

# 73 AMATEUR RADIO

USA \$2.95  
CAN. \$3.95  
A WGE Publication

## HAND-HELD SPECIAL

Five Hot HT Reviews  
Power Amp Playoff  
Super Charger Projects  
Hand-Held Wish List

**NEW!**

Profile:  
Meet Janette  
Newcomers  
Welcome!

**Exclusive!**

WB6RQN's  
Packet Talk



**Extra!  
Extra!**

US Frequency Privileges  
Plus DX Prefix Pullout





**FIVE Watt  
IC-02ATHP  
(High Power)  
now available!**

# ICOM IC-02AT

## Full Size, High Power



IC-2AT  
with IC-BP3  
battery pack

IC-02ATHP  
(High Power)  
version  
with IC-BP7  
battery pack

If you want a 2-meter handheld with exceptional features, quality built to last, and a wide variety of interchangeable accessories, take a look at the ICOM IC-02AT and IC-2AT handhelds.

**Frequency Coverage.** The IC-02AT covers 140.000 through 151.995MHz and the IC-2AT, 141.500 through 149.995MHz...both include frequencies for MARS operation.

**IC-02AT Features.** ICOM's versatile IC-02AT handheld has the following outstanding features:

- DTMF/direct keyboard entry  
LCD readout
- 3 watts (IC-BP3 battery pack) standard, or 5 watts (IC-BP7 battery pack)
- 10 memories which store duplex offset and PL tone (odd offset can be stored in last 4 memories)
- Frequency dial lock
- Three scanning systems: priority, memory and programmable band scan (selectable increments of 5, 10, 15, 20, or 25kHz)

**IC-2AT Features.** The IC-2AT is ICOM's most popular handheld on the market. The IC-2AT features a DTMF pad, 1.5 watts output, and thumbwheel frequency se-

lection. The IC-2A is also available and has the same features as the IC-2AT except DTMF.

**Accessories.** A variety of slide-on battery packs are available for the IC-02AT and IC-2AT, including the new long-life 800mah IC-BP8 which can be used with both handhelds.



Other accessories include the HS-10 boom headset, HS-10SB PTT switchbox, HS-10SA VOX unit (for IC-02AT), and an assortment of battery pack chargers.

**The IC-02AT and IC-2AT** come standard with an IC-BP3 NiCd battery pack (IC-02ATHP comes with IC-BP7 battery pack), flexible antenna, AC wall charger, belt clip, wrist strap, and ear plug. See the IC-02AT and IC-2AT 2-meter handhelds at your local ICOM dealer.

**Often imitated,  
never duplicated.**

**ICOM**  
First in Communications

ICOM America, Inc., 2380-116th Ave. N.E., Bellevue, WA 98004 Customer Service Hotline (206) 454-7619  
3150 Premier Drive, Suite 126, Irving, TX 75063 / 1777 Phoenix Parkway, Suite 201, Atlanta, GA 30349  
ICOM CANADA, A Division of ICOM America, Inc., 3071 - #5 Road, Unit 9, Richmond, B.C. V6X 2T4 Canada

All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. 02AT587



# 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 embarrassing 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

1. ½ second electronic voice delay
2. FCC registered coupler
3. CW ID chip



**CONNECT SYSTEMS INC.**  
23731 Madison St.  
Torrance CA 90505  
Phone: (213) 373-6803

**AMATEUR ELECTRONIC SUPPLY**  
Milwaukee WI, Wickliffe OH,  
Orlando FL, Clearwater FL,  
Las Vegas NV

**BARRY ELECTRONICS CORP.**  
New York NY

**EGE, Inc.**  
Woodbridge VA

**ERICKSON COMMUNICATIONS**  
Chicago IL

**HAM RADIO OUTLET**  
Anaheim CA, Burlingame CA  
Oakland CA, Phoenix AZ  
San Diego CA, Van Nuys CA,  
Atlanta GA

**HENRY RADIO**  
Los Angeles CA

**INTERNATIONAL RADIO SYSTEMS**  
Miami FL

**JUNS ELECTRONICS**  
Culver City CA

**MADISON ELECTRONICS SUPPLY**  
Houston TX

**MIAMI RADIO CENTER CORP.**  
Miami FL

**MIKES ELECTRONICS**  
Ft. Lauderdale, Miami FL

**N&G DISTRIBUTING CORP.**  
Miami FL

**OMNI ELECTRONICS**  
Laredo TX

**PACE ENGINEERING**  
Tucson AZ

**THE HAM STATION**  
Evansville IN

**WESTCOM**  
San Marcos CA

**CANADA:**  
**CARTEL ELECTRONIC**  
**DISTRIBUTORS**  
Surrey B.C.

**COM-WEST RADIO SYSTEMS, LTD.**  
Vancouver B.C.

CIRCLE 12 ON READER SERVICE CARD

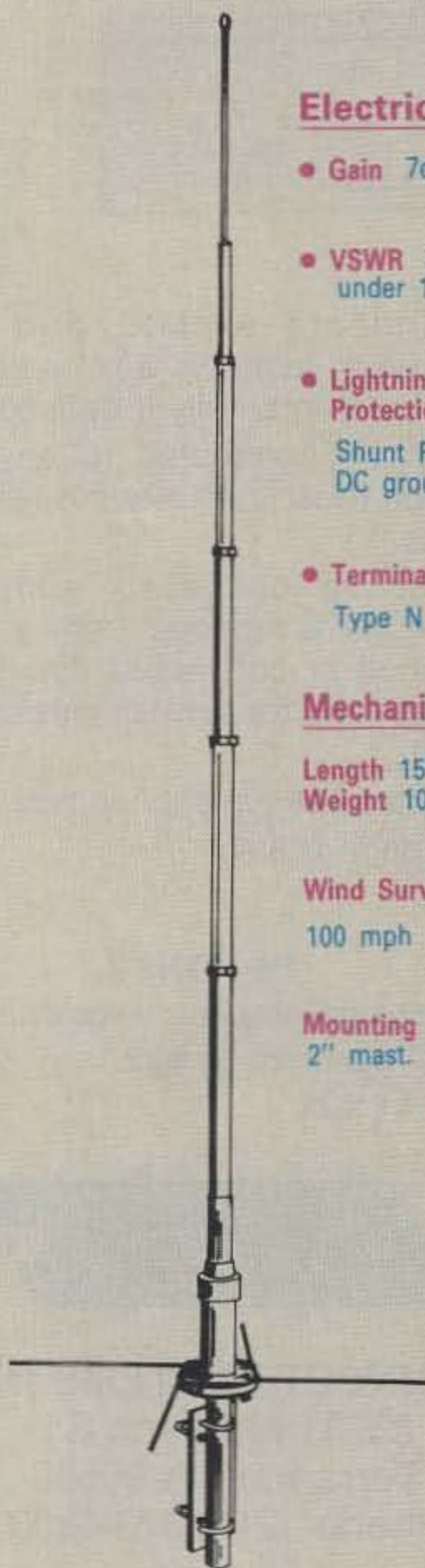




Hustler VHF and UHF antennas offer a combination of gain, durability and value which have made them the antenna most often demanded for repeater applications.

Reliability and Performance - Beyond Your Expectations

G7 - 144



Electrical

- Gain 7dBd
- VSWR 3 MHz under 1.5:1
- Lightning Protection  
Shunt Fed - DC ground
- Termination  
Type N Female

Mechanical

- Length 15'4"
- Weight 10 lbs.
- Wind Survival  
100 mph
- Mounting Up to 2" mast.

G7 - 220



Electrical

- Gain 7dBd
- VSWR 4 MHz under 1.5:1
- Lightning Protection  
Shunt Fed - DC ground
- Termination  
Type N Female

Mechanical

- Length 10'2"
- Weight 7.0 lbs.
- Wind Survival  
110 mph
- Mounting Up to 2" mast.

G6 - 440



Electrical

- Gain 6dBd
- VSWR 8 MHz under 1.5:1
- Lightning Protection  
Shunt Fed - DC ground
- Termination  
Type N Female

Mechanical

- Length 7'3"
- Weight 16 lbs.
- Wind Survival  
125 mph
- Mounting Up to 2" mast.

HUSTLER, INC. • One Newtronics Place • Mineral Wells, Texas 76067 • (817) 325-1386

CIRCLE 269 ON READER SERVICE CARD



# MFJ TUNERS

This may be the world's most popular 3 KW roller inductor tuner because it's small, compact, reliable, matches virtually everything and gives you SWR/Wattmeter, antenna switch, dummy load and balun — all at a great price!

Meet "Versa Tuner V". It has all the features you asked for, including the new smaller size to match new smaller rigs—only 10¾" W x 4½" H x 14 7/8" D.

Matches coax, balanced lines, random wires—1.8 to 30 MHz. 3 KW PEP—the power rating you won't outgrow (250pf-6KV caps).

Roller inductor with a 3-digit turns counter plus a spinner knob for precise inductance control to get that SWR down to minimum every time.

Built-in 300 watt, 50 ohm dummy load, built-in 4:1 ferrite balun.



MFJ989B \$349.<sup>95</sup>

Lighted Cross-needle Meter reads SWR, forward and reflected power all in one glance. Has 300 and 3,000 watt ranges. Meter light requires 12 VDC.

6 position antenna switch (2 coax lines, through tuner or direct, random/balanced line or dummy load). SO-239 connectors, ceramic feed-throughs, binding post grounds.

Deluxe aluminum low-profile cabinet with sub-chassis for RFI protection, black finish, black front panel with raised letters, tilt bail.

## MFJ's Fastest Selling TUNER

MFJ-941D \$99.95



MFJ's fastest selling tuner packs in plenty of new features. New styling! Brushed aluminum front. All metal cabinet. New SWR/Wattmeter! More accurate. Switch selectable 300/30 watt ranges. Read forward/reflected power.

New antenna switch! Front panel mounted. Select 2 coax lines, direct or through tuner, random wire/balanced line or tuner bypass for dummy load.

New airwound inductor! Larger more efficient 12 position airwound inductor gives lower losses and more watts out. Run up to 300 RF power output.

Matches everything from 1.8 to 30 MHz! dipoles, inverted vee, random wires, verticals, mobile whips, beams, balanced and coax lines.

Built-in 4:1 balun for balanced lines. 1000 V capacitor spacing. Black. 11 x 3 x 7 inches. Works with all solid state or tube rigs. Easy to use anywhere.

## MFJ's 1.5 KW VERSA TUNER III

MFJ-962B \$229.95



Run up to 1.5 kw PEP and match any feedline continuously from 1.8 to 30 MHz: coax, balanced line or random wire.

Lighted Cross-needle Meter reads SWR, forward and reflected power in one glance. Has 300 and 3,000 watt ranges. 6 position antenna switch handles 2 coax lines, wire and balanced lines. 4:1 balun. 250 pf, 6 kv variable capacitors. 12 position ceramic inductor switch. New smaller size matches new rigs: 10¾ x 4½ x 14¾ inches. Flip stand for easy viewing. Requires 12V for light.

## MFJ's Best VERSA TUNER

MFJ-949C \$149.95



MFJ's best 300 watt tuner is now even better! The MFJ-949C all-in-one Deluxe Versa Tuner II gives you a tuner, cross-needle SWR/Wattmeter, dummy load, antenna switch and balun in a new compact cabinet. You get quality conveniences and a clutter-free shack at a super price.

A new cross-needle SWR/Wattmeter gives you SWR, forward and reflected power—all at a single glance. SWR is automatically computed with no controls to set. Has 30 and 300 watt scale on easy-to-read 2 color lighted meter (needs 12 V).

A handsome new black brushed aluminum cabinet matches all the new rigs. Its compact size (10 x 3 x 7 inches) takes only a little room.

You can run full transceiver power output—up to 300 watts RF output—and match coax, balanced lines or random wires from 1.8 thru 30 MHz. Use it to tune out SWR on dipoles, vees, long wires, verticals, whips, beams and quads.

A 300 watt 50 ohm dummy load gives you quick tune ups and a versatile six position antenna switch lets you select 2 coax lines (direct or thru tuner), random wire or balanced line and dummy load.

A large efficient airwound inductor—3 inches in diameter—gives you plenty of matching range and less losses for more watts out. 100 volt tuning capacitors and heavy duty switches gives you safe arc-free operation. A 4:1 balun is built-in to match balanced lines.

Order your convenience package now and enjoy.

## 2 KW COAX SWITCHES

MFJ-1702 \$19.95



MFJ-1702. \$19.95. 2 positions. 60 dB isolation at 450 MHz.

Less than .2 dB loss. SWR below 1:1.2.

MFJ-1701, \$29.95.

6 positions. White markable surface for antenna positions.



## MFJ's Smallest VERSA TUNER

MFJ-901B \$59.95



MFJ's smallest 200 watt Versa Tuner matches coax, random wires and balanced lines continuously from 1.8 thru 30 MHz. Works with all solid state and tube rigs. Very popular for use between transceiver and final amplifier for proper matching. Efficient airwound inductor gives more watts out. 4:1 balun for balanced lines. 5 x 2 x 6 inches. Rugged black all aluminum cabinet.

## MFJ's Random Wire TUNER

MFJ-16010 \$39.95



MFJ's ultra compact 200 watt random wire tuner lets you operate all bands anywhere with any transceiver using a random wire. Great for apartment, motel, camping operation. Tunes 1.8-30 MHz. 2 x 3 x 4 inches.

## MFJ's Mobile TUNER

MFJ-945C \$79.95



Designed for mobile operation! Small, compact. Takes just a tiny bit of room in your car. SWR/dual range wattmeter makes tuning fast and easy. Careful placement of controls and meter makes antenna tuning safer while in motion.

Extends your antenna bandwidth so you can operate anywhere in a band with low SWR. No need to go outside and readjust your mobile whip. Low SWR also gives you maximum power out of your solid state rig—runs cooler for longer life.

Handles up to 300 watts PEP RF output. Has efficient airwound inductor, 1000 volt capacitor spacing and rugged aluminum cabinet. 8x2x6 inches. Mobile mounting bracket available for \$5.00.

ORDER ANY PRODUCT FROM MFJ AND TRY IT-NO OBLIGATION. IF NOT SATISFIED, RETURN WITHIN 30 DAYS FOR PROMPT REFUND (less shipping).

• One year unconditional guarantee • Made in USA • Add \$5.00 each shipping/handling • Call or write for free catalog, over 100 products.

# MFJ

MFJ ENTERPRISES, INC.  
Box 494, Mississippi State, MS 39762

TO ORDER OR FOR YOUR NEAREST DEALER, CALL TOLL-FREE

800-647-1800

Call 601-323-5869 in Miss. and outside continental USA Telex 53-4590 MFJ STKV





# 73 AMATEUR RADIO

DECEMBER 1987

Issue # 327

## TABLE OF CONTENTS

### FEATURES



- 5 Welcome, Newcomers! A "read-this-first" for budding hams ..... KA1HY
- 18 History of the ICOM 2AT The world's most popular handheld ..... KT2B
- 20 ICOM BP-4 Charging Adapter Our technical editor beats the system ..... WB9RRT
- 26 Yaesu FT-209 Modifications Expanding your HT's horizon ..... KD2WA
- 28 Buyer's Guide to Handhelds A little help from your friends at 73 ..... NA5E
- 30 History of Hand-Held Communications Their place in western civilization ..... 2MFM
- 44 Mobile Extender Using VOX Control  
Wire up your transceiver to jump over mountains ..... K6YDW
- 50 Make VIC Talk This little chip offers big benefits ..... WA4DSO
- 52 Battery Charger A handy NiCd power project ..... N0FNF
- 106 Remote Base Control Work DX from your HT ..... K9EID
- 103 EXTRA! EXTRA! . . . Frequency Privilege Chart
- 104 DX Prefix List

### REVIEWS

- 13 The Kenwood 215A Handheld High-class hand-held hamming ..... N1BLH
- 14 The Kenwood 205A Affordable personal communications ..... NA5E
- 16 The Alinco ALX-2T Mini-Handheld A big contender in the featherweight class ..... KA1HY
- 22 ICOM's 12AT Breaking new ground on 23 cm ..... KT2B
- 24 The First Dual-Band HT A look at the Yaesu FT-727R panel by panel ..... KA1HY
- 34 Power Play Comparison RF Concepts' RFC 2-23 and the Tokyo Hi-Power HL-37V,  
30-Watt 144-MHz Power Amplifiers ..... KT2B
- 42 The Banker A memorable accessory for the Kenwood TS-940S/AT ..... NA1A

### DEPARTMENTS

#### FEEDBACK... FEEDBACK!

It's like being there—right here in our offices! How? Just take advantage of our FEEDBACK card on page 96. You'll notice a feedback card 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.

- |                       |                     |
|-----------------------|---------------------|
| 92 Above and Beyond   | 40 New Products     |
| 96 Advertiser's Index | 91 Op Ed            |
| 70 Aerial View        | 59 Packet Talk      |
| 74 ATV                | 86 Profile          |
| 61 Barter 'n' Buy     | 84 Propagation      |
| 64 Circuits           | 80 QRP              |
| 90 Dealer Directory   | 9 QRX               |
| 105 DX                | 6 QSL of the Month  |
| 32 Fun                | 88 RTTY Loop        |
| 111 Ham Help          | 98 73 International |
| 82 Hamsats            | 78 Special Events   |
| 108 Index, 1987       | 66 Weathersat       |
| 6 Never Say Die       |                     |



Profile: Jeanette LeBlanc

## STAFF

**PUBLISHER**  
Wayne Green W2NSD/1  
**ASSOCIATE PUBLISHER**  
Stuart Norwood

**EDITOR IN CHIEF**  
Larry Ledlow, Jr. NA5E

**MANAGING EDITOR**  
Gisela Bickford

**COPY EDITOR**  
Bryan Hastings KA1HY

**EDITORIAL ASSISTANT**  
Becky Niemela

**INTERNATIONAL EDITOR**  
Richard Phenix

**ART DIRECTOR**  
James Fletcher

**GRAPHIC DESIGNER**  
Deborah Smith

#### ASSOCIATES

Mike Bryce WB8VGE  
John Edwards KI2U  
Bill Gosney KE7C  
Jim Gray W1XU  
Chod Harris VP2ML  
Dr. Marc Leavey WA3AJR  
Andy MacAllister WA5ZIB  
Bill Pasternak WA6ITF  
Brian Lloyd WB6RQN  
Peter Putman KT2B  
Mike Stone WB0QCD  
Dr. Ralph Taggart WB8DQT  
Arliiss Thompson W7XU

#### ADVERTISING

1-603-525-4201  
1-800-225-5083

**SALES MANAGER**  
Sam Greene

**ADVERTISING SALES**  
Ed Verbin

**SALES SERVICES MANAGER**  
Hope Currier

#### WGE PUBLISHING, INC.

**CHIEF FINANCIAL OFFICER**  
Tim Pelkey

**CIRCULATION MANAGER**  
Peter M. Gaviorno

**NEWSSTAND MANAGER**  
Rodney Bell

**TYPESSETTING/PAGINATION**  
Bob Dukette, Systems Supervisor,  
Steve Jewett KA1MPM, Linda Drew,  
Susan Allen

**GRAPHICS SERVICES**  
Richard Clarke, Manager;  
Sue B. Flanagan, Dan Croteau,  
Jodi Johnson

#### Editorial Offices

WGE Center  
Peterborough, NH 03458-1194  
603-525-4201

Wayne Green Enterprises is a division of International Data Group.

