverage communications receiver.

The Palomar Engineers VLF-A Converter is $79.95. It uses a crystal-controlled local oscillator and a mixer to heterodyne or translate the 10–500 kHz range to the 80 meter amateur band, from 3510 to 4000 kHz. The converter is inserted between a receiving antenna and the antenna input of any amateur band or general-coverage receiver that covers the 80 meter band. The similar Model VLF-S converts VLF to 4010–4500 kHz to work specifically with general-coverage shortwave receivers.

Antennas for The Sub-Basement

It's hard to construct an efficient receiving antenna for the sub-basement because the wavelengths involved preclude erecting anything larger than a small fraction of a wavelength long. Various short wire,



The LF Engineering H-800 Skymatch is a broadband active antenna that covers 10 kHz through 50 MHz. Its active components are housed in a 26 inch sealed probe and powered via a coax feed from a remote coupler at the receiver. The system is an alternative to a longwire in which restricted space or local noise would prohibit its effective use. It's $109. (Photo courtesy LF Engineering Co., Inc.)

loop, and active antenna systems predominate. Even huge government and military VLF antennas using arrays of masts hundreds of feet tall and with earth ground mats covering acres achieve efficiencies of only about 1 percent.

Wire Receiving Antennas. Variations on singlewires, longwires, end-feds, Marconis, and combination vertical and horizontal L's are common. As a rule, with a wire antenna you should get as much wire as possible in the air. Even so, at sub-basement frequencies you may have difficulty getting the antenna a sufficient distance from AC line hum and noise, so listening at remote sites often is the only practical solution.

As the operating frequency increases, more familiar types of antennas are found. There are many types of horizontal and dual-polarized antennas you can adapt, although very little has been written about them in recent years. *The ARRL Antenna Book* will give you some basic principles and ideas.

Small Loops and Whips. Certainly not new, having been in use from the earliest days of radio, receiving loops are enjoying new-found acceptance. This is because loops can be physically small yet work well, they can be resonated or tuned to a particular frequency, and they can be rotated to take advantage of their directivity to peak and null signals. Most loops give a figure-eight pattern similar to that of a halfwave dipole.

Loops tend to be quieter than single-wire outdoor antennas, are less prone to swamping by strong local broadcast stations, and can be used to null out noise and interference. However, some hobbyists report poor results with indoor loops as a result of noise magnetically radiated from household wiring.

Palomar Engineers offers an excellent preamp/loop, adjustable in azimuth and elevation, for its VLF converter or any low-band receiver. The amplifier can be used with several plug-in loops to extend coverage to the AM Broadcast Band and well into the shortwaves. LF Engineering Co. sells a basement-band resonant loop receiving system that covers 300 Hz to 8 kHz.

Active gain antennas using a steel whip or wound coil element and an antenna-mounted preamp also are very popular; several designs are offered by Curry Communications, LF Engineering Co., and others. Typically such systems are mounted outdoors, away from noise and distracting objects. The amplified signal is routed to the receiver through coax.

Summary

This article explored the sub-basement of the radio spectrum by surveying the ULF, ELF, and VLF regions lying below 30 kHz. The article presented signals you're likely to encounter, including natural, man-made, and dangerous radio emissions. It also covered underground communications; phenomena and storm warning; ULF/ELF/VLF propagation, equipment, and antennas; and some mysterious anomalies. Various resources were listed.

At the bottom line, we hope we've shown that there's a great deal more to the lower reaches of the electromagnetic spectrum than we amateurs normally experience. And while much contemporary interest focuses on ever-higher frequencies and shorter wavelengths, there's a lot going on in the radio sub-basement. Check it out; you won't be disappointed. ■

NAMES AND NUMBERS

Adventures Unlimited Press, 303 Main St., P.O. Box 74, Kempton, IL 60946 (815-253-6390).
CRB Research Books, Inc., P.O. Box 56, Commack, NY 11725-0056 (516-543-9169).
Curry Communications, 737 North Fairview St., Burbank, CA 91505 (818-846-0617).
Earthpulse Press, P.O. Box 201393, Anchorage, AK 99520 (907-249-9111).
Electronic Equipment Bank, 325 Mill St. N.E., Vienna, VA 22180 (703-938-8105).
Geo-Monitor, Charles R. Patton, Editor, 21490 Camino Arriba, Murrieta, CA 92562 (909-698-9657).
Grove Enterprises/*Monitoring Times,* P.O. Box 98, 7540 Highway 64 West, Brasstown, NC 28902-0098 (1-800-438-8155).
LF Engineering Co., Inc., 17 Jeffry Rd., East Haven, CT 06513 (203-248-8851).
Longwave Club of America, 45 Wildflower Rd., Levittown, PA 19057 (215-945-0543).
McCallie Mfg. Corp./Stormwise, P.O. Box 8631, Greenville, TX 75404-8631 (902-883-3684).
S.P. McGreevy Productions, 604 North F St. #1, Lakeview, OR 97630-1127 (541-947-5508).
National Speleological Society, Inc., 2813 Cave Ave., Huntsville, AL 35810 (205-852-1300).
RSM Communications, P.O. Box 1046, Key Largo, FL 33037-1046 (305-853-0379).
Speleonics, Frank Reid, W9MKV, P.O. Box 5283, Bloomington, IN 47407-5283.
Popular Communications, 76 N. Broadway, Hicksville, NY 11801-2953 (516-681-2922).
Palomar Engineers, P.O. Box 462222, Escondido, CA 92046 (619-747-3343).
Frank Reid, W9MKV, Box 5283, Bloomington, IN 47402-5283.
These Records, 112 Brook Dr., London SE11 4TQ, U.K.
Universal Radio, Inc., 6830 Americana Parkway, Reynoldsburg, OH 43068-4113 (1-800-431-3939).

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Boost your 2 Meter handheld or multimode (like ICOM 706) to a super powerful 100 watts . . . All modes: FM, SSB, CW . . . 15 dB GaAsFET receive preamp . . . Reverse polarity protection . . . Silent cooling fan . . . Free HT-to-amp coax and mobile bracket

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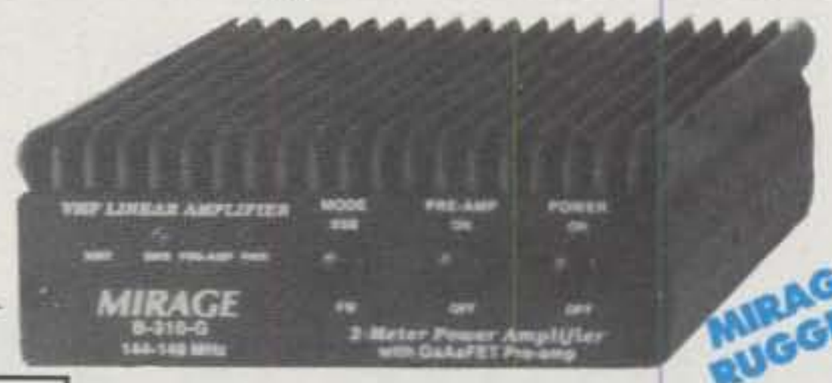

Power Curve -- typical B-310-G output power							
Watts Out	*25*	*50*	*75*	*95*	*100*	*100+*	*100+*
Watts In	*¼*	*½*	*1*	*2*	*4*	*6*	*8*

For an incredibly low $199, you can boost your 2 Meter handheld to a super powerful 100 watt mobile or base!

Turn "You're breaking up . . . Can't copy" into "Solid Copy . . . Go ahead."

Talk further . . . Reach distant repeaters . . . Log onto faraway packet bulletin boards.

This rugged Mirage B-310-G amplifier operates *all modes*: FM, SSB and CW. It's perfect for *all* handhelds up to 8 watts *and* multi-mode SSB/CW/FM 2 Meter rigs.

***It's** great for the ICOM IC-706 -- you'll get 100 blockbuster watts on 2 Meters!*

Low noise GaAsFET pre-amp

A built-in *low noise* GaAsFET receive pre-amp gives you 15 dB gain -- lets you dig out weak signals.

Fully Protected

***SWR** Protection* prevents damage from antennas whipping in the wind. *Reverse Polarity Protection* can save your amp if you connect power backwards.

Compact but Powerful

Mirage's integrated *HeatsinkCabinet™* and whisper quiet fan gets heat out fast!

The results? An *ultra-compact* 4¾x1¾x7¾ inch 2½ pound amplifier that delivers a *super powerful* 100 watts.

Free Accessories

Free 3 foot handheld to B-310-G coax cable -- just plug and play! ***Free*** mobile bracket! ***Free*** rubber mounting feet for home use!

Plus more . . .

Automatic RF sense Transmit/Receive switch. Remote keying jack. LEDs monitor "On Air", high SWR, pre-amp, power. Push buttons select SSB/FM, pre-amp, power. Draws 15 amps at 12-15 VDC.

Full one year MIRAGE warranty

With Mirage's legendary ruggedness, you may never need our superb warranty.

Dual Band 144/440 MHz Amp

$159.95 BD-35 Suggested Retail

Power Curve -- typical BD-35 output power							
Watts Out (2Meters)	*30*	*40*	*45*	*45+*	*45+*	*45+*	*45+*
Watts Out (440 MHz)	*16*	*26*	*32*	*35+*	*35+*	*35+*	*35+*
Watts In	*1*	*2*	*3*	*4*	*5*	*6*	*7*

***Add** this Mirage dual band amp and boost your handheld to 45 watts on 2 Meters or 35 watts on 440 MHz!*

Works with all FM handhelds up to 7 watts. Power Curve chart shows typical output power.

Full Duplex Operation

Mirage's exclusive *FullDuplexAmp™* lets you talk on one band and listen on the other band at the same time -- *just like a telephone conversation!* (Requires compatible HT)

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- ***Single input connector and single output connector for both bands*** -- easy to use with dual band radios and antennas
- ***First-class strip-line techniques*** -- superb RF performance and reliability
- ***Custom wrap-around heatsink*** -- runs cool
- ***Reverse Polarity Protection*** -- saves your amp if you connect power backward
- ***Automatic RF sense Transmit/Receive switch*** -- makes operation easy
- ***Low input SWR*** -- keeps your handheld safe from overheating
- ***"On Air" LEDs*** -- for each band
- ***Free mobile mounting bracket***
- ***Free 3 foot handheld-to-BD-35 coax cable***
- ***Small size:*** just 5x1¾x5 inches
- ***Full one year MIRAGE warranty***
- ***Legendary MIRAGE ruggedness***

Call your dealer today for your best price!

35 Watts for 2 Meter HTs

B-34-G

$89.95

Suggested Retail

Power Curve -- typical B-34-G output power								
Watts Out	*18*	*30*	*33*	*35+*	*35+*	*35+*	*35+*	*35+*
Watts In	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*

- ***35 Watts Output on 2 Meters***
- ***All modes: FM, SSB, CW***
- ***18 dB GaAsFET preamp***
- ***Reverse polarity protection***
- ***Includes mobile bracket***
- ***Auto RF sense T/R switch***
- ***Custom heatsink, runs cool***
- ***Works with handhelds up to 8 watts***
- ***One year MIRAGE warranty***

MIRAGE RUGGED!

35 watts, FM only . . . $69.95

B-34, $69.95. 35 watts out for 2 watts in. Like B-34-G, FM only, less preamp, mobile bracket. 3⅛x1¾x4¼ inches.

160 Watts on 2 Meters!

B-5016-G

$299

Suggested Retail

MIRAGE RUGGED!

Power Curve -- typical B-5016-G output power								
Watts Out	*130*	*135*	*140*	*145*	*150*	*155*	*160*	*165*
Watts In	*20*	*25*	*30*	*35*	*40*	*45*	*50*	*55*

***The** MIRAGE B-5016-G gives you 160 watts of brute power for 50 watts input on all modes -- FM, SSB or CW!*

Ideal for 20 to 60 watt 2 Meter mobile or base. *Power Curve* chart shows typical output power.

Hear weak signals -- low noise GaAsFET preamp gives you excellent 0.6 dB noise figure. Select 15 or 20 dB gain.

B-5016-G has legendary ruggedness. *We know of one that has been in constant use since 1979!*

Heavy-duty heatsink spans entire length of cabinet -- prevents overheating. Power transistors protected by MIRAGE's *Therm-O-Guard™*.

Fully protected from high SWR and excessive input power. Has warning LED.

Has smooth adjustable Transmit/Receive switching with remote external keying.

RC-1, $45, Remote Control. On/Off, pre-amp On/Off, selects SSB/FM. With 18-ft cable.

Draws 17-22 amps at 13.8 VDC. 12x3x5½ in.

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MIRAGE . . . the world's most rugged VHF/UHF amplifiers

The future of amateur radio lies with those not old enough to remember spark gap transmitters and vacuum tubes. That does not mean that interest in these electronic marvels is dead, however. KB7RYU has combined the past and the present, and still looks forward to the future in amateur radio.

The Future is Theirs

BY JOE VERAS*, N4QB

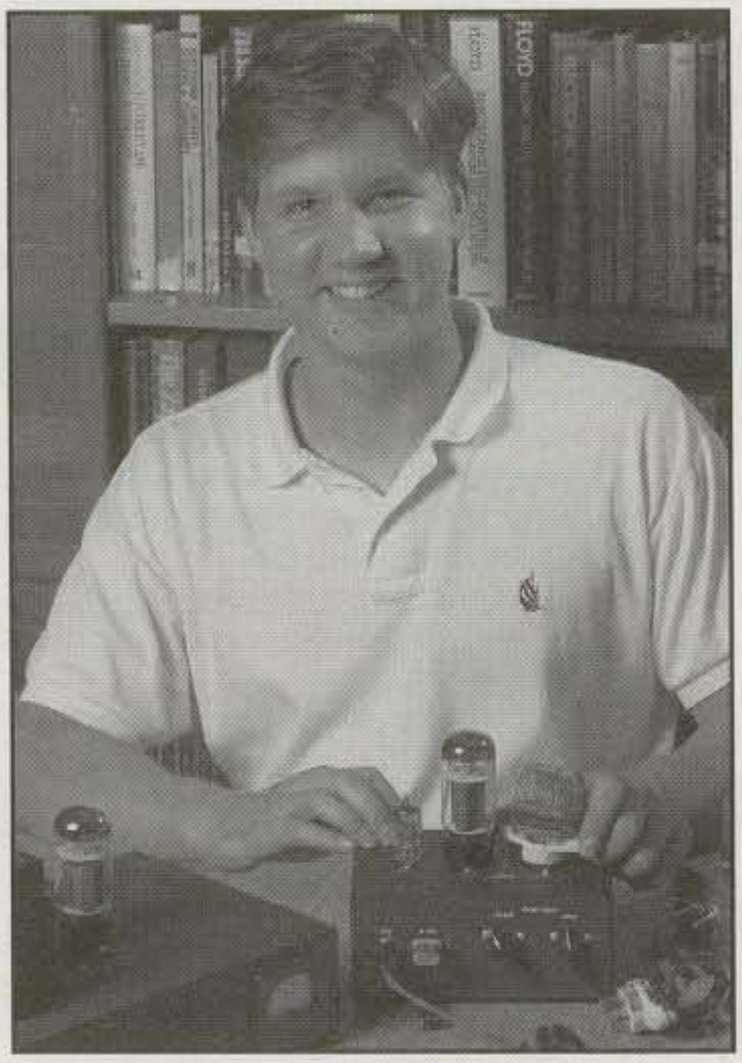
I have seen the future of amateur radio. It is not in the graying, balding amateur who peers back at me from the mirror. The hobby's future is embodied in younger forms. Tomorrow's bands will be populated by the teenage boy or girl just now taking the first steps along what can be a rewarding and life-long journey.

Such an amateur is Joel Steenis, KB7RYU, of Phoenix, Arizona. Joel entered the amateur radio ranks in 1993 at the General class level, but his interest in radio and things electrical goes back much farther than that. When Joel and his brother John were young enough to ride in child car-seats, their father, Dick, entertained them during automobile trips with tales about electrical circuits and stories starring Newton and Boyle.

That early interest evolved into an array of experiments and science fair projects in subsequent years. Joel's parents' encouragement, however, stopped short of endorsing Joel's plans to construct a home x-ray machine from plans he found in a magazine. Not surprisingly, John, KI7LX, is now a sophomore in the Electronic Engineering program at Purdue University. Dad, an electrical engineer at Motorola, is KB7RYW.

Amateur radio, and much of life, is a family affair in the Steenis household. Joel, now 18 and in his senior year in high school, is home-schooled. His curriculum is coordinated by his mom, Marsha. In addition to his high-school work, Joel is taking college-level courses at Paradise Valley Community College. Classes already completed or currently underway include Introduction to Physics, Physics I, Chemistry I & II, and an introductory Computer Science course. Joel particularly enjoys the chemistry classes, giving credit to his instructor, Dr. Linn Lalco, for presenting the material in a way that is both interesting and applicable to everyday life.

*P.O. Box 1041, Birmingham, AL 35201



Joel displays some of the equipment he has constructed. Behind him is a small part of his book collection.

Joel's parents consider amateur radio a valuable part of his education. By building and fixing things, Joel is always learning.

In addition to the hands-on learning, Joel has acquired a large body of knowledge from books. He collects books and literature on electricity, electronics, and radio. They fill several bookcases in his bedroom/hamshack and elsewhere in the house. In the current vernacular, the collection is interactive; he has read nearly all of them. Among his favorites are *The Boy Electrician*, *The Boy's First Book of Radio and Electronics*, as well as the *Wireless Boys* mysteries. At the very top of the list is the 4th edition of the *Radiotron Designer's Handbook*, which Joel considers to be the best book on vacuum tube circuitry.

Vacuum tubes? Here on the verge of the 21st century in an article about the future of the hobby? Well, yes. Let me explain. I became acquainted with Joel because of a mutual interest in tube-type amateur gear. We belong to an internet list devoted to that subject and have communicated via e-mail, U.S. mail, and the amateur bands over the past couple of years. I'm interested in the equipment because it permits me to revisit my own youth and early days in the hobby. It also has provided subject matter in my professional life as an author and photographer. Joel's story has a different twist.

Amateur radio entered the Steenis home in the form of a Hammarlund HQ-100 receiver borrowed from WB6DHI, a friend of Joel's dad. Listening to the amateur bands led to a desire to transmit, and that provided the motivation to earn a license. That first receiver and the transmitting gear which followed was older tube-type equipment. Much of it proved to be far from trouble-free. Most of us view equipment malfunction with dismay. Joel, however, considers it good fortune.

"If the radios had been trouble-free, there wouldn't have been an incentive to learn how it worked," Joel says. "Instead of being discouraging, it increased my interest in the hobby." He feels that the first step in repairing something is to figure out how it's supposed to work in the first place.

Fixing existing gear led Joel to homebrewing his own vacuum-tube equipment. As he showed me some of his well-constructed projects, I felt I was watching handbook and magazine articles from the 1950's and '60's come to life. What is nostalgic for me, though, is imminently practical for Joel. He told me, "Even though I'm learning about tubes, the principles are easily applied to solid-state circuits. The general flow of things is the same despite the difference in active devices." A visit with John at Purdue showed Joel

how his tube-circuit knowledge translated into understanding the state-of-the-art things his brother was studying.

Although Joel first went on the air with a transceiver, most of his station configurations since have included "separates." When he acquired a Drake 2-A receiver, he realized he would need a TR switch to pair it with his transmitter. One of his handbooks furnished a vacuum-tube circuit that would do the job, and a little time with the soldering iron completed the project.

Joel has an appreciation for more than just the circuitry inside vintage radios. The look of the radios appeals to him as well. "Some of them have enough chrome to be a '55 Chevy," Joel says, smiling. "You can just about picture some of the radios with tail-fins." It may be no coincidence that both E.F. Johnson and Plymouth made Valiants. He surprised me by mentioning Raymond Loewy, the famed industrial designer whose creations include both cars and short-wave radios.

In keeping with his love of vintage equipment, Joel is proficient in that oldest of digital modes, CW. From time to time KB7RYU can be found in the autobahn-like, no-speed-limit zones at the lower end of 40 meters. His amateur radio activity spreads across a broad spectrum of interests. His favorite bands are 160 and 40 meters. He says he especially likes the people he meets on the top band. He also uses the equipment he repairs or homebrews to chase DX and rag chew. He began making a serious effort at contesting last year and plans to continue this pursuit in the future.

Joel's outlook on life is not focused solely on the rear-view mirror of tube-based radio, however. He talks excitedly about the future of electronics and communications. As for his own future, Joel sees himself as a physics professor. He likes the idea of working in the academic realm, while also having time to do private consulting. Photography is another of his hobby interests. In fact, Joel assisted me during a *Radio Classics* calendar photo shoot at the Carefree, Arizona home of Harry Snyder, W7HC.

Meeting Joel is both rewarding and eye-opening. He is able to focus on the joys of amateur radio with a vision not yet blurred by the cynicism which older amateurs refer to as experience. It has also given me a glimpse of amateur radio's tomorrow—futuristic and exciting, yet also a place in which The Old Man himself would feel right at home. It is comfortable to hang out with our old cronies on a favorite repeater or HF band, but that too easily can separate us from one of the hobby's most essential components—change.

Amateur radio is based on a technology which moves at 300 million meters-per-second. It is an unreasonable expectation to hope that things will stand still. ■

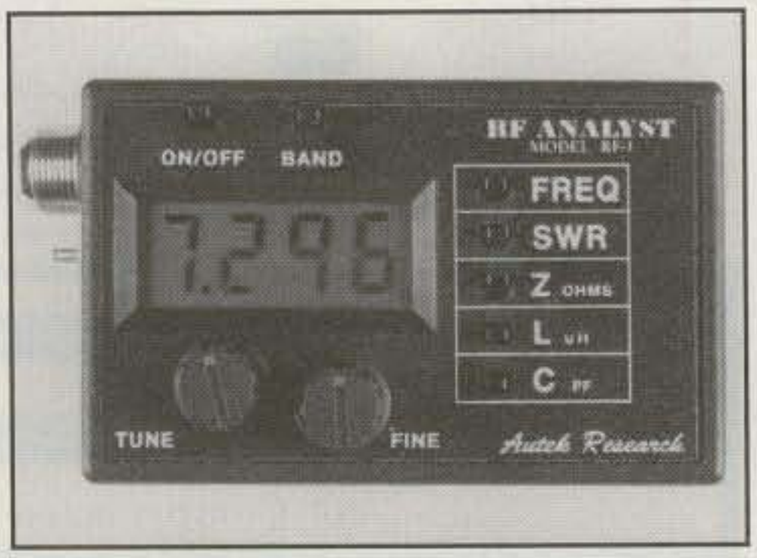
BY KARL T. THURBER, JR., W8FX

THE DIGITAL DIPOLE

FROM SOFTWARE THROUGH ANTENNAS FOR THE SHACK

February Fun '98

Okay, gang, so February may not be much of a "fun" month, at least not for readers in the northern climes. However, we're writing this column from our Millbrook, Alabama QTH, where the winters aren't too bad (usually). In any case, we'll have fun this month with our regular "Digital Dipole" column happenings. We'll begin our survey this February with a fresh look at antennas and antenna accessories.



The original Autek Research RF-1 RF Analyst, shown here, is intended to be the only instrument you need to adjust any antenna. As such, it greatly simplifies the construction, measurement, and adjustment of antennas, transmission lines, tuners, and RF networks from 1.2 to 35 MHz. Besides measuring SWR with its built-in "transmitter," it's reportedly the first affordable digital impedance (Z) meter. The RF-1 also calculates L (inductance) and C (capacitance). Similar in function to the RF-1 Analyst (and looking similar to it), although without the capability to directly read out L and C values, the new Autek Research RF-5 VHF Analyst goes well beyond the frequency range of the RF-1 to cover all remaining amateur bands up to the 440 MHz band and beyond, plus most frequencies in between. A prominent feature is a timesaving Instant SWRTM mode. Here the RF-5's microprocessor finds the frequency of minimum SWR (or Z) on command in a few seconds. The new VHF Analyst is discussed in the text of this month's column. (Photo courtesy Autek Research)

Antenna Notes

PAR Electronics Omniangle Antennas. Previously we profiled the PAR Electronics 2-Meter Intermod Filters offered by proprietor Dale Parfitt, WA2YPY. The filters use "asymmetrical notch filtering" to eliminate the specific frequencies responsible for intermod or front-end overload, representing an alternative to traditional, brute-force filtering making use of conventional bandpass filters.

Dale advises that the PAR Electronics filter product line now has been expanded to now include 2 meter intermod filters, the VHFDN152 and VHFDN152HT (for handie-talkies); UHFDN450 (for 70 cm); and the VHFDN153HT (for VHF scanners). Custom filters are available from PAR Electronics for a variety of frequency-shaping applications in the 50–1000 MHz range.

Dale now also offers the Omniangle series of VHF antennas. He asserts that the horizontal Omniangles accomplish what the halo and turnstile started out to do—provide a clean, omnidirectional, horizontally polarized antenna. He cites range tests which show that both halo and turnstile antennas didn't closely approximate omnidirectionality in their performance.

The PAR Electronics Omniangle antenna is considerably longer than a simple dipole would be. This fact, in addition to its unique shape, yields a horizontally polarized antenna the pattern of which reportedly is within 0.8 dB of being a perfect circle, with a 2:1 VSWR bandwidth in excess of 2 MHz at 2 meters.

Consequently, the Omniangles lend themselves nicely to VHF SSB mobile work and fixed station use where a rotor isn't convenient, as in contesting and net control. Also, the small, unobtrusive size makes the antennas good for use where antenna restrictions are in effect.

The new Omniangle antennas are available in two configurations. The OA-144 ($54) covers 138–150 MHz, while the OA-50 ($63) covers 49.5–54 MHz. Both are horizontally polarized and designed for 50 ohm feed. Each handles 160 watts RF.

For more detailed information, contact Dale at PAR Electronics, 6869 Bayshore Drive, Lantana, FL 33462 (phone 407-586- 8278; e-mail <par@magg.net>).

Woodland Creek Quads. Charles Davis, AD4KT, offers several VHF and UHF quads. One of these is an assembled 2 meter, four-element quad at $50 ($45 in kit form) that claims 8 dBd gain and a 1.2 SWR at 146 MHz. The antenna has a beamwidth of less than 30 degrees and front-to-back ratio of 25 dB or greater.

Also offered are an assembled 70 cm, six-element quad ($35) that has a claimed 13 dBd gain and a dual-bander, 2 meter/70 cm assembled quad ($70) that offers four elements on 2 meters and five elements on 70 cm. This quad is available either with dual or single coax feed.

All antennas are sturdily fabricated from fiberglass and PVC and use stainless-steel hardware and stranded copper elements. The antennas are easily rotated by light-duty rotators and are even good choices for attic installation where space or other restrictions must be considered.

For more technical details and shipping information, contact Woodland Creek Antennas, 11 Old Pendergrass Road, Jefferson, GA 30549 (706-367-8069).

Autek Research VHF Analyst™. In the October 1994 column we profiled the Autek Research RF Analyst™. As we noted at that time, Autek Research has been turning out high-quality amateur radio accessories since 1972 under the capable stewardship of Bill Onesky, N6WO.

To recall, the original Model RF-1 RF Analyst was (and still is) a digitally based, "do-all" HF antenna analyzer with a microprocessor for digital readout of everything, not just frequency. As such, it greatly simplifies the construction, measurement, and adjustment of antennas, transmission lines, tuners, and RF networks from 1.2 to 35 MHz continuously, in five overlapping bands.

Besides making basic measurements of SWR, Z (impedance), L (inductance), C (capacitance), and other parameters, you can use the $129.95 device to precisely adjust quarter-wave and half-wave transmission lines, measure cable loss, check balun and RF transformer characteristics, measure SWR on lines with impedances other than 50 ohms, check the effects of adding radials to a vertical antenna, adjust your antenna tuner without transmitting, measure trap resonant frequency, produce a sine-wave RF signal, and perform other tasks of interest to the antenna aficionado.

Now Bill has expanded his RF Analyst product line to include the new Model RF-5 VHF Analyst. Similar in function to the

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JST-245

160-10 Meters PLUS 6 Meter Transceiver

Fifteen reasons why your next HF transceiver should be a JST-245. . .

1 All-Mode Operation (SSB,CW,AM,AFSK,FM) on all HF amateur bands and 6 meters. JST-145, same as JST-245 but without 6 meters and built-in antenna tuner.

2 MOSFET POWER AMPLIFIER • Final PA utilizes RF MOSFETs to achieve low distortion and high durability. Rated output is 10 to 150 watts on all bands including 6 meters.

3 AUTOMATIC ANTENNA TUNER • Auto tuner included as standard equipment. Tuner settings are automatically stored in memory for fast QSY.

4 MULTIPLE ANTENNA SELECTION • Three antenna connections are user selectable from front panel. Antenna selection can be stored in memory.

5 GENERAL COVERAGE RECEIVER • 100 kHz-30 MHz, plus 48-54 MHz receiver. Electronically tuned front-end filtering, quad-FET mixer and quadruple conversion system (triple conversion for FM) results in excellent dynamic range (>100dB) and 3rd order ICP of +20dBm.

6 IF BANDWIDTH FLEXIBILITY • Standard 2.4 kHz filter can be narrowed continuously to 800 Hz with variable Bandwidth Control (BWC). Narrow SSB and CW filters for 2nd and 3rd IF optional.

7 QRM SUPPRESSION • Other interference rejection features include Passband Shift (PBS), dual noise blanker, 3-step RF attenuation, IF notch filter, selectable AGC and all-mode squelch.

8 NOTCH TRACKING • Once tuned, the IF notch filter will track the offending heterodyne (±10 Khz) if the VFO frequency is changed.

9 DDS PHASE LOCK LOOP SYSTEM • A single-crystal Direct Digital Synthesis system is utilized for very low phase noise.

10 CW FEATURES • Full break-in operation, variable CW pitch. built in electronic keyer up to 60 wpm.

11 DUAL VFOs • Two separate VFOs for split-frequency operation. Memory registers store most recent VFO frequency, mode, bandwidth and other important parameters for each band.

12 200 MEMORIES • Memory capacity of 200 channels, each of which store frequency, mode, AGC and bandwidth.

13 COMPUTER INTERFACE • Built-in RS-232C interface for advanced computer applications.

14 ERGONOMIC LAYOUT • Front panel features easy to read color LCD display and thoughtful placement of controls for ease of operation.

15 HEAVY-DUTY POWER SUPPLY • Built-in switching power supply and a cooling system designed for continuous transmission at maximum output.

JRC *Japan Radio Co., Ltd.*

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CIRCLE 165 ON READER SERVICE CARD

RF-1, although without the capability to directly read out L and C values, the RF-5 VHF Analyst goes well beyond the frequency range of the RF-1 to cover 35 to 75 MHz and 138–500 MHz. It therefore covers all remaining amateur bands up to the 440 MHz band and beyond, plus most frequencies in between (the actual upper limit of coverage typically reaches 530 MHz). A prominent feature of the unit is a timesaving Instant SWR™ mode. Here the RF-5's microprocessor finds the frequency of minimum SWR (or Z) on command in a few seconds.

The RF-5 VHF Analyst offers crystal-controlled, four-digit frequency readout that is accurate to the last digit on all bands. The unit measures SWR over the range 1.0 to 6.0, relative to 50 ohms. Other characteristics similar to the RF-1 include the same size, an auto-off feature, and mode cycling. The new unit is $229.95 plus $5 s/h.

For a flyer with detailed specs, contact Autek Research, P.O. Box 8772, Madeira Beach, FL 33738 (813-886-9515).

Cushcraft Big Thunder Series HF Yagis. Cushcraft's amateur radio antennas catalog seems to get slicker each time they issue it. Their latest, an 18-page catalog, includes photos and specs on a number of new HF and VHF/UHF antennas.

One of the most interesting of their new products is the Big Thunder series of HF Yagis, optimistically dubbed by the manufacturer as "the performance tribanders for the DX years just ahead." Both the X6 (a total of six elements) and the X8 (a total of eight elements) Triband Yagis are intended to set new standards in computer-modeled on-the-air performance and mechanical reliability. Both of the new Yagi antennas cover 10, 15, and 20 meters, with high-claimed forward gain figures and front-to-back (F/B) ratios.

Interestingly, each mechanical component was designed for 100+ mph wind survival, with a 1.25 safety factor for best reliability and long life. Traps were eliminated from the high-current elements and reflectors using the new Tri-Feed™ system, which purports to yield virtual monoband performance, maximum power-handling capability, and wide VSWR bandwidth.

Traps are used only in the lower-current directors for increased gain and a sharper radiation pattern. Of course, such electrical and mechanical elegance doesn't exactly come cheap. But both antennas arguably are well worth the $675 list price tag on the X6 and the $995 list price tag on the X8. Optional driven element and two-element, 40 meter kits are available.

For a catalog and more detailed information and specs on the two new beams, contact Cushcraft Corp., P.O. Box 4680, 48 Perimeter Road, Manchester, NH 03108 (telephone 603-627-7877; e-mail <hamsales@cushcraft.com>; on the web <http://www.cushcraft.com>). (See fig. 1.)

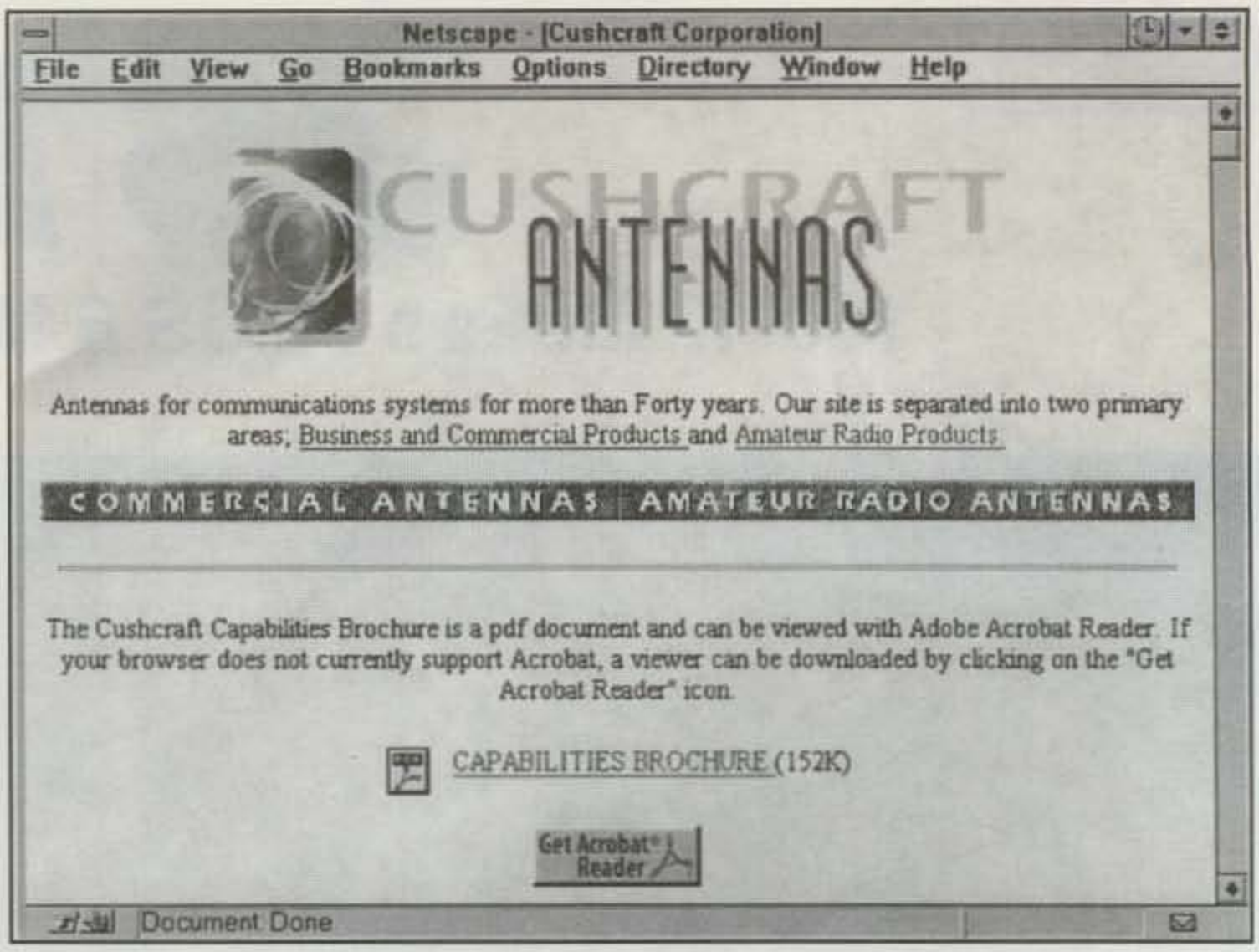

Fig. 1– Cushcraft's attractive and technically informative Web page serves its business, commercial, and amateur radio customers. The site includes product specifications, photos, pricing and shipping information, dealer locations, and a glossary, amounting to an online catalog. The site also lets you view or download a rather extensive "Cushcraft Capabilities Brochure" that details the company's background, engineering and manufacturing capabilities, and sales and service functions. You'll find the site at <http://www.cushcraft.com>.

Hustler Antennas Catalog. The Newtronics Antenna Corp., with its Hustler antennas, is a supplier well-known for its CB, monitor, and amateur fixed station and mobile antennas. Hustler has a new 26-page antenna and antenna accessories catalog that details their antenna selections and a variety of mounts, springs, and other accessories. I find the catalog particularly useful and educational in that its sections covering each type of antenna offered have succinct explanations of the antennas' electrical, mechanical, and mounting features.

The amateur line still includes the classic 4-BTV, 5-BTV, and 6-BTV HF fixed station verticals, which trace their lineage back to 1959. In fact, Hustler claims that many of their original verticals still are in service today! The verticals' prices remain reasonable, although they're naturally priced somewhat higher than they were in 1959, at $166.95, $211.95, and $246.95, respectively.

Also featured in the catalog are the heavy-duty "HS" Spirit Series VHF and UHF antennas. These rugged vertical antennas originally were produced for the professional market and now are available for amateur use. The "HS" antennas feature a white extruded fiberglass radome and heavy-wall aluminum base for stability and rigidity—reportedly even in heavy winds.

The "HS" antennas are available in configurations from 144 MHz to 1.3 GHz; power-handling capability of the antennas typically is about 500 watts. The catalog also shows the similar, very heavy-duty "HD" Series Antennas which, like the "HS" antennas, are virtually impervious to the effects of lightning, ice, wind, and water.

For a copy of the new catalog, contact Newtronics Antenna Corp., One Newtronics Place, Mineral Wells, TX 76067-9563 (940-325-1386).

Soft Stuff

EZNEC Antenna Software by W7EL. Several times previously, most recently in the August 1993 column, we discussed ELNEC, an antenna modeling software package offered by Roy Lewallen, W7EL. ELNEC is based on the classic MININEC program. Roy's ELNEC is surprisingly easy to use for modeling and analyzing virtually any antenna. Its menu-like entry format, graphic and tabular antenna displays, and shortcut features make it a very friendly ham shack companion.

