APRIL 1988
ISSUE #331

# 73 AMATEUR RADIO

*International Edition*

USA $2.95
CAN. $3.95
A WGE Publication

## Ham Radio Responds!

**Exciting features and essential projects — Be Prepared!**

## Exclusive Profile

**Leonid Labutin UA3CR**

## Reviews

- **Kenwood's TS-140 sets a new standard**
- **ICOM's IC-900 —Futuristic FM**
- **Amp Supply TR-110 —tops on ten**

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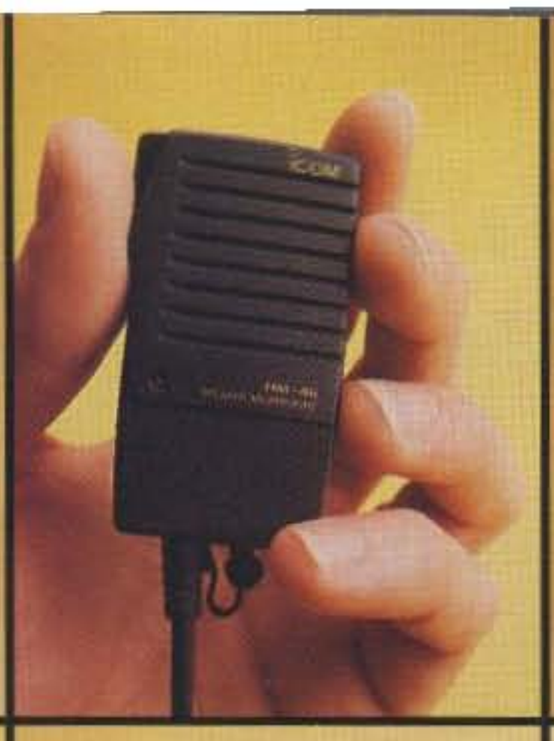







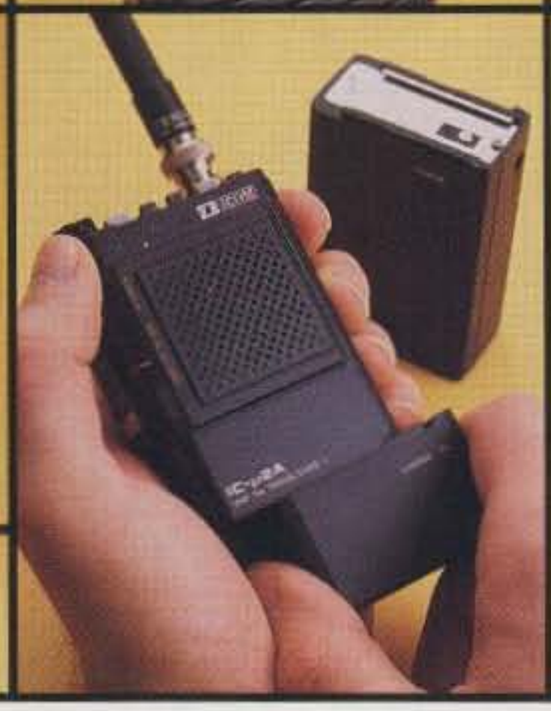


# ICOM VERSATILITY

ICOM's versatile family of handhelds provides superb performance and reliability to keep you talking. With an incomparable full line of interchangeable accessories and options, they're suited to fit your every radio need.

## 2 METERS

ICOM's advanced IC-02AT, compact IC-μ2AT Micro, and rugged IC-2AT dominate the 2-meter bands from 139.0-163.0MHz.

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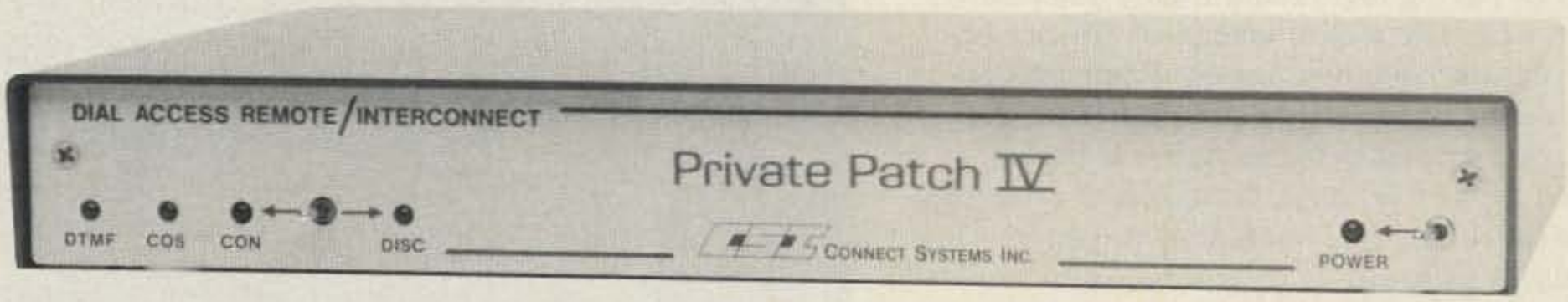
# THE ALL NEW PRIVATE PATCH IV BY CSI HAS MORE COMMUNICATIONS POWER THAN EVER BEFORE

- Initiate phone calls from your HT or mobile
- Receive incoming phone calls

NEW!
- Telephone initiated control . . .
  - ✓ Operate your base station with complete control from any telephone
  - ✓ Change frequencies from the controlling telephone
  - ✓ Selectively call mobiles using regenerated DTMF from any telephone
  - ✓ Eavesdrop the channel from any telephone
  - ✓ Use as a wire remote using ordinary dial up lines and a speaker phone as a control head.




The new telephone initiated control capabilities are awesome. Imagine having full use and full control of your base station radio operating straight simplex or through any repeater *from any telephone!* From your desk at the office, from a pay phone, from a hotel room, etc. You can even change the operating channel from the touchpad!

Our digital VOX processor flips your conversation back and forth fully automatically. There are no buttons to press as in phone remote devices. And you are in full control 100% of the time!

The new digital dialtone detector will automatically disconnect Private Patch IV if you forget to send # (to remotely disconnect) before hanging up. This powerful feature will prevent embarassing lock-ups.

The importance of telephone initiated control for emergency or disaster communications cannot be overstated. Private Patch IV gives you full use of the radio system from any telephone. And of course you have full use of the telephone system from any mobile or HT!

To get the complete story on the powerful new Private Patch IV contact your dealer or CSI to receive your free four page brochure.

Private Patch IV will be your most important investment in communications.

✓ = NEW FEATURE

- ✓ ★/# or multi-digit connect/disconnect
- ✓ Fully regenerated tone dialing
- • Pulse dialing
- • Toll protection
- • Secret toll override code
- • Busy signal disconnect
- ✓ Dialtone disconnect
- • CW identification
- • Activity timer
- • Timeout timer
- ✓ Telephone initiated control
- ✓ Regenerated DTMF selective calling
- • Ringout
- ✓ Ringout or Auto Answer on 1-8 rings
- • Busy channel ringout inhibit
- ✓ Status messages
- ✓ Internally squelched audio
- • MOV lightning protection
- ✓ Front panel status led's
- ✓ Separate CW ID level control
- ✓ 24 dip switches make all features user programmable/selectable.

- ■ Connects to MIC and ext. speaker jack on *any* radio. Or connect internally if desired.
- ■ Can be connected to any HT. (Even those with a two wire interface.)
- ■ Can be operated simplex, through a repeater from a base station or connected directly to a repeater for semi-duplex operation.
- ■ 20 minutes typical connect time
- ■ Made in U.S.A.

### OPTIONS

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2. FCC registered coupler
3. CW ID chip


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## FX SERIES (pictured mounted)

- 3.4 db gain | 5/8 wave
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  PL-259 connector installed
- Magnetic mount holds to
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**Also Available in Black**
Model FX-2B, 2 Meter
Model FX-220B, 220 MHz ..... **29.95** ea.

## RX SERIES (pictured lying down)

- 3.4 db gain | 5/8 wave
- 100 watt rating
- 15 foot coax
  PL-259 connector installed
- Magnetic mount holds to 75 mph

**Model RX-2**, 2 meter black and chrome
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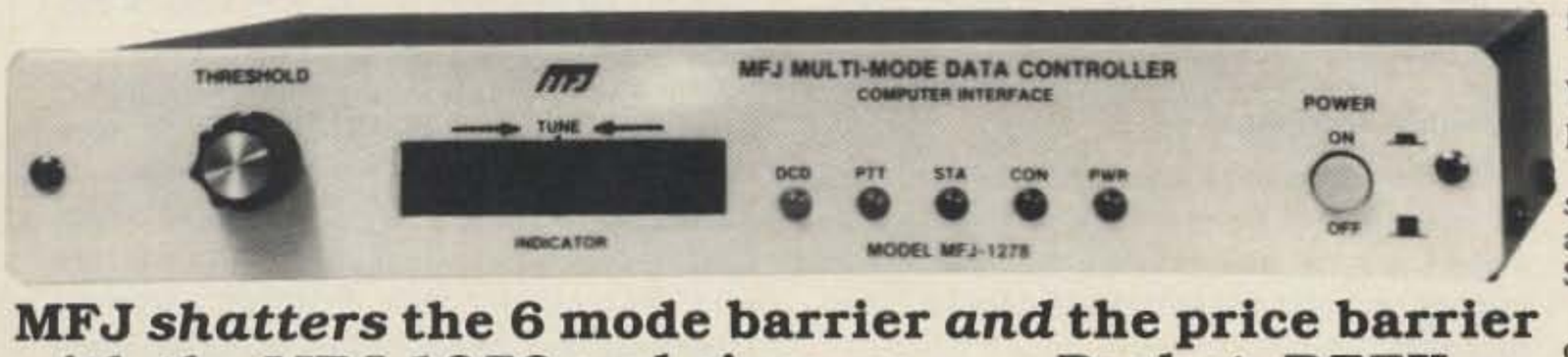
# MFJ multi-mode data controller




## MFJ *shatters* the 6 mode barrier *and* the price barrier with the MFJ-1278 and gives you . . . Packet, RTTY, ASCII, CW, WEFAX, SSTV and Contest Memory Keyer . . . 7 digital modes . . . for an affordable $249.95

**Amateur** radio's newest multi-mode data controller -- the MFJ-1278 -- lets you join the fun on Packet, RTTY, ASCII, CW, Weather FAX, SSTV and gives you a full featured Contest Memory Keyer mode . . . you get 7 modes . . . for an affordable $249.95.

**Plus** you get high performance HF/VHF/CW modems, software selectable dual radio ports, precision tuning indicator, 32K RAM, AC power supply and more.

**You'll** find it *the most user friendly of all multi-modes.* It's menu driven for ease of use *and* command driven for speed.

**A** high resolution 20 LED tuning indicator lets you *tune in signals **fast** in any mode.* All you have to do is to center a single LED and *you're precisely tuned in to within 10 Hz* -- and it shows you which way to tune!

**All** you need to join the fun is an MFJ-1278, your rig and any computer with a serial port and terminal program.

**You** can use the MFJ Starter Pack to get on the air instantly. It includes computer interfacing cable, terminal software and friendly instructions . . . everything you need to get on the air fast. Order MFJ-1282 (disk)/MFJ-1283 (tape) for the C-64/128 and VIC-20 or MFJ-1284 for the IBM or compatible, $19.95 each.

### Packet

**Packet** gives you the fastest and most reliable error-free communications of any amateur digital mode.

**With** MFJ's super clone of the industry standard -- the TAPR TNC-2 -- you get **genuine TAPR** software/hardware plus more -- not a "work-a-like" imitation.

**Extensive** tests published in *Packet Radio Magazine* ("HF Modem Performance Comparisons") prove the TAPR designed modem used in the MFJ-1278 gives better copy with proper DCD operation under all tested conditions than the other modems tested.

**Hardware** DCD gives you more QSOs because you get reliable carrier detection under busy, noisy or weak conditions.

**A** hardware HDLC gives you full duplex operation for satellite work or for use as a full duplex digipeater. And, it makes possible speeds in excess of 56K baud with a suitable external modem.

**Good** news for SYSOPs! New software lets the MFJ-1278 perform flawlessly as a WORLI/WA7MBL bulletin board TNC.

### Baudot RTTY

**You** can copy all shifts and all standard speeds including 170, 425 and 800 Hz shifts and speeds from 45 to 300 baud. You can *copy not only amateur RTTY but also press, weather and other exciting traffic.*

**A** high performance modem lets you copy both mark and space for greatly improved copy under adverse conditions. It even tracks slightly drifting signals.

**You** can transmit both narrow and wide shifts. The wide shift is a standard 850 Hz shift with mark/space tones of 2125/2975 Hz. *This lets you operate MARS and standard VHF FM RTTY.*

**You** get both the American Western Union and the international CCITT character sets. Autostart for unattended reception and selectable "Diddle".

**A** receive Normal/Reverse software switch eliminates retuning and Unshift-On-Space reduces errors under poor receiving conditions.

### ASCII

**You** can transmit and receive 7 bit ASCII using the same shifts and speeds as in the RTTY mode and using the same high performance modem. You also get Autostart and selectable "Diddle".

### CW

**You** get a Super Morse Keyboard mode that lets you send perfect CW effortlessly from 5 to 99 WPM, including all prosigns -- it's tailor-made for traffic handlers.

**A** huge type ahead buffer lets you send smooth CW even if you "hunt and peck".

**You** can store entire QSOs in the message memories, if you wanted to! You can link and repeat any messages for automatic CQs and beaconing. Memories also work in RTTY and ASCII modes.

***A** tone Modulated CW mode turns your VHF FM rig into a CW transceiver* for a new fun mode. It's perfect for transmitting code practice over VHF FM.

**An** AFSK CW mode lets you ID in CW.

**The** CW receive mode lets you copy from 1 to 99 WPM. Even with sloppy fists you'll be surprised at the copy you'll get with its powerful built-in software.

**You** also get a random code generator that'll help you copy CW faster.

### Weather FAX

***You'll** be fascinated as you watch WEFAX signals blossom into full fledged weather maps on your printer.* Other interesting FAX pictures can also be printed -- such as some news photographs from wire services.

**Any** Epson graphics compatible printer will print a wealth of interesting pictures and maps.

**Automatic** sync and stop lets you set it and leave it for no hassle printing.

**You** can save FAX pictures and WEFAX maps to disk if your terminal program lets you save ASCII files to disk.

**Pictures** and maps can be *printed to screen in real time or from disk* on IBM and compatibles with the MFJ-1284 Starter Pack.

**You** can transmit FAX pictures right off disk and have fun exchanging and collecting them.

### Slow Scan TV

**The** MFJ-1278 introduces you to the exciting world of slow scan TV.

**You'll** not only enjoy receiving pictures from thousands of SSTVers all-over-the-world but you can send your own pictures to them, too.

**You** can print slow scan TV pictures on any Epson graphics compatible printer. If you have an IBM PC or compatible you can print to screen in near real time or from disk with the MFJ-1284 Starter Pack.

**You** can transmit slow scan pictures right off disk -- there's no need to set up lights and a camera for a casual contact.

**You** can save slow scan pictures on disk from over-the-air QSOs if your terminal program lets you save ASCII files.

**The** MFJ-1278 transmits and receives 8.5, 12, 24, and 36 second black and white format SSTV pictures using two levels.

### Contest Memory Keyer

***Nothing** beats the quick response of a memory keyer during a heated contest.*

**You'll** score valuable contest points by completing QSOs so fast you'll leave your competition behind. And you can snag rare DX by slipping in so quickly you'll catch everyone by surprise.

**You** get iambic operation with dot-dash memories, self-completing dots and dashes and jamproof spacing.

**Message** memories let you store contest RST, QTH, call, rig info -- everything you used to repeat over and over. You'll save precious time and work more QSOs.

**You** get automatic incrementing serial numbering. In a contest it can make the difference between winning and losing.

**A** weight control lets you penetrate QRM with a distinctive signal or lets your transmitter send perfect sounding CW.

### More Features

**Turn** on your MFJ-1278 and it sets itself to match your computer baud rate. Select your operating mode and the correct modem is automatically selected.

***Plus . . .*** printing in all modes, threshold control for varying band conditions, tune-up command, lithium battery backup, RS-232 and TTL level serial ports, watch dog timer, FSK and AFSK outputs, output level control, speaker jack for both radio ports, test and calibration software, Z-80 at 4.9 MHz, 32K EPROM, and socketed ICs. FCC approved. 9x1½x9½ inches. 12 VDC or 110 VAC.

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CIRCLE 24 ON READER SERVICE CARD

# Welcome, Newcomers!

### AMATEUR RADIO AND PUBLIC SERVICE

The Amateur Radio Service was created *as* a public service. Look no further than the first tenet of the Basis and Purpose of the Amateur Radio Service in **Part 97**, to see this:

*(a) Recognition and enhancement of the value of the amateur service to the public as a voluntary noncommercial communications service, particularly with respect to providing emergency communications.*

A newcomer tuning around on the amateur bands, however, probably senses anything but *bien public* there. He hears **pile-ups** dotting the 15- and 20-meter **bands**. While tuning around the 40- or 80-meter bands, he runs across hams chatting amiably about the weather, new equipment, equipment modifications, and other similarly low-key topics. He also finds this **rag-chewing** on the 2-meter, 220-MHz, and 440-MHz bands. He soon discovers **nets** where members meet to pursue common interests—such as trading information about equipment from a particular manufacturer, playing chess, or reminiscing about common war-time experiences. (I once came across a grandfather clock net where the members recognized each other by the sound of their clocks' chimes!)

He may conclude from all of this that amateur radio caters only its own interests and is unprepared for future emergencies—a service straying from its premier **FCC** mandate. How wrong he would be! The conditions outlined below show why amateur radio is the world's finest and most reliable emergency communications system.

### Marriage of Self-Interest and Public Service

Many nets meet with the intent to rehearse emergency communications. The conduct of almost *all* nets, however, contributes to this end.

Traffic nets and **DX** nets are two of the most common kinds of ham nets. **CW** as well as **voice** nets are very popular. Members of traffic nets relay **radiograms**, which anyone[1], ham or no, may originate and receive. One ham relays a message to the next, until it reaches its destination. People who have played the "rumor" circle game as kids may recall how information tends to distort as it passes from person to person. Traffic nets have developed a strict procedure to minimize this distortion.

DX nets meet to provide hams an opportunity to contact other hams in rare countries. These nets need tight control to maximize the number of stations contacting the rare station. If the situation is left uncontrolled, the hapless rare station spends more time trying to get DXers to quiet down than actually contacting them!

The skills hams develop in these pursuits—message handling and net control—are vital to the smooth operation of emergency communications.

### Resilient and Fair

Besides retaining the largest pool of skilled volunteers, the Amateur radio service provides the most enduring communications in regions ravaged by natural disasters for these reasons:

- System portability and compactness
- Self-contained power supply
- Requirement of knowledge of CW
- Volunteer-*only* tenet of the Amateur Radio Service.

There are **transceivers** available now that, weighing less than ten pounds, powered for a number of hours from a car battery, and requiring only a **dipole** antenna a few dozen feet above the ground, afford *reliable* long-distance communications. Such self-contained systems let amateur communications remain intact when a natural disaster such as a hurricane or earthquake strikes an area and knocks out telephone lines and public service electricity.

CW and voice are the two most common communication modes. CW—this much-maligned mode—is the more reliable of the two during poor conditions. This is because CW conveys information using only three distinct elements—the "dit" (short tone), the "dah" (long tone), and the "space" (no tone)—which stand out in greater contrast to the ambient noise than do the many **amplitudes** and **frequencies** that voice uses to compose intelligence. Since most countries still require aspirants to learn CW to get any sort of amateur license, amateur radio service world-wide retains the largest pool of CW operators of *any* communication service.

One must not discount the non-remunerative nature of ham radio. Those who do have forgotten their horror at the callousness of nurses striking solely for pay, or that of a hospital that refuses to treat seriously ill patients who can't pay for their treatment! *Amateur radio's non-pecuniary nature deters preferential treatment.*

This policy, however, has not deterred hams' willingness to assist in emergencies. There are innumerable accounts—the most recent are the vital role hams played in emergency communications during the 1976 Guatemalan earthquake, and, documented in this issue, the Salvadoran earthquake of October 1986. A few of the many situations are doctors thousands of miles away talking their inexperienced colleagues through an operation; summoning medical supplies; locating foundering ships at sea; finding lost campers; and directing rescue operations for people caught in floods, blizzards, earthquakes, hurricanes, and tornadoes. Jerrold Swank W8HXR in his book *The Magic of Ham Radio* lists 65 pages of the most spectacular rescue operations our service has assisted.[2]

The Amateur Radio Service is a great latent strength. You hopefully will never need proof of this, but rest assured we're there for you! 73

. . . de KA1HY/AE

1 - *If the message passes only between countries with third-party agreements.*

2 - *The Magic of Ham Radio is sold in Uncle Wayne's Bookshelf, found on page 95 of this issue.*

## GLOSSARY

**Amplitude**-The strength of a signal. CW uses only maximum strength or no strength. The amplitude of a voice-modulated signal constantly varies.
**Band** - A segment of the radio-frequency spectrum.
**CW** - Synonymous with Morse code.
**Dipole** - A simple and effective antenna popular with hams due to its easy and fast assembly.
**DX** - "Long-distance."
**FCC** - Acronym for "Federal Communications Commission." This is the US government agency responsible for the allocation of frequencies for radiocommunications and broadcasting in the US.
**Frequency** - As a radio wave travels through space, its amplitude varies with wave-like peaks and troughs. The frequency of a wave, denoted in Hertz (Hz), is the number of peaks that pass a fixed point in space in one second.
**Part 97** - The section of the FCC Rules and Regulations that deal specifically with the Amateur Radio Service.
**Pile-up** - A collection of many stations tuned to the same frequency. Simultaneous transmissions cause confusion due to mutual interference. This often occurs when many hams try to contact a rare station.
**Radiogram** - A telegram which the Amateur Radio Service (ARS) is authorized to send, free of charge.
**Rag-chew** - Casually discuss.
**Transceiver** - A radio station capable of both receiving and transmitting.
**Voice** - Mode in which the human voice modulates a radio wave.

# 73 AMATEUR RADIO

APRIL 1988 — Issue # 331





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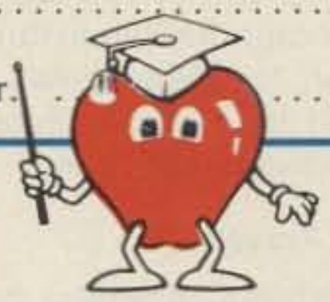

## REVIEWS



## BOOK REVIEW



## DEPARTMENTS

**FEEDBACK . . . FEEDBACK!**
It's like being there—right here in our offices! How? Just take advantage of our FEEDBACK card on page 97. You'll notice a feedback number at the beginning of each article and column. We'd like you to rate what you read so that we can print what types of things you like best. And then we will draw one Feedback card each month for a free subscription to *73*.



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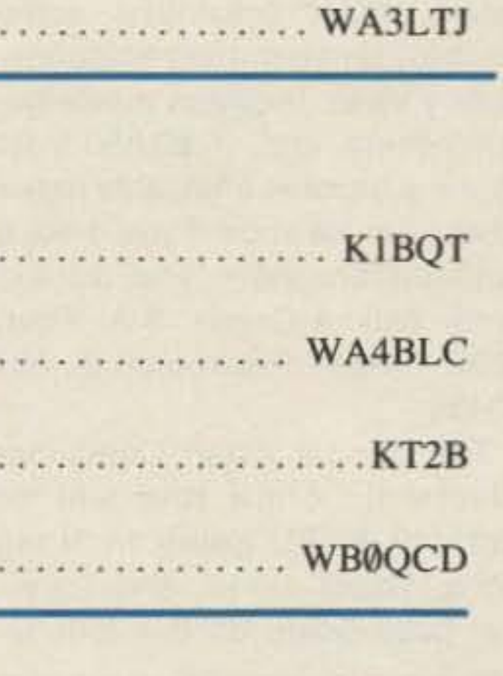
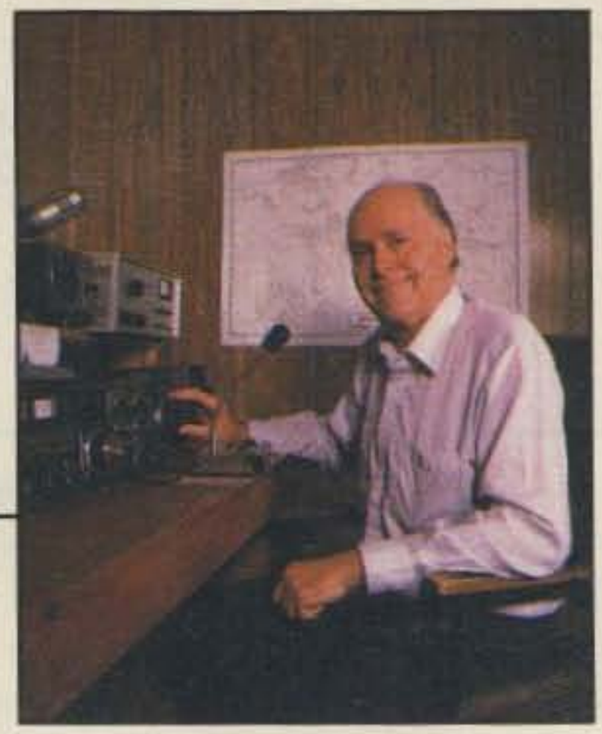
Model construction by Deborah Smith
Cover photography by Suzanne Torsheya



Number 2 on your Feedback card

# NEVER SAY DIE



### 1988 Electronic Show Tours

Commerce Tours has three trips coming up this year that may interest you. One will get you to Sao Paulo for the Tropictronics trade show, and then to Buenos Aires for Electronica 88, May 22–June 3. It also stops at Rio for a couple of days. The tour is great for sightseeing and for checking out import/export potentials, in case you need a business purpose for the trip. The B.A. show has over 250 exhibitors from all over South America, and it's probably the best opportunity you'll ever have to meet with small businessmen.

The tour, including first-class hotels, airfare, breakfasts, some lunches, dinners and receptions, factory visits, business meetings, sightseeing, etc., is $2,850 from Miami (a bit more from other major cities). Let me know if you'd like a detailed brochure and prices. Write Wayne Green, S.A. Tour, WGE Center, Peterborough, NH 03458.

The annual Asian Consumer Electronic Show tour will be October 8–22, going to Hong Kong, Taipei, Seoul, and Tokyo. I've been going on this tour for over ten years, and it's first rate. There's always a bunch of hams. It's great for sightseeing, for import/export business, or just for keeping track of Asian electronics progress.

For anyone interested in developing business with China, there's a special China electronics tour November 2–12 to Beijing, Nanjing, and Shanghai. If you're interested in any of these tours, call or drop me a line and I'll get the details to you. Business with China is picking up fast these days and offering many opportunities. You may want to get inside reports on this via China EDP, a superb computer/electronics newsletter, for $395 a year. It's published by a good Chinese friend of mine in Hong Kong.

### Wayne's Travel

The Orlando hamfest happened the same weekend as a music convention in Los Angeles, put on by the National Association of Record Merchandisers (NARM), so I missed Orlando. As the editor/publisher of *Digital Audio and Compact Disc (DA)*, NARM is where I get to talk with the major record company executives. It's like the Dayton of the record industry.

In late May, we're planning on a short *73* DXpedition to St. Pierre FP8. You can bet I don't plan to miss that. In June there's the Dallas hamfest, which is usually a corker—think I'm speaking there again.

In September I'm planning a short visit to the Dusseldorf CES show to see what's doing in Europe. Then on to Switzerland for an IARU international fox-hunting contest. I hope to get fox-hunting revived here in America, so I thought you'd be interested in this event. Right after this, I'll be back to give a talk at the Peoria hamfest—if you're in the area.

### Dayton in Perspective

Dayton's doing well. About 30,000 attended in 1987, though I think I heard some mumbling about a bunch of counterfeit tickets, so the actual attendance may be in doubt. Cramming 193 commercial exhibitors into a small space made it difficult to get around.

It isn't much better in the flea market, with around 1,500 exhibitors there. If only $1,000 each changes hands, that's $1.5 million in sales in the flea market. No wonder they're queued up for hours before set-up time.

The commercial exhibitors come armed with truckloads of ham gear, ready to be beat down to pennies of profit, or even a slight loss, so they won't have to cart it all back to the store. I remember when Drake used to trade in on this pattern—letting dealer back orders pile up, and then dumping huge loads of their equipment on their dealers at the Hamvention, thus assuring that no one made anything much except Drake. It sure moved a lot of Drake gear into midwestern hamshacks at rock bottom prices, and it helped put many dealers out of business.


**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.


# QRM

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*...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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220 MHz TM-321A Coming Soon!

# Here's One for You!

## TM-221A/321A/421A

### 2 m and 70 cm FM compact mobile transceivers

**The all-new TM-221A, TM-321A and TM-421A FM transceivers represent the "New Generation" in Amateur radio equipment. The superior Kenwood GaAs FET front end receiver; reliable and clean RF amplifier circuits, and new features all add up to an outstanding value for mobile FM stations! The optional RC-10 handset/control unit is an exciting new accessory that will increase your mobile operating enjoyment!**

- **TM-221A provides 45 W, TM-321A, 25 W. The TM-421A is the first 35 W 70 cm mobile!** All three models have adjustable 5 W low power.
- **Selectable frequency steps** for quick and easy QSY.
- **TM-221A receives from 138-173.995 MHz. This includes the weather channels!** Transmit range is 144-148 MHz. Modifiable for MARS and CAP operation. (MARS or CAP permit required.) *(Specifications guaranteed for Amateur band use only.)*
- **TM-321A covers 220-224.995 MHz. The TM-421A covers 438-449.995 MHz.**
- **Built-in front panel selection of 38 CTCSS tones.** TSU-5 programmable decoder optional.
- **Simplified front panel controls**— makes operating a snap!
- **16 key DTMF hand mic., mic. hook, mounting bracket, and DC power cable included.**
- **Kenwood non-volatile operating system.** All functions remain intact even when lithium battery back-up fails. (Lithium cell memory back-up— est. life 5 yrs.)
- **Packet radio compatible!**
- **14 full-function memory** channels store frequency, repeater offset, sub-tone frequencies, and repeater reverse information. **Repeater offset on 2 m is automatically selected.** There are **two channels** for "odd split" operation.
- **Programmable band scanning.**
- **Memory scan with memory channel lock-out.**
- **Super compact:** approx. 1-1/2"Hx5-1/2"Wx7"D.
- **New amber LCD display.**
- **Microphone test function on low power.**
- **High quality, top-mounted speaker.**
- **Rugged die-cast chassis and heat sink.**


### RC-10 Remote Controller

For TM-221A/321A/421A. Optional telephone-style handset remote controller RC-10 is specially designed for mobile convenience and safety. All front panel controls (except DC power and RF output selection) are controllable from the RC-10. One RC-10 can be attached to two transceivers with the optional PG-4G cable. When both transceivers are connected to the RC-10, **cross band, full duplex repeater** operation is possible. (A control operator is needed for repeater operation.)

### Optional Accessories:

• **RC-10** Multi-function handset remote controller • **PG-4G** Extra control cable, allows TM-221A/TM-421A full duplex operation • **PS-50/PS-430** DC power supplies • **TSU-5** Programmable CTCSS decoder • **SW-100A** Compact SWR/power/volt meter (1.8-150 MHz) • **SW-100B** Compact SWR/power/volt meter (140-450 MHz) • **SW-200A** SWR/power meter (1.8-150 MHz) • **SW-200B** SWR/power meter (140-450 MHz) • **SWT-1** Compact 2 m antenna tuner (200 W PEP) • **SWT-2** Compact 70 cm antenna tuner (200 W PEP) • **SP-40** Compact mobile speaker • **SP-50B** Mobile speaker • **PG-2N** Extra DC cable • **PG-3B** DC line noise filter • **MC-60A, MC-80, MC-85** Base station mics. • **MC-55** (8-pin) Mobile mic. with gooseneck and time-out timer • **MA-4000** Dual band antenna with duplexer (mount not supplied) • **MB-201** Extra mobile mount

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

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# QRX . . .

EDITED BY BRYAN HASTINGS KA1HY

## 150 Years of CW

**The 150th anniversary of the first demonstration of the telegraph** will occur in 1988. Special events are planned at several sites including Speedwell—the restored historic village in Morristown, New Jersey. In 1838, Samuel F.B. Morse and his assistant Alfred Vail first publicly demonstrated the electromagnetic telegraph in Morristown. After multiple careers as an inventor, painter, minister, and New York City mayoral candidate, and failed experiments with the telegraph, Morse successfully transmitted, "A patient waiter is no loser," at Vail's home in Morristown, New Jersey. Today, the site's buildings contain working models of the telegraph with demonstrations and lectures provided. From February 1–March 20, the newly established Sci-Tech Center will show its first Morse related exhibit titled "A World of Wire and Light" and in April, an International Telegraphers hook-up will be staged from either the Speedwell site or the nearby Victoria Station restaurant in Whippany, New Jersey.

## Scholar Dollars

**The Dayton Amateur Radio Association is now accepting applications for its 1988 Scholorship Program.** The program is open to any licensed amateur graduating from high school in 1988. Awards will be based on a combination of financial need and academic accomplishment with consideration given for service to amateur radio and community involvement. There are no restrictions on a students course of study, and applicants are not restricted to those preparing to pursue four year baccalaureate degrees. DARA will also consider ham applicants working toward Associate Degrees or planning to attend an accredited technical institution. Each winner will receive $1,000 toward their tuition at a school of their choice. All entries must be postmarked no later then May 15 with winners announced on or about June 1. For information and application forms write to the Scholarship Committee, Dayton Amateur Radio Association, 317 Ernest Avenue, Dayton OH 45405.

## More $$ For Ham Scholars

**The Foundation for Amateur Radio, Inc,** a non-profit organization headquartered in Washington, D.C. plans to award 28 scholarships for the academic year 1988–89 to assist licensed radio amateurs. The foundation, composed of fifty local area Amateur Radio clubs, fully funds six of these scholarships with the income from grants, and its annual hamfest. It administers the remaining scholarships, without cost to the donors. These donors include the QCWA, 10-10 International, and ARCs nation-wide, many in the DC area.

Some of the scholarships require that the applicant hold at least a General-class license. The awards range from $500–$2000, and preference is in some cases given to residents of specified geographic areas, and to students pursuing certain study programs.

For additional info and application forms, send a letter or QSL card postmarked before May 31, 1988, to FAR Scholarships, 6903 Rhode Island Avenue, College Park, MD 20740.

## TAPR

**In a surprise announcement, Lyle Johnson WA7GXD resigned as President of TAPR,** the Tucson Area Packet Radio group. He cited intense professional and family pressures as reasons for his resignation. No one, even those who worked with Lyle on a day-to-day basis, anticipated this move.

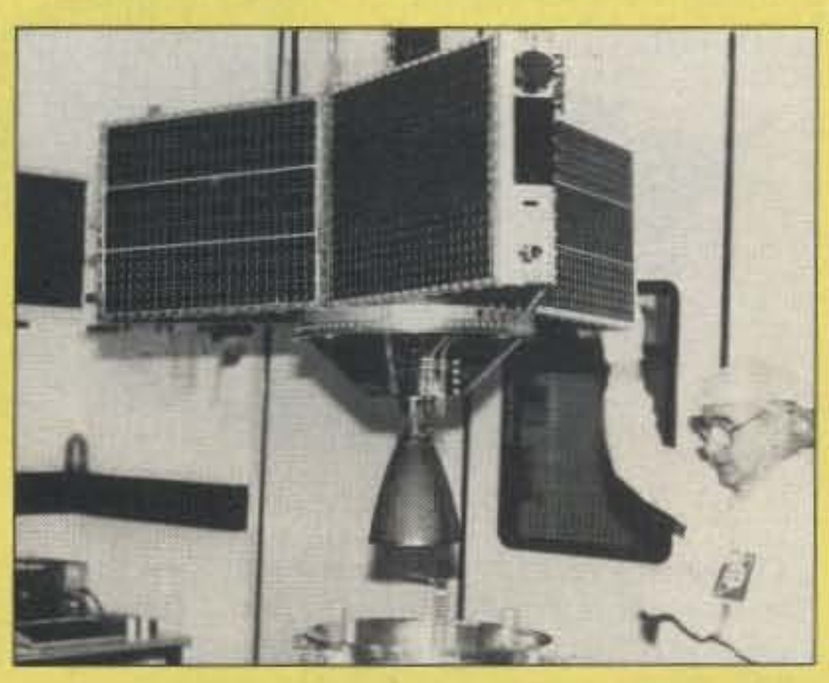
Johnson is instrumental in packet radio development.

## 6m in PA-land

**Effective 1 March 1988, radio amateurs in the Netherlands** will be permitted to operate up to 30 watts out on CW on the 50–50.45 MHz portion of the 6m band. Previously, the 6m band was off limits to amateurs in this country.

## New 610 Forms

**As of 1 Jan, 1988 the FCC made available the new version of the FCC Form 610** application for an Amateur Radio station and/or operator license. The revised form is useful for both FCC Volunteer Examination programs. The new form has the administering VE's report providing for the split of Element 3 into 3A for Technician and 3B for General class tests. The reverse side of the 610 provides for two Novice VEs. The forms are available from FCC, Attn: Larry Weikert, Chief-General Radio Branch, PO Box 1020, Gettysburg PA 17326 or at (717) 337-1212.



*AMSAT's Phase 3C satellite is carefully lowered onto a shake table for vibration tests. Launch of this satellite is slated for late spring. (W4PUJ photo)*

## ERP Radar

**The Canadian DOC** finally decided in favor of erecting a 1-MW ERP Doppler-shift radar site near Egbert, Ont. The radar station may not be in operation for nearly two years, however, because of high construction costs. It's now believed, too, that its potential for causing interference to the amateur 70cm band is not nearly as bad as first thought.

## McNamara

**Robert H. McNamara** has been named the permanent successor to Raymond A. Kowalski as the FCC's Chief of the Special Services Division. For the past few years, McNamara served as Chief of the Aviation and Marine Branch under Kowalski. Roger Madden, who has been acting Division Chief, is reportedly returning to his Deputy Chief's position.

## 73 BBS Back Up!

**In an effort to further connect with our readership,** *73 Magazine* brought the Bulletin Board System back up after a year-and-a-half interlude. Our readership once again has another medium by which to express their ideas and comments, and, of course, submit manuscripts. It is a 24-hour/day service, and a "sysop" (system operator) will be attending the system for an hour each weekday. Call us at (603) 525-4438!

## And . . .

**Meet the *73* Editorial people on the air!** Larry NA5E is on the air on Tuesdays and Thursdays at 1830 UTC on 14.173 MHz. Bryan KA1HY is on at 1700 UTC most weekdays on 14.200 MHz, and at 2000 UTC on the same frequency on Sundays. Wayne W2NSD/1 keeps an irregular schedule, but listen on 20 meters SSB Saturdays from 1200 UTC.

## Hats Off to

***Westlink, W5YI Report, CRRL Newsletter*, and AMSAT,** for their news contributions this month. We welcome any and all news items of interest to hams. Don't forget black and white or color photos! Please send them to *73 Magazine*, 70 Rt. 202N, Peterborough, NH 03458. Attn: QRX.

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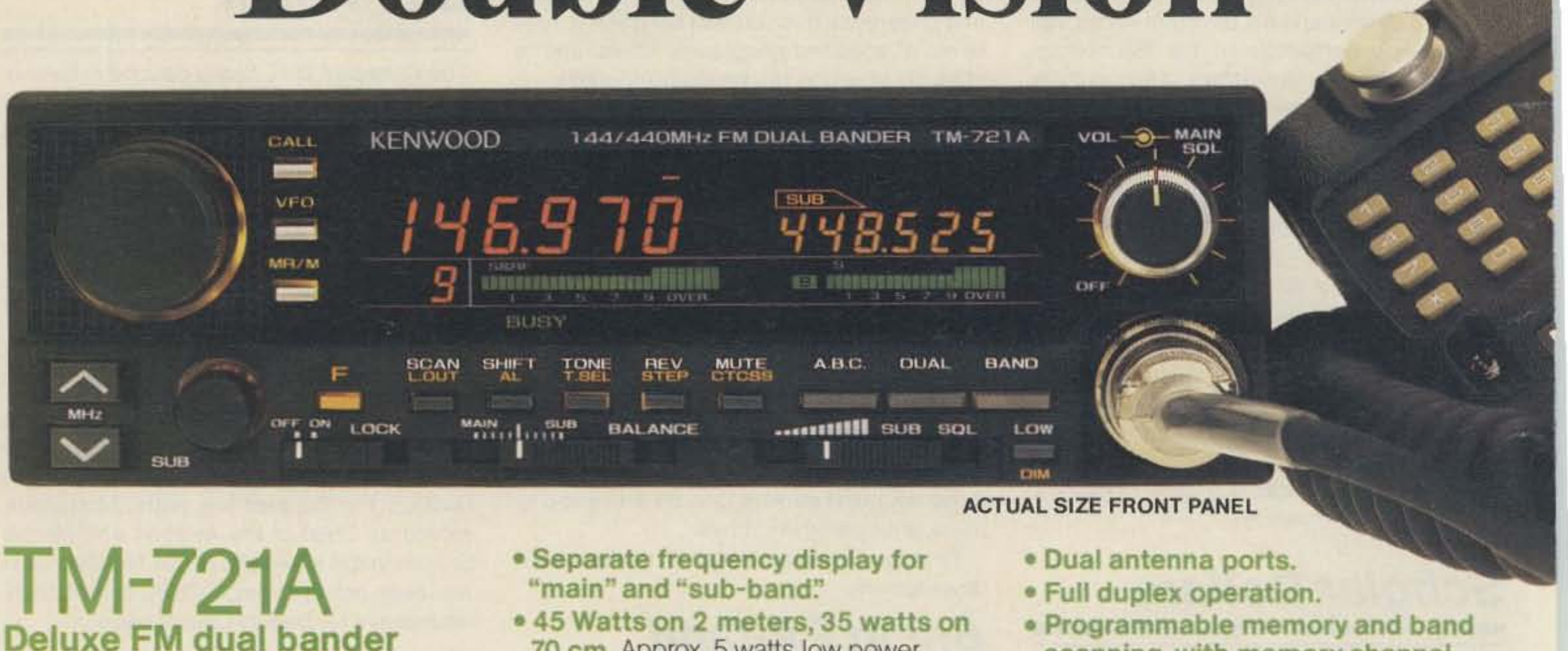
ALL NEW!

# Double Vision




ACTUAL SIZE FRONT PANEL

## TM-721A

### Deluxe FM dual bander

**The Kenwood TM-721A re-defines the original Kenwood "Dual Bander" concept. The wide range of innovative features includes a dual channel watch function, selectable full duplex operation, 30 memory channels, extended frequency coverage, large multi-color dual digital LCD displays, programmable scanning, and more with 45 watts of output on VHF and 35 watts on UHF. TM-721A—Truly the finest full-featured FM Dual Band mobile transceiver!**

- **Extended receiver range** (138.000-173.995 MHz) on 2 meters; 70 cm coverage is 438.000-449.995 MHz. (Specifications guaranteed on Amateur bands only. Two meter transmit range is 144-148 MHz. Modifiable for MARS/CAP. Permits required.)
- **30 multi-function memory channels.** 14 memory channels and one call channel for each band store frequency, repeater offset, CTCSS, and reverse. Channels "A" and "b" establish upper and lower limits for programmable band scan. Channels "C" and "d" store transmit and receive frequencies independently for "odd splits."
- **Separate frequency display for "main" and "sub-band."**
- **45 Watts on 2 meters, 35 watts on 70 cm.** Approx. 5 watts low power.
- **Call channel function.** A special memory channel for each band stores frequency, offset, and sub-tone of your favorite channel. Simply press the CALL key, and your favorite channel is selected!
- **Automatic Band Change (A.B.C.)** Automatically changes between main and sub-band when a signal is present.
- **Dual watch function allows VHF and UHF receive simultaneously.**
- **CTCSS encode/decode selectable from front panel** or UP/DWN keys on microphone. (Encode built-in, optional TSU-6 needed for decode.)
- **Balance control and separate squelch controls for each band.**
- **Dual antenna ports.**
- **Full duplex operation.**
- **Programmable memory and band scanning, with memory channel lock-out and priority watch function.**
- **Each function key has a unique tone for positive feedback.**
- **Illuminated front panel controls and keys.**
- **Dimmer control.**
- **16 key DTMF mic. included.**
- **Handset/remote control option (RC-10).**
- **Frequency (dial) lock.**
- **Supplied accessories:** 16-key DTMF hand mic., mounting bracket, DC cable.

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


*TM-721A shown with optional RC-10.*

**Optional Accessories:**
• **RC-10** Multi-function handset/remote controller • **PS-430** Power supply • **TSU-6** CTCSS decode unit • **SW-100B** Compact SWR/power/volt meter • **SW-200B** Deluxe SWR/power meter • **SWT-1** 2m antenna tuner • **SWT-2** 70 cm antenna tuner • **SP-40** Compact mobile speaker • **SP-50B** Deluxe mobile speaker • **PG-2N** DC cable • **PG-3B** DC line noise filter • **MC-60A, MC-80, MC-85** Base station mics. • **MA-4000** Dual band mobile antenna (mount not supplied) • **MB-11** Mobile bracket • **MC-43S** UP/DWN hand mic. • **MC-48B** 16-key DTMF hand mic.

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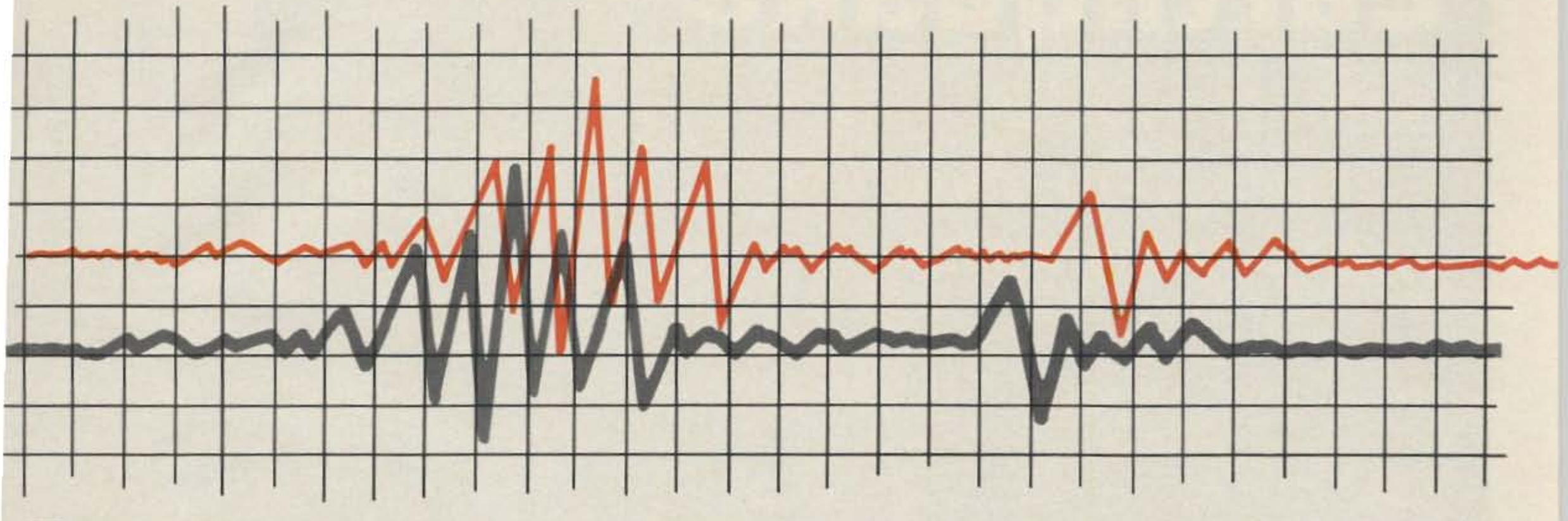
# Ham Radio at Its Best

## *Emergency! Turn to 14.275 MHz— the International Amateur Radio Network.*

*by Jim Sammons KA1PZV*



It is a morning like many mornings in October. A slight chill is in the air. Breezes rustle the colorful leaves. Time to get the blood going with a cup of coffee! The power is already turned on in the ham shack. The Collins KWM-380 is alive with signals from faraway lands. The scene is Belgrade Lakes, Maine, station K1MAN, outpost for the International Amateur Radio Network. Day in and day out, seven days a week, fifty-two weeks a year, Glenn Baxter makes himself available to help people when they need it most.

### The Earthquake

This morning will be different from most. The date is October 1, 1987. The time is 10:58 AM. The phone rings and CBS News in New York calls to inquire if the International Amateur Radio Network (IARN) has any information concerning the earthquake that ripped through the Los Angeles area just 12 minutes ago. CBS is asked if they have called the Earthquake Center in Colorado. CBS replies, "Yes, but we were put on hold."

The IARN immediately activates with a call put out for information to or from the LA area. Instantly, Dale Martin KF6NQ answers the call to confirm reports of a 6–6.1 Richter Scale reading in the area south of LA.

A quick telephone call to assistant net manager KA1PZV, and the telephone computer bulletin board system is ready to handle emergency traffic. The 10-meter net activates on 28.475 MHz to handle local traffic, and David Speltz KB1PJ turns on the computer BBS system for Central US operations in Shaker Heights, Ohio.

Within a few short minutes, information begins to reach net control. Reports from the area tell of destruction, fires, several deaths, and aftershocks. CBS News shares their information with IARN for the next ninety minutes.

Amateur radio is about to perform as intended. The frequency is now alive with radio operators from around the country, some making queries, some asking if they can be of assistance.

***"Within a few short minutes, information begins to reach net control."***

With past experience in emergency communications, a well-tuned and oiled emergency communications network is ready to handle the traffic. Preparations for such a situation have been in place for quite a while at the IARN. Tests are made regularly to look for flaws in the system. This time it is not a drill.

Net Control K1MAN takes command. He's been through this many times—his calm control is conveyed over the air and brings about a smooth and orderly process of taking traffic, assigning coded numbers for reply, and transmitting the traffic to California for query. Hundreds of signals from England, Germany, South America, and every corner of the US come in nearly simultaneously. All receive a caring and orderly response until each and every one has been acknowledged. Contact with IARN directors in the UK and Germany has brought about world-wide mobilization of emergency radio communications.

Meanwhile, support operators pass traffic to net control using every means available. Charlie Mills KC1FK passes traffic to the 20-meter net gathered from the 10-meter net. KF5TC reports that he is standing by on 14.090 MHz to respond to RTTY communications.

In what seems a very short time, the replies are coming in from California: Mexico 1 is ok, Mexico 2 is ok, and so on. Radio operators get replies to their queries, and many thank the net for the help. The emergency could have been much worse, and IARN would have responded in the same professional manner.

### The Key

This is what IARN is all about: Helping without regard to politics or race or any of the issues that are irrelevant to the emergency. These are the people who can respond when the chips are down.

Literally thousands know where to turn—what frequency will get the message through—14.275 MHz, the International Amateur Radio Network.

It is an evening much like any other in October. There is a chill in the air and a breeze rustles the leaves. Time for a cup of coffee... 73

---

*Jim Sammons KA1PZV lives on Jodie Lane in Fairfield Center, ME 04937. He is a former medical research technologist and serves the IARN as Director of Computer Operations.*

# San Salvador Earthquake

## Sometimes amateur radio is more than a hobby.

by Al Vayhinger W9ELR

On October 10, 1986, a major earthquake ravaged El Salvador, inflicting considerable damage to its capital, San Salvador. Many countries immediately mobilized aid for the tiny Central American country, but weeks later El Salvador still had many needs to satisfy. While tuning across the 20-meter band in early November, I came across Glenn Baxter K1MAN of the International Amateur Radio Network. During his conversation with a Salvadoran ham, the country's continued troubles became all too clear.

### Instant Volunteer

All of the telephone lines were out of order in San Salvador. They needed a volunteer ham in the country to pass emergency traffic and coordinate the activities of volunteer medical personnel already in El Salvador. I knew very little about the country, but I immediately offered to help, and Mario Tona YS1TG came on the frequency and agreed to be my host in El Salvador.

### Arrival

The following Friday, with just a suitcase and a pair of two-meter transceivers, this new recruit arrived in San Salvador. Mario further offered his HF radio for traffic handling and coordination.

Richard Horner KZ1P and Chester Stemp YS9CHE met me at the airport. Richard was also a volunteer from the States and had been there about two weeks operating and repairing radio and medical equipment. Chester, an American who lives in San Salvador, speaks Spanish fluently.

### Getting Down to Business

No time to waste. Shortly after my arrival, we began making plans for a team of nine volunteer medical doctors, headed by Dr. F.H. Young K4SFE, to arrive from Columbia, South Carolina. We made daily contact with either Walt Ockoskis K4VMG or Bill Weathersbee WB4UGV in Columbia to arrange to get the medical team into the country.

While waiting for the team to arrive from South Carolina, we handled all of the radio traffic for a makeshift field hospital set up by the Salvation Army. The IARN had sent two volunteer American doctors to work in this hospital. There were several phone patches to

the States for medical supplies urgently needed for the hospital. In the meantime, a small girl caught her hair in a sugar cane mill and needed urgent medical attention in the States. The IARN arranged her trip there. Later this important network also helped arrange a trip to the US for a Salvadoran infant with a congenital heart defect.

When the Salvadoreans needed assistance, amateur radio often provided an essential link to aid.

After we made several trips to the airport to expedite the arrival of medical supplies, the team from South Carolina finally arrived. They brought with them over 1½ tons of medical supplies, donated to the relief effort. These supplies were all taken to Chester's home for inventory and to decide where they were most needed. Even 3000 pounds of medical supplies sometimes fell short. Volunteer doctors and members of the local ham club took money out of their own pockets to purchase badly needed drugs when emergency situations arose.

**Phone Home**

Ham radio also provided essential links between stressed and overworked volunteers and their families in the US. Phone patches with loved ones meant a great deal to everyone involved.

Thanksgiving Day proved especially uplifting for the American volunteer medical team. The Governor of South Carolina talked by phone patch directly to the members of the medical team. Amateur radio's utility certainly received a boost then.

On my wife's birthday, I talked to Gordon Carlson N9GDV, who agreed to have flowers delivered for my wife. Gordon did everything right. However, my wife happened to be listening on 14.275 MHz, and that spoiled the whole surprise!

I spent 30 days in San Salvador. After seeing the volunteer doctors treating children whose parents had literally no money to pay, I was proud to be a small part of amateur radio and able to do something to help.

If you've thought twice about volunteering, think a third time. As the Salvadoreans say, "Una Experiencia Inolvidable!"

**Thanks...**

...to the members of the San Salvador Amateur Radio Club for their tremendous assistance. Special thanks to Mario and Chester, Maggie Garcia de Call YS1ZA, Magda YS9MBB, Francisco Rosales YS1AZ, and Francisco Rodriguez YS1FB. Many more local amateurs went out of their way to assist in the emergency and make us feel welcome. 73

---

*Al W9ELR worked for 20 years for the Indiana State Police as a communications officer, before going on to Thailand to work for the State Department as a radiocommunications advisor. He's been a ham SWLer since 1943, and obtained his call and transmitting license in 1946. His address is R. R. #3, Box 149, Connersville, IN 47331.*

Illustrations by Neil and Ian Dukette

# The Bears Project

## A Promising Educational Program

*by Peter W. Kemp KZ1Z*

The Bethel Educational Amateur Radio Society (BEARS) Project provides a series of practical amateur radio activities to use in the classroom to supplement and enhance traditional methods of instruction. The Technical Education Department of the Bethel Middle School in Connecticut introduced the program into their curriculum several years ago. The new Electronic Communications curriculum better acquaints the student with the basic fundamentals, theories and practical applications of electricity and electronics. The students learn various electronics specialities through a program of hands-on experiences and related research. At the end of this program, the students also qualify to take the Novice Class amateur radio examination.

The varied teaching methods used in the course provide students many opportunities to reinforce the information presented in lectures, media presentations and class demonstrations. The students gain hands-on experience through group and individual experiments, field trips, peer teaching, and independent research.

Electronic Communications is designed to span ten weeks. Classes run five days a week, for 45 minutes each period. It is geared for the eighth grade. By modifying the depth of the knowledge presented, however, a teaching group can readily apply this course to other grade levels. In addition to the regular course of study, there's a wide variety of co-curricular activities. Students participate in the co-curricular activites before and after school, and in the evening or weekends. Besides hamming, other activities include antenna erection parties; car pools to attend area electronic shows; local amateur radio club meetings; and tutorial programs, both as instructors and learners.

### Student Activities

Specifically, students learn how to construct, assemble and operate an amateur radio station. They also learn a variety of communication techniques including Morse code, amplitude modulation, frequency modulation, single sideband (SSB), television (fast and slow scan modes), satellite modes, text (Baudot, ASCII, AMTOR, Packet VHF/HF), FAX, computers, telemetry and microwave techniques.

Students who refine their skills in any specialized area are encouraged to become tutors to other students as part of the class' Peer Teaching Program. These students provide Morse code instruction and basic operating/technical skill practice to other students. In this sense, the electronic communications program is self-perpetuating. Further, the students research and explore various areas of communications through independent study units.

The practical aspects of operating play large roles in the students' education. They do not focus entirely on the technical aspects of communications. As the students communicate with other hams, they learn about world geography, cultures, industries and foreign languages. They listen to major news events as they happen. Such examples include the evacuation of U.S. students in Grenada and the earthquakes in Mexico City. They secure weather data directly from the National Weather Service and the U.S. Naval Eastern Oceanography Center.

Students relay information to other school departments. Weather data goes to the science department, foreign language text goes to the Spanish and French classes, and current news events are relayed to the social studies department.

Also, students listen to a host of other transmissions, including Space Shuttle communications. Several years ago students took part in an experimental communications project, attempting to communicate with the STS-9 Space Shuttle Columbia.

The students participate in Field Day every June. This activity, sponsored by the American Radio Relay League, involves radio operators from the United States and Canada, operating under simulated emergency conditions. The experience includes setting up a radio station, using portable antennas and non-commercial power, and operating for a 24-hour period. This real-life application is a true test of a student's operating skills, and serves to develop his or her potential for public service.

More recently, students activated special event station KZ200Z, celebrating the bicentennial of the U.S. Constitution.

### Outstanding Response

All classes have had a capacity enrollment since the program's inception. The great popularity of the program permits extra noncredit classes after school on the local public access cable. The community and students learn how to use the television public access channel at the station.

Since the formation of this program, nearly 400 students have obtained their Federal Communications Commission (FCC) Novice class amateur radio licenses. Alumni from the middle school are encouraged to remain active in the program. These alumni have greatly encouraged newcomers to the field with tutorial assistance and provided transportation to activities away from the school.

### Diverse Study Program

The success of the program hinges largely on its interdisciplinary nature. The topics included are:

**Mathematics**
formula application
measuring skills
calculator use
the metric system
graphs and charts
data interpretation

**Science**
frequency
meterology
basic electricity
radiowave propagation
technology development
NASA Space Program
The Scientific method

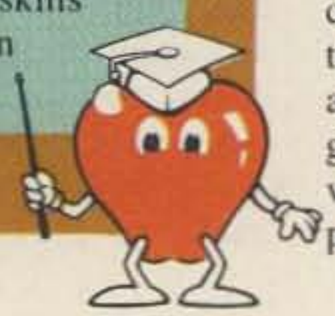
**Music**
frequency
sound reproduction

**Graphic Arts**
graphic reproduction
graphs and charts
cartography

**Foreign Languages**
French
Spanish
speech
culture

**Social Studies**
map and globe skills
map projections
international date line
time zones
geography
cultural and industrial development
current events

**Language Arts**
speech
note-taking skills
letter-writing skills
text translation



Students currently enrolled in the program arrive early to use the school's radio equipment and depart long after the school day has ended. Students and their parents have the opportunity to use the facilities during special Saturday morning and evening sessions.

The students often cite the Radio Field Day participation as one of the highlights of the program. The participants enjoy the planning and teamwork it takes to make it a successful event. Parents are also encouraged to assist in the overnight camping/communications activity.

Students frequently write about this program's activities in their language arts journals, as well as in local and school newspapers. The BEARS also publish a newsletter to encourage members to participation in ongoing programs in many levels.