73 Amateur Radio (ISSN 0889-5309) is published monthly by WGE Publishing, Inc., a division of Wayne Green Enterprises, Inc., WGE Center, Peterborough NH 03458-1194. Entire contents © 1987 by WGE Publishing, Inc. No part of this publication may be reproduced without written permission from the publisher.

Cover Photo by Suzanne Torsheya



# Welcome, Newcomers!

**W**elcome to Amateur Radio! Ham lingo can baffle a newcomer at first, but it doesn't have to be a real impediment. Check the glossary of terms below to help you explore this fascinating new world.

## Radio Spectrum

Radio waves, heat (infrared), visible light, ultraviolet light, and x-rays are all part of the **electromagnetic spectrum**. As the term radio wave implies, radio signals oscillate up and down much like waves in the ocean. How quickly a wave moves up and down is called **frequency**, and is measured in cycles (oscillations) per second or **Hertz (Hz)**. Kilohertz (kHz) and Megahertz (MHz) refer to thousands and millions of cycles per second, respectively, and are common units of radio wave frequencies. Another measure of a radio wave is **wavelength**, which is the distance between peaks of the wave. The higher the frequency, the shorter the wavelength. Radio waves are divided in segments or **bands**. Here are a few the ham community is most interested in:

### MF—Medium Frequency—300 kHz–3 MHz

This includes the AM broadcast band 535–1605 kHz and the 160-meter ham band (1800–2000 kHz).

### HF—High Frequency—3–30 MHz

This segment covers the 80/75-, 40-, 20-, 18-, 15-, 12-, and 10-meter bands. This is the most popular region for worldwide **DX**, or long-distance operation.

### VHF—Very High Frequency—30–300 MHz

Our two bands on this are 2 meters (144–148 MHz), and 1.25 meters (220–225 MHz). The two meter band is just above the FM broadcast band. **Repeaters**, stations that receive and rebroadcast signals to allow broader area coverage, are extremely popular at these frequencies. The characteristics of VHF signals mean that communications are often limited to line of sight.

### UHF—Ultra-High Frequency—300–3000 MHz

UHF communications are also limited in area coverage, and repeaters abound on the 70-cm (420–450 MHz) band. The 23-cm (1240–1300 MHz) band finds increasing use these days, but the 33-cm (902–928 MHz) band is virtually unpopulated throughout most of the country. Many hams enjoy satellite (**hamsat**) and amateur television (**ATV**) communications at these higher frequencies. Frequencies above 1000 MHz are generally called **microwave**.

## Modes

Mode has many meanings, but here it is the method used to package information on a radio wave.

### CW—Continuous Wave

Amateur radio's first mode of communication was continuous wave or **CW**, which was useful for Morse code. This wave is transmitted to produce a tone whose length can vary ("dits" and "dahs"), and shut off for spaces between tones. Morse code is still referred to by hams as **CW**.

### AM—Amplitude Modulation

Our first voice mode.

### FM—Frequency Modulation

The first hi-fidelity mode.

### SSB—Single-Side Band

An AM signal has two sidebands, called **Upper-Side Band**, or **USB**, and **Lower Side Band**, or **LSB**. Both sidebands contain the same information. A clever way to save space on overcrowded frequencies is to use only one of the sidebands, but SSB equipment is more complicated than old, double sideband (DSB) AM radios. SSB development was a major advance in radio communications.

### Digital Modes

Information in this mode is represented by discrete units, or ones and zeros. Read up on these in our Packet and RTTY Loop columns.

### RTTY—Radio Teletype

RTTY sends characters as combinations of two tones. One tone represents ones, the other zeros. For example, the letter A is 11000, and B is 10011. RTTY is a more efficient and faster mode than CW, because tone combinations are machine-generated from keystrokes on a typewriter-like keyboard.

### AMTOR—Amateur Teleprinting Over Radio

AMTOR is a special form of RTTY that checks itself for errors that arise during transmission. It was introduced about 10 years ago.

### Packet Radio

Packet is latest in amateur digital communications, and one of the most fascinating modes. Discrete "packets", or bursts, of information are sent back and forth between packet stations. Each packet contains a line of information, station to and from addresses, routing data, and error correction codes. The **protocol**, or method of coding within each packet, is also referred to as **AX.25**, an amateur implementation of a commercial system. Packet is convenient for computer-to-computer communications. Many hams set up bulletin boards (**BBS**) not unlike computer BBSs accessed on telephone lines. The radio modem that interfaces the computer with a transceiver is called a **TNC**, or Terminal Node Controller. TNCs are the radio equivalent to telephone modems. They take data from a computer, "package" it, and send it on to the transmitter.

### Image Modes

These modes convey images. What follows are the three most popular in amateur radio. Look for more information on these modes in our ATV (Amateur Television) and in our Weathersats columns.

### FSTV—Fast-Scan Television

This is the mode used to carry images to your TV screen. Hams have adapted this TV technology for their own needs and to see other operators that they have contact with. Color FSTV has recently become more popular.

### SSTV—Slow-Scan Television

So named because it requires almost 9 seconds to scan and display an image on the CRT.

### FAX—Facsimile

Similar to SSTV, except that the scan rate is much slower (1–2 lines/second).

## "Q" SIGNALS

The language of amateur radio is riddled with strange three-letter words beginning with "Q"—you may have noticed that four of our monthly departments are titled with 'em.

They first came into being in the code-only days to a way to reduce common questions and statements to a short code and make communications more efficient. "Q" was likely chosen as the first letter because it's the least common letter in the alphabet, and always always followed by "U"—if it was followed by anything else, it was a sure bet that it was a code.

"Q" signals can be either questions or statements. Here are the most common ones, followed by an example.:

**QRL**—"Are you busy? I am busy." Send this to see if a frequency is clear.

**QRM**—"Is my transmission interfered with? Your transmission is being interfered with." Often said "Q-R-Mary" to distinguish it from QRN.

**QRN**—"Are you troubled by static? I am being troubled by static." Often said "Q-R-Nancy".

**QRP**—"Shall I decrease power? Decrease power". There are some hams devoted to elegance of low-power operation. Mike Bryce WB8VGE devotes his QRP column to them.

**QSB**—"Are my signals fading? My signals are fading" Often said "Q-S-Baker". "There's a lot of QSB on the band"

**QSL**—"Do you copy me, do you acknowledge? I copy, I acknowledge". Hams exchange QSL cards to verify their contacts with each other. See "QSL of the Month" on page 6 for colorful and imaginative examples of these.

**QSO**—Conversation. "Thanks for the QSO, Old Man".

**QSY**—"Shall I change frequency? Change frequency." "Let's QSY up 5 kHz."

**QTH**—Location. "My QTH is Peterborough, NH."

**QRX**—"When will you call me again? I will call you at (hours) on (kHz)." Our QRX column is devoted to Amateur Radio news.

**QRT**—"Shall I stop sending? Stop sending." "The phone's ringing, I must QRT."

## JUST PLAIN JARGON

What's a language without fun words and endearments? Following is a list of a few of ours. (Again, most descend from the CW-only days).

### DX—Long Distance.

On HF this could mean contacts outside a ham's own country, but on VHF/UHF DX could be the next county.

### OM—Old Man

Man of any age.

### YL—Young Lady

Unmarried woman of any age.

### XYL—Ex Young Lady

Wife.

### Harmonics

Children of the OM and the XYL.

### 88s

Hugs and kisses

And lastly . . .

### 73s—

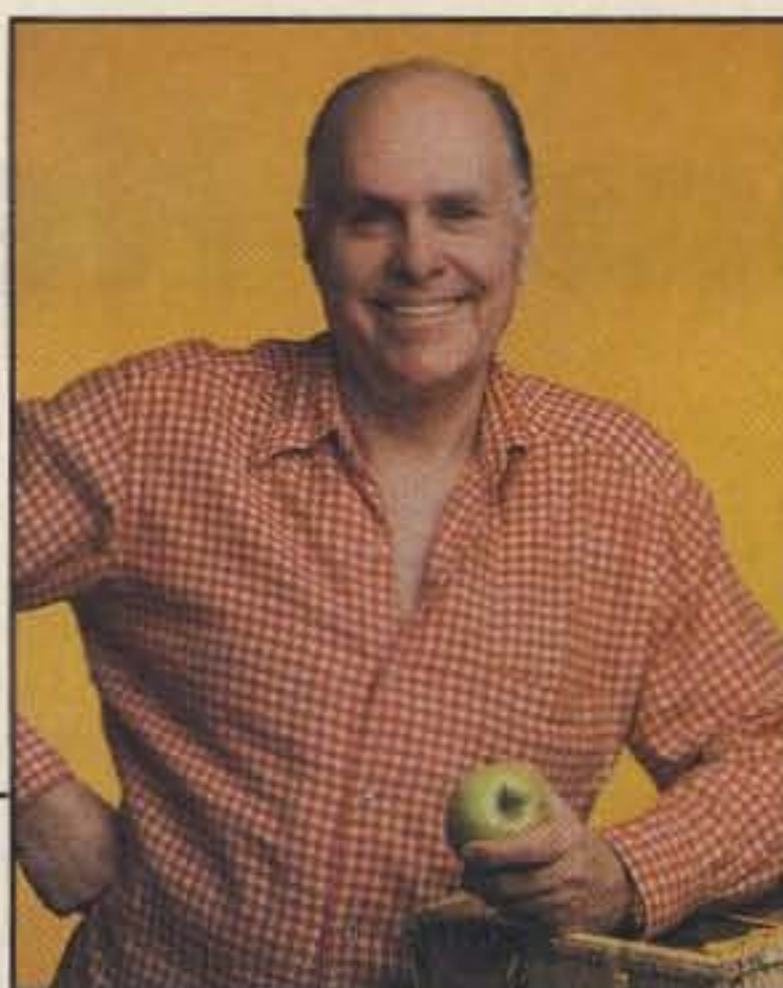
the very best to you! Enjoy our magazine!

. . . de KAIHY



# NEVER SAY DIE

Wayne Green



## ROSIER PROSPECTS

Things are coming together for us—we're finally heading in the right direction... newcomers are up. After a 10% loss in newcomers per year for several years we're seeing a turn-around. No, I don't ascribe it all to the Archie comic book.

The critical element was the recent Novice voice breakthrough—and for two reasons. Obviously the idea of being able to enjoy ham repeater communications is attractive, even restricted to 220 MHz. But perhaps an overlooked aspect of this is the impact of the new regs on ham clubs... who suddenly have seen an indication that the FCC admits there's an emergency.

Of course, the FCC telegraphed their concern over the gradual dying of the hobby when they tried so hard to replace the code requirement with a more difficult technical test. Many amateurs ignored the technical aspect of the proposals and whipped up emotions in less-smart hams

by crying that the CBers were coming.

I'm glad that the FCC didn't give up—even if they were responding more to the commotion over the threatened ham 220 loss than any serious interest in rebuilding our aging hobby.

My goading of ham clubs to get busy recruiting Novices has been having an effect. The Novice voice rules have given them a powerful tool—and they're using it. The League has also been voicing an increased concern—another prod to get clubs moving.

We have one other force helping us—the sun. With the sun spots increasing we're getting more and more openings on our higher bands—plus more hours of action on 20m. This has increased the general ham energy level, building up spirits. It's difficult to get all excited about a hobby where the crummy bands are dead most of the time.

### A Serious Increase

So we're starting to see the first

serious increase in Novices in years. Will we be able to keep it up? That's largely in the hands of our clubs. If they run Novice classes and get radio clubs going in their local schools, we'll see things improving.

One more powerful factor is at work. Fred Maia W5YI, together with Gordon West WB6NOA, have put out a Novice Voice Class package—booklet and tapes. The best part of it is they've gotten Radio Shack to list it in their catalog! That could get the product where millions will see it. It sure isn't going to hurt.

I tried a few years ago to interest Radio Shack in a similar project, but they didn't see amateur radio as having any prospects for growth then. Heck, they wouldn't even test the idea just to see if it would work. Let's hope it works out and Shack will continue to carry the product.

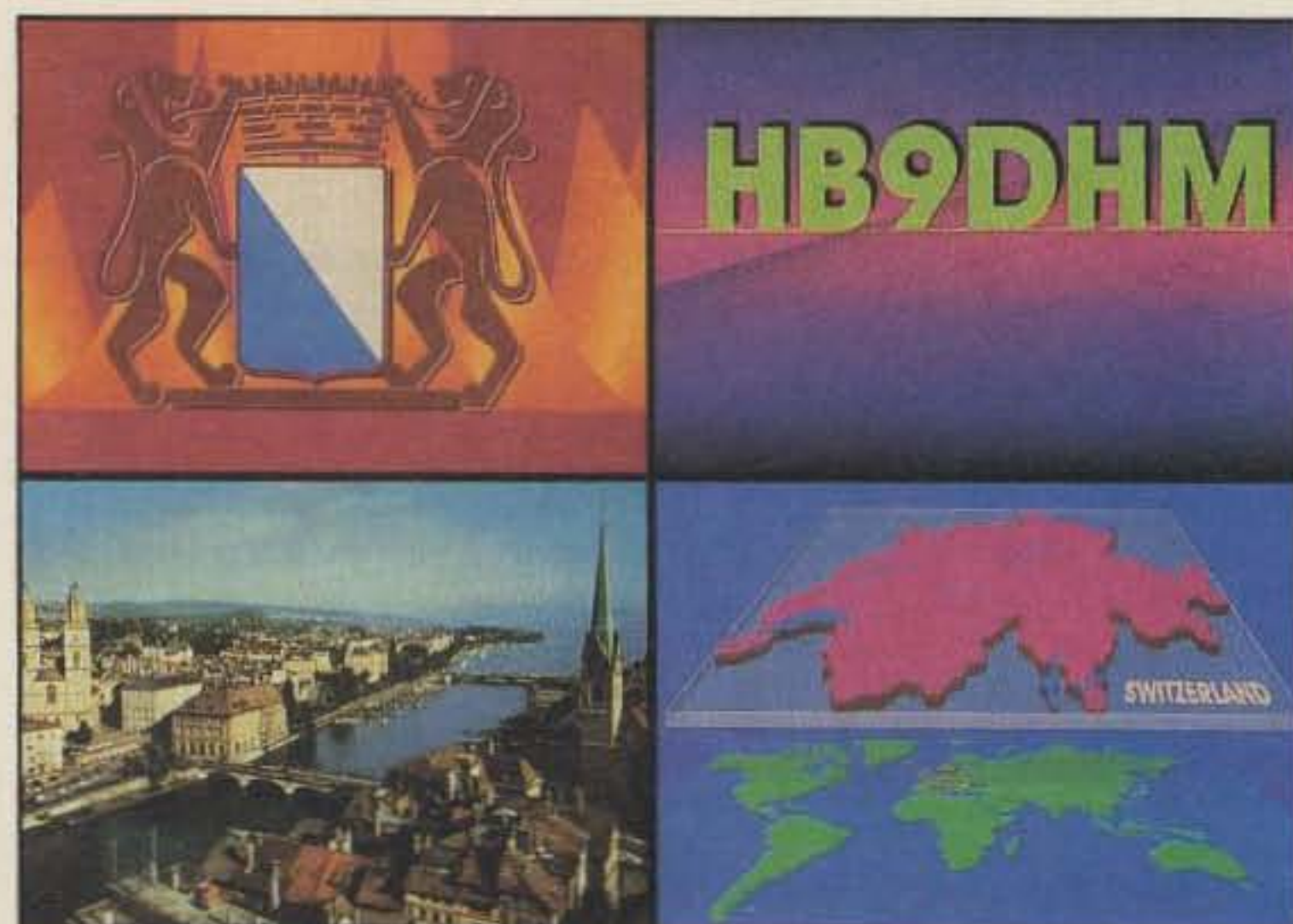
### Culture Shock

If we really do start seeing youngsters showing up on our bands we're going to have some problems. I'm not talking a generation gap—we've got a double generation gap. Most of us are about 45 years older than the newcomers, so we're going to have some problems finding things to talk about.

Heck, I find I'm having problems—and I'm the same age as the average ham today. The difference is that I've chosen not to retire, so my interests are quite different. It seems to me that about 90% of the hams I find on the air today are retired—which is logical. The few who are still working are earning a living instead of operating. So the retirees, who can ham during most of their waking hours, are who's there.

How are you going to communicate with a 13 year old? At least twenty years ago you had some teenagers around the house, so

*Continued on page 12*



## 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

## Editorial Offices

WGE Center  
Peterborough NH 03458-1194  
phone: 603-525-4201

## Advertising Offices

WGE Center  
Peterborough NH 03458-1194  
phone: 800-225-5083

## Circulation Offices

WGE Center  
Peterborough NH 03458-1194  
phone: 603-525-4201

## Manuscripts

Contributions in the form of manuscripts with drawings and/or photographs are welcome and will be considered for possible publication. We can assume no responsibility for loss or damage to any material. Please enclose a stamped, self-addressed envelope with each submission. Payment for the use of any unsolicited material will be made upon acceptance. A premium will be paid for accepted articles that have been submitted electronically (CompuServe ppn 70310,775 or MCI Mail "WGPUB") or on disk as an IBM-compatible ASCII file. All contributions should be directed to the 73 editorial offices. "How to Write for 73" guidelines are available upon request. US citizens must include their social security number with submitted manuscripts.

## Subscription Information

Rates: in the United States and Possessions: One Year (12 issues) \$24.97; Two Years (24 issues) \$45.47. Elsewhere: Canada and Mexico—\$39.00/1 year only, US funds. Foreign surface mail—\$45.00/1 year only, US funds drawn on US bank. Foreign air mail—please inquire. To subscribe, renew or change an address: Write to Subscription Department, PO Box 931, Farmingdale NY 11737. Return postage guaranteed. For renewals and changes of address, include the address label from your most recent issue of 73. For gift subscriptions, include your name and address as well as those of gift recipients. For questions concerning your subscription, call toll free 1-800-227-5782. To place subscription orders, please call us toll free at 1-800-722-7790 between 9 am and 4:30 pm Eastern time or write to 73, Subscription Department, PO Box 931, Farmingdale NY 11737. 73 Amateur Radio (ISSN 0745-080X) is published monthly by WGE Publishing, WGE Center, Peterborough NH 03458-1194. Second class postage paid at Peterborough NH 03458 and at additional mailing offices. Canadian second class mail registration number 9566. Entire contents copyright © 1986, WGE Publishing. All rights reserved. No part of this publication may be reprinted or otherwise reproduced without written permission from the publisher. Microfilm Edition—University Microfilm, Ann Arbor MI 48106. Postmaster: Send address changes to 73 Amateur Radio, Subscription Services, PO Box 931, Farmingdale NY 11737. Nationally distributed by International Circulation Distributors. Contract: The mere opening of this magazine establishes a binding legal contract between you and the publisher. Thus you are hereby directed to become a royal pain in your ham club, egging them on mercilessly to bring in youngsters and get them Noviced. Neither rain nor a sudden DXpedition surfacing on 20m shall deviate you from this course.