To recall, ELNEC plots azimuth and elevation patterns; tells you gain, feedpoint impedance, SWR, and current distribution; and reports beamwidth, angles of the

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TS-570D/S

16-bit DSP technology for superb audio quality on both transmit and receive. Large LCD display. Scrolling Menu system offers 46 types of functions. Automatic antenna tuner. TX: 160-10M Amateur bands (6M on S model), RX: 500khz to 30 mhz. Radio Control Program software allows PC control of radio. RS-232 computer port for up to 57,600 bps PC control. Dedicated packet port. Electronic Keyer built-in. Worlds first CW auto tune

TS-50S

super-compact, 100 watt, 160m-10m transceiver, General Coverage Receiver. DDS(Direct Digital Synthesizer) with fuzzy control. AIP system. 100 memory channels. CW reverse. Menu system

TS-60S

50mhz all-mode operation. Max 90W RF output (SSB,CW,&FM). 100 memory channels. DDS w/"fuzzy logic" control. AIP, IF shift(SSB&CW) and opt 500hz CW filter. Dual menu system

TS-790A

144Mhz/440Mhz dual-band operation. 1200Mhz unit(opt.). All mode operation. Satellite communications with Doppler effect frequency correction. 59 multi-function memory channels with lithium battery back-up

TM-255A

144Mhz all-mode operation. 101 memory channels. DDS with "fuzzy logic" control. TF-SET (TX frequency set). DTSS selective calling with page. 1200/9600 bps packet capable

TM-742ABL

144/440 Mhz dual-band operation. Four band options to choos for tri-band operation: UT-28S, 28Mhz 50W; UT50S, 50Mhz 50W; UT220S 220Mhz 25W; and UT1200 1.2Ghz 10W. Dual/triple receive. 101 memory channels per band.

TH-G71A

144/440Mhz FM Dual Bander. 6W VHF, 5.5W UHF at 13.8VDC. PC Programmable. 200 memory channels with alphanumeric display. MIL-STD 810E (rain & shock) CTCSS tone scan. Wide range coverage.

TH-235A

Kenwood's new TH-235A (144MHz) handheld was designed to be user-friendly and offer all features one could need in an HT. The easy-to-use menu system, 60 memory channels and built-in keypad put everything you need at your fingertips. Features such as programmable squelch and DTMF memory will prove to you that the compact TH-235A was designed for utmost convenience.

TH-22AT

144Mhz single band operation. MOS FET power module. Built-in DTMF keypad. 40 memory channels in E2PROM (plus 1 call channel). Multiple scan functions(VFO, call & memory). Dual scan stop modes(CO & TO)

TM-261A

Memory indexing. Inovative menu setup method combines sophisticated features with simple operation. Programmable with a RX and TX tone(CTCSS) seperately

TM-V7A

2m/440mhz dual band. Built-in CTCSS, DTSS, and page functions. Guide mode serves as an on board instuction manual. Data connector for 1200/9600 bps packet. Detachable control panel. Cool blue reversible LCD. 280 memory channels. Programmable memory for storing five operating profiles

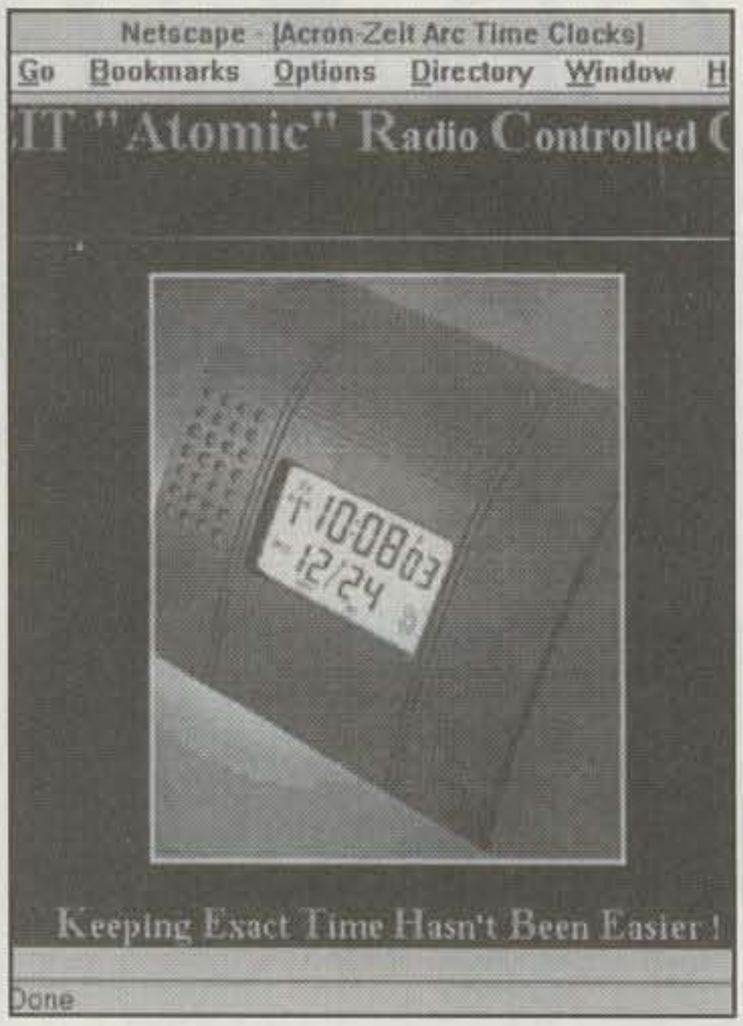

Fig. 2– The Arcron-ZEIT Web page tells you about the company's unique product line of German-import clocks and watches, reminding you that the "ARC" in the company's name stands for "ATOMIC Radio-Controlled." The firm's interesting Web site also provides some practical details on radio-controlled timekeeping, facts about the company, details on the timepieces, and clock and watch ordering information. You'll find the site at <http:// www.arctime.com>. See the discussion about the Arcron-ZEIT timepieces in the text of this month's column.

3 dB pattern points, and front- to-back (F/B) ratio. It offers nearly all of the features of the more expensive EZNEC (see below) except transmission line models. ELNEC also has a limitation of about 127 segments, or six to eight total wavelengths of wire. It's $49.

In November 1995 we profiled the fuller-featured EZNEC. To review, EZNEC has all the features of ELNEC, and then some. EZNEC, priced at $89 vs. ELNEC's $49, overcomes many of ELNEC's limitations because it's based on the powerful NEC-2 code rather than on MININEC. And it does this without compromising the easy-to-use interface that's a signature feature of ELNEC.

EZNEC—which Roy bills as "ELNEC on the outside, NEC-2 on the inside"—lets you analyze practically any kind of antenna, including quads, long Yagis, and antennas within inches of the ground, in their actual operating environment. Simple keystroke depresses let you see the antenna's pattern, gain, beamwidth, and F/B ratio. You easily can see SWR, feedpoint impedance, and more. The EZNEC program has 500-segment capability, which lets you model very complex antennas and their immediate surroundings.

A number of new EZNEC features are offered. These include three-dimensional pattern plot with selectable highlighted "slice" and cursor gain readout, SWR graph with cursor readout, near-field analysis, automatic radial creation, quick frequency scaling, and considerably more.

Also available are two "EZNEC pro" professional programs, EZNEC-M ($425) and EZNEC/4 ($600). These are high-segment versions of EZNEC with additional features for analyzing extremely complex antennas with more than 3000 segments and 2000 wires, reading and writing NEC files, and including ground-wave and near-field analysis, plus several other specialized features of interest to the antenna professional.

For more details and specs, contact Roy Lewallen, W7EL, P.O. Box 6658, Beaverton, OR 97007 (phone 503-646-2885; e-mail <w7el@teleport.com>).

From The Radio Bookshelf

The ARRL Operating Manual. *The ARRL Operating Manual,* edited by Paul Danzer, N1II, is an excellent, authoritative reference covering almost all aspects of on-the-air operating practices. Each of the 17 chapters has been revised by authors who are experts in their fields, to reflect the many changes that have taken place in the amateur radio hobby in recent years. The manual attempts, with some success, to be a "one stop" source of operating information that encompasses most types of on-the-air activities.

The new sixth edition of *The ARRL Operating Manual* pays special attention to the changes in operating practices and techniques wrought by new digital modes, the Internet, PCs in the radio ham shack, and the ins-and-outs of the sunspot cycle. Some of the 17 chapters have been completely rewritten, while others have been modified and updated.

Of special note, Chapter 1, Shortwave Listening, and Chapter 5, DXing, have been rewritten; Chapter 4, Antenna Orientation, now includes a discussion of computer tools and Web sites; Chapter 6, The Internet, is brand new to this edition; and Chapter 16, Image Communications, has been brought up to date. The new edition also includes a separate 24-page "Ham Desktop Reference" booklet that contains many of the most popular tables and operating aids you would want to have right at your fingertips.

The 8" × 11", 420-page book is $25 plus $5 s/h from the American Radio Relay League (ARRL), 225 Main St., Newington, CT 06111-1494 (phone 1-888-277-5289;

e-mail <pubsales@arrl.org>; on the web <http://www.arrl.org>).

Personal Computers in the Ham Shack. The new ARRL book, *Personal Computers in the Ham Shack,* coauthored by Paul Danzer, N1II, and Richard Roznoy, K1OF, explores the diverse ways you can enhance your enjoyment of amateur radio with another favorite hobby, that of personal computers (PCs).

Whether you're a computer whiz or you've just bought your first PC, this is the kind of book you'll probably want to keep close at hand. As a "show me how" sort of text, in its seven chapters it shows you how to choose an operating system and computer accessories; use your PC as a communications terminal to operate digital modes; use database, logging, and contesting software; test new antennas before actually erecting them; design sophisticated new circuits; control radio ham shack equipment; use the Internet to obtain information, tips, and software; and considerably more.

The book contains a separate Resources Guide chapter that describes a wide range of available resources, and four appendices detail filenaming conventions, explain computer terms, describe related ARRL books, and show how to use the online ARRL Technical Information Service (TIS). *Personal Computers in the Ham Shack* is $15.95 plus $4 s/h from the ARRL, address above.

Short Bursts

Radio-Controlled "Atomic" Clocks from Arcron-ZEIT. Udo Mallinckrodt, of Arcron Time-Technology, Inc., sent us information on a line of German-manufactured, radio-controlled "atomic" clocks his firm offers. Several interesting models are offered, including a ZEIT Executive Desktop Clock ($99.95, or $79.95 for the travel version); ZEIT-PC Executive Desktop Clock w/RS232 capability ($149.95); ZEIT Piccolo Travel Alarm Clock ($69.95); ZEIT Modern and Antique Wall Clocks ($79.95 and $99.95, respectively); and several radio-controlled watches, priced from $179.95 to $249.95.

Okay, the clocks themselves may not really be "atomic" in the strictest sense, but they indeed are unique. You could rightfully call them atomic-driven, in that they're controlled by the National Institute of Standards and Technology (NIST) low-frequency standard time-and-frequency station WWVB in Ft. Collins, Colorado. This station time is, in turn, derived from an assemblage of atomic clocks that NIST uses. The bottom line is that the Arcron-ZEIT clocks are probably the most accurate, reliable, and convenient timepieces you can buy for the ham shack.

The Arcron-ZEIT clocks are similar in function. They all feature fully-automatic, rapid timesetting via the 60 kHz radio signal from WWVB's atomic clock. The Arcron-ZEIT clocks automatically compare the received time signal with the time actually shown by the clocks, and in case of a deviation they intelligently correct the time in accordance with the time signal they receive. The clocks also execute automatically the setting from standard to daylight savings time and back; basically, all you need know to set the time is your local time zone. The clocks have a button for switching to UTC time in 24-hour format.

The desktop clocks have a built-in, 3 inch long ferrite antenna; the AC power cords are not used, and no external antenna is required. The firm's watches have a very short (1/2 inch) antenna to pick up the WWVB signal, which we understand is in the process of being upgraded in its transmitted power from 10 KW to 50 KW output, which may be complete by the time you read this.

The ZEIT-PC Executive Desktop Clock w/RS232 capability is particularly interesting. It's essentially the same as the regular desktop clock, as both have built-in WWVB receivers. However, you can directly hook up the PC Clock to an RS232 port on a PC running Windows or DOS, with the clock synchronizing the PC to the time and date. Since the ZEIT-PC Executive Desktop Clock operates independently of the PC itself, time and date are available immediately after switching on the PC.

For more details and product flyers on the clocks and watches, contact Arcron, Inc., 1010 Jorie Blvd. #324, Oak Brook, IL 60521 (phone 1-800-985-8463; e-mail <time@arctime.com>; web <http://www.arctime.com>). (See fig. 2.)

Wrap-Up

That's all for this time, gang. Next time more "Digital Dipole" topics of current interest. See you then.

Overheard: It's just wonderful to be known as a ham of but few words. And why so? Well, you can't tell when you may just have to *eat* them!

73, Karl, W8FX

BY JOE LYNCH, N6CL

VHF PLUS

ALL ABOUT THE WORLD ABOVE HF

Mountaintopping and Rovering

Mountain-topping has long been popular on the VHF+ amateur bands, mainly because the VHF+ operator recognizes that the higher above obstructions he is, the farther he can transmit. In recent years the grid locator system and the Rover category in contests have given this popular activity an even added boost.

By definition, the *Rover* is a one or two person team that sets up portable operations from at least two grids during a set time period. Rovers have been known to operate from as many as 20 grid locators during a contest, but the average is closer to four or five grids on a given trip.

Rover contest operation has been around in one form or another for many years. Before grid locators, mobile stations would travel to rare states and put them on the air for others who needed to work them. Interest increased with the adoption of grid locators, as more mobile stations were able to travel to relatively nearby rare grid locators. (For example, from my home in Oklahoma City, I need only travel 45 miles, to the other side of El Reno, Oklahoma, to be inside EM05, a grid locator rarer than my home grid locator, EM15. However, the closest "rare" state is South Dakota, three states and several hundred miles to the north.)

The Rover concept really got a push when contest station operators discovered that it provided a way to augment their operations during contests. Club stations such as the Rochester VHF Group, the Pack Rats, or the W2SZ Contest Group would enlist the a mobile station to go to a nearby state, set up, and provide contacts to the club station.

The concept grew until, based on a recommendation from the ARRL Contest Advisory Committee, the League adopted a Rover category for the June 1991 VHF QSO Party. (The idea of including a Rover category, as well as the limited multi-op category, was originated and promoted by Emil Pocock, W3EP, Curt Roseman, K9AKS, and Michael Owen, W9IP, in several of the "VHF-UHF Contesting!" columns in the *National Contest Journal*, beginning with the September/October 1989 issue. The idea really gained steam when the results of a survey they published in the March/April 1990 issue indicated the proposal had overwhelming support.) The category was an instant success; nearly 50 stations submitted entries.

Riding their success, the League decided to adopt the category for the January and September VHF contests, as well. Based on feedback from fellow contest operators, I adopted the category for the revised CQ WW VHF WPX Contest (now called the CQ WW VHF Contest). In the 1992 ARRL June VHF QSO Party contest, Rovers accounted for nearly 10 percent of the entries.

Although the Rover concept has become an official part of contests, the original activity—mountaintopping—is still popular. Oftentimes during the summer months a group of operators will get together and travel to rare grids to give others an opportunity to fill in the holes on their grid locator maps.

VHF Plus Calendar

Feb. 1	Good EME conditions.
Feb. 3	First quarter Moon.
Feb. 7	Highest Moon declination.
Feb. 8	Poor EME conditions.
Feb. 11	Full Moon.
Feb. 15	Moon apogee. Poor EME conditions.
Feb. 19	Last quarter Moon.
Feb. 22	Lowest Moon declination. Very poor EME conditions.
Feb. 26	New Moon.
Feb. 27	Moon perigee.

** EME conditions courtesy W5LUU.*

Why is Mountaintopping/ Rovering So Popular?

As I said before, it's relatively easy for most people to drive to a rare grid locator and put it on the air. And, with the inclusion of the category in contest rules, Rovers find themselves competing with each other to be the best. The fascination with Rovering also includes what I call the "being DX" factor. Once on the air, the Rover finds that contacts with his station are "in demand." Although not anywhere near as intense as an HF DX pileup, the thrill of being the "hunted" is just as real. Dave Hallidy, K2DH, reported that one of his biggest thrills as a Rover is giving out new grids on 13 cm to operators who are new to that band and running minimal stations. Also, Rover operation is often relatively inexpensive and sometimes surprising. You never know what interesting events you may observe when you're out and about. For instance, Tim Marek, K7XC, reported that while he was setting up his equipment in a shopping center parking lot on a recent trip, he watched, open mouthed, as the local police busted a drug dealer right in front of him!

The Successful Rover Expedition

How does one put together a successful Rover expedition? To find out, I interviewed a number of successful operators and researched the operations of others. These intrepid rovers included Ted Goldthorpe, W4VHF; Gary Colborne, WA1EHL; Denise Hagedorn, AJØE; Tom Bishop, KØTLM; Dave Hallidy, K2DH; John Walker, WZ8D; Emil Pocock, W3EP; Jerry Becker, WA8R; Byron Swainey, WA8NJR; Ron Hammil, KC6WLC; Tim Marek, K7XC; Kent Britain, WA5VJB; Frank Moorhus, AA2DR; Ray Veldran, N4KWX; Chip Angle, N6CA; Tom Brown, N7AMA; Pete Scola, WA7JTM; Pat Rose, W5OZI; John Godwin, K5IUA; Wayne Overbeck, N6NB; Jack Henry, N6XQ; and Geoff Krauss, WA2GFP. A compilation of their experiences follows.

Perhaps the most important factor in all successful Rover trips is planning. This includes how far in advance you plan for your trip, where you go, how long you stay within a particular grid locator, what kind of equipment you take, what kind of vehicle (or vehicles) you drive, what time of year you take your trip, how long your trip is, and who goes with you. It helps to make a list of all of these items and check them off as you accomplish them.

First, consider your destination. To a large extent, where you go will be dictated by the rarity of the surrounding grids. For example, in the panhandle and western part of Texas there are several grids that are relatively rare. A Rover might start in DM96 and work his way down to DM91, spending most of the time in the most rare grid locator, DM94.

Unless you're out for a Sunday afternoon drive and you just happen to have the 6 meter rig in the car, you'll be better off if you have a good idea as to the location of the high points in the grids you plan to visit. This means you almost have to travel the route before your trip, or at least

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Features:

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- Covers all Amateur HF Bands plus General Coverage Receiver
- IF Stage 16/24 Bit Digital Signal Processing (DSP)
- II DSP Bandpass Filter Widths from 100 Hz to 3.5 kHz (6 kHz in AM Mode)
- Band Activity Display with "Point and Click" Frequency Tuning
- On-screen Antenna "Smith" Chart, Logging Software and Help Menus
- Automatic Frequency Calibration from WWV or Other External Standard
- "Snapshot" Keys for Instant Recall of Frequencies and Settings
- Optional Internal Antenna Tuner

PC not included

The Kachina 505DSP Computer Controlled HF Transceiver After twenty years of building commercial transceivers in Arizona, Kachina has decided the time is right for a new approach to amateur radio. The Kachina 505DSP is nothing short of a revolution in HF transceivers.

Why Use Knobs if You Have Windows? The old-fashioned front panel has become too cluttered to be useful. Too many knobs, too many buttons. Kachina's 505DSP transceiver connects to your computer's serial port and is completely controlled under Windows™. With optional cables, the radio may be remotely located up to 75 feet away from your computer. Imagine combining a state-of-the-art DSP transceiver with the processing power and graphics capabilities of your PC and you'll soon wonder why all radios aren't designed this way. Why settle for a tiny LCD display when your computer monitor can simultaneously show band activity, antenna impedance, heat sink temperature, SWR, forward and/or reflected power and a host of other information?

16/24 Bit DSP/DDS Performance In addition to 100% computer control, the Kachina 505DSP offers exceptional 16/24 bit DSP/DDS performance. IF stage DSP, "brick-wall" digital filtering, adaptive notch filters and digital noise reduction, combined with low in-band IMD and high signal-to-noise ratio, produce an excellent sounding receiver. Sophisticated DSP technology achieves performance levels unimaginable in the analog world. The transmitter also benefits from precise 16/24 bit processing. Excellent carrier and opposite-sideband suppression is obtained using superior phasing-method algorithms. The RF compressor will add *lots* of punch to your transmitted signal without adding lots of bandwidth, and the TX equalizer will allow you to tailor your transmitted audio for more highs or lows.

Seeing is Believing American-made and designed, and able to stand on its own against the world's best, the 505DSP is bound to set the standard for all that follow. But don't take our word for it. Visit our website at http://www.kachina-az.com for detailed specifications, to download a demo version of our control software, or to see a current list of Kachina dealers displaying demonstration models in their showrooms.

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CIRCLE 4 ON READER SERVICE CARD

get in touch with someone who knows the area and has pictures.

Second, you must secure permission to operate from the sites you've selected. This means getting permission from property owners, local authorities, and so on, which may be very difficult. As an example, Gary Colborne, WA1EHL, and Bob Thompson, N4YZJ, were run off their location on Rich Mountain during the 1992 June ARRL contest by local authorities because they were blocking an access road. Even though no one lived on property accessed by the road, a neighbor who didn't want them there complained. The authorities used the "access road blockage" as the basis for dispersing the Rover team. As disconcerting as that was, it doesn't compare with being hauled in for questioning for roving around one's own neighborhood, as was Geoff Krauss, WA2GFP, during the January 1993 VHF Sweepstakes contest. Fortunately, his lawyering skills helped "bail him out" once he was at the police station.

After your trip, be sure to thank your host for allowing you to use the property for your hobby. It was no accident that Bryan Snyder, WA8MZQ, asked me to convey his appreciation to his hosts—including the Royal Canadian Air Force—in my column write-up of his 1992 trip.

How long should you stay at a given location? There are several factors to consider. Are you on an extended trip, or are you participating in a contest? Is the grid you're within relatively rare and worth the effort involved in spending some extra time? Are you in the contest to win, or are you just having a good time? If you are contesting, how long will you stay to work every last station before moving on? Is it worth it to you to stay just so someone can finally complete that contact on 23 cm, even though you're delayed an hour? During contests, some of the on-the-air intimidation from the intense operators on the other end can be relentless. Remember, you are in control. You make the decision when to pack up and when to move on. Denise Hagedorn, AJØE, and Tom Bishop, KØTLM, have often been faced with the decision to help someone complete a contact when time has expired for their schedule. On one occasion they stayed "too long" in an attempt to complete a contact (unsuccessfully). When they finally got on the road, they were only able to travel a short distance before being too exhausted to go any farther. They stopped at a motel and got rooms for the night. Unfortunately, they had used their credit cards to guarantee rooms at another motel farther down the road. Although they didn't lose a lot of money in the deal, it was nevertheless a bit disconcerting to have to pay to stay in two different places the same night.

The kind of equipment you take depends on how many bands you want to operate. For ease of operation, many operators choose out-of-the-box multiple band radios. There are numerous radios available today. Among the more popular is the IC-706 for its ability to operate on both 6 and 2 meters. The Yaesu FT-726 and FT-736 transceivers are very popular because they offer the ability to operate on more than one band with a flick of the switch. Unfortunately, this benefit is also a drawback. If there's more than one person on your team, operating on one band will keep one of you very busy, while the other operator stands around awaiting a turn at the mic (or key). If you plan to operate more than one band on the air simultaneously, take the necessary equipment.

You'll also need backup equipment. If something fails, you can't just drive home and replace it. Make sure you have extra microphones, extra coaxial cable, and plenty of extra connectors. In your box of spare connectors include mic connectors, coaxial connectors, and phone plugs. Bring all the tools you think you'll need, and then some. What about a soldering iron? RadioShack sells a butane-powered soldering iron for around $30. Don't forget the solder!

Antennas and rotators are a challenge. Some operators, such as Denise and Tom, choose to mount the antennas atop their van. This saves setup and disassembly time. However, this means their vehicle is their rotator. Others, such as Gary and Bob, bring along a tower. It takes longer to put up the antennas, but they're also higher in the air. Still others, such as Ted, W4VHF, and Itice, KB4CSE, Goldthorpe, opt for something in between—assembling their antennas on a single mast and attaching the mast to the van. They use an "armstrong" rotator (you know, your strong arm). Others use an inexpensive TV antenna rotator powered by the generator or an inverter (that's equipped to power a motor). John Lindholm, W1XX, has gone so far as to punch a hole in the top of his van, install a PVC-type fitting, and run the mast down inside the van. When operating, he merely reaches over and "rotates" the antennas from the comfort of the van's interior.

The type of power you run tends to dictate how you'll run your equipment. If you run more than a brick (100 to 150 watts), you'll need either a small gas generator or deep-discharge marine-type batteries. Notice I said *batteries*. Even if you use just a brick, a marine battery is something to consider. It was awfully mortifying to find myself standing by the road holding my jumper cables in the air on Sunday morning during a June contest. Fortunately, I didn't have to answer too many embarrassing questions once a very kind motorist stopped to assist me. Faced with a similar experience in the past, Denise and

Tom have decided to keep the engine running in their van all the time.

How do you keep track of your contacts? You can use a laptop computer. However, most of the people I've talked with who have tried this method have returned to pencil and paper logs. The chief complaint is that the software used isn't versatile enough to accommodate the logging needs of the Rover, and the computer is just one more item that can break. If you go with paper logs, bring plenty of pencils and paper. Have a safe place to stow the logs. Keep containers full of sharpened pencils near the operating positions, because you never know when you'll drop one or break a lead.

How do you keep track of time? If you're going to run meteor schedules, you must have an accurate source of time for the sequencing. You'll need an HF radio and an antenna that will pick up the WWV signal, plus a clock on which you can control the "seconds" setting.

What's the best way to operate CW? The cheapest way is a hand key. However, some operators use keyers that can double as beacons. Still others use a keyboard such as the one MFJ makes. Finally, some use the laptop computer. The choice is up to you. Remember to bring a hand key as a backup. You never know.

What kind of vehicle makes a good Rover station? The most popular seems to be a full-size passenger or panel van. Chip Angle, N6CA, and Wayne Overbeck, N6NB, both have elaborately equipped panel vans for this kind of operation. Jack Henry, N6XQ, uses a passenger van with all of the seats but the driver's and front passenger's removed. Denise and Tom use a conversion van that has been partially modified for camping out. Gary and Bob use a small travel trailer. Ted and Itice use a passenger van, and set the equipment between the two front captain's chairs. Gordon West, WB6NOA, and your author use conversion vans basically as they were modified by the manufacturer. Whatever the vehicle, it's imperative that it be in excellent running condition (down to the tires) for the trip. Your automobile club towing service will never find some of the locations you choose. Also, know how to operate what you are driving. Towing something takes a certain set of skills. Driving something with limited side and rear vision takes another set of skills. If you're driving something with a limited field of vision and towing something else, your work is really cut out for you.

In addition to choosing the type of vehicle you plan to use, you must decide where you're going to stay. This refers back to planning your route. If you stay inside the vehicle, be sure you're protected from the elements. If you choose to stay at a motel, know where to find one once you arrive at your destination.

What about operating while in motion? If you're in a contest, the temptation exists to make as many points as possible. One source of points is FM simplex (if you are near a metropolitan area that supports this type of activity). The other is via 6 meters, if the band is open. During one contest, I operated while traveling from grid locator to grid locator, using the FT-726, a brick and the base mast of a Hustler whip mobile antenna from my car, and the same setup with a 2 meter whip on the van. However, it's safer to have a co-pilot do the operating. Trying to operate contest style and log at the same time can be very distracting, not to mention dangerous. If you choose to operate and drive and find yourself in a pileup, pull over. If you don't, you might find yourself in another type of pileup.

What time of year is the best time for Rovering? Obviously, the best time is when the band is open. This often seems to be during the summer. However, when planning for your trip, make provisions for any kind of weather. You may run into snow in June if you travel through some parts of North America.

Whom will you take on your trip? You may want to go by yourself. However, the long stretches between band openings make for lonely times. If you choose to travel with someone, make sure you are compatible before you go on a long trip. Not only is compatibility important, so is trust. I watched a video tape that showed Jerry, WA8R, and Byron, WA8NJR, walking in front of the pickup that John, WZ8D, was driving very slowly across a rickety old bridge in the middle of nowhere in northern Canada. Trust is knowing that your friends are going to lead you across the right spot. Trust is also knowing that your friend isn't going to run over you.

How many of you should there be on a trip? If you're operating in a contest, all contest rules (as they are written now) state that there may be no more than two operators. However, for the *CQ* contests and (with clarification from Billy Lunt, KR1R, at the League) the ARRL contests, a third person—a non-operator—can go along as a driver. Obviously, if you're not participating in a contest, take along as many of your friends as you can live with at a time!

During the planning stages of your trip, check out your equipment exactly as it is to be used. When he operated from VP5, Chris Patterson, W3CMP, discovered the need for this in a dramatic way. Once at VP5, he found things didn't go together quite as he expected. On your trip you'll find the same thing. Knowing what to expect before you leave can save you from yet another headache when you arrive at your destination.

Probably the most important part of your planning is giving someone your itinerary. Without it, your friends won't know where to look if something happens to you. Your family, not to mention your many friends on the VHF+ frequencies, care about you. They want you to have fun on your trip. However, they also want you to return home—or at least know how to find you if you don't make it back.

What about publicity? The more publicity, the more successful your trip. Nowadays most people are using the VHF reflector as a vehicle for publicizing their Rover plans. If you have enough of a lead time when you have your trip itinerary worked out, let me know and I'll publicize it in this column.

Second Ariane Launch Unsuccessful

The second launch of the Ariane series 5 rocket, which took place late October last year, failed to achieve proper orbital height when an engine in the first stage shut down prematurely. What is significant for the amateur radio community is that the Phase 3D Satellite was scheduled to be on board that flight. However, last-minute design changes required by the European Space Agency forced AMSAT to bow out of its commitment. Even so, AMSAT did furnish a dummy module that replicated the size and weight of the satellite for the payload on this launch.

In a press release from AMSAT News Service, AMSAT-NA President Bill Tynan, W3XO, is quoted as saying that the structural work is now essentially complete and the crew at the Orlando Lab is beginning to re-install electronic modules and other equipment which had to be removed so that the structural work could proceed. Following this, tests will be conducted to confirm satisfactory inter-operability of all of the satellite's various sub-systems and then environmental testing will take place.

Tynan further stated that he doesn't expect any new information concerning a launch date and vehicle for Phase 3D until well after European space authorities determine the root cause of the early engine shutdown that took place on the recent Ariane 502 flight.

Ariane's next qualifying launch was scheduled for May, and the first commercial launch was scheduled for some time in the second half of this year. However, considering the problems encountered with the 502 launch, and the previous failure of 501, it is most likely that these dates will slide considerably. At this point, no one from AMSAT is speculating on a possible launch date for the Phase 3D Satellite.

Last Chance To Work *Mir*?

Late last month U.S. astronaut Andy Thomas, KD5CHF, was scheduled to replace U.S. astronaut David Wolf, KC5VPF. According to NASA, Thomas is to be the last U.S. astronaut to ride onboard the *Mir* Russian space craft. Thomas is scheduled to come home in May when U.S. Space Shuttle *Discovery*, commanded by Charles Precourt, KB5YSQ, will, as part of its final space shuttle/MIR docking mission, retrieve him from the Russian spacecraft. Considering that Wolf was having problems getting on the air after a power outage in November, it is uncertain at this press time as to whether or not Thomas will be on the air during his tour of duty onboard *Mir*.

Space Station to Include Hams Among Crews

The following is from AMSAT News Service: "NASA recently named the first team members to live and work aboard the International Space Station, and four crew members already hold ham tickets. In addition, several of the crew members are studying for their licenses.

"The first crew will consist of American astronaut William M. Shepherd, as the expedition commander. Shepherd is currently studying for his ticket. He'll be accompanied by Russian cosmonauts Yuri Gidzenko and Sergei Krikalev, U5MIR. The crew is training for an early 1999 launch and a planned five-month mission on the ISS.

"The second crew, headed by Russian cosmonaut Yuri Usachev, R3MIR, will include U.S. astronauts Susan Helms, KC7NHZ, and James S. Voss, who has indicated an interest in getting his ham ticket.

"No licensed hams are among the third crew, which will be headed by astronaut Kenneth Bowersox and will include Russian crewmates Vladimir Dezhurov and Mikahil Turin. Bowersox also has said he'd like to get his ham license.

"Russian cosmonaut Yuri Onufrienko will head the fourth crew. U.S. astronauts Carl Walz, KC5TIE, and Daniel Bursch will accompany him.

"AMSAT-NA's VP of Manned Space, Frank Bauer, KA3HDO, reports that the international team developing the ISS ham radio station is now working hard to incorporate a transportable ham station for ISS, and deliver this equipment to the Johnson Space Center in Houston, Texas for flight certification in June 1998. Initially, ISS crews will inhabit the service module, which will include a ham radio antenna, with ham gear scheduled to be delivered aboard the STS-96 shuttle flight. Microsat/repeater payloads are tentatively scheduled to arrive in early 2002, expanding ham radio capability aboard the station."

1997 Leonids Meteor Shower Portends Storm

The activity of the 1997 *Leonids* meteor shower was very high during the peak

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Like a great artist who steps back, reflects, then adds a final brush stroke, we hams at TEN-TEC could not resist a few subtle but powerful refinements to our treasured OMNI-VI. Take a look at this new "OMNI-VI *PLUS*", and judge for yourself how we improved a masterpiece....

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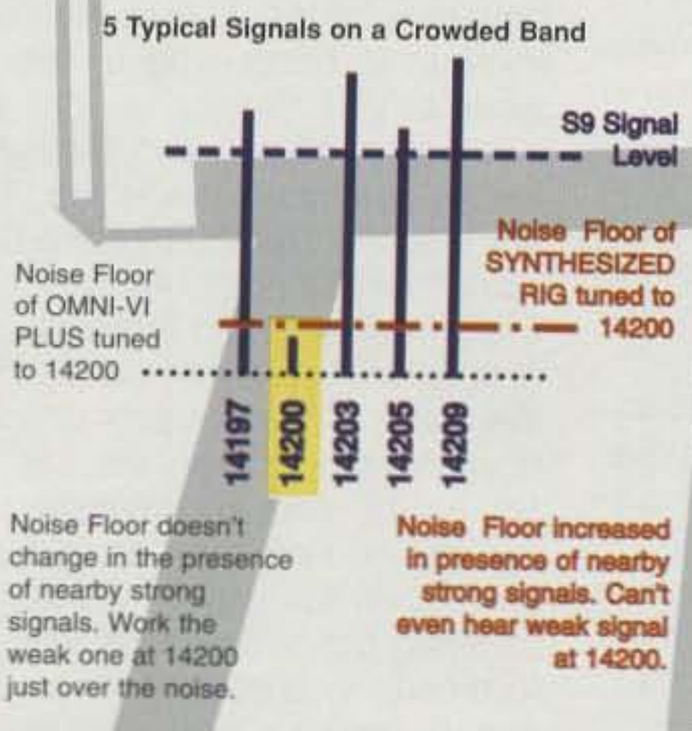
WORK STATIONS OTHER RIGS CAN'T EVEN HEAR

Let's compare OMNI to any competitor's synthesized rig with both tuned to the same frequency.



Phase noise generated *inside* the competitor's rig causes the noise floor to *temporarily* increase, covering weak signals *inside* your passband, especially when strong signals *outside* your passband are within a few KHz of where you'd like to listen. No other transceiver comes close. With this masterpiece in your shack, you'll work stations missed by others.

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period, which seemed to have centered around 1500 UTC on 17 November. Activity reports on the VHF reflector on the Internet indicated that operators were achieving previously unheard of activity. For example, Bert, NS4F, and George, KØFF, both reported working in excess of 20 grids. Jordan, VE2SWL/VE6, reported working W9JN at a distance of 1247 miles.

Among the e-mail I received was this one from George: "I would say my personal peak was from 1050 to 1120 UTC with one or more pings per minute and 9 complete call letters resulting in 7 two-ways. Then it looks like clusters of 1–2 minutes of activity every 10 minutes or so, giving a pretty smooth flow. Worked one station that I copied his call as K'B'5hhn although it may have been K'C'5hhn, my recorder messed up and some of the guys are pretty inexperienced at giving phonetics in a pileup situation; anyhow he was in EM11 and was *mobile*! I heard him on several exchanges, and he definitely said he was mobile, but couldn't confirm his call due to no phonetics and a southern accent (maybe a word to the wise on this to the newbies in an article?).

"Later I took to my own mobile and heard KØGU, K2SMN, and others at a good, solid S-7 on my Squalo/IC-706 but made no two-ways. It will be interesting to pursue this further on a serious basis. In all, I found this a pleasant and *fun* shower, and quite easy to make contacts. Compared to *Perseids*, I feel there was a sharper, more defined peak and that signals, when "in," were much stronger and lasted longer. The expected longer range due to more energetic/higher altitude ionization activity did *not* materialize for me, and distances compared very close to that of the *Perseids*.

"For all practical purposes my shower ended at 1515, but experience told me to wait it out, and sure enough, after 45 minutes of silence, one last Whizzer dropped and gave a beautiful burn to KØGU in DN70, after all the locals had given up and started rag chewing on the calling frequency (a pet peeve of mine).

"Also, immediately after the shower subsided, there was a very good 6 meter opening covering east coast/New Orleans, Canada, and all the way to Nevada—all at the same time! It was as if we were under a 'bubble' and may have to do with residual ionization after the storm. My last M/S QSO was at 1602 and I beat that dead horse for another 45 minutes before switching to 6 meters, where I found a wide-open band that continued until 1820. This would be a good one for a newcomer to get his feet wet on."

Reports like these continue to fuel speculation that this year's shower will be of storm proportions. More on this in a future column.

High-Speed Meteor Scatter Takes Hold

A growing number of meteor jockeys are now trying out High Speed Meteor Shower activity. This type of activity got its start in Europe decades ago and has finally made its way across to our side of the Atlantic. Originally, the operators would send CW at a very high speed for a period of 2.5 minutes and then tape record their listening time, marking places that indicated possible reception. Then during their next transmit time, the tape would be slowed down and these parts would be listened to in order to see if data were received relevant to a possible QSO.

Now, with the inclusion of the computer, the speeds have been increased even higher. Operators are sending CW at a rate of around 800 wpm and using the computer's memory for playback.

For more info on HSMS, check out the web page of Bernie Gapinski, DK3XT/AB7IY, at <http://www.qsl.net/dk3xt/>.

First VA 10 GHz QSO

The following is from an e-mail sent to me by Dave Meier, N4MW: "Today (8 December) I worked WB5LUA (Texas) via moon bounce on 10 GHz. This was my first QSO on 10 GHz EME as well as the first from Virginia on that band/mode. My station uses an 8 foot offset dish and 8 watts."

And Finally . . .