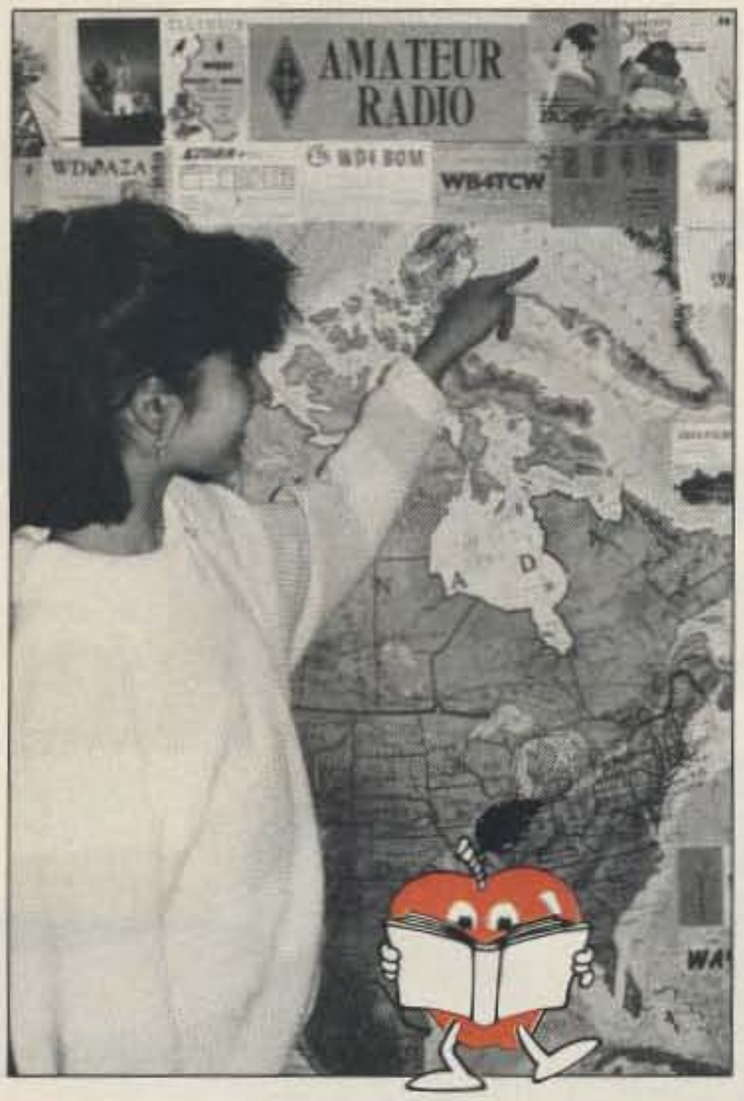



*Photo A. A student finding the location of a recent contact–and developing geographical skills.*

### School and Community Response

The school and community overwhelmingly support the Electronic Communications program. The Parent Teacher Organization supported the program by allocating a portion of the proceeds from the school's annual magazine sale for amateur equipment for the school's radio station. State and local educational grants have provided additional funding. Amateur radio operators, businesses and estates of community residents have very generously donated to the Society, also.

The BEARS program supports the community in turn. Area newspapers often visit the facility during major news events to secure up-to-the-minute reports of domestic and foreign happenings. During the recent events in Greneda, the Bethel Middle School Amateur Radio Club relayed messages to the island for a family of a local resident attending St. George's University.

The school has recently assisted the local Office of Civil Preparedness in the development of a community communication plan.

*Photo B. Jane Eager KA1FRQ snags a friendly contact.*

Together they set up a complete emergency operations communications center. The center offers complete coverage of all government and amateur radio frequencies. It also has the first full-time Civil Preparedness Packet station in Connecticut, and a full-time Digipeater (KZ1Z-1, 145.07 MHz) serving the western part of the state. The middle school radio station is authorized to provide back-up communications for the Office of Civil Preparedness in the event of an emergency. The program received support from local amateur radio clubs, civic organizations, and community members.

The BEARS operate the first 220 MHz repeater in northern Fairfield County (KZ1Z/R 224.32 MHz), using it for technical training for the students and an ongoing public service to the community. Repeater users also handle National Traffic System messages.

In 1984 the school became a testing site for the FCC amateur radio examinations. The Electronic Communications program has also sponsored television programs on the local cable television channel and was featured in the recently released video, *The New World of Amateur Radio.*

### Recent Developments

The BEARS Project has expanded into both the elementary and high school levels. Students from other schools regularly participate in BEARS activities. The high school plans to continue the middle school's electronic communications curriculum.

Further, the BEARS sponsor a short-term equipment loan program. The loan provides Novices with basic on-air equipment and accessories for operating from home stations or portable locations, such as the Boy Scout Jamboree On The Air events.

The students have also developed an independent learning center for elementary level students, complete with shortwave receivers and portable antennas. This has motivated younger students toward the major BEARS activities that go on at the middle school.

*Photo D. BEARS participant Bob Murphy KA1FRE concentrates on code.*

*Photo C. Modern American Gothic? A fast-scan TV system held by Norbie Tarala N1EZI (left) and John MacDonald N1ERL.*

### It's Great!

The BEARS Program provides for the needs of students at all levels, elementary through adult. The program encourages participants to pursue the practical applications of technology both vocationally as well as avocationally. It stresses the interdiscipinary nature of amateur radio, thus enhancing all areas of the curriculum. The BEARS Program provides all participants with a sense of pride in accomplishment and, at the same time, *it's fun!* 73

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*Peter W. Kemp has received many outstanding awards for his achievements in education. He lectures professional educators on curriculum development and implementation of electronic communications programs for the Connecticut State Department of Education. He currently serves on two local government committees, the Cable Television Advisory Council and Emergency Telephone Communications (E-911) Study Group, and is the Coordinator of Technical Education at the Bethel Middle School.*

"They said I couldn't work DX with just 100 watts. Especially with a radio that has less than 1000 switches on the front panel.

But the truth is, I'm working lots of DX, more than some of these blockbuster types, thanks to my Yaesu FT-747GX.

You see, my no-nonsense FT-747GX was designed with me in mind, so I can hop around the band fast to nail those DX stations. While the other guys are warming up their amplifiers, I'm working the new country!

My FT-747GX has a super receiver, with a directly-driven mixer for great overload protection. And, Yaesu included the CW filter in the purchase price (I used the money I saved on postage for the QSL cards!).

And my FT-747GX is loaded with other features. The receiver works from 100 kHz straight through to 30 MHz, and it's a fantastic shortwave broadcast receiver. I can use all twenty memories for that alone! Plus it's got dual VFOs. A noise blanker. Split frequency operation for the pile-ups. And scanning up the band helps me check out openings as they happen.

I just put in the optional crystal oven, and next month I'm going to pick up the FM board. I can't wait to tell my buddies I worked England on a repeater!

And with the money I saved when I bought my FT-747GX, I got a second ten-meter antenna for satellite work on the high end of the band. I use my personal computer to tell me what satellites are going by, and the computer even sets the frequencies on the radio for me.

Now my friends are getting FT-747GX rigs, too. I knew they'd figure out my secret weapon sooner or later. But now I'm setting the pace!

Thanks, Yaesu. You've made a rig that makes sense."

**Yaesu USA** 17210 Edwards Road, Cerritos, CA 90701 (213) 404-2700. **Repair Service:** (213) 404-4884. **Parts:** (213) 404-4847. Prices and specifications subject to change without notice.

YAESU

CIRCLE 111 ON READER SERVICE CARD

# "They laughed when they saw my radio. Then they saw my logbook."

# Handheld DX with the DX Handy™

The idea of handheld DX seems far-fetched, but it's actually very simple. The DX Handy is a battery powered (six penlight AA drycells included) SSB/CW transceiver with two watts output. DX Handy can also use nicad rechargeable batteries, or be powered with 9 VDC.

Two variable crystal oscillators (VXOs), each with 50 KHz range, can be selected with a top panel switch. Crystals for 28.250 to 28.300 and 28.300 to 28.350 Mhz are included, and other crystal ranges for the 10 meter band are also available at a nominal cost.

CW operation can be by either the built-in push button or with an external key or keyer. External speaker and microphone jacks are also provided, and the telescoping antenna is included. The DX Handy also has a top panel S-meter/ output power meter and an effective noise blanker circuit. DX Handy is housed in an attractive gray metal case comparing in size to popular VHF FM handhelds.

Ten meters is coming back strong. With DX Handy all amateurs, novice to extra class, can enjoy the thrill of working handheld DX.


## Specifications

**General**
- Frequency Coverage: Any two 50 KHz segments in the 28.0–29.0 MHz Amateur Band (28.25–28.30 and 28.30–28.35 MHz supplied)
- Frequency Control: VXO provides 50 KHz of continuous tuning with a single crystal
- Frequency Stability: Within ±500 Hz from a cold start
- Antenna: 50 Ohms Unbalanced, BNC connector
- Power Requirement: 8.4–9.0 VDC
  (Included): 6-AA Dry Cells (1.5 volt/cell) = 9.0 VDC
  (Optional): 7-AA NiCads (1.2 Volt/cell) = 8.4 VDC
- Current Drain: Receiving - Approx. 70 mA
  Transmitting - Approx. 620 mA
- Dimensions: (W) 66mm × (H) 39mm × (D) 142mm
- Weight: 710 Grams (1 lb. 9 oz.) with batteries and antenna

**Transmitter**
- Output Power: 2 Watts at 9.0 VDC
- Emission modes: A3J (USB) and A1 (CW)
- Spurious Emissions: More than 40 dB down

**Receiver**
- Sensitivity: less than 0.5 uV for 15 dB S/N
- Intermediate Frequency: 11.2735 MHz

**Controls and Indicators**
- On/Off Volume control Top mounted Potentiometer
- Receiver Incremental Tuning (RIT): Top mounted Potentiometer with center off detent position
- Frequency: Top mounted 50 KHz VXO
- Frequency Range: Top mounted 2-position switch
- Noise Blanker: Top mounted On/Off switch
- S/RF meter: Top mounted S/RF meter
- Built in CW key: Top mounted momentary switch
- External Speaker output: Top mounted 1/16" phone jack
- External Microphone input: Top mounted 1/8" phone jack
- Antenna Connector: Top mounted Female BNC
- Transmit Indicator: Top mounted Transmit LED
- Push-To-Talk: Side mounted momentary switch
- External Power: Bottom mounted 2.1 mm coaxial
- External key input: Bottom mounted 1/8" phone jack
- Mode Selector Switch: Bottom mounted 2-position switch
- Charge/External Power: Bottom mounted 2-position switch selecting 12 VDC external power function

**AEA**
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P.O. Box C2160
Lynnwood, WA 98036-0918
(206) 775-7373

**AEA Retail $379.95** **Amateur Net $319.95**

Specifications and prices subject to change without notice or obligation.

**CIRCLE 65 ON READER SERVICE CARD**

# Spectrum Repeater/Link

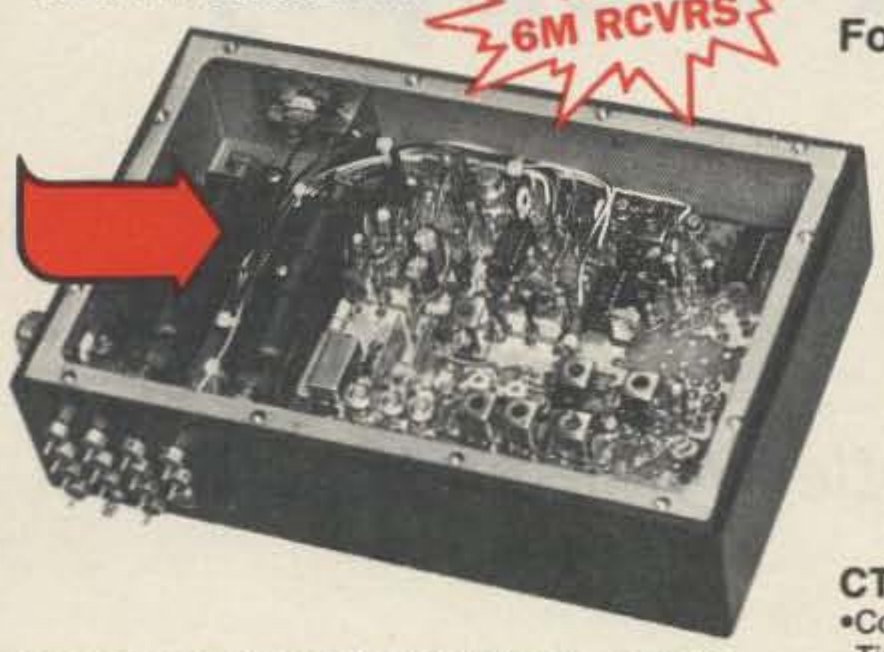
## High Performance Boards & Sub-Assemblies

**New FL-4 UHF Helical Resonators**
Installed in Receiver or FL-4H Preselector Unit

NEW— 6M RCVRS

**These are professional "Commercial Grade" Units—Designed for Extreme Environments (−30 to 60° C.) All Equipment Assembled & Tested.**

**For 10M, 2M, 220 MHz, & 440 MHz**



### COMPLETE SHIELDED RCVR. ASSY.

### VHF & UHF Receiver Boards

### SCR200A-VHF SCR450A-UHF

- ***Totally Advanced Design!***
- 8 Pole Front End Fltr. + wide dynamic range—Reduces Overload, Spurious Resp. & Intermod.
- Sens. 0.25 µV/12dB SINAD typ.
- Sel. -6dB @ ± 6.5 KHz. -130dB @ ±30KHz. (8 Pole Crystal + 4 Pole Ceramic Fltrs.
- 'S Meter', Discriminator & Deviation Mtr. Outputs!
- Exc. audio quality! Fast squelch! w/0.0005% Crystal. (*"Super Sharp" IF Fltr. also avail.*)
- ***New! 30 KHz B.W. IF Filter for High Speed Packet.***

### Complete Receiver Assemblies

- Rcvr. Board mounted in shielded housing.
- Completely assembled & tested, w/F.T. caps, SO239 conn.
- As used in the SCR 1000. Ready to drop into your system!
- UHF Rcvr. Assy. Now Available w/Super Sharp FL-4 Helical Resonators. Greatly reduces IM & "out of band" interference!

**FL-4H**

NEW

### Receiver Front-End Preselectors

- **FL-6: 6Hi Q Resonators with Lo-Noise Transistor Amp (2M or 220 MHz)**
- **FL-4H: 4Hi Q Helical Resonators & Lo-Noise Tr. Amp. in shielded housing. (420-470 MHz)**
- **Provides tremendous rejection of "out-of-band" signals w/out the usual loss!** Can often be used instead of large expensive cavity filters.
- Extremely helpful at sites with many nearby transmitters to "filter-out" these out-of-band signals.

### ID250A CW ID & Audio Mixer Board

- **Improved! Now includes "audio mute" circuit and "Emergency Power ID" option.**
- 4 input AF Mixer & Local Mic. amp.
- PROM Memory—250 bits/channel.
- Up to 4 different ID channels!
- Many other features. Factory programmed.

### CTC100 Rptr. COR Timer/Control Bd.

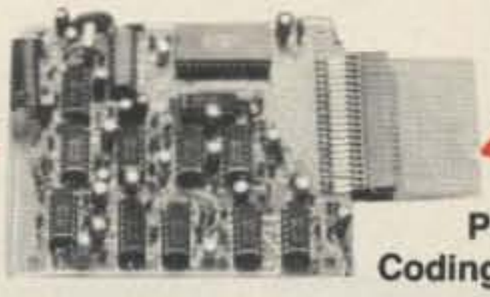
- Complete solid state control for rptr. COR, "Hang" Timer, "Time-Out" Timer, TX local & remote Shut-down/Reset, etc.
- Includes inputs & outputs for panel controls & lamps.

### Power Supply Boards

NEW

- **SCP12** 12 VDC @ 0.3A MAX. OUT.
- **SCP512** 12 VDC @ 1A & 5VDC @ 0.4A out. (1.1A total max. out.)
- **SCP512A** As above, but also w/ −12VDC @ 0.1A

NEW



**Plug-in Coding Card**

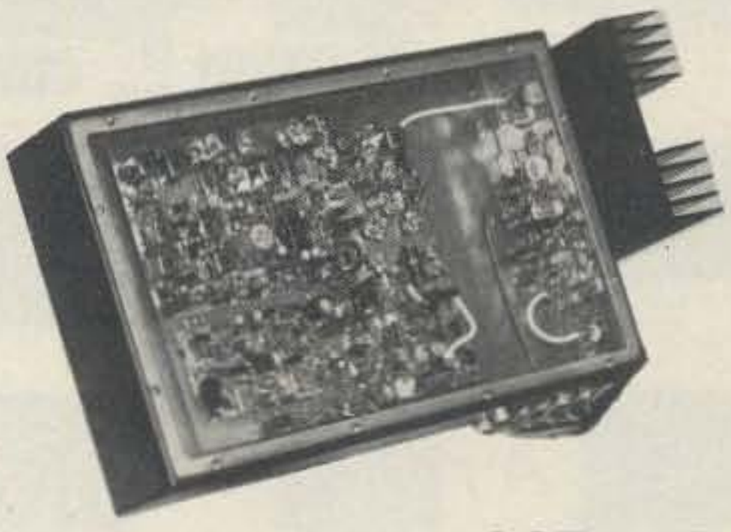
### TTC300 TOUCH TONE CONTROLLER

- High performance, Super versatile design. To control any ON/OFF Function at a remote site via DTMF Radio Link.
- Uses new high quality Xtal Controlled Decoder IC, w/high immunity to falsing
- Decodes all 16 digits
- 3 ON/OFF Functions per Main Card. Easily expandable to any no. of functions w/Expansion Cards.
- Codes quickly field programmable via plug-in Coding Cards. Many unique 3-digit codes available. Not basically 1-digit as with competitive units.
- Latched or pulsed outputs.
- Transistor Switch outputs can directly trigger solid state circuitry or relays, etc. for any type of control function.
- Low Power Consumption CMOS Technology. 5VDC Input. Gold-plated connectors.

NEW

### SCP30 HEAVY DUTY 30 AMP RACK MT. POWER SUPPLY

- 13.8 VDC out. 115/230 in, 50/60 Hz.
- 30A @ 70% duty, 25A @ 100% duty.
- Massive 30 lb. Transformer & Heat Sinks.



### Improved SCT410B Transmitter Assy.

### SCT110 VHF Xmtr/Exciter Board

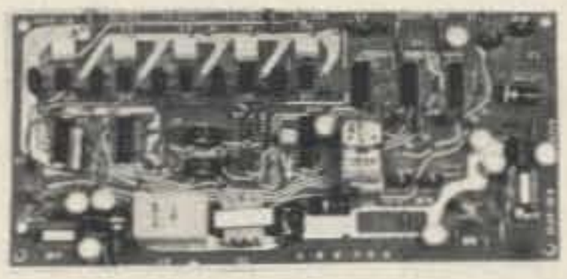
- **10 Wts. Output. 100% Duty Cycle!**
- Withstands High VSWR
- True FM for exc. audio quality
- Designed specificially for continuous rptr. service. Very low in "white noise."
- Spurious − 75 dB. Harmonics − 60 dB.
- With .0005% precision grade xtal.
- **BA-30 30 Wt. Amp board & Heat sink,** 3 sec. L.P. filter & rel. pwr. sensor.
- **BA75 75 Wt. unit also available**

### SCT110 Transmitter Assembly

- ***SCT110 mounted in shielded housing***
- Same as used on SCR 1000 & 2000X
- Completely assmbld. w/F.T. caps, SO239 conn.
- 10, 30, or 75 Wt. unit.

### SCT 410B UHF Transmitter Bd. or Assy.

- Similar to SCT110, 10 Wts. nom.
- ***Includes "on board" proportional Xtal Osc./Oven circuitry for very high stability!***
- **BA-40 40W. U HF AMP. BD. & HEAT SINK**



### SCAP Autopatch Board

- Provides all basic autopatch functions
- Secure 3 Digit Access; 1 Aux On-Off function, Audio AGC; Built-in timers; etc. Beautiful Audio!
- 0/1 inhibit bd. also available
- Write/call for details and a data sheet

### RPCM Board

- Used w/SCAP board to provide "Reverse Patch" and Land-Line Control of Repeater
- Includes land-line "answering" circuitry

### Lightning Arrester For Autopatch

- Gas Discharge Tube shunts phone line surges to ground
- Handles up to 40,000 Amps!
- The Best device available to protect Autopatch equipment from lightning damage. $17.00 + S/H.

**Call or Write for Data Sheets**

# SPECTRUM COMMUNICATIONS CORP.

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*"When You Buy, Say 73"*

CIRCLE 51 ON READER SERVICE CARD

# Universal Power Supply Module

*A regulator building block with countless applications.*

*by Rick Littlefield K1BQT*

Need some power to make that project play? Here is a universal circuit that adapts to many applications!

All too often, power supplies are "crash efforts." Hams often hastily concoct them to get a project off the bench-supply and onto a dedicated source. However, the safety, reliability, and appearance of those supplies often reflect a slap-dash approach.

To get around this, I designed a "one-fits-all" regulator board to allow me to build supplies quickly, without placing valuable equipment, lives, and real estate at risk!

### Circuit Description

This project takes advantage of the flexibility offered by U1, an LM-317 adjustable regulator (Figure 1). This device provides sophisticated short-circuit protection and automatic current limiting at 1.5A. Input voltage to the regulator is supplied by DB1, a 4A 100 PIV full-wave bridge rectifier. Capacitor C1 provides initial filtering. U1 provides additional electronic filtering as part of the regulating function. The output level of the regulator is set by trim-pot R1. Bypass capacitors on the input and output of U1 prevent high-frequency oscillation.

Transformer selection is important. When using a bridge-rectifier, the current rating of the transformer must be at least 1.8 times the rated continuous-duty output of the supply. This means that a 1.5A supply should use a 2.7A transformer. For light or intermittent loads, a smaller 2.0A transformer may suffice as long as it does not overheat or show an excessive voltage drop. Make sure the full-load output of the bridge is at least 3–4 volts above the desired output of the supply to insure that U1 will not drop out of regulation.

Parts should be easy to find. The circuit board was designed around off-the-shelf items available at most Radio Shack stores. Before starting construction, use the PC board as a template to mark mounting-hole locations on the power supply cabinet. Then, mount all parts as shown (Figure 2A). Note that U1 is located *underneath* the board, allowing it to use the cabinet as a heat-sink (Figure 2B). Be sure to connect transformer leads, the voltage output lead, and the LED output indicator lead before mounting the board in place. Use ¼" spacers to provide clearance for regulator. A ⅜" hole in the PC board provides access for U1 mounting hardware. Use heatsink compound and a TO-220 insulating kit to isolate the regulator mounting tab from ground.

*Photo A. This adjustable bench supply and 3A power-pack for a QRP rig are just two of many possible module applications.*

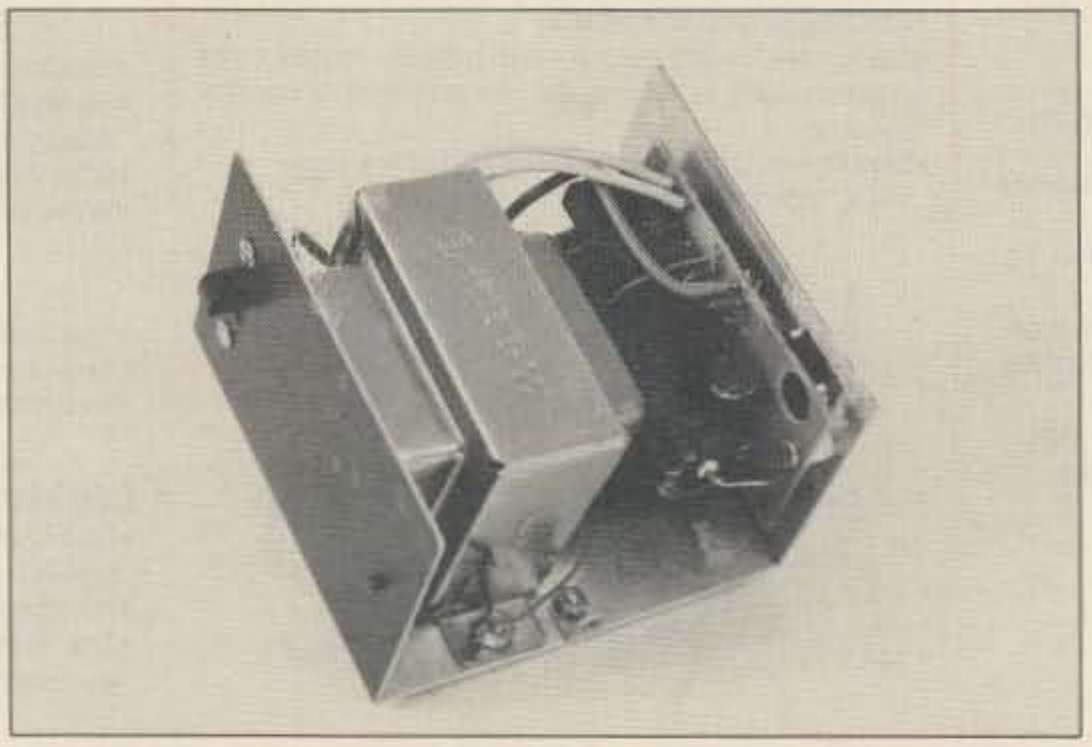


*Photo B. Nearly all power supply parts mount on this 1⅜" x 2⅞" (4.2 x 7.3 cm) circuit board at left in box. Note that U1 fastens to the power supply cabinet which serves as a heatsink.*

### Applications

The regulator board can be used as is or modified to meet other needs. For example, a 5kΩ panel-mount pot wired in place of the PC trimmer creates an adjustable-voltage bench supply. The user needs only to add a simple voltmeter circuit to monitor output voltage. When the demand requires more than 1.5A, the basic module is modifiable in several ways to extend current-handling capacity (see Figure 3A).

•Add a 2200–4700µF capacitor at the output (C2) to stabilize output voltage when momentary peaks exceed 1.5A. C2's buffering action also improves U1's ability to track sudden load shifts, such as those encountered during CW or pulse eying. The 1N4002 diodes protect against the possibility of C2 discharging back through U1 and destroying it. Adding a 10µF electrolytic to the voltage-control terminal (C3) improves transient response further.

•Wiring a second LM-317 (U2) in parallel with U1 is a "quick-and-clean" way to increase the current-limiting threshold to 3A without sacrificing short-circuit protection.

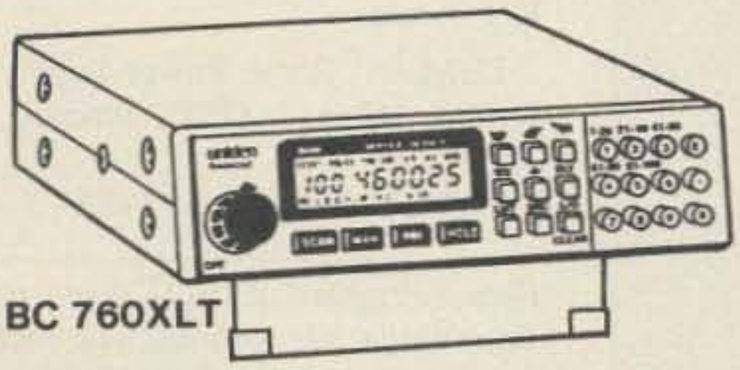
•When more than 3A is required, the regulator module can be used to drive the base of one or more pass-transistors (see Figure 3B).

# uniden®
# CB Radios & Scanners

**Communications Electronics,™** the world's largest distributor of radio scanners, introduces new models of CB, radar detectors and scanners.

## *NEW!* Bearcat® 760XLT-SA

List price $499.95/**CE price $294.95**
***12-Band, 100 Channel • Crystalless • AC/DC***
*Frequency range: 29-54, 118-174, 406-512, 806-956 MHz. Excludes 823.9875-849.0125 and 868.9875-894.0125 MHz.*
The *Bearcat* 760XLT has 100 programmable channels organized as five channel banks for easy use, and 12 bands of coverage including the 800 MHz. band. You also get automatic scanning of preprogrammed aircraft, police, marine, and emergency services. It also includes Weather Search, Priority, Squelch, Lockout and Delay. It has automatic and manual band search to find new active frequencies in other areas of the radio spectrum. The *Bearcat* 760XLT mounts neatly under the dash and connects directly to fuse block or battery. The unit also has an AC adaptor, flip down stand and telescopic antenna for desk top use. 6-5/16" W x 1⅝" H x 7⅜" D. Model **BC 580XLT-SA** is a similar version without the 800 MHz. band for only $219.95.



BC 760XLT

## Regency® TS2-SA

List price $499.95/**CE price $309.95/SPECIAL**
***12-Band, 75 Channel • Crystalless • AC/DC***
*Frequency range: 29-54, 118-175, 406-512, 806-950 MHz.*
The *Regency* TS2 scanner lets you monitor Military, Space Satellites, Government, Railroad, Justice Department, State Department, Fish & Game, Immigration, Marine, Police and Fire Departments, Aeronautical AM band, Paramedics, Amateur Radio, plus thousands of other radio frequencies most scanners can't pick up. The *Regency* TS2 features new 40 channel per second *Turbo Scan*™ so you wont miss any of the action. Model **TS1-RA** is a 35 channel version of this radio without the 800 MHz. band and costs only $239.95.

## Regency® RH256B-SA

List price $799.95/**CE price $329.95/SPECIAL**
***16 Channel • 25 Watt Transceiver • Priority***
The *Regency* RH256B is a sixteen-channel VHF land mobile transceiver designed to cover any frequency between 150 to 162 MHz. Since this radio is synthesized, no expensive crystals are needed to store up to 16 frequencies without battery backup. All radios come with CTCSS tone and scanning capabilities. A monitor and night/day switch is also standard. This transceiver even has a priority function. The RH256 makes an ideal radio for any police or fire department volunteer because of its low cost and high performance. A *60 Watt* VHF 150-162 MHz. version called the **RH606B-SA** is available for $429.95. A UHF 15 watt, 10 channel version of this radio called the **RU150B-SA** is also available and covers 450-482 MHz. but the cost is $419.95

## *SALE* Bearcat® 100XL-SA

List price $349.95/**CE price $159.95/CLOSEOUT**
***9-Band, 16 Channel • Priority • Scan Delay Search • Limit • Hold • Lockout • AC/DC***
*Frequency range: 30-50, 118-174, 406-512 MHz.*
Uniden has authorized CEI to closeout the famous *Bearcat* 100XL to make room for new models. This scanner has a full 16 channels with frequency coverage that includes all public service bands. Wow... what a scanner! Included in our low CE price is a sturdy carrying case, earphone, battery charger/AC adapter, six AA ni-cad batteries and flexible antenna. Since this is a special closeout price on our last 200 pieces, you must order your *Bearcat* today to take advantage of this excellent scanner opportunity.

## ★★★ Uniden CB Radios ★★★

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 540e to the 310e handheld, there is no better Citizens Band radio of the market today.

**PRO310E-SA** *Uniden* 40 Ch. Portable/Mobile CB ... $85.95
**PRO330E-SA** *Uniden* 40 Ch. Remote mount CB ... $109.95
**NINJA-SA** PRO310E with rechargeable battery pack $99.95
**B-10-SA** 1.2V AA Ni-cad batt. for Ninja (set of 10) .... $20.95
**KARATE-SA** *Uniden* 40 channel rescue radio ..... $69.95
**PRO520E-SA** *Uniden* 40 channel CB Mobile ..... $59.95
**PRO540E-SA** *Uniden* 40 channel CB Mobile..... $119.95
**PRO640E-SA** *Uniden* 40 channel SSB CB mobile... $159.95
**PRO710E-SA** *Uniden* 40 channel CB Base..... $119.95
**PRO810E-SA** *Uniden* 40 channel SSB CB Base.... $179.95

## ★★★ Uniden Radar Detectors ★★★

Buy the finest *Uniden* radar detectors from CEI today.
**RD7-SA** *Uniden* visor mount radar detector ..... $109.95
**RD9-SA** *Uniden* "Passport" size radar detector... $129.95
**RD9XL-SA** *Uniden* "micro" size radar detector ... $159.95
**RD25-SA** *Uniden* visor mount radar detector ..... $59.95
**RD500-SA Uniden** visor mount radar detector .... $79.95

## *NEW!* Bearcat® 200XLT-SA

*New Product...Available May, 1988*
List price $509.95/**CE price $299.95**
***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 20 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-SA** for only $219.95. Includes antenna, carrying case with belt loop, ni-cad battery pack, AC adapter and earphone. Order your scanner now.

## Bearcat® 800XLT-SA

List price $499.95/**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-SA** is available for $196.95.

## Bearcat® 145XL-SA

List price $189.95/**CE price $98.95/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.

## Bearcat® 175XL-SA

List price $279.95/**CE price $156.95/SPECIAL**
***11-Band, 16 Channel • Weather Search Priority control • Search/Scan • AC/DC***
*Bands: 29-54, 118-174, 406-512 MHz.*
The *Bearcat* 175XL has an automatic search feature to locate new frequencies. Priority, lock out, delay and scan speed are all included.

## Regency® Informant™ Scanners

*Frequency coverage: 35-54, 136-174 406-512 MHz.*
The new *Regency* Informant scanners cover virtually all the standard police, fire, emergency and weather frequencies. These special scanners are preprogrammed by state in the units memory. Just pick a state and a category. The Informant does the rest. All Informant radios have a feature called *Turbo Scan*™ to scan up to 40 channels per second. The **INF1-SA** is ideal for truckers and is only $199.95. The new **INF2-SA** is a deluxe model and has ham radio, a weather alert and other exciting features built in for only $239.95. For base station use, the **INF5-SA** is only $149.95 and for those who can afford the best, the **INF3-SA** at $209.95, is a state-of-the-art, receiver that spells out what service you're listining to such as Military, Airphone, Paging, State Police, Coast Guard or Press.

## Regency® HX1500-SA

List price $369.95/**CE price $179.95/SPECIAL**
***11-Band, 55 Channel • Handheld/Portable Search • Lockout • Priority • Bank Select Sidelit liquid crystal display • EAROM Memory Direct Channel Access Feature • Scan delay***
*Bands: 29-54, 118-136, 144-174, 406-420, 440-512 MHz.*
The new handheld *Regency* HX1500 scanner is fully keyboard programmable for the ultimate in versatility. You can scan up to 55 channels at the same time including the AM aircraft band. The LCD display is even sidelit for night use. Includes belt clip, flexible antenna and earphone. Operates on 8 1.2 Volt rechargeable Ni-cad batteries (not included). Be sure to order batteries and battery charger from the accessory list in this ad.

## ★★★ Uniden Cordless Phones ★★★

A major consumer magazine did a comparison study on cordless phones. The check points included clarity, efficiency and price. *Uniden* was rated best buy.

**XE300-SA** *Uniden* Cordless Phone ..... $69.95
**XE500-SA** *Uniden* Cordless Phone with paging.... $84.95
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## ★★★ Extended Warranty Program ★★★

If you purchase a scanner, CB, radar detector or cordless phone from any store in the U.S. or Canada within the last 30 days, you can get up to three years of extended warranty service from Warrantech. This service extension plan begins *after* the manufacturer's warranty expires. Warrantech will perform all necessary labor and will not charge for return shipping. Extended warranties are non-refundable and apply only to the original purchaser. A two year extended warranty on a mobile or base scanner is $29.99 and three years is $39.99. For handheld scanners, 2 years is $59.95 and 3 years is $79.95. For radar detectors, two years is $29.95. For CB radios, 2 years is $39.99. For cordless phones, 3 years is $34.99. Order your warranty for your merchandise today.

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**Z60-SA** *Regency* 60 ch. scanner ... **CLOSEOUT** $129.95
**UC102-SA** *Regency* VHF 2 ch. 1 Watt transceiver ... $117.95
**BPS5-SA** *Regency* 16 amp reg. power supply .... $169.95
**MA549-SA** Drop-in charger for HX1200 & HX1500 ... $84.95
**MA518-SA** Wall charger for HX1500 scanner ..... $14.95
**MA553-SA** Carrying case for HX1500 scanner .... $19.95
**MA257-SA** Cigarette lighter cord for HX12/1500 ... $19.95
**MA917-SA** Ni-Cad battery pack for HX1000/1200 ... $34.95
**BP205** Ni-Cad battery pack for BC200/BC100XLT... $49.95
**B-8-SA** 1.2 V AA Ni-Cad batteries (set of eight) .... $17.95
**FB-E-SA** Frequency Directory for Eastern U.S.A. .... $14.95
**FB-W-SA** Frequency Directory for Western U.S.A. ... $14.95
**ASD-SA** Air Scan Directory ..... $14.95
**SRF-SA** Survival Radio Frequency Directory..... $14.95
**TSG-SA** "Top Secret" Registry of U.S. Govt. Freq.... $14.95
**TIC-SA** Techniques for Intercepting Comm..... $14.95
**RRF-SA** Railroad frequency directory..... $14.95
**EEC-SA** Embassy & Espionage Communications ... $14.95
**CIE-SA** Covert Intelligenct, Elect. Eavesdropping ... $14.95
**MFF-SA** Midwest Federal Frequency directory .... $14.95
**A60-SA** Magnet mount mobile scanner antenna... $35.95
**A70-SA** Base station scanner antenna..... $35.95
**USAMM-SA** Mag mount VHF ant. w/ 12' cable..... $39.95
**USAK-SA** ¾" hole mount VHF ant. w/ 17' cable.... $35.95
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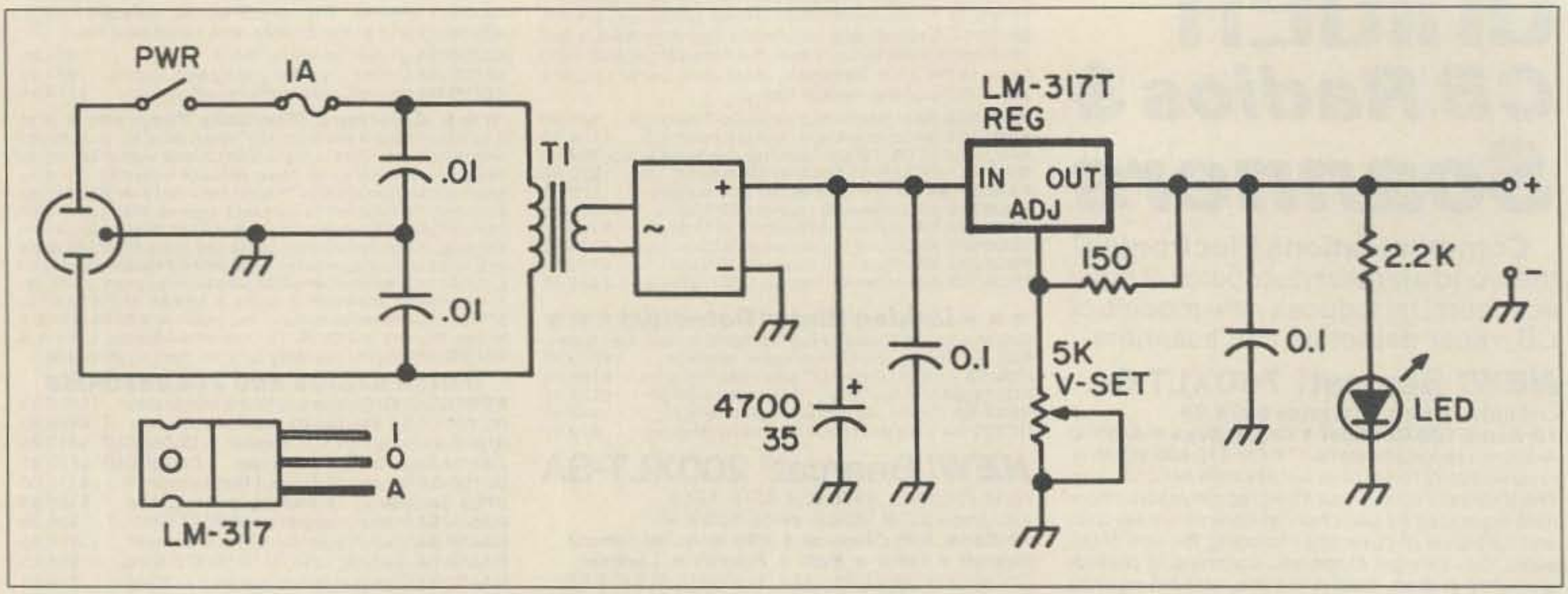



*Figure 1. Circuit for the basic 3–30V, 1.5A adjustable power supply regulator.*

Remember to follow basic safety practices when building *any* power supply. Use a three-wire or polarized line cord, and install a fuse or circuit-breaker in-line with the transformer primary. Switch the AC line, and bypass the primary against RF. Use shrink-tubing to cover exposed terminals carrying AC line voltage. Finally, make sure the DC supply is heavy enough to handle the current.

**Voltage Regulator Module Parts List**

1 — 4A, 100V PIV monolythic full-wave bridge (DB1)
1 — LM-317 adjustable regulator (U1)
1 — 4700µF, 35V electrolytic (C1)
1 — 2.2kΩ, ¼W
2 — .1µF ceramic, 50 volts
1 — 5kΩ, PC vertical-mount trim-pot
1 — 150Ω, ¼W
1 — Drilled and planted circuit board.

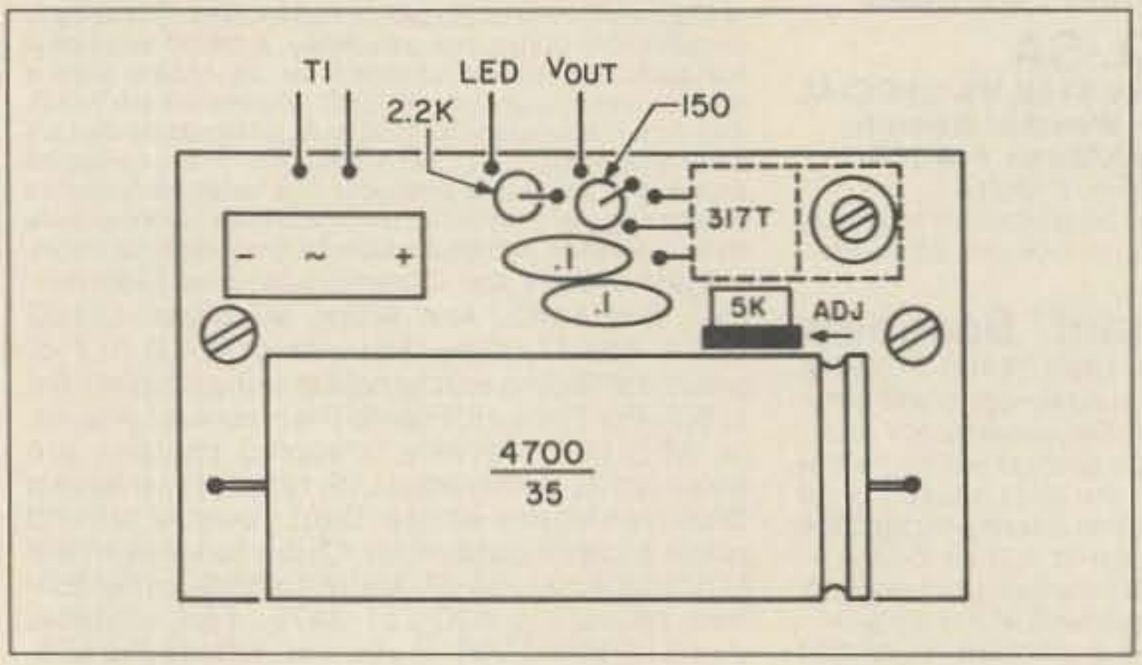
## Conclusion

This module has reduced the task of designing and building supplies to a matter of selecting the right transformer, and finding a box to put it in. I generally build two or three regulator boards at a time, and keep the spares for later projects. Sooner or later, they always find a home! 73

### References

DeMaw, "Some Power-Supply Design Basic," *QST*, January, 1987.
*The ARRL Handbook*, 1985.

*Rick Littlefield K1BQT lives in Barrington NH with his wife and son. He is president of Omnicom Productions, a company dedicated to producing training videos for education and industry.*



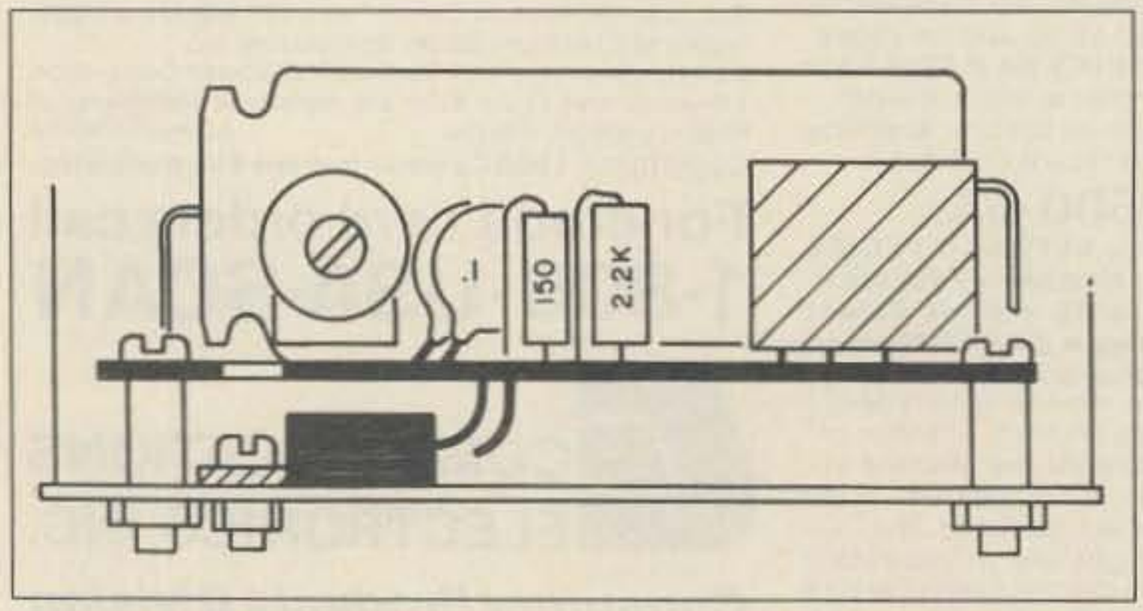




*Figure 2A and 2B. Parts layout and mounting detail for the power supply regulator module. The circuit board is available from Radiokit.*

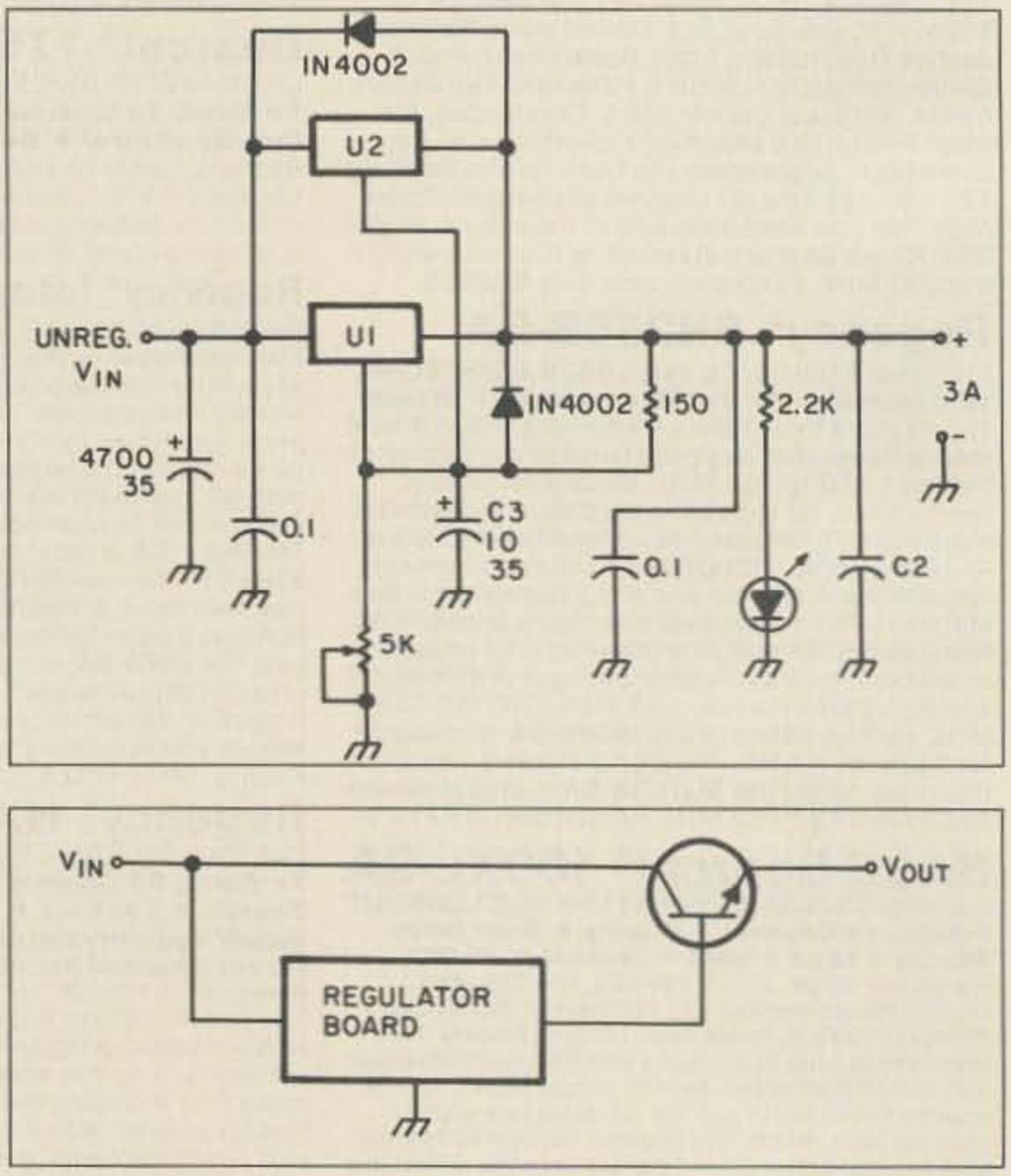



*Figure 3A and 3B. Circuit modifications that increase transient response and current-handling capacity of the module.*

### Where are the Novices?

There's going to be a lot to talk about Novices this year at Dayton. It's now clear that the Novice Enhancement has been a total failure as far as attracting Novices to the hobby is concerned. The sad fact is that we're losing newcomers even faster than we lost 'em before, apparently due to the increased difficulty of the new Novice exams.

The number of newcomers to the hobby had been dropping about 10% a year. Now that rate has increased 50%, for a total loss of 15%.

Yes, I've read the rosy reports of mobs of new Novices. Now, it turns out, as we look more carefully at the 1987 FCC figures, all the ado and self-congratulations was over a two-month anomaly: Novices rushing to get their tickets before the new, stiffer rules went into effect.

Despite my call for ham clubs to make the licensing of Novices their #1 priority, the number of newcomers has dropped even further. Yes, a few clubs are making an effort, but most of the club newsletters I get are full of chit-chat, with little about Novice classes, and with not one mention of a club sponsoring a radio club in a neighborhood school. Not one.

Perhaps this year at Dayton it's time for me to discuss how we can best enjoy the few remaining years of our once wonderful hobby. Maybe it's time to stop trying to fight the tide, to go with the flow. Bad language, jamming, everyone for himself seems to be where we're going. Should we have awards for net jamming? How about articles on how to build repeater trashers—little hidden oscillators that randomly time repeaters out?

There goes Wayne, being rotten and sarcastic again. What'd you expect, Rodney Dangerfield? You want one-liners, try Neil Simon. So, do I have the half-baked notion that this whole mess lies on the conscience of what remains of our ham clubs? Pretty much, yep.

The scenario: more Novices = more hams = more engineers/technicians/scientists = more American electronics = more manufacturing of high value goods = regaining American financial leadership. Yes, that's simplified, but that's the basic way I see it—and I'm not going to expand it to a complete book right now.

You know as well as I do that electronics is the key to the next century. You also know that Japan is working diligently to be #1 in every aspect of electronics: communications, office equipment, entertainment, and finance.

At my Dayton talk, I'll try to have a place to put your walkers, an oxygen section for the emphysema sufferers, an ambulance standing by for stroke and heart attacks during my talk. I may have petitions for you to sign for a return to spark using the original and now largely forgotten Morse Code. Narrow band spark, naturally. Bring posters to wave. We're going to have ball!

The Dayton officials tell me that my talk draws the largest crowd of the Hamvention. Well, outside of the banquet, anyway. Hmm, I think the last time I addressed the Hamvention banquet was around 1956. 73

# 73 Review

*by Rick Littlefield K1BQT*

# TR-110 Transceiver

## *Small, simple, and reliable 10-meter rig.*


Amp Supply Co.
6307 Chapel Hill Rd.
Raleigh NC 27607
Price Class: TR-110 Xcvr: $330
Mobile mounting bracket: $9.95
Noise blanker module: $24.50
250-Hz CW filter: $44.50

Ten-meter DX is improving rapidly, and Novice Enhancement has created a whole new wave of activity. Consequently, many folks are discovering (or re-discovering) how interesting and how much fun this band can be. The 10-meter monobander from Amp Supply couldn't come at a better time!

The TR-110 is actually one of a series of new rigs from Amp Supply Company, with other models covering 15, 20, 40, and 75/80 meters. Packaging is compact and lightweight, measuring 2⅜" high by 7" wide by 10" deep, and weighing just over 5 pounds. Tuning covers the entire band in both SSB and CW modes. Output is 20 watts, plenty of power to work the world without packing mega-pounds of DC supply. As 10 meters continues to open up, I suspect rigs like this will provide an exciting alternative to VHF-FM mobile operation for Novice and Extras alike.

### Operation

The TR-110 comes in the traditional foam shipping box, complete with a mobile-type microphone, DC power cable, and spare fuse. The mobile mounting bracket is optional. To get on the air, all the buyer needs is a 5-amp 13.8 volt power source, and an antenna. A rapid-duped 12-page manual spells out installation and operation, and provides a block diagram of the transceiver's inner workings.

The front panel is attractive, conveniently laid out, and, best of all, simple. A large, easy-to-find VFO tuning knob is located on the right side of the panel. This drives a smooth opto-controller, which provides two tuning rates. Slow rotation yields a 5 kHz per turn rate in 100 Hz steps, while fast rotation boots the synthesizer into overdrive for large frequency excursions. Two smaller knobs control AF gain and RIT. One can easily identify these three controls by touch—a real plus for mobile operation. A vertical bank of four push-button switches select the band segment (10 meter version only), CW or SSB mode, optional noise blanker, and a dial-lock circuit.

The transceiver's four-digit frequency display uses easy-to-see .4" red LEDs and reads out to the nearest 100 Hz (the display doesn't indicate whether the 28 or 29 MHz band segment is selected from the push button control). The synthesizer sets itself to 000.0 on power up. As long as the power cable remains connected to an active power source, the radio may be turned on and off without disrupting the last frequency setting. A small green LED in the frequency display window indicates transmit status.

A conventional meter to the left of the frequency display indicates signal strength and power output. Mini-jacks are conveniently positioned next to the microphone jack for connecting a key and headphones. A sturdy 3" speaker is ported through the bottom of the cabinet, and a tilt-bail elevates the front to improve sound quality and provide a better view of the panel.

Looking under the hood, it was evident that the TR-110 is not a CB conversion or cut-rate rig. The circuitry is that of a radio designed specifically for ham use.

### Performance

For initial testing, I set the transceiver on the bench and connected a dummy load. A quick check into a calibrated power meter revealed the transmitter was delivering the promised 20 watts in both modes. I then connect a Cushcraft R3 ½λ vertical and began tuning across the band. As luck would have it, a few strong South American signals came in. Right away, I contacted FG5BM and AY60F—and received good signal reports.

Next came a QSO with a local ham, familiar with my voice. He said the audio quality was good, and I sounded very natural. To compare his observation, I monitored myself on a second receiver and observed the waveform on a scope. To my ear, the audio quality was natural, though perhaps a bit too "mellow" to punch through heavy QRM and noise. Serious DX hunters may find some advantage in substituting a microphone with more bite. On the other hand, the scope pattern was clean.

Though I didn't measure sensitivity with a calibrated signal generator, on-air observations suggested a very hot front end. The design uses a low-noise MOSFET RF preamplifier, which may explain why the TR-110 easily outperformed a $1,000 all-band transceiver in side-by-side weak-signal comparisons. The AGC rate seemed to be a pleasant compromise for SSB and CW operation. Limiting was effective over a wide range of signals without pumping or cracking on voice peaks. Cranking up the AF gain revealed plenty of audio power, good for comfortable mobile operation. The one receiver feature local net operators may miss is a squelch.

### CW Test

For the next test, I tuned down to the bottom of the band and plugged in a key. Again, working into South America was no problem. The TR-110 is surprisingly pleasant to operate on CW. It features semi-QSK operation and adjustable sidetone. The test unit didn't have the optional 250 Hz filter, but it's usually not necessary for casual CW operation on this band. (Twenty-meters is a different story). Checking the keying, I found the wavefront hard but free of clicks. Attack of the first character, the T/R switching cycle was audibly soft but not objectionable. On-air reports were good.

A couple of days later a friend Barry K1ZDS loaded the TR-110 into his diesel VW Rabbit for a mobile test ride. He too enjoyed the radio a great deal. During his travels around New England, Barry made several mobile contacts into the Southeastern United States and the Caribbean—including Cayman Island. In the diesel-powered vehicle, there wasn't any on-board ignition noise to contend with. Barry noted, however, that the optional noise blanker would be helpful in city traffic. His only real complaint was that the microphone cord was a bit short for his VW floor mount.

### Conclusion

Overall, I found the Amp Supply TR-110 a very respectable little radio, and highly recommend it. The TR-series of monoband transceivers carry a standard factory warranty through a familiar and reputable import manufacturer (Tokyo Hi-Power Labs), and are manufactured for Amp Supply. 73

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*Rick K1BQT got his first ticket in 1957 at age 13, and is currently an Extra-class licensee. He publishes in many amateur radio publications including* CQ Ham Radio *(Japan). His forte is building QRP equipment. Those interested may reach Rick at Box 114, Barrington NH 03825.*

# Emergency "Pocket" Packet

## *Instant Packet in your Jacket.*

*by David McLanahan WA1FHB*


In ham radio, as in many other endeavors, helping people in time of need is one of the most satisfying rewards. Of course for hams this requires skill, procedures, and equipment. While many great inventions have come "in the heat of battle" or while faced with a crisis of some sort, nothing beats advanced preparation.

Packet radio offers many advantages for disaster and emergency communications. It offers fast, error-free, transmission of data, names and addresses, in a form that can be viewed, studied, and even printed, and a modicum of security from the ubiquitous police scanner listeners. Thus, this tinkerer decided to put together an emergency/disaster packet station.

For the station, I wanted to be able to have either a user terminal or a digital repeater, called a "digipeater." It had to be small and light-weight—nearly pocketable—for easy portability. Of course, it had to be self-powered and affordable. It turns out this is not hard to do, if one accepts this equipment as a temporary, emergency expedient, and doesn't expect the convenience, reliability, and full features of a permanent set-up.

### The Components

The radio for the station is the ICOM 02-AT. An assortment of rechargeable NiCd batteries can power this. Alternate supplies are two alkaline AA packs; a rechargeable Lithium pack; and 12 volts from a storage battery, that could be part of, for example, an automobile. It offers two output powers, ½ watt and 5 watts, and its "rubber ducky" is attached by a standard BNC connector, so it's easily replaced by a larger antenna.

There's another advantage to the 02-AT. While most packet activity is on 2 meters, there's also a lot on 220. This is either "backbone" stuff for the PBBSs or local activity in the Novice segment. The 02-AT sports a 220 twin sister, the 03-AT, that uses the same connectors and accessories. If a packeteer is set up with the 02-AT on 2m, he needs only to substitute a 03-AT to come up on 220.

The ICOM 2-AT, or the μ2-AT, are acceptable substitutes. Their main problems are a lower maximum output power and inability to run directly on 12 volts DC. Of course, "overshoes" in the form of one of the small, 12 volt, 1 watt to 10 watt amplifiers such as the Heath HA-201A can be added to either hand-held for a bit more umphf!