# KENWOOD

...pacesetter in Amateur Radio

New  
220 MHz

## 220: FM for All!



Kenwood brings you a wide range of 220 MHz gear designed for every need. Choose from two types of mobile and two types of HT. The TH-315A is a

**TH-315A**  
Full-featured HT

full-featured HT covering 220–225 MHz. Ten memory channels and 2.5 watts of power. (5 W with PB-1 or 12 V DC.) Uses the same accessories as the TH-215A for 2 meters or TH-415A 440 MHz. For truly "pocket portability," choose the TH-31BT, a thumb-wheel programmable, 1 watt unit. For mobile use, select the TM-321A or TM-3530A.

The TM-321A is the 25 W, 220 MHz, 14-channel version of the super popular, super compact TM-221A. The 25-watt TM-3530A has 23 channels, a 15 telephone number memory and auto dialer. Direct keyboard frequency entry and front panel DTMF pad enhances operating convenience. Novice to Amateur Extra, these transceivers will put everyone on the air "Kenwood Style"!

**TM-321A**  
Compact mobile transceiver

**TH-31BT/31A**  
Pocket-held HT

New



New



**TM-3530A**  
Full-featured mobile transceiver

# KENWOOD

KENWOOD U.S.A. CORPORATION  
2201 E. Dominguez St., Long Beach, CA 90810  
P.O. Box 22745, Long Beach, CA 90801-5745

**A complete line of accessories is available for all models.**  
Complete service manuals are available for all Kenwood transceivers and most accessories.  
Specifications and prices are subject to change without notice or obligation.



# KENWOOD

...pacesetter in Amateur radio

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.

## KENWOOD

KENWOOD U.S.A. CORPORATION  
2201 E. Dominguez St., Long Beach, CA 90810  
P.O. Box 22745, Long Beach, CA 90801-5745



## Congrats to KA9PMK!

David Rosenman KA9PMK received the 1987 Young Ham of the Year Award at the ARRL Southwestern Division Conference in Scottsdale, Arizona, on October 10th. The 16 year old Advanced Class licensee has been on the air since age 11. The precocious young man has devoted countless hours to public event communications support and recently served as aid de camp to US Olympic Committee President Robert Hemlick. David helped translate Spanish and Portuguese during the Pan American games in Indianapolis. He also speaks Italian and French. Westlink and Yaesu USA presented David with an FT-757 HF transceiver and power supply.

## 430-440 MHz Threat

The possibility of hams losing this spectrum hemisphere-wide looms. Vern Riportella WA2LQQ reports that Friday, September 25th, the representatives of the Mexican government at the 1987 Mobile Radio World Administrative Radio Conference in Geneva put forth a demand to reassign the current amateur radio spectrum from 430-440 MHz to land mobile use on an expedited basis. Mexico indicated it had strong support from other Central and South American nations, and noted that even if it were turned down by the WARC body as a whole, it may unilaterally make this reallocation. The US delegation was caught off-guard by the unexpected motion and spent the weekend attempting to rally support for the measure.

## Ears to You

100 sight-handicapped radio stations throughout the USA are broadcasting special news, editorials, and programs as varied as the world itself, for the sightless, and anyone else with a reading disability.

This free service is operated almost entirely by volunteer readers. Special closed-circuit receivers are also furnished at no cost.

Anyone with a visual impairment may locate the reading service nearest them by writing to: the Association of Radio Reading Services, 1133 20th St. NW, Suite 250, Washington DC 20036.

## Cocos-Keeling

Starting November 25th, 1987, F6GVD Hans, and G3AAV Victor will be QRV from Cocos-Keeling Island for 2 weeks. No specific

time or frequency is available. The first 10 minutes of the hour operators will listen for QRP stations, and at the half-hour for hand-capped operators.

The calls are VK9YH Hans and VK9YV Victor. QSL via QSL Manager VK9YC or direct to F6GVD.

## Running Dogs' Choice

Several new mainland Chinese stations are reported on the air. BY1CKJ says to QSL to Box 6206, Beijing, Peoples' Republic of China. Also, BY5RT gives Box 707, Fuzhou, Peoples' Republic of China, as his QSL route. Finally, BY2HIC has been heard on 14.028 MHz at 0326 with an operator named Wendy at the station controls.

## GMT Dying

The six atomic clocks at Britain's oldest scientific institution, the Royal Greenwich Observatory, are running down. The observatory that gave the world GMT, marked the Prime Meridian, and became the ultimate reference point for anyone setting a precision timepiece will be forced—312 years after its inception—to ask others what time it is.

Le Bureau International de l'Heure (International Time Bureau) in Paris will become the new standard, after the Greenwich clocks tick their last.

## Mobile Op Illegal?

In 1937, the Minnesota Legislature passed a law prohibiting radios in cars that could copy police and emergency service transmissions. It is still on the books, which means any mobile amateur in this state could be subject to arrest due to the wide frequency coverage of current rigs.

Hams organized a movement to change this law, and a bill is now working through the legislature to make it legal for hams to have that receiving ability, provided:

- Convicted felons wait 10 years after their sentence expiration to use such a radio.
- Such radios must be under the direct control of licensed amateurs. No unlicensed persons can operate these rigs, even to receive.

This example can serve as a model for amateurs in states that still have such outmoded laws on the books.

## Western Sahara

The Lynx group launched a joint project with the Saharan Arab Democratic Republic (R.A.S.D.) authorities two years ago with the aim to establish amateur radio in this

country. The R.A.S.D., formerly the Spanish Sahara, is located on Africa's northwest coast. The project was finalized in September, and is expected to be carried out soon. They will enter the R.A.S.D. from Algeria.

## Heard Is. Reheard

Dan Shaw VK3DHF/VK0HI has returned to this rare DX spot for another 6-month stint.

## Aussie Novice 2m Phone?

A proposal generated at the 1987 Federal Convention to give Australian Novices phone privileges on the entire 2-meter band received full support from Federal Councillors from all divisions except VK1. Apart from providing Novices more incentive, it arose from two considerations:

- To give a common band for Australian pan-license Class communications.
- To accommodate the recent VJ/JA reciprocal licensing agreement. Japan has a long-standing amateur Telephone-only license grade with VHF operating privileges and a no-code proficiency exam. Australia still has no no-code license class.

Despite nearly unanimous support, this proposal was ignored at the Convention and so may have to wait for another year.

## Miami Pope Visit

A Miami Radio Club coordinated communications for the recent visit of Pope John Paul II to that city. The Miami Archdiocese selected the Sociedad Internacional De Radio Aficionados to organize and plan the communications for the Pope's visit to Miami on September 10-11.

SIRA Prez Rafael Estevez WA4ZZG took an unpaid leave of absence from work and worked around the clock for the last four weeks to prepare for the Pope's arrival. He trained personnel and volunteers to operate 115 hand-held and 3 base station commercial radio units. Dubbed "Operation Omnidirectional," the Miami Papal network used a pair of commercial UHF repeaters, and several UHF and VHF simplex channels. Other hams and secret frequencies were in reserve for emergency situations.

## Thanks to . . .

Westlink, TSRAC Bulletin, Delaware-Lehigh ARC News, W3PYF, VK3YJ, W4ATE, and VE3JPP for this month's news items. Keep'em coming to: 73 Magazine, WGE Center, 70 Rt. 202N, Peterborough, NH 03458-1194, Attn: QRX



# KENWOOD

...pacesetter in Amateur Radio



## Kenwood: from Novice

Kenwood has been producing the finest communications equipment for over three decades. Kenwood is the name recognized the world over as the number one manufacturer of Amateur Radio equipment.

Being number one means that we are committed to offer you the finest selection of equipment available. It's all here—everything for a truly "top notch" station. Commercial grade receivers for the Short Wave Listener. The latest in 220 MHz

transceivers for the enhanced Novice. The finest selection of VHF and UHF rigs. Our legendary HF line continues to earn top billing in Product Reviews, winning contest stations, and DXCC Honor Roll. All in your choice of base, mobile, or portable packages. All designed with the latest innovations in communications technology.

When you are on the air with a Kenwood rig, fellow Amateurs recognize that "Kenwood Sound"—it separates you from

the pack and lets everyone know that you are serious about communications, whether it's traffic handling, contesting, DX chasing, or just plain rag chewing.

Leading edge technology, and superior field-proven performance—that's the Kenwood Experience!

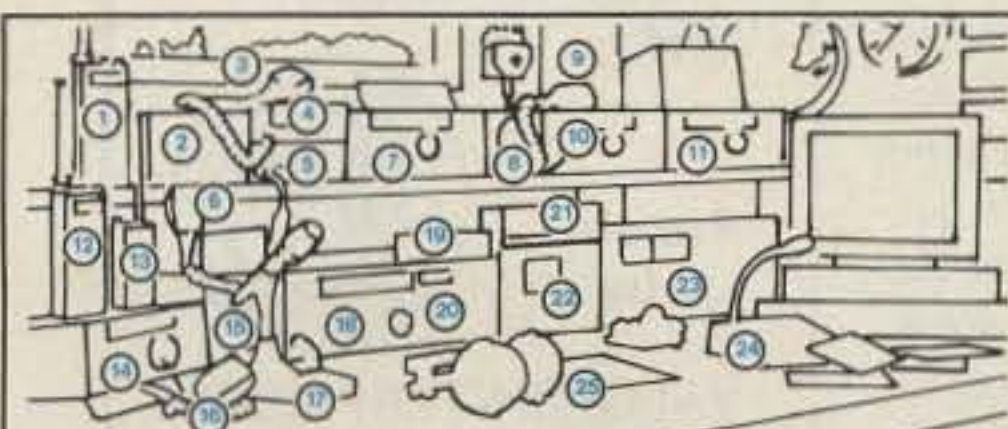
Contact your nearest Authorized Kenwood Amateur Radio Dealer for more details on the hottest ham gear in the world!



Listen for  
WD6DJY  
Kenwood's Club  
Station



# to Amateur Extra Class!



1) TH-315A: 220 MHz Hand-held Transceiver; 2) PS-50: DC Power Supply; 3) MC-43S: UP/DWN Microphone, included with 4) TM-2530A: Deluxe 25 W, 2m FM Transceiver; 5) TM-3530A: Deluxe 25 W, 220 MHz Transceiver (also comes with MC-43S mic.); 6) MC-48B: 16-key DTMF Microphone;

7) R-5000: High Performance Receiver; 8) SP-430: Matching External Speaker for TS-430S/TS-440S; 9) MC-48B; 10) TS-711A: 2m, 25 W, All Mode Base Transceiver; 11) TS-811A: 70cm, 25 W, All Mode Base Transceiver; 12) TH-215A: 2m, Full-featured HT; 13) TH-218T: Pocket-sized, 2m FM Transceiver; 14) TS-440S: HF Transceiver (with AT-440 installed); 15) SP-940: Matching External Speaker for TS-940S; 16) MC-48B; 17) MC-60A: Base Station Microphone with UP/DWN controls; 18) TS-940S: Competition Class HF Transceiver with General Coverage Receiver (AT-940 installed); 19) IF-232C: Computer Interface Level Translator; 20) IF-10B: Computer Interface Module (installed inside TS-940S); 21) SW-2000: SWR/Power Meter; 22) SM-220: Station Monitor with pan display option BS-8 installed; 23) TL-922A: HF Linear Amplifier; 24) MC-85: Multi-function Desk Microphone with Graphic Equalization and three outputs; 25) HS-5: Deluxe Headphones.

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

## KENWOOD

KENWOOD U.S.A. CORPORATION  
2201 E. Dominguez St., Long Beach, CA 90810  
P.O. Box 22745, Long Beach, CA 90801-5745



# NEVER SAY DIE

from page 6

you weren't completely out of touch. My youngest daughter is 17 now, so I have an idea of what you're up against.

Their world is school, dates, sports, rock music... while yours is golf, picnics, 807s and TV. Great mix. It doesn't even help having been through the woods before, because most teenagers are convinced they know more than we do and don't want to hear about it. Kennedy and Lincoln were assassinated presidents—history. Lucy? Who's Lucy?

It's going to be difficult, and we're going to need some help. Let's not fight it because these Novices are our ticket to holding our frequencies. No matter how difficult, treat 'em right... make 'em welcome. Get 'em to your club and see that they have fun. There's no way you'll be able to give them too much attention. Invite 'em to your shack. If you've got a big signal, let 'em enjoy talking to some DX.

Due to the usual absurdity of government regulations you can let a pre-Novice operate your station while you are "in control"—like sitting nearby. But a Novice can only operate in the bands he's licensed to use. Great, eh? You can let 'em talk, but you have to switch. Your mother, if she isn't licensed, can operate the switch. No, don't ask me about the VOX... and please don't ask the FCC either. Just go ahead and shut up.

The FCC will let you do almost anything you want that isn't actually prohibited—unless you ask. Then their normal response is to prohibit it. That's the only safe move for career bureaucrats.

## 73 GROWTH

Let's see—outside of the hams who are mad at me for wanting to substitute a tougher technical exam for the code—those who are mad at me for wanting to increase the code speed—those who are mad at me for criticizing the ARRL—those who are furious with me for supporting ARRL—those who hate me for being pro or con on a hundred subjects—yes, outside of that majority, 73 has been growing faster than it ever

has in the past. Not that many readers know where I actually stand on many things because I can argue heatedly either way—and do.

Finding younger hams for the 73 staff has been very difficult. When I first moved to Peterborough 25 years ago I had no problem in attracting a whole bunch of young college dropout hams. We had a ball, living in my 40-room old house with me cooking the meals. But with so few young hams today, there's almost no one interested in making amateur radio their career.

Well, if I can't find young hams to work in my hamshack testing new gear as it comes out, perhaps you'll lend a hand. Whenever you buy a new piece of ham gear I wish you'd check it out for a few weeks and then write and let me know what you think of it. I'm not so much interested in lab

hasn't been reviewed in 73. Heck, I want to know as much as you do how something new works.

Speaking of new, we've got my new hamshack perking. When we moved 73 from Peterborough five miles up to Hancock I had to start over. We've a nice tower and a massive Sommer antenna—driven by the ICOM 761. Now and then someone gets through to rare DX before I do, but not often. The first day I got it on the air I worked five HLs for the Worked All Seoul certificate (WAS). What a delight to call someone and know he's going to come back.

There's no way I can put in the hamming hours I'd like, not with five other publications—plus some other small businesses. So I need help in getting my hamshack set up for OSCAR, active on packet, more functions on my repeater, and so on. Find ham help today? It isn't easy. I'd love to hear from anyone who might be interested.

## ASPEN HAMFESTETTE

You a skier? Doing anything special in January? If I've got a

## "How are you going to communicate with a 13 year old?"

measurements as your objective experience.

Let me know how easy it was to set up and use. How are the controls? Are they easy to use? Are some missing? Are some superfluous? How about the quality of construction? If you have any problems, how's their customer service? Perhaps you've made some changes... what and why? If you'll let me know how the gear is working for you, I'll pass it along in 73 so we can all benefit from your good or bad experiences.

Maybe you've finally gotten active on packet and would like to tell everybody what fun you're having. I'd love to have several letters a month from readers who've tried new ham interests and are fired up about 'em.

We'll be looking for hams who can write to help us test out new gear. No, you don't get to keep it—all you get is the fun, the fame and a few bucks to keep your wife quiet. I don't want there to be any ham gear on the market which

yes-no on that pair, there's a group of us who get out to Colorado the second week of January most every year and burn up the slopes and the Aspen repeater, HTs in hand.

This got started as a small ham industry meeting back in 1976 providing a medium for a few manufacturers and dealers to get together to talk about hobby and industry problems. Local and vacationing hams joined in, so now it's just a general ham skiing week in Aspen.

We not only have a ball on the slopes, the apres-ski is fun, too, with group dinners at different restaurants every night.

For some reason the second week of January usually finds Aspen almost deserted, so there are no lift lines and no problems getting seats in restaurants. Let me know if you think you can make it. Yes, there'll be some wives... and the skiing skills range goes from bunny to gung-ho. I'm a fast intermediate, but slowing down as my old bones get brittle. **73**

Professional-  
Amateur  
Antennas and  
Accessories



pro-am

Quality, Performance and Value - the better Part of Valor!

Antennas, Mounts and Accessories for Land Mobile.

From 30 to 900 MHz

Pro-am ... by



VALOR ENTERPRISES  
185 W. Hamilton St.  
West Milton, Ohio 45383  
Call Toll Free :  
1-800-543-2197



by Marc Stern N1BLH

Kenwood USA, Corp.  
2201 E. Dominguez St.  
Long Beach CA 90801  
Price: \$323

## Kenwood TH-215 Handheld

### High-Class Hand-Held Hamming

No matter how many times you look at or think about today's equipment, one fact becomes clear: It's amazing how much manufacturers are cramming into smaller and smaller spaces. For example, the Kenwood TH-215A two-meter transceiver packs a lot more wallop than the handheld it replaced (the 2600) more than a year ago—in a package that's the same size. In fact, the TH-215A corrects many of the things that I find somewhat troublesome on my own TR-2600A.

#### Great Stuff!

Take the squelch, for instance. On the TR-2600A, Kenwood combined the squelch and volume controls into one position, rather than two. The manufacturer did this by using concentric controls, one shorter than the other. The only problem is that many times when you turn off the 2600, you open the squelch and that can be a shock when you're not expecting it. On the 215, the squelch and volume controls are in two positions, as they were on the older Kenwood TR-2500A, which preceded both the 2600A and 215A.

Another area that Kenwood improved upon is the liquid crystal display. On the 2600A, it is small but usable, and there is really no easily distinguishable way to determine the mode your rig is in—carrier-operated squelch for scan or priority mode, for example. Yes, there are indicators in the display, but they are small (a C for carrier-operated squelch) and easy to miss in the display. On the 215A, the display shows not only if the rig is in priority, but there is also a clear indication of the rig's mode in an easily visible grid at the bottom of the display.

Another interesting feature of the 215A is its multiple tone capability. Instead of registering command entry into the microprocessor-controlled handheld with simple tones as was the case on the 2600A, you now have a range of tones which indicate an action has taken place. Each action seems to have a different sequence of tones, which is a good reinforcement if you have doubts that the action you wanted really happened.

Still another improvement is the scan rate. Like the 2600A, the TH-215A has 10 memories and offsets are stored for each memory, as well as any subaudible tone which may be needed. On the 2600A, there was no built-in range of subaudible tones. Instead, you had to buy a separate module to activate any

tones. It's a nice improvement and should be welcomed by those operators who need this feature.