Finally, I am in my last semester of seminary. For the last three years I have been hitting the books very hard, thereby forcing amateur radio way into the background of my life. Even so, having this column to write has helped me keep current in what is happening in the wonderful world of VHF Plus.

I hope to be active in the summer contests, once again as a Rover. To this end, our club the DRIVERS Ham Club, which stands for Daredevil Rovers In Vehicular Experimental Radio Stations, has recently obtained the Vanity callsign WRØVER. We have already been speculating on how we are to sign the call. "Whiskey Rover Squared" and "Whiskey Rover Rover" are two potential candidates for use as a Rover entry in the contests. Look for us trying our best to have some fun in the forthcoming contests. Who knows? We might even try out the call before the contest during a good opening on the VHF Plus amateur bands.

My thanks goes to all of you who continue to keep me informed as to what is happening on the bands. Please continue to keep me in your loop, as this is what makes this, your column, successful.

Until next month . . .

73, Joe, N6CL

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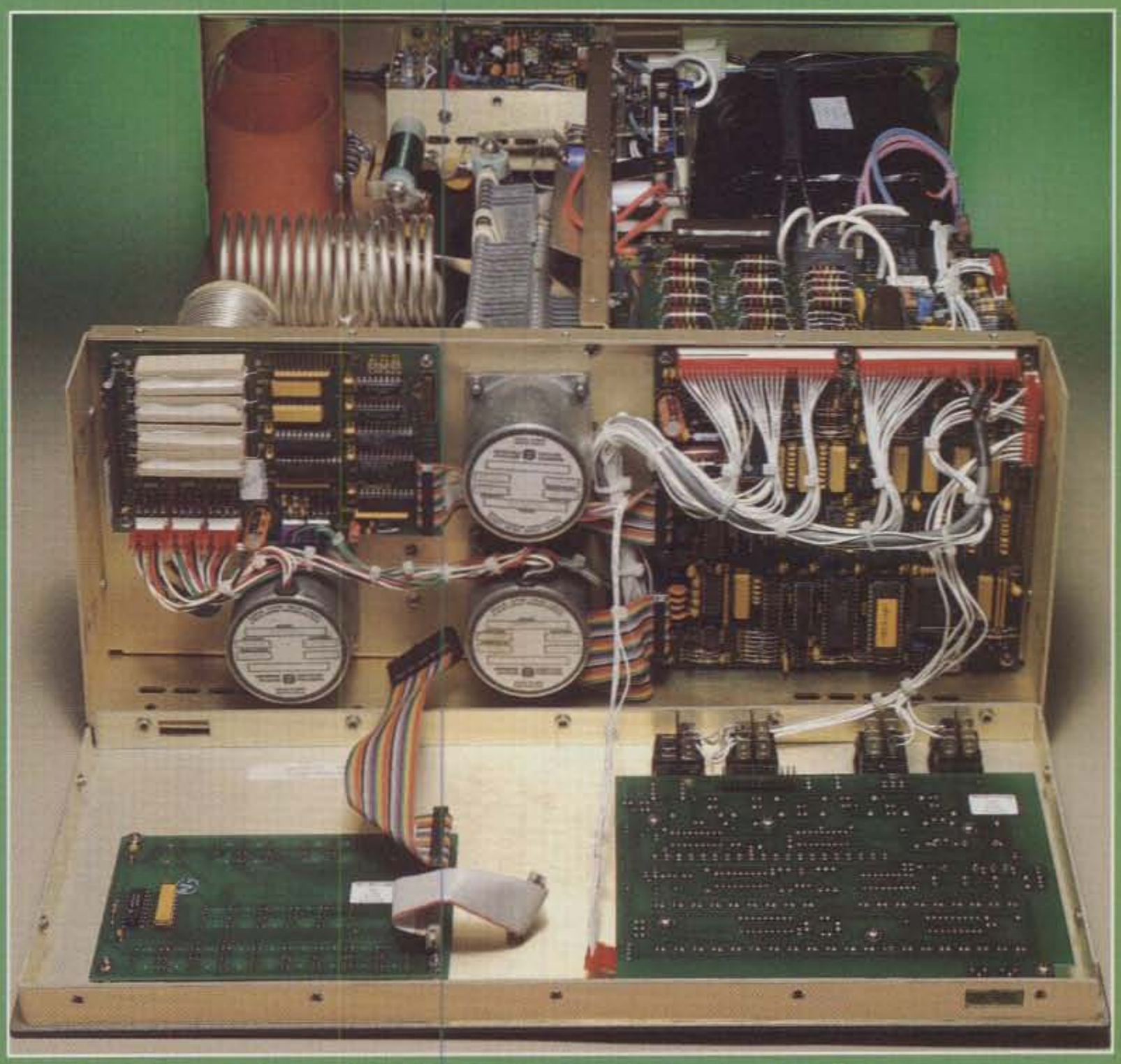
• ***RadCom*** (U.K.) 2/97: "The *87A* really is the ultimate linear amplifier...the 'Rolls Royce' of all linear amplifiers."



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BY IRWIN MATH, WA2NDM

MATH'S NOTES

WHAT'S NEW AND HOW TO USE IT

Moving—One of Life's Better Experiences?

During the latter part of last year we experienced one of life's traumatic experiences: We moved to a new home! Anyone who has done so recently knows exactly what I mean. We had no choice, however, so we did. There is a bright side to all of this, however, and that's what I will try to relate to you this month.

The new home is actually a house that needed a lot of work (an understatement). This meant opening walls, replacing sheetrock, and the usual mess that goes along with it. What it also meant (and this is the good part) was that we had the opportunity to run wires wherever we wished (within reason, of course). Quickly making a plan as to where the shack would be located, we ran three coax lines (one for HF, one for VHF, and one for UHF) up to the attic by drilling access holes through a number of wall and ceiling studs. We also ran a separate 115 volt AC power line (#12 wire) back to the main circuit breaker box so the shack would not be tied into any other circuits. As those of you with a kilowatt know, a 220 volt #10 gauge line is also useful. A 7/8 inch or 1 inch diameter wood boring bit and a variable-speed drill with a 3 inch extension ($3.95 at the hardware store) made this job quite easy. It's amazing how short the coax path actually turned out to be when the walls were open. In addition, alongside the coax we ran some shielded multi-conductor cable for possible rotor and audio/control use. My feeling was that this sort of opportunity would probably not present itself again and I had better have more than enough conductors, even a couple of shielded ones, to try to cover any eventuality that might come up. Incidentally, some heavy-gauge copper wire (#8) was procured from a local scrap dealer and used to install a fairly decent ground lead from the cold-water pipe in the basement to an outside ground rod through the walls as well.

Another feature we added was to provide BNC and UHF feed-through connectors mounted on blank outlet plates which were then screwed to standard electrical outlet boxes in the normal manner. A surplus MS-3106 style multi-point connector and some RCA phone jacks were likewise employed for the multi-conductor cable. The result was a very neat and professional-looking installation—everything hopefully in the correct physical location!

The ultimate accomplishment was to install an emergency lighting system throughout the house. This was accomplished by obtaining a number of the highest output red LEDs we could find and installing a couple of them at the diagonal corners of each room directly through the sheetrock in the ceiling as per fig. 1. A close-fitting hole and bit of joint compound was all that was necessary to achieve a tight and unobtrusive fit. The LEDs were

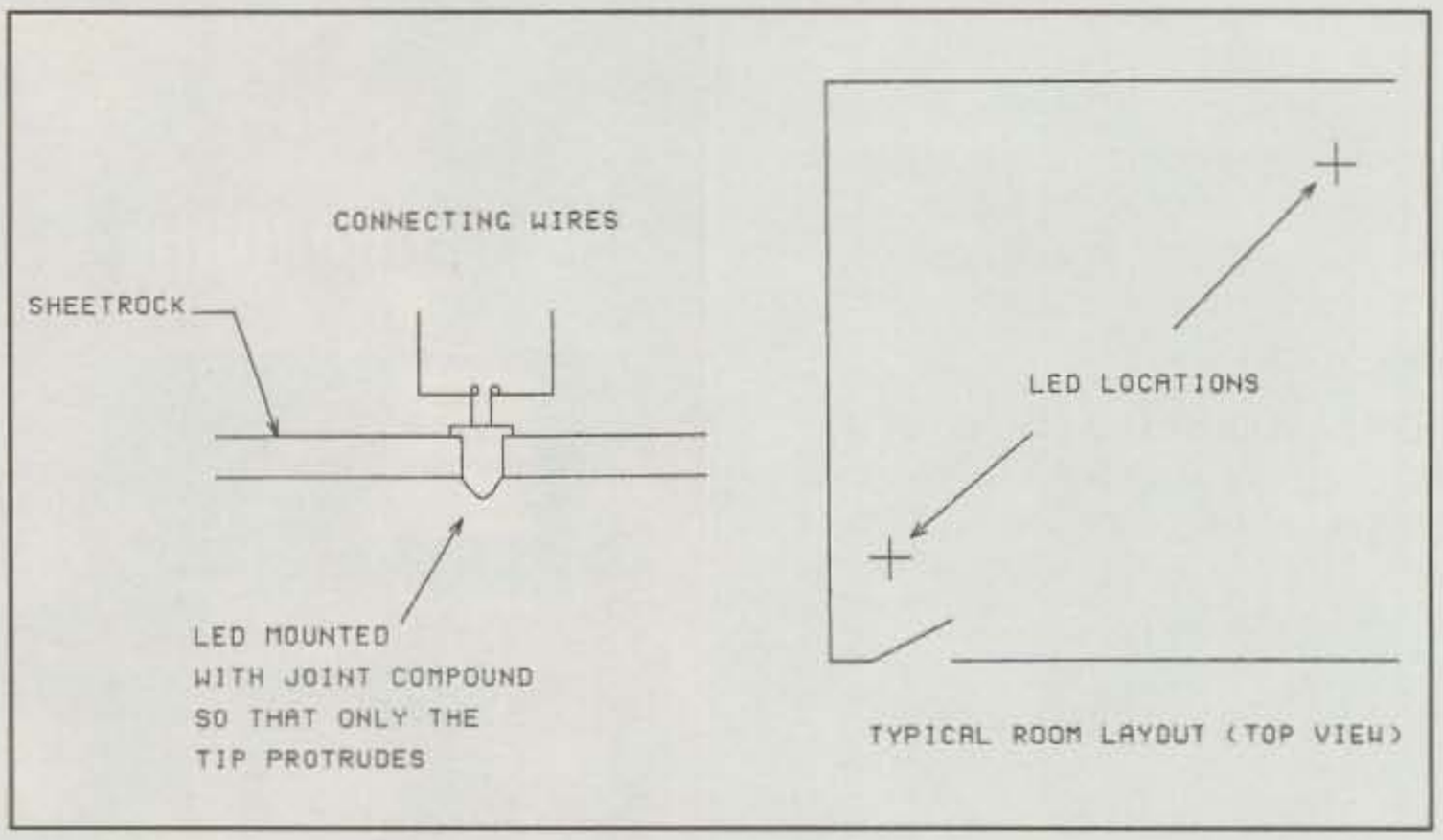

Fig. 1– Suggested installation for emergency LEDs.

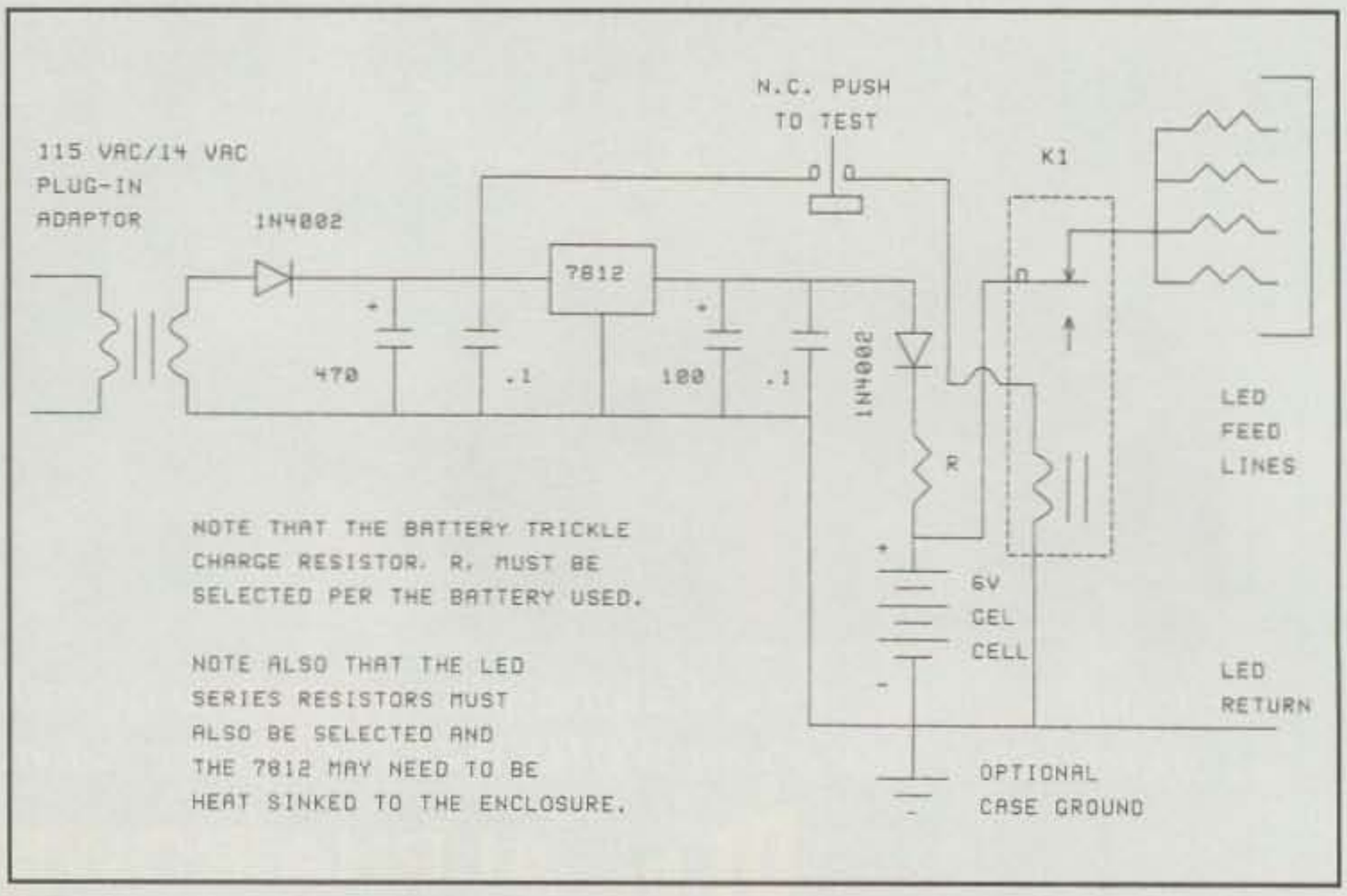

Fig. 2– Schematic of battery backup power supply.

c/o CQ magazine

then wired in series (per room) and connected to the AC line sensor/battery back-up power supply shown in fig. 2. Upon the loss of AC power, K1 drops out and the batteries take over, providing emergency illumination. Although the color is red, there is more than enough light to get around and the battery life is quite good. If you want to see how effective this can be, connect one of these LEDs to a couple of batteries and take it into a dark room.

We wired the LEDs using inexpensive RadioShack ZIP-cord type speaker wire through grooves cut into the sheetrock where necessary. We then re-spackled the grooves. We also ran some of the wire along the ceiling of the room behind some crown molding we had installed. The sensor/power supply was built into a minibox, and a surplus 6 volt 7.2 amp lead acid gel-cell battery was used for prime power. In normal operation the battery is kept trickle charged by R1 through CR1. Note that the value of R1 will have to be chosen to only allow the correct amount of trickle current for the battery being used. This usually works out to about 3 to 5% of the rated discharge current, but check the rating for the battery you plan to use. Too much current will damage the battery and too little will prevent proper charging. Since this type of system is used only rarely (How often does the AC power line in your area fail?), repeated charge-discharge cycles are not a real concern. If you do use a lead-acid battery, be sure to get the totally sealed non-corrosive-fume-generating type.

The value of the series resistor for each LED branch will also have to be chosen so that only about 20 ma flows to assure long life. Now when AC power does fail, K1 drops out, power is applied to the LEDs, and a safe, reasonable illumination level throughout the house is the result. A push-to-test button was included to periodically check on the operation of the system.

I sincerely hope that the above will give you some sort of idea as to what can be accomplished when you think and plan ahead. It is true that open walls present an opportunity, but you do not have to move your family to accomplish this sort of thing. If you live in a ranch house, you have covering each room an entire attic in which to run wires. If your house has a crawl space, you have a lower "level" to run your cabling. If you have neither, consider using crown and baseboard decorative moldings. They will not only make any room look better, they will provide an excellent hiding place for the wires. The possibilities are really only limited by your imagination.

73, Irwin, WA2NDM

BY BUCK ROGERS, K4ABT

PACKET USER'S NOTEBOOK

CONNECTING YOU AND PACKET RADIO IN THE REAL WORLD

Fly A Jet If You Like, But The Railroad is Still Hauling Freight!

Faster, faster . . . and on and on. I remember in the early 1960s when the dooms-day prophets were predicting that railroads would soon be a thing of the past. As a matter of fact, they were saying that within a decade the railroads would give way to the airlines. I got a good laugh out of that one. To this day, I've yet to see a 747 hauling 100 new Fords as part of its cargo.

Coal, oil, construction steel, automobiles . . . and the list goes on. The cargo is radically different—lightweight cargo for the airlines, but the real burden goes via rail. The analogy between the internet and packet radio is not too different. When the telephone lines are down, the rails are still there (and packet radio nodes are still on the hill).

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The Fun is in The Sun

Packet radio took a short breather, and is showing greater strength than ever before. It is revealing a state of real cooperation and camaraderie within the ranks of the System Node Operators (SNOs). Many SNOs who in the past operated nodes and let them die are reviving them and putting them on the keyboard-to-keyboard networks. This is where they can really be put to good use, too. In the face of el nino bad weather, these keyboard-to-keyboard networks are worth their weight in gold—or maybe human life.

True, the voice repeaters are good during all kind of disasters, but the packet radio node can be built and activated for much less money and can be installed in minutes instead of hours or days. The most prominent advantage of a packet message over that of the spoken word (voice) is that packet radio is error-free.

When an Emergency Operations Center (EOC) receives a packet message, it is printed just the same as it was sent. There is no asking the distant "voice" station to "please repeat" because they did not copy. The packet message is complete and unedited as it is sent to the printer, and then (hardcopy) is passed on to the FEMA, Red Cross, physician, or other intended receiver.

Fads and Novelties

For awhile the internet novelty was good and fun. Then the ISPs (internet service providers) began to experience massive server slow-downs due to the millions of users hitting them all at once. Some of the nationwide ISPs had to call a "time-out" due to the overload. Even some bureaucrats (pseudo politicians) jumped on the box and stated how bad the internet had become and made idle threats at some of

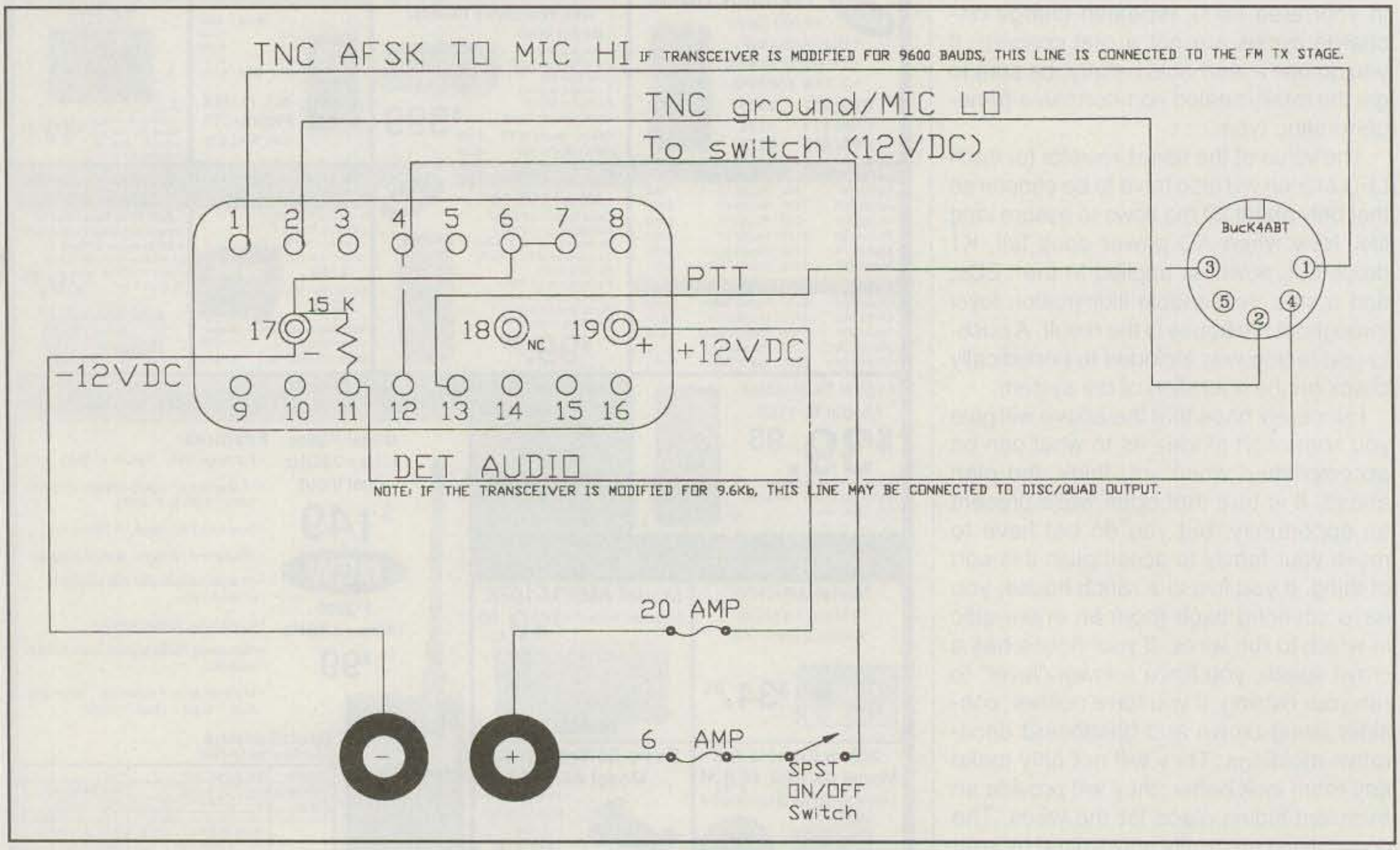


Fig. 1– Only connector J1 is modified for 1200 baud operation. Note the 15,000 ohm resistor between J1 pin 11 and A- pin 17. This transceiver may also be modified for use at 9600 baud (see November 1997 CQ). If the Mitrek runs more than 60 watts output, use a 25 or 30 amp fuse in place of the 20 amp fuse.

the ISPs about their recruiting new users while the present crop of customers couldn't use the system as it was, without adding *more* users to the ISPs.

I just read an article in a well-known PC worldwide magazine that gave a list of the top ISPs. It then gave a list of the slowest ISP. The number one ISP was AOL. Guess who was the slowest! Yup, you got it—AOL. The internet has slowed down, and some ISP owners are afraid that it will only become slower as the masses join the Citizens Band of the '90s.

If you have a problem with what I'm saying, try the internet any day between 7 AM and 9 AM, then again between 10 AM and 1:30 PM. That's just for openers. For the real test, jump on the internet between 5 PM and 11 PM. That's the same as what used to be called television "prime time."

Not long ago a fellow amateur who lives near Charleston, South Carolina was bewildered over the onslaught of the internet and was predicting that the internet would destroy the U.S. Postal Service. Hellooo! A few nights ago I saw a TV network news anchor person interviewing Marvin Runyan, the Post Master General. For the first time in history, he says the U.S. Postal Service made a profit of over a billion dollars (in 1996 and 1997). I think the rumor of Ben Franklin's death is highly exaggerated.

When was the last time you received a two pound *Packet Radio Operator's Manual* from CQ Communications via the internet? The magazine you are now reading came to you via the U.S. Postal Service.

Don't get me wrong. The internet has its place. And now that it is beginning to find its nitch, some decipline has to be developed along with each dose of it. True, it is a useful resource for the student and researcher alike when it comes to probing for up-to-date information. The internet also allows interaction between users via e-mail for immediate resolution. But it has also gained unprecedented notoriety in other "insipid" areas. If as a parent you want to exert dicipline to junior, threaten to move his computer from his bedroom and onto the kitchen table. Or if you just want to perform a short-term diciplinary parody, take the modem away from him (or her) for one 24-hour period.

Have You Looked at The Internet Lately?

Have you seen what your kids are learning (looking at) on the internet lately? And you were afraid that sex education in the schools might go awry. Are you in for a surprise! Maybe you should look at the cache file (this is where most of the "viewed/previewed" files are stored for up to nine days after a website visit) in the NetScape™ browser or whatever browser you have on the PC in the kid's room.

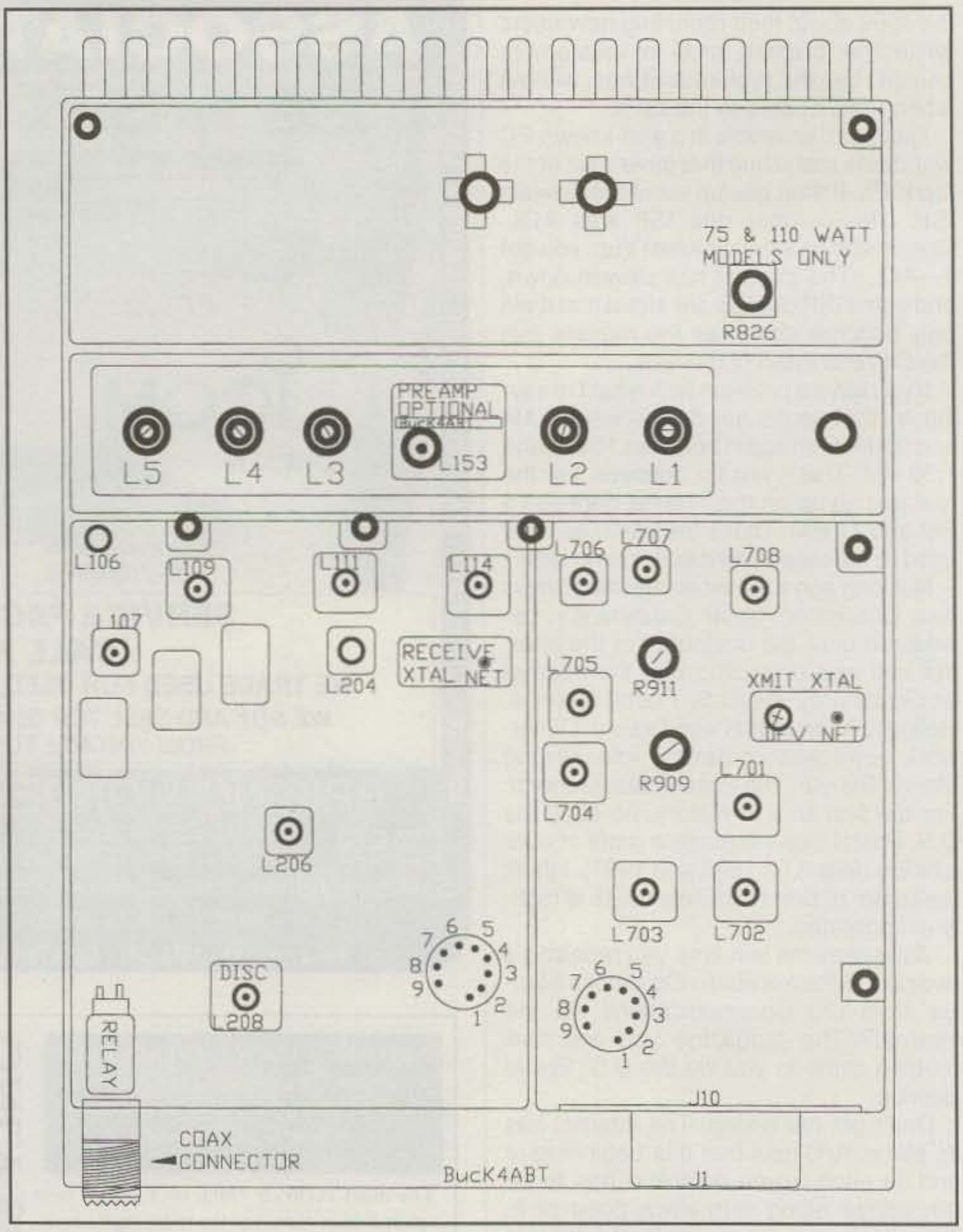


Fig. 2– Once you have the crystals installed into the holders, you can begin tune-up using this diagram.

Now it's time for mom and pop to upgrade their education.

Yes, I continue to maintain my web page, primarily as a packet Radio Networking information source.

My "Homesite"

Lately I have received e-mail from several users of these Packet Radio Networking pages (http://www.sedan.org) stating that they were having problems with some of the downloads from my site. Upon sending a reply to the complaining users, I learned that they were using AOL as an ISP. I'm sorry, but the problem is on the user end.

The Packet Radio Networking site is working overtime lately. I see the number of "hits" moving up daily. This is good, as it is an indicator that more and more users are gathering information about how to use packet radio and how to build packet nodes and networks.

In addition, it gets lots of use from the users who need TNC-to-radio interface cable drawings or an illustration that shows how to change a TNC into a packet radio network node. I try to include a couple of TNC-to-transceiver drawings in this column each month for the new packeteer who is interfacing a packet station for the first time. Later I add the drawing to the SEDAN Packet Radio Networks pages for future reference.

I receive a lot of mail, both U.S. Postal Service and e-mail, asking which HTML editor I use to build my web pages. Well, I ran through the gamut from "hot dogs" to hamburgers. Then one day I was alpha testing an HTML editor HomeSite 1.# written by Nick Bradbury. I beat it to death because it had so many of the features I frequently use in building my web site. I

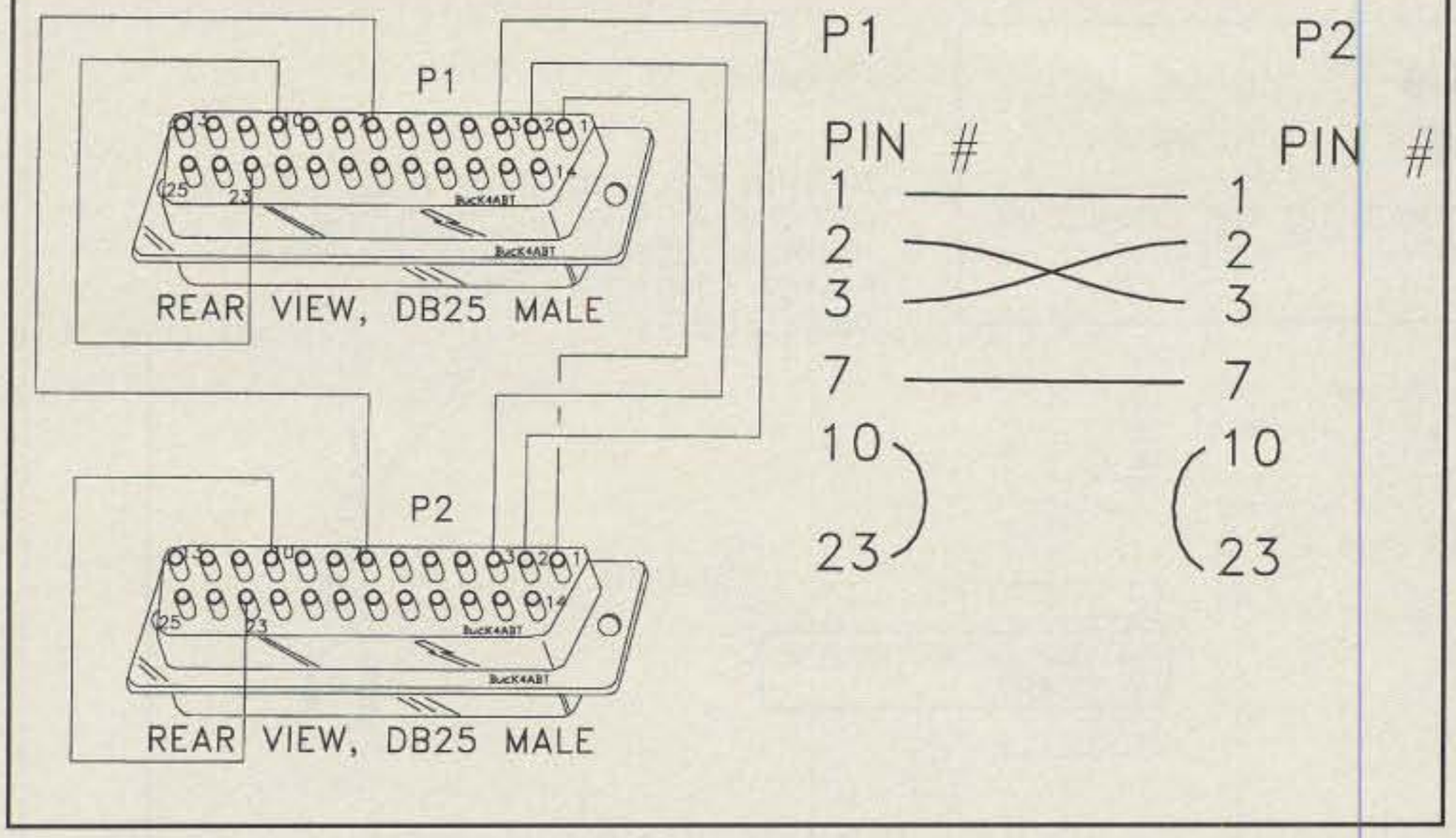


Fig. 3(A)– The cable that I use to interface the transceiver(s) and the TNC are supplied in the box with the MFJ-1270C TNC. It is already equipped with a 5-pin DIN connector that mates with the 5-pin DIN female connector on the TNC. A DB25 interface cable must be made to interface/gateway the two nodes (TNC) together. This (and fig. 3[B]) is the schematic for this interface.

later purchased version 2.5 of the same program. Wow! This time I thought Bradbury had outdone himself until a few weeks ago. A company called "ALLAIRE" had grabbed old "St. Nick" and built an even more user-easy HTML editor 3.0.

Fads Fade, But LANs Live

The trend in packet use has also changed. The new trend is general QSOs and operator-to-operator keyboarding. BBSes have all but disappeared mainly due to the fact that most personal TNCs have an onboard mailbox built in. The LAN users can now connect across the network and directly to another user's mailbox and leave a message.

The one thing that makes the direct mailbox link easy is that at least 85% of all packet LAN users have adopted the mailbox SSID of "dash one" (–1). It is now easy for everyone who wants to connect to another LAN, and into a user mailbox within that LAN, to use the –1 as the mailbox connect call. In other words, if some distant user wishes to connect to my mailbox within the southeastern U.S., all he has to do is connect across the network on 145.770 MHz (much of the 145.770 traffic is automatically routed across the 6 meter, 9600 baud backbone), and when hy reaches a node in my area, he issues a connect request for my mailbox (C K4ABT-1).

It is no longer a task to link to a mailbox on our network 500, 800, or a thousand miles away. Many mornings I check my TNC and see the MAIL LED flashing, indicating that I have mail waiting. John,

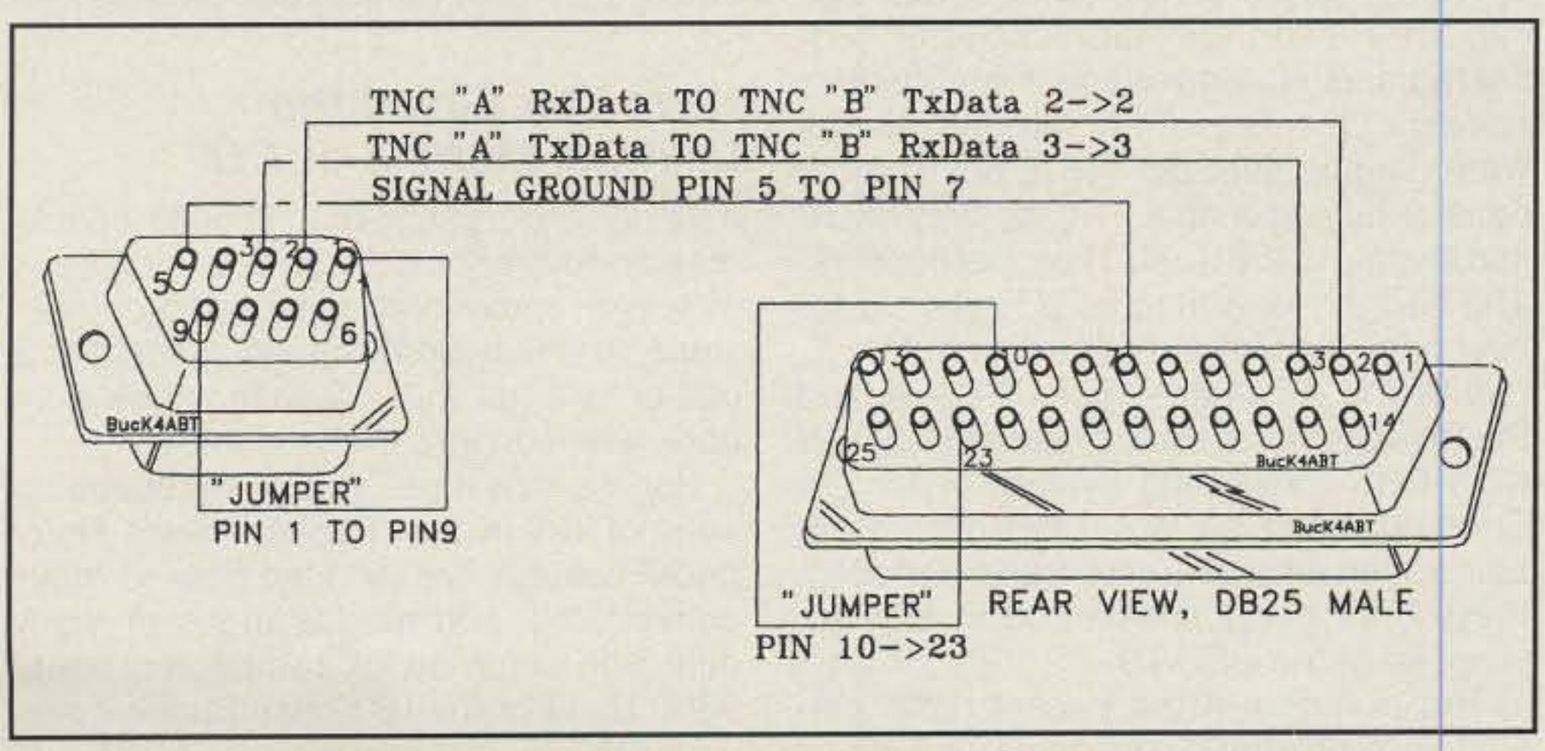


Fig. 3(B)– Some TNC/nodes use 9-pin RS232 ports. This drawing illustrates how the DB25 is configured to the DE9.