A fixed frequency handie-talkie might need a bit less stand-by power than a synthesized one and would lessen the possibility of changing frequency accidently, but for emergency work, a "rock-bound" rig is very limiting.

### TNC

The best choice by far is the GLB PK1-L. At 25 mA, it uses about one tenth the current of the nearest competitor. A NEDA 1604 alkaline (the regular 9 volt "transistor" battery) will run the TNC for about 20 hours! The only problem that some may have with the PK1-L is a control code structure that is different from the TAPR and TAPR clones. I personally favor the GLB's commands. For example, if one gets a "busy signal" it's only a keystroke to reuse the same connect string. If a TAPR-compatible person uses the station, however, he'll need the cheat-sheet of instructions and still be exasperated.

### The Computer

I use the NEC 8201A laptop, for no better reason than finding it on sale at a local computer store. It also runs on AA alkalines, which last for about a month of occasional use.

The major disadvantage to this type of computer is its 40-column-by-8-line liquid-crystal display. The screen is large and easy to read, but 320 characters is a pretty small window on a text file (most computer terminals offer 80 columns and 25 lines, or 2,000 characters, at a time). Also, the W0RLI PBBS software is based on 80 columns so, with 40 columns, PBBS entries don't line up under their headings and formatting is shot.

This won't be a big consideration for emergency work, however, unless a lot of arcane data is passing to or from a PBBS or other "unfriendly" computer facility. Of course, using an 80-column printer skirts this prob-

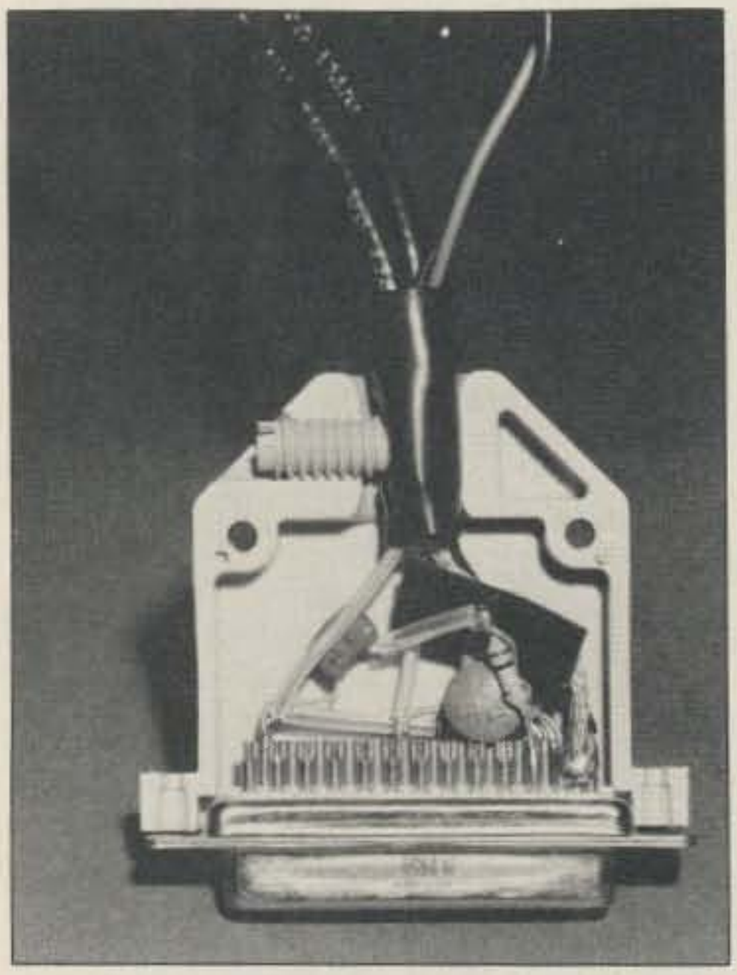

*Photo A. TNC plug with components.*

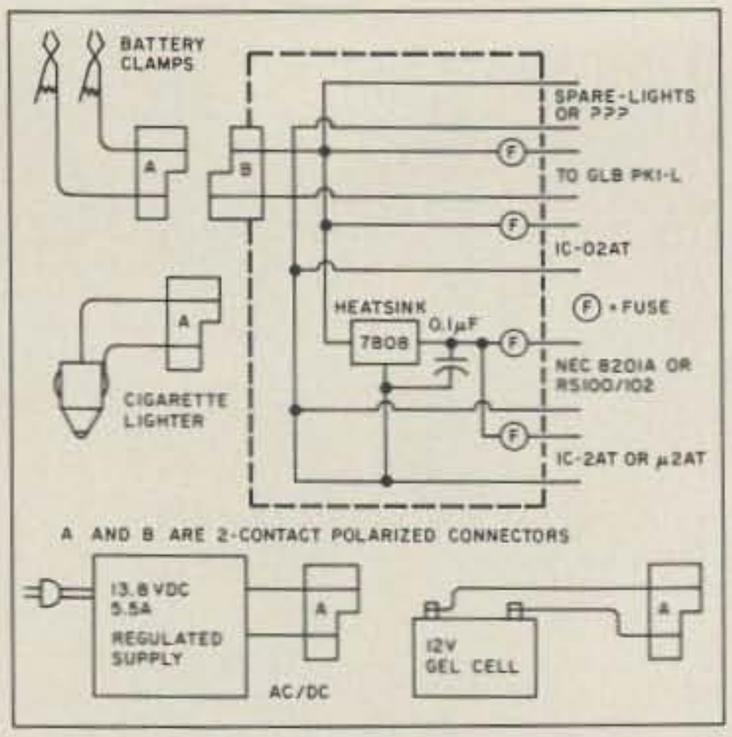


*Figure 1. Power distribution box schematic.*

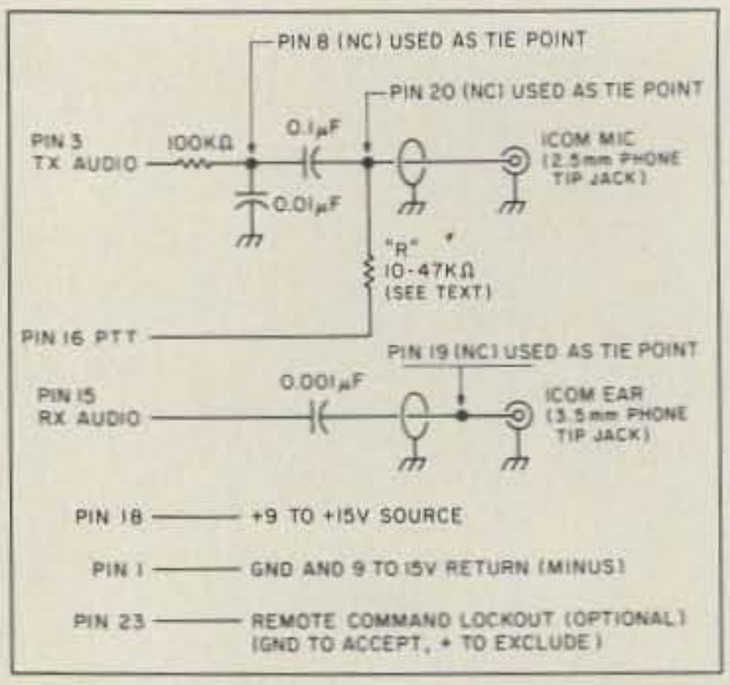


*Figure 2. Radio-to-TNC cable schematic.*

lem. (The 40-column limitation is only on the screen and does not affect hard-copy.) Using a printer, however, may not be practical in the field.

Slowness in displaying is another problem with the LCD. The NEC insists on displaying all incoming material. At high data speeds (such as 4800 or 9600 Baud) the display can't keep up. Run the computer-to-TNC link slower, (e.g. 1200 Baud) without using flow control. This translates to a TELCOM Status of 5I71NN. (This will make sense to the operator when he gets into the documentation for the NEC's ROM-resident TELCOM program.)

The Radio Shack Models 100/102 are very similar to the NEC 8201A, and would also work well in this application. The Radio Shack and NEC models listed here, incidentally, are made by the same firm. Both come with ROM-resident terminal emulators including file up- and down-load capability. The inherent up- and down-load capability is important. It allows preparation of a message "off-line," where it can be reviewed and edited on the screen, then sent in a burst. It also allows storage of an incoming file for later study or reference. These computers are also capable of simultaneously printing an incoming file that it is storing (with a parallel printer hooked up).

These computers usually come with RAM (Random Access Memory) varying from "very little" to "not enough." Both NEC and Radio Shack, as well as several aftermarket firms, sell RAM expansion modules. I'm using the ones from Purple Computing. On the basic 8201A, two 8 KB modules fill out the first 32K bank and four more add a second 32K bank. That may not sound like a lot of storage these days, but at least the terminal program is in ROM, and so doesn't take up RAM space.

There are much more powerful (and expensive) portable and laptop computers that would work very nicely. These have 25 x 80 screens and much more storage capacity. I rejected them because of weight, fragility (if equipped with a disk drive), and most important, power consumption. The "large" machines have much bigger and heavier batteries, but most still get only 4 to 5 hours of operation on a charge.

There's one other possible accessory: a portable battery-operated printer. This moves the station set-up out of the "pocketable" category, and battery life (of four C cells) is limited, but it's certainly viable for those who need hard-copy capability. (See Photo 1.)

### Power

A good emergency packet station should be able to use any of three alternative power sources (and to swap from one to another), depending on the situation.

•Internal batteries. The complete set of disposables:
TNC - one 9-volt alkaline
Computer - four 1.5-volt AA alkalines
ICOM 02-AT - either six or ten 1.5-volt AA alkalines (This depends on the battery case. The 2-AT can't use the ten-cell case.)

•12-volt storage battery, or an automobile with one. The GLB and the 02-AT can be connected directly to 12 volts, but the NEC 8201A (or RS M-100) and the ICOM 2-AT, or µ2-AT (if used as a substitute) need no more than 8 volts. They require a 7808 solid-state series regulator. This calls down a little "spider box" distribution system to house the 7808, fuses, and the plugs for the various cables. (See Figure 1.)

•117-VAC house current. All of these devices can use individual AC power supplies, probably of the integral wall-plug transformer type. With the house current, however, there's less to carry and it's less confusing to use a single 3 or 4 ampere "CB-type" 13-volt regulated brick power supply to power the 12-volt distribution system.

•Gel cells. Two six-volt gel cells strapped together and kept on "float charge" serve as an excellent emergency power source. Several types of connectors hard-wired to the cells make the power pack extremely versatile.

### CABLING Radio-to-TNC

Ideally, one would run the audio connections to the discriminator and to the modulator to avoid noise, and, particularly, to bypass the audio shaping that's meant to enhance voice communications. The problem is that going that route spells some radio modification. Radios couldn't be swapped

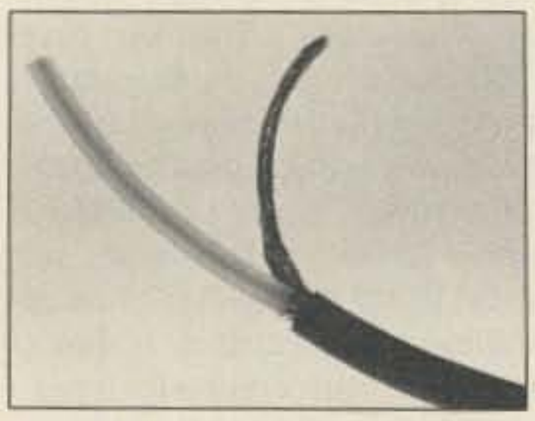

*Photo B. To prepare the coaxial cable for connector attachment, strip the outer insulation and bulge the shield . . .*

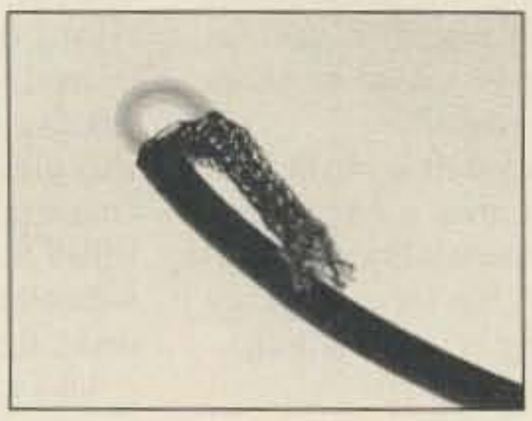

*Photo C. . . . tease a diamond-shaped hole near the end of the insulation . . .*

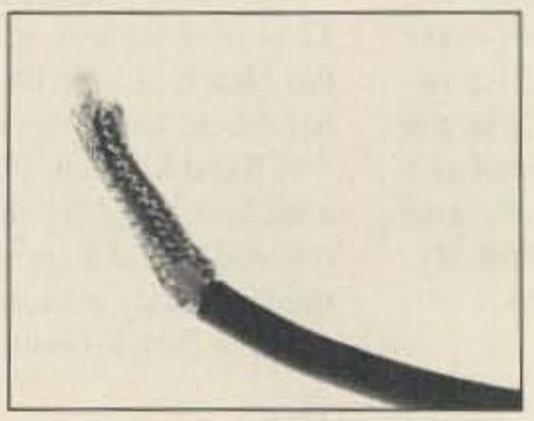

*Photo D. . . . bend the coax and work tool through the hole and pull the center insulation loop clear . . .*

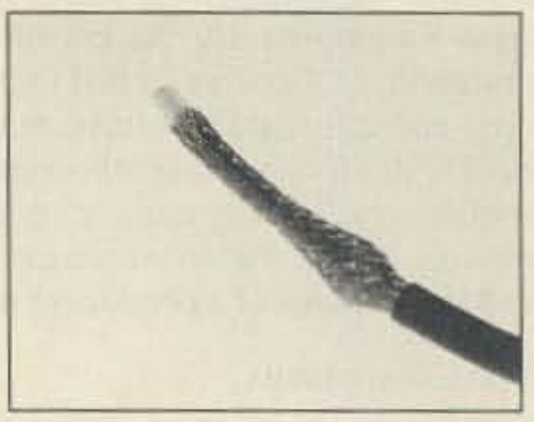

*Photo E. . . . and massage the shield flat and tight.*

quickly in the event of a failure. An operator has to accept a bit of signal degradation, work with the mike and speaker plugs, and at least partially compensate for the audio shaping with capacitors.

Both radio connections use RG-174-U. A 2.5mm plug is used on the mike line and a 3.5mm plug on the speaker line. There are nice cords made for use with computer cassette tape recorders, sometimes found in ham flea markets, that combine the mike and phone plugs. If it looks cheap, such as the mike cord for a cheap audio cassette recorder, watch out for poor or intermittent connections in the plug end. The TNC end of the cable is a DB-25S that needs some components within the shell to compensate for the audio shaping in the rig and to combine the transmit audio with the push-to-talk for the ICOM (Figure 2 and Photo 2).

A small note of explanation for "R" in the diagram. The ICOM uses a single line for both transmitted audio and for push-to-talk. If the value of "R" is too large, the radio won't detect the PTT closure. If it's too small, the audio level and the bias of the input transistor will be lowered, causing poor audio.

Connecting the ends of small coax is a bit tricky. First remove the outer insulation by cutting around the wire without nicking the shield. Then slide the shield back a small amount to loosen it (Photo B) and bend the stripped part of the coax sharply right next to the end of the outer insulation. With a jeweler's screwdriver (or similarly pointed tool), tease a diamond-shaped hole between bunches of the shield braid (Photo C). Work this hole large enough to pull the bent loop of insulated center conductor out through it (Photo D). Try to avoid cutting or breaking any strands of the braid. The braid can now be massaged down small and flat (Photo E).

In addition to providing the radio interface, this connector offers some interesting options. One is that, in unattended digipeater service, the PK1-L is capable of accepting remote commands to change operating parameters, beacon text, and even the digipeater call. Now, this is both a useful feature and a real opportunity for mischief. The commands to change these parameters aren't that hard to figure out.

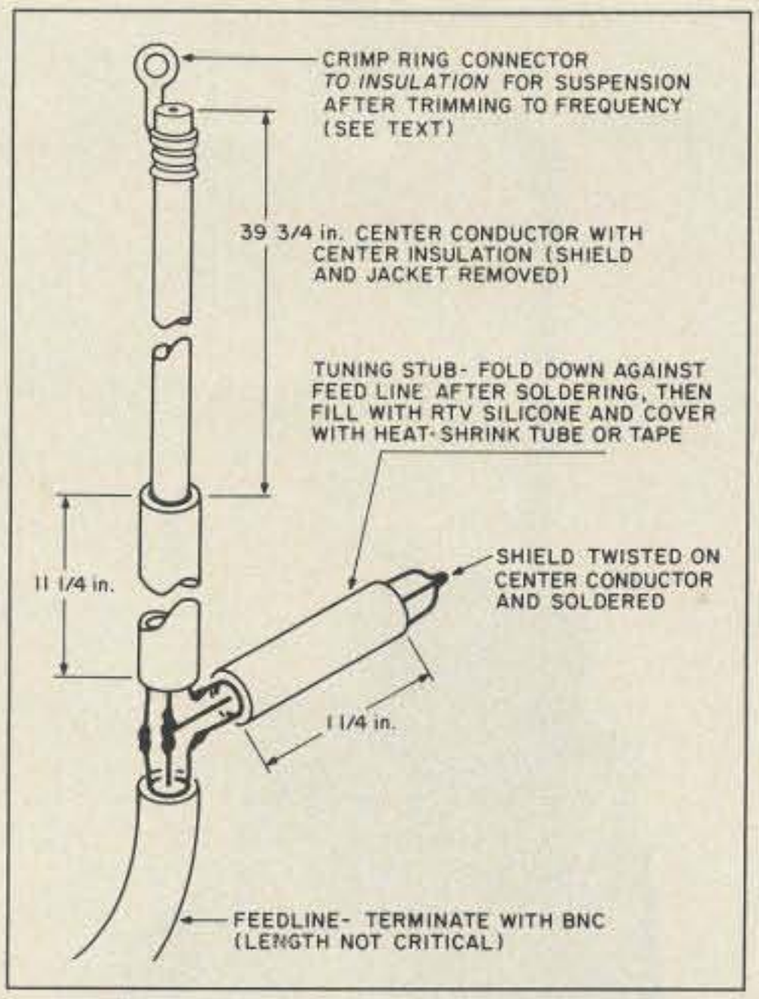


*Figure 3. This half-wave antenna made from coaxial cable will provide much better performance than an HT's rubber duck.*

Therefore, I suggest disabling the remote commands by tying Pin 23 of this connector high. They who are gluttons for punishment can mount a mini-sized slide switch in the side of the plug shell to switch Pin 23 between high and ground. It will suffice, however, to just hard-wire it in the position of choice.

This connector offers a RESET pin, but that's redundant with the internal reset switch, accessible through a hole in the side of the TNC case. There's also a "connected" signal, but it's too low-power to drive a buzzer or LED directly, even if the operator had battery power to spare. There are also some uncommitted inputs and outputs (in other applications, the uncommitted outputs could be used, for example, to switch frequencies, if remote commands are enabled), but I left these inputs and outputs unconnected for this use.

### TNC Digi Jumper Plug

If the set-up is to be a pure digipeater (i.e., no communications at the digipeater site) the operator has to inform the TNC program of that fact by holding the RS-232 RxD (receive data) line high during power up or reset. To do this, he needs to wire a jumper between pins 2 and 5 of the DB-25P.

### TNC–Computer Cable

This is the easiest cable—simply connect two DB-25Ps pin-to-pin. The most common way to make this is to use two insulation displacement connectors (IDCs) with 25-conductor ribbon cable (take one conductor from a 26 strip). Hand-wirers need only pins 1–7 and 20. I made my cable fairly long (5′ or so), in order to keep the connections between the radio and TNC short and still move the radio around for the best signal. Positioning flexibility is important when using the integral antenna, and because of the ability of the system to QRM itself with certain geometries.

Mark well the power cables for the radio, TNC, and computer for extended use, when 12-volt external power is available. The computer cable needs a 7808 voltage regulator to run from a 12-volt source. So does the radio, if it's the ICOM 2-AT or μ2-AT. An operator should be able to connect this cabling array to both an automobile cigarette lighter and to the posts of an automobile storage battery, with BIG battery clamps. *Clearly* mark positive and negative—one never knows who'll be hooking it up, and it might in the dark!

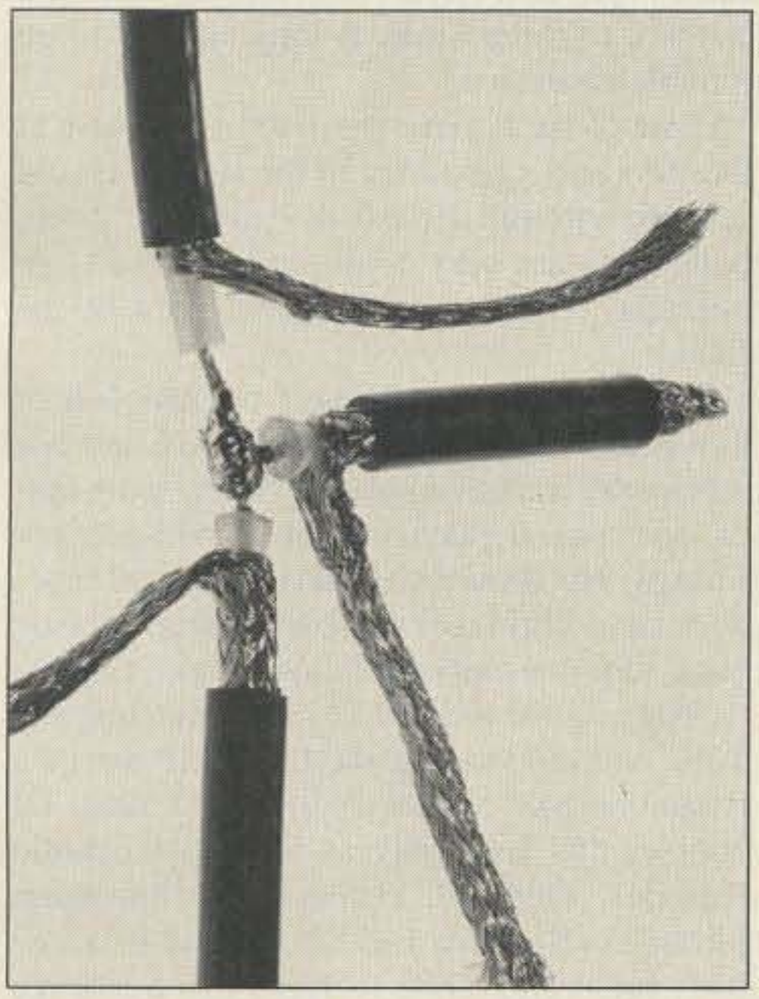

*Photo F. Prepare the antenna pieces by stripping braid, twisting the end of the tuning stub, and soldering the center conductors together.*

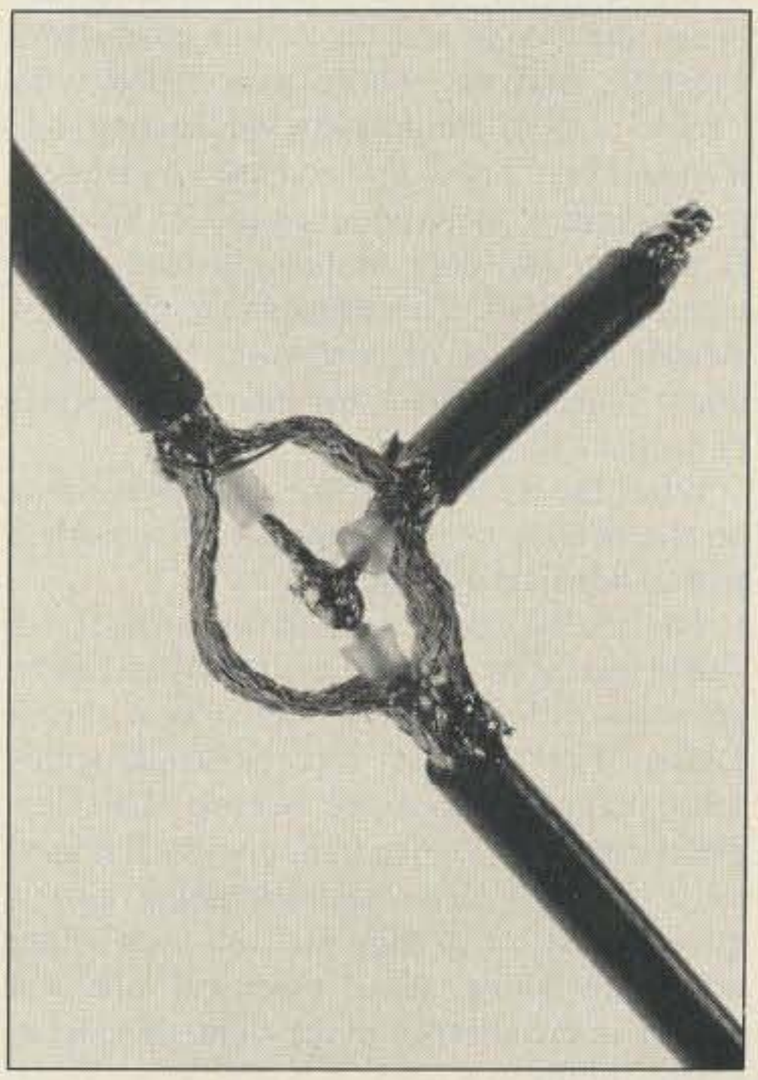

*Photo G. Next connect the pieces' braid as shown.*

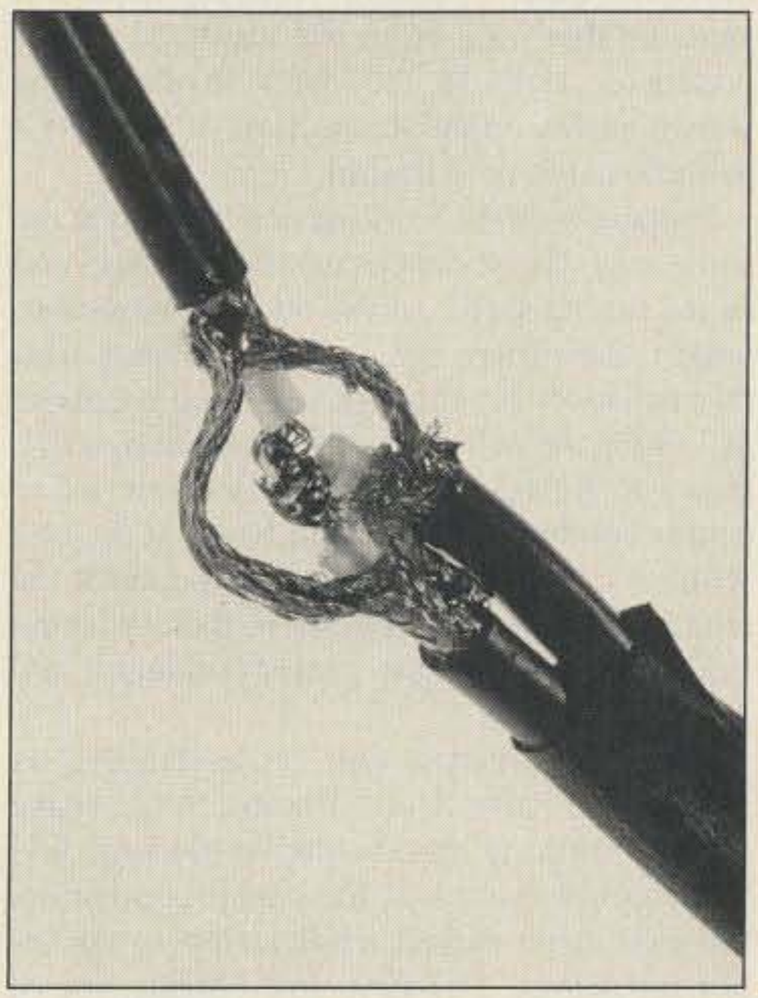

*Photo H. Bending the stub down parallel to the feedline, secure with electrical tape, waterproof the joint with RTV, and cover with heat-shrink tubing.*

### Antennas

Of course the easiest and least effective antenna to use is the rubber duck that comes with the radio. However, because the ICOM 02-AT, 2-AT, and μ2-AT use a standard BNC antenna connector, alternatives abound. Always carry a quarter wave BNC-type pull-out rod antenna. Also, very important in any bag of goodies is a BNC-to-UHF adaptor (UG-255/U) that allows the use of an automobile roof-top ¼λ or ⅝λ whip, or even a structure-mounted 2-meter aerial. Here in southwestern New Hampshire, some hams have "pre-installed" permanent 2-meter antennas on several critical public buildings such as schools used as evacuation centers.

### Easy-to-Make Vertical

Jack Knott of Aire Sciences suggests a great emergency ½λ vertical, economical to make and easy to carry and use. It's shown in Figure 3. It can be hauled up a (non-metallic) flagpole or pulled up between two trees using thrown (or sling-shotted) fishing line.

One can make Jack's antenna either from RG-58A/U or RG-174/U. The former offers lower losses, but is not quite as easy to make, store, and handle. (Bear in mind that antenna and feedline are one piece.) The length of the feedline will always be either too short or too long, but it's not critical. Mine's about 20'.

To prepare the antenna, cut the outer insulation carefully 39-¾ inches from one end of the coax, then work it off the end of the cable with a series of pushes and pulls. Cut and remove the shield, being careful not to nick the insulation around the center conductor. Now, clip that piece of coax to length, and at the other end of the same piece, remove the outer insulation from the coax and separate the braid from the insulated center conductor tight to the outer insulation as shown earlier in the discription of the TNC-to-radio cable preparation.

Prepare both the feedline and the stub in the same way. To short circuit the opposite end of the tuning stub, cut the outer insulation to length, then force the center conductor with its insulation out through the braid by about ¼". Strip the ¼" of the center insulation off, then pull it back so that there is about ¼" of center conductor and shield braid at the end with no center insulator between. Check the length of the center insulation, then twist the braid down around the center conductor and solder.

Now the antenna can be assembled as shown in Figure 3 and Photos F–G. Make sure everything fits before soldering, and make doubly sure that the center conductors have not been nicked while stripping the inner insulators. The first time I made one of these antennas, I damaged one of the center conductors, which broke at the last moment. Of course only the feedline can be re-terminated without messing up the dimensions. When soldering, use a hot, heavy iron in order to get in and out fast without exposing the center insulator to any more heat than necessary.

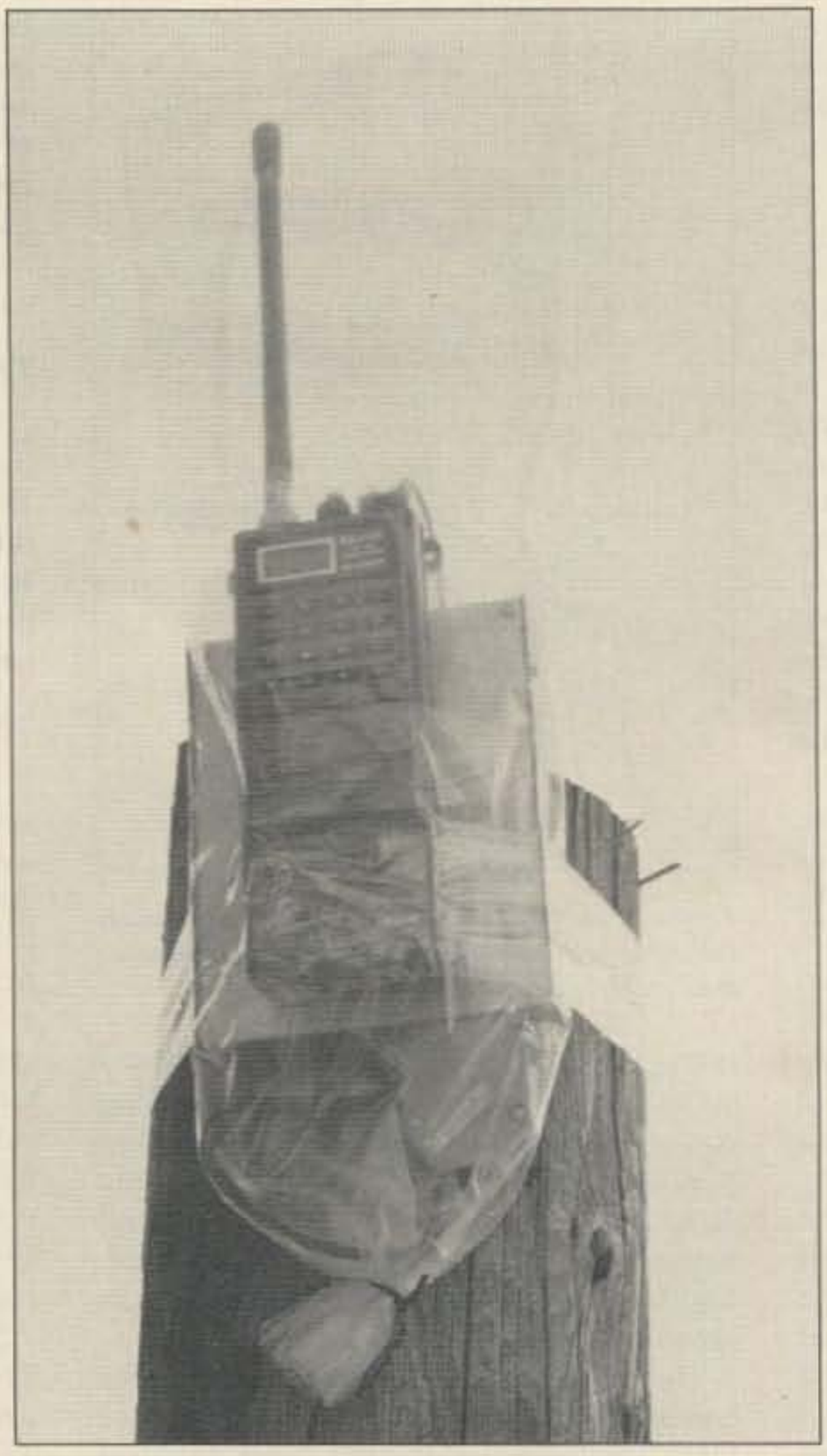

*Photo I. A complete pole-top digipeater with HT and TNC protected with a plastic bag and secured with ducting tape.*

The stub can now be folded down parallel to the feedline (Photo H), the spacing between the braids and the center conductors checked, and the whole joint filled with "RTV" (room-temperature vulcanizing) silicone rubber. Try to find and use a hydrogen-peroxide cure material, such as GE Silicone II window and door sealant, instead of the acetic acid kind. This reduces the chance of electrical leakage or corrosion. If the label doesn't specify, check for the vinegar smell of acetic acid.

When the RTV has set up, any rough spots on the outside of the joint can be smoothed with sandpaper or a file.

To "ice the cake," both the end of the coax shield and the stub connection and stub can be covered with the proper-sized heat-shrink tubing. The "official" tool for shrinking this tubing is pretty expensive, but one of the new electric paint-stripping guns does well if used *very* carefully. The paint-stripping gun is quite capable of melting the stub-joint solder under the tubing. Good electrical tape will suffice in the absence of the right-sized heat-shrink tubing.

In addition to increasing reliability, neat work at this point will be rewarded during thenext flood when the mayor points out you and your equipment to the governor, mentioning your invaluable public service.

### The Final Step

Install a BNC connector on the opposite end of the feedline, and test the antenna using a VSWR bridge and the trusty 02-AT. Erect the antenna using heavy fishline or twine thrown over a tree branch or suspended from a piece of 2-by-4 or other nonconducting support, positioned vertically and as far as possible from the trunk or support. Measure and plot the VSWR every half MHz over the 2 meter ham band. It should show a null somewhere just below 144 MHz. If it does, clip about ¼" off the insulated center conductor at the top of the antenna, and remeasure and replot the VSWR.

Most 2 meter packet activity is around 145.01 through 145.09 MHz, so stop snipping when measurements show the null there. It's a good idea, however, to bring the null up a bit further in frequency, bearing in mind the possible need to operate voice. Most repeaters inputs are above 146 MHz. When the length is correct, crimp a ring connector onto the inner insulation (not the center conductor) in order to tie the suspension string to it.

For field erection, fasten either a regular fish sinker or a heavier-weight "sounder" to a piece of string, which is in turn tied to the end of the antenna. Throw the weight over a convenient tree. Many often use a sling-shot for some antennas, but for this application the extra bulk and weight may not be justified.

### Accessories

Spare batteries. Any of these components can be run from NiCd batteries, but alkalines last two to three times as long and are more reliable in service.

A set of fresh batteries in the equipment at the start and a spare set in the pocket should see one through almost any disaster. Since both types are very common trade sizes, an operator can likely find them even in the field.

The operator should have pockets full of junk, a BNC-to-PL-259 adaptor, ¼λ and ⅝λ collapsible antennas, pocket beam, spare fuses, and coaxial extension cables with adaptor fittings. He should also have electrical tape, duct tape, clip leads, and waterproof plastic bags. One can make a "quicky-digi" by plastic-bagging the radio with a whip antenna and TNC and duct-taping the lot to the top of a telephone pole or other convenient mast. Of course, this lasts only as long as the radio batteries. One will also need an extension power cord with a fork at the end to allow both radio and TNC to run from a storage battery at the base of the pole.

One very handy tool to have is the Camillus Boy Scout knife!

*Photo J. Margaret LePage N1FBC operates the emergency packet station just after a New Hampshire snow storm. It pays to be prepared.*

**Supplies**

Paper, logging forms, pencils, and erasers!

Also take along manuals and/or command "cheat sheets" for all the equipment that's commonly used in the area in question. Photocopy the essential instructions out of manuals. In many emergency situations, an operator may be relieved from his station by someone far less familiar with both packet and the equipment.

Get a list of all the available frequencies in the area. Get also a list of tone-codes and instructions for any computer-controlled voice repeaters in the area. Don't forget packet system maps, lists of Q-codes, and ARL numbered messages. Bear in mind that, in an emergency, one will likely be using unfamiliar procedures and facilities and may be called upon to provide information for others that the operator wouldn't himself may not need.

Take also state road maps, and copies of local area Coast & Geodetic Survey Quadrangles (topographic maps). A number of organizations (such as Civil Air Patrol and, in this area, the New Hampshire Forest Fire Service) have their own grid overlays for maps that allow them to specify map locations by alphanumeric groups. It's helpful to have keys for these locating schemes. Typical of government (or government-related) organizations, CAP is not generally aware of the Fire Service grid, nor is the Fire Service aware of CAP's!

Many newer VHF and UHF rigs (as well as the ubiquitous scanners) are able to monitor the adjacent public service bands, so it helps to have frequency lists for police, fire dispatch, utility and similar services, as well as other disaster helpers such as the Red Cross and CAP.

Of course, it's always wise to have a listing of phone numbers, both for area public services (civil defense, fire, police, hospital, utilities, etc.). Often one can also get (and should keep confidential) unlisted numbers for town/county/state disaster officials and coordinators.

If an emergency group has installed "just in case" antennas on any buildings that might be used during disasters, they should also have a listing of exactly where to find the radio end of the coax (it'll probably be hidden from the normal building occupants) and how to tell which is which if there's more than one.

This information constantly changes. Someone should be responsible for the periodic updating and distribution of the information in the "emergency book." The middle of an earthquake or a tornado is not a good time to try to deliver a year's worth of revision sheets!

All of this literature can go into a slim Accopress Binder that's kept in a plastic zip-top envelope along with some folded light plastic. Many disasters are accompanied by such inclemencies as wind and rain! Those really prepared will take along a flashlight, candles and matches. There's also a great "soft-case" First Aid kit that's available from any American Red Cross Chapter House for only $25.

**Case for a Case**

All of this material (with the obvious exception of an automobile storage battery) fits into an attache case found in many local discount stores. I've used one of these, and for many situations, it's very effective. I am also apt to respond to an emergency situation in a surplus military field jacket, the kind with BIG pockets! When called on in most emergencies, one can get some idea of the nature and duration of the service that's needed, and fill these pockets accordingly.

**Finis**

A lot of fine equipment for emergency use is wonderful, but it's not enough if an operator doesn't know how to operate it. Hams have the advantage here in that, in an emergency, they do something they normally do every day: communicate. To exploit qualifications and equipment properly, hams must plan and drill, even if only informally.

When the emergency packet station is set up as described here, try it out under varied, simulated emergency conditions. Pay particular attention to transmit and receive audio levels settings, which are covered in the manuals. Find out *before* the emergency that the plugs don't mate or the SSID of the big digi on a little-used frequency. With some thought and practice, hams can maintain and improve their reputation as a valuable national disaster resource! 73

## References Equipment/Accessory Sources

*GLB Electonics, Inc.*
*151 Commerce Parkway*
*Buffalo NY 14224*
*PH: (716) 675-6740*

*ICOM America, Inc.*
*2380 116th Avenue, N.E.*
*Bellevue WA 98004*
*PH: (206) 454-7619*

*NEC Home Electronics (USA) Inc.*
*1401 Estes Avenue*
*Elk Grove Village IL 60007*
*PH: (312) 228-5900*

## Aftermarket Equipment

The Lithium battery pack kit for the ICOM is available for $99 (US) from:

MoliKit
PO Box 2460
N. Burnaby BC Canada V5C-5Z1
PH: (800) 663-6658

The "Ham Sack" is a padded carrying case for a hand-held. It's nicely-made with zipper compartments for spare battery pack and antennas and connectors. It's available for $12 from:

Frank and Linda Reed
15 Daniel Webster Highway
Hudson NH 03051

The RAM expansion for NEC 8201A or Radio Shack M-100 for $20/8K, and the battery-operated printer for $99, are available from:

Purple Computing
420 Constitution Avenue
Camarillo CA 93010
PH: (800) 732-5012

The "SafeSkin" flexible waterproof keyboard cover is available for $30 from:

Merritt Computer Products, Inc.
2925 LBJ Freeway, Suite 180
Dallas TX 75234
PH: (214) 942-1142

73 Review

*by Bill Clarke WA4BLC*

Trio-Kenwood Communications
1111 West Walnut St.
Compton CA 90220
Price Class: TS-140S: $ 900
YK-455C-1 CW filter: 90
TU-8 tone unit: 37
IF-10C interface kit: 45

# Kenwood TS-140

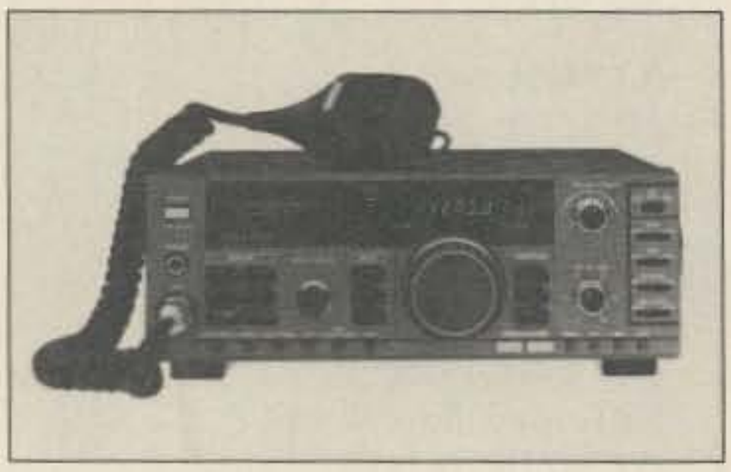

*Photo A. The business end of the TS-140S (courtesy Kenwood USA).*

Top-of-the-line radios are expensive, and the prices seem ever increasing. Kenwood-Trio, however, attacks the high price of high quality HF gear with the TS-140S.

The TS-140S is the first low-cost HF transceiver produced by Kenwood in several years. It is light weight, small-sized, full-featured, and all solid-state. Although a fine rig for mobile operation, many 140s will find warm homes in shacks.

### First Impressions

The TS-140 is Kenwood gray, of course. It weighs in at just 13 pounds. Its 36 front-panel controls are laid out in a handy manner, and the display is much more than just digital frequency read-out.

The nice features include RTTY, Packet, AMTOR and optional FM operation; UP/DOWN microphone buttons for scanning and tuning; full-break keying; selectable AGC; 20-dB attenuator; speech processor; VOX; and adjustable RF power output control.

The built-in speaker, although quite small, provides very nice audio.

### Operating Impressions

Before operating the TS-140, I read the entire instruction manual, especially concentrating on the memory operations. I highly recommend a new 140 owner to do this.

Every button and control operates easily and crisply on the TS-140S. At first the main knob tuned too lightly for my taste, but a simple twist of the knob's collar weighted properly.

The rear panel has the VOX controls, antenna and ground connections, key and external speaker jacks, and several accessory plugs for remote control, optional antenna tuner, and other functions.

### Receiver

The blue-colored digital frequency read out is part of the 140's display panel. I find it easier on the eyes than some of the red LED or green LCD displays seen on other radios. Other information (VFO in use, memory position, RIT, mode, scan, etc.) shows on the main display in an assortment of red, blue and yellow colors. All are very readable.

Kenwood still includes the option of a 10-Hz read-out on the digital frequency display. The user can select this from the front panel. There is no need to open the rig and make any internal modifications.

The tuning rate is 10 kHz/revolution of the VFO tuning control. This seemed too fast, and five kHz per turn would be suitable. Fast tuning is done by using the Memory Channel knob. Tuning rate for the Memory Channel knob is 10 kHz per click, which is 240 kHz per turn. At first the idea of using two knobs for tuning seemed complicated. After the initial 30 minutes of use, however, I found it quite natural.

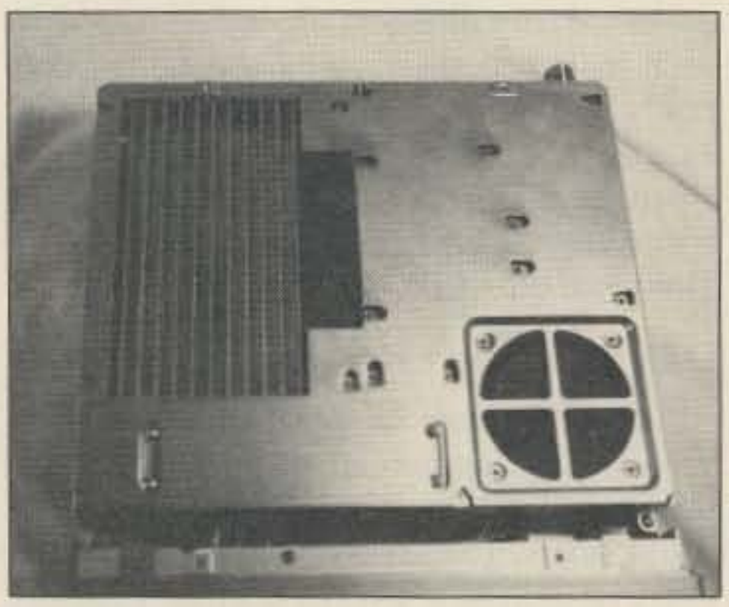

*Photo B. The RF deck folds out from the main chassis for service. Note the large heat sink.*

The memory scheme used on the 140 is a little complicated. There are 31 memories, broken into banks of single frequency, split frequency, programmed band marker, and scan. The manual explains clearly their use. I had no problem programming them from the very first entry.

The TS-140S has almost all the necessary filters built-in. Only the 500 Hz CW filter is optional. IF shift is included, which works well to augment filtering for interference reduction. It is detented at the zero point.

The receiver is very quiet and doesn't get too excited by background static. It is almost as quiet as the Ten-Tec Corsair. I found reducing the RF gain made receiving quieter when conditions were very noisy. This is normal with all sensitive receivers, and the 140 is very sensitive.

The 140 has two noise blankers. The first attenuates "woodpecker" noise, and the other attenuates other pulse interference, like ignition noise. They both are very effective, even with household noise generated by fluorescent lamps and some light dimmers.

The TS-140 has both band and memory scan. Scan speed is adjustable from the front panel. The operator can also manually scan memories by pushing the UP/DOWN buttons on the mike.

USB/LSB selection is made by the rig but may be over-ridden by the operator. The user can also select fast or slow AGC action.

### Transmitter

Like most current rigs, the TS-140 has two VFOs, a nice touch for working SSB and CW splits. The two VFOs also allow split-band operation. Also, the 140 is easily modifiable for use on MARS frequencies. Modification is required, since the CPU doesn't allow transmitting outside the ham bands.

The TS-140S sports semi- or full break-in keying. QSK operation was great. It could be broken with a dit or two. The CW note had good reports.

I received consistently good audio reports on SSB. Each indicated excellent quality voice transmissions. None stated I was overdriving the rig. All contacts were made using the standard microphone supplied with the radio.

### I've Got Memories

The TS-140S has 31 memories to complement the two VFOs. The memories are changed from a knob on the front panel or with the microphone UP/DOWN buttons. A user can program the mode in all memories.

There are four types of memories.

•Eleven single frequency memories are used for receive and transmit.

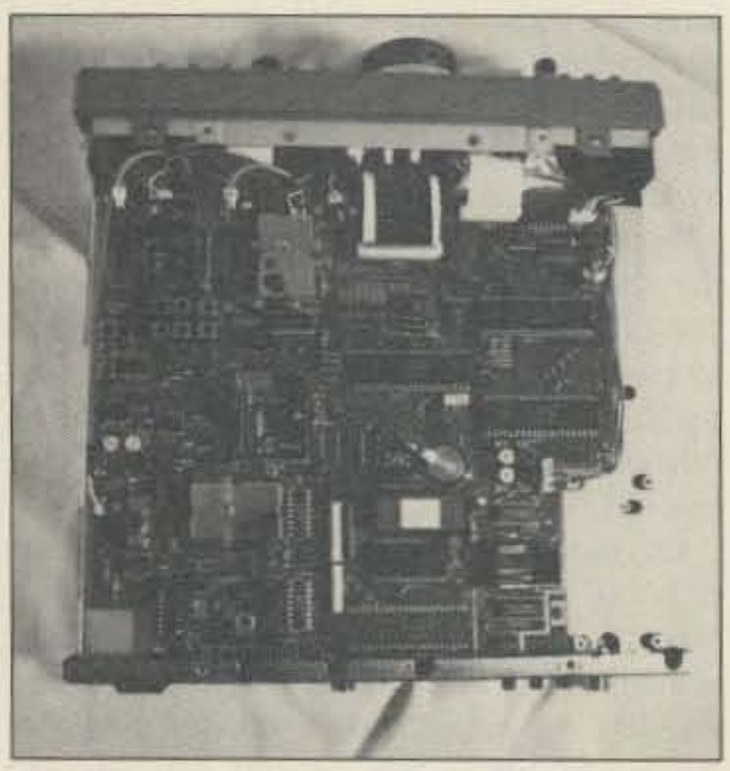

*Photo C. Bottom board of the 140 shows the computer-like layout.*

•Split frequency. There is a frequency in this memory for transmit and another for receive. This is most useful for 10-meter FM repeater operation, and split DX. If the same frequency is entered for both transmit and receive, then a split memory will function as a normal memory. There are 10 split memories.

•The programmed band marker. The user enters upper and lower band limits in this memory. A Novice, for example, may wish to enter 28.300 MHz and 28.500 MHz as the two band limits. From that time forward, when that memory is selected, turning the VFO knob will change frequency, yet excursions will automatically be kept within the limits of the programmed band markers. Continuous tuning will cause the frequency to stop at the end of the programmed limit and restart at the other end of the limit. There are ten programmed band marker memories.

•The last memory contains band scan limits. These are the highest and lowest frequencies that will be scanned. Of course this memory may be used as a standard memory if both frequencies entered are the same. There is only one scan memory.

### Inside the 140

The inside of the TS-140 is a complete departure from all Kenwood HF equipment built to date. The unit is made of two circuit boards and an RF deck. The latter hinges away from the main chassis for service.

The first thing I noticed upon opening the 140 was that there were very few interconnect wires. Most interconnections are handled with ribbon cable. This results in a very uncluttered interior. At the side of the top board is a place to install the optional CW filter.

The computer-style interconnections and well-planned circuit board will lead to excellent reliability. At the very least they promote easy service.

### Bench Testing

Bench testing is the only method of checking a transceiver's specifications against those published by the manufacturer. I completely checked the 140, and it met or surpassed all published specifications (see sidebar).

The following equipment was used in checking the performance of the TS-140S:

Leader LDC 8243 Frequency Counter
Marconi Instruments 2022 Signal Generator
Hewlett Packard 606 HF Signal Generator
Hewlett Packard 651A Audio Generator
Bird 43 Wattmeter
Hewlett Packard 8551B/851B Spectrum Analyzer
Cushman CE-5 Monitor
Tectronics 475 Oscilloscope

Remember that the performance of currently available amateur transceivers generally exceeds the capabilities of the human ear, propagation, and atmospheric conditions.

### Drawbacks

The instruction manual for the 140 is complete and contains many charts and diagrams. It's generally easy to understand. A few instructions, however, are written incorrectly.

I was particularly disturbed at the incorrect instructions for IF SHIFT, Tuning Knob VFO, and Mobile Antenna Tuning. Even worse was the mention of bonding the accelerator for mobile noise reduction. The latter could prove to be very dangerous.

Kenwood USA is now aware of these conditions. Hopefully they will soon improve their manual for the 140.

The 140 has no notch filter, but I didn't miss it. Past experience has shown me that notch filter controls are too sensitive to set quickly. In lieu of built-in notch filtering, I use the Datong Automatic Notch Filter. The later is something no modern station should be without.

Keypad direct frequency entry is another modern innovation I have come to like on another rig (ICOM IC-761). I plan to use the Stone Mountain Engineering QSYer for keypad direct frequency entry on the TS-140S.

The slide controls on the right side are delicate to operate, but they are usually only irregularly adjusted.

Amplifier users need to open the rig and set a switch to the ON position. This switch activates the relay coil for the remote contacts. Kenwood says they leave it in the OFF position to reduce operational noise. Even when on, however, neither the relay nor the cooling fan on the final amplifier is very noisy. Its operation is barely noticeable.

Many of the front panel selections provide feedback with beeps, which I found annoying. The beeps are CW for the modes and alarms. Blind operators may find this feature a bonus, however. Some can be turned from the panel. All can be silenced by an internal adjustment.

### Wrap-up

Would I recommend the TS-140S? Yes! It has all the necessary features of the heavyweights and is certainly a very capable transceiver, yet the price is remarkably low. Don't think low price means low quality. The 140's price brings the features and capabilities of expensive rigs to financial reality.

Would I personally purchase a TS-140? As a matter of fact, I did.

Thanks to the folks at the Electronic Equipment Bank of Vienna, Virginia, for the loan of a new Kenwood TS-140S, and the use of their very complete test bench. 73

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*Bill WA4BLC regularly reviews amateur equipment for 73 Magazine. His address is Box 2403, Falls Church VA 22042*

**KENWOOD TS-140 SPECIFICATIONS (as stated in the manual)**

**GENERAL**

| | | | |
|---|---|---|---|
| Frequency Coverage: | Receive: | 50 kHz to 35 MHz | |
| | Transmit: | 1.8 | 2.0 |
| | | 3.5 | 4.0 |
| | | 7.0 | 7.3 |
| | | 10.1 | 10.15 |
| | | 14.0 | 14.35 |
| | | 18.068 | 18.168 |
| | | 21.0 | 21.45 |
| | | 24.89 | 24.99 |
| | | 28.0 | 29.7 |
| Modes: | | SSB/CW/FM/AM | |
| Frequency Control: | | CPU-based 10 Hz step digital PLL synthesizer | |
| Frequency Stability: | | ± 10 PPM (parts per million) (14 to 140 degrees F) | |
| Antenna Impedance: | | 50Ω | |
| Power Requirements: | | 12 to 16 VDC (std. is 13.8 VDC) | |
| Dimensions: | | $11^{1}/_{16}$ x $4^{7}/_{32}$ x 12 inches | |
| Weight: | | 13.4 lbs. | |

**RECEIVER**

| | | | |
|---|---|---|---|
| Circuitry: | | Double conversion superheterodyne | |
| IF Frequencies: | | 1st IF | 40.055 MHz |
| | | 2nd IF | 455 kHz |
| Sensitivity: | SSB/CW | for 10 dB S/N | |
| | | 500 kHz–1.62 MHz | less than 3.98µV |
| | | 1.62 MHz–30.0 MHz | less than .25µV |
| | AM | for 10 db S/N | |
| | | 500 kHz–1.62 MHz | less than 39.8µV |
| | | 1.62 MHz–30.0 MHz | less than 2.5µV |
| | FM | for 12 db SINAD | |
| | | 21.5 MHz–30.0 MHz | less than .35µV |
| Squelch Sensitivity: | | less than .32µV | |
| Selectivity: | SSB/CW | 2.2 kHz/ −6 dB | 4.4 kHz/ −60 dB |
| | AM | 6 kHz/ −6 dB | 18 kHz/ −50 dB |
| | FM | 12 kHz/ −6 dB | 25 kHz/ −50 dB |
| Audio Output: | | 1.5 W at 10% distortion into an 8 ohm load | |
| RIT Range: | | ± 2.5 kHz (20 Hz step) | |

**TRANSMITTER**

| | | |
|---|---|---|
| Output Power: | SSB | 110W PEP (160–15 meters) |
| | | 100W PEP (12–10 meters) |
| | AM | 40W |
| | CW | 100 W (160–12 meters) |
| | | 95W (10 meters) |
| | FM | 50W (10 meters) |
| FM Deviation: | | ± 5 kHz |
| Spurious Emissions: | | less than −40 dB |
| Carrier Suppression: | | greater than 40 dB |
| Unwanted Sideband Suppression: | | greater than 50 dB |
| Microphone Impedance: | | 500–50kΩ |

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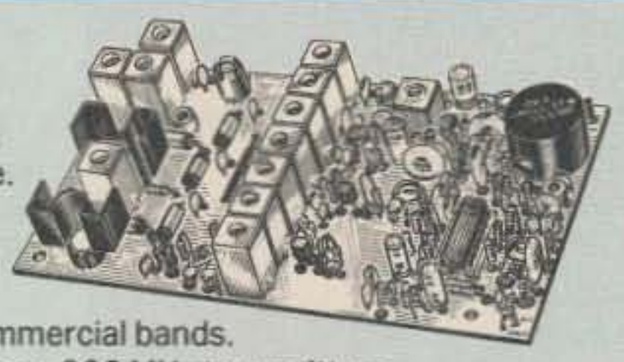

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- Call for latest information on 900 MHz transmitters.
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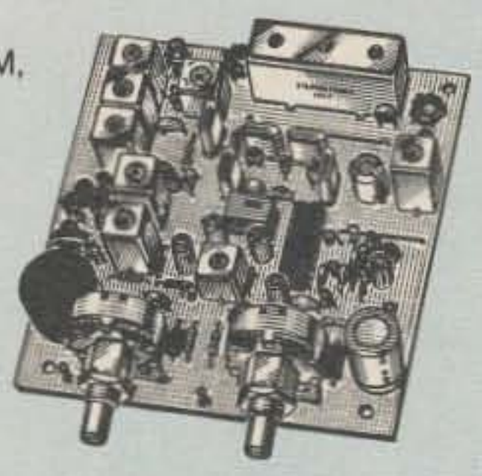

- **R144/R220 FM RECEIVERS** for 2M, 150-174, or 220 MHz. **GaAs FET** front end, 0.12uV sensitivity! Both crystal & ceramic filters plus helical resonator front end for exceptional selectivity: >100dB at ±12kHz (best available anywhere)! Flutter-proof squelch. AFC tracks drifting transmitters. Kit $149, w/t $229.
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** Specify tuning range desired: 26-30, 46-56, 137-150, 150-172, 210-230, 400-470, or 800-960 MHz.*

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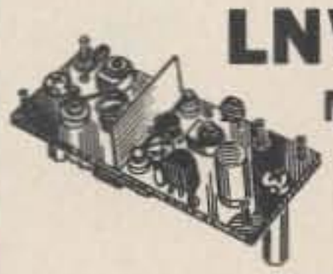

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| | |
|---|---|
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| Kit less Case | $39 |
| Wired w/case | $89 |

**UHF MODELS**

| | |
|---|---|
| Kit with Case | $69 |
| Kit less Case | $49 |
| Wired w/case | $99 |

| Antenna Input Range | Receiver Output |
|---|---|
| 28-32 | 144-148 |
| 50-52 | 28-30 |
| 50-54 | 144-148 |
| 136-138 | 28-30 |
| 144-146 | 28-30 |
| 145-147 | 28-30 |
| 146-148 | 28-30 |
| 220-222 | 28-30 |
| 220-224 | 50-54 |
| 222-224 | 28-30 |
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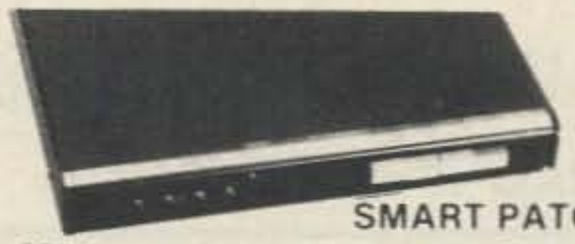
**FT-767GX, FT-757GXII, FT-311 RM, FRG-8800, FT-736, FRG-9600, FT-211/711RH, FT-2700RH, FT 212/712RH.**



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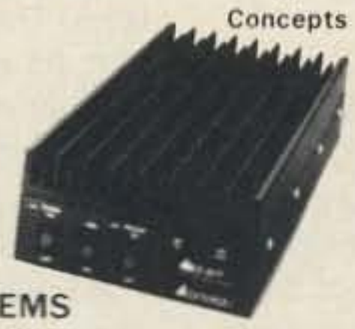
RF Concepts



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**73 Review** *by Pete Putman KT2B*

# ICOM IC-900 Multi-band FM Transceiver System

*The World's most advanced mobile transceiver.*

ICOM America, Inc.
2380 116th Ave NE
Bellevue WA 98004

Price Class: Fiber optic basic controller unit: $590
Band units: $295–349

**Where is it ?!**

This is one of the most unusual product reviews I've ever written. It concerns a mobile 6-band (10m, 6m, 2m, 1.25m, 70cm, and 23cm) transceiver that . . . well . . . uh, isn't visible! Provided, of course, if it's installed as ICOM intended, in five different places with interconnecting cables and a fiber optic link between the two main chassis.