Another improvement for those who like to monitor many repeaters is a higher-speed scan rate for the 215A. Where the 2600A improved on the older 2500, the 215A rockets past the 2600A. The scan rate seems on the order of about 8 to 10 memories a second, which means that you'll seldom miss a conversation, unless you have the carrier-operated squelch feature activated. If the carrier-operated scan feature is activated, then you'll find the rig stays with one QSO until it's over and then moves on when the tail drops.

#### The List Goes On

The list of improvements goes on and on, but here's a look at some of the other key changes: signal strength meter is now part of the LCD, rather than at the top of the rig as on the 2600A; the keypad is smaller and uses soft-feel rubber keys which should last for a while; the reverse switch is on the front of the rig instead of the top; the offset switch is also on the front, instead of the top, and the enter key is plainly labeled. Also, the keyboard lock and transmit lock functions are no longer separate and on the side of the rig where it's easy to forget them. Instead, they are on the keypad, too.

With the number of functions that have been included on the front of the rig and with the ease of access, it's quite evident that Kenwood is finally realizing that many handhelds are used in place of mobile rigs, especially when you consider that most handhelds are now capable of three to five watts of output.

The TH-215A falls into the five-watt category. Using a lightweight metal (magnesium, probably) rear case as the heatsink, the TH-215A is capable of five watts of output when 13.8 VDC is applied to the rig.

Another feature surely everyone will like is the 215A's extended receive capability. It receives from about 141 to 163 MHz, which makes this rig useful for those people who want to listen to public service frequencies or the National Oceanic and Atmospheric Administration's broadcasts in the 162 MHz range. Of course, this is also a bow to competitive pressures because other rigs have had this feature for a long time.

Some other interesting features of this rig



Photo A. The Kenwood TH 215A Handheld.

include the ability to store odd offsets in memory 10; a battery saver which extended battery life; a tone squelch setting which works in conjunction with the built-in tones capability; memory lockout to skip over unwanted frequencies, and the multifunctional display.

This package also comes with some good specifications. For example, it has three output levels, about 200 mA on low power, 2.5 watts on high power with the battery, and five watts with 13.8 Vdc; maximum deviation is preset at the factory at 5 kHz; sensitivity of less than 0.2  $\mu$ V; squelch sensitivity of 0.16  $\mu$ V; selectivity of more than 12 kHz at -6 dB and less than 24 kHz at -40 dB, and 350 mW of audio, which is more than adequate in most situations.

#### Swapping Accessories

If you are in the market for this rig be aware of several things. First, unlike other, older handheld series that Kenwood has manufactured, the TH-215A has nothing in common with its predecessors. For example, I can use 2500A accessories with the 2600A and vice versa. But, I can't use anything more than the speaker-microphone of the 2600A with the TH-215A.

Also, the batteries have changed with Kenwood opting for the Motorola style twist on battery. So, where some people may have had problems with rails breaking on the older plastic battery cases, especially when the battery dropped, it is likely other people will have



problems with the two plastic retaining tabs which extended from the base of the TH-215A. This is only a observation, rather than an empirical result from prolonged testing. It is more than likely that people will use this rig for years with no problem.

If you plan to use the five-watt capability when you're driving, be aware that the metal case becomes quite hot to the touch and if you lay it on plastic, it is conceivable you may mar

the plastic with the rig. Be sure to keep it so that air circulates freely around the handheld.

Finally, where Kenwood's documentation used to have a few problems, the instruction manual they send with the TH-215A is barely understandable and other than providing a semblance of an idea of what each function does and how to do it, you can probably figure out each function yourself about as quickly. It also omits certain things, evidently assuming

that hams are little more than appliance operators. One of the key items that is missing is how to wire up a speaker-microphone or headset of your own. It's nowhere to be found, although you are told how to wire up the 13.8 VDC plug.

Overall, the Kenwood TH-215A is a worthy replacement for the 2600A. It's worth a look and, in fact, if I was in the market for a handheld today, I'd probably opt for this one. **73**

## The Kenwood TH-205AT Two-Meter Handheld

Number 13 on your Feedback card

by Larry Ledlow, Jr. NA5E

Kenwood USA Corp.  
2201 E. Dominguez St.  
Long Beach CA 90810  
Price: \$260

### Good Heavens! Good Value!

**T**hese days hams shopping for a handheld FM transceiver face some difficult choices. The TH-205AT/A/E models are Kenwood's answer to shoppers looking for a functional two-meter rig without a lot of complicated or expensive features they don't intend to use. Kenwood introduced the TH-205 and its 70cm sister TH-405 to satisfy those frugal hams who want good value in a hand-held radio.

#### A Nice Package

The TH-205 is a standard-sized handheld. The transceiver module (without the battery pack) matches the dimensions of an ICOM IC-2AT. The supplied PB-2 makes the Kenwood about 1/2 inch taller than the IC-2AT with its standard BP-3 battery pack. Specifically, the TH-205 measures 2 3/4" x 7 1/8" x 1 1/2" and weighs approximately 19 ounces with the NiCd battery pack and antenna. Fashion-conscious hams will no doubt rejoice to find the rig's tasteful black and gray color scheme matches most any shack accessory. This attractive package features two watts output with the supplied PB-2 and five watts output with the PB-1 battery pack. The USA version also comes with a DC cable to operate from any 13.8-volt source to get 5 watts output. Low power output is approximately 500 milliwatts.

The suffix AT designates the model equipped with a 16-button DTMF keypad. Other features and controls common to both TH-205 and TH-405 radios include up/down tuning keys; three memory buttons; scan, offset select ( $\pm$ /simplex), and display lamp keys; frequency lock switch; and a multi-purpose LCD readout with frequency, offset, battery status, ON AIR, and channel BUSY indicators. The rig accepts 7.2-16 VDC in a receptacle adjacent to the BNC antenna connector. It also has receptacles for an external speaker and a microphone. The TONE switch atop the rig activates a sub-audible tone encoder. Selective hams who won't let just anyone break their squelch will find the optional TSU-3 CTCSS tone squelch unit absolutely essential. The TSU-3 prevents the squelch opening unless the received signal contains the appropriate tone.

#### On the Air

Off the shelf, the TH-205AT receives from 141.000 to 162.995 MHz and transmits from 142.000 to 148.995 MHz. The user tunes

frequencies with the up/down buttons in 5-kHz steps. Depressing the tune buttons for longer than a second will cause the unit to tune quickly, somewhat greater than 3 MHz per minute. The fastest frequency change strategy is to select the memory channel nearest the desired operating frequency followed by fast tuning from the keyboard. The repeater offset is fixed at  $\pm$  600 kHz.

Reactance modulation produces the frequency deviation for the transceiver. Several hours of on-the-air tests proved the rig worked well with favorable reports of transmitted signal quality. Audio quality from the small speaker is average and unsurprising, since the output is approximately 350 milliwatts across 8 ohms and with 10% distortion. Noisy environments would require an external speaker or headset. All handhelds suffer from this deficiency.

The final power amplifier unit uses the back panel of the rig as a heat sink. This panel becomes noticeably warm after even short contacts. The operating manual carries a worrisome warning to keep the back panel away from plastic or vinyl surfaces when operating in the 5-watt mode for long periods. Installation of the metallic belt loop on the back panel should help dissipate the heat more efficiently.

Kenwood rates the supplied PB-2 at 8.4 volts and 500 mAh. This gives the user about an hour operating time in the high power mode. This rating assumes a duty cycle of one minute transmissions followed by three minutes reception. As usual, the NiCd pack gives very little warning of impending depletion, and the BATT warning indicator on the LCD serves a useful purpose. The TH-205 uses a battery saver function, which turns a number of functions off after one minute idle time. The receiver reactivates when it detects a signal. Lithium batteries maintain memory and VFO settings while changing battery packs.

The three memories retain frequency and offset information. Two keystrokes enter a frequency into memory from the main VFO, and one keystroke recalls the memory information. The memory recall buttons actually toggle between the selected memory and the previous selection, whether it was the main VFO or another memory.

The user initiates scanning on the TH-205 by depressing the SCAN button. Only full-band scanning is available, and pressing an up/down tune button determines the direction of scan. The scan stops on a busy channel and does not resume until the user presses the scan button again. The scan rate is slightly less than the fast tune rate. I measured 2.9 MHz per minute. The radio will not scan its memories.

Several other features are worth noting. A MONITOR button above the PTT switch temporarily opens the squelch and allows the user to quickly check the channel for activity. This prevents fumbling with the squelch level setting to check for weak signals. The DTMF saves a little work, too. The rig will remain in transmit mode for two seconds after the PTT and first DTMF button are depressed. Each subsequent press of a DTMF key also activates the transmitter for two seconds. Therefore, the user can release the PTT and complete the dialing with very little hand coordination. Users with certain physical handicaps may really appreciate these features.

#### A Winner!

The TH-205AT represents good value. In today's ham market, all hand-held FM transceivers command respectable prices. Price-conscious operators who are looking for a basic HT will find the TH-205AT more than adequate. Although a simple rig, the TH-205 offers a few nice features without adding a few hundred dollars to its price. Kenwood has a winner here. **73**

#### TH-205AT Specifications

Frequency Coverage:	141.000-162.995 MHz RX 142.000-148.995 MHz TX	Receiver:	Double-conversion superheterodyne 30.825 MHz first IF 455 kHz second IF
Power Requirements:	6.3-15 VDC Battery Pack 7.2-16 VDC External DC	Sensitivity:	Less than 0.25 $\mu$ V for 12 dB SINAD
Power Output:	5 watts (with PB-1 or external DC) 2 watts (with standard PB-2) 500 mW (low power)	Selectivity:	More than 12 kHz at -6 dB Less than 28 kHz at -40 dB



# Spectrum Repeater/Link

## High Performance Boards & Sub-Assemblies

### New FL-4 UHF Helical Resonators

Installed in Receiver or FL-4H Preselector Unit



### 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  $\mu$ V/12dB SINAD typ.
- Sel. -6dB @  $\pm$  6.5 KHz. -130dB @  $\pm$  30KHz. (8 Pole Crystal + 4 Pole Ceramic Filtrs.)
- '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



### 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.

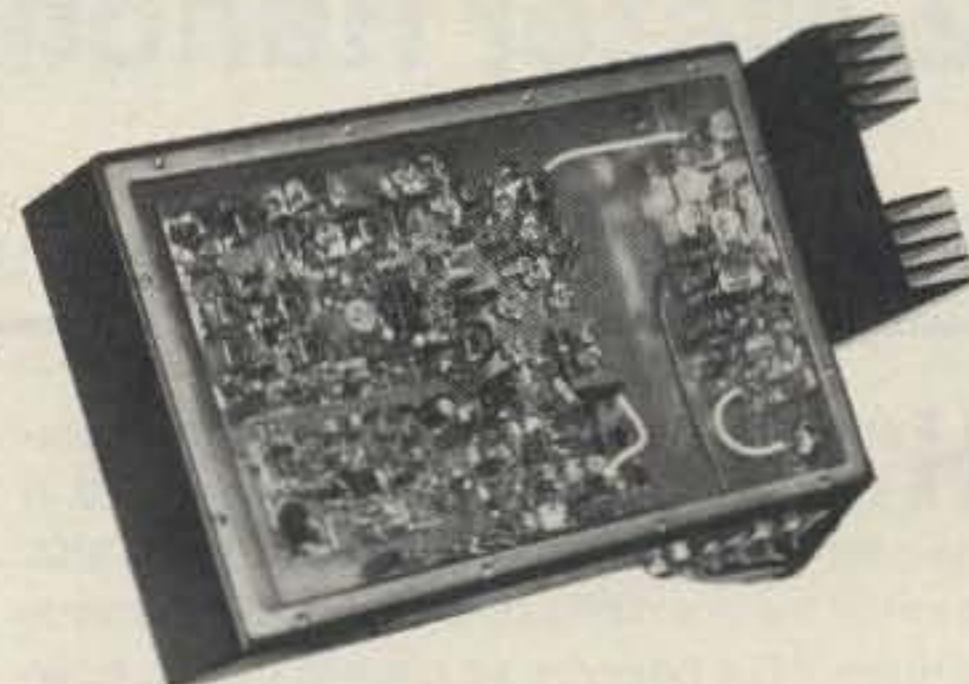
Call or Write for Data Sheets

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

### 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.



### Improved SCT410B Transmitter Assy.

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

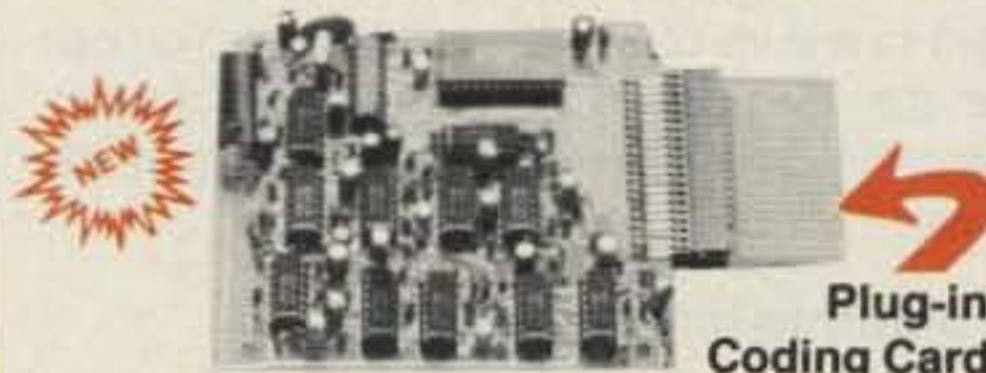
- Complete solid state control for rptr. COR, "Hang" Timer, "Time-Out" Timer, TX local & remote Shut-down/Reset, etc.
- Includes inputs & outputs for panel controls & lamps.

### SCT110 VHF Xmtr/Exciter Board

- 10 Wts. Output. 100% Duty Cycle!
- Withstands High VSWR
- True FM for exc. audio quality
- Designed specifically 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

### Power Supply Boards

- 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



### 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.



### 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.

### 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. UHF 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.



# SPECTRUM COMMUNICATIONS CORP.

1055 W. Germantown Pk, S9 • Norristown, PA 19403 • (215) 631-1710 • Telex: 846-211

"When You Buy, Say 73"

CIRCLE 51 ON READER SERVICE CARD



by Bryan Hastings K1HY

## Alinco ALX-2T 2-Meter Handheld

Alinco Electronics, Inc.  
20705 S. Western Ave., Suite 104  
Torrance CA 90501

Price Class: \$250 (AC Charger, DC drop-in Charger,  
Tone Board, and EBP-3N 450-mAh Battery Pack)

### Small and Simple

**H**and-helds—amateur personal communication devices—have quickly evolved in the past 10 years, and the obvious trend was to make them smaller and pack more features in them. HTs became so over-featured, however, that soon hams demanded one with fewer frills and made easier to operate. The ALX-series HTs from Alinco, their first mini line, are such rigs.

They have been on the market only since mid-October. I spotted the 2-m prototype down at the Atlanta Hamvention in July, and 220- and 440-MHz versions are also on the market. At the time I received the 2T for review, the tone boards weren't yet available.

#### ALX Features

The features are *basic*. The frequency is thumbwheel-set on the top panel of the rig, with three thumbwheels for the 1-MHz, 100-kHz, and 10-kHz digits. The 5-kHz offset is set with a pushbutton, also located on the top panel. You cannot set a non-standard offset frequency.

The on/off/volume switch is adjustable, but the squelch isn't. A three-contact jack for an external mike and speaker is between the volume and squelch. To open the squelch, press its button on the top panel and keep it pressed for as long as you want it open. There is a similar switch for the lamp, which glows soft

green and changes to red in the transmit mode. There is only *one* memory.

The only "scan" feature is the priority switch, which allows the unit to monitor the alternate channel. There is a pushbutton on the top panel for dial and memory mode, and one for encoding a 1750-Hz tone. This tone is found only on the European version (2E) of this HT, since many European repeaters require this tone for access. The memory channel has its own 5-kHz offset switch, but the dial and memory channels share the single repeater offset control.

The keyboard on the front panel has only the numeric keys and the star and hatch, for autopatching. The DTMF tones are not user-audible.

The transceiver also has a battery-save function, set by a slide switch on the front panel. Battery save lowers receive-mode current to a third of the normal setting. You can set the rig to battery save-high power, battery save-low power, or high power without the save.

#### Operating Impressions

I had no trouble assembling the rig except for a sticky battery pack. The antenna connectors are unusual. They are threaded and resemble RCA phone connectors. The audio is acceptable.

Its big advantage is portability. I reviewed the rig with the 450-mAh battery pack (EBP-3N), which weighs only 12 ounces and has dimensions very close to the ICOM  $\mu$ 2-AT. With the smallest pack, the 2N, total unit weight is only 9½ ounces, putting it under the Kenwood minis in size and weight.

Now for the disadvantages. Bear in mind that these are *ergonomic* comments only, and don't reflect on the electronic integrity of the rig. Some operators may not even see them as problems.

The biggest drawback is the difficult-to-dial single memory channel. It's set with three recessed dials on the front panel that correspond to the 1-MHz, 100-kHz, and 10-kHz digits, and



The Alinco ALX-2T with charging stand and AC adaptor.

require a flat-edge blade, similar to that on a jeweller's screwdriver, to adjust. You are also required to carry this special tool, though Alinco provides it on the carrying strap. These controls are stiff, and in the half-dozen times that I reset the memory frequency, the soft plastic around the dial groove began to wear a bit.

The priority function samples the alternate channel at three-second intervals and emits a tone when the alternate channel is busy. Its two distractions are the raspy screech of this tone, and the stuttering effect due to the selected channel audio dropping out during the sampling cycle. This stuttering is a feature common to most rigs with priority channel scanning.

The thumbwheels for dialing the main channel require nimble fingers. They are flanked from the top by the protruding dial lamp, on the right by the antenna connector, and on the bottom by a small protrusion. It can be difficult to crank the wheels toward the lamp. In the same vein, the keypad keys are also very small, not widely spaced, and have modest detent.

#### Accessories

There are four battery packs available, which permit power outputs from two to four watts and from 30 to 90 minutes of operation time. This HT came with the 450-mAh battery pack, and a charging stand that accepts either 110 VAC or 12 VDC with the AC and cigarette-lighter adaptors.

