73 AMATEUR RADIO

International Edition

DECEMBER 1988
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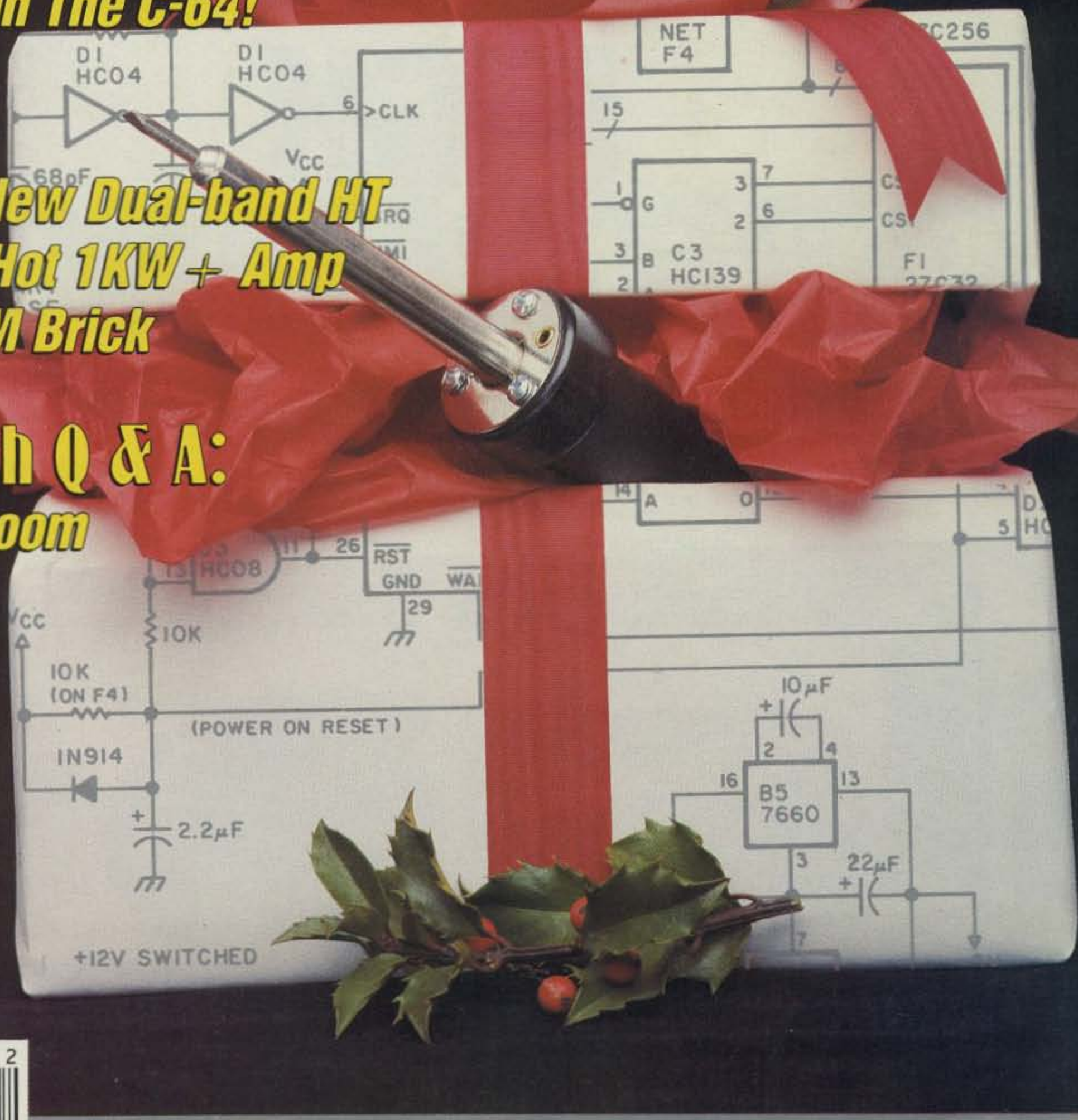

Annual Holiday Buyer's Guide

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HIGH PERFORMANCE

ICOM has a commitment to high performance 220MHz gear. That's why we're the only manufacturer who can offer you a full line of 220MHz equipment...whether it's a mobile, handheld, base station transceiver, or fiber optic multi-bander.

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IC-37A Mobile

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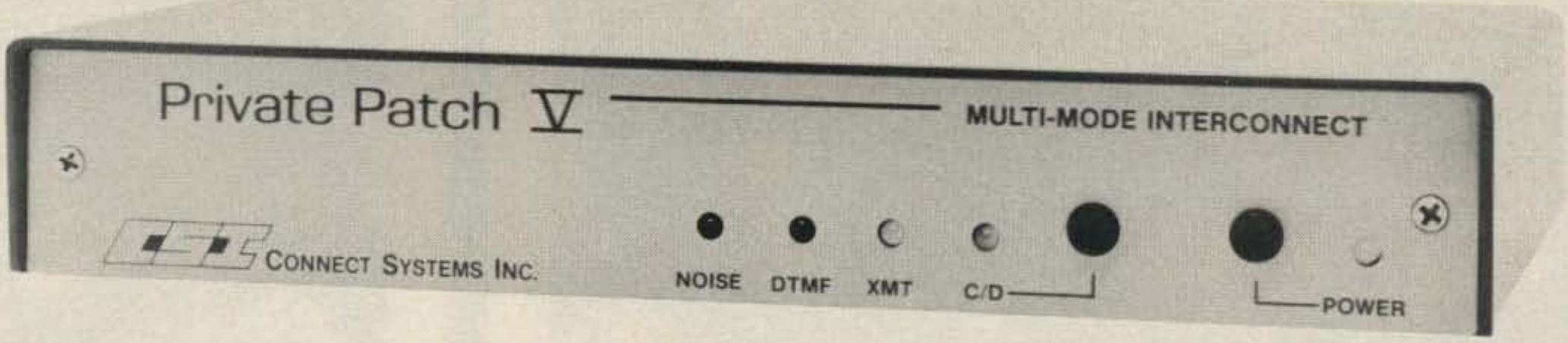

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Rick Woodsome

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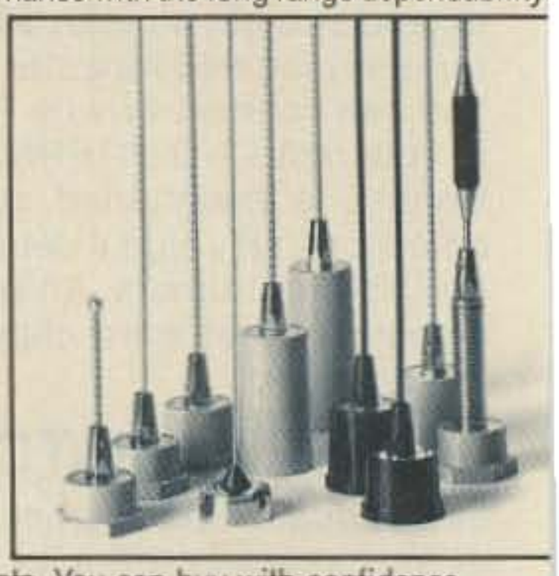

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With **three continuously** variable components -- two massive 6 KV capacitors and a high inductance roller inductor -- you get precise control over SWR **and** the widest matching range possible from 1.8-30 MHz.

You get a **new** lighted **peak** and average reading Cross-Needle SWR/Wattmeter with a **new** more accurate directional coupler.

You get a giant two core balun wound with teflon wire for balanced lines and a 6-position antenna switch with extra heavy switch contacts.

MFJ-989C **$349.95**

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

Its compact 10¾x4½x15 inch cabinet slides right into your station.

The MFJ-989C is not for everyone.

However, if you do make the investment, you'll get the finest 3 KW tuner money can buy -- one that will give you a lifetime of use, one that takes the fear out of high power operation and one that lets you get your SWR down to absolute minimum.

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MFJ-949C **$139.95**

The MFJ-949C gives you more precise matches than any tuner that uses two tapped inducters. Why? Because you get two **continuously** variable capacitors that give you infinitely more positions than the **limited** number on switched coils.

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

MFJ-941D **$99.95**

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

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

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You can **operate anywhere in a band and get low SWR.** You'll get maximum power out of your solid state or tube rig and it'll run cooler and last longer.

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MFJ-1702, $19.95. 2-positions. 60 dB isolation at 450 MHz. Less than .2 dB loss. SWR below 1:1.2.

MFJ-1701, $29.95. 6-positions. Unused positions grounded. For desk or wall mount.

$29.95 MFJ-1701

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MFJ-962C **$199.95**

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You can read both **peak** and average power with the lighted 2-color Cross-Needle SWR/Wattmeter. A **new** directional coupler gives you more accurate readings over a wider frequency range.

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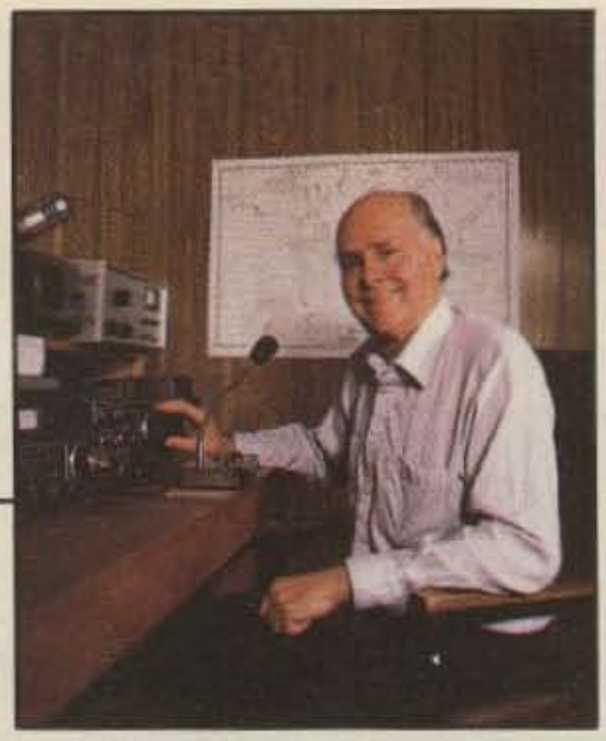

Sun Spots and Antennas

Even though antennas are by far the most interesting area for amateur experimentation—and also one of the easiest to investigate, the field has seen pathetically little development in recent years. Tsk!

With the sun spots rising at the fastest rate in history, it's getting time for all of us to start working on antennas. How much do you know about 'em? Have you ever read an article on how they work? Do you have even a faint idea of how they work? Do you give a damn?

What do you know about bi-squares, cubical quads, the Twin Three and the ZL-Special? I remember when I first ran up against a bi-square. Sam Harris W8UKS, out near Cleveland, had put up a whopping tower and hung a 75m bi-square from it. To change its direction he'd run out and move the pegs holding the antenna away from his tower. How'd it work?

Well, this was 1951, so he was running an old 40 watt Collins AM rig. I was in Brooklyn with my rock-crushing kilowatt and a dipole. I worked out pretty well, working all over Europe, down into Africa and even over to Japan. Sam, with his lousy 40 watts, clobbered me. He'd be talking with a ZS6. I'd break in and the ZS6 would mention that he'd heard a slight heterodyne in the background. So they'd stand by to see who was breaking in. Drat!

When's the last time you saw an article on building a bi-square? And why it puts out such a whopping signal? If you want a killer contest antenna. . .?

In the middle of the rugged winter of 1947 I decided to try the W8JK Twin-Three antenna. Two dipoles spaced a sixth wave apart. For some reason this beaut has a lower angle of radiation than dipoles, yagis or quads. The result was that I'd have the first signal from my area. I'd call CQ and get calls from England saying I was the only signal on the band. Then, as they'd hear other signals getting stronger, mine would fade down and I'd talk with Italy. A little later I'd be the first signal into the middle east—then into India.

One morning I heard a very faint W7 portable something in the DX part of the band calling CQ. Hmmm. I called the "W7 something, portable something." I felt so stupid I only called him once. He came right back, his signal gradually improving. It was W7IMW/C7 in Tsiensin, China! I was the only American signal on the band.

We talked for a while, then he mentioned that other stations were beginning to call him, so we parted. An hour later he called again to say that everyone else had faded out.

The ZL-Special antenna is very similar to the Twin-Three, but made entirely from twin-lead. Have you used either of these barn-burners? They only seem to work well during high sun spot times, when the ionosphere is so heavily ionized that these extremely low angle signals can propagate.

The Twin-Three is simple to make. It's a wire beam with two three-wire dipoles spaced a sixth wave apart. You hang them from a pair of 2x2s, which, in turn, are hung by ropes between a couple trees or between a tall tree and your house. You feed 'em with quarter-wave 300Ω twin-line sections and feed the junction of the two feeders with 300Ω twin-line.

My question is this, how come you're not outside trying new antennas? Hells bells, it isn't as if you don't have a personal computer to do the calculations for you, an aid we didn't have forty years ago. Let's see some experimenting and some antenna articles!

How about a 40m Twin-Three? Maybe even one for 80m? How about stacked Twin-Threes? What's the radiation pattern from something like that? How about some club projects to test out different antennas?

Continued on page 6

QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, WGE Center, 70 Rte. 202 N., Peterborough NH 03458, Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

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Wayne Green Enterprises is a division of International Data Group.

Reprints: The first copy of an article—$3.00 (each additional copy $1.50). Write to 73 Amateur Radio Magazine, WGE Center , Rte. 202 North, Peterborough, NH 03458. ATTN: Article Reprints.

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Subscription Information
One Year (12 issues) $24.97; Two Years (24 issues) $44.98. Canada, Mexico and Foreign Surface: One Year $31.75 (US Funds); Two Years $57.00 (US Funds). Foreign Airmail: One Year $39.00 (US Funds); Two Years $70.00 (US Funds). Send new or renewal notices, inquiries, and change of address to *73 Amateur Radio*, P.O. Box 58866, Boulder CO 80322-8866. Allow 4-6 weeks for subscription and change of address processing. For Customer Service, call toll-free at 1-800-525-0643. Colorado/Foreign subscribers call 1-303-447-9330. For renewals and changes of address, please include the address label from your most recent issue of *73*. For gift subscriptions, include your name and address as well as those of the gift recipients. Second class postage paid at Peterborough NH 03458, and at additional mailing offices. Canadian second class mail registration number 9566. Microfilm Edition—University Microfilm, Ann Arbor MI 48106.
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73 AMATEUR RADIO (ISSN 0889-5309) is published monthly by WGE Publishing, Inc., a division of Wayne Green Enterprises, Inc., WGE Center, 70 Rte. 202N, Peterborough, NH 03458-1194. Second-class postage paid at Peterborough, NH and additional mailing offices.

Postmaster: Send address changes to *73 Amateur Radio*, P.O. Box 58866, Boulder CO 80322-8866.

73 AMATEUR RADIO

DECEMBER 1988 — Issue # 339

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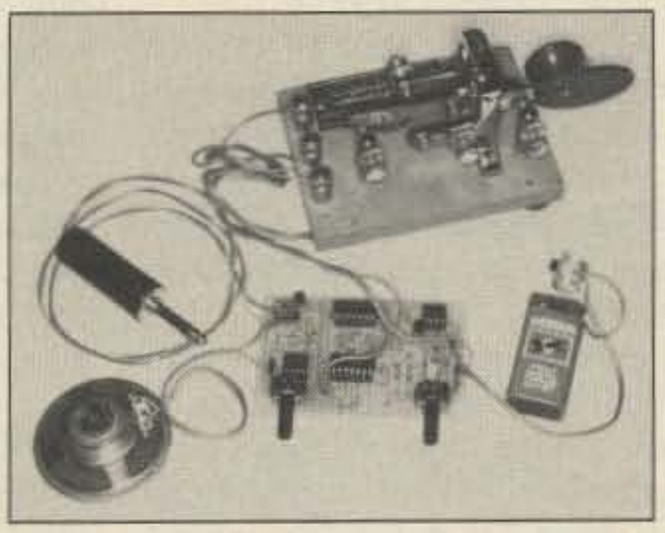

DEPARTMENTS

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Photography by Suzanne Torsheya

Never Say Die

Continued from page 4

A few years back I visited the Hustler antenna range out in eastern Ohio—a ham's paradise! They even had a platform for cars so they could rotate a car on it and run a curve on the radiation pattern. That's something a club could do as a club project. Any takers?

I remember reading an article on the optimum height for 20m beams. It turned out that about 73' above the virtual ground gave the best DX pattern. Beat out even higher antennas. Come on, fellas, let's get going on antenna experimenting and get some articles into *73* so we can all have a ball as the sun spots open our bands. 20m will soon be providing DX contacts around the clock. 10m will be fantastic almost every day, giving Novices and Techies DX thrills. On 6m you'll be able to work all over the world with low power. Let's set some QRP records.

We're already seeing crazy sporadic-E openings on 6m. It's a hint when you tune your FM radio and hear strange FM stations pouring in by the zillions.

If you want to build a Twin-Three, dig back into a 1947 issue of *CQ* or an old Jones Radio Handbook and find the plans. Build one and let us know how you've made out.

Music on 20m—Legally

Yes, of course you can transmit music on 20m—or any other ham band. And, yes, if you do it right it's entirely legal. Would it help if I offered a prize for the first 20m ham transmission of The Blue Danube?

For that matter it's also legal to send fast scan TV over 20m—if you use the same system. Heck, you can send high definition 3D full color TV in the 20m phone band if you want.

So how do we send an Erich Kunzel and the Cincinnati Pops Orchestra playing The Blue Danube over 20m? Easy as pi. All it takes is some sneaky time shifting. You see, it's like this, that stuff on compact discs is digital data, not music. It isn't until we run it through a converter, deciphering the bit stream, that we get music.

The digital data on a CD is clocked at 44,100 Hz, so if you send it at full speed it's going to take up around 100 kHz of bandwidth, a bit much for 20m. It'd probably play on the UHF bands all okay. So okay, let's slow it down by a factor of twenty so it'll only tie up 5 kHz—like we do for slow scan TV, where we pare down a 5 MHz bandwidth and cram it into a 5 kHz slot.

A five minute musical selection would take a hundred minutes to transmit. Nobody said this was a fast system. we're aiming for sound perfection, not speed.

Slowing the bit stream down for transmission and then speeding it up again for playing is an obvious challenge. One fairly simple way of doing it would be to dump about 20 megabytes at a time from a CD onto a hard disk. You'd then program your computer to put it out at the slower speed into your rig. The receiver would do the opposite, loading the signal onto a hard disk and from there to a DAT recorder. Voila: The Danube floweth.

I've got $100 each for the first pair of you who pull this off . . . and prove it.

What about the FCC? If you'll read the rules carefully you'll find nothing to prevent your experimenting in this way. However, if you ask a civil servant to put his pension on the line by providing you with an official okay to do this you are a nut case and should be demoted to a CBer. Just go ahead and do it and stop your confounded nit-picking.

Pappy is SK

I first met Pappy K4PP (K4LAP/K8LAP) when I was working as an announcer/engineer for WSPB in Sarasota, Florida. 1950. Nice gig, where I put the station on the air in the morning, did some announcing, read news, did a morning disk jockey show and then laid around on the beautiful Gulf Coast beach in the afternoon, working on skin cancer and premature skin aging.

Bandel Linn, "Pappy," did an afternoon talk show, so we got to be good friends. He'd bring in well known writers such as his good friend McKinley Cantor and interview them. He and Cantor were always pulling practical jokes on each other. Like the time Cantor bought hundreds of old books for a quarter each and had a rubber stamp made with Pappy's address. Cantor left the books on store counters and in hotel rooms all over the country. There still being a few honest people in those days, these books would be returned to Pappy, often sent collect. Hundreds.

Pappy was also an ace cartoonist. When I started *73* in 1960 I got him to do my first cover. Down through the years I've published hundreds of his cartoons for you. The last time I saw him, we got together while I was down in Mobile attending my old submarine crew reunion. Smoking had broken his health, but not his spirit.

Not long after my visit he had a stroke that paralyzed his left side. He was still able to turn out more cartoons for *73*—then a second stroke ended that—and his hamming.

That's two old ham friends and *73* contributors gone in a couple months—Bill Hoisington K1CLL and Pappy. Since most of you are about my age, you're having the same thing happen to you—good old friends dying. In this case we've lost two hams who have done much to make amateur radio more fun for all of us.

"What do you know about bi-squares, cubical quads, the Twin Three and the ZL-Special?"

Digital Audio

At a recent ham club talk I asked the assembled how many had CD players. Bunch hands went up. Great! Then I asked how many were reading *Digital Audio* magazine. Darned few hands. Whoa!

The reason I started *Digital Audio* magazine four years ago was because I knew that a high percentage of the early CDs would be technical disasters. I was right. Heck, even now, four years later, we're finding that 17% of the new CDs being released are barfs. They're so bad that most people who buy them play them once and that's it. Some are simply awful performances. Some are terrible recordings. Would you believe that you could end up with a CD made from old 78 rpm records, complete with the lousy sound and needle scratch?

A recent survey of the field showed that the average CD buyer is spending about $670 a year on CDs, mostly to replace his old LP collection. That's $114 a year wasted. Worse, another 60% of the CDs coming out can best be termed mediocre. They're okay, but with modest performances or only fair sound. That's another $402 blown through a simple lack of research.

Now if you've got enough money so that you can afford to waste $516 a year by buying lousy or so-so CDs, fine. I'll tell you this, you won't find wealthy people throwing away their money like that. You get to be wealthy by taking care of your money, not wasting it. Yes, the solution to the problem is simple: subscribe to *Digital Audio* magazine—a crummy $20 a year. This is the only magazine devoted to reviewing CDs, so it isn't like you have to buy a half dozen new magazines to keep track of the field.

In *DA*, as in *73*, I have an in-depth index to each issue so you can find the composer, performer, music or label of your particular interest. *DA*, like *73*, is fun to read. My *DA* editors don't take themselves any more seriously than the *73* editors. Try it, you'll like it.

If you haven't gotten a CD player yet you'll want to read the player reviews in *DA*. Compact discs are killing LPs, slowly, but surely. I stopped by the Sound Warehouse in Houston recently and found their sales were running 78% CD, 2.6% LP and the rest cassettes. The down side of CDs is that their sound is so fantastic that you'll be wanting to improve your hifi system in order to hear that wonderful sound better. If you're short of money you can make do with some Koss headphones, that will knock your sox off with the sound they let you hear.

Call my operator at 800-722-7785 with your credit card number and get started with *DA*. It's four years old now and has over 100,000 delighted readers. In fact, according to the Audit Bureau, it's one of the fastest growing magazines in the country. Or you can send $19.97 to *Digital Audio*, Peterborough NH 03458-1194.

And yes, you're in for another Wayne Green editorial every month. 73

KENWOOD

...pacesetter in Amateur Radio

All New Compact HF!

"DX-citing!"

TS-440S Compact high performance HF transceiver with general coverage receiver

Kenwood's advanced digital know-how brings Amateurs world-wide "big-rig" performance in a compact package. We call it "Digital DX-citement"—that special feeling you get every time you turn the power on!

- **Covers All Amateur bands**
  General coverage receiver tunes from 100 kHz—30 MHz. Easily modified for HF MARS operation.
- **Direct keyboard entry of frequency**
- **All modes built-in**
  USB, LSB, CW, AM, FM, and AFSK. Mode selection is verified in Morse Code.
- **Built-in automatic antenna tuner (optional)**
  Covers 80-10 meters.
- **VS-1 voice synthesizer (optional)**
- **Superior receiver dynamic range**
  Kenwood DynaMix™ high sensitivity direct mixing system ensures true 102 dB receiver dynamic range. (500 Hz bandwidth on 20 m)
- **100% duty cycle transmitter**
  Super efficient cooling permits continuous key-down for periods exceeding one hour. RF input power is rated at 200 W PEP on SSB, 200 W DC on CW, AFSK, FM, and 110 W DC AM. (The PS-50 power supply is needed for continuous duty.)

- **Adjustable dial torque**
- **100 memory channels**
  Frequency and mode may be stored in 10 groups of 10 channels each. Split frequencies may be stored in 10 channels for repeater operation.
- **TU-8 CTCSS unit (optional)**
- **Superb interference reduction**
  IF shift, tuneable notch filter, noise blanker, all-mode squelch, RF attenuator, RIT/XIT, and optional filters fight QRM.
- **MC-43S UP/DOWN mic. included**
- **Computer interface port**
- **5 IF filter functions**
- **Dual SSB IF filtering**
  A built-in SSB filter is standard. When an optional SSB filter (YK-88S or YK-88SN) is installed, **dual** filtering is provided.
- **VOX, full or semi break-in CW**
- **AMTOR compatible**

Optional accessories:

- AT-440 internal auto. antenna tuner (80 m—10 m)
- AT-250 external auto. tuner (160 m—10 m)
- AT-130 compact mobile antenna tuner (160 m—10 m)
- IF-232C/IC-10 level translator and modem IC kit
- PS-50 heavy duty power supply
- PS-430/PS-30 DC power supply
- SP-430 external speaker
- MB-430 mobile mounting bracket
- YK-88C/88CN 500 Hz/270 Hz CW filters
- YK-88S/88SN 2.4 kHz/1.8 kHz SSB filters
- MC-60A/80/85 desk microphones
- MC-55 (8P) mobile microphone
- HS-5/6/7 headphones
- SP-40/50B mobile speakers
- MA-5/VP-1 HF 5 band mobile helical antenna and bumper mount
- TL-922A 2 kw PEP linear amplifier
- SM-220 station monitor
- VS-1 voice synthesizer
- SW-100A/200A/2000 SWR/power meters
- TU-8 CTCSS tone unit
- PG-2S extra DC cable.

Kenwood takes you from HF to OSCAR!

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

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2201 E. Dominguez St., Long Beach, CA 90810
P.O. Box 22745, Long Beach, CA 90801-5745

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...pacesetter in Amateur Radio

220 MHz TH-315A Here Now!

This HT Has it All!

TH-215A/315A/415A

Full-featured Hand-held Transceivers

Kenwood brings you the greatest hand-held transceiver ever! More than just "big rig performance," the new TH-215A for 2 m, TH-315A for 220 MHz, and TH-415A for 70 cm pack the most features and the best performance in a handy size. And our full line of accessories will let you go from hamshack to portable to mobile with the greatest of ease!

- **Wide receiver frequency range.** Receives from 141-163 MHz. Includes the weather channels! Transmit from 144-148 MHz. Modifiable to cover 141-151 MHz (MARS or CAP permit required).
- **TH-315A covers 220-225 MHz, TH-415A covers 440-449.995 MHz.**
- **5, 2.5, or 1.5 W output, depending on the power source.** Supplied battery pack (PB-2) provides 2.5 W output. Optional NiCd packs for extended operation or higher RF output available.
- **CTCSS encoder built-in.** TSU-4 CTCSS **decoder** optional.
- **10 memory channels store any offset, in 100-kHz steps.**
- **Odd split, any frequency TX or RX, in memory channel "0."**
- **Nine types of scanning!** Including new **"seek scan" and priority alert.** Also memory channel lock-out.
- **Intelligent 2-way battery saver circuit extends battery life.** Two battery-saver modes to choose, with power saver ratio selection.
- **Easy memory recall.** Simply press the channel number!
- **12 VDC input terminal for direct mobile or base station supply operation.** When 12 volts applied, RF output is 5 W! (Cable supplied!)
- **New Twist-Lok Positive-Connect™ locking battery case.**
- **Priority alert function.**
- **Monitor switch to defeat squelch.** Used to check the frequency when CTCSS encode/decode is used or when squelch is on.
- **Large, easy-to-read multi-function LCD display with night light.**
- **Audible beeper to confirm keypad operation.** The beeper has a unique tone for each key. DTMF monitor also included.
- **Supplied accessories:** Belt hook, rubber flex antenna, PB-2 standard NiCd battery pack (for 2.5 W operation), wall charger, DC cable, dust caps.

Optional Accessories:

• PB-1: 12 V, 800 mAH NiCd pack for 5 W output • PB-2: 8.4 V, 500 mAH NiCd pack (2.5 W output) • PB-3: 7.2 V, 800 mAH NiCd pack (1.5 W output) • PB-4: 7.2 V, 1600 mAH NiCd pack (1.5 W output) • BT-5 AA cell manganese/alkaline battery case • BC-7 rapid charger for PB-1, 2, 3, or 4 • BC-8 compact battery charger • SMC-30 speaker microphone • SC-12, 13 soft cases • RA-3, 5 telescoping antennas • RA-8B StubbyDuk antenna • TSU-4 CTCSS decode unit • VB-2530: 2m, 25 W amplifier (1-4 W input) • LH-4, 5 leather cases • MB-4 mobile bracket • BH-5 swivel mount • PG-2V extra DC cable • PG-3D cigarette lighter cord with filter

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

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QRX . . .

EDITED BY BRYAN HASTINGS NS1B

Space Operations

AO-13 operations continue normally. On 19 September, a new schedule reflects the spacecraft attitude change.

The first Mode S transponder tests were successfully performed beginning at about 2025 UTC, 17 September. Three stations were on during the first test run—VE4MA, WB5LUA, and K0RZ. Mode S uses an uplink at 435 MHz and produces a downlink at 2.4 GHz. All three stations on the initial test ran SSB. K0RZ says the measured uplink bandwidth was 35 kHz; the measured downlink, 34 kHz. More than a dozen stations around the world reported hearing the 2.4 GHz beacon. Recent reports suggest good to excellent results may be obtained from very modest antennas. DF5DP used only a 20 dB gain yagi.

AMSAT-DL and AMSAT-NA thanks all those who submitted telemetry reports on the Mode L AGC levels. They have now established an automated system on AO-13 for logging AGC levels.

AO-10 is out of service for an indeterminate period due to poor sun angles. Recently, its beacon has been occasionally heard sending garbled PSK telemetry. This indicates the spacecraft IHU is powering down during eclipses and, when re-powered, logic circuits assume an indeterminate state. Occasionally the PSK beacon will be commanded by a chance logic state.

RS-11 will be operating Tuesday through Friday on Mode KA and weekends on Mode A. There is currently no RS-10 operation.

The new Mode S test window will be announced. Mode S beacon will run concurrent with Mode L but, for power budget reasons, will cause Mode J to be turned off during Mode S beacon operations. On or about 19 September, the attitude will be changed to BLON=210 and BLAT=+5 to respond to seasonal sun angle changes.

Canada

A new Radio Communications bill was brought to the table in the House of Commons by the Hon. Flora MacDonald, Minister of Communications. This is the first proposed major revision to Canadian communications law since 1938. If passed, it will permit the Canadian Government to stop the importation, manufacture, and sale of substandard radio equipment, and also permit the government to deal with electromagnetic interference problems by setting EMI susceptibility standards.

Scotland

Packet digipeating has come to Scotland. A packet radio digipeater (switch) became operational in central Scotland on 27 August. It operates on 144.650. Address reception and verification reports to GM1VBE.

Guinea Biseau

Dave Heil J52US finally obtained 6 meter operating privileges in this tiny nation on the western tip of the African continent, located 12 degrees north of the equator. Dave (US: K8MN) works for the US State Department.

To get this truly rare locale on the air, several members of the Midwest VHF/UHF Society are working toward finding a 50 MHz transceiver to loan to Dave, and welcome any donations. Equipment sought includes a Yaesu 620B transceiver, amplifier, and memory keyer. Contact the Midwest VHF/UHF Society, c/o Terry Netzley W8NJR, 1821 E. Troy Urbana Rd., Troy OH 45373.

$$ HOME-BREW IV $$

73 Magazine again invites all home-brewers to turn their hot solder into cold cash, and to get their name in print to boot. All project have a chance to appear in the magazine, and we will handsomely reward the authors of the *creme de la creme* of these.

First prize is $300 *plus* a ten-year subscription to *73*. Second prize is $150. Third prize is $75. This is in addition to the payment every author receives for publishing in *73*.

Contest Rules

1. Entries must be received by 1 April 1989.
2. To enter, write an article describing your best home-brew construction project and submit it to *73*. If you've never written for *73*, send an SASE for a copy of our Writer's Guide, or download them from CompuServe (Hamnet forum, Library 0., filename "73WRIT").
3. Here's the real challenge: The total cost of your project must cost under $73, even if all the parts were bought new. Be sure to include a detailed parts list with prices and sources.
4. Our technical staff will evaluate each project on the basis of originality, usefulness, reproducibility, economy of design, and clarity of presentation. The decision of the judges is final.
5. All projects must be original. That is, they must not be published elsewhere. There is no limit to the number of projects you may enter.
6. All purchased articles become the property of *73 Magazine*.
7. Mail your entries to:

73 Magazine
WGE Center
70 Rte. 202 N
Peterborough, NH 03458-1194
Attn: Home-Brew IV

Reciprocal Agreements

The FCC announced that three more countries—Antigua and Barbuda, Dominica, and Hong Kong—signed reciprocal licensing agreements with the US.

Never Too Old

Murl Fox KB6YPF is one man who apparently has never heard the adage about "teaching an old dog new tricks." Murl received his Technician class call only three months after celebrating his 97th birthday!

Hams at the Scene

Amateurs were among the first to arrive at the scene of the August 31st crash of Delta Flight 1141. The aircraft, a Boeing 727, crashed at takeoff. Immediately after the plane went down, both Dallas and Tarrant County RACES activated their "Mass Casualty Plan" mode. Under the Mass Casualty Plan, amateurs were dispatched to the crash scene and to all area hospitals to provide tactical backup communications. Virtually all the amateur radio communications between the hospitals, where survivors were taken, were on the 220 MHz band.

Some of the key operators were Art Hunstable N5KSA who served as Net Control Station for Dallas RACES, Ken Winters N5AUX who was one of the first hams at the crash scene, and Jim Haynie WB5JBP who manned the City of Dallas Emergency Operations Center.

There were 94 survivors and 13 fatalities in the crash.

87-139 Extension

Hams have been granted an 90-day extension to the commentary cutoff date on PR Docket 88-139. This rule-making seeks to streamline the rules governing the Amateur Radio Service. The new cutoff date was changed to 29 November. This came about as a result of many hams' concern about a part of the rewrite proposal which would give the Com-

QRX . . .

mission sweeping authority to restrict a ham from operating if his station caused any RFI. If passed as written, there would no longer be a system of checks and balances of FCC personnel handling RFI complaints. They could simply order hams off the air without appeal recourse.

Dead Sputniks

Leonid Labutin of Moscow, a prime mover in the Soviet Radio Sputnik (RS) program, reports that on 15 July, the first Western amateur visited the USSR RS command station RS3A in Moscow. Danny Kohn SMØNBJ of AMSAT-SM, visited UA3CR during his recent stay in Moscow. Danny interviewed the chief operator there, Leo Makhakov RA3AT, made tape recordings, and took pictures.

Danny will likely make an extensive report on his visit to RS3A after returning to Stockholm. Perhaps the most interesting news he learned was that, according to the operators at RS3A, RS-5 and RS-7 are now definitely out of operation. RS3A gradually lost control over these last two active RS satellites of the RS-3 to RS-8 series. They are convinced that the batteries in RS-5 and RS-7 are dead and so expect no new activity from them. RS-3 through RS-8 were launched together on 17 December 1981.

Amateur Radar?

Nick Leggett N3NL continues his campaign with the FCC to obtain permission for amateurs to experiment with radar. He has now asked the FCC to modify Part 97 of the rules so that all RACES radio stations and all commercially built amateur equipment be protected from Electromagnetic Pulse (EMP). Leggett claims that, to date, only a few selected military systems are shielded from EMP. He claims communications equipment can be protected from EMP by conductive shielding and active bypass devices. He asks that Part 97.4 require that all amateur stations manufactured or sold after 1 January 1990 be so protected.

Japanese T-Hunting

T-hunting is quickly gaining popularity in Japan. Last year, the first National Amateur Radio Direction Finding (ARDF) Competition was held in November 1987, with amateurs from the People's Republic of China (CRSA) and the Republic of Korea (KARL) participating. ARDF, which was introduced to Japan from Europe, is attracting the interest of many Japanese hams. ARDF events have already been held in various locations throughout Japan under the auspices of JARL branches and JARL-affiliated clubs.

88 and 73

The numerals 88 and 73 have been a tradition in communication languages for almost 130 years. The older of the two, 73, appeared in 1853 meaning "My love to you." In 1857, the first official definition made it a "fraternal greeting between operators." Two years later, in 1859, Western Union made 73 a part of their "92 code" to indicate "Accept my compliments." The final change came in 1895, when 73 meant "Best Regards" for the telegraph, and later for radio, operators.

88 never received the formality of an official listing until it was adopted as one of the ham abbreviations. It had been one of the telegrapher operator's traditional terms since well before the turn of the century. During the First World War, 88 was used by the U.S. Army Signal Corps, again strictly as an operator's abbreviation in unofficial communications. But at the close of the First World War, 88 achieved official status as part of amateur radio terminology, "Love & Kisses."

Not-So-Secret Service

Ever wanted to listen in on the men in shades during a presidential visit? It's easier than you may think!

Most frequencies used by the Secret Service/presidential protection agents are in the UHF range, and most of the transmissions are unscrambled voice narrowband FM. It appears that as many agents use plain English, as those who use code and ciphers. The secret service has also been known to use portable repeaters. Frequencies used in the past (either repeater output or simplex):

Air Force One/Two in the air—
171.235 MHz
Air Force One/Two on the ground—
171.285 MHz
Presidential Limo—164.885 MHz
Secret Service agents—165.375/
.685/.785, 166.700, 167.025,
169.625/.925, 171.235/.285 MHz

France On 6 Meters

France has authorized its amateurs the use of the 50–51 MHz band on a permanent basis. The band will be available only to amateurs living more than 100 miles from a television transmitter. Three watts ERP at a distance of 150 km from a channel 2 transmitter is permitted. . .extending to 10W at a distance of 200 km. For channels 3 and 4, the protection zone is the signal coverage area of the television station. CW, SSB, RTTY, and packet are authorized to fixed stations only.

Repeaters in China

Members of the Boeing (Seattle) Aircraft ARC were in China demonstrating FM, repeaters, and interlinking systems on the amateur 2 meter and 1¼ meter bands. According to Yaesu USA Vice President of Marketing C.H. "Chip" Margelli K7JA, the Seattle amateurs took with them repeaters from ICOM and Spectrum Communications, antennas from Larsen, and a number of Yaesu handhelds that are being used to demonstrate all aspects of VHF-FM operation, including autopatching. They also took along packet radio gear from Advanced Electronic Applications, and various peripherals supplied by a long list of manufacturers.

The demonstration was a joint effort of the amateurs from Boeing working with the Amateur Radio Manufacturers and Publishers Association.

Navy Testing at Va Capes

If you live near the Virginia Capes or will be on a boat near there, be sure to listen to the maritime notices about the Navy testing going on in that region. The Navy is simulating nuclear blasts to learn about its effect on radio equipment. Make sure your gear is well shielded!

NBC Hams

Hams who are current or former employees of the National Broadcasting Company can keep track of one another over the 20 meter NBC Retirees Net. Hosted by Tony Rokosz W5RFO, the net meets daily at 10 AM Eastern time on 14.242 MHz. Rokosz, a former NBC Maintenance Supervisor, runs the conclave from his home in Rio Rancho Estates, just north of Albuquerque, New Mexico. For more information on the net, write Tony at: 1523 Sara Rd., Rio Rancho, New Mexico 87124, or call him at (505) 892-8308.

A Hearty Thanks

. . .to the cast of thousands who helped supply this month's QRX items. Among them are: *Westlink, ASR, FSAARC Newsletter, TSRAC B-N-T, QRZ Newsletter, CAREN's World, BirmingHam, JARL News, WcrldRadio, Great Falls AARC Newsletter, Mike & Key, NABET News*, CARF, W7OIO, and GB2RS.

73 Review *by Jennifer Roe WA6OHX*

Number 3 on your Feedback card

The TE-144 Deluxe CMOS Keyer

TRAC Electronics, Inc.
PO Box 7685
Charlottesville VA 22906
PH: (804) 973-3669
Price Class: $76

TRAC down this good value keyer.

The TE-144 is a deluxe CMOS electronic keyer from TRAC Electronics, Inc. There are six different models of keyers that TRAC manufactures, of which the TE-144 is the middle-of-the-line. It offers dot and dash memory, sidetone, a tune function, and speed (5–50 WPM) and weight controls.

Dot and dash memory only remembers that a dot/dash is sent in a specific order and outputs it in the proper order, (if the operator gets ahead of the output). This memory assures accurate output, but can't be recalled or programmed. The sidetone feature includes a tone and volume control. Sidetone capability permits the keyer to be used as a practice code oscillator. If sidetone is not required, TRAC suggests turning the volume to minimum to prolong battery life. The weight control allows you to add a distinction, or thickness, to the dot and dash for different operating conditions.

"The sidetone has tone and volume control."

The input and output are ¼" jacks. In the TE-144, the tip of the plug is common, a somewhat unusual configuration. The schematic and instructions do not specify which connector is for the dot and dash, which requires a little detective work.

To tune, put the SEMI-AUTO/AUTO switch (positioned in the back of the box), in the SEMI-AUTO position. This is somewhat awkward if the back side of the box is not easily accessible in the shack. The only other adjustment on the back is the POS/NEG (grid block) switch. Unless there are other changes in the shack, it only needs to be adjusted at installation.

Circuit Workings

The CMOS circuitry allows the TE-144 to draw low current from the battery, thus eliminating the need for an on/off switch. A single 9 volt battery will last one year under normal operation.

The circuit is described as follows: A clock oscillator establishes the basic speed of the dots or dashes selected by the paddle-controlling IC. A clock division in another IC establishes precision timing control of the dots' intra-character spacing and the dashes. A third IC with its weight control, allows some "stretching" of the dots and dashes as desired by the operator. This weight-modified code gates on the audio oscillator, whose tone (frequency) is operator-variable with the TONE control. This audio version of the code is brought to a suitable output level by a transistor amplifier using VOLUME to control the level. A fourth IC, in addition to gating on the audio oscillator (sidetone), controls the transistor switch MPSA92 and MPSA42, which provides contact-to-ground output for one SW (POS/NEG grid block switch) position and a positive output voltage for the other SW position (for the requirements of the transmitter to be operated).

All the chips are on sockets and solid wire is used for all interconnects. The unit is housed in a heavy aluminum box with "feet" on the bottom to prevent marring. (I recommend scraping some paint away from where the cases connect (at the screws) to improve the bonding.) The integrated circuits (ICs) are easily available at most electronics stores.

With the TRAC TE-144 connected between my Bencher Paddle and IC-430S, the keyer functions well and reliably. The TRAC TE-144 is competitively priced and is a good looking, good operating piece of equipment. 73

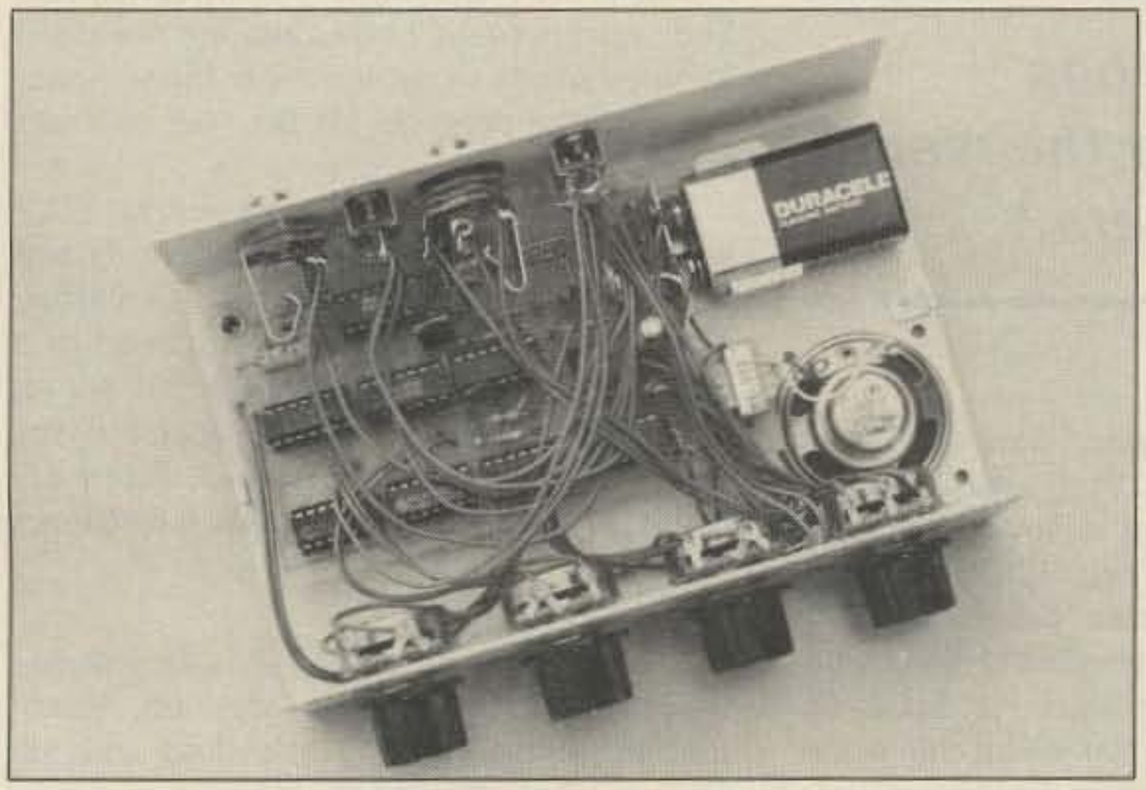

Photo A. Internal view of the TRAC TE-144.

Photo B. The back panel showing the positions of the switches.

CIVIL AIR PATROL

Best kept secret in the world.

by Phil Nowak KA9KAF

What kind of radio operator's license can you obtain without having to wade through either code or theory? CB is such a license—but it lets you operate only on a few channels, and with very limited power. Yet there is a license that allows considerably more scope—one hundred and fifty watts on 26.620 MHz, operation on HF and VHF subspectra, and operation in a number of modes, including voice and RTTY. Much ham gear nowadays is easily convertible to frequencies in this Service. Licensing starts at fourteen years old. If you're lucky, you might even get a couple of weeks of an all-expense-paid vacation in a foreign land.

Photo A. One of the many activities of CAP. Mitch Hall "Red Fox 271" copying traffic.

No, I'm not suffering from code-induced delusions. This service actually exists, and quite naturally, thrives. It is the Civil Air Patrol, the US Air Force Auxiliary. CAP has over seventy thousand members, many of them cadets under the age of eighteen. Senior members are generally twenty-one and older.

The Waukegan Civil Air Patrol squadron is an outstanding example of what can be done to interest young people in amateur radio. Based at the local airport, the Waukegan squadron boasts its own communications building equipped with a complete radio room. A CAP group consists of several squadrons. Lieutenant Colonel Leonard Bromstead WB9MTC is the communications officer for both the squadron and Group Twenty-Two. Col. Bromstead, a CAP member since 1952, was chosen CAP Communicator of the Year for 1986. He has been the "Elmer" for dozens of young people in his area and conducts ham classes in his home. Over thirty people have become amateurs as a result of these classes.

CAP Hams

Ted Mathis N9HJN is a sixteen year old ham. "I was interested in radio as a small boy. After I joined CAP, Col. Bromstead encouraged my interest in communications." Ted is the only licensed amateur in a high school of 5000 students. When he carries his handie talkie to school, other kids think it's some kind of CB. He notes that "Most school kids have never heard of ham radio." Ted, who has recently upgraded to Technician, remembers what launched him into this fascinating hobby: "I wouldn't be in ham radio had it not been for CAP."

"CAP has over seventy thousand members."

Mitch Hall age fifteen, who holds the CAP call "Red Fox 271," also recently entered the ham ranks as a Novice licensee. He concurs with Ted: "I wouldn't have even thought of a ham license without CAP." Mitch has also had a wonderful time with CAP, and really appreciates the hands-on practice. Asked if there was a ham club in his school, he answered with depressing predictibility: "No, and most of the kids have never heard of amateur radio."

Best Way to Go

Why is amateur radio activity in schools on the wane? For one, it's very hard to get teachers to run ham clubs. Len WB9MTC feels that the main reason, however, is that ham clubs don't offer enough initial excitement for young people. In a CAP program, cadets often ride on Air Force aircraft, such as the C-130 Hercules. They take camping and hiking trips. Cadets visit Air Force bases (Wright-Patterson AFB in Dayton, Ohio, and Strategic Air Command at Offut AFB, for cadets from the Chicago area). CAP has three primary purposes: aerospace education, emergency services, and the cadet program. Cadets participate in all three.

"Young people are introduced to radio-communications, in the midst of all the excitement, and so they develop a good association with it," continues Len, "This helps them appreciate amateur radio that much more when they start getting involved with it."

Cadets are encouraged to study aerospace. They take periodic exams and are rewarded for good marks by promotion to higher rank. A cadet can progress all the way to cadet colonel.

The US Air Force sponsors several CAP search and rescue missions each year. Group Twenty-Two cadets are capable of handling most of the communications workload of a mission, both in the radio shack and out on the flight line. They talk to pilots, flying observers, and ground personnel. Pretty exciting stuff, especially on an actual mission.

Plenty of Incentive

A very nice feature of CAP is the international air cadet exchange program. Every summer, a few lucky cadets, along with senior member chaperons, spend two weeks visiting foreign countries—at government

expense. The cadets chosen to go are the ones who are very active in their units.

Aviation is a big drawing card. Angela Greanias "Red Fox 311," a fifteen year old female cadet, joined CAP to enter a flight training program at reduced cost. She stresses, "CAP doesn't have to lead to a military career. I personally have no desire to join the military, but that doesn't keep me from having a lot of fun with CAP." Angela is the Cadet Personnel Officer for the squadron. Angela's made many new friends in CAP, and she feels it's developed her leadership abilities. Angela operates a Regency VHF crystal-controlled radio for her CAP communications. She's now studying for her ham ticket to broaden her communications horizon.

RDF Activities

What bearing does CAP have on foxhunting? Plenty! There are many simulated downed aircraft searches. In the Waukegon group, Col. Bromstead conducts ELT (Emergency Locator Transponder) search exercises. An ELT is an automatic on-board transmitter used to locate downed aircraft. A radio operator at a base station directs cadets in a car to a target location. A senior member drives the car and follows the directions of the lead cadet. When they reach the target, they identify it. The next cadet in the car gets to be the lead cadet, and they search for another target. Everyone gets a turn.

"...most of the kids have never heard of amateur radio."

Cadets also participate in actual ELT searches. A ground team goes into action looking for the target. Ninety-seven percent of the time it is a false alarm—but they often save lives in the remaining 3 percent of true alarms.

Opportunity and Fun with a Structure

Cadet squadrons meet once a week. This provides an ongoing structure for both cadet and senior members. When someone like Col. Bromstead takes an active role in recruiting, motivating, and training young communicators, it is inevitable that the ham community benefits.

Kids aren't the only ones becoming hams, either. Carol Szarfinski KA9PRE is a captain in CAP. She is a senior member and a graduate of Col. Bromstead's ham class. She told me, "I heard about the week long CAP communications school held annually by the Great Lakes Region. I joined CAP to go to that school." Her husband, Mike KA9ATL, and her father W0NSW, are pleased at the new hams. Now, as Red Fox 277, she conducts the Tuesday night CAP northern Illinois VHF net. She can now keep in touch via ham radio with her father, Milo W0NSW, in Kansas.

Photo B. Several cadets getting the low-down on a Canadair Challenger from the co-pilot, Charlie Tennstedt.

Indeed, CAP and amateur radio activities often support each other. For example, the Waukegan squadron runs an annual hamfest. "It has been profitable every year we have held it. The proceeds go to fund squadron activities thoughout the year."

CAP Lingo

While there is a lot of emphasis on hands-on training, formal communications procedures are also taught. The student learns the use of prowords. These are words with specific meanings that communicators recognize, such as "Over," "Roger," and "Out." The CAP radio operator takes an exam on communications and operational procedures at the end of the class. If he passes, he receives a Radio Operators Permit. This allows him to talk on any CAP radio with all the privileges mentioned earlier.

Just the Beginning

The Civil Air Patrol offers many exciting activities for teenagers and adults alike. Communications is an integral part of the entire process. While it is much easier to get an ROP card than it is to get a ham license, there are just a few frequencies that you can use. Your audience is also quite limited. Rag-chewing is not encouraged, since these are military frequencies. Once CAP radio operators gain some experience using the radio, they often want to talk to more people on more frequencies.

Photo C. Col. Bromstead, flanked by Angela and Veronica, holding his "Communicator of the Year" trophy.

Get Involved!

Sound appealing? Look up CAP in your telephone directory. Can't find it there? Send a postcard to *HQ CAP-USAF/PA, Maxwell AFB, AL 36112-5572; ATTN: Tsgt. Scott* and ask them to put you in contact with the unit nearest you. Too impatient to wait for the mail? Call *205-293-5463* and ask the same question. Tell them you read about it in *73* magazine. Break and end. This is Red Fox 197, out. 73

RS-232 Port For The C-64

Allows easy file transfer to and from the C-64.

by Ralph Neal

There were many text files on my old C-64 computer I really wanted to transfer to my Amiga. Unfortunately, this wasn't easy to do. I transferred the first files by uploading them to a local BBS, and then downloading them with my Amiga. This works, but it is time consuming, and requires two modems, one each for the C-64 and the other computer.

For the Amiga, it is more convenient to use a program that allows the computer to read C-64 files. However, the disadvantage is that to use the program, you must have a 5¼" disk drive attached to your Amiga, not a popular drive for the Amiga.

A third possibility, and the one I prefer, is to use a null modem. For most computers, this is simply an RS-232 cable running from one computer to the other via the serial ports. This will not work for the unmodified C-64 because it has no RS-232 serial ports. With a little work and time, however, you can build an RS-232 port for the C-64. But first, you need to know a little about how the RS-232 works.

A Little RS-232 History

Several years ago, an industrial committee agreed to a standard interface for serial transmissions. They agreed that −3 to −25 volts would represent a logic of 1, and +3 to +25 volts would represent a logic of 0. While the C-64 is quite capable of sending and receiving serial transmissions, it does not do so at these voltage levels. The C-64 uses a TTL standard in which 1 is defined as a voltage between +2.4 to +5 volts, and 0 as a voltage between ground to about 0.8 volts. There are several ways to to make the TTL standard compatible with the RS-232. They range from discrete circuits composed of transistors, optical isolators, and the like, to ICs designed just for that purpose. In this article I chose the latter, using the MC1488 line driver and the MC1489 line receiver.

The Circuit

See Figure 1. This is a relatively simple arrangement, requiring only three ICs for its operation. However, the voltages needed to power the MC1488 line driver range from +15 volts DC to +7 volts DC on the positive side, and from −15 volts DC to −2.5 volts DC on the negative side. In fact, there are no usable voltages for the MC1488 line driver, plus or minus.

It was not hard to generate the required voltages. I obtained the negative power with a special purpose IC, the 7660 voltage inverter. Using two 10µF capacitors, this IC takes +5 volts DC and converts them to −5 volts DC. The positive voltage was even simpler to obtain. While the user I/O has nothing greater than 5 volts DC, it does have a 9 volt AC source. With a diode and small filtering capacitor, I was able to half-wave rectify the 9 volts AC and obtain about 12 volts DC, well within the 7–15 volts needed.

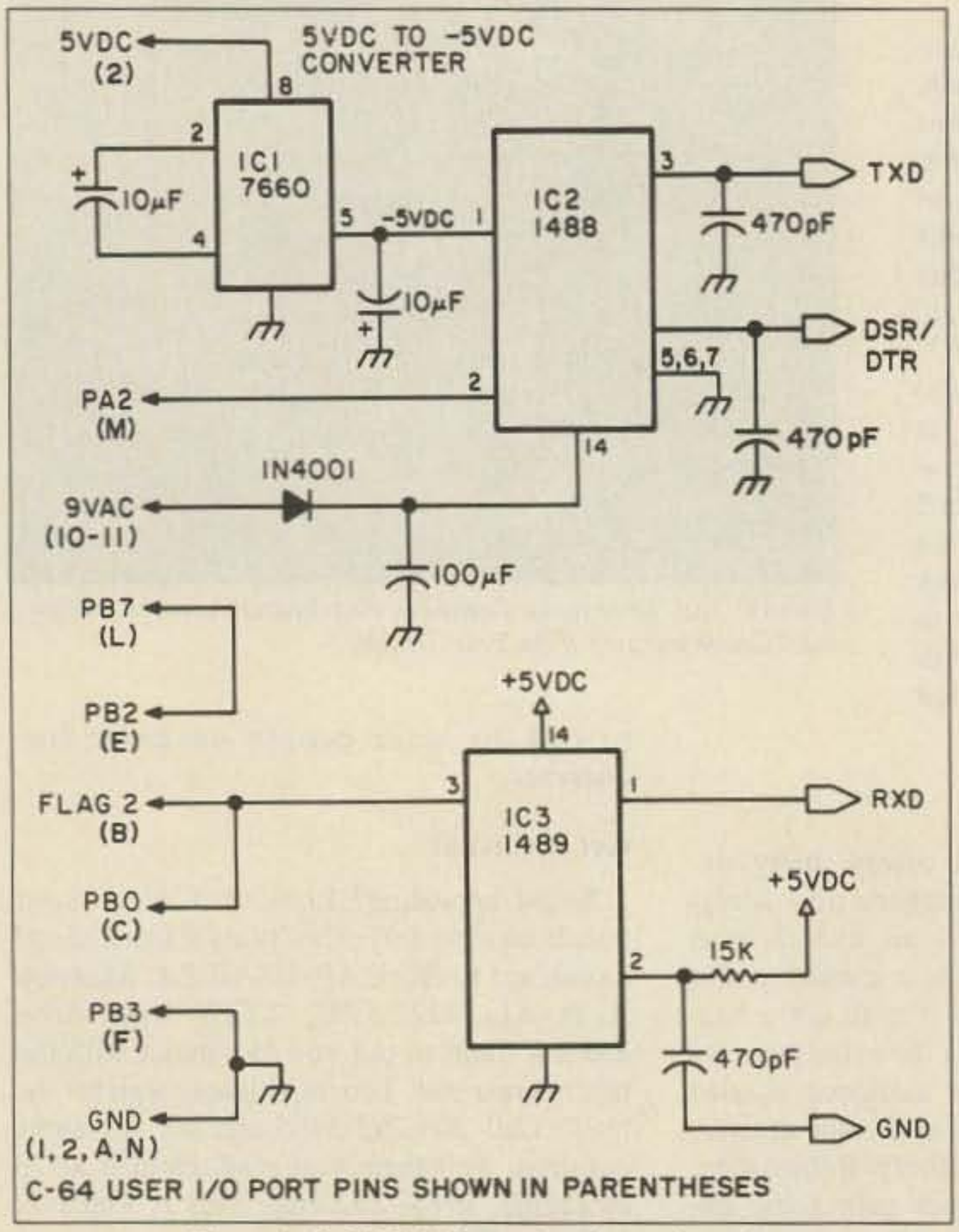

Figure 1. C-64 RS-232 port interface schematic.