Using the IC-900 requires a radical change in thinking. The concept of remoting the bulk of the radio to the trunk or under a seat isn't new. This idea dates back to older GE ProLine and Motorola mobile transceivers with separate control heads. Although the IC-900 involves connecting three separate chassis and outboard accessories to make it work on one band, *additional* bands can be added in no time at all.

Photo A shows the individual units that make up the IC-900 system. (Take a close look—you won't see them again.) The key component is the controller, a small black box that is 5 ⅞" W X 2" H X 1" D. ICOM supplies both a rigid bracket and plenty of Velcro fasteners. The Velcro system is ideal for easy removal in a vehicle.

The controller displays a wealth of information, including dialled frequency, memory channel, repeater offsets, signal strength, and subtone actuation. The display is a soft backlit near-turquoise green, pleasing to the eye and easy to read. It also displays the receive frequency of the second selected module, if turned on.

The compact front panel keyboard sports a wide range of functions.

- Power On/Off;
- VFO selection;
- Memory Recall;
- Sub Band Switch;
- Main/Sub Band Selector;
- Hi/Low Power;
- Call Channel;
- Memory Write;
- Tuning Step;
- Tone Squelch;
- Duplex/Simplex;
- Subtone Switch;
- Reverse Switch;
- MHz Tuning; and
- Set Switch (parameters).

The remaining tiny button mutes the audio of the Sub Band.

There are almost too many buttons crammed onto the front panel. The main tuning dial, however, lies just to the right of these pushbuttons, and it's plenty big enough to easily grasp. The Volume and Tone controls are another story. They are dual pushbutton mode controls, with the left side lowering the squelch threshold/volume and the right side raising threshold/volume. While any of the four are depressed, a visual display shows the increment of squelch or volume selected. A clever idea—for a base station. I find that more conventional controls are considerably easier to use in a mobile situation where you often perform most functions by feel—not by sight.

At this point, the reader may wonder how all those controls fit in that little box. They don't, but the sophisticated microprocessor controls allow for multiplex signalling via the supplied three-wire miniature cable. This connects from the controller to Interface Unit A.

*Photo A. A three-band IC-900 package. When properly installed, the only visible portions of the radio are the LCD control unit and microphone. The display unit is easily removed for extra security when parked.*

**Interface A**

This is designed to fit under the driver's or front passenger's seat, and provides the microphone, speaker, and Interface B connections. This is the "brains" of the IC-900 system. Its microprocessor takes the command signals and actuates the necessary band units, controls two different audio outputs and squelch settings, and keeps track of main band and subband selection.

A bracket secures Interface A under either seat. Either physically bolt this bracket to the car chassis or just let it float under the seat. The microphone has a special multi-pin jack at the end of an extension cable which is secured near the center transmission area. The supplied HM-14 then connects at that point. (This is not a DTMF microphone, by the way.) Interface A also has two mini-jacks for speakers. The first monitors the main selected band, while the second works on the subband. Only one speaker comes with the IC-900, and it connects to the Speaker A jack.

Aside from these connections and the mini-jack connection to the main controller, there is a DC power cable and the unusual fiber optic cable to Interface B. All low-level signalling to change bands and set frequency and power levels occurs through this line. ICOM strongly cautions against bending or cutting the fiber optic link, and more than enough cable is supplied to make any conceivable connection. I suggest looping the unused portion near Interface B and securing it with a twist tie.

**Interface B**

Consider this black box as the "analog" part in this "digital/analog" combination. It directly powers up and supplies operating voltages to the various band units. Only the optical fiber cable from Interface A and a heavy DC power cable to the car battery connect to this unit. Interface B is considerably heavier than A and should be very securely

fastened somewhere in the trunk or rear of the vehicle.

The front of Interface B contains a removable panel that allows interconnection of the various band units, and there are plenty to choose from, according to the owner's manual. When I received the test unit, the only module available was the UX-29A 2 meter module. Since then, other models have been introduced for operation on 28 MHz, 50 MHz, 220 MHz, 440 MHz and 1260 MHz. A small joint cable is needed between the selected band unit and Interface B. A front-panel LED verifies that power is on.

Finally, the UX-29A and other band units nestle atop Interface B and can be secured to it with the supplied brackets. Incidentally, these brackets look as if they'll allow up to three band units to be chained together, so more brackets would be required to enable additonal bands. As I mentioned, the short ribbon cable connects the first band unit to Interface B. Each added band unit daisy-chains to the preceeding one with a similar jumper. Finally, a short length of coax with either type N or UHF connectors mates with the antenna of your choice.

*Photo B. Interior view of the 1987 Toyota Corolla LX, showing the IC-900 control head and microphone. The main interface lies underneath the driver's seat. The rest of the system is in the trunk.*

**Impressions**

Still trying to make sense of all the previous paragraphs? I'll admit I spent a few hours staring at all of these interface units, wires and lots of hardware trying to make sense of it. After all, I reasoned, why would anyone want to spend the extra money to wire all of this into their car just to get on 2 meters? Deb Davis at ICOM said, however, there is, indeed, a demand for a remote, hide-away multi-band FM transceiver, and ICOM has tried to satisfy this market in their best fashion.

I installed the IC-900 in a brand new 1987 Toyota Corolla LE Sedan. Careful study of the Corolla interior revealed a path through which to route all the cables without drilling any holes. The key was the fold-down split seat-back in the LE, which allowed access to the trunk.

Interface B and the 2-meter band unit snugged alongside the left rear wall very well. However, I did loop the remainder of the fiber optic cable alongside the combination and tied it with a twist tie. Interface A nested under the driver's seat, left unsecured since the area around the unit prevented any lateral motion. The microphone extension attached to the transmission housing with the supplied bracket, and the speaker fit all the way to the rear of the lower map/change tray.

Figure 2 shows the end result. The microphone rests inside the lower compartment and the controller sits on the dashboard. Nothing else is visible. An alternate postion for the controller is atop the dash directly behind the steering wheel—not in the line of vision, but easy to get at.

My wife Gayle KA9ESB at first suspiciously regarded the IC-900 controller. She soon discovered, however, that she could pre-program ten different repeater and simplex channels for instant access—just by tuning the large black knob. One need not know much about the radio to perform that function! Most of the time, we use four or five channels for local work.

When one of the repeaters nearby went to subtone access to alleviate a co-channel interference problem, she used the SET key to select the 151.4 subtone and load it into that memory channel. Piece of cake.

Receiver produces PLENTY of audio volume for even the loudest interiors. The catch is remembering where it's set, since the operator has to depress the volume buttons to get the displayed increment. The same goes for the squelch—ordinarily left alone—during tropo conditions. The memory channels are a must in heavy traffic. There's no time to look at the display and program all of the necessary buttons for the selection.

The pushbuttons themselves are somewhat difficult to read unless the operator sits right in front of the controller. The backlighting doesn't make it any easier at night.

I used the IC-900 on several long trips last summer and received excellent audio reports through at least 10 different repeaters. The receiver is on a par with any FM mobile transceiver I've ever used, and the signal strength indication is fairly honest. After many miles on both smooth highways and a fair amount of bumpy roads, the trunk-mounted Interface B and UX-29A band unit don't appear any worse for wear. Power output at 146.000 was measured at 25 watts when I installed everything, and it was still 25 watts 3 months later.

One feature not tested here is the dual receiving mode, which allows simultaneous listening to both main and subband units. Of course the operator can mute the subband receiver when the main band is in use. Any two-band unit combination is configurable this way from the controller. An accessory duplexer is available for simultaneous 146/440 MHz operation with one antenna.

**Conclusions**

The road tests showed the IC-900 receiver to be as good as many contemporary mobile transceivers I've had the chance to use.

There are a lot of credits to the IC-900. One of them is the ability to hide the bulk of the radio in the trunk. On the other hand, comparable small-sized 25-watt mobile transceivers abound on the market for considerably less money than the IC-900. Budget-minded folks should check out the next paragraph.

**$$$ Comparison**

The interface units and controller sell for $590 list, according to a Fall '87 catalog from one of the largest retailers of ham equipment. This is just the set-up sans band units! That kind of money can buy an IC-28A with a few accessories.

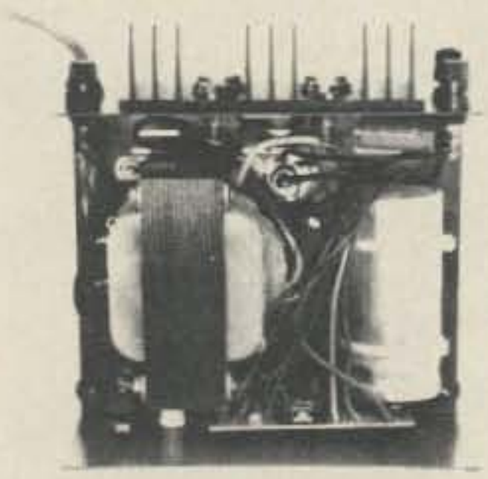
The UX-29A 2 meter band unit sets the ham consumer back another $295. This adds up to $885 just to get on 2 meter FM with 25 watts. The cost per band decreases, however, as additional band units are added. With four or more band units, the IC-900 may make economic sense. Besides, most people haven't room in their car for two, much less four radios, and the IC-900 can fill their needs.

The IC-900 is, indeed, a clever radio design and very reliable. It's easy to use once configured, but I don't recommend dialing up frequencies or programming while driving! The keypad is difficult to read under most conditions. The main tuning is easy to use and the display rates very highly as far as information and readability.

Should one buy an IC-900? If multi-band FM operation and rig inconspicuousness are priorities, then the IC-900 is worth considering—if price is no object.

The IC-900 represents a quantum leap in amateur transceiver technology, and is probably the ultimate FM operating system ever seen in this country. 73

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

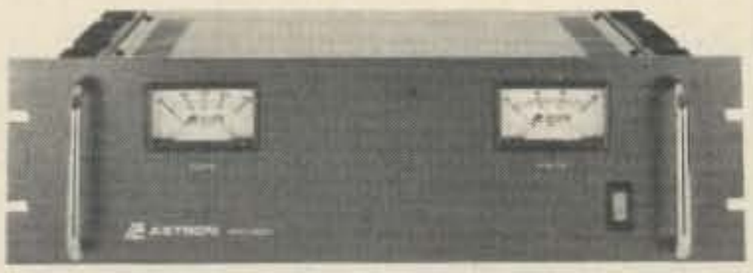
- INPUT VOLTAGE: 105-125 VAC
- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE Less than 5mv peak to peak (full load & low line)
- **Also available with 220 VAC input voltage**

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 |

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

Number 12 on your Feedback card

# Stop, Look, and Listen!

## *A shortwave program guide unlike any before it.*

***Passport To World Band Radio***
**International Broadcasting Services, Ltd.**
**400 Pages, $15**

*reviewed by Larry Ledlow, Jr. NA5E*

Just a short time ago, shortwave broadcast listeners (SWLs) in this country were few and far between. Many SWLs had discovered the rich and varied programming available on the HF bands while traveling or living overseas. Still others (like myself) found SW broadcasters quite by accident. I first heard the Voice of America as intermodulation on an inexpensive radio I had received for Christmas. Many hams have long known shortwave broadcasters as little more than sources of great consternation, especially on 40 meters in the evening.

Twenty years ago SWLs were a small, slightly eccentric group, but no longer. More and more people discover SW listening every day. Most modern ham transceivers receive all of the HF broadcast bands. Sony, Panasonic, Grundig, and other electronics companies market quite affordable portable SW receivers. These manufacturers have responded to the increasing interest in SWLing, which has largely come about from John Q. Public's boredom with American network offerings. In general, too, we are moving towards a global community. The public's interest in international affairs has increased accordingly.

### A Handy Program Guide

Listeners can't just pick up the local newspaper to check the transmission schedules of Radio Moscow or the BBC. Until recently, SWLs relied on direct mailings from broadcasters and the annual *World Radio TV Handbook* from Billboard Publications for schedule information. Several years ago SWL extraordinaire Larry Magne and company created *Radio Database International*, which provided a comprehensive list of hundreds of shortwave broadcasters' schedules.

In 1988, there is a much improved RDI offering, Magne's *Passport to World Band Radio*. The "in" word for shortwave broadcasting these days is world band radio. As the title implies, *Passport to World Band Radio* offers both new and experienced listeners an excellent and easy-to-use guide to shortwave broadcasting. More than just a schedule listing, the book offers fantastically useful information on receivers to buy, antennas, and more. *Lots* more!

Don Jensen gives an interesting essay on Jackie Gleason's SWL interests. Canadian broadcaster Ian Macfarland discusses broadcasting north of the border. News and weather hounds learn where to tune for the best reports on the air. Read a frank profile of Vladimir Posner, a well known Radio Moscow announcer. Maud Blankson-Miles takes readers to Ghana and then tells them how to listen to that West African country. China offers a fantastic mix of world band broadcasting, as Bob Hill discusses in his essay. Anyone care to tango? Check out *Passport's* guide to traditional Latin American music.

The book dedicates 43 pages to dozens of receiver ratings and detailed reviews for the most popular models. Newcomers to shortwave listening will appreciate the frank evaluation of these radios. Larry Magne and RDI have impeccable reputations and will not lead would-be buyers astray.

Of course, the heart of *Passport to World Band Radio* is the blue page section. The blue pages, all 255 of them, provide information on broadcasters' schedules, languages, power, and target areas from 2300 to 21605 kHz. The book's ingenious encoding scheme clearly illustrates all of this information. Not much mystery here. The schedule guide is exceptionally easy to use.

Want to know when Radio Zambia broadcasts in English? Just turn to the "World Scan" guide preceding the Blue Pages and find 9505 and 11880 kHz. Turn to 9505 kHz in the blue section and note Zambia keeps an irregular schedule between 1600 and 2100 UTC. Their programs are beamed to southern Africa. The world at the flip of a few pages.

*Passport to World Band Radio* has a slick, modern look. It is rightfully aimed at an audience far broader than the SWLs of old. The number of world band radio listeners is growing more rapidly than ever before. Some soothsayers predict more than half of American households will have shortwave broadcast receivers by the next decade... and that's just around the corner!

*Passport to World Band Radio* is here to meet increasing demands for timely information of and from the busy world around us. It satisfies those needs like no other book can. Travel to foreign lands has never been eaiser. Just turn a page and spin a dial... and don't forget your *Passport*. 73

Most shortwave broadcast stations transmit on frequencies agreed upon by members of the International Telecommunications Union (ITU). Some out-of-band broadcasts occur, but most fall within the following frequency ranges.

| | | |
|---|---|---|
| 120 meters | 2300–2498 kHz | Tropical countries domestic service |
| 90 meters | 3200–3400 kHz | Tropical countries domestic service |
| 75 meters | 3900–3950 kHz | Pacific and Asia |
| | 3950–4000 kHz | Outside the Americas |
| 60 meters | 4750–4995 kHz | Tropical countries domestic services |
| | 5005–5060 kHz | Tropical countries domestic services |
| 49 meters | 5950–5060 kHz | |
| 41 meters | 7100–7300 kHz | Outside the Americas |
| 31 meters | 9500–9900 kHz | |
| 25 meters | 11650–12050 kHz | |
| 21 meters | 13600–13800 kHz | |
| 19 meters | 15100–15600 kHz | |
| 16 meters | 17550–17900 kHz | |
| 13 meters | 21450–21850 kHz | |
| 11 meters | 25670–26100 kHz | |

Hams may find shortwave listening useful for their own operations, too. Activity on the SW bands may indicate current or impending ham band DX openings. Further, many stations feature propagation reports and DX programs. Some SWL clubs and stations offer various achievement awards. Most broadcasters confirm SWL reports with QSL cards, too. Numerous stations offer on-the-air language and culture courses, and still others provide useful radio computer programs to listeners. Try it. You just may like it!

Number 13 on your Feedback card

Advanced Electronic Applications
P.O. Box C2160
Lynnwood, WA 98036
Price Class: $25

**73 Review** *by Mike Stone WBØQCD*

# AEA PK-FAX Software

## *Push PK-232's FAX to the max.*

Interest in amateur radio and commercial facsimile communications is growing steadily.

In late summer of 1987, AEA (Advanced Electronics Applications, Inc.) of Lynnwood, Washington, decided to make a major improvement to the FAX mode in their popular PAKRATT PK-232 data controller. The PK-232's FAX receive mode was limited to dot-matrix hard-copy printouts. AEA hired Steve Stewart, a free-lance computer hacker in California, to develop "PK-FAX," a program that also sends a composite video signal to the monitor. It's packed with bells and whistles.

"PK-FAX" is for those who have AEA's PK-232 or (Heathkit's) HK-232 terminal data controller, at least a January 1987 PC-PAKRATT software update, and an IBM PC or clone. The PC must have at least 256K of memory, two floppy disk drives (or one floppy and a hard drive), DOS 2.0 or above, an available serial port (and card), a serial cable capable of 4800-baud operation (included with PK-232 unit at purchase), and a receiver. Users can also enhance the program's usefulness with a dot matrix printer capable of bit-graphics, a parallel port, a Paintbrush™ (ZSOFT Corp.) program, and a transceiver. There may be one or more software upgrade version before Dayton in late April. The software package costs $24.95.

### Start Up

First, copy PK-FAX on to a disk with a PC Paintbrush (Microsoft Paintbrush, Logi Paint, etc.) program. A hard disk is very helpful here. A hard disk can store many more FAX pictures than a floppy disk drive, and the user can then take full advantage of the neat AUTOSAVE feature.

A 5-¼ inch floppy can store 6–7 pictures. I requested AEA to provide some sort of a image directory callup within PK-FAX. The test program required an exit to DOS for a directory list.

LOAD the program by entering PKFAX> (not the brackets). An initial Menu will ask for:

- (C)onfiguration
- (Y) FAX receive/transmit - disk and printer
- (N) FAX, disk and printer
- E(X)it

The configuration option lets users customize the PK-FAX control program applications. The program lets the user select serial port, printer port status, baud rate to printer (300–9600), parity, printer designation, graphics density (120 dbi default), and video graphics type. PK-FAX will support Epson, IBM, Radio Shack, Apple (G) or (S), Okidata, Star Gemini or Micronics, GX-100, Gorilla Banana, Texas Instruments, Genicom, NEC, and miscellaneous printers. Also, the user can select Hercules or IBM Color (CGA or EGA), graphics, a six-character Morse ID, and AUTOSAVE start and stop times.

The (Y) command starts the PK-FAX program to set up communications with the PK-232 unit. Once initialized, the TV monitor goes to black except for a white status line indicator at the very bottom of the screen. This very helpful status line indicator displays mode and status while operating the PK-FAX program features. This STATUS line includes F1 (HELP), LPM (default 120), IOC (Index of Cooperation or Aspect ratio, L-R (Scan direction adjustment), buffer (full or empty), time clock, percentage (transmit/receive percentage sent or received) and Mode (STBY or SYNC). On the Nov. 20, 1987, software upgrade, the F1> key now gives a quick on-screen HELP MENU window. Any picture in memory is unaffected by the window.

***"PK-FAX is a program that sends a composite video signal to the monitor."***

### Tuning in on FAX

FAX is transmitted using a 800-Hz shift. The PK-232's filters require a signal tuned to a 1.7 kHz center frequency. The PK-232 bar-graph display aids correct tuning. With a signal properly centered, remove the PK-FAX program from STBY to SYNC (receive active) by hitting the Y> key. B> returns PK-FAX back into STBY. The L> key cycles through 60, 90, 120, 180 or 240 LPM scan rates.

The I> key determines the aspect ratio. IOC 288 (one out of 3 lines) is for WEFAX satellites, IOC 352 (one out of 2 lines) for wire photos, and IOC 576 (2 out of 3 lines) for weather charts.

The D> key controls the pictures scan direction (LEFT to RIGHT or RIGHT to LEFT.) Some foreign images come backwards to USA viewers, so this control becomes quite useful.

The up/down or left/right ARROW keys brings an on-screen target cursor. This cursor identifies the edge of the picture for automatic justification and image alignment with the J> key. This image is then saved to disk. Unlike less sophisticated programs or FAX hardcopy machines, the PK-FAX user can manipulate the image on screen for perfect realignment at any time. The Control>V> key toggles the incoming or captured picture in reverse B/W form.

The actual video display can show only two-thirds of the captured picture at a time. Page up> and Page down> keys allow the viewer to look at either the top or bottom two-thirds of each picture. The END> key shows a 0.67 (or two-thirds) reduced picture. Hitting the HOME> key gives the viewer a 4X zoom presentation. PK-FAX allows LOOK and ZOOM anywhere in the captured picture by using the ARROW keys. The true "whole picture" and best resolution comes out when the captured picture is printed on a dot-matrix printer. Keep on hand a hefty supply of well-inked ribbons!

To SAVE captured pictures, hit the W> key and give a file name. To retrieve an image from disk, hit the R> key and give the filename. The special AUTOSAVE feature lets the user program start and stop times, so the computer will automatically record and save FAX images. Weather stations normally adhere to a transmission schedule with maps and photos sent at the same time every day. AUTOSAVE makes unattended reception of particular items of interest a snap.

### Transitting FAX Pictures

In a word, simple! Just hit the T> key, and that's it! The STATUS line indicator at the bottom of the screen goes from STBY RCV to STBY SEND. The PK-232 interfaced to a VHF or HF radio sends out a black tone for 5 seconds, then START sync pulses (5% white) tone for 30 seconds, and finally the FAX contents of the picture. It usually takes anywhere from 8 to 13 minutes to transmit a full FAX picture.

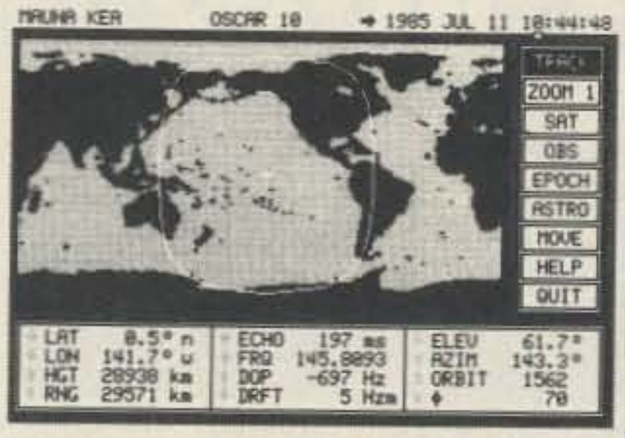
The program can use Paintbrush-type programs. This opens the door to computerists who want send more than just captured weather-type photos! First save the pictures in a 1280-dot by 400-dot screen. A program called FRAME reduces or rotates pictures to a more convenient form for the Paintbrush program.

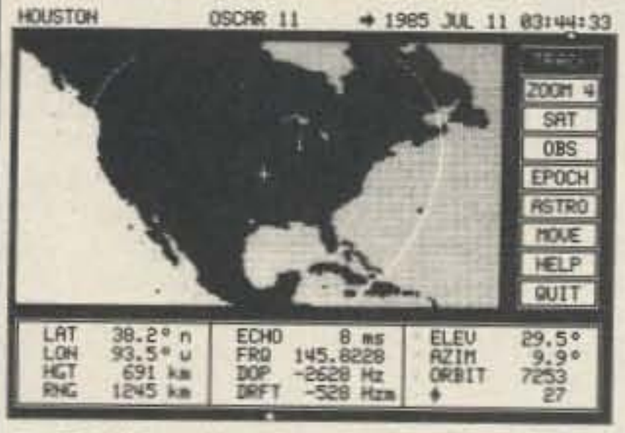
The FCC authorizes FAX transmission on all amateur HF, VHF and UHF bands except 160 meters. 14.240–14.245 MHz is the best place to find other world-wide FAX operators on 20 meters.

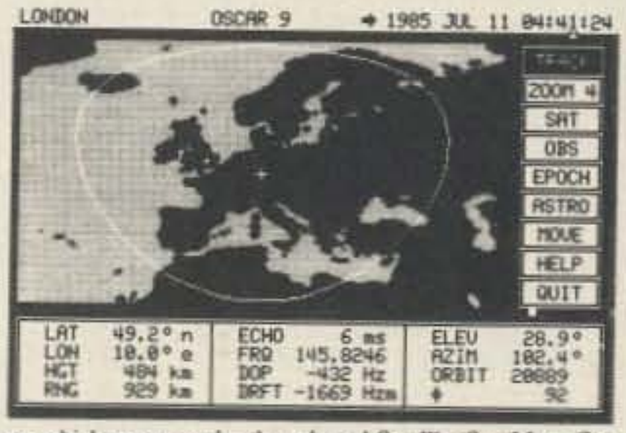
I anticipate amateur radio facsimile to blossom in the next few months as more and more AEA customers and PK-232 owners obtain the new PK-FAX software. A whole new group of sending and receiving facsimile enthusiasts is about to be born, and we have the fine people at AEA to thank for opening up this opportunity! If you see me smiling a lot this year at Dayton, it's because I have an informed feeling for what directions AEA is heading next with yet another great technical accomplishment! Stay tuned and "see you" on the Net! 73

# GET A BIRD'S EYE VIEW

From GrafTrak II™ and your IBM® PC


GrafTrak II™ provides realtime graphic display of a flat projection map which moves under the selected Satellite/Sun/Moon/Star coverage circle and updates once per second. Spherical projection views and graphic screen dumps to an IBM/Epson/Oki printer can also be produced. Requires an IBM PC, PC/XT, PC/AT, or true compatible, an IBM Color/Graphics Monitor Adapter or true compatible, 8087 math coprocessor, minimum 256K RAM with 512K recommended, DOS 2.0 or later, and either two 360K floppy drives or one 360K floppy and one hard drive.

SILICON EPHEMERIS™ provides tabular data output to the screen, printer, or disk file for the following operating modes: 1 observer to 16 satellites, 16 observers to 1 satellite, schedule for 1 observer to 1 satellite, window between 2 observers and 1 satellite, rise and set times for 1 satellite, time ordered rise and set times for 16 satellites, Almanac for Sun and Moon, 16 observers to Sun/Moon, schedule for 1 observer to Moon, window between 2 observers and Moon, schedule for 1 observer to Sun. Requires either an IBM PC, PC/XT, PC/AT, or true compatible, and IBM Monochrome or IBM Color/Graphics Monitor Adapter or ture compatible, an optional 8087 math coprocessor, 256K RAM, DOS 2.0 or later, and one 360K floppy drive.

Each package includes SED, an editor program to construct and modify Satellite/Observer database files. These products can be run from a hard disk and are not copy protected.

GrafTrak II™ and SILICON EPHEMERIS™ are priced at $119.95 each or $199.95 for both. Texas residents add sales tax. Order by check, money order, MasterCard, or VISA.

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*Performance Above and Beyond*

# AR2002

**Continuous Coverage**
**Professional Scanning**
**Monitor Receiver**
**25 – 550 MHz/800 – 1300 MHz**

## *Specifications:*

Receiving mode – Narrow band FM, Wide band FM & AM

Receiver circuit – Microprocessor controlled PLL Frequency synthesized superheterodyne type with high-level doubled balanced mixer

Receiver IF – 750MHz, 45.03MHz, 5.5 MHz (WFM) and 455kHz (NFM & AM)

Sensitivity – NFM – 0.35 uV (12dB SINAD)
WFM – 1.00 uV (12dB SINAD)
AM – 1.00 uV (10dB S/N)

Selectivity – NFM – ±7.5kHz @ 6dB
±20kHz @ 70dB
WFM – ±50kHz @ 6dB
±250kHz @ 60dB
AM – ±5.0kHz @ 6dB
±10kHz @ 70dB

Number of memory channel – 20 channels
Scan rate – 5 channels per second
Search rate – 6 seconds per MHz
Antenna connector – Standard BNC type, 50-ohm
Audio output power – 1 watt at less than 10% THD
Power requirement – 12 to 14Vdc at 300 to 500mA
Size and weight – 5.4"W x 3.15"H x 7.88"D, 2.6 lbs.

**OPTIONS:**

Mobile mounting bracket $14.90
Trunk lid mobile antenna with 12 ft cable $57.00
Discone base antenna with 30 ft cable $68.00

**WARRANTY:**

AR2002 covered by One Year Limited Warranty. Extended warranty service available at the following rates: $45.00 – 3 years; $30.00 – 2 years.

Please: No Dealer Inquiries

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*Professional Monitor Receiver*
**$499.00**
*(California res. add $29.94 tax)*
*Visa and MasterCard orders welcome*
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*Except UPS, C.O.D. is $3.00 extra*
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**Facsimile (714) 768-4410 (not a phone)**
**TOLL FREE 1-800-523-6366**

ACE communications

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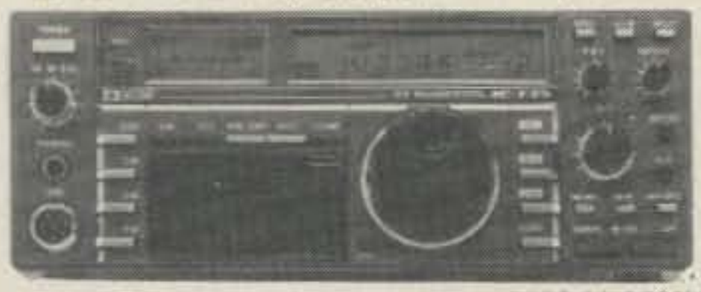
| *HF Equipment* | Regular | SALE |
|---|---|---|
| **IC-761** HF xcvr/SW rcvr/ps/AT | 2699.00 | **2369** |
| **HM-36** Scanning hand microphone | 47.00 | |
| **SP-20** Ext. speaker w/audio filter | 149.00 | **139.95** |
| **FL-101** 250 Hz 1st IF CW filter | 73.50 | |
| **FL-53A** 250 Hz 2nd IF CW filter | 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 | **1449** |
| **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 | **959.95** |
| **PS-55** External power supply | 219.00 | **199.95** |
| **AT-150** Automatic antenna tuner | 445.00 | **389.95** |
| **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 | **89.95** |
| *VHF/UHF base multi-modes* | **Regular** | **SALE** |
| **IC-275A** 25W 2m FM/SSB/CW w/ps | 1299.00 | **1149** |
| **IC-275H** 100W 2m FM/SSB/CW | 1399.00 | **1229** |
| **IC-375A** 25W 220 FM/SSB/CW | 1399.00 | **1229** |
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# Bicycle-Mobile Packeteering

## *It's time to pull packet radio out of its infancy!*

*by Steven K. Roberts N4RVE*

My ramblings hardly seem like a bicycle trip. It hardly even seems like TRAVEL sometimes, with the familiar intertwined layers of Dataspace swirling around me no matter where I roam. Whether clipped into a modular jack in Jackson, hunkered down at a pay phone in Phoneton, or prowling through NET/ROMs from Netcong, I always feel a sense of connection with my stable electronic community. Somehow, the pedaling interludes seem but playful diversions—an endless source of tales and insights to keep those keyboard fingers exercised while living comfortably in Dataspace.

The network world is home alright, but culturally, the amateur packet community is still in its infancy. For well over a decade, a complex society has been developing in the large computer networks, prowled not only by the original hackers but by a diverse cross-section of humanity.

I mention all this because hams possess a unique set of tools quite the envy of traditional networkers everywhere. Yet hams have hardly begun to develop the "nth-layer protocols" that govern style and behavior...the essential underpinnings of human culture. Instead, we get ***connected and talk about our technology or offer hardware for sale. Very few true personas have emerged—for fame in the packet community comes instead from authoring a BBS package or owning a big-gun digipeater.

I propose that we make every effort possible to outpace the limitations of our demographics and use these new tools to build an electronic neighborhood.

Every network has to graduate from a period of self-examination to survive. In the early on-line days, there was an obsession with "who we are" and "what all this implies." I remember rhapsodizing into the night on the CompuServe CB simulator, releasing real-time pheromones into the cosmos and tossing thoughts through my electronic window, pausing every few minutes to comment to unseen friends about the magic of this medium. We soon became as gods, dancing through the ether in porpoise-playful alacrity, weaving and bobbing among the indelicate compu-boors and DUMB-TERMINAL USERS WHO ALWAYS SEEMED TO SHOUT ALL THE TIME. There was an endless buzz of intellectual energy, for we recognized in ourselves a species a-borning.

Then we matured, forming subcultures within subcultures, and life on-line became every bit as real as real estate. When I finally sold the house and moved to a bicycle, there was nary a glitch in my sense of home.

And it wouldn't BE home if it weren't robust, diverse, and infinite in possibilities.

Packet radio grows now on the fringes, enabling another major step in disconnection: the elimination of a wire umbilicus to the closest network node. We have the technology to make a major impact...but do we have the culture? Do we have the diverse range of intellects, the crazies, the impostors, the mad flamers, the playful hackers, the sexy prowlers? Or is packet destined to remain a mix of practical messaging, public service, point-to-multipoint technical exchange, forum for its own documentation, and DX frontier for those burned out on HF contesting?

It's up to all hams. Here's a suggestion: When on packet AND on a big network, take steps to download culture as well as software. Inject network style and commentary onto 145.01; seduce wire-bound networkers into our lair. Proselytize. Build a gateway. Put your SELF onto packet, not just the equipment. Bring women online and flirt with them electronically. Play with software-controlled multi-connects and build multiport conferencing systems to speed things up. And then...let the madman inside come out to frolic in the comparative anonymity of life online.

*Photo A. The Winnebiko's packet station uses a Pac-Comm Micropower-2 TNC, a Yaesu FT-290 two meter radio, and a Radio Shack Model 100 computer with its display an integral part of the bike's console.*

### Now...How the System works

First, the introductory overview piece in this series ("On the Road and On the Air," February 1988) is prerequisite reading for the articles that follow. Those who missed the original issue and want a photocopy, send $1 to the Computing Across America address at the end of this article.

At its heart, of course, the Winnebiko's packet system contains a TNC—the original CMOS unit from Pac-Comm (which is about to be replaced by their nifty new 40mA "Micropower-2" unit). The TNC is standard...but at all levels, its interface to the outside world is non-traditional.

The board is buried deep in the console electronics package, so its status LEDs are remoted to the control panel—along with a switch for power and another to allow a convenient loopback test. Likewise, on-board linear voltage regulators are disabled to save power, since the bike's efficient switching supplies already provide 3, 5, 6, 9, and -12 volts in addition to the twin 12-volt battery buses.

The radio interface is a bit more elaborate than usual, since the Yaesu 290 is a major communications hub in this mobile system. The TNC's push-to-talk line is ORed with both software and handlebar PTT commands before being passed on to the radio; a similar merging occurs with mike and speaker lines through a small "audio nexus board" that includes such things as preamps, a 4-pole filter, mixers, and so on. There's quite enough thought required to run the system without having to manually establish a connection between TNC and radio every time!

### Serial Port

Readers may recall from February that all data communication among the bike systems takes place through a "serial crossbar network" under control of the bicycle control processor (BCP). When designing the machine, I knew that I'd want to run packet in two completely different settings: on the road while mobile, and through the HP laptop

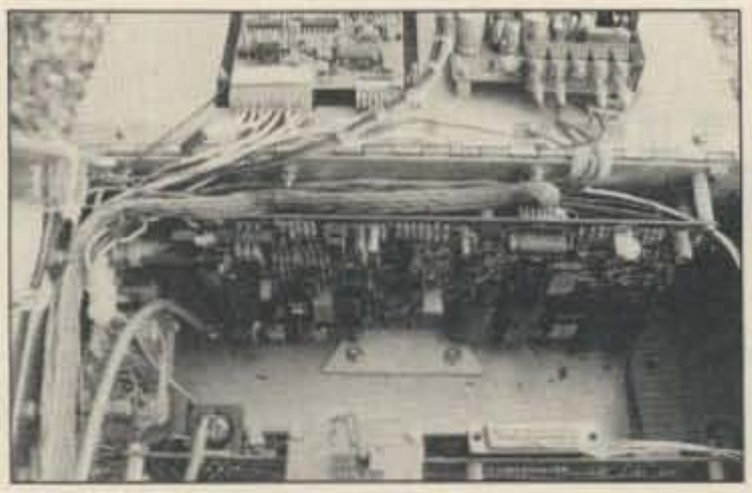

*Photo B. The Pac-Comm Micropower-2 TNC, buried deep within the console, actually appears as a node in the serial crossbar network controlled by the bicycle control processor (BCP).*

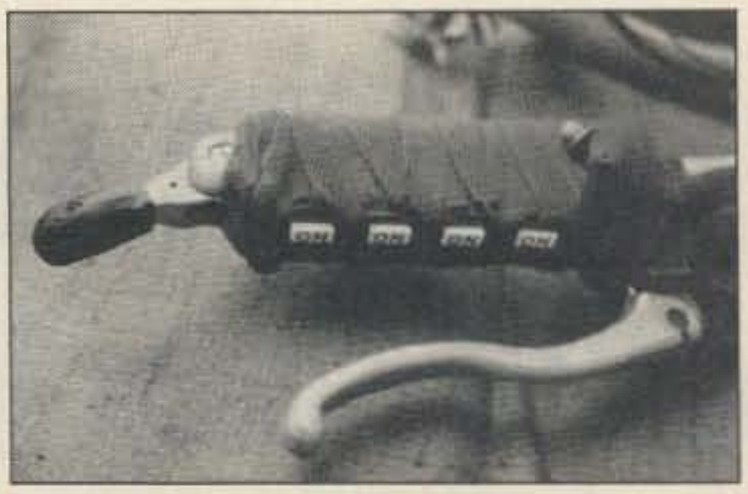

*Photo C. The Model 100 accepts input from the eight handlebar keys, which are routed through Schmitt triggers. The BCP watches for activity transitions at the keyboard before further decoding.*

while parked. It was also essential that the hardware architecture allow automation of all packet functions to support the BBS as well as future security and telemetry systems.

The TNC appears as a node in the serial crossbar network, which acts as a central office for all asynchronous data floating around in the bike. This logic can be controlled by 4-bit commands from the BCP or overridden via a front-panel rotary switch. It does its job with an array of 74HC4016 analog switches wired to permit connection between all possible pairs of transmit and receive data lines...with much less overhead than a traditional LAN. From the TNC's standpoint, of course, the only meaningful connections are to the front-panel DB9 (for the HP Portable PLUS) and the Model 100.

In the simplest case, the laptop drives the TNC with no other system components powered up. Things are a little more complex, however, when I'm on the road. Three processors come alive and work together to support a packet QSO.

Besides the TNC, a heavily modified Model 100 with a tree-structured operating system (Traveling Software's Booster Pak) runs BBS and terminal software, displaying its activity on a console LCD. For the last few thousand miles, this machine has been processing under the delusion that it has a normal keyboard, but as I noted back in February, its parallel console port is tied to a chunk of interface logic owned by the BCP.

### The Handlebar Keyboard

To understand how this subsystem works, it's necessary to view it in three parts: the handlebar keyboard itself, the interface software, and the the hardware that links the BCP to the Model 100.

First, there are a total of eight waterproof keys on the grips, four on each side. The connection between them and the 68HC11 board that runs the bike has become trivial. After riding a few months with a flaky hardware interface, I wised up and tied the pushbuttons to an input port through some Schmitt triggers. Why mess around with timing logic and noise-sensitive edge detection when there's a fast and lightly-loaded CPU spinning in a wait loop all day long? The BCP now polls an input port to see what's happening back on the handlebars.

The code is straightforward, more or less. As I type in a variant of parallel ASCII, the processor watches for a transition from "no keys down" to "any keys down." As long as that condition exists, it lights a console LED and ORs together any active bits that comprise the character to be latched as soon as "any keys down" returns to "no keys down." This eliminates any tendency toward timing-sensitivity, something that would be a nightmare on bumpy roads with Morse, Braille, or any other one-handed system requiring both setup and strobe actions.

From here, a few checks are made to see if the character is "ignore me" (FF hex) or contains bit combinations that imply a local command to the BCP itself. Then it's passed on to decoding and lookup logic. In short, this maps the handlebar character onto the Model 100's keyswitch matrix, assembling an 8-bit value that contains row address, column address, and a special bit to denote simultaneity (control, shift, graph, and code keys). This byte is then output to hardware with a corresponding flash of another console LED.

But it's not ready for the 100 yet—that machine expects a keyboard full of of passive switches in an X-Y matrix. There's an active 17-pin interface to deal with here, in which decoded column strobes are exhaled by the 100 while row data are inhaled. To emulate all this, a comparator watches the former, matching them against a decoded version of the three column bits in my synthetic character byte. When a match occurs, it causes the appropriately decoded row code to be generated...with another multiplexed into the same cycle if the key has a simultaneous modifier.

### Handlebar Key/Character Setup

To keep things reasonably simple for the operator, I shuffled the handlebar bits enough to allow my five strongest fingers, working alone, to generate lower-case alpha. The right little finger causes upper case; the left, control. The left ring finger signifies numeric or special characters (hmmm) and various combinations of those three yield less-common columns on the code chart or a short library of frequently-used words. Alone, the three minor fingers produce return, backspace, and space.

The thumbs handle 2- and 11-meter PTT, air horns, and sirens. The fleshy outsides of the palms handle two of the three dimensions in the 54-speed transmission, and the entire hands abort their typing and squeeze like hell when the disc brakes are needed. There are many degrees of freedom remaining, but I need to steer and stay sane as well.

### Ergonomics of Mobile Packet

Heh. It's a common question: "How d'ya concentrate on the road when running thet computer?" The answer is that the two activites occupy such different parts of my brain that virtually no wetware resource-management is necessary. (I can see it now: my last words captured in a RAMdisk file like the data in a DC-9's "black box." They peel me off a mountain, reconstruct the bike like an airplane to determine the cause of the crash, and find in a file called LSTWRDS.DOC the following text: "Aaaaauuuuggghhhhhhhhhh!")

Actually, running bicycle-mobile packet is pure pleasure—and not just because of the naughty sense of beating trade-offs by inventing new rules and then ignoring them. The pace of packet radio is slow enough that the intrinsic synchrony of a handlebar keyboard (limiting me to about 30 wpm) is not as frustrating as it would be in, say, a GEnie real-time conference room. In a perverse way, it fits bicycle touring perfectly....

Imagine chatting digitally with Sourcevoid Dave, himself car-mobile, while pedaling from Palo Alto to Menlo Park. Sending mail to an Internet friend in Sweden while negotiating city streets. Patching together 15,000 miles of NET/ROM links, including two passes through the wormhole, while waiting for KA8ZYW to emerge from a store with an armload of burrito fixin's. Getting directions to W2ICZ's house in Buffalo while pumping along the Lake Erie shore. Watching out a restaurant window as the BBS accumulates mail, the bike's CON, STA, KEY, DCD, PTT, BUSY, and OK lights blinking in the dusk of an unfamiliar town as it opens its electronic doors to a tired wanderer.

Electronic communication is an essential part of today's lifestyle. My perception of ham radio changed a lot when I realized it could be much more than a celebration of technology, a medium for competition, and an off-hours hobby for those not already burned out on knobs and switches. A delicious melding is happening now—a synthesis of widely divergent technologies.

Readers who want to sample network life and have direct access to Steve and his online ramblings (over 40 chapters so far, as well as a dozen or so technical articles), sign onto GEnie. Use a modem to call (800) 638-8369, and when connected, hit HHH and wait for the U#= prompt. When it appears, type control-R followed by XJM11878,GENIE and hit RETURN. Have credit-card or checking account data ready—the system goes through a one-time sign-up and then bills the user $5/hour for subsequent non-business-hours access. Steve can be reached by electronic mail as WORDY; Larry Ledlow, the editor of *73*, can be reached online as L.LEDLOW or EDITOR73. Finally, please note that my call has changed from KA8OVA to N4RVE. 73

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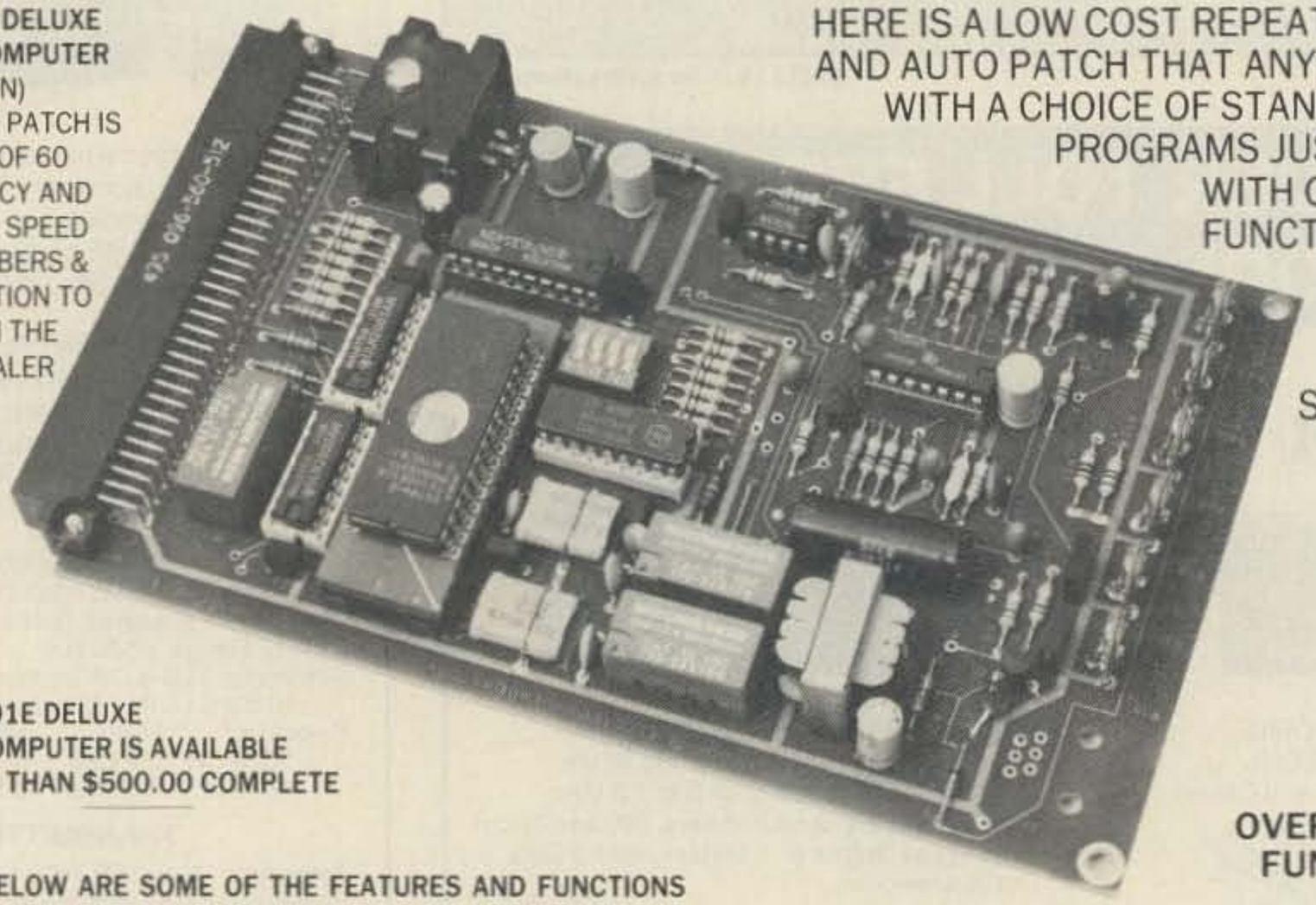

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## New DXCC Rules and Awards

At its regular January meeting, the Board of Directors of the ARRL voted to update the DX Century Club (DXCC) rules, and to sponsor some new, single-band awards.

These changes resulted from a comprehensive study of the entire DXCC program, dating back to July 1986. At their July 1986 meeting, the Board directed the DX Advisory Committee (DXAC) to "consider the advisability of restructuring DXCC." This study was intended to be far-reaching. The Board motion said, "This group will not be precluded from considering any possibilities, up to and including even a 'fresh start' award, replacing the present DXCC."

Over the next 18 months, three subcommittees of the DXAC, and the DXAC as a whole, looked into all aspects of the DXCC program. The group solicited comments from DXers all over the world. They were rewarded with about 1500 opinion polls, comments, letters, suggestions, and ideas. The sixteen members of the DXAC then produced a carefully-considered, well-reasoned update to the entire DXCC program.

In his cover letter to the ARRL Board, DXAC Chairman John Parrott W4FRY says, "The cliche 'If it ain't broke, don't fix it,' became the battle cry of the DX community worldwide when it became known that the DXAC was studying the possibility of restructuring the DXCC program. The message the DXAC received was loud and clear: add a few more awards, clarify and simplify some of the rules, but don't change the basic program—just fine-tune it." John continues, "Many worthy recommendations were considered and discarded because they were not practical to implement or manage. Other majority recommendations, such as dropping or shelving DXCC countries that have been inactive for long periods of time, were considered as not being in the best interest of the DXCC program."

Even without making major changes to the program, the DXAC review will have considerable impact on DXCC and DXing in the future. Here are some of the new DXCC rules, and how they affect DXers.

### Single-Band Awards

The new DXCC rules provide for three additional single band DXCC awards. DXers will soon be able to apply for awards on 80, 40 or 10 meters, as well as the previously existing awards for 160, 6 and 2 meters. The application deadlines for these new single-band awards will be phased in over the next year, to ease the workload at the DXCC desk in Newington. For example, applications for the 10-meter single band award will be processed starting July 1, 1988, with the 80 and 40 meters awards starting November 1, 1988, and May 1, 1989, respectively. These dates are the application dates. Contacts for each award may be made after the date of the start of post-war DXCC: November 15, 1945.

They chose the early start date specifically to reward old-time DXers, without penalizing newcomers. The League is still smarting from the outcry that ensued when they used January 1, 1975 as the start date for the CW DXCC.

There is a new wrinkle to the application procedure for these single-band awards. All previous DXCC awards were numbered in order of date the application was received. When the 160 meter DXCC started, for example, W1BB showed up early in the morning at ARRL Headquarters to be the first to submit his application, and get 160 meter DXCC #1. For these new single-band awards, the ARRL will accept applications during a two-week "window" prior to the official application date. Thus, applications for 10-meter DXCC will be collected June 15–June 30. The ARRL will then review all applications received by July 1, and award the certificates in order of most countries confirmed. The station with the highest 10-meter country total gets #1, and so on. In case of ties, the stations will get the same number, and the subsequent number will be skipped. Applications received after July 1, 1988, will be numbered in order of date received. The same procedure will be used for 80 and 40 meter single-band DXCC awards.

### DXCC Country Criteria

The DXAC also clarified one of the more controversial parts of the DXCC rules: the country criteria. These are the guidelines whereby new countries can be added to the DXCC list. The DXAC eliminated some of the ambiguities and fuzzy language from the old rules, and incorporated some of the informal country criteria that the DXAC has been using for many years, but seldom published.

To determine if an entity is sufficiently independent to qualify as a new country for DXCC, some of the characteristics to be considered include membership in the UN or specialized agencies of the UN, such as the ITU; authorized use of ITU-assigned call sign prefixes; diplomatic relations with other countries and maintaining a standing army; and regulation of commerce, trade, customs, immigration, and licensing, and the issuance of currency and stamps.

Another clarification of the country criteria might be called the anti-Pribolof rule. The Alaska DX Association has been trying for years to add the Pribolof Islands to the DXCC list, on the grounds that they are more than 225 miles from the mainland of Alaska. Their petition was consistently denied, based on the presence of other islands between the mainland and the Pribolofs.

The new DXCC rules are unambiguous, and will prevent any conflicting interpretation such as the Alaska DX Association issue.

### Deletion Criteria

A new section of the DXCC rules is the deletion criteria. These rules spell out the circumstances under which a country is removed from the DXCC list. Again, this is a formal presentation of a collection of informal rules that had been used for years. Among the reasons for dropping a country from the DXCC list are:

•Annexation. This is when a country is taken over by a neighboring country, such as when China annexed Tibet.

•Unification. This is when two neighbors combine under a single government.

•Partition. This is when a country is split into more than one country.

•Independence.

### Accreditation Criteria

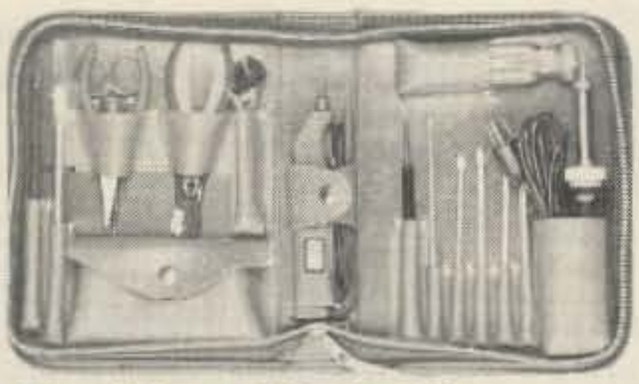
No single part of the DXCC rules causes more problems than the accreditation criteria, under which a given amateur operation from a DXCC country is accepted for DXCC credit. From the days of Don Miller's lawsuit against the League after having one of his operations not accepted, to the recent controversy surrounding Frank Turek's Mt. Athos operation, the accreditation criteria have been the center of ill feelings and misunderstandings. The DXAC fine-tuned the accreditation rules by spelling out some of the documents that would make the operation acceptable for DXCC credit. These include contract agreements with governments, details of "license" authorizations, and detailed landing information for uninhabited islands.

### Other Changes

The three new single-band awards are the most dramatic changes in the DXAC report, but there are many other, more subtle updates in the new rules. For example, the DXCC rules now spell out how to get on the DXCC Honor Roll, and specify that new Honor Roll recipients will be listed monthly in *QST*. There is also a provision for a #1 Honor Roll plaque for those DXers who have worked every country on the current DXCC list. Another new rule involves QSL cards: each card must contain the call signs of both stations, the country, mode, date, time, and frequency. (Note that signal reports are not required for DXCC credit.) The DXAC recognized that the addition of new awards and more detailed rules might increase the workload of the DXCC branch.

Thus they suggested that the League investigate the possibility of having the initial 100 cards for DXCC checked by volunteers, at other than ARRL HQ., as is done for most other awards. This suggestion was send to the Membership Services Committee of the ARRL Board for further study.

The DXAC study of DXCC restructuring has cleared up many of the problems with the existing DXCC rules. Although this is unlikely to be the last word in DXCC, their efforts will have a significant impact on the DXCC program for years to come. 73



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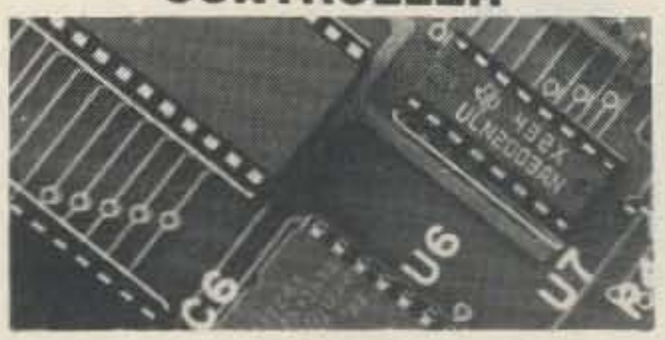

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# NEW PRODUCTS

*Compiled by Rebecca Niemela*


## PRODUCT OF THE MONTH

**SR-15 SCANNING RECEIVER**

Cobra announces its new miniaturized, 100-channel unit with electronic digital tuning and five memory banks. The SR-15 is a pocket-sized hand-held scanner. This unit ($300 suggested retail) features 11-band coverage for police, fire, paramedic, government, military, aircraft, business and amateur radio broadcasts. There are many automatic operating functions, including normal scan, automatic search, channel lockout, channel priority, selective scan delay, channel hold, and manual scan. Its five memory banks stores up to 20 frequencies each.

The SR-15 scanner is 6" H x 2¾" W. Accessories include flexible rubber antenna, rechargeable NiCd battery pack, AC adapter/charger, earphone, and carrying case. For more information contact: Cobra Consumer Electronics Group/Dynascan Corp., 6500 West Cortland Street, Chicago IL 60635, (312) 889-8870 or circle Reader Service number 201.


**EPSILON**

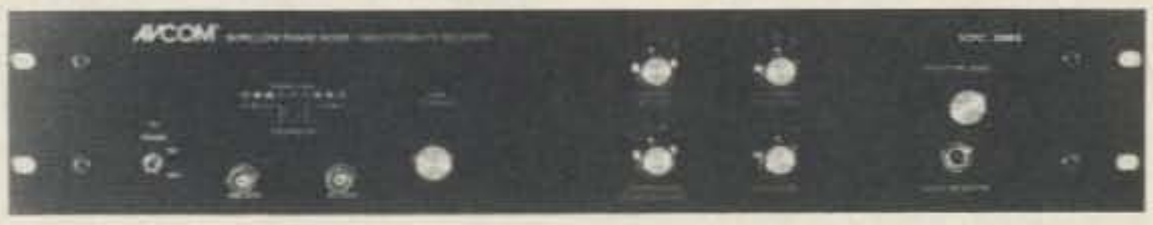
Epsilon is marketing a software package for the long-wire antenna experimenter called Long Wire Pro. This software allows the user to model several horizontal wire antennas and optimize their use, even before starting construction. It takes into account wire length, height, tilt with respect to the horizon, kind of ground, and (when using vees and rhombics) the apex angle, all to determine radiating lobe alignment. Using the above factors, the program generates a sinusoidal projection of radiated power. It shows the resulting pattern over a half hemisphere at a time. One sees how the lobes are formed and how they are affected by various trade-offs in design. It's astonishing how misleading the usual 2-dimensional patterns in most antenna books can be.

The Long Wire Pro software is $35. For more information contact: Epsilon Company, Box 715, Trumbull CT 06611, (203) 261-7694, or circle Reader Service number 203.


**TINY TNC-2**

Pac-Comm announces a totally redesigned TNC-2 clone, which uses unmodified TAPR TNC-2 software. This new Tiny TNC-2 uses an integrated circuit modem and simplified circuitry. This insures reliability and size reduction at a much lower cost. The 1200-baud unit includes as standard features: 32K RAM, 32K EPROM, RS-232 and TTL compatibility, watchdog timer, modem disconnect header, switch selectable terminal baud rates, and 12V DC operation. The Tiny TNC-2 is about half the size of the original TNC-2, and comes fully assembled and tested.