#### Conclusions

Bear in mind your particular circumstances when considering this rig. Are you looking for a pocket-sized rig to satisfy your basic communications needs? This rig is one of the lowest priced units available. The ALX-2T, one of the smallest and lightest HTs on the market, is a big contender in today's heavyweight HT market. **73**

#### ALX-2T Specifications

##### GENERAL

Frequency Range	144-147.995 MHz (2T)
Operating Temperature	-10°C to +60°C
Power Supply	Receive Requirement
	Batt. Save ON 25 mA
	Batt. Save OFF 8 mA
	Transmit
	High (2 W) 750 mA
	Low (400 mW) 350 mW
Dimensions	58 (W) x 141 (H) x 23 (D) mm
(including projections)	66 (W) x 151 (H) x 28 (D) mm
Weight	240 g

##### TX Section

Power Out	2.0 W/400 mW (7.2 V)
Modulation System	Reactance Modulation
Max. Freq. Deviation	±5 kHz
Unwanted Reflection	Less than -60 dB

##### RX Section

Sensitivity	12 dB SINAD, less than 0.25 $\mu$ V S/N more than 26 dB at 0.5 $\mu$ V input
Squelch Sensitivity	Less than 0.25 $\mu$ V
Selectivity	More than ±7.5 kHz at -6 dB Less than ±15 kHz at -60 dB
AF Output	More than 200 mW (8 $\Omega$ load, 10% distortion)



For your best price on  
**KENWOOD, YAESU, ICOM and**  
 all MAJOR BRANDS dial

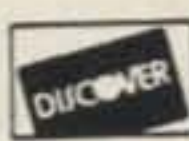
**800-227-7373**



# COLORADO COMM CENTER

303-288-7373

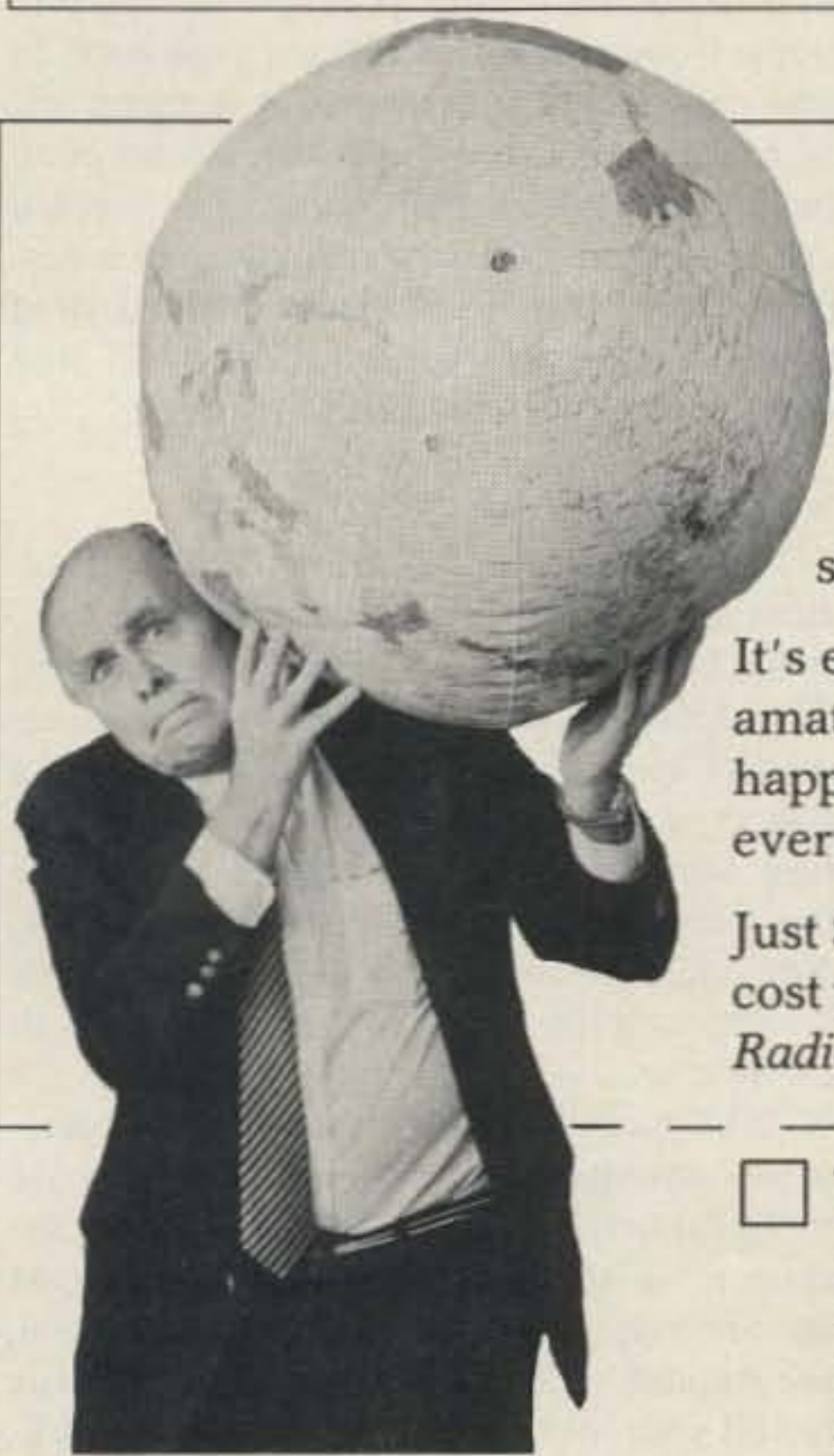
525 E. 70th Suite 1W



CODS Welcome

Denver, CO 80229

CIRCLE 174 ON READER SERVICE CARD



## HEAVY STUFF

### Face it, the world

of ham radio is a lot more complex than it used to be. We have new modes popping up everyday, satellites racing around the globe, computers, spread-spectrum . . . how can you keep up with it all?

It's easy. Every month, the new *73 amateur radio* covers the whole spectrum of amateur radio with a light, easy-going style. We'll keep you up-to-date on what's happening in your hobby with an array of features, reviews, and columns on everything from ATV to Packet, from QRP to DXing!

Just \$19.97 will bring you 12 issues of *73*. A monthly trip to the newsstand would cost you over \$35. Find out what your friends already know: the new *73 Amateur Radio* puts the fun back into ham radio!

**You're right! Let's have some fun—sign me up for a year of 73 for only \$19.97, a savings of over 43% off the cover price! (With your paid subscription, you'll also receive a giant DX Map of the World—a \$5 value—absolutely free!**

AE     MC     VISA     Check  
 Card# \_\_\_\_\_ Exp. Date \_\_\_\_\_

For immediate service, call toll-free 1-800-722-7790. Offer valid in the U.S. and possessions for a limited time only. Please allow 6 weeks for processing of first issue.

Name \_\_\_\_\_

Call \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

**Mail to: 73 Magazine, Circulation Dept., WGE Center, 70 Rte. 202N, Peterborough, N.H. 03458-9995**

7756DX





Pete Putman KT2B  
353 Fieldstone Dr.  
Doylestown PA 18901

# ICOM's Classic IC-2AT: The Most Popular Hand-Held of All Time

*The IC-2AT has left an indelible mark on the amateur radio world since 1979.*

**S**tep right up, folks. Don't be shy! Look at this little beauty. I'm telling you, it's a marvel of construction, full of features and easy to use. Small enough to fit in your pocket, too. Best of all, it costs only two hundred thirty dollars. At that price, you'll want two of 'em! Hurry...hurry." Snake oil? Nope. Just amateur radio's equivalent to the Model T: The ICOM IC-2AT hand-held, perhaps the most popular and enduring transceiver of all time.

Since it burst onto the scene in December, 1979, over 500,000 units have been sold world-wide according to ICOM America. It's been manufactured in several versions depending on the country of destination, and has spawned a wealth of aftermarket accessories ranging from quick-charge adapters to drop-in mobile docking boosters. The IC-2AT also single-handedly created a strong market for hand-held amplifiers, typically running 25-35 watts output for 1-2 watts drive.

73 readers first found out about this little marvel in the May, 1980, issue which featured a full-page advertisement with a life-size photograph. The copy read, "When Is ICOM Coming Out With a Hand-Held?" and below the transceiver was the reply: "The Answer Is: Now!". This sent thousands of hams to their phones, charge cards clutched in one hand while dialing with the other. Initial orders overwhelmed dealers! The IC-2AT pioneered a number of features commonly found on HTs today. It was the world's first synthesized hand-held to use both thumbwheel encoding and detachable battery packs. It also offered a range of these packs for various charge rates and output power levels. This approach kept downtime to an absolute minimum. Other hand-



ICOM's IC-2AT

helds on the market couldn't be used while charging. ICOM also forced the rest of the industry to standardize BNC antenna connectors.

Frequent visitors to hamfests will remember a long period in the early '80s when

hamfest organizers didn't have to advertise the door prize: an IC-2AT, of course. Many lucky winners went home with a second unit to back up their initial purchase of this HT. Some wound up with three and even four! In one case, the winner actually refused the prize and negotiated to get the second prize (an antenna tuner). Failing that, he accepted and turned the 2AT into ready cash at a bargain price, which he then spent on the desired tuner. When asked why, he replied "I sure don't need four 2-meter hand-helds."

## The First Runners

The first modifications for IC2A/2AT series radios made their appearance in the July, 1981, issue of 73, and (wouldn't you know it) they detailed the installation of a non-standard offset, using an extra CD4051 IC and a few crystals to do the trick. ICOM by this time had announced 10 accessories for the line, including 5 different battery packs. VoCom had come out with a neat little 2-meter amplifier that produced 30 watts with as little as 200 MW of drive—perfect for IC-2AT mobiling. A number of small enterprises introduced battery eliminators for use in the car or base station, perhaps fueled at the time by a shortage of the official ICOM factory version. Subsequently, an article in the August, 1981, issue of 73 detailed a way to roll your own accessories for the IC-2AT, specifically a PTT microphone, trickle charger and the use of a K-Mart 110 camera case to protect the hand-held.

By this time, both Yaesu and Kenwood were into their second generation of synthesized hand-helds, and Santec had jumped into the market to compete with ICOM. No problem, as ICOM stole the march on everyone by announcing the IC-3AT for 220 MHz



in December, 1981, and promptly sent every 220 enthusiast running to the phone with credit card clutched in one hand as they frantically dialed with the other. More companies came out with accessory amplifiers and 5/8 wave base-loaded antennas as the hand-held market in general was heating up.

For most purchasers, the IC-2AT (or -2A, without the DTMF option) became an indispensable companion rivalling the family dog. IC-2ATs went to plane flights, ocean cruises, family outings, in hot air balloons, hiking, camping, skiing and bicycling. For the travelling ham, the rig proved indispensable.

One climber took an IC-2AT up Mt. McKinley to communicate with a base station many miles distant. Scott Nelson, W7KUF, told this dramatic tale in the January, 1982, of 73 and detailed the climb of North America's highest peak with members of his Snowbird Expedition. He chose the IC-2AT because it was small, easy to use and didn't drain the batteries to operate such things as a display and other bells and whistles. His choice paid off during a very real emergency on the climb: The IC-2AT was pressed into service to request an airlift for an injured climber.

In May, 1982, ICOM advertised the IC-4AT, sending the usual 440 MHz FM enthusiasts flying to the telephones clutching credit cards. More modifications had appeared by this time, including several conversions to MARS and CAP frequencies.

Other manufacturers lowered their prices to compete with the IC-2AT, which hovered about the \$230 range but could be had for closer to \$210 with judicious shopping.

The years followed with innumerable modifications to batteries, frequency coverage, DC supplies and all kinds of wacko

**"The IC-2AT became an indispensable companion rivalling the family dog."**

portable antenna designs for portable use. Other manufacturers continued to evolve new generations of hand-helds (and many of them adopted the slide-on battery pack system pioneered by ICOM) with more bells and whistles than ever before. The IC-2AT? It continued to sell at a steady pace, as did the IC-3AT and -4AT versions. But pressure was building on ICOM to come up with a comparable whiz-bang answer to their competitors.

#### Updating a Standard

So the answer came in 1984, with the IC-02AT and IC-04AT series radios, with scanning, memory storage and a backlit

LCD display. Additional accessories were introduced, among them a VOX headset and a high-current battery pack. Many of the new accessories were interchangeable with the older IC-2AT/3AT/4AT series, however. ICOM had no intention of replacing the Volkswagen Beetle of HTs!

Today, eight years after the unit's introduction, the picture is pretty much the same. The product line has added 23 cm in the form of the IC-12AT, but the IC-2AT continues to chug along, albeit at a somewhat higher price. And it can't claim to be the most popular grand prize at hamfests anymore (to the relief of owners with 7 or 8 units).

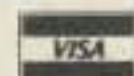
And the survival tales are still told of the legendary endurance of the tough case and innards: drops from 70-foot towers; dives into a pool, retrieval, drying in an oven and springing back to life; flights out of a car window or door at 30 mph, hitting the ground and squawking back to life with a new battery pack. I can personally testify to the ruggedness of the IC-2AT. After a fall and slide down a ski slope for 100 feet on top of one, buried about a foot under the snow, I resecured the battery pack, switched it on and heard a nearby repeater—as if nothing had happened.

Yes, the IC-2AT has certainly left its mark on the amateur radio world over the past few years and will continue as an industry standard. **73**

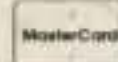
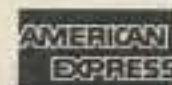
**313-469-4656**  
28360 South River Rd.  
Mt. Clemens, MI 48045

# Michigan Radio

SALES SERVICE

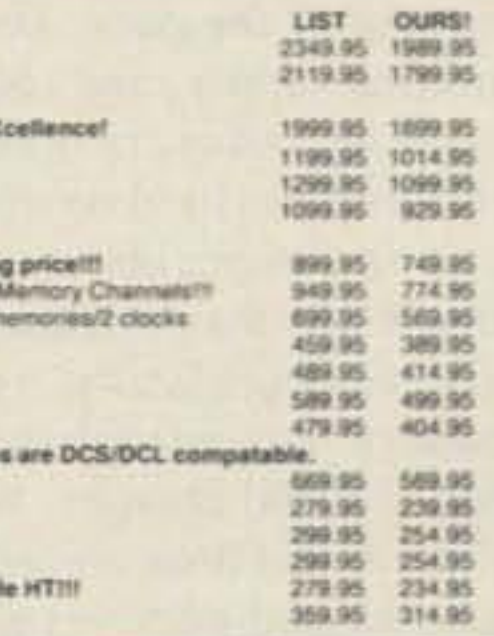
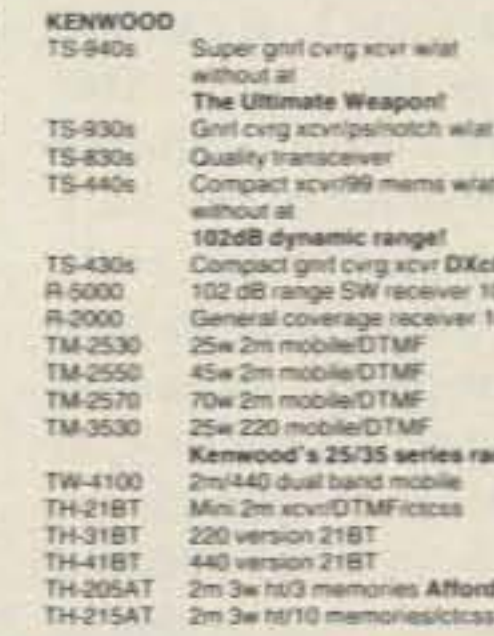


WE NOW HAVE



\*ALL PRICES SUBJECT TO CHANGE

ICOM	LIST	OURS!
IC-761	2499.00	2149.95
IC-751A	1649.00	1394.95
IC-745	1049.00	899.95
IC-735	999.00	849.00
R-71A	949.00	799.00
R-7000	1099.00	949.95
IC-27A	429.00	369.95
IC-27H	459.00	389.95
IC-37A	499.00	424.95
IC-47A	549.00	469.95
IC-28A	459.00	389.95
IC-28H	489.00	414.95
IC-38A	489.00	414.95
IC-48A	489.00	414.95
IC-271A	899.00	699.95
IC-471A	1049.00	809.95
IC-275A	1199.00	1034.95
IC-275H	1389.00	1199.95
IC-375	TBA???	TBA???
IC-475A	1399.00	1189.95
IC-475H	TBA???	TBA???
IC-900	589.00	504.95
IC-2AT	299.00	254.95
IC-3AT	339.00	289.95
IC-4AT	339.00	289.95
IC-02AT	399.00	339.95
IC-03AT	369.00	314.95
IC-04AT	449.00	389.95
IC-u2AT	329.00	279.95
IC-u4AT	369.00	319.95



KENWOOD	LIST	OURS!
TH-315AR	379.95	324.95
TH-415AT	379.95	324.95
TM-221A	419.95	354.95
TM-321A	439.95	374.95
TM-421A	439.95	374.95
TR-751A	629.95	534.95
TS-711A	999.95	849.95
TS-811A	1199.95	1014.95

TEN TEC	LIST	OURS!
585 PARAGON	1995.00	1709.95
581 CORSAIR II	1345.00	1159.95
525D ARGOSY II	695.00	599.95
579 CENTURY 22	389.00	349.95
RX-325	699.00	574.95
2591 HT	319.00	274.95
2510	549.00	474.95

YAESU	LIST	OURS!
FT-980	1795.00	1499.00
FT-757H	1714.95	1429.95
FT-736R	1079.95	939.95
FT-726R	TBA???	TBA???
FRG-8800	699.95	609.95
FRG-9600	679.95	499.95
FT-727RH	519.95	429.95
FT-109RH	379.95	319.95
FT-209RH	379.95	319.95
FT-709RH	379.95	319.95
FT-23R	299.95	259.95
FT-73R	314.95	279.95
FT-211RH	459.95	399.95
FT-311RH	439.95	384.95
FT-711RH	479.95	414.95

**New All-Band Portables!**  
Two High-Tech Luxury Receivers On Their Way  
To North America From Europe

**GRUNDIG**  
CALL FOR  
INFORMATION AND  
HOLIDAY PRICES



**POCKET HANDHELD  
MAKE GREAT XMAS GIFTS**

**CALL FOR  
HOLIDAY PRICES  
ON TH-21BT  
AND TH-21AT**



CIRCLE 162 ON READER SERVICE CARD



# ICOM BP-4 Charging Adapter

*Our own technical editor beats the system.*

**P**ractically every ham radio operator, and certainly everyone involved with electronics, has at one time or another experienced a feeling of absolute despair. The despair usually occurs right after the project you just built fails to work, or when that puff of creamy smoke comes out of your month-old rig, or as you watch your new tribander slowly drive itself through the garage roof. The feeling usually is a combination of extreme frustration, confusion, and sadness, followed by the realization that there really is no governing force in the universe.

Physical symptoms that accompany these feelings include long sighs, drooping shoulders, poor posture, and a knot in the abdominal region.

## A Serious Deficiency

Not having experienced any of the above situations recently, I had been feeling quite immune to any feelings of hopelessness. This all changed with the purchase of a simple battery pack for my IC-2AT. My original battery pack was getting a little weak, and I



Photo A. The WB9RRR el-cheapo IC-BP4 charger adapter, inserted under the rails of the battery pack. See Figure 1 for foil layout on board bottom.

knew it was time for a replacement. After pricing new battery packs, it occurred to me that I could buy the empty BP-4 pack, fill it with slightly used NiCds that I could get for free at work, and have a perfectly good battery—all for only \$15.25. I bought the BP-4 pack at the next hamfest.