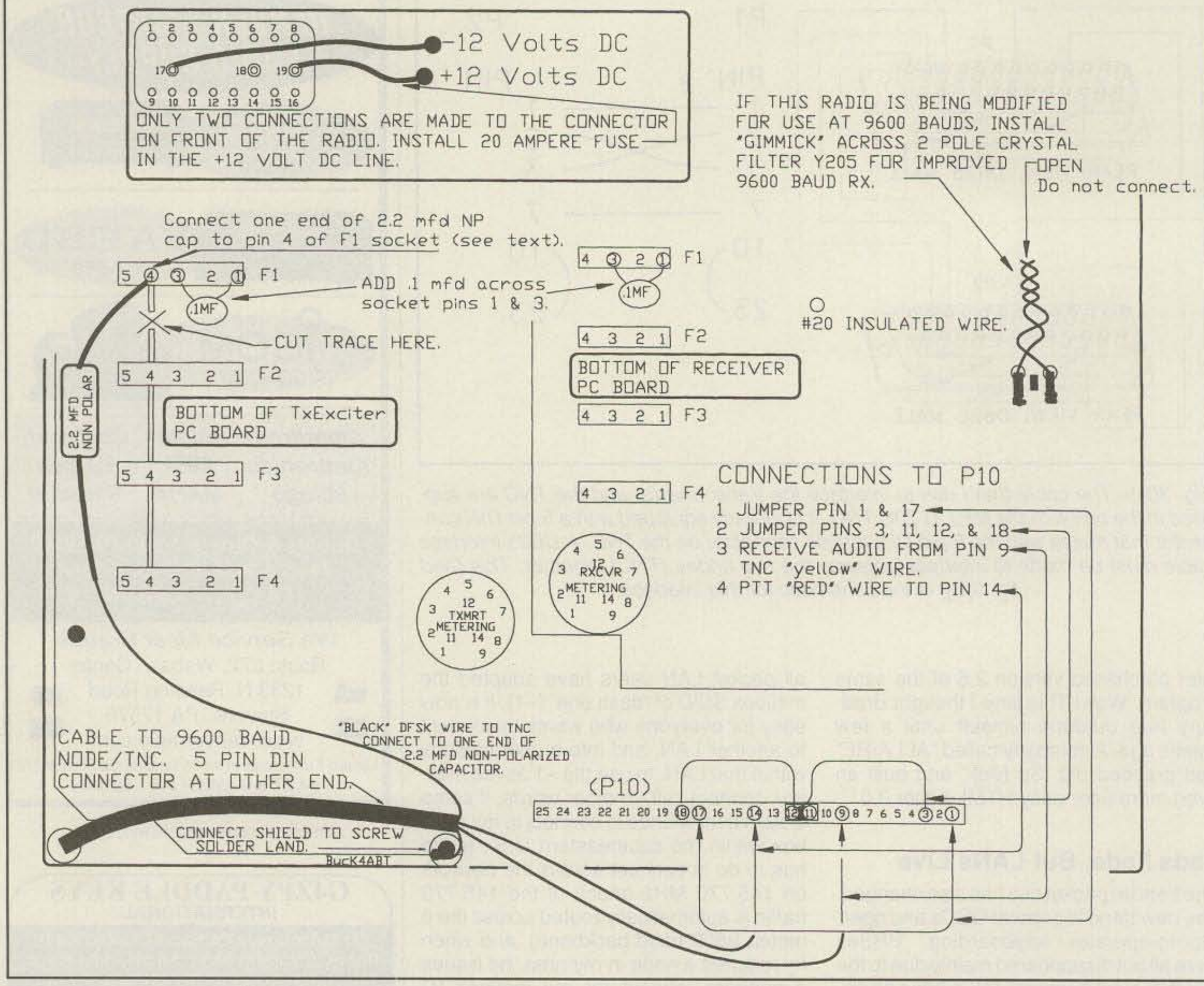


Fig. 4– This figure is for use by the reader who wishes to modify the VHF Mitrek as a 9600 baud radio. Note the .1 µFd caps at F1 pins 1 and 3 are installed in both the 1200 and 9600 baud mods.

KF4RKK, in Selma, Alabama leaves me lots of mail. Dennis, KT4BT, in Lake Martin, Alabama does the same. They are traversing a network of nodes over 1000 miles to my mailbox in central Virginia.

I often leave mail in Frank's (K4ICT-1) mailbox in Macon, Georgia (700 miles as the crow flies from my QTH here in central Virginia, and more than 800 miles as the network goes). What's even more fun are the links that are 300 to 500 miles apart. These are fun because Fred, WA4SWF, and the guys in central Kentucky connect to my mailbox and leave mail sometimes three and four times a day. The link is easy at two and three seconds "ping" time.

The Fun in Packet is Back

The fun in packet radio is back, and packet is "back with a vengeance." This time we are "keyboarding." I like the line I received in a message from one of the SNOs in West Virginia. WR8D "Dud" (I won't go into the reason for that nickname) connected and left a message in my mailbox stating that many of his internet friends were digging their old TNCs out of moth balls or buying a new TNC so they could join the fun on the SEDAN packet network. The SEDAN operates as a keyboard-to-keyboard system in concert with ARES, Sky-Warn, Weather-Watch, RACES, and the Red Cross. We do not use the SEDAN as a BBS forwarding system or for DX Spotting, because when the network is being used for emergency traffic handling, these kinds of activities would impugn the purpose of the SEDAN.

The purpose of the packet radio network is to provide digital communications throughout a large geographic area. The SEDAN is now into eleven of the southeastern United States, where it provides a very strong keyboard-to-keyboard and emergency communications network.

Have You Saved the Last Six Months of *CQ*?

If for no other reason than to build a packet radio reference manual or a scrapbook of packet radio interfaces, radio conversions, and modifications, you should fill a binder with all the *CQ* magazines from back when on into the year 2006.

For the last three years, in several issues of *CQ* in the "Packet User's Notebook" column I've detailed how to make conversions and modifications of many different commercial radios for either 9600 baud or for 1200 baud packet service. These include the GE MVP, the GE/Ericsson Ranger, the Phoenix, the Motorola Mitrek, Motorola Micor, and a

couple of non-commercial types.

Last month we modified the GE (now Ericsson) MASTR EXEC II for use at 1200 bauds. I've been reminded that several other radios also work well at 1200 baud. You asked for radios that are easily modified for packet radio node use, and I've been doing just that. Just so you know, before I write about one of these modifications or radio conversions, I perform the conversion myself. Then I write about it from first-hand experience. No, I did not invent the wheel; I just filed off the rough places so it would roll easier!

A Picture, A Thousand Words

First of all I want to thank the readers who sent me the nice mail complimenting my drawings and illustrations. It is my firm belief that a picture or graphic makes a topic easier to understand than 50 pages of dialogue.

In this month's column we're going to modify the VHF Mitrek for use at 1200 baud packet. This interface is much simpler than the others that I've written about in past columns. The mod is made external to the radio and only to the control cable input connector. You will not need the control head, you will not need a volume control, and you will not need a squelch control. All jumpers and connections are made inside the J1 plug that plugs into the front of the radio. This is all it takes to make it into a "plug-n-play" radio. Thanks to Mike Malta, WA4FRB, for his contribution and help with this mod (see fig. 1).

Once we have the crystals installed into the holders, we then begin the tune-up using fig. 2. More on tuning the receiver and transmitter later.

We will not be using the MFJ-1270CQ Turbo (9600 baud version) as the node. However, we will be using the MFJ-1270C (1200 baud version) as the node. The 1200 baud version is all we will need in this application. As I mentioned above, we will not have a volume or squelch control to contend with. When we finish this month's project, we will have a transceiver and node that have all levels preset and all you will have to do is:

1. Connect the antenna.
2. Connect the transceiver to a 15 to 25 amp, 13 volt DC power source.
3. Plug the pre-wired radio/TNC interface cable into the TNC.

If this node is to be linked to a 9600 baud node to perform as a gateway, configure the 1200 baud node to talk with the 9600 baud node and vice versa. This may be done by allowing the two nodes to recognize one another after about 10 minutes, or by actually connecting to the node(s) and setting (locking) them to each other using the route locking procedure. You must use the umbilical interface shown in the drawing(s) at figs. 3(A) and 3(B).

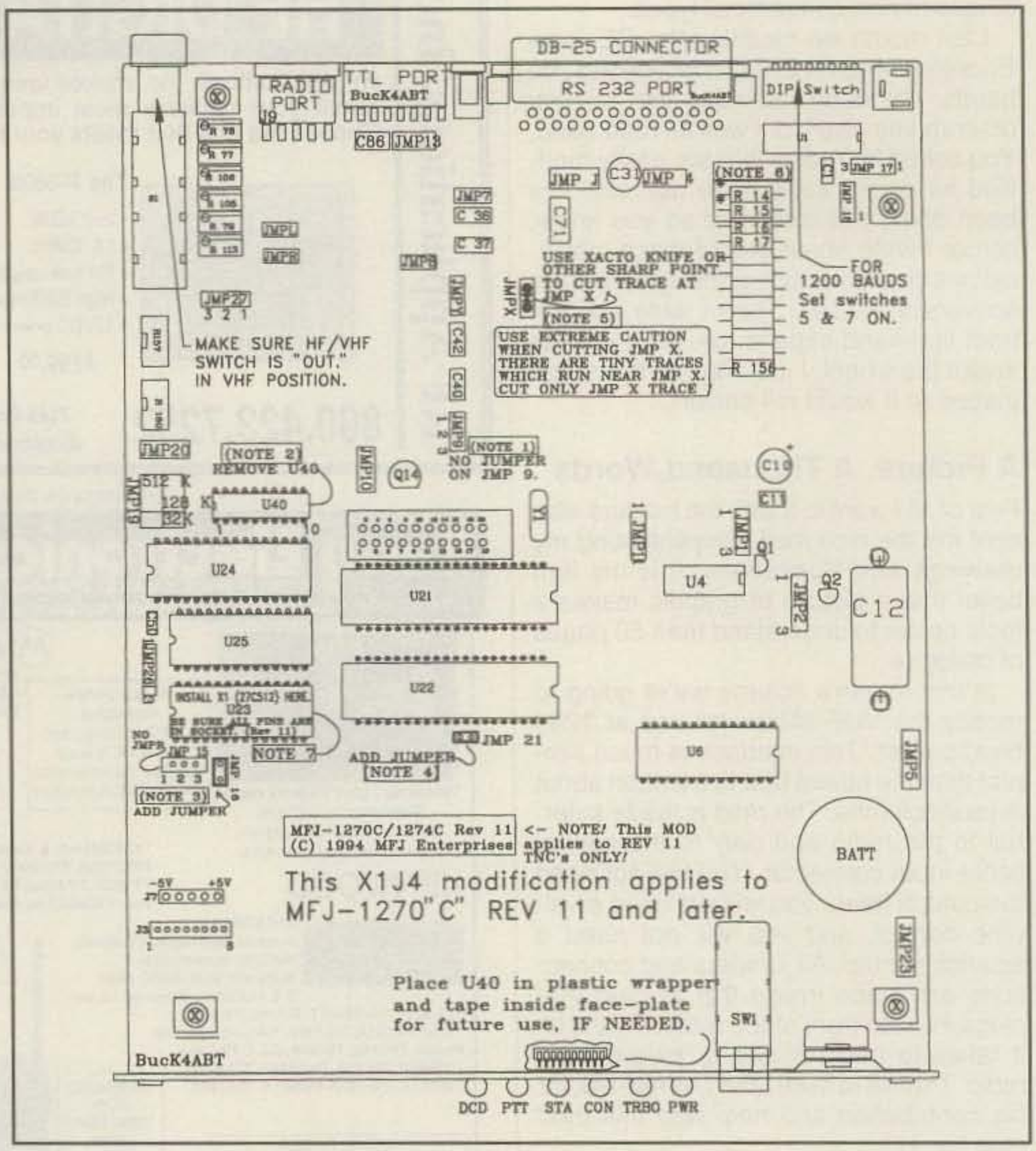


Fig. 5– Note that TNC/node models vary. Therefore, if it is an early model (prior to 1989 "B" models), additional TNC mods may be required. The TNC shown here is the current MFJ-1270"C" revision 11. Setup and configuration are shown in the November and December 1997 issues of CQ in the "Packet User's Notebook."

If you intend to operate the node as a standalone 1200 baud node, then skip the next section, "Configuration Examples."

Configuration Examples

So that we understand what is involved in locking the 1200 and 9600 baud nodes as a gateway, let's call the 1200 baud node K4ABT-7 (alias SEVEN) and the 9600 baud node K4ABT-9 (alias 9600). The format for locking routes within a node is:

[ROUTE] [port] [call/SSID] [+] [quality of the locked route]

Once I have the nodes interfaced via the RS232 ports (using the umbilical shown at fig. 3), I then connect to node "SEVEN," using the password, enter the sysop command mode, and configure it as follows:

R 1 K4ABT-9 + 255

Node "SEVEN" is the 1200 baud node. Notice that we locked the ROUTE via port "1" (RS232 port) of node K4ABT-9 (9600).

Next we connect to node "9600" (the 9600 baud node, K4ABT-9), and using the password, we enter the sysop command mode and lock the path via the RS232 port to the 1200 baud port:

R 1 K4ABT-7 + 255

For neighbor nodes that are heard via the radio port of the 9600 baud nodes, we lock as follows:

R 0 (neighbor node) + 224

Here we used R 0 (zero) to designate the "radio port" for the node. It is always good if the SNOs of neighbor nodes cooperate to lock paths to each other at the same number. This establishes consistency and the network continuity.

The Umbilical

The cable that I use to interface the trans-

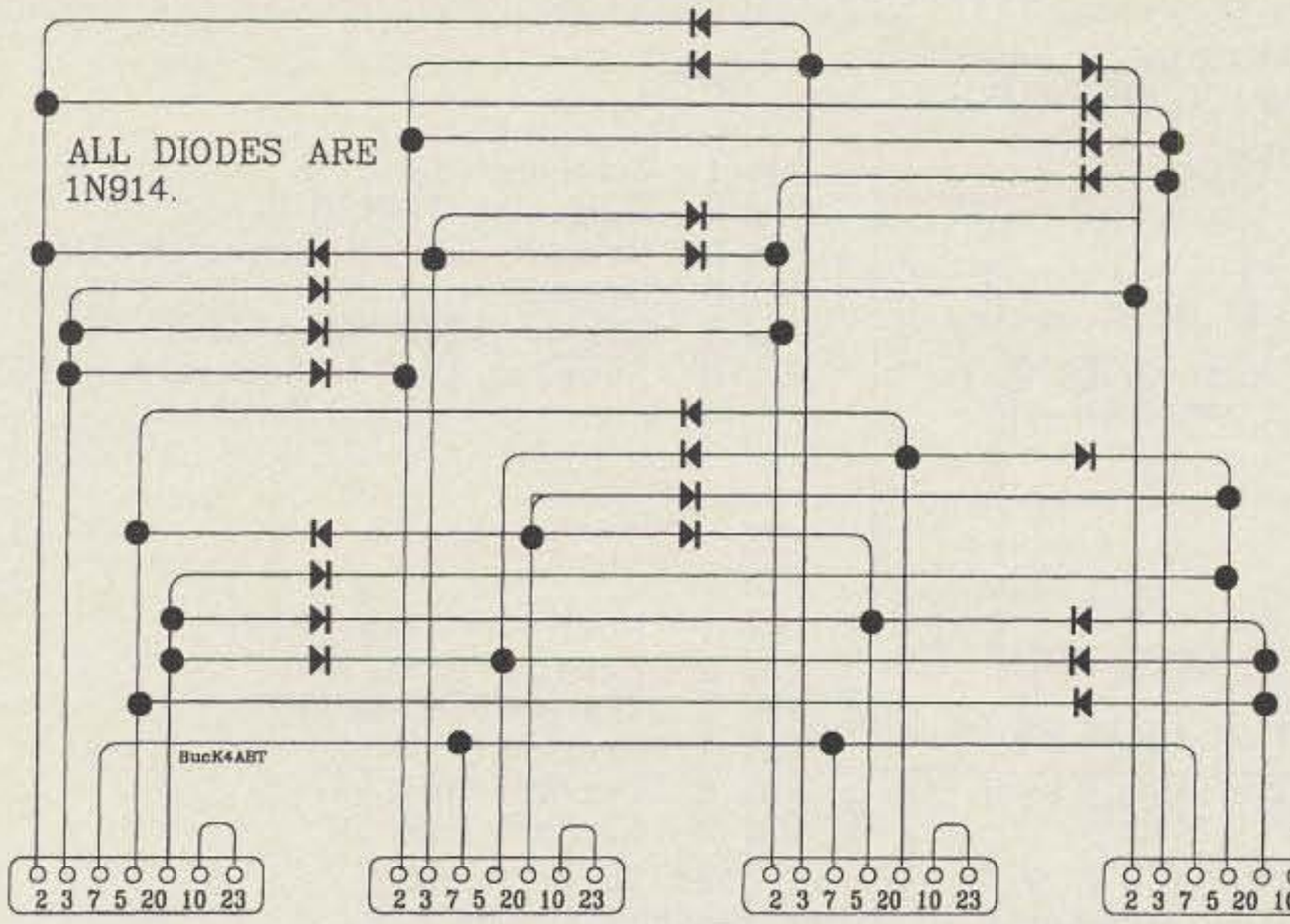


Fig. 6– When more than two X-1 nodes are linked to gateway from band to band, pr from 1200 to 9600 bauds, use this diode matrix to interface the RS232 ports together. An unused port will not affect other ports that are in use.

ceiver(s) and the TNC is supplied in the box with the MFJ-1270C TNC. It is already equipped with a 5-pin DIN connector that mates with the 5-pin DIN female connector on the TNC. A DB25 interface cable must be made to interface/gateway the two nodes (TNC) together. The schematic/drawing for this interface is shown in figs. 3(A) and 3(B).

Let me explain the "3(B)" part. Some TNC/nodes are made from the DRSI or PacComm Tiny 2. These TNC/nodes have 9-pin (DE9) RS232 connectors. Therefore, we may have to use an umbilical interface

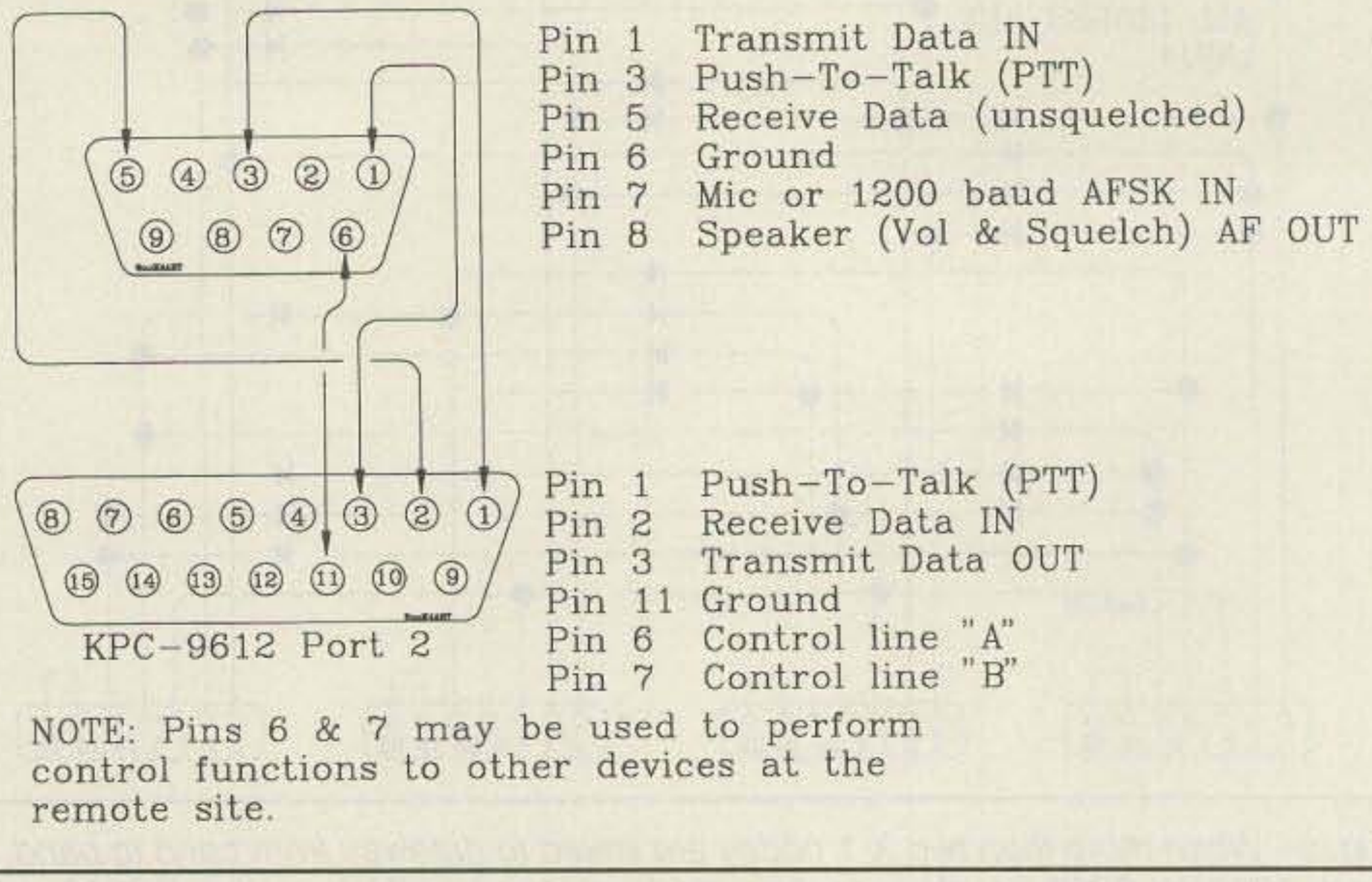


Fig. 7– Interfacing the Kantronics D-410 Data Transceiver to the Kantronics KPC-9612 Packet Controller.

cable with dissimilar connectors at each end. This is where the cable configuration at figure 3(B) comes into play.

One caveat: If you are using the DRSI TNC, don't forget to set jumper JP9 to the correct address (jumper both pins) so the node will communicate over the 232 lines or via a diode matrix (see fig. 6).

Let's Get Busy

Unless you need the Mitrek manual to tune the radio, you will not need it for the mod we are about to make.

Note: If your Mitrek has the "tone-board," remove it and toss it away! The tone board is a piggy-back PCB about 3 by 5 inches found in the near-left corner area (viewed front of the radio facing you), top of unit (component side).

Just A Couple of Rocks

Whoops, speaking of crystals, we must have the crystals on hand to make this combo work. I have provided two sources of crystals here. Their mention herein is in alphabetical order only. I do not endorse either one of these crystal vendors over the other.

Bomar Crystals, 201 Blackford Avenue, Middlesex, NJ 08846 (phone 732-356-7787; fax 732-356-7362; toll-free 800-526-3935; toll-free fax 800-777-2197; ask for Audrey Heyder). I confirmed the cost for each crystal, and Ms. Heyder stated they were $10 per crystal, or $20 per set. Be sure to specify that the crystals are for the Motorola VHF Mitrek. Audrey will have the information for the Mitrek in the Bomar database.

Another source of crystals is JAN Crystals, 2341 Crystal Drive, P.O. Box 60017, Ft. Myers, FL 33906-6017 (crystal order line 800-JAN-XTAL [800-526-9825]; phone 941-936-2397; fax 941-936-3750; ask for Sue Brick). When ordering the crystals from JAN Crystals, be sure to let Sue know that the radio is the Motorola VHF Mitrek. It is always good to give her the model number of the radio. You should provide her with the transmit and receive frequency on which the radio will be operating at VHF (144 to 148 MHz). Sue has the rest of the Mitrek information in a database at JAN Crystals. The crystals from JAN Crystals are $15 each. You will need a transmit and a receive crystal; therefore the set will cost $30 plus the cost of shipping. I received my crystals in about two weeks, and the priority postage was $3.

Installing The Rocks

When installing the crystals into the element, note that the transmit and receive elements are different. *Do not* interchange them in the radio (kind of hard to do, but given a big enough hammer . . .). It is also important that you install the transmit crystal into the transmit element and the receive crystal into the receive element. Weird things happen if you make the mistake of switching the rocks!

When soldering the crystals into the element, *do not* overheat the wire leads of the crystal(s). Bend the crystal leads and seat the crystal into position before finally soldering the leads in place. Using the frequency counter and/or the centering meter, set (net) the radio to the center of your transmit frequency (see fig. 4).

In all the VHF Mitreks that I've converted, I've found that very little alignment of the RF and IF stages is required. If you

are uneasy as to how to align the RF stages, then apply an on-frequency signal to the coax connector (input) and send enough signal into the radio to detect your (modulated tone) signal. I modulate the signal with a 1000 Hz tone at 3 kHz deviation until I have found the signal. Then as I get enough signal to do the rest of the setup, I remove the tone and use only the RF signal from the IFR 1200 S. I may apply a 1200 or 1500 Hz tone while setting the discriminator. This is your option, or better yet, follow the procedure in the manual for the Mitrek.

If you've not done so already, be sure to "net" (warp) the receive crystal to frequency as soon as you have signal through the radio. A meter set to read AF level helps, or you can use the test points (J 1001 appears similar to a 9-pin tube socket) provided in the receive section of the radio.

Pin 1 is from the detector (R222). "A point to read signal level (output)."

Pin 2 is from the audio pre-amp (R234). "This could be a point to look at the discriminator output."

Pin 3 is from the "extender" if your Mitrek is so equipped.

Now, if all else fails, use the alignment procedure in the Mitrek manual.

Tuning The Transmitter And Setting The Levels

After you tune the coils in the transmitter exciter section L701, L702, L703, L704, L705, L706, L707, and L708, be sure to go back and warp (net) the crystal to center the operating frequency—again. If you are as picky as I am, you may want to measure the exciter power output. A meter set to read RF level helps, or you can use your VOM to read the test points at J1002 (appears similar to a 9-pin tube socket) provided in the transmit section of the radio.

Pin 1 & 2 are GROUND.
Pin 3 is from the "exciter" buffer output.
Pin 9 is the Push-To-Talk line.

Again, when all else fails, use the alignment procedure in the Mitrek manual.

If you have already installed the X-1J4 EPROM, then set MODE number 6 to 120 for the TXDelay period. After you have the transmit deviation set to 3 or 3.5 kHz, reset the MODE number 6 back to 35 (or for 350 milliseconds).

One other note: In some older Mitreks, spurious emissions (RF) may be detected. To reduce RF leakage from the local oscillators in the Mitrek (on the PC board solder side), add a .1 µFd ceramic cap from pin 1 to pin 3 of the transmit crystal element. Referring again to fig. 4, do the same to the receive crystal socket.

Some Final Words To The Wise

If you are already stacking your nodes and about to add the third or fourth port to your stack, you may be interested in the diode matrix at fig. 6. Then again, you may wish to skip the hassle of stuffing 24 diodes in tiny perf-board holes and contact Amateur Networking Supply for their 6-port node stacking kit. I call it the "Slack-Stack." The address and number for Amateur Networking Supply is P.O. Box 219, Montvale, NJ 07645 (phone 201-722-0144).

The drawings at figs. 7 and 8 are for your "Packet User's Notebook" radio-to-TNC interface collection.

Happy New Year! Visit the SEDAN internet WebSite at <http://www.sedan.org>. Packet radio is fun again!

73 de BucK4ABT
e-mail: <k4abt@inmind.com>

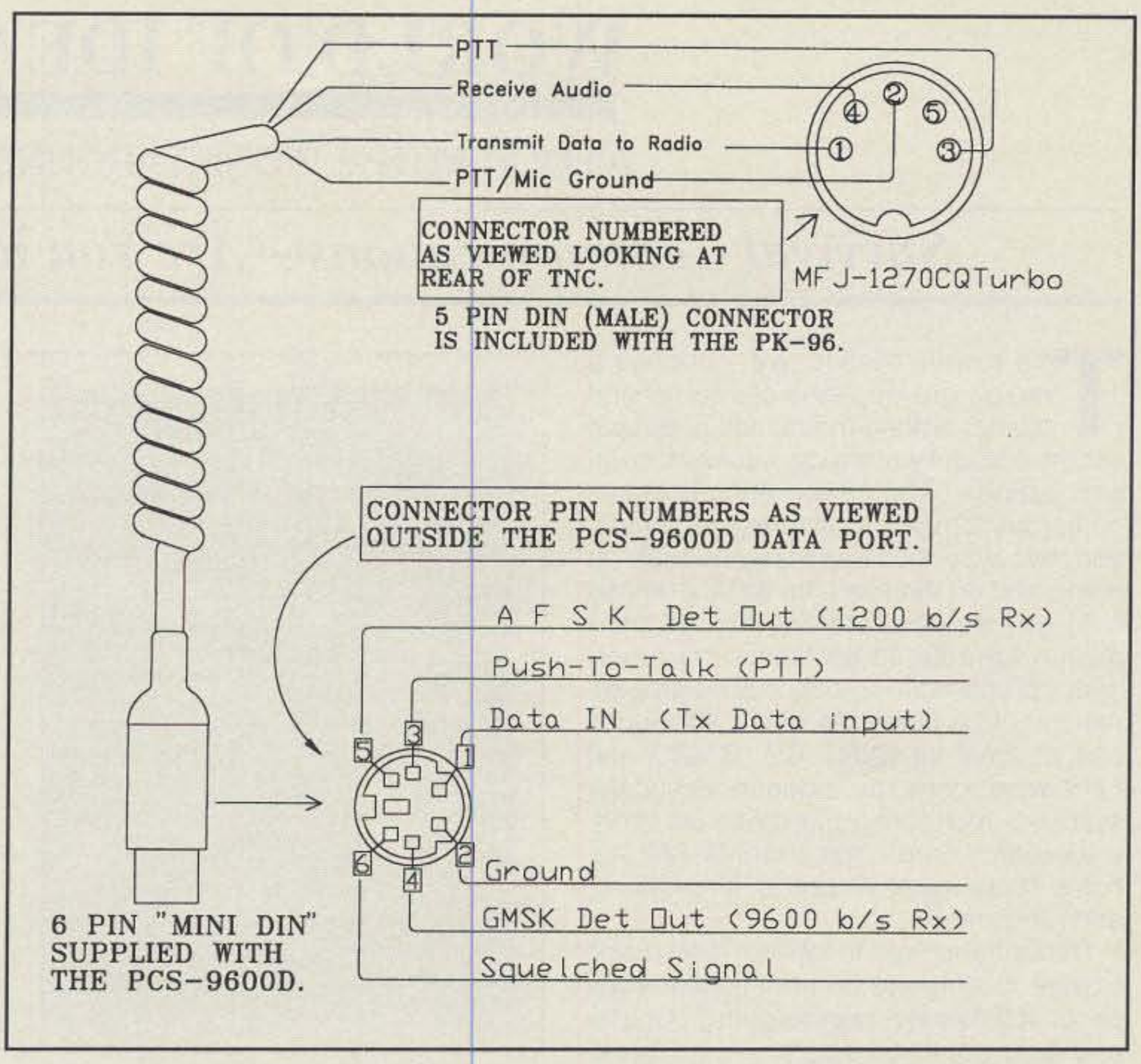


Fig. 8– The Azden PCS-9600 UHF transceiver interfaced to the MFJ-1270"CQ" Turbo, 9600 baud TNC. An ideal combo for the serious-minded 9600 baud packet operator.

BY DAVE INGRAM, K4TWJ

WORLD OF IDEAS

A LOOK AT THE WORLD AROUND US

Survival Communications—Are You Really Prepared?

This month, friends, we introduce a rapidly growing area of interest and pursuit among thousands of people nationwide and worldwide—survival communications. This area encompasses numerous forms of monitoring, scanning, and two-way communications both at home and on the road. Its basic purpose is to acquire accurate and factual information for safe coexistence and emergency preparedness to face abnormal situations of all types. As such, it includes use of amateur radio, CB, GMRS and FRS, weather radios, independent power systems, monitoring international shortwave bands and clear-channel AM stations, scanning VHF and UHF services, and much more.

Understand my following discussion relates to only the communications aspects of survival and emergency pursuits and does not involve paramilitary, quasi-guerilla, or covert-type operations. It simply presents some general communications information beneficial to all folks.

As radio amateurs, most of us have a head-start advantage. We have much of the equipment and operating know-how to communicate and exchange accurate information during times of need. Our resources are of limited benefit, however, if we do not know precisely what frequencies or channels to operate or monitor during a particular situation—and practice using them before they are needed. Bearing those thoughts in mind, I have included a variety of "getting started" frequency guides and notes in this month's column for your assistance.

Monitoring International And National Affairs

Initial reports of threatening situations in distant lands usually reach us by conventional means such as newspapers, television, and AM/FM radio. Such reports are often biased, and separating fact from fiction can be quite challenging. Is there an alternate solution? Yes, indeed! Almost every country supports an international broadcast station serving as their voice to the world on shortwaves. Some familiar examples are Radio Kuwait, Radio Sweden, HCJB (Ecuador), Deutsche Welle (Germany), and Radio Australia. Tuning in their news broadcasts gives us "direct from the source" insight on world affairs; however, we must again separate facts from propaganda. This can be accomplished by monitoring broadcasts from stations in several countries rather than a single country, then comparing reports with those from an unbiased "third party" station in a neutral country. Shortwave broadcast stations transmit on international bands such as 60, 49, and 31 meters, and they shift frequencies each hour (fig. 2). Two reliable sources of station/frequency lists are CQ Communications' *Popular Communications* magazine and Bob Grove's *Monitoring Times.* Additionally, both publications include up-to-date frequency lists used by military, government, and underworld stations on a regular basis.

4941 Scenic View Dr., Birmingham, AL 35210

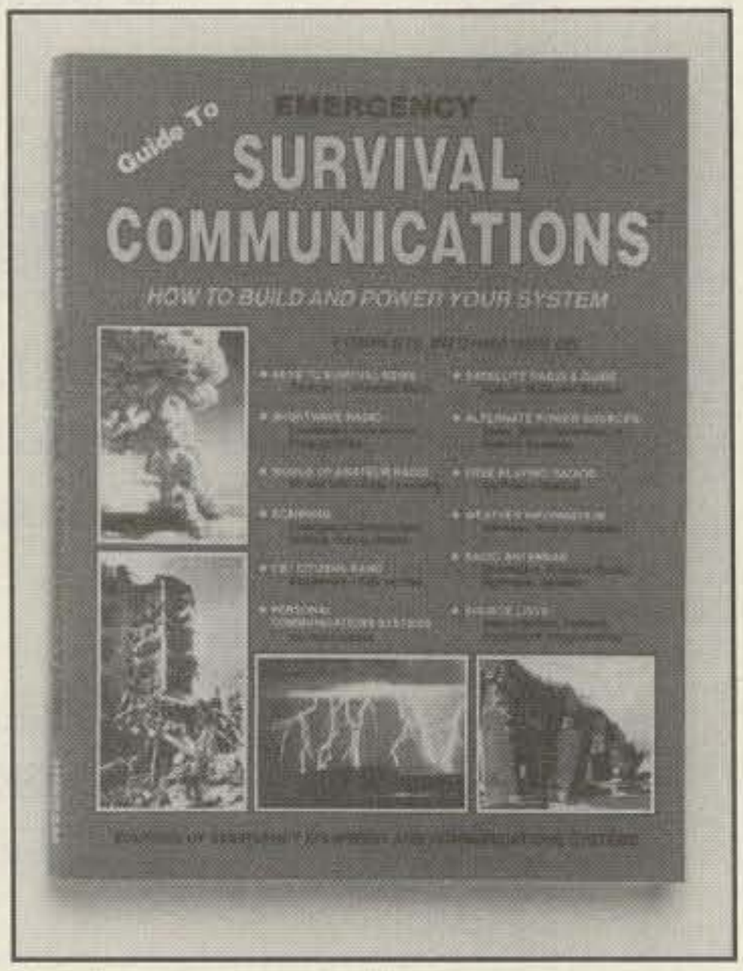


Fig. 1– Want to learn more about survival communications? My new book Guide to Survival Communications *covers the complete field with details on all types of equipment, alternate energy systems, frequency guides, getting started info, and more. (Details in text.)*

Frequency (kHz)	Frequency (MHz)	Meter Band
2300–2500	2.3–2.5	120
3200–3400	3.2–3.4	90
4600–5100	4.6–5.1	60
5950–6200	5.95–6.2	49
7100–7300	7.1–7.3	41
9500–9900	9.5–9.9	31
11650–12050	11.65–12.05	25
13600–13800	13.6–13.8	22
15100–15600	15.1–15.6	19
17550–17900	17.5–17.9	16
21450–21850	21.45–21.85	13

Fig. 2– Popularly used international shortwave broadcast band stations in all countries of the world transmit news and cultural information in the above listed frequency ranges.

Full-coverage amateur radio transceivers are good for SWLing. However, a separate receiver frees the main rig for monitoring amateur band activities and communicating with other stations during abnormal situations. High-grade shortwave receivers are made by companies such as R. L. Drake, Kenwood, Yaesu, ICOM, and Grundig (fig. 3). Prime features to consider include wide selectivity for AM operation, narrow filters for SSB and CW use with a QRP transmitter for emergencies, and ability to use AC or battery power.

Most HF operators are familiar with techniques for acquiring information on national events or situations; we monitor emergency nets on 75, 40 and 20 meters, and stations reporting from related areas. VHF/UHF-confined amateurs, however, rely on reports relayed on local repeaters. Alternate sources of information available to both groups are clear-channel stations transmitting 24 hours a day on the AM broadcast band. A sampling of these stations, selected for their reliability and large coverage area, is shown in fig. 4. In addition to stereo AM, new developments include stations transmitting their call letters and/or QTH, plus names of aired songs and their artists. That information, in turn, is displayed on readouts in new style receivers. Unofficially, I understand this feature may soon be available in car radios. too.

Addressing Local Area Needs

Inclement weather situations have made us vividly aware of the role weather radios, handheld FM transceivers, and VHF/UHF emergency nets play in our daily lives. Additionally, the National Oceanic and Atmospheric Administrations's network of almost 400 NOAA weather stations located in all states serves 80 to 90 percent of our population with up-to-the-minute information on storms. NOAA's seven VHF weather channels are listed in fig. 5.