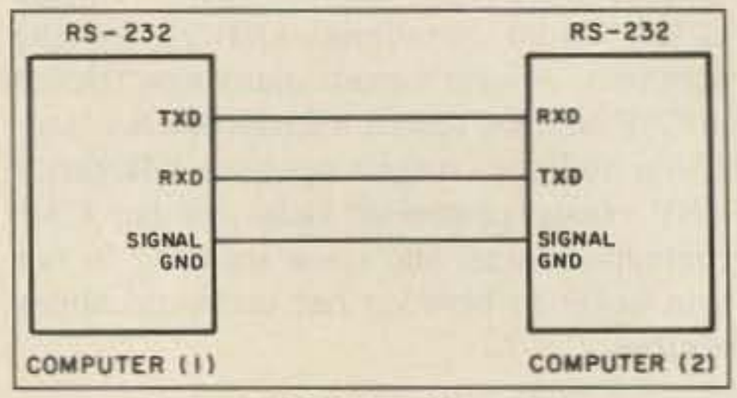

Figure 2. RS-232 cabling wiring.

When building this circuit, you will notice that only seven of the 14 pins are used on the MC1488 and five on the MC1489 ICs. Often it's a bad idea to leave your inputs dangling, as in TTL and CMOS logic, but in this case it does not seem to hurt. I have used this circuit several times now, with good data transfer each time.

Now refer to Figure 2. To use the RS-232 interface as a null modem, connect the TXD (transmit) pin to the RXD (receive) pin and the RXD pin to the TXD pin. You may need a third line, marked DSR/DTR (Data Set Ready/Data Terminal Ready), to inform the other computer that the C-64 is alive and ready. The fourth line from the RS-232 interface is attached to the signal ground from the other computer's RS-232 interface. Once the null modem cable is configured correctly, you will need to load terminal programs into both computers. Then you should be able to communicate from one computer to the other, as you would in communicating with a BBS.

In closing, I would like to point out that this circuit has other possible uses besides that of a null modem. It should be possible to connect RS-232 modems and printers to the C-64 using this interface. Perhaps someone reading this will be inspired to do so. Happy building! 73

User I/O Port

Pin	Type	Pin	Type
1	GND	A	GND
2	+5V	B	FLAG2
3	RESET	C	PB0
4	CNT1	D	PB1
5	SP1	E	PB2
6	CNT2	F	PB3
7	SP2	H	PB4
8	PC2	J	PB5
9	SER.ATN IN	K	PB6
10	9 VAC	L	PB7
11	9 VAC	M	PA2
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1	Never Say Die
2	QRX
3	Review: TE-144 Deluxe CMOS Keyer
4	Civil Air Patrol
5	RS-232 Port for the C-64
6	Review: Home-Brew Fun!
7	Don't Lose Your Memory!
8	Packet Tuning Indicator
9	Midland 13-509 Modifications
10	Decatur Ham Launches Satellites
11	Charging Without Over-Charging
12	New Products
13	Review: Communications Concepts
14	Review: Carolina Windom Antenna
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73 Review

by Allen Short WA9FPU

Home-Brew Fun!

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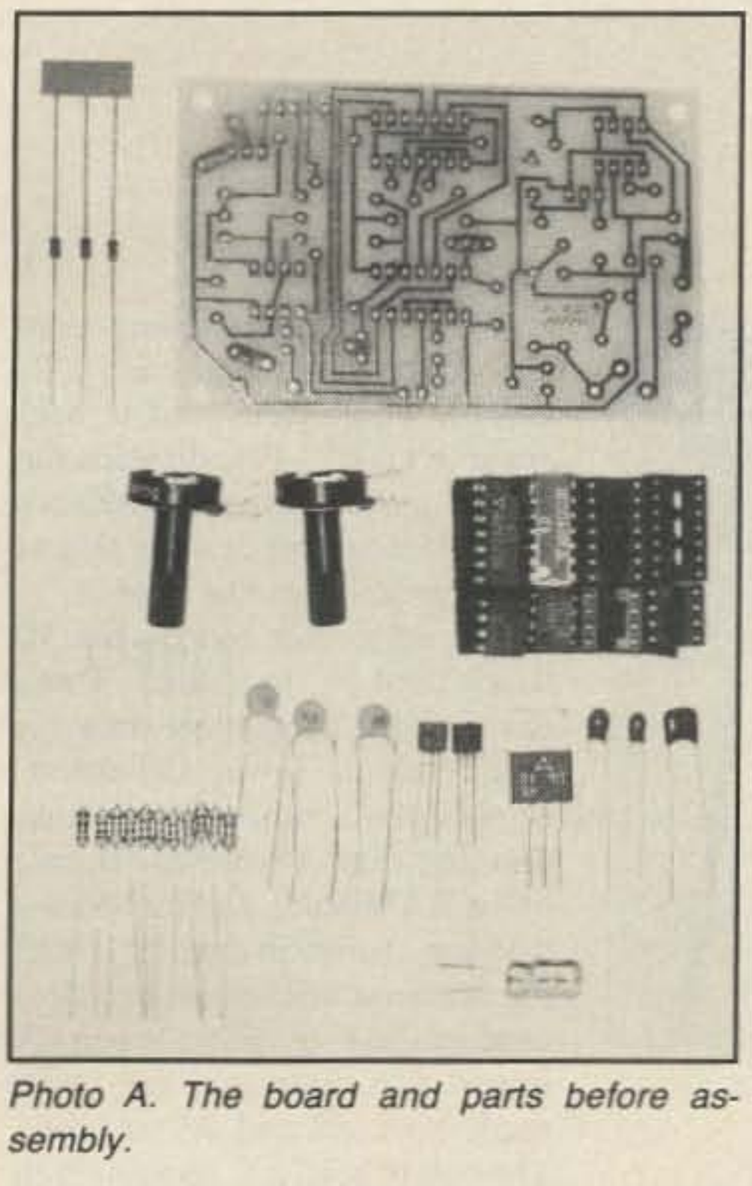

Photo A. The board and parts before assembly.

Are you a new Novice in need of your first keyer? Or perhaps an experienced Extra looking for a bargain in ham radio? I spotted an ad for the Bel-Tek CMOS keyer kit that described a unit that seemed to fit both bills, in the November 1987 issue of *73 Magazine*. It mentioned neat features such as a triggered clock to eliminate start delay, circuitry that automatically inserts a dot or a dash between tones, acceptance of any power voltage between five and 12 volts DC, accidental polarity reversal protection, operation between five and 50 WPM, adjustable 800 Hz sidetone volume, and compatibility with grid block, cathode keyed, and solid-state transmitters.

All this sounded pretty tempting. The low cost of the kit—$9.95—finally convinced me to give it a go.

First Look

The printed circuit board for the keyer was small (2.5" x 3.5"), and it could be placed into many low band transceivers, but I wanted to use it with several different rigs.

When I started the CMOS keyer, I wanted to see if the cost of the project could be kept low while still providing a nice piece of equipment when finished. As I looked through the well stocked junk box, I found the following parts: a speaker, a battery clip, a battery power lead, a switch, all of the hardware, the decal kit, and the paint. I had some extra boxes, but they weren't the right size for the project. So one night after work, I stopped at Radio Shack and bought the box shown in Photo C. It has a Radio Shack part number of 270-238, and it just fits the project.

Bel-Tek did a nice job on the kit for the money. They provided the board and the parts, with a set of instructions on building the board. To solder the board, I used a small iron to make the connections, but I didn't put in the CMOS chips until all solder connections were made. After building the board, I had a trial run to see if it worked. I have an old HW-16 CW transceiver that I used for the test. The keyer worked just fine. The only problem was that, when powering up the keyer, it would only send a single dash. I didn't find this to be a problem since I have heard other keyers do this same thing.

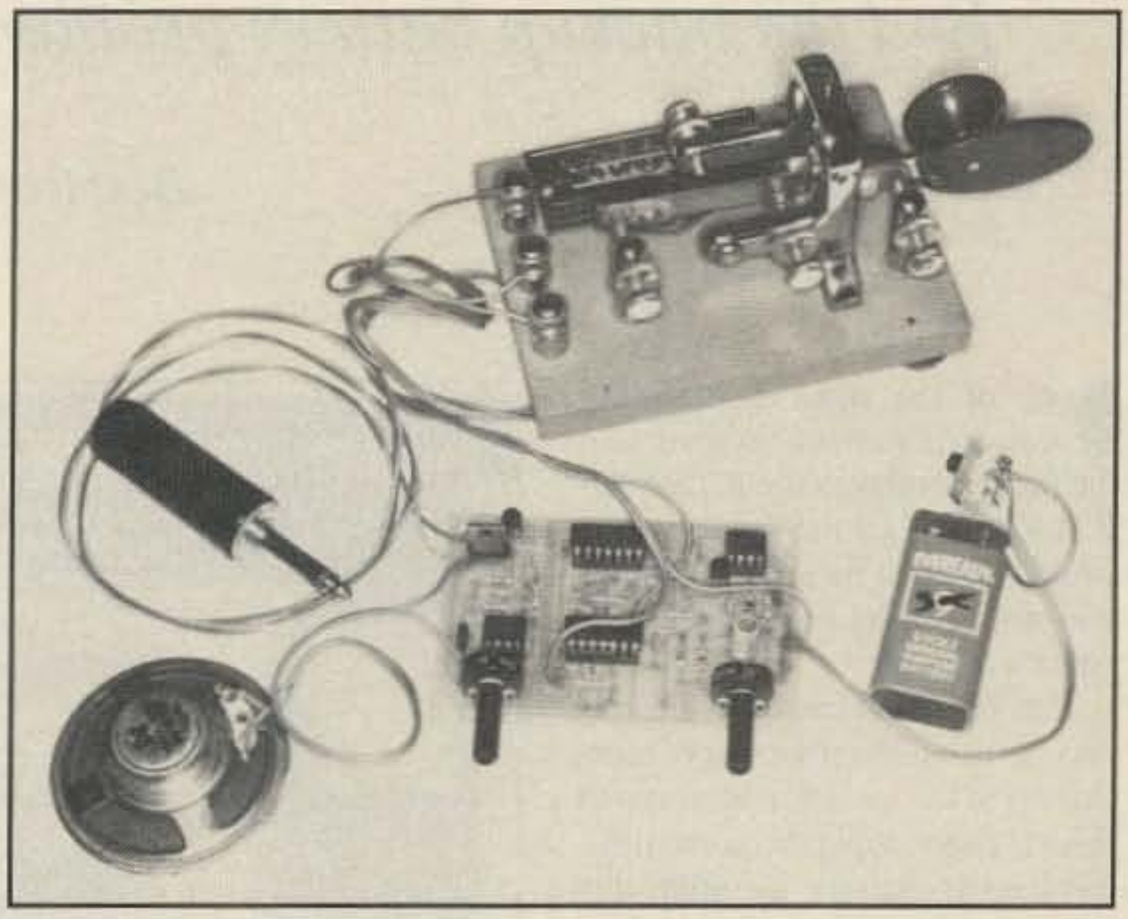

Photo B. Getting ready for the test run of the keyer.

Final Touches

After the test run, I did get into another problem of my own doing. Some of my friends know me as a very conservative fellow, or just plain cheap. What happened is that I tried to use an old nine volt battery, and it wouldn't work. So I went out and bought a new nine volt battery just like the instructions sheet said to do.

Once all of this was brought under control, it was time to begin the final assembly. The box was made of soft aluminum, so I used my old drill press to do all of the drilling. I had a can of spray paint from K-Mart that had a Fanspray valve on it, to give a very nice finished paint job at a low cost. After the paint had set up, I baked the box in the oven for 10 minutes at 200 degrees. This gave a nice baked paint job on the box. The decals were cut out and placed on the box to complete the finishing touches.

Photo C. The front of the finished project.

On the back of the box, I have two terminal strips, one for the transceiver, and the other for the key. The small jack is for external power for the power supply used as long as it is five to 12 volts DC, and of adequate current. I thought this would be a worthwhile addition, so that another type of power supply can be used other than the built-in battery. Have you ever been in a contest and had a battery die at a very late hour of the night?

The keyer is very easy to switch between grid block and cathode keying. Simply reverse the leads on the transceiver terminal strip. It doesn't need any modification to the equipment in the set-up.

The goal of the low cost keyer was achieved. The cost was as follows; the Bel-Tek kit $9.95 postage $1.50; the box $2.50; the battery $1. Total cost: $14.95.

In Sum

I think the keyer will give many years of service at low cost. It was a rewarding experience to build it and I would encourage the newcomers to amateur radio to give this project a try. It is a first homebrew type of project and from this, try something a little more difficult. I feel that this keyer is a good way to break into homebrew. 73

Don't lose your memory!

End the backup battery problem in the ICOM IC-R71A receiver.

Bob Roehrig K9EUI

One of the most outstanding communications receivers on the market today is the ICOM IC-R71A. It has all the features you could want in a receiver, whether you are an SWLer, amateur, or commercial user.

The big drawback of this receiver is that the necessary information to its operation is stored in RAM, and it depends on the lithium backup battery to retain this information. If this data is lost, the radio simply will not work.

The lithium battery is supposed to be good for several years (I have heard that the expected life may be as long as 7 years). What if you were using this receiver, however, during a DXpedition, or during a contest, and suddenly the radio went dead? The manual says "Contact your dealer or ICOM service center." I learned that, for $25, ICOM will replace the battery and reprogram the board if you send it to them. I figured there had to be a better way, and indeed there is.

Some other ICOM models have the same RAM board, and so have the same problem. The ideas presented here will likely also apply to this equipment.

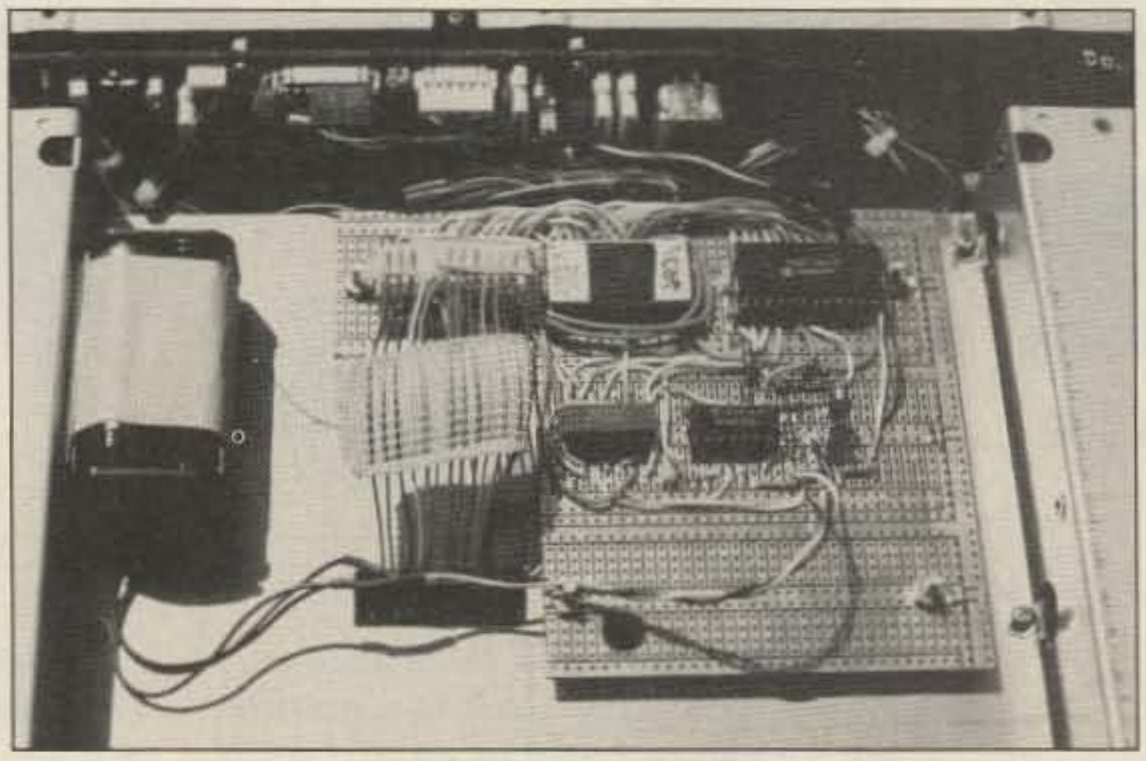

Photo A. The new board in K9EUI's receiver.

Choices

There are other options to handle the battery problem besides sending the board to ICOM. You could change the battery yourself before it goes dead. To replace the battery, simply remove the board from the receiver and power it from a 5 volt bench supply. You might consider changing over to a more standard type of battery, such as three AA alkaline penlight cells. As long as power is applied to the board, the batteries can be replaced without losing the memory.

To understand what is going on in the receiver, look at Figure 1, the schematic of the RAM board. There are apparently two versions of this board. The board layout drawing in my manual is different than the board in my receiver. One version uses an 18-pin RAM and the other uses a 24-pin device. The result is the same so it doesn't make any difference which one you have. (Figure 1 shows the 24-pin version.)

Power and addressing connect to the board via J1, and the data lines, write, and ground are on J2. Notice that only four data lines are used. When the receiver is turned on, the RAM IC is powered from the radio's 5 volt bus through diode D1. When the receiver is turned off, the RAM is kept alive by battery voltage through D2, and the chip select lead is held positive by R1. This disables the IC and puts it in a high impedance state. The current drain is almost not measurable in this state.

Also notice that address line 10 is not used but grounded. Thus, only half the available memory is used. Only the lower 256 memory positions contain the information that cannot be lost. The rest of the RAM holds the frequencies that are stored in memory, and the last frequencies (and modes) used by the two VFOs. When the lowest 256 addresses are being used, both A8 and A9 are low. The output of IC2-C remains high which inhibits writing to the RAM. If either A8 or A9 or both are high (above address 256) Q1 is turned on to permit writing to the RAM.

If the battery does go dead, you can reprogram the board yourself. Table 1 shows the listing of what is in the lower 256 bytes of memory. Figure 2 shows the circuit for a manual programmer. Switches S1 through S8 select the address, and S9 through S12 are the data switches. A simple adapter can be made using a piece of perf board and stiff wires to mate with J1 and J2. After the battery has been replaced and the board is connected to this programmer, apply power and close the PROG switch. Step through the addresses, one at a time, select the correct data for each address, and press the WRITE button.

PROM Program

00:	0,	0,	F,	1,	F,	F,	1,	F,	F,	0,	0,	2,	F,	F,	F,	F
10:	0,	0,	0,	B,	5,	9,	6,	8,	6,	8,	0,	0,	0,	3,	2,	0
20:	0,	5,	9,	3,	0,	0,	0,	5,	0,	0,	0,	0,	0,	0,	0,	0
30:	0,	1,	0,	0,	0,	0,	0,	0,	3,	0,	0,	0,	3,	0,	0,	0
40:	1,	0,	0,	0,	0,	0,	0,	0,	3,	0,	0,	F,	F,	F,	F,	F

50 Through FF: Data is all "F"

Table 1.

RAM-Only to RAM and ROM

The best solution to the problem is to replace the present RAM board with a new board containing both RAM and ROM. The essential receiver information is put in an EPROM and the RAM is used just to store the memory/VFO information. So if the battery does go dead, you do not lose the operating data itself.

You can manually program the EPROM programmer with the data in Table 1 or you can build an adapter that allows the data to be

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read from your RAM board directly into the EPROM programmer. Figure 3 shows such an adapter. The adapter simulates a 2716 EPROM for read-only purposes. The highest four data bits are not used and are grounded so that zeros result. Even though the programmer expects 2048 bytes, we only need the lowest 256, and that is all the new 2716 EPROM is programmed with.

Figure 4 is the schematic for the new receiver board. J1-11 switches low when the board is addressed. When both A8 and A9 are low, the 2716 CS pin goes low to select the RAM. If A8 and/or A9 are high, pin 18 of the 6116 RAM switches low, enabling this IC. The data and address lines of IC1 and IC2 are paralleled. I used a Hitachi HMS-6116 for the RAM chip. This is an inexpensive device and the pinout is similar to the 2716 EPROM. While most of the 2716 is not used, this is a popular EPROM that most all programmers can handle. Other RAM and EPROMs can be used if desired.

There are devices available called NOVRAMs, that can be used in place of the 6116. These devices need no separate battery to retain their data. I don't know the life expectancy of them, but the idea is certainly attractive. There is a NOVRAM that is pin-for-pin compatible with the 6116.

Power for the 6116 RAM is obtained via D1 or D2, as on the original board. I used a pair of germanium diodes to minimize the voltage drop.

The second advantage of using this circuit in the R71 is that the number of memory channels can be doubled to 64. Since the highest address, A10, is not used by the receiver, only half the available storage is used. By switching A10 of the RAM high, we now have twice the storage capability. If you do not have the remote option board in your receiver, the remote switch on the front panel does nothing but light the remote LED. Pin 4 of J12 on the matrix board switches to approximately 13 volts when the remote switch is turned on. Connecting this pin to Q2 of the new board permits selecting another bank of 32 memory channels with the remote switch. When scanning, only one bank can be scanned at a time.

For a backup battery, I used a Radio Shack holder with three AA alkaline cells. The standby current of the 6116 is in the microampere region so the battery should last for some years. Do not forget to check for corrosion occasionally.

The photo shows the new board installed in my receiver. There is not room to install it in place of the original board, so it is mounted on a metal plate above the logic unit. I replaced the original plate with one of sheet metal about 1 inch longer. The old plate was used as a drill template for the four mounting holes and the scan rate control access hole. Slots for the connectors were cut in the plate with a nibbler tool. The cables for J1 and J2 have amp connector strips on the ends and were taken from a surplus computer board. The pins have 100 mil spacing and can be obtained from many supply houses specializing in computer accessories. My board is a lot larger than necessary but it allows for adding future modifications.

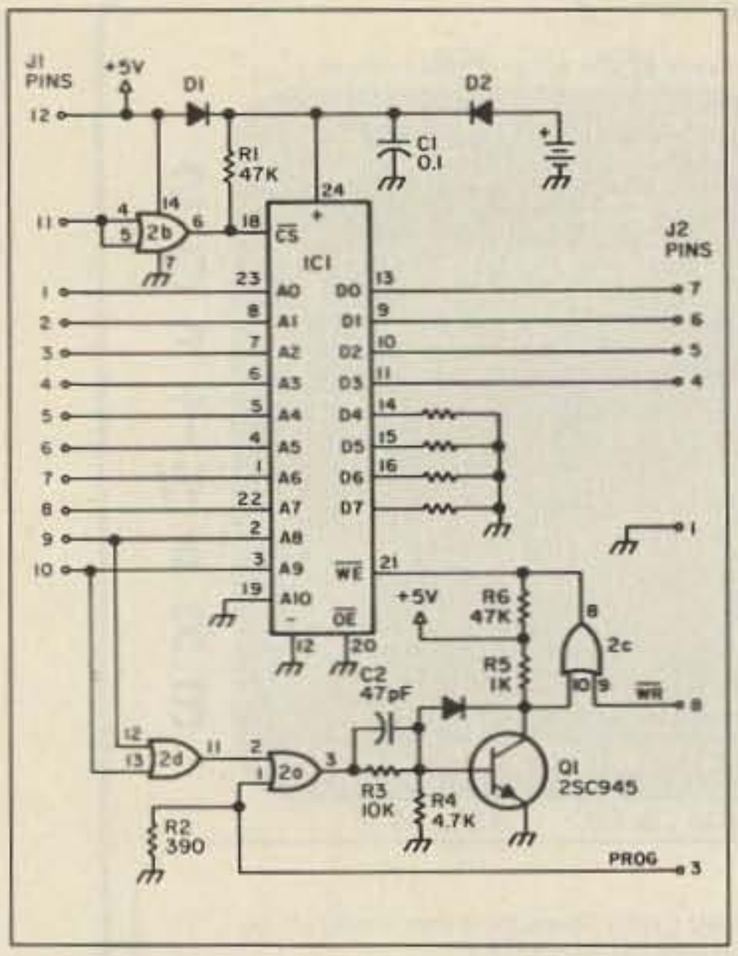

Figure 1. Schematic for the IC-R71A RAM board.

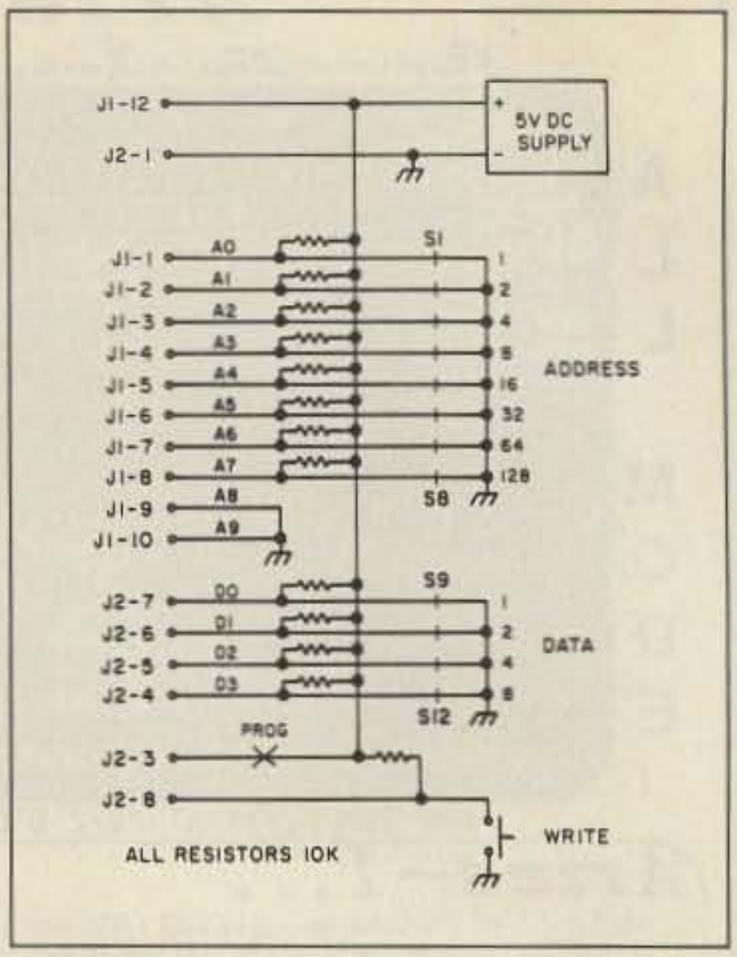

Figure 2. Manual programming setup.

With this new board in your receiver, you no longer have to worry about your radio losing its essential operating data. The receiver itself is not modified in any way and can be restored to its original condition in minutes, if desired.

If you wish to build this board and need the programmed EPROM, contact me at 314 S. Harrison St., Batavia, IL 60510 and send a SASE for details.

Thanks to AJ9S and WA9FVP for their comments on the R71 and special thanks to W9DJN for the use of his PC/XT and EPROM programmer. 73

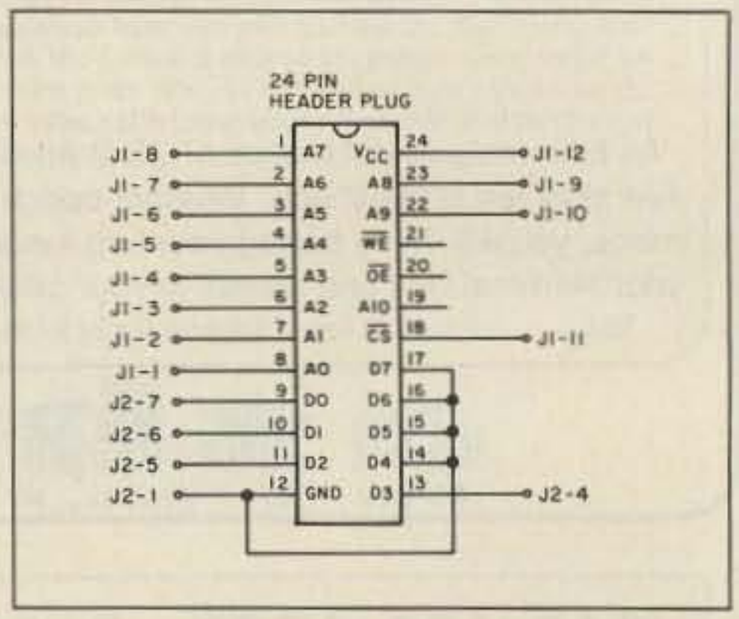

Figure 3. RAM board to 2716 EPROM read adapter.

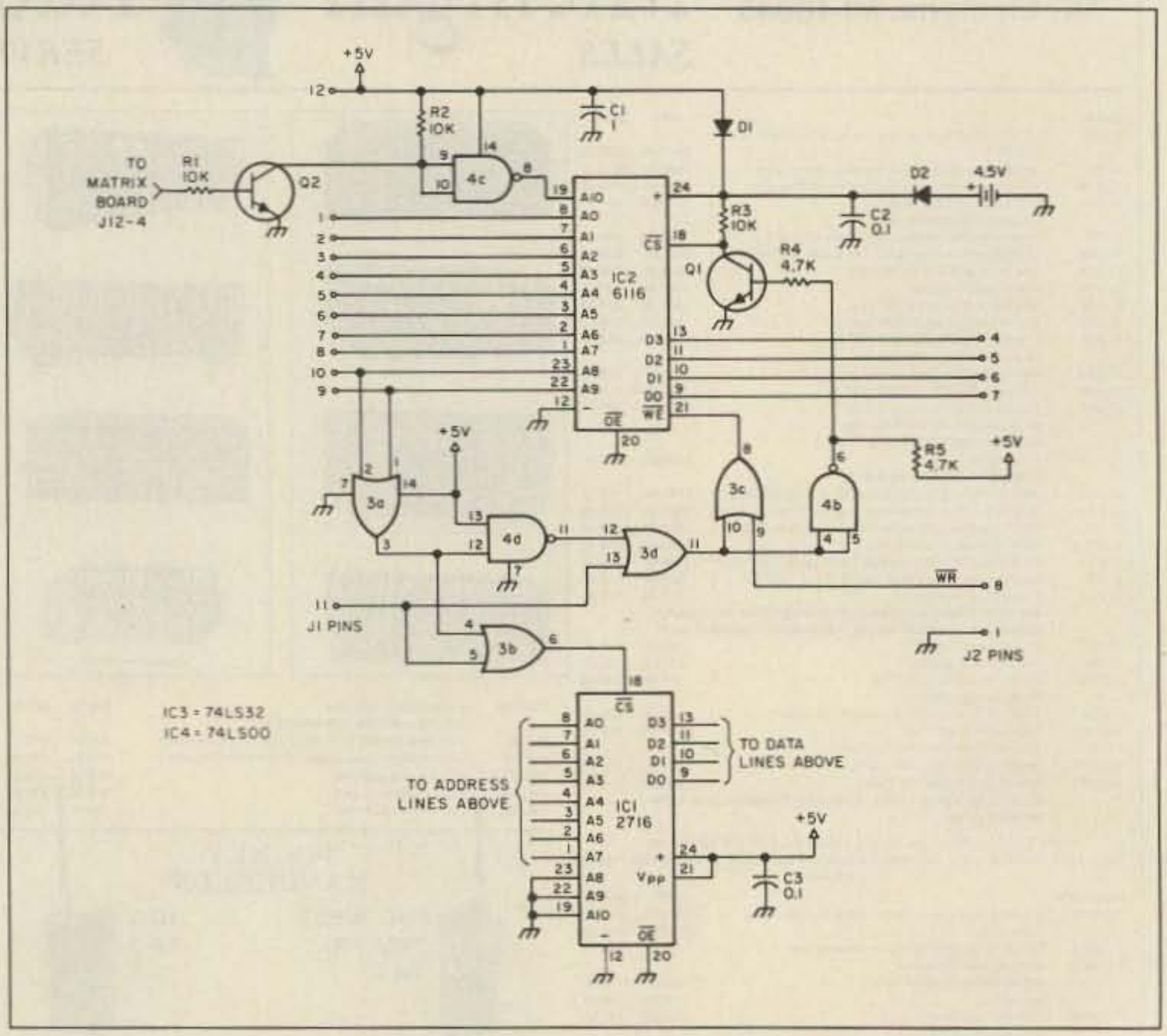

Figure 4. Schematic for the new R71 memory board.

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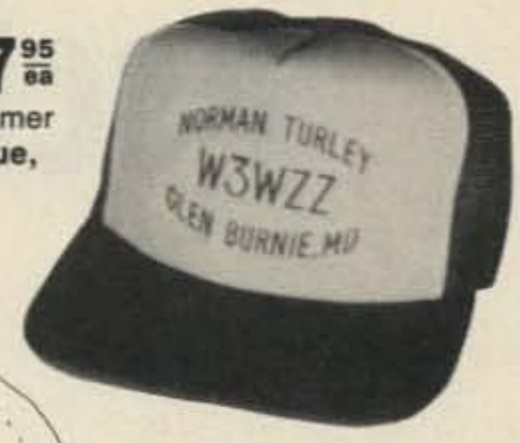

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by Ronald B. Koester W2EKY

Many packet stations, including this one, got their feet wet on the VHF bands, where tuning is just a matter of button-pushing. Sooner or later, the old DX bug bites and the temptation of HF DX operation arises. This is where the trouble begins: no buttons! Tuning in a packet station on the 20 meter band without a tuning indicator can be exceedingly aggravating because you must tune to the 2025 Hz and 2225 Hz modem frequencies directly. The slightest mistuning leads to no received packets on HF.

You can buy commercial tuning indicators for around $40, or build one for less than half that. The unit described here can be built for about $15, depending on what the old scrap box contains.

The Circuit

The circuit consists of two identical phase-lock loop (PLL) decoding ICs (see Figure 1). Decoding is a function of the timing components R1/C7 and R2/C8. The outputs of both IC1 and IC2 feed a resistor transistor NAND gate Q1.

R1 and R2 are 5kΩ 10-turn potentiometers. (I used 10kΩ in the original design due to availability, but they required more critical tuning.) Both pots should be preset to 3k across the unshorted portion before soldering.

The tuning indicator fits on a PC board measuring 2″ x 3″. Should you decide to use a different type of construction, you should find little difficulty at these low frequencies. You can house the completed unit in a plastic or metal box.

A few more construction hints: note the use of a jumper directly above R3, and use a shielded cable for signal input.

You can find all the parts you need at most Radio Shack stores. I listed below the parts by value and corresponding Radio Shack numbers.

Adjustment

This is best done using an audio signal generator and frequency counter, shown in Figure 2. Adjust the output of the generator to 2025 Hz as read on the counter. Adjust R1 on the decoder until the red LED 1 lights up. Keep reducing the level of the signal by adjusting control RA and repeated adjustments of R1. This adjustment is critical for proper performance. Repeat the same procedure with R2, but use a frequency of 2225 Hz for LED 2. There's a small amount of interaction between IC1 and IC2, so it pays to repeat both adjustments.

Lacking a signal generator and counter, you can tune the circuit by carefully adjusting your receiver until you are consistently receiving packets. Next, alternately adjust R1 and R2 until they light at the lowest possible volume level. In operation, the correct reception of a packet station will result in both LEDs flickering, and the corresponding lighting of the green LED 3. In normal operation, the red LEDs 1 and 2 are dimly lit in absence of a signal.

Have a spare fifteen bucks and an evening? You can go out an have a (modest) meal with a friend. Or—put together this project and enjoy worldwide packet with dead-on tuning! 73

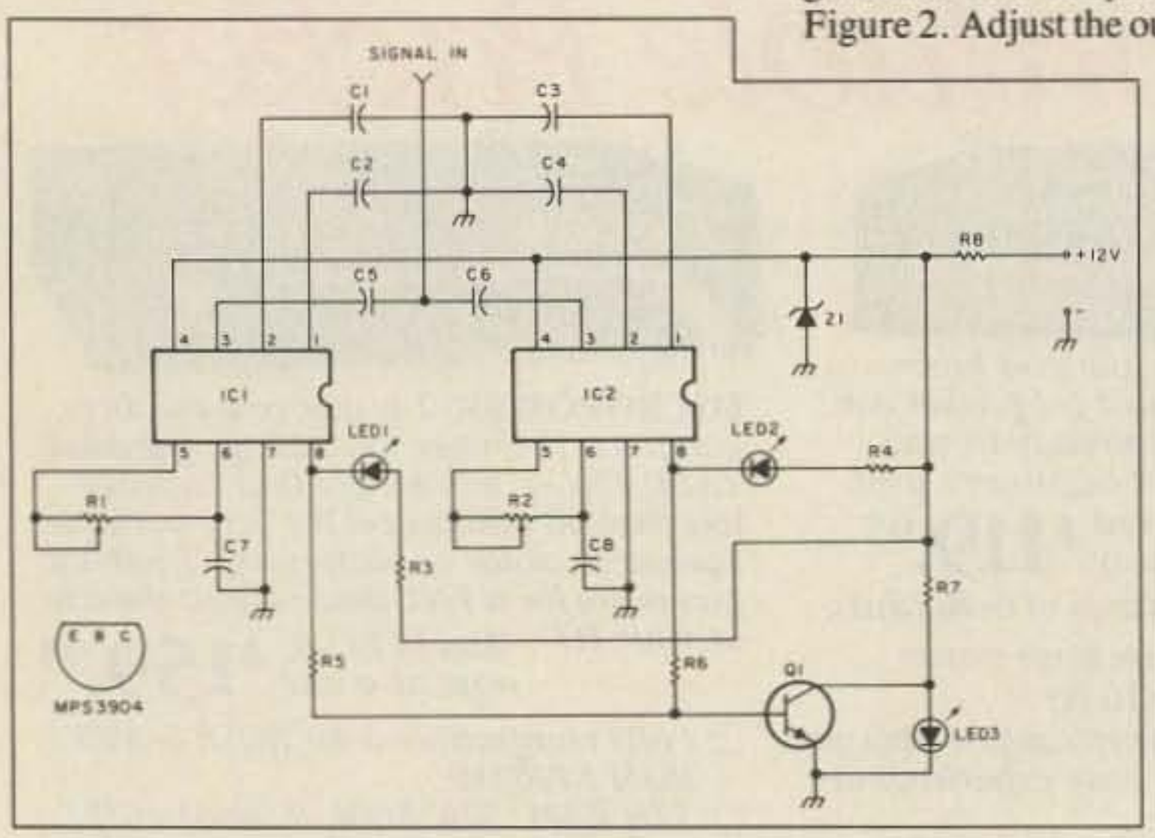

Figure 1. Schematic for the HF packet tuning indicator.

Parts List

Quantity	Part#	Value	Radio Shack#
2	C1-C4	1 µF, 35 V	272-1434B
2	C5-C6	4.7 µF, 35 V	272-1012
2	C7-C8	0.1 µF, 50 V	272-1069
2	R1-R2	5k 10-Turn Pot	271-343/10K Sub.
2	R3-R4	1k ¼ W	
2	R5-R6	47k ¼ W	271-1342
1	R7	560 Ω ¼ W	
1	R8	100 Ω ½ W	271-012
1	Q1	MPS 3904	276-2016
2	IC1-IC2	LM 567	276-1721
2	LED1-LED2	Red	276-026
1	LED3	Green	276-037
1	Z1	9.1 Zener	276-562

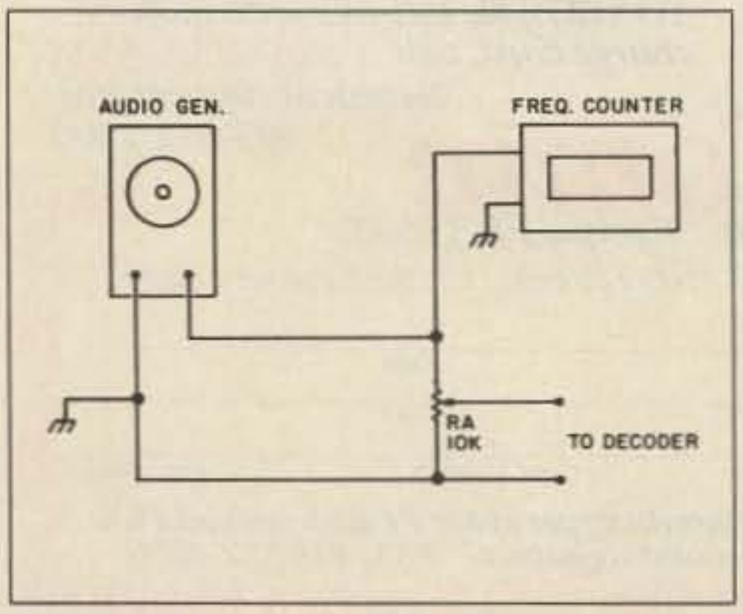

Figure 2. Alignment set-up for the tuning indicator.

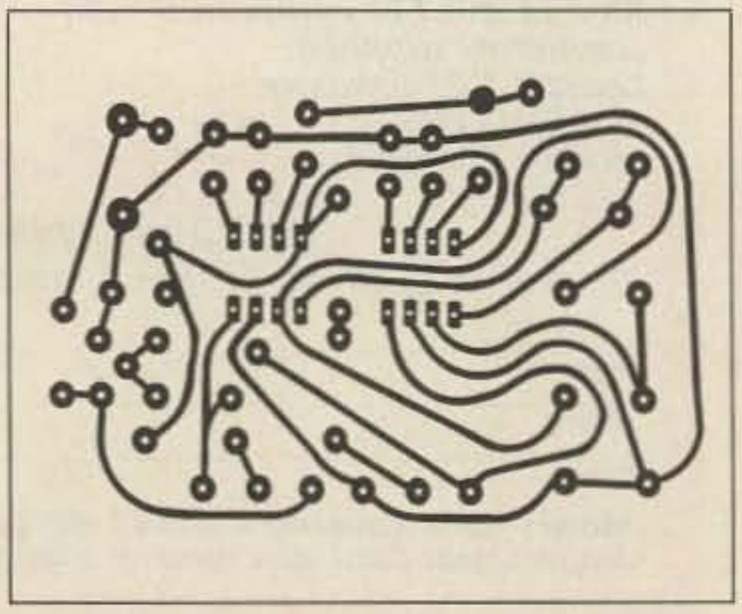

Figure 3. PC board foil diagram.

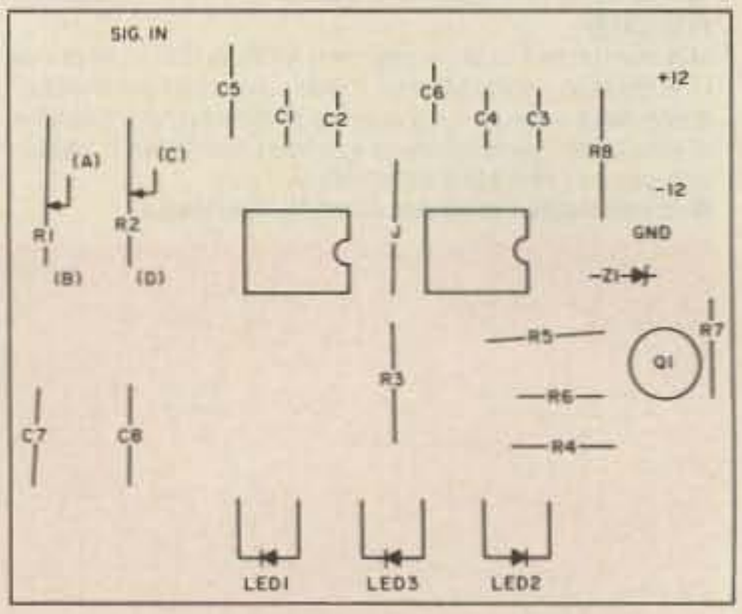

Figure 4. Parts placement diagram.

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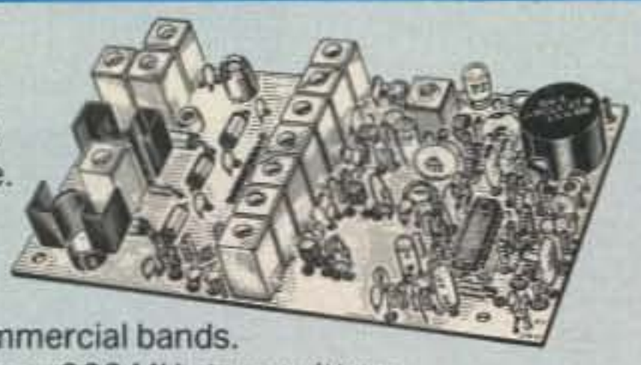

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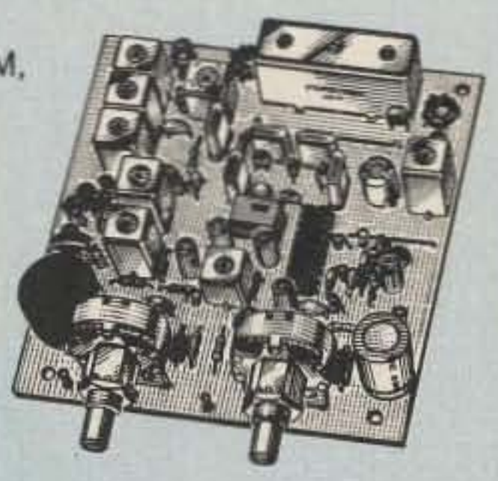

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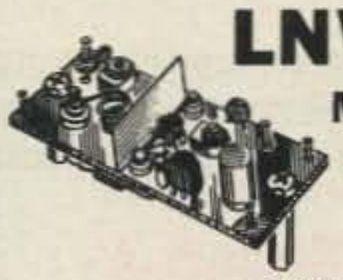

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220-224	50-54
222-224	28-30
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Midland 13-509 Modifications

A few fun and useful mods.

by Klaus Spies WB9YBM

Although the Midland 13-509 radio has not been in production for ten years, many still consider it *the* 220 radio because of its reliability and versatility. Even today, it's the rig of many repeater links. Therefore, it's inevitable that more modifications and improvements are becoming available for it. The type of transmit and receive boards used in the 509 are also used in similar radios, such as the Clegg.

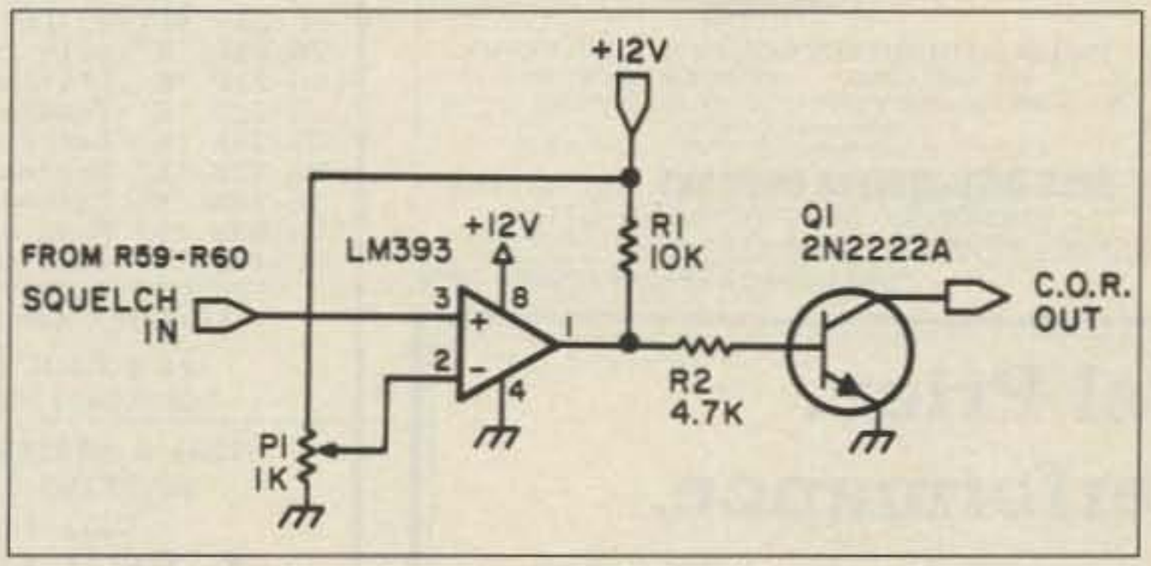


Figure 1. The high impedance load for the squelch circuit. This ensures no audio degradation when an additional signal (as for a COR function) comes from the squelch circuit.

Better Squelch Performance

The first circuit described here, the "High-Z COR," came about primarily because the squelch circuit in the 509 (R59-60 is the typical place where the signal is obtained) is rather sensitive. It is prone to making the squelch sound strange when loading occurs, even when the load is buffered by a 2N2222A transistor. What is therefore needed is a high impedance load for the squelch circuit, so that there will be no degradation in its performance when an additional signal (as for a COR function) comes from the squelch circuit.

There are two ways to bring a high impedance load to the squelch circuit. You can use a high-gain Darlington transistor with a large base resistor (wire the Darlington as a common-base switching amplifier), or use a component with a naturally high input impedance, such as a FET or an IC with a FET input. This way, the loading on the squelch would be light enough to not affect the performance of the squelch, while providing enough amplification and current capabilities to act as a COR. It is practical to use an IC rather than a FET. An IC, such as the LM393 comparator, has gates left over which you may want to use later for other circuits.

The squelch circuit of the 509 provides 2.5 to 2.65 volts when the squelch opens (either at a received signal, or when the squelch is manually opened by turning down the squelch potentiometer), and a few tenths of a volt when the squelch is closed. P1 is biased for approximately 1.5 volts. Even though the LM393's specifications claim it can operate within a few tenths of ground, it isn't always wise to operate an IC near its limit. It's wise to bias it up. A potentiometer makes setting the voltage easier. You don't have to calculate voltage dividers or experiment with resistor tolerances.

The output of the LM393 drives a transistor which can handle higher currents than the IC. I have used this circuit to actuate the REMOTE on/off function of a tape recorder for logging signals when the squelch opens in my 509, and it works flawlessly.

Are You Really TX?

The second circuit, the TX Light Control, developed through a two-stage modification. In the first modification, the 509's small transmit light bulb was replaced with an LED. In the second modification, I realized that the 509's transmit indicator (now an LED) went on whenever the PTT line was toggled into transmit, and not necessarily when the radio itself was transmitting. There is a difference between these two functions. When the relay used in the radio's T/R section becomes worn, the radio will not necessarily toggle into transmit mode, even though the TX light comes on. Just because the radio toggles into transmit, it doesn't mean it *is* transmitting.

In effect, therefore, the TX light was actually a PTT light—which is a bit misleading. The easiest way to turn this into a regular transmit light was by checking the antenna for outgoing RF. That was done as follows: a signal diode of the 1N914 variety was connected to the RF connector on the back of the radio (on the inside!!), using the shortest possible lead lengths; in series with this, a 100 kΩ resistor provided (again, using the shortest possible lead lengths) high impedance isolation between the antenna circuitry and our sampling circuit. With this high impedance and short lead lengths, effects on the antenna circuit is kept at a minimum.

I added a 3.3 MΩ resistor to keep the transmit LED from staying on, especially in the low-power position. Mount this resistor as near as possible to the antenna coax connector, with the shortest lead length possible. From this point on the radio's back panel, to where the LM393 is mounted, I used very thin, shielded coax, for two reasons: to minimize the reception of any unwanted signals from inside the radio, and secondly, to prevent RF still on the line from creeping into the radio's circuitry.

Adjust P1 so that the LED lights with the radio on low power. In all other respects, this circuit operates the same way as the high impedance squelch circuit previously described.

The LM393 dual comparator is a very versatile IC you can use for many applications. It is commonly available as a quad package from Radio Shack. I purchased the dual package from Jameco Electronics in California for 39¢. A very reasonably priced IC for the experimenter. You can use either the quad or the dual LM393 in these circuits.

So, there you have it: two useful mods for a very popular rig. Have fun and enjoy improved operation! 73

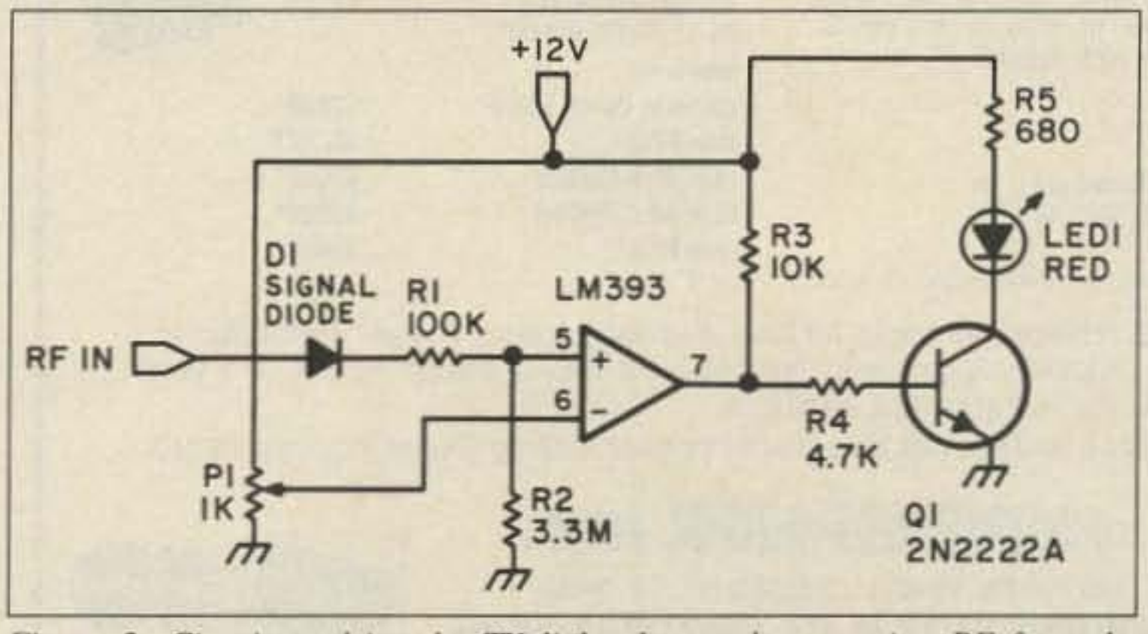
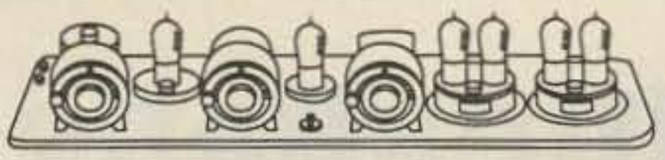


Figure 2. Circuit to drive the TX light. It samples outgoing RF from the antenna.



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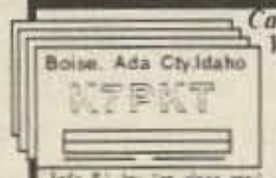

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Decatur Ham Launches Satellite

A most unusual college project

by Mark Lambert WB8UUE

In 1957, a photo of 12-year-old Frank Wiesenmeyer and a few other hams appeared in their local newspaper. Sputnik, the world's first satellite, had just been launched by the USSR, and Wiesenmeyer's radio club was the only one in the area that knew where to listen for the beep-beep-beep of the space beacon. Now Wiesenmeyer K9CIS, and a group of 12 others in Decatur, Illinois, are the creators of their own satellite!