A few days later I brought home some NiCds, secure in the knowledge that I was advancing ham ingenuity and outsmarting ICOM. I disassembled the pack, popped in the batteries, and screwed it back together. I plugged in the wall charger and stood there, my power plug in my right hand, my new cheap battery in my left, when I made this discovery—there was no hole on the BP-4 for the power plug! I turned the battery over seven or eight times, searching for the jack. There was none. It turns out that the battery pack with the unreplaceable NiCds has the charging jack, but the pack for the replaceables doesn't! I had just spent \$15.25 on something that I couldn't use unless I spent another \$74.50 for the proper charger. (Please see paragraph one.) So much for saving money.

I realized that I could simply cobble some jumper clips onto the two contacts on the bottom of the pack, hook them to a current-limited supply, and charge the battery. This was OK, but every once in a while I slammed the door too hard on the way out of the shack and the jumper clip would jump off (no doubt that's why they call them that). I'd come back sixteen hours later to a completely uncharged battery. I toyed with the idea of converting an old HT-200 charger, but I knew that I'd get that project done sometime in 1998. I needed a quick-and-dirty yet reliable setup to charge my battery.

## Eureka!

The final result can be seen in Photo A. The adapter allows the regular wall charger power plug to be plugged into the BP-4 battery pack, charging through the output terminals. The small amount of circuitry on the board imitates the circuit found inside the standard pack. The adaptor slides onto the top of the battery, under the lips that normally hold the radio and battery together. It provides a solid means of providing contact to the  $\pm$  terminals, and can be built in about thirty minutes.

Construction of the adapter is quite simple, but it is critical in two areas. The printed circuit board used must be quite flexible, since it needs to bend slightly in order to be slid into the pack. Common dime-a-dozen hamfest boards work quite well. An alternate method is to use a piece of stiff plastic material, and cement brass stock to it. The other critical spot concerns the 1mm gap around the outside of the board. This prevents the traces from touching the  $\pm$  terminals at the same time while the adaptor slides in and out. Failure to include the gap on your board would cause a momentary short circuit each time the adaptor was used, which your battery doesn't like. If the phone rang while the adaptor was exactly half way out, you'd return to a pile of smoking plastic. Don't forget the gaps.

You can etch the board, but the "X-acto-Knife-Cut-and-Peel" method works fine. I cut the side gaps with a file, running diagonally across the edge of the board. The notch at the bottom of the board was cut in with a nibbling tool, but a file and some patience work just as well.

The BP-4 adapter is certainly not a high-tech device. Until you get around to building that Multi-Voltage/Digital Readout/Auto Cycling/Drop-In battery charger, however, it is a quick, cheap, reliable method for charging "jackless" ICOM batteries. **73**

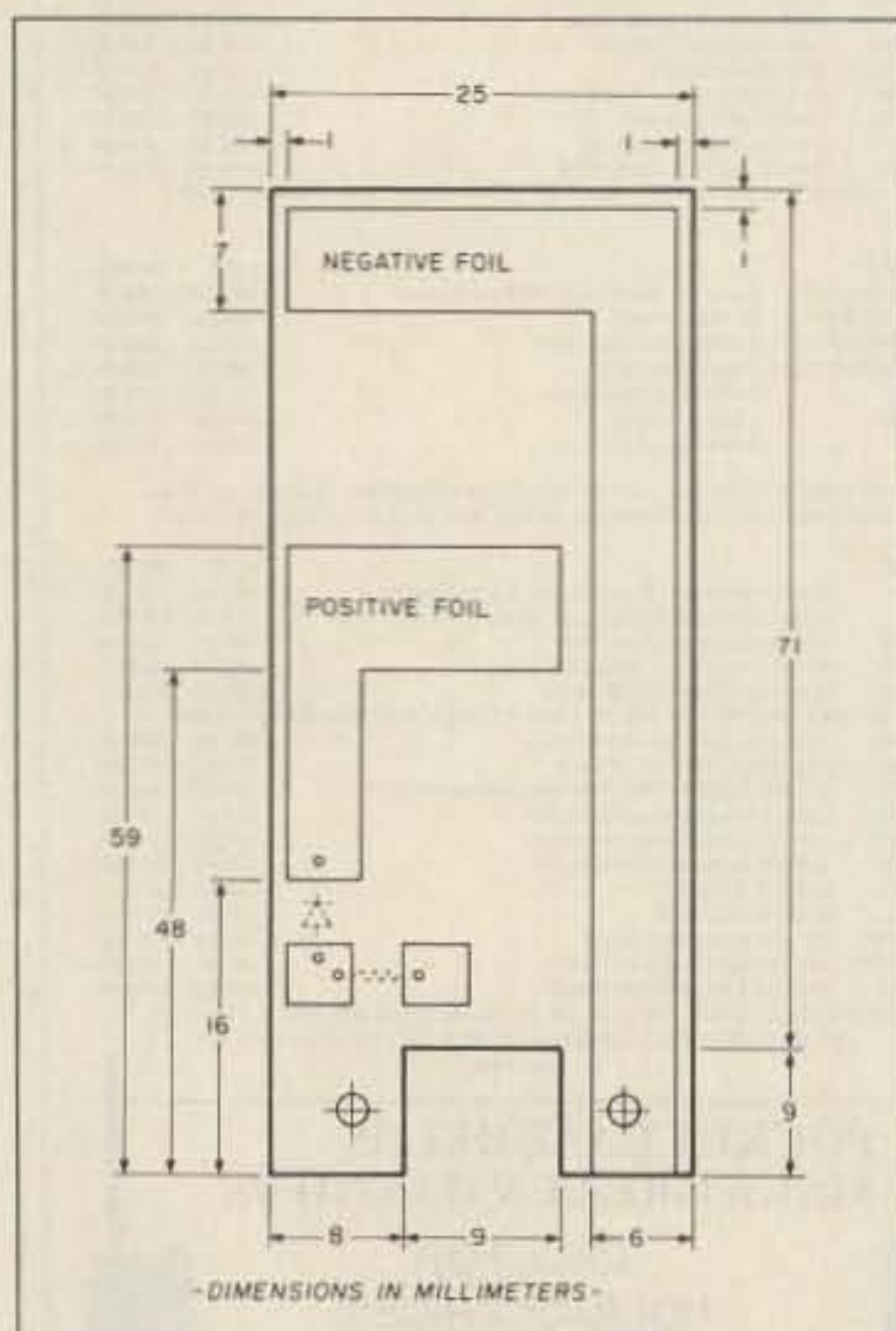


Fig. 1. PC board dimensions. The two small foil pads provide mounting points for CR1 and R1. Their dimensions are not critical.

## Parts List

- CR1 1N914, 1N4148 Diode
- R1 82  $\Omega$  1/2 W Resistor
- J1 Coaxial Power Jack (RS #274-1565)
- Thin, Flexible PC Board Material





## SOLID BRASS MORSE KEY

- AVAILABLE WITH LOW PROFILE OR CLASSIC STYLE ARM
- THE ULTIMATE STRAIGHT KEY FOR THE CW OPERATOR
- QUALITY BRITISH CRAFTSMEN: R.A. KENT (ENGINEERS)
- SMOOTH OPERATION WITH BALL RACE BEARINGS
- PRECISION ADJUSTMENTS, SOLID SILVER CONTACTS
- MAHOGANY, WEIGHTED BASE WITH NON-SLIP FEET

EXCLUSIVE U.S. DISTRIBUTOR:

TOTAL ELECTRONIC CONCEPTS (TEC)  
P. O. BOX 5400, LINCOLN MA 01773  
(617) 259-0125



KIT ..... \$59.95  
ASSEMBLED ..... \$74.95

Plus \$6.00 shipping, handling and insurance.  
Massachusetts residents add 5% state sales tax.

CIRCLE 170 ON READER SERVICE CARD

## THE RF CONNECTION

"SPECIALIST IN RF CONNECTORS AND COAX"

Part No.	Description	Price
PL-259/USA	UHF Male Phenolic, USA made	\$ .50
83-1SP-1050	PL-259 Phenolic, Amphenol	.75
83-822	PL-259 Teflon, Amphenol	1.45
PL-259/ST	UHF Male Silver Teflon, USA	1.30
UG-175	Reducer for RG-58	.20
UG-176	Reducer for RG-59 & MINI 8	.20
UG-21D/U	N Male RG-8, 213, 214, Amphenol	2.95
UG-21B/U	N Male RG-8, 213, 214, Kings	3.75
9913/PIN	N Male Pin for 9913, 9086, 8214 fits UG-21D/U & UG-21B/U N's	1.50
UG-21D/9913	N Male for RG-8 with 9913 Pin	3.95
UG-21B/9913	N Male for RG-8 with 9913 Pin	4.75
UG-146/U	N Male to SO-239, Teflon USA	5.00
UG-83/U	N Female to PL-259, Teflon USA	5.00

"THIS LIST REPRESENTS ONLY A FRACTION OF OUR HUGE INVENTORY"

THE R.F. CONNECTION  
213 North Frederick Ave. #11  
Gaithersburg, MD 20877  
(301) 840-5477

PRICES DO NOT INCLUDE SHIPPING  
PRICES SUBJECT TO CHANGE  
VISA, MASTERCARD, OR C.O.D.  
UPS C.O.D. ADD \$2.00 PER ORDER

CIRCLE 115 ON READER SERVICE CARD

# SPECIALISTS IN FAST TURN P.C. BOARDS

PROTO TYPE P.C. BOARDS AS LOW AS \$25.00

- SINGLE & DOUBLE SIDED
- PLATE THROUGH HOLES
- TEFLON AVAILABLE
- P.C. DESIGN SERVICES

FOR MORE INFORMATION



34374 EAST FRONTAGE ROAD  
BOZEMAN, MT 59715 (406) 586-1190

CIRCLE 252 ON READER SERVICE CARD

# MADISON FALL SHOPPER

New rigs and old favorites, plus the best essential accessories for the amateur.



ICOM 28H/TTM ..... 399.00

### AMPHENOL

831SP-PL259 Silverplate	1.25
UG176 reducer RG8X	.30
831J Double Female UHF	2.00
82-61 N Male	3.00
82-97 N Female Bulkhead	3.00
82-63 Inline Female N	4.00
82-98 N elbow	9.00
82-202-1006 N Male for 9913	4.50
31-212 BNC-RG59	1.50
31-216 UG201 A/U N Male-BNC Female	2.00
31-2 BNC-RG58	1.50
34025 N Male RG58	3.00
34125 N Female UHF male	9.00
3128 BNC Female-PL259	3.00
4400 N Male-SO 239	7.00
2900 BNC-SO 239	4.00
Coax Elbow	9.50/10

### TUBES

Collins & Drake Replacement tubes	Stock
GE 6146B	13.95
3-500Z	119.95
GE Industrial Tubes	Call
GE 12BY7A	7.00
GE 6JS6C	12.95
GE 8950	16.00
12JB6 Sylvania	6.00
Hard to find Tubes 50-90% off list	
6JB6A	9.95
6JE6C/6LQ6	9.95
RCA 6BFS	6.00
6KD6	10.95

### PACKET POWER

AEA PK-232 with new WX FAX	299.00
Kantronics KPC II	149.00
MFJ 1270	119.00
MFJ 1274	149.00
New Kantronics KAM	299.00

### SERVICES

Complete KWM 2 Retube	179.00
Flat fee Collins rebuild	Call
Wanted - Collins KWS 1 - Mint - Will Pick Up	

### USED EQUIPMENT

All equipment, used, clean, with 90 day warranty and 30 day trial. Six months full trade against new equipment. Sale price refunded if not satisfied.

Call for latest used gear  
(800) 231-3057

TS-430S, TS-830S, TS-520S, FT101E, and Collins

### 220 MHZ

TH-31BT - Small rig, small bucks	CALL
IC-03AT	399.00
TM-3530	CALL
Santec FM340, 25w, new	CALL
IC-38A, TTM	429.00

### POLICIES

Minimum order \$10.00. Mastercard, VISA, or C.O.D. All prices FOB Houston, except as noted. Prices subject to change without notice. Items subject to prior sale. Call anytime to check the status of your order. Texas residents add sales tax. All items full factory warranty plus Madison warranty.

### DON'S CORNER

Madison Double Warranty on Kenwood Radios! We will double Kenwood's 90 day warranty regardless of who you purchased the radio from.

# MADISON Electronics Supply

3621 FANNIN  
HOUSTON, TEXAS 77004



CIRCLE 25 ON READER SERVICE CARD

73 Amateur Radio • December, 1987 21

### CALL FOR ORDERS

1 (800) 231-3057  
1-713-520-7300 OR 1-713-520-0550  
TEXAS ORDERS CALL COLLECT

ALL ITEMS ARE GUARANTEED OR SALES PRICE REFUNDED

### EQUIPMENT

New Icom IC 761	Trades wanted
Kenwood TH205AT	Trade in your old HT
Kenwood TS 440S/AT	Call for trade
Icom R7000 25-2000 MHz	949.00
Icom IC735	849.00
Santec FM 340, 220 MHz, 25w	319.00
Santec FM 240 NT	319.00
Mirage Amps	15% OFF
Tokyo Hy-Power HL 1K AMP, no 4CX250B	699.00
New Kenwood TM-221A, 45W mobile	Call
VJ Amplifier, VHF, built in England, 1 in-100 out	
3-100, 5-100	(ea) 249.00
10 in-100 out	229.00
25 in-160 out	319.00
All models include preamp	
Lunar 2M4 40P	109.00
Kenwood TW-4100A	Call

### ACCESSORIES

B&W VIEWSTAR ANTENNA TUNER	89.95
Heil HC4/HC5	Stock
Heil BM10 Boom Mike headset	CALL
Tri-H 5000A Remote Phone	\$189.00
Daiwa NS660A 30/300/3000 watts	135.00
Alinco ELH 230D - Excellent buy	88.00
Nye MB5-A (for the big boys!)	529.00
Shure 444D	54.95
Ameco PT-3	Soon
New Tokyo HC 200A	115.00
Astatic MC321 Cartridge D104	12.00
Ten-Tec Mobile Switch 3001	17.00

### ANTENNAS

Isopole 144 MHz	44.95
Isopole 440 MHz	59.95
Cushcraft 124-WB (146 MHz)	33.00
Butternut HF6V, 80-10 vertical	125.00
HF2V, 80 & 40 vertical	119.00
HF4B	189.00
Hustler G7-144	119.95
Hustler 6BTV	139.00
KLM HF World Class Series Antennas	Call Don
ALPHA Delta DX-DD	63.00
Coax Seal	2.00/roll
B&W Dipoles	Less 10%
KLM KT-34A	399.00
W2AU, W2DU	Now Available
NEW KLM 1 2-44LBX	129.00
1296 Power Divider	69.00
Create CD-78 + BS 80 75/80 rotatable dipole	385.00
G5-RV	44.00

### OTHER ANTENNAS

Diamond D-130 Discone 25-1300 MHz	79.00
Larsen Kulduck	17.00
Larsen 2M 1/2 wave telescope ant	25.00
Avanti AP151 3G on Glass Antenna	36.00
Anteco 2M, 5/8, Mag. Mount, Comp	25.00
Van Gordon ND-4, 4 band Novice dipole	45.00
Valor AB-5 Mobile	79.95
Stoner DA100 D Active Rx Antenna	190.00
DC Tenna Hitch 3/8-24 Thread	
Fits 3/4" trailer hitches	29.95

### PARTS

1.5 Amp/400V full wave bridge rectifier	1.95
2.5A/1000PIV Epoxy diode	29 each or 19.00/100
.0015/10KV or .001/20KV	1.95 each
3N201	.95
4 inch ferrite rod	1.95
365pF cap	1.95
Sanyo AAA, AA Nicads w/tabs	2.00
2, 4, 5, 6, 8 pin mic plugs	3.00
1/8, 1/4, watt carbon resistors	.05 each
Meter 0-3000 VDC 0-1 Amp DC 2 1/2" Square with shunt	19.95
Drake - Collins mike plug	2.00
Thousands of panel meters	3.95 up CALL
MICA Cap .004/3KV	5.00 others CALL
Diodes 3A/1000 PIV	.29
Duracell 9 Volt Battery - 2 Pak MN1604	3.49
DC Fan 3 1/2" Sq. x 1"	9.95
CINCH 12 pin conn fitz (Drake etc.) female	3.00
Aerovox 1000 pf/500 V feedthrough caps	1.95
Mallory 6 volt, 4 prong Vibrator PN/600A	5.00
100 mfd/450V Axial Cap	2.00
Eveready 9 volt batt. (216)	.99
01/1000V Bakelite Molded Caps	.25



# 73 Review

by Pete Putman KT2B

## ICOM IC-12AT:

### The Exotic 23-cm Hand-held Transceiver

ICOM America, Inc  
2380-116th Ave. NE  
Bellevue WA 98004  
Price Class: \$460

#### FIRST 1.2-GHz HAND-HELD

We've graduated from watching Captain Kirk and Mr. Spock with nifty pocket communicators to the real thing... a portable, 1-watt FM transceiver for 23 centimeters, courtesy of ICOM. It's not quite as small as those legendary communicators, but it has a lot more features and doesn't depend on dilithium crystals for its energy source.

#### Plenty of Features

The IC-12AT does make a compact package, slightly larger than the IC-02AT/03AT/04AT series radios at 6 1/2" H x 2 1/2" W x 1 1/2" D. With the supplied BP-3 battery case, this great little handheld makes for an easy tote at just over one pound.

The output power is rated at 1 Watt and 100 mW on high and low power settings, respectively. This should mean quite a long period between charges except that the current consumption is rated at nearly 900 milliamperes in the high-power position. With the standard battery voltage of 8.4 volts, that means that the IC-12AT uses nearly 7.5 watts battery power to generate that 1 Watt output as well as run everything else on board. This rig draws 400 milliamps in the low power position, meaning 3.3 Watts of power are consumed to generate 100 mW output. Solid state microwave circuits tend to be rather inefficient. The batteries are dead after several hours of average-duty operation on high power. The transceiver also connects directly to a 13.8-volt power source to eliminate the battery pack altogether. The battery pack will even charge while connected to this jack.

The IC-12AT accepts all of the accessories of the IC-0X series handhelds. Users familiar with other radios in this series will find many familiar functions, including subaudible tone selection and activation, DTMF signalling, memory scan, programmed band scan, and priority channel mode. The IC-12AT features two new controls essential to 23 cm operation: RIT (Receive Incremental Tuning) and VXO (Variable Transmit Offset). The former shifts the receive frequency up or down by 5 kHz from the display, while the latter shifts both.

The antenna will surprise some folks. It's a

The ICOM IC-12AT 23cm FM hand-held transceiver.

**"The IC-12AT accepts all of the accessories of the IC-0X series."**

flexible vertical that attaches via a TNC connector (as opposed to the more conventional BNC connector), and I wonder why ICOM made the switch. After all, BNC connectors work at this frequency without any appreciable insertion loss. Further, a BNC would

allow easier connections to an external antenna or an outboard amplifier using low-loss cable. Besides, most hams are unfamiliar with the TNC.