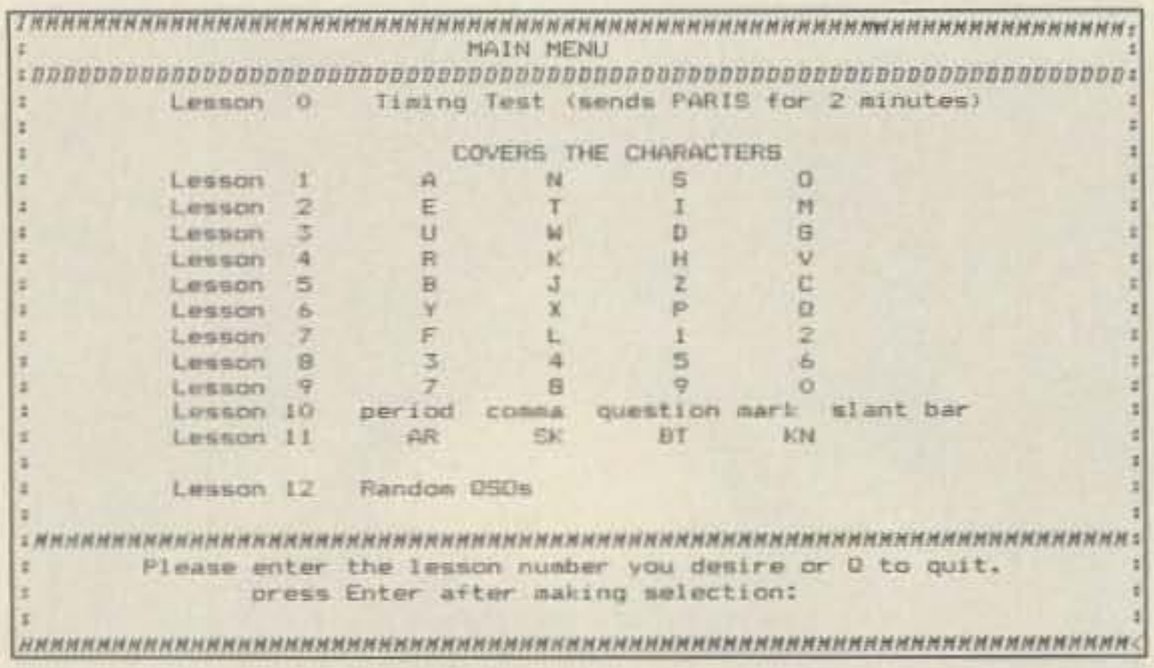
The Tiny TNC-2 retails for $120, plus tax and shipping. To order, call (800) 223-3511 (in Florida, (813) 874-2980). For additional information, the address is: Pac-Comm Radio Systems, Inc., 3652 W. Cypress Street, Tampa FL 33607, (813) 874-2980, or circle Reader Service number 204.




**AVCOM**

AVCOM of Virginia, Inc., recently developed the SCPC-2000E Single Channel Per Carrier Receiver to receive FM SCPC signals from satellites operating in the 3.7–4.2 GHz band. The SCPC-2000E is capable of tuning up to 4 specific crystal-controlled channels from a transponder, and adapting to variety of de-emphasis requirements. A sophisticated phase-locked cavity oscillator referenced to an oven warm crystal oscillator provides exceptional frequency stability. The SCPC-2000E allows very high audio or data signal-to-noise ratios.

The SCPC-2000E receiver comes with a 1-to-2 or 1-to-3 expander module, selectable low-pass 15, 7.5, and 5 kHz audio filters, on-board driver stage for low-impedance headphones, and wideband or narrowband models. The SCPC-2000E is rack-mountable and may be used with the AVCOM SS-1000 SCPC demodulator for simultaneous reception of additional channels. Suggested retail price is $1,875. For more information contact: Kevin Nolan, at AVCOM of Virginia Incorporated, 500 Southlake Blvd., Richmond VA 23236, (804) 794-2500, or circle Reader Service number 202.

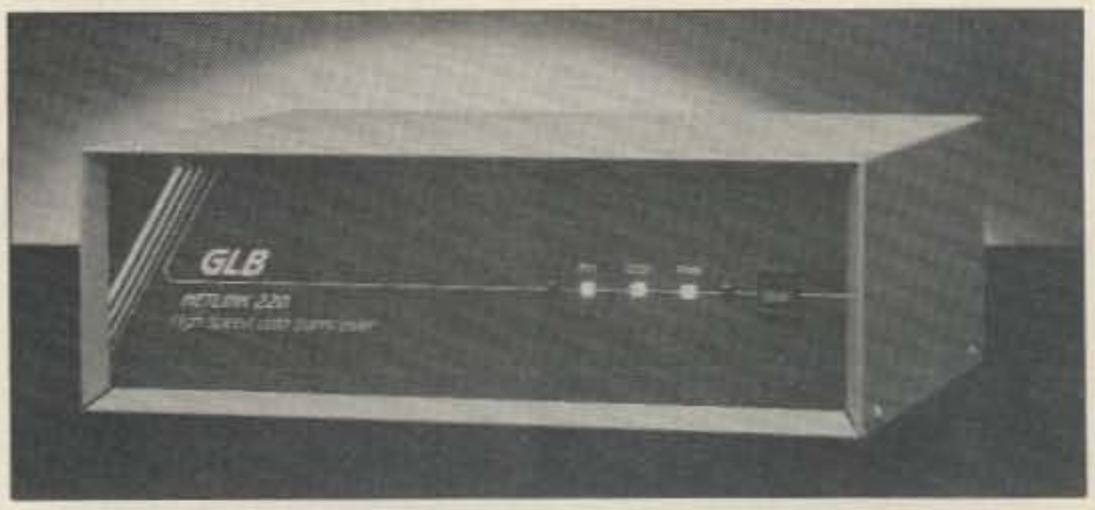



## MORSE TUTOR

GGTE announces Morse Tutor©, Version 2.1, It teaches the International Morse Code, and improves the skills of those already familiar with the code.

Morse Tutor is available for IBM PC, XT, AT and equivalents. The program features both the Standard Method (words and characters at same speed) and the Farnsworth method (characters sent faster than the actual word rate). Morse Tutor also constructs and generates random QSO-type code practice. Users can calibrate the program for different PC clock speeds from the keyboard.

Morse Tutor sells for $19.95 plus $2 for shipping and handling (California residents please add $1.20 sales tax). To order, send check or money order to GGTE, 21881 Summer Circle, Dept. MTS, Huntington Beach CA 92646. Dealer inquiries are welcome. Circle Reader Service number 206 for more information.

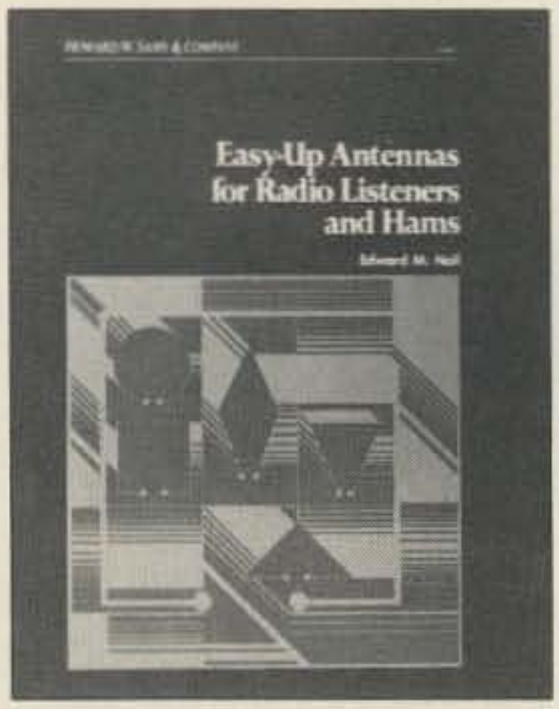



## GLB ELECTRONICS

GLB Electronics announces a digital-in, digital-out data radio designed for high-speed packet linking. The Netlink 220 High-Speed Data Transceiver features 220–225 MHz simplex operation, 2 watts of output, and a data rate of 19.2 KB. The design was optimized for digital data transmission, providing a superior alternative to the adaptation of voice equipment. One can adapt it to use with any Node Controller capable of generating and accepting 5-volt CMOS logic levels, such as the TNC-2A.

The Netlink uses FSK modulation, requiring a 25-kHz receiver bandwidth at 19.2 KB. Its operational temperature range is −30 to +60 degrees C, making it suitable for use at sites having uncontrolled ambient temperatures. It meets Part 97 specifications.

The list price is $799, $699 Amateur net. For further information, contact GLB Electronics, Inc., 151 Commerce Pkwy, Buffalo NY 14224, (716) 675-6740, or circle Reader Service number 208.

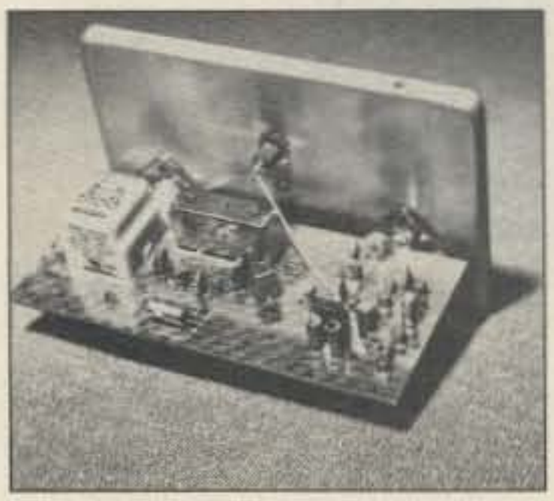



## EASY-UP ANTENNA BOOK

*Easy-Up Antenna for Radio Listeners and Hams* is a practical antenna book for radio amateurs and prospective radio amateurs, as well as for shortwave broadcast, FM broadcast, medium wave broadcast, LW, utility and scanner radio listeners. All of the basic and some of the more advanced antennas are covered. The antennas in it are easy to construct, erect, and put into operation.

The handbook is in two parts. The first is for radio listeners, the second for hams. Information in both parts, however, that is valuable to both hams and listeners.

This 157-page book sells for $16.95 plus $2 P+H. For further information contact: Edward M. Noll W3FQJ, Box 75 Chalfont PA 18914, or circle Reader Service number 205.



## AMPIRE INC

Ampire, Inc., offers a mast-mounted preamplifier with a helical filter installed in the preamp itself. This GaAsFET preamp is RF-switch-able, and is voltage-regulated and RF-surge protected. The three models of preamps available are the 146, 1460S, and 440.

The 146 and 1460S have a noise figure of 0.92 dB and 19-dB gain. Model 146 covers the entire 2-meter band. Model 1460S has a 3-dB bandpass of 600 kHz, and is also factory-tunable for a specific frequency at customer's request. Both models handle up to 160 watts.

Model 440 is factory tunable at 430–440 MHz or 440–450 MHz. It has 0.75-dB noise figure, 15-dB gain, and handles up to 100 watts.

Models 146 and 1460S are $179, and Model 440 is $189. For further information call (612) 425-7709, write Ampire Inc., 10240 Nathan Lane, Maple Grove MN 55369, or circle Reader Service number 207.


## KB1T RADIO SPECIALTIES

The 1988 edition of KB1T's attractive Amateur Radio Calendar is a must for every shack. Keep up with amateur radio contests, major gatherings, and important historical dates throughout the year. The calendar also features a handy generic contest logging form, ITU and CQ zone maps, a North American grid locator map, and much more.

The photos for each month attempt to cover the range of activities of the hobby. The topics are contesting, DXpeditioning, QRP, Field Day, Novice, and antennas. This year's calendar includes some history of radio. Two photos show the original site of Marconi's "wireless cable" commercial radio communications station, the first to establish transatlantic message traffic, starting in 1903.

In the US, Canada and Mexico, the 1988 Amateur Radio Calendar comes, first-class postage paid, for $9.95. Overseas, the price is $12. Ordering two or more calendars sent to the same address reduces the prices to $8.90 and $11 (overseas) each. For more information, contact: KB1T Radio Specialties, Box 1015-Y, Amherst NH 03031, or circle Reader Service number 209.

## PK-FAX Program

*PK-FAX Program allows display and transmission of Facsimile using PCs and compatibles. See page 38 for PK-Fax Program Review.*

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# DRIFTING ALONG THE TELEGRAPH TRAIL

## *Memoirs of a Former Telegrapher*

Many are the tales told about "boomer" telegraphers, the legendary characters who travelled extensively throughout the United States and Canada during the years that telegraphy was the only means of communication.

My wife, a registered nurse, could currently arrive in any city and be employed within an hour at a hospital because of the great demand today for trained nurses. The same situation existed with telegraphers years ago—their services were in great demand, and employment anywhere was never a problem. There were five hundred full-time telegraphers employed in the city of Atlanta at one time.

### The Transient Life

This plethora of employment opportunities was one reason the boomer telegrapher often walked off the job without even a day's notice —at times he even quit work in the middle of a shift. So when the boomers working for railroads in North Dakota felt the approaching winter, they would be on their way via freight train to Florida where the breezes were soft and warm, and where they could steal oranges off the trees for breakfast.

The station agent at Death Valley Junction on the Tonopah and Tidewater Railroad, after giving his son six months of instruction in the American Morse code, felt that the young man was sufficiently expert in telegraphy to pound brass by the larger railroad with which the T and T connected. So, armed with a pass to Los Angeles, where the Chief

Dispatcher would examine him on his telegraphic abilities and knowledge of train orders, the young man boarded the T and T passenger train and rode it to the junction with the big railroad where he would have to wait a couple of hours for his westbound train. That he would pass the required examinations was a foregone conclusion, since his services were badly needed.

While waiting for his train, he fell into conversation with the boomer telegrapher on duty at the junction. The boomer wore leather puttees as protection against the numerous rattlesnakes in the area. As the conversation and a freight train closely approached, a far-away look appeared in the boomer's eyes.

"Hell, kid" the boomer said, "You don't have to go all the way into L.A. to hire out, you've got a job right here!" The boomer tossed the depot keys to the young man and, with the expertise born of years of practice, boarded the slowly moving train and was gone.

Thus, the Chief Dispatcher, in absentia, placed a new employee on his payroll without having even seen him.

### Shake a Keg

I once worked with a boomer operator who, although he had been wandering around the U.S. and Canada for forty years as an itinerant telegrapher, had not seen fit to buy a suitcase. He said it would be foolish to spend good money for one when whiskey was so cheap.

In lieu of regular luggage, he had a nail keg. Matching holes had been drilled through the sides of the keg, near the top and corresponding holes were also in the wooden cover of the keg. A light rope had been threaded first through the sides of the keg and then brought out through the holes in the keg cover. The two ends then tied together. The rope, of course, was the carrying "handle" for this wooden "suitcase." The rather clever method of inserting it into the keg insured that the more weight put into the keg, the tighter its wooden cover would be seated into the top of the keg.

***"the boomer telegrapher often walked off the job without even a day's notice—at times he even quit work in the middle of a shift."***

### Extra Cash

During the many years Morse telegraphy was in its hey-day, Western Union had what they termed "bonus" wires operating between the major cities of the United States. A diminutive man, less than five feet tall, worked one of the bonus wires at the "Woods" office of Western Union in Chicago. (This was the largest telegraph office in the world.) Every day, after he had received two hundred messages (called his "stint"), he would say to the telegrapher in New York City (with whom he worked seven days a week) "Let's skip 400 numbers." After their stints, each of these telegraphers would be paid a bonus of two cents a message for each message they sent or received during the remaining hours of their shift. Every message was numbered. Skipping 400 messages numbers at two cents per message meant that each of these operator would be paid an extra eight dollars for messages they had never actually handled. This procedure resulted in a big increase in their take-home pay, which was only normally about three dollars per day. A dollar a day insured the cooperation of the file clerk (who was supposed to audit the "bonus" message account), and the fraud continued unchecked for years.

However, the little man foolishly started to quarrel with the Chicago file clerk, with the result that she reported the cheating, conveniently failing to mention her own participation in the scheme for many years. The tiny telegrapher was, of course, immediately required to report to the office of his boss who threatened to "blackball" him so that he could never get another job telegraphing anywhere in the United States.

This was an idle threat, however. There were no Social Security numbers in those days or any other means of identifying individuals. The discharged telegrapher would merely adopt a new name and journey to another city where instant employment would be available to him because of the great demand for telegraphers.

However, the small man looked his boss squarely in the eyes and said, "Look, I have my own home paid for here in Chicago, and I have it fixed up just the way I want it. So I don't want to leave Chicago. But if you fire me and put some boomer in my postion, he will start skipping numbers the first day on the job, because he will have nothing to lose and doesn't give a damn whether he stays here one day or a year. He can get a job anywhere. If you keep me on the job, I promise by all that's holy, I will never skip another number as long as I live."

The boss digested this statement for a minute or two and said, "I guess you are right. Now go back to your position. I'll be checking on you, and don't let me ever catch you skipping numbers again!"

(The final part of this series will follow next month.) 73

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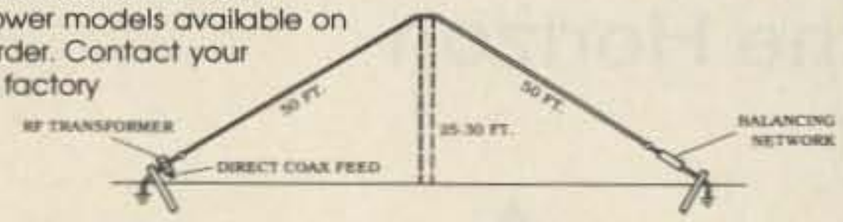


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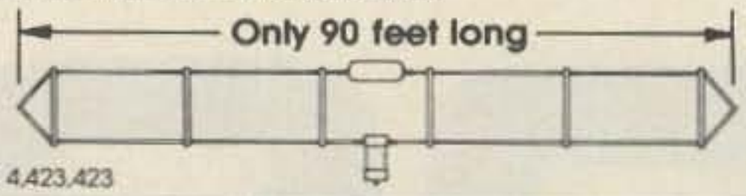


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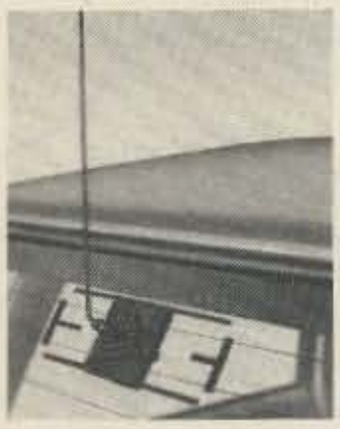

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# The 4 + 1 Tone Decoder

*Decoder for both group and individual calls for under $35!*

*by Andrew Mitz WA3LTJ*

Hams often wish they could shut off all the signals on a busy repeater except the one calling specifically for them. It would be nice to leave the HT on at work without getting fired!

Now they can with the 4 + 1 Decoder. It's a smart speaker that plugs into a speaker jack and remains silent until someone activates it with a personal 4 digit DTMF (Touch-Tone[1]) sequence.

The circuit was inspired by the local RACES/ARES emergency group. All the members had 2 meter radios, but few were willing to keep them turned on during the day at the office or late at night at home. The solution was to design a circuit that would allow each member to have his own four digit sequence, and also respond to a single command to activate everyone at once.

The 4 + 1 Decoder responds at any time to either a four digit sequence, or one digit sent for three seconds, hence the name "4 + 1 Decoder." Everyone's decoder can be set to the same 3 second (long-tone) for a general call-up. Whether or not the call-up feature is used, each operator can still select a tone sequence up to four digits long for his own personal calling code. For under $35 in parts, it's hard to beat.

The idea of using a DTMF decoder to control a radio's speaker is not new, especially for emergency communications[2]. There's at least one high quality decoder with speaker available commercially for under $100 (Auto-Kall), and Heathkit offers a kit that can be readily adapted[3]. The 4 + 1 Decoder, however, is the first low-cost circuit that allows both individual and group calling.

### Typical Operation

DTMF digits are selected with jumper wires in an IC socket. For low cost and simplicity, only digits 1 through 9 and special digit, "D", are decoded. The digits 0, *, #, A, B, and C are not recognized. One digit is selected for the single long tone, and one to four digits are selected for the sequence. A single digit can be used repeatedly.

The only other adjustment is a potentiometer. This is used to preset how many seconds the speaker will be on, once the proper digit is recognized. The decoder is then connected to the radio as an external speaker. The decoder's speaker remains off until it receives the proper digit or sequence. Once triggered, a "call" lamp lights and the speaker is connected to the radio's audio. After the preset period, the speaker is shut off until another valid input reactivates the speaker. There is a bypass switch to defeat the decode function and thus allow the user to listen to all traffic on the frequency. There is also a reset button on the decoder that immediately quiets the speaker and extinguishes the call lamp.

### Circuit

Figure 1 is a schematic of the decoder board. U1 is a DTMF decoder chip. It does 90% of the work by recognizing DTMF digits and converting them into binary codes. Since U1 uses a "colorburst" crystal and sophisticated digital filtering, its accuracy and stability are superior to decoders made from phase-lock loop tone decoder ICs (e.g., the LM567)[4]. U2 converts the binary codes from U1 into individual signals, one for each digit 1 to 9, and digit D.

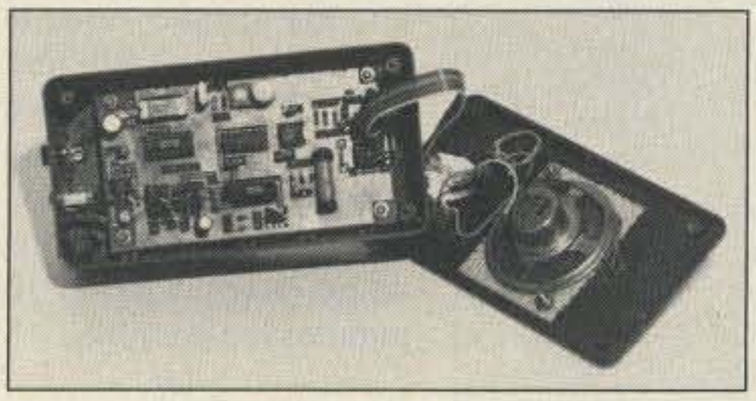

*Photo A. Inside view of the completed decoder. The circuit board is on the bottom of the box. A ribbon cable connects the board to the speaker, LED, and switches on the front panel. Jacks for audio input, external speaker output, and power are mounted on the far end of the box. A piezo buzzer (see Figure 2) was not included in this version.*

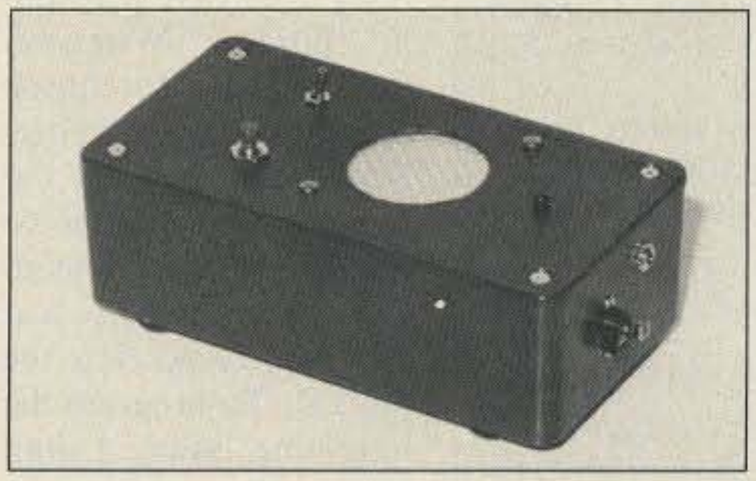

*Photo B. The encased tone decoder.*

### Sequence Entry

The programming socket allows the user to pick off the digits and send them to U4 for either sequencing or timing. The sequencing method is unusual and is one reason for the low cost. The first digit of the sequence charges C5 via CR2. C5 will hold its charge at one of the two inputs to U4a for about half a second. During this period, the second digit can enable the other input to U4a. Once both inputs to U4a (an AND gate) are active, the output of U4a turns on and charges C6 via CR3. Now one input of U4b is enabled for half a second, while the circuit waits for the third digit in the sequence, to enable the other input to U4b. A successful third digit activates the output of U4b, which this time charges C7 through CR4. If the fourth digit arrives within the next half second, it similarly enable U4c's output. This output activates the call lamp latch (U5) and speaker timer (U6).

### Long-tone Timer

The long-tone timer operates on a variation of the sequencer. While the long tone is received, R3 slowly charges C4. If the long tone stops before the three second interval, CR1 (which has the opposite polarity in the circuit as D2-D4) rapidly discharges C4. Once C4 is fully charged by a sufficiently long, uninterrupted digit, the output of U4d is enabled, which triggers U5 and U6.

A successful sequence or single three second DTMF digit starts timer U6 and latches U5. U5 holds the call lamp on. Meanwhile, while U6 is running, relay K1 is energized and connects the speaker to the radio's audio. The reset button resets U5. The reset button also interrupts the timing period of U6.

U4 is the regulator for a versatile power supply which will accept 7–14 volts, AC or DC. Two typical power sources are an automobile cigarette lighter and a modular wall transformer.

### Changing Timing

The value of C4 determines the duration requirement for the long tone. Longer times require larger capacitance values. Three sec-

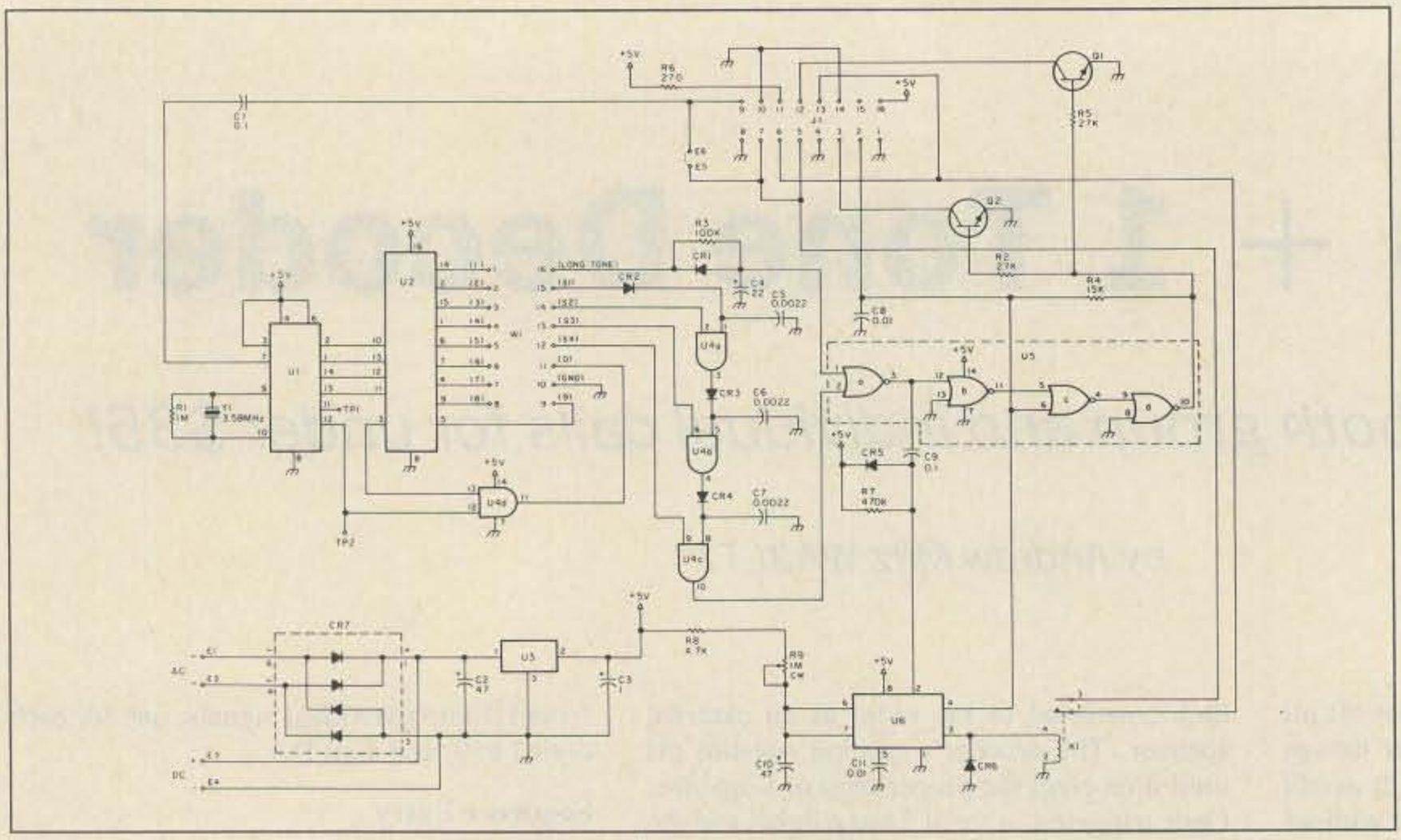

*Figure 1. Schematic of decoder circuit.*

**Parts list:**

| | | | |
|---|---|---|---|
| *Circuit board* | | | |
| C1 | 0.1µF | | |
| C2 | 47µF | 16V electrolytic | |
| C3 | 1µF | 6V electrolytic | |
| C4 | 22µF | 16V electrolytic | |
| C5–C7 | 0.0022µF | | |
| C8 | 0.01µF | | |
| C9 | 0.1µF | | |
| C10 | 47µF | 6V electrolytic | |
| C11 | 0.01µF | | |
| CR1–CR6 | 1N914 or similar | | |
| CR7 | DB101 or VM08 bridge rectifier, or 4 1N4001 diodes | | |
| K1 | Radio Shack 275-232 miniature 5-volt relay | | |
| Q1,Q2 | 2N3904 | | |
| R1 | 1.0MΩ | ¼W | 10% |
| R2 | 27kΩ | ¼W | 10% |
| R3 | 100kΩ | ¼W | 10% |
| R4 | 15kΩ | ¼W | 10% |
| R5 | 27kΩ | ¼W | 10% |
| R6 | 270Ω | ¼W | 10% |
| R7 | 470kΩ | ¼W | 10% |
| R8 | 4.7kΩ | ¼W | 10% |
| R9 | 1MΩ | 1-turn trimpot | |
| U1 | RCA CDD22204E or SSI 204 DTMF receiver | | |
| U2 | CD4028B CMOS BCD decoder | | |
| U3 | 78L05AC low power 5V regulator | | |
| U4 | CD4081B CMOS quad AND gate | | |
| U5 | CD4001B CMOS quad NOR gate | | |
| U6 | NE555 timer | | |
| W1 | 16 pin IC socket and 16 pin header | | |
| Y1 | 3.579545 Colorburst crystal | | |
| *External to circuit board* | | | |
| Buzzer | Radio Shack miniature piezo buzzer | | |
| Case | Radio Shack 270-223 (6″ x 3.15″ x 1.84″) | | |
| LED | regular or flashing LED | | |
| Power | 8 vdc, 400 mA wall transformer (Jameco DC800) | | |
| Speaker | 4Ω or 8Ω miniature speaker | | |
| Switches | SPST normally open momentary switch (reset) | | |
| | SPST miniature toggle switch (buzzer disable) | | |
| | DPST miniature toggle switch (decode/bypass) | | |

Except for U1 and K1, the parts for this project can be obtained from Jameco Electronics, 1355 Shoreway Road, Belmont CA 94002. (415) 592-8097. U1 is available through RCA (CD22204E), 17731 Irvine Blvd. Suite 104, Magnolia Plaza Building, Tustin CA 92680. (714) 832-5302 or Silicon Systems (SSI 204), 14351 Myford Road, Tustin CA 92680, (714) 731-7110.

onds, however, proved most practical. The entry speed for sequential decoding is determined by C5–C7. Larger values relax the speed requirement, but increases the possibilty of false triggering from digit sequences similar to the programmed sequence. For example, if the sequence of 6-8-2-1 is sent fast enough, it will trigger a decoder set for the sequence 6-2-1. If false triggers are a problem, decrease values for C5–C7. The speaker timer is controlled by R9 and C10. The values shown allow times ranging from 1 to 60 seconds. Increasing C10 increases this range. Ranges up to 10 minutes are possible.

### Programming

Both the long-code and the 1 to 4 digit code sequence are programmed at the programming socket (W1). The easiest method for programming is to wire a 16-pin IC "header." Wire several headers for quick programming changing. Pins 1 through 9 of the header correspond to DTMF digits 1 through 9, pin 10 is ground, and pin 11 corresponds to the digit D. To program the long-tone, select a digit and tie a jumper from the corresponding pin number to pin 16. Jumping pin 16 to the ground, pin 10, disables the long-tone timer.

Sequence programming is almost as simple. Wire pin 15 to the first digit of the sequence, pin 14 to the second digit, pin 13 to the third digit, and pin 12 to the fourth digit. If only a 3, 2, or 1 digit sequence is desired, wire the unused sequence pins (12, 13, or 14) to the last digit of the code. For example, when programming the 2 digit sequenee 1-2, pins 12, 13 and 14 are all connected to pin 2. Here's a 3-digit programming example.

Header wiring to program Long-tone 5 and sequence 2-7-2:

| | |
|---|---|
| Long-tone | pin 16 to pin 5 (digit 5) |
| 1st digit of sequence | pin 15 to pin 2 (digit 2) |
| 2nd digit of sequence | pin 14 to pin 7 (digit 7) |
| 3rd digit of sequence | pin 13 to pin 2 (digit 2) |
| 4th digit of sequence | pin 12 to pin 2 (digit 2) |

This example illustrates one important limitation to the sequence programming: The decoder can't differentiate between a single digit and a single digit repeated (e.g. 2 versus 2-2-2). For example, the program sequence 9-1-1 triggers the audio with 9-1

### Power Consumption

The circuit draws 15 mA while waiting for a call, mostly due to U1. This makes operation from a small (9 volt) battery impractical, so I use a $15 motorcycle battery to power the decoder and HT at night. When the relay and LED are energized, the circuit draws slightly over 40 mA.

### Construction

Component layout is not critical. Just remeber to keep the connections from U1 to the crystal fairly short, and carefully handle the U2, U4, and U5 CMOS ICs. Either wire-wrap or point-to-point wiring will suffice, but using a printed circuit board is easiest (see using a printed circuit board is easiest (see parts list). The available PC board will hold all the components except LED, speaker, connectors and switches. Most of the connections external to the board (Figure 2) are connected via holes for a 16-pin IC socket (J1). One can wire connections either directly to the board or through a header plugged into an IC socket.

I built the completed unit shown in Photo A into an inexpensive plastic box (see parts list). A hole saw, normally used to cut 1″ subminiature toggle (decode/bypass) switch holes or smaller, drilled a speaker hole into the removable lid of the box. A piece of perf board served as the speaker grille. When mounted in the box, the inexpensive 2-inch speaker had remarkably good audio quality. The call LED was mounted just above the speaker using a dab of epoxy to hold it in

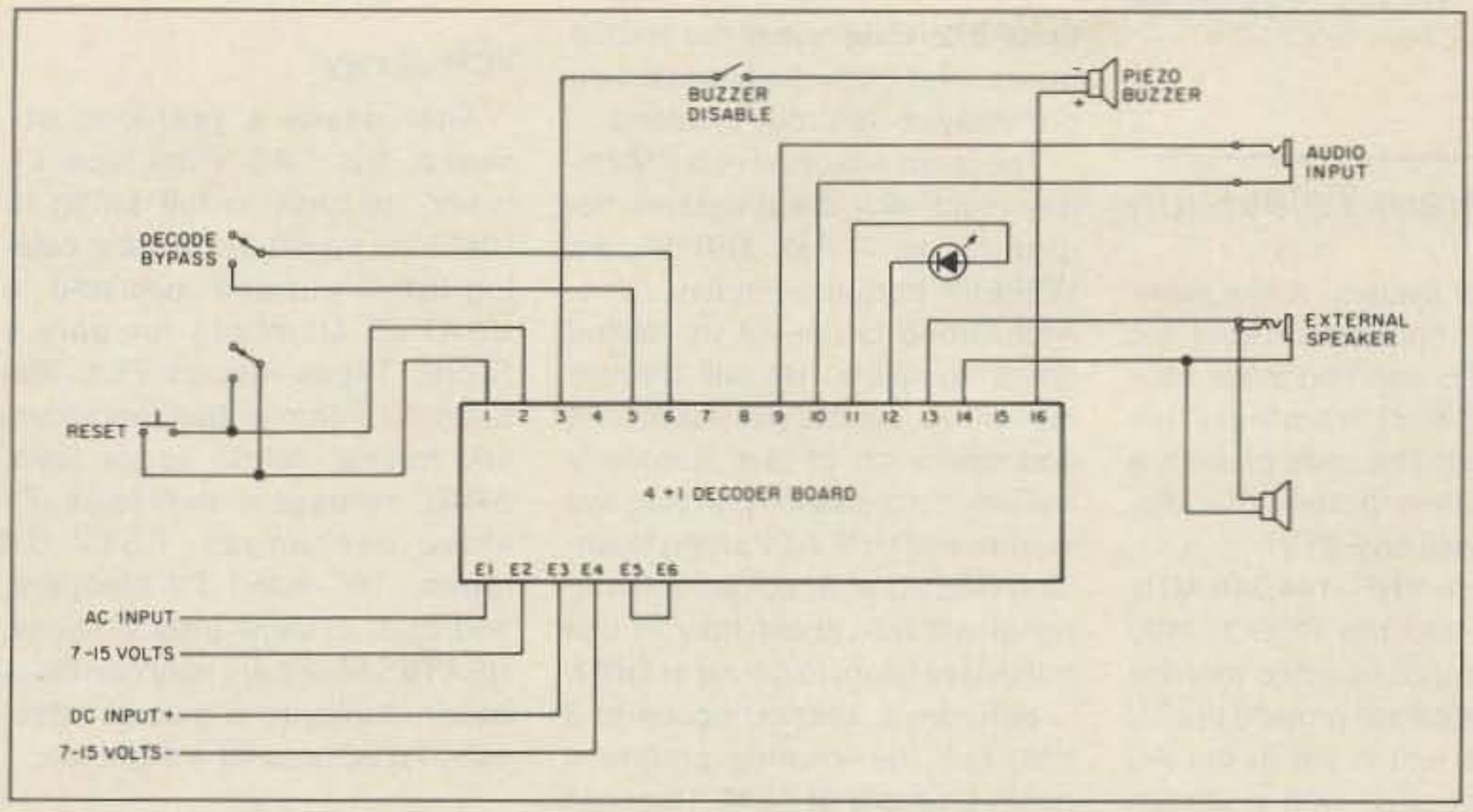


*Figure 2. Wiring external to the circuit board. This configuration is for activating an internal or external speaker.*

place. A push button reset switch and a DPST subminiature toggle (decode/bypass) switch are mounted below the speaker. The PC board sits on metal stand-offs bolted to the bottom of the box, but before the circuit board fit into place, connectors were mounted at one end of the box to accomodate audio input, external speaker, and power. I chose the external speaker jack to match the jack on my rig. (This way, I don't need an adapter to use my external speaker with either rig or decoder.) The audio input jack is a different size to prevent errors. A standard concentric-type power jack is the power connection. Ribbon cable connects the circuit board to the jacks, and the circuit board to the top panel. Stick-on rubber feet added to the bottom of the case puts on the finishing touch.

### Configuration

The board operates from either AC or DC. Board connections E3 and E4 are for + and − connections, especially if a DC source is used. Omit rectifier CR7 in this case. There's a DC wall transformer in the parts list (obviously an AC transformer with built-in rectifiers) available for under $2. For those who already have an AC wall transformer from an old calculator battery charger, use either a bridge rectifier chip (DB101, VM08, etc.) or 4 individual power rectifiers (1N4001 or similar) for CR7. AC input goes to board connections E1 and E2.

One can use relay K1 to switch something other than the speaker. E5 and E6 are jumpered for speaker operation. Removing the jumper separates the relay from the audio input.

A latched output is useful to drive a buzzer or an open-collector driver for another logic circuit.

While most radios have sufficient audio to drive the decoder, there may be some applications where the decoder needs to accept a low audio level. Since the decoder's input impedance is much higher than the typical 8Ω output of most radios, an 8–1000Ω audio matching transformer makes the decoder more sensitive.

### Testing and Operation

It's best to test the power supply before installing the ICs. Assuming the PC board is used, install U4, C1, C2, and optional, CR7. Apply power to the circuit and measure the voltage across C2. This voltage must be between 4.5 and 5.5 volts. Install the remaining components, being careful about the polarities of diodes CR1 through CR6.

Test the decoder by connecting it to the radio with which it will be used, and use a second radio (driving an RF dummy load, of course) to generate the tones. Those with an ICOM IC-2AT or similar radio can connect the decoder to the earphone jack and the antenna connector to a dummy load. These HTs produce the DTMF tones in the speaker circuit at the same time they are transmitted. Connect a voltmeter to TP2 on the board. Without any incoming tones, the reading should be under half a volt. Turn down the audio to the decoder and transmit any DTMF digit. Slowly increase the volume. At some point, the voltmeter should jump up to around 4.5 or 5 volts. This volume is the minimum necessary to trip the decoder. Try increasing the volume and see if there is a point where the voltmeter drops back below 2 volts. This is the upper limit. Set the volume control somewhere between the two limits and move the voltmeter to pin 1 of the programming socket. Hit "1" on the DTMF keypad. When the digit is pressed, the voltage at pin 1 should go from under half a volt to over 4.5 volts. Check pin 2 by sending a 2, and so on through pin 9. If the rig has the 16 digit keypad, check pin 11 while holding down digit D.

### Overall Operation Test

Program the header for a long-tone and a 4 digit sequence, and set potentiometer R9 to approximately its midpoint. Try the sequence or long-tone. If the call lamp lights but the speaker fails to activate, check the connections of U6 and K1. If the call lamp fails to light altogether, check the header programming, the wiring of U5 and the polarity of CR1 through CR6.

### Conclusions

The 4 + 1 Decoder is a versatile circuit that allows the user peace and quiet without the threat of missing a personal call or emergency callup. It's ideal for the office or wherever hearing conversations on a busy channel are not appreciated. 73

### References

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3. Model HD-1530 Touch-Tone Decoder, Heathkit Electronics, Benton Harbor MI. Auto-Kall AK-10, Motron Electronics, 695 W. 21st Ave., Eugene OR 97405.

4. Time-DTMF Emergency Decoder Kit (#LJM2RK, also called STORM-ALERT), Metheny Corporation, 204 Sunrise Drive, Madison IN 47250.

5. PC boards are available from Midland Technologies, 34374 East Frontage Road, Bozeman MT 59715, tel 406-586-1190.

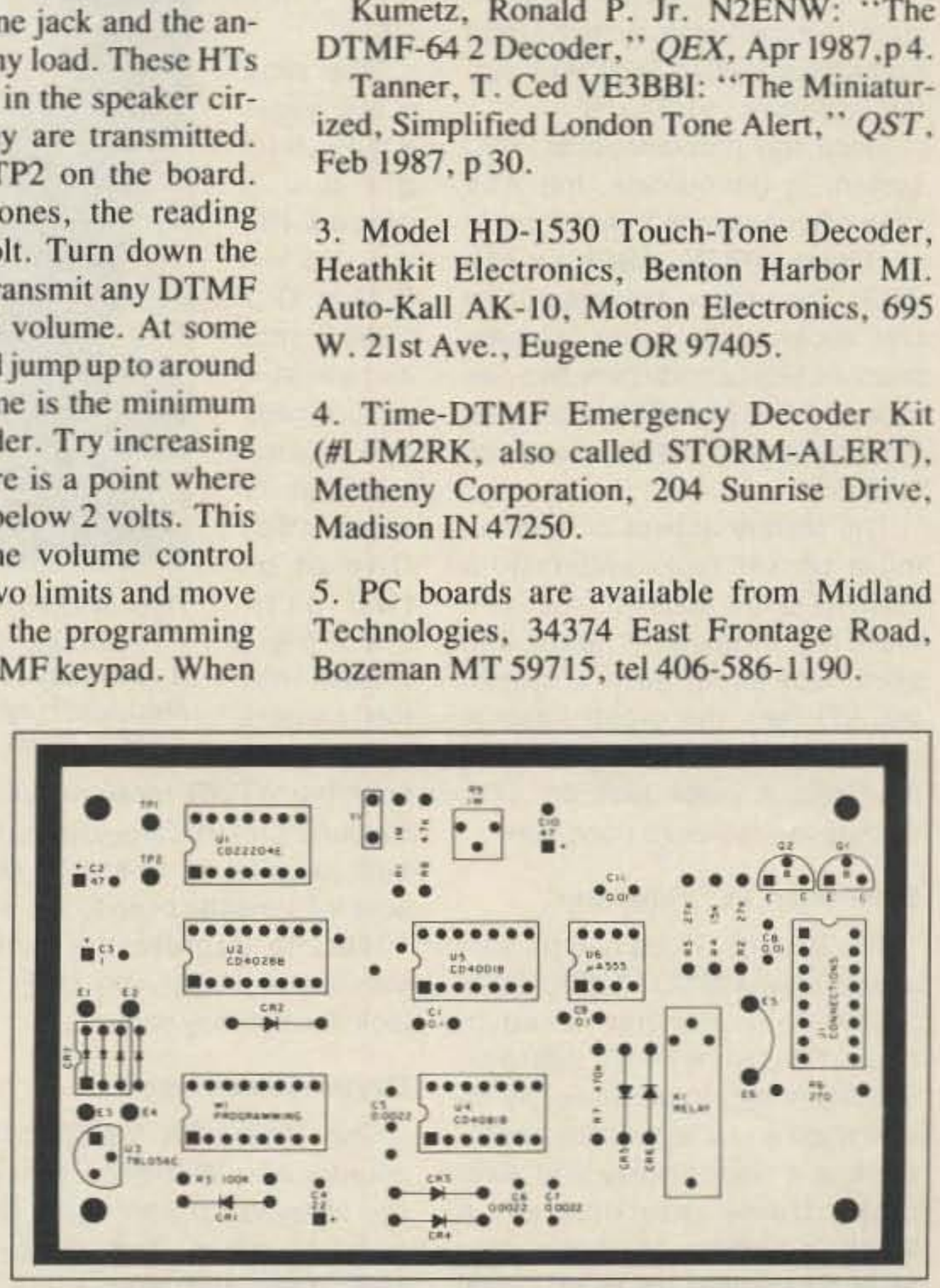

Figure 3. Parts placement on the circuit board for the 4 + 1 Decoder.

Number 19 on your Feedback card

# ATV

## Ham Television

*Mike Stone WBØQCD*
*PO Box H*
*Lowden IA 52255*

### Interfacing Packet Radio to ATV

The BRATS ATV Group in Iowa was the first known group to integrate packet radio and SSTV modes into a Fast Scan TV Repeater. The idea and application is unique and not all that complicated. Ten folks of the 40-member group went packet and six got into SSTV because of this feature.

#### Packet

The Commodore 64 is the computer for this system. It uses a direct color composite video feed output that goes to a channel input to the ATV/R transmitter. The AEA PK-64 is the system TNC. It provides large 40-column text lettering, which is easier to read on ATV. The system also doubles as a vital, wide-coverage, 24-hour packet station digipeater (WBØBIZ-1) on 145.01 MHz, all housed at the Davenport, Iowa, KWQC-TV (NBC) Studio. BRATS plans to expand this system with a Kantronics KPC-4 Dual-Port system to connect VHF to HF.

Since the data-controller TNC system is multi-mode, the ATV Club can choose to monitor packet, Morse, RTTY, ASCII or AMTOR. They place the system on CW occasionally to let listeners practice Morse code over two meters (144.340 MHz FM) and watch the characters display back on UHF-ATV.

The unique aspect of interfacing a packet radio system to a FSTV/R is the ability to see what the TNC digipeater hears and sees. Monitoring such a system via ATV lets the group keep in touch with the operating status of the TNC. A quick look on ATV, verifies the system's condition.

#### Slow-Scan TV "Repeater"

The BRATS Group had on loan at one time a ROBOT 1200C Color SSTV Converter interfaced to their N9CAI ATV/R system. BRATS hopes to permanently install such a unit to add the excitement of a color display and automatic frame rate display. A black-and-white, 16-shade gray level, 8.5 sec/picture, ROBOT 400 SSTV converter is now interfaced into the ATV system. A few years ago, these converters sold for $795. ATVers can find these converters now at hamfests for around $100! The units present a good resolution picture that displays very well on FSTV.

Audio from VHF (144.340 MHz FM) feeds into the ROBOT 400 with the composite video monitor feed jack tapped to provide the TV output. The unit is left in the AC power ON position with a system switcher activated upon touch-tone user call-up. Members send taped or real-time SSTV signals over VHF and watch them repeated (cross-band and cross-mode) on ATV! Some system users pipe in SSTV signals off of the HF bands, such as those from the Saturday afternoon W1JKF/W9NTP net at 14.230 MHz. All of UHF ATV-dom can enjoy the show without investing one dime in SSTV!

One time a few years ago, our group placed the on-line ROBOT 1200C into automatic picture-camera snatch mode at 72 seconds. One of us fed processed video into the camera input jack from the ATV/R receiver output. Stations on UHF would put their best pictures on at 439.25 MHz, hold for a minute or so to allow the 1200C to capture the locked frame, then unkey on UHF and look at what they sent!

*Bob W7KPW of the Central Texas ATV Group. He's at the 1450' level of a remotely-located W7KPW ATV/R Repeater system pointed toward Austin, Texas.*

#### Dayton Draws Near!

The 1988 USATVS/Spec-Com Journal ATV Workshop sessions are shaping up with some great guest speakers. This group will meet again this year at the Ramada Inn North (I-70 & I-75) in Suite 212. Ride one of the shuttle buses over from the Hamvention on Friday or Saturday to attend.

The room will open at 5 PM Friday night with the programs beginning at 7 PM. Bill Brown WB8ELK from the Findlay, Ohio, ATV Group is one of the slated guest speakers. He will discuss his group successful launching and operation of last summer's helium- filled balloon carrying two meters and UHF ATV. John Beanland G3BVU of Spectrum International will talk about how to use bandpass filters to get rid of QRM.

Saturday's session opens at 3 PM, and the evening programs begin promptly at 7 PM. Two reps from the BATC ATV Club in England will speak on the state of Ham TV in Europe. Tom O'Hara W6ORG has another good line up for ATV forum meeting this afternoon. This columnist will give a short presentation on how to bedeck with bells and whistles an ATV repeater system. The smallish suite room holds 30–40 sitting people, and has standing room for a few more.

I'll be at the in-room bar keeping all refreshed, as last year. There is a $1/session door admission to help pay for the $100/night room. Come early to get a good comfy seat and — please — leave your cancer sticks in the car. Talk-in at Dayton for ATVers is on 147.450 MHz simplex FM (the ATV sound channel input) or 144.340 MHz FM. With luck, there will be a working station in the room monitoring the Dayton ATV/R system.

Don Miller W9NTP will hold his annual SSTV get-together at the Holiday Inn North, not far from the Ramada. Fred Sharp W8ASF of Timekit will team up with John at the Spectrum International booth in the main arena. The weather facsimile folks will meet on Sunday morning.

#### VCR Library

After nearly a year-long absence, the "A5 Videotape Library" is back in full swing to USATVS members! A new catalog list is out and available to USATVS Members for only a SASE. Tapes include FCC lectures, ATV demos, hamfest shows and forums, NASA space films, ARRL releases, overseas TV video exchanges, FSTV DX tapes, "R"-rated TV bloopers, and club system presentations. USATVS Members may borrow or obtain duplicate copies of established programs for a slight fee.

#### New Book Reprints

Ralph Wilson WBØESF of ESF Copy Services 4011 Clearview Lane, Cedar Falls, Iowa 50613 has a few new "A5/Spec-Com Reprint Booklets" on the market. Booklet #100 are copies of the "sold out" *Everthing You Always Wanted to Know About ATV But Were Afraid to Ask* manual. Booklet #101 is a new release full of information about building ATV repeaters. Booklet #108 is on packet radio. He has several other booklets, all 100 pages or more in content on RTTY, satellites and TVRO, facsimile, SSTV, computers, UHF antennas, and construction projects. The booklets are well worth the money at $10 each. Include an extra dollar for return postage. Also look for them on sale at Dayton at the ATV Workshop sessions.

#### Frequency QRM Letter

Finally, a word about the frequency coordination problem violations against ATVers. The USATVS drafted up a 3-page letter with several addenda information sheets, charts, and tables about ATV Interference. This letter went to nearly all ARRL-recognized Frequency Coordinators, some ARRL and FCC Officials, and key USATVS committee members. Copies are available for a double-stamped SASE. This type of thing should have been done years ago, to avoid a lot of unnecessary misunderstanding and problems.

Hopefully, a better understanding and alertness of ATV groups around the country will at least temper the ignorant and prejudiced manner in which some FCs are acting. Register those ATV/R systems! Refer area FCs to this letter on any future problems or QRM correspondence. 73s de WBØQCD. 73

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**WHAT ELSE DOES IT TAKE TO GET ON ATV?**

Any Tech class or higher amateur can get on ATV. If you have a camera you used with a VCR or SSTV & a TV set, your cost will just be the TC70 and antenna system. If you are working the AMSAT satellites you can use the same 70cm antennas on ATV.

DX with TC70-1s and KLM 440-27 antennas line of sight and snow free is about 22 miles, 7 miles with the 440-6 normally used for portable uses like parades, races, search & rescue, damage accessment, etc. For greater DX or punching thru obstacles: 15 watt p.e.p. Mirage D15N or 50 watt p.e.p. D24N or D1010N-ATV.

The TC70-1 has full bandwidth for color, sound, like broadcast. You can show the shack, home video tapes,computer programs,repeat SSTV, weather radar, or even Space Shuttle video if you have a home satellite receiver. See the *ARRL Handbook* chapt. 20 & 7 for more info & *Repeater Directory* for local ATV repeaters.

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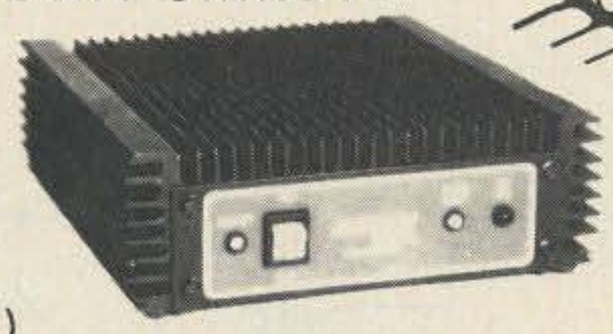

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(optional) 15 watts RF out.
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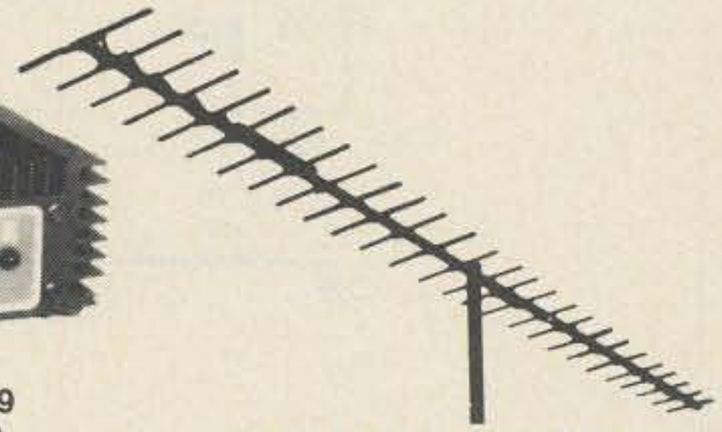

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# QRP

Number 20 on your Feedback card

## Low Power Operation

*Mike Bryce WB8VGE*
*2225 Mayflower NW*
*Massillon OH 44646*

With spring comes hamfests. For the home-brewer, hamfests are the largest single supply of parts. Almost 80% of the components in my home-brews come from hamfests!

With the exception of some Radio Shack parts and parts from mail-order suppliers, the components in my shack come from the different hamfests that I attend each year.

### Dayton!

The Dayton Hamvention, which again will become a large meeting place for QRP operators, will be held on the last full weekend of April. Hamvention '88 will provide lots of eye-ball QSOs with other low-power enthusiasts. There will be a QRP forum held on Saturday. There will again be several guest speakers this year. I'll be there talking about home-brewing in the '80s. Last year it was standing room only, so come early to get a good seat!

The QRP banquet will also be held on Saturday night. Bob promises to find us an outstanding place for the QRP dinner this year.

### Don't Delay

Time is running out for to reserve lodgings for the convention. Myron Koyle N8DHT furnishes the reservation procedure. Send the following to: The Reservations Chairman, Myron Koyle N8DHT, 1101 Miles Ave. SW. Canton, OH 44710:

- Name and call
- Address
- Telephone number
- Room nights wanted (Thursday, Friday, Saturday, Sunday)
- Check made out to the Belton Hotel for one night's lodging ($55).
- Three SASEs (Self-Addressed Stamped Envelopes)
- Roommate's name, call (if there is one), address and phone number.

Many will remember that Dayton adds a room tax. For now, however, just send in the basic daily rate.

Myron records the name(s) and deposit and forwards both to the hotel. The hotel then sends the confirmation to him. He then records the verification and sends it back to the guest in one of the SASEs. This method ensures that the guest and the hotel work with only one person, which minimizes the chances of a foul-up.

Those who already made reservations with the Belton and didn't go through Myron should check with him to make certain that their names are on his list. The hotel will use only Myron's list to hold rooms.

Only one of a pair of roommates needs to contact Myron and send in a deposit. Remember, however, that if the person who made the deposit cancels out and gets a refund, the hotel cancels the room reservation! Be sure to coordinate efforts and not miss out on the outstanding QRP happenings this year at Hamvention '88!