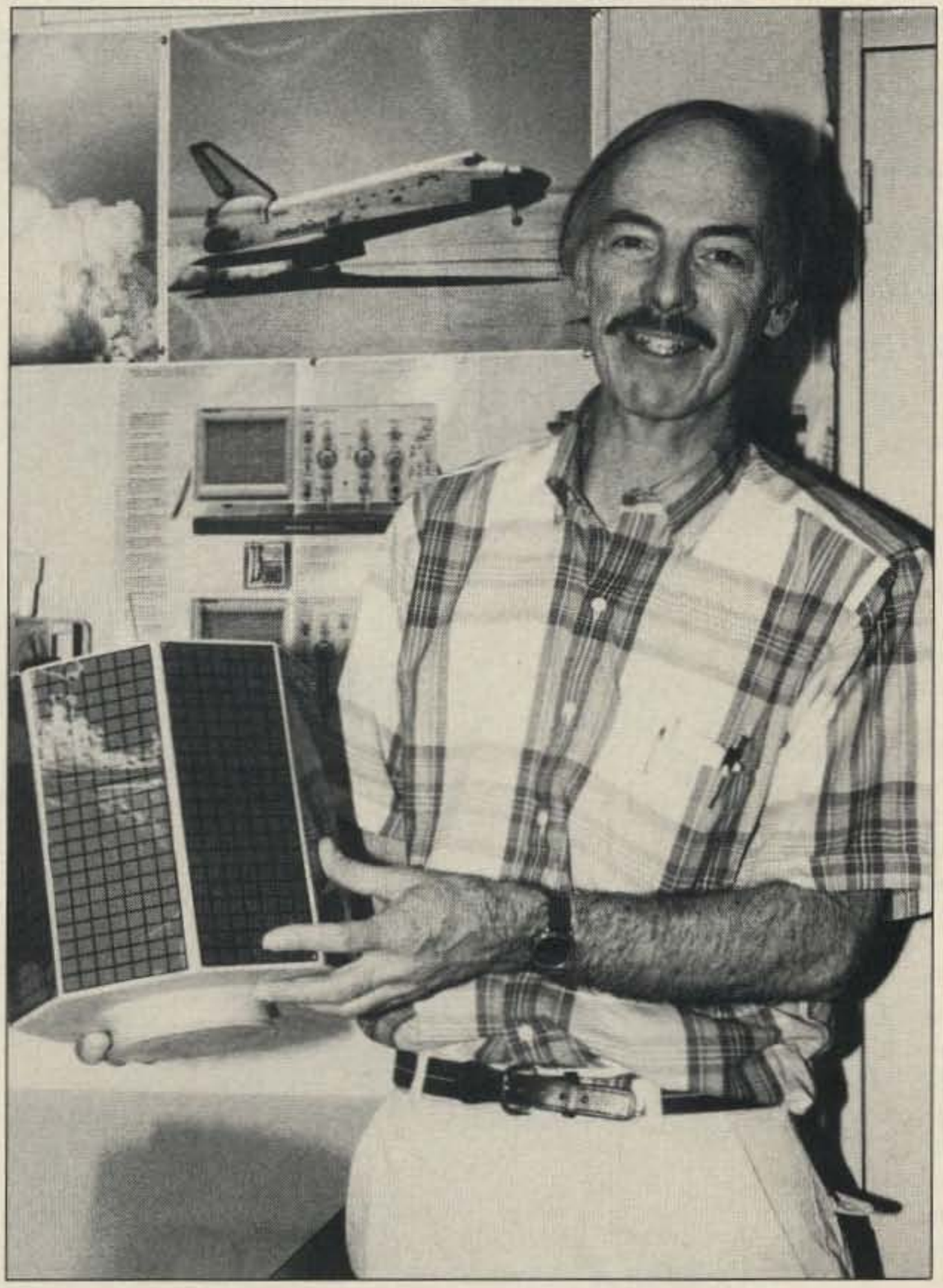


Photo A. Frank Wiesenmeyer with a model of the EDSAT satellite, expected to go up in early 1989.

Educational Bird

EDSAT, an eight-sided satellite a little larger than a five-gallon pail, is expected to be launched by this group of Central Illinois enthusiasts in early 1989. The Space Shuttle will deploy this in the low-cost Getaway Special program offered by the National Aeronautics and Space Administration (NASA). (See sidebar.) The satellite will feature a CW beacon and an amateur radio transponder. It will receive signals on two meters at 146 MHz and transmit on a 436 MHz downlink. A CW beacon will transmit on 436.1 MHz.

Once the satellite is built, the EDSAT team will transport it to Goddard Space Center in a special five cubic foot container. The satellite will then be transferred to a Getaway Special (GAS) can for its Space Shuttle ride.

After the Shuttle reaches the desired orbit, the satellite will be shot out of the opened GAS can by a simple spring-loaded pedestal. It will have a 57-degree inclination at its high point and will orbit at an altitude of at least 350 kilometers. Because the simple device will not have any boosters to adjust its altitude, EDSAT's final position in the atmosphere won't be known until after launch.

The special launch canister was designed to spring a similar satellite into orbit in 1985. A team at Weber State University in Utah used a GAS can to launch NUSAT, a small satellite designed to calibrate radar for the Federal Aviation Administration.

EDSAT, Wiesenmeyer said, will be an educator's tool. The acronym stands for Educational Door to Space and Technology. "There were all kinds of interesting science experiments with the OSCAR series," Wiesenmeyer said, referring to the popular amateur radio satellite program. Of particular scientific interest was the telemetry, which included temperature readings, solar panel array current readings, and other related information. Wiesenmeyer is an associate professor of electronics technology at Richland Community College in Decatur, and he used OSCAR to introduce space to his students. For example, he taught them how to plot Doppler frequency shift as the satellite whizzed by, using it to calculate the satellite's altitude.

"It fit in perfectly with me," he said. "It provided an interest in space science, filled the bill for extracurricular science activity, and gave us an involvement in antennas and communications."

With the death of OSCAR 8 in 1983, however, Wiesenmeyer said the emphasis on education also died. Today's amateur satellites, he said, are intended more for communication and not as a space science tool. He

hopes EDSAT will restore the educational aspect to ham radio satellites.

EDSAT will use a speech synthesizer to speak directly to students. The voice messages will include the spacecraft's temperature, the condition of the battery and electronics, the satellite's position, and other data. As it orbits the earth, it also will transmit voice bulletins to users. A high-speed digital transmission mode will be available for advanced users with access to a personal computer.

Cheap (Relatively)

Wiesenmeyer said they designed the satellite with as many commercial off-the-shelf components as possible, to keep costs down and to encourage others to try satellite building on a limited budget. Donations of material also have been invaluable. General Motors donated the high-quality aluminum for the satellite shell, and Motorola donated radios for the bird's transponder. Even so, it will cost the college team $25,000 to launch the satellite. The device itself will be valued at $100,000.

Satellites have been the topic of discussion around Wiesenmeyer's small electronics lab since NASA announced the Getaway Special program in 1982. It wasn't until 1985, however, that the right combination of space enthusiasts came together at the college to get the project off the ground.

"He (Wiesenmeyer) hopes EDSAT will restore the educational aspects to ham radio satellites."

Twelve people form the EDSAT design, engineering, and advisory team. There are other instructors, local businessmen, farmers and students involved in the project. The team has completed design of the satellite and is beginning to bolt the hardware together.

Funds Needed

Now the real work begins. The group will launch a fund-raising drive this summer to come up with the $25,000 needed to put its creation in orbit. "It looks like our experiment is way up the ladder, and we will go soon after shuttle flights resume, so we need to be ready," Wiesenmeyer said. He talks about the launch with restraint, but it is obvious he is excited.

"Think about what went on in the seventies! We launched satellites and payloads to Mars and Venus, and Voyager went to Jupiter, Saturn, and on out to Uranus and Neptune," Wiesenmeyer said. "All those successes have had no real follow-up.

"We are obviously in a period of declining space activity, and that is something we hope to change." 73

Getaway Special

The Getaway Special (GAS) program was never intended to launch satellites. It was designed by NASA to carry science projects on the Space Shuttle and return them in an unopened cylinder.

A group of college students at Weber State College in Utah, however, requested in 1985 that a hinged lid be made available on one of the cans. They had done the unexpected, designing a satellite small enough to fit inside the 28-inch high cylinder. A hinged lid and a spring-loaded base inside the tube were needed to launch the bird.

The team successfully launched NUSAT in April of 1985 from the Space Shuttle Challenger. Already, the team led by an amateur radio operator at Richland Community College in Decatur, Illinois, was planning the second use of the modified can to launch another mini-satellite.

Getaway Special got its start in 1983 when 10 experiments by college students flew on the shuttle. Things like ant colonies and hybrid corn seed traveled up and back in sealed cans to test a variety of scientific theories. Since that flight, dozens of other experiments have flown, and reservations for hundreds more are waiting for shuttle flights to resume.

There are two sizes of GAS cans. The one used by each of the satellite groups is a five cubic foot cylinder which is 28 inches high. It will hold 200 pounds of material, and costs $10,000 per launch. The hinged-lid version costs about $25,000.

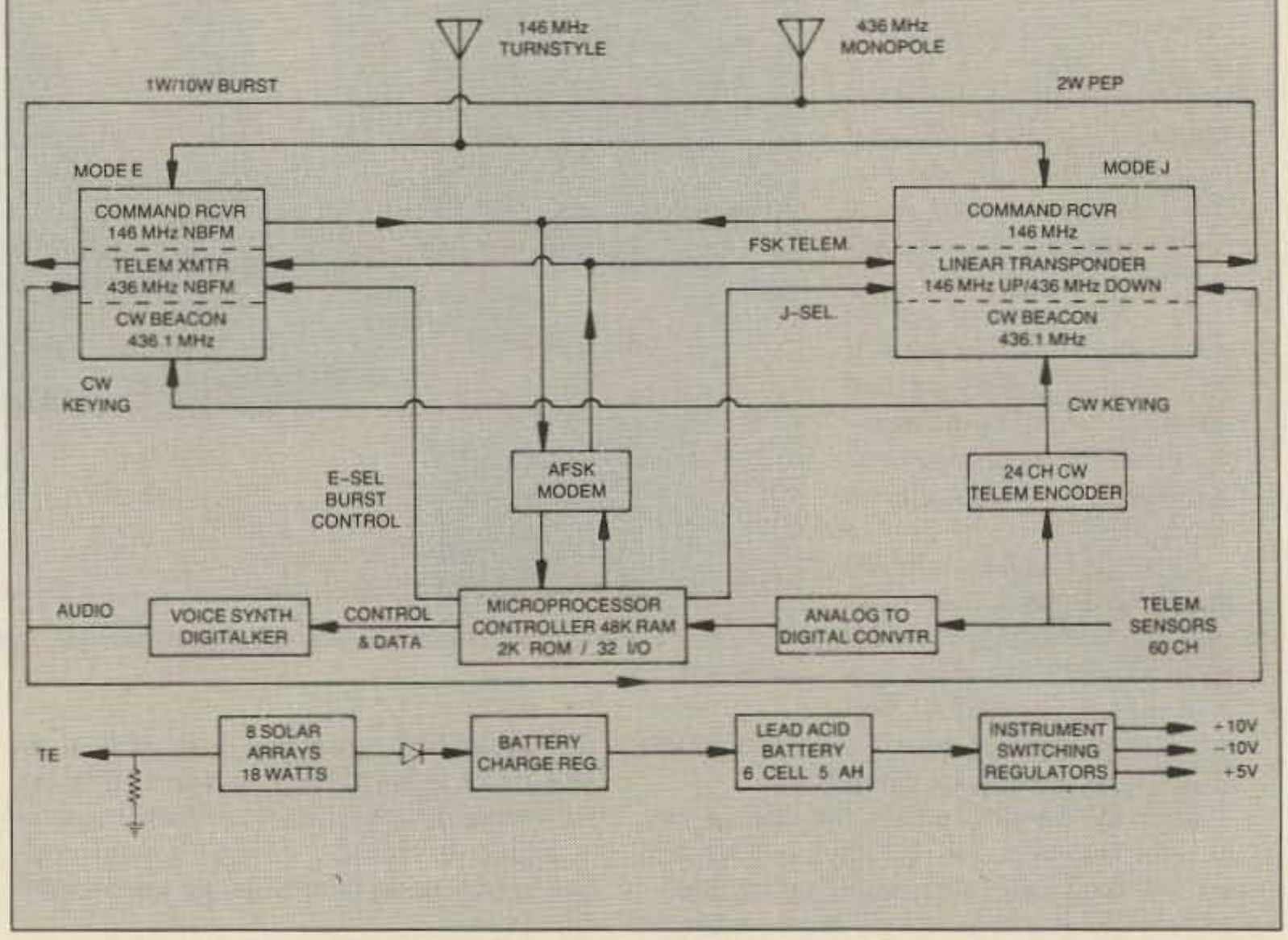
For experimenters with less grandiose projects, a 14-inch high cylinder is also available. It holds 2 ½ cubic feet of material. If you stuff it with 100 pounds of payload, it will cost you $5,000 per launch. Limit the baggage to 60 pounds and pay only $3,000.

According to NASA, sponsor of the program, GAS cans are leased only to non-profit groups to carry out space-related research and development. Foreign groups are welcome to rent a can, but each project flown must be "peaceful in nature." Shuttle astronauts will assist with a maximum of three remote on-off commands for each can.

Interested participants must classify their project in one of three categories: Governmental, Educational, and "Everything Else." A contract is signed with NASA and each group must pay $500 earnest money. NASA then sends each participant a videotape and manuals describing their responsibilities.

Projects are flown on a "space available" basis, and the fee must be paid in full before launch. If you are interested in learning more, contact: Getaway Special, Goddard Space Flight Center, Greenbelt, MD at (301) 344-6760.

EDSAT Block Diagram



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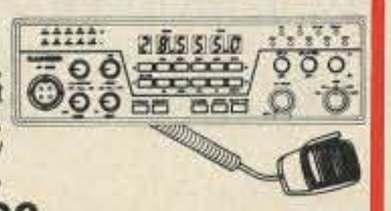

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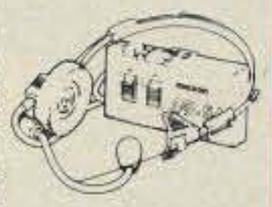

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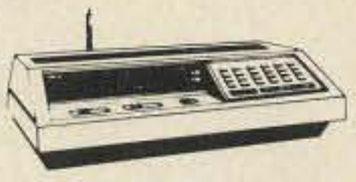

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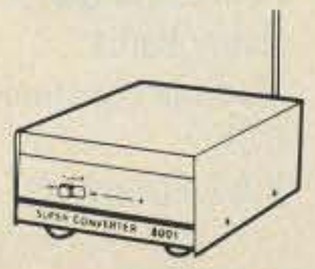

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The *Uniden* line of Citizens Band Radio transceivers is styled to compliment other mobile audio equipment. Uniden CB radios are so reliable that they have a two year limited warranty. From the feature packed PRO 810E to the 310E handheld, there is no better Citizens Band radio on the market today.

PRO310E-T *Uniden* 40 Ch. Portable/Mobile CB ... $83.95
PRO330E-T *Uniden* 40 Ch. Remote mount CB ... $104.95
PRO500D-T *Uniden* 40 Channel CB Mobile $38.95
NINJA-T PRO310E with rechargeable battery pack $99.95
B10-T 1.2V AA Ni-cad battery for Ninja (set of 10) ... $20.95
KARATE-T *Uniden* 40 channel rescue radio $53.95
PRO510XL-T *Uniden* 40 channel CB Mobile..... $38.95
PRO520XL-T *Uniden* 40 channel CB Mobile..... $56.95
PRO540E-T *Uniden* 40 channel CB Mobile..... $97.95
PRO640E-T *Uniden* 40 channel SSB CB Mobile ... $137.95
PRO710E-T *Uniden* 40 channel CB Base $119.95
PRO810E-T *Uniden* 40 channel SSB CB Base ... $174.95

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RD25-T *Uniden* visor mount radar detector..... $54.95
RD500-T Uniden visor mount radar detector..... $74.95

Bearcat® 200XLT-T

List price $509.95/**CE price $254.95/SPECIAL**
12-Band, 200 Channel • 800 MHz. Handheld Search • Limit • Hold • Priority • Lockout
Frequency range: 29-54, 118-174, 406-512, 806-956 MHz. Excludes 823.9875-849.0125 and 868.9875-894.0125 MHz.
The *Bearcat* 200XLT sets a new standard for handheld scanners in performance and dependability. This full featured unit has 200 programmable channels with 10 scanning banks and 12 band coverage. If you want a very similar model without the 800 MHz. band and 100 channels, order the **BC 100XLT-T** for only $189.95. Includes antenna, carrying case with belt loop, ni-cad battery pack, AC adapter and earphone. Order your scanner now.

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List price $549.95/**CE price $259.95/SPECIAL**
12-Band, 40 Channel • No-crystal scanner Priority control • Search/Scan • AC/DC
Bands: 29-54, 118-174, 406-512, 806-912 MHz.
The Uniden 800XLT receives 40 channels in two banks. Scans 15 channels per second. Size 9¼" x 4½" x 12½." If you do not need the 800 MHz. band, a similar model called the **BC 210XLT-T** is available for $178.95.

Bearcat® 145XL-T

List price $189.95/**CE price $94.95/SPECIAL**
10-Band, 16 Channel • No-crystal scanner Priority control • Weather search • AC/DC
Bands: 29-54, 136-174, 406-512 MHz.
The *Bearcat* 145XL is a 16 channel, programmable scanner covering ten frequency bands. The unit features a built-in delay function that adds a three second delay on all channels to prevent missed transmissions. A mobile version called the **BC560XLT-T** featuring priority, weather search, channel lockout and more is available for $94.95. CEI's package price includes mobile mounting bracket and mobile power cord.

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BC175XLT-T *Bearcat* 16 channel scanner $156.95
R1090-T *Regency* 45 channel scanner..... $119.95
UC102-T *Regency* VHF 2 ch. 1 Watt transceiver... $114.95
BPS5-T *Regency* 16 amp reg. power supply..... $179.95
MA549-T Drop-in charger for HX1200 & HX1500 .... $59.95
MA518-T Wall charger for HX1500 scanner $14.95
MA553-T Carrying case for HX1500 scanner..... $14.95
MA917-T Ni-Cad battery pack for HX1000/1200 ... $39.95
BP205-T Ni-Cad batt. pack for BC200/BC100XLT ... $49.95
B8-T 1.2 V AA Ni-Cad batteries (set of eight)..... $17.95
FBE-T Frequency Directory for Eastern U.S.A..... $14.95
FBW-T Frequency Directory for Western U.S.A. $14.95
ASD-T Air Scan Directory $14.95
SRF-T Survival Radio Frequency Directory $14.95
TSG-T "Top Secret" Registry of U.S. Govt. Freq.... $14.95
TTC-T Tune in on telephone calls..... $14.95
CBH-T Big CB Handbook/AM/FM/Freeband..... $14.95
TIC-T Techniques for Intercepting Comm..... $14.95
RRF-T Railroad frequency directory $14.95
EEC-T Embassy & Espionage Communications.... $14.95
CIE-T Covert Intelligenct, Elect. Eavesdropping ... $14.95
MFF-T Midwest Federal Frequency directory..... $14.95
A60-T Magnet mount mobile scanner antenna..... $35.95
A70-T Base station scanner antenna $35.95
A500-T 10 & 11 Meter – 500 Watt antenna..... $38.95
A1300-T 25 MHz.–1.3 GHz Discone antenna..... $109.95
USAMM-T Mag mount VHF ant. w/ 12' cable $39.95
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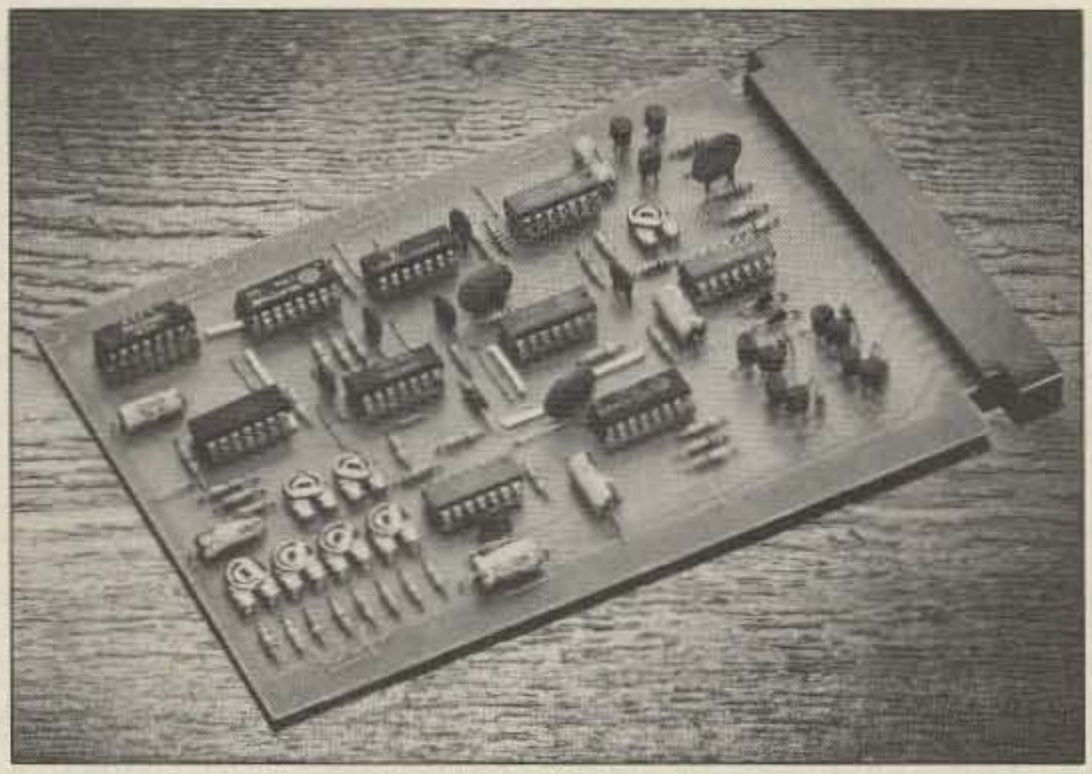
CIRCLE 121 ON READER SERVICE CARD

Charging Without Overcharging

This circuit conserves AC and charges—not chars—station batteries!

by Dennis Knittel WB8VQR

It's always a good idea to have an emergency power source for the ham station. Hams are often needed the most during power outages. Auto batteries are good to keep the 12 volt station running, but deep-cycle marine batteries from GNB, Sears, and others are ideal. Auto batteries are designed to provide a whopping current (100–200 amperes) for very short periods, such as needed to start a car, and to float the load—lights ignition, radio, and so forth—against the alternator the rest of the time.



The deep-cycle batteries, on the other hand, are designed to be fully charged, and then to provide a steady, medium range current (10–20 amperes) until discharged. Thus the deep-cycle is more appropriate to this application, but if the automobile batteries are free "pull-outs," or nearly so...

More Than Just Trickle Charging

A popular method has been to trickle-charge auto batteries while running gear off a power supply. When the power goes out, the battery takes over automatically. The problem with this is that unless the charging voltage is set exactly, and the condition of the battery monitored occasionally with a hydrometer, the battery will be either undercharged (leaving less reserve in an outage) or overcharged (driving off water and eventually killing the battery).

The circuit shown in the schematic uses two batteries alone to supply the station. When their voltages drop to a preset point, a control circuit activates the charger. One of the batteries begins to charge while the other continues to supply the station. After the first battery is charged, it powers the station while the second battery charges. After the second battery is charged, the charger shuts off and the station runs from both batteries. The charger draws AC only when needed. The charger doesn't need to be well-filtered because it doesn't run the station directly.

Since the equipment is not endangered, this method also allows the batteries to charge at 15.5 volts. Once the charger is removed, the batteries will be at about 13.5 volts. Charged at only 13.5 volts, the battery voltage would be only about 12 volts after removing the charger. In the following text, you will note that the set points of 12.25 volts for starting charge, and 13.50 for stopping, are values for new batteries. If your batteries are older, you could use lower numbers like 12 and 13 volts. This just means slightly different settings on R6 and R5, respectively. Be aware of voltage drops due to the voltmeter when adjusting the potentiometers.

Outage Warning

During an outage, the station continues to operate from the batteries. When the controller begins to charge the batteries, however, it discovers the outage and sends a pulsating audio warning to indicate trouble. This audio can be piped to useful locations, such as to a speaker in the ham shack, or through a transmitter audio input at a repeater site. The controller can also switch the equipment to low-power operation during the outage. It won't allow the batteries to over- or undercharge. The batteries power the controller, which, due to its mostly CMOS circuitry, draws under 2.5 mA.

Voltage Reference

The controller circuit requires a voltage reference. Voltage reference criteria are: stability, low current draw, and over-voltage detection. Over-voltage protection is set a little above the normal peak charge. If, for example, the batteries are charging at 15.5 volts, a good over-voltage point is 16 volts.

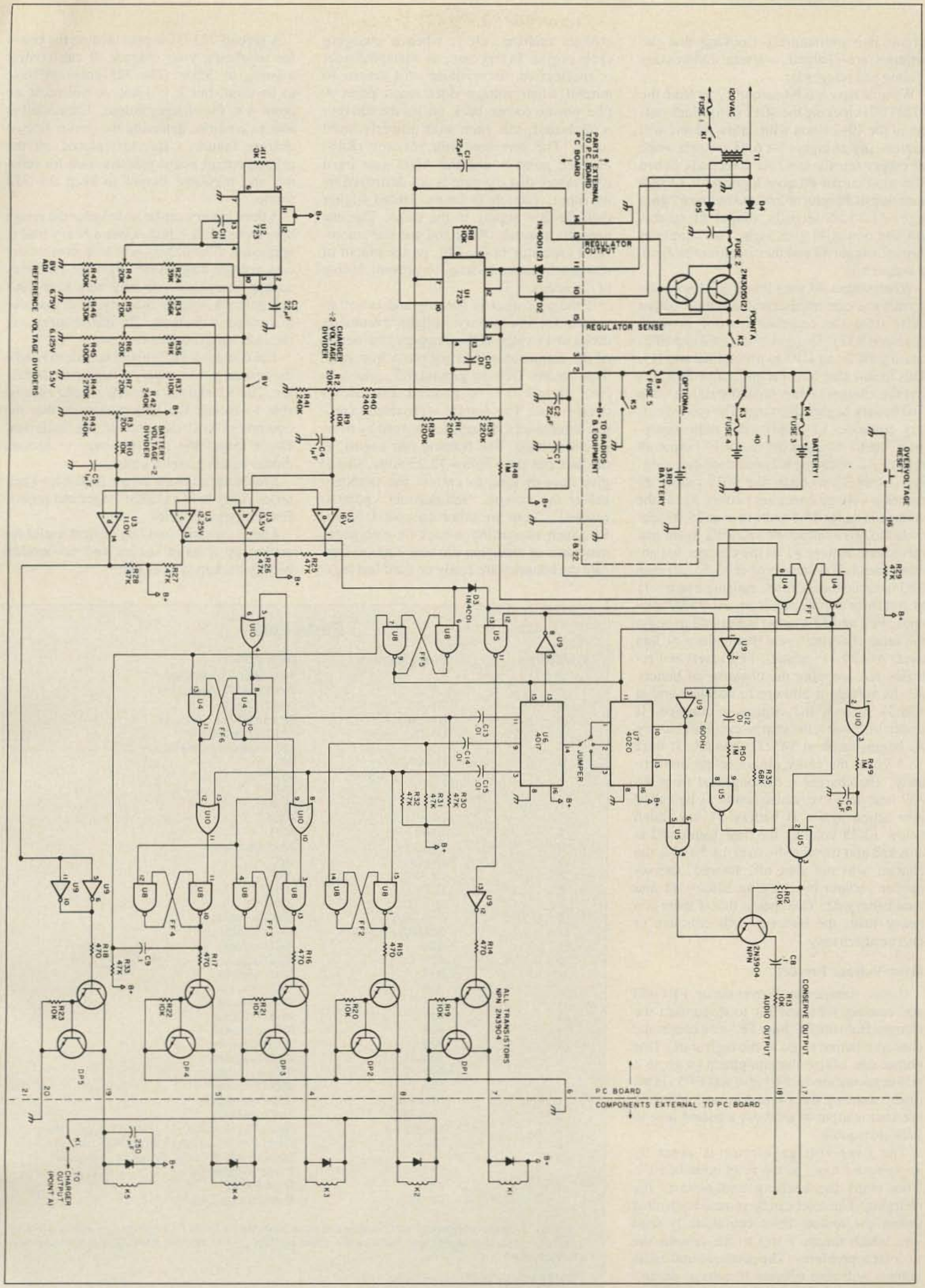
It's easy to derive a stable 16 volt reference from batteries that fluctuate between 12.25 and 13.5 volts. A 723 voltage regulator chip (U2), powered from the batteries, is set for an 8 volt output. A voltage divider (R40, R2, and R41) divides charger voltage in half and compares it to the 8 volt reference from the 723. If the divided charger voltage goes above the reference voltage, the controller removes the charger from the AC line and begins the audio warning. It remains this way until manually reset. This over-voltage protection keeps the batteries from overcharging, and protects the equipment from what might well be a fatal over-voltage.

An LM339 voltage comparator chip (U3) monitors four voltage points. The four points are: 16 volts (over-voltage), 11 volts (under-voltage), and the two inner limits of 12.25 and 13.5 volts, which control battery charging. All reference voltages for the 339 come from the 723 voltage regulator, and are separately adjustable. The capacitors and the series resistors, which are after the battery and charger voltage dividers, smooth out any spikes caused by load changes so that the comparators are not accidentally tripped.

Circuit Operation

Normal operation begins with comparator U3c. When it detects that the batteries have run below 12.25 volts, it sets flip-flop #5 (FF5). This starts the 600 Hz oscillator, and the 4020 and 4017 divider chips. FF5 also causes Darlington pair #1 (DP1) to ground relay #1 (K1), that connects the charger to the AC line. The time when FF5 starts the divider chips is the time reference for other events described later. The 4020 is a unique CMOS chip in that it is capable of division by as much as 16,384. Its last three outputs divide the 600 Hz down to one cycle every 6.83, 13.65, and 27.3 seconds.

This explanation uses the 1 cycle/6.83 second output. It gives 54.6 seconds of charge to the battery during each cycle. The 13.65 second output gives 109.2 seconds of charge, and the 27.3 output gives 218.5 seconds per cycle to the battery. If the batteries require longer charging cycles, the 13.65 or 27.3 second outputs can be used, giving the longer times. Select the desired output with a jumper on the printed circuit board. The circuit recycles on each battery until it is fully charged, eliminating the need to worry about undercharging. Using too short a charge cycle, however, causes the circuit to test the battery voltage before it stabilizes. This fools the


120VAC
FUSE 1
K1
T1
D4
D5
FUSE 2
2N3055(2)
PARTS EXTERNAL TO PC BOARD
REGULATOR OUTPUT
REGULATOR SENSE
POINT A
K2
C1 22µF
IN4001(2) D1 D2
R8 10K
U1 723
C10 .01
R2 20K
R41 240K
R40 240K
R9 10K
C4 1µF
R1 20K
R38 200K
R39 220K
R48 1M
C2 22µF
C7 .1
B+ TO RADIOS & EQUIPMENT
K5
B+ FUSE 5
OPTIONAL 3RD BATTERY
K3 FUSE 4
K4 FUSE 3
BATTERY 1
40
OVERVOLTAGE RESET
R29 47K
B+
411 10K
U2 723
C11 .01
C3 22µF
R47 330K
R4 20K
R24 39K
R46 330K
R5 20K
R34 56K
R45 300K
R6 20K
R36 91K
R44 270K
R7 20K
R37 110K
R42 240K
R43 240K
R3 20K
R10 10K
C5 1µF
BATTERY VOLTAGE -2 DIVIDER
8V ADJ
6.75V
6.125V
5.5V
8V
REFERENCE VOLTAGE DIVIDERS
CHARGER +2 VOLTAGE DIVIDER
R11 20K
R12 10K
U3 I10V
U3 I2.25V
U3 I3.5V
U3 I6V
R28 47K
R27 47K
R26 47K
R25 47K
D3 IN4001
U10
U8
U5
U9
U4
FF1
FF2
FF3
FF4
FF5
FF6
U6 4017
U7 4020
JUMPER
600Hz
C12 .01
R50 1M
R35 68K
C13 .01
C14 .01
C15 .01
R30 47K
R31 47K
R32 47K
U10
U5
R49 1M
C6 1µF
R12 10K
2N3904 NPN
C8 .1
R13 10K
AUDIO OUTPUT
CONSERVE OUTPUT
R14 470
R15 470
R16 470
R17 470
R18 470
R33 47K
C9 .1
R23 10K
R22 10K
R21 10K
R20 10K
R19 10K
DP5
DP4
DP3
DP2
DP1
ALL TRANSISTORS NPN 2N3904
250 µF
X5
X4
X3
X2
X1
K1
TO CHARGER OUTPUT (POINT A)
PC BOARD
COMPONENTS EXTERNAL TO PC BOARD

circuit into prematurely thinking that the batteries are charged, causing unnecessary cycling and relay wear.

We now have a 6.83 second cycle from the 4020 (U7) clocking the 4017 (U6). Each output of the 4017 starts with output #0 and will sequentially go higher for 6.83 seconds while all others remain low. At 0 seconds (when FF5 sets) output #0 goes high. At 6.83 seconds output #0 returns low and output #1 goes high. At 13.65 seconds, output #1 returns low and output #2 goes high. This continues through output #9 and then begins over again at output #0.

When output #0 goes low at 6.83 seconds, it causes a one millisecond negative output pulse from the capacitor-resistor network (C15 and R32). This pulse sets FF2 and FF3, causing DP2 and DP3 to ground K2 and K3. This means that 6.83 seconds after FF5 sets and the charger comes on and stabilizes, the first battery begins charging. The second battery continues to supply your radio equipment. At 61.44 seconds, the 4017 output #8 resets FF2, releasing K2, and stops the charging. At 68.27 seconds, the 4017 output #9 causes a voltage check on battery #1. If the voltage is under 13.5 volts then at 75.09 seconds the 4017 output #0 sets FF2 again and reconnects battery #1 to the charger for another round. If voltage is over 13.5 volts then FF3 is immediately reset, causing battery #1 to return to supply the load. At 75.09 seconds, FF2 and FF4 cause battery #2 to begin the same charging cycle that battery #1 had used. At 129.71 seconds, FF2 resets and releases K2, stopping the charging of battery #2. Its voltage is allowed to stabilize and at 136.53 seconds the voltage is checked. If under 13.5 volts, the charge cycle for battery #2 begins again at 143.37 seconds. If over 13.5 volts, the entire circuit resets immediately. The charger is disconnected from the AC line, and everything waits to be called into action again. If battery #1 has fallen below 12.25 volts by the time battery #2 is checked and found to be over 13.5 volts, the charger will not shut off. Instead, the sequence restarts by charging battery #1 and then battery #2. This means that if there is a heavy load, the batteries will continue to charge alternately.

Over-Voltage Protect

If over-voltage should ever occur, FF1 will set, causing DP1 and K1 to disconnect the charger from the AC line. FF1 also causes the conserve output to go to the high state. This output can advise the equipment to go to a power saving mode. FF1 also sets FF5 via the diode, starting the oscillator, and allowing the audio output to send out a pulsed tone to indicate trouble.

The over-voltage circuit is reset by applying a "low" to the reset input of FF1. This stops the beeping and restarts the charging. The reset can be remote controlled unless the remote reset continuously trips out, which means a trip to the remote site to correct problems. The conserve and audio outputs will also operate if voltage doesn't reach point A, (due to AC power line failure, charger melting, etc.), when a charging cycle begins. In this case, an attempted reset is ineffective. Everything will return to normal when voltage does reach point A (the power comes back on or the charger is replaced), this time with properly sized fuses. The one megohm resistor (R48) between point A and the AND gate input is to insure that the gate is not destroyed by its input, (which is being forced higher than the B+ supply to the chip). The one megohm resistor (R49) and the one microfarad capacitor (R49, C6), on the output of that gate, causes a delay to prevent falsing of the audio.

If the controller is beeping and is not attended to, the battery voltage eventually drops to 11 volts. If this happens, the output of the comparator U3d goes to a low state. This causes DP5 to ground K5, which in turn shorts B+ to ground and blows the B+ fuse. This feature is provided to protect equipment that may be damaged by overly low voltage. The beeping that begins, as the batteries drop below 12.25 volts, should give enough time to correct the problems before the 11 volt "self-destruct" point is reached. There are other uses for U3d and K5, such as starting a back-up emergency generator or changing the beep rate (to indicate the batteries are really on their last leg).

A second 723 U1 is provided on the board for regulating your charger. It can control a string of 3055s. The 723 does not have to be used, but if it's not, it still must tie point A to the charger output. The circuit is able to continue detecting the power line or charger failure. Capacitors placed off the printed circuit board pins are used for sensing and regulator output to keep the 723 stable.

A third battery can be added after the relays but *before* the B+ fuse. Once a heavy load is applied, a third battery will help prevent excess voltage drop caused by wire and relay contact resistances. It may also save your equipment's volatile memory from loss due to dirty relay contacts. The third battery will remain charged by the first two.

The contacts of K2 should be able to handle the current power supply charging the batteries. The K3 and K4 contacts should each be able to handle the largest current that the equipment will demand of the batteries. Don't forget the reverse surge protection diodes across all relay coils.

I recommend using larger (500 Ah+) batteries. They hold a charge longer and require fewer charging cycles.

I hope you will find this project useful for setting up a more secure and economical battery backup system. 73

Parts List

Quantity	Parts number	Description
2		2N3055 power transistor
11		2N3904 NPN transistor
3	D1–D3	1N4001 diode
2	D4–D5	20 amp 50V on heatsinks
2	U1–U2	723 voltage regulator
1	U3	339 voltage comparator
2	U4–U5	4011
1	U6	4017
1	U7	4020
1	U8	4044
1	U9	4069
1	U10	4071
3	C1–C3	22uF electrolytic
3	C4–C6	1uF
3	C7–C9	.1uF
6	C10–C15	.01uF
7	R1–R7	20kΩ
5	R14–R18	470Ω ¼ resistor
11	R8–R13, R19–R23	10kΩ resistor
1	R24	39kΩ resistor
9	R25–R33	47kΩ resistor
1	R34	56kΩ resistor
1	R35	68kΩ resistor
1	R36	91kΩ resistor
1	R37	110kΩ resistor
1	R38	200kΩ resistor
1	R39	220kΩ resistor
4	R40–R43	240kΩ resistor
1	R44	270kΩ resistor
1	R45	300kΩ resistor
2	R46–R47	330kΩ resistor
3	R48–R50	1mΩ resistor
3	K1, K2, K5	Relay 12 volt coil 20–25 amp SPST contacts
2	K3, K4	Relay 12 volt coil 20–25 amp SPDT contacts
5		200 volt amp snubber diodes for relay coils
1	T1	Power transformer
1	F1	Fuse 5 amp
4	F2–F5	Fuse 20 amp 3 AG*

A surplus 3-phase magnetic circuit breaker can be substituted for fuses F3-F5 to disconnect all power in case of overcurrent in any leg. Remove B+ (coming through F5) also disables AC input through the contacts of K1.

*Do not substitute slow-blow for F5.

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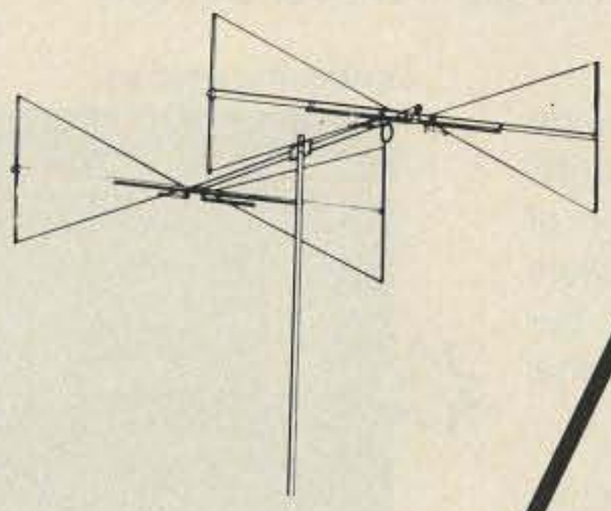

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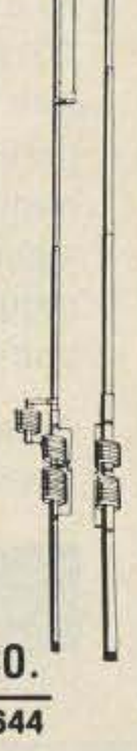
Butternut's HF verticals use highest-Q tuning circuits (not lossy traps!) to outperform all multiband designs of comparable size!

Model HF6V

- 80, 40, 30, 20 15 and 10 meters automatic bandswitching.
- Add-on kit for 17 and 12 meters available now.
- 26 ft tall

Model HF2V

- Designed for the low-band DXer
- Automatic bandswitching on 80 and 40 meters
- Add-on units for 160 and 30 or 20 meters
- 32 feet tall - may be top loaded for additional bandwidth

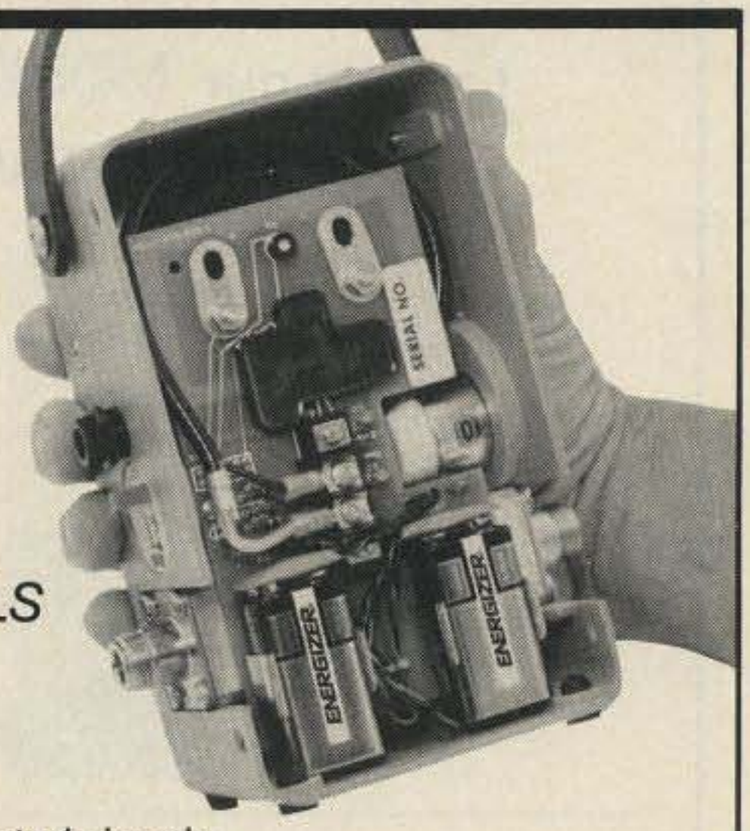


For more information see your dealer or write for a free brochure

BUTTERNUT ELECTRONICS CO.
405 East Market, Lockhart, TX 78644

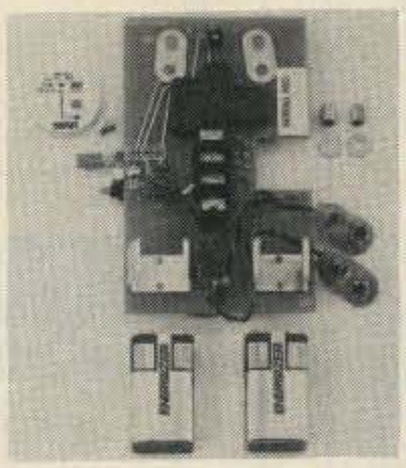
NEW

New Mod Kit for Bird Model 43 Wattmeter



MEASURES PEAK POWER OF SSB AND OTHER AM SIGNALS

Bird Model 4300-400 modification kit quickly adapts any Bird Model 43 Wattmeter to measure audio peak power of single sideband and other AM modulated signals.



The 4300-400 kit pc board mounts inside the Model 43 housing, on the meter studs. Estimated conversion time is only 15 minutes from start to finish.

Once modified, you can measure peak power to an 8% F.S. accuracy, without affecting cw operation or accuracy.

And, the Model 4300-400 is surprisingly inexpensive. Contact your Bird distributor or factory for details.

BIRD Electronic Corporation

30303 Aurora Rd., Cleveland (Solon), Ohio 44139 — 2794
216-248-1200 TLX: 706898 Bird Elec UD FAX: 216-248-5426
WESTERN REGION OFFICE:
Bird Electronic Corp.
621 Ojai Ave., Suite F, P.O. Box 28, Ojai, CA 93023 805-646-7255

CIRCLE 176 ON READER SERVICE CARD

RAMSEY ELECTRONICS

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$2495.00 THE COMMUNICATIONS SERVICE MONITOR THAT WORKS HARDER FOR LESS.

Introducing COM-3... the new service monitor designed by service technicians for service technicians. It works harder for less... giving you advanced testing capabilities at a very affordable price. FEATURES • Direct entry keyboard with programmable memory • Audio & transmitter frequency counter • LED bar graph frequency/error deviation display • 0.1-10,000 μv output levels • High receive sensitivity, less than 5 μv • 100 KHz to 999.9995 MHz Continuous frequency coverage • Transmit protection, up to 100 watts • CTS tone encoder, 1 KHz and external modulation

$49.95
wired includes AC adapter
PR-2 kit **$39.95**

PR-2 COUNTER PREAMP

The PR-2 is ideal for measuring weak signals from 10 to 1,000 MHz • flat 25 db gain • BNC connectors • great for sniffing RF • ideal receiver/TV preamp • 3 db NF

$69.95
wired
PS-2 kit **$49.95**

PS-2 AUDIO MULTIPLIER

The PS-2 is handy for high resolution audio resolution measurements, multiples Up in frequency • great for PL tone measurements • multiples by 10 or 100 • 0.01 Hz resolution & built-in signal preamp/conditioner

$89.95
wired includes AC adapter

PS-10B 1.5 GHz PRESCALER

Extends the range of your present counter to 1.5 GHz • 2 stage preamp • divide by 1000 circuitry • super sensitive (50 mV typical) • BNC connectors • 1.5 GHz in, 1.5 MHz out • drives any counter.

CT-70 7 DIGIT 525 MHz

$139.95 WIRED, INCLUDES AC ADAPTER

CT-90 9 DIGIT 600 MHz

$169.95 WIRED INCLUDES AC ADAPTER

CT-50 8 DIGIT 600 MHz

$189.95 WIRED INCLUDES AC ADAPTER

CT-125 9 DIGIT 1.2 GHz

$189.95 WIRED INCLUDES AC ADAPTER

FREQUENCY COUNTERS

Ramsey Electronics has been manufacturing electronic test gear for over 10 years and is recognized for its lab quality products at breakthrough prices. All of our counters carry a full one year warranty on parts and labor. We take great pride in being the largest manufacturer of low cost counters in the entire USA. Compare specifications. Our counters are full featured, from audio to UHF, with FET high impedance input, proper wave shaping circuitry and durable high quality epoxy glass, plated-thru PC Board construction. All units are 100% manufactured in the USA.

ACCESSORIES FOR COUNTERS

Telescopic whip antenna—BNC plug	$ 8.95
High impedance probe, light loading	16.95
Low pass probe, audio use	16.95
Direct probe, general purpose use	13.95
Tilt bail for CT-70, 90 & 125	3.95
Nicad pack for CT-70, 90 & 125	8.95

MODEL	FREQ RANGE	SENSITIVITY	ACCURACY	DIGITS	RESOLUTION	PRICE
CT-70	20 Hz-550 MHz	< 50 mv To 150 MHz	1 PPM	7	1 Hz, 10Hz, 100Hz	139.95
CT-90	10 Hz-600 MHz	< 10mv To 150 MHz < 150mv To 600 Mhz	1 PPM	9	0.1Hz, 10Hz, 100 Hz	169.95
CT-50	5 Hz-600 MHz	LESS THAN 25 mv	1 PPM	8	1Hz, 10Hz	189.95
CT-125	10 Hz-1.25 GHz	< 25mv @ 50 MHz < 15mv @ 500 MHz < 100mv @ 800 MHz	1 PPM	9	0.1Hz, 1Hz, 10Hz	189.95
CT-90 WITH OV-1 OPTION	10 Hz-600 MHz	< 10mv To 150 MHz < 150mv To 600 MHz	0.1 PPM	9	0.1Hz, 1Hz, 10Hz	229.90

MINI KITS—EASY TO ASSEMBLE—FUN TO USE

TONE DECODER
A complete tone decoder on a single PC board. Features: 400-5000 Hz adjustable range via 20 turn pot, voltage regulation, 567 IC. Useful for touch-tone burst detection, FSK, etc. Can also be used as a stable tone encoder. Runs on 5 to 12 volts.
Complete kit, TD-1 **$5.95**

40 WATT 2 mtr PWR AMP
Simple Class C power amp features 8 times power gain 1 W in for 8 out, 2 W in for 15 out, 5 W in for 40 W out. Max output of 50 W, incredible value, complete with all parts, less case and T-R relay.
PA-1, 40 W pwr amp kit **$27.95**
TR-1, RF sensed T-R relay kit **6.95**

COLOR ORGAN
See music come alive! 3 different lights flicker with music. One light each for, high, mid-range and lows. Each individually adjustable and drives up to 300 W. runs on 110VAC.
ML-1 Kit, **$8.95**

VOICE ACTIVATED SWITCH
Voice activated switch kit provides switched output with current capability up to 100 mA. Can drive relays, lights, LED or even a tape recorder motor. Runs on 9 VDC.
VS-1 KIT **$6.95**

VIDEO MODULATOR
Converts any TV to video monitor. Super stable, tunable over ch 4-6. Runs on 5-15V accepts std. video signal. Best unit on the market! Complete kit, VD-1 **$7.95**

LED BLINKY KIT
Alternately flashes 2 jumbo LEDs. Use for name badges, buttons, warning panel lights. Runs on 3 to 15 volts.
BL-1 Kit, **$2.95**

MAD BLASTER
Produces LOUD ear shattering and attention getting siren like sound. Can supply up to 15 watts of obnoxious audio. Runs on 6-15 VDC.
MB-1 Kit **$4.95**

UNIVERSAL TIMER
Provides the basic parts and PC board required to provide a source of precision timing and pulse generation. Uses 555 timer IC and includes a range of parts for most timing needs.
UT-5 Kit **$5.95**

WHISPER LIGHT
An interesting kit, small mike pics up sounds and converts them to light. The louder the sound, the brighter the light. Includes mike, controls up to 300 W, runs on 110 VAC.
WL-1 Kit **$6.95**

FM WIRELESS MIKE
Transmits up to 300' to any FM broadcast radio, uses any type of mike. Runs on 3 to 9V. Type FM-2 has added sensitive mike preamp stage.
FM-1 Kit **$3.95**
FM-2 Kit **$4.95**

SIREN
Produces upward and downward wail. 5 W peak audio output, runs on 3-15 volts, uses 3-45 ohm speaker.
Complete kit, SM-3 **$2.95**

SUPER SLEUTH
A super sensitive amplifier which will pick up a pin drop at 15 feet! Great for monitoring baby's room or as general purpose amplifier. Full 2W rms output, runs on 6 to 15 volts, uses 8-45 ohm speaker.
SN-9 Kit **$5.95**

60 Hz TIME BASE
Runs on 5-15 VDC. Low current (25ma) 1 min/month accuracy
TB-6 Kit **$5.50**
TB-6 Assy **$9.95**

TELEPHONE TRANSMITTER
Low cost with professional performance. Features include; self phone line powered, tunable from 76 to 100 MHz, polarity antisensitive, compact size (1" x 1¼"), easily installs anywhere on the phone line or inside the instrument itself.
PB-1 KIT **$14.95**

FM RECEIVER
For built-in applications or hobby experimentation. Full fledged superhetrodyne receiver, microvolt sensitivity, 10.7 MHz IF, Integrated Circuit detector, 50 mw audio amplifier, 9V external power source, operation on standard FM broadcast band as well as large portions on each side, compact (6" square), for bug detection or reception
FR-1 KIT **$14.95**

FM MINI MIKE
A super high performance FM wireless mike kit! Transmits a stable signal up to 300 yards with exceptional audio quality by means of its built in electret mike. Kit includes case, mike, on-off switch, antenna, battery and super instructions. This is the finest unit available.
FM-3 Kit **$14.95**
FM-3 Wired and Tested **19.95**

NEW

MICROWAVE INTRUSION ALARM
A real microwave doppler sensor that will detect a human as far as 10 feet away. Operates on 1.3 GHz and is not affected by heat, light or vibrations. Drives up to 100 ma output, normally open or closed, runs on 12 VDC.
Complete Kit, MD-3 **$16.95**

NEW

SPEECH SCRAMBLER
Communicate in total privacy over your telephone or radio. This scrambler kit features full duplex operation using frequency inversion. Runs on a 9 volt battery. Both mike and line or speaker output/inputs. Easy to connect to any radio—telephone use requires no direct connection! Easy to build, uses IC DBM circuitry . Can also be used to descramble most com. scramblers.
Complete kit, SS-7 **$29.95**
Case kit, CSS-7 **12.95**

ALL NEW KITS

Complete kit, SG-7
$89.95 PERSONAL SPEED RADAR

New low cost microwave doppler radar kit "clocks" cars, planes, boats, horses, bikes, baseballs, models, runners or virtually anything that moves. Operates at 2.6 GHz with over 1/4 mile range. LED digital readout displays speeds in miles per hour, kilometers per hour or feet per second! Earphone output permits listening to actual doppler shift. Uses two 1 lb coffee cans for antenna (not included) and runs on 12 VDC. Easy to build—all microwave circuitry is PC stripline. Kit includes deluxe ABS plastic case with speedy graphics for a professional look. A very useful and full-of-fun kit.

RADIOS

40 & 80 METERS HAM RECEIVERS

Sensitive all mode, AM, CW, SSB receivers for 3.5—4.0 or 7.0—7.5 MHz. Direct conversion design using NE602 IC as featured in QST and ARRL handbooks. Less than 1 μv sensitivity, varactor diode tuned, 50 mw audio output. Runs on 9VDC, has RF gain control. This kit is very easy to build, lots of fun and educational—ideal for the beginner or the old pro. The optional matching case kit features a rugged ABS plastic case with screened graphics. Included are machined aluminum knobs for a well-finished professional look.

40 Meter receiver kit, HR-4 **$24.95** 80 Meter receiver kit, HR-8 **$24.95** Receiver case kit, CHR **$12.95**

QRP TRANSMITTER KITS, 40 & 80 METERS

Operate a mini ham shack. These little CW rigs are ideal mates to our 40 and 80 meter receivers. Features include smooth variable tuning, one watt output and excellent keying characteristics. Runs on 12 VDC and is VSWR protected. See how far you can stretch your signal with one of these mini rigs. Optional ABS cases are available.

40 meters QRP rig, QRP-40 **$24.95** 80 meters QRP rig, QRP-80 **$24.95** Case kit, CQRP **$12.95**

AIRCRAFT RECEIVER KIT

Hear exciting aircraft communications—picks up planes up to 100 miles away. Receives 110—136 MHz AM air band, varactor tuned superhet design with AGC, ceramic filter and adjustable squelch. Runs on 9V battery, 50 mw audio output, 1 μv sensitivity. Optional matching ABS plastic case lets you take it anywhere, features screened graphics and machined aluminum knobs for a real professional look. Compact—great for airshows or for just plain hanging around the airport.

Complete kit, AR-1 **$24.95** Receiver case kit, CAR-1 **$12.95**

SHORTWAVE RECEIVER KIT

A fantastic receiver that captures the world with just a 12" antenna! Receives 4—11 MHz in 2 MHz bands, varactor tuned, superhet design with AGC, RF gain control, and 50 mw audio output. Uses new Signetics mixer chip for less than a microvolt sensitivity, runs on 9V battery. This is a fascinating scout, school or club project, and will provide hours of fun even to the most serious DX'er. Add the optional case kit and you have a real nice looking shortwave set.

Complete kit, SR-1 **$24.95** Receiver case kit, CSR-1 **$12.95**

PACKET RADIO

Commodore C64/128 packet radio interface. Uses famous German Digicom software. Features EXAR IC chip set for reliable operation—runs HF or VHF tones. Includes FREE disk software. PC board, all necessary parts and full documentation.

Complete kit, PC-1 **$49.95**

FM COMMUNICATIONS/2 METER RECEIVER

Sensitive superhet FM receiver tunes any 5 MHz segment from 135—175 MHz. Listen to 2 mtr ham operations, high band police calls, weather or mobile phone calls! Easy to build receiver features varactor tuning, IC mixer stage, ceramic IF filters and dual conversion design with adjustable squelch. Less than 1 μv sensitivity, runs on 9 V battery, with 50 mw audio output. Optional ABS case with screened graphics and machined aluminum knobs provide a nice professional look.

Complete kit, FR-7 **$29.95** Receiver case kit, CFR-7 **$12.95**

NEW MINIKITS—NEW MINIKITS

BROADBAND PREAMP
A sensitive all purpose preamp, ideal for scanners, TV sets, VHF, UHF rigs, counters, etc. Features low noise, 4 db NF, 20 db gain, 100 KHz—1 GHz operation. Runs on 9—12 VDC, 50 ohms input.
Complete kit, SA-7 **$12.95**

LIGHT BEAM COMMUNICATORS
Transmits modulated infrared light up to 30 feet without lenses, up to 1/4 mile using lenses. Uses 30 KHz carrier for hum-free operation, transmits thru windows, etc. Ideal for "bugs" or listening to IR remote controls. Transmitter has sensitive mike input, receiver uses PIN detector and drives speaker output. Units operates on 9—12 VDC.
Transmitter kit, LB-6 **$8.95**
Receiver kit, LB-5 **$9.95**

HIGH POWER FM WIRELESS MIKE
A high power unit that will transmit up to 1/2 mile to any FM broadcast radio. Sensitive input accepts any type of mike, will pick up normal voices 10 feet away using the available mini-electric mike cartridge. Operates on 9—12 VDC.
FM-4 kit **$9.95**
Sensitive microphone cartridge **$2.95**

2 MTR & 220 BOOSTER AMP

- 30 WATTS OUTPUT
- LOW NOISE PREAMP
- LOW COST
- RUGGED CAST ALUMINUM CASE
- ONE YEAR WARRANTY

Here's a great booster for any 2 meter or 220 MHz hand-held unit. These power boosters deliver over 30 watts of output allowing you to hit the repeaters full quieting while the low noise preamp remarkably improves receptions. Ramsey Electronics has sold thousands of 2 mtr amp kits but now, we offer completely wired and tested 2 mtr as well 220 MHz units. Both have all the features of the high priced boosters at a fraction of the cost.

PA-10 2 MTR POWER BOOSTER (10 X power gain)
Fully wired & tested $59.95
PA-20 220 MHz POWER BOOSTER (8 X power gain)
Fully wired & tested $59.95

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TERMS: • satisfaction guaranteed • examine for 10 days; if not pleased, return in original form for refund • add 6% for shipping and insurance to a maximum of $10.00 • foreign add 15% for surface mail • COD add $2.50 (COD in USA only) • orders under $20.00 add $1.50 • NY residents add 7% sales tax • 90 days parts warranty on all kits • 1 year parts & labor warranty on all wired units.

PHONE ORDERS CALL
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FAX 716-586-4754

RAMSEY ELECTRONICS, INC., 2575 Baird Rd., Penfield, N.Y. 14526

CIRCLE 34 ON READER SERVICE CARD

HIGH PERFORMANCE PRESELECTOR-PREAMP

The solution to most interference, intermod, and desense problems in **AMATEUR** and **COMMERCIAL** systems.