Fig. 3– A stand-alone shortwave receiver such as this R. L. Drake SW-8 is ideal for monitoring international shortwave broadcasts. Inclusion of SSB and CW operation also permits monitoring amateur band activities and/or portable/field use with a pocket QRP transmitter during emergency situations. (Photo courtesy R. L. Drake Company)

Freq. (kHz)	Station Call Letters	Location
650	WSM	Nashville, TN
680	WRKO	Boston, MA
700	WLW	Cincinnati, OH
720	WGN	Chicago, IL
740	KCBS	San Francisco, CA
750	WSB	Atlanta, GA
770	WABC	New York, NY
870	WWL	New Orleans, LA
890	WSL	Chicago, IL
1000	KOMO	Seattle, WA
1040	WHO	Des Moines, IA
1080	KRDL	Dallas, TX
1170	WWVA	Wheeling, WV
1170	KVOO	Tulsa, OK
1180	Radio Marti	Marathon Key, FL
1520	KOMA	Oklahoma City, OK

Fig. 4– Condensed list of clear-channel AM broadcast stations with nationwide coverage. (Discussion in text.)

(1) 162.550 MHz
(2) 162.400 MHz
(3) 162.475 MHz
(4) 162.425 MHz
(5) 162.450 MHz
(6) 162.500 MHz
(7) 162.525 MHz

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service

Fig. 5– Primary frequencies used by NOAA Weather Service. Almost 400 stations coast to coast transmit continuous weather information on these channels.

Numerous other activities covering everything from border patrols and FBI to railroads and the secret service are conducted within VHF and UHF ranges. A condensed listing of services and frequencies is shown in fig. 6. More exact frequency listings are found in my new *Survival Communications* book, scanner guides, and *Popular Communications*. I delve into greater details and more areas, however, in my new book *Guide to Survival Communications*, which has just been published. Copies are available for $20 plus $4 for Priority Mail shipping from Universal Electronics, Inc., 4555 Groves Rd. Suite 12, Columbus, OH 43232 (telephone 1-800-241-8171). Quite often 2 meter and 70 cm operators compare frequency lists of local services in the VHF/UHF range. Check around: If a list is available in your area, it can sidestep a lot of "digging."

If your FM handheld is capable of extended/out-of-band reception, it may serve double duty for monitoring NOAA weather stations plus local law enforcement agencies, etc. Alternately, a wide-range scanner is a wise investment. Recently proposed congressional rulings and restrictions may soon result in limited receiver coverage for all VHF/UHF transceivers. Getting everything in one palm-size unit may prove difficult, and older units with wide coverage may be snapped up like hotcakes. Scanners are also under intense scrutinization, and the results may challenge our ability to monitor various agencies during municipal conflicts, riots, unexpected long-term power outages, wildfires, transportation disasters, and more (fig. 7). The prime factors to consider in handheld VHF/UHF units are size and portability, frequency coverage, scanning speed, number of memories, and the ability to interface with external power

Alcohol, Tobacco, Firearms
165–168 MHz (ATF)
406–420 MHz

Ambulance
155.0–155.5 MHz
462–468 MHz

Aircraft
118–128 MHz (Air Traffic Control)
123.5–123.7 (arrival & departure)
Note: Above aircraft use AM mode

Border Patrol
408–417 MHz

Business Bands
150–162 MHz
461–465 MHz
502–512 MHz
851–853 MHz

Cellular Phones
870–896 MHz
Note: Commercial aircraft cell phones use 894–896 MHz range.

Cordless (home) Phones
46.6–49.9 MHz (older models)
900–902 MHz (newer models)

FBI
162–167 MHz

Federal Emergency Management Agency (FEMA)
166.2–170.2 MHz
Also 138.225, 141.725, 408.40, 410.48, 413.21, 417.66, and 417.05 MHz

Fire
154.0–154.5 MHz
451–454 MHz

General Mobile Radio Service (GMRS)
462.5–467.7 MHz

Maritime—Near Shore
156–162 MHz

Military Aircraft
236.4–236.7 MHz (Air Traffic Control)
243.0 MHz (emergency

National Oceanic & Atmospheric Administration (NOAA)
162–163 MHz

Naval Aircraft
277.5–278 MHz
340.2 MHz (air traffic control)

News Medias
450.0–455 MHz

Nuclear Regulatory Commission
167–172 MHz

Police
154–159 MHz (smaller cities and rural areas)
453–454 MHz & 460.0–460.6 MHz (larger cities and metropolitan areas)
810–816 MHz (new "800 MHz" band activity)

Police & Municipal Trunking
856–867 MHz

Railroads
159–161 MHz

Secret Service
164–167 MHz

Strategic Air Command (SAC)
311.0 MHz

Fig. 6– Highly condensed list of services using VHF/UHF ranges for communications.

sources. Empty battery cases you fill with alkalines are also invaluable accessories.

Personal Communications And Travel Aids

Once again amateurs with handheld FM transceivers have a creditable advantage in this area—assuming the talkie is small enough to be carried everywhere you go, just like eyeglasses, house/car keys, and a billfold. Visualize, for example, being trapped in an elevator during a power outage, involved in a public transportation emergency, or simply losing a spouse at a rest stop while traveling or while waiting in a shopping mall parking lot. The ability to communicate during such times is invaluable, especially when used in a "reverse manner"—that is, establishing communications before facing "unknowns," then checking or summoning assistance if the link is disrupted. Ah, but not everyone is a licensed radio amateur. That brings to light the need for additional communications services such as FRS and GMRS. Licensing is not required to use FRS talkies. They are good for communicating within a 1 to 4 mile range, and they are also handy assistance-summoning aids for nearby invalid family members. GMRS is typically used for more semi-professional applications, such as security guards in buildings and malls, and by groups such as volunteer firemen. The two services (FRS and GMRS) operate on separate channels in the 462 MHz range, and simply monitoring those channels often serves one's special needs. An FRS and GMRS frequency chart is thus included in fig. 8.

Fig. 7– Scanners and older model FM talkies with extended receiver coverage such as Alinco's DJX10 and DJ580 are priceless assets during emergencies. Recently proposed congressional rulings, however, may soon challenge our freedom to monitor most non-amateur-related communications. (Photo courtesy Alinco International)

GMRS	
Base & Mobile Frequencies	**Repeater Input Frequencies**
462.550 MHz	467.550 MHz
462.575 MHz	467.575 MHz
462.600 MHz	467.600 MHz
462.625 MHz	467.625 MHz
462.650 MHz	467.650 MHz
462.675 MHz	467.675 MHz
462.700 MHz	467.700 MHz
462.725 MHz	467.725 MHz

FRS	
Channel	**Frequency**
1	462.5625
2	462.5875
3	462.6125
4	462.6375
5	462.6625
6	462.6875
7	462.7125
8	467.5625
9	467.5875
10	467.6125
11	467.6375
12	467.6625
13	467.6875
14	467.7125

Fig 8– Frequencies/channels authorized for GMRS and FRS communications.

Channel	Freq. (MHz)	Channel	Freq. (MHz)
1	26.965	21	27.215
2	26.975	22	27.225
3	26.985	23	27.255
4	27.005	24	27.235
5	27.015	25	27.245
6	27.025	26	27.265
7	27.035	27	27.275
8	27.055	28	27.285
9	27.065	29	27.295
10	27.075	30	27.305
11	27.085	31	27.315
12	27.105	32	27.325
13	27.115	33	27.335
14	27.125	34	27.345
15	27.135	35	27.355
16	27.155	36	27.365
17	27.165	37	27.375
18	27.175	38	27.385
19	27.185	39	27.395
20	27.205	40	27.405

Fig. 9– Frequencies/channels authorized for AM Citizens Band communications.

Personal communications aids for travelers are influenced by the time and related circumstances and restrictions, and they vary significantly. When moving by airplane, for example, the smallest-feasible FM handheld with extended frequency coverage (or a talkie and a "DC to daylight" scanner) and personal survival beacon such my Micronaut transmitter (described here a few months ago) can be carried in pockets. A tiny HF QRP rig such as the SST (described here last month) plus earbud 'phones, mini-key, and roll-up antenna are a clever addition to your carry-on bag.

Another handy item when traveling by car or visiting small towns is a new-style handheld CB transceiver with NOAA weather reception. Truckers, RVers, and a large segment of the general population use CB for relaying "what's happening" information on the road. By checking channel 19 (truckers), 13 (RVers), and 9 (emergency channel) you may be able to sidestep long delays, get on or off crowded roads during hurricane evacuations, or summon assistance when 2 meter repeaters are not accessible. CB also serves as a community party line and neighborhood watch aid in many areas. Quite often, simply listening on CB channels gives you insight to flooding conditions or closed roads during storms or blizzards. A list of CB channels/frequencies is thus included in fig. 9.

Stand Down for Now

We are overflowing available space as usual. Please overlook the matter-of-fact tone and brevity of my previous discussions, friends. It was necessary to squeeze the maximum amount of ground-floor information into this column. We often hear the difference between "average" and "brilliant" engineers or technicians is the latter group knows precisely which references to check for specific information. Applying that same logic to survival communications, we could say all radio amateurs have the capability; they only need associated references at their fingertips. That's why I included several frequency charts in this month's column. Copy the charts so you will have them on-hand in the future.

Next month we will continue with more notes and ideas plus discussions on developing survival plans, equipment considerations, and emergency/alternate energy systems of all types. Stay tuned! Also, we would like to hear your opinion of our survival communications discussions. Do you find them beneficial? Do you want to see more? Drop me a note!

73, Dave, K4TWJ

BY JOHN DORR, K1AR

CONTEST CALENDAR

NEWS/VIEWS OF ON-THE-AIR COMPETITION

DX Packet Spotting is Alive and Well!

February's Contest Tip of the Month

Having considered the topic of packet this month, I thought it would be appropriate to suggest something radical—at least for the 1990s! Try operating for a week or so without the packet screen glaring at your face. With the advent of multipliers being "hand fed" to us these days, many of us have lost that treasured skill of "finding them on our own." The art of sniffing out multipliers is a major differentiator in contest score making. Try looking for them the old-fashioned way. It's great practice for your next single operator effort.

Well, another amazing event happened this fall. I missed another CQ WW DX SSB Contest due to work commitments. In a new job it's tough to excuse yourself from your company's "Dayton Hamvention," especially when you are the marketing guy. Fortunately, the good news is our convention will be held on a non-CQ WW weekend next year. I'm already getting excited about the '98 WW and there are nine months to go!

Having missed out on the action last September, I did have some curiosity about exactly what I missed. Fortunately, we have an easy way to document the event. We call it *packet radio*. A recent e-mail thread among Yankee Clipper Contest Club members yielded some analysis of the packet spotting environment from the fine PacketCluster™ node of Pete, W1RM. Let me take a few moments to document what I learned.

Perhaps the most amazing statistic of all is the number of spots that were put out during the weekend—10,769 to be exact! A little math shows that to be an average of 224.4 spots/hour! If that's not enough, here are some other facts to dazzle you:

• All 40 zones were spotted on 20 meters.

• Had you worked every spot, you would have logged 197 countries.

• Had you worked every spot, your CQ WW score would have been 7,656,759 points (minus dupes).

• Only 135 spots were on bands outside of the CQ WW (i.e., VHF, WARC), or 1.25%. Now that's discipline by the users.

• The peak spotting band was 15 meters at a rate of 61.1 spots/hour—not bad for a band that's dead most of the night!

• There's no excuse for needing KH6 and KL7 for your WAS; Alaska and Hawaii were spotted nearly 300 times.

• Europe certainly reigns in New England, claiming 3642 spots, or approximately one third of all packet spots.

• Did anyone miss a CE? You had 81 chances to get one this weekend.

• Africans were everywhere, with 1100 spots across all the bands.

Debate continues to rage on about the positive and negative contributions of packet spotting to contesting. I have to believe that packet has had one significant negative impact to our sport. It has made us lazy (see this month's contest tip). Many operators are very content to just watch the screen like a television. With the popular logging programs at our fingertips, contest operating has become akin to sitting on the couch with your remote, flipping through the cable channels looking for something good to watch (or work in our case).

What has become obvious to me is the increased activity that packet spotting has brought to contesting; especially within the ranks of the casual DXing operator. This is especially true now that nodes are interconnected via the Internet around the world. Frankly, I'm finding my mid-week packet access is happening via the telephone rather than with the 2 meter radio packed in a box in my basement.

Finally, let me make one small admission. Yes, I was hard at work during the SSB weekend. However, I do work for a computer software company, and yes, we did have Internet access in our booth. Yes, Windows 95™ has TELNET bundled into the operating system. And, yes, I did bring some key IP addresses with me to fine industry research sites such as K1XX, WU3V, N7TR, and others—all for furthering our company's market knowledge and computer experience, of course. I guess I just couldn't miss everything in the WW!

2 Mitchell Pond Road, Windham, NH 03087
e-mail: K1AR@contesting.com

Calendar of Events

Jan. 23-25	**CQ WW 160 Meter CW Contest**
Jan. 24-25	REF CW Contest
Jn.31-Fb.1	UBA SSB Contest
Jn.31-Fb.1	Classic Radio Exchange
Feb. 1	North American SSB Sprint
Feb. 7-8	Vermont QSO Party
Feb. 7-8	New Hampshire QSO Party
Feb. 7-8	Ten-Ten Winter SSB QSO Party
Feb. 8	North American CW Sprint
Feb. 14-15	PACC Contest
Feb. 14-15	World-Wide RTTY WPX Contest
Feb. 14-15	RSGB 1.8 MHz Contest
Feb. 21-22	ARRL CW DX Contest
Feb. 21-22	REF SSB Contest
Fb.27-Mr.1	**CQ WW 160 Meter SSB Contest**
Fb.28-Mr.1	North Carolina QSO Party
Fb.28-Mr.1	UBA CW Contest
Mar. 7-8	ARRL SSB DX Contest
Mar. 15-16	Wisconsin QSO Party
Mar. 17-18	CLARA HF Contest
Mar. 21-22	Bermuda Contest
Mar. 28-29	CQ WW WPX SSB Contest
Apr. 4-5	SP DX Contest
Apr. 4-5	EA RTTY Contest
Apr. 25-26	Helvetia Contest

Final Comments

Well, that wraps it up for this month. I appreciate the effort that many of you have taken to complete your *CQ* Contest Survey responses on contest ethics. My mailbox has been overflowing with data that will prove to be very interesting. Some of the results are going to surprise you! Time is almost up to get your responses to me. Don't be left out!

Due to the magic of publishing, I'm actually writing this month's column only a few weeks after the conclusion the CQ WW CW Contest. Even though I've been contesting for nearly 30 years, I can boldly say that the 1997 CQ WW CW affair was one of the best contests I've ever operated. A little searching through your memory banks may reveal a similar opinion. Watch for the story next month.

Remember, I must receive your contest announcements for the May issue no later than March 1st. Make sure you send your information to my new home QTH, please (2 Mitchell Pond Road, Windham, NH 03087), or via e-mail.

73 John, K1AR
e-mail: K1AR@contesting.com

The Classic Exchange Contest

2000Z Sat. to 0500Z Sun., Jn. 31–Fb. 1

The Classic Radio Exchange ("CX") is a contest celebrating the older commercial and homebrew equipment that was the pride of our ham shacks and our bands just a few short decades ago. The object is to encourage restoration, operation, and enjoyment of this older equipment. A "Classic Radio" is at least ten years old (age figured from first year of manufacture), but is *not* required to participate in the Classic Exchange. You may use anything in the contest, although new gear is a distinct scoring liability.

Exchange: Your name, RST, QTH (state/province for US/Canada; country for DX), receiver and transmitter type

Zone	All	160	80	40	30	20	17	15	12	10	6	VHF
1	79	10	9	21	0	13	0	15	0	10	1	0
2	3	0	0	0	0	2	0	0	0	1	0	0
3	60	0	4	16	0	21	0	16	0	3	0	0
4	189	33	34	37	0	25	3	32	0	10	3	12
5	460	29	61	89	5	86	23	105	1	55	4	2
6	206	19	15	48	0	27	0	45	0	52	0	0
7	334	6	26	61	0	77	2	86	0	76	0	0
8	1297	69	183	242	3	229	0	301	0	270	0	0
9	617	28	67	106	0	197	0	111	1	107	0	0
10	205	1	8	34	0	66	0	59	0	37	0	0
11	589	3	4	31	0	121	0	188	0	242	0	0
12	81	0	0	4	0	19	0	25	3	30	0	0
13	772	0	10	33	0	162	0	150	2	415	0	0
14	1609	40	100	310	1	525	14	470	6	143	0	0
15	1553	21	114	285	0	522	2	506	4	99	0	0
16	269	0	8	43	0	148	1	66	0	3	0	0
17	28	0	0	6	0	18	0	4	0	0	0	0
18	6	0	0	0	0	6	0	0	0	0	0	0
19	12	0	1	0	0	10	0	1	0	0	0	0
20	211	3	4	18	0	113	7	45	0	21	0	0
21	16	0	0	3	0	7	0	6	0	0	0	0
22	5	0	0	0	0	5	0	0	0	0	0	0
23	1	0	0	0	0	1	0	0	0	0	0	0
24	6	0	0	0	0	6	0	0	0	0	0	0
25	258	0	6	31	0	139	3	72	0	7	0	0
26	5	0	0	0	0	5	0	0	0	0	0	0
27	85	0	2	16	0	23	0	44	0	0	0	0
28	67	0	0	22	0	22	0	20	0	3	0	0
29	11	0	1	8	0	2	0	0	0	0	0	0
30	110	0	10	47	0	22	1	25	0	5	0	0
31	206	13	15	64	0	38	0	60	0	16	0	0
32	286	1	7	78	2	45	0	83	2	68	0	0
33	384	9	33	59	0	49	2	170	2	60	0	0
34	6	0	0	0	0	2	2	0	2	0	0	0
35	174	0	3	23	1	40	8	53	4	42	0	0
36	259	0	3	10	0	49	0	88	0	109	0	0
37	77	0	0	0	0	16	1	42	0	18	0	0
38	138	1	0	5	1	11	3	14	1	102	0	0
39	62	0	2	4	0	10	0	19	0	27	0	0
40	15	0	0	0	0	5	0	10	0	0	0	0

Table I– Spots by zone on W1RM PacketCluster™ node in the 1997 CQ WW DX SSB Contest.

(homebrew entries send final amp tube or transistor), and other interesting data. The same station may be worked with different equipment combinations on each band and on each mode. Non-participants may be worked for credit.

Frequencies: CW: 3560, 7060, 14120, 21180, 28240 kHz; Novice/Tech Plus: 3695, 7120, 21180, 28240; Phone: 3880, 7290, 14.280, 21.380, 28.320. Note that 7060 and 3560 kHz tend to be the most popular CX frequencies.

Scoring: Multiply the total QSOs (all bands) by the total number of different receivers plus transmitters (transceivers count as both xmtr and rcvr) plus states/provinces/countries worked on each band and mode. Multiply that total by your CX Multiplier—the total years old of all receivers and transmitters used, three QSOs minimum per unit. For transceivers, multiply the age by two. If equipment is homebrew, count it as a minimum of 25 years old unless actual construction date or date of its construction article (in the case of a "reproduction") is older.

Final Score: Total QSOs all bands times RCVRs + XMTRs + states/provinces/countries (total each band and mode separately; add totals together) times CX Multiplier.

Awards: Certificates and appropriate memorabilia are awarded every now and then for the highest score, the longest DX, exotic equipment, best excuses, and other unusual achievements.

Send logs, comments, anecdotes, and pictures to Jim Hanlon, P.O. Box 581, Sandia Park, NM 87047; or to Marty Reynolds, AA4RM, P. O. Box 13354, Atlanta, GA 30324. Be sure to include a two-unit SASE for the next CX newsletter and CX announcement.

Vermont QSO Party

0000Z Sat. to 2400Z Sun., Feb. 7–8

This is the 40th annual Vermont QSO Party sponsored by the Central Vermont Amateur Radio Club. This is a great opportunity to work one of the rarest states on several bands. Participation is open to all licensed radio amateurs worldwide on 160–2 meters.

Classes: Single or multi-operator all bands, club, QRP, rover.

Exchange: Vermont stations send RS(T), and county (14 total). Others send RS(T) and state/province or DXCC country.

Frequencies: Phone—first 25 kHz up from the beginning of the General band and Novice 10 meter band. CW—40 kHz up from the bottom edge of the bands and 20 kHz up from the bottom of Novice portions. VHF: 50.20, 144.20, and 146.69 MHz. Other modes can be used. Repeater contacts do not count.

Scoring: Credit 1 point per phone QSO and 2 points for CW or digital mode QSOs. Non-Vermont stations multiply total QSO points by the number of VT counties and special-event QSOs with W1BD. Contact W1OFW and W1OFW/m for a one-time bonus of 2000 and 5000 points, respectively. Vermont stations follow similar format with the addition of states/provinces/DXCC country multipliers. Stations may be worked up to four times per band (i.e., SSB, CW, RTTY, etc.).

Awards: Special certificates will be awarded to the three highest scoring Vermont stations. Certificates will also be awarded for the highest scoring station in each state, province, and DXCC country. In addition, there will be a QRP category with the high-scoring station winning a certificate.

Send your postmarked entries no later than March 1, 1998 to: Central Vermont Amateur Radio Club, Vermont QSO Party, Barry Driscoll, KE1BV, P. O. Box 674, Montpelier, VT 05602. Be sure to include an SASE for final results.

New Hampshire QSO Party

0000Z Sat. to 2400Z Sun., Feb. 7–8

This year's party is again sponsored by the NH Amateur Radio Association. It's New Hampshire stations working all other stations. As with most QSO Parties, the same station may be worked once on each band mode. Total operating time is limited to 24 hours. Off-times must be a minimum of 15 minutes and be clearly indicated in the log.

Classes: Single or multi-operator all bands, club (large 50+, small <50), low power (<150W), high power, QRP, mobile, and above 50 MHz.

Exchange: RS(T) and QTH. County and state for NH stations; state, province, or country for others.

Scoring: All stations credit 1 point/SSB QSO and 2 points for digital QSOs. (RTTY, CW, packet). NH stations multiply QSO points by number of NH counties, states, provinces, and DXCC countries. Others simply use counties. Count 5 points for phone and 10 points for CW when working the bonus stations: WB1CAG, K1BKE, W1WQM, KC1XG,

Band	Spots	Countries	Zones
All	10769	197	40
160	286	54	16
80	731	90	26
40	1757	121	30
30	13	6	6
20	2892	163	40
17	72	26	14
15	2934	148	32
12	28	17	11
10	2034	120	28
6	8	2	3
VHF	14	1	2

Table II– Total spots on W1RM PacketCluster™ node in the 1997 CQ WW DX SSB Contest.

W1UWS, and K1BKE. Stations may be worked once per band and mode.

Final Score: Final score is calculated by multiplying QSO points times total multiplier and adding bonus points.

Frequencies: CW—1830, 3530, 7030, 14030, 21030, 28030. SSB—the first 25 kHz up from the bottom of the General band plus 50.20, 144.20 and 146.55 MHz. Repeater QSOs do not count.

Awards: Awards are available, although no details were provided in the contest announcement.

Logs must be received no later than March 31, 1998. Be sure to include an SASE for final results. Send logs and comments to: North Country ARC, Richard C. Force, WB1ASL, 12 Cottage Street, Lancaster, NH 03584-1903.

Dutch "PACC" Contest

1200Z Sat. to 1200Z Sun., Feb. 14–15

Sponsored by the Vereniging voor Experimenteel Radio Onderzoek in Nederland (VERON), it's the world working The Netherlands on all six bands, 1.8 through 29.7 MHz, in the 41st PACC Contest. The same station may be worked on each band, but on one mode only, phone or CW, for QSO and multiplier credit. Note that SSB QSOs are not allowed on 160 meters.

Categories: Single operator, multi-operator, and SWL.

Exchange: RS(T) plus a QSO number starting with 001. Dutch stations will add two letters to identify their province. There are 12 provinces: DR, FR, GD, GR, LB, NB, NH, OV, UT, FL, ZH, and ZL.

Scoring: Each QSO with a PA/PB/PI station counts one point. DX stations determine their multiplier by the number of provinces worked on each band (maximum of 72).

Final Score: Total number of QSOs times the number of provinces worked on each band.

Awards: Certificates will be awarded to the top-scoring station in each category in each country. The famous PACC Contest Ribbon will be presented to all foreign participants.

SWL's must log the call of the Dutch station as well as the station being worked and both serial numbers. Scoring same as above. Indicate the multiplier in a separate column in your log only the first time it is worked on each band. Include a summary sheet showing the scoring, your name and address in block letters, and the usual signed declaration.

Mailing deadline is March 31st to: PACC Contest, Hans P. Blondeel Timmerman, PA3EBT, Nieuweweg 21, 4031 MN Ingen, The Netherlands.

Digital Journal RTTY WPX Contest

0000Z Sat. to 2400Z Sun., Feb. 14–15

This is the fourth annual running of this digital mode contest sponsored by Hal Communications Corp. It is open to amateurs worldwide using any digital mode including Baudot, AMTOR, PACTOR, G-TOR, and CLOVER. Although inspired by the CQ WW WPX Contest, this contest is not affiliated with *CQ* in any way.

Classes: Single operator (all band-high and low power, single band), multi-single, multi-two transmitters (new), multi-multi,

and SWL. All categories are limited to 30 hours of operating except for multi-multi entries. Packet spotting is allowed in all categories.

Exchange: RST and serial number. Multi-multi stations may use separate numbers on each operating band.

Scoring: QSOs between stations on different continents are worth 3 points on 20–10 meters and 6 points on 40–80. QSOs with stations on the same continent but different countries are worth 2 points on 20–10 meters and 4 points on 40–80. QSOs with stations on the same continent and in the same country are worth 1 point on 20–10 meters and 2 points on 40–80. Each valid prefix is counted as a multiplier. Multipliers are only counted once (not per band). The CQ WPX rules are used to determine valid prefixes. Final score is calculated by multiplying total QSO points times the total multiplier.

Awards: A wide range of certificates and plaques is available for category winners. Contact K5DJ for more information.

Entries must be postmarked no later than 30 days after the end of the contest. Hard copy logs and/or disks may be sent to: Eddie Schneider, W6/G0AZT, 1826 Van Ness, San Pablo, CA 94806. Electronic logs can be sent via Internet to: <edlyn@global.california.com> (MIME encoded).

YLRL YL-OM Contest

SSB: 1400Z Fri. to 0200Z Sun., Fb. 14–16
CW: 1400Z Sat. to 0200Z Sun., Fb. 21–23

Sponsored by the Young Ladies Radio League, this annual event is open to all licensed men and women amateur radio operators around the world.

Exchange: Callsign, QSO number, RS (T), ARRL section/VE province/country.

Scoring: Phone and CW are considered separate contests. Score 1 point for each station worked. YLs only work OMs and OMs only work YLs. Credit a special multiplier of 1.5 if you are using 100 watts or less on CW and 200 watts PEP on SSB. Final score is the total QSO points times the sum of ARRL sections, provinces, and countries worked per band.

Frequencies: CW—3540-3570, 7040-70, 14040-070, 21120-150, and 28180-210 kHz. SSB—3940-70, 7240-70, 14250-280, 21380-410, 28280-410 kHz.

Awards: Special award cups will be given to the winning phone and CW YL and OM. Certificates will be sent to the high scorers in each US call area, VE province, and DX country, provided there are at least 10 valid QSOs in the log.

All logs are to be postmarked no later than 30 days after the contest and should be sent to: Nancy Hall, KC4IYD, P.O. Box 775, N. Olmsted, OH 44070-0775.

ARRL International DX Contest

CW: Feb. 21–22 Phone: March 7–8

0000Z Saturday to 2400Z Sunday

This is a great DX contest you shouldn't miss. I strongly recommend that you study the rules on ARRL's website for more details. Send a large SASE (2 IRCs for DX) for sample log and entry forms.

All bands may be used, 1.8 through 28 MHz, but not 10, 18, or 24 MHz. Aeronautical or maritime mobile stations cannot be worked for contest credit.

Categories: Single operator, both single and all band, and single operator assisted. Multi-operator, one transmitter and two transmitters. Also multi-operator, multi-transmitter. QRP, all band only (5 watts or less output). Multi-transmitter stations must remain on a band at least 10 minutes once a contact is made.

Exchange: RS(T) and state or province for W/VE; RS(T) and power input for DX stations (three-digit number).

QSO points: W/VE stations earn three points for each W/VE contact.

Multiplier: Each DXCC country worked on each band for W/VEs. DX stations use US states (48), District of Columbia (DC), and VE provinces (13) for their multiplier (maximum multiplier of 63 per band).

Final Score: Total QSO points times the sum of the multiplier from each band. Entries with 500 or more QSOs must include a QSO check sheet.

Awards: Certificates given in each category, in each country, and in each ARRL section, plus a wide selection of plaques. Also certificates are awarded to DX stations making over 500 QSOs.

Disqualification regulations will be strictly enforced and are listed in the official rules. Mailing deadline for all entries is April 8th and they go to: ARRL DX Contest, 225 Main St., Newington, CT 06111.

CQ WW 160 Meter SSB Contest

2200Z Fri. to 1600Z Sun., Fb. 27–Mr. 1

Just a reminder that the SSB section of our 160 Meter Contest will be coming up the last full weekend of this month.

Extensive coverage has been given to this event, with complete rules in the November issue. With the exception of the new "DC" multiplier, the rules are the same as have been used over the past many years.

Mailing deadline for your entry in last month's CW contest is February 28th, and March 31st for this month's SSB section.

They can be sent directly to the 160 Contest Director, David L. Thompson, K4JRB, 4166 Mill Stone Court, Norcross, GA 30092. They can also be sent to CQ 160 Meter Contest, 76 North Broadway, Hicksville, NY 11801. (Be sure to indicate CW or SSB on the envelope.)

BY TED MELINOSKY, K1BV

AWARDS

NEWS OF CERTIFICATE AND AWARD COLLECTING

This month Chris Kielich, K6CF, tells us what his road to USA-CA All Counties #930 was like.

Chris Kielich, K6CF
USA-CA All Counties #930
October 17, 1997

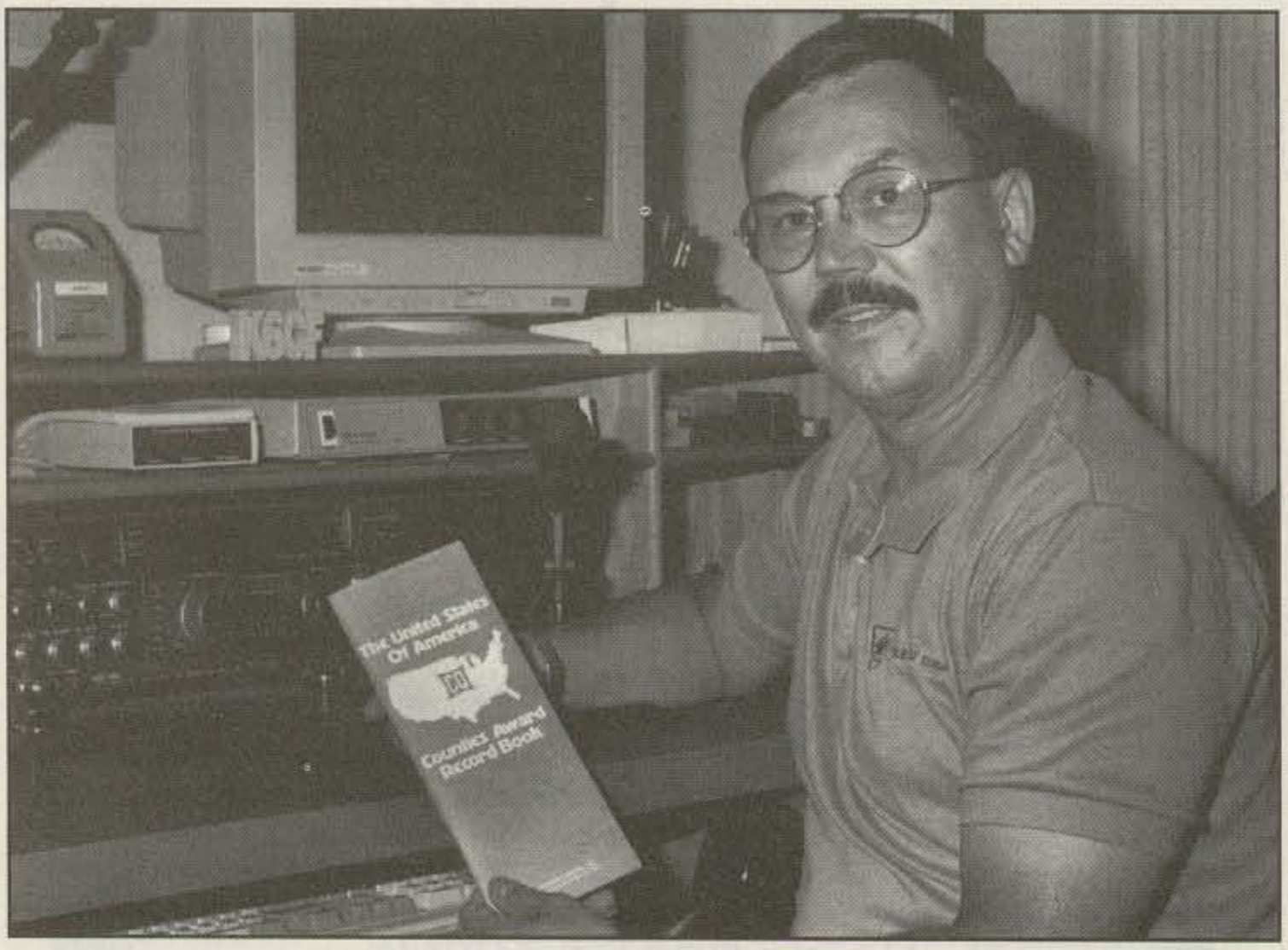
The HF aspect of amateur radio has always been my passion. After being licensed in 1973, I briefly set out to achieve DXCC. A marriage and subsequent move to an apartment put my DXing ambitions on hold. After moving to a residence that would allow me to install a tower, I again set out to conquer the world. Like many before me, it wasn't long before there just weren't any more "new ones" on the bands. After acquiring 5BDXCC, 5BWAS, WAZ, and several other awards, I began to think that there weren't many more mountains to climb, especially with the sunspot cycle, and the resulting propagation, at rock bottom.

One day, while tuning through the upper portion of the 20 meter band, I stumbled across what sounded like a genuine DX pile-up. Folks were calling a mobile station that was somewhere in Montana. I listened for a while and discovered the 20 meter Mobile Emergency and County Hunter's Net. As an avid DXer, I was not a big fan of nets. For me, making DX contacts on a net was like going on a big game safari to bag a lion at the local zoo—not much in the way of sport and certainly not a test of one's operating skill. However, this net was different. The net control station announced who was operating and where. After that, it was open season. I jumped in and began working counties.

County hunters also have get-togethers and conventions all over the country. I decided to take in just such a convention in Las Vegas a couple of years ago. What I found was a great bunch of real down-to-earth folks who shared a common bond—amateur radio. Many of these people also had experienced the same dilemma that I faced. Several of the county hunters I met had #1 DXCC on the wall along with just about every other DX award on the planet. They were looking for one more mountain to climb, just like me.

The road to USA-CA was not an easy one to travel. My job in law enforcement requires a huge amount of time, sometimes as much as 60 hours a week. More than once I was heard to say that my police career was getting in the way of my county hunting. Perseverance, however,

65 Glebe Road, Spofford, NH 03462-4411
e-mail: k1bv@top.monad.net



Chris Kielich, K6CF, USA-CA All Counties #930, October 17, 1997.

USA-CA Special Honor Roll

Randy Sisson, AD4IA
USA-CA All Counties #936
October 31, 1997

Ken Carpenter, KC4UG
USA-CA All Counties #937
October 31, 1997

Richard King, KD4ABC
USA-CA All Counties #938
November 7, 1997

Robert C. Boyd, W1VXV
USA-CA All Counties #939
November 9, 1997

David Ertel, KJ8V
USA-CA All Counties #940
November 11, 1997

Thelma McClanahan, AE4FL
USA-CA All Counties #941
November 11, 1997

Wally Teto, KT1M (N1JAC)
USA-CA All Counties #942
November 11, 1997

USA-CA Honor Roll

500		2000	
VE7IU	2988	AD4IA	1117
AD4IA	2989	KC4UG	1118
KC4UG	2990	KD4ABC	1119
KD4ABC	2991	W1VXV	1120
KJ8V	2992	KJ8V	1121
AE4FL	2993	AE4FL	1122
KT1M	2994	KT1M	1123

1000		2500	
AD4IA	2455	AD4IA	1043
KC4UG	2456	KC4UG	1044
KD4ABC	2457	KD4ABC	1045
KJ8V	2458	W1VXV	1046
AE4FL	2459	KJ8V	1047
KT1M	2460	AE4FL	1048
		KT1M	1049

1500		3000	
AD4IA	1214	AD4IA	953
KC4UG	1215	KC4UG	954
KD4ABC	1216	KD4ABC	955
W1VXV	1217	W1VXV	956
KJ8V	1218	KJ8V	957
AE4FL	1219	AE4FL	958
KT1M	1220	KT1M	959

The total number of counties for credit for the United States of America Counties Award is 3076. The basic award fee for subscribers is $4.00. For nonsubscribers it is $10.00. To qualify for the special subscriber rate, please send a recent *CQ* mailing label with your application. Initial application may be submitted in the USA-CA Record Book, which may be obtained from *CQ* Magazine, 76 North Broadway, Hicksville, NY 11801 USA for $2.50, or by a PC-printed computer listing which is in alphabetical order by state and county within the state. To be eligible for the USA-CA Award, applicants must comply with the rules of the program as set forth in the revised USA-CA Rules and Program dated March 1, 1997. A complete copy of the rules may be obtained by sending an SASE to Ted Melinosky, K1BV, 65 Glebe Road, Spofford, NH 03462-4411 USA. DX stations must include extra postage for airmail reply.

paid off. On September 30, 1997, I worked Gene Tyree, N4ANV, in Towns County, Georgia for my last of 3076 counties. Considering that only about 930 other amateurs have accomplished this feat, I consider it a major milestone in my amateur radio career. After completing USA-CA, I reflected back on the journey that I had just experienced. In a way, getting to the end was kind of bittersweet. The thrill of the hunt was definitely more rewarding than the trophy on the wall.

County hunting is just one of the many aspects of our hobby that I find so appealing. In the final analysis, it's the people who make amateur radio great. I would like to thank all of the fine folks who helped me reach USA-CA. I look forward to helping them reach their goal in the future.

—73, Chris, K6CF

Awards From Denmark

This month several awards from Denmark are featured. Thanks to Jens, OZ5MJ, for the sample copies. I've always been fascinated with the Danish Underground Award. "Fox Hunting" during WW II was a deadly serious business involving short, desperate contacts made in full knowledge that the penalty for being located could be your life. For stations outside of Denmark, the award requirement is just one contact, but I'm still looking. Here are the full rules for the awards.