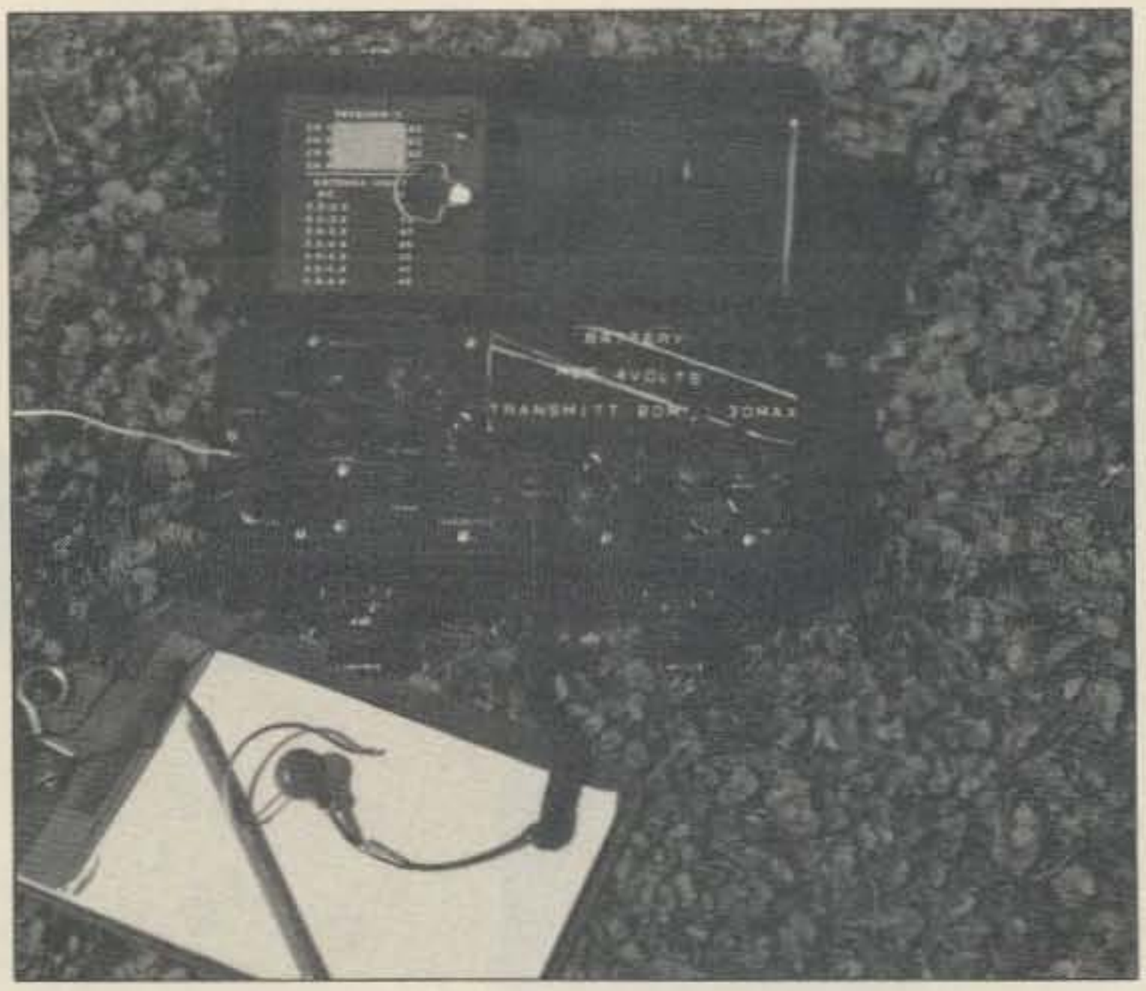

*Photo A. The AN/PRC-64 right at home, in the field.*

### Military Surplus

This is a great source of parts. Not all military surplus weighs over a ton—a lot of it was made to be man-portable. Michael Tyler WA8YWO writes to tell about a rather unique military surplus radio, the AN/PRC-64. This

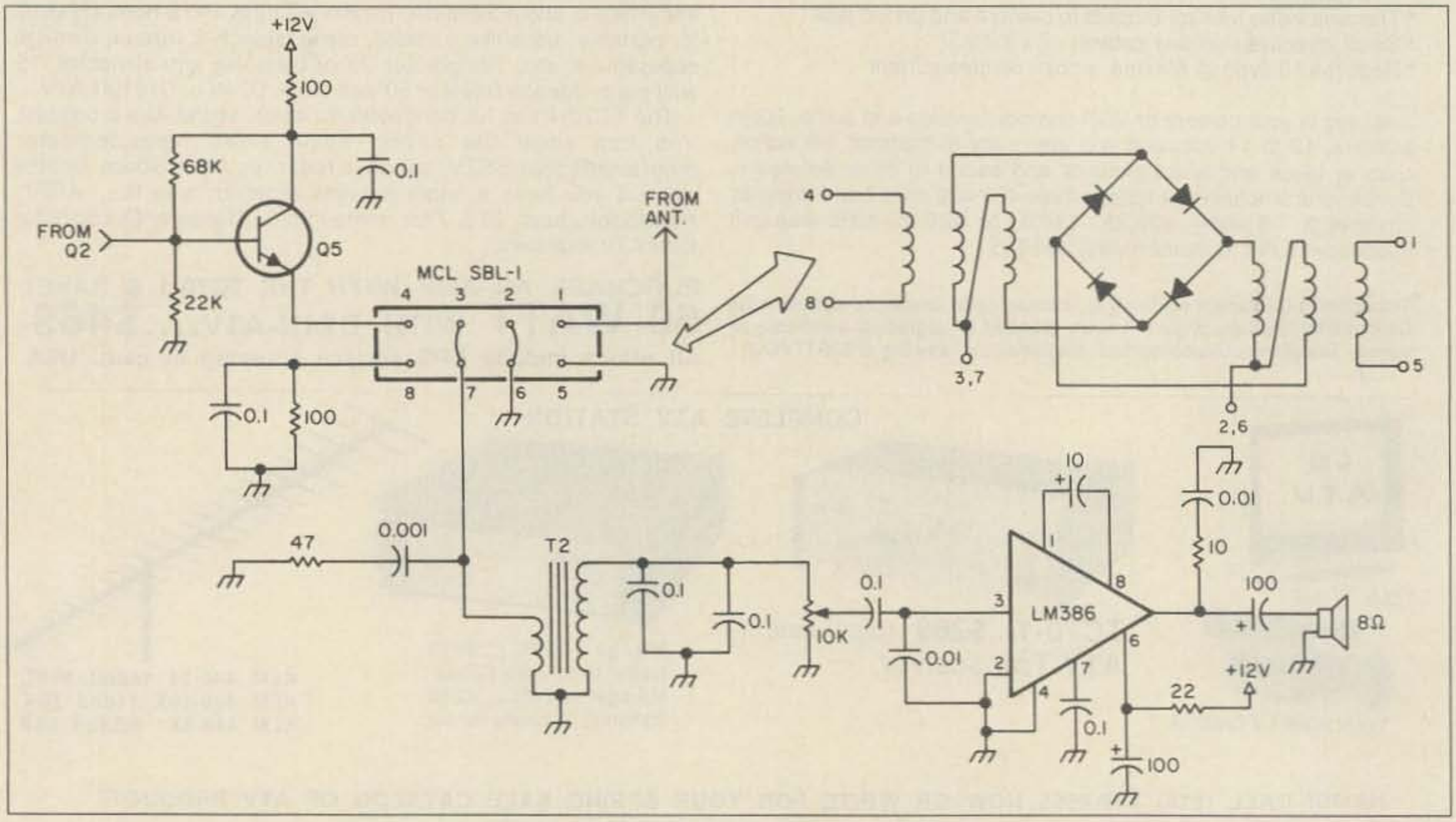


*Figure 1. Original Two-Fer receiver schematic.*

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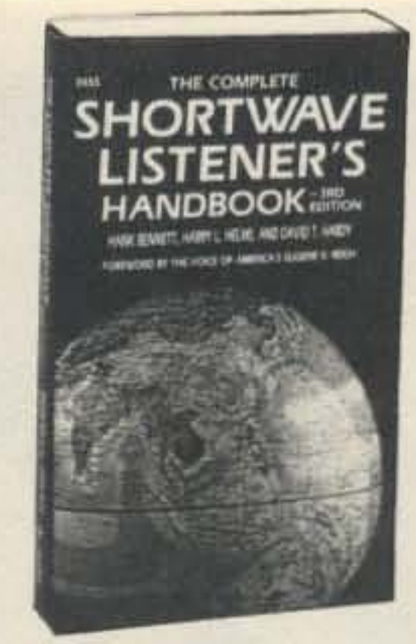


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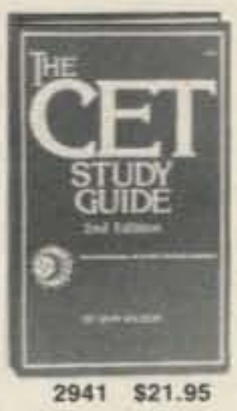


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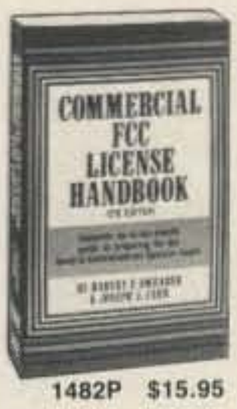


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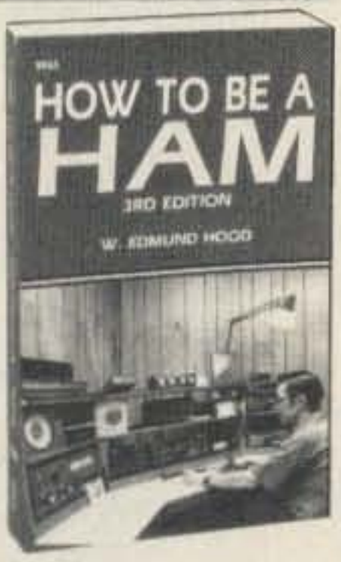



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STAR-488

**CIRCLE 128 ON READER SERVICE CARD**

*Photo B. All homebrew equipment from my shack. Most was built using hamfest parts.*

*Photo C. Why are all the people smiling? Could it be that I left the table to take this photograph? Or perhaps the good time all were having at the QRP dinner at the Dayton Hamvention. Left to right, Terry, N8ATZ, Dave, WD8AYE, Steve, N0CZV, and his wife Becky.*

relates to the PRC-64, a military surplus transceiver. It has four crystal-controlled channels, five watts CW and 1.5 watts AM voice. The radio operates from 15 "AA" batteries. It is 5" X 4.5" X 10" and weighs in at only seven pounds with the batteries installed. The transceiver is also waterproof. This little rig will load into a dipole or a long-wire antenna thrown over a tree limb via the built-in antenna tuner. Tune up is very simple using the on-board peak indicator. The frequency range for this rig is 2–8 MHz, perfect for the 80 meter and 40 meter ham bands. Look through the Fair Radio Sales catalog, and keep an eye out at hamfests for an AN/PRC-64 (see Photo A).

Since the transceiver is crystal-controlled, you'll need a handful of rocks on your favorite frequency. Write to Jan crystals for their catalog.

### Two-Fer Revisited

A lot of letters asked about the receiver section of the Two-Fer. I intended on waiting until John reworked the receiver, but the response from the Two-Fer prompted me to include the original receiver's schematic in this month's QRP column.

Oscillator energy (from the Two-Fer transmitter) is coupled to Q5, an emitter follower that provides +7 dBm to the mixer without loading the oscillator very much due to its high input impedance. The circuit is borrowed from the HW-8, which uses two of them.

### The Circuit

The series capacitor/resistor to ground terminates at RF the output of the SBL-1 DBM. The audio is then applied to T2, a Radio Shack 1kΩ transformer. It steps up the audio voltage about 11 times and fairly well matches the 50Ω impedance of the DBM to the 10kΩ pot (volume control). The two 0.1µF capacitors across the secondary resonate it at 720 Hz giving about a 500 Hz bandwidth response and a nice clean waveform.

An LM383 amplifier chip is used for the audio section of the receiver. Don't forget to install the large capacitor from the 12-volt supply to the chip to keep the chip happy.

Last month I showed how to make trifilar toroids. Use that to homebrew a toroid if the SBL-1 can't be found. To wind the core, use ten trifilar-wound turns of #24 gauge wire wound on a FT-37-61 core. Use four matched 1N914 diodes. Use a VOM set on the ohms scale and check each diode for the same resistance. This is the way I match diodes for my mixer projects.

Now it should be clear why the transmitter's oscillator runs all the time—the receiver requires it. Note that the receiver is based on the direct conversion scheme.

There are *no* PC boards for the receiver. Use either perf-board or the "ugly construction" method. Keep all the RF leads short. Use shielded cable from the Two-Fer transmitter to the receiver. Since there are no adjustments for the receiver, it should fly on power-up. Just remember that the transmitter section of the Two-Fer is needed for the receiver to work. The crystal oscillator supplies injection for both the transmitter and the receiver. Those handy with circuit switching can use a different source of RF for the mixer.

Since there is considerable interest in the Two-Fer, the QRP ARCI offers a rather attractive plaque. Winners have their names engraved on the brass plate on the front of the award.


*Photo D. Who will be the first to win the Two-Fer competition plaque?*

### Elmer SK

Glen Raudebaugh NR8Q, the one responsible for getting me involved in QRP, is now a silent key.

I recall going over to Glen's house and watching him work stations using only an HW-8 and some magnet wire thumb-tacked to the corner of his ceiling. Many a Field Day Glen and I worked QRP with a homebrew rig backing up the HW-8. Glen was very active within the Findlay Radio Club—he helped run the hamfest for several years and held office for the club.

Glen was only 35. Amateur radio lost an outstanding ham. I lost a close friend. 73

# ABOVE AND BEYOND

## VHF and UHF Operation

*Pete Putman KT2B*
*3335 Fieldstone Drive*
*Doylestown PA 18901*

### In Praise of 13cm

This month's column goes above, beyond and way out with a look at a nifty transverter kit for the 13 centimeter (2304 MHz) microwave band. It's the LMW Electronics 2304TRV1K, manufactured in England and imported for the USA by Down East Microwave of Troy, Maine.

LMW manufactures a variety of UHF products, including assembled transverter units for 903, 1296 and 2304 MHz, with power outputs in the 2–6 watt range. The options are endless, including outboard preamplifiers and internal sequencing boards. I elected to build up one of the kits (A) to save a few dollars and (B) to try my hand at some microwave construction.

### Transverter Schematics

The heart of the LMW transverter is the Universal Local Oscillator board, or ULO (see Figure 1). This is a stable LO for microwave use that uses relatively few parts, is easy to fire up, and delivers plenty of output.

Both the 1296 and 2304 transverters use the ULO. For 1296 operation, the crystal frequency is 96 MHz, which multiplies 12 times to 1152 MHz (1152 + 144 = 1296). For 2304 operation, a 90.667 MHz crystal multiplies 12 times to give 1088 MHz. This is doubled to give 2176 MHz (2176 + 144 = 2304) on the transmit and RX mixer boards .

Figure 2 is the schematic of the RX mixer. T1, a 2N918 is used as the oscillator powered from an 8-volt regulator. T2 is a 2N5179 which works as a buffer/doubler stage and drives T3, a BFR91 tripler. Another BFR91 works as a doubler and the output is fed to yet another BFR91 Class-A amplifier. The outputs are derived from a 3 section filter at two points, providing both low and high level LO injection.

I bought the ULO, transmit mixer, receive mixer, IF amplifier and a chassis from Bill Olson of Down East during the Pack-Rats Hamarama in October 1987. Each individual board came in a ZipLoc bag with instructions, a schematic and several bags of parts.

### Parts only Partly There

The first thing I did was to check the parts against the parts list and found a number of items missing from each board. For example, all five low-level amplifier stages and a mixing diode were missing from the TX mixer. Some capacitors and a mixing diode were missing from the RX mixer as well. On the other hand, the ULO kit contained two 2N5179 transistors instead of one which turned out to be a happy accident, as the 2N918 oscillator transistor simply would not work.

Bill said there were problems with kit packing in England, and he began packing the kits on this side of the Atlantic. The missing parts showed up promptly from Maine via First Class mail, and I set about to work.

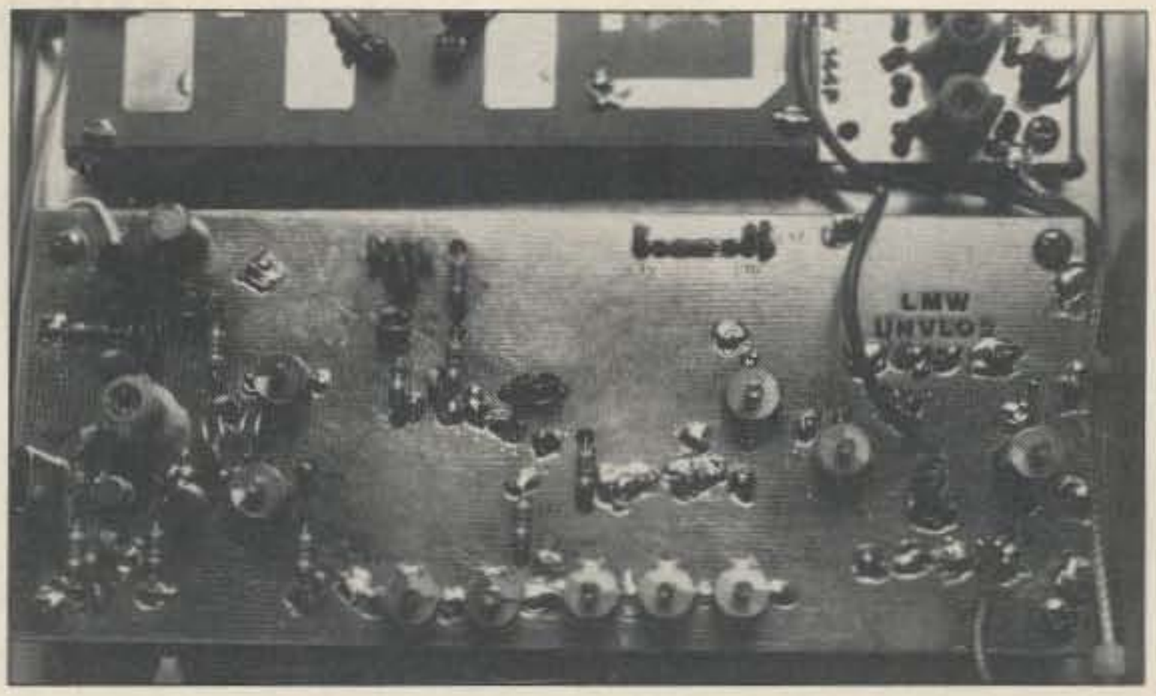


*Photo A. Top view of the ULO board. Note the crystal oscillator to the far left. TX/RX outputs lie on the right.*

### The ULO

This took little time to assemble. It shouldn't take more than about 2 hours to wire one and briefly test it. As mentioned earlier, not detecting output from the 2N918, I replaced it with the spare 2N5179, and the output shot right up! All stages are easily tunable with a diode probe and VTVM. One construction note: The interstage coupling capacitors after Q3 are extremely small and fragile chip capacitors, which cannot withstand much heat. The instructions suggested heating and tinning the PC board pad, allowing solder to flux over the ends to make a secure connection.

The pictorial diagram shows the approximate position of the trimmer capacitors for full output. Setting them as prescribed, with just a bit of tweaking, yielded just that. I connected each output to my Boonton 92 RF Millivoltmeter for the final alignment—not necessary but very helpful. The manual claims 40 mW at point "Y" and 10 mW at point "X", which seems like quite a bit of LO injection at first glance!

There is, however, a good reason for it. Both the TX and RX mixer boards double the LO frequency before injection. In the case of the RX mixer, that is accomplished by a pair of Hewlett-Packard HP2817 hot-carrier diodes–certainly not a scheme with lots of gain, but effective. The TX mixer board also uses two HP2835 diodes as a ring mixer, with an NEC 85637 transistor as the doubler.

I measured nearly 50 mW from the "Y" port and 12 mW from the "X" port, so the manufacturer's specifications were up to snuff. The output was also checked with a frequency counter and trimmed to 1080.00 MHz after sitting for 30 minutes. The display still sat on 1080.00 MHz 30 minutes later—very stable indeed.

### RX Mixer, IF Amp

Photo B shows both these boards in the completed transverter case. LMW describes the RX board as a "Low Noise Preamp, Filter and Mixer" stage. The design is very simple (Figure 3). It uses just four active components: a Hewlett-Packard HXTR3645 bipolar transistor (T1), an NEC 85637 bipolar device (T2), and the two HP2817 diodes mentioned earlier.

T1 functions as a low-noise (2 dB NF) amplifier stage driving T2, which also has about a 2 dB noise figure. The 2300 MHz signal is then mixed in the interdigital filter with the doubled LO signal to provide output at 144 MHz, and not much output at that. Total conversion gain is only on the order of 8 dB with a 4-dB system noise figure, which is the reason for the IF amplifier stage.

This is nothing more than a 2-meter low-noise preamplifier using a BF981 MOSFET to develop nearly 20 dB gain with about a 1.5 dB noise figure. The total sys-

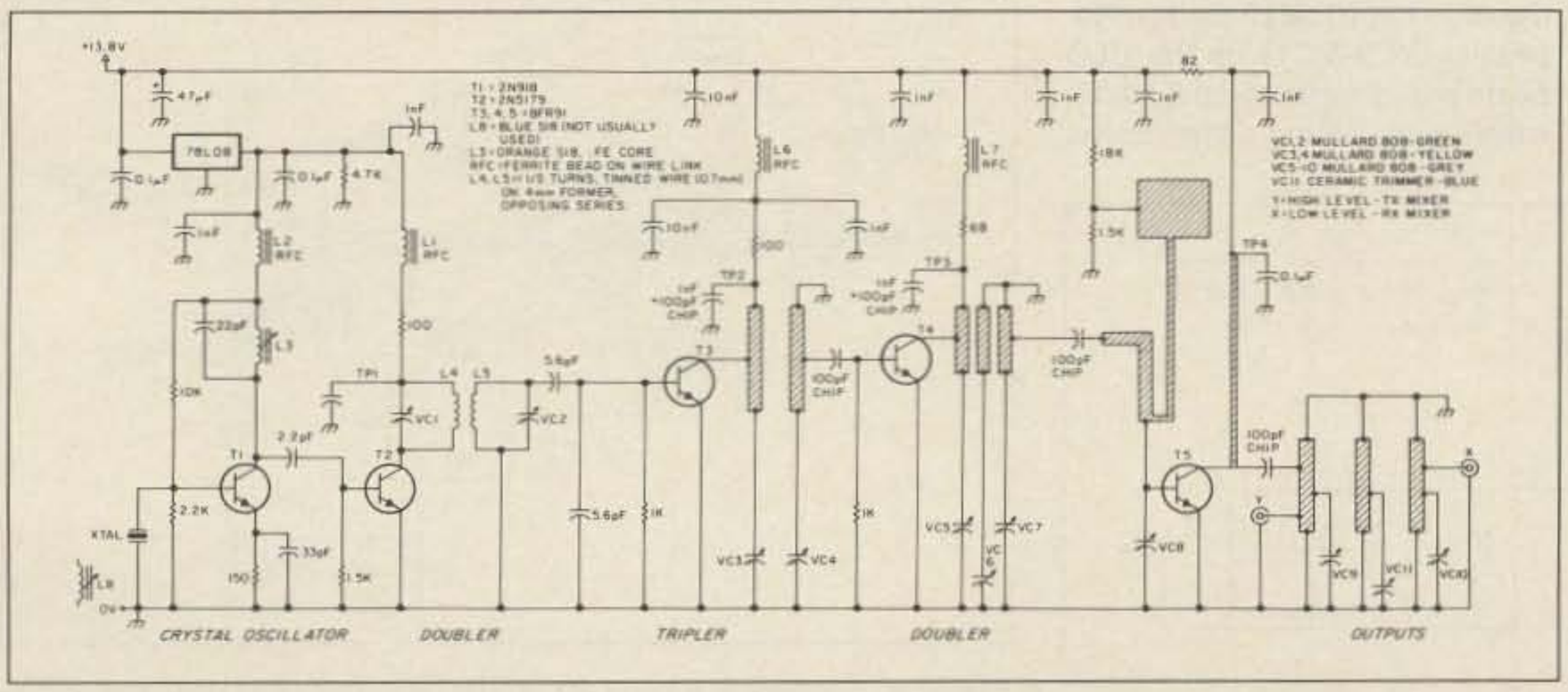


*Figure 1. The Universal Local Oscillator schematic—the heart of the LMW transverter.*

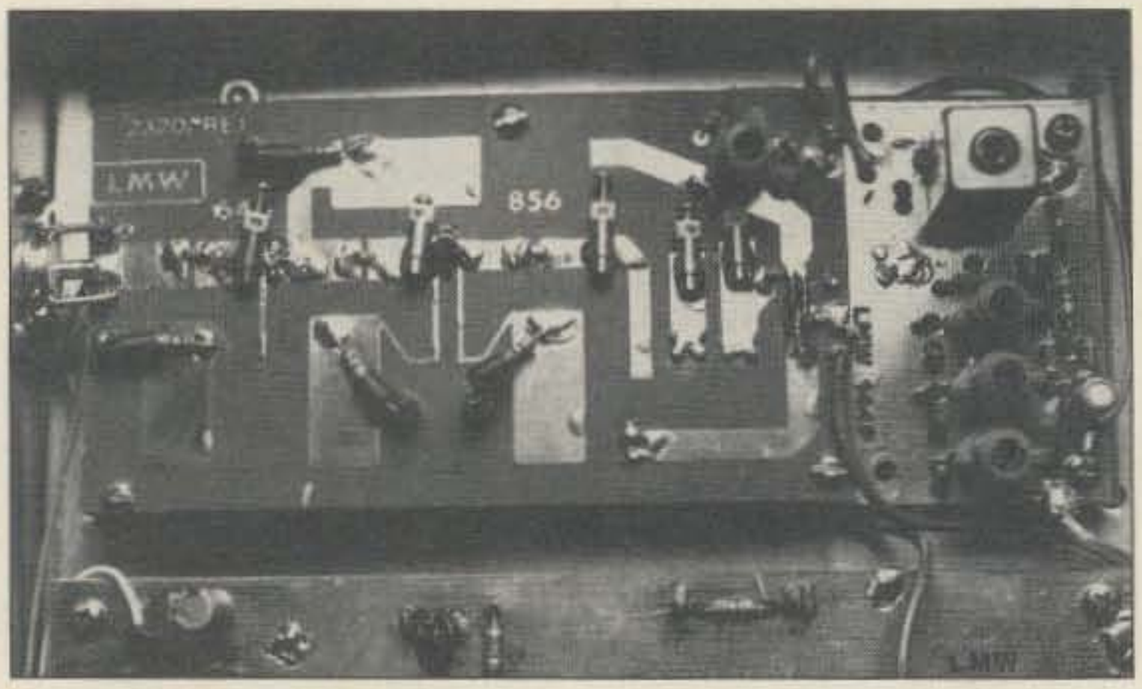


*Photo B. 2320 PRE RX mixer (left) and 144P IF amplifier (far right) boards in the transverter case. The diode mixer/doubler is to the immediate right of the RX mixer.*

tem conversion gain then works out to about 28 dB with a 5–6 dB noise figure. I found this level tolerable for 2304 weak-signal work.

Both boards go together in a snap! The bias networks and DC connections are soldered below the RX mixer board, strung in between the various feedthrough capacitors. (One note about these feedthroughs: the pre-drilled holes were too small and had to be enlarged with a hand drill. Be careful to not damage the etched inductors and tuned lines.)

The two transistors should be installed last, since they are extremely small and fragile. I tack-soldered one lead on each device to hold them into position on the board, then gently flux-soldered over the leads to minimize heat problems.

The IF amplifier board assembly is conventional, but one must take care to protect the gates against static electricity when installing the BF981. Unplug the soldering iron and make sure the board is grounded. Assembly time for both boards is two hours. The IF amplifier tunes up easily when using a signal source at 144 MHz and a receiver, since maximum gain is close to best noise figure.

The RX mixer board requires a signal source at 2304, which could be the 16th harmonic of 144 MHz. Dave Mascaro WA3JUF of the PackRats was nice enough to tune my RX board up with a microwave oscillator and spectrum analyzer probe, after which he determined the noise figure to be 4–5 dB, and the conversion gain to be 8 dB. These are close to the specs. Incidentally, LMW does make an outboard GaAsFET preamplifier using an NEC 72084 device for 2304 MHz. I strongly recommend purchasing it, as it yields about 10 dB gain with about a 1.5–2-dB NF, and makes a big difference in received signal strength.

### To Be Continued . . .

The IF amplifier input may need retuning once it's connected to the output of the RX mixer board. The ULO input to the RX mixer will almost certainly need repeaking. When I initially tested the RX mixer on the air, I couldn't hear a peep from two nearby stations which should have been S-9 plus. A quick check with the Boonton 92 and counter showed insufficient injection of the 1088 MHz signal to the HP2817 diodes. Repeaking VC9–VC11 on the ULO board brought it up another 10 dB, which made all the difference as both stations were now S9 + 20dB! The GaAsFET preamp increased signal levels a bit more and also improved the signal to noise ratio.

At this point, I had a working local oscillator, preamp, mixer and IF amplifier for 2304 that was percolating nicely. Despite missing parts and somewhat hard-to-read pictorial diagrams, assembly was relatively painless. The next step was to build up the TX mixer board and this turned out to be quite a job in itself! We'll cover its assembly and the final on-air tests next month.

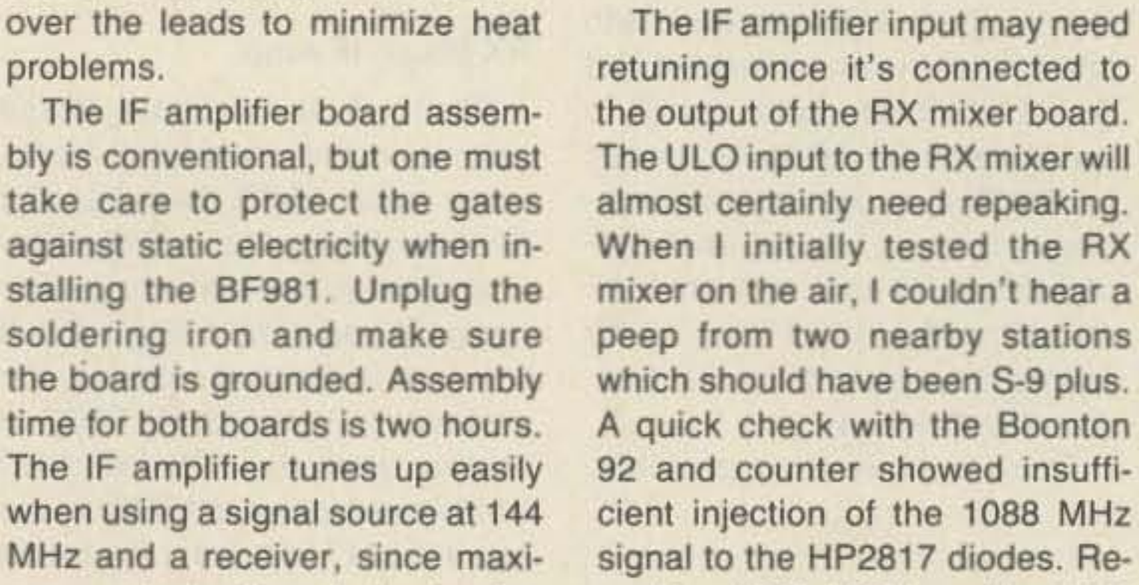


*Figure 2. The RX mixer schematic.*

## JANUARY VHF SWEEPSTAKES

This time I opted to stay off the mountains and out of the maternity wards to operate from the confines of my warm and cozy shack. Activity levels were excellent on all bands except 6 meters, which was a bit of a puzzle—after all, there were no football games to distract from or interfere with.

In my shack, an IC-740 drove a Microwave Modules MMT 50/28S linear transverter, with a Mirage A1015 running 125 watts to a 7-element KLM yagi at 35 feet. This is a real compromise 6 meter set-up, as soon explained.

The 2-meter lineup was the IC-740, MMT 144/28R, and a Mircowave Modules MML-200 amplifier running 150 watts to a Cushcraft 32-19 Boomer at 53 feet. The 220-MHz setup was the IC-375A feeding a Mirage C1012 running 120 watts to a Cushcraft 220 Boomer at 60 feet, and 432 activity was had with the IC-475A driving a Mirage D1010, developing 100 watts to a pair of Tonna 21-element yagis at 63 feet.

On 903, I used the SSB Electronics LT-33S to drive directly into a Down East Microwave 33-element loop yagi at 40 feet. An LT-23S was used on 1296 to feed an Adler cavity amplifier which pumped 80 watts to a 55-element Tonna at 65 feet. Finally, the LMW transverter ran a modest 300 milliwatts to a 45-element loop yagi at 40 feet. ARS KT2B was active on seven bands, six of which averaged 100 watts to single yagis in all but one case.

### The Results

The final tally was 598 QSOs in 75 grid squares, including 11 QSOs on 2304. Some commonly-worked grids weren't logged this time, but a few surprises showed up on the bands and were quickly added to the log. Perhaps the biggest success was that no equipment failures occured, no water built up in the coax, and no rotors seized up!

UHF activity levels were excellent. I logged 90+ QSOs on 220, 110 on 432, and nearly 50 on 1296. Even 903 is quickly becoming popular—I bagged 22 stations in 6 grids. One can certainly make a lot of contacts with 150–200 watts on 2 meters during a contest. I bagged nearly 230, but probably could have increased that score substantially by running the 800-watt linear. When surrounded by stations running high power, it's hard to break through the QRM to a distant station, especially if it's near 144.200. The extra 6-dB can make all the difference!

Lastly, for those who haven't run the VHF Sweepstakes yet—why wait? I can't think of more stay-put fun to have during the cold January winter. There are more stations on during this contest than any other during the year, and it's a great "under the gun" way to evaluate your station. See you next year for the SS! 73

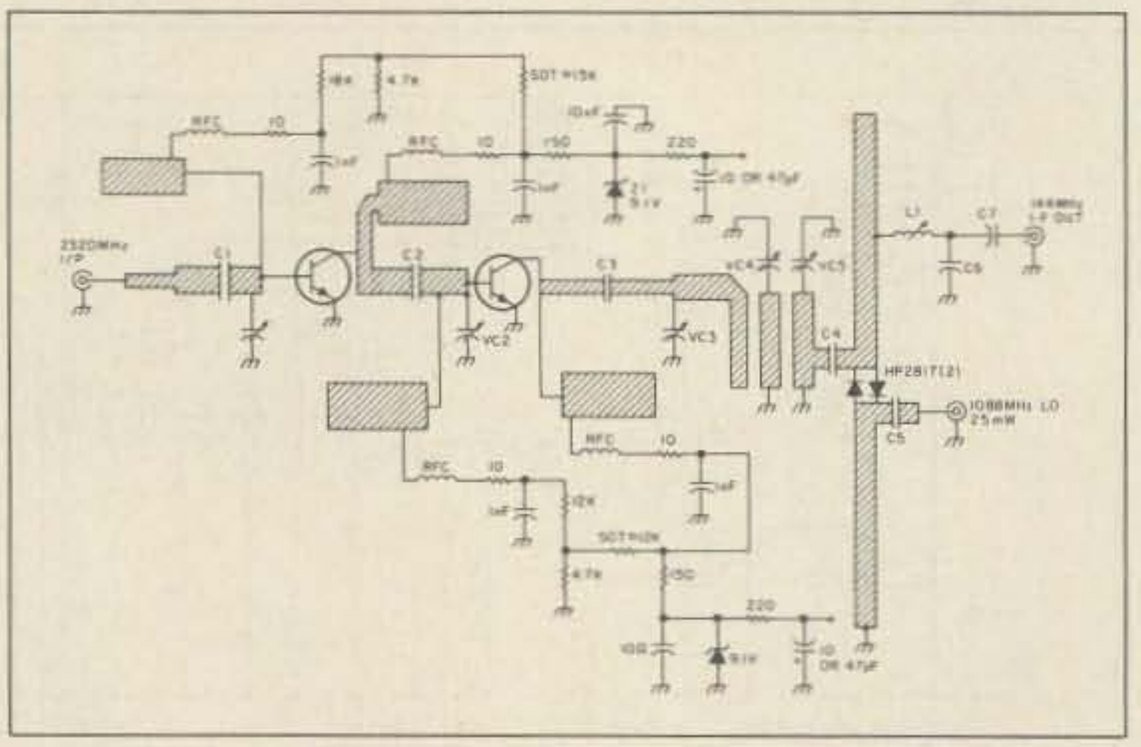


*Figure 3. Schematic for the RX mixer circuit. It uses only four active components.*

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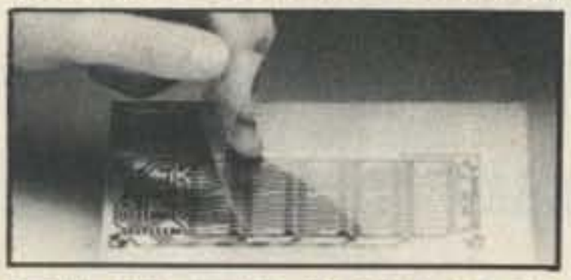

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### Packet in Emergency Communications

Ask almost any packeteer, and they are likely to tell you that packet radio is a natural mode for emergency and public service communications. Upon asking why, the answer may be, "It is error free," or, "Many people can share a channel." These responses, however, do not reflect an understanding of emergency communications needs. They're important, but they're not sufficient.

I have been involved in two large Simulated Emergency Tests (SETs) performed by the National Disaster Medical Service (NDMS). These events were very enlightening. The first test flopped monumentally as far as packet radio was concerned. Our group was able to pass only two or three pieces of traffic the entire day. There were several problems:

1. A critical digipeater failed.
2. Many of the operators didn't really know packet operations.
3. Many of the packet stations had not been tested beforehand.
4. There were no in-place procedures.
5. Connected-mode AX.25 did not facilitate the free flow of messages from one point to many points or from many outlying points to a single central collection point.

The second SET was a success for packet radio largely due to the efforts of Bob Bruninga WB4APR. Bob noticed that most of the messages were short and would fit into a single packet. Inspired by this observation, he wrote a program for the Commodore-64 that sends each message as an unconnected packet and receives acknowledgments the same way. In other words, this protocol sent each message as a "datagram" using the unconnected mode of the TNC. Bob also gathered together the equipment and operators ahead of time to ensure that the stations worked and that the operators knew how to use the software and equipment. Bob's successful experience with this SET later proved useful in moving a large amount of health-and-welfare information for a real emergency.

About a year ago there was a serious train wreck in Baltimore, Maryland, involving a large number of injured and significant loss of life. Again Bob Bruninga was on the scene. Bob had a complete battery-operated station in a briefcase, which he quickly put to work moving information into the W3IWI BBS. Tom Clark W3IWI removed the information locally and redistributed it via VHF and HF. All the traffic flowed efficiently and in a timely manner. Here, the connected mode of AX.25 was quite useful since, essentially, only two packet stations took part.

Looking at these cases more closely, note several common factors contributing to packet radio's success here:

1. Trained operators;
2. Pretested and preconfigured equipment; and
3. A knowledge of the type of communications so an appropriate mode can be selected.

Many hams often ignore the third element. Sometimes voice is the best way to move information; at other times the telephone. A ham isn't necessarily "cheating" by using the phone or removing his fingers from the keyboard and talking into a mike.

Hams tend to be communications specialists. Many understand both voice and data communications. Many are technically qualified and can use their knowledge and equipment to enhance communications when existing emergency communications are overloaded or broken down. It's usually more efficient to help shore up existing emergency communications than to offer a new and unfamiliar system to the responsible authorities.

The key to successful emergency and public service packet communications is careful planning and preparation. Make attempts to establish guidelines and procedures in conjunction with the local NTS, ARES, RACES, Civil Defense, Red Cross, City, County, State, and Federal emergency planners. Without this, it's VERY difficult to provide USEFUL service during an emergency. It's too late to begin at the time of the emergency.

The following few paragraphs are some ideas on improving emergency packet communications.

***"(Bob WB4APR's) protocol sent each message as a "datagram" using the unconnected mode of the TNC."***

### High-level Network Services

The packet community should take a great interest in Bob's unconnected datagram program for the C-64. It's a first attempt to tailor a system to disaster communications needs. It worked where a BBS would have failed miserably. Bob's success reveals the general need to define the required kinds of packet communications, and thus the software needed.

### Fully-Automatic Mail System

This would deliver mail to the destination system and perhaps even print a copy of the message. This would be a godsend in an emergency situation. The operator need only tear off the message and hand it to the recipient. The originator addresses the mail to user destination. The networking protocol structure would release the operator from the need to know the message routing.

### Automatic File Transfer Protocol

Like the mail service, this should be able to deliver any type of file—binary or ASCII—to the recipient without a great deal of operator intervention. Simply tell the system where to put the file and let it do the rest of the work.

### Keyboard-to-Keyboard Mode

This would allow chatting or exchanging timely information.

All of these services should be able to run concurrently. The operator should be able to send mail, receive mail, send files, receive files, and carry on a QSO with several stations concurrently. It should be fully automatic so that the operator need only initiate the desired operation while the network does the rest of the work.

Since the data is digital, packet radio has the ability to move information other than ASCII text. Imagine the service offered by carrying a portable packet station to the site of a disaster, capturing an image of the damage, storing it inside the computer, and then finally transferring the digital image to the appropriate agency via packet radio. This is now possible!

Another area of interest is using digital voice messages. A fast packet network can move voice as well as other data. Current technology allows transmission of fully understandable voice data at 2400 bps, or telephone quality voice at 9600 bps.

How about facsimile? Most of the fax units manufactured today are digital units designed to move data over a telephone line using a modem. Why not pipe that data stream into the packet network to transfer the documents?

Packet radio has many possibilities for emergency, public service, and even just-for-fun use. Evaluate the need and then apply the appropriate technology. Don't try to replace HTs and repeaters with a packet station—the HT will win. On the other hand, there are many applications for packet where voice can't serve. Pursue those and let packet radio take its unique place in emergency and public service communications.

### TCP/IP on Packet with net.exe

The previously promised review of the KA9Q TCP/IP networking code for the IBM-PC, Commodore Amiga, and Apple MacIntosh, dovetails nicely with the "wish list" above.

The TCP/IP package written by Phil Karn KA9Q is a comprehensive implementation of the Internet Protocol Suite used commercially and by the Department of Defense for connecting different computers together using dif-

ferent and possibly incompatible underlying networks. TCP/IP is designed to run on top of other networks by inserting or encapsulating the TCP/IP packets inside the packets recognized by other networks (such as enclosing TCP/IP packets inside AX.25 packets). This technique of running a single simple standard protocol on top of other networking protocols is called internetworking. This led to the creation of the Internet Protocol (IP).

The KA9Q net package includes all the items mentioned in the wish list. A packeteer can do ASCII and binary file transfers, electronic mail, and keyboard-to-keyboard QSOs all at the same time with the same or different users.

The user needs an IBM-PC(lone), a Commodore Amiga, or an Apple MacIntosh to run the KA9Q net code. The system TNC needs the KISS protocol (all TNCs from Kantronics and AEA have KISS built-in and KISS ROMs are available from TAPR for TNC-1s and TNC-2s). What follows is based on my experience with the PC version of the software, since my system uses a PClone.

Now for the software. The PC package is distributed on two or three diskettes, available from either Kantronics or TAPR. The three diskette set with the preconfigured disk is especially nice.

The files autoexec.net and bm.rc need some minor changes. These two files contain all the configuration information to allow the user to tailor the software to his station. This is the most difficult part of installing net.exe, but it is very clearly described in the documentation. The documentation has a tutorial that goes step-by-step through the configuration process.

Those with the two-disk set need to use the provided archive program to extract the files that make up the distribution, and place them on a floppy or the appropriate location on a hard disk. Once this is done, simply edit the configuration files and go from there. This is described quite clearly in the README file included on the disk.

Net.exe needs a network address to run. The only requirement is that this address be unique relative to all the other users. There is currently a plan to assign addresses on the basis of general location. Most parts of the world already have someone to assign addresses in a given area. Users who can't find someone to assign an address can check the documentation to find out whom to contact to get an address block for their area.

After getting the address, construct the routing table. This is how net.exe knows where to send its packets. Once done, ignore it until there is a major change in the network. Usually a packeteer needs to know his neighbors (those stations he can work directly) and his gateway (an IP packet switch). Any packets that have an address not belonging to a neighbor IP will route to the gateway. The gateways know how to route packets to other users outside the local area.

***"I'm sold on the software... It's VERY simple to use and provides a level of service unavailable in any other packet program."***

Once configured, run net with the net command. Net will start up and give you the following prompt:

net>

This means that net is waiting for input. To have a keyboard QSO with WB3ABC, use the command "telnet wb3abc" and net establishes the connection. The user need not enter any digipeater or other routing information. The routing table entries and those of the gateway take care of making the packets reach the destination. If WB3ABC is reachable, the operator is rewarded with the message "Established." Should he wish to establish another session with another station, he can press F10> and enter another command at the net> prompt.

To do a file transfer with WB6XYZ, he enters the command "ftp wb6xyz" and net again establishes the connection. When he gets the "Established" and the banner messages from the other station he logs in with the user command. Most stations use the user ID of "guest" for guests. After that, he will be prompted for the password. Here is an example (the operator's typing is indented):

```
net > ftp wb6rqn
SYN sent
Established
220 wb6rqn.ampr FTP version
871225.6 ready at Mon Feb 8
20:15:13 1988
user guest
331 Enter PASS command
pass wb6rqn
230 Logged in
```

He's now free to enter commands to the remote system. The dir command gets a list of files on the remote system, the cd command allows the user to change directories, the get command is for downloading files, and the put command is for uploading files. The type command allows for selection between image (binary) and ASCII file transfers. Image transfers do no conversion and the file is sent EXACTLY as it is. ASCII transfers translate characters from the standard used on the remote machine to the standard used on the packeteer's machine. This is useful only for text files.

The bm.exe program sends mail. The name comes from the name of the original author, Bdale Garbee, and stands for Bdale's mailer. Starting up bm tells about all arrived mail. The user chooses messages to read, respond to, or delete. He may also originate a message. If he responds to an existing message, bm automatically addresses it to the original sender and fills in the subject field. Nothing more is needed after processing the mail. Net checks for outgoing mail every five minutes (or any selected time period) and the mail is delivered automatically.

The user can also check into the local bulletin board or talk to a friend who does not have net.exe. He just uses the connect command as if net were a TNC. There is one small difference: he needs to specify the port to use, since net supports multiple TNCs and radios (this is how it can be used as a packet switch). An AX.25 connection command might look something like this:

```
connect tncA wb3ffv wb2sef
```

This means to use the port named tncA to connect to wb3ffv via wb2sef. Simple.

The biggest point of net.exe is that it allows concurrent operations (multitasking). It's fun and useful to set up one or more long file transfers then go read mail or have a QSO while the transfer is going on. There's essentially no limit to the number of things that can go on simultaneously. Net does a good job keeping sessions separate so that messages from one connection don't interfere with messages from another.

Some people are concerned about running an incompatible protocol, such as TCP/IP, on amateur radio. Rest assured, however, that all outgoing packets are pure AX.25. The only difference is that they contain the IP and TCP packets internally.

I'm sold on the software. It's my only packet program now since it communicates with NET/ROM, TEXNET, COSI, the local BBS, other TCP stations, and any other TNC. It's VERY simple to use after set-up, and provides a level of service unavailable in any other packet program.

The price is right, too. Phil has made it freely available to amateurs. TAPR and Kantronics charge a nominal fee to cover the costs of duplication and mailing. There's no better deal than that. Since PClones now cost about what a Commodore-64 system did a couple of years ago, more hams will likely be running this package. This software is a definite winner, especially in the area of emergency and public service events where the user just wants to send information and doesn't want to be bothered with the other details. 73

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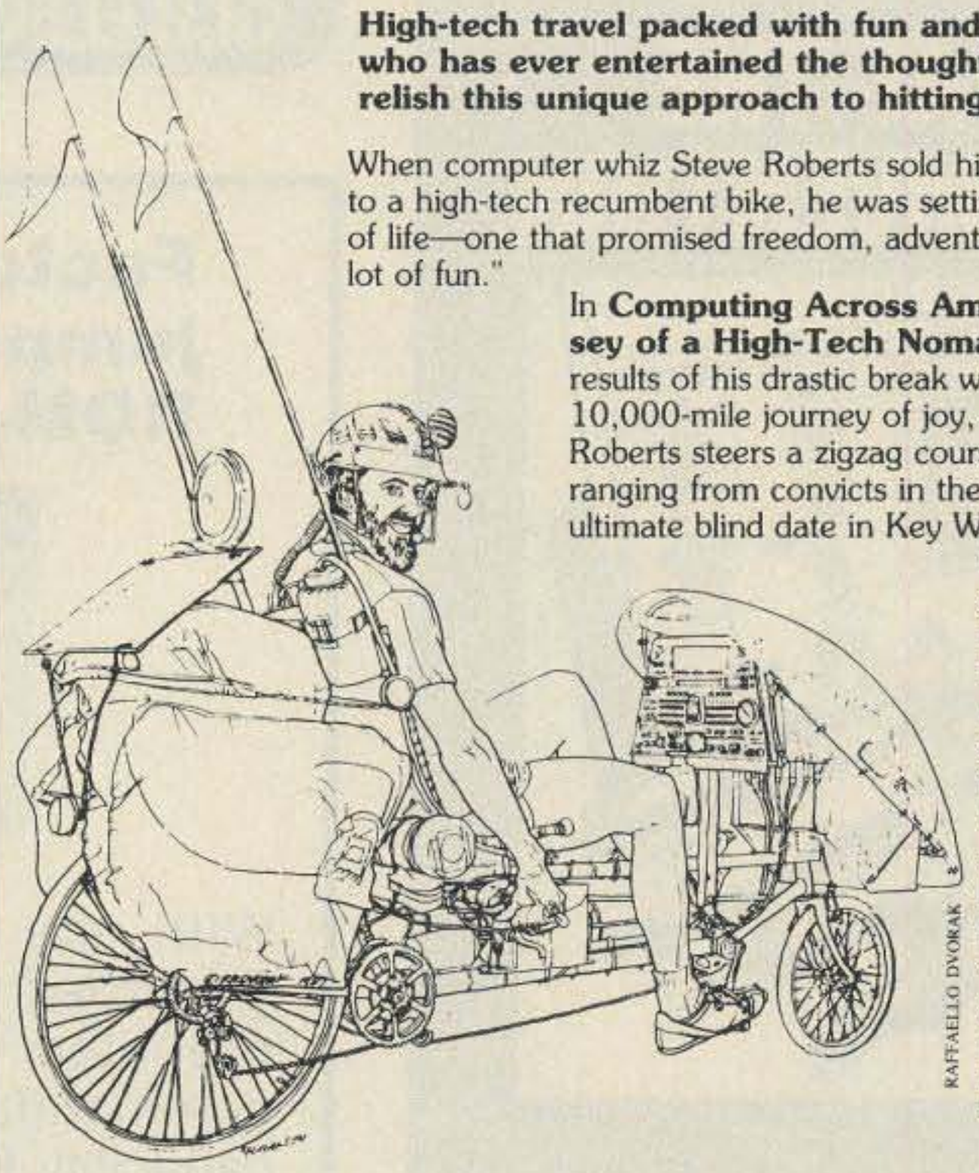


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# WEATHERSATS

## View On Video Processing

*Dr. Ralph E. Taggart WB8DQT*
*602 S. Jefferson*
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### Deadline Blues

Occasionally, *Weathersats* is missing from the pages of *73*. The first time this happened, I got anxious calls from people wanting to know why the column was canceled!

Not to worry. Every once in a while, there's a lot of graphics support for the column and it's not ready by deadline. This accounts for the lack of *Weathersats* in March. If the column is missing it won't do any good to berate the poor editorial staff—berate the columnist instead!

### WB8DQT Station

This month is a run-through of my own installation along with a few comments on the evolutionary trends in the station to appear in upcoming columns.

### Antennas

The primary WEFAX antenna is a four-foot (1.2 meter) Metsat GA-4 dish. The dish is spun aluminum. It has a weather-sealed O-ring feed assembly with a solid coax support that terminates in a Type-N connector at the rear of the dish. The antenna is mounted on a swing-arm assembly that mounts to the side of the house outside of a second floor window. (Read about the anatomy of this mount in the August 1987 Weathersat column.)

This antenna costs more than other options, but it's built like a tank. This unit has served continuously outside for almost ten years and is completely trouble-free. Considering all that can go wrong with a WEFAX receiving system, it's comforting to have one item to discount when trouble-shooting the system!

I also have a two-foot (0.6 meter) version of this antenna for portable work, such as providing weather coverage for soaring contests. This antenna shows a positive gain margin, but the pattern is too broad for regular use, which results in interference from adjacent satellites at some look angles!

Driving by the house, one may assume I don't have a VHF antenna system. The house, however, is an historic Victorian piece with a cavernous attic under all the steeply sloping roof gables—all the VHF antennas are in the attic! The antennas are completely out of the weather. Weather protection more than compensates for the incurred modest signal losses.

The primary VHF antenna is the omnidirectional "Zapper," described in *Weather Satellite Handbook* (*WSH*), with a Hamtronics GaAsFET preamp at the antenna. The feedline is RG-58 foam which makes the tortuous run down through the walls to the basement station location. The attic also contains the crossed yagi featured in *WSH*, complete with elevation and azimuth rotors. This antenna has a Vanguard JFET preamp and a feedline arrangement identical to the Zapper. The beam sits idle most of the time, however, since most polar orbit reception here is automatic, and the omnidirectional Zapper performs very well (see the picture of the month).

***"An IBM PCjr runs the whole operation. It talks to the receiving/recording system through . . . a standard Centronics parallel-printer port."***

### Receivers

The 1691-MHz receiving system starts with a Microwave Modules GaAsFET preamp mounted on the dish feed, driving about 20 feet of Belden 8214 to get the signal inside the house. A Microwave Modules downconverter takes the signal from there and converts it to 137.5 MHz for a long RG-58 cable run to the basement. John Beanland at Spectrum International in Concord, MA, sells both preamp and downconverter. John thoroughly checks out all units prior to shipment, because their performance on leaving the factory in Britain is not always up to his stringent standards. A Metsat GDC-4 converter receives a second satellite, and is used for portable work. VHF preamps are a must for long cable runs.

The primary receiver is a Vanguard unit equipped with crystals for 137.30, 137.40, 137.50, 137.62, and 137.85 MHz. This covers the operational U.S. TIROS/NOAA frequencies, 137.50 for the WEFAX IF and the most common Soviet frequencies. In addition to the standard manual switching, modifications permit the receiver to switch via TTL logic lines.

A Regency MX-5000 wide-range scanner is the search receiver to look for Soviet activity on non-standard frequencies. Its antenna system is a discone and a preamp, both located in the attic. This system isn't for imaging but just to spot new activity.

### Automatic Operation

In the June '87 column, there are some simple but very effective approaches to unattended satellite reception. The one I use operationally is somewhat more complex but achieves great results.

Almost any computer that supports such a port could be used. I chose the PCjr because it has nothing better to do during the day, and generates little RF hash.

The parallel port configuration:

- (1) The 8-data lines are used for receiver channel selection.
- (2) One status line (input) looks at the 2400-Hz tone decoder output that is connected to the receiver audio output.
- (3) One control line (output) switches in the WEFAX downconverter.
- (4) One control line is used to switch power to cassette deck #1 while another control line does the same for cassette deck #2.

The computer has a real-time clock that provides constant access to date and time. The operating system is a simple BASIC program built around a customized version of the PREDICT program from *WSH*. The customizing primarily allows the system to keep track of both operational NOAA spacecraft. In addition, the program contains the complete GOES Central WEFAX schedule, less the charts.

The operating program is a balance of dealing with both knowns and unknowns. The "knowns" are the transmission times for any given WEFAX product, plus the AOS and LOS times (on any given day) for the NOAA spacecraft. The "unknowns" are times and frequencies for Soviet spacecraft passes. In operation, I select the specific WEFAX products of interest. For reasons to become evident next month, I usually specify the prime 1800Z quads for the full earth disc in both IR and visible light, but I can select anything from the complete schedule. Barring other imperatives, just prior to the effective time of a WEFAX quad, the system switches the receiver to 137.50 MHz and switches in the WEFAX converter. The computer then monitors the 2400-Hz tone decoder and starts the recorder if a tone is present. If the channel is inactive for 3 minutes after the scheduled transmission time, the system switches back to the VHF search mode. Otherwise, recording continues until the quad transmission finishes.

Except for scheduled WEFAX transmissions, the system works on VHF. Since it knows when to expect the NOAA spacecraft, it ignores 137.50 and 137.62 MHz except when it reaches the AOS time for a specific NOAA spacecraft. It then switches to the appropriate frequency and begins to monitor the tone detector.

Early in a pass, the spacecraft signal is noisy, marked by pulsing of the detector. The system doesn't begin taping until the detector has a solid lock for at least 15 seconds. Taping terminates anytime within 4 minutes of the calculated LOS time, when the tone detector again becomes erratic, indicating a noisy signal. This alone saves a tremendous amount of tape and makes review of tapes quite simple.

If there's no tone detector indication within three minutes of the predicted AOS time, the system switches to the secondary frequency, flipping back and forth for two more minutes in search of a subcarrier signal. It tapes whatever is found, otherwise the pass terminates and the system returns to the search mode. One may opt for AM, PM, both AM and PM, or lockout (no recording) for each of the two operational spacecraft, giving complete control over what is recorded.

The system sequentially scans all the primary Soviet frequencies most of the time. It looks for 2400-Hz subcarrier signals. Any signals

that meet the criteria noted under the NOAA discussion are taped, and the system keeps looking!

### Three More OS Features

The first is that one can set priorities among the WEFAX, NOAA, and Soviet "modes." If the NOAA priority is set higher than the Soviet search mode, for example, the system breaks away from an active Soviet channel to record a NOAA pass. The system can also operate on a "first come, first served" basis.

Second, the system keeps a complete log on disk, noting active frequency, tape on and off times, and the date. This allows tape sequencing with no ambiguity. The final feature concerns the second tape deck. The decks are normally loaded with C-120 tapes, which record 60 minutes on a side. Once the system has recorded over 50 minutes of total time (the computer keeps track) on recorder #1, it makes all further recordings on recorder #2 with suitable notes on the disk log. In the unlikely event that both tapes fill to capacity, the system continues to log all active channel data to disk along with a notation that these were not taped! The tape capacity values (in minutes) can be changed to accommodate other cassette lengths. I do this routinely when going out of town, since I typically use a high capacity reel-to-reel system in such cases.

The bottom line? If it's a transmitting spacecraft, I can nail it on tape for later viewing. I hope to catch some 240 LPM Soviet COSMOS imagery!

### Display

The heart of the display system is the *WSH* scan converter using the 512K Color Computer 3. This system's capabilities grow daily. Later columns will outline these enhancements.

The system can store a 768-line image (1024 pixels per line) and is compatible with any weather satellite image format, live or taped. In addition to gathering and displaying images on a standard monochrome TV monitor, the system has a growing number of output functions that support archiving of full resolution images. It can output as WEFAX any image in memory, regardless of the original format. Further, this requires less than 4 minutes of tape for storage with the added advantage of fully automatic display to review the archive tape. Full-resolution hard-copy is supported via Smartfax (see WEATHERSAT for September and October of 1987) or dumps to the Alden Weatherchart recorder. The full-resolution image can also dump to a much simplified CRT display, for photographic records. This is also the subject of a future column. I will also highlight some of the software features of the system next month, when I discuss some new tricks to perform on WEFAX imagery.

### Picture of the Month

This rather elongated specimen represents approximately 10 minutes of a Soviet METEOR 2-15 pass over the Great Lakes in early December, 1987. The receiving system was the omnidirectional Zapper antenna on 137.85 MHz. The PCjr auto-tape system recorded this. The pass was ascending and image coverage to the south begins in the Caribbean just south of the Tropic of Cancer. The spacecraft passed across the U.S. and Canada, and the coverage ends at the southern end of Baffin Island, north of Hudson Bay, just short of the Arctic Circle! If you have any doubts about the effectiveness of omni antennas when teamed up with low-noise GAsFETs, this should set your mind at ease!

The scan converter can hold slightly over 6 minutes worth of 120 LPM imagery so the tape was displayed in two overlapping 768 line segments. The Smartfax printer printed each one from memory. The two prints, overlapped, makes the final composite of 10 minutes of image data. The scan converter permitted precision phasing and contrast adjustment, assuring the quality of the final FAX prints without wasting a single sheet of paper!

This print also illustrates the general utility of Soviet METEOR 2 imagery for winter viewing. Winter imagery from the U.S. TIROS/NOAA spacecraft is quite marginal here in the north country during the winter months. The daylight passes are early in the morning or late in the afternoon and sun angles are quite low. The visible light pictures are very difficult to "fix" in terms of display contrast, since one side of the image will be bright while the other side will be in deep shadow. This makes it difficult to achieve a single contrast setting across the entire image. IR data are all biased toward the cold (white) end of the dynamic range and are rarely useful without significant video processing. Thus, the TIROS/NOAA spacecraft, which do such a fine job in the summer months (or year round in the tropics), become marginal for easy use in the winter.

Here, the Soviet METEOR 2 spacecraft picks up the slack. This spacecraft series is notorious for the inability of the sensors to make distinctions between land and water features, so summer imagery is rather dull, consisting of beautiful clouds against a black background! The orbits are not sun-synchronous, however, so it is possible to get them passing overhead near midday during the winter, as was the case here. To the sunny south, the pictures look like typical METEOR 2 products but with the snow cover to the north you can get some simply fantastic ground detail that is a definite change of pace from murky TIROS/NOAA coverage.

Look for more samples in the coming months! 73

*Picture of the Month. Image of the Great Lakes region by the Soviet METEOR 2-15 satellite. Winter imagery from the METEOR 2 spacecraft is often better than that from the TIROS/NOAA spacecraft for the northern U.S.*

### Reference

References to *WSH* refer to the Third Edition of the *Weather Satellite Handbook*, available from the columnist at $15.00 per copy. For orders outside of the U.S., please include an additional $1.00 for postage.

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# HAMSATS

## *Amateur Radio Via Satellite*

*Andy MacAllister WA5ZIB*
*2310 Romayor Court*
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### U-O-11 and the Polar Skitrek

While we wait patiently(?) for the launch of Phase 3C, another amateur satellite, UoSAT-OSCAR-11 provides a new public service. Its temporary mission is to relay navigational information to a group of skiers travelling across the North Pole from the Soviet Union to Canada.

*73* Editor-in-Chief Larry Ledlow NA5E discussed the basics of the joint Canadian and Soviet Transpolar Skitrek in his January article "Look North!" He described mission objectives, the use of amateur radio for communications and the activities of several trek participants and support personnel.