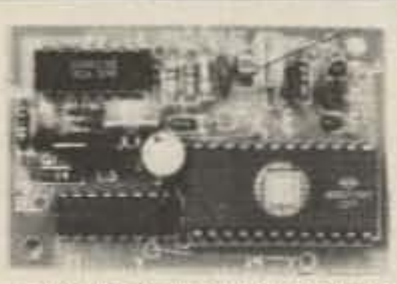
- 40 to 1000 Mhz - tuned to your frequency
- 5 large helical resonators
- Low noise - High overload resistance
- 8 dB gain - ultimate rejection> 80 dB
- 10 to 15 volts DC operation
- Size - 1.6 x 2.6 x 4.75" exc. connectors
- **FANTASTIC REJECTION!**

Typical rejection:
±600 Khz@144 Mhz: –28dB
±1.6 Mhz@220 Mhz: –40dB
±5 Mhz@450 Mhz: –50dB

Price - CALL bipolar w/RCA jacks
Connector options: BCN $5, UHF $6, N $10
SUPER HOT! GaAs Fet option $20

AUTOMATIC IDENTIFIERS

ID-1



ID-2

- For transceivers and repeaters - **AMATEUR** and **COMMERCIAL**
- Automatic operation - adjustable speed and amplitude
- Small size - easy installation - 7 to 15 volts DC
- 8 selectable, reprogrammable messages - each up to 2 min. long
- Wired, tested, and programmed with your message(s)

Model ID-1 - $54.95 Model ID-2 w/2 to 10 minute timer - $79.95

We offer a complete line of transmitter and receiver strips and synthesizers for amateur and commercial use.
Request our free catalog. *Mastercard and VISA welcome*

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CIRCLE 17 ON READER SERVICE CARD

Study Aid for the FCC / ARRL Amateur Radio Exams

Ver 3.4
QSO Tutor

Copyright @ 1988 by N4CST

Program Features:

- Runs on IBM Personal Computers and compatibles with minimum 256K RAM and CGA EGA or VGA graphics capability.
- Contains entire question pool for each license class. The Extra class version contains the question pool that will become effective in November 1, 1988.
- Work with the entire pool or selected areas, ie. "Rules and Regulations", "Practical Circuits" etc.
- Includes full screen graphics on appropriate questions.
- Logs multiple study sessions and allows resuming at a later time
- Returns to review missed questions if desired.
- Creates ramdonly generated sample tests and analyzes results showing areas for additional study.

•"After unsucessfully trying the Techniciam test twice, I passed with a perfect score by using your tutor"
•"Thanks for thinking of us hams. Your program has eliminated the worry of the Theory part of the test for me" **KA3RHW**
•"As a computer professional, I can recognize a quality piece of software. As a student I can appreciate a study tool that helps me gain the confidence I need to pass the amateur exams. By the way, I passed with 100% of the questions answered correctly." **Dan Derence Jr.**

Public Domain disk also available contains excellent morse code tutor as well a contest logger, propagation predictors, beam plotter and others. Cost is $3 to cover materials and handling, $2 if shipped with QSO TUTOR.

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$29.95 * / Class
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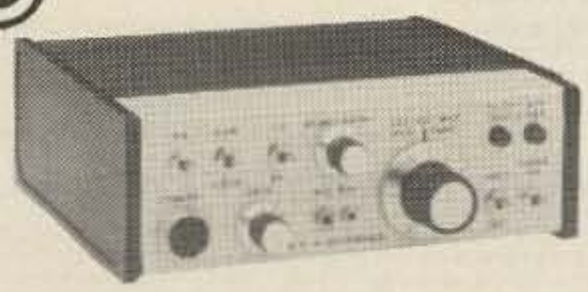
CIRCLE 145 ON READER SERVICE CARD

AMATEUR TELEVISION

SMILE! YOU'RE ON TV



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Designed and built in the USA
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With our all in one box TC70-1 70cm ATV Transceiver you can easily transmit and receive live action color and sound video just like broadcast TV. Use any home TV camera or VCR by plugging the composite video and audio into the front VHS 10 pin or rear phono jacks. Add 70cm antenna, coax, 13.8 Vdc and TV set and you are on the air...it's that easy!

TC70-1 has >1 watt p.e.p. with one xtal on 439.25, 434.0 or 426.25 MHz, runs on 12-14 Vdc @ .5A, and hot GaAsfet downconverter tunes whole 420-450 MHz band down to ch3. Shielded cabinet only 7x7x2.5". Transmitters sold only to licensed amateurs, for legal purposes, verified in the latest Callbook or with copy of license sent with order.

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- 10 DB of Audio Gain
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- Automatic Shut-OFF
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Model HTS-1

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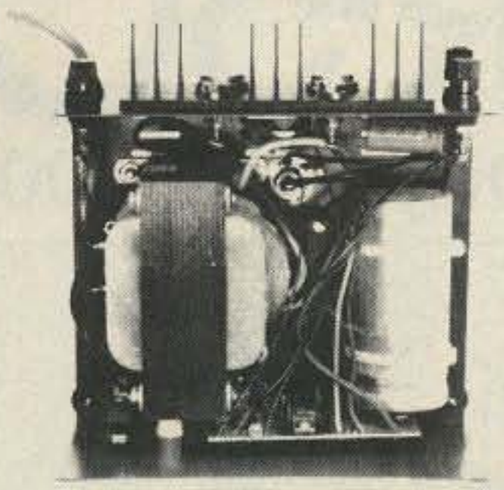
CIRCLE 349 ON READER SERVICE CARD

ASTRON CORPORATION
9 Autry
Irvine, CA 92718
(714) 458-7277



INSIDE VIEW — RS-12A

ASTRON POWER SUPPLIES

• HEAVY DUTY • HIGH QUALITY • RUGGED • RELIABLE •

SPECIAL FEATURES

- SOLID STATE ELECTRONICALLY REGULATED
- FOLD-BACK CURRENT LIMITING Protects Power Supply from excessive current & continuous shorted output
- CROWBAR OVER VOLTAGE PROTECTION on all Models **except RS-3A, RS-4A, RS-5A.**
- MAINTAIN REGULATION & LOW RIPPLE at low line input Voltage
- HEAVY DUTY HEAT SINK • CHASSIS MOUNT FUSE
- THREE CONDUCTOR POWER CORD
- ONE YEAR WARRANTY • MADE IN U.S.A.

PERFORMANCE SPECIFICATIONS

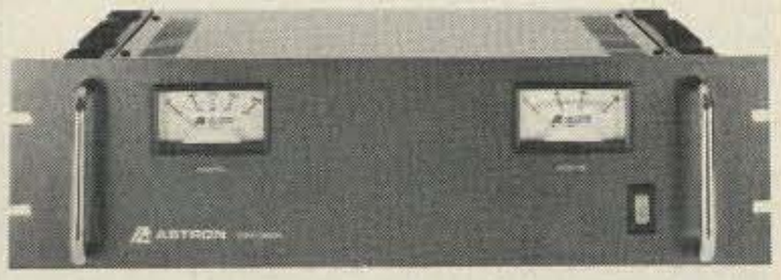
- INPUT VOLTAGE: 105-125 VAC
- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE Less than 5mv peak to peak (full load & low line)
- **Also available with 220 VAC input voltage**

MODEL RS-50A

MODEL RS-50M

MODEL VS-50M

RM SERIES



MODEL RM-35M

19″ × 5¼ RACK MOUNT POWER SUPPLIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50

RS-A SERIES

MODEL RS-7A

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A	2.5	3	3 × 4¾ × 5¾	4
RS-4A	3	4	3¾ × 6½ × 9	5
RS-5A	4	5	3½ × 6⅛ × 7¼	7
RS-7A	5	7	3¾ × 6½ × 9	9
RS-7B	5	7	4 × 7½ × 10¾	10
RS-10A	7.5	10	4 × 7½ × 10¾	11
RS-12A	9	12	4½ × 8 × 9	13
RS-12B	9	12	4 × 7½ × 10¾	13
RS-20A	16	20	5 × 9 × 10½	18
RS-35A	25	35	5 × 11 × 11	27
RS-50A	37	50	6 × 13¾ × 11	46

RS-M SERIES

MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46

VS-M AND VRM-M SERIES

MODEL VS-35M

• Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES

MODEL RS-12S

• Built in speaker

MODEL	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	5	7	4 × 7½ × 10¾	10
RS-10S	7.5	10	4 × 7½ × 10¾	12
RS-12S	9	12	4½ × 8 × 9	13
RS-20S	16	20	5 × 9 × 10½	18

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MORSE CODE TRAINER

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DECODER

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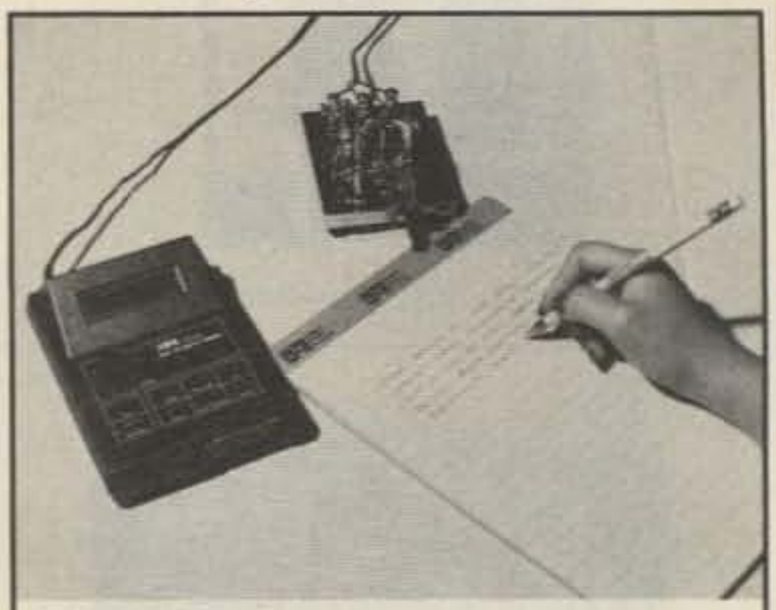
Input impedance	• 8 to 1kΩ—600Ω typical
Decoding speed	• 5 WPM to 30 WPM
Audio filter	• 800 Hz ±80 Hz Active and PLL filters 700 Hz to 900 Hz internally adjustable.



TRAINER

Code generator	• Random code generator 5 characters/code group
Speed	• 5 WPM to 30 WPM 1 WPM increment

ELECTRONIC KEYER

Paddle input	• TTL level —LO/Actuating, HI/Stop Contact input —ON/Actuating, OFF/Stop
Key input	• TTL level —LO/Mark, HI/Space Contact input —ON/Mark, OFF/Space
Keying speed	• 5 WPM to 30 WPM 1 WPM increment
Keyer output	• Transistor switching, Open collector type

SPECIFICATIONS

Model	• AR-501 Radio telegraph terminal
Power source	• DC 12V to 13.8V—165mA
Size	• 4.5"-W x 2.24"-H x 6.25"-D
Weight	• 12.5 oz. (358 g)
Controls	• Power On/Off • Random code generator On/Off • Print-out On/Off • Monitor speaker level • Electronic keyer mode select • Speed Up & Down
Display	• LCD 32 characters—16 per line
Indicators	• Power On—Green LED • Tuning—Red LED
Front connections	• Paddle—Standard/Iambic • Ordinary telegraphic key • Headphone/Earphone
Rear connections	• DC 13.8V input • Audio input • External speaker • Keyer output • Printer output

PRINTER PORT

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BACK TO BASICS —•—• But far more advanced ——•—

The AR-501, triple mode CW terminal in a small package, is a powerful gear to practice and play with. For the Novice, SWL and Amateur radio operators it detects Morse code between 5 to 30WPM. Just plug the AR-501 to your receiver to start translating the Morse code onto full 32 character LCD display. Very simple and easy to operate. You ask; for code practice?, both receive and transmit? Yes, the AR-501 does just that. It will improve your cord reception and keying technique at the speed you want. More?. it operates as an electronic keyer both standard and iambic. More Yet? How about a printer port? You bet, the AR-501 provides parallel printer port for hard copy. You can Log the QSO, and Practice. It will help you immeasureably. We even offer a standalone Nicad operated thermal printer as an option. **ACCESSORIES SUPPLIED:** The AR-501 Radio telegraph terminal comes complete with Receiver cable, DC Power cable, Miniature Phone plug, Miniature stereo phone plug, Spare fuse, Wall receptacle style power adaptor and Instruction manual. **ACCESSORIES AVAILABLE:** CC-501 Parallel printer cable — **$30.00**/DPU-411 Standalone Thermal printer with 8K buffer.—**$235.00**

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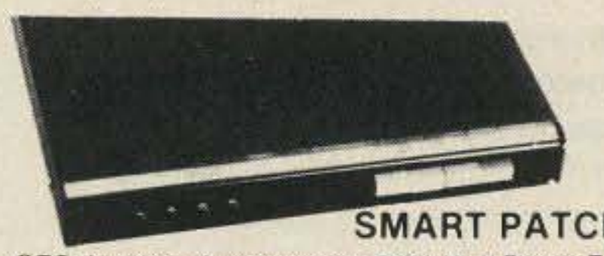

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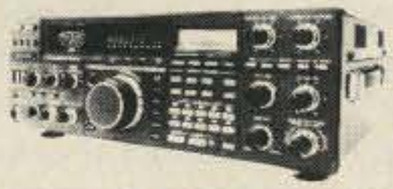

Antennas
A-S, AES, Cushcraft, Hy-Gain, Hustler, KLM, METZ, Mosley, MODUBLOX, TONNA

TS440S/AT, R-5000, R-2000, TS-940 S/AT, TM 221A/421A, TM-2570A/50A/30A, TR-751A, Kenwood Service Repair, TM-721A, TS-711/811A, TM3530A, TH205AT, TH215A, TM-621A, TM-321A, TS140S, TS680S, RZ-1, TS-790A.

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FT-23/73/33/727R
FT-2/1/709R/H
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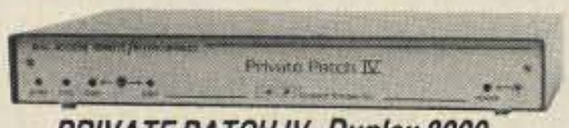

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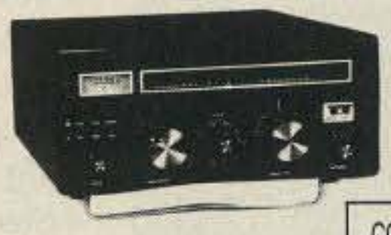

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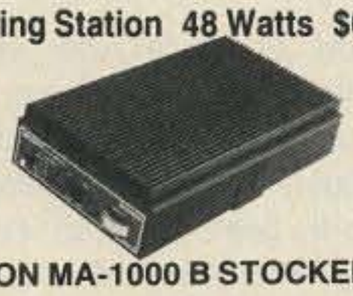

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NEW PRODUCTS

Compiled by Linda Reneau

PRODUCT OF THE MONTH

AMERICAN ANTENNA

American Antenna has a new 10 meter antenna, the Ham-Ten, whose design is based on their K-40 CB antenna. It will handle power input up to 1500 watts when properly installed, and has a bandwidth of 1.5 MHz between 2:1 SWR points. The Ham-Ten complements all the single-band 10-meter rigs currently on the market. An adjustable trunk lip mount comes with the Ham-Ten, or you can use American Antenna's Magnamount.

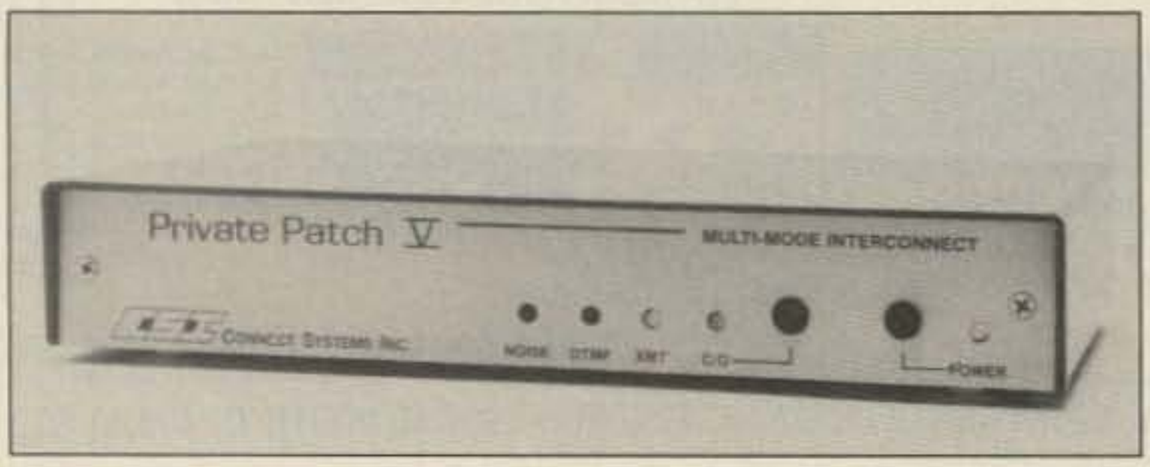
Price for the Ham-Ten is $45.50. For further information, write *American Antenna, 1575 Executive Drive, Elgin IL 60123.*

dbx PROFESSIONAL PRODUCTS

dbx announces new software enhancements and price reduction (from $6,950 to $4,500) for the RTA-1 Professional Real-Time Analysis System. The features include enhanced room-response curve capabilities, and customized printout. Present owners of the RTA-1 will be able to upgrade their equipment. The new version, designated RTA-1 V.1.5, also offers improved confidence indication and faster automatic gain setting. Direct readout of dB SPL is now possible, and the V.1.5 stores information for up to ten microphones, allowing calibration for any microphone and use of a microphone calibrator for automatic correction. Users may enter a 1–42 character banner at the top of the printout. Printouts also contain an area for location, date, time, and other notations. For more information contact *dbx Professional Products, PO Box 100C, Newton MA 02195. Or circle Reader Service number 207.*

HEATH COMPANY

The SB-1400 All-Mode Transceiver is now available from Heath Company. It provides all-band, all-mode coverage with 100 watts of transmit power on all nine HF amateur bands. Maximum AM output is 25 watts. The SB-1400's receiver has 0.25 µV (or better) sensitivity, dual VFOs, RIT, a built-in 500 Hz CW filter, "split" operation, squelch in all modes, 20 memories, front panel controls and AGC action, and computer interface. Available accessories are: 20 amp power supply with speaker, FM module, hand-held microphone, mobile bracket, and switching relay. The SB-1400 is a no-frills transceiver with all the important features. Price is $800. To order, call *800-253-0570 or 800-44-HEATH,* or write for a Heathkit catalog at *Heath Company, Department 350-036, Benton Harbor MI 49022.*



CONNECT SYSTEMS INCORPORATED

CSI's Private Patch V can be programmed in four modes: Sampling Patch (VOX enhanced), VOX Patch (with remote), Duplex Patch, and Repeater Controller with Duplex Patch. It has a built-in keyboard and digital display, a 90-number auto-dialer, redial, remote hook-flash, programmable CW ID, toll protection, 1–5 digit access code, 2–5 digit secret toll override code, telephone remote base, remote controlled relay, and regenerated tone/pulse dialing. Options include a plug-in CTCSS conversion board and an electronic Voice Delay board.

Price is $500. Contact *Connect Systems, Inc., 23731 Madison St., Torrance CA 90505. 213-373-6803.*

WA9YWJ PRODUCTS

WA9YWJ offers a custom photo engraved callsign plaque on ¼" thick glass in a gold-colored frame. You can choose a red, blue, black, or green velvet background. The callsign plaque is 7" long x 2¾" wide. WA9YWJ guarantees its craftsmanship. Price: $24.95 plus $2 shipping. *WA9YWJ Products, 907 Baxter Ave., Superior WI 54880.*

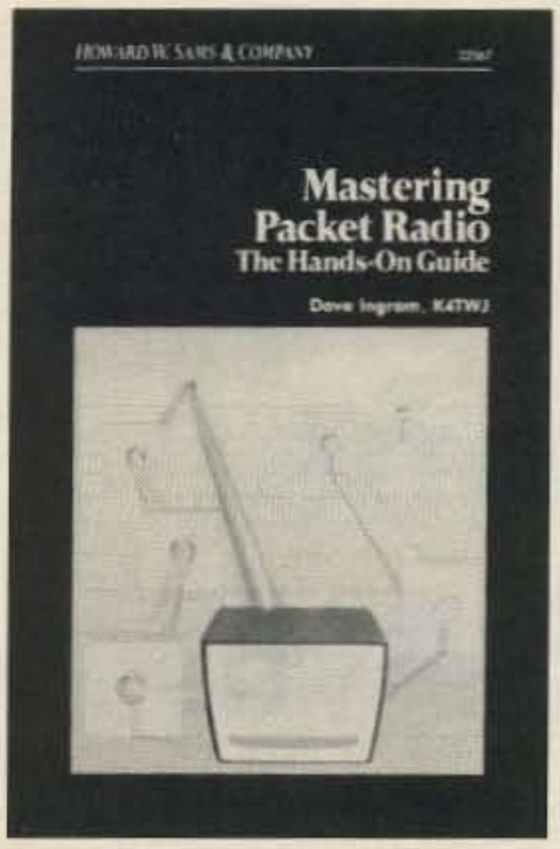
ADVANCED COMPUTER CONTROLS, INC.

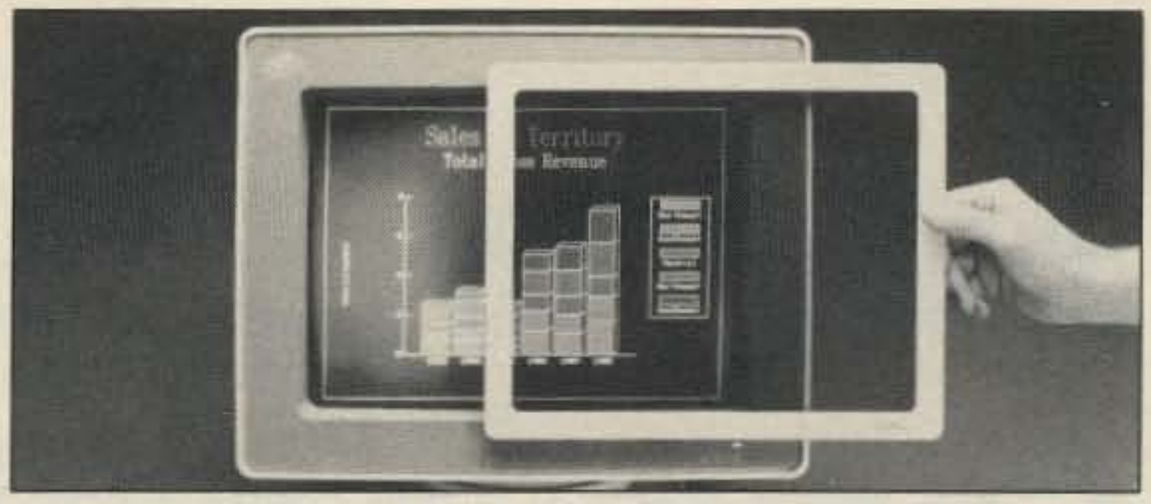
Advanced Computer Controls' new RC-850 Repeater Controller Computer Interface allows remote control, programming, and information access to FM repeater systems from a home computer or terminal via modem or packet TNC. Controller commands may be entered through the remote terminal with responses displayed on the terminal screen. The controller stores programmable speech and Morse code messages. The menu-driven RC-850 has two additional Touch-Tone decoders to offload the main shared decoder for full-time coverage of links and remotes.

The RC-850 Interface is $350. For $75 more, the Vocabulary Expansion Option increases the synthesized speech to 530 words. Contact *Advanced Computer Controls, Inc., 2356 Walsh Avenue, Santa Clara CA 95051. 408-727-3330.*

HOWARD W. SAMS & COMPANY

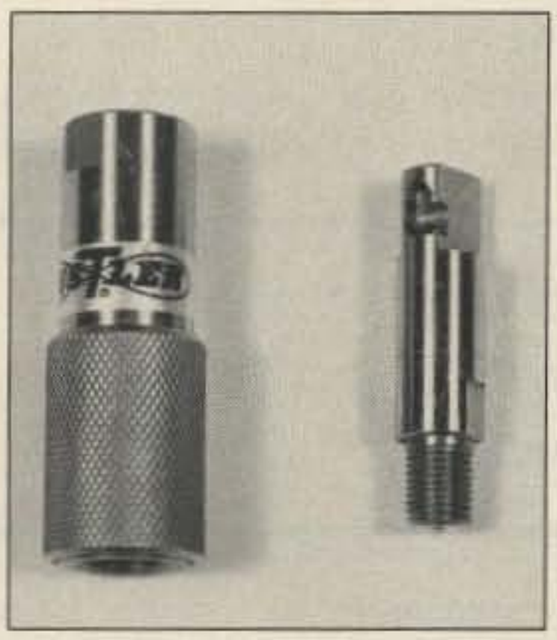
Mastering Packet Radio: The Hands-On Guide, by Dave Ingram K4TWJ, is now available from Howard W. Sams & Company. The book covers basic concepts as well as the more technical areas of this mode. It describes what packet is, how it works, why it is, and the hardware involved. Dave Ingram K4TWJ has written twelve books and over 300 articles for amateur radio magazines. He holds a First Class Radiotelephone Commercial License and an Amateur Extra Class License. *Mastering Packet Radio* retails for $13 and is available at bookstores, computer stores, electronics distributors, or direct from the publisher by calling 800-428-7267. *Howard W. Sams & Company, A division of Macmillan, Inc., 4300 West 62nd Street, Indianapolis IN 46268. 317-298-5400.*





CURTIS MANUFACTURING COMPANY, INC.

Curtis Manufacturing's Anti-Glare Filter for computer monitor screens is made of distortion-free optically-coated glass. It absorbs 95% of reflected light internal and external to the computer monitor. The all-glass Anti-Glare Filter increases contrast and character resolution. The Filter comes in seven sizes to fit most color and monochrome computer monitors. It carries a lifetime warranty. Suggested retail price is $60. *Curtis Manufacturing Company, Inc., 30 Fitzgerald Drive, Jaffrey NH 03452. 603-532-4123.*



HUSTLER INC

Hustler, Inc., has a new version of Quick Disconnect, the Model QD-2. The QD-2 is similar to the original Model QD-1, but it features a new design for the lower half. Milled from a solid piece of stainless steel, the new design is virtually indestructible. The warranty extends to two years. For more information, contact the Sales Department at *Hustler, Inc., 1 Newtronics Place, Mineral Wells TX 76067.*

RADIO TEL

Radio Tel offers a full duplex private mobile phone as an extension of a regular home or business phone up to 30 miles away with no separate monthly phone bill. Send or receive calls from anywhere in the world. Outgoing calls appear on the regular phone bill. This system operates on VHF (138–174 MHz) or UHF (440–512 MHz) with a 5 MHz transmit/receive split for duplex. Optional features are voice scramblers, intercom, and selective calling for multi-users. Prices start from $2,995 for the entire system. *Radio Tel, 1025 S. La Brea Ave., Los Angeles CA 90019. 213-937-6766.*

ULTRASOFT INNOVATIONS, INC.

ULTRALUCENT™, from Ultrasoft Innovations, Inc., is a screen restoration product that eliminates hairline and deep scratches from the hard plastic display of any laptop or notebook computer. It comes in a standard kit that includes 6 re-usable, color-coded, abrasive pads, anti-static finishing cream, application foam block, wiping towel, and complete instructions for $20. For minor touch-ups, and for laptops with soft plastic displays, ULTRALUCENT EL is available for $15. *UltraSoft Innovations, Inc., 76 Main Street, PO Box 247, Champlain NY 12919, 514-487-9293.*

MOTOROLA INC.

The KDT portable data terminal provides communication between the people in the field and the central computer data files. It features a 4-line by 40-character supertwist, backlit LCD display. The terminal is battery-powered and contains an integrated radio transceiver for cordless operation. The unit weighs 30 ounces and is small enough to hold comfortably in one hand. The KDT has up to 96K of memory. Code reading and other accessories are available. The terminal is compatible with Motorola's Data Radio Network.

Price for the data terminal is $3300. Contact *Motorola, Inc., 1301 E. Algonquin Road, Schaumburg IL 60196. Attn: Nadine Sudnick, 312-576-6640.*

BUCKMASTER PUBLISHING

Originally designed for librarians, the Place-Name-Index CD-ROM from Buckmaster Publishing contains information valuable for amateur radio operators. It offers quick access to more than one million place names collected from the quadrangle maps of the US Geological Survey. Each record on the Place-Name-Index contains the state, county, feature type, FIPS code, elevation, longitude/latitude, and quadrangle map name. Search on place name, multi-word phrases, wildcards, and other terms. The user can find the longitude and latitude of a contact in seconds.

The Place-Name-Index CD requires a Hitachi, Phillips, or Sony CD-ROM drive. The user can store search results on disks or printouts. The Place-Name-Index CD-ROM leases for $295 and sells for $1,495, including retrieval software. *Buckmaster Publishing, Whitehall, Route Three, Box Fifty-six, Mineral VA 23117. 800-282-5628 or 703-894-5777. Jack Speer N1BIC, President.*

73 Review *by Pete Putman KT2B*

Number 13 on Feedback card

Communications Concepts 335A-K

2 meter 35 watt amplifier kit

Communications Concepts Inc.
121 Brown Street
Dayton OH 45402
(513) 220-9677
Prices: $79.95 kit
$109.95 assembled

Communication Concepts Inc. has advertised this amplifier for several years. Basically, it is a gain block with T/R switching to boost a low-level 2 meter signal, such as a handheld, from 1–3 watts up to the 30–35 watt range. Unlike other amplifiers made by RF Concepts, Mirage, and THL, no preamplifier is available. It is strictly a no-frills way to add better than 13 dB to a handheld. (This review is somewhat unusual, as the product is sold as a kit, but the review unit arrived completely assembled.)

The circuit is straightforward. A Motorola MRF-240 is used in a grounded-emitter configuration, running Class AB1 bias for true linear operation. Hence, this amplifier can be used on sideband as well as FM and CW. The disadvantage of this is that idling bias current is always drawn, and there is no power switch. This means the user has to tie into a switched DC line when using the amplifier in a car, or else the battery runs down in short order.

Photo A shows the PC board. Workmanship on this model is good quality, and the component layout, plus simplicity of design, should allow any experienced builder to achieve similar results. All the components mount on the top plane of the PC board, except the bias regulator Q3, which mounts below. The layout is uncluttered, as only small components are used. RF keying switches the antenna relay, but there's no provision for hard-keying.

The DC power connector is a standard 4-pin TRW/Jones type, but only two pins are needed. This might be a good place to bring out a hard keying line, which could be nothing more than a 4.7k resistor to the base of Q2. Input and output RF connectors are BNC types. SO-239 connectors would have been better choices, since they hold up better in mobile nvironments.

Performance

Input	Output
.3 W	3.0 W
1.2 W	25 W
2.3 W	30 W

Note: Maximum input specified by manufacturer to be 5 watts.

". . . the manual is so thorough that inexperienced builders might want to try it as their first RF project."

Instructions

The instruction manual is well written and contains a check-off box for each series of instructions (a la Heathkit). The tune-up procedure is simple but does involve a trial-and-error method of soldering and resoldering the chip capacitors, along the etched lines to obtain lowest VSWR. The manual does include several pictorials and a component layout to speed things along. In fact, the manual is so thorough that inexperienced builders might want to try it as their first RF project.

Conclusion

The CCI 335A-K is a no-frills amplifier kit that appears to be easy to construct and uses top-quality components. An amplifier such as this can serve many purposes. For example, it could be used to provide higher drive for grounded grid amplifiers, such as the 3CX800 or 8877 tubes which need at least 30 watts or more to really perk. It could also be used as a booster amplifier for QRP contest work, and, of course, it can be used to kick up the signal from a handheld while portable, at home, or in the car. 73

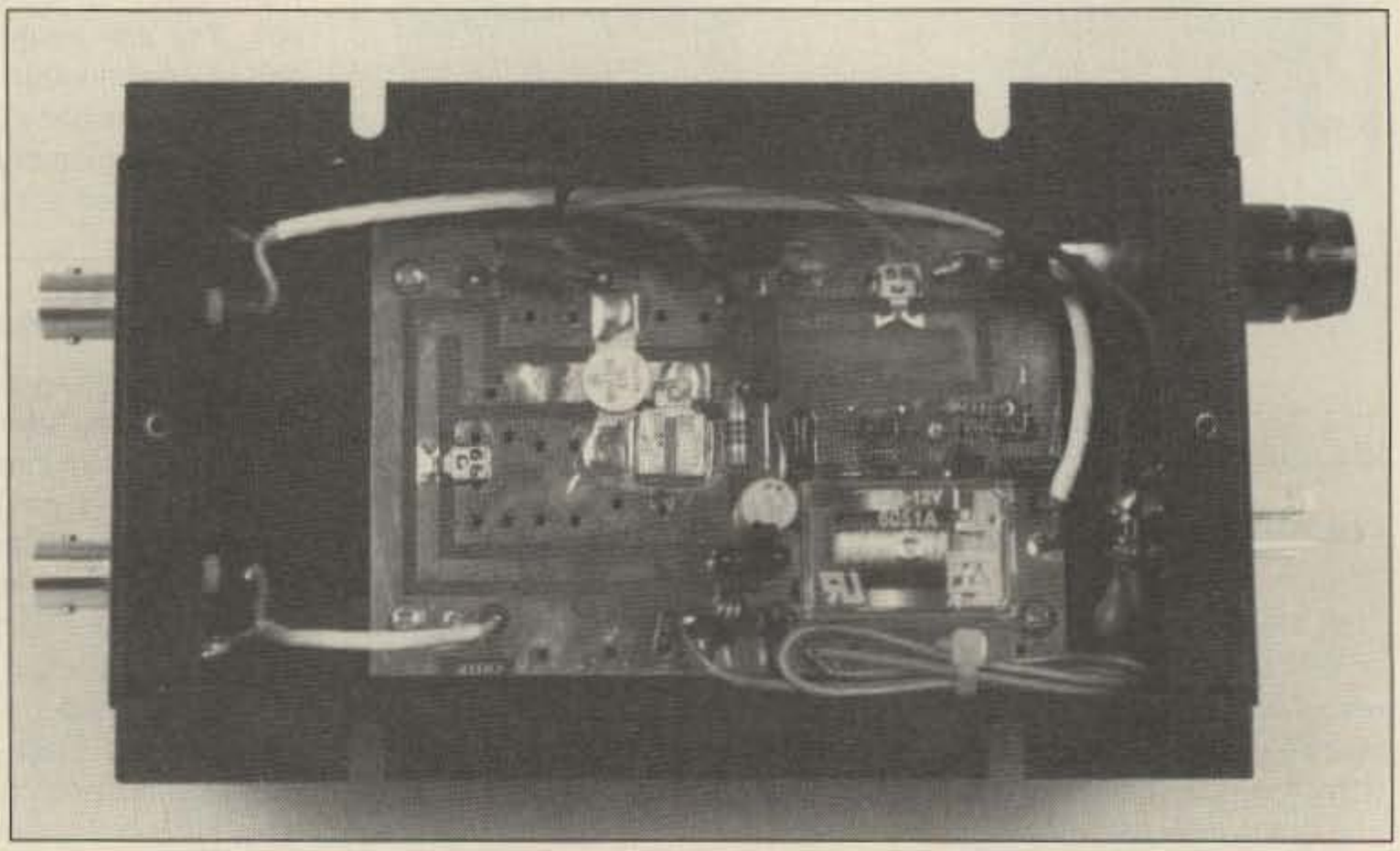


Photo A. Interior of the assembled 335A-K amplifier. Note the uncluttered PC board.

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PN2907	PNP	TO-92	5 for .75
2N3055	NPN	TO-3	$1.00 each
PN3569	NPN	TO-92	5 for .50
2N3904	NPN	TO-92	5 for .75
2N3906	PNP	TO-92	5 for .75
2N4400	NPN	TO-92	5 for .75
2N4402	PNP	TO-92	5 for .75
2N5400	PNP	TO-92	4 for $1.00
2N5880	PNP	TO-3	$2.00 each
2N5882	NPN	TO-3	$2.00 each
MJ2955	PNP	TO-3	1.50 each
MJE2955T	PNP	TO-220	.75 each
MJE3055T	NPN	TO-220	.75 each
TIP30	NPN	TO-220	.75 each
TIP31	NPN	TO-220	.75 each
TIP32	PNP	TO-220	.75 each
TIP41	NPN	TO-220	.75 each
TIP42	PNP	TO-220	.75 each
TIP121	NPN	TO-220	.75each
TIP126	PNP	TO-220	.75each

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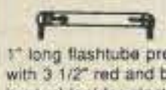

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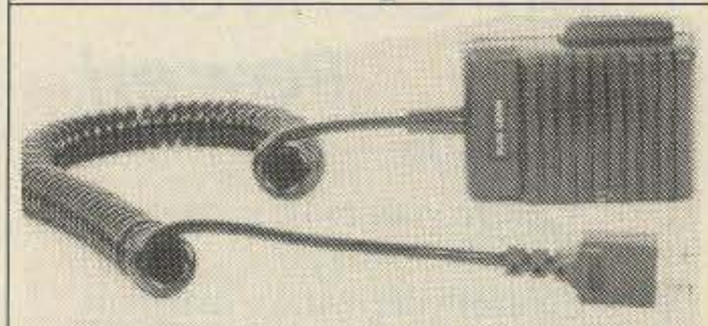

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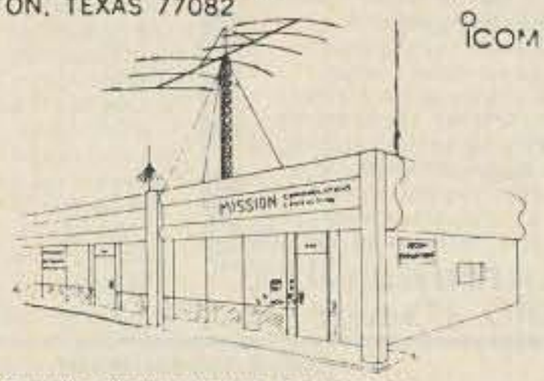

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CIRCLE 136 ON READER SERVICE CARD

73 Review *by Bill Clarke WA4BLC*

The Carolina Windom Antenna

Improvement on a tried and true design.

Radio Works
PO Box 6159
Portsmouth VA 23703
PH: (804) 484-0140
Price Class: $70

The Windom antenna was first invented in 1928 by W8GZ, and immediately became popular. Like many older types of antennas, however, it eventually faded into obscurity. Although the Windom popped up from time to time with a new twist or two, it never became really popular again, mainly due to the inherent feeding problems.

The last Windom I saw in everyday use was in 1972, which belonged to a fellow in Cape Cod. It was a 1928 classic, fed with a single conductor. He used it only on 75 meters AM phone. It put out a loud signal heard regularly in Virginia.

The Windom has reappeared once again, reinvented by Joe Wright W4UEB, Jim Wilkie WY4R, and Edgar Lambert WA4LVB. So much has changed with this new version, though, that they now call it the Carolina Windom—"Carolina" for that beautiful part of the country where much of the improvement on it was done, and "Windom" for the basic off-center feed concept.

The Carolina Windom Antenna.

Theory of Operation

The only real resemblance the Carolina Windom has to the original is the off-center feedpoint. The off-center feed creates an imbalance, which causes the feedline to radiate. The feedline and antenna then produce both vertical and horizontal polarization patterns—horizontal along the wire elements, and vertical from the feedline. The manufacturer claims that this combination of radiations is what makes the Carolina Windom successful.

While most transformers try to eliminate feedline imbalance and radiation, the Windom's matching transformer, at the feedpoint, is designed to encourage feedline radiation. But this radiation must be controlled. A line isolator, installed twenty-two feet from the horizontal element's feedpoint, acts as a brute force RF choke, to limit the vertical radiator at a predetermined length and to keep RF out of the shack.

The overall design provides an antenna that is usable across the entire 75/80 meter band without an antenna tuner. Operation on other HF bands requires a tuner. 40/75/80 meter patterns are horizontal with vertical components. 20/15/10 meter radiation is primarily vertical. On the higher bands, the effect is an upside-down vertical with the horizontal elements as the radials, and the feedline as the vertical element.

Installation

I installed the Carolina Windom as a sloping dipole, with the apex at a height of fifty feet. I oriented it the same as my trusty 160/75/40 meter fan dipole, figuring this would afford me a chance to make comparisons. I used seventy-five feet of feedline (seventy feet or more recommended) and placed my tuner in the line. After an initial smoke test, I compared my results with the Radio Works SWR curve (see Figure 2). They displayed the same general curve, but my SWR curve was one full point higher than the one shown in Figure 2.

I then tried to load the antenna on other bands by using the tuner. All was well except for 15 meters. There, it was no-go under any circumstances. I decided to change feedlines and put a forty-five footer on. It worked great. All bands tuned up easily, and the SWR on 80 dropped to where the book said it should be. I checked the feedline, and have since placed others of varying length in service. Evidently, the Carolina Windom antenna is "feedline-length" conscious.

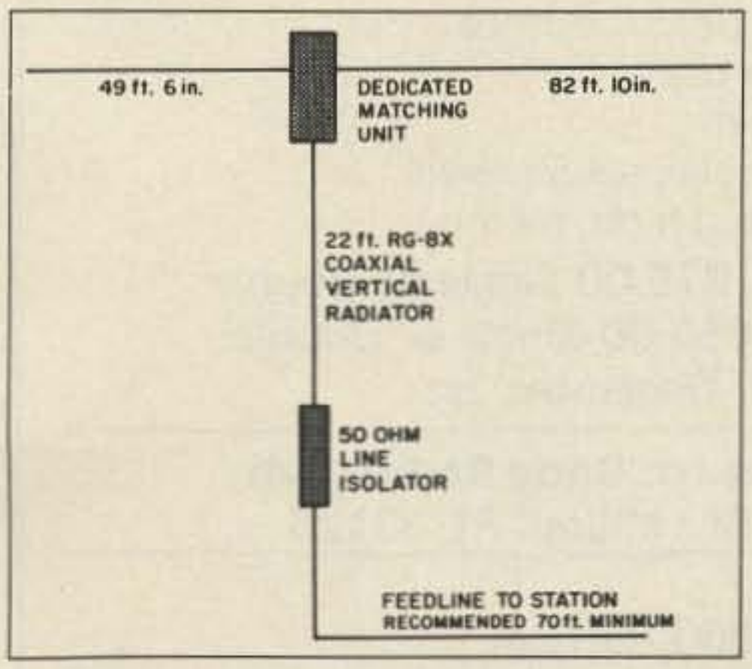

Figure 1. Diagram of the Windom antenna.

Specifications
(as stated by the manufacturer)

Coverage:	80–10 meters
Gain:	3–5 dB gain over a dipole
Radiator Length:	Horizontal 132'; Vertical 22'
Feedline:	50Ω Coax
Matching Method:	Dedicated Matching Transformer & User's
Transmatch Requirements:	40–10 meters
Power Rating:	1500 Watts
Recommended Height:	Above 35'
Radials:	Not Required

Table 1.

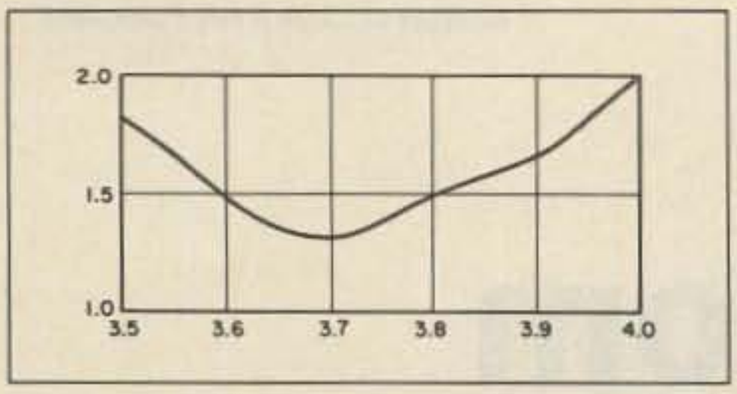

Figure 2. Typical 75/80 meter SWR curve shown in the Radio Works instruction sheet. The curve this reviewer came up with, using 75 feet of feedline, resembled this figure, but was a full point higher.

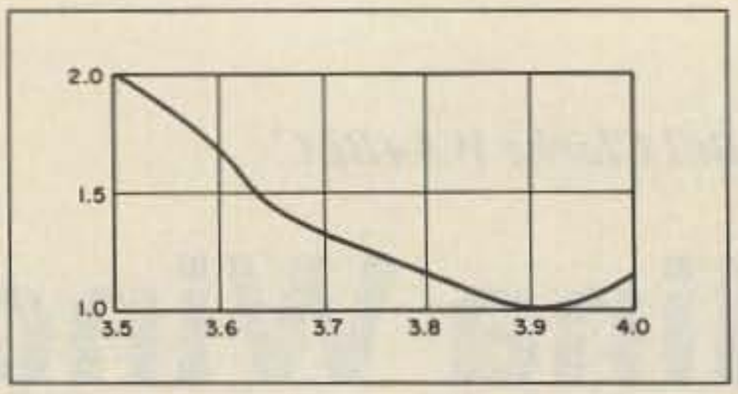

Figure 3. SWR curve of the Windom on 75 meters after slightly shortening the two elements.

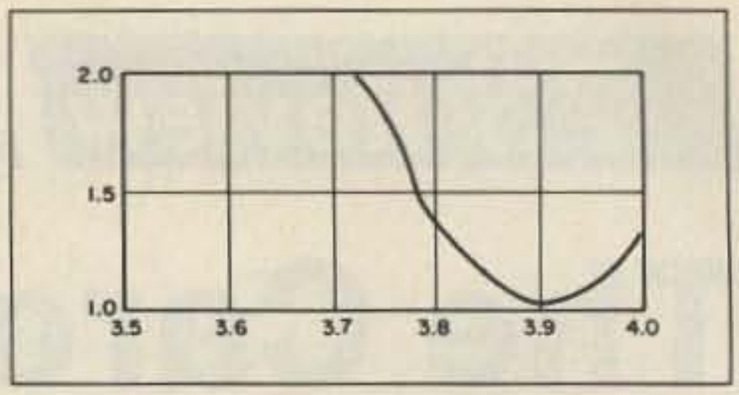

Figure 4. Typical SWR plot of a full-sized 75/80 meter dipole.

Operation

On 75 meters I found that the antenna consistently performed as well, or slightly better, than my dipole. When working stations with 20+ over nine signals, I could hear only small differences between the dipole and the Windom. Reception reports indicated about the same for my signal. However, very obvious performance gains were seen when working stations at S-5 or S-6 levels. The Windom won every time.

Since the initial installation, I have used the Carolina Windom on 10, 15, 20, and 40 meters. All tests have indicated that the antenna performs as advertised. On 40, it consistently performs better, on the long haul, than the dipole, no doubt due to the vertical radiation component. On close contacts, it is always at least equal to the dipole. When I compared the Windom to a tribander, I found that what it lacked in directional capabilities, it made up for with vertical polarization. Signal reports were generally better on the beam than on the Windom, and I could not turn to get away from offending QRM. However, I had no problem working stateside or DX stations.

Changes

In the booklet that accompanied my Carolina Windom, I saw a brief mention of optimizing the antenna for the 75 meter band. I took this to heart and reduced the shorter element's length by one foot, and the remaining element by three feet. The results were transparent on 40–10 meters, however the 75 meter SWR dropped down to that of my dipole. This is a worthwhile adjustment (see Figure 3).

Impressions

First impressions of the packaged Carolina Windom are good. The package contains two custom-made assemblies (feedline transformer and isolator), quality end insulators, stranded #14 copper wire, pre-built vertical coax element, and even a pack of coax seal.

It offers unusual bandwidth on 75/80 meters, something my dipole cannot do (see Figure 4). Though the antenna is about the same size as a full-size 80 meter dipole, and is fed with a single coax feedline, you can work all bands with a tuner. Using a plain, 80 meter dipole and a single feedline, you cannot efficiently do this.

The $69.95 price tag is reasonable. After all, you could invest more than $45 in the materials alone, if you could find them all, and you would still have to measure and cut the vertical and wire elements, install the coax connectors, solder the cut elements to the center insulator, put the end insulators in place, and then build your own RF isolator. How much is your labor and time worth?

The Carolina Windom would make an excellent "take-along" antenna for vacations and field day. If you are looking for a good wire antenna that can do it all, and don't mind using a tuner on the higher bands, the Carolina Windom is likely for you.

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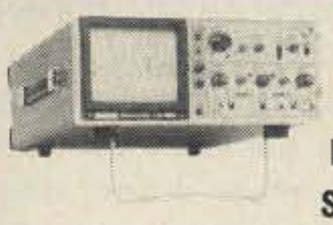

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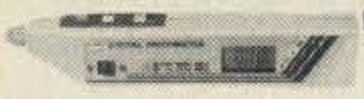

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Loops:
A Love/Hate Relationship

"What equipment do I need for T-hunting?" That's the most common question I hear. This month we'll begin to look at the many types of radio direction finding (RDF) gear. Stick around for plenty of no-nonsense advice on what equipment to choose for your particular hunting needs.

Would-be T-hunters have had trouble finding information on the sport in ham magazines. Of the few articles that have made it into print, a large percentage of them have been about making and using loop antennas. It's easy to see why.

Loops are the simplest RDF antennas to build. They're small and easy to mount, or you can hold them out the car window. They can be made for any of the popular ham bands. In an hour or so, you can have one ready to go.

T-hunt loops aren't like the full-wavelength square or delta loops DXers use. Loops for RDF are small, usually less than 1/10 wavelength in circumference. Electrically, they behave more like a coil than like a wire antenna.

I have a file folder full of articles on simple RDF loops, taken from major magazines and club newsletters. It's fun to read the authors' claims. Here's one for two meters that says, "Throw your competitors for a loop! A little practice will make you an expert, and you'll be able to invite your fans, family, and friends into your trophy room . . ."

These claims are reminiscent of the "hidden antenna" articles in which the author says he worked DXCC in a weekend after hooking his rig to a downspout through a tuner made of old bedsprings. STOP! Time for a reality check. It just isn't that easy.

Left or Right?

The biggest problem with simple loops is that they're bi-directional. As you rotate the loop 360 degrees, you get signal peaks when the plane of the loop is in the direction of the source, and nulls (minimum signal points) through the loop at the source. The peaks are broad and the nulls are sharp, so the nulls give greatest RDF accuracy. But there are two nulls, and they're in exactly opposite directions.

"The biggest problem with simple loops is that they're bi-directional."

How do you figure out which way to go when the RDF system has 180 degree ambiguity? You could take bearings from two widely separated locations and triangulate, but that would involve too much time and mileage. You could circle in from the edge of the hunt boundary area, instead of starting at the center—but even if the hunt rules allow you to do that, you'll probably lose time or mileage because you have to pick the most distant edge. Or you could watch to see which way the hunters with uni-directional antennas start out. But you don't want to follow them, do you?

Though there are ways to electronically solve the bi-directionality problem at 2 meters, none of the VHF loop designs I've seen in the magazines have such a feature. Parasitic elements, like directors and reflectors, will not work on a fractional wavelength loop antenna. Shielding methods, such as screens and metal plates won't make them uni-directional, either. The most effective way is to add a nondirectional whip to the antenna system. Then sum the whip and loop outputs with just the right amplitude and phase relationship, to either enhance one lobe or create a cardioid (heart-shaped) pattern. For decades, this loop/sense scheme has been standard for RDF below 60 MHz. It's tricky at 2 meters, but it can be done. (For details of a simple loop/sense system for 2 meters, see page 27 of *Transmitter Hunting—Radio Direction Finding Simplified*, TAB Books #2701, available from Uncle Wayne's Bookstore.)

The surplus AT-339/PRC loop and a portable receiver make a nice mobile or hand-carried RDF system for 6 meters. George Stokes WT6U and Bob Miklos K6LPF are ready to hunt.

Loops Hate Multipath

It is common in VHF transmitter hunting for the signal to arrive from more than one direction. This is called "multipath." It occurs because features of the terrain, such as mountains, hills, and buildings, reflect VHF signals. Good performance in multipath situations is an important feature of a successful RDF system.

Null-hunting with a loop can be very frustrating when multipath is present. As the hunter sweeps his loop past the direct signal, trying to find the exact null direction, the null is filled in by a signal arriving from the reflection. Even if the reflection is much weaker than the

Continued on page 54

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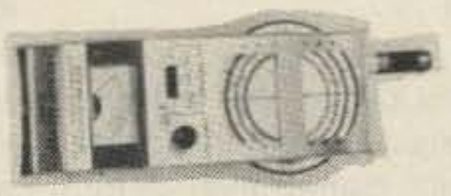

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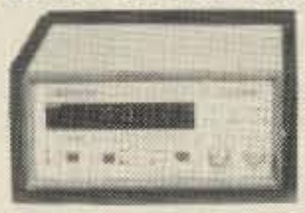

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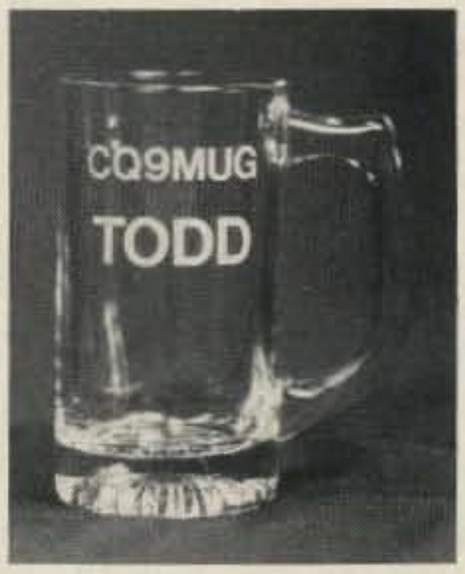

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CIRCLE 88 ON READER SERVICE CARD

Homing In

Continued from page 52

direct signal, it may be impossible to get a correct bearing on the direct signal.

Hunters using beams can distinguish the peaks of direct and reflected signals as long as there is sufficient signal level difference. Furthermore, when the signal is weak, the higher gain and larger capture area of the beam make it a much better performer than the loop.

Forget Loops?

Were all those guys who wrote glowing descriptions of their 2 meter loops wrong? No, just overly enthusiastic. Either they didn't have serious competition, or they didn't realize how much more successful they'd be with a better setup.

The loop is not the best tool for the task. It may be your idea of fun to enter a 20 meter DX contest with a QRP rig and a grounded vertical, but you wouldn't do it with the expectation of winning (unless everyone else in the contest had QRP and a vertical). You need something much better to be truly competitive against the big gun stations. In T-hunting, it's the same.

Several years ago, Dick Reimer W6ET knew there was a 2 meter repeater jammer in his neighborhood, because the jammer had a strong signal on the input. Dick didn't have RDF gear at the time, so he spent a couple of hours building a simple 8-inch diameter loop. It gave good nulls, and its 0.3 wavelength size gave it good sensitivity. The jammer cooperated (unknowingly) by staying on the air and being in a location free of multipath. W6ET tracked him down in short order, and ended the problem.

"Null-hunting with a loop can be very frustrating when multipath is present."

In that situation, a loop can do the job well, but the serious sport hunter would not want a loop as his primary RDF system on a competitive hunt against experienced hunters. W6ET knew that, so he later got a commercial Doppler RDF for serious hunting.

As part of my T-hunt talks to local radio clubs, I used to demonstrate W6ET's loop as an easy way to get started on T-hunt contests. I don't do that any more. Loops have their place, but competitive 2 meter T-hunting around Los Angeles isn't one of them. Signals are too weak, and the hiders usually pick spots in the hills or in urban areas that make the signal ricochet around like a ping pong ball.

If you want to get started simply and cheaply in 2 meter hunting, and you want a fighting chance against big gun hunters, my advice is to skip loops and use a simple quad or beam. It's a bit more work, but there'll be no null-fill or bi-directionality problems to worry about. You'll get much more signal, too.

Try a Loop on HF

Loops are far more successful on 6 and 10 meters, since there is much less multipath on these bands. Signals are stronger because they must overcome atmospheric noise to be heard. The Southern California Six Meter Club sponsors a monthly dual-band 6 and 10 meter hunt in the Orange County area. Many of the participants use loops.

The most popular 6 meter loop is the low-cost Army surplus AT-339/PRC (see photo). Ruggedly built for field use, it tunes 38 to 55 MHz with a built-in attenuator for strong signals, and a sense circuit to resolve the back/front ambiguity. You can find other models with a little scrounging, including the older AT-249/GRD, which also covers the same range. The AT-340/PRC looks just like the AT-339/PRC, but it's for 20 to 39 MHz, making it suitable for 10 and 11 meter use.

What's Better Than a Loop?

In summary, a loop is a poor performer for serious RDF work above 100 MHz. In future columns, we'll look at the methods that top-notch hunters use on the VHF bands, including beams, switched antennas, and dopplers. We'll compare their performance in a variety of hunt situations.

If there's a T-hunt topic you'd like to see covered, please drop me a line. I am also eager to hear about hunting activities in your area. 73

ATV

Number 17 on your Feedback card

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Mike Stone WBØQCD
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ATV for Weather/Packet Public Service

The ATV mode can be especially helpful in aiding already established weather storm alert and emergency weather nets commonly held on 2 meters across the country. All our local amateur weather spotter nets were doing an admirable job over the years, protecting and serving local law enforcement and city/county officials with storm spotting information updates. Many of the amateurs realize that they lacked professionalism in two areas: 1) passing witnessed "spotter" messages and sightings on to nearby counties and states, and 2) getting advanced early warnings to all affected areas, prior to establishing the weather watch spotters nets.