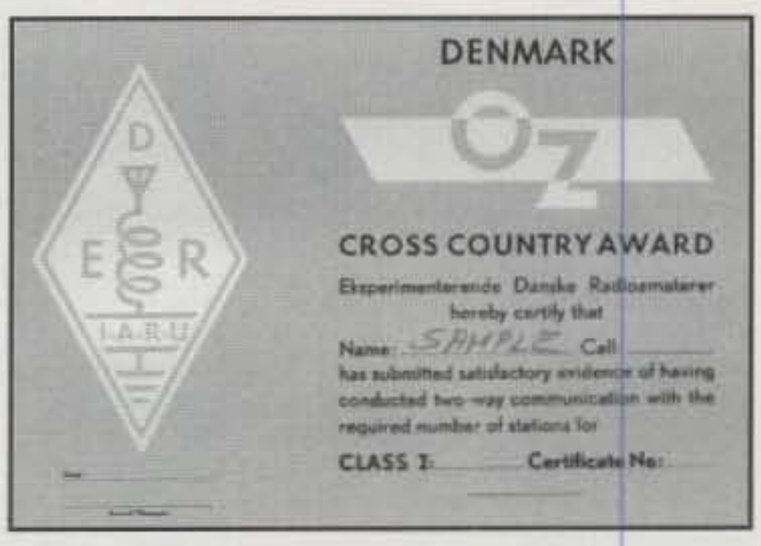
Danish Underground Award. This award if given for contacts with OZ5MAY, a commemorative station located in Denmark's Fight For Freedom Museum 1940–1945. This station is on the air using WW II clandestine radio sets exclusively. They were partly built in Denmark from parts supplied by parachute drop.

OZ stations: contact OZ5MAY on three different bands or on three different days on two different bands. *Other Europeans:* contact the station on two bands or on the same band on two different days. *DX:* one contact with OZ5MAY. A contact credit is given if you visit the Museum of Denmark's Fight for Freedom 1940–45. SWL okay. Send GCR list and six IRCs to: Allis Andersen, OZ1ACB, Kagsaavej 34, DK-2730 Herlev, Denmark.

Copenhagen Award. This certificate is awarded on the occasion of the 800th anniversary of Copenhagen, the capital city of Denmark. Contact stations in the Copenhagen area. Scandanavian stations need 15, other Europeans need 10, and all others need 5. Available for CW, phone, or mixed, all bands. SWL okay. Send GCR list and fee of 5 IRCs or $US3 to: Allis Anderson, OZ1ACB, Kagsaavej 34, DK-2730 Herlev, Denmark.

Cross Country Award. Contact OZ and OX prefixes after 1 April 1970. Available for all CW or all phone.

Point requirements. Scandanavian stations: Class 1 = 70 points in all countries plus OX3; Class 2 = 50 points in at least 10 counties. Other Europeans = 50 points. All others = 40 points. Points are earned as follows:



Denmark's Cross Country Award.

Scandanavian: 80 to 2 meters = 1 point; 432 MHz contacts = 2 points. Three stations must be contacted in each county on 80 and 40. Four stations must be contacted in each county on 20, 15, 10, and 2. Five stations must be contacted in each county on 70 cm.

Other Europeans (contact OZ call areas): Each prefix OZ1 to OZ9 and OX3 *must* be contacted. Two contacts with each prefix permitted on each band except OX3, where nine are permitted on each band. Each contact = 1 point, except 70 cm = 2 points.

All others (contact OZ call areas): Each prefix OZ1 to OZ9 and OX3 must be contacted. Three contacts with each prefix permitted on each band except OX3, where nine are permitted on each band. Contact points as above.

Counties in Denmark:

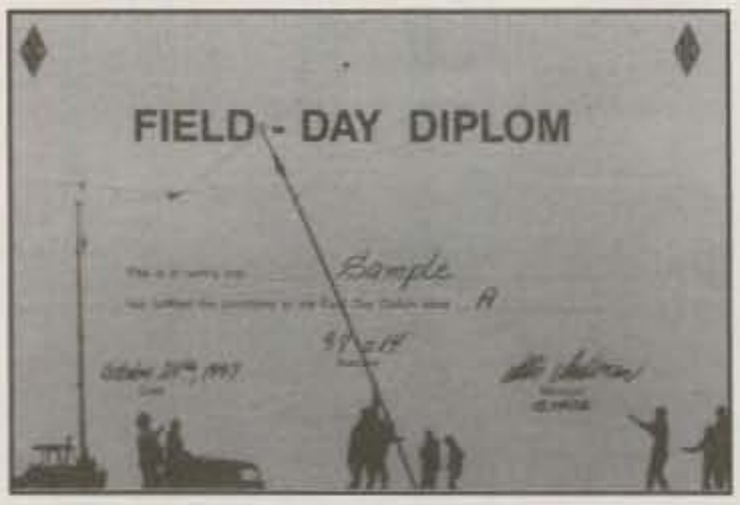
1. Koebenhavns amt (IOTA EU-029)
2. Frederiksborg amt (IOTA EU029)
3. Roskilde amt (IOTA EU-029)
4. Storstroems amt (IOTA EU-029)
5. Storstroems amt (IOTA EU-029)
6. Bornholms amt (IOTA EU030)
7. Fyns amt (IOTA EU-029)
8. Sydjyllands amt
9. Ribe amt
10. Vejle amt
11. Ringkoebing amt
12. Aarhus amt
13. Viborg amt
14. Nordjyllands amt

To apply for the award send GCR list and 39DKK, $US6, or 6 IRCs to: Jens Palle Moreau Joergensen, OZ5MJ, Jaegerbakken 13, DK-5260 Odense S., Denmark.

Field Day Diploma. This award is designed to increase interest in the EDR National Field Day. Earn FD points: One FD point on each band (CW or SSB) for each contact with a Danish Club station working field day during their annual FD, starting in 1987.

Class A: 15 FD points on one band in the same year.

Class B: 30 FD points the same year, on at least four HF bands.



From Denmark, the Field Day Diploma is presented to increase interest in EDR National Field Day.

Send GCR list and DKr. 20 or 5 IRCs to: Allis Anderson, OZ1ACB, Kagsaavej 34, DK-2730 Herlev, Denmark.

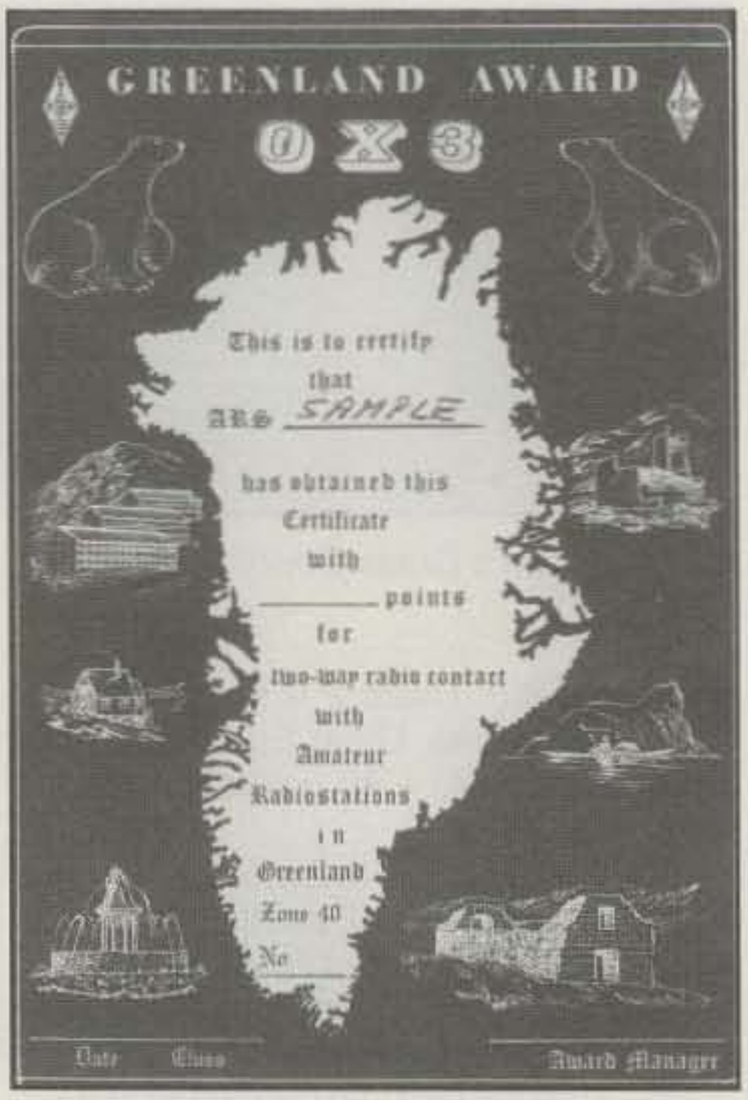
OZ Locator Award. For the base award, contact at least 10 of the Locator Squares in Denmark after 1 January 1985. OZ is covered by the following squares: JO44, JO45, JO46, JO47, JO54, JO55, JO56, JO57, JO64, JO65, JO66, JO74, and JO75. Contacts via active repeaters do not count, nor do crossband and crossmode contacts. Phone or CW contacts okay. QSLs must be submitted when applying. There are endorsements for each additional three squares. Endorsements are for Phone, CW, EME, MS, and Satellite by band. Send QSLs and fee of 20 DKK, $US4, or 10 IRCs to: Jens Palle Moreau Joergensen, Jaegerbakken 13, DK-5260 Odense S, Denmark.

Denmark's OZ Locator Award is issued for contacting at least ten of the Locator Squares in Denmark after 1 Jan. 1985.

OZ Prefix Award. Work or hear OZ stations as follows: OZ must work three stations with each OZ prefix (OZ1–OZ9), other Europeans need two of each prefix, and rest of the world needs one. A QSL card from club station OZ5EDR can be used to replace any missing card. Any band or mode is allowed, and special mode/band endorsements will be made on request. Send GCR list and 10 IRCs to: Alli Andersen, OZ1ACB, Kagsaavej 34, DK-2730 Herlev, Denmark.

Greenland Award

Contact different locations and stations in Greenland after 1 January 1978. There are three classes:



The Greenland Award is available for CW and phone, and only OX3 stations count.

Class 1—5 different locations and 15 different stations.

Class 2—4 different locations and 10 different stations.

Class 3—3 different locations and 5 different stations.

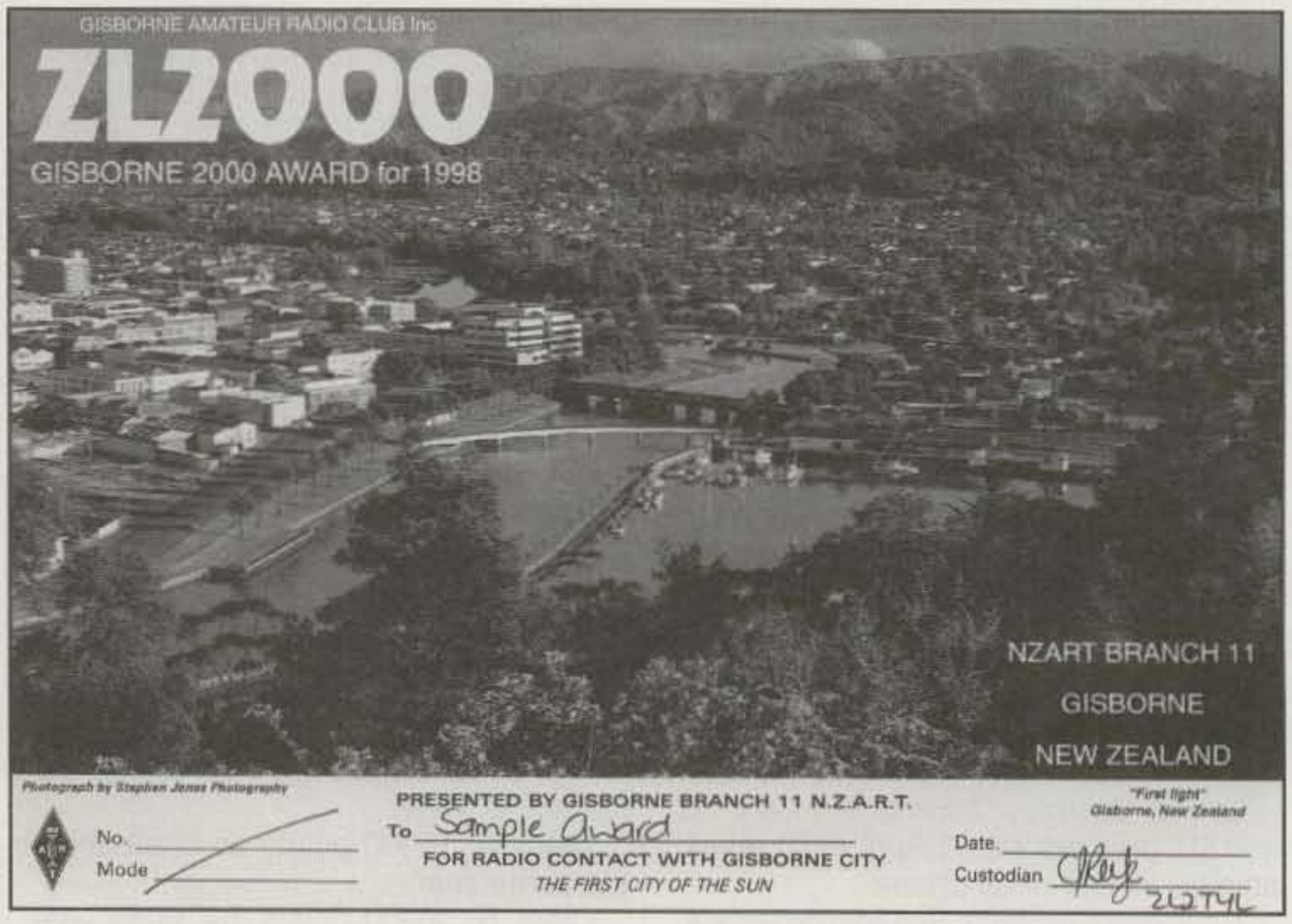
Award is available for CW or phone for amateurs. SWLs may apply for CW, phone, or mixed mode. Only OX3 stations count. A contact on each band is allowed with the same station. No cross band, portable, or mobile QSOs. Send GCR list and fee of 20DKK, $US4, or 4 IRCs to: Award Manager, Jens Palle Moreau Joergensen, OZ5MJ, Jaegerbakken 13, DK-5260 Odense S, Denmark.

Short-Term Awards Corner

As we approach the long-awaited "milennium," one group in New Zealand is capitalizing on their unique location as being one of the first places on earth that celebrates the new year. Starting in 1996, the Gisborne Amateur Radio Club made available the Gisborne 2000 Award. They will issue a uniquely beautiful certificate for making one contact with ZL2OOO any time during the month of January of the respective year up to the year 2000. They gave out 1700 contacts in January of 1997 and look forward to increasing that number this year with the generally improving conditions as sunspots return. Since you probably received this magazine in late January, there is still a chance to work ZL2OOO for the award version created for 1998. If you worked the station in January 1996 or 1997, you may send log data for these as well, since the multicolored pictures are different for each year. The big award will be for year 2000. The fee for the award is $NZ5, or $US10. Apply to: Ric Coleman, ZL2RIC, Gisborne 2000 Award, P.O. Box 1017, Gisborne 3801, New Zealand.

I'd like to see a sample award from your club or special-interest group. Please send it, along with the rules and any other related information, to my address on the first page of this column.

73, Ted, K1BV



The Gisborne 2000 Award offered by New Zealand's Gisborne ARC.

DX

BY CHOD HARRIS, VP2ML

NEWS OF COMMUNICATION AROUND THE WORLD

The Maldive and Spratly Islands

With the improving propagation on the higher bands, more groups are embarking on serious DXpeditions. Two of interest today are major operations on the Maldives and Spratlys.

The Central Arizona DX Association is mounting a significant operation from the Republic of the Maldives in the Indian Ocean. Operation is planned for Jan. 19–28, with a 24-hour-a-day effort. Look for **8Q7AA** on all bands, with special attention to the low bands and the brief openings to North America. SSB operators include Dan Brown, NA7DB; Rick Chatelin, K7ZV; Sally Martinez, KM5EP; Oscar Resto, KP4RF; and Nilda Resto, NP3BY. CW operators are Stephen Towne, NN7X; Steve Thompson, N7TX; Warren Hill, K7WX; Darryl Hazelgren, AF7O; and Bruce Sawyer, N6NT. They will have four stations running Yaesu FT-1000MP transceivers, Alpha amplifiers, and Force 12 antennas for 160–10 meters, including the new bands. The team will also be active in the CQWW 160 Meter CW DX test January 23–25. QSL either direct or via the bureau system to Steve Thompson N7TX, 119 E. Jasmine Street, Mesa AZ 85201-1811. Bureau cards may be requested via <n7tx@cadxa.org>. The subject line should read "8Q7AA QSL Request." The body of the message should have your callsign, date, time in UTC, and band all on separate lines. You can check to see if you are in the log for a given contact by sending the same massage to the same location, with the subject line of: "8Q7AA log check." More info on this operation is available on the World Wide Web at <http://www.cadxa.org/8q7aa>.

Stateside DXers will have their work cut out for them in working 8Q7AA. The path between the US and the Maldives is a very long one, nearly 10,000 miles. Further, the direct path cuts straight across the north polar region, with its high absorption, noise, and distortion. West coast DXers should try 80 and 40 meters just before local dawn—1330–1530Z. The best times for 30 meters to W6 are around 1600Z and again around 0130Z. On 20 meters, try 1700–2200Z. If the sun cooperates and boosts the solar flux well above 100, look for a 15meter opening around 2000Z.

East coast DXers should enjoy some longer and stronger openings to 8Q7AA. The mutual darkness period is longer; try 40 and 80 meters from 2100–0130Z.

Bob Schenck, N2OO, makes his long-delayed first contact from the Spratlys.

Thirty meters should be workable 1800–2300Z. On 20 and 17 meters, try 1400–1900Z. Again, there is a chance of a 15 meter opening around 1600Z, given sufficient solar activity.

DXers in Japan and Europe will have a much easier time working 8Q7AA due to favorable propagation paths. As many as four bands can be open simultaneously between Europe and the Maldives, including 10 meters. Try the lower bands any time during mutual darkness: 1600–0130Z. Try the higher bands during mutual daylight—0700–1400Z.

The next major DXpedition on tap for 1998 is an effort by the Chiltern DX Club from England to operate as **9M0C** from the Spratly Islands, February 12–24. The multi-national (and very talented) crew includes G3NUG, G3OZF, G3SED, G3WGV, G3XTT, G4JVG, GØOPB, K5VT, VK2BEX, 9M2OM (G3NOM), and

STATION CALL SIGN 1S 2CHO

SPRATLY ISLAND
POSTS AND TELEGRAPHS ADMINISTRATION
RADIO STATION LICENSE

EXPIRES 0300 GMT 31 Dec 1988

NOT TRANSFERABLE

Fixed transmitter location (and remote control position when authorized)
SPRATLY ISLAND (8-35-00N, 111-55-00E)

Licensee and P. O. Address:
Chod Harris
c/o The DX Bulletin
816 Fourth Street, Suite 1001
Santa Rosa California 95404
United States of America

NOT VALID WITHOUT OFFICIAL STAMP

Class of Station	Frequencies (MHz)	Power Input (kW)
___ Broadcast		
___ Point to Point		
___x Other (Specify)	All Amateur	2 KW

SEE UPPER RIGHT CORNER FOR EXPIRATION DATE

Countersigned

Licensee

An "official" amateur radio "license" for the Spratly Islands.

P.O. Box 50, Fulton, CA 95439
e-mail: chod@compuserve.com

HA3OK works DX from this neat shack. (Z32KV photo)

9M6SU. They plan to have four stations on around the clock, on CW, SSB, and RTTY. Antennas include both monobanders and multiband antennas for the higher bands and four-square arrays on 40 and 80 meters.

The precise location in the Spratlys is Layang Layang, also know as Swallow Reef, the site of most of the recent DXpeditions to the scattered-island "country." Malaysia has solidified its claim on the Spratlys by developing the island into a permanently inhabited military base and dive resort. The island features an air strip, making transportation back and forth to mainland Malaysia easy.

Yaesu is providing four FT-1000MP transceivers and two FT-920s, the latter being slated for backup and 6 meter and beacon use. All operating positions will be equipped with a PC for logging, and the logging computers will be linked by a low-power UHF system to a master log server. The logging program will be a special DXpedition version of TurboLog, developed by John Linford, G3WGV, who also wrote the server software. The linked computers should provide real-time logging and information transfer, putting valuable propagation information at the fingertips of the DXpeditioners. TurboLog was used in the '93 VK9MM Mellish Reef operation, which logged some 44,000 QSOs.

The antenna farm is extensive. The famed Battlecreek Special is the main 160 meter antenna, which will also serve as a backup on 80 and 40 meters. Four-square arrays of Gladiator verticals are the prime 40 and 80 meter antennas. Cushcraft Yagis are the main high-band antennas, including a monobander for 20 meters and A3S and A3WS multibanders for 17–10 meters. A Butternut HF-6V is a general backup antenna and for monitoring propagation. The operators expect to be able to be on CW and SSB on the same band at the same time, thanks to significant separation between the antennas on the small island.

The DXpeditioners will be operating split frequency throughout the operation,

The WAZ Program

Single Band WAZ

15 Meter SSB

510 .....JH3DNC

20 Meter SSB

1015 .....KE7PB 1016 .....ISØYWA

40 Meter SSB

87 .....YC2OK

160 Meter WAZ

121.....K6TQ, 32 Zones New
92.....33 Zones, Update

Satellite

16.....F5ETM

All Band WAZ

SSB

4408.....GØWAZ 4411.....KE7PB
4409.....IN3MQT 4412.....YC2OK
4410.....AB6QM

CW/Phone

7766.....WØCP 7768 .....DL5ZAB (CW)
7767 .....JA8FRA

All CW

108 .....UA9FAR

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Manager, Jim Dionne, K1MEM, 31 DeMarco Road, Sudbury, MA 01776. The processing fee for all *CQ* awards is $4.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $10.00 for nonsubscribers. Please make all checks payable to the Award Manager. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. Questions regarding the WAZ Award may be sent to K1MEM with an SASE.

The WPX Program

SSB

2659 .....JG3WCZ

CW

2971.....UR7CA 2972 .....KZ9A

Mixed

1792 .....9A2HB 1794 .....F5LND
1793 .....2Z4P 1795 .....RW9QA

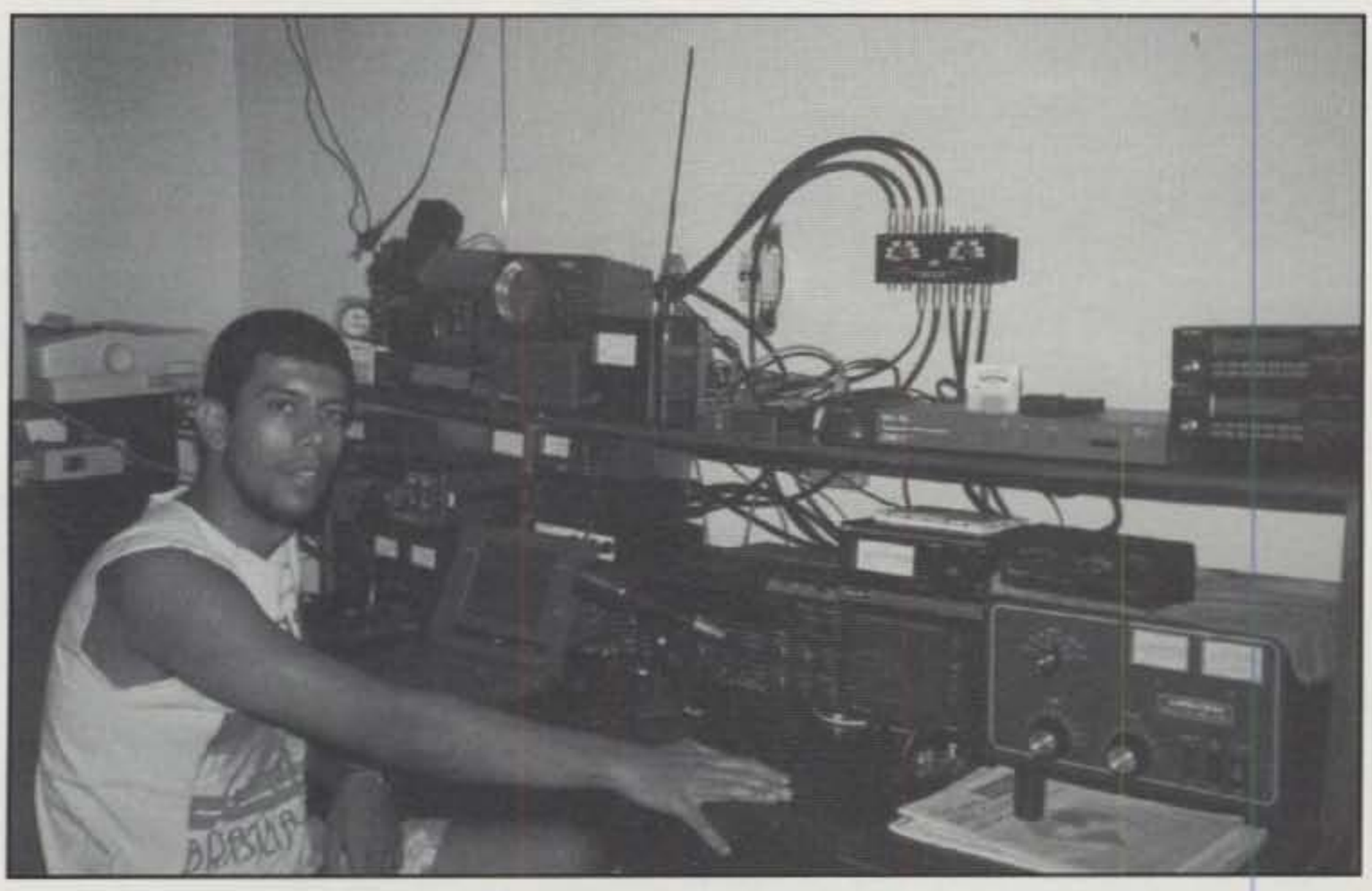
CW: 350 JR3TOE. 400 JR3TOE. 450 JR3TOE. 500 JR3TOE. 550 F5MQW. 600 F5MQW. 1500 K9UQN. 1550 K9UQN. 1600 IK3GER. 1600 IK3GER. 1650 IK3GER. 2000 G4SSH. 2150 G3VQO. 2200 G3VQO. 2750 W2ME. 4100 WA2HZR.
SSB: 350 JG3WCZ. 400 N1RT. 500 KZ9A. 800 N3DRO. 900 JR3TOE, IK6JYY, N1RT. 1150 KWØU. 1200 KWØU.
Mixed: WZ4P, F5LND. 500 WZ4P, F5LND. 600 KZ9A. 650 KZ9A. 700 K1NU. 750 K1NU. 800 K1NU, ON4CAS. 850 ON4CAS. 1050 JR3TOE. 1100 KB5OHT, JR3TOE. 1900 K9UQN. 1950 K9UQN. 2600 HA5NK. 2650 HA5NK. 3000 WB2YQH. 4200 W2FXA.
15 meters: IK4QJH
20 meters: IK4QJH
40 meters: IK4QJH, K1NU, JR3TOE
80 meters: IK4QJH
160 meters: UR7CA, IK4QJH

Europe: UR7CA

Award of Excellence Plaque Holders: K6JG, N4MM, W4CRW, K5UR, K2VV, VE3XN, DL1MD, DJ7CX, DL3RK, WB4SIJ, DL7AA, ON4QX, 9A2AA, OK3EA, OK1MP, N4NO, ZL3GQ, W4BQY, IØJX, WA1JMP, KØJN, W4VQ, KF2O, W8CNL, W1JR, F9RM, W5UR, CT1FL, W8RSW, WA4QMQ, W8ILC, VE7DP, K9BG, W1BWS, G4BUE, N3ED, LU3YL/W4, NN4Q, KA3A, VE7WJ, VE7IG, N2AC, W9NUF, N4NX, SMØDJZ, DK5AD, WD9IIC, W3ARK, LA7JO, VK4SS. I8YRK, SMØAJU, N5TV, W6OUL, WB8ZRL, WA8YTM, SM6DHU, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, DK4SY, UR2QD, AB9O, FM5WD, I2DMK, SM6CST, VE1NG, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, HA8XX, K7LJ, SM3EVR, K2SHZ, UP1BZZ, EA7OH, K2POF, DJ4XA, IT9TQH, K2POA, N6JV, W2HG, ONL-4003, W5AWT, KBØG, HB9CSA, F6BVB, YU7SF, DF1SD, K7CU, I1POR, K9LJN, YBØTK, K9QFR, YU2NA, W4UW, NXØI, WB4RUA, I6DQE, I1EEW, I8RFD, I3CRW, VE3MS, NE4F, KC8PG, F1HWB, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, KC7EM, YU1AB, IK2ILH, DEØDAQ, I1WXY, LU1DOW, N1IR, IV4GME, VE9RJ, WX3N, HB9AUT, KC6X, N6IBP, W5ODD. IØRIZ, I2MQP, F6HMJ, HB9DDZ, WØULU, K9XR, JAØSU, I5ZJK, I2EOW, IK2MRZ, KS4S, KA1CLV, WZ1R, CT4UW, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, OE1EMN, W9IL, S53EO, DF7GK, S57J, EA8BM, DL1EY.

Award of Excellence Plaque Holders with 160 Meter Endorsement: K6JG, N4MM, W4CRW, K5UR, VE3XN, DL3RK, OK1MP, N4NO, W4BQY, W4VQ, KF2O, W8CNL, W1JR, W5UR, W8RSW, W8ILC, K9BG, W1BWS, G4BUE, LU3YL/W4, NN4Q, VE7WJ, VE7IG, W9NUF, N4NX, SMØDJZ, DK5AD, W3ARK, LA7JO, SMØAJU, N5TV, W6OUL, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, UR2QD, AB9O, FM5WD, SM6CST, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, K7LJ, SM3EVR, UP1BZZ, K2POF, IT9TQH, N6JV, ONL-4003, W5AWT, KBØG, F6BVB, YU7SF, DF1SD, K7CU, I1POR, YBØTK, K9QFR, W4UW, NXØI, WB4RUA, I1EEW, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, YU1AB, IK4GME, WX3N, W5ODD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, K9XR, JAØSU, I5ZJK, I2EOW, KS4S, KA1CLV, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, S53EO, S57J, DL1EY.

Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage if airmail desired) to "CQ WPX Awards," P.O. Box 593, Clovis, NM 88101-9511 USA.



Eduardo Nascimento, PP8EB, operated the CQ WW DX SSB Contest from this well-equipped station.

with some transceive work near the end of the DXpedition, when the pile-ups have died down. On SSB watch 1845, 3805, 7080, 14195, 18145, 21295, 24945, 28495, and 50145 kHz. On CW, try 1824, 3502, 7002, 10102, 14022, 18072, 21022, 24892, 28022, and 50102 kHz. For RTTY, which will be a major focus of the trip, try 7035, 14080, 21080, and 28080 kHz. In all cases except 75 meters, the listening frequency will be up; listen to the operator for exact range.

As discussed here last year, CQ Zone 26 on the low bands is one of the most difficult for 5-Band WAZ. Given this, the DXpeditioners plan special attention to the sunrise and sunset openings around the world.

Lucky DXers on the west coast should have a easy shot at 9M0C. Both 80 and 40 meters should be workable during our long period of mutual darkness: 1030Z–1500Z. Thirty meters should provide QSOs soon after local sunrise: 1500–1700Z, followed by a brief 20 meter openings around 1800Z. If solar flux nears 125, look for 15 meter openings around 2400Z and excellent 30 meter propagation from 0900–1800Z.

East coast DXers have a very short

Doris, 9M6DU, and Alfons, 9M6MU, are the owners of the radio-equipped Hillview Gardens Resort in East Malaysia.

5 Band WAZ

As of September 30, 1997, 466 stations have attained the 200 Zone level.

New recipients of 5 Band WAZ Award with all 200 Zones confirmed:

UA4CJJ DK2GZ

The top contenders for 5 Band WAZ (zones needed, 80 meters):

N4WW, 199 (26)
AA4KT, 199 (26)
K7UR, 199 (34)
WØPGI, 199 (26)
W2YY, 199 (26)
W9WAQ, 199 (26)
VE7AHA, 199 (34)
W1FZ, 199 (26)
W9CH, 199 (26)
ACØM, 199 (34)
IK8BQE, 199 (31)
JA2IVK;199 (34,40m)
K1ST, 199 (26)
ABØP, 199 (23)
KL7Y, 199 (34)
UY5XE, 199 (27)
NN7X, 199 (34)
OE6MKG, 199 (31)
HA8IB, 199 (2 on 15)
OH2DB, 199 (1)
IK1AOD, 199 (1)
DF3CB, 199 (1)
F6CPO, 199 (1)
W6SR, 199 (37)
S57J, 199 (2)
W3UR, 199 (23)
KC7V, 199 (34)
GM3YOR, 199 (31)
KZ4V, 199 (26)
W8DX, 199 (34)
N4CH, 199 (18 on 10)
UA3AGW, 198 (1, 12)
VO1FB, 198 (19, 27)
EA5BCK, 198 (27, 39)
K4PI, 198 (23, 26)
G3KDB, 198 (1, 12)
KG9N, 198 (18, 22)
KM2P, 198 (22, 26)
DKØEE, 198 (19,31)
KØSR, 198 (22, 23)
K3NW, 198 (23, 26)
UA4PO, 198 (1, 2)
K5RT, 198 (22, 23)
JA1DM, 198 (2, 40)
OE1ZL, 198 (1,31)
9A5I, 198 (1, 16)
KE9A, 198 (18,23)
DJ4GJ, 198 (1, 31)
OH2VZ, 198 (1, 31)
W2YC, 198 (24, 26)

The following have qualified for the basic 5 Band WAZ Award:

UY5ZZ, 190 Zones

Endorsements:

W8DX, 199 Zones
DJ4GJ, 198 Zones
HK5LEX, 181 Zones
OH2VZ, 198 Zones
N4CH, 199 Zones
DK2GZ, 200 Zones

1060 Stations have attained the 150 Zone level as of October 31, 1997.

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Manager, Jim Dionne, K1MEM, 31 DeMarco Road, Sudbury, MA 01776. The processing fee for all *CQ* awards is $4.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $10.00 for nonsubscribers. Please make all checks payable to the Award Manager. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. Questions regarding the WAZ Award may be sent to K1MEM with an SASE.

propagation window on 80 meters—11–1200Z. On 40 meters the opening is a little longer (1030–1330Z). Thirty meters provides two short windows: 1300–1430Z and 2230–2400Z. On 20 meters try 1500–1900Z. Again, if solar activity is relatively high, try 17 meters 1530–1900Z and 30 meters 1200–2400Z.

Midwest DXers have a slightly longer period of mutual darkness—1030–1330Z, the best times for 40 and 80 meters. The 30 meter opening is 1430–1730Z. On 20 meters try 1530–1900 and again 2230–0030Z. With increased sunspots, look at 15 meters around 1730Z.

DXers in other parts of the world will have an easy time with 9M0C. Japanese DXers will find four or five bands open at all times to the Spratlys. European DXers should also enjoy a choice of bands at most hours, with the low bands being best 1630–2300Z and the high bands best 0800–1330Z. Look for 10 meter openings around 1100Z.

The Spratlys have a long and colorful DX history, from the first operation by Don Miller, W9WNV, in 1965 to the 1983 attempt by Baldur, DJ6SI, and others that left two DXpeditioners dead. An excellent summary of the amateur radio history of the Spratlys is in the September/October issue of *The DX Magazine,* in which Charlotte Richardson, KQ1F, and Paul Young, K1XM, describe their recent operation from Layang Layang.

An interesting footnote to Layang Layang: Bob Schenck, N2OO, a member of the 1S1DX team that was turned away by gunfire from Amboyna Cay in 1979, finally got to operate from the Spratlys this past August. After attending the grand opening of the Hillview Gardens Ham Radio Resort in Sabah, East Malaysia, Bob flew to Layang Layang to operate as **9M6OO** (see photo). It took 18 years, but Bob finally got to make contacts from this disputed land.

Montserrat

Following the publication of the story of Montserrat's volcano crisis in November, I received dozens of expressions of sympathy and support from many fans of Montserrat scattered around the globe. One letter in particular caught the unique atmosphere and way of life that have marked Montserrat in better times, so much so that I want to share it with you. The letter comes from Graham Dawes, MØAEP, from Grimsby in Lincolnshire, England. Graham writes:

"I have just received my copy of *CQ* magazine and read with interest your notes on Montserrat. As a family we have very close ties with the island, having been regular visitors since 1981. My father-in-law has a house just above the Vue Pointe Hotel [now in the volcano-threatened exclusion zone]. Amateur radio interests, which had lain dormant since my schooldays in the mid-sixties, were revived there in the Emerald Isle Bookstore one day in February 1991! Whilst casually browsing I spotted a copy of *CQ,* which I bought and read during the halcyon tropical evenings! The bug had rebitten, and upon returning to the U.K. acquisition of a Drake RC-4 and MS-4 combination soon had thoughts of my own license on the boil. It wasn't easy finding time with our own business and two young growing boys (now 11 and 12 years old), but by June 1992, I had a U.K. Class B call, and in June 1996 I passed the Morse test (which I found easier than I had imagined due to reading all the hype!).

"In August 1994, whilst out in Montserrat, I contact Victor, VP2MQ, up at his garage in Trials and found him most helpful in pointing me in the right places to obtain a local operating license. It could only happen in Montserrat! One lunchtime there was a gentle, apologetic tap on the door and there was the licensing officer (Sylvester) with all the necessary forms.