#### The Inside Story

Internally, the IC-12AT has a few neat features. For one, the output stage is a power module instead of a discrete device—supposedly a first in hand-helds (according to the literature). The receiver is a dual-conversion design with no less than 3 bandpass filters before the 1st mixer to reduce spurious IMD products. A bonafide antenna relay is also employed instead of diode switching (this would account for some of the additional current consumption).

The receiver scheme has the first i-f at 59.55 MHz and the second i-f at 455 kHz. In fact, the second LO, i-f amplifier, mixer, FM detector, and noise amplifier are all on one IC (similar to the Plessey designs of some years ago). Although not unusual, it saves a lot of space, which is at a premium! The transmitter uses six stages to get to the final output power.

#### A Performance Test

Now for the burning question: How well does this rig work? After all, the 23 centimeter band presents a new challenge for hams familiar with 2 meters and 70 centimeters. A number of tests would determine the unobstructed maximum usable path, as well as the range through a fair amount of obstructions—such as a stretch of woods. A cleared field about 1/2 mile in length and nearby woods provided a suitable test environment for two IC-12ATs.

Both high and low power settings easily yielded clear communications over the length of the field. The effects of multipath from nearby objects were minimal. Trees noticeably attenuated the signal, and communications were completely lost after about 1/2 mile of separation through the woods of mountain laurel and pine.

During this test the more pronounced effects of multipath reflections and refractions became apparent. By remaining stationary and moving the IC-12AT through an arc of 90 degrees, 5 feet above the ground, no fewer than 20 peaks and nulls appeared in







# Yaesu FT-727R

## The First Duoband HT

Yaesu USA  
17210 Edwards Rd.  
Cerritos CA 90701  
Price Class: \$520

### More Features in Less Space

Yet another stride has been made to pack more and more features into less and less space. In November of last year, Yaesu began marketing the FT-727R, an FM handie for the 2m and 70cm amateur bands. This HT, with the FNB-4A battery pack, measures approximately 8" high x 3" wide x 1½" deep and weighs a little under 1½ lbs. It hosts a daunting array of features. This review discusses how relevant, and even how employable, some of these 40-odd functions are.

Take note that the first version of this handie had some limitations, and Yaesu soon replaced it with the present model in February, adding \$30 to the price tag. This review covers the present model.

The top panel of the rig, where the female BNC connector for the antenna is located, has three push switches for 0.5W/5.0W Power Out, Lamp, and VOX; the Squelch and On/Off/Volume controls; and three jacks for earphone, mike, and "Computer-Aided Tuning" (CAT). More about CAT later.

You might expect a dual-band rubber duck to compromise somewhere. Indeed, 70 cm gets short shrift with the supplied YHA-27 flex antenna. Several people reported getting much better performance out of a ¼"-wave on 440 MHz, though they had no troubles getting out on two with the YHA-27.

Sensitivity for the VOX is set by the High/Low small recessed slide switch on the FT-727R's back panel. Take note that the VOX function works *only* with an external audio output and mike, such as the Yaesu YH-2 Headset. This makes sense when you consider the feedback problem resulting from the internal mike picking up audio from the speaker—they are less than an inch apart. Unfortunately, there's no readily accessible control for the VOX delay, and I find the delay too short.

The LAMP on/off switch is very handy. Many HTs, like many digital watches, provide switches which have to be kept manually depressed to keep the lamp lit. The lamp adequately illuminates the LCD readout screen, though unevenly, since it is located on the lower right of the screen. The keys on the

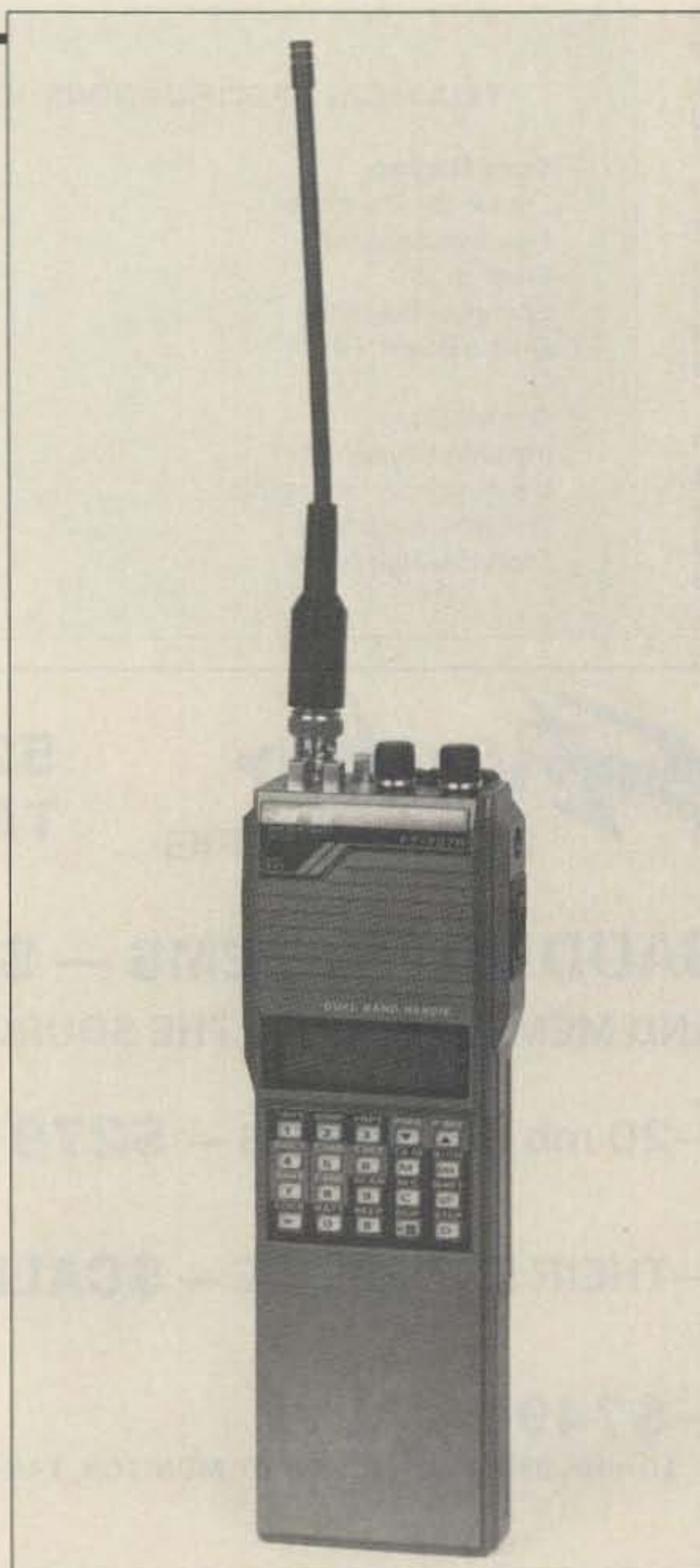


Photo A. Front panel of the Yaesu FT-727 dual-band HT for 144- and 440-MHz operation. Power output is 5 Watts with the battery pack shown.

keypad glow green when the lamp is on.

The right side panel has the Tone Burst/PTT, and the left, the FUNC, press switches. All three have good detent, though you have to be careful to press the right switch when using the PTT, since it is located under the same rubber covering as the Tone Burst.

The ON AIR/BUSY and BATTERY lamps are at the top left of the front panel. Moving down this panel from them, we find the speaker (approx. 1¼" diameter) and mike, then the multifunction LCD screen. Below the screen is the 20-key keypad, each with a primary function, marked on the key, and an alternate function, marked above the key and activated by the FUNC switch.

#### 727R Keyboard Functions

How do these functions shore up? The '727R has most of the now-standard features of HTs—ten memories; frequency dialing from a numerical keypad, which can also be used as a touchtone pad; standard and programmed frequency offset entry; band, programmed, and memory scan; and frequency lock. A beep option acknowledges keystrokes, useful here since the keypad keys don't have good detent. The beep, however, is the same tone for any key depressed.

Two less common features are the SAVE function and battery life display. The save function allows the user to save on current drain in the receive mode by turning the receiver off for up to 9 seconds, and then reactivating for ½ second. There is a cycle timer on the screen that counts down to "0" before the frequency display. The radio will stay in receive as long as there is a signal present. In the present version, the battery-saver function restarts after transmitting. In the old version, key-up deactivates the battery-saver function.

The battery command lets the user monitor battery drain by a voltage display on the screen. The scan function is adequate but has some limitations.

First, it takes almost two minutes to scan one megahertz in 10-kHz steps. Second, there's no way to mask out unwanted frequencies in a scan. Finally, the programmed scan is awkward. A conventional programmed scan is set by entering the two boundaries of the scan and the step size. The FT-727 requires you dial in the starting boundary, then the number of steps to take. You have to calculate the number of steps by the step size to get the scan range!—and that



range is limited to 99 steps x 10 kHz/step = 990 kHz, or just under one megahertz. Also, when the receiver stops at a busy frequency, the programmed scan deactivates. To scan the same portion of spectrum, you have to first dial in the original boundary. All in all, the programmed scan is limited and cumbersome to use.

The FT-727R's memory capacity is quite adequate. It has 10 memory cells, and you can store non-standard offset frequencies in the first four. This is a big improvement over the original model, which accepted only three standard offset frequencies into memory (the other 7 cells were for simplex). You can set and enter the offset into a memory conventionally by using SHIFT and the - or + repeat key. The alternate (and easier) method, however, is to enter the receive frequency into memory, and then dial up the transmit frequency and enter *that* into the same memory cell, using the TX M command.

The memory mode is easy to use. It requires only 2 keystrokes to enter a dialed frequency into memory and only one keystroke to recall a memorized frequency when the rig is in the memory mode. There is also a CALL (priority) memory, a frequency that can be recalled with a single keystroke.

One curious feature is cross-band operation, with the transmit and receive in different bands. I went up to the local Pack Monadnock mountain and hooked up with Ted W1ALE in Concord NH (40 miles NE, as the electromagnetic wave flies). He has both a 440 and 2m repeater in Concord. I transmitted on two and received on 440. Imagine the confused looks on the faces of the people monitoring the one-way conversations on each machine! I am hard put to think of a real use for this feature. A dual-band *single side-band* handie would be really neat for OSCAR 10 work.

The combined S-meter/Power out/Memory cell indicator is a clever design. All of this is represented by a 10-element (each element



Photo B. Top panel of the 727R.

numerically labelled) LCD bar graph at the bottom of the screen. When in memory mode, only the element of the memory cell called up shows. Its only failing is that the display doesn't return to the original memory cell flag after transmitting in memory mode.

#### Just What Is CAT?

Computer-Aided Tuning means remote control of the rig from a computer's serial port, and a number of Yaesu transceivers use CAT. Digital data is transferred serially at 4800 bits/second. The proper initializ-

***"Calculate  
the number of  
steps by the step  
size to get the  
scan range!"***

ing command from the computer prompts an acknowledgement response from the '727R, a process called "handshaking". All functions on the rig can be controlled from the computer. Rig memory is limited only by the memory of the computer, and the rig's scan rate can be increased from 1-2 channels/second to up to about 3-4 channels/second.

Yaesu wasn't fully prepared to support CAT when they introduced the rig on the market. Charlie N3CXO made several unsuccessful attempts to obtain the ASCII codes from Yaesu about a month or so after the new version of the FT-727 came out. Engineering Consultants in Brea, California, produced the first software/hardware package to interface the '727R with a computer (Commodore 64) only last June. According to Bob N16R this lag occurred because they had to "reverse-engineer" the 727R. They received

only scanty programming data from Yaesu. This package will soon be available from Engineering Consultants for the IBM PC, and another package will soon be available from Applied Solutions in Garden Grove, California. Now programming data is also available from Yaesu.

The '727R is very easily modified for out-of-band operation. There

is a switch on the rig that clears the CPU, and it can be reprogrammed by a 6-digit initialization code entered on the keypad. There is a code that isn't listed in the operation manual which expands the coverage of the rig to 100-199 MHz and 400-499 MHz. The FT-727R has not been type-accepted by the FCC for this operation.

#### Conclusions

This is by no means an exhaustive review. I can't comment on the rig's tone squelch operation (subaudible tone encoding/decoding), which functions only with the FTS-6 option board, and, of course, the CAT needs a full review.

The rig is well isolated. Last week I took a walk deep into the woods to gaze at our beautiful fall foliage and to find a relatively RF-free spot, and in scanning both bands, the squelch opened only twice—for activity on two local repeaters. This is also an ideal rig for those with 2m repeaters that have a remote control input on 440 MHz.

The FT-727R's main shortcomings are the programmed scan and slow scan rate, compromise rubber duck on 440 MHz, and Yaesu's weak support for the CAT feature. The rig is a bit pricey at \$520, but I found it state-of-the-art and completely reliable in my several months of operation.

#### The Complete 2m/70cm Mobile Station

By now, you may have thought it would be great to convert the FT-727R into a mobile station, but where in the world am I going to find a dual-band power booster and outboard antenna? These units are already on the market! Be on the lookout for my next review which will feature the World Systems Engineering WP-727DX Power Booster and Rad-Com's new DDDR antenna, the CR2/4A "Utenna".

My thanks to Charlie N3CXO, Bob N16R of Engineering Consultants, and Michael Henderson N6JFD of Yaesu USA, for sharing their experiences with the 727R with me. <sup>73</sup>

#### FT-727R TECHNICAL DATA

	2-m	70-cm
Standard Frequency Coverage	144-148 MHz	440-450 MHz
Power Output	4.5 W(HI) 0.5 W(LO)	3 W(HI) .3 W(LO)
Squelch Law	.18 $\mu$ V	.17 $\mu$ V
Sensitivity		
(10-dB quieting)	.25 $\mu$ V	.25 $\mu$ V
(20-dB quieting)	.45 $\mu$ V	.4 $\mu$ V
Selectivity	$\pm$ 15 kHz ( $<$ 20 dB)	$\pm$ 12 kHz ( $<$ 30 dB)



# FT-209 Modifications

## Jump to New VHF Frequencies.

**D**on't you wish your Yaesu FT-209R/RH or 709R would go above 150 or 450 MHz like ICOM's HTs do? I did, so I called the Yaesu service center to find out how to go about doing this. The technician I spoke with told me this was "secret" information, but allowed that their equivalent commercial units have the same microprocessors as the FT-209 and FT-709 HTs.

That's all I needed to know. I opened my radio, heated the soldering iron, and proceeded to jump pins in the control unit until I found the correct configuration. [Ed. note, this is *not* a recommended procedure!] The following are the results.

### The Mods

The modifications are:

- Extended frequency coverage
- Enhanced power saver
- Improved scan feature
- Increased receiver sensitivity.

The extended frequency modification allows you to program the lowest and the highest receive and transmit frequencies. The enhanced power saver allows receive times 0.4 to 4.0 seconds, in 400 millisecond steps. The new scanner stops on a signal and waits for the conversation to conclude, and then restarts scanning after two seconds. Finally, a quick tune-up of the RF amplifier increases receiver sensitivity.

### Doing the Work

To open the radio, first remove the battery pack and turn the radio on and off once to discharge the circuitry. Next, remove the the four screws holding the battery track and pry it out. Remove the two screws holding the belt clip and the one beneath it. Also, remove the two screws holding the carrying strap to the radio.

Now, slide a flat jeweller's screwdriver in from the bottom, between the black side trim and the radio, until it stops. Twist the screwdriver, and the trim should pop off. Now remove the two side screws and slide the U-shaped back cover off. At this point, be careful not to damage the electronics. Now, remove the four tiny Phillips-head screws holding the front panel into place, then fold the panel to the right (in the 709R, you have to desolder a ground jumper on the left-hand side.)

### The Jumpers

Take the following steps to extend the frequency coverage on the 209R/RH:

1. Jump (solder across) pins 1, 7, 9, 10, 11,

### Public Service Scanning with Ten Tec HT

by Fred Lehman WD8MGO

The Ten Tec 2-meter HT can scan 149-158.995 MHz with just a few keystrokes. Follow these simple steps.

1. F V 0.000
2. F ^ 8.995
3. F 0 STEP 15 kHz (or your choice)
4. F M S P S

The handheld will scan upward from 150 MHz. To tune between 149.000 and 149.995 MHz, follow step 1 above then V LWR. This portion of the band must be tuned manually using the LWR key. Happy listening!

13, and 16. Leave the pre-soldered pins alone.

2. To extend the power-saver, jump pin 12.
3. Remount the front panel with the four small Phillips-head screws.

4. Standard VCO range is 136-153 MHz. To move the VCO span up, turn TO1 (on the control board) clockwise (inward) one to two turns, one turn at a time. TO1 is located in the 1" x 3/4" shielded enclosure. This is the left hole when the unit is face-down and bottom toward you.

I adjusted the VCO to span 142-157 MHz to prevent lostpower and sensitivity in the ham bands. You may have to remount the battery track, reset, and program the unit for 150-160 MHz, and move TO1 until RF output is indicated on *no higher* than 156.5 MHz.

5. To get improved sensitivity, remove the front cover, dial 146 MHz, and, with a generated signal, tune TO2, TO3, and TO4 for maximum signal. These are the three consecutive cans from the antenna jack on the receiver board (under the speaker). I found mine to be each 1/2 to 1 turn off. Also, adjust TO5, the fifth can from the antenna, for maximum signal.

Follow the steps below extend the frequency coverage for the 709R:

1. Same as for the 209R/RH, plus jump pin 4.
2. The power-saver modification can't be done here unless pin 12 is present.
3. Same as for the 209R/RH.
4. Same, but the VCO range 430-455 MHz.

If TO1 is adjusted inward about two turns, the range shifts to up to 439.5-465 MHz.

5. Not necessary for the 709R.
6. Resolder the ground jumper between the control board and ground.

This completes the modification section. Reassemble the unit.

### The Programming

When you finish the modifications and reassemble the unit, reset it once more. The programming:

1. In the first memory, enter the lowest receive frequency and dial, and in the second memory, enter the highest receive frequency and dial.

2. In the third memory, enter the lowest possible transmit frequency and dial, and in the fourth memory, enter the highestset possible transmit frequency and dial.

3. Enter repeater shift F, and SHIFT

Here is a sample program for the FT-209R/RH:

```
reset  
1451D  
1570D  
1440D  
1480D  
0600shift
```

This memorizes a receiver range of 145.1-157 MHz, + a transmit range of 144-148 MHz, and a 600-kHz repeater shift.


A sample program for the 709R:

```
reset  
4420D  
4650D  
4400D  
4500D  
5000Fshift
```

This memorizes a receiver range of 442-465 MHz, a transmit range of 440-449.975 MHz, and a 5-kHz repeater shift.