Two years ago, our BRATS ATV club installed on our remote transmitter and repeater system (N9CAI ATV/RT/R) a *Kavorus* Color Weather Radar feed for 910 MHz. We obtained this feed from a local NBC TV station (KWQC-TV) which employs a couple of our ATV club members. We got permission from The Kavorus Company in Minnesota for just such a non-public view feed. These feeds and other types of radar services, including Doppler, are available in many area TV and radio stations or at National Weather Service facilities. They are also available at some commercial business facilities, such as local Airport Flying Services or other business that use weather radar equipment. Once a weather radar feed source is captured on the ATV repeater or remote transmitter, your ATV system will blossom with new interest, members, and public service projects!

EARWARN

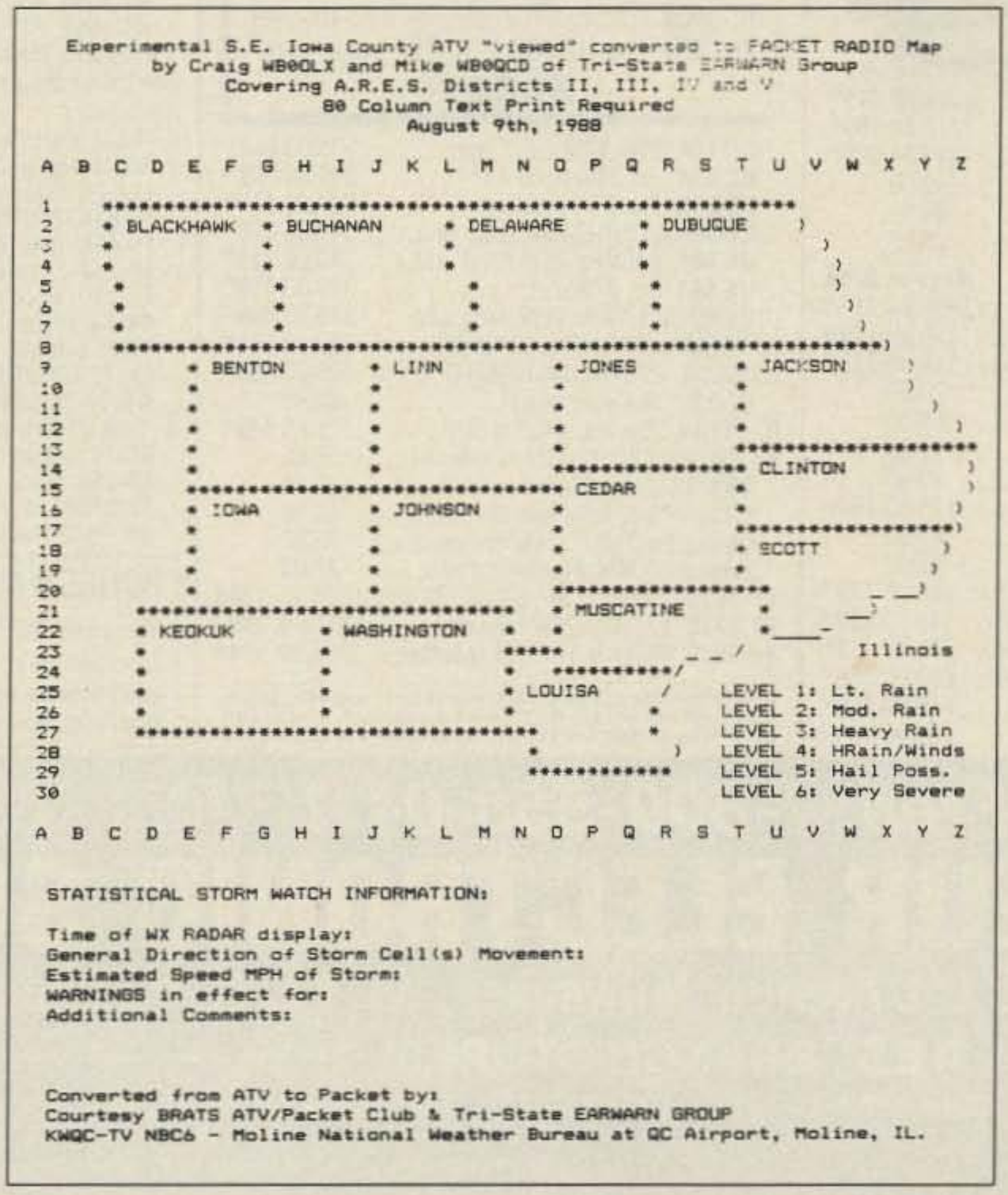
We established a brand new inclement weather early warning group that comprised county-appointed ARRL EC and assistant ECs, RACES personnel, county and state disaster services officials, local and county law enforcement department, ESDA directors, and weather observers. The basic purpose of this new group was to provide early warning and storm advancement information to all the local weather spotter nets. We chose a wide-range, hardly used, quiet 2 meter FM repeater (in Maquoketa on 147.06 MHz), to conduct our meetings and nets rather than interfere with the ongoing local weather spotter nets. Assigned members from these nets come to our frequency most of the time and thus report back into their own nets with updated information. We also hold a regular Sunday evening *EARWARN NET* at 9:30 PM after all other local nets are over. This new group met monthly at different locations to get things established, and eventually voted for quarterly meetings. We have our own newsletter—*Take Cover*—funded by donations from other local amateur radio clubs and groups.

The Tri-State EARWARN Group works this way: Members of the local Fast Scan gang observe incoming inclement weather on a regular basis on the ATV weather radar feed. Once bad weather threatens, packet radio beacon messages (145.01 MHz) are sent to designated EARWARN relay digipeaters in the projected path of the storm. We also go on FM voice to several of the local 2 meter repeaters in the area and announce what is happening to local EC or RACES personnel. The ATV radar feed and television transmitter is "locked on" for all to see during the entire span of the storm period. Packet radio beacon (unconnected) messages are constantly sent up through the digi relay stations. We also man the mentioned *EARWARN* 2 meter FM frequency for general WX related talk discussions and updates.

We are doing something on packet radio that relates to the used FSTV mode and is quite interesting and perhaps a "first" for packet use around the country. We designed a video screen map of Iowa and Illinois counties and placed around this map (across the top), an A–Z and (down the left side), 1–20 numbered grid reference index for marker indicators. We distributed copies of these maps at meetings and may also sit on local BBSs for packet operators to download and print out on their own personal computers. (We have, by the way, a *KA Node* designated weather BBS established (KØOQP-3) that takes and stores all weather-related messages, announcements, maps, charts, etc.) At the ATV radar viewed station, and with these maps stored on disk files, the packet maps are filled in with XXXs and various NWS storm warning level indicators (222, 333, 444, etc.) on the TV screen as to exactly where the inclement weather is located. Then this now updated, filled-in packet information map is sent over packet, or, on voice, is described in exact detail using the provided A–Z and 1–30 grid locators. Even those in the net without ATV capability then has on paper a map showing where the inclement weather storm cells sit. This hardcopy is especially useful for passing on to County Radio and Disaster Services Officials for their judgments and decisions. The officials now have something to back up their decisions which may be controversial by the public after the storm period passes. All maps also include, among other information, lower page time, direction of storm, and estimated storm movement speed. There's nothing like hardcopy evidence of Level 5 and 6 intensity build-ups to set storm warnings in action!

The work of being able to harmonize several Amateur Radio Groups together for inclement weather situations (ARRL District DEC), is similar to the job of a county disaster services director. It is important to understand the operations and needs of all of the local groups who are all trying to accomplish the same goals. ATV radar is the vehicle to do it. It is up to someone, or some newly established *EARWARN* type group, to take charge and blend these groups and services.

For more information on this type of service, the *EARWARN Take Cover* newsletter is available. Send $1 and your SASE to Kurt Johnson KØOQP, c/o Cedar County ARC, Cedar County Courthouse, Tipton, Iowa 52772. 73



Map obtainable from packet radio on which observers plot the location and movement of storm cells.

HF Equipment	Regular	SALE
IC-781 Xcvr/Rcvr/ps/tuner/scope ...	5995.00	Call

IC-761	Xcvr/Rcvr/ps/tuner	2699.00	**2369**
HM-36	Scanning hand microphone	47.00	
SP-20	Ext. speaker w/audio filter ..	149.00	**139.95**
FL-101	250 Hz 1st IF CW filter	73.50	
FL-53A	250 Hz 2nd IF CW filter	115.00	**109.95**
FL-102	6 kHz AM filter	59.00	
EX-310	Voice synthesizer.....	59.00	

IC-751A	9-band xcvr/.1-30 MHz rcvr	1699.00	**1469**
PS-35	Internal power supply	219.00	**199.95**
FL-32A	500 Hz CW filter (1st IF)....	69.00	
FL-63A	250 Hz CW filter (1st IF)....	59.00	
FL-52A	500 Hz CW filter (2nd IF)...	115.00	**109.95**
FL-53A	250 Hz CW filter (2nd IF)...	115.00	**109.95**
FL-33	AM filter.....	49.00	
FL-70	2.8 kHz wide SSB filter	59.00	
RC-10	External frequency controller	49.00	

IC-735	HF transceiver/SW rcvr/mic	1099.00	**949.95**
PS-55	External power supply.....	219.00	**199.95**
AT-150	Automatic antenna tuner ...	445.00	**369.95**
FL-32A	500 Hz CW filter	69.00	
EX-243	Electronic keyer unit	64.50	
UT-30	Tone encoder	18.50	

Other Accessories	Regular	SALE
IC-2KL 160-15m solid state amp w/ps	1999.00	**1699**
PS-15 20A external power supply.....	175.00	**159.95**
PS-30 Systems p/s w/cord, 6-pin plug	349.00	**319.95**
MB Mobile mount, 735/751A/761A...	25.99	
SP-3 External speaker	65.00	
SP-7 Small external speaker	51.99	
CR-64 High stab. ref. xtal for 751A....	79.00	
PP-1 Speaker/patch.....	179.00	**164.95**
SM-6 Desk microphone	47.95	
SM-8 Desk mic - two cables, Scan.....	89.00	
SM-10 Compressor/graph EQ, 8 pin mic	149.00	**139.95**
AT-100 100W 8-band auto. antenna tuner	445.00	**389.95**
AT-500 500W 9-band auto. antenna tuner	589.00	**519.95**
AH-2 8-band tuner w/mount & whip	659.00	**589.95**
AH-2A Antenna tuner system, only....	519.00	**449.95**
GC-5 World clock.....	91.95	**79.95**

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IC-475A 25W 440 FM/SSB/CW w/ps	1399.00	**1099**
IC-475H 75W 440 FM/SSB/CW.....	1599.00	**1289**
IC-575A 25W 6/10m xcvr w/ps	1399.00	**1129**
IC-575H 100W 6/10m xcvr.....	1699.00	**1499**
IC-471H 75W 430-450MHz base (c/o)	1399.00	**989.95**
PS-35 Internal power supply	219.00	**199.95**
AG-35 Mast mounted preamp	99.95	
AG-35 (Purchased with IC-471H)	99.95	**9.95**
SM-6 Desk microphone	47.95	
EX-310 Voice synthesizer	59.00	
TS-32 CommSpec encode/decoder....	59.95	
UT-15 Encoder/decoder interface...	34.00	
UT-15S UT-15S w/TS-32 installed.....	96.00	

VHF/UHF/1.2 GHz Mobiles	Regular	SALE
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IC-47A 25w 440 FM/TTP mic... (c/o)	549.00	**399.95**
PS-45 Compact 8A power supply ...	145.00	**134.95**
UT-16/EX-388 Voice synthesizer ...	34.99	
SP-10 Slim-line external speaker ...	35.99	
IC-28A 25W 2m FM, **TTP** mic	469.00	**409.95**
IC-28H 45W 2m FM, **TTP** mic	499.00	**439.95**
IC-38A 25W 220 FM, **TTP** mic	489.00	**349.95**
IC-48A 25W 440-450 FM, regular mic	459.00	**369.95**
IC-48A 25W 440-450 FM, **TTP** mic....	509.00	**449.95**
HM-14 Extra TTP microphone	59.00	
UT-28 Digital code squelch	39.50	
UT-29 Tone squelch decoder	46.00	
HM-16 Speaker/microphone	34.00	
IC-228A 25W 2m FM/TTP scan mic...	509.00	**449.95**
IC-228H 45W 2m FM/TTP scan mic...	539.00	**479.95**
UT-40 Pocket beep function	45.00	
IC-900A Transceiver controller.....	639.00	**569.95**

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UX-19A	10m 10W band unit	299.00	**269.95**
UX-29A	2m 25W band unit.....	299.00	**269.95**
UX-29H	2m 45W band unit.....	349.00	**319.95**
UX-39A	220MHz 25W band unit....	349.00	**289.95**
UX-49A	440MHz 25W band unit....	349.00	**319.95**
UX-59A	6m 10W unit	349.00	**319.95**
UX-129A	1.2GHz 10W band unit ...	549.00	**499.95**
IC-1200A	10W 1.2GHz FM Mobile.....	699.00	**549.95**
IC-3200A	25W 2m/440 FM/TTP (c/o)	695.00	**499.95**
UT-23	Voice synthesizer.....	34.99	
IC-3210A	25w 2m/440 FM/TTP	739.00	**649.95**
AH-32	2m/440 Dual Band antenna ...	39.00	
AHB-32	Trunk-lip mount	35.00	
Larsen PO-K	Roof mount	20.00	
Larsen PO-TLM	Trunk-lip mount....	22.00	
Larsen PO-MM	Magnetic mount	22.00	
RP-1210	1.2GHz 10W 99 ch FM xcvr	1529.00	**1349**
RP-2210	220MHz 25W repeater	1649.00	**1469**
RP-3010	440MHz 10W FM repeater...	1299.00	**1149**

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

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Hand-helds	Regular	SALE
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IC-3AT 220/TTP (c/o)	349.00	**269.95**
IC-4AT 440 MHz, TTP	349.00	**299.95**
IC-02AT/High Power	409.00	**349.95**
IC-03AT for 220 MHz	449.00	**289.95**
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IC-u2AT for 2m w/TTP	329.00	**289.95**
IC-u4AT 440 MHz, TTP	369.00	**299.95**
IC-2GAT for 2m, TTP	429.00	**379.95**
IC-4GAT 440MHz, TTP	449.00	**399.95**
IC-32AT 2m/440MHz	629.00	**559.95**

IC-u2A for 2m **w/o TTP**
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IC-12AT 1W 1.2GHz FM HT/batt/cgr/TTP	473.00	**369.95**
IC-12GAT Dlx 1/7W 1.2GHz FM HT/TTP	529.00	**469.95**

Aircraft band handhelds	Regular	SALE
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A-20 Synth. aircraft HT w/VOR.....	625.00	**569.95**

Accessories for all except micros	Regular
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BP-8 800mah/8.4V Nicad Pak - use BC-35...	79.00
BC-35 Drop in desk charger for all batteries	79.00
BC-16U Wall charger for BP7/BP8.....	21.25
LC-11 Vinyl case for Dlx using BP-3	20.50
LC-14 Vinyl case for Dlx using BP-7/8	20.50
LC-02AT Leather case for Dlx models w/BP-7/8	54.50

Accessories for IC and IC-O series	Regular
BP-2 425mah/7.2V Nicad Pak - use BC35....	49.00
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	39.50
BP-4 Alkaline battery case.....	16.00
BP-5 425mah/10.8V Nicad Pak - use BC35	65.00
CA-5 5/8-wave telescoping 2m antenna	19.95
CP-1 Cig. lighter plug/cord for BP3 or Dlx....	13.65
CP-10 Battery separation cable w/clip.....	22.50
DC-1 DC operation pak for standard models	24.50
MB-16D Mobile mtg. bkt for all HTs.....	25.99
LC-2AT Leather case for standard models.....	54.50
RB-1 Vinyl waterproof radio bag.....	35.95
HM-9 Speaker microphone.....	47.00
HS-10 Boom microphone/headset.....	24.50
HS-10SA Vox unit for HS-10 & Deluxe only	24.50
HS-10SB PTT unit for HS-10.....	24.50
SS-32SMP Commspec 32-tone encoder	27.95

For other HT Accessories not listed please CALL

Receivers	Regular	SALE
R-71A 100kHz to 30MHz receiver.....	$999.00	**869.95**
RC-11 Infrared remote controller....	70.99	
FL-32A 500 Hz CW filter	69.00	
FL-63A 250 Hz CW filter (1st IF)	59.00	
FL-44A SSB filter (2nd IF).....	178.00	**159.95**
EX-257 FM unit.....	49.00	
EX-310 Voice synthesizer	59.00	
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Holiday Buyers Guide

ICOM

The IC-32AT 2m/70cm dual band hand-held is new from ICOM. It is a full-featured HT. The 32AT has five watts of power output on UHF, and five and a half watts out on VHF. It has out-of-band reception (138–174 MHz and 440–450 MHz). The 32AT also has full duplex capabilities when the two channels are in different bands.

There are also many memory features. The 32AT has 40 simplex memory channels, that allow storage of up to 20 duplex frequencies. Each independent memory stores frequency, offset, and subaudible tone. It also has programmed scan. The memory scans all the channels except the one you have locked out. The optional UT-40 tone squelch unit monitors busy channels and beeps and flashes when the subaudible tone is received. By pushing the monitor switch, you can check the repeater output. All ports have rubber plugs that insert into them when they are not in use. The IC-32AT also has priority watch, that monitors the call channel every five seconds while operating on another frequency. The IC-32AT is available for $629. For more information, circle Reader Service number 230.

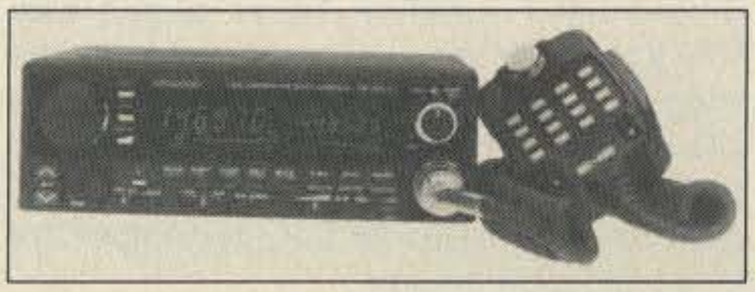
The IC-781 HF base station transceiver operates all modes and bands 160–10 meters, and receives continuously from 100 kHz–30 MHz. Its prominent feature is a band spectrum scope that displays signals in a 50/100/200 kHz range of the operating frequency. This all displays on a built-in five inch CRT screen. This screen displays frequencies, modes, memory contents, operating notes, RIT, two memo screens, and subdisplays for Packet and RTTY. The IC-781 also features dual band watch, twin passband tuning, 99 tunable memories, all wide and narrow filters, direct keyboard frequency entry, 150 watts output, built-in power supply, dual noise blanker, five multi-function timers, and two internal clocks.

Suggested retail for the 781 is $5,995. For more information on this and the IC-32AT, contact *ICOM America, Inc., Corporate Headquarters, 2380 116th Ave. NE, PO Box C-90029, Bellevue, WA 98009-9029; 206-454-8155.* The Reader Service number is 229.

KENWOOD

The new TH-25 2 meter hand-held is similar in size to the BT hand-held series. The TH-25 puts out 5 watts on the high setting. The frequency coverage of the TH-25AT is 141–163 MHz (RX) and 144–148 MHz (RX and TX). It has a front panel DTMF pad and 14 memories. Other features include automatic offset selection, multi-function LCD display, rotary dial for memory, tone alert for quiet monitoring, band and memory scan, automatic power-off circuit, and a CTCSS encode/decode unit (optional). It is also water-resistant. The price is $329.95.

The TM-621A is the first 144/220 MHz FM dual-bander. It includes a dual channel watch function, selectable full duplex operation, 30 memory channels, extended frequency coverage on receive (138–174 MHz and 215–230 MHz), large multi-color LCD display, and programmable scanning. The 621 outputs 45 watts on 144 MHz and 25 watts on 220 MHz. Also included is an automatic offset selection on both bands, and dual frequency display for "main" and "sub-band" with automatic band changes. The suggested retail price is $700. For more information contact *Kenwood USA Corporation, Communications and Test Equipment Group, 2201 E. Dominguez Street, Long Beach CA 90810; 213-639-4200.*



YAESU

The FT-747GX is a compact SSB/CW/AM and FM (optional) transceiver outputting 100 watts PEP on all HF amateur bands. It also has general coverage reception continuously from 100 kHz to 30 MHz. Features include operator selectable coarse and fine tuning steps optimized for each mode: 25 Hz and 2.5 kHz for SSB and CW, 1 and 10 kHz for AM, and 5 and 12.5 kHz for FM (with the optional FM board).

The 747GX has a dual VFO, along with 20 memory channels, which also store mode. You can choose frequencies, too, over which the scan skips. Scanning can be set for auto-resume. Memories are selectable from the microphone UP/DOWN keys. Eighteen of the memories can also store independent transmit and receive frequencies for non-standard split-frequency operation. Suggested retail price is $890. Circle Reader Service number 228 for more information.

The FT-767GX from Yaesu receives from 100 kHz to 30 MHz continuously and transmits on all HF amateur bands. The receiver design is an upconverting triple superheterodyne. The PLL includes a modular temperature-compensated crystal oscillator (TCXO), to minimize frequency drift.

Features include memorized programmable tuning steps for each mode, from 10 Hz to 100 kHz; digital wattmeter and auto-calculating SWR meters; and selectable VFO tracking, where both VFOs tune together (for convenient repeater operation). Ten memories include modes and a check function, by which memory contents may be displayed without affecting simultaneous operation on a VFO. There is also band, memory, and limited band scan.

The FT-767GX has a built-in automatic

antenna tuner. The automatic HF antenna tuner includes one memory per band. The contents of this memory automatically returns the settings to their previous positions for quick settings when changing bands.

Suggested retail price is $1,930. For more information, contact *Yaesu USA, 17210 Edwards Road, Cerritos CA 90701*. Circle Reader Service number 227 for more information.

HEATH

Heath's new SA-2060A deluxe antenna tuner will effectively tune and match balanced or unbalanced feedlines and single-wire and ladder lines up to 1 kW, on the 160–10 meter bands.

It features a dual wattmeter, single switch antenna selection, and total front panel control. With a single switch, the user can select a dummy load, or any of three permanently connected antennas, including a long-wire antenna.

Dual wattmeters read both forward and reflected average power, and in two ranges. The wattmeter section of the antenna tuner installs directly into a transmission line to measure the power on all frequencies between 1.8 and 30 MHz. It measures output up to 200/2000 watts in the forward direction and up to 50/500 watts reflected. The antenna tuner handles power input up to 2000 watts PEP on SSB, and 1000 watts on CW. The suggested retail price is $270. Circle Reader Service number 226 for more information.

Heath's HK-21 Pocket Packet TNC is the latest and smallest TNC available.

If your hand-held transceiver uses a mini phone jack for speaker output and a sub-mini for microphone, you can immediately connect the transceiver to the Pocket Packet unit at any time with the two shielded cables supplied. The HK-21 includes a built-in mini bulletin board. The HK-21 requires a
9 to 13.8V supply at 40 mA nominal current. The price is $219.95. For a free catalog and more information contact *Heath Company, Dept. 011-652, Benton Harbor MI 49022*. For this product, circle Reader Service number 225 for more information.

MFJ ENTERPRISES

The 3 kW Versa Tuner Model MFJ-989C is a full-featured HF antenna tuner. It has two large transmitting variable capacitors that can withstand 6000 RF volts. The 250 pF cap gives an extremely wide matching range, even on 160 and 10 meters. It also has a roller inductor. A three digit turns counter and a spinner knob give precise inductance control. You can use this tuner from 1.8 to 30 MHz, including MARS and all the WARC bands.

Retail on the MFJ-989C is $349.95. For more information contact circle Reader Service number 224.

Also from MFJ Enterprises is the new MFJ-986 2-knob 3 kW Differential-T Antenna Tuner with peak and average reading cross-needle SWR/wattmeter. The T-network tuner uses a single differential capacitor in place of two variable capacitors. It covers 1.8 to 30 MHz continuously, including MARS and all the WARC bands. The user adjusts only two controls. The MFJ-986 is broadband, which eliminates constant retuning. A three-digit turns counter plus spinner knob gives precise inductance control.

A lighted two color peak and average reading cross-needle SWR/wattmeter lets the user read forward and reflected power and SWR. It also has a new directional coupler that gives more accurate SWR and power readings over a wider frequency range. The six-position antenna switch lets you select two coax lines and/or random wires (direct or through tuner), balanced line, and external dummy load.

A new current balun for balanced lines reduces feedline radiation that causes RF in your shack, field pattern distortion, and TVI. Ceramic feedthrough insulators for balanced lines withstand high voltages and temperatures. The new MFJ-986 3 kW Roller Inductor Differential-T Antenna Tuner comes with MFJ's one year unconditional guarantee. The suggested retail price is $239.95. For more information contact *MFJ Enterprises, Inc., PO Box 494, Mississippi State, MS 39762; 601-323-6551*. Circle Reader Service number 214 for additional information.

GORDON WEST RADIO SCHOOL

Gordon West Radio School offers cassette theory courses for the following amateur radio license categories: 1) Novice–two cassette theory and two cassette code; 2) Technician–four cassette theory and textbook; 3) General–four cassette theory and textbook; 4) Combination Tech/General–four cassette theory and textbook; 5) Advanced–four cassette theory and textbook; 6) Extra–four cassette theory and textbook.

Each theory course features the new revised question pool that parallels the actual VEC-administered examination. Questions are covered on the cassettes in the same order as they are in the book.

Visually impaired will especially appreciate the fact that this course can be followed without any visual aids. The included textbook assists, however, in better understanding some schematic diagrams and block diagrams.

Each cassette course with its accompanying textbook is $19.95, plus $2.50 postage and handling, when ordering directly from Radio School. For more information write: *Gordon West Radio School, 2414 College Drive, Costa Mesa CA 92626; 714-549-5000*. Reader Service number 223.

WILLIAM M. NYE CO.

The Nye RF Power Monitor System contains many features. It gives peak, average, or peak and hold readings at a flick of a switch It has a sample and hold analog memory circuit capable of displaying for up to 20 seconds the correct peak power readings of a single 1 ms pulse. The power monitor automatically switches power scales to 5 kW. It has a built-in adjustable ALO. It comes with a directional coupler that goes in-line with the coax, and is connected to the meter with a four-conductor flexible cable. This lockout circuit for your amplifier will operate from either SWR or reflected power. It uses heavy duty relays with isolated contacts rated at 5 A at 120VAC/28VDC. The monitor is available in two models, the RFM-003 and RFM-005, which differ only in

wattmeter scaling. The models are priced the same at $297, and backed by the Nye full two-year warranty. For more information, contact: *William M. Nye Company, 1614 130th Ave. NE, Bellevue WA 98005; (206) 454-4524.* Circle Reader Service number 222.

KANTRONICS, INC.

Kantronics has combined the features of the KPC-2 and UTU-XT to create a true All-Mode unit, the KAM (Kantronics All Mode). It functions with VHF packet, CW, RTTY, ASCII, and AMTOR.

KAM features HF and VHF radio ports, simultaneous HF and VHF packet connects, digipeating, and VHF/HF gateway.

KAM also features bargraph tuning, user-programmable Mark and Space tones for RTTY and HF Packet, and limiter/limiterless operation on HF for weaker signal operation. KAM's separate CW demodulator is also center frequency and bandwidth programmable. The price is $319. For more information contact: *Kantronics, Inc., 1202 E. 23rd Street, Lawrence KS 66046.* Circle Reader Service number 221 for additional information.

ALINCO

Alinco Electronics, Inc., has introduced the DJ-100T hand-held 2 meter transceiver. The DJ-100T puts out about 3 watts in the high-power mode. A number of accessory batteries are available, which will supply up to 6.5 watts of output power.

The DJ-100T has a frequency coverage of 144–148 MHz, and is easily modified for CAP and MARS simplex operation. Also included are 10 memories, automatic battery saving feature, a function and frequency lock, and a subaudible tone encoder.

The price of the DJ-100T is $299. For more information on this product, contact: *Alinco Electronics, Inc., 20705 S. Western Ave., Suite 104, Torrance CA 90501; 213-618-8616.* For additional information circle Reader Service number 220.

HAL COMMUNICATIONS CORP.

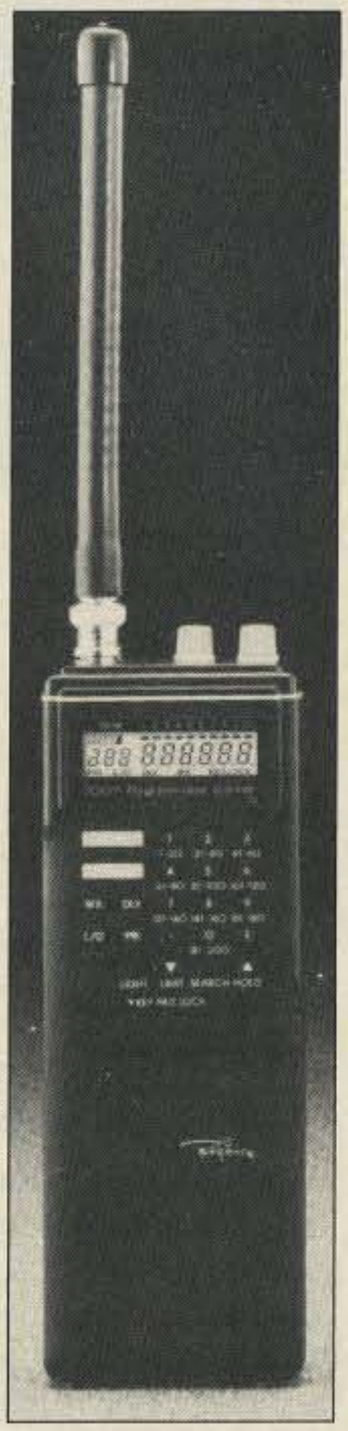
The ST-7000 is specifically designed for 300 baud HF packet. Techniques developed for the government and military ST-8000 (MD-1232/G) HF Modem are applied in the ST-7000 for the unique problems of high frequency packet radio operation.

AGC-controlled AM signal processing is used, providing a very wide dynamic range. All filters and detectors in the ST-7000 are optimized for 300 baud HF packet. The user has the choice of two modes: the standard 200 Hz shift mode, and the 600 Hz shift mode. Both shifts are fully supported by separate optimized 6-pole input filters and a 40 dB AGC system. The standard 200 Hz shift mode uses an optimized phase-locked loop (PLL) detector, whereas the more optimum 600 Hz shift mode uses separate 4-pole Mark/Space filters, active detectors, and a 3-pole post-detection filter. The transmit tone generator uses a proven crystal-based sine-wave synthesizer circuit to assure minimum phase distortion and spectrum splatter. The ST-7000 has three different packet controller (TNC) interfaces: RS-232C, TTL, and TNC Audio, making it fully compatible with all existing packet controllers on the market.

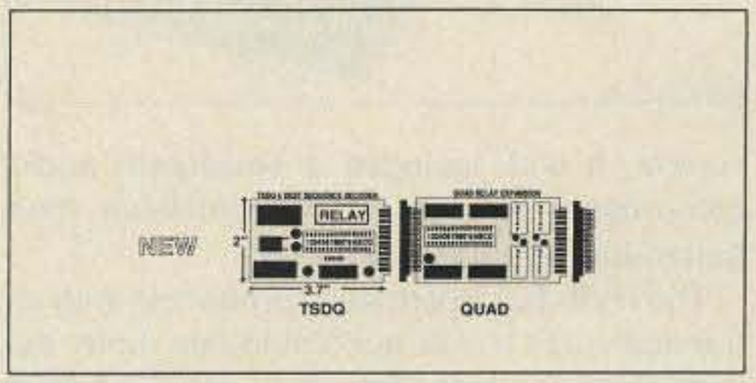
ST-7000 operates from +11 VDC to +15 VDC at .25 A. It is available for $299 from *Hal Communications Corp., Government and Commercial Products Division, 1201 West Kenyon Road, PO Box 365, Urbana IL 61801-365; 217-367-7373.* Circle Reader Service number 219 for more information.

UNIDEN

The new Regency R-4030 Programmable hand-held Scanner has many features. Among them are 800 MHz coverage with 12 bands including 806–956 MHz; 200 channel capacity; 10 priority channels to keep a close watch on up to 10 channels; 10 channel banks to store frequencies for convenient use; rechargeable batteries with a detachable battery pack; weather search to find the NOAA weather channel that is active in your area; keypad lock; channel lockout to lockout unused or busy channels to concentrate on others; and a track tuning feature that gives perfect tuning on every channel for crystal clear reception.



The R4030 is available for $399 from *Regency, Uniden Corporation, 4700 Amon Carter Blvd., Ft. Worth TX 76155.* Circle Reader Service number 218 for additional information.



ENGINEERING CONSULTING

The new Model TSDQ four digit sequence decoder replaces the popular TSD decoder and adds several new features, including a DPDT 2 A relay, on-board 5 volt regulator, and digit valid indicator and expansion connector. Board connections are via a 24-pin card edge connector, which provides quick disconnect and the added feature of expansion with the new Model "Quad" four relay expansion card.

The TSDQ operates as a stand-alone two to four digit touch-tone sequence decoder. The output may be either latching or momentary control of the DPDT relay. All 16 digits output to the card edge connector and can be used for single digit commands. The relay is turned on with a four digit code and relays which may be turned off with individual access codes. A master on code followed by the relay will turn on a relay while a master off code followed by the relay number turns the relay off. These relay on/off codes can be a total of three to five digits in length. In addition to the relay outputs, there are four transistor outputs that can be used to provide LED read-outs of the relay states, or as control voltage for other devices. All output connections are via a 24 pin card edge connector using the same pin numbers for all inputs as the TSDQ card. This allows instant compatibility when adding the Quad expansion card.

The TSDQ and quad specifications are: +8 to +20 VDC of power, 200 mV–3 VAC of audio, 2 amp double pole relay for output TSDQ, 16 individual digits (0–5V), and 2 A 4DP relays for logic output quad is four double pole relays with 2 amps. The price for the TSDQ is $79.95 and the price for the Quad is $99.95. For more information contact: *Engineering Consulting, 583 Candlewood Street, Brea CA 92621; 714-671-2009.* Circle Reader Service number 217 for additional information.

NEL-TECH LABS

The NTL Digital Voice Keyer (DVK-100) is a state-of-the-art microprocessor controlled digital voice storage and announcement system. It has been designed specifically for amateur radio communications and represents the latest technology in audio processing.

The DVK-100 provides four independently selectable, variable length, voice storage memories. It also contains a built-in selectable audio amplifier capable of driving an external 8Ω speaker, with mute and high/low level

control. It also includes a selectable audio compressor and end of transmission tone generator have been included.

The DVK-100 is virtually compatible with all transceivers. It will accommodate both dynamic and condenser mikes and both positive and negative PTT transceiver inputs. The DVK-100 suggested retail price is $260. For more information contact *Nel-Tech Labs, Inc., PO Box 1030, Londonderry NH 03053.* Circle Reader Service number 216.

STONE MOUNTAIN ENGINEERING CO

Stone Mountain's KW-QSYer for Kenwood rigs provides high speed keying and easy frequency selection. Its full-size keypad is inclined at a 10 degree angle for comfort as well as speed. It is popular with contesters and blind operators. It has an internal speaker that sounds a different tone for each key. The KW-QSYer works with the TS-940 series (with the Kenwood IF-10B interface), the TS-440 series (with the IC-10 interface), the TS-140 series (with the IF-10C interface), the TS-711/811 series (with the IF-10A interface), and requires an 8–16V, 100 mA, external DC supply. The sister models are available for the 757GX, 757GX-II, 767GX, and the IC-735. Priced at $89.50 plus $2.50 shipping. A companion 12-volt DC wall supply for the KW-QSYer is $10. For more information contact *Stone Mountain Engineering Company, Box 1573, Stone Mountain GA 30086; 404-879-0241.* Circle Reader Service number 215.

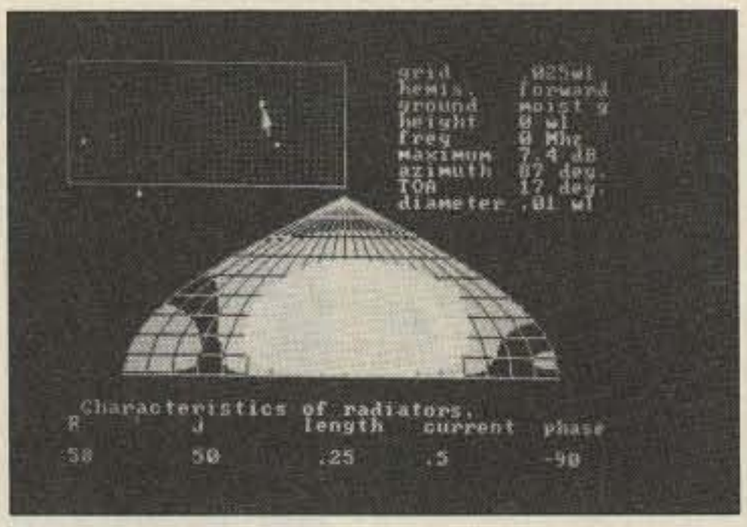
CALL SIGN CUPS

Call Sign Cups will personalize 10 oz. coffee mugs and/or 15 oz. beer mugs with your call sign. Ceramic decals are placed on stoneware mugs. They are machine washable and microwave safe. The prices are $5.95 for the coffee mug and $7.95 for the beer mug, plus shipping and handling. Quantity discounts for clubs are available. For more information contact *Call Sign Cups, PO Box 17062, Raleigh NC 27619.*

EPSILON COMPANY

Epsilon Company announces Vertical Pro, software that enables you to design medium wave and short wave vertical arrays. By modeling several possible antennas before building, you can decide what to build on an objective basis. Vertical Pro gives you the capability to design your own at an affordable price. Modeling the antenna first will stimulate creativity in finding better solutions given limited resources.

The Vertical Pro gives a sinusoidal projection of the radiation pattern. This is a flat projection of the three dimensional radiation pattern, color coded according to signal intensity. The projection can be explored with a mouse or cursor keys and the gain can be read at a particular azimuth and take off angle in a window below. Antennas modeled with Epsilon's software can be modeled over your choice of ground types such as: sea water, fresh water, moist, average, or dry earth. The projection is displayed in the center of the screen, the original grid is on the upper left, and a report is on the upper right. By moving the cursor over an element on the grid, the resistance, reactance and element parameters are displayed on the bottom. Moving the cursor over the sinusoidal projection will display the gain at a particular take-off angle and azimuth.



Epsilon software runs on IBM-PCs and compatibles with at least 256K (640K recommended), DOS 2.0 or higher. CGA or EGA needed. The programs can make use of a 8087/80287 math co-processor and a mouse.

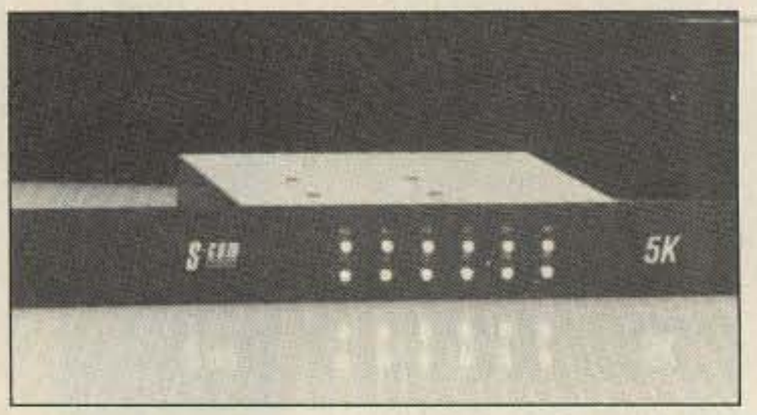
Vertical Pro sells for $80 plus $5 for international shipping. Order by sending a US check or international money order in US dollars to *Epsilon Co., PO Box 715, Trumbull, CT 06611; 203-261-7694.* Circle Reader Service number 213 for more information.

S-F AMATEUR RADIO SERVICES

The S-F Radio Desk STD-36, from S-F Amateur Radio Services, eliminates clutter by providing enough space for a complete radio station. It has enough space for antenna tuners, VFO, CW keyers, filters, telephone, and log books. It will support over 200 pounds. It comes as a quick-assemble kit. The rear shelf is angled at 15 degrees for better viewing of the displays. The S-F Radio Desk is 50″ high by 39″ wide. The suggested retail price is $200. For more information contact: *S-F Amateur Radio Services, 4384 Keystone Ave., Culver City, CA 90230; 213-837-4870.* Circle Reader Service number 212 for more information.

S-COM INDUSTRIES

S-COM Industries introduces an option display cabinet for the S-COM 5K repeater controller. This cabinet may be retrofitted to the 5K controller without soldering or rewiring. The front panel is made with non-chipping black anodized, with white graphics and hidden fasteners. The red Hewlett-Packard AlGaAs LED lamps inform the viewer of important circuit status data, e.g. receiver COR, transmitter PTT, CTCSS decoder, control receiver COR, DTMF data valid, power on, logic inputs 1, 2, and 3, and logic outputs 1, 2, and 3. These LED lamps draw only 1 µA each.



A conductive iridite-plated chassis box reduces RFI and houses the 5K board, display board, and an optional audio delay module. The cabinet provides cutouts for the 5K's power and input/output connectors, and uses PEM fasteners to eliminate troublesome nuts and standoffs. A ribbon cable assembly attaches to connectors located on the 5K and display boards, making for easy installation. The assembled and tested display cabinet is priced at $69 plus $5 shipping and handling. A similar cabinet is available without the display feature. Contact *S-COM Industries, PO Box 8921, Fort Collins, CO 80524; 303-493-8316.* Circle Reader Service card number 211 for more information.

MFJ ENTERPRISES

MFJ Enterprises Inc. has a new MFJ-109 World Time Clock. This clock features a sliding indicator you can set to learn the times of any of 24 international cities. It has a 24-hour world time display and a local time display. The LCD characters are ⅜" high.

The MFJ-109 also has a Greenwich Mean Time (GMT) pointer for instant access to the international standard. Other features include alarm with snooze, night light, daylight savings time adjustment, date change indicator, suede-like carrying case, and flip stand. The MFJ-109 World Time Clock comes with a one year unconditional guarantee. Price is $18.95. For more information, contact *MFJ Enterprises Inc., PO Box 494, Mississippi State, MS 39762; 601-323-5869. Call 800-647-1800 to order.* Circle Reader Service number 210 for additional information.

SIBEX INC.

The VR-1 is one of the new lines of portable test equipment from Sibex Inc. The VR-1 is a battery-powered voltage calibrator. The user can select its output from 10 mV to 10 V in a 1-2-5 sequence, using the 11 position switch Both + and − voltages are available at the output terminals. The front panel has a low battery indicator. The VR-1 can be used for equipment servicing and calibration, R&D work, instrument calibration, and recorder calibration, to name a few applications.

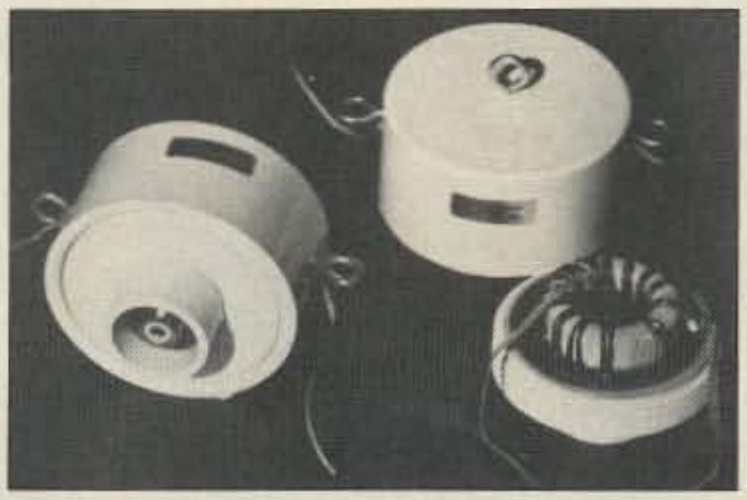
It is housed in a pocket sized plastic case, shaped for convenient holding. The power is supplied by a standard 9V battery contained within the case. VR-1 is available from stock at $89.95. For more information, contact *Sibex Inc., 1088 Kapp Drive, Clearwater, FL 34625; 813-441-8525.* For additional information, circle Reader Service number 209.

CUSTOM TECHNOLOGY

Custom Technology now offers a line of wideband RF BALUN antenna auto-transformers. The transformers match unbalanced loads (coax) to balanced loads (antennas and ladder transmission lines).

The BALUNs are rated at 2 kW (PEP) from 1.8 to 30 MHz continuous. The cores are powdered iron toroidal types covered with glass tape. Windings are high isolation magnet wire to ensure maximum performance without breakdown even when subjected to high SWR conditions.

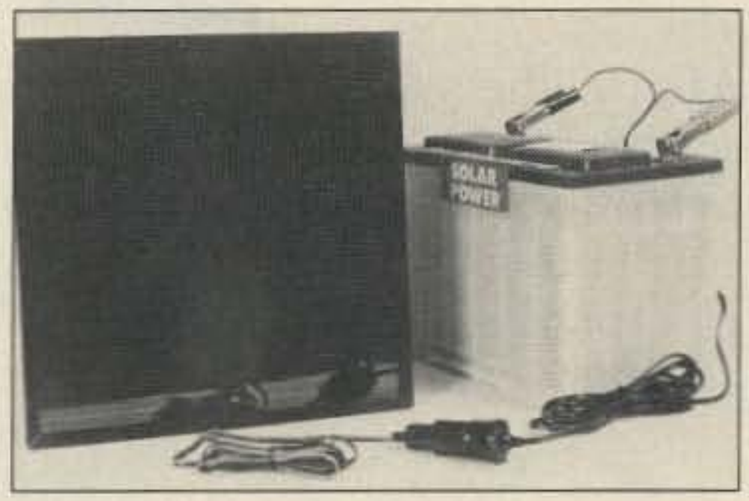
Available ratios are 1:1, 1:4, 1:6, and 1:9. Coaxial termination is made with a UHF SO-239 receptacle. The coaxial connection is housed in a PVC cover. An "N" type receptacle is available at extra cost as a special order. The 3" x 4" BALUN is made of cadmium steel; the termination is made of flexible copper braid. The complete BALUN assembly is potted in epoxy backfill for ruggedness. The price for each BALUN is $25. Multiband antenna kits are available for $35 each, plus $3 for shipping and handling. Product literature is available on request from *Custom Technology, 8385 Locust, Kirtland OH 44094.* For more information, circle Reader Service number 208.



SCOOTER PRODUCTS

Scooter Products' Model SP4M Guard-It™ Surge Protected Outlet Strip protects modular FAX, modem, and electronic equipment and peripherals from surges and noise. Model SP4M has an anti-static grounding jack for your anti-static accessories, such as touch pads and screens. There is full MOV protection on the power sockets to protect your equipment.

Model SP4M handles peak surge currents up to 6000 amperes with a clamping time of less than 1 nanosecond. In addition to a master on-off lighted switch, the Model SP4M has a surge failure light which indicates abnormal voltage or noise. This UL listed unit includes a resettable circuit breaker and a six-foot heavy duty cord. The Model SP4M Surge Protected Outlet Strip is $89.95. *Scooter Products, Ohm/electronics, Inc., 746 Vermont St., Palatine IL 60067. 800-323-2727 (Illinois, 312-359-6040); FAX number is 312-359-9686.* For more information, circle Reader Service number 206.



SOLAR ELECTRIC

Hams and other radio operators can keep their batteries fully charged with Solar Electric's new line of solar battery chargers. Measuring only a few feet square, the Maintainer 2 model is portable enough to bring almost anywhere. The panels will keep storage batteries charged on-site, or power the devices directly during daylight hours. The new generation of solar panels are also more sensitive to low light levels and more efficient in high temperature sites. The Maintainer 2 is available for $89.95. For technical details, write or call *Solar Electronic, 175 Cascade Court, Rohnert Park, CA 94928; 800-832-1986 or 707-586-1987.* Circle Reader Service number 205 for additional information.

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AERIAL VIEW

Antenna News

Arliss Thompson W7XU
RR 3, Box 224
Sioux Falls SD 57106

Transmission Line Transformers

The column covering transmission line transformers in the August 1988 issue of *73* generated more feedback than any previous installment of *Aerial View*. This month's column will be devoted to answering some questions and making comments of general interest to all readers.

Many attempted to run the BASIC program listed in that article, but had problems with it. Readers alerted me to several problem areas. Joel WBØQGF pointed out two errors in the program listing. First, there are two lines numbered 220. Change the first line number to 200. The second error in the listing is in line 470. In this line, change "nad" to "and."

A number of persons complained that, while they were able to get the program to run in the quarter-wave transformer mode, they ran into difficulties when they used the series section mode. The general theme seemed to be that, in the program, the impedances of the matching section and the main transmission line were too close in value. Since some of these comments came from users of IBM clones and GW BASIC (the same version of BASIC that I use), the difficulty probably arose from constraints imposed by the program and its equations.

Impedance Values

Recall that the impedance of the matching section cannot be too close to that of the main transmission line. Program lines 230–280, and line 340, involve some calculations that determine if those two impedances are too close in value. The general rule is to first calculate the SWR that would exist if the antenna and main transmission line were not matched. If the square root of that number is greater than 1, then the impedance of the matching section should be greater than the square root of the SWR multiplied by the impedance of the main transmission line.

Next, reverse the numerator and denominator in the SWR calculation. The impedance of the matching section is now acceptable, being less than the square root of the SWR times the impedance of the main transmission line. For example, say the antenna has an impedance of 200Ω and the main transmission line has an impedance of 50Ω. Without matching, the SWR would be either 4/1 (that is, 4:1) or 1/4 (normally SWR is calculated so that it is always greater than 1, but we must make an exception in this case).

The square root of 4/1 is 2. Therefore, the matching section must be greater than 2(50) = 100Ω, or it can be less than the square root of 1/4 times the main line impedance. With this example, that means that the matching section impedance would also be acceptable if its impedance was less than 1/2(50) = 25Ω. If you have difficulty with this, try working through the examples that appeared in the column. The answers in the examples were calculated by the listed program. If you have problems with the examples, check your listing for the above corrections.

BASIC Problems

An ever-present hazard of writing programs in BASIC is that different computers frequently use different versions of BASIC. For example, a BASIC program written on an IBM clone may not run perfectly on a Commodore machine. In fact, it may not run at all! Larry W8VLN wrote that his Commodore 64 consistently gave an error message when he tried to run the series-section portion of the August program.

Speaking of BASIC dialects, I know of at least one book which can help you translate different versions of BASIC—*The BASIC Handbook*, by David Lien (Compusoft Publishing, PO Box 19669, San Diego, California 92119; 1981). It may no longer be in print, but it might be available at your local library. Similar volumes may also be available from your local computer store.

Those readers with Apple II or IBM PC computers may be interested in an offer from Larry W1HUE. He wrote an improved version of this program in "Applesoft" BASIC as well as in PC-style BASIC. He also has another short program that calculates the design parameters for antenna traps made from coaxial cable. Larry will supply copies of both programs for $10 ($12 for overseas airmail) to cover the cost of the disk and mailing. They are available on either 3.5" or 5.25" diskettes in either IBM or Apple format (specify which). Write to Larry East W1HUE, 119-7 Buckland St., Plantsville, CT 06479.

Frequency Specific

Another question centered on transmission line transformer use in the field. One reader wanted to know what length of series-section matching transformer he should use to feed a multiband trap dipole. Unfortunately, series-section transformers are frequency specific; they work over a relatively narrow band of frequencies, such as an amateur band, but not on multiple bands. The same is true for quarter-wave transformers (a special case of series-section transformers), quarter- and half-wave baluns, etc. It's not possible to feed a multiband antenna through a single series-section transformer and obtain the correct impedance transformation on all bands.

Another reader asked whether series-section transformers function as baluns. The answer is no. A balun is a device that matches an unbalanced line (such as coax) to a balanced line or load (such as open wire line or a dipole antenna). Series-section transformers here *match impedances*. They could be coiled to form an RF choke type of balun, or ferrite beads could be slipped over the outside of coaxial series-section transformers to choke off currents flowing on the outside of the coax.

Ground Systems for HF Verticals

The recent column on ground systems and vertical antennas brought in some interesting questions. Let's see how your answers compare to mine.

Q. "The well-known manufacturer of my multiband trap vertical says that the antenna has minus 3-dB gain compared to a dipole. This is less than that of an isotropic antenna—can this be true?"

A. Keep in mind that a dipole has 2.14-dB gain over an isotropic antenna *only in free space*. Over perfect ground, an additional 6-dB of gain is possible (the direct and reflected waves reinforce each other); gain over real ground is less, but still important. Even if this gentleman's antenna has 3-db less gain than a dipole, it may still show gain over an isotropic radiator, particularly when over very good ground.

Now for the meat of the question: might a vertical be 3-db down from a dipole? Yes! A vertical with better than a fair ground system can easily be fifty percent or less efficient. Dipoles, on the other hand, are typically over 90 percent efficient. Of course, this analysis overlooks any differences in polarization, angle of maximum radiation, and so forth, but as a general statement, yes—a multiband vertical over fair to poor ground will probably be 3-dB or more down from a dipole.

Q "I have a horizontal monobander 18 feet above my roof. The roof is 13 feet above ground. Does my antenna think it is 18 feet above ground, or 31 feet up? Do wires running across the roof act as a ground?"

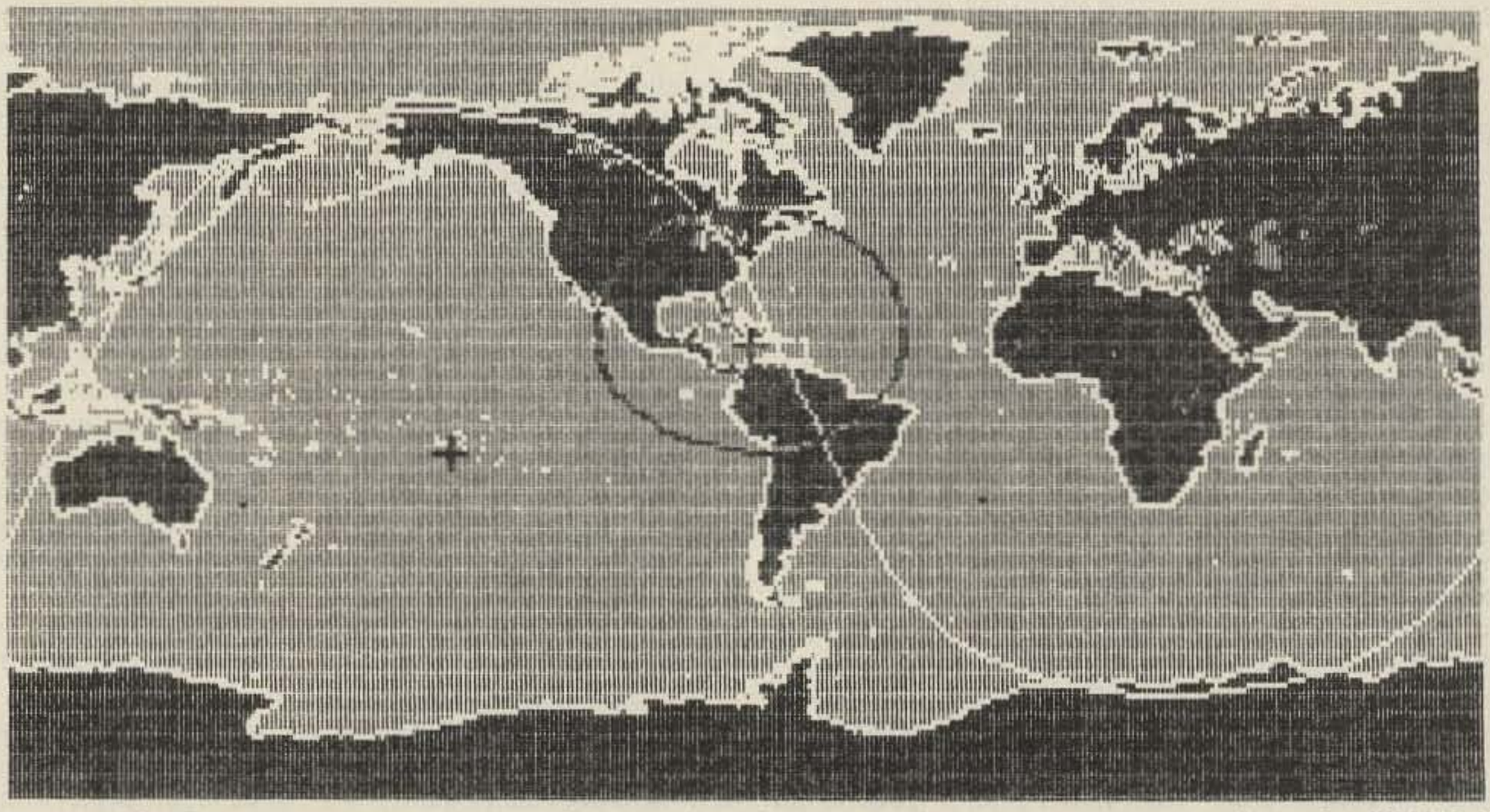
A This ham's antenna probably "thinks" it is 31 feet or so above ground, as far as distant communication is concerned. Radiation straight up may be reinforced by wires lying beneath the antenna, but that radiation will be of little use on the higher frequency bands. As the angle of radiation is lowered, the reflection point moves farther from the antenna. At low angles of radiation, the area of reflection for the antenna may be up to 10 wavelengths away.

If the roof were very large in terms of wavelength, there could be some ground effect from nearby wires lying beneath the antenna, though this is not likely in most suburban or rural locations. Note that these comments are directed with regard to a horizontal antenna. Also, the ground may not be RF ground. The point of reflection for signals typically does not occur exactly at ground level, but rather it is usually a few inches to a few feet below the surface. It is deeper in poor soil, and closer to the surface over highly conductive surfaces.