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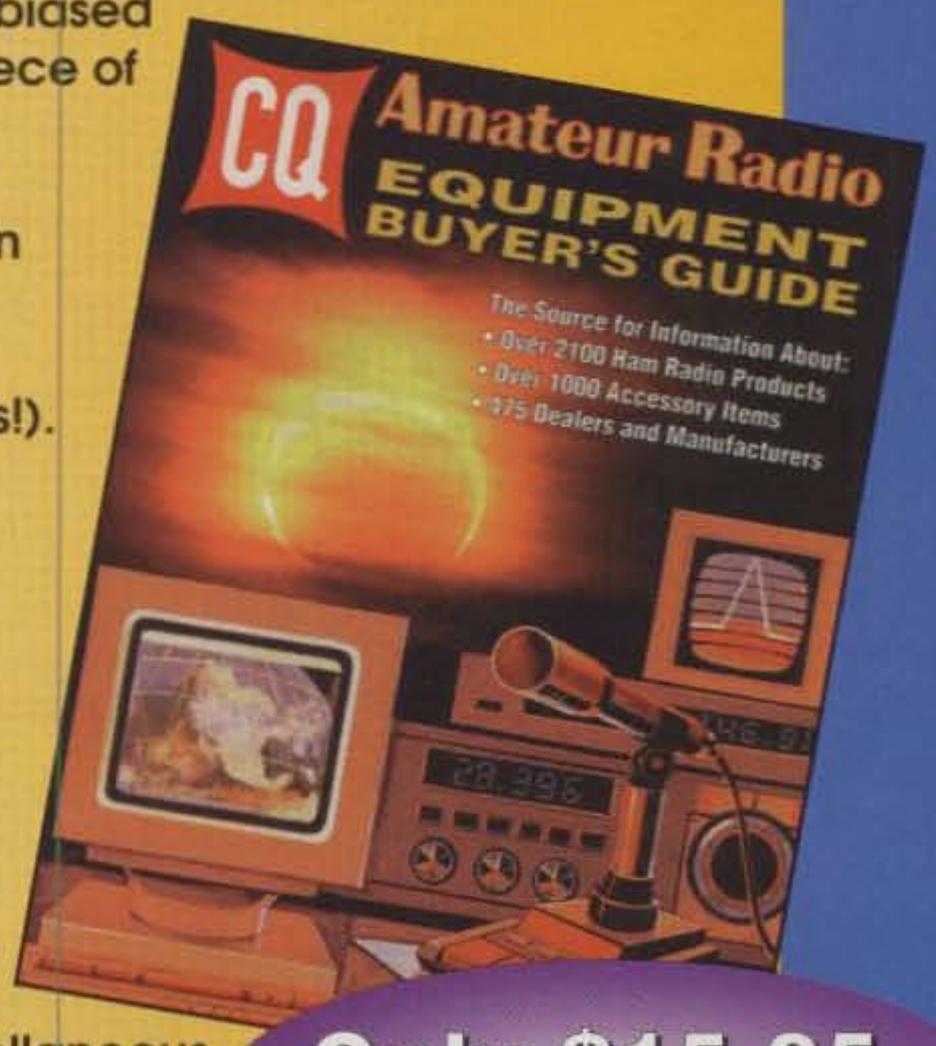

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The CQ Amateur Radio Equipment Buyer's Guide also includes the most comprehensive directory anywhere of Ham product manufacturers and dealers n the USA, complete with phone numbers, FAX numbers, Web sites, and e-mail addresses. Dealer and Manufacturer listings include major products manufactured or sold, and service and repair policies, where applicable, with 475 dealers and manufacturers listed. These listings alone are worth their weight in gold.

The CQ Amateur Radio Equipment Buyer's Guide is jam-packed with solid information and great reading. In addition to being an incredible source of insight into the current state of Ham Radio technology, it will continue to be a reliable Ham equipment reference source for many years to come.

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CQ Communications, Inc. 76 North Broadway, Hicksville, NY 11801

He requested I take them, when completed, to his wife in the launderette in Plymouth, who would have the license, as he was going off-island and did not want to inconvenience my application due to his absence! I think I must be the only ham in the world to obtain a license from a launderette! No, on second thought, there have probably been others on Montserrat!

"I operated a little from the house on 6 meters using an FT-690 Mk2 and a four-element Yagi up at about 30 feet. Not a great success!

"The following year we arrived in July on the day Chances Peak actually vented for the first time in the present cycle. Great excitement from our two boys, with a little less enthusiasm from Mum and Dad! We tried to get on with life, but the tremors got worse and the request to keep tuned to ZJB all night, 'just in case,' became wearing with a family unit. Eventually Plymouth was evacuated and the Royal Navy had to relocate the shore base for their attendant Frigate's helicopter from Sturge Park. You guessed! 'We do hope you don't find the noise too disturbing but this spot is really ideal.' The spot? That's right—the other side of the road from the back garden! Sam and Phil really thought all their Christmases had come at once. Inside of 24 hours what they didn't known about a Lynx helicopter would have fit on a postage stamp! As you are probably aware, this machine flew sorties over the mountain every three hours or whenever requested, day and night. Our boys helped clean, cover, and secure the rotor blades and soon knew the crew as bosom buddies.

"Meanwhile, attempts to work my beloved 6 meters (this time with a DX-70 and 100 watt linear) were not meeting with much success again!

"One night in August ZJB burst into life at 0400 local with Frank Savage making 'get off the island if you don't have business here' noises. 'Unable to guarantee air services after today.' We decided to make our exit. Fortunately, the DX-70 made it into one of our two small bags, but as far as I am aware, the four-element Yagi and the low-loss coaxial feeder is still in the store room where I managed to put them after hastily dismantling the portable mast and antenna.

"We have made many friends on Montserrat over the years and hope to meet them again in the not-too-distant future! We have been amazed at some of the pictures received from the island. We are also fortunate enough to occasionally receive, from a local friend, updates from the MVO [Montserrat Volcano Observatory] from the Internet. As Christmas approaches, our thoughts will be with those people barely surviving up in the north. We are personally ashamed of the way our [British] government hasn't handled the crisis. But that's another story. I hope you don't mind my writing, but I sensed a shared love of a beautiful island with friendly people!"

CQ DX Awards Program

CW

967 .....UR7CA 968 .....OK1AU

SSB Endorsements

320 .....LA7JO/328
320 .....NC9T/327
320 .....K4JLD/326
320 .....K1HDO/326
320 .....K2JF/325
320 .....KØHQW/325
320 .....YV1JV/323
310 .....CE1YI/318
310 .....K4JDJ/312
300 .....K6BZ/309
300 .....N5QDE/302
200 .....RW9SG/207
150 .....4Z5FL/150
28 MHz 9A9R

CW Endorsements

320 .....NC9T/327
320 .....W4OEL/324
320 .....KA7T/320
320 .....I4LCK/320
310 .....K2JF/319
310 .....HA5NK/319
310 .....N1HN/313
310 .....K4JLD/312
310 .....LA7JO/311
300 .....KH6CF/300
275 .....KØHQW/299
275 .....YC2OK/280
200 .....F5YJ/210

RTTY Endorsements

310 .....WB4UBD/310

Total number of active countries is 328. The basic award fee for subscribers to *CQ* is $4. For non-subscribers, it is $10. In order to qualify for the reduced subscriber rate, please enclose your latest *CQ* mailing label with your application. Endorsement stickers are $1.00. Updates not involving the issuance of a sticker are made free when an SASE is enclosed for confirmation of total. Rules and application forms for the CQ DX Awards Program may be obtained by sending a business-size, No. 10 envelope, self-addressed and stamped, to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. DX stations must include extra postage for airmail reply. Please make all checks payable to the awards manager.

Upcoming DXpeditions And DX Operations

Eric Jauch, F5JKK, should now be active from Chad as either **TT6M** or **TT8AQ**. He plans to stay in Chad until May. Eric prefers CW and will operate near 1837, 3525, 7025, 10103, 14025, 18075, 21025, 24895, and 28025 kHz. On SSB, try 1848, 3795, 7060, 14180, 18145, 21280, 24945, and 28480 kHz. Eric will also be active on 6 meters. QSL via F6FNU. (To get a QSL card from F6FNU, triple-check the accuracy of the information on your QSL card; the smallest error will prevent an answer. Send the card direct only to F6FNU with a self-addressed return envelope, return postage, plus a "tip," such as a US$1 or IRC, over and above return postage. If you do everything to F6FNU's satisfaction, you'll get your reply quickly. Cards handled by F6FNU are not valid for any REF awards.)

F6OYM is now in Djibouti operating as **J28AG**; QSL via F6FNU (see above).

Bob, N6BFM, is back in Kuwait and is active as 9K2ZZ until the end of this year. QSL via W8CNL, direct only. Bob has set up log server <http://194.54.253.223/>

THE WPX HONOR ROLL

The WPX Honor Roll is based on the current confirmed prefixes which are submitted by separate application in strict conformance with the CQ Master Prefix list. Scores are based on the current prefix total, regardless of an operator's all-time count. Honor Roll must be updated annually by addition to, or confirmation of, present total. If no up-date, files will be made inactive. Lifetime Honor Roll fee is $4.00 (U.S.) for each mode, with no fee for additions.

MIXED

4773 .....F9RM
4684 .....9A2AA
4136 .....IT9TQH
3858.....W2FXA
3740.....EA2IA
3675.....UA3FT
3585.....W1CU
3583.....K6JG
3523.....N4NO
3454.....N6JV
3413.....VE3XN
3285.....N4MM
3258.....N9AF
3253.....I2PJA
3251 ...SM3EVR
3249 .....N4UU
3183 .....YU1AB
3154 .....N5JR
3114.....9A2NA
3103.....I1EEW
3001...WA8YTM
2990 .....HA8XX
2952 ...PAØSNG
2899.....YU7SF
2880....YU7BCD
2848.....K9BG
2831.....KF2O
2789 .....IT9QDS
2719 .....I2MQP
2678.....N2AC
2640...WB2YQH
2572 .....4N7ZZ
2546...SM6DHU
2512 ....JH8BOE
2503.....S53EO
2500 .....HA5NK
2464 .....K8LJG
2452.....I2EOW
2419 .....IK2ILH
2396.....KØDEQ
2376.....HAØIT
2358.....S51NU
2185.....K2XF
2168.....N6JM
2165.....S58MU
2175 .....W7PI
2128.....W4UW
2126.....9A4RU
2111.....W9IL
2088.....W8UMR
2087.....KS4S
2039 ....YU7JDE
2019.....G4OBK
2001....OE6CLD
1919....SM6CST
1778.....DJ1YH
1765.....K5IID
1739 .....HA9PP
1732.....LU8DY
1718 ....VE4ACY
1701.....IØAOF
1696....PY2DBU
1691 .....EA5BM
1673 .....CT1QF
1656.....I2EAY
1628 ....JN3SAC
1625.....KØNL
1607....OZ1ACB
1587.....AE5B
1533.....W7CB
1490 ....CT1EEB
1431 ....I1-21171
1396 .....YU1ZD
1378 .....Z32KV
1371.....F6HMJ
1356.....NG9L
1313.....KSØZ
1299.....N3ED
1254 .....W0IZV
1212 .....WT3W
1151....VE6BMX
1125.....AA1KS
1123.....S52M
1116 .....N4PYD
1100....KB5OHT
1098.....VE6FR
1073 ....JR3TOE
1064 ...WB2PCF
1006 .....W2EZ
927.....VE7CBH
829 .....EA5BHK

SSB

4688 .....F9RM
4141 .....IT9TQH
4122.....I0ZV
3743 .....VE1YX
3607.....ZL3NS
3338.....K6JG
3311 .....F6DZU
3246 .....I2PJA
29813....CT4NH
2892 .....N4MM
2855.....F2VX
2855.....EA2IA
2745.....OZ5EV
2731.....HA8XX
2728 .....I4CSP
2725.....I1EEW
2707.....N4NO
2638.....N5JR
2552....PAØSNG
2510 .....I5ZJK
2507.....I2MQP
2411 .....9A2NA
2404....LU8ESU
2390 ...EA3AQC
2354 ..WA8YTM
2378 .....KF2O
2349 .....UA3FT
2296.....I8KCI
2274 .....EA5AT
2267 .....YUBCD
2265.....PY4OY
2251 .....4X6DK
2230 ...CT1AHU
2189 .....KF7RU
2184 .....I2EOW
2169.....WF4V
2124 .....KD9OT
2063 .....CX6BZ
2014 .....EA1JG
1958.....IN3QCI
1881...SM6DHU
1867 ...OE6CLD
1809 .....LU8DY
1760 .....HAØIT
1716 ...OE2EGL
1664.....N6FX
1659 .....KBØC
1653.....K8LJG
1651 .....YU7SF
1649...EA5CGU
1639.....K2XF
1590.....KS4S
1536.....HA5NK
1522.....W6OUL
1497.....DK5WQ
1494....CT1EEB
1490.....AE5B
1489 .....K3IXD
1485..CT1BWW
1464 .....K8MDU
1437 .....K2EEK
1415.....IKØEIM
1398.....IK2AEQ
1396.....I3ZSX
1353.....K5IID
1346 .....W9IL
1336 .....G4OBK
1288.....I3UBL
1273 .....NG9L
1243.....DF7HX
1229.....YC2OK
1196.....KØNL
1189...SV3AQR
1175...LU5EWO
1155 ...WA2FKF
1127.....EA8AG
1063.....N4PYD
1038 .....S51NU
1010 .....KI7AO
999.....WT3W
965.....DJ4GJ
954 .....EA1AX
933 .....DF1IC
924.....EA1MK
912 .....LU3HBO
873.....I2EAY
869 .....N3ED
869 .....JR3TOE
866.....HA9PP
837 .....N1RT
836.....EA3EQT
804 .....AG4W
778 .....N3DRO
740.....JN3SAC
675 .....VE6BMX

CW

4081 .....IT9TQH
3790...WA2HZR
3439 .....N6JV
3098.....UA3FT
3073 .....N4NO
3011....VE7CNE
2992.....YU7LS
2881 .....N4UU
2864 .....K6JG
2824 .....EA2IA
2614.....YU7SF
2600 .....K9QVB
2468 .....W2ME
2337 .....N5JR
2326.....G4YIK
2314....YU7BCD
2301...WA8YTM
2288.....N4MM
2247.....LZ1XL
2145.....W8IQ
2124 ....JA9CWJ
2104.....9A2NA
2074.....S51NU
2046 .....HA8XX
20356 ....HA5NK
2011 .....KA7T
1982.....KF2O
1973 .....G3VQO
1927 .....K8LJG
1927...SM6DHU
1904 .....VR2UW
1876.....HAØIT
1867 .....S58MU
1857 .....G4SSH
1854.....TI4SU
1816....SM6CST
1804.....N6FX
1795.....W1WAI
1777.....OZ5UR
1755.....K5UR
1695.....K2XF
1690.....DJ1YH
1687.....I7PXV
1641.....G4OBK
1641 .....W6OUL
1594.....I1EEW
1588.....LU2YA
1538.....IK3GER
1527 .....EA6BD
1510.....KS4S
1454 .....EA5YU
1416 .....9A3SM
1411 ...SM6DAC
1389.....I2EAY
1347 .....IK2ECP
1346.....9A2HF
1341 ...EA7AAW
1317.....N1IA
1293.....IK5TSS
1280 .....ZB2EO
1270.....K5IID
1268 .....DJ4GJ
1230.....EA6AA
1168.....AC5K
1133 .....EA2CIN
1074.....W9IL
1085.....I2MQP
1066 .....N3EO
1032.....W4UW
1017.....LU3DSI
982 .....LU7EAR
937.....9A3UF
911 .....HA9PP
906 .....YU1TR
894.....DF6SW
890.....KB5OHT
884.....I2EOW
884.....PY4WS
820.....K3WWP
759 ...VE6BMXZ
725.....KØNL
690 .....WT3W
623.....LY3BY
604 .....AC6DD
603.....OE6CLD

which includes his logs as 9K2ZZ, 9K2ZZ/NLD, N6BFM/9L, and N6BFM/4U.

The special-event station **8NØWOG** will be active this month, marking the 1998 World Olympic Games in Nagano, Japan. Amateurs visiting the Olympics may operate this station, but should carry the original copy of their amateur license.

During the entire year, the Philippines special-event station **DU100** will commemorate the 100th anniversary of Philippine independence.

OH2NSM and other Finns will operate from Guatemala as **TG0O** from Jan. 20 to Feb. 25.

A group of South Africans plan to operate from a mountain in the Kingdom of Lesotho Jan. 22–25, emphasizing SSTV and RTTY on 10, 15, and 20 meters, with CW and SSB as time permits. Look for ZS6HZ/7P8, ZS6XJ/7P8, ZS6CAL/7P8, and ZS6RVG/7P8. QSL direct or via the bureau to Dave Plaskett, ZS6RVG, P. O. Box 8116, Edleen 1625, Republic of South Africa.

DX information thanks to "The Daily DX," a daily e-mail DX newsletter. For more information on "The Daily DX," contact W3UR at <bernie.mcclenny@mail.wdn.com> or fax to 301-854-5105.

DX Club Officers

The Oklahoma DX Association has elected the following officers for the coming year: President Bruce Burnette, K5PX; Vice President Craig Boyer, AH9B; Vice President Dave Land, KD5FX; and Secretary/Treasurer Mark Byard, N5OGP. The following Directors have been appointed: Northwest Lu Fisher, K5YP; Southwest Troy Warren, K5OH; Central Coy Day, N5OK; Southeast Lee Ward, W5UDA; and Northeast Jerry Chouinard, K5YAA.

The Mile High DX Association of Denver, Colorado, announces these officers for 1998: President Don McCoy, WØDM; Vice President Bill Leahy, KØMP; and Vice President/Treas. Greg Dunn, WØZA.

The South East Michigan DX Association has selected the following officers for the next year: President Gene Klinger, AA8GX; Vice President Hank Kohl, K8DD; Treasurer Buck Switzer, N8CQA; Secretary Stan Arnett, AC8W; Program Chair Byron Johnson, WA8LCZ; Awards Manager Gary Rutledge, KR8V; and Director Bob Thompson, VA3RJT. The SEMDXA meets on the second Friday of the month at the Troy-Clawson Elks Club.

The Redwood Empire DX Association has elected the following officers: President K6RIM; Vice President N6AD; Secretary/Treasurer WA6IKQW; and Directors K6ANP, N6EYU, and N6OJ.

Other DX News

The 1998 International DX Convention in Visalia, California, is May 1–3 at the Holiday Inn. Pre-registration (before April 15) is US$55, including Saturday banquet and Sunday breakfast. Send your name, callsign, address, and choice of chicken, prime rib, or salmon for dinner to Don Bostrom, N6IC, 4447 Atoll Avenue, Sherman Oaks, CA 91423.

The 1998 New Orleans International DX Convention is Aug. 14–15 at the Royal Sonesta Hotel on Bourbon Street in the historic French Quarter of New Orleans. This is a very well-run affair, with excellent programs and the best banquet food you've ever tasted. The hospitality room overlooking Bourbon Street on Saturday night is worth the price of admission by itself! Plan on attending this year. More information later.

Nominations for *CQ*'s **DX Hall of Fame** are due by the end of this month. Any radio club may nominate an outstanding DXer. Send a description of why the nominee should be considered for this honor to the Hall of Fame Committee, c/o Bob Cox, K3EST, 1816 Poplar Lane, Davis, CA 95616.

Finally, got some stamps from DX stations and no good place to give them to? If your local Scout Troop can't take them off your hands, try the Stamp Club at Shriner's Hospital for Children, 2425 Stockton Blvd., Sacramento, CA 95817. *(Thanks, K3SWX.—ed.)*

73, Chod, VP2ML

QSL Information

3A/AA2LF to WA4JTK
3D2AL to 7M3VAL
3D2HW to I5JHW
3W6EZD to XW2A
3Z0AMW to SP2PMW
4K7F to UA9AB
4L0CR to IK7JTF
4U/TF1MM to TF-Bureau
5A2A to DL3KDV
5A7A to DL3KDV
5B4/T97M to K2PF
5B4AGC to G3LNS
5C8M to CN8MC
5H3HG to WY3V
5J2X to HK3DDD
5N37CPR to SP5CPR
5N37T to F2YT
5R8FX to DJ9DX
5X1M to ON5NT
6C50O to YK1AO
7P8/ZS6CAL to ZS6RVG
7P8/ZS6XJ to ZS6RVG
7S6QW to SK6QW
8P9DX to VE3ICR
8Q7DV to UA9CI
8Q7LB to UA9CI
9A20D to 9A1CRD
9A4U to 9A2AJ
9K2/T97M to K2PF
9K9K to 9K2RR
9M2OM/P to G0CMM
9M2TD to JR4PDP
9M6BG to VS6BG
9M6OO/P to N2OO
9M8YY to JH3GAH
9N1FP to RU6FP
9Q2T to ON5NT
9U5W to VE2EK
9W0A to DL5WM
A43/K3LP to W3UR
A43/KE3Q to W3UR
A45XR/SJ to SP5EXA
A45ZN to G0BVQ
A61AJ to W3UR
A720 to KA5TQF
AH2R to JI3ERV
AM0MM to EA3MM
AM3AR to EA3AR
AM3GCV to EA3GCV
AO3AKH to EC3AKH
BA1DU to W3HC
BA4TA to 9A7W
BP0A to BV2AD
BV0CQ to BV8BC
BV0GSM to BV4ME
BV5BG to I0WDX
CF3/EA3AOK to EA3BT
CI9DH to VE9DH
CQ5FIJ to CT1FIJ
CQ7FIJ to CT1FIJ
CT7ECP to CT1EOK
CV5A to CX2ABC
CW166NP to CX3FL
CW1CIC to CX2ABC
CW1RFP to CX2ABC
CW5W to CX7BY
CX5X to W3HNK
CY0SAB to VE1NR
D3SAA to CT1BZJ
DA0RP to DJ0JE
DU2/WA4QDE to N2OO
DU2/WD4KMD to N2OO
EA6IB to EA3KU
EA8HH to OH2MM
ED2MGB to EA2URV
ED5JAC to EA5GMB
EG0MGB to EA2URV
ER1CW to ERIDA
ER3R/P to ER1DA
ER7A to ER1DA
ER8C to ER1DA
EX8F to DL8FCU
FG/PA3BBP to PA3ERC
FO0KEO to KA7CQQ
FO8BRD to N6RT
FP5BZ to F5TJP
FT5XN to F6PEN
GB5ML to GM3PXK
GC0STH/P to G4DIY
GJ4IFB to G4IFB
GT3FLH to GD3AHV
HG1XBI to F6AJA
HI8/KD9KP to AD4LR
HK0/KH8AL to JH1NBN
HP1XBH to W4WX
HP2XBI to F6AJA
HP5XBI to F6AJA
HS0/JR3XMG to JF3PKJ
IF9/IT9HBT to IT9FXY
II9S to IT9PVS
II9S/J to IT9PVS
IK/FM5GU to WA4JTK
IL3CII to IV3CII
IQ2I to IK2FXQ
J28DB to F4AAQ
J38SR to W6SR
J41GRC/J to SV1CEI
J42QEE to SV2CWW
J43KRA to SV1HR
J49IL to DJ5IL
J8/DF2SS to DL2MDZ
JT1FBB to W9JOE
JY8ZW to K4ZW
K1K to WU1F
KG4DC to W4WX
KG4PK to W4WX
KH7A to JA5DQH
KP3Z to WC4E
L20H to LU4HAW
L20XSI to LU6EF
L75KT to LU4KC
LX8DH to LX1DA
LX8DH/P to LX1DA
LY8X to LY1BZB
MJ4IFB/P to G4IFB
MU0BKA to K4ZLE
MW0BKA to K4ZLE
N2NL/KH2 to W2YC
N6O to N6RO
NH2/NH6D to N6FF
OE2S to OE2GEN
OF0TA to OH2TA
OF1KAG to OH1KAG
OF1MDR to OH1MDR
OF9AR to OH9AR
OT7A to ON7LR
OX3LG to OZ2ELA
P43HOT to P43ARC
P5/JA1CGR to PIRATE
PJ8/KG8XV to JH1ROJ
PV2P to PT2NP
PX5JP to PP5OW
R1ANL to UA6AH
RA3RCL to 7L1MFS
RA3RQF to 7L1MFS
RU2RCU to N2OO
RZ3Q to N2UCK
S21GM to N2OO
S59L to W6ZQ
SO1HH to DL7VRO
SP0IPA to SP9BRP
SP0PEA to SP1NQF
SU1JOTA to SU1ER
SV0AB to N2OO
SV0LK to DJ4TR
SV1/N2OO to N2OO
SW0AA to N2OO
T32CC to KD4YED
T49C to SK0UX
T88KH to JM1LJS
T94POPE to T94YT
TA2/OK1MM to OK1DWX
TF/KE8RO to KC8CSD
TL8PL to F5LNA
TM0CC to F5MCC
TO0RM to DL2JRM
TR8XX to F2XX
TT37Y to F6FNU
TU3F to F3KT
TZ6HP to JA1OEM
UE6FST to RZ6HWA
UT7OU to UT3UA
V26AK to N4TK
V26FV to W3FV
V26OC to N3OC
V29AK to N2TK
V29TT to 4X6TT
V2BE to AB2E
V47NZ to K9NW
V63CV to JP1WDM
V85TG to JH3GAH
VD3NJ to VA3NJ
VK2IDR to G3AUA
VK2TDL to G3AUA
VO2PP to G8PP
VP9LR to K1EFI
VR97LC to VR2LC
VR97UW to VR2UW
VU2JBK to VU2DVC
VX2KH to VE2KH
VX3SJL to VE3SJL
VX6VK/P to VE6VK
VX8XN/P to VE3XN
WH2Z to N2NL
XE2VNX to K6VNX
XF3/EA3AOK to EA3BT
XV8FP to F6BFH
XX9OO to N2OO
YA/PA3BTQ to PA-Bureau
YC9VX to YB1ZZ
YE52AB to YB2FRR
YJ0AMF to ZL2MF
YN6/JM6EBA to JARL
YN6WW to JA6VU
YQ5TO to YO5CUU
YR7C to YO7VS
YX1D to YV1AVO
Z22EW to ZS6EW
Z31AD to YT1AD
ZB2IQ to G3AUA
ZD8TC to N2OO
ZF2LH to N7NU
ZF2RA to K7AR
ZK1GM to AA0FT
ZK1MJF to ZL2MF
ZK2KY to JA3MVI
ZK2MF to ZL2MF
ZK3MF to ZL2MF
ZL8AA to ZL2AL
ZP27T to ZP5WYV
ZS2BBG to DF1OC
ZW5GSD to PY5AWB
5H3HG to Harold Germany, Jr., American Embassy-Dar es Salaam, Department of State, Washington, D.C. 20521
8P9IV to Michael Wondergem, #23 Durants, Christ Church, Barbados
BD4DH to Chen Ming, Shi Hua 6 Chuen 640/601, Shanghai 200540, China
BD4DJ to Zhuang Da Hua, P.O. Box 085-299, Shanghai 200085, China
BV2HL to Tony, P.O. Box 4-73, Shulin, Taipei 238, Taiwan
BV2OL to Jelly, P.O. Box 11877, Taipei, Taiwan
DS5USH to Nam Joo-Ho, 417-6 Beom-Eo Dong, Susung Ku, Taegu 706-012, Korea
HL0C to Hanyang University Wave Research Club, CPO Box 4397, Seoul 100-643, Korea
HL0Z to Gyeongsang National University Marine Science College, 445 Inpyung Dong, Tongyung 650-160, Korea
HL1OUX to Hwang Young Su, 515-105 Do Si Gae Bal Apt., Gayang Dong, Seo Gu, Seoul, Korea
HL1SWT to Kim Pil Sik, 515-105 Do Si Gae Bal Apt., Gayang Dong, Seo Gu, Seoul, Korea
HL5PPK to Hong-gyu Jun, 601 Sam An Green APT, 803 Gum Se, Sam Rang Jin, Mir Yang City, Kyung Nam 627-900, Korea
KP2SJ to St. John Amateur Radio Club, P.O. Box 1318, Cruz Bay, VI 00831
LX1KC to Kieffer Christian, 121, rue Klensch, L-3250 Bettembourg, Luxembourg
LX1TI to Trezzi Carlo, P.O. Box 117, L-4901 Bascharage, Luxembourg
LX9UN to P.O. Box 111, L-9502 Wiltz, Luxembourg
SV1DET to Jim Tsifakis, 30-32 Kanari Str., GR-185 38 Piraeus, Greece
SV1DHU to John Krikelis, P.O. Box 132, GR-301 00 Agrinio, Greece
SV1DKR to John Kyriakos, 4 El Benizeloy Str., GR-173 43 Athens, Greece
SV1EPB to Dinos Nicandros, 17 Plapouta Street, GR-167 77 Helliniko, Athens, Greece
SV1RK to Mike Krideras, P.O. Box 9, GR-303 00 Nafpaktos, Greece
TA7V to Erol Tuncay, P.O. Box 62, 61001 Trabzon, Turkey
XX9BB to Leong Kam Po, P.O. Box 6018, Macau
YB0BUF to Hendra Djaya, P.O. Box 120 JKB, Jakarta, Indonesia
YB0S to Gerakan Pramuka Kwartir Nasional, Jl. Merdeka Timur 6, Jakarta 10110, Indonesia
YB7HWI to Nazaruddin, P.O. Box 171, Banjarmasin 70001, Indonesia
YC1FRW to Sutaryono, Jl. Sempur Kaler IV/5, Bogor 16153, Indonesia
YC9WZJ to Joni Salim, P.O. Box 127, Sorong 98401, Irian Jaya, Indonesia
YF7PT to R. Soesanto Eko Wardojo, SP, P.O. Box 226, Banjarmasin 70001, Indonesia
ZP5FAF to Felix Acosta Granados, Tte. Alvarenga No. 1324, Asuncion, Paraguay
ZP6GMA to Gricelda Maria Rotundo de Johansen, C. C. 21101, Palma Loma, Luque, Paraguay
ZP9GBC to Javier Obregon Linares, P.O. Box 191, Ciudad del Este, Paraguay

The table of QSL managers is courtesy of John Shelton K1XN, editor of The GOLIST, P. O. Box 3071, Paris, TN 38242 (telephone 901-641-0109; e-mail <golist@iswt.com >).

BY FREDERICK O. MAIA, W5YI

WASHINGTON READOUT

REGULATORY NEWS IN THE WORLD OF AMATEUR RADIO

FCC Releases RF Safety Supplement for Amateur Radio Stations

"As of January 1, 1998, amateur licensees and grantees will be expected to routinely evaluate their stations for potential human exposure to RF fields that may exceed the FCC-adopted limits for maximum permissible exposure (MPE). If such an evaluation shows that potential exposure will exceed the MPE limits, the amateur licensee must take appropriate corrective action to bring the station into compliance before transmission occurs (see 47 CFR § 97.13(c), as amended."

Last August the Commission issued a revised version of OET Bulletin 65, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields." This revised bulletin, Edition 97-01, provides assistance in determining whether FCC-regulated transmitters comply with limits adopted by the Commission in 1996 for human exposure to radiofrequency (RF) electromagnetic fields. (See Report and Order, ET Docket 93-62, adopted August 1, 1996.)

The new guidelines replaced the 1982 RF protection guides of the American National Standards Institute, ANSI, which had been used by the FCC since 1985. For amateur stations, the new policy requires that the station be subject to "routine evaluation" when it will be operated above certain threshold power levels. A routine evaluation is a formal determination as to whether the station conforms to the RF exposure requirements.

In the past, although amateur stations were expected to comply with the FCC's guidelines, routine station evaluation was not required. The Amateur Service was "categorically excluded," since the FCC determined that it was unlikely that amateur radio operators would exceed the RF safety standards. The new RF exposure guidelines are more stringent, however, and amateurs are no longer exempt.

On November 18th the FCC released a new Supplement B to Bulletin 65 which provides specific guidance for use by amateur radio applicants and licensees in evaluating their stations for compliance with the RF safety limits. This addendum is entitled "Additional Information for Amateur Radio Stations" and is the second supplement to be released in connection with Bulletin 65. Supplement A, issued earlier, provides additional compliance information for radio and television broadcast stations.

Supplement B contains information, tables, and figures which can be used by amateur station licensees in determining whether a station must be evaluated for RF compliance, and, if so, how that evaluation can be accomplished. The publication was developed in consultation with amateur licensees and organizations, including the American Radio Relay League and the W5YI Group.

It was Dr. Wayne Overbeck, N6NB (a professor at California State University, Fullerton), who suggested that the FCC should develop the additional RF safety bulletin aimed at amateur radio operators. He pointed out that vast numbers of amateurs are neither members of the ARRL nor subscribers to any amateur service magazines, and consequently these educational sources are not sufficient to ensure adherence to the RF safety guidelines. He felt that a special version of OET Bulletin No. 65 for radio amateur operations could supplement Part 97 rules and be used by amateurs to certify compliance with the RF exposure safety guidelines. It would include charts and tables that would assist amateurs in determining the required separation distances between antennas and inhabited areas for various power levels.

N6NB prepared many excellent tables for Supplement B that give estimated distances to meet RF power density limits in the main beam of typical antenna installations. Overbeck also suggested that amateurs be tested on this topic as part

(A) Limits for Occupational/Controlled Exposure (see Note 1)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minutes)
0.3–3.0	614	1.63	(100)*	6
3.0–30	1842/f	4.89/f	($900/f^2$)*	6
30–300	61.4	0.163	1.0	6
300–1500	—	—	f/300	6
1500–100,000	—	—	5	6

(B) Limits for General Population/Uncontrolled Exposure (see Note 2)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minutes)
0.3–1.34	614	1.63	(100)*	30
1.34–30	824/f	2.19/f	($180/f^2$)*	30
30–300	27.5	0.073	0.2	30
300–1500	—	—	f/1500	30
1500–100,000	—	—	1.0	30

f = frequency in MHz.
*Plane-wave equivalent power density.
Note 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure. These limits apply to amateur station licensees and members of their immediate household as discussed in the text.
Note 2: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons who are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure. As discussed in the text, these limits apply to neighbors living near amateur radio stations.

Table I– FCC limits for Maximum Permissible Exposure (MPE).

National Volunteer Examiner Coordinator, P.O. Box 565101, Dallas, TX 75356-5101 (817-461-6443)

of operator license examinations. The FCC adopted both of his suggestions. The Commission also incorporated the proposal of the American Radio Relay League (ARRL) that amateurs should be required to certify, as part of their license application process, that they have read and understand the RF Safety bulletins and the relevant FCC rules.

The complete text of OET Bulletin 65 and the new Supplement B (about 150 pages total, complete with all the tables) can be viewed and downloaded from the FCC's OET Web site at <http://www.fcc.gov/oet/>.

The following is a digested version of the new RF Safety rules contained in Supplement B.

Section 1: What it Radiofrequency Radiation?

This chapter contains definitions of radiofrequency (RF) energy and electromagnetic "radiation," "waves," and "fields." The relationship of wavelengths to frequency is also discussed. "The RF part of the electromagnetic spectrum can generally be defined as that part of the spectrum where electromagnetic waves have frequencies that range from about 3 kilohertz (kHz) to 300 gigahertz (GHz)."

The updated Maximum Permissible Exposure (MPE) limits are indicated in electric (V/m) and magnetic (A/m) field strengths and power density (mW/cm^2) between 300 kHz and 300 MHz. MPE limits above 300 MHz are specified in power density only. (See Table I.)

§ 97.13 Restrictions on station location.

(c) Before causing or allowing an amateur station to transmit from any place where the operation of the station could cause human exposure to levels of radiofrequency (RF) radiation in excess of that allowed under § 1.1310 of this chapter, the licensee is required to take certain actions.

(1) The licensee must perform the routine RF environmental evaluation prescribed by § 1.1307(b) of this chapter, if the power of the licensee's station exceeds the following limits:

	Wavelength Band	Evaluation Required if Power* (watts) Exceeds
MF	160 meters	500
HF	80 meters	500
	75 meters	500
	40 meters	500
	30 meters	425
	20 meters	225
	17 meters	125
	15 meters	100
	12 meters	75
	10 meters	50
VHF	All bands	50
UHF	70 cm	70
	33 cm	150
	23 cm	200
	13 cm	250
SHF	All bands	250
EHF	All bands	250
Repeater Stations	All bands	non-building mounted antennas: height above ground level to lowest point of antenna < 10 m and power > 500 W ERP building-mounted antennas: power > 500 W ERP

*Power = PEP input to antenna except, for repeater stations only, power exclusion is based on ERP (effective radiated power).

(2) If the routine environmental evaluation indicates that the RF electromagnetic fields could exceed the limits contained in § 1.1310 (See Table I) in accessible areas, the licensee must take action to prevent human exposure to such RF electromagnetic fields. Further information on evaluating compliance with these limits can be found in the FCC's OET Bulletin Number 65, "Evaluating Compliance with FCC-Specified Guidelines for Human Exposure to Radio Frequency Radiation."

Table II– Power thresholds for routine evaluation. The above are the new FCC Part 97 rules that apply to RF safety.

Section 2: FCC Exposure Guidelines And Their Application

This section covers the exposure environments and time/power averaging. The FCC guidelines incorporate two separate tiers of exposure limits that are dependent on the situation in which the exposure takes place and/or the status of the individuals who are subject to exposure.

Occupational/controlled exposure limits apply to situations in which persons who are exposed have been made fully aware of the potential for exposure and can exercise control over their exposure. Occupational/controlled exposure limits also apply where exposure is of a transient nature as a result of incidental passage through a location where exposure levels may be above general population/uncontrolled limits (see below), as long as the exposed person has been made fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Occupational/controlled exposure limits apply to amateur licensees and members of their immediate household (but not their neighbors—see below). In general, a controlled environment is one for which access is controlled or restricted. In the case of an amateur station, the licensee or grantee is the person responsible for controlling access and providing the necessary information and training as described above.

General population/uncontrolled exposure limits apply to situations in which the general public is not made fully aware of the potential for exposure or cannot exercise control over their exposure. Therefore, members of the general public always fall under this category. Neighbors of amateurs and other non-household members would normally be subject to the general population/uncontrolled exposure limits.

For purposes of applying these definitions, awareness of the potential for RF exposure in a controlled or similar environment can be provided through specific training. Warning signs and labels can also be used to establish such awareness as long as they provide information, in a prominent manner, on risk of potential exposure and instructions on methods to minimize such exposure risk. For example, a sign warning of RF exposure risk and indicating that individuals should not remain in the area for more than a certain period of time could be acceptable.

Time Averaging—A feature of the exposure guidelines is that exposures may be averaged over certain periods of time with the average not to exceed the limit for continuous exposure. The averaging time for occupational/controlled exposures is six minutes, while the averaging time for general population/uncontrolled exposures is thirty minutes.

It is important to note that for general population/uncontrolled exposures it is usually not possible or practical to control access or otherwise limit exposure duration to the extent that averaging times can be applied. In those situations, it normally would be necessary to assume continuous exposure to RF fields that would be created by the on/off cycles of the radiating source.

As an illustration of the application of

time-averaging to occupational/controlled exposure (such as would occur at an amateur station), consider the following, the relevant interval for time-averaging six minutes. This means, for example, that during any given six-minute period an amateur could be exposed to two times the applicable power density limit for three minutes as long as he or she was not exposed at all for the preceding or following three minutes.

Power-averaging consists of both the time of full exposure during any six (or thirty) minute period (i.e., the on-and-off transmitting time of the signal) and the "duty factor" of the transmitting mode being used.

Section 3: Methods of Predicting Human Exposure

This section discusses the many ways of predicting exposure and estimating compliance distances. These include using tables developed from field strength equations and antenna modeling. Compliance distances can also be estimated by using calibrated field-strength measurements.

Most amateurs will use various tables to estimate compliance distances for MPE limits. The simplest of these tables was developed using a far-field equation and assuming ground reflection of electromagnetic waves from the RF source. This model, although simplified, has been verified to be a reasonable approximation against a number of dipole, ground-plane and Yagi antennas, based on computer modeling carried out by the ARRL. In most cases, however, the tables derived from this far-field approximation give conservative results that over-predict exposure levels. The W5YI Tables are probably the easiest of the tables to use. They are followed by a number of tables based on specific antenna types.