Since Larry's article, there have been updates on the use of U-O-11 and some new expedition features. The amateur media received information from the following sources: the Polar Bridge Expedition, Inc. of Canada, *Komsomolskaya Pravda* (Soviet Youth Newspaper), The University of Surrey in England and AMSAT Science Education Advisor Dick Ensign N8IWJ.

#### About the Trek

The expedition began in early March and will last up to 100 days. The skiers will cross the North Pole from Cape Artichesky in the Soviet Union to Cape Columbia in northern Canada across 1700 kilometers of ice and snow.

In addition to being a challenging adventure coupled with the inherent political potential of a joint Canadian-Soviet activity (remember Apollo-Soyuz?), this walk across the top of the world has several scientific purposes. The trekkers will make geomagnetic, glacial and meteorological observations. They will test new materials and equipment. They will conduct experiments in physiology and biochemistry to test the limits of human endurance.

Four Canadians and several Russians are on the trek. The average age is 30, and two of the team members are doctors. They set out in the darkness of Arctic night during the coldest time of the year. Toward May they will be in constant light. This can become psychologically disorienting. For the last part of the trek, they will ski into the sun and the intense glare of its reflection from the ice.

The Arctic terrain won't allow a smooth and easy journey. Open water (rafts will be taken), thin ice, pressure ridges and low temperatures are just a few of the expected obstacles. The temperature will drop to −50 degrees Celsius. The wind-chill factor and the probability of storms will further hamper the skiers.

The trekkers will carry as much as 90 pounds of equipment in each backpack. Planes will drop supplies six times over the course of the trek. The first three flights are Russian, the last three Canadian. These planes will land only in an emergency.

#### On the Air

Project Nordski Comm (North Ski Communications) will provide the communications and navigation. Amateur radio is the main communications link to the skiers. They have a Russian-built, 10 watt, solid-state, crystal-controlled transceiver capable of operation at selected frequencies on the 20, 40 and 80 meter bands. Due to the limited life of their lithium batteries, the skiers will make only direct contacts with their support bases. The bases, however, are not working under the same power constraints. They encourage hams to contact any of the support operations during the period of the trek when not involved in mission-related activities.

The Canadian base station is located at Resolute Bay on Cornwallis Island. The ham station, special call CI8C, has been active since February. Operators of the station with VE8 callsigns can use the base callsign, or add the CI8 prefix while communicating from the base. Since there is a rotating crew of amateur operators, the station is active on the 20, 40 and 80 meter amateur bands many hours a day. Those who contact Resolute may QSL to PO Box 313, Don Mills, Ontario M3C-2S7, Canada. Other support stations will be on the air from Toronto and Ottawa. Modes of operation between support bases include CW, SSB, AMTOR and HF packet radio.

Listen for EKØKP on the Soviet side. This station is located on Sredny Island in the Severnaya Zemlya archipelago. Other support will be stationed at the Russian North Pole Station on Ice Island 28. Both Soviet and Canadian operators will operate from this mid-point base. Well known hamsat supporter and Chief Radio Operator Leonid Labutin UA3CR in Moscow and others in Dikson, USSR, will also be active.

***"(The skitrek support bases) encourage hams to contact any of the support operations during the period of the trek when not involved in mission-related activities."***

The navigation part of the Project Nordski Comm starts with small Emergency Locator Transmitters (ELTs) carried by the skiers. The SARSAT (Search And Rescue SATellite) and the Soviet counterpart COSPAS satellites, which hear the signals from the ELTs, relay location information to SARSAT/COSPAS processing ground stations. This information is then relayed to the University of Surrey in England.

At the UoSAT Control Center, the position of the ski trek participants is transmitted to the On-Board Computer (OBC) of U-O-11. The uplinked data is then used to program the digitalker experiment to provide a synthesized speech announcement of the expedition location. The satellite system has a 550-word vocabulary, including numbers.

The downlink frequency is 145.825 MHz FM. The skiers use a pair of ICOM IC-μ2AT HTs to monitor the satellite downlink. These radios have been tested for reliable operation at extremely low temperatures. ICOM America donated the HF communication equipment at the support bases and the skiers' HTs. Advanced Electronic Applications (AEA) provided packet radio equipment for the operation. Although the Skitrek team did not carry any packet gear, the support bases were provided with PK-232 packet/RTTY/AMTOR/WEFAX units.

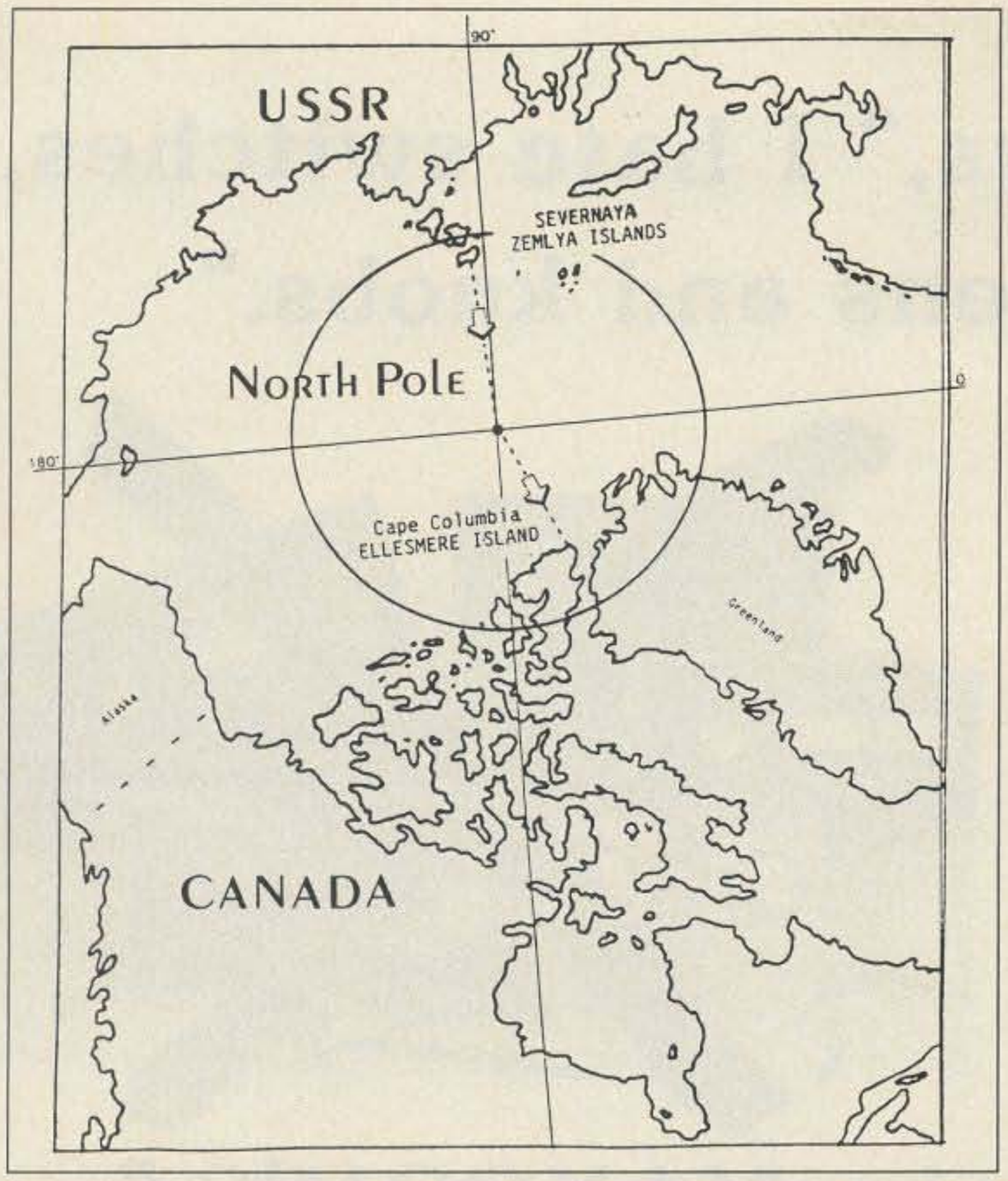
#### Listen In!

Since the skiers are at the North Pole, and U-O-11 is a polar-orbit satellite, they hear every pass. The satellite has a period of nearly 100 minutes, which corresponds to 14 orbits per day. For someone at 30 degrees North latitude (Houston, TX), about four to five orbits per day is typical. Monitor in the late evening hours between 7 and 11 PM and also in the morning from 9 AM until 1 PM local time. Any good HT can hear the beacon, but a good mobile rig or home station will make listening easier. Expect even better results from a beam antenna and tracking aids.

Since there is Doppler shift, monitor a few kilohertz above 145.825 MHz at the beginning of a pass. Shift the receiver lower as the satellite comes by, perhaps to 145.820 MHz as it reaches the end of the pass. A good pass will last between ten and 15 minutes.

Don't expect continuous digitalker. The University of Surrey has scheduled a mix of the usual 1200 baud data (Bell 202 compatible) and periods of digitalker operation. For every minute of voice, there are three minutes of digital telemetry. On Wednesdays (UTC) the schedule is somewhat different, but the digitalker is still heard less than the telemetry.

What can listeners do with the Skitrek positional data from U-O-11? Plot it on a map of the North Pole. In the Gulf Coast area, plotting hurricanes is a seasonal activity. Maps are even printed on grocery sacks in the worst




*Polar Bridge Expedition map showing the route the skitrekkers will take. The skiers will receive supplies from six air drops, three each from both the USSR and Canada.*

is something done in preparation for possible disaster, Skitrek is an opportunity to plot the progress of a challenging adventure through a region of the world few dare to travel.

### The Educational Side

AMSAT NA (The Radio Amateur Satellite Corporation of North America) offers educators around the world information guides entitled "Exploring the High Arctic from Your Classroom." They provide this package through Dick Ensign N8IWJ.

The purpose of the guide is to allow teachers to share the Canadian/Russian Transpolar Skitrek via amateur radio with their students. Those pursuing the progress of the journey will encounter disciplines such as orbital mechanics, geography, arctic conditions (including ice-pack motion), and amateur radio. The package of materials includes tracking information for the location of the recipient with details on how to use the predictions effectively. They define terms and explain examples. They also include ideas for bulletin board sized maps and information on AMSAT tracking programs. Many other educational spin-offs are possible, and perhaps it will interest some young, potential hams. Educators may request this package from the AMSAT at P.O. Box 27, Washington, DC 20044.

AMSAT nets, packet radio networks, and the Amateur Satellite Report from AMSAT NA will furnish further news. All these sources of information, including the U-O-11 positional data and HF operations on 20, 40 and 80 meters, will make this exciting event accessible to all.

### Updates

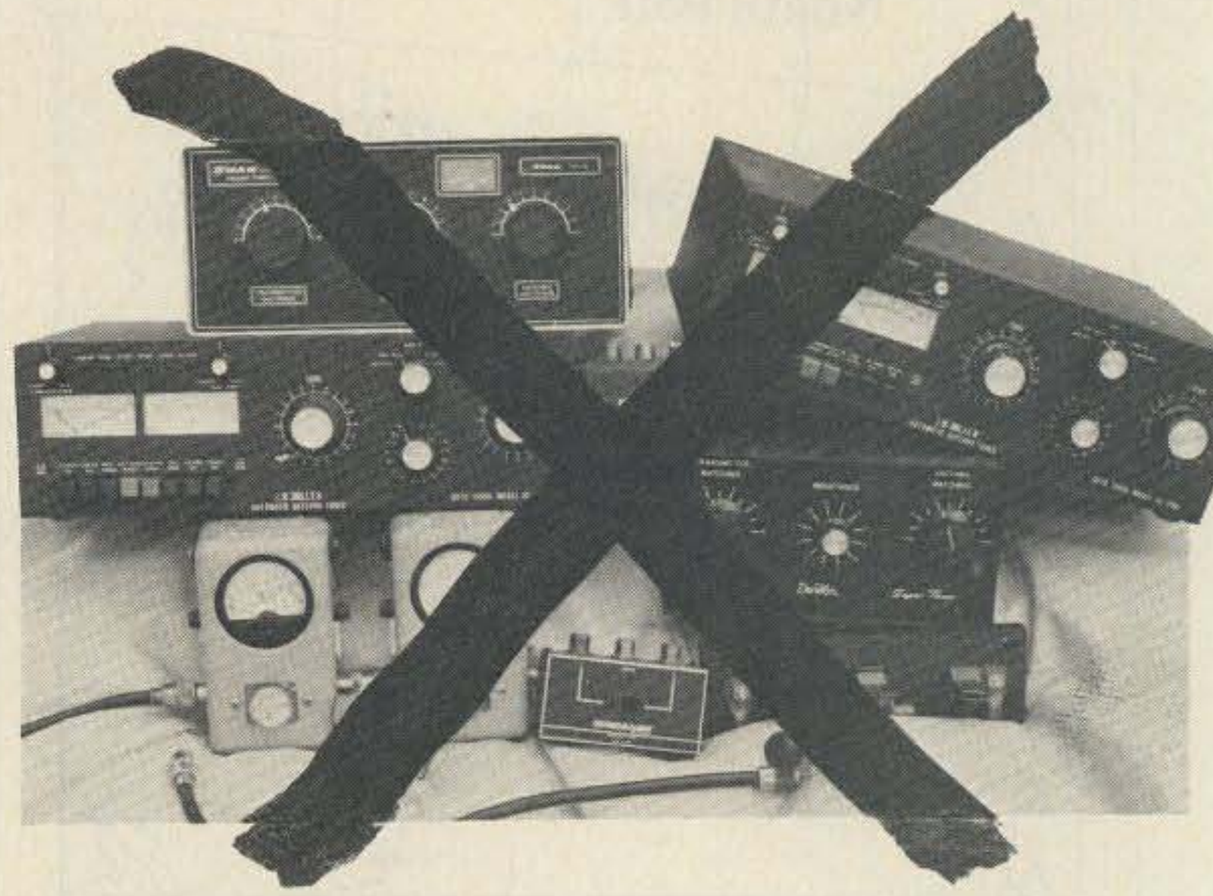
After many delays, the launch of Phase 3C is scheduled for June. AMSAT support teams from the US and West Germany will travel to Kourou, French Guiana to prepare the spacecraft for integration into the Ariane 4 booster. They need to apply thermal blankets, install antennas, and load fuel. Upon completion, a small group will remain in Kourou to monitor the satellite's vital signs and await launch day.

RS-10/11 and Fuji-OSCAR-12 have been performing nobly lately. Both Mode A and Mode K transponders have been active on RS-11. Signals have been good, but due to enhanced 15 meter conditions, a lot of hams not purposely uplinking to the satellite are being heard though it. It's been necessary to call "CQ Satellite" to let other hamsat chasers know that the ten-meter downlink is monitored.

F-O-12 had more power problems in January, however, after further study of the power budget, the team in Japan has begun pre- senting month-long, or greater, activity schedules for modes JA (the analog mode) and JD (the digital mode). Check the AMSAT nets for further information and follow the trekkers via U-O-11. 73

***"After many delays, the launch of Phase 3C is scheduled for June."***

# SONNY IRONS says," I hate switches, buttons and knobs."

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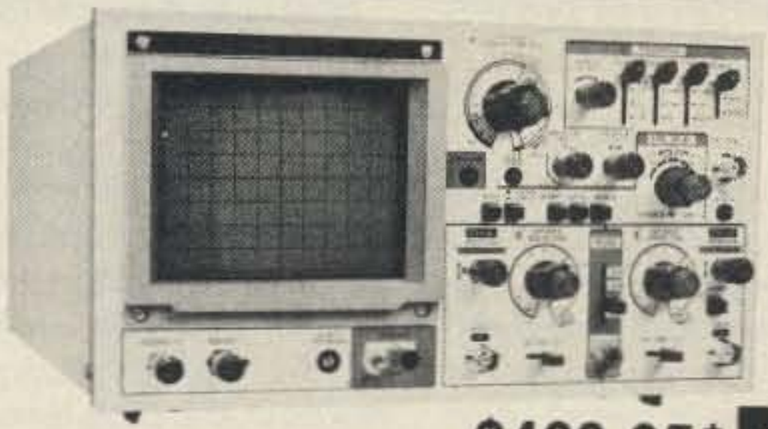

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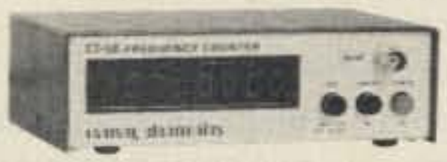

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# AERIAL VIEW

*Antenna News*

*Arliss Thompson W7XU*
*7314 SW 28th Ave.*
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## Spider Quad for Ten Meters

After several years of ho-hum openings and low levels of activity, conditions are finally improving on the 28 MHz band. And while a DXer can work the world with ten watts and a dipole when that band is open, an antenna with some gain can really pay off when conditions are marginal. Not only does gain help the transmitted signal, it also increases the strength of received signals from the desired direction and knocks down potentially interfering signals coming from other areas. That combination of features often gives the station with a gain antenna quite an advantage over the operator using a dipole or ground plane and high power.

Gain antennas come in a variety of sizes and configurations. The one described here is a spider quad. The 2-element spider quad has gain comparable to a 3-element yagi, is constructed from readily available materials, and doesn't cost an arm and a leg. Although I thought primarily of the Novice operator when I built my version of this antenna, the design is also adaptable to the 12 and 15 meter bands.

Most of hamdom is familiar with the classic quad antenna shown in Figure 1A. The spider quad, Figure 1B, is a less common version of this antenna. It has several advantages over the classic configuration, such as constant spacing between elements in multiband designs and no boom, which represents a potential savings in weight, wind loading, and cost. The chief disadvantages of the spider quad are the increased complexity of designing a spider mount, compared to mounting convential quad spreaders, and the need for longer spreaders in the boomless design. I can't argue with the need for longer spreaders with boomless quads, but the fashioning of a spider mount need not be difficult.

### Mounting the Spider

The mount I used for my antenna was described by Lynda Crowley KP4DIP in a "Hints and Kinks" column some years ago (*QST*, December 1970). Her hub was low cost and easy to replicate. I haven't seen it repeated elsewhere, however, so it may be new to many hams.

The hub is constructed from a short length of steel pipe (I used a 2.5 foot section of 1.5 inch diameter water pipe that I had on hand). Make two cuts in one end of the pipe, each approximately twelve inches long, across the diameter of the pipe. The cuts should be at right angles to one another. Similar cuts are made at the other end of the pipe, taking care to make these cuts align with the first ones (see Figure 2A). This is quick work with a bandsaw, but less than fun (trust me) with a hacksaw. Leave about 6 inches of undisturbed pipe in the center in which to drill to allow attachment of a hub-to-mast clamp.

Next bend the cut ends of pipe outward to form the spider itself (Figure 2B). The desired angle is 108 degrees. This angle simultaneously controls the distance between the tips of the spreader arms and the element spacing. However, the angle is not especially critical since there is ample spreader material for 10- and 12-meter band antennas and good performance is possible with a variety of spacings in the 0.15 to 0.20 wavelength region. The builder can measure the angle with a protractor or approximate the correct angle with a wooden form in the shape of a triangle 10 7.16 x 3 ⅜ x 11 inches. Once the spider is complete, it needs a few coats of paint to protect it from the weather.

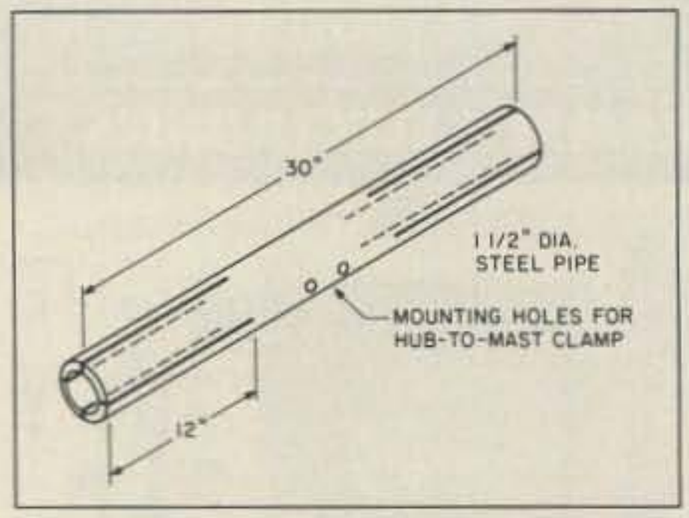


*Figure 2. (a) Cuts to be made in 1.5" pipe to form spider hub.*

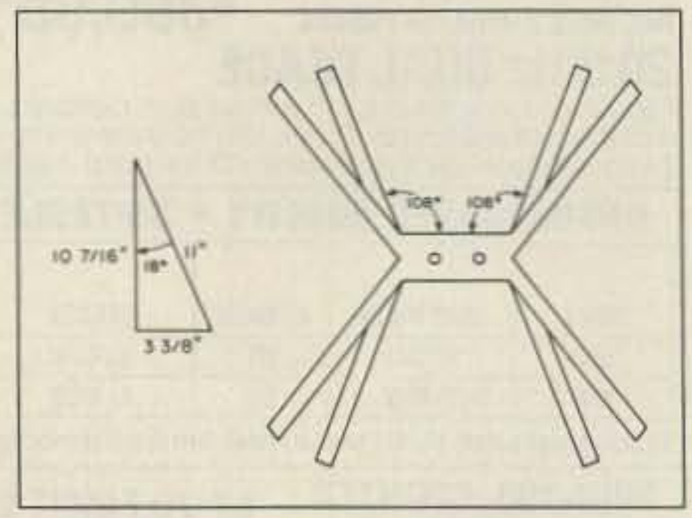


*Figure 2. (b) Forming the hub. Wooden form for measuring the required 18 degree (108–90) is also depicted.*

For spreaders, I purchased 8 ten-foot lengths of 0.75 inch diameter Schedule 40 PVC pipe. The price is right at well under $2 each. These spreaders are long enough to support a 15-meter band quad, but aren't rigid enough for an antenna that size. One-inch diameter PVC (particularly with some heavy monofilament or lightweight nylon cord for added bracing, as shown in Figure 1B) should be adequate for a 15-meter model. The 0.75-inch diameter material suffices for a 10-meter band antenna. Figure 3 gives the length of the spreaders and other dimensions for each band.

I attached each spreader to its corresponding spider arm with two stainless steel hose clamps. They can also be attached by fastening spreaders to the arms with glass filament shipping tape. The shipping tape should be overwrapped with black vinyl tape to protect it from sunlight. While I have not tried the tape method, it was apparently used successfully by Mitchell NØARQ, on his "Optimum Gain Boomless Quad" (*ARRL Antenna Compendium*, Vol. 1, pp. 11–17), and is worth consideration, particularly for keeping expenses down.

### The Loops

Loop dimensions are listed in Figure 3. These dimensions are for uninsulated wire. Wire insulation may cause the resonant frequency of the antenna to be lower than the calculated value (Boucher, N., "Cubical Quad Antenna Design," *ARRL Antenna Compendium*, Vol. 1, pp. 41–45). Stranded wire is better to solid in this application since it has less tendency to break with flexing of the spreader arms. Number 14 or 16 wire is adequate. There are many ways to attach the wire to the spreader arms. The simplest is to pass the wire through holes drilled in the spreaders. An additional short piece of wire can be wrapped around the loop wire on either side of the point where it passes through the spreader arm to hold the loop in place. Loops may also be strung through lightweight insulators that have been attached to the spreaders.

Figure 4 shows two ways the quad may be fed for horizontal polarization. To match the impedance of the driven loop to that of 50Ω coax, feed the antenna either through a quarter-wave transformer of 75Ω coax, or through a gamma match. These are shown in Figures 1A and 5. A quarter-wave transformer will require a separate feedline for each band. It's a good idea to use a separate feedline for different bands in the case of the gamma match, but if necessary, feed the loops for several bands in parallel with a single length of coax (Figure 5).

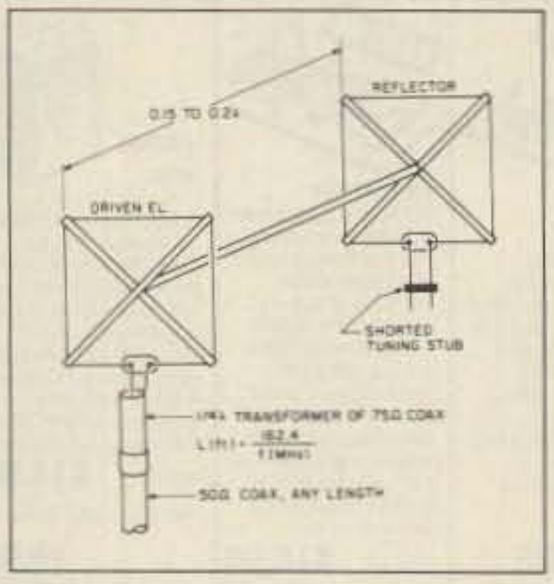


*Figure 1. (a) Conventional cubical quad. Illustrated method of feeding is applicable to other designs as well.*

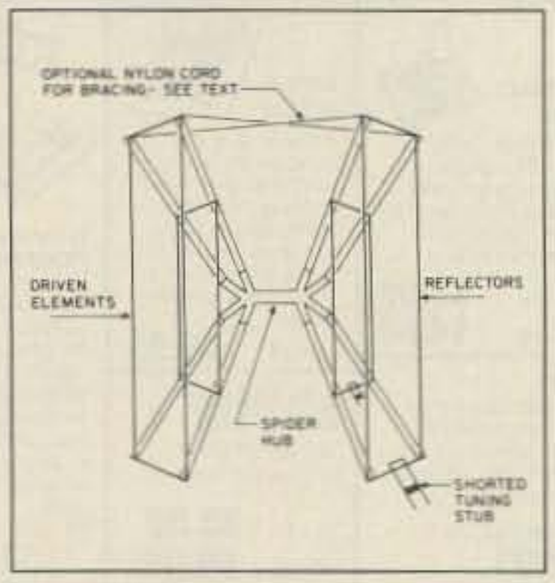


*Figure 1. (b) Two-band spider quad. The tuning stubs for each band are two wires 12" long, spaced 3" apart.*

| BAND | DRIVEN ELEMENT | REFLECTOR | MINIMUM LENGTH OF SPREADER ARM | LENGTH OF 75Ω 1/4λ TRANSFORMER (IF USED) |
|---|---|---|---|---|
| 10M | 33'4" | 36'3" | 7'3" | 5'8 1/2" |
| 12M | 40'4" | 41'4" | 8'0" | 6'6" |
| 15M | 47'6" | 48'8" | 9'6" | 7'8" |

*Figure 3. Spider quad dimensions.*

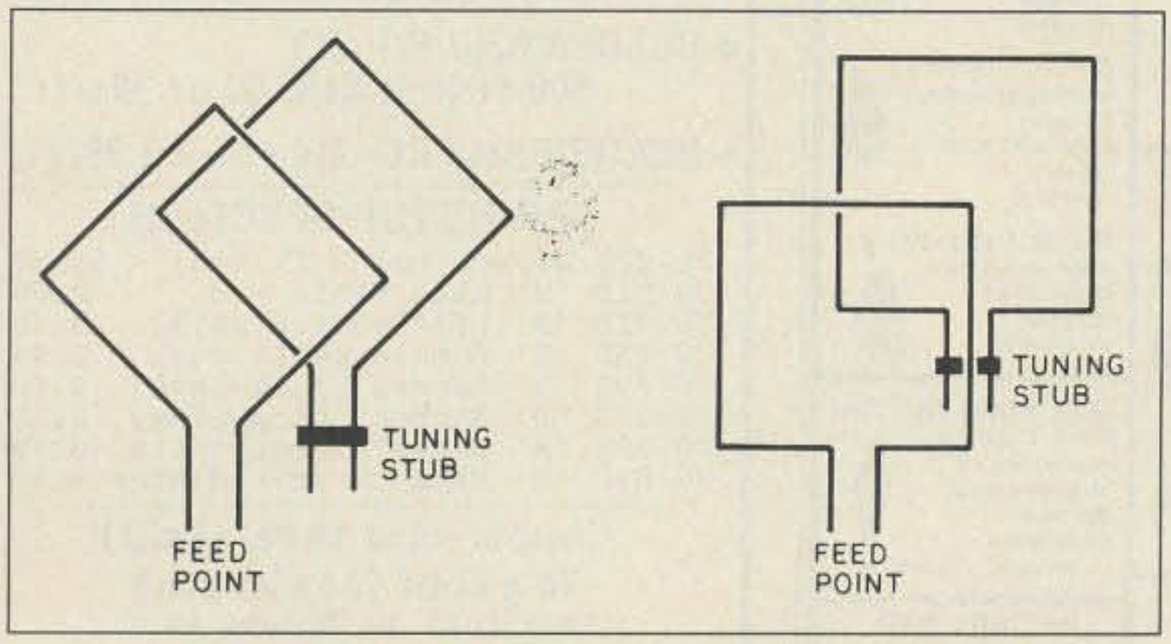


*Figure 4. Two methods of feeding to obtain horizontal polarization.*

A third, more complex, solution is to mount a remotely-controlled coax switch at the antenna and use that to switch between bands. Whatever the method of feeding, it's best to avoid long runs (over 50 feet) of RG-58 at these frequencies due to its relatively high losses. Use RG-8 or -213 if at all possible.

The quad performs best when the bottom of the quad is one-half wavelength or higher above ground. When mounted closer than this to the ground, radiation is reduced at the low angles commonly needed for long distance communication at 28 MHz.

**Tuning the Spider**

The final step is to tune the antenna for maximum performance. It's possible to use the antenna "as is," but tuning the reflector stub yields optimum performance. The reflector may be tuned either for maximum gain or for best front-to-back ratio (the latter is normally done).

Aim the back of the antenna at a nearby (but no closer than a few hundred feet) signal source and adjust the shorting bar for minimum signal. If using the gamma match feed system, it's necessary to apply a low level of power to the antenna and adjust the match for minimum SWR. If it is a multiband quad with the gamma matches connected in parallel, adjustment for minimum SWR is more involved. With that system, the taps and associated variable capacitors of the gamma matches need adjusting for minimum SWR on each band. Adjust the compensator capacitor if necessary to improve the match. By repeating those steps several times it should be possible to get a low SWR on each of the bands.

That's all there is to it. This antenna is easy to build and a good performer. Try it out as the new sunspot cycle breathes life into the higher frequency HF bands. 73

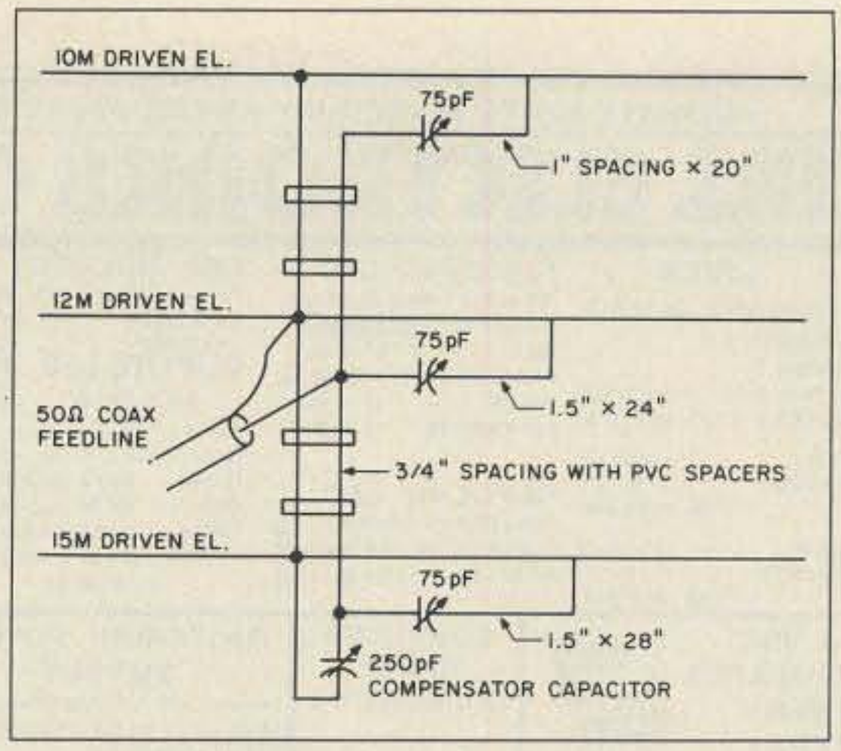


*Figure 5. Details of gamma match for multiband design. Once adjusted, the variable capacitors may be replaced with fixed mica capacitors of the same value. See text for adjustment details. Each band must be adjusted separately with great care.*

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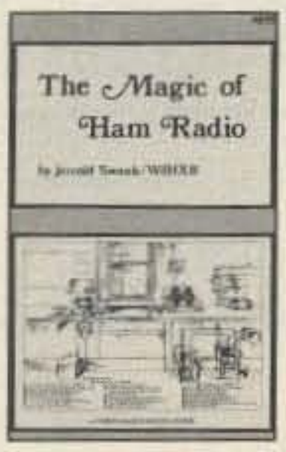



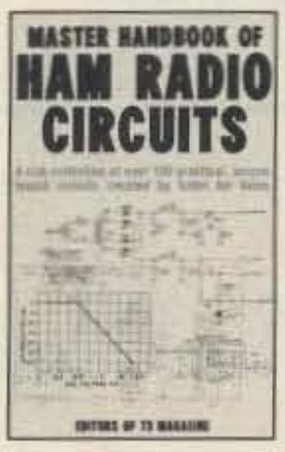


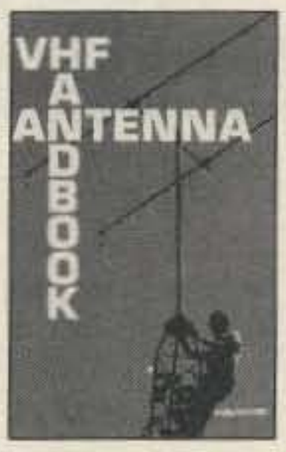


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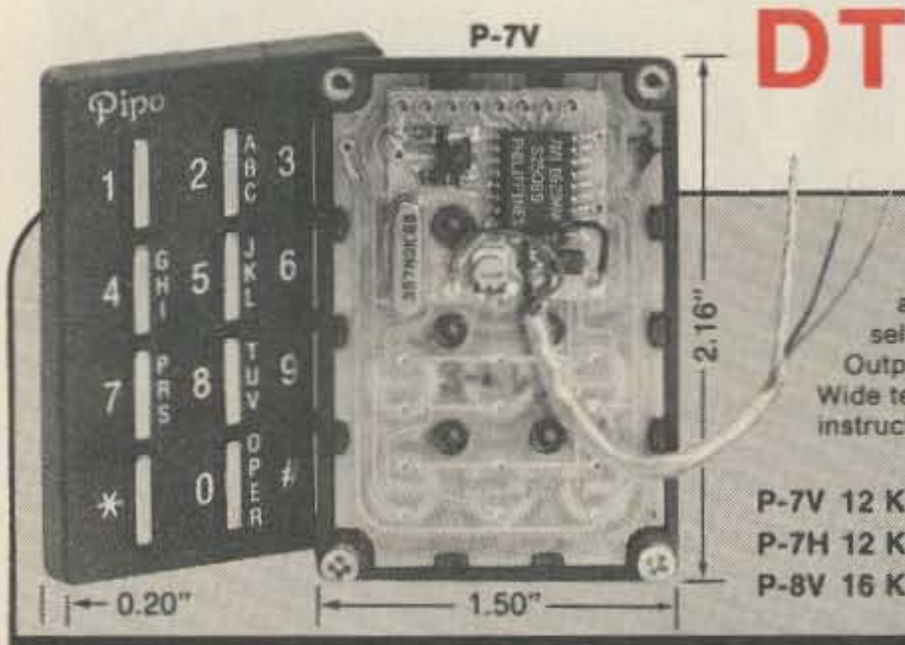


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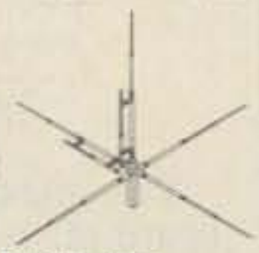

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Multiplication Factors: Horizontal - 17 Times, Vertical - 15 Times
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# PROPAGATION

*by Jim Gray W1XU*

*Jim Gray W1XU*
*210 Chateau Circle*
*Payson AZ 85541*

## PROPAGATION FORECASTS

Readers have shown increasing interest in radio propagation forecasting, so 73 has asked me to expound on my method of radio propagation prediction.

I prepare the forecasts approximately two months in advance in order to meet deadlines. The government provides a summary of past data for the previous week or so and also gives an estimate of expected solar behavior for the coming month. Although they give past data in great detail with much information about the sun and earth, future estimates are very general. Indeed, they have to be. Ionospheric propagation forecasting is empirical, not exact. Future trends are estimated based on thousands of past observations plus some new material developed independently and used in concert with previous data. I, and my crystal ball, reserve the right to be wrong on occasion.

### Sunspots

People have been observing solar cycles for at least 200 years. Solar cycles occur approximately every 11.2 years (they vary either way as much as a year) and are based on sun-spot observation.

Sunspots are areas on the solar disk that appear darker than surrounding areas. They are thousands of degrees cooler than sun's 100,000° surface temperature. Scientists believe the spots result from large magnetic field concentrations or vortexes having a particular polarity. They emit high concentrations of radiation and particles.

Spots disappear during the low part of a typical 11-year sunspot cycle, and are most numerous during the high part of the cycle. New spots at the beginning of the cycle appear high on the solar disk and gradually work their way down toward the solar equator as the cycle progresses. Each cycle's spots appear on the alternating halves of the sun as seen from earth. Therefore, the period for the cycle with spots the same solar longitudinal "polarity" occurs once every 22 years.

Solar flux and the maximum usable frequencies (MUFs) are low during the cycle low. Solar flux and MUF increase with the sunspot number.

### Cycles within Cycles

Solar flux also varies seasonally. Further, there is a near-monthly variation due to the sun's 27-day rotation period. This means that a given area of the sun—with its peculiar characteristics—appears every 27 days.

The sun radiates all manner of electromagnetic waves and particles, including X-rays, infrared, and ultraviolet radiation. Ultraviolet radiation from the sun is the principle cause of ionization in the earth's upper atmosphere—ionization that produces the disassociation of molecules and atoms into "free" electrons and ions. The earth's ionosphere, a region of the upper atmosphere, serves as a prism that bends radio waves.

From this, you can see that the ionosphere varies from daylight to dark and from season to season. . . and year to year. There is nothing really constant about the sun's output, and it is this inconstancy that produces our variable ionosphere.

### DX Forecast

Expect April to yield excellent DX opportunities on bands 10 through 20 meters, with seasonally good MUFs, somewhat longer days than in March. . . and bands open later in the day, especially with Daylight Savings Time coming toward the end of the month. The outlook for the first half of the month is Good to Fair on a daily basis, while the outlook for the last half in general is for more erratic conditions. The last week of the month looks better than the third week. Consult the daily outlook for the symbols F, G, and P, and trends from one to the other. The magnetic field will be unsettled to active on the days marked Poor, and quiet on the days marked G or F.

As always, consult WWV at 18 minutes past the hour for the present day's conditions and the previous day's conditions, plus the expected conditions for the following day. Planetary A index below about 10 will yield fair conditions (F), an A index below about 5 will yield good conditions (G), and an A index above 10 will yield poor conditions (P). Overall, the solar flux should be rising constantly and show daily values of at least 100, and sometimes up to 110 or even higher. This means excellent DX, as long as the magnetic field remains quiet.

The days centered around the 20th of the month may be exciting geophysically. Trends upward and downward from WWV reports will tell what to expect. Make use of them.

Propagation forecast for January approximated 85% accuracy for the month. Some forecasts were clearly wrong, while many others were approximately correct. The remainder were entirely correct.

### Analyzing Propagation Forecasts

Forecasts are only as good as they prove to be in the event. Here's analysis of November 1987 to see how close the forecasts came to the actual conditions on each day of the month.

Symbols are as follows:

P = Poor
F = Fair
G = Good
P–F = Poor to Fair
F–P = Fair to Poor
F–G = Fair to Good
G–F = Good to Fair

The actual conditions are reflected by the condition of the magnetic field. I use the Planetary A index as reported weekly by the joint NOAA–USAF Space Environment Services Center in their *Preliminary Report and Forecast of Solar Geophysical Data*.

A = 0–5 Magnetic field quiet, conditions Good
A = 5–10 Magnetic field quiet to unsettled, conditions Good to Fair
A = 10–20 Magnetic field disturbed, conditions Fair to Poor
A = 20–30 Magnetic field at storm level, conditions Poor
A = Greater than 30 Large magnetic field storm, conditions Poor

Now for a look at the actual conditions. I circled the days when the predictions were clearly wrong and squared the days when the predictions were close, but not exact. The unmarked days show that predictions and actual conditions were the same.

Results:

5 out of 30–wrong: 16.66%
5 out of 30–close: 16.66%
20 out of 30–right: 66.66%

If the days counted as "close" and "right" are combined (and for practical operating this would be a fair assumption), then the forecast was useful 25 days out of 30, or 83.33% of the time for the month of November. 73

**APRIL**

| SUN | MON | TUE | WED | THU | FRI | SAT |
|---|---|---|---|---|---|---|
| | | | | | 1 G | 2 G–F |
| 3 F | 4 F–G | 5 G | 6 G | 7 G | 8 G–F | 9 F |
| 10 F–G | 11 G | 12 G–F | 13 F | 14 F–P | 15 F | 16 G |
| 17 G | 18 F–P | 19 P | 20 P | 21 P | 22 P | 23 P–F |
| 24 F | 25 F–G | 26 G | 27 G | 28 G | 29 G–F | 30 F |

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# LETTERS

## From the Ham Sack

You don't have to tell me how great ham radio operators are. I am aware that they have to demonstrate a high degree of intelligence to qualify for their licenses. In addition, over the years ham operators have–again and again–given proof of a real concern for the safety and well-being of the public. I will never forget the invaluable services that they performed for the safety officers and the citizens of the Commonwealth during the blizzard of '78.

**Michael S. Dukakis**
**Governor of Massachusetts**

I agree with your results on your test of MAXCOM. I also agree with your overview on their advertising—if they would just present it as it is, and keep the price appropriate, they would have a nice product, similar to B & W.

This product has been tested by many others, all leading to the same results that you have discovered—and that is, its effectiveness is anywhere from 2 to 4 dB down from a dipole cut to length—and that's only when the MAXCOM is hooked up to the extreme 128-foot dipole. When the MAXCOM is hooked up to a "cut to length" dipole to act as the balun, radiation is even further attenuated.

**Gordon West WB6NOA**

I recently received your February 1988 issue and was extremely pleased to see TWO articles concerning 1750-meter operation.

Both articles referenced my monthly *Western Update*, a newsletter for Lowfers (1750-meter experimenters), but somehow it was not made clear that this is a non-profit affair, and I require 60 cents per issue (about $7 per year), together with the SASEs, in order to break even on my production costs (photocopies, halftones, etc.). Unfortunately, I am already receiving SASEs (sans donation) from many of your readers. When *Western Update* started several years ago, we handled the cost issue on a donation basis. We now have about 110 subscribers, and I just can't afford to carry it from my pocket.

The purpose of *Western Update* is to provide fast turnaround information (I can literally write the newsletter on my computer one day and mail it the next) concerning band conditions, which Lowfers are on what frequency, resource information, schematics, antenna designs, etc. At present, *Western Update* is the only publication of its kind in the USA.

Thank you for setting the record straight.

**Jim Ericson**
**Lowfer beacon "EK"**
**184.02 kHz**

You blew it! Arliss Thompson W7XU wrote the best article I've ever seen on Antenna SWR in the Aerial View Section of the February 1988 issue of *73*, and you duplicated part of it (page 90) and left out part of it (between page 90 and 91).

Would you like to hire me to proof read [*sic*] your magazine? In the age of high technology, life is confussing [*sic*] enough without stupid mistakes being made. And in a time when the U.S. economy is loosing [*sic*] ground to foreign competition because of lack of attention to detail, you are exhibiting a prime example of sloppy American workmanship.

**R.L. Miller N8IWO**
**Professional Engineer**

*Apologies to our readers for this mistake. We are but mere humans in an electro-mechanical publishing world. The full text of the article is available for an SASE.*

*Now, Mr. Miller, what's* your *excuse?*

*. . . de NA5E*

I have received several letters asking if any "typos" were in the code listing for my program listing in the January 1988 *73*. There are none, but the equations in this program are difficult to type in the first time around. The program contains many LOOPS, and when it CRASHES, it is a bear to de-bug.

**Jim Cooper KD5EA**
**Spring TX 77386**

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# SPECIAL EVENTS

## Ham Doings Across the Country

*Special Events listings will be provided by 73 magazine free of charge on a space-available basis. Announcements must be received by us by the first of the month, two months prior to the month in which the event takes place (by March 1, for example, for a May or later event). Please mail to Editorial Offices, 73 Magazine, WGE Center, Peterborough NH 03458. ATTN: Special Events*

### HARROGATE ENGLAND

The Darley Amateur Radio Club of North Yorkshire will operate special event station GB75USA throughout the spring as part of a joint British and American celebration of the RSGB's 75th Anniversary. The main HF activity will center on 15, 20, and 80-meter SSB bands. QSLs via G0FWG or to *Darley Amateur Radio Club, MHS, Darley, Harrogate, N. Yorkshire HG3 2RF England.*

### BENTON KY
### APRIL 4–5

The Marshall County Amateur Radio Association will operate KA4WWS, April 4–5 at 1800Z Sunday till 2400Z Monday to commemorate the 145th Annual Tater Day Celebration. Suggested frequencies are around the middle of the General Phone, CW bands and 10 Meter Novice band. For QSL send SASE to *Clyde Dexter KA4WWS, Route #1 Box 486, Benton KY 42025.*

### CLARKSVILLE TN
### APRIL 9

Clarksville Amateur Transmitting Society is having its annual swapfest on April 9th at 8 AM to 4 PM in the National Guard Armory. Reservations for tables call 615-362-3859. FCC Exams will be administered, call WD4DBJ at 615-232-6141. Talk-in on 145.805 – or 147.39 +. For more information call or write to *C.A.T.S c/o WD4DBJ, Rt 1 Box 162A, Indian Mound TN 37079.*

### ROCHESTER MN
### APRIL 9

Rochester Amateur Radio Club will hold its 11th Annual Rochester Area Hamfest on Saturday April 9. Set up is on Friday the 8th. Gates open at 8:30 AM. Talk-in on 146.22/82 MHz. For reservations contact *R.A.R.C. c/o WB0YEE, 2253 Nordic Ct. N.W., Rochester MN 55901; 507-288-7688.*

### SPOKANE WA
### APRIL 9

The Inland Empire Hamfest committee will hold its 11th Annual Inland Empire Hamfest on Saturday, April 9, at the Red Cross Bingo Hall. It starts at 8 AM until 5 PM. There will be Amateur License Exams at 1:30 PM, Upgrades and Technician–Extra. Dealine for exam applications is March 12. For more information contact *Hamfest 88 c/o W7EQU, 318 E. Courtland Ave., Spokane WA 99207.*

### UPPER SADDLE RIVER NJ
### APRIL 9

On April 9th the Chestnut Ridge Radio Club will sponsor a Ham Radio Flea Market. It will be held at the Educational Building, Saddle River Reformed Church. For more information on tables and times contact *Jack Meagher W2EHD, 27 Fourth St., Closter NJ 07624; 201-768-8360.*

### BRAINTREE MA
### APRIL 10

The South Shore Amateur Radio Club of Braintree MA will again hold its annual indoor flea market at the Viking Club on Sunday April 10th. Hours are 11 AM to 4 PM. For more information on table reservations contact *Hal Jones WB1ABM, 48 Saning Rd., N. Weymouth MA 02191; 617-335-5777.*

### MADISON WI
### APRIL 10

The Madison Area Repeater Association, Inc. (M.A.R.A) is pleased to announce its 16th annual Madison Swapfest which will be held on Sunday April 10th, at the Dane County Exposition Center Forum Building. Doors will open at 8 AM. Talk-in will be on the M.A.R.A. repeat, WB9AER/R, 146.16/.76. For admission tickets, table reservations, or information on commercial exhibit space write to *M.A.R.A., P.O. Box 3403, Madison WI 53704; 608-274-5153, leave a message on the answering machine.*

### RALEIGH NC
### APRIL 10

Raleigh, the City of Oaks, and the Raleigh Amateur Radio Society is sponsoring the 16th Annual R.A.R.S. Hamfest, NC State ARRL Convention and Computer Fair in the Graham Building at the NC State Faigrounds on April 10th. There will be many programs meetings and contests. Dealer setup is on Saturday the 9th. Talk-in on 04/64 and 28/88. For pre-registration, flyer or dealer information contact *Rollin Ransom NF4P, Rt. 5 Box 267, Zebulon NC 27597; 919-269-4406.*

### AUCKLAND NEW ZEALAND
### APRIL 15–25

Special Amateur Radio Station for the Centenary Celebration of Local Government in Birkenhead will operate from the Public Library of the Birkenhead City Council, for which the special call sign of ZM1BCC has been issued. It will be operated by local hams on the high frequency bands as well as VHF and UHF. Times of operations will be from 9 AM (local time) to 5 PM with later times on Thursday and Friday 21 and 22 of April. A full-colour QSL card has been designed, showing our proximity to Auckland City. It will be of particular interest to us in Birkenhead to contact other hams who live in districts of Birkenhead, Birkdale, or Beach Haven in other parts of the world. For more information contact *Ray Tout ZL1BXC, Branch 29 NZART, 4 Mayall Ave., Birkenhead Auckland 10, New Zealand.*

### ANGLETON TX
### APRIL 16

Brazosfest '88 will be held on Saturday, April 16th at the Brazoria County Fairgrounds, from 8 AM to 5 PM. Features will include a Swapfest, technical seminars, Amateur Radio examinations and exhibits. Talk-in on 147.980/380. For more information send a SASE to *Mark Nace N5KAE, 111 Carnation St., Lake Jackson TX 77566.*

### AUBURN NY
### APRIL 16

The Auburn Amateur Radio Association will hold its annual Hamfest on Saturday April 16th, at the Aurelius Volunteer Fire Department. It opens at 8 AM to 4 PM. For more information on tables reservations contact *James P. Nash N2DTG, 114 Dunning Ave., Auburn NY 13021; 315-253-0512.*

### FLEMINGTON NJ
### APRIL 16

Cherryville Repeater Association is sponsoring its annual Hamfest on Saturday, April 16th at the Hunterdon Central High School Field House. Doors open at 8 AM. Talk-in on 146.52, 147.975/.375, 147.615/.015, 222.52/224.12, and 449.85/444.85 MHz. For table reservations and advance ticket sales, write or call *Marty Grozinski NS2K, 6 Kirkbridge Rd., Flemington NJ 08822; 201-788-4080.*

### LAWTON OK
### APRIL 16

Ft. Sill Amateur Radio Club Annual Event. Our 41st year. Starts at 8 AM to 6 PM on April 16 at the Comanche County Fairgrounds. Again, it's an old fashioned one-day Swapfest. Preregistration needed only for tables. For more information contact *AA5DS Edwin, 4624 NE Bell Ave., Lawton OK 73507.*

### COLUMBIA TN
### APRIL 17

The Maury Amateur Radio Club will sponsor its 2nd annual indoor Hamfest from 8 AM to 4 PM at Maury County Park in the Baker Building. Talk-in on 147.72/.12. To reserve tables or get more information contact *George Russell WB4JCR, P.O. Box 832, Columbia TN 38402; 615-388-0577.*

### CAMBRIDGE MA
### APRIL 17

Tailgate electronics, computer and amateur radio flea market is sponsored by the MIT UHF Repeater Association and the MIT Electronics Research Society. Starting at 9 AM to 4 PM. Talk-in on 146.52, 449.725/444.725 (PL 2A) W1XM/R. Mail advanced reservations before April 5th to *W2XM, c/o Mike Strange, 229 Commonwealth Ave., Boston MA 02116.*

### SOUTHINGTON CT
### APRIL 17

The Southington Amateur Radio Association is pleased to announce their 5th annual Flea Market on Sunday, April 17th at the Southington National Guard Armory. Talk-in on 146.28/88 and 145.600 Simplex. For more infor-

mation contact *Chet KA1ILH, 138 ½ Summit St., Plantsville CT 06479.*

**SULLIVAN IL**
**APRIL 17**

The Moultrie Amateur Radio Klub (MARK) Hamfest will be held at the Moultrie County 4-H Fairgrounds, from 8 AM to 3 PM. Talk-in on .055/.655 and 52. Tests will be given for Amateur licenses by preregistration only. Tickets in advance. For more information write *MARK, P.O. Box 79, Sullivan IL 61951; or call Vernon E. Jack K9SWY at 217-728-7596.*

**WILLIAMSPORT MD**
**APRIL 18–24**

Special event amateur radio station WA9EOP will be on the air April 18–24 to celebrate Maryland Odd Fellow Week. Members of the Odd Fellow Ham Club, Radio Amateurs Worldwide and Shortwave Listeners are invited to listen for this special station which may be on any of the following suggested frequencies–MHz phone 3.870, 7.240, 14.265, 21.375, 28.375. CW (Morse Code) operation is anticipated at 7.120 MHz and FM at 147.09 MHz may be utilized. A special commemorative certificate will be offered for an amateur contact (QSO) plus a QSL card and a SASE. Accurate shortwave reception reports will be accepted in lieu of a two way contact for short wave listeners. Send details of the QSO and SASE to *Page Pyne WA3EOP, 109 S. Artizan St., Williamsport MD 21795, for this special award.*

**VISALIA CA**
**APRIL 22–24**

The 1988 International DX Convention will be held at the Grosvenor Holiday Inn. This special event is sponsored by The Southern California DX Club on April 22 thru the 24. For more information contact *Don Bostrom N6IC, 4447 Atol Ave., Sherman Oaks Ca 91423.*

**CORNWALL ENGLAND**
**APRIL 23**

The Cornish Radio Amateur Club, Cornwall England, and five additional stations worldwide, representing early Marconi Station locations, will celebrate the birthday of Guglielmo Marconi on April 23, from 0000Z to 2400Z. Participating special event stations will be GB4IMD, VO1IMD, VE1IMD, EI2IMD, IY4FGM, and K1VV/IMD. Operations will be in the general class bands with special QSLs. For 3 IRCs, a certificate for working 5 of the 6 stations is available from the Cornish Radio Amateur Club, P.O. Box 100, Truro, Cornwall England. For more information contact *R.J. Donerty K1VV, 153 County St., Lakeville MA 02347.*

**GALENA IL**
**APRIL 23**

The Great River ARC of Dubuque, Iowa, will operate N9FVN from 15:00Z until 21:00Z, April 23rd, at the site of the annual Boy Scouts of America U.S. Grant Pilgrimage in Galena, Illinois. Frequencies will be in the lower 20 kHz of the general bands. Station N9FVN will also operate CW in the lower 25 kHz of the 80 and 40 meter bands and voice in the lower 25 kHz of 10 meter bands. Scouts will also be able to send messages to parents and relatives. For QSL card send SASE to *N9FVN, R.R. 1, Shullsburg WI 53586.*

**LAS CRUCES NM**
**APRIL 23–24**

The Mesilla Valley Radio Club is sponsoring the 24th annual Amateur Radio Extravaganza and Bean Feed on April 23 thru the 24. There will be VEC exams, technical information, and many more. Talk-in on 146.04/146.64 and 146.16/146.76. For more information write or call *Karl Wess WF5A, 712 Stagecoach Dr., Las Cruces NM 88001; day 505-646-5132, night 505-522-1172.*

**PHILADELPHIA PA**
**APRIL 23–24**

The Olympia Radio Amateur Club will celebrate the Anniversity of the United States Submarine Service by operating from the *USS Becuna*, a World War II Submarine and the *USS Olympia*, flagship of Admiral Dewey in 1898. Transmissions can be heard beginning April 23, 1300Z until 2000Z. On April 24 frequencies for CW are 3.590; 3.725; 7.050; 7.125; 14.050; 21.090; 21.150 and phone frequencies 3.890; 7.240; 14.250; 21.360; 28;325; 28.600 (all frequencies within 10 kHz). Two meter operation: 144.225 sideband and 144.270 FM. The ORAC call is WA3BAT. For additional inquiries about the ship's history or the club's operation and QSL information please write to *Olympia Radio Amateur Club, P.O. Box 928, Philadelphia PA 19105.*

**FITCHBURG MA**
**APRIL 24**

The Montachusett ARA will hold a Flea Market at the George Wallace Civic Center. Doors open at 10 AM until 3 PM. Talk-in on 144.85/145.45 and 146.52. For table reservations contact *James Beauegard KB1AY, 7 Mountion Ave., Fitchburg MA 01420.*

**HAYS KS**
**APRIL 24**

The 3rd annual Hays Hamfest will be held on Sunday April 24, just south of 13th and Canterbury. For more information contact *Andy Oldham N0FBS, 117 8th St., Wakeeney KS 67672.*

**GREENVILLE SC**
**APRIL 30–MAY 1**

The Blue Ridge Amateur Radio Society proudly sponsors the 49th Annual Greenville Hamfest and Electronic Flea Market at the American Legion Fairgrounds on April 30 thru the 1st of May. Amateur Radio License Exams (walk in). Indoor/outdoor Electronic and Computer Flea Market starting on Saturday at 8 AM to 5 PM; Sunday 8 AM to 3 PM. For advanced tickets or additional information, please send a SASE to *BRARS, P.O. Box 6751, Greenville SC 29606.*

**DAYTON OH**
**APRIL 24–26**

Dayton's annual Hamvention will be held on April 24 thru the 26th. The Flea Market will open at 12 until 6 PM on the 24th and 6 AM to 5 PM on the 25th, and from 6 AM to 4 PM on the 26th. You must have a General Admission ticket to enter the flea market area. The ticket is valid for Friday, Saturday and Sunday. All flea market spaces are sold in advance. Watch for our ad and order your tickets as soon as possible after January 1. Ticket requests postmarked prior to January 1 will be returned. Either talk-in on 146.34/94 all weekend or 146.31/91 Saturday and Sunday, or 222.34/223.94 Friday noon thru Sunday. A special Hamvention certificate will be sent for contacts made with W8BI during the Hamvention. Send your QSL card and SASE to *Box 44, Dayton OH 45401. (ATTN: DARA Van). For exhibits information write to the same address with the ATTN: Exhibits Chairman.*

**CONWAY ARKANSAS**
**APRIL 30**

The Faulkner County ARC will operate W5AUU on Saturday, April 30 from 1500Z to 2100Z in celebration of Toad Suck Daze. The suggested frequency is 14.250. Send QSL with large SASE to *Kelly Boswell KA5MGL, 599 4th Avenue, Conway AR 72032-5805.*

**SANDWICH IL**
**MAY 1**

The Kishwaukee Amateur Radio Club is sponsoring their 33rd annual hamfest the first Sunday in May at the Sandwich Fairgrounds in Sandwich IL. Hours are 8 AM to 1 PM. Overnight camping is permitted, but there are no hook-ups. Reserved tables are $5 in advance. Tickets are $2 in advance and $3 at the door. Talk-in is 1373. For more information, contact *Howard Newquist, Kishwaukee Amateur Radio Club, P.O. Box 264, Sycamore, IL 60178.*

**LONG ISLAND NY**
**MAY 1**

The Suffolk County Radio Club Indoor-Outdoor Electronic Flea Market will be held on Sunday, May 1 from 8 AM to 2 PM at Republic Lodge No. 1987, Long Island NY. There will be a refreshment stand on the premises and plenty of free parking. General admission is $3 (spouse and children under 12 free). Indoor sellers' tables are $10 each and outdoor space is $7. Each includes one free admission. Talk-in on 144.61/145.21 and 146.52 simplex. For additional information, contact *Bill Sullivan N2ETG at (516) 689-9871 in the evenings.*

**WHEATON IL**
**MAY 7**

Boy Scouts of the DuPage Area Council will operate the Wheaton Community Radio Amateurs Club station W9CCU from the DuPage County fairgrounds at 0400 to 0900 on May 7 with WCRA youth as control operators. This Special Event station, an active part of Scoutarama 88, with the theme "Scouting America's High," is intended to encourage Radio as a hobby of local youth. Suggested frequencies: 28.390, 14.290, and 146.490 FM. For certificate, send an SASE to: *WCRA, P.O. Box QSL, Wheaton IL 60189. Attn: Scoutarama.*

# HAM PROFILES

## Leonid Labutin UA3CR

*Bryan Hastings KA1HY*
73 Magazine *staff*

*73 Magazine* had the great fortune to obtain an interview with one of the Soviet Union's premier hams: Leonid Labutin UA3CR. "Lyonya" is the Chief of Communications in the Soviet Union for the joint Canadian/Soviet polar skitrek. The expedition left a northern USSR island in February, and expects to arrive at Ellesmere Island in Canada's Northwest Territories three months later. See "Look North!" in the January 1988 issue of *73* Magazine for more information on this trek.