That's it for this month. Thanks to all of you who wrote with questions, comments, and suggestions. Due to my recent move, replies to some requests for information have been somewhat less than prompt, but any backlog will have been cleared by the time this appears in print. My apologies for any delays. Keep those cards and letters coming (with SASEs, please, for a reply). 73

Satellite Tracking

with your PC and the Kansas City Tracker & Tuner



The **Kansas City Tracker** is a hardware and software package that connects between your rotor controller and an IBM XT, AT, or clone. It controls your antenna array, letting your PC track any satellite or orbital body. The **Kansas City Tracker** hardware consists of a half-size interface card that plugs into your PC. It can be connected directly to a Yaesu/Kenpro 5400A/5600A rotor controller. It can be connected to other rotor assemblies using our Rotor Interface Option.

The **Kansas City Tuner** is a companion product that is used in satellite work. It can provide automatic doppler-shift compensation for digital satellite work. Using our new **F-Trak** feature it can also slave the uplink radio frequency to the downlink radio's frequency. The **Tuner** is compatible with most rigs including Yaesu, Kenwood, and Icom. It controls your radio thru its serial computer port (if present) or through the radio's up/down mic-click interface.

The **Kansas City Tracker** and **Tuner** include custom serial interfaces and do not use your computer's valuable COMM ports. The software runs in your PC's "spare time," letting you run other programs at the same time.

The **Kansas City Tracker** and **Tuner** programs are "Terminate-and-Stay-Resident" programs that attach themselves to DOS and disappear. You can run other DOS programs while your antenna tracks its target and your radios are tuned under computer control. This unique feature is especially useful for digital satellite work; a communications program like PROCOMM can be run while the PC aims your antennas and tunes your radios in its spare time. Status pop-up windows allow the user to review and change current and upcoming radio and antenna parameters. The KC Tracker is compatible with DOS 2.00 or higher and will run under DESQ-VIEW.

Satellite and EME Work

The **Kansas City Tracker** and **Kansas City Tuner** are fully compatible with AMSAT's QUIKTRAK (3.2) and with Silicon Solution's GRAFTRAK (2.0). These programs can be used to load the **Kansas City Tracker's** tables with more than 50 satellite passes. We also supply assembled & tested TAPR PSK modems with cases and 110v power supplies.

DX, Contests, and Nets

Working DX or contests and need three hands? Use the **Kansas City Tracker** pop-up to work your antenna rotor for you. The **Kansas City Tracker** is compatible with all DX logging programs. A special callsign aiming program is included for working nets.

Packet BBS

The **Kansas City Tracker** comes complete with special control programs that allow the packet BBS user or control-op to perform automated antenna aiming over an hour, a day, or a week. Your BBS or packet station can be programmed to automatically solicit mail from remote packet sites.

Vision-Impaired Hams

The **Kansas City Tracker** has a special morse-code sender section that will announce the rotor position and status automatically or on request. The speed and spacing of the code are adjustable.

The **Kansas City Tracker** and **Tuner** packages include the PC interface card, interface connector, software diskette, and instructions. Each Kansas City unit carries a one year warranty.

- KC Tracker package for the Yaesu/Kenpro 5400A/5600A controller $189
- Interface cable for Yaesu/Kenpro 5400A/5600A ..... $ 19
- KC Tracker package with Rotor Interface Option (to connect to ANY rotors) $199
- KC Tuner (must be purchased with KC Tracker) .... $ 79
- Assembled & tested TAPR PSK modem with case & 110v power supply $219
- AMSAT QuikTrak software ..... $ 75

Visa and MasterCard accepted.
Shipping and handling: $5, $20 for international shipments.
Prices subject to change without notice.

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Communications Products
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For more info: Telephone 609-751-1018
CompuServe 72677,1107

CIRCLE 11 ON READER SERVICE CARD

Number 20 on your Feedback card

HAMSATS

Amateur Radio Via Satellite

Andy MacAllister WA5ZIB
14714 Knightsway Drive
Houston TX 77083

Photo B. Mission patch from STS-26: America's return to space.

A Great Year!

Wow! 1988 has been the best year ever for the amateur satellite program. Hamsats have come a long way since the launch of OSCAR 1 in December, 1961. Twenty-seven years ago, we had a single small transmitter in space sending "HI" in code as it circled the earth, until atmospheric drag took its toll a few short months later. Today the picture is much different.

For me, 1988 satellite activity started a few minutes after New Year's festivities had subsided. AMSAT-OSCAR 10 was up and running in Mode B (70 cm up and 2 meters down) with good access to Europe. After a leisurely conversation with G1IMM, a check of my satellite predictions showed RS-10/11 available with a pass to the west. WA6TKV and N6DGK were both ready with New Year's greetings for those on RS-11 Mode A (2 meters up and 10 meters down). Later that day, I tracked more RS-10/11 passes which yielded contacts all across North America. The UoSAT spacecraft, U-O-9 and U-O-11, were both sending telemetry and messages at 1200 baud on 2 meters. Fuji-OSCAR-12 was soon to be available with its digital packet-radio system bulletin board using Mode J (2 meters up and 70 cm down). Operation via the analog J transponder continued for voice communications. Things were looking good for 1988, and they only got better.

Those Still With Us

OSCARs 9, 10, 11 and 12 are still with us as the year comes to a close. U-O-9 continues with telemetry and bulletins. A-O-10 is available again for contacts as its orientation of its panels to the sun improves. The loss of control due to onboard memory degradation has not affected the Mode B transponder's performance. The only concern among those active on this five-and-a-half-year-old satellite is for the batteries. During each period of off time, when the satellite's panels are pointed away from the sun, the batteries experience serious and potentially damaging discharge. During September, the beacon was occasionally heard sending meaningless PSK, indicating that complete discharge could be causing system resets at low voltage levels. As long as the batteries hold on without shorting internally, A-O-10 with its high elliptical orbit may provide many more months, or even years, of service.

Earlier this year, U-O-11 performed admirably during the transpolar Ski-Trek operation involving a joint Canadian and Soviet group of skiers. This University of Surrey satellite is now back to its normal activities with the digital communications experiment, radiation measurements, and digitalker synthesized voice transmissions.

F-O-12 still suffers from its negative power budget. The systems require more electricity than the solar cells can provide. The schedule of digital and analog transponder activity alternates with recharge days to keep the batteries up. The JARL (Japan Amateur Radio League) has provided satellite itineraries as much as a month at a time, though. This has helped remove the guesswork from F-O-12 operation. It is no longer necessary to listen for a pass in hopes of finding an active transponder. AMSAT North America forwards the schedule updates every week via HF and satellite nets, and also publishes them in *Amateur Satellite Report*, the bi-weekly newsletter for members.

RS-10/11 seems to be stuck. For 1988 there has been no RS-10 operation, and Mode T (15 meters up and 2 meters down) has not been heard via either unit. For the year, we have had Modes A and K (15 meters up and 10 meters down) via RS-11. Mode A has been active continuously, while K can be used on weekdays. Uplink sensitivity is still excellent and downlink signals are strong. The auto-transponder, ROBOT, has been calling CQ on 29.452 MHz every day. Many stations have received QSLs for ROBOT contacts. Unfortunately, they are old RS-5/RS-7 cards with RS-10 or RS-11 handwritten over the old satellite names.

AO-13 Settles In

On June 15th, A-O-13 joined the club of active hamsats. After several months of great contacts, system tests and flawless ground control, the verdict is in. This is the satellite for which we've been waiting. With A-O-10 still performing well when properly illuminated, we now have two Phase 3 type (high-orbit and long-life) satellites.

Thousands of stations are set up for Modes B and J. A few hundred are on Mode L (23 cm up and 70 cm down), and a few dozen have been on the air via Mode S (70 cm up and 13 cm down).

During September, tests were run on the Mode S transponder. The beacon frequency was quite different from previous announcements and charts, but the transponder limits were close. The average Mode S station has 2 kW effective radiated power for the 70 cm uplink and a five-foot dish with a GaAsFET preamplifier for the 13 cm downlink. Due to the highly directional helix antenna on the satellite for the 13 cm downlink, you can only operate Mode S when the satellite's antennas are aimed directly at the earth. Short stretches of S activity have been scheduled in the middle of Mode L periods, another mode with highly directional characteristics.

Now that the satellite's circuitry has stabilized, accurate frequency lists have been made. Bob N5LCO composed Table 1 using data from AMSAT-NA and Bill McCaa KØRZ. Bill was the designer and project manager of the Mode S system.

Shuttle Activity

Amateur satellite enthusiasts around the world closely followed the launch, in-orbit activities, and the landing of STS-26. The mission did not carry any amateur radio equipment, but it represented a return to space for America and the potential return of ham-in-space activities on future shuttle flights.

Most hams recall the 2 meter activities of Dr. Owen Garriott

Photo A. RS-11 "re-made" QSL card.

W5LFL on STS-9 in December, 1983. Signals from Owen's HT and window-mounted antenna on 145.55 MHz were excellent. Ten years of planning had finally paid off. Earlier requests to place a ham rig on Skylab had been turned down.

During the summer of 1985, Dr. Tony England W0ORE on board the Challenger provided many scheduled voice contacts and excellent SSTV (slow scan television) transmissions from space. Even though there was little time for making casual contacts, the TV system was activated much of the mission.

In late autumn 1985, Spacelab mission D1 took two German amateurs and one Dutch ham to low-earth orbit on board the Columbia. Using the callsign DP0SL, this operation used 70 cm as an uplink with 2 meters as the downlink. A CQ message in Morse Code (F2 transmission) could be heard on 2 meters when the system was not used for voice communications. Listeners could then call on 70 cm (FM voice) in hopes of being heard by the DP0SL receiver and recorded on tape.

AMSAT OSCAR-13 Phase 3C
Operating Modes and Frequencies

Mode JL

L Uplink	*J Uplink*	*Downlink*	*Sum = 1705.356 / Sum = 580.413*
1269.351 MHz		436.005 MHz	L passband upper limit
1269.361		435.995	
1269.366	144.423 MHz	435.990	J sub-band upper limit
1269.376	144.433	435.980	
1269.386	144.443	435.970	
1269.391	144.448	435.965	J sub-band center
1269.396	144.453	435.960	
1269.406	144.463	435.950	
1269.416	144.473	435.940	J sub-band lower limit
1269.421		435.935	
1269.431		435.925	
1269.441		435.915	
1269.451		435.905	
1269.461		435.895	
1269.471		435.885	
1269.481		435.875	
1269.491		435.865	
1269.496		435.860	L passband center
1269.501		435.855	
1269.511		435.845	
1269.521		435.835	
1269.531		435.825	
1269.541		435.815	
1269.551		435.805	
1269.561		435.795	
1269.571		435.785	
1269.581		435.775	
1269.591		435.765	
1269.601		435.755	
1269.611		435.745	
1269.621		435.735	
1269.631		435.725	
1269.641		435.715	
1269.731	RUDAK up	435.677	Engineering beacon/RUDAK downlink
		435.675	
		435.665	
		435.655	
		435.651	General beacon

Mode B

Uplink	*Downlink*	*Sum = 581.398*
	145.985 MHz	Engineering beacon
435.423 MHz	145.975	Passband upper limit
435.433	145.965	
435.443	145.955	
435.453	145.945	
435.463	145.935	
435.473	145.925	
435.483	145.915	
435.493	145.905	
435.503	145.895	
435.508	145.890	Passband center
435.513	145.885	
435.523	145.875	
435.533	145.865	
435.543	145.855	
435.553	145.845	
435.563	145.835	
435.573	145.825	Passband lower limit
	145.812	General beacon

Mode S

Uplink	*Downlink*	*Diff = 1965.113*
435.636 MHz	2400.749 MHz	Passband upper limit
435.635	2400.748	
435.630	2400.743	
435.625	2400.738	
435.620	2400.733	
435.619	2400.732	Passband center
435.615	2400.728	
435.610	2400.723	
435.605	2400.718	
435.602	2400.715	Passband lower limit
	2400.661	Engineering beacon

Mode B and Mode JL are inverting transponders, i.e. up on LSB, down on USB
Mode S in non-inverting, i.e. up on USB, down on USB

AMSAT OSCAR-13 Phase 3C operating modes and frequencies.

Columbia again played host to an amateur radio project in early January 1987. MARCE, the Marshall Amateur Radio Club Experiment, flew in a Get Away Special canister. Using a voice synthesizer, data from the alloy solidification experiment, the plant physiology experiment, and the crystal growth experiment, flowed to ground stations on 70 cm. The transmission frequency was set to match the uplink band of A-O-10, allowing linking of the transmissions through the satellite for those not able to monitor the signals from the payload bay directly.

Dr. Ron Parise WA4SIR will continue in the tradition of the previous amateur activities with SAREX-2 (Shuttle Amateur Radio Experiment number 2). In addition to voice contacts, Ron will have a packet radio system. It will be activated continuously to allow automatic contacts to be logged during times when the station is not manned. The ROM (Read-Only memory) software has been in a TNC (terminal node controller) and on the air from the Johnson Space Center with the callsign W5RRR.

Ron's mission was originally scheduled for March 1986. Now it is planned for March 1990. Other opportunities to fly the SAREX-2 equipment may come before then, but at least ham-in-space activity is on the NASA manifest. Till then we have four microsats, RS-12/13, JAS-1B, and two UoSATs waiting for their trips to space. While 1988 was great, '89 may be better yet. 73

Number 21 on your Feedback card

LETTERS

From the Hamshack

73 Worldwide

As usual, *73* has always provided interesting articles and information. However, the days are gone when the magazine could be considered an "American" magazine. With its primary and secondary readership worldwide, the editorial slant ought to lay greater emphasis on the needs of hams worldwide.

J. Srinivasan VU2JX
Bangalore, India

Thanks very much for your kind comments on the magazine! 73 has always made a serious effort to stay in tune with hams worldwide. What other magazine devotes a monthly 3–4 page column to international ham affairs? This represents a minimum *of 7–8% of our editorial material each month. (Foreign subscriptions are only 5% of the total) If you are interested in becoming our Indian correspondent for "73 International," contact Richard Phenix here at 73 HQ . . . de NS1B.*

No Code Rerevisited

I wish to express my appreciation for the useful data I have gleaned from *73*. I have only been reading it for one year, but I have already learned from your antenna articles how to get our mobile-to-base range up to about 30 miles on a good morning.

While I'm on-line, I'll put in a plug for a code-free VHF/UHF license. Some of us radio devotees have a good deal more to do than memorize things which we will use so seldom that we forget. This is a busy time in human history. I expect that there are a lot of us out here who could make a bit of time for vox ham, but who decline to (as we see it) waste the time to memorize, then forget, a language which is arcane and becomes increasingly archaic.

If radio is looking to the youth, it will have to offer them a twenty-first century—not 19th century—mode of operation.

J.R.Mainfort
Farmville VA

Thanks to the Maritime Net

I am currently serving with the US Navy in the Persian Gulf area. I would like to personally thank Fred W3WZU and Dick WB1BYN on the Maritime Mobile Net.

Once I was licensed as a ham, I have met quite a few extraordinary people who take their free time seriously to help out others in need. I was tasked to get priority calls through involving deaths, illnesses, and Easter greetings. With no phone for 57 days straight, people look for alternatives.

Thanks to all the net members on 14.313.

Bill Poulin KA4WWG/MM3
USS San Jose

Try 160!

Which BS is Bill W4TAL referring to when he says, "Sure don't care for the BS that clutters up the low bands . . . sure enjoyed the days when you could get into a good technical conversation with another amateur?" Sure hope he isn't referring to ME!

One reason I like 160 meters is that there IS plenty of technical conversation, and very few short rubber stamp QSOs.

Listen on about 1823 kHz any morning before work. There are some W4 stations talking computer technology EVERY DAY. Fascinating to listen to. And every evening there are a couple of hours of conversation about packet, AMTOR, and antennas, on about 1865 or so by a group of 7s.

And Wayne—Newfoundland was not an independent country in 1959. The province joined the Confederation on March 31, 1949.

Bob Eldridge VE7BS
Pemberton BC

191 Hz or 1 Meg?

I have to take issue with Mr. Hotine's claim that a narrow frequency spectrum is occupied by his method of phase modulation in which short pulses are used to phase modulate a carrier using a small deviation. The phase modulated signal can be expressed as:

$s(t) = A(\cos[wt + m(t)])$

where A is the amplitude of the signal, w is the carrier frequency in radians/sec., and $m(t)$ is the time-varying modulating signal.

Using a trigonometric identity, the equation can be written:

$s(t) = A(\cos[wt]\cos[m(t)] - \sin[wt]\sin[m(t)])$.

If the amplitude of $m(t)$ is small (less than 0.1 radians), the equation can be approximated:

$s(t) \approx A(\cos(wt) - m(t)\sin[m(t)])$

since $\sin[m(t)] \approx m(t)$ and $\cos[m(t)] \approx 1$ if $m(t)$ is small.

The equation shows a carrier component, $\cos(wt)$, and a double sideband component, $m(t)\sin[m(t)]$.

This second term determines the bandwidth of the signal. The modulating signal $m(t)$ is the superposition of the narrow pulse trains shown in Mr. Hotine's article (Fig. 1B and 1D), with one of the waveforms inverted, since one causes a leading phase angle and the other a lagging phase angle.

The bandwidth of a pulse train such as this is well known and will in fact be inversely proportional to the pulse width, *1 µsec* in this case. Therefore, the bandwidth of one sideband will be approximately 1 MHz, far greater than the 191 Hz that Mr. Hotine calculated.

Dan Mulally WI0C
Rapid City SD

73 Review *by Jozef Hand-Boniakowski WB2MIC*

Full Duplex in a Hand-held

The ICOM 32AT Dual-Band HT

ICOM America, Inc.
2380 116th Ave., N.E.
Bellevue, WA 98004
206-454-7619
Price $629

The 32AT, ICOMS's entry into the dual-band HT field, is a little beauty about the size of the 02AT. It is one of the slickest FM phone radios of any type that I have had the pleasure to use, and I've used many HTs and portable 2 meter ham gear over the years, beginning in 1967 with the Varitronics HT2.

Less rounded in appearance than the 02AT, the 32AT weighs 590 grams with the stock BP-70 battery, 510 grams with the BP-3, and 545 grams with the BP-4. The BP-4 pack is just a shell for two AA-size NiCds. With the BP-70, overall metric dimensions are 65mm x 180.5mm x 35mm.

Feature Packed

It takes a bit of reading to become familiar with the 32AT's features. Relying heavily on surface-mount technology, this dynamo sports 20 independent memories. Similar to the 02AT, you can program each memory with its own input and output frequency, PL tone, offset, and any frequency scan lockout. Each memory therefore has two stages. When not used, they serve as additional memory channels. If you programmed only simplex frequencies into memory, 40 channels would be available. In addition to the stock memories, there are two VFOs, one each for VHF and UHF, a priority frequency and two call frequencies, which again are one VHF and one UHF.

You can program quick frequency and memory selection through the keyboard or the main tuning dial, a welcome addition. For me, this was more memory, power, and flexibility than I could possibly use. The right hand column of the touch-tone pad has the A, B, C, and D keys. Used in conjunction with the function key located on the left side of the radio, they perform Clear-Scan-Stop/Transfer memory frequency into VFO, Memory Read/Write, and VHF/UHF Split operation and Call functions.

Full-Duplex Operation

The most amazing feature of the above is the Split function. It allows a memory to retain a TX frequency in VHF, and an RX frequency in UHF and vice-versa, AND allows full-duplex operation. That is, you can wear a headset and talk one on band while listening on the other, simultaneously—just like using a telephone! This is a great feature for public service communications, such as directing traffic, coordinating hamfest activities and bike-a-thons, and, of course, checking repeater links. Imagine full-duplex in an HT! The possibilities are astounding, including dual-band, full-duplex packet operation, and digipeating!

A word of caution: When operating full-duplex, your frequency on UHF receive must not be the third multiple of the VHF TX frequency. The third harmonic would be picked up, and you'd receive howling feedback.

Also, you cannot use the optional HS-10 headset. However, I can't see why a headset cannot be rewired or home-brewed for separate TX and RX audio lines. OK, ICOM, when will that accessory be available?

Scanning Capabilities

The 32AT comes equipped with scanning capabilities. You can set it to do a full band scan, a programmed band scan with user-defined top and bottom limits, a memory scan of both bands, or a selected band memory scan and priority watch. You can do the full band scan within one band only. In the memory scan mode, use the SKIP function to eliminate any memory frequency from being checked. SKIP functions with all of the 20 memory channels. It comes in handy when you need to put non-amateur frequencies into memory for occasional recall.

For example, I programmed 162.550 and 162.450 MHz into my 32AT for listening to NOAA weather information from Albany, New York, and Burlington, Vermont, with the SKIP function enabled for both frequencies. When I want to scan the 2 meter band, these are skipped over, thus preventing NOAA's 24-hour transmission from locking up the radio.

You can set the 32AT to temporarily stop for a few seconds on every active frequency, then continue. This allows a quick listen to busy repeater frequencies, and comes in handy when you're listening for a friend and you're uncertain about which repeater he or she will show up on.

Programming the 32AT

You can activate many combinations of scan and watch operations: VFO and memory channels, VFO and call channel, VFO and another band, and of course, all of the above with the priority channel.

With such complexity, you may be overwhelmed by the programming requirements. However, there is a SET mode, accessed by depressing the FUNCTION button along with the "5" key, which makes programming convenient. Then you can use the main tuning knob to set subaudible tone frequencies, offset frequencies, tuning steps (the rate of frequency change when using the main tuning knob or the UP and DOWN keys), scan edges, and whether you want the power saver on or off.

Continued on page 70

TECH TALK from ICOM

ICOM

Limelight Views of the IC-781

ICOM's incomparable IC-781 HF transceiver is truly creating widespread excitement in the amateur radio world and requests for additional plain language details continue filling the ICOM company mailbag. Thank you! Responding to your inquiries, this Tech Talk will overview some of the IC-781's most noticeable front panel operating attractions. Future Tech Talks will delve further into special features and circuit designs of this pacesetting transceiver.

So what's behind all the initial view "oohs and ahhs" of the IC-781? In addition to its numerous front panel controls and its five-inch multi-function CRT is a complete station control and monitor center with tremendous flexibility. Despite its sophisticated and futuristic appearance, however, the IC-781 is surprisingly easy to operate. Its special features are simply "called into use" as you desire.

The CRT's top section always displays your present operating frequency (in bold numbers) plus the selected mode, filters, RIT/XIT offset and VFO or memory operation. The alternate VFO's data is displayed below that bold/in use information. Although not readily apparent in ad photos, VFO A and VFO B plus any selected memory can also be set to different bands! A highlighted block in the CRT's lower right area also indicates local or world time right on the screen!

An impressively advanced concept of frequency selection and control is included in the IC-781. Initially pressing VFO A and rotating the main tuning knob selects frequencies in the usual way. Rotating that knob after pressing VFO B, however, lets you select standby operating frequencies on the alternate VFO while continuing an on-the-air QSO with the operating VFO! You can also change band and/or modes on VFO B or load informaton into any memory without disrupting an ongoing QSO! In other words, the VFO A and B buttons electronically shift only the main tuning applications. Totally unique! There's more! Press the CHANGE button and operating/standby VFO content swap positions. You can shift between VFO's and bands for rapid-fire DX'ing in a genuine contest-winning manner.

When split-frequency DX'ing, alternately working two DX pile-ups or lining up sequential contest QSO's, both VFO's contents can be received simultaneously. This dual receive function is activated by pressing the DUAL WATCH button then adjusting the front panel's BALANCE control for a comfortable VFO A/B blend. A single speaker is used for this simultaneous dual reception, and the previously mentioned VFO A or VFO B buttons select which VFO is tuned via the main knob. Simultaneous dual receive within the same mode on different bands like VFO A on 20 meters and VFO B on 15 meters is also a snap; however, greatest sensitivity always coincides with the operating VFO/bold numbered CRT display.

The panoramic display indicates all received signals within a horizontally-marked range of 50, 100 or 200kHz as selected by "F" keys in the CRT's escutcheon. The IC-781's present operating frequency always appears in the spectrum display's center with lower frequencies to the left and higher frequencies to the right of that point. Horizontal marks indicate relative signal strengths, and background noise appears as "grass" along the bottom edge. It also reads your instantaneous signal level during transmissions.

On-the-air activities and DX pile-ups are easily detectable at a glance, and they shift position according to frequency selections on the main tuning knob. Visualize combining this superb asset with the DUAL WATCH and you, too, will echo the slogan **"ONLY WITH AN ICOM!"**

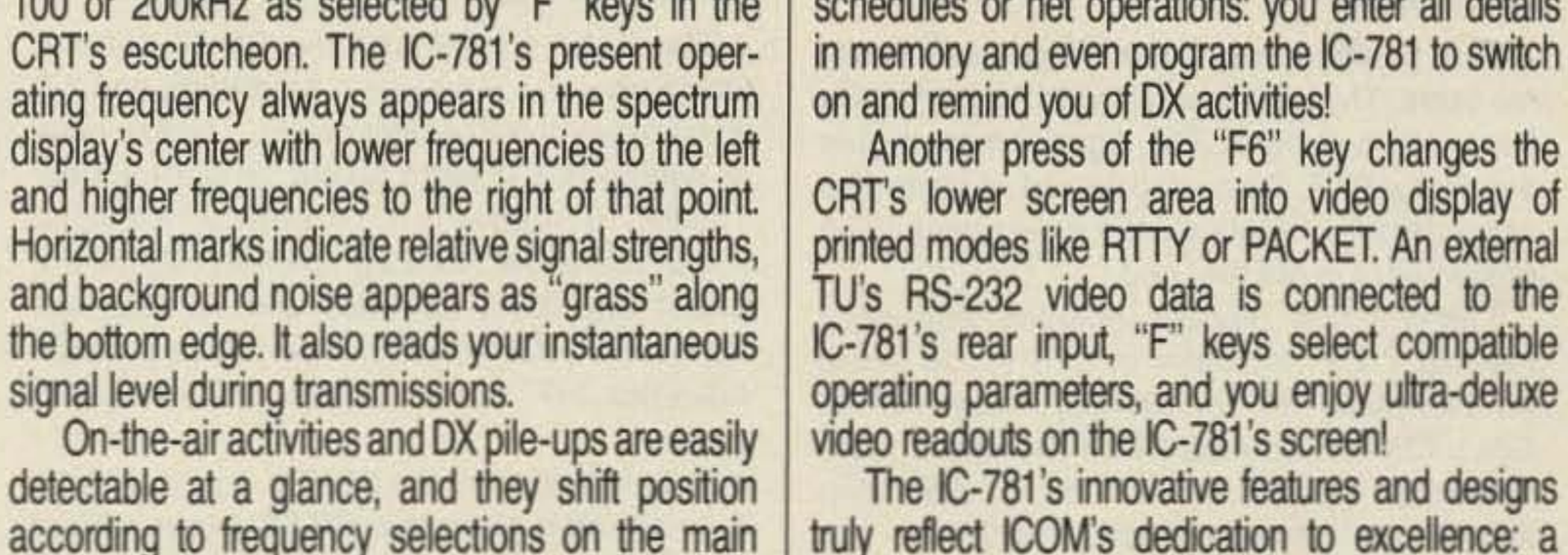
Pressing the CRT estutcheon's "F6" key changes its screen's lower area to indicate memory contents. Consequently, pressing the "F1" key and rotating the main tuning knob scrolls Memory 1 through 99 for reviewing their contents. Additionally, pressing the VFO/MEMO button switches frequency control from VFO to the cursor-indicated memory.

An electronic notepad for memory use can also be called up for use by pressing the "F5" button. Personal memos can thus be included in selected memories by selecting letters via the main knob with one hand while pressing the "F2" (Write) button with the other hand.

The previous functions, incidentally, can even be performed while you are in QSO or not selecting frequencies with the main knob. Visualize the versatility and convenience of this feature for noting schedules or net operations: you enter all details in memory and even program the IC-781 to switch on and remind you of DX activities!

Another press of the "F6" key changes the CRT's lower screen area into video display of printed modes like RTTY or PACKET. An external TU's RS-232 video data is connected to the IC-781's rear input, "F" keys select compatible operating parameters, and you enjoy ultra-deluxe video readouts on the IC-781's screen!

The IC-781's innovative features and designs truly reflect ICOM's dedication to excellence: a proud tradition that is built into every ICOM unit. Tune in with ICOM and join the winning team!



ICOM'S NEW IC-781 ***"The future of amateur communications."***

CIRCLE 84 ON READER SERVICE CARD

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ICOM continued from p. 68

Changes in offset frequency come in handy when you're using repeaters with non-standard splits. The standard offsets are 600 kHz on VHF, and 5 MHz on UHF. There are 38 different tone encoder frequencies.

Coverage

The general coverage of the 32AT (USA model), guaranteed by ICOM to meet the manufacturer's specifications, is 144–148 MHz and 440–450 MHz. Within these frequencies, the double conversion superheterodyne receiver boasts a sensitivity of less than 0.25 µV for 12 dB SINAD and a squelch threshold of less than 0.158 µV. The RX audio is greater than 400 mW at 10% distortion with an 8 ohm load. Compared to the 2AT and 02AT, the 32AT RX audio is more than adequate, and in fact, a big improvement. The IF frequencies are 30.875 MHz and 455 kHz. The operational range of the 32AT receiver is 138–174 MHz and 440–450 MHz. For the transmitter, it is 140–150 MHz and 440–450 MHz.

There are five versions of the 32AT. They are the USA, Italian, Spanish, Australian, Southeast Asian, and European versions. The main differences are in the frequency coverage, while minor differences involve tone burst operation. In non-USA versions, coverage includes 430–440 MHz. This leads me to suspect that, as with the 02AT, a minor component removal or change is all that is necessary to extend the range of the USA version. Within the guaranteed range, the transmitter puts out a clean signal with +/– 5 kHz deviation. This swing is derived from a variable reactance frequency modulator.

LCD Display

The function display is large and easily readable. The LCD is sidelit with 2 green LEDs from left and right. The light button is just below the PTT. Once depressed, it gives five seconds of illumination if the main tuning knob or keyboard is not touched.

The function display includes frequency readout, "TS" indicator in SET mode (more on this later), "M" in memory mode, "C" in CALL CHANNEL mode with the appropriate numbers 1–20, "DUP" or "–DUP" indicating appropriate frequency split, "SPT" on full-duplex operation, "PROG" during programmed scan operation, "PRIO" in priority watch mode, "T" for activated tone encoder, "SQL" with optional pocketbeep UT-40, "T SQL" with optional tone squelch without pocketbeep, "SKIP" for skip a frequency during memory scan, "TO" for setting the subaudible tone, "OW" while writing an offset frequency, and "L" when the keyboard is locked. Finally, there is a large S/RF bar graph meter.

Versatility

The UT-40 transforms the 32AT into a pager. If the transmitting station's PL tone is the same as the tone set on the 32AT, and if the pocketbeep function is enabled, beep tones are emitted for 30 seconds, and the "SQL" and "(((.)))" displays on the HT's large LCD screen begin to flash. Within 30 seconds, press the CLEAR key ("A" on the touch-tone pad), or the PTT will cause the 32AT to select the tone squelch function and audio from the transmitting station. It is checked for PL tone, and, if it matches, audio comes through the speaker.

There is, however, a MONITOR button located just above the PTT and FUNCTION buttons which will disable pocketbeep operation and automatically break the squelch for frequency spot checks. MONITOR also works during casual listening, when you do not wish to break the squelch with the squelch knob.

Features at the top include a BNC antenna connector, external RX/TX audio and PTT, a13.2 V DC jack, volume control, a tuning knob for the dual VFOs, ON/OFF and volume control, squelch, and HI/LOW power.

In a previous product review of the µ2AT, I complained about how easily the ON/OFF knob can be accidentally and unknowingly set to ON, killing the battery. On the 32AT, ICOM has placed the squelch control on the top far left of the radio with the ON/OFF switch in the middle, thus eliminating this possibility. The 32AT ON/OFF switch is also more secure with a positive click.

"... this dynamo sports 20 independent memories."

Battery and Accessory Compatibility

The 32AT comes with the BP-70 battery, which provides 5.5 watts output VHF, and 5.0 watts output UHF in high power. The low power setting is 1.0 watts output on both bands. The BP-70's capacity is 270 mAh at 13.2 volts. ICOM made the 32AT compatible with all the 2A/AT and 02AT batteries and accessories. As a result, ICOM has not yet made a single full-sized HT which suffers from obsolescence.

In anticipation of the 32AT's arrival, I had a fully charged Periphex BP-8S super-battery ready to go. The 32AT easily played a 12–15 hour day. The programmable power saver function helps out here. If there are no incoming signals, PTT, or keyboard entries for more than 30 seconds, the 32AT shuts down, and goes into listen mode briefly every few seconds. This feature saves 10 mA on VHF and 12 mA on UHF.

Also included with the 32AT are a good quality dual-band rubber ducky antenna, a belt clip with mounting screws and washers, an earphone, rain-proof cap, hand strap with clip, and a BC-16U wall charger. Popular accessories are available, such as an external speaker/microphone, headset (PTT or VOX), desktop battery charger, and a nifty little device called the UT-40 tone squelch decoder and "pocketbeep."

ICOM makes a rounded speaker/microphone that is very convenient to use with the 2A/AT/02AT radios. They are now also making a much smaller, sleeker speaker/mike called the SM46L. However, it has a right angle double connector, a miniature plug for the RX audio and a subminiature for the TX AUDIO/PTT, that bends right over the 13.8 V DC jack at the top of the 02AT/32AT. This makes external 12 VDC mobile operation very inconvenient. If the right angle were shifted 180 degrees, 02AT owners would be happy, but 32AT owners would find the cable jammed into the antenna.

The Culmination of High Tech

I bought my ICOM 32AT from Ham Radio Outlet in California in early June, and received it in late July. I knew that I was buying a new radio which might be included in the "test market" category, but I did not want to wait.

Being very active on packet, I quickly sent an "ALL" message inquiring about the 32AT. Surprisingly, I received a reply from an old friend in New Jersey who had purchased one as well. Steve WA2NHZ mentioned that he and a few others were having PLL problems. When running the transmitter for three to seven minutes in full duplex, they reported that the synthesizer would go out of lock in UHF. I tried to create the problem, but could not. Steve's 32AT had a lower serial number than mine. The serial number of my unit is 01267.

I can find no operational problems with the radio. In fact, I find the 32AT remarkable. I am thoroughly satisfied with its operation, and I have used it daily in my summer employment as a painter. The backplate/heatsink of the HT does not heat up as the 02AT's did. The 32AT is ruggedly constructed, and its sections and backplate are sealed with water-resistant gaskets.

My one and only complaint is minor—I am disappointed with the lighting on the LCD function display. If ICOM could have provided the back lighting of the µ2AT for the 32AT, this review would have been flawless.

We've come a long way in twenty years, since the Varitronics HT2. The 32AT is the present culmination of high tech. With ICOM and the IC-781 HF radio making such a splash with its built-in video display screen, I wonder how long it will be before we see a packet TNC and LCD text screen inside HTs? How long before a triband HT becomes available? The prospects of a full-duplex OSCAR HT are becoming more real. In the meantime, I'm having a lot of fun with a very nice radio. 73

ICOM battery pack life chart, based on a ratio of 1:1:8 of transmit/receive/standby operation:

Pack	Volts	mA	VHF Op hours	UHF Op hours
BP-2	7.2	450	3.7	3.1
BP-3	8.4	270	1.9	1.6
BP-5	10.8	450	3.2	2.4
BP-7	13.2	450	3.4	2.4
BP-8	8.4	800	5.8	4.8
BP-70	13.2	270	2.0	1.5

Number 23 on your Feedback card

QRP

Low Power Operation

Mike Bryce WB8VGE
2225 Mayflower NW
Massillon, OH 44646

To maximize the use of solar energy, we need some means of storing it for use during cloudy days. Recall in physics the law of the conservation of energy: You cannot create or destroy energy, only change it. In this case, kinetic solar energy converts to potential energy, to be stored and later converted back to kinetic energy at will. The best container of this energy in its potential form is the lead-acid battery.

Good ol' Pb and H_2S0_4

Even in today's technology, the composition of a lead-acid battery remains basically the same: lead and acid. A lead-acid battery is typically constructed of lead or lead-alloy plates immersed in a sulfuric acid/water solution. This solution is called the *electrolyte*. Lead-acid batteries store and release electricity by a process know as an *electrochemical reaction*, which involves a series of chemical changes within the battery and the flow of electrons.

What happens when we discharge a lead-acid battery? When a battery is connected to an external load (e.g. a rig), current flows through the load and the battery starts to discharge. The lead dioxide, PbO_2, in the positive plate is a compound of lead, Pb, (sometime called "sponge lead") and oxygen, O_2. Sulfuric acid, the electrolyte, is a compound of hydrogen, H_2, and the sulfate radical, SO_2. As the battery discharges, lead combines with the sulfate, SO_4, found in the electrolyte, forming lead sulfate, $PbSO_4$, on the positive plate. Oxygen, O, in the active material of the positive plate combines with the hydrogen, H_2, from the sulfuric acid to form water, H_2O, which reduces the concentration of acid in the electrolyte. A similar reaction is occurring at the negative plate at the same time. Lead, Pb, of the negative active material combines with sulfate, SO_4, from the sulfuric acid to form lead sulfate, $PbSO_4$, on the negative plate. As the load remains (e.g, as we continue the use the rig), the discharging progresses, the newly formed water continues to dilute the sulfuric acid in the electrolyte, lowering its specific gravity. (You can measure the specific gravity with a hydrometer to accurately and conveniently determine the battery state-of-charge.) The active material of both plates slowly changes to lead sulfate, $PbSO_4$. The plates become more alike and the acid becomes weaker. Therefore, the terminal voltage lowers, since this is a function of the difference between the two plate materials and the concentration of the electrolyte. Keep using the rig, and you eventually reach a point when the battery can no longer deliver electricity at a useful voltage.

About Face

Using electricity from the photovoltaic array, we start the charge cycle. When we apply current to the battery, we simply get the reverse of the above reaction. This causes the specific gravity of the battery to raise as acid forms, replacing the water in the electrolyte.

A battery gives off gas as it charges; hydrogen from the negative plate, and oxygen from the positive plate. These gases result from the decomposition of water, H_2O. Heavy gassing can be caused by several conditions: overcharging, cold electrolyte, and old age. Since these gasses can combine violently, causing an explosion, make sure to properly vent your batteries. If your batteries are contained in an enclosure, make sure there's plenty of convective air movements such that air moves from the bottom of the containment to the top, then out.

Batteries are rated on the basis of capacity (in ampere hour, Ah, capacity) and life cycle (the number of times a battery can be discharged before failing). Capacity is directly related to discharge rate. For example, a battery rated at 100 amperes over 20 hours can deliver 5 amperes for 20 hours. The same battery will only deliver 70 amperes, however, if it is discharged within five hours. The faster you discharge the battery, the less capacity you'll receive. Battery capacity is also a function of size, construction, temperature, and concentration of electrolytes and plate construction.

Temperature has a direct effect on the capacity of a battery; the lower the temperature, the lower the amount of capacity available for use. A battery rated at 100% available capacity at 80°F is rated at 105% at 85°F. The same battery is rated at 90% efficient at 60°F. Long periods of higher-than-normal temperatures, however, decrease battery life. Warm temperatures will also cause the battery to overcharge. The opposite happens in colder months.

Battery cycle life depends on the depth of discharge. An 80% discharge (to a 20% state-of-charge) is considered deep. Best battery cycle life occurs at discharge depths of 60–70% of total capacity.

There are of course other factors that affect battery performance. Charging procedure is one. For example, if a battery is never allowed to be charged over its float voltage, two problems can occur. First, the electrolyte may stratify. The acid, being heavier than water, concentrates on the bottom, resulting in poor performance and increased susceptibility to freezing. Second, in a battery bank that has several batteries connected in series, one or more batteries may lose its capacity before the rest. This reduces the entire battery bank performance.

"Battery capacity is directly related to the rate of discharge."

Car Vs. Deep-Cycle Batteries

Let's look at deep-cycle vs. starter batteries. A deep-cycle battery supplies a relatively low amount of current for a long duration. Car batteries can supply a great deal of current for short periods, and run down and recharge repeatedly with a minimum loss of capacity. "If you want to run something, you select a deep-cycle battery; if you want to start something, get a car battery."

Now for a harder look at deep-cycle batteries. Deep-cycle lead-acid batteries are constructed with several different types of plate and grid compositions, depending on use. The pure lead battery typically has a very long life, 25 years or more. This is the most common type used by the phone company today to provide back-up power.

The second type of deep-cycle battery is the lead antimony. Lead antimony batteries have 2.5–4% antimony on their positive plates. They are the most common type of deep-cycle battery on the market. These batteries are designed to tolerate a deep discharge and have very good charge/discharge cycling capabilities. The antimony is, however, a real poison to the batteries. The lead antimony battery often requires an overvoltage charge during the charge cycle to assure that all of the batteries in the bank recharge to the same level. This is called equalizing the batteries. The lead antimony battery has a much higher self-discharge rate. As the battery ages, the self-discharge rate increases. The battery will also produce more gassing than others. Even with all this going against the lead-antimony battery, it's a solid performer!

The lead-calcium battery, as the name implies, contains lead alloyed with calcium. The lead-calcium batteries, which have about the same output and Ah rating as the lead-antimony batteries, usually do not require an equalizing charge, and they are less prone to self-discharge, typically less than 1 to 4% per month at room temperatures. They also produce less gassing when charged.

They have several disadvantages, however. Principally, they are limited in the number of deep discharges. Further, lead-calcium batteries are "maintenance free" batteries and are most often sealed. This stops you from taking the preferred specific gravity readings with a hydrometer. Finally, they are expensive.

The jury is still out on which type to use in a stand-alone PV system. I opt for the lead-antimony units. For ease of maintenance, others prefer the lead-calcium batteries.

Look to next month's column for a continuing discussion of batteries.

Before I Go . . .

I'm on the lookout for more mods for the for the Heath HW series of radios: the HW-7, HW-8, and the new HW-9. I'll be reprinting the HW-8 Handbook sometime in early 1989. In closing, when you turn it on, turn it down! 73

ASK KABOOM

The Tech Answer Man

Michael Jay Geier KB1UM
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So. Burlington, VT 05403

Welcome to "Ask Kaboom." This column will dispense advice regarding the adjustment and repair of your rigs, with emphasis on modern solid-state gear. Many problems can be fixed right in your shack, saving you time and money, and fulfilling a basic purpose of amateur radio: the maintenance and advancement of technical skills. Besides, doesn't it feel great to use the old noodle instead of the old wallet?

Have you ever noticed when listening to a SSB QSO on HF that no two stations seem to be on the same frequency? They always appear to be 30 or 40 Hz offset from each other. It's especially frustrating in roundtable situations; you have to twiddle your RIT constantly. In the analog days, that was understandable, because VFOs weren't all that stable, and dials were neither accurate nor precise. In addition, many rigs had internal controls to set the transmitter and receiver to the same frequency, and these settings drifted over time.

With today's frequency-synthesized rigs, there is just no excuse for being more than a few Hz off frequency at any time. Yet, many stations continue to have this problem, due to a simple lack of calibration. In my experience, Japanese gear is often badly aligned at the factory! The problem is compounded by the fact that the crystals, which serve as the reference for the frequency synthesizer, drift, both with aging and temperature. So you can't assume that, just because you have a digital-synthesized radio, it is dead on frequency.

Invariably, there is a trimmer capacitor in the master reference oscillator which you can set to correct the error. In some rigs, like the Kenwood TS-940S, it can be accessed from the outside. In others, you will have to remove the covers to get at it. The big problem with this adjustment is that the manufacturers' instructions, if there are any at all, are so confusing that most folks can't tell when the rig is correctly adjusted.

Here is a simple method that will get you right on the money, with absolutely no test equipment. It is done best with a plastic tool (such as one found in Radio Shack's TV tool set, catalog number 64-2220, which sells for $2.99), but can even be done with a small screwdriver, as long as it has a plastic handle.

First, let the radio warm up for a good half-hour. While the rig cooks, get the owner's manual and find out where the master reference adjustment is. If there's no mention in the book, then look at the schematic and try to find it. Failing that, call up a ham store or the manufacturer and ask. The phone call is a lot cheaper than the shipping charges.

If you have to remove the covers, do so now, after disconnecting power and antenna from the rig. Find the adjustment and then reconnect the power and antenna and let the rig warm up for a few more minutes. Now comes the secret: tune in WWV on 5, 10, or 15 MHz. If 20 meters is open, 15 MHz is probably your best bet, but any of them will do. If you have 10 Hz readout on your display, be sure the last two digits are set to "00." If you only have 100 Hz readout, then you can't know precisely where you are, and can make things worse by adjusting the frequency to "15.000.00" when the rig is really set to "15.000.07." There is, however, an easy way out of this mess. The mikes that come with nearly all digital rigs have "up" and "down" buttons. Set the rig to "14.999.9" and then click the "up" button repeatedly until the display changes to "15.000.0." Now you are really set to "15.000.00" and ready to go.

You must wait until WWV is sending tones, rather than clicks. Place the rig in USB and listen to the tone. Now switch to LSB. If the pitch of the tone stays exactly the same, then your rig is dead on frequency. If it changes, then you must adjust your trimmer. If you are really tone-deaf, get someone else to listen for you. (A note to ICOM owners: Many of their rigs shift the frequency display when you change from USB to LSB. It is tedious, but you will have to go through the whole mike clicking thing to reset the display every time you switch modes.)

Slowly turn the trimmer just a little bit. Now, switch modes again. If the difference in pitch gets worse, then you turned it the wrong way. Go the other way and try again. Keep adjusting (slowly!) and changing modes until the tones are exactly the same pitch. Your rig is now precisely on frequency.

If you are using a metallic tool, you may find that the frequency shifts a little when you remove the tool from the trimmer. In that case, pull the tool away before checking the tones. This makes things harder, but the results will be the same. Be careful not to short anything with the metal in the tool!

When you're satisfied with the adjustment, shut off the rig, disconnect the power and antenna and close it all up. Voila!—no more complaints of "you're too high, OM."

As the radio ages, it may shift frequency slightly, you should do this procedure again if you are as picky as I am. I touch up my '940 about every six months.

Oh yeah, one caveat, there are other crystal oscillators (besides the master one we have just adjusted) and they, too, can drift off. If the rig seems REALLY far off, and one sideband sounds MUCH more muffled than the other, your radio may need more alignment than this, and probably should be seen by the service shop.

Now that we're all on frequency, let's look at some letters.

Dear Kaboom,

I wired up a favorite mike for my Kenwood TS-440. It works, but I get terrible RF feedback. This doesn't happen when I use the stock mike. What gives?

Signed,
Whattd I do

Dear Whattd I do,

When wiring the mike, you may have noticed that there were two grounds on the connector. Yes, they both go to the radio's ground, but there is an important difference between them. Pin 7, the "mike gnd," goes directly to the mike preamp circuit, and is the internal cable's shield. Pin 8, the "stby (standby) gnd," is the rig's general ground. It is done this way to avoid RF ground loops, which can cause the feedback problem you have. The shield on the mike cable should go to pin 7 and the PTT switch's ground to pin 8. Even if you have wired them separately, you may find that they are connected inside the mike! Open it up and separate them.

Dear Kaboom,

I use a 20-amp DC supply with an ICOM IC-28A mobile rig for a base station. Sometimes, there's a hum on my transmitted signal and other times, it's not there. Tests of the supply show no ripple at the output. Where the heck is that hum coming from?

Signed,
Hummin' Away

Dear Hummin' Away,

Sounds like RF is getting into the DC leads coming out of the supply. Check your antenna SWR and also make sure your antenna is not real close to the rig or supply. Never plop a mobile antenna on top of the supply. The RF is high enough in frequency to get past the filter caps and into the regulator, where it can mix with AC hum in mysterious ways and cause trouble. Try putting a .01 µF cap across the DC lines right at the supply. Also, keep the DC cord short, or try coiling it or wrapping it through a large toroid. Finally, try the same toroid trick for the AC cord.

Dear Kaboom,

My Yaesu FT-757GX has been in for repair twice now. Each time, the FM quit and then the whole rig wouldn't TX or RX. Now, it's doing it again. What should I do?

Signed,
Love it but Hate it

Dear Love it but Hate it,

This is a common problem in '757s which were made two to three years ago. The cause is bad switching diodes. The radio uses lots of diodes, rather than a relay, to switch between TX and RX. It's a good idea, but there was a run of bad diodes a few years back. They get leaky and allow voltage to the wrong circuits at the wrong times, causing the radio to try to TX and RX at the same time! The result is a blown transistor in the FM squelch circuit and a dead-acting rig. Sometimes, some tiny coils also get blown. This is a compact rig and not easy to work on. Also, they are special low-noise diodes and should be replaced with the same type. Unless you're really skilled, you're better off sending this one to Yaesu.

Finis

That's it for this month. Next month's topic: Troubleshooting, the art of finding what does work, not what doesn't!

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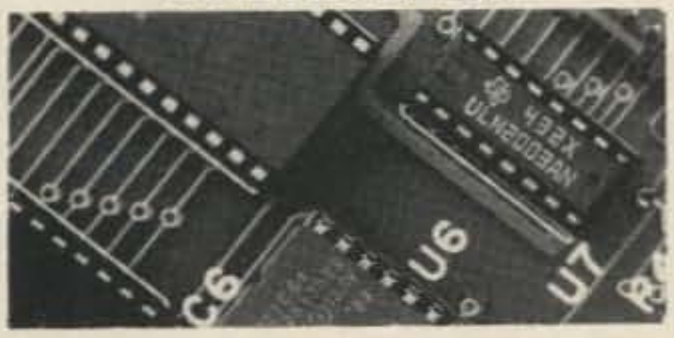

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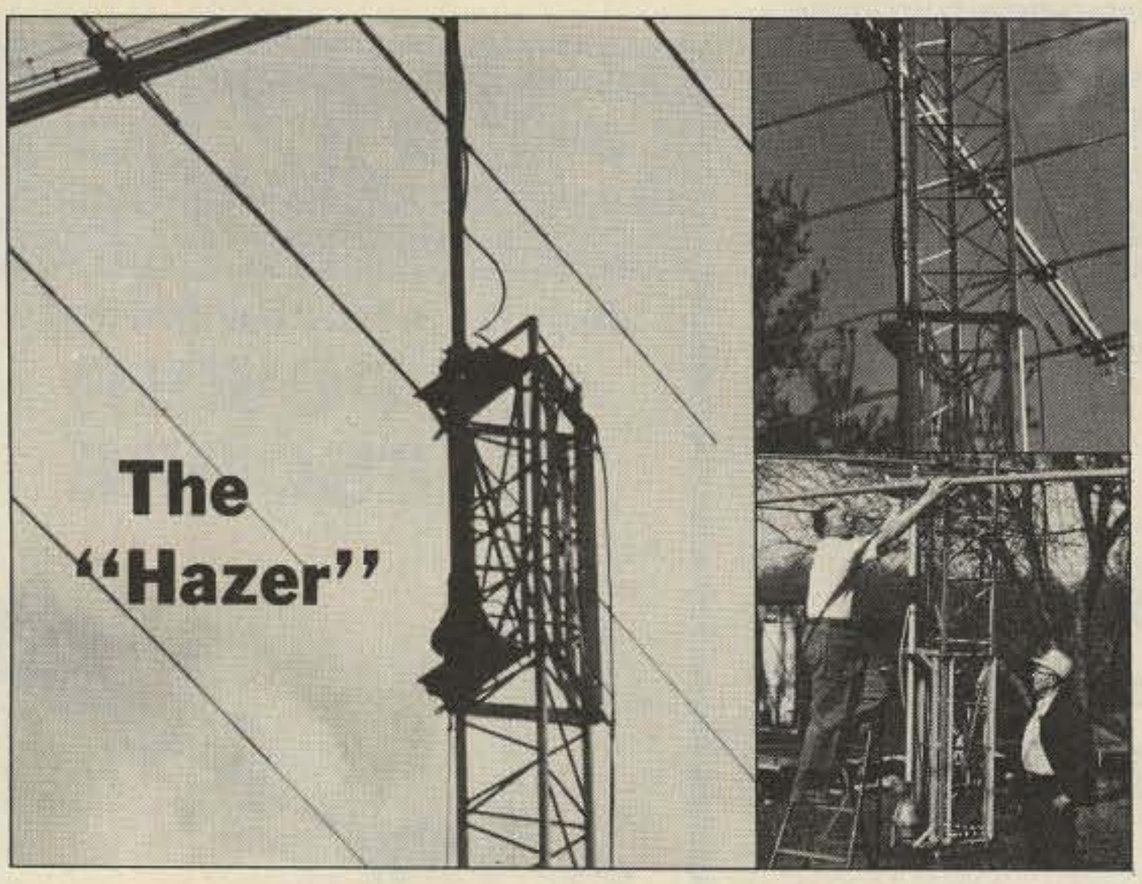

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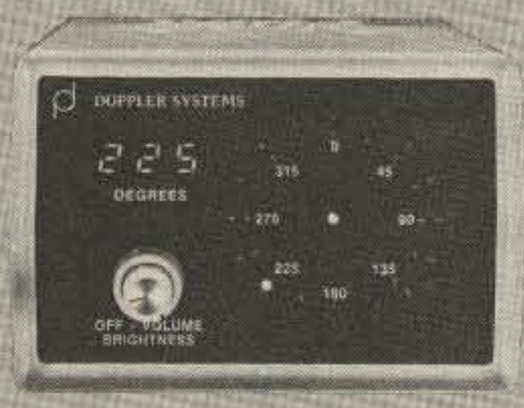

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ABOVE AND BEYOND

VHF and UHF Operation

Pete Putman KT2B
3353 Fieldstone Drive
Doylestown, PA 18901

NY and Ontario Grid-peditioning

I don't know how these things get started . . . Sometimes you get an inspiration, sometimes just a cockeyed notion. Like trying to combine a long weekend with some grid-hopping. Like driving almost 1000 miles in 4 days via the "scenic route" for the privilege of standing in a downpour with 60 pounds of equipment on your back. Or running back and forth through Canadian and US Customs via inconvenient ferry trips to work a couple of stations on 903 MHz.

This was to be nothing more than a short jaunt up through New York state to the St. Lawrence River, where I'd board a ferryboat to Wolfe Island, Ontario. Once there, I'd spend a leisurely weekend helping my family close up their summer home for the season . . . get a little swimming and boating in . . . maybe a little fishing . . . maybe throw some 903 gear in the car and try operating from the back yard . . . no, make that the ferry slip at the southern end of the island . . . better take some 1296 gear along as well . . . maybe even something for 2304 . . . not to mention a 2 meter liaison station.

Well, things got quickly out of hand (as usual) and I found myself speeding north on the Pennsylvania Turnpike on Thursday morning, August 25 with the Honda completely stuffed to the gills with camping and radio gear. Three loop yagis and 15 feet of antenna mast were fastened to the roof carrier, and I left behind more than a few very interested operators who would attempt to contact me in three different grids over the weekend.

I had decided to spend that evening at my aunt's house in Goose Bay, NY . . . just a few miles northeast of the dividing line between grids FN14 and FN24. Both are fairly quiet on the microwave bands, with most operation limited to grid-peditions. The plan was to drive to a suitable high spot after dinner and activate FN24 for a few hours on 903, 1296, and 2304, using 144.150 MHz as a coordinating frequency.

To that end, I packed the Yaesu FT-290R and a Microwave Modules MML-200S amplifier along with a Tonna nine element portable yagi to make sure I'd be heard. The Yaesu also served as the IF stage for the microwave equipment: An SSB LT-33S running barefoot with 20 watts on 903.100; SSB LT-23S and DownEast Microwave 2335PA running 30 watts on 1296.100, and a homebrew transmitter/receive converter running eight watts concocted by Ron Whitsel WA3AXV. The antennas were half-sized loopers designed by Bill Olson W3HQT, with 19 elements on 903, and 25 elements on 1296. Only the 2304 looper was full-sized at 45 elements.

The forecast called for clear skies and no precipitation through the weekend, so (of course) a good-sized thunderstorm showed up about 6 PM Thursday and washed out my carefully-laid plans. A quick call to Dave Hackford N3CX allowed me to re-schedule for early Friday morning, and I spent the better part of the evening assembling the stacking frame for the yagis as well as packing the car.

Station Setup

After dragging myself out of bed at 5 AM, the three stations were wired up on the passenger seat. A terminal strip was plugged into the main battery connector and I brought out 13.8 VDC lines to the two transverters and the amplifier. The Yaesu was fitted with the YBA-8 battery case, allowing a maximum of three watts output—suitable to drive the transverters or the MML amplifier to 150 watts output. An interconnected sequencing box made sure all the relays fired at the right time. The only trouble was keying it with a footswitch held in my hand!

The entire station managed to travel about 20 miles down Route 26 to the small village of Pamelia Four Corners, NY without crashing to the floor . . . quite an achievement in itself. After arriving at the chosen location—a 500+ foot rise along a lonely rural road—I set about erecting the mast sections and microwave antennas just in front of the Honda, using the bumpers as two of the guy anchors. This was made necessary by the soil adjacent to the road, which was very loose and sandy.

Despite all of the time I spent setting up the night before, things took longer than expected and I was unable to get a signal out on two meters until almost 7:15 AM. Considering it was a weekday morning and I was several hundred miles removed from my target audience, I didn't expect much activity on the liaison frequency. But lo and behold, there was Dave Halliday KD5RO in Pittstown, NY (near Rochester), all tuned up and ready to roll. Someone actually believed I'd make it on the air . . . will wonders never cease?

Dave's two meter signal wasn't too encouraging until he mentioned that his hardline was full of water. Seen in that light, his signal strength was amazing! We quickly QSYed to 903, working a path across Lake Ontario of about 100 miles with 599 reports either way. Dave suggested moving directly to 2304 MHz to take advantage of some nice tropo enhancement over the lake. It was a good call, as his 13 cm signals were just as strong as those on 903, hitting S-9 on peaks and never dropping below S-3. Our 1296 QSO was anticlimactic, as we both enjoyed armchair copy (well, bucket seat copy for me).