The first step an amateur should take is to select the simple table that best applies to his station and determine the estimated compliance distances for the relevant operating bands. If a compliance distance is less than the actual distance to an exposure location, the station "passes" and the evaluation is complete. It can be that simple. Remember that these distances are for the absolute distance from the antenna at any angle.

Section 4: Estimating Compliance Distances from Typical Transmitting Antennas

This section contains a number of tables for amateurs who desire a more accurate estimate of the RF fields expected near their antennas. In many cases, a station that may not pass based on "worst-case" predictions could easily be shown to be in compliance using these tables. The ARRL tables offered in this supplement are only a few examples of a large number of tables prepared by that organization using this method.

There are also several based on use of far-field power density equations assuming the reflection factor used by the EPA. These tables represent "worst case" estimates of the far-field equivalent power density. These tables should be used unless the exposure situation of interest is in the main beam or lobe of the antenna being considered. In the latter case, surface reflection would not necessarily be of major concern.

Performing the "Routine Evaluation." No station is exempt from *compliance* with the FCC's rules and with the MPE limits. However, many amateur stations are categorically exempt from the requirement to perform a *routine station evaluation* for compliance.

Stations operating at or below the power levels given in Table II are not required by the FCC to perform a routine evaluation for compliance. Also, stations using mobile and portable transmitters and PTT (push-to-talk) operation are not required to be routinely evaluated. The FCC has defined "mobile" devices as those designed to be

used in other than fixed locations and to be used in such a way that a separation distance of at least 20 cm (about 8 inches) is normally maintained between the transmitter's antenna and the body of the user or nearby persons.

The FCC defines "portable" devices as those designed to be used so that the antenna is within 20 cm of the body of the user. This would include amateur hand-held talkies. Although amateur vehicular mobile and portable PTT transceivers are categorically exempt from routine evaluation, operators are cautioned to be aware that relatively high-powered mobile or hand-held devices can expose persons in their immediate vicinity to significant RF fields under conditions of relatively continuous transmission.

Amateur radio operators should take measures (such as reducing transmitting power to the minimum necessary, positioning the radiating antenna as far from humans as practical, and limiting continuous transmitting time) accordingly to protect themselves and the occupants of their vehicles. Locating mobile antennas in the center of a metal roof is also preferable to window-mount installations.

Amateur repeater stations operating with 500 W PEP output or less whose antennas are not mounted on buildings and which are located at least 10 meters (about 33 feet) above ground are also categorically exempt from performing an evaluation. In the case of building-mounted repeater station antennas, the exemption applies regardless of height if power is 500 W or less.

The person responsible for making the determination is the person named on the data base license grant as the primary station licensee or as the club, military recreation, or RACES station license trustee, and any alien whose amateur radio station is transmitting from a place where the service is regulated by the FCC under the authority that is derived from a reciprocal arrangement.

If the amateur station is to be operated on more than one wavelength band, or with several different antennas or combinations of apparatus, each is considered to be a separate station and must be separately evaluated.

In order for an amateur to perform an evaluation of his or her station for RF compliance, the following questions should first be asked:

1. Which category of exposure applies at the location(s) in question (i.e., "controlled" or "uncontrolled" environment)?
2. What type(s) of transmitting antenna is/are being used (and what is the gain of the antenna)?
3. What transmitting power levels will be used?
4. How far is the area being evaluated from the antenna(s) in question?

The tables in Supplement B can then be used to help determine compliance with exposure guidelines. If this supplement does not contain a table that is relevant to your particular station parameters, Bulletin 65 should be consulted for alternative methods of determining compliance (for example, calculations, measurements, etc.).

There are two ways to determine whether your station's radio frequency radiation is within the MPE guidelines established for "controlled" and "uncontrolled" environments. One way is direct "measurement" of the RF fields. The second way is through "prediction" using various equations and calculational methods described in OET Bulletin 65 and Supplement B.

In general, most amateur radio operators will not have access to the appropriate calibrated equipment to make accurate field strength/power density measurements. The field-strength meters in common use by amateur operators and inexpensive hand-held field strength meters do not provide the accuracy necessary for reliable measurements, especially when different frequencies may be encountered at a given measurement location.

It is more feasible for amateurs to determine their PEP output power at the antenna using the RF Compliance Worksheet and then look up the required distances to the controlled/uncontrolled environments using the W5YI Tables. These tables, contained in Supplement B, estimate distances to the controlled and uncontrolled environment for the various

amateur bands for typical antenna gains and power levels.

Section 5: Controlling Exposure to RF Fields

After an evaluation is performed, if a determination is made that a potential problem exists, Section 4 of Bulletin 65 should be consulted for a discussion of recommended methods for reducing or controlling exposure. Such methods could include one or more of the following:

1. Restricting access to high RF-field areas.
2. Operating at reduced power when people are present in high RF-field areas.
3. Transmitting at times when people are not present in high RF-field areas
4. Considering duty factor of transmissions.
5. Time-averaging exposure.
6. Relocating antennas or raising antenna height.
7. Incorporating shielding techniques.
8. Using monitoring or protective devices
9. Erecting warning/notification signage.

Limiting access may be the easiest method to reduce exposure. If an antenna is in an area where access is generally restricted (such as a fenced-in yard), it may be sufficient to simply control access to the yard when transmissions are in progress (assuming exposure levels exceed the guidelines in the yard). An antenna could also be placed high enough on a tower or mast so that access to high RF levels is generally impossible.

Reducing transmitting power can also significantly reduce exposure levels. The power output of a transmitter has a linear relationship with the power density exposure level that could be experienced by a person near the transmitting antenna. For example, if power output is reduced by 20%, then power density at a given location will also be reduced by 20%.

An often overlooked method of reducing exposure is by utilizing the inherent duty factor of the transmissions from an amateur station. The worst-case duty factor, 100%, occurs during continuous or "key down" transmissions. However, most amateur service two-way transmissions are more likely to be of the "key on, key off" type, resulting in more typical duty factors of, say, 50%.

Amateur radio operators should be aware that the new FCC radiofrequency safety regulations address exposure to people—and not the strength of the signal. Amateurs may exceed the MPE limits as long as no one is exposed to the radiation.

Conclusion

The Commission has always relied on the skills and demonstrated abilities of amateurs to comply with its technical rules, and it will continue to do so. The FCC believes that amateur licensees and applicants should be sufficiently qualified to conduct their own evaluations and act accordingly. In OET Bulletin 65 and in Supplement B, the FCC attempts to provide the amateur community with as much information as possible to accomplish these tasks.

In addition, Commission staff will continue to be available to answer questions and provide further information if requested. The Commission will also continue to work with amateur organizations such as the ARRL to improve the usefulness, accuracy, and inclusiveness of this supplement.

Future editions of Supplement B (as well as of Bulletin 65) may be issued as needed to update the data and information provided here or to make any major corrections that may be necessary. In that regard, the Commission invites amateurs to provide input to FCC staff relating to evaluating RF exposure and the contents of the Bulletin 65 and its supplements (Federal Communications Commission, Office of Engineering and Technology, 1919 M Street NW, Washington, DC 20554 - [202-418-2464]).

The FCC encourages the amateur community to continue its activities in developing its own methods and information for performing RF environmental evaluations. "We believe that these efforts will result in an improved and safe amateur service that will benefit both amateur licensees and those persons residing or working near amateur facilities," the FCC said.

Optional Worksheet and Record of Compliance

Supplement also contains an excellent fill-in-the-blank worksheet that takes you step-by-step through an evaluation of your station. It was prepared by the FCC's Barnett C. "Jay" Jackson, Jr., W3VG. During the early 1980s Jackson worked in the Private Radio Bureau, and for at least a couple of years his primary duty was developing the amateur radio license exam questions.

The optional worksheet can be used to determine whether routine evaluation of an amateur station is required by the FCC's rules. It also can be used as an aid in determining compliance. However, use of this worksheet is not required by the FCC. Once you determine what your output power to your antenna is, you can easily determine the needed separation distance to the controlled and uncontrolled environment by using the W5YI Tables. For 99% of all amateur stations, these are the only two tools that you will need.

73, Fred, W5YI

BY GEORGE JACOBS, W3ASK

PROPAGATION

THE SCIENCE OF PREDICTING RADIO CONDITIONS

Mother Nature Smiles on CW Contest!

Better than even the expected good propagation conditions took place during the CQ World-Wide DX CW Contest weekend of November 29–30. The solar flux climbed to 112 on both days, the sunspot count was 39 on the 29th and 42 on the 30th, the geomagnetic field was exceptionally quiet, and the ionosphere was stable. Overall conditions ranged from Low Normal in polar and auroral regions, to High Normal at mid-latitudes, to between High and Above Normal in low and equatorial latitudes. There was no solar flare activity reported during the contest weekend. What more could one have asked for?

Conditions were noticeably better during the CW weekend than during the October SSB weekend, with more widespread 10 and 15 meter openings.

Thank You, Mother Nature!

Table I summarizes worldwide HF propagation conditions based on reports jointly made by the USAF and NOAA through the Space Environmental Services Center, Boulder, Colorado.

Table II shows the level of geomagnetic activity taken every three hours during the contest weekend as measured by the Kp worldwide, or planetary, index.

The improved HF propagation conditions noted during the 1997 SSB and CW Contest weekends are a certain sign of increasing solar activity. We can expect increasingly better HF propagation conditions for at least the next several years as the new sunspot cycle continues its rise.

Sunspot Cycle Progress

The Royal Observatory of Belgium reports a mean sunspot number of 23.3 for October 1997. A high count of 40 was recorded on October 17, while the 23rd was the only spotless day during the month. October's mean value results in a 12-month running smoothed sunspot number of 16.5 centered on April 1997. This is a 2.5 point increase from March's level.

A smoothed sunspot number of approximately 50 is forecast for February 1998, as Cycle 23 is expected to climb somewhat more rapidly than during its early months.

Canada's Dominion Radio Astrophysical Observatory in Penticton, British Columbia reports a 10.7 cm solar flux level of 85 for October 1997. This results in a smoothed value of 78 centered on April 1997. A smoothed 10.7 cm solar flux level of approximately 110 is predicted for February 1998.

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LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for February 1998

	Expected Signal Quality			
Propagation Index.....	(4)	(3)	(2)	(1)
Above Normal: 1, 8, 13, 16 28	A	A	B	C
High Normal: 2, 4, 9, 12, 14-15, 19-20, 24, 27	A	B	C	C-D
Low Normal: 3, 6-7, 17-18, 21, 23, 25-26	B	C-B	C-D	D-E
Below Normal: 5, 11, 22	C	C-D	D-E	E
Disturbed: 10	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 S9, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S6, with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find the *propagation index* associated with the particular path opening from the 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 path opening for any given day of the month. For example, an opening shown in the Propagation Charts with a *propagation index* of (3) will be excellent (A) on February 1st, good (B) on the 2nd, fair-to-good (C-D) on the 3rd, good (B) on the 4th, fair-to-poor (C-D) on the 5th, etc.

Internet News

Two new websites which should be very useful to radio amateurs interested in solar, solar flux levels, sunspots, and geomagnetic indices, both for past records and up-to-date information, are <http://www.oma.be> and <http://www.dxlc.com>. The first connects directly to the Royal Observatory of Belgium, the world's official keeper of sunspot records. After contacting the home page of this website, select "ORBKAB," which in French and Flemish are the initials of the Royal Observatory of Belgium. Then select "Information About the Observatory," "International Centers," and then "Sunspot Index Data Center."

There is a wealth of sunspot data here from the first observations recorded during the 18th century to the present day. Numbers are given as daily values, monthly mean values, annual mean values, and monthly smoothed values. There is also a great deal of other interesting information.

The second website is maintained by the DX Listeners Club in Norway. Under the listing "Solar Activity Information" you will find graphically presented in color sunspot counts, solar flux data, and geomagnetic planetary A indices for the past two months, including the most updated values and information. My good friend Bill Orr, W6SAI, reviewed this website in his "Radio FUNdamentals" column in the December 1997 issue of *CQ*.

My website at <http://www.gjainc.com> is being updated to have both these websites added to the lists of links.

February Conditions

A seasonal decline is expected in 10 and 12 meter DX openings during February, but some good ones should still be possible, especially during periods when conditions are High or Above Normal. The bands should occasionally open towards Europe and the east, particularly from the eastern half of the country, between 9 AM and noon. Better conditions should exist towards South America and various re-

Geographical Area	November 23	November 24
Polar	Low Normal	Low Normal
Auroral	Low Normal	Low Normal
Middle Latitude	High Normal	High Normal
Low Latitude	High/Above Normal	High/Above Normal
Equatorial	High/Above Normal	High/Above Normal
10.7 cm Radio Flux	112	112
Sunspot Count	39	42
WW Geomagnetic Ap Index	4	4

Table I– Summary of HF propagation conditions reported jointly by USAF and NOAA during the CQ WW DX Contest CW weekend of November 29–30 1997.

HOW TO USE THE DX PROPAGATION CHARTS

1. Use chart appropriate to your transmitter location. The Eastern USA Chart can be used in the 1, 2, 3, 4, 8, KP4, KG4, and KV4 areas in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9, and 0 areas; the Western USA Chart in the 6 and 7 areas; and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (15 through 80 meters) for a particular DX region, as shown in the left-hand column of the charts. An * indicates the best time to listen for 160 meter openings. An ** indicates best time to check for 10 meter openings.

3. The propagation index is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of days during the month on which the opening is expected to take place as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual dates on which an opening with a specific *propagation index* is likely to occur, and the signal quality that can be expected.

4. Times shown in the charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. Appropriate *standard* time is used, not GMT. To convert to GMT, add to the times shown in the appropriate chart 8 hours in PST Zone, 7 hours in MST Zone, 6 hours in CST Zone, and 5 hours in EST Zone. For example, 13 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 04 GMT, etc.

5. The charts are based upon a transmitted power of 250 watts CW, or 1 kw, PEP on sideband, into a dipole antenna a quarter-wavelength above ground on 160 and 80 meters, and a half-wavelength above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 dB gain above these reference levels, the *propagation index* will increase by one level; for each 10 dB loss, it will lower by one level.

6. Propagation data contained in the charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept of Commerce, Boulder, Colorado 80302.

February 15–April 15, 1998
Time Zone: EST (24-Hour Time)
EASTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	09-12 (1)	08-09 (1) 09-10 (2) 10-13 (3) 13-14 (2) 14-15 (1)	06-07 (1) 07-09 (3) 09-11 (2) 11-12 (3) 12-14 (4) 14-15 (3) 15-17 (2) 17-19 (1)	17-18 (1) 18-19 (2) 19-22 (3) 22-01 (4) 01-02 (3) 02-03 (2) 03-04 (1) 19-21 (1)* 21-00 (2)* 00-02 (1)*
Northern Europe & CIS**	08-11 (1)	08-09 (1) 09-12 (2) 12-13 (1)	06-07 (1) 07-09 (3) 09-11 (2) 11-13 (1) 13-15 (2) 15-17 (1) 00-03 (1)	17-19 (1) 19-02 (2) 02-03 (1) 20-01 (1)*
Eastern Mediterranean & Middle East	08-11 (1)	08-09 (1) 09-11 (2) 11-13 (1)	06-07 (1) 07-09 (2) 09-12 (1) 12-15 (2) 15-16 (3) 16-18 (2) 18-20 (1) 00-02 (1)	18-20 (1) 20-23 (2) 23-00 (1) 20-23 (1)*
Western Africa	09-11 (1) 11-13 (2) 13-14 (1)	07-09 (1) 09-10 (2) 10-12 (3) 12-14 (4) 14-15 (3) 15-16 (2) 16-17 (1)	05-06 (1) 06-08 (2) 08-13 (1) 13-14 (2) 14-15 (3) 15-17 (4) 17-18 (3) 18-20 (2) 20-22 (1)	18-21 (1) 21-01 (2) 01-03 (1) 22-02 (1)*
Eastern & Central Africa	09-11 (1)	08-10 (1) 10-12 (2) 12-14 (3) 14-15 (2) 15-16 (1)	07-09 (1) 12-14 (1) 14-15 (2) 15-18 (3) 18-19 (2) 19-20 (1)	19-22 (1) 22-00 (2) 00-01 (1) 20-00 (1)*
Southern Africa	09-10 (1) 10-12 (2) 12-14 (1)	07-10 (1) 10-13 (2) 13-15 (3) 15-17 (2) 17-18 (1)	07-14 (1) 14-16 (2) 16-18 (3) 18-20 (2) 20-22 (1) 22-00 (2) 00-01 (1)	18-20 (1) 20-23 (2) 23-00 (1) 21-23 (1)*
Central & South Asia	08-11 (1) 19-21 (1)	08-10 (1) 19-21 (1)	06-07 (1) 07-09 (2) 09-11 (1) 19-21 (1)	19-22 (1) 04-06 (1)
South-east Asia	10-13 (1) 18-20 (1)	08-10 (1) 17-19 (1)	06-07 (1) 07-09 (2) 09-11 (1) 19-21 (1)	05-07 (1) 19-22 (1)
Far East	17-19 (1)	16-17 (1) 17-19 (2) 19-20 (1)	06-07 (1) 07-09 (2) 09-11 (1) 17-18 (1) 18-20 (2) 20-22 (1)	05-08 (1) 05-07 (1)*
South Pacific & New Zealand	12-14 (1) 14-16 (2) 16-18 (1)	10-14 (1) 14-16 (2) 16-18 (3) 18-19 (2) 19-20 (1)	09-11 (2) 11-19 (1) 19-23 (2) 23-06 (1) 06-07 (2) 07-09 (3)	00-01 (1) 01-02 (2) 02-05 (3) 05-07 (2) 07-08 (1) 03-07 (1)*
Austral-asia	09-11 (1) 16-18 (1)	08-12 (1) 14-16 (1) 16-19 (2) 19-21 (1)	06-07 (1) 07-09 (3) 09-10 (2) 10-14 (1) 14-16 (2) 16-19 (1) 19-22 (2) 22-00 (1)	02-04 (1) 04-06 (2) 06-08 (1) 04-06 (1)*
Carib-bean, Central America & Northern Countries of South America	09-11 (1) 11-12 (2) 12-14 (3) 14-16 (2) 16-18 (1)	07-08 (1) 08-09 (2) 09-11 (4) 11-13 (2) 13-16 (4) 16-17 (3) 17-18 (2) 18-20 (1)	22-00 (2) 00-06 (1) 06-07 (2) 07-09 (4) 09-10 (3) 10-14 (2) 14-16 (3) 16-19 (4) 19-22 (3)	18-19 (1) 19-20 (2) 20-03 (4) 03-05 (3) 05-06 (2) 06-07 (1) 20-22 (1)* 22-03 (2)* 03-05 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	09-11 (1) 11-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	07-08 (1) 08-10 (2) 10-13 (1) 13-15 (2) 15-16 (3) 16-17 (4) 17-18 (2) 18-19 (1)	13-15 (1) 15-16 (2) 16-18 (3) 18-20 (4) 20-21 (3) 21-23 (2) 23-06 (1) 06-08 (2) 08-10 (1)	19-21 (1) 21-03 (2) 03-06 (1) 21-05 (1)*
McMurdo Sound, Antarctica	Nil	14-17 (1) 17-19 (2) 19-20 (1)	17-19 (1) 19-23 (2) 23-01 (1) 06-08 (1)	22-00 (1) 00-04 (2) 04-06 (1)

*Predicted times of 80 meter openings. Openings on 160 meters are also likely to occur during those times when 80 meter openings are shown with a forecast rating of (2), or higher.

Time Zones: CST & MST
(24-Hour Time)
CENTRAL USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Southern Europe & North Africa	09-11 (1)	08-09 (1) 09-13 (2) 13-14 (1)	00-07 (1) 07-09 (2) 09-11 (1) 11-13 (2) 13-15 (3) 15-16 (2) 16-18 (1) 22-00 (1)	17-19 (1) 19-22 (2) 22-00 (3) 00-01 (2) 01-02 (1) 20-22 (1)* 22-00 (2)* 00-01 (1)*
Northern Europe & CIS**	09-11 (1)	07-09 (1) 09-11 (2) 11-12 (1)	06-07 (1) 07-10 (2) 10-12 (1) 12-13 (2) 13-15 (3) 23-01 (1)	19-22 (1) 22-00 (1) 00-02 (1) 22-01 (1)*
Eastern Mediterranean & Middle East	09-11 (1)	07-09 (1) 09-11 (2) 11-13 (1)	07-12 (1) 12-15 (2) 15-17 (1) 22-00 (1)	19-22 (1) 20-22 (1)*
Western Africa	09-10 (1) 10-12 (2) 12-14 (1)	07-09 (1) 09-10 (2) 10-12 (3) 12-13 (4) 13-15 (3) 15-16 (2) 16-17 (1)	06-12 (1) 12-14 (2) 14-15 (3) 15-16 (4) 16-17 (3) 17-19 (2) 19-21 (1)	18-20 (1) 20-23 (2) 23-01 (1) 21-00 (1)*

Eastern & Central Africa	09-12 (1)	08-11 (1) 11-15 (2) 15-17 (1)	06-12 (1) 12-14 (2) 14-16 (3) 16-18 (2) 18-19 (1)	19-22 (1)
Southern Africa	08-09 (1) 09-12 (2) 12-13 (1)	07-09 (1) 09-11 (2) 11-14 (3) 14-15 (2) 15-16 (1)	05-07 (2) 07-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-20 (1) 23-01 (1)	19-22 (1) 20-21 (1)*
Central & South Asia	07-09 (1) 17-19 (1)	08-10 (1) 19-21 (1)	06-07 (1) 07-09 (2) 09-11 (1) 19-21 (2)	05-07 (1) 18-20 (1)
South-east Asia	08-10 (1) 18-20 (1)	09-12 (1) 16-17 (1) 17-19 (2) 19-20 (1)	06-07 (1) 07-10 (2) 10-12 (1) 16-18 (1) 18-20 (2) 20-21 (1)	04-07 (1)
Far East	16-19 (1)	14-16 (1) 16-18 (2) 18-20 (1)	06-07 (1) 07-09 (2) 09-11 (1) 16-18 (1) 18-21 (2) 21-23 (1)	02-04 (1) 04-06 (2) 06-08 (1) 05-07 (1)*
South Pacific & New Zealand	11-13 (1) 13-14 (2) 14-15 (3) 15-16 (2) 16-17 (1)	10-12 (1) 12-15 (2) 15-17 (3) 17-19 (2) 19-20 (1)	06-07 (1) 07-09 (3) 09-11 (2) 11-18 (1) 18-20 (2) 20-21 (3) 22-00 (2) 00-02 (1)	22-00 (1) 00-01 (2) 01-06 (3) 06-07 (2) 07-08 (1) 00-02 (1)* 02-05 (2)* 05-07 (1)*
Austral-asia	14-15 (1) 15-17 (2) 16-18 (1)	08-14 (1) 14-16 (2) 16-18 (3) 18-19 (2) 19-21 (1)	06-07 (1) 07-09 (3) 09-12 (2) 12-15 (1) 15-17 (2) 17-19 (1) 19-21 (2) 21-01 (1)	02-04 (1) 04-06 (3) 06-07 (2) 07-08 (1) 04-05 (1)* 05-06 (2)* 06-07 (1)*
Caribbean, Central America & Northern Countries of South America	08-09 (1) 09-10 (2) 10-14 (3) 14-15 (2) 15-16 (1)	07-08 (1) 08-09 (2) 09-13 (3) 13-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	07-09 (4) 09-11 (3) 11-15 (2) 15-16 (3) 16-18 (4) 18-21 (3) 21-00 (2) 00-06 (1) 06-07 (2)	18-19 (1) 19-20 (2) 20-00 (3) 00-02 (4) 02-03 (3) 03-04 (2) 04-06 (1) 19-21 (1)* 21-03 (2)* 03-05 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	08-11 (1) 11-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	07-08 (1) 08-13 (2) 13-14 (3) 14-16 (4) 16-17 (3) 17-18 (2) 18-20 (1)	14-15 (2) 15-16 (3) 16-19 (4) 19-20 (3) 20-00 (2) 00-02 (1) 04-06 (1) 06-08 (2) 08-14 (1)	19-20 (1) 20-02 (2) 02-05 (1) 21-03 (1)*
McMurdo Sound, Antarctica	Nil	13-16 (1) 16-18 (2) 18-20 (1)	16-19 (1) 19-23 (2) 23-02 (1) 07-09 (1)	22-02 (1) 02-04 (2) 04-06 (1)

Time Zone: PST (24-Hour Time)
WESTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Southern Europe & North Africa	09-11 (1)	08-09 (1) 09-12 (2) 12-14 (1)	05-07 (1) 07-09 (2) 09-11 (1) 11-13 (2) 13-14 (3) 14-16 (2) 16-18 (1) 22-00 (1)	19-20 (1) 20-22 (2) 22-00 (1) 20-22 (1)*
Northern Europe & CIS**	Nil	07-08 (1) 08-10 (2) 10-12 (1)	06-07 (1) 07-09 (2) 09-12 (1) 12-13 (2) 13-15 (1) 22-00 (1)	19-21 (1) 21-23 (2) 23-00 (1) 21-23 (1)*
Eastern Mediter-ranean & Middle East	Nil	07-08 (1) 08-10 (2) 10-12 (1)	07-12 (1) 12-14 (2) 14-17 (1) 22-02 (1)	18-21 (1)
Western Africa	08-10 (1) 10-12 (2) 12-14 (1)	07-09 (1) 09-12 (2) 12-15 (3) 15-16 (2) 16-17 (1)	04-06 (1) 06-08 (2) 08-12 (1) 12-14 (2) 14-17 (3) 17-19 (2) 19-21 (1)	18-22 (1)
Eastern & Central Africa	09-12 (1)	08-10 (1) 10-13 (2) 13-14 (1)	06-08 (1) 12-14 (1) 14-16 (2) 16-18 (1)	18-20 (1)
Southern Africa	09-12 (1)	07-10 (1) 10-14 (2) 14-15 (1)	06-08 (2) 08-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-19 (1) 23-01 (1)	18-21 (1)
Central & South Asia	17-19 (1)	07-09 (1) 16-17 (1) 17-19 (2) 19-20 (1)	16-18 (1) 18-20 (2) 20-22 (1) 06-07 (1) 07-09 (2) 09-12 (1)	05-07 (1) 19-21 (1)
South-east Asia	09-11 (1) 17-19 (1)	08-10 (1) 15-17 (1) 17-19 (2) 19-22 (1)	07-08 (1) 08-11 (2) 11-13 (1) 20-22 (1) 22-00 (2) 00-02 (1)	00-02 (1) 02-05 (2) 05-07 (1)
Far East	15-17 (1)	12-14 (1) 14-17 (2) 17-18 (3) 18-19 (2) 19-20 (1)	06-07 (1) 07-09 (2) 09-11 (1) 11-13 (2) 13-15 (1) 15-17 (2) 17-20 (3) 20-22 (2) 22-02 (1)	00-02 (1) 02-07 (2) 07-08 (1) 02-06 (1)*
South Pacific & New Zealand	12-15 (1) 15-17 (2) 17-18 (1)	10-14 (1) 14-16 (2) 16-19 (3) 19-21 (2) 21-22 (1)	06-07 (1) 07-09 (3) 09-11 (2) 11-17 (1) 17-19 (2) 19-20 (3) 20-22 (4) 22-00 (3) 00-02 (2) 02-04 (1)	19-21 (1) 21-22 (2) 22-23 (3) 23-05 (4) 05-06 (3) 06-07 (2) 07-08 (1) 22-01 (1)* 01-05 (2)* 05-06 (1)*
Austral-asia	12-15 (1) 15-17 (2) 17-18 (1)	09-12 (1) 12-16 (2) 16-19 (3) 19-20 (2) 20-21 (1)	07-08 (1) 08-10 (3) 10-12 (2) 12-17 (1) 17-19 (2) 19-22 (3) 22-01 (2) 01-04 (1)	00-01 (1) 01-02 (2) 02-05 (3) 05-06 (2) 06-08 (1) 02-04 (1)* 04-06 (2)* 06-07 (1)*
Caribbean, Central America & Northern Countries of South America	09-11 (1) 11-12 (2) 12-14 (3) 14-15 (2) 15-16 (1)	06-07 (1) 07-09 (2) 09-12 (3) 12-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	06-07 (2) 07-09 (3) 09-14 (2) 14-16 (3) 16-19 (4) 19-21 (3) 21-23 (2) 23-06 (1)	18-20 (1) 20-01 (3) 01-03 (2) 03-06 (1) 19-21 (1)* 21-02 (2)* 02-04 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	09-11 (1) 11-13 (2) 13-15 (3) 15-16 (2) 16-17 (1)	07-08 (1) 08-09 (2) 09-11 (1) 11-13 (2) 13-15 (3) 15-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	12-14 (1) 14-15 (2) 15-16 (3) 16-18 (4) 18-20 (3) 20-23 (2) 23-05 (1) 05-07 (2) 07-09 (1)	18-20 (1) 20-01 (2) 01-03 (1) 22-02 (1)*
McMurdo Sound, Antarctica	13-16 (1)	12-15 (1) 15-18 (2) 18-20 (1)	16-19 (1) 19-20 (2) 20-22 (3) 22-00 (2) 00-02 (1) 05-06 (1) 06-08 (2) 08-10 (1)	22-02 (1) 02-04 (2) 04-06 (1)

*Indicates best times to listen for 80 meter openings. Openings on 160 meters ar also likely to occur during those times when 80 meter openings are shown with a propagation index of (2) or higher.
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.
**Former European USSR.

gions of Africa, with fairly regular openings possible between 1 and 5 PM, and occasionally as early as 9 AM. Some good openings are expected towards Oceania and Asia between 2 and 6 PM, but these openings should favor the western half of the country.

Fifteen and 17 meters look good for worldwide DX during most of the daylight hours. The bands are expected to open first towards Europe, Africa, and the east about 9 AM, and often remain open to as late as 2 PM. Openings towards South America should be possible throughout the day, with conditions peaking between noon and 4 PM. Openings towards Oceania, the Far East, and Asia look best between 4 and 8PM, favoring the western states. The path to Antarctica should peak on 15 meters between 4 and 7 PM.

On 20 meters look for a window of fairly good openings in almost all directions for an hour or two after sunrise. The band should peak again toward Europe and the east between 11 AM and 3 PM. Best bet for long-path openings from the western states to Europe and Africa is for a period of about two hours immediately after sunrise. Openings towards the south should peak again during the late afternoon, with the band remaining open towards South America until as late as midnight when conditions are High or Above Normal. Check until midnight for openings to Antarctica as well. Evening openings on 20 meters should also be possible to Oceania, the Far East, and Asia, with signals expected to peak between 7 and 9 PM in the eastern states and 7 to 11 PM in the west.

Fairly good 40 and 30 meter openings are forecast to most areas of the world during the hours of darkness in February. Check between 7 PM and 2 AM for openings to Europe; between 7 PM and midnight towards Africa; and between 8 PM and 5 AM for openings towards the south. From the West Coast, the bands should open to Oceania, the Far East, and Asia between midnight and 7 AM, with openings extending towards the East Coast between 4 and 7 AM local time.

Eighty meter openings are also forecast to most areas of the world during the hours of darkness. Conditions are not expected to be as good as 40 meters, with weaker signals and higher levels of static. Best bet for openings to Europe and the east is between 8 and 10 PM in the western half of the country and from 8 PM to about midnight in the east. Conditions are not expected to be very good towards Africa, but check between 8 PM and 11 PM for an occasional opening. Best bet for openings towards South America is between 8 PM and 5 AM. From western states there is a chance for some openings to Oceania between midnight and 6 AM with possibilities in the eastern states between 3 and

7 AM local time. Conditions to the Far East are expected to be poorer, but with an occasional opening possible, particularly from western states, between 4 and 7 AM.

Static levels are expected to increase on 160 meters during February, but some DX openings should be possible during the hours of darkness. Expect signals to peak when it is sunrise on the easternmost part of a path. For example, openings towards Europe and the east should peak between midnight and 1 AM in the Eastern time zone, while openings towards Oceania should peak between 5 and 8 AM in the Pacific time zone, etc.

Short-Skip Openings

No significant skip openings are expected on 160 meters during the daylight hours, but openings up to 1300 miles should be possible at night, often extending to the one-hop limit of 2300 miles. On 80 meters expect openings up to 250 miles during the day, and between 500 and 2300 miles at night. On 40 and 30 meters daytime skip should be possible between 250 and 750 miles, extending to between 750 and 2300 miles during the evening to about 9 PM, and between 1500 and 2300 miles until sunrise. On 20 meters, daytime skip should range between 750 and 2300 miles to about 4 PM. Between 4 and 7 PM the skip is expected to lengthen to between 1500 and 2300 miles, with the band out for short-skip by 8 PM on most days. On 15 and 17 meters skip should range between 1300 and 2300 miles during most of the day to about 6 PM, with the bands usually dead for short-skip after that time. An occasional F-layer short-skip opening may be possible on 10 and 12 meters during the afternoon for distances between approximately 1500 and 2300 miles. Some sporadic-*E* openings over shorter distances may also be possible.

VHF Ionospheric Openings

No significant meteor showers are expected during February, and very little sporadic-*E* propagation is likely to occur. Best chances for ionospheric openings on the VHF bands during February should result from auroral activity expected during periods when HF conditions are Below Normal or Disturbed. Such openings on 2 and 6 meters, usually characterized by flutter fading and signal distortion, result from the intense regions of ionization that accompany auroral displays. Auroral-type openings usually range in distance from a few hundred up to approximately 1300 miles. Check the "Last-Minute Forecast" at the beginning of this column for those days during February that are expected to be Disturbed or Below Normal.

Trans-equatorial propagation (TE) usually improves during the spring months and particularly when a solar cycle rises.

Planetary Kp Index	UT 00-03	03-06	06-09	09-12	12-15	15-18	18-21	21-24
Nov. 29	0	0	0	0	0	1	1	1
Nov. 30	1	1	1	1	2	1	1	1

Table II– Worldwide geomagnetic indices (planetary Kp) reported every three hours during the CW Contest weekend of November 29–30. Indices of 0 or 1 indicate an exceptionally quiet geomagnetic field, while 2 indicates a quiet field. No geomagnetic storminess took place during the contest weekend.

Some TE openings may be possible on 6 meters in February between South America and the southern states. The best time to check for TE openings is between 7 and 10 PM local time.

This month's propagation charts contain band opening predictions for major DX paths for the period of February 15 through April 15, 1998. A short-skip propagation forecast for February appeared in last month's column. Instructions for the proper use of these charts appear at the beginning of this column.

73, George, W3ASK

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(continued on page 107)

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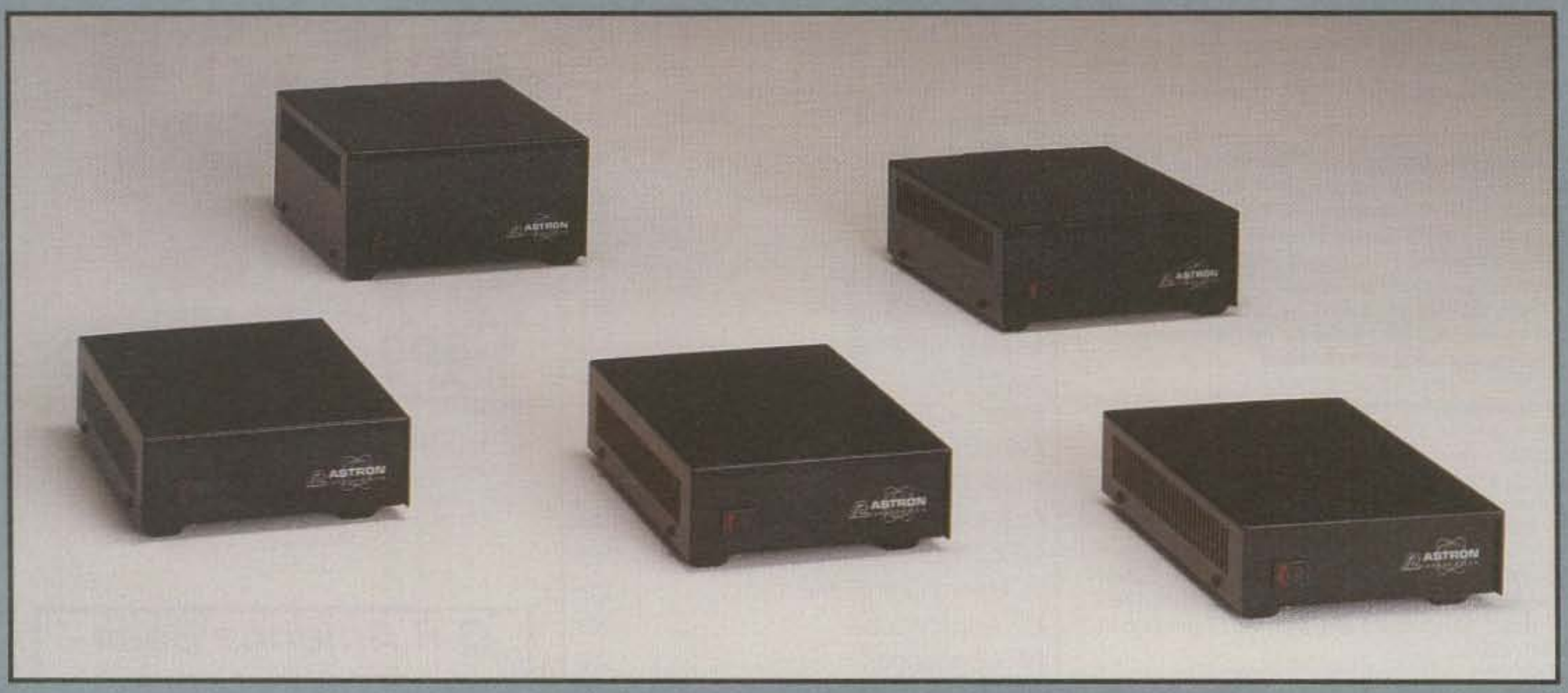

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Other Great Features:

- Enhanced 0.03-200 MHz broadband all mode receive
- Slots for 2 optional crystal filters
- Quiet Thermally Controlled Cooling Fan
- Crossband Split Operation
- Superior Transmit Audio Characteristics
- Large Speaker
- Tone Squelch (option UT-86 required)
- New 350 Hz RTTY Filter (opt.FL-232)

- Detachable Front Panel (Option OPC-581 required)
- "S" menu for quick access to 3 bands
- Built-in CI-V serial communications port
- Spectrum Scope
- IF Shift
- Narrow-FM
- 102 Memory Channels with Alphanumeric Display
- Large Dot-Matrix Display
- Optional UT-102 Voice Synthesizer
- Optional AT-180 Antenna Tuner
- Optional PS-85 DC Power Supply
- And Much More!

See your ICOM dealer or call 425-450-6088 for a brochure

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