The Soviet Union has a very active amateur population, and the *Callbook* lists over 18,000 Soviet hams. Despite this, not very much is known about the state of amateur radio in this vast country, which under *glasnost'* is just beginning in earnest to open up to the West. Leonid provides us with a look into his personal experience and sheds light on the state of amateur radio in this powerful and mysterious nation.

***73***: Let's begin by finding out a little about yourself.

**L.L.**: OK, well, I've lived all my life in Moscow. I studied at the Radiotechnical faculty at Mayakovskyi Institute, and finished up there as a radio construction engineer.

I have a wife and a 21-year-old son. He's in his last year of Electrical Engineering at the Moscow Electro-Technical Institute. He wants to do his thesis on packet radio.

***73***: When did you first become interested in ham radio?

**L.L.**: I made my first rig in 1939, when I was 11 years old. It was a crystal detector. I used a very long antenna with it and received a few stations on the medium- and long-wave bands.

***73***: Was it hard to get permission to put up an antenna in Moscow?

**L.L.**: No, not then, but it's more difficult now. Before, the administration didn't pay too much attention to outside views, but now there are several organizations against aerials, because they feel they are eyesores.

***73***: Did you have an Elmer? Who first got you involved in amateur radio?

**L.L.**: Yes, at first it was my father. He was not a ham, but an SWLer. I really became interested in short-wave after reading a remarkable article in our journal *Radio* by one of our first ham-polar researchers, Ernest Krenkilo RAEM [*an early Soviet callsign–Ed.*] He spent months at a time at a North Pole research station as the radioman.

He was also president of the Radio Sports federation in the USSR. I had the good fortune to get to know him—his dacha was close to mine and we often went out together.

***73***: Have you been on a DXpedition before?

**L.L.**: Yes, I went to Franz Josef Land in 1962 with SSB radios. It was a brand new country on SSB. That was my first trip to the Arctic.

***73***: Are there any hams there now?

**L.L.**: Yes, one I think.

***73***: Is your wife a ham?

**L.L.**: No, but she minds me being one.

***73***: What other hobbies do you have?

**L.L.**: I love to listen to classical music. I also like to read contemporary historical novels and cross-country ski.

***73***: You were involved in building the first Soviet ham satellites, is that right?

**L.L.**: That's right. I worked on RS-1 and RS-2, which went into orbit in 1978.

***73***: There are now 11 ham satellites from the USSR?

**L.L.**: Yes. Satellites RS-3 through RS-8 were made very much in the mold of the first two.

***73***: What aspect(s) of amateur radio interest you the most?

**L.L.**: It differs at different times. I've always been interested in new developments. At first SSB, then satellite communications, and now packet radio.

***73***: Is there packet radio now in the Soviet Union?

**L.L.**: So far, no. We are working hard to get the administration to allow hams to experiment with packet radio.

*Leonid UA3CR/VE3 on packet. This photo was taken at the home of Tom Atkins VE3CDM of Toronto, Ontario, where Leonid spent much of his time during his two-week visit to Canada before Christmas. Tom is the Canadian Coordinator for the Polar Bridge skitrek.*

***73***: Are there a lot of hams in the Soviet Union?

**L.L.**: There's a fair number—probably around 50,000. About half of them have their own stations.

***73***: What's the equivalent organization in the USSR for the FCC?

**L.L.**: There's an organization under the auspices of the Ministry of Communications that administers the exams to hams. The Government Inspector of Electro-communications grant licenses to hams to transmit.

***73***: In the US, we have a government ruling—PRB-1—permitting hams to put up antennas in cities, even those cities with local sanctions against antenna and tower erection. How is it in the Soviet Union?

**L.L.**: There is a similar document in Moscow. Only, to put up an aerial, we must first apply to the appropriate ministry and show our amateur license and give the details of the erection. Then, they send us permission.

***73***: How long do you have to wait for this permission?

**L.L.**: It varies...sometimes a long time, sometimes not. Some cities don't have the document system, and in these places it's harder.

***73***: Are there many ham nets in the Soviet Union?

**L.L.**: Yes. DX nets are very popular, especially in the Ukraine.

***73***: Yes, I've spoken with many Russian DXers. Most only want to say, "Hello, ur 5 x 9 OM, vy gud 73."

**L.L.**: Yes, for them it's just sport. There's a lot of radio sport in the USSR and not enough *tekniki*. This is a bad situation.

***73***: Are most of the people in the Soviet Union who want to become hams from technical backgrounds?

**L.L.**: They're from all different backgrounds. Many are from technical backgrounds. It seems that more hams there than here come from radio technology background—perhaps 20–30%.

***73***: Are there a lot of female hams in the Soviet Union?

**L.L.:** Not so many—even less than here. Most hams' girlfriends tolerate their hobby until they get married, and then completely reject it.

There are exceptions, however. Yuri UA3HR's XYL, Alla RA3AZ, just got her ticket. She's very keen on amateur radio and helped us quite a bit to prepare for this DX-pedition.

***73***: Is *Radio* the best known journal for amateur radio in the Soviet Union?

**L.L.:** Yes.

***73***: Is there a journal devoted entirely to amateur radio?

**L.L.:** Unfortunately, no.

***73***: Is it hard to find amateur radio journals from the West in Moscow? For example, can you buy *73 Magazine* in Moscow?

**L.L.:** It's impossible to buy it there. It's possible, however, to subscribe to some Western journals.

***73***: Is *QST* available?

L.L.: We get it only by reproduction. As well, it arrives late, and we don't get to spend much time with it. We get this at the library. A lot of hams also get a magazine by their "personal route." *[Black market–Ed.]*

***73***: Do you have any well-known people from diverse backgrounds who are hams? We have from the US, for example, Barry Goldwater K7UGA a well-known statesman, and Marlin Brando FO8GJ, a well-known movie actor, to name a few.

**L.L.:** No, there are no such people in the USSR. *[There was, however, Yuri Gagarin UA1LO, the first man in space–Ed.]*

***73***: Do Soviet hams have microcomputers?

**L.L.:** Microcomputers are becoming widespread here, especially after the publication in *Radio* of the detailed construction plans for the *Radio* 86 RK. It's a computer for amateur radio purposes that uses a Russian version of the Intel 8080 microprocessor. Many hams have built this computer.

***73***: There is a Russian version of an Apple model called the *Agat*. Is this popular among hams?

**L.L.:** A few hams have it, but it's not very popular, mainly because it's so expensive. Another relatively popular computer is the *Mikrosha*, issued to industry. The *Elektronika* VK-0010 is a microcomputer issued to schools, but it's fairly popular among hams, too.

We have several computers at home. For example, the Sinclair ZX spectrum, for which I have a lot of amateur radio programs for satellite communications and HF propagation. My son and I built several computers, including the *Radio* 86 RK. We also have the *Elektronika* 0010, and I recently bought the Sharp DC-1276. It's a special pocket computer to calculate orbits using Karl Meinzer's DJ4ZC program.

***73***: Can you relate any specifically Russian ham jargon words?

**L.L.:** There's one I can think of. We often address each other as *Tov [short for* tovarishch, *meaning "comrade"–Ed.]*

***73***: Well, we've arrived at the end of the interview. One last question: Do you find a big difference between hams here and in the Soviet Union?

**L.L.:** Yes, and this is a point I want to emphasize. Many amateurs here have a great interest in the latest developments in the hobby. I encourage Soviet hams to begin to focus more on the technical side of amateur radio. We have a lot of "sportmen," such as DX contesters, but we really need to get more experimenters, more people interested in keeping up with the latest developments. 73



# HAM HELP

## *Your Bulletin Board*

*We are happy to provide Ham Help listings free, on a space available basis. To make our job easier and to ensure your listing is correct, please type or print your request clearly on a full (8½ x 11) sheet of paper. Double space and use upper and lower case letters where appropriate. Also, write numbers carefully—a 1, for example, can be read as an l or an i or a 7. Thanks.*

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**6612 Pleasant Street**
**Cincinnati OH 45227**

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**Rick Thompson N0HKE**
**217 57th Place**
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**Tom Cronick N5FOI**
**2010 W. 8th Street**
**Odessa TX 79763**

I need a schematic/services info for a Gemtronics Model GT-25 VHF Marine-Band transceiver. Thanks.

**Bob Raker WB8ZFF**
**2459 Ambassador Drive**
**Cincinnati OH 45231**

Need schematic or photocopy of manuals for the following: Gonset 3-30 converter, Hallicrafter S53A and S85 receiver. Will gladly pay copying and mailing costs.

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Issue #331

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**UNLOCK THE POWER OF YOUR HEATH COUNTER.** IM-2400 owners, easy one evening kit yields two decades greater resolution. Measure things you thought you'd have to buy another counter for. You won't believe the difference. $12.95 for kit #1041 to L&R Distributing, P.O. Box 4643, Northbrook IL 60062. BNB718

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**C64 & 1541 12v CONVERSION** Power your C64 & 1541 from 13.8vdc & have AC/DC capability. (May require you to use the ext. power opt. on User-Port Hdwe if powered by int. 9vac instead of 5vdc line). Power Supply/Timebase Kit $29.95 1541 D/D opt. add $9.95. Assd w/D-D opt. $49.95 (Simple C64/1541 mods req'd). $2.00 S/H C.Check/M.O. to N7FAE, P.O. Box 373, Bonanza OR 97623. BNB720

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**1988 NORTH AMERICAN 6 METER REPEATER DIRECTORY** and 50 MHz SSB/Beacon Directory now available. $15.00 for both - Postal Money Orders preferred. Harry School KA3B, 1606 South Newkirk Street, Philadelphia PA 19145. BNB721

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**WANTED:** Drake R74 Receiver. Tony Ficarra, 144 Gladstone Ave., Wollongong, NSW AUSTRALIA 2500. BNB722

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**MORSE CODE GENERATOR** for PC/AT or compatible clones. All speeds from 1 to 35 wpm, 7 tones. Data for 720 minutes of copy at 10 wpm and file utilities supplied at no additional charge. $12, $2 s&h, Tax 7%, Dallas area 8%; RAMTRONICS, 1809 Chamberlain Dr., Carrollton TX 75007. BNB724

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# ALL BAND ANTENNAS

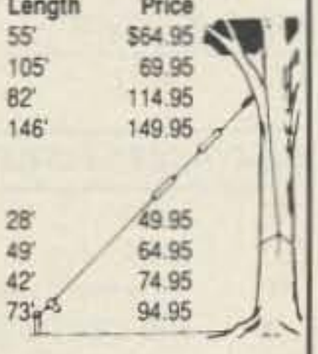
## MULTI BAND TRAP ANTENNAS

**TRAP DIPOLES**

| Model | Bands | Traps | Length | Price |
|---|---|---|---|---|
| D-42 | 10/15/20/40 | 2 | 55' | $64.95 |
| D-52 | 10/15/20/40/80 | 2 | 105' | 69.95 |
| D-56 | 10/15/20/40/80 | 6 | 82' | 114.95 |
| D-68 | 10/15/20/40/80/160 | 8 | 146' | 149.95 |

**TRAP VERTICALS-"SLOPERS":***

| | | | | |
|---|---|---|---|---|
| VS-41 | 10/15/20/40 | 1 | 28' | 49.95 |
| VS-52 | 10/15/20/40/80 | 2 | 49' | 64.95 |
| VS-53 | 10/15/20/40/80 | 3 | 42' | 74.95 |
| VS-64 | 10/15/20/40/80/160 | 4 | 73' | 94.95 |



*Can be used without radials
*Feedline can be buried if desired

*Permanent or Portable Use

ALL TRAP ANTENNAS are Ready to use - Factory assembled - Commercial Quality - Handle full power - Comes complete with: Deluxe Traps, Deluxe center connector, 14 ga Stranded CopperWeld ant. wire and End Insulators. Automatic Band Switching - Tuner usually never required - For all Transmitters, Receivers & Transceivers - For all class amateurs - One feedline works all bands - Instructions included - 10 day money back guarantee!

## SINGLE BAND DIPOLES (Kit form):

| Model | Band | Length | Price |
|---|---|---|---|
| D-10 | 10 | 16' | $17.95 |
| D-15 | 15 | 22' | 18.95 |
| D-20 | 20 | 33' | 19.95 |
| D-40 | 40 | 66' | 22.95 |
| D-80 | 80/75 | 130' | 25.95 |
| D-160 | 160 | 260' | 34.95 |

Includes assembly instructions, Deluxe center connector, 14ga Stranded CopperWeld Antenna wire and End insulators.

**●Any single band, or Trap antenna with "Pro-Balun" instead of Deluxe Center Connector; Add $8.00 to antenna price.**

## COAX CABLE: (includes PL-259 connector on each end)

| Type | Length | With antenna purchase | Separately |
|---|---|---|---|
| RG-58 | 50' | $8.00 | $11.95 |
| RG-58 | 90' | 12.00 | 16.95 |
| RG-8 | 50' | 20.00 | 25.95 |
| RG-8 | 100' | 33.00 | 39.95 |

## ALL BAND--LIMITED SPACE ANTENNA

- Only 70 feet overall length!
- Works ALL Bands 160 thru 10 Meters
- Perfect for ALL classes of Amateurs
- Install as Flat-top, Sloper, Inverted "V", or almost any configuration
- Shorteners provide full 135 feet electrical length; with only 70 feet physical length
- Utilizes Heavy 14 guage stranded CopperClad (CopperWeld) antenna wire, (30% copper; 70% high-strength steel) NO rust, Will not stretch like copper
- Sealed, weatherproof lightweight shorteners utilize NO rust terminals
- Perfect match for your Antenna Tuner with balanced line output
- Handles Full Power
- Works with all transmitters, tranceivers, receivers, etc.
- Completely Factory assembled—Ready to Install—NO adjustments necessary
- INCLUDES 100 feet of 450Ω Feedline
- Feedline can be shortened

Model AS-2 **$49.95** (U.S. Postpaid)

## DELUXE CENTER CONNECTOR

- NO RUST Brass Terminals
- NO Jumper Wires Used
- NO Soldering
- Built-in Lightning Arrestor
- With SO-239 Receptacle
- Handles Full Power
- Completely Sealed & Weatherproof
- Easy Element Adjustments
- Commercial Quality

CE-1 $8.95

## "PRO-BALUN"

PB-1 $17.95

- 1:1 For Dipoles, Beams & Slopers
- Handles Full legal power
- Broadband 3 to 35 Mhz.
- Lightweight, Sealed & Weatherproof
- Deluxe connectors require NO soldering
- NO jumper wires
- Minimizes coax & harmonic radiation

## DELUXE ANTENNA TRAPS:

Completely Sealed & weatherproof - Solid brass terminals - Handles Full Power - NO jumpers - NO Soldering. Instructions included.

1 1/4" Diameter

For 4-band Dipole Ant. 40/20/15/10 $36.00/pr.
For 5-band Dipole Ant. 80/40/20/15/10 $38.00/pr.

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**CIRCLE 134 ON READER SERVICE CARD**

# National Tower Company

**P.O.Box 15417 Shawnee Mission, KS. 66215**
**Hours 8:30-5:00 M-F** Price Subject to Change Without Notice
**913-888-8864**

## ROHN FREE BASE STUBS WITH EACH BX SERIES TOWER

| | | |
|---|---|---|
| 25G | 10' section | $56.50 |
| 25AG2 & 3 | model 2 or 3 top section | $66.00 |
| 25AG4 | model 4 top section | $73.50 |
| 45G | 10' section | $133.00 |
| 45AG3 & 4 | model 3 or 4 top section | $136.00 |
| 55G | 10' section | $166.50 |
| TB3 | thrust bearing | $56.25 |
| M200 | 10' mast, 2" o.d. | $13.50 |
| BX-40 | 40'self supporting [6 sq.ft.] | $196.00 |
| BX-48 | 48'self supporting [6 sq.ft.] | $250.00 |
| BX-56 | 56'self supporting [6 sq.ft.] | $334.50 |
| BX-64 | 64'self supporting [6 sq.ft.] | $431.50 |
| HBX-40 | 40'self supporting [10 sq.ft.] | $226.50 |
| HBX-48 | 48'self supporting [10 sq.ft.] | $308.00 |
| HBX-56 | 56'self supporting [10 sq.ft.] | $392.50 |
| HDBX-40 | 40'self supporting [18 sq.ft.] | $284.50 |
| HDBX-48 | 48'self supporting [18 sq.ft.] | $384.50 |
| | ★ GUY WIRE SPECIAL ★ | |
| 3/16EHS | 500' galvanized 7 strand | $40.00 |
| 1/4EHS | 500' galvanized 7 strand | $50.00 |
| | 1,000 Foot Also Available - Call for PRICES | |

## HYGAIN/TELEX ANTENNAS

| | | |
|---|---|---|
| | **HF ANTENNAS — Tribands** | |
| TH3JRS | 3 element 'Junior Thunderbird' | ★ |
| TH5MK2S | 5 element 'Thunderbird' | ★ |
| TH2MKS | 2 element 'Thunderbird' | ★ |
| TH7DXS | 7 element 'Thunderbird' | ★ |
| TH6DXX | conversion kit to TH7DXS | ★ |
| EXP 14 | Explorer 14 triband beam | ★ |
| QK710 | 30/40 M conv. Exp 14 | ★ |
| | **Monoband** | |
| 103BAS | 'Long John' 3 element 10 mtr | ★ |
| 105BAS | 'Long John' 5 element 10 mtr | ★ |
| 155BAS | 'long John' 5 element 15 mtr | ★ |
| 205BAS | 'Long John' 5 element 20 mtr | ★ |
| 7-1S | 'Discoverer' rotary dipole 30/40mtr | ★ |
| 7-2S | 'Discoverer' 2 elem. 40 meter beam | ★ |
| 7-3S | converts 7-2S to 3 elem. beam | ★ |
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| 14RMQ | roof mt kit for 12 AVQ,14AVQ and 18ATV/WB | ★ |
| 18VS | base loaded, 10 thru 80 meters | ★ |
| 12AVQS | trap vertical 10 thru 20 meters | ★ |
| 14AVQ/WBS | trap vertical 10 thru 40 meters | ★ |
| 18AVT/WBS | trap vertical 10 thru 80 meters | ★ |
| | **Multiband Doublets** | |
| 18TD | portable tape dipole 10-80 meters | ★ |
| 2BDQS | trap doublet 40 and 80 meters | ★ |
| 5BDQS | trap doublet 10 thru 80 meters | ★ |
| | **VHF ANTENNAS — Beams & Verticals** | |
| 23BS | 2 meter 3 element beam | ★ |
| 25BS | 2 meter 5 element beam | ★ |
| 28BS | 2 meter 8 element beam | ★ |
| 214BS | 2 meter 14 element beam | ★ |
| 64BS | 4 element 6 meter beam | ★ |
| V-2S | colinear gain vertical 138-174 MHz | ★ |
| V-3S | colinear gain vertical 220 MHz | ★ |
| V-4S | colinear gain vertical 430-470 MHz | ★ |
| GPG2A | base, 2 mtr. ground plane 3 dB | ★ |
| | **VHF & UHF Mobiles** | |
| HR144GRI | figerglass 2 mtr. 6dB gain 3/8-24 mt | ★ |
| HB144GRI | HyBander 2mtr 6dB gain 3/8-24 mt. | ★ |
| HB144MAG | HyBander 2 meter | ★ |
| BN86 | ferrite balum for 10-80 meters | ★ |
| | **OSCAR LINK ANTENNA** | |
| 215S | 70cm, 435 MHz | ★ |
| 218S | Complete Oscar link system | ★ |

**★ CALL FOR PRICES ★**

## CUSHCRAFT ANTENNAS

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|---|---|---|
| AP8 | 8band ¼wave vertical | $139.90 |
| A3 | 3 element triband beam | $216.00 |
| A743 | 7 & 10 MHz add on kit for A3 | $74.50 |
| A744 | 7 & 10 MHz add on kit for A4 | $74.50 |
| 4218XL | 18 element 2 mtr, 28.8' boomer | $101.50 |
| A4 | 4 element triband beam | $290.50 |
| AV4 | 40-10 mtr. vertical | $94.50 |
| AV5 | 80-10 mtr. vertical | $101.00 |
| ARX2B | 2 mtr. 'Ringo Ranger' | $35.00 |
| ARX450B | 450 MHz. 'Ringo Ranger' | $35.00 |
| A144-11 | 144 MHz. 11 ele. VHF | $47.50 |
| A147-11 | 11 element 146-148 MHz. beam | $47.50 |
| A147-22 | 22 element 'Power Packer' | $128.50 |
| A144-10T | 10 element 2 mtr. 'Oscar' | $50.50 |
| A144-20T | 20 element 2 mtr. 'Oscar' | $74.50 |
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| 220B | 17 element FM 'Boomer' | $94.00 |
| 230WB | 144-148MHz, 30 element | $216.00 |
| 32-19 | 19 element 2 mtr. 'Boomer' | $94.00 |
| 424B | 24 element 'Boomer' | $81.00 |
| 10-4CD | 4 element 10 mtr. 'Skywalker' | $108.00 |
| 15-4CD | 4 element 15 mtr. 'Skywalker' | $121.50 |
| 20-4CD | 4 element 14 MHz 'Skywalker' | $270.00 |

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| 5BTV | 80-10 mtr. vertical | $105.00 |
| 6BTV | 6 band trap vertical | $124.00 |

## ROTORS

| | | |
|---|---|---|
| Alliance | HD73 [10.7 sq.ft.] | $104.00 |
| Alliance | U110 | $47.00 |
| TELEX | AR40 TV, 3 sq ft. | CALL |
| TELEX | CD45-II [8.5 sq.ft.] | CALL |
| TELEX | HAM IV [15 sq. ft.] | CALL |
| TELEX | T2X [20 sq. ft.] | CALL |

## ROTOR CABLE

| | | |
|---|---|---|
| [2-18 & 6-22] | 4080 - per foot | $0.18 |
| [2-16 & 6-20] | 4090 - per foot | $0.35 |
| 1108 | RG8U Mini 8 low loss foam per foot | $0.17 |
| | 500' roll | $79.00 |
| 1198 | RG8U Columbia superflex $31/100' or 500' for | $139.00 |

## unlden Special

**BC145XL . $92.90**
16 Ch 10 band programmable, built-in delay, review, priority, memory backup, Ch lockout, direct Ch access, weather, track tuning AC/DC.

**BC100XL**
**$149.90**
16 Ch 9 bnad, aircraft, keyboard lock, track tuning, lighted LCD display, auto search, auto squelch, scan delay, battery low indicator, Ch lockout, direct Ch access, with AC adaptor/charger, earphone & case.

| | | |
|---|---|---|
| BC50XL | 10 Ch 10 Band, Ch lockout, **PACKAGE PRICED,** with battery pack & charger | $124.90 |
| BC70XLT | 20 Ch 10 band hand held | $159.90 |
| BC100XLT | 100 Ch 11 band, hand held, aircraft | $189.90 |
| BC175XL | 16 Ch 11 band, aircraft, AC/DC | $159.90 |
| BC210XLT | 40 Ch 11 band, weather, aircraft AC/DC | $179.90 |
| BC580XLT | 100 Ch 11 band mobile, weather, air | $219.90 |
| BC760XLT | 100 Ch 12 band w/800MHz mobile | $279.90 |
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| BC200XLT | 200CH 12 band w/800MHz | APRIL DELIVERY |

**TS2 . . . $319.90**
75 channel 12 band, 800 MHz, aircraft & weather, Turbo-Scan® , bank scanning, instant weather, programmable, accuseek, permanent backup, direct access, with AC adapater, DC cord & mobile mt bracket.

**INF1 . . . . $219.90**
WITH TURBO SCAN® preprogrammed by state to receive any type of police transmission, plus instant weather. programmed for all 50 states. Turbo Scan® scans at 40 Ch per second, DC power cord.

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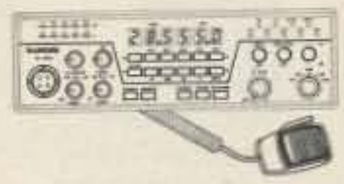
10 meter transceiver, 25 watt, can be programmed to split transceive, SSB, CW, AM, FM, programamble scanning, fully automatic noise blanker, 2½H, 7¾W, 11D.



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Chrome plated base station amateur microphone. Factory wired to be easily converted to electronic or relay operation. Adjustable gain for optimum modulation.

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Same as above with end of transmision 'Roger Beep'

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**Model 49SA - 49 MHz, FM 2-WAY RADIO**
hands free operation, voice activated transmit up to ½ mile. Batteries optional

**model 49B** . . . . . **$34.95**
same features as 49SA except uses "AA" nicad batteries and comes with battery charger

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**PS4** . . . . . **$19.90**
Fully regulated, 13.8 VDC - 4 amps constant with surge protection, overload protection w/instant auto reset.

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Regulated 4.5-15VDC-25 Amp constant 27 amp surge, instant auto reset, dual meter for current & voltage.

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Same as above except, 35 amp constant, 37 amp surge, adjustable from 10 to 15 volts.

**CIRCLE 323 ON READER SERVICE CARD**

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## A convenient service for our Readers.

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# FEEDBACK

In our continuing effort to present the best in amateur radio features and columns, we've decided to go directly to the source—you, the reader. Articles and columns are assigned feedback numbers, which appear on each article/column and are also listed below. These numbers correspond to those on the feedback card opposite this page. On the card, please check the box which honestly represents your opinion of each article or column.

"What's in it for me?" comes the cry from our faithful readers. Beside the knowledge that you're helping us find out what you like (and don't like), we'll draw one feedback card each month and award the lucky winner a free one-year subscription (or extension) to 73.

To save some money on stamps, why not fill out the the Product Report card and the Feedback card and put them in an envelope? Toss in a damning or praising letter to the editor while you're at it. You can also enter your QSL in our QSL of the Month contest. All for the low, low price of 22 cents!

# 73 INTERNATIONAL

*edited by Richard Phenix*

## Notes From FN42

April brings such important celebrations to so many that, although religious, they demand listing here.

On the 1st: Hanuman Jayanti (Hindu—Hanuman is a guardian spirit, helper of Rama); Passover (Jewish) begins on the 2nd; Easter (Christian) is on Sunday the 3rd (10th for Orthodox); Buddha's birthday is on the 8th (Buddhism); and Ramadan, the month of fasting (*sawm*—the Fourth Pillar of Islam) begins on the 18th.

Happy New Year on the 14th, Bangladesh! And Happy Birthday to the Queen (Denmark on the 16th and the 30th for the Netherlands) and to the King (Sweden on the 30th), and to the Emperor of Japan on the 29th.

Other days: 1—Youth Day, Benin; 4—Independence Day, Senegal (and on the 18th for Zimbabwe) and it is Liberation Day, Hungary (and on the 25th for both Italy and Portugal); 5—Arbor Day, South Korea; 6—Victory Day, Ethiopia (on the 24th for Togo); 7—World Health Day, and Woman's Day in Mozambique; 11—National Heroes Day, Costa Rica; 12—National Redemption Day, Liberia; 13—National Day, Chad (and on the 27th for Afghanistan), 14—Pan American Day; 15—Military Regime Anniversary, Niger; 17—Evacuation Day, Syria; and in the U.S., Secretaries Week begins; 19—Republic Day, Sierra Leone; 23—St. Georges Day, U.K.; 25—Anzac Day, Australia and New Zealand; 26—Union Day in Tanzania. And Happy 197th Birthday on the 27th, Mr. Samuel F. B. —— ——— .—. ... .!

## Roundup

New arrangements for our correspondents. The wider the world coverage in *73* International, the less space available to any one report.

It's unfair to ask correspondents for material and then use little or none of it. Beginning with the June issue, therefore, any ham, a citizen of his (her) country, may be given by *73* the title of foreign correspondent (one per country, with exceptions) and a year's subscription in return for sending to this column three reports yearly. Present correspondents can, of course, continue under the new arrangement. *73* encourages all to send in the kinds of reports seen here, but now submit them for possible purchase, for consideration along with all other non-*73* International material.

The three annual reports should concentrate on short items on hamming in the correspondent's country: exciting happenings (to readers in the U.S. and around the world), new technological developments (packet, for example), new and changed regulations, and special events.

Do not submit to this column, however, detailed contest information. *73* International will announce new contests, but details, and results—unless spectacular—should be sent for publication where contesting is a bigger subject for reporting.

*73* International invites comments on this new plan. The column also welcomes input on what the readers want to see and don't, and what they *do* see and *don't* want.

**Universal Permit Application.** *(Refer to January issue, p.78.)* More changes, deletions, and comments next month, but see permit information in national reports, below.

**Ireland.** Baile Atha Cliath celebrates its "One Thousand Years as a City" during 1988. *[That's Dublin.—Ed.]* The Special Event Station EI1000 rung in the new year; plans for St. Patrick's Day: the ambitious attempt to make contact with all the Dublins around the world (some 20 of them) on SSB and some pre-arranged SSTV (a first for amateur radio). EI1000 will be active on all bands and modes all day. Then, on the Millennium Birthday (July 10) EI1000 will be active again. One can receive a special QSL card through the Irish Radio Transmitters Society bureau or direct upon receipt of three IRCs. (From the *IRTS Newsletter* for December 1987.)

### CHINA ADDRESSES
(PO Box and City)

| | | |
|---|---|---|
| BY1PK | 6106 | Beijing |
| BY1QH | 2654 | Beijing |
| BY1SK | 2916 | Beijing |
| BY1CJK | 6206 | Beijing |
| BY4AA | 205 | Shanghai |
| BY4AG | 5304 | Shanghai |
| BY4AOM | 227 | Shanghai |
| BY4RN | 2405 | Nanjing |
| BY4RB | 413 | Zhen Jiang |
| BY4SZ | 51 | Suzhou |
| BY4WNG | 1827 | Nanjing |
| BY5RA | 730 | Fuzhou |
| BY5RF | 209 | Fuzhou |
| BY5QA | 507 | Fuzhou |
| BY5HZ | 804 | Hangchow |
| BY5RT | 707 | Fuzhou |
| BY7KT | 1285 | Guangzhou |
| BY7HL | 105 | Changsha |
| BY8AA | 607 | Chengdu |
| BY8AC | 607 | Chengdu |
| BY9GA | 12 | Lanzhou (Gansu Province) |
| BY0AA | 202 | Wulumuchi (Xinjiang) |

### AUSTRALIA

*J. E. Joyce VK3YJ*
*44 Wren Street*
*Altona 3018*
*Victoria*
*Australia*

Australia celebrates its bicentenary in 1988 and special celebrations are planned for all States. The two largest are a re-enactment of Captain Cook's landing in VK2 (Sydney) when Tall Ships from many nations, led by a replica of Cook's *Endeavour*, arrive after a 12,000 mile re-enactment journey from England; and the 1988 World Exposition, in Brisbane (VK4), from April to October. Amateurs will have a special station within the Expo complex.

Antennas for all bands and modes have already been approved. The call (pity the poor CW op) will be VI88EXPO. The station will provide the public with an insight into amateur radio, and be a meeting place (eyeball or via the waves) for hams. QSLs via the bureau should be no problem, since the Expo authorities have agreed to provide 200,000 QSL cards.

Special callsigns, pending clearance with the ITU, will be VI88A through VI88Z. This I learned from the DOC (now the DOTC, for Department of *Transport* Communications, since it combined with the Ministry of Transport). The thought sprang to my mind as the switchboard girl answered with the new name, "10-4 good buddy, we've got a convoy."

VK7 Tourist Information is a pleasing addition to the scene, accompanying the upsurge of tourism in Tasmania. The efforts of VK7NGH (Greg) and VK7OL (Owen) have been much appreciated by both VK and overseas amateurs. Owen is the official handshaker at the Tasmanian Ferry Terminal (for ferries arriving at Devenport from Melbourne (VK3)). The reception usually includes an invite home for a cup of tea with Owen and his wife. He and Greg (and also John VK7JK, the editor of the local VK7 WIA newsletter) are always willing inform newcomers about places to visit in Tasmania. It always pays to write beforehand to give them a chance to organize a timetable. *[Always do this!—Ed.]* Reach them at the following: Owen Lanchan, 4 Lynd Court, Devenport 7310, Australia, phone: 004–243010; Greg Honey, 63 Mirramar Park, Blackman's Bay 7052, Australia; and John Rogers, 1 Darville Court, Blackman's Bay 7052, Australia, phone: 002–293402.

John says, "If you wish to pat the local Tasmanian Devil during your visit, please bring your own fingers."

Marine Mobile amateurs traveling to Australia should get a 1986 DOTC guide. They should also know of this statement:

*Please note that when an amateur station is licenced outside Australia, and is installed and operated from a vessel registered in another country, an additional Australian licence is not required when the station is operating within Australian Territorial waters. This applies so long as the station remains an integral part of the vessel. Operation of the station, however, must conform with Australian regulations. Amateurs require permission to operate and should first establish the conditions with which they must comply before any transmissions are made in Australian waters.*

### HONG KONG

*Phil Weaver VS6CT*
*10A Bonaventure House*
*91 Leighton Road*
*Hong Kong*

**1987 In Review—Part 1 of 2.**

The big step this year has been in Packet Radio. Brett Graham VS6UP sparked growth to the current 50 stations. Also, Asia is about to embark on a NET/ROM system using 29.010 MHz. Currently in Hong Kong we operate a digipeater on 144.25 MHz, and the HF gateways are VS6UP on 14.107 MHz, VS6EL on 14.109, VS6UF/1 on 21.099, and VS6UP/2 on 29.010 MHz.

I am currently in charge of the Port Communications Center of

the Maritime Department in Hong Kong, and welcome visitors interested in our Port Control Center and Maritime Rescue Coordination Center. We cover all of the South China Sea. We have HF, SSB, telex, AFTN and facsimile.

I have regular schedules with BY1QH Saturdays at 0530Z on 14.130 MHz, and after reading the very good article on amateur radio in China *[January issue, Chang Han Dong, on p. 94—Ed.]* I wondered, how do you get a QSL card from China? I asked Yuan Bo, and he advises that QSL cards can be sent *into* China care of BY1PK for distribution but they have no funds or machinery to operate an outward bureau. I have, therefore, put together an up-to-date and complete list of stations currently operating in China and recommend you send the card direct to the station concerned. (See box, page 98.)

**ITALY**

*Giancarlo Martelli IØXXR*
*Via A. Bevignani, 18*
*00162 Rome*
*Italy*

*[Welcome back, IØXXR! The last report from Italy written specifically for us was from I2MQP (February 1986).*

*IØXXR was licensed in 1946 and was I1PL until 1955, but he was very active in 1938–1940 as a boy when it was illegal in Italy. The Fascist government, however, tolerated it. He wrote last for us for the August 1984 issue! —Ed.]*

Some will remember I wrote last about the "80-meter affair," in Italy. It was an ugly story about Italian hams being confined to the two thin slices, 3613–3627 and 3647–3667 kHz, so that the CW and RTTY portions could not be used, and the SSB DX window close to 3800 was forbidden as well. This was an old, old rule and gradually nobody paid attention to it—hams and authorities alike. "Don't wake the sleeping dog," says an old Italian proverb, and hams tried to be silent about it and QSYed from 3.5 to 3.8 just as hams in other countries were doing legally.

Then, about five years ago, there was suddenly a shower of heavy fines and license suspensions on hams monitored outside the permitted slices. Our anger

*IØXXR in his QTH with TS-830S and backup FT-101E. Antenna is TH3 for the HF bands and a quad loop zepp fed for the LF bands.*

and disappointment was great and a very strong opposition started against that governmental policy by many, including ARI (Associazione Radioamatori Italiani). After much pressure, letters to newspapers, talks with politicians, debates, the truth emerged. A very long time ago the Defense Ministry had registered with the International Radio Frequency Board in Geneva over a hundred frequencies in the 80m band for itself and possible military use.

As we explained to ministry officials about the 3.5–3.8 WARC recommendations for shared frequencies (amateurs, fixed, and mobile), we discovered that the policy had been born out of armchair discussions. For years, ministry officials believed that their registered frequencies had been frozen for them alone and that they had been kept clear from any kind of traffic!

Finally, on December 14, the Ministero delle Poste e Telecomunicazioni informed ARI that 3.500 to 3.800 was opened to the Italian Amateurs Service on a Seconday Status. According to WARC, amateurs should be Primary on this band, but we don't bother too much about the small limitation. Who can feel "Primary" in competition with a 25 or 50 kW RTTY commercial or government station?

Years ago, our law was one of the most limiting. The VHF and UHF repeaters were illegal, no mobile traffic was permitted, the maximum legal input power was 300 Watts (and still is), but many things have been changed, and many others are going to change!

**ALIEN AMATEUR PRIVILEGES IN JAPAN**

| License Class | | | | | Japanese |
|---|---|---|---|---|---|
| Australia | Canada | W. Germany | France | US | Permit Class |
| Unrestricted | Advanced | B | E | Extra | 1st[1] |
| | Digital | | | | Limited 1st[2] |
| | | | D | Adv. and Gen. | 2nd[3] |
| | | | C | | Limited 2nd[4] |
| Novice | Amateur | A | B | Tech. | Telegraph[5] |
| | | | | Novice | Limit. Teleg[6] |
| Limited | | C | A | | Telephone[7] |

1. All modes, all bands, 500W max.
2. All modes, all bands above 30 MHz, 500W max.
3. All modes, all bands, 100W max.
4. All modes, all bands above 30 MHz, 100W max.
5. All modes, all bands except 10 and 14 MHz, 10W max.
6. A1A and A1B mode only, on 3.5, 3.8, 7, 21, 28 MHz, 10W max.
7. All modes but A1A, A1B, all bands but 10, 14 MHz, 10W max.

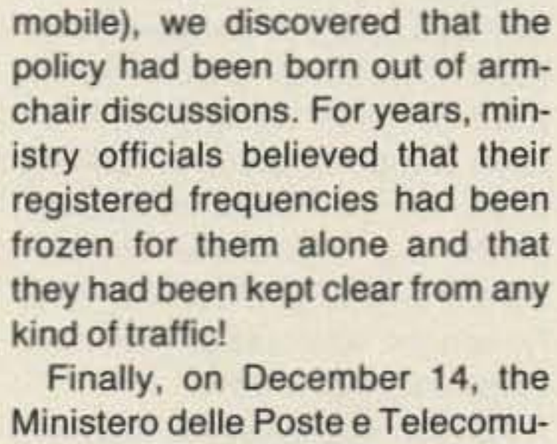
**JAPAN**

*The Japan Amateur Radio League, Inc.*
*International Section*
*14–2, Sugamo 1-chome*
*Toshima-ku, Tokyo 170*
*Japan*

*[Applying for permit to operate is complicated, but it is efficiently described.* 73 *International will not now try to incorporate the Japanese procedure into the development of the Universal form. If a reader wishes to use the two forms reproduced here, complete with Japanese language, send* 73 *an SASE with your request for copies—Ed.]* Submit to the above address the completed application and "Letter of Attorney" forms 60 days before beginning transmitting in Japan. Also send photocopies of the photo page of the passport (or equivalent proof of citizenship) and the current amateur radio license, and payment as specified below (or as proof of payment, a copy of the bank transfer document). The permit will be valid for one year or until your current license expires, whichever is less. (Five year permits for alien permanent residents will be granted upon proof of this status.)

It's recommended to request a portable 50-watt station for use anywhere in Japan—see item 13 on application form. (A separate license and an additional fee is charged for fixed station operation in addition to the portable 50-watt-or-less station.) Fees: 10-watt station or less (mobile/portable)—10,000 yen; over 10 to 50 watts (mobile/portable)—13,000 yen; over 50 to 100 watts (fixed only)—19,000 yen. *[Figure 125 yen to the dollar just to estimate costs, but use official exchange amount when making payment by International Money Order to JARL with application, or by bank transfer to the JARL account (# 061-9003391) at the Komagome Branch, Mitsubishi Bank, Tokyo, marked "For reciprocal amateur radio license." —Ed.]* If planning to run over 100 Watts output, write for special permit process. This could take over three months to arrange.

A license will be forwarded to the applicant's address in Japan (line 6 on the application form). If he prefers, he may choose a mobile/portable station, put the JARL address on line 7, and mark on line 6, "Hold license at JARL." In this case, pick up the license at JARL by presenting passport or other such ID.



LETTER OF ATTORNEY
委任状

*These forms for Japan may be obtained from 73 International by sending a #10 SASE with your request.*

## LIBERIA

*Kamal T. Hamzi EL2AY*
*c/o Carol McClure N5GAP*
*3428 Kilrush Drive*
*Arlington TX 76014*

*[Liberia appeared here last in April 1986, when Don EL2AL moved away. Perhaps EL2AY will become the new Liberian correspondent? This is our invitation to him.*

*73 is pleased to learn that Kamal met with great hospitality while he was in this country. He wrote his appreciation with such emphasis, that duplications were edited out to save space!—Ed.]*

Every Sunday night but one since I returned I have had a 2100Z schedule on 14200 with my friend Norris Gaynor KA2QWZ—a friendship which started with a single QSO a few days before I left for the USA. The one exception, he arranged for his friend Neda PT7WY to fill in and to present his regrets. His family invited me and my friend Issa to their home in Pine Grove, and from them, including the nine-year-old daughter, Melissa, we received the kind of warm hospitality one associates with close family members. I used his station to contact Abdullah EL2CE who called my wife to report my safe arrival. The Gaynors arranged also for a luxurious fruit basket to greet us at our hotel.

At Harrisburg I was met by Maryann WA3HUP, QSL Manager for JY1 and 67 other hams all over the world, and her son Gary. It was sheer pleasure to finally meet her after years of talking with her. We visited a mutual friend, Ruth WB3CQN, and I wished I didn't have to fly on to Boston, where I was met by my Liberian friend Jerome Bowen, at whose brother's (Brunel's) house I spent the night. His wife, Virginia, took me shopping the next day.

In Dallas I was met by my QSL Manager, Carol N5GAP, well known to the Liberian Radio Amateur Association. She is Stateside Net Control for the Liberian-African Queen Net every Monday. She had cancelled my hotel reservation and insisted I stay with her family in Arlington. Here I went through a stack of correspondence, my QSL mail, and the A-8 QSL contribution cards for the Ganta Leprosy Center. Carol is in charge of collecting all A-8 contributions. Carol told me to make myself at home in her radio shack, and I made contact with EL2CE and EL2EN in Monrovia. It was hard to leave to fly home, but Carol promised to visit Liberia for our 25th Anniversary celebrations.

Generosity had not ended yet. On the flight home I had an animated conversation with a Massachusetts journalist writing for the *Martha Vineyard Gazette*. I still receive courtesy copies of this newspaper!

## NORFOLK ISLAND

*Kirsti Jenkins-Smith VK9NL*
*PO Box 90*
*Norfolk Island, 2899*
*Australia*

Last July, amateur radio played a role in an emergency at sea near Norfolk Island.

It all started on the maritime mobile net on 14.315 MHz, where John Anderson VK9JA reports daily, keeping yachts at sea informed of weather conditions in the area.

The San Diego-registered yacht, *Heather Marie*, was nine days out of Aukland, New Zealand, when she sailed into heavy weather in the Tasman Sea. On board were four people, one of whom had been taken ill and suffered severe dehydration. The skipper, New Zealand-born Patrick Waddick KB6GKS, knew that the ill crew member had only half a kidney, and so decided to head for the nearest land.

The yacht was already on a course for Norfolk Island. The crew had decided earlier to have a look at the Island on their way to Australia, but from a safe distance. Two yachts had already come to grief this year while at anchor off Norfolk, which has no safe harbor.

In trying to increase speed, the skipper ran too much canvas, resulting in a torn mainsail and damaged rigging. In worsening weather, he reported his plight to the maritime mobile net.

John VK9JA was aware of the yacht and of the ill man on board. They sought and obtained medical advice from the Norfolk Island hospital via John, and began to feed the patient sweetened water to slow down dehydration. With the damaged rigging and sails, however, the situation became more urgent. It was time for a sea rescue. Norfolk Island does not have any facilities for rescues at sea. Motorized fishing vessels go out when weather permits. They are small open craft usually remaining within sight of the Island.

John contacted the local authorities, who in turn got in touch with Sea Safety in Canberra, Australia. Sea Safety unsuccessfully tried to raise assistance from other ships in a radius of 100–300 miles. Norfolk Island is, after all, on the way to nowhere—far from normal shipping lanes. They finally sought assistance from the Royal Australian Navy.

As luck would have it, the *HMS Whyalla* happened to be in a position about 100 miles west of Lord Howe Island, which placed her some 600 miles from Norfolk. As the *Whyalla* sped towards the *Heather Marie*, John stayed with his rig, monitoring and relaying all messages.

When radio conditions failed from time to time, other amateurs on the frequency were able to relay. The Norfolk Island Police became the local authority in charge, and John now made his home available to the Police as operations center. Hourly position reports were required from the yacht. Thanks to satellite navigation equipment on board, this presented no problems. A couple of small planes visiting the Island at the time, also made a few runs out to the yacht to confirm positions already relayed via amateur radio.

All traffic was conducted on the amateur radio bands. The *Whyalla* also had access to the emergency frequency in use with her skipper operating. Although Norfolk Island has a Coastal Radio Station, it's of fairly limited use and manned only for contacting the regular supply ship. In this case, it was of no use as the yacht had only amateur radio on board and the coastal radio is not equipped for these bands.

After a 29-hour high-speed run, the *HMS Whyalla* finally sighted the yacht on July 27 at approximately 3:30 p.m. The *HMS Whyalla* took the yacht in tow and brought it to the relative safety of Cascade Bay, Norfolk Island. The sick crew member spent a night in the hospital before flying home to his own doctor in the U.S.A. After some repairs to the yacht, the skipper set course for Australia once more.

After a 48-hour vigil at the radio, during which John had hardly slept, the first-ever amateur radio/sea-rescue operation involving Norfolk Island was thus successfully concluded. The local police and other authorities praised John for his excellent conduct on the communications side of the operation.

To quote the senior Sergeant, "John's expertise and experience with the radio were invaluable to the authorities throughout the whole operation. It appears that in John's case, the term 'ham operator' seems rather inadequate." 73


**Liberian Commemorative Stamps**

Liberia has just issued a set of four colorful stamps commemorating the 25th anniversary of the Liberian Radio Amateur Association. Jim DeLoach EL2GA/KB6EH reports that Liberian hams are now using these stamps for their correspondence.

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### Isle of Intrigue

In some select circles, a person hasn't really traveled until they've visited Bang on Iron, Goat House, Down Under Johnnie Fall, and No Guts Captain.

Still, they do earn two points if they recognize those names as key locations on the fascinating DXCC country of Pitcairn Island—VR6.

But unusual place names are not the only strange and largely unknown facts about Pitcairn.

### Mutiny on the Bounty

Many people know that mutineers from *His Majesty's Ship Bounty* settled Pitcairn. She was a 100 foot, three-masted, armed merchantship. The crew's mission was to sail from England to Tahiti, barter for breadfruit trees, and deliver them to British colonies in the West Indies to provide food for slaves.

The mate, Fletcher Christian, and other crew members took over the ship and aborted that mission. The mutineers put the deposed captain William Bligh and eighteen of his crew in the ship's small boat and set them adrift. Most eventually reached England.

The rebels sailed the Bounty back to Tahiti to continue the fabulous partying they'd started there earlier.

Beyond these basic facts, however, what most folks know about the mutineers comes from Clark Gable's portrayal of Fletcher Christian in the 1935 film, *Mutiny on the Bounty*, and from Marlon Brando's role as Christian in a second film version, in 1962.

Unfortunately, both those films are packed with errors. Probably the most extreme error was the depiction in Brando's film of Christian dying on a Pitcairn Island beach. There isn't a beach on the island, and Christian died in a field of yams, fatally shot by oppressed Tahitian men. According to Ian M. Ball's 1973 book *Pitcairn: Children of Mutiny*, however, even today's descendents of the mutineers "accept (those faulty films) as gospel."

People also incorrectly assume the mutineers were the first people to inhabit Pitcairn. Actually, Polynesians lived there centuries earlier. Rock carvings, human burial sites, earth ovens, and other artifacts on the island show this. Indeed, the mutineers were not even the first Europeans to sight the island. In 1767, 23 years before Christian and his gang arrived, English Captain Philip Carteret, in command of *His Majesty's Ship Swallow*, sailed by, but didn't land because—as he noted in his ship's log—"the surf broke upon (the island) with great violence."


*Figure 1. The author's QSL card from Pitcairn Island's most prominent ham, Tom Christian VR6TC.*

Despite the landing hazard, the mutineers settled on the island in 1790—"almost in desperation," according to a government booklet about the island—after two months sailing in search of a safe hideout.

### Dangerous Ground

The mutineers made a poor choice. The island is only about two miles long and one mile wide. It covers approximately 1,120 acres—less territory than the Rock of Gibraltar. The only access is through a boulder-strewn cove on which heavy seas pound almost continually. Nearly vertical cliffs 300' and higher surround the rest of the island.

To get on and off the island, the settlers built distinctive 36' longboats, which they learned to work in and out of the cove—by oar, of course. Diesel engines later replaced oars as the main propulsion for these boats, but they are still the only means of landing on the island. To make boat-handling easier, the British Navy built a concrete jetty in the mid-1970s.

### Far from Everywhere

Pitcairn is located roughly halfway between the United States and New Zealand. The nearest commercial port is some 1,350 miles east and slightly south of Papeete, Tahiti.

Another myth abounds that today's Pitcairn is the home base for descendents of the mutineers. Actually, fewer than *three* percent of the rebel's descendents live on Pitcairn. Worldwide, there are some 1,500 descendents. Nearly half live on Norfolk Island, a possession of Australia located 3,700 miles to the east. Nearly 400 descendants live in Australia, 160 in New Zealand, and 150 on Tahiti and other French Polynesian islands.

Tom Christian VR6TC, the Radio Officer, is the most famous radio communicator on the island. Many hams have worked Tom. This position pays Tom to handle official and personal traffic mostly through a commercial station in Suva, Fiji.

Tom is a sixth generation descendent of the original leader, Fletcher Christian. Tom is six feet, two inches tall, trim, and in his early fifties.

Tom's wife, Betty, operates as VR6YL. Irma Christian—a relative of course—is licensed as VR6ID. Then there's Kari Young VR6KY, one of the few outsiders to join the Pitcairn community. When she was a teenager in her native Norway, she read the 1932 book *Mutiny on the Bounty*, by Charles Nordhoff and James Norman Hall. This book also expounded many myths for it was meant to be fiction, yet it fascinated Kari. She thus studied to be a ship's radio operator, went to sea, reached Pitcairn Island, and settled in.

### Isolated

Many people also mistakenly believe that ships often visit the island. Years ago, several ships a week visited Pitcairn, but now only about two vessels a month stop by. Thus, for Pitcairners, radio is now more important than ever.

Radio first arrived on Pitcairn in 1922, in the form of a donated crystal receiver from the Marconi Company. A small coil transmitter that a New Zealander gave to the community sent the first radio transmissions from the island in 1926. Two Americans installed transmitting and receiving gear paid for by private contributions in 1938. In 1940, the New Zealand Navy built shortwave facilities, providing the first regular link with the outer world.

Radio, however, is nearly the only modern convenience on the island. Most residents live in unpainted, ramshackle houses built from lumber thrown overboard from passing ships. There is little furniture. Kitchens have dirt floors and stone ovens.

Yet there is some modernization. The nearly 30-year-old bulldozer used in building the jetty remains on the island. The islanders occasionally use this tired old beast to rehabilitate the dirt path running from the landing to the homes 300 feet above and to help move cargo. There are several dozen motorcycles and a few 3-wheel all-terrain vehicles. There are now even a few VCRs on the island, showing tapes that hams around the world sent to the islanders! They also have a video camera.

Only 28 souls constituted the original group that settled on Pitcairn—nine mutineers, six Tahitian men, 12 Tahitian women, and an infant girl. This original group spawned large families—the population peaked in 1937 at 223 residents. Today, however, there are only 40 people on Pitcairn, which causes grave concerns for the future of the island.

As the number of residents dwindles, some observers say that the end of the community is in sight. According to *National Geographic* writer Ed Howard, in a 1983 article about his visit to the island, "If only a few more (residents) leave Pitcairn, it may not be possible to man the longboats and make contact with the few passing ships." Indeed, some recent visitors to the island claim that even Tom Christian says he would like to leave Pitcairn. Others report he's been saying that since at least the early 1970s. 73

# OP-ED

*by Larry Ledlow, Jr. NA5E*

### Good Morning, Class!

Oh, how I used to dread school. The prospect of another day of ABCs or other tedious exercise hardly motivated me to drag my lazy buns out of bed. The real motivator was my mother's recipe for rise-and-shine, which she very deftly applied with the palm of her right hand. Ugh!

> ***"The ham industry devotes a great deal of rhetoric (and darned little else) to recruiting young hams into the hobby."***

School days were either feast or famine, intellectually speaking. I can still recall the countless sessions reciting addition tables in harmony with two dozen other children. Or the ocean of tiny bodies hunkered down with giant pencils and Big Chief tablets, our tongues positioned for maximum concentration, while we made miles of graphite loops between the lines on the paper. I would ask myself if there really was intelligent life beyond second grade. Better yet, the history lessons, staring at datelines, maps, and family trees hoping to burn the images onto my retina for easy recall on the next exam.

You, too, eh?

### Sweet Memories

Ah, but who remembers the taste of paste? How about feeding the gerbils? Then the chemistry experiments, making that bookcase in wood shop, or the field trip to the candy factory? THOSE were the feast days, those memorable interludes from the humdrum of rote learning. Those special days and events actually meant something. They were diverse sensory experiences. I got my hands dirty, created something tangible—I used something more than a book or the blah-blah-blah lectures to learn something new. All of the truly memorable experiences in school were FUN!

Thank goodness for innovative teachers and understanding administrators, who successfully promote fun and meaningful learning experiences. But, alas, the opportunities to explore creative teaching and learning are few and far between, especially in our nation's public school systems.

Nonetheless, there are a few shining lights in the darkened halls of academic endeavors. Take a look at Peter Kemp's BEARS project in this issue. Carole Perry WB2MGP of the New York City school system is another innovative instructor you'll read about in an upcoming issue. And a handful more teacher-hams recognize amateur radio as something more than an end in itself.

They view this great and varied hobby of ours as an effective teaching tool. They use amateur radio as a means to get the students involved with the subject at hand: science, geography, government, foreign languages, civics, mathematics, and so on. The student and faculty responses have been overwhelming. Amateur radio's use in the classroom to teach a variety of subjects *works*. Full stop. It's fun for both students and teachers, and amateur radio gains some respect amongst non-hams.

The ham industry devotes a great deal of rhetoric (and darned little else) to recruiting young hams into the hobby. Is there a better way to expose the public at large to amateur radio than in the school system? Students, parents, teachers, and administrators—most of us fit into at least one of those categories—would all be exposed to amateur radio! Further, it doesn't have to be limited to high school or elementary grades. Why not extend the concept to college or adult continuing education programs?

### Just the Beginning

OK, suppose we all agree that ham radio would succeed as a teaching tool. Big deal. That's the easy part. We have to successfully pitch the idea to hundreds of thousands of non-ham teachers and school board members. THAT could be a problem, but not if we're smart about the sales job.

First, we need to find the sympathizers amongst the teachers. By highlighting successful programs already in progress around the country, the industry is bound to win over quite a few converts. After all, a lot of the teachers are just as tired of the routine exercises as the students. With data on current programs, the next step would present the pros, cons, and hard facts to the National Education Association (NEA) and other teachers' organizations at national and regional conventions.

An important point: Sympathetic educators who believe in the potential of ham radio in the classroom would have to make the actual presentation. I seriously doubt the NEA or other educational groups would view a ham industry pitch as anything other than a commercial venture. That doesn't mean the industry can't support Educators for Amateur Radio, however. For that matter, all of hamdom should support such a group to give the hobby a great shot in the arm.

> ***"Congress no longer feels education is of paramount importance."***

Why not team up with other organizations with similar goals? For example, the Institute of Electrical and Electronics Engineers (IEEE) is especially concerned about the dwindling number of engineering students in America. Certainly amateur radio programs in schools would interest many students in electronics technology. Hence, a common interest between the IEEE and the ham industry.

A plan well thought out and properly executed between national organizations would carry a lot more weight than a call to arms on editorial pages of the ham magazines.

You're probably saying, "Yeah, sure. This is just a lot more rhetoric. Nothing will ever happen." Why not? There's a lot of inertia to overcome, but with a few shakers and movers, we can get things rolling.

Volunteers, please step forward!

### The Tax Man Cometh

Speaking of education, like a lot of other folks this year, I am learning about the new tax laws that took effect on January first. There's nothing quite like staring down the barrel of a 1040 long form aimed squarely at my pocket book to make me read the fine print.

Our politicians, in their infinite wisdom, have decided employer-paid education benefits are now taxable! Yessir, all tuition-assistance benefits to US employees are subject to Federal income tax and Social Security withholdings. Imagine getting your employer to pay for a few evening courses you need for the next promotion, then finding your tax bill increased by another $500!

The impact is potentially disasterous on advanced engineering and technical education in this country. After all, many technical graduates, until now, have pursued after-hours degree programs sponsored largely by their employers. With education benefits taxable, some employees can no longer afford school, thus putting an end to their academic careers. Obviously, Congress no longer feels education is of paramount importance in our society. This does not bode well for the future of America.

Uncle Sam has just taxed our efforts to improve ourselves. (Wouldn't it make more sense to tax the uneducated?) Warm up your pencils and word processors and encourage your representatives in Washington to make tuition assistance untaxable again. We'll all be better for it. 73

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- **MC-43S UP/DOWN mic. included.**

**Optional Accessories:**

• **AT-130** compact antenna tuner • **AT-250** automatic antenna tuner • **HS-5/HS-6/HS-7** headphones • **IF-232C/IF-10C** computer interface • **MA-5/VP-1** HF mobile antenna (5 bands) • **MB-430** mobile bracket • **MC-43S** extra UP/DOWN hand mic. • **MC-55** (8-pin) goose neck mobile mic. • **MC-60A/MC-80/MC-85** desk mics. • **PG-2S** extra DC cable • **PS-430** power supply • **SP-40/SP-50B** mobile speakers • **SP-430** external speaker • **SW-100A/SW-200A/SW-2000** SWR/power meters • **TL-922A** 2 kW PEP linear amplifier (not for CW QSK) • **TU-8** CTCSS tone unit • **YG-455C-1** 500 Hz deluxe CW filter, **YK-455C-1** New 500 Hz CW filter.




## TS-680S

### All-mode multi-bander

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

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

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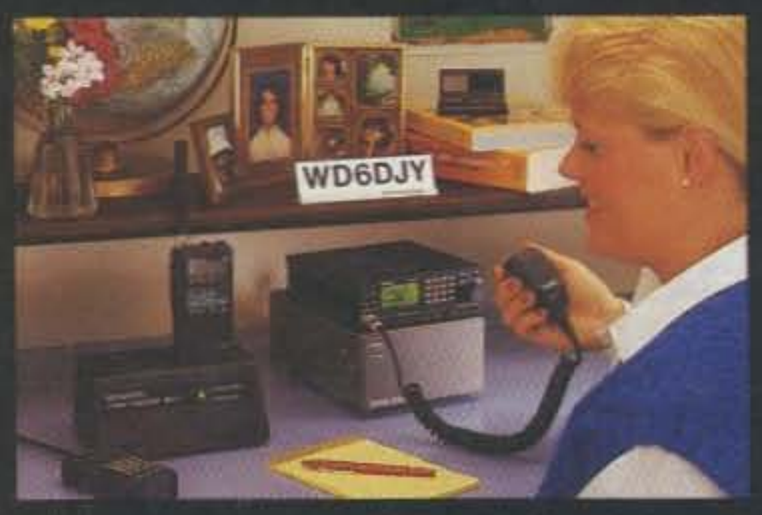


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