Wayne King N2WK was raised at work and got on the air a little after 9 AM, when we quickly exchanged reports on 903 and 1296. Were we having fun yet? You bet, so as you might expect a squall line quickly blew up over the lake and headed in my direction, with 40 mph wind gusts straining against the ⅛" diameter guy ropes. The 2304 attempt was brought to a sudden halt when the microwave array became airborne and landed ten feet away in the ditch. So much for FN24. SCORE: five contacts on three bands, four bent elements, and one ruined piece of coax.

North Of The Border

After fussing with the Canadian Customs and Immigration service and one wild ride across the St. Lawrence on the Kingston ferry, I

Photo A. The Honda Civic's front seat set up for 903, 1296, and 2304 MHz operation.

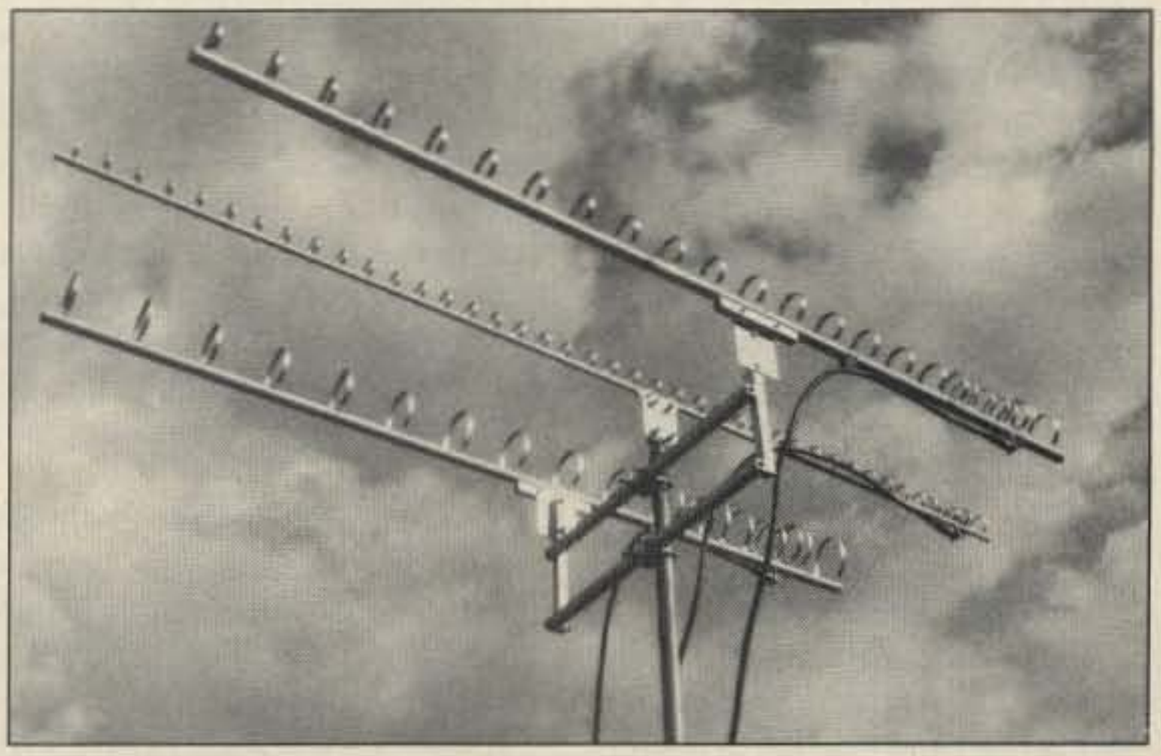

Photo B. The portable antenna array, with 19 elements on 903, 25 on 1296 and, 45 on 2304. Lots of gain in a small area.

arrived on Wolfe Island and immediately scouted out five potential locations for that evening. In keeping with the general trend, none proved suitable. It was the ferry slip or nothing!

The work at the house went fairly quickly, so I was able to spend some time repairing the loop yagis and reconfiguring all the equipment for Friday night. The two 12 volt gell cells needed to run the 2304 station were difficult to fasten down. The object was to keep the power run short, so everything wound up carefully stacked and balanced against the door and the seat. One sudden stop and CRASH!!! No more equipment!

Friday's blustery weather finally died down about 8 PM, so I bid adieu to the clan and drove for about 25 minutes to the Cape Vincent ferry slip. Unlike the Kingston ferry, this service stops after 7:30 PM and the area is relatively deserted at night (albeit well-lit). Three huge tires served as excellent guy anchors, and within a half-hour I was up and running again on 144.150 from FN14.

Contact was immediately made with K2SMN and K2OWR in New Jersey, and I was informed that quite a few stations were ready to take a shot on 903. Unfortunately, the excellent tropo conditions of Friday morning were nowhere to be found, which I assume was the price paid to Mother Nature for having such a beautifully calm and clear night! Both N3CX and K2SMN did report hearing my CQs on 903, although I was unable to detect anything coming back the other way.

Wayne N2WK was once again on with a potent signal, so we ran on 903 and 1296 with Tom Mott W2DRZ in Jamestown, NY tailending both times. Wayne's big thrill came when I finally heard his 2304 signal after about 15 minutes of back and forth CQs, giving him a new grid and me a headache from having the receiver volume up all the way! Shortly thereafter, KD5RO popped up and we quickly fired off QSOs on 903, 1296 and 2304...again, armchair copy each time. After a few more tries with K2SMN, I pulled the plug on FN14 at 1 AM. SCORE: ten contacts on four bands.

On The Last Leg(s)

All of the previous weather conditions did nothing to prepare me for the third and final leg of the trip up Cathead Mountain in the lower Adirondacks. I'd been up there during the August ARRL UHF Contest, operating 432 and 903 with splendid results, but this time things were going to be a bit rougher.

I proceeded serenely along to my tent site at Northampton Beach State Campground, assured by the ranger that no rain was in the immediate forecast. The backpack was loaded up and the antennas broken down for the climb next morning. The pack was quite a bit heavier than I had planned, tipping the scales at well over 50 pounds! This was largely due to the two gell cells which made up 16 pounds of the total weight...a necessary evil.

Six hours of driving and packing made nodding off easy at 10 PM. Thirty minutes later, I was jolted awake by a tremendous thunderstorm and torrential rains. It continued to rain off and on all night long, and a heavy fog had settled around the campsite as the alarm went off at 5:30 AM. It didn't look any better at the base of the trail an hour later. To scrub or not to scrub...that was the question. Well, the temperature was comfortable...I had plenty of bug repellent...everything was packed up as tight as possible...what the heck!

One of the quaint features of the Cathead trail is that it does double duty as a stream-bed after heavy rains. This and the extra ten pounds of stuff on my back combined to extend the climb to nearly one hour and 45 minutes, after which I reached the top of the mountain and was promptly soaked in a downpour. To make things worse, there are no sheltered areas on the mountain to operate from, so my choices were simple: (1) Give up and retreat or (2) Wait it out at the ranger cabin 100 feet down from the top.

Option two gave me a chance to dry out (slightly) while looking for a glimmer of sunshine. After 45 minutes without rain, the ranger solemnly informed me that the forecast called for thunderstorms the rest of the day. Weighing his advice carefully and considering my soaked condition, I made the only logical decision: Go back up to the top and get on the air from FN23!

This was the fastest I've ever set up on a mountaintop, with all four bands fully operational within 20 minutes. Although things got off nearly an hour late, the faithful listeners were quickly raised, and I banged out four 1296 contacts with WA2TEO, N3CX, K2JWE, and K2SMN. N2FRB and KA2CKV in FN30 were worked on two meters for their first FN23 contacts. A sked with W3IP in Baltimore didn't pan out (although I did hear his signals), so it was back to 1296 for a QSO with Bill K2OWR. N3CX ran with me on 2304 and copied a little bit of CW, but the on-and-off cloud cover wasn't making things any easier.

Finally, KD5RO showed up to try for the 13 cm hat trick. We quickly made contact on 1296 for another new grid but the path looked pretty bad, as copy was rough on both sides. No armchairs this time! To make matters worse, the batteries were running down, causing instability problems with the 903 station. And—you guessed it—thunder was now heard to the northwest. Despite the odds, Dave and I finally hooked up after about ten minutes, giving him three new grids on 2304 in three days! I signed off with K2SMN and crammed everything into the pack, making a quick getaway down the mountain about 1 PM. SCORE: nine contacts on three bands, two dead batteries, three banged up loop yagis, and a nice head cold.

The grand total for the weekend was 23 contacts. Not quite as many as I'd hoped for, but given the cards I had to play with, I'll take'em. The cold will go away soon, and I'll get over that sore shoulder eventually. The loopers can easily be repaired as can the nine element Tonna for two meters. All the sand I brought back in my shoes will end up in Ross' sandbox. Most importantly, the memories—good and bad—will last a long time. And maybe–just maybe—it'll be a little easier next time I go...Above and Beyond. 73

Photo C. Mast support plate and guy lines. The Honda makes a good anchor point!

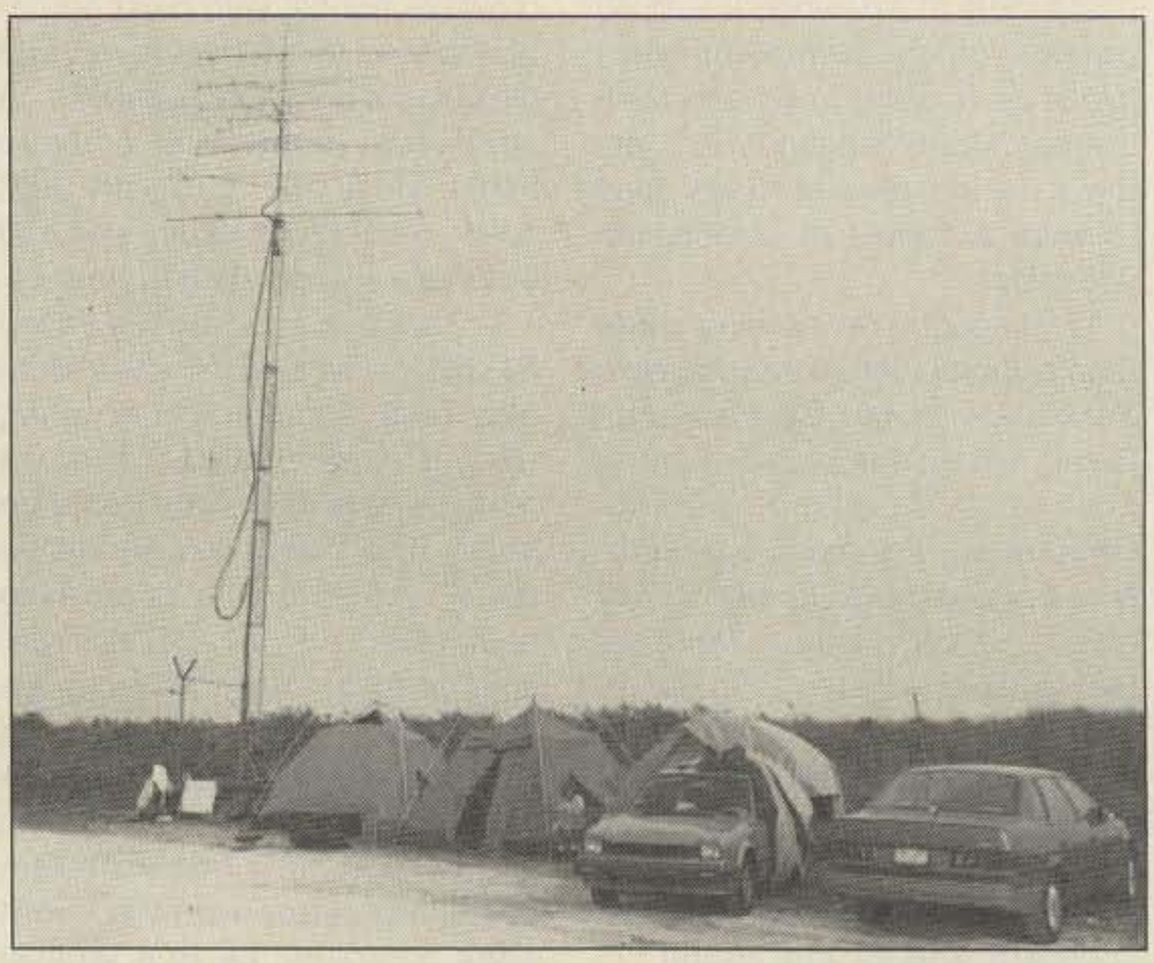

Photo D. Last year's modest setup will be replaced by three separate towers plus lots of aluminum!

Dx

Hams Around the World

Chod Harris VP2ML
PO Box 4881
Santa Rosa, CA 95402

The 4J1FS M-V Island DXpedition

In early July, 1988, a team of three Finnish and three Soviet amateurs operated 4J1FS from the tiny island of Malyj Vystoskij, in the Bay of Vyborg. The one-mile-long island lies about 75 miles northwest of Leningrad, and only 25 miles from the border between Finland and the Soviet Union.

The unique DXpedition started as the Finns drove their van, heavily laden with a tower, antenna, rig, amplifier, generators, and lots of gear, down the roadway bordering the Saimaa Canal, surrounded by Soviet territory, to the last lock of the canal, on the Bay of Vyborg, at the eastern end of the Gulf of Finland. John Ahlbom OH5NZ, Pertti Turunen OH2RF, and Martti Laine OH2BH made up the Finnish half of the joint east-west DXpedition. Their gear totaled 800 pounds, and included tables and chairs, as well as drinking water, food, tents, and even a bag of toilet paper!

Off To The Island

On July 7, 1988, the three DXpeditioners loaded their gear onto the 50-foot motorboat *Veera*, for the short ride from the lock to Malyj Vystoskij. The boat stopped at a Soviet Coast Guard station to pick up the Soviet half of the joint DXpedition: Enn Lohk UR2AR, Boris Stepanov UW3AX, and Gene Shulgin UZ3AU. The bare-chested Finns (it does get hot in Finland in July!), showed their papers to the guards at the Coast Guard station, and then all six sailed the short distance across the bay to Malyj Vystoskij.

The crew quickly unloaded their gear and started to set up the tower, antenna, and gear. Their operating permission restricted them to a single rig, so they decided to concentrate on 20 meters. A 40-foot aluminum tower was capped with a KLM KT-34A. A Kenwood TS-940 and TL-922 provided the 4J1FS signal. They gassed and tested the 3 kW Honda generator, and all was ready for the opening gun, at local midnight.

Operating

The gang concentrated on SSB, and made about 70% of the total 14,800 QSOs on that mode. About 5,000 contacts were made with US amateurs, and another 5,000 with Europeans. They were even successful in working 2,500 Japanese DXers over the difficult polar path. Excellent propagation prevailed for the entire operation, to the great pleasure of the DXpeditioners.

They were allowed to operate only for 96 hours. Just before shutting down, UW3AX and UZ3AU carved a center insulator of scrap wood, and improvised a low-band antenna for a few contacts. On July 12, they lowered the tower and antenna, packed up their gear, and took the short boat ride back to their respective countries. The first-ever joint east-west pure DXpedition drew to a successful close.

"The gang concentrated on SSB, and made about 70% of the total 14,800 QSOs on that mode."

History of Malyj Vystoskij

Malyj Vystoskij lies near the mouth of the Saimaa Canal. The canal was first constructed in 1856 to provide access for ocean-going vessels to the lake region of southeastern Finland. During World War II, the Soviet Union annexed that portion of Finland, incorporating the canal and Vyborg Bay into the Soviet Union. In 1962, the Soviets agreed to lease back to Finland that part of the canal that ran through the now-Soviet territory. Malyj Vystoskij Island was part of that 50-year lease. The Finns intended to set up a reloading port and storage facilities on M-V Island, but the plans were never carried out. The civilian population of the island left in World War II, and the island has since remained uninhabited.

The Saimaa Canal, and M-V Island, are administrated by the Saimaa Canal Authority (SCA), which is composed of commissioners appointed by both Finland and the Soviet Union. To get permission to operate from the island, the DXpedition team had to secure not only the permission of the SCA to land on and operate amateur radio from the island, but also permission from the USSR to cross the intervening territory, which swarms with military activity. The complexities of getting all proper papers, and the need for discussions at the highest levels of government in both the USSR and Finland, prevented easy access to the island. In fact, the Finns worked on obtaining such permission for about 20 years!

In the 1960s, Finnish amateurs felt that the island would qualify as a new DXCC "country" under the "separation by foreign land" provision in the DXCC country criteria. The island is essentially surrounded by Soviet territory, and thus met Point 3 of the DXCC country criteria in 1970.

The ARRL Awards Committee agreed with the Finns, and then-DXCC administrator Bob White W1CW wrote a letter to the Finns saying that the island would be added to the DXCC list "at such time as operation takes place." There the matter sat for almost 18 years, until the 4J1FS DXpedition.

DXCC Questions

Will Malyj Vystoskij count as a *new one* for DXCC? The situation has raised many questions, questions that must be answered before the DXAC can make a decision.

The first question, and perhaps the most basic, is whether the island can be immediately added to the DXCC list on the basis of the 18-year-old letter from W1CW? The Finns feel that they have a firm commitment from the ARRL that Malyj Vystoskij would be added to the DXCC list "at such time as operation takes place" from the island. There are no conditions nor time limit imposed.

The ARRL however, elected to treat M-V island as a new application for separate country status, and referred the matter to the DX Advisory Committee for evaluation.

This raises two more questions: Should the application be evaluated under the DXCC guidelines that prevailed in 1970 or should the new DXCC rules, adopted by the ARRL Board in January, 1988, be used instead? If the latter, does Malyj Vystoskij count as one of two islands, or must the more stringent 75-mile separation limit be used? (M-V is only 25 miles from Finland, and would not count as a separate country under new Point 3(a).) So which rule applies, continent land mass—Point 3(a), or Islands—Point 3(b)?

The use of the 4J1FS callsign confused many DXers. If Malyj Vystoskij island is actually Finnish territory, why did the DXpeditioners use a Soviet 4J callsign? They argue that the SCA does not have its own International Telecommunications Union (ITU) callsign allocation, and thus any callsign can be used, as in the case of Spratly or Abu Ail. Discussions with the Russian Radio Sport Federation (RSF) led to the issuance of the 4J1FS call, symbolizing the first joint Finnish-Soviet DXpedition. The RSF only provided a distinctive callsign, not a license. SCA licensed the operation.

Further evidence that the island is indeed under Finnish and not Soviet jurisdiction is that the Finnish members of the team did not have Soviet visas, normally needed by Finnish visitors to Soviet territory. Their passes were issued by the SCA, not the USSR.

The DXAC has a great many questions to resolve over the DXCC status of Malyj Vystoskij, but regardless of their determination, the 4J1FS was a splendid example of east-west cooperation, persistence, and planning. Congratulations to all involved! 73

73 Review *by Larry L. Ledlow, Jr. NA5E*

Barker and Williamson PT-2500A HF Amplifier

Speak softly and carry a big signal

Barker and Williamson
Bristol PA 19007
(215) 788-5581
Price: $2175

Part 97 states that amateurs should use the minimum amount of power necessary to carry on a contact. Often it's 10 watts, sometimes 100. There are those times, however, when that extra few dB make all the difference, especially in contests and DX pileups. These situations demand both craft and a solid kilowatt. For the latter, Barker and Williamson has just the linear you need: the PT-2500A 1.5 kW amplifier.

Sensible, Mature Design

In one relatively small, 80-pound package, B&W has produced a superb Class AB2 linear amplifier rated for continuous duty at 1500 watts output. It will run happily and quietly for extended periods in SSB, AM, CW, ATV, and RTTY. The PT-2500A offers excellent performance for any mode or style of operation.

The PT-2500A uses two Eimac 3-500Z zero-bias triodes, real tried and true workhorses in many HF amp designs. In fact, the PT-2500A uses a sensible, mature design all around. As a Class AB linear amplifier, it produces very little intermodulation distortion, −33 dB according to the specifications. Typical plate efficiency for such an amplifier is 60–65 percent, and the PT-2500's manual guarantees a minimum of 60 percent on all HF bands. This amplifier requires a 100–125 watt drive for full output power. Most contemporary HF rigs can supply at least 100 watts of drive.

Circuit Superiority and Plenty of Power

Each band uses a separate pi-network for its input circuit. These are superior to L-networks, since they attenuate harmonics more effectively, and match somewhat greater impedance variations. Accurate matching on the input is essential, especially using a solid-state transceiver as a driver. Further, although two Eimac 3-500Zs in parallel operating at 3 kV (in a grounded-grid design) have an input impedance just over 55Ω, circuit Q must be maintained.

The output circuit is a pi-L design using a 235 pF, 6 kV variable tuning capacitor and a heavy-duty, silver plated 7 kV rotary inductor, which allows impedance matching over an even greater range than the simpler pi- and L-networks. Pi-L circuits attenuate harmonics better than the other networks, typically −50 to −55 dB with circuit Q in the 10–15 range. The PT-2500A specification calls for 50 dB minimum suppression of harmonics, easily meeting FCC requirements. (Part 97.73 specifies no spurious emission shall exceed −40 dB below the fundamental or 50 mW. Assuming a mean carrier power of 1500 watts, 50 mW is −44.8 dBc.)

Since the PT-2500A uses a grounded-grid (cathode-driven) design, it is well suited for HF linear operations. Actually, grounded-grid amplifiers require higher drive levels than, say, grid-driven circuits. Also, the design must precisely maintain circuit Q, or waveform distortion occurs. The Pi-L output circuit components assure constant Q, and so help minimize intermodulation products.

A chain is only as strong as its weakest link, and in many amplifiers, the power supply is given less attention than the rest of the circuit. Not so here. B&W has designed a power supply worthy of a continuous-duty amplifier. It uses a main transformer rated at 1300 VA, a separate filament transformer, as well as "computer grade" filter capacitors. Although B&W recommends 230 VAC primary power, the unit will run from 115 VAC if 25–30 ampere service is available.

Assembling the PT-2500A

When the UPS man finally delivers the three boxes comprising the PT-2500A main components, you won't spend the rest of the week fiddling with cables or soldering. Unpacking and component integration take an hour or two, depending on your familiarity with components. Proceed slowly and carefully, in any case.

The 3-500Z tubes, the main chassis, and the 40-pound power supply transformer are packed and shipped separately. Aside from the usual paperwork, you get two control cables, an AC power cord, two tube chimneys and plate cap heat sinks, three extra fuses, and a 7/16" T-wrench.

Transformer installation is the most tedious exercise, but requires only a screw driver and the T-wrench. After opening the main unit's cover, the power supply filter bank is removed (three screws). Then the transformer is carefully positioned over three ¼" threaded mounting studs that protrude upward from the chassis bottom. The T-wrench screws ¼" nuts to the studs, thereby securing the transformer in place. A wiring terminal block then attaches to the top of the transformer, and six transformer primary leads and plate harness leads are attached to the block. Several other leads and jumpers are connected before installing the power tubes.

Despite their power-handling ability, the 3-500Zs are still mechanically fragile. It's worth

the extra few minutes to carefully inspect each tube and chimney for possible damage. A magnifying glass can help highlight small cracks. (Report damage to the carrier.)

The tubes drop relatively easily into place. Do not twist the glass tube envelopes! They will break. Also, be careful not to bend or break the base pins. Even moderate lateral force can damage the tubes. Assuming the tubes are undamaged at this point, the glass chimneys mount concentrically around them. The plate heat sinks then screw atop the tubes, and the sinks in turn accept a screw connection from the parasitic chokes. Voila! An amplifier almost ready for action.

flip of the main power switch, and I got quite a surprise when my PT-2500A came to life: It was quiet! I could actually carry on a whispering conversation without an obtrusive whirring from the 60 cfm squirrel cage fan. QRM on the band is bad enough, but hours into a contest I have found myself hating unnecessary noise in the shack. What a nice surprise, indeed, to find the PT-2500A MUCH quieter than the old Alpha 340 I had come to despise.

The second moment of truth comes with the application of RF to the input for initial tune-up. No problem here, and tune-up is very simple. Fortunately, the PT-2500A does not require a warm-up period. The green OPERATE

"The first moment of truth is always the initial flip of the main power switch, and I got quite a surprise when my PT-2500A came to life . . ."

Don't even think about plugging in the AC power cord until the cover is secure again. The PT-2500A has microswitches closed by proper cover seating, and only then will main power be available. Good safety practice, however, insists on no AC connections until the cover is screwed back on. Remember, this is a high-voltage device, not a solid-state transceiver with CMOS circuitry and TTL voltage levels. Treat the amplifier with the utmost respect and with safety in mind.

After the RF input, connect the antenna relay (key down) and ALC cables between your transceiver and the amplifier, and attach a properly resonant antenna (SWR less than 2:1, and preferably less than 1.5:1) or a dummy load to the RF output connector. Use the latter while becoming familiar with control settings and tuning.

Dream Shack Operation

The controls and meters are surprisingly simple to understand, and the instruction manual clearly explains each function. Review the manual BEFORE turning the power on.

The large vernier knobs on the amp's left face control load and tune settings for adjusting the output impedance to the load, and tuning the variable RF capacitor, respectively. The scales are 0–100, which make accurate recording of settings very easy. The knobs' actions are very smooth, though with respectable resistance to prevent inadvertent movement. The six-position bandswitch—yes, it only has five markings—selects the band of operation: 160, 80, 40, 30, 20, 17, 15, and (with modification) 10 meters.

Two white rocker switches below the meters select SSB/CW/RTTY modes and OPERATE/STANDBY. The multi-function meters show plate voltage and grid current, as well as forward and reflected power.

The first moment of truth is always the initial lamp lights when the STANDBY switch is flipped to OPERATE. With no input, a quick check of the plate current should show 40 mA and 100 mA in RTTY and SSB modes, respectively. A quick adjustment of the exciter drive so the grid current is 90 mA (CW mode) followed by alternating TUNE and LOAD adjustments, will resonate the amplifier.

After several more checks to make sure the currents and voltages are within specs, the PT-2500A is ready to speak to the world. For fumbling fingers or forgetful hams, the PT-2500A has an SCR grid protection circuit, which will shut the amplifier down if grid current exceeds 400 mA. This is a nice feature, particularly for hams who forget to reduce drive or who get carried away and try to get every last milliwatt out of their amp by overdriving it.

Several months of use didn't turn up anything wrong with the PT-2500A. It worked great in all modes. It does not key fast enough for AMTOR or QSK CW, but with a long TXDELAY, it's even fine for HF packet. All signal reports were clean; no one reported AC hum or other signal distortion. A sonagram taken by a friend several hundred miles away showed no leading edge clicking or chirp from 35 WPM CW signals. In a dozen comparisons of audio quality of SSB signals with and without amplification, there were no remarkable changes in signal characteristics except strength, indicative of little intermodulation distortion.

It's too bad I had to send the demo unit back. The PT-2500 fits in quite well with the "superstation" many of us dream about. Considering the bang for the buck (about $1.45 per watt), it's a pretty good deal. B&W is known for quality products, antennas, and components. The PT-2500A linear amplifier is worthy of their name. I know what's going on my Christmas wish list this year . . . 73

SPECIAL EVENTS

Ham Doings Around the World

ORLANDO FL
DEC 3

Shows Unlimited, Inc., is holding its annual PC Fest Computer Show and Sale. It will be held at the Orlando Twin Towers Hotel. The show consists of: supplies, chips and ICs, software/hardware, new and used equipment, local and national dealers, closeouts and liquidations, Commodore, Amiga, and Atari Software, brand names, IBM Clones, Apple products and savings of 25–85%. Show hours are from 10 AM to 4 PM. For more information to reserve a table or to get on the mailing list contact; *Shows Unlimited, Inc., at 301-970-2210 or 301-626-0311.*

FLAMINGO FL
DEC 3–4

The Everglades ARC will operate W4SVI from 1400Z Dec. 3 to 1900Z Dec. 4th, to celebrate the 41st anniversary of Everglades National Park. Operation on CW is near 7030, 14030, and 21130 kHz, and on SSB, near 7230, 14230, 21330, and 28375 kHz. Novice contacts on 7130, 21130, and 28375 kHz. Send QSL and 2 stamps for unfolded certificate. Novice certificate for those who identify as Novices on 2 of 3 bands, no stamps required. *E.A.R.C., PO Box 113, Homestead FL 33090-0113.*

SAN BENITO TX
DEC 3–4

The San Benito ARC's Texas State QSO Party is from 0001 UTC the 3rd to 2359 UTC the 4th. Texas stations may contact any station, non-Texas stations may contact only Texas stations. All amateur bands, except WARC. Three contacts of 1 each per band permitted. Suggested frequencies are 40 kHz up from band edge for CW, and 1.890, 3.885, 7.285, 14.285, 21.360, and 28.405. Novice segment CW operation, 25 kHz up from low band edge. Certificates. For information on exchanges, scoring, and certificates, contact *San Benito Amateur Radio Club: #2247 SSC, PO Box 1382, San Benito TX 78586-1382.*

APACHE JUNCTION AZ
DEC 3–4

The Superstition Amateur Radio Club will host the 1988 ARRL Superstition Hamfest at the corner of Brown and Meridian. Swap and shop both days. Test booth with 120 volts AC and antenna. Food, camping (no hookups). Tailgate admission is $3 and general admission is $1 for both days. Primary talk-in will be on 147.12(+) repeater, and on the 145.41(−)/223.82(−) link system. You can obtain information on 146.74, 146.94, and ZIA system repeaters as well. Contact *Bill Glaze KA7SUF at 602-832-3955 or Larry Kuck WB7CRK at 602-986-2298.*

HAZEL PARK MI
DEC 4

The Hazel Park Amateur Radio Club will hold its 23rd Annual Swap & Shop at the Hazel Park High School, 23400 Hughes. General admission is $2 in advance, $3 at the door. Children under 11 free. Tables, $1 per foot. Plenty of free parking. Talk-in from the 9-mile and I-75 area on 146.640−. For tickets and table reservations, contact *H.P.A.R.C., PO Box 368, Hazel Park MI 48030.*

JACKSONVILLE FL
DEC 4

Shows Unlimited, Inc., is holding its annual PC Fest Computer Show and Sale. It will be held at the Prime Osborn Convention Center. The show consists of: supplies, chips and ICs, software/hardware, new and used equipment, local and national dealers, closeouts and liquidations, Commodore, Amiga, and Atari Software, brand names, IBM Clones, Apple products and savings of 25–85%. Show hours are from 10 AM to 4 PM. For more information to reserve a table or to get on the mailing list contact; *Shows Unlimited, Inc., at 301-970-2210 or 301-626-0311.*

ALABASTER AL
DEC 10–16

The Shelby County Amateur Radio Club will operate AC2ØØT to celebrate the 200th anniversary of the US Constitution and the opening of the club station in Pelham, Alabama. AC2ØØT plans to operate all HF bands, concentrating on CW and SSB. Other modes will be used if available. Special efforts will be made to contact Novices. Include SASE with QSLs and send to *W4DYL, 632 Glen Park Drive, Fairfield AL 35064.*

NEW CARROLLTON MD
DEC 17

Shows Unlimited, Inc., is holding its annual PC Fest Computer Show and Sale. It will be held at the New Carrollton Howard Johnson's Hotel. The show consists of: supplies, chips and ICs, software/hardware, new and used equipment, local and national dealers, closeouts and liquidations, Commodore, Amiga, and Atari Software, brand names, IBM Clones, Apple products and savings of 25–85%. Show hours are from 10 AM to 4 PM. For more information to reserve a table or to get on the mailing list contact; *Shows Unlimited, Inc., at 301-970-2210 or 301-626-0311.*

BURLINGTON IA
DEC 17–23

The Iowa Radiosport Society will be operating Amateur Radio Special Event Station K2Ø ØRW in celebration of the Constitutional Bicentennial and the 150th anniversary of Burlington, Iowa, as the first territorial capitol. Operations will be on CW and SSB, as propagation permits, with special emphasis on operations in the 10 meter and other Novice segments. Special QSL cards will be available for return upon receipt of SASE or SAE and IRC sent to: *I.R.S.A.C., 923 N. 9th St., Burlington IA 52601.*

GARLAND TX
DEC 24–30

K2ØØQHD, of the Garland Amateur Radio Club, will operate CW, SSB, and digital, on 80 through 10 meters beginning 0001Z the 24th through 2359Z the 30th. For special QSL, send your QSL and SASE to *KF5PE, 2934 Cotton Gum Road, Garland TX 75044.*

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The Ameritron AL-80A combines tne economical 3-500Z with a heavy duty tank circuit to achieve nearly 70% efficiency from 160 to 15 meters. It has wide frequency coverage for MARS and other authorized services. Typical drive is 85 watts to give over 1000 watts PEP SSB and 850 watts CW RF output. A new Pi-L output circuit for 80 and 160 gives full band coverage and exceptionally smooth tuning.

Size: 15½"D. x 14"W. x 8"H. Wgt. 52 lbs.

AL-1200 LINEAR AMPLIFIER

3CX1200 TUBE

Full legal output with 100 watts drive.

AL-1500 LINEAR AMPLIFIER

8877 TUBE

Full legal output with 65 watts drive.

The cooling system in both amplifiers keeps the tube safely below the manufacturers ratings even when operating at 1500 watts output with a steady carrier. The filament supply has inrush current limiting to insure maximum tube life.

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AL-84 LINEAR AMPLIFIER

The **Ameritron AL-84** is an economical amplifier using four 6MJ6 tubes to develop 400 watts output on CW and 600 watts PEP on SSB from 160 through 15 meters. Drive required is 70 w typical, 100 w max. The passive input network presents a low SWR input to the exciter. Power input is 900 watts. The AL-84 is an excellent back-up, portable or beginner's amplifier.

Size: 11½"W. x 6"H. x 12½"D. Wgt. 24 lbs.

ATR-15 TUNER

The **Ameritron ATR-15** is a 1500 watt "T" network tuner that covers 1.8 through 30 MHz in 10 dedicated bands. Handles full legal power on all amateur bands above 1.8 MHz.

Five outputs are selected from a heavy duty antenna switch allowing the rapid choice of three coaxial lines, one single terminal feed or a balanced output. An internal balun provides 1:1 or 4:1 ratios (user selectable) on the balanced output terminals.

A peak reading wattmeter and SWR bridge is standard in the ATR-15. It accurately reads envelope powers up to 2KW.

Size: 6"H. x 13¼"W. x 16"D. Wgt. 14 lbs.

Remote COAX Switches

RCS-4 FOR CONVENIENT INSTALLATION

No control cable required.
Selects one of four antennas.
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Impedance: 50 ohms.
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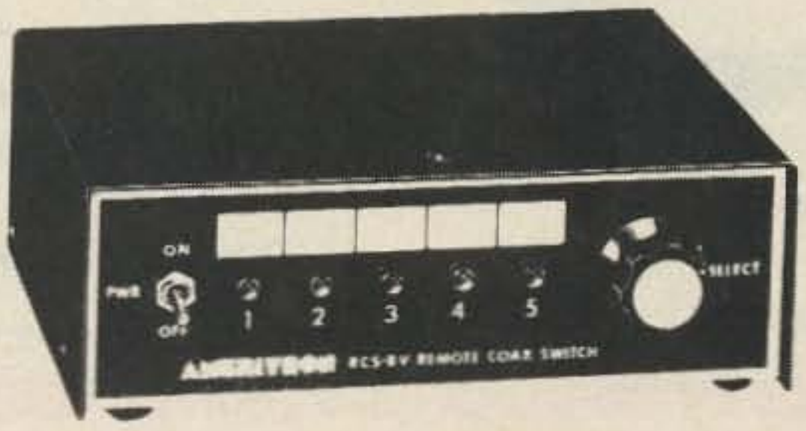

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Selects up to five antennas.
Loss at 150 MHz: less than .1 dB.
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Power capability: 5 kW below 30 MHz, 1 kW at 150 MHz.

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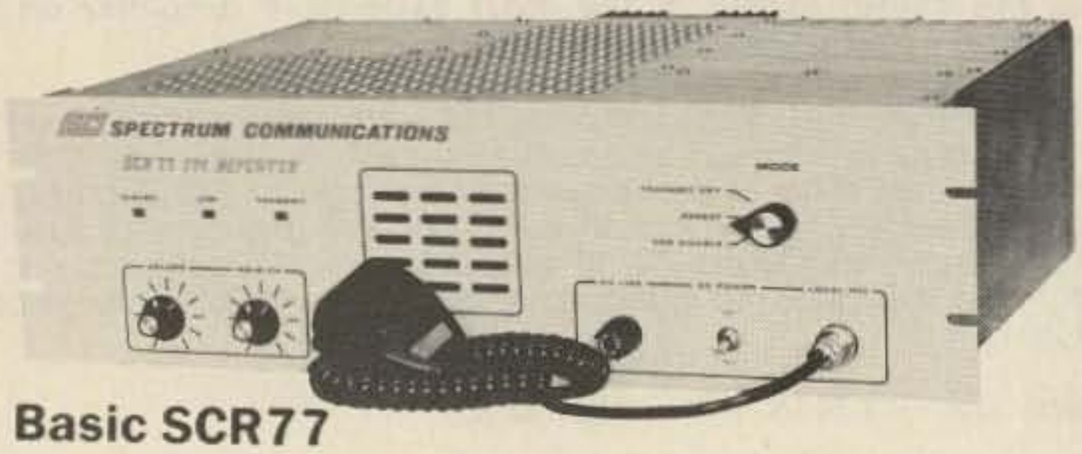

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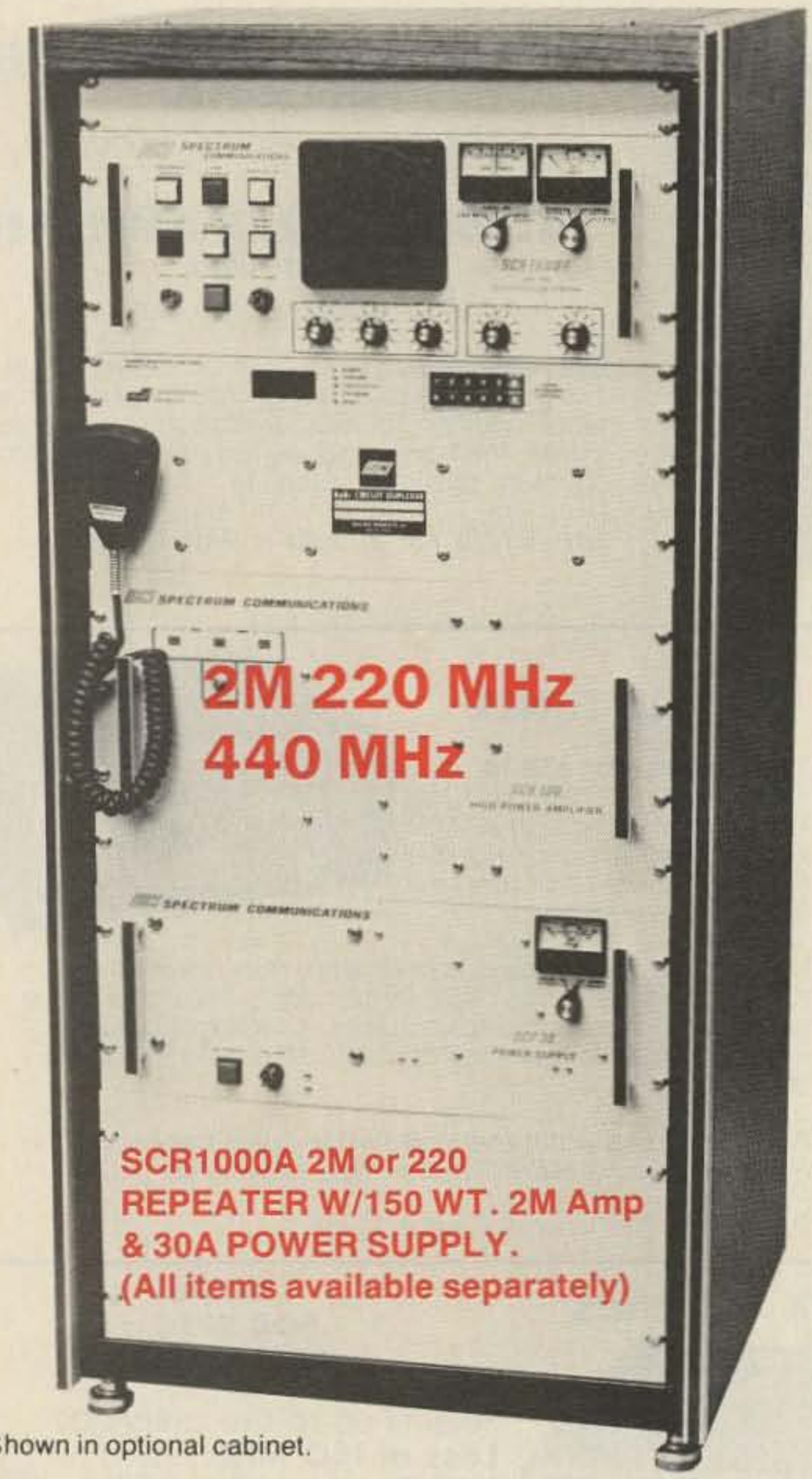

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For that new Machine—Spectrum now makes 3 lines of Repeaters—the world famous Deluxe SCR1000A, the Low Cost line of SCR77s, and the new State of the Art Microprocessor Controlled SCR7000X Line of Repeaters which will be out very soon.

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LOOKING WEST

Bill Pasternak WA6ITF
28197 Robin Ave.
Saugus, CA 91350

The Save 220 NTRN

How does amateur radio tell a deaf-eared FCC that we will not accept their highly questionable reallocation of 220–222 MHz? This was the question puzzling *220 Notes* Editor Art Reis K9XI and myself when we sat on the phone trying to find some answers to this and other allied questions.

Since the release of the Report and Order on PR Docket 87-14 last August, the amateur community continued to grow ever more incensed at what it saw. In its decision, the Commission used arbitrary and capricious methods to take 220–222 MHz from hams and give it to private business interests. Even after the story dropped from the front pages of the various amateur news publications, the level of resentment toward the Commission, and specifically its Office of Engineering and Technology, continued to grow. That became a story unto itself. Usually, without follow-up coverage, nothing is forgotten sooner then yesterday's news. It wasn't the case here, as everyone—be it the Novices on 10 meters and the repeaters of 1¼ meters, the Techs of 2 meters, the DXers on 20, or the late-night Extras in QSO on 75—became involved and *stayed* involved. The inter-community and intra-community chatter was the same: *US hams will not rest until the reallocation decision is reversed and the entire spectrum from 220–225 MHz is declared "amateur exclusive!"*

> ***". . . bungled divided efforts would only ensure that the FCC decision would stick."***

Fits and Starts

There's great motivation in the amateur community to fight this matter, but many people are going off half-cocked in their attempts. The worst it of all seemed to be the ham/lawyers, many of whom obviously did not understand either the terms of the Federal Administrative Procedures Act or the limits available to them in the Federal Court system. They were heard loud and clear before many clubs and on many nets with their threats of Civil Rights suits against the FCC. Fortunately, one perspicacious ham/lawyer, Joe Merdler N6AHU, pointed out the danger of all the rhetoric and posturing—bungled divided efforts would only ensure that the FCC decision would stick. Unity was desperately needed.

Resurrecting the NTRN

Enter the NTRN. Many people were involved in getting the National Teleconferencing Radio Network (NTRN) back up and going. (See November "Looking West" for details.) Lou Appel K/0IUQ is the unsung engineering hero of these events. He supplied the mid-USA telephone intertie system and was the man who sat there controlling it during each of these events in the past, and came through for us in shining colors again on 2 October.

There were four basic jobs to do, and really only two people to do them. We worked out the NTRN format in one night. We needed a panel of experts representing every interest on 1¼ meters. We had to publicize the time and date of the NTRN. Finally, we had to register all participating outlets where the NTRN would be heard and assigned a port on the teleconference bridge.

While Art put together the "panel" and secured studio facilities, I alerted the vast majority of active hams in the US to the NTRN through my Westlink Radio Network Newsline, and other newsletters. Soon the phone at my house was ringing day and night with requests for teleconference bridge assignments. Only repeater groups, bulletin stations,

Continued on page 100

Number 29 on your Feedback card

QTH-DX

QTH is Christmas Island

Leon Fletcher N6HYK
274 Webster Drive
Ben Lomond, CA 95005

The Yuletide Island

On Christmas day in 1643, Captain William Mynors of the Dutch sailing ship *Royal Mary*, spotted a small isolated bit of land in the Indian Ocean and named it Christmas Island.

Apparently Captain Mynors was navigating from an outdated chart. The island had actually been discovered 28 years earlier, in 1615. Richard Rose, master of the *Thomas*, founded this island and named it Moni on a Dutch chart dated 1618.

Today, the name Christmas Island has won out, but the island is still largely unknown. Although the island is Australian territory, the information officers at both the Embassy of Australia, in Washington DC, and at the Australian Tourist Commission in California, said they'd not heard of the island. The latest *Current Report* about Christmas Island, sent out by the Australian Information Service, is five years old. In the last four years, the 400 "major magazines" published in the United States have printed only two articles about the island. In the giant *Australia Encyclopedia*, the island gets just a two and one half inch notice.

Out Of Obscurity

Such solitude will soon be gone if the Australian government's plans work out. They authorized the construction of a 170-room hotel-casino, scheduled to open by the end of 1989. Private investors are planning additional hotels, restaurants, charter fishing boats, and other leisure activities.

Such changes are needed on Christmas Island. The island has been relying on just one economic base—the mining of phosphate, a vital ingredient in fertilizers. The mining hit its peak in 1978, when more than 1.26 million tons of phosphate were exported. In December 1978, with the supply of phosphate nearly exhausted, mining stopped. But in July 1988, the Australian government announced that mining may resume.

Santa Claws

Still, other economic resources are clearly needed. In addition to tourists, the government is trying to entice small-scale manufacturing and agricultural ventures. But a bothersome block to those plans—actually inhibiting virtually all activities on Christmas Island—are the swarming red crabs.

Once a year in late spring, for about nine to 18 days, some 120 million of the crustaceans—nearly 9,000 tons—march on a breeding migration from the inland forest to the seashore. Their claws are so sharp that they could puncture the tires of an automobile running over them.

The red crabs are just one of the 15 species of land crabs that live on the island. Among them is the world's largest crab, the giant robber, or coconut crab. They weigh up to seven pounds.

The island also ranks as one of the world's great seabird habitats, according to Australian conservationist John W. Hicks. Of the eight kinds of birds which breed there, three—the Christmas Island frigate bird, Abbott's booby, and the gold bosun bird—breed nowhere else.

In addition, of the some 200 different flowering plants growing on the island, about 30 are endemic.

To preserve those distinctive plants, birds, and crabs, a six square mile national park was established in 1980.

A Little Geography

Christmas Island is in the Indian Ocean, 220 miles south of its nearest neighbor Indonesia, 1,000 miles north and slightly west of the mainland of Australia. It is 12 miles long, 3.5 to 9 miles wide, and it is a 55-square mile top of an undersea mountain.

The island's central plateau is about 1,000 feet high. Rain forest covers three-fourths of the island, fed by as much as 100 inches of rain a year. Temperatures range between 75 and 85 degrees.

Most of the coastline consists of cliffs up to 600 feet high. There are a few sandy beaches and some small bays. Flying Fish Cove is the island's lone port.

Who's There?

Only about 1,000 people live on Christmas Island. The majority are Chinese and Malays; most of the others are from Australia, New Zealand, and India. Just three years ago, before mining declined, there were around 3,000 residents.

Unemployment is high. In 1985, the government started retraining programs to help islanders find jobs in Australia. A "Resettlement Scheme" provides incentive payments to encourage residents to move off-island.

Until just 100 years ago, the island was uninhabited. The first residents came in 1888—14 British adventurers. The coconut palms they planted still stand along the beach.

In 1895, large deposits of phosphate were discovered. A British company started mining there two years later.

During World War II, the Japanese occupied the island. In 1946 the island became part of the Colony of Singapore. The mining company was bought by Australia and New Zealand in 1948, and ten years later, the island became an Australian territory.

In 1963, Christmas Island began issuing its own stamps. They are especially colorful and attractive. Some show the early sailing vessels and sail-and-steam ships which visited the island. One 1980–81 series shows 16 steps of mining—drilling, drying, crushing, etc. While the stamps are avidly sought after by many collectors, they have not yet become particularly valuable. In a single year, the stamps brought more than a half-million dollars to the island.

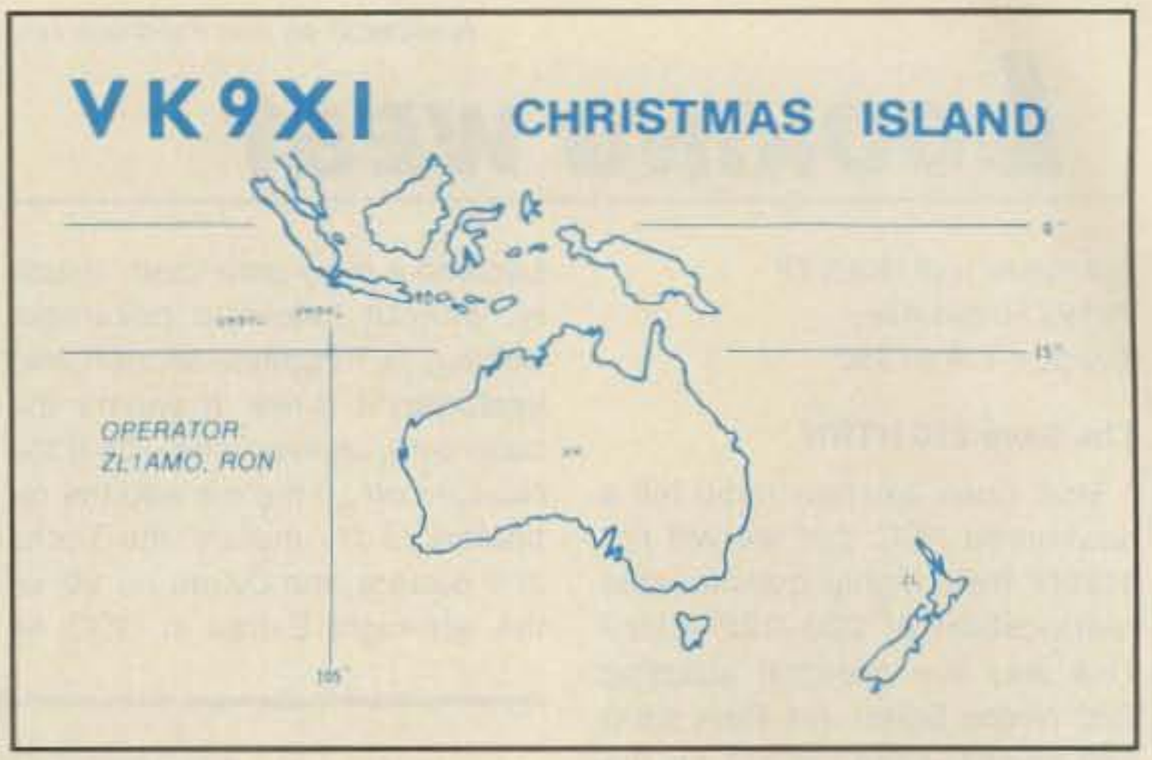
For resident Europeans, the center of social life is the Christmas Island Club, featuring a swimming pool, tennis courts, and movies. Other island attractions include a nine hole golf course, cricket club, and, on Phospate Hill, a building known island-wide as the "Ham Shack."

Two Christmas Islands

Hams around the world know the island as VK9. The current *Call Book* lists just two stations on the island, and one of those is the club station. Still, the island is on the air enough so that it didn't make the latest list of "100 most wanted DX stations," compiled by *The DX Bulletin*.

One caution: This Indian Ocean Christmas Island is often confused with the other Christmas Island, the one in the South Pacific, located 1,300 miles south of Honolulu. This South Pacific Christmas Island is the largest of the 33 islands of the Republic of Kiribati.

Dedicated DXers never confuse the two islands—hams on the South Pacific Christmas Island use the East Kiribati prefix T32, which counts for the country of Kiribati, not for the "country" known as Christmas Island. 73



"Christmas Island is in the Indian Ocean, 220 miles south of its nearest neighbor Indonesia . . ."

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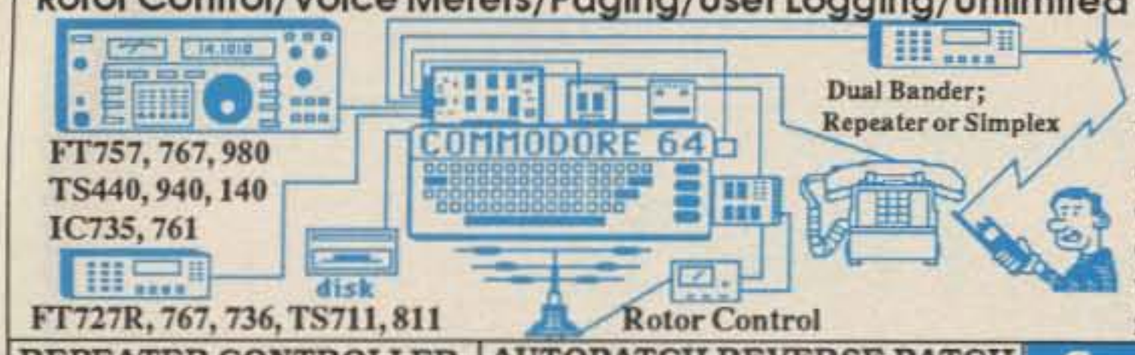

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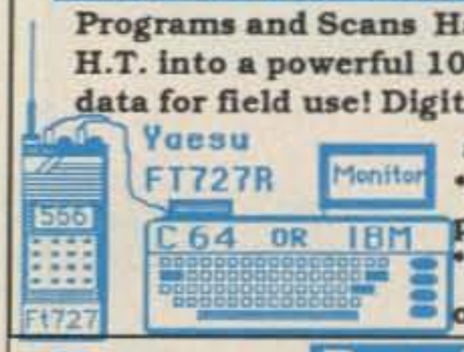

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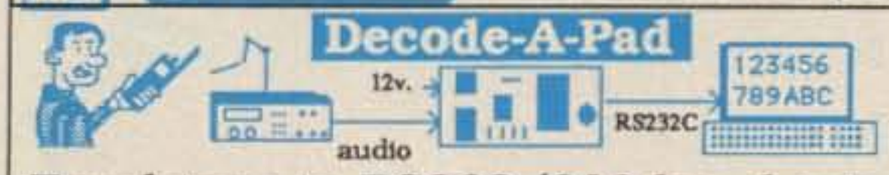

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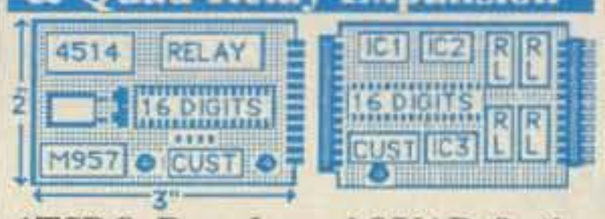

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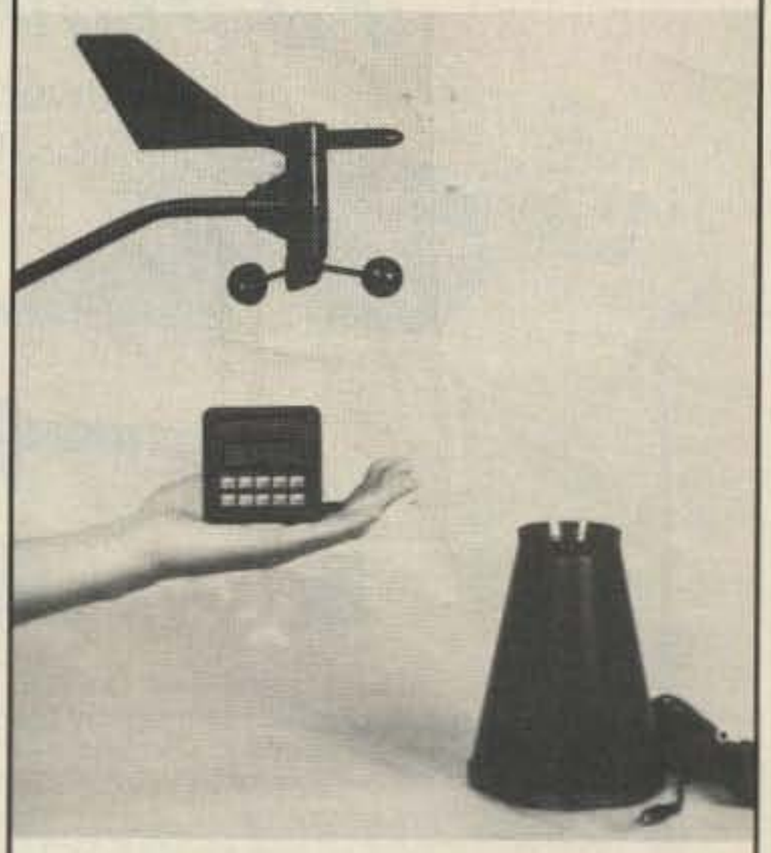

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continued on p. 88

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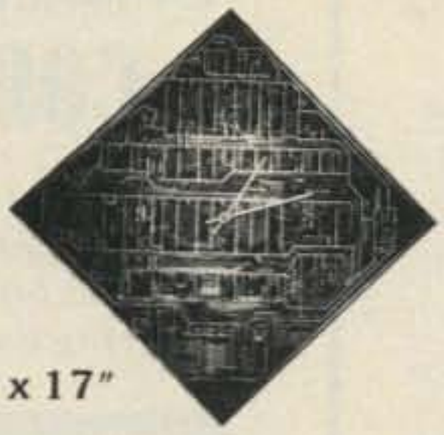

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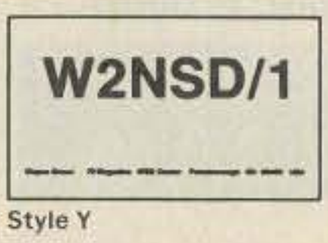

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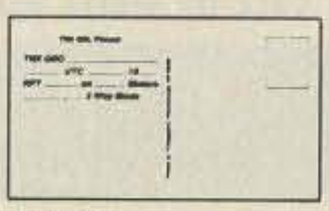
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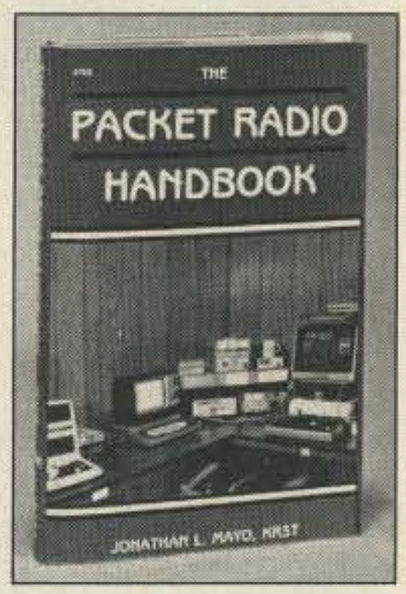

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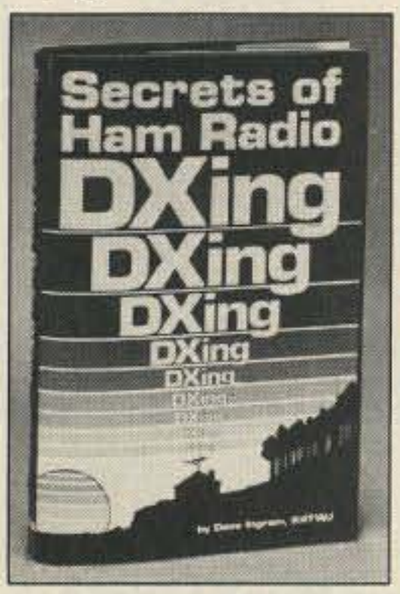

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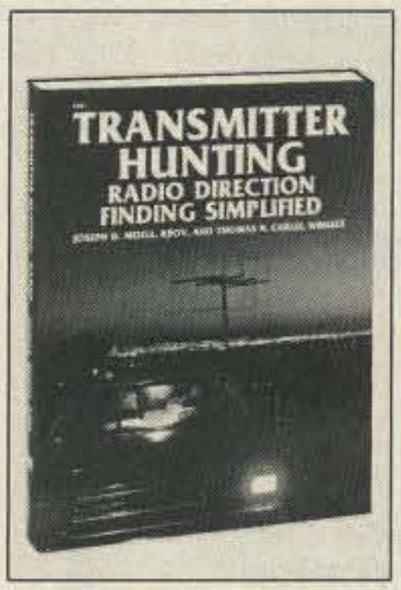

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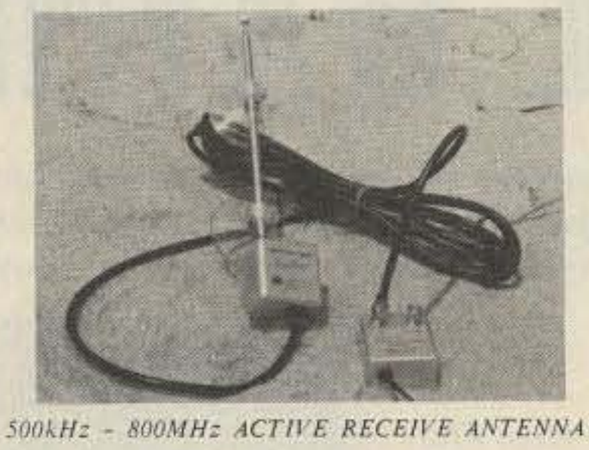

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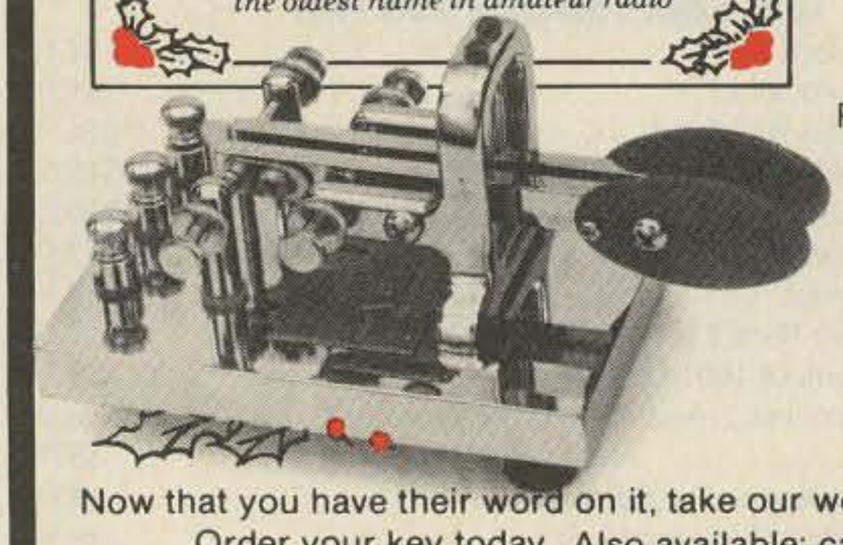

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TECH TIPS

Pearls of Tech Wisdom

PS Fix for the PK-232

The AEA PK-232 is a very popular terminal unit. I've had mine for a year now. Recently, though, it developed a problem. The Pakratt sometimes lost its presets in memory, even though the memory backup batteries checked out OK. The three LEDs on the left side of the display lit up randomly. The unit sometimes locked up and didn't print a thing.

I soon found out that the problem was in the voltage regulator connection to the circuit board. A screw with lock washer and nut at the bottom of the board loosened up, due to the heat sink temperature. This screw connects the output of the regulator from the heat sink tab to the circuit board. Tightening down this screw improved the connection, but there is a better way and permanent fix to this problem.

To make a permanent fix, solder a wire to the center tab of the LM-317T voltage regulator and the other end to the anode of diode D12. If the tab is cut off too short, you will have to replace the IC with a new one. (Radio Shack has them in stock.) Apply heat sink compound to the regulator IC before mounting it to the heat sink unit. To remove the circuit board from the chassis, unscrew the six screws on the top of the board and the knob, and nut on the threshold pot on the front of the unit. The board will then lift out (don't bend any of the LEDs). You may have to hold the screws on the bottom from turning to loosen up the top ones. After you are done with the modification, carefully replace the board and align it, then replace the six screws, nut, and knob.

Recheck connections before applying voltage to the unit, then fire it up. Be sure the memory batteries have been replaced. You will get the AUTOBAUD message asking to print an "*" to set the RS-232 port. The BAUDOT LED will be lit. Reset the missing presets. Turn off the unit, unplug the power then replace the top of the metal cabinet and the six screws. Now, install the unit as before and plug in the power and RS-232 cable and you're ready for problem-free operation.

Remember to observe safety precautions when working around ICs to prevent static shock damage, and watch your soldering to prevent shorts and damage to the printed wiring.

I love my Pakratt and have been very satisfied with its performance. Although you may not have this problem for a while, it will eventually come up, so don't pull your hair out until you check this regulator connection. What seems like a complex problem may be this simple. Here is the corporate address if you need them for advice or IC upgrades. *AEA Inc., Units O&P, 2006 196th S.W., Lynwood, WA 98036; (206) 775-7373.*

Robert Fisher KF6DF
5994 Arden Ave.
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Lightning Protector

As I settled the dust in the new shack, I found that my previous lightning protect system was inadequate. I sifted through the materials that had been pack-ratted away and came up with a system that satisfied my needs.

The materials I used were: a sheet metal box, measuring 7" cubed, enough SO-239s for each of the antenna systems I have, copper braid stripped from old coaxial cable, star washers and nuts to secure the SO-239 to the box, solder and soldering iron, and a drill.

On the bottom of the sheet metal box, I drew a pattern of the SO-239s, leaving enough space between each to allow securing with star washers and nuts. I also left enough room to label each one. I then drilled the patterns and reamed the holes to take off any sharp edges. I connected the SO-239s in series by soldering the end terminals to the copper braid. A short strip of braid was cut and soldered to the shielding coupler of each SO-239, to insure complete grounding. I cut a longer strip of copper braid long enough to reach the ground rod outside the shack. The series of SO-239s then fed through the open end of the box, so the threaded end protruded through the predrilled patterns. The SO-239s were then secured with the star washers and nuts and labeled. The longer strip was run to the ground rod and secured with a clamp.

This system saved me the cost of buying commercially made lightning arresters and splicing my coaxial cable. Now when the thunder starts to rumble, I simply screw my coaxial connectors to my home-brew lightning arrester and pray like everyone else that I don't take a hit. I do feel better, however, knowing that, if I do take a direct hit, the energy will not travel to my radio gear. I would rather replace my antenna system than expensive radios.

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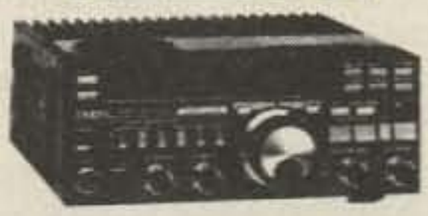

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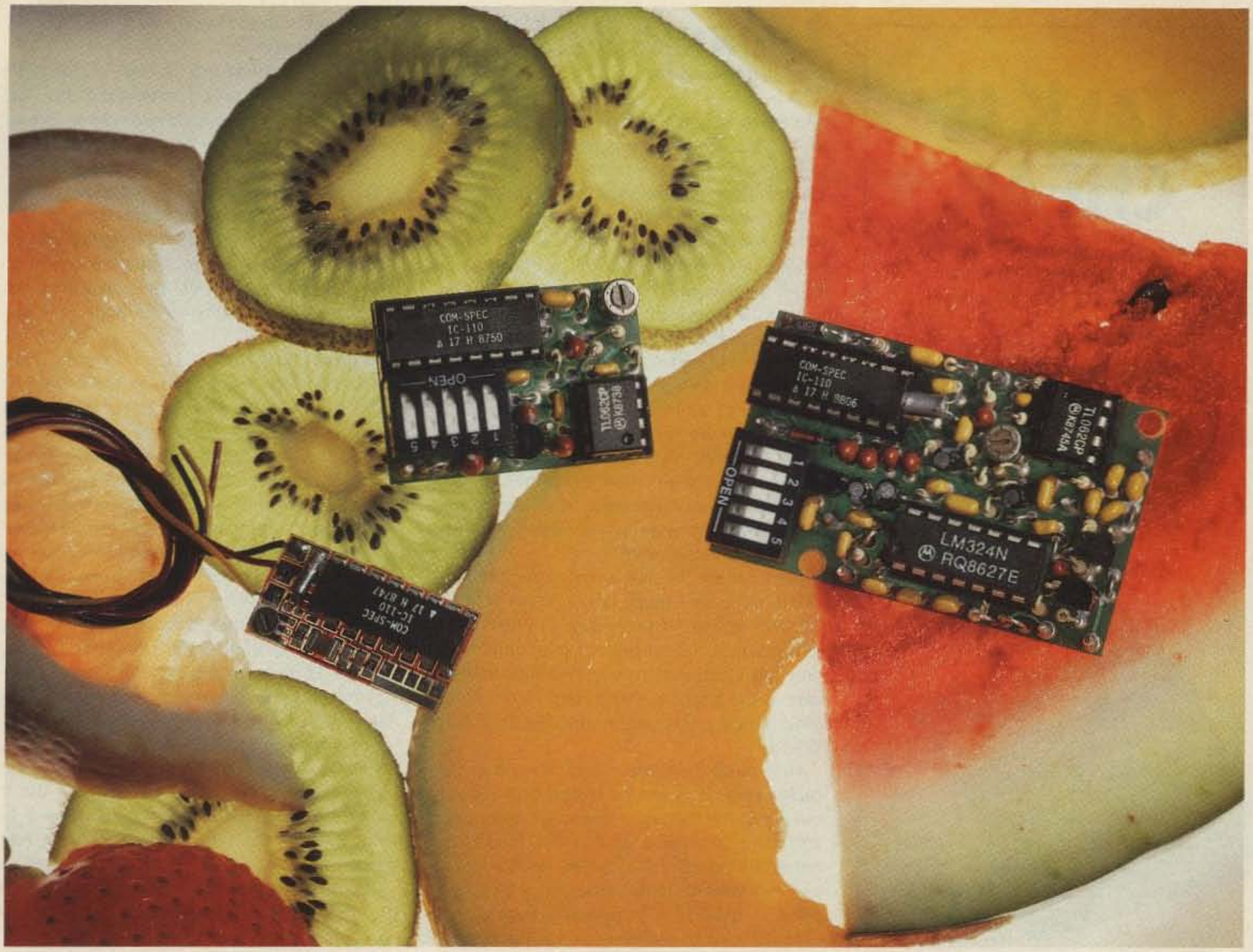

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CIRCLE 10 ON READER SERVICE CARD

LOOKING WEST

Continued from page 83

and those capable of distributing the net on the bands were granted assignments. With the number of bridge ports limited to 70, no individual hams were given special treatment.

The crowning link to all this was donated by Bill Duval K5UGM of Irving, Texas. Bill arranged the donation of uplink and air time on KSAT satellite radio. KSAT is on the ATT Telstar 303 communications satellite on Transponder 19. With the addition of KSAT to the quickly filling teleconference bridge, it appeared as if the distribution was complete.

Art wasn't sitting on his laurels. He managed to secure the facilities of the Satellite Music Network in Mokina Illinois. It is state-of-the-art: a full-blown Auditronics mixing console, audio cart machines, telephone hybrid interconnect, and an all-volunteer engineering and production staff.

First chosen for the panel of experts was ARRL Counsel Chrisopher D. Imlay N3AKD. Chris practices his profession in Washington and probably has a better understanding of how the Commission functions then anyone else in the League. From *Ham Radio Magazine* came its Associate Editor Joe Schroeder W9JUV.

Hurt more then any others are the packet radio users. They are the fastest growing subculture in the modern world of amateur radio and were depending on 220–222 MHz to become the backbone of a real-time, coast-to-coast, border-to-border emergency communications network. A network, that due to channel loading elsewhere on 220 and on all other suitable VHF and UHF bands in urban areas, will now never come to be. Thanks to Steve Goode K9NG in Illinois, their position was well-addressed during the NTRN.

Ed Gray W0SD in Salem, South Dakota and Roger Cox WB0DGF in Lincoln, Nebraska eloquently addressed the needs of the EME and weak signal operators.

FM isn't unaffected by this reallocation move. The job of making sense out of this falls to the nation's frequency coordinators. Everyone that now operates below 222 MHz, must be redistributed into the urban sprawl above 222. Thus Karl Pagel N6BVU, president of the 220-SMA frequency coordination group, came to be a part of the interactive panel. 220-SMA, however, represents the "western view" so for balance we prevailed on Gary Cantor WA2BAW of the the Tri-State Amateur Repeater Council.

Finally, the Condor Connection. This NTRN, through the outspoken Mark Gilmore WB6RHQ, told the country about the world's largest 220 MHz open intertied repeater network. This is a radio network that permits hams throughout California and Nevada to talk to each other as if they were next-door neighbors. This legendary system relies totally on the 220–222 MHz band to interlink its sites. This system, which has served in numerous emergencies, will disappear if the reallocation is permitted to proceed. Due to overcrowded conditions on other bands, there's no place for it to move.

I have never seen such cooperation between the various and sometimes highly divergent factions of the amateur community. While each speaker represented a particular point of view, the theme throughout the 2 hours of on-air activity kept coming back to what people like Joe Merdler N6AHU, had hoped for. One of unity, of purpose, and an ongoing determination to do all that is within the power of man to keep 220–225 MHz and every ham band for the use of amateurs only.

The NTRN's message to the FCC and the business community is clear: *"We are as one and we mean business!"*

Look for details on this NTRN, and info on future ones. Happy Holidays from the night shift in LA! 73

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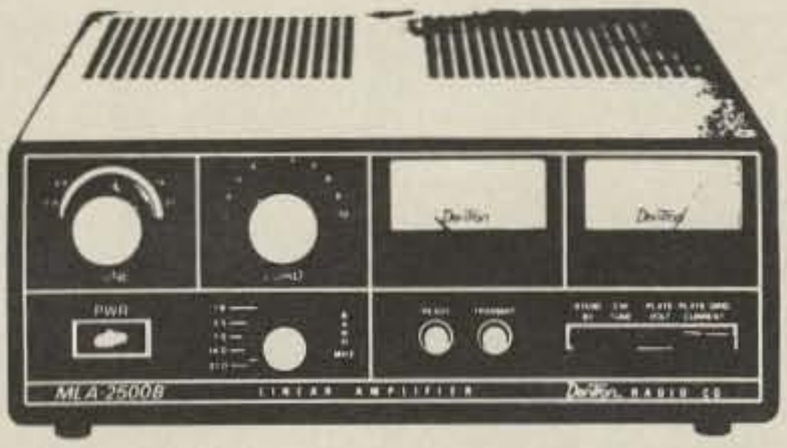

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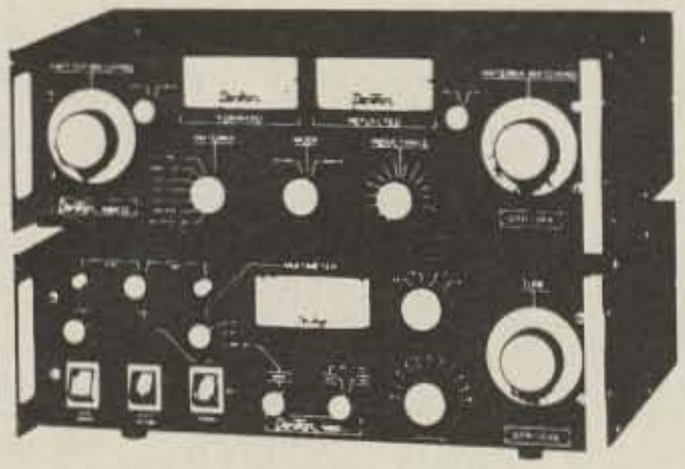

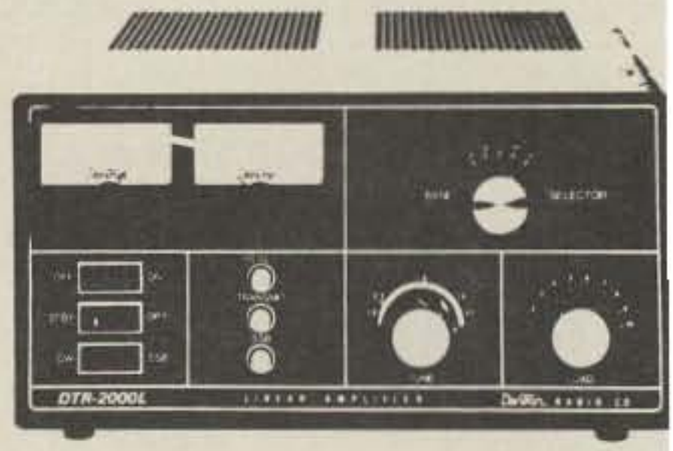

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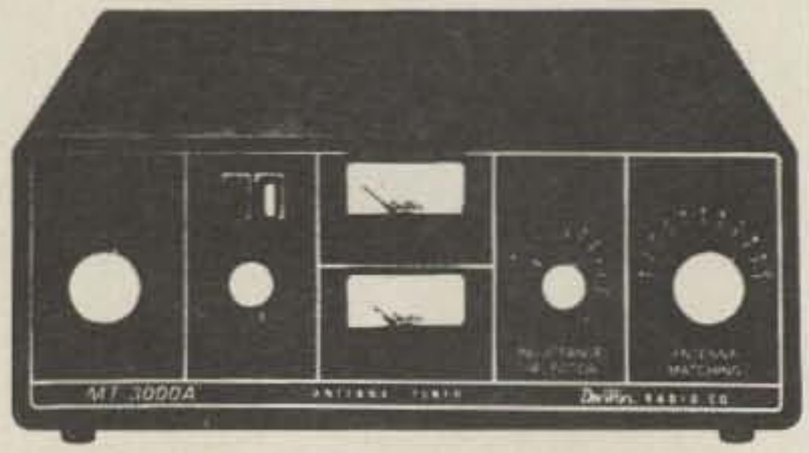

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73 INTERNATIONAL

edited by C.C.C.

Notes from FN42

***Air mail subscriptions** are beginning for established Hambassadors to 73 International! New Hambassadors' subscriptions will graduate to air mail on the January after their first year's third report (third of the three Hambassadors send in each year). This will improve report follow-ups and help keep information as much up to date as is possible in a monthly magazine. And Hambassadors will be the most up-to-date readers in their countries!*

***Callbook editors around the world:** See the first item in the report from Israel, below. And even before receiving his October issue with the first revision of **The 73 International Universal Permit Application**, 4X1MK (not 4X11MK, as mentioned in it!) has sent in some good news. Thanks to the good offices of the Israel Amateur Radio Club (whose Membership Services volunteers will do the work), visitors to Israel wishing to make good their reciprocal licensing privileges no longer will have to show up in person at the Ministry of Communications in Tel-Aviv.*

Here's why. Send the IARC (PO Box 4099, 61040 Tel-Aviv, Israel) a photocopy of your valid license, a photocopy of the first page of your passport (with your photo on it), and a check or M.O. for the amount of US$12 (the Ministry is not authorized to receive foreign currency, so the IARC does the conversion) and the following information: Family name, previous family name (if changed), first name(s), father's name, place and date of birth, country of previous residence, present address, last address, occupation, present and previous places of employment, passport number and country. State expected date of arrival in Israel and equipment to be used: make, model number, frequency range, power output, and types of emission.

Your reciprocal license will be kept for you at the address of your choice here, OR, if you send the IARC the materials far enough in advance ("Give us a few good months!" writes Ron) the license will be mailed to your home address. (Ron's regular report follows in this issue.)

December's special days to mention in your QSOs: 1—National Day, Central African Republic (5th for Thailand, 17th for Bhutan), and Anniversary Day, Portugal (30th for Madagascar); 2—National Holiday, United Arab Emirates (3rd for Laos); 5—Discovery Day, Haiti; 6—Independence Day, Finland (7th for Ivory Coast, 9th for Tanzania, 11th for Upper Volta, 12th for Kenya, 16th for Bahrain); 10—Human Rights Day, Equatorial New Guinea; 13—Republic Day, Malta (18th for Niger); 15—Statue Day, Netherlands Antilles,, Bill of Rights Day, USA; 23—Victory Day, Egypt; 25—MERRY CHRISTMAS TO ALL!; 26—Boxing Day, Canada, Great Britain; 27—Constitution Day, North Korea; 28—King's Birthday, Nepal.

***Special Calendar Note:** As this is written, in Japan the 63rd year of Showa (meaning "enlightened peace") is in its 10th month. There may not be a 64th year, because the 124th Emperor, Hirohito, is gravely ill, and an era with a new designation will begin Year One with the reign of Crown Prince Akihito. Autumn festivals have been cancelled in that nation, so in your QSOs with Japan on November 23rd, rather than sending "Labor Thanksgiving Day" greetings (as listed on last month's international calendar) it will be more appropriate to express condolences. Sympathy will be appropriate for the entire time of mourning—which could be as long as a year—for the period will be a sad one for the Japanese. Rice will be planted on sacred ground when Hirohito dies, and Akihito will eat its harvest in a ceremony which completes the rites of accession, whereupon he becomes Emperor fully and in every way.—CCC*

Willis Island's current total population. L to R: P. Giese, C. Clark (radioman), P. Dawson (the O.I.C.), and D. Webb.

AUSTRALIA

The following is from the last report sent in by Jim Joyce VK3YJ before he retired as Australia's Hambassador to 73 International. (The WIA should be naming his replacement soon.) We call his story "Four Men and an Island—Weather from Beyond the Outback."

"Willis Island—the site of one of the most remote 'Observing Offices' of Australia's Bureau of Metereology."

It is a tiny outcrop in the Coral Sea 400 km east of Cairns, a mere speck in the ocean. (If Australia is thought of as the face of a clock, Cairns is at 0200.) It is 400 meters long, 100 meters wide, and 9 meters high. The population of the island is 4. The morning paper sometimes drops down out of the sky; the island is bombed (with food and supplies) every six months.

This is Willis Island—the site of one of the most remote "Observing Offices" of Australia's Bureau of Meteorology. It is staffed for six months at a time by a team of three Observers and one Radio Operator/Technician, whose reports are used in the tropical cyclone warning system.

On November 8, 1988, Willis celebrated the 67th anniversary of its establishment. It has come a long, long way since the first team stepped ashore onto a bare, windswept island, inhabited only by birds and turtles.

Davis, the Australian Antarctic Station, was named for the Commander of the *Aurora* of the 1911 Australasian Antarctic Expedition, and Captain John King Davis was also responsible for the Willis Island station. As Commonwealth

Pilot's-eye view of Willis Island on the run-in for a drop.

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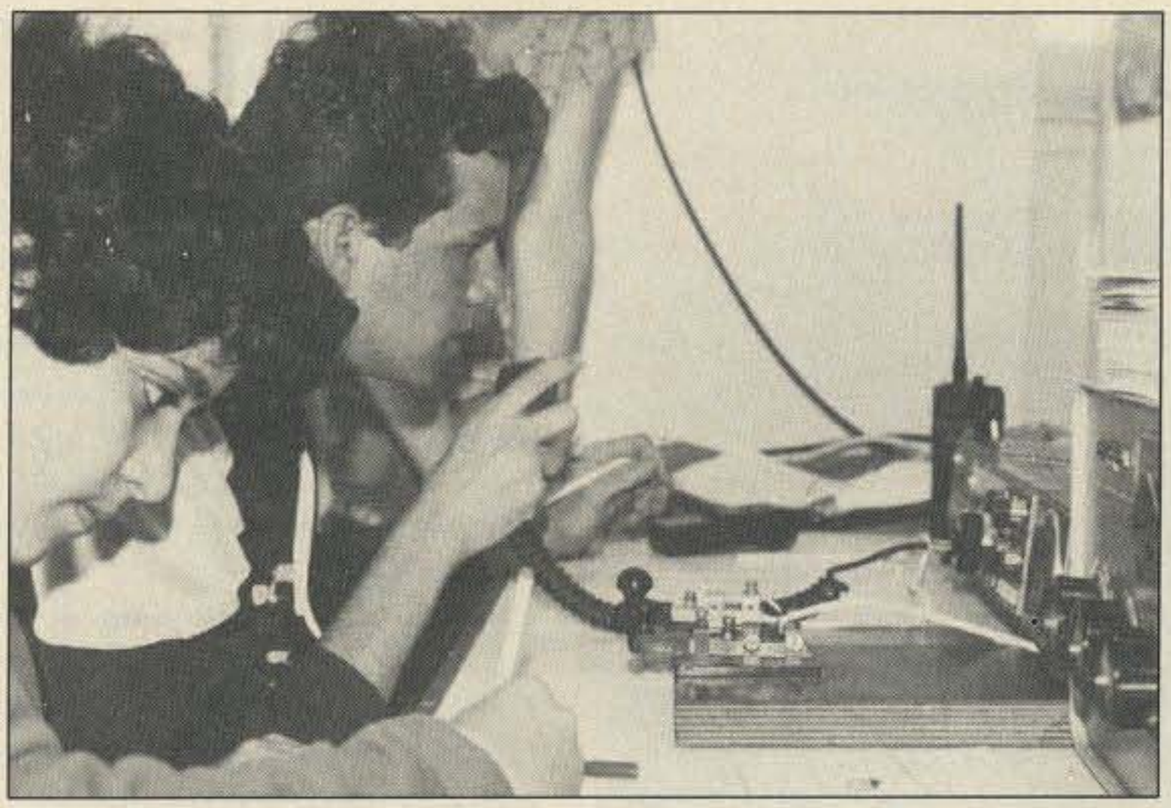
Director of Navigation, he saw its forecasting value since it sat in the cyclone-prone waters of the Coral Sea. In September of 1921, he rode over governmental objections that the cyclone season was less than two months away by volunteering to lead the first party himself. Davis didn't fool around, and one month later the steamer *Innisfail* dropped anchor off Willis and unloaded a 15-man party and 150 tons of cargo.

Sixty-seven years later Willis has established coconut trees for welcome shade, well-kept lawns around the buildings, and concrete paths to the weather-balloon launching area, the radar, and the beach. The beach is *not* a place to go to swim, however. By official decree, the ocean is reserved for the large shark population and other marine life.

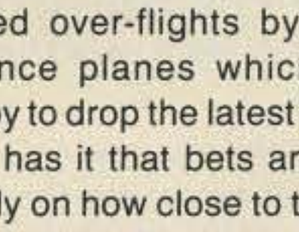
A large cool room and four freezers ensure fresh foods, and off-duty hours are made pleasant by TV from Cairns or Townsville, video cassette films, hi-fi music, billiards, table tennis, and a well-stocked library. Additional amusements Captain Davis wouldn't have believed are (1) the mid-duty-term "bombardment" of food, supplies, and what *really* can be called air mail, by the Royal Australian Air Force, and (2) unheralded over-flights by reconnaissance planes which often swing by to drop the latest papers. Rumor has it that bets are made regularly on how close to the front door the pilots can deliver a morning paper!

(Next installment: Amateurs on Willis Island.)

Jim wishes to express his appreciation for their help in his report on Willis to Ken McLachlan VK3AH, Dave Shaw VK3DHF, Dr. Peter Barclay VK3FR, Reg Carter VK3CAZ, and Bureau of Meteorology staffers Trevor Farrar (PR Officer), Michael Joyce (Weather Observer), and the Bureau's house jounal, Weather News.



Eyal 4X6TC (right) makes contacts from 4X40R in Jaffa (one of the four commemorative stations for Israel's 40th Anniversary) while Nir 4X6RK logs and fills out QSL cards. (Photo by 4X1MK)



ISRAEL

Ron Gang 4X1MK
Kibbutz Urim
Negev Mobile Post Office
85530 Israel

A request from the Soviet Union has come to me. Alex Lavrenchenko UM8MRG, QSL Manager for the UM prefix, the Kirghiz Republic, would like his address to be known to all the callbooks around the world. It seems to me that 73 International is a good place to pass this on. It is PO Box 392, Frunze-55, Kirghiz 720055, USSR.

Congratulations to the Israel 40th Anniversary Contest winners! Nearly 400 logs were received from around the world, and over 150 different Israeli calls were logged during the 24-hour period last April. (Complete results may be had from the IARC using the above address, for the price of return postage.)

In Europe the top three were I5VIT first, SP2FAP, and OH7RS; in Asia, JA1BNW, JA7HMZ, and VU2UR; Africa: EA9GS, EA8ABG, and EA9IB. From South America: LU7EVL, PY5EG, and LU1JDL; and from North America: K1MEM, K3ZO, and W4MLA. The first three Israeli single ops were 4Z4YX (4Z4KK), 4X6UU, and 4X1MJ.

Fox hunting DFing gains momentum here, perhaps glorified by the catching of "Dr. Bereleh," the Tel-Aviv jammer (see my August column, "The Phantom Unmasked.") In July in the Haifa area, Moshe 4Z4GM played the fox on 2 meters and finally was caught on the walls of the ancient city of Acre. The Holon Bat-Yam Club (just south of Tel-Aviv) plans a hunt on 80 meters.

The packet explosion has been such that the 4X4HF BBS in Haifa received more messages and files than its memory capacity, hampering operations. Just two short years ago its planners never imagined such widespread use.

In July of 1987, **Amir Bazak 4X6TT started a year-long around-the-world DXpedition.** In eleven months he made 67,000 QSOs from 18 countries, visiting 22, neglecting no modes, and giving many of us new countries for our DXCC collection. (Don't confuse Amir with Barukh 4Z4TT, who close to a decade ago put some rare ones on the air in the Pacific area! They're two different chaps!)

Some of the calls Amir put on the air were HS0B, XX9TTT, N4MJH/DU8, 4X6TT/DU1, XX9T, VK3ETT, AX3ETT, AX9L, VK3ETT/VK9, ZL0ACF, 4X6TT/FW0, T2STT, T27DX, 5W1TT, 4X6TT/KH8, and 4U1UN. Not bad at all! Amir is taking care of his own QSLing, and cards can be sent to his home address in the International Callbook. Just remember to send return postage! There is no way this young man can handle the mailing of cards from his own exhausted pocket!

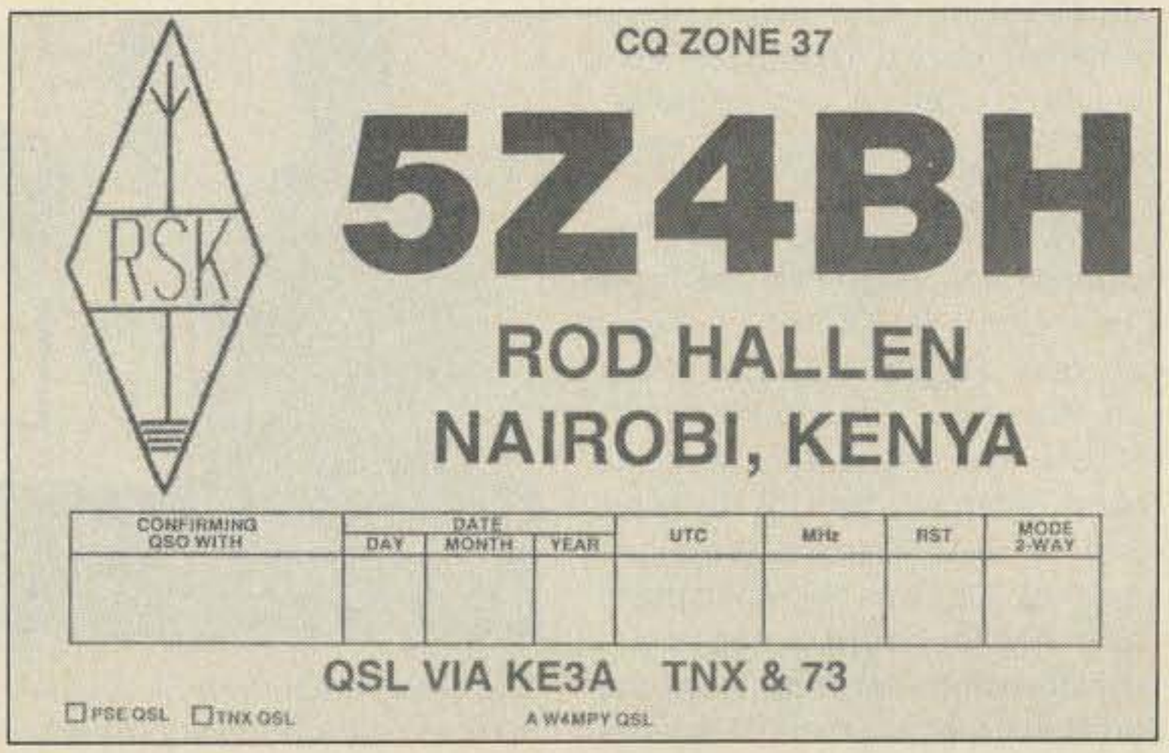
To the best of my knowledge, **Ralph 4X6IF is the first Israeli station to make Earth-Moon-Earth contacts.** Using four stacked Cushcraft "Boomers" fed by a kilowatt, the first historic QSO from Israel using the moon as passive repeater on the half-million mile route (!) was made with W5UUN on June 1 this year. If you want to work Ralph, chances are it won't be on the conventional bands, no siree! Check out 2 meters or 70 centimeters-satellite, EME, or Sporadic E. Ralph likes to sweat for his DX!

KENYA

Rod Hallen 5Z4BH
Box 55
APO New York 09675

[*We welcome KB7NK (take a deep breath: ex-9G1RT, C5AZ, 5T5AZ, TL8AZ, TU4BB, EL2AE, 3D2RH, ZL0AGS, VK2EFI, VK1HR, /5NO /VS6 /DU1, WA7NEV, WB6BOW) as our roving East Africa Hambassador (see last month's Kenya* ***Roundup*** *item). He will be traveling there extensively for the next four years and hopes to operate from many countries. (Bill KE3A will be his QSL Manager.) Rod is a Regional Communications Officer with the American Embassy in Nairobi; he has been a ham since 1962, and was an Associate Editor of* Kilobaud *(later* Microcomputing*) around 1978.—CCC*]

Kenya celebrates its 25th Anniversary this month (December) and will be using the special prefix 5Z25 (so I will be 5Z25BH). On October 14 and 15, Kenya was represented on the Boy Scout Jamboree on the Air by 5Z4LBP (LBP=Lord Baden Powell, Boy



Gennady Kolmakov UA9MA.

Scout founder), operated by Ted 5Z4OT and Palle 5Z4EJ.

The Kenya Award is issued by the Radio Society of Kenya (RSK). Only contacts made after December 31, 1977 count. Ten points are needed: 2 points for a contact with any 5Z4 member of RSK, 5 points for contact with the RSK club station, 5Z4RS. Any band, any mode, SWLs eligible. Some past and present members of RSK are 5Z4–BG, BH, BJ, BP, DS, DU, EJ, JB, LH, LL, LT, MR, OC, OT, PR, PT, RK, RT, RY, SS, WB, and ZC.

Send a log photocopy witnessed by an official of a local radio society or the licensing authority—QSL cards not necessary—with 10 IRCs or US$5 and a self-addressed adhesive label. Mail to Radio Society of Kenya, PO Box 45681, Nairobi, Kenya. Put KENYA AWARD on the upper left corner of the envelope.

USSR

Gennady Kolmakov UA9MA
PO Box 341
Omsk - 99
USSR

[*The following comes from a letter direct from Gena UA9MA and a letter from him written in Russian and sent via Ed Kritsky NT2X for translation. Ed will be helping us out (as an Assistant Hambassador!) with translations and interpretations, when needed; his help plus our plan to send many Hambassador subscriptions airmail will speed up and make more up to date our reports from far-away countries.—CCC*]

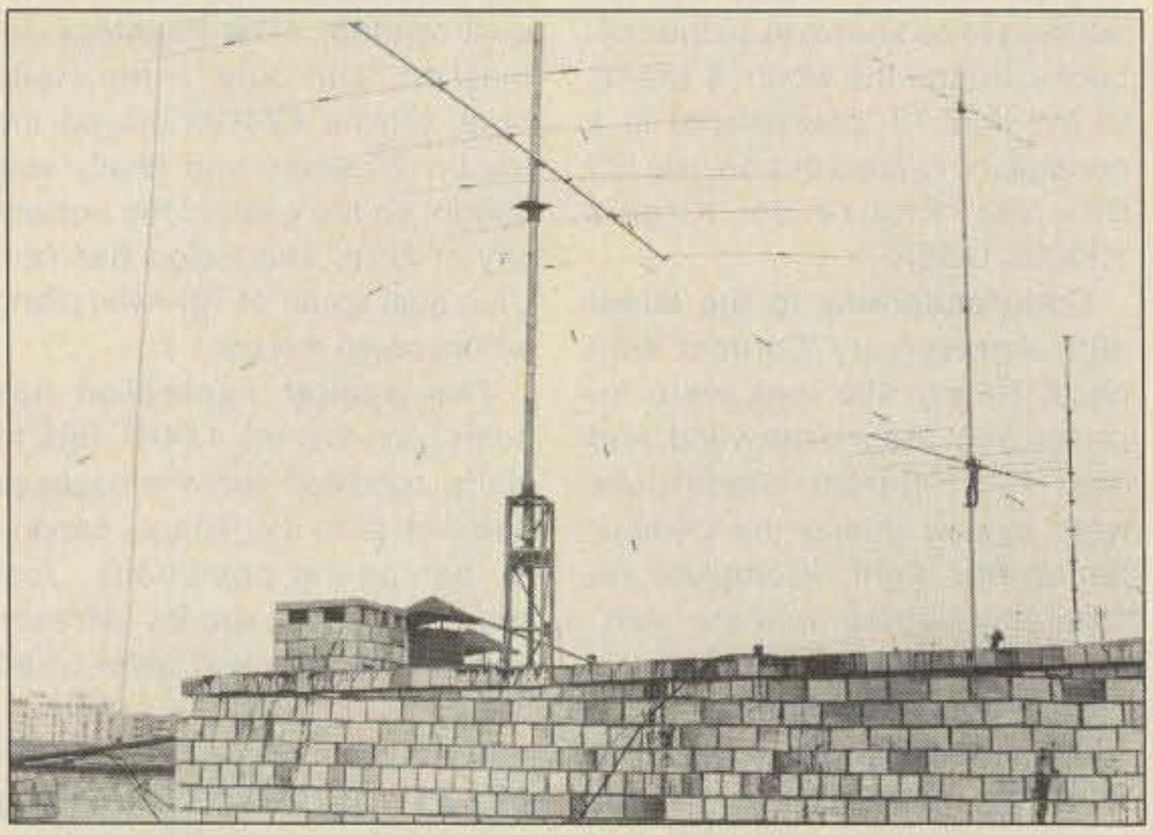
I received the August column with my first report and will send my next one some day! Hi! Also received my first issue of *73 Amateur Radio.* Thank you very much! You made very considerable article with my very short report!

I have been away at a very big contest station for this year's All Asia Contest, RL8PYL. Exact address: RL8PYL, 472300 Kazakh Republic, Temirtau Box 49, USSR. We operated in a multi-multi category, 28, 21, 14 days and 14, 7, 3.5 nights. We made 3500 QSOs, with 300 multipliers and scored approximately 1 million points—at least twice the previous record I think. A special RL1P call was used (and will be used throughout the year).

Lots of stations called us, primarily at night. During the day 20 was dead and 15 good only mornings and evenings. We had a damaged reflector on our 40-meter 4-el yagi and only a vertical loop (delta) on 80 meters. Nevertheless, on 80 we worked 5Z4, ZS, VK, PY, LU, ZP, CX, YB, 5T5, CN8—and all that in the middle of the summer!

The ops there are planning to put up 5 over 5 for 14, 4 over 4 for 7, and a 3-el yagi for 3.5. Big plans. I will be there, multi-multi again, for the *CQ* WW SSB.

The station ops are making plans for a Vietnam DXpedition next year, with UL7PAE, UL7PCZ, RL8PY and one other. It will be sponsored by the Youth Communist League of Kazakh Republic (VLKSM), and a large sum of money has been allotted.



The RL1P antennas, L to R: 36-meter mast with delta loop for 80, the lower antenna of the 28 stack (6 x 6), 6 x 6 el on 21. The op on the tower is, yes, Gena!

In addition to all that, I'm involved with the newly organized West Siberia DX Club, and we hope to have our own bulletin and issue an international award. We also want to have joint US–USSR expeditions, exchange delegates, etc. Many hams in the Soviet Union are now looking into organizing such regional clubs to have such plans implemented.

This year I am planning a serious effort to be among the 10 best "Soviet Sportsmen of the Year," and make the grade of "Master of Sports, International Class." [*The former is a Federation of Radio Sports title awarded those who win a certain number of contest honors. —CCC*]

I am happy to be a Hambassador!—Gena.

[*NT2X tells us that the USSR "has lifted all restrictions" on the sending of all electronic goods and magnetic media (VCRs, PCs, etc.) to the country. Tariffs, which used to be as much or more, even double, the value of items mailed, are now down to 10% to 30% of the value. He also says there no longer is a risk of causing offense if US dollar bills are sent instead of IRCs, which cost $.95 anyway.*

Readers can now QSL directly to Soviet hams and Soviet hams can now QSL directly to hams out of the country. For more information on the lifting of restrictions for Soviet hams. see the August 1988 "QRX" column, titled "No Longer Just 'QSL via Box 88.'"

And see other USSR information in the Israel report, above: "A request from the Soviet Union."

—CCC] 73

The RL1P team, L to R: UA9MA, UL7PAE ["chief"], UL7PCZ, and the op responsible for computer-duping of logs.

Number 37 on your Feedback card

RTTY LOOP

Amateur Radio Teletype

Marc Leavey M.D. WA3AJR
6 Jenny Lane
Baltimore MD 21208

AMTOR

While sitting in the doctors' lounge at a local hospital, another physician began gesturing to me. Expecting a question about medicine, or at least some hospital gossip, imagine my surprise when he asked me if I were the same Dr. Leavey who wrote *73's* RTTY Loop column! Thanking him for the attention, I sat back as he challenged me with his situation.

He had recently become interested in AMTOR. While he could hear a great number of stations transmitting this mode, he could only obtain copy on a relatively small number of them. He wondered why an AMTOR station of equal signal strength to a conventional Baudot RTTY station, was so much more difficult to copy.

His problem touches on a basic difference between Baudot and AMTOR, representing how the advance from the old to the new sometimes catches a tad in the cracks.

Conventional Baudot or Murray RTTY allows transmission of data from sender to receiver, one way at a time. This is often termed "half-duplex" communication. With data rates typically of 45.45 baud (bits per second), each data pulse lasts at least 22 ms. A noise pulse would have to last a substantial time, perhaps at least 7 to 12 ms, to destroy a data pulse.

Contrast this with AMTOR, in which a special seven level code is transmitted at 100 baud. Here, each data pulse is only about 10 ms wide. Consequently, a much briefer burst of noise can "take out" a data pulse.

Therefore, you may get the impression that AMTOR is a much less reliable medium than Baudot for RTTY transmission. Further, even if characters in Baudot RTTY take a noise hit, they can often be figured out by context. The receiver's brain fills in the missing characters. Thus, if you are looking at a line that says *TO ALL STJTIONS* your brain has little trouble realizing that the third word should be "STATIONS," particularly if you know that Baudot codes for "A" and "J" differed by just one bit. Monitoring a Baudot transmission is no problem. Everyone expects "hits" now and then, and you develop the knack for reading through them.

Perfect Copy

AMTOR, however, has one critical advantage over Baudot—error correction. Each character must meet certain bit matching criteria to be valid. Groups of characters containing an error are as invalid as random noise and are not displayed. The error correction scheme, however, works completely only when two AMTOR stations are in synch with each other—that is, when two stations share the same timing cycle.

Stations receiving AMTOR from another station with which it is not in synch, such as a broadcast station, have only partial error correction. AMTOR broadcast stations typically send each bit bundle twice. If the first comes up as an error on the receive end, the receive station looks for the second bundle. If *that* comes up as an error, then the receive station puts a blank, question mark,or some other symbol indicating the uncorrected error in that character's space on the monitor. Unlike Baudot RTTY, a blank is left on the screen instead of a misinterpreted character.

With a noise-free circuit, the rates of data transmission can approach the maximum data rate being sent. With a noisy circuit, however, the many retransmissions can slow information exchange to a crawl. But the data *will* get through perfectly.

"AMTOR, however, has one critical advantage over Baudot—error correction. Each character must meet certain bit matching criteria to be valid."

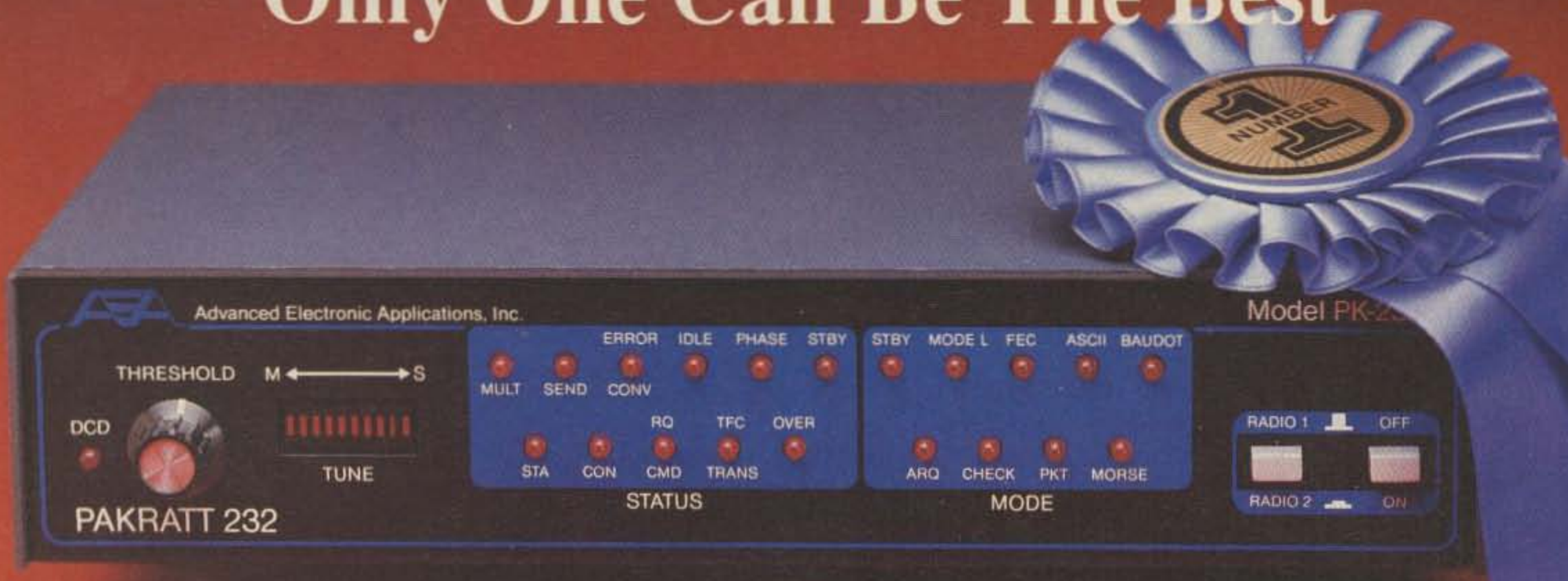
Those of you familiar with packet will see a certain similarity between AMTOR and packet, and indeed there is. With packet, the groups are longer and there are other conventions which have been established, but the operating principles are the same.

As with packet, you can command many controllers to ignore error checking, and just display what is received. That is the way to monitor an AMTOR circuit. There are solutions to these problems, though they're not always quite so obvious. It just takes understanding what is going on in a mode to make it work the way you want it to!

We have all kinds of goodies on tap for 1989, folks. From answering all of your questions, to asking a few of my own, I think it will be very exciting. Be sure to let me hear from you, by mail, by CompuServe (ppn 75036,2501) or by Delphi (username MARCWA3AJR). I have had little feedback on a Computer Corner here in the Loop. Let me hear from you. You really do have input into this RTTY Loop! 73

Others May Try to Imitate, But...

Only One Can Be The Best



Morse Code - Baudot - ASCII - AMTOR - Packet - Facsimile - Navtex

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Facsimile Screen Display

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PROPAGATION

by Jim Gray W1XU

Jim Gray W1XU
PO Box 1079
Payson, AZ 85541

December 1988

Conditions may be fair to poor on many days during the first and last week of the month. In particular, note the 4th–7th, and again the 26th–29th. The remainder of the month, however, should provide fair to good DX conditions, particularly the period from the 11th through the 22nd. During the fair to poor days, the Earth's magnetic field is likely to be unsettled to active, with the "A" index running well above normal; i.e., over about 10. On days of an active magnetic field, look for north-south propagation only on the higher bands, with typical "ringing" or hollow-sounding signals from the auroral zone to the north.

Do not expect any DX on 40, 80, or 160 meters during the poorest days. Look for some VHF auroral openings, however, on the days when the magnetic field is most active. In particular, 6 and 2 meters should be good. While on the subject of VHF, the Geminid and Ursid meteor showers occur about the 13th and 22nd, respectively. Expect some meteor trail propagation on VHF bands during the peak showers. During the "Good" (G) days on the chart, you will find some excellent DX on 10, 12, and 15 meters—as well as on 20. Darkness comes early at this time of year and band openings will just about fade out at sundown, except on rare days when you may find early evening openings on 10 and 15. Your best times for DX will be toward the east in local morning hours and toward the west in local late afternoon hours. For those who enjoy DX on 40, 80, and 160 meters, the low atmospheric noise levels of December will provide a good opportunity to hear even weak DX signals, and days of quiet magnetic field conditions will help the countries totals of low-band DXers.

Late afternoon and early evening hours, as well as early morning hours, are the best times to listen for DX on the low bands. As always, keep your radio tuned to WWV at 18 minutes after each hour, for the latest propagation information. Consult the charts here for the most likely times to work the countries of your choice on Fair (F) to Good (G) days. Although the winter conditions are not quite as favorable for DX on the HF bands as they are in spring and fall, remember that solar flux is constantly rising along with sun spot activity, and the MUFs continue to climb during daylight hours. Although the northern hemisphere is tilted away from the sun in the winter, remember that the Earth, in general, is closest to the sun at this time of year! 73

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15	20	–	–	–	–	20	20	–	–	–	15
ARGENTINA	20	40	40	40	–	–	20	15	15	10	10	15
AUSTRALIA	15	20	20	–	40	40	40	–	–	20	20	15
CANAL ZONE	20	20	20	20	20	20	20	15	10	10	15	15
ENGLAND	40	40	40*	40*	–	20	15	10	15	20	20	–
HAWAII	15	20	–	–	–	–	20	20	20	10	10	15
INDIA	–	–	–	–	–	–	20	20	–	–	–	–
JAPAN	15	20	–	–	–	–	20	20	–	–	–	15
MEXICO	20	20	20	20	20	20	20	15	10	10	15	15
PHILIPPINES	–	–	–	–	–	–	20	20	–	–	–	–
PUERTO RICO	20	20	20	20	20	20	20	15	10	10	15	15
SOUTH AFRICA	20	40*	–	–	–	–	20	10	10	10	15	20
U. S. S. R.	–	–	–	–	–	–	20	15	20	20	–	–
WEST COAST	15/20	20/40	80	160	160	160	–	–	–	10	10	15

CENTRAL UNITED STATES TO:

ALASKA	15	–	–	–	–	–	–	20	–	–	–	15
ARGENTINA	20	20	20	40	40	–	20	20	15	10	15	15
AUSTRALIA	15	20	20	–	–	–	40	–	–	–	15	10
CANAL ZONE	15	20	40	40*	40*	–	20	15	10	10	10	15
ENGLAND	40	40	80	–	–	–	–	20	15	15	20	40
HAWAII	15	20	–	40	40	40*	40*	20	20	15	10	15
INDIA	–	–	–	–	–	–	–	20	–	–	–	–
JAPAN	15	–	–	–	–	–	–	20	–	–	–	15
MEXICO	15	20	40	40*	40*	–	20	15	10	10	10	15
PHILIPPINES	15	20	–	–	–	–	–	20	–	–	–	15
PUERTO RICO	15	20	40	40*	40*	–	20	15	10	10	10	15
SOUTH AFRICA	20	40	–	–	–	–	–	15	10	10	15	20
U. S. S. R.	–	–	–	–	–	–	–	20	15	20	–	–

WESTERN UNITED STATES TO:

ALASKA	10	15	20	–	–	–	40	40	40	–	–	20
ARGENTINA	15	20	–	40	40	–	–	20	–	10	10	15
AUSTRALIA	10	15	20	20	–	–	40*	40*	20	20	15	15
CANAL ZONE	15	20	20	–	–	–	–	20	15	10	10	10
ENGLAND	20	40	40	–	–	–	–	–	15	15	20	20
HAWAII	10	15	20	40	40	40	–	20	20	15	15	10
INDIA	–	15	20	–	–	–	–	–	20	–	–	–
JAPAN	10	15	20	–	–	–	40	40	40	–	–	20
MEXICO	15	20	20	–	–	–	–	20	15	10	10	10
PHILIPPINES	10	15/20	15/20	–	–	40	40	40	–	20	–	20
PUERTO RICO	15	20	20	–	–	–	40	40	40	–	–	20
SOUTH AFRICA	20	20	–	–	–	–	–	–	15	10	15	15
U. S. S. R.	–	–	–	–	–	–	–	–	20	20	–	–
EAST COAST	15/20	20/40	80	160	160	160	–	–	–	10	10	15

*Try 80 meters.

The bands shown represent the highest usable at these times . . . on "Good Days."

Note that the lower frequency bands open first and close last.

DECEMBER

SUN	MON	TUE	WED	THU	FRI	SAT
				1 F	2 F	3 F–P
4 P	5 P	6 P	7 P–F	8 F	9 F	10 F
11 F–G	12 G	13 G–F	14 F	15 F–G	16 G	17 G
18 G	19 G–F	20 F–G	21 G	22 G–F	23 F	24 F–P
25 F–P	26 P	27 P	28 P	29 P–F	30 F	31 F

U.S. Postal Service
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(Required by 39 U.S.C. 3685)

1A. Title of Publication	1B. PUBLICATION NO.	2. Date of Filing
73 Amateur Radio	0 7 4 5 0 8 0 X	9/19/88
3. Frequency of Issue	3A. No. of Issues Published Annually	3B. Annual Subscription Price
Monthly	12	$24.97

4. Complete Mailing Address of Known Office of Publication (Street, City, County, State and ZIP+4 Code) (Not printers)
WGE Center, 70 Rte. 202 North, Peterborough, NH 03458-1194 Hillsborough County

5. Complete Mailing Address of the Headquarters or General Business Offices of the Publisher (Not printer)
WGE Center, 70 Rte. 202 North, Peterborough, NH 03458-1194 Hillsborough County

6. Full Names and Complete Mailing Address of Publisher, Editor, and Managing Editor (This item MUST NOT be blank)
Publisher (Name and Complete Mailing Address)
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Editor (Name and Complete Mailing Address)
Stu Norwood, WGE Center, 70 Rte. 202 North, Peterborough, NH 03458-1194
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10. Extent and Nature of Circulation (See instructions on reverse side)	Average No. Copies Each Issue During Preceding 12 Months	Actual No. Copies of Single Issue Published Nearest to Filing Date
A. Total No. Copies (Net Press Run)	64,702	68,800
B. Paid and/or Requested Circulation 1. Sales through dealers and carriers, street vendors and counter sales	15,589	16,721
2. Mail Subscription (Paid and/or requested)	26,083	27,627
C. Total Paid and/or Requested Circulation (Sum of 10B1 and 10B2)	41,672	44,348
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E. Total Distribution (Sum of C and D)	42,105	44,796
F. Copies Not Distributed 1. Office use, left over, unaccounted, spoiled after printing	7,605	7,722
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