### The Performance

There is a loss of sensitivity in the lower 2 MHz of the band on the FT-209R/RH model, but, if the VCO is tuned as above, the ham bands aren't affected. There's no perceptible loss of power or sensitivity on the FT-709R.

In conclusion, go ahead and jump—and make your 209R/RH and 709 better than before! 

Andrew Mill is a high school senior whose hobbies include current HT modification.



WE SHIP WORLDWIDE

# Barry Electronics Corp.

WORLD WIDE AMATEUR RADIO SINCE 1950

Your one source for all Radio Equipment!

For the best buys in town call:  
**212-925-7000**  
Los Precios Mas Bajos en  
Nueva York...

KITTY SAYS: WE ARE NOW OPEN 7 DAYS A WEEK.  
**Saturday & Sunday 10 to 5 P.M.**

Monday-Friday 9 to 6:30 PM Thurs. to 8 PM  
Come to Barry's for the best buys in town.



**ICOM**

IC-R71A, 751A, 745, 28A/H, 38A, 48A, Micro2/4,  
R-7000, IC-761, IC-375A, 275A/H, 3200A,  
475A/H, 735, IC-900



Santa Kitty says,  
"Seasons Greetings to All"

## KENWOOD



TS440S/AT, R-5000, R-2000, TS-940 S/AT,  
TM 221A/421A, TM-2570A/50A/30A, TR-751A,  
Kewood Service /Repair, TH 21/31/41 BT,  
TS-711/811A, TM3530A, TH205AT, TH215A,  
TW-4100A, TM-321A

**Budwig ANT. Products**  
NEL-TECH DVK-100 Digital Voice Keyer  
**FLUKE 77 Multimeter**

Media Mentors—  
Amateur Radio Course: \$99.95

VoCom/Mirage/Alinco  
Tokyo Hy-Power/TE SYSTEMS  
**Amplifiers &**  
5/8 λ HT Gain  
Antennas IN STOCK



**Soldering Station,**

48 Watts, \$68

MICROLOG-ART 1, Air Disk,  
SWL, Morse Coach

## KANTRONICS

UTU, KAM, UTU-XT,  
KPC 2400, KPC IV

AEA 144 MHz  
AEA 220 MHz  
AEA 440 MHz  
ANTENNAS



EIMAC  
3-500Z  
572B, 6JS6C  
12BY7A &  
6146B

BIRD  
Wattmeters &  
Elements  
In Stock



ONV Safety  
belts-in stock

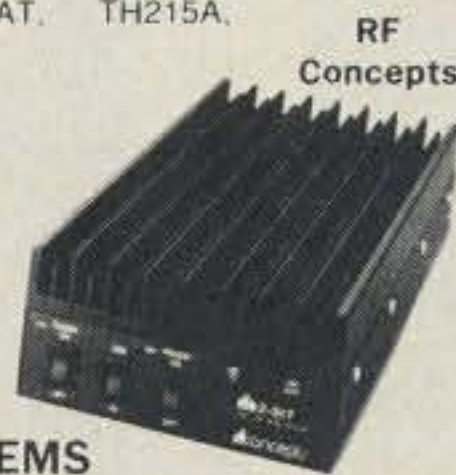
**YAESU**

FT-767GX, FT-757GXII,  
FRG-8800, FT-736, FRG-9600,  
FT-211/711RH, FT-2700RH

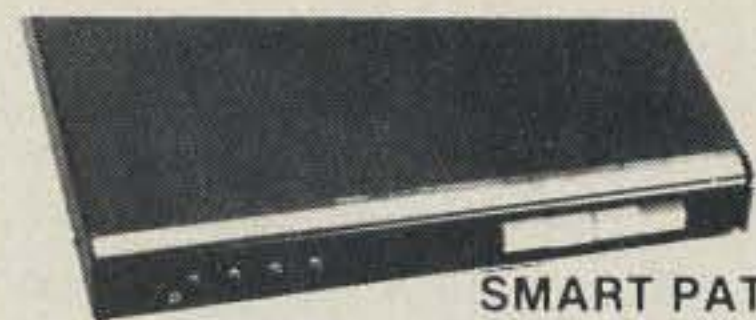
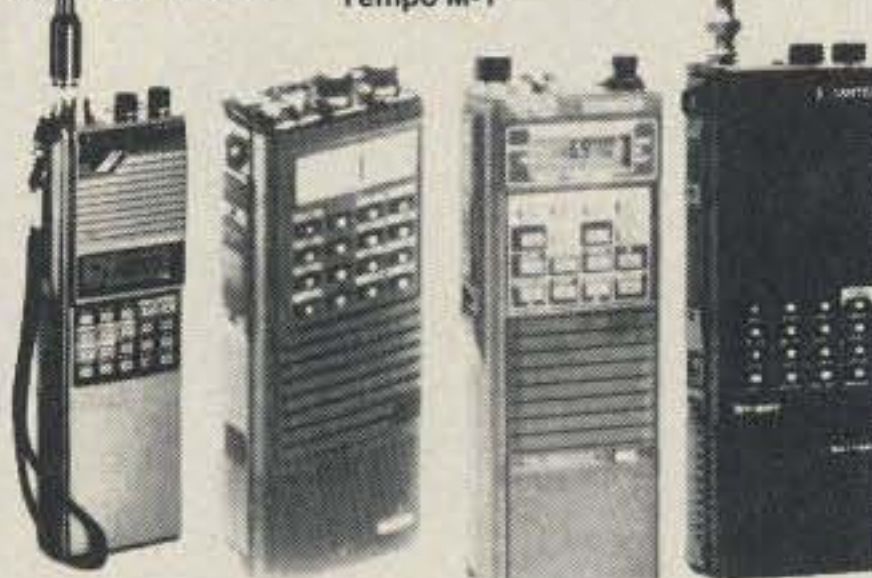
YAESU  
FT-23/73/727R  
FT-2/1/709R/H  
FT-1903/1123  
FTH-2005/7005

ICOM  
IC2AT/12AT  
ICO2AT  
IC-03/04AT  
IC-A2/U16

Land-Mobile H/T  
Midland/Standard  
Wilson Maxon  
Yaesu FTC 1123, FTC 1143  
ICOM IC-M5 (Marine) M700  
Tempo M-1

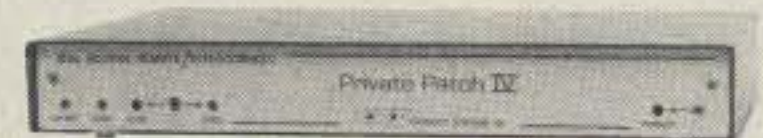


RF  
Concepts

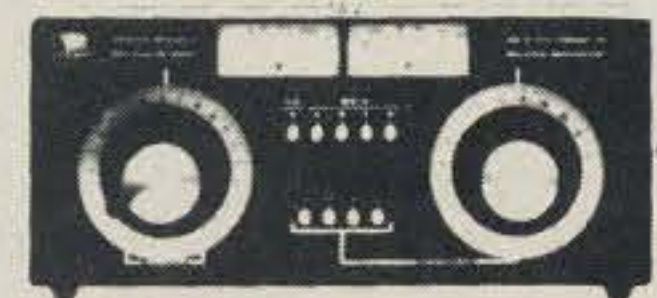


**SMART PATCH**

CES-Simplex Autopatch 510-SA Will Patch FM  
Transceiver To Your Telephone Great For  
Telephone Calls From Mobile To Base. Simple  
To Use.



**PRIVATE PATCH IV, Duplex 8000**



**NYE MBV-A 3 Kilowatt Tuner**

## AMERITRON AMPLIFIER AUTHORIZED DEALER

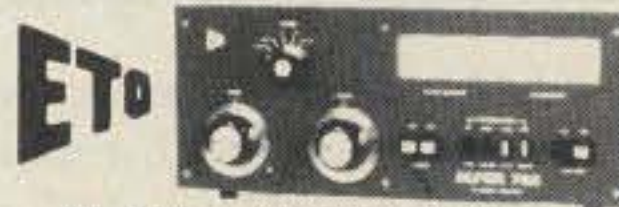


Yaesu FTR-2410, Wilson  
ICOM IC-RP 3010 (440 MHz)  
ICOM IC-RP 1210 (1.2 GHz)

SANTEC  
ST-222/UP  
ST-20T  
ST-442/UP  
HT-7



**MFJ-989B**



**ALPHA AMPLIFIERS**



Ten-Tec  
Tuner 229B

## Complete Butternut Antenna Inventory In Stock!

DIGITAL FREQUENCY COUNTERS

Trionyx, Model TR-1000, 0-600 MHz

## AMP SUPPLY STOCKED

Long-range Wireless  
Telephone for export in stock

**BENCHER PADDLES,  
BALUNS, LOW PASS FILTERS  
IN STOCK**

MIRAGE AMPLIFIERS  
ASTRON POWER SUPPLIES  
Saxton Wire & Cable, Int'l Wire



**SANGEAN Portable Shortwave Radios**

**HEIL  
EQUIPMENT  
IN STOCK**



Tri-Ex Towers  
Hy-Gain Towers  
& Antennas, and  
Rotors will be  
shipped direct to  
you FREE of  
shipping cost.

New TEN-TEC

Corsair II, PARAGON, Century 22, Argosy II

MAIL ALL ORDERS TO: BARRY ELECTRONICS CORP., 512 BROADWAY, NEW YORK CITY, NY 10012 (FOUR BLOCKS NORTH OF CANAL ST.)

## New York City's LARGEST STOCKING HAM DEALER COMPLETE REPAIR LAB ON PREMISES

### "Aqui Se Habla Espanol"

BARRY INTERNATIONAL TELEX 12-7670  
MERCHANDISE TAKEN ON CONSIGNMENT  
FOR TOP PRICES

Monday-Friday 9 A.M. to 6:30 P.M. Thursday to 8 P.M.  
Saturday & Sunday 10 A.M. to 5 P.M. (Free Parking)

AUTHORIZED DIST. MCKAY DYMEK FOR  
SHORTWAVE ANTENNAS & RECEIVERS.

IRT/LEX "Spring St. Station"

Subways: BMT "Prince St. Station"

IND "F" Train-Bwy. Station"

Bus: Broadway #6 to Spring St.

Path—9th St./6th Ave. Station.

Commercial Equipment  
Stocked: ICOM, MAXON,  
Midland, Standard, Wil-  
son, Yaesu. We serve  
municipalities, busi-  
nesses, Civil Defense,  
etc. Portables, mobiles,  
bases, repeaters...

We Stock: AEA, ARRL, Alpha, Ameco, Antenna Specialists, Astatic, Astron,  
B & K, B & W, Bencher, Bird, Butternut, CDE, CES, Collins, Communications  
Spec. Connectors, Covercraft, Cushcraft, Daiwa, Dentron, Digimax, Drake,  
ETO (Alpha), Eimac, Encomm, HeilSound, Henry, Hustler (Newtronics), Hy-  
Gain, Icom, KLM, Kantronics, Larsen, MCM (Daiwa), MFJ, J.W. Miller, Mini-  
Products, Mirage, Newtronics, Nye Viking, Palomar, RF Products, Radio  
Amateur Callbook, Rockwell Collins, Saxton, Shure, Telex, Tempo, Ten-Tec,  
Tokyo Hi Power, Trionyx TUBES, W2AU, Waber, Wilson, Yaesu Ham and  
Commercial Radios, Vocom, Vibroplex, Curtis, Tri-Ex, Wacom Duplexers,  
Repeaters, Phelps Dodge, Fanon Intercoms, Scanners, Crystals, Radio  
Publications.

WE NOW STOCK COMMERCIAL COMMUNICATIONS SYSTEMS

HAM DEALER INQUIRES INVITED PHONE IN YOUR ORDER & BE REIMBURSED

**COMMERCIAL RADIOS stocked & serviced on premises.**

Amateur Radio Courses Given On Our Premises, Call

Export Orders Shipped Immediately. **TELEX 12-7670**

ALL  
SALES  
FINAL



# Hand-held Wish List

Number 17 on your Feedback card

edited by Larry Ledlow N5SE



## A Condensed Buyer's Guide to HTs

The lives of hams shopping for a hand-held transceiver used to be simple. They only had to keep a few models and specifications in their head. For a while they could almost make the choice by tossing a coin. No longer! Now hams have a daunting selection of HTs, and even those folks dedicated to a single manufacturer must choose between two or three models for the same band. To ease the burden a bit, we have distilled a bevy of manufacturers' brochures into a reasonably complete list of hand-held transceivers available in the US marketplace.

### About the Chart

Frequency coverage of modern synthesized rigs is generally very broad. Those units with microprocessor controls are extremely versatile and often cover MARS, CAP, or public service frequencies without modification. Many HTs receive or transceive well outside their published frequency limits, although some degradation in performance is possible. Note that it is *illegal* to transmit on a non-amateur service frequency using a rig without an FCC type-acceptance certificate, even if you have a license for that service! Some manufacturers do not publish frequency coverage specifications outside the ham bands.

Some companies brag about how much power their HTs produce and then sock the

buyer with a surprise. More often than not, high power specifications require either an optional external DC power supply or a heavy duty battery pack. Don't forget the heavy duty charger for the battery pack, too. The combination can run well over \$100 extra for high power options. Also, high power

---

***"More often than not, high power specifications require either an optional external DC power supply or a heavy duty battery pack."***

---

HTs tend to get very hot during long transmissions, because the rear panel of the units serve as heat sinks for the power amplifier. It is not always pleasant or possible to hold a 5-watt HT for a long time.

Frequency entry or tuning is carried out manually (M) by stepping through the band or by direct keyboard entry (K). Naturally, for a fast change of frequency keyboard entry

is the best choice. The higher-priced units universally offer this feature. Do not discount thumb wheels for fast QSY, though. You can normally make large frequency changes much faster with thumb wheels than with a manual toggle or electronic stepping.

Not so long ago liquid crystal displays (LCD) had a bad reputation. They were sensitive to shock and therefore unsuitable for the average HT operating environment. On modern transceivers, LCDs are sturdy and feature a lot of advantages over thumb wheel (TH) displays. LCDs often combine frequency display, S- and power output meter functions, memory selection, and other information. LCDs are also easily backlit for night viewing. Alinco offers a thumb wheel light, however, on its mini HTs.

Memories are always nice to have. If you have a lot of favorite frequencies to scan, then you probably want all the memory you can get. Almost all of the HTs with memories will store offset information with the frequency, but some will even store CTCSS tone information, too. Although we have not included all of the memory details here, they bear some consideration. On the other hand, if you're happy with that memory cell between your ears, you don't need a rig to help you along.

Automatic scanning saves a lot of work when looking for an active or clear channel.





Some rigs offer scanning only over the entire band (B), and others allow the user to program the limits of the search (P). Memory

scanning (M) implies the rig can scan each memory consecutively. Some units allow the user to lock out selected channels. Still others allow the operator to select a scan stop strategy; e.g., stop on a busy or empty channel. We have not indicated these features on the chart. Priority scanning (Y) periodically and briefly searches a selected frequency for activity before returning to the main operating frequency. Manufacturers implement this feature in different ways, but the theory of operation is the same. It is a nice feature if you find yourself torn between two frequencies.

Standard repeater offsets in the United States are 600 kHz on two meters, 1.6 MHz on 220 MHz, and 5 MHz on 440 MHz. There are a few repeater operators who like to be different and use nonstandard offsets. With a fixed offset in your HT, you can forget about trying to be different. Some high-end handies allow programmable offsets, but this is far from an essential feature.

Various tone sets are available on HTs these days. DTMF (D) tone pairs allow access to autopatch facilities (if you know the access code) to make telephone calls. Some repeaters have interesting auxiliary functions that are controlled with DTMF tones. Time of day, temperature, repeater system status, and other data can come through your handy with a sophisticated repeater or base unit. CTCSS (C) tones are also called sub-audible tones, and they come in 37 standard frequencies. Some repeaters require a CTCSS tone to activate. Again, some repeater operators like to be different. This also helps cut down QRM. CTCSS tone selection is usually made with a DIP switch, though a few

rigs offer CTCSS selection from the keyboard. We have not differentiated these methods in the chart.

The tone squelch feature (S) found on many rigs today is handy for those HT owners who like to be different. Tone squelch operation requires CTCSS decoding. In other words, the rig will not receive signals without the proper CTCSS tone encoded on them. Do not confuse this feature with a digital squelch function, which requires a series of DTMF tones to alert the radio's owner that someone wants to talk to him.

Most hand-held transceivers have BNC antenna connectors. This is virtually an industry standard. Kenwood and Alinco use "Thread-lock" (THL) connectors on their pocket-sized HTs. The thread-lock connector looks a bit like an RCA phono jack with threads. Note the nonstandard TNC antenna connector on the IC-12AT, too. Use of nonstandard antenna connectors makes attachment of other antennas or external amplifiers difficult at best.

We have listed the manufacturer's suggested retail price. If you pay the full amount, you probably won't be able to afford your subscription renewal to 73. We like to think our readers are frugal and sensible. Check dealers for deep discounts and closeout specials. A little telephone shopping can save a lot of money. Consider the savings in sales tax when buying through out-of-state mail order. UPS or priority mail shipping costs on these little rigs are unlikely to match sales tax in some states. And make sure you tell the dealer you saw the information in 73! **73**

Brand	Model	Frequency (MHz)	Power Out	Freq. Entry	Display	Mem.	Scan	Offset	Tones	Ant.	Price	Comments
AEA	DX Handy	28.0-29.0 <sup>1</sup>	2W	M (VXO)	Analog	0	No	NA	No	BNC	\$319.95	SSB/CW
Alinco	ALX-2T	140-149.995	2W	M	TH	1	Y	Fixed	D,C	THL	\$250	Mini HT
Alinco	ALX-4T	440-450	1W	M	TH	1	Y	Fixed	D,C	THL	\$TBA	Mini HT
Alinco	ALM-203T	144-147.995	5W <sup>3</sup>	M,K	LCD	10	M,P	Prog.	D,C	BNC	\$328	Rx 150-160 MHz
ICOM	IC-u2AT	140-149.995	1.5/3W <sup>3</sup>	M	LCD	10	M,B	Prog.	D,C	BNC	\$329.00	Rx 140-169.995 Mini HT
ICOM	IC-2AT	144-147.995	1.5/2.5W <sup>3</sup>	M	TH	0	No	Fixed	D	BNC	\$299.00	
ICOM	IC-02AT	140-151.995	3/5W <sup>3</sup>	M,K	LCD	10	M,P,Y	Prog.	D,C	BNC	\$365.00	
ICOM	IC-3AT	220-224.990	1.5/2.5W <sup>3</sup>	M	TH	0	No	Fixed	D	BNC	\$339.00	
ICOM	IC-03AT	220-224.995	3/5W <sup>3</sup>	M,K	LCD	10	M,P,Y	Prog.	D,C	BNC	\$449.00	
ICOM	IC-u4AT	440-450	1.5/3W <sup>3</sup>	M	LCD	10	M,B	Prog.	D,C	BNC	\$369.00	Mini HT
ICOM	IC-4AT	440-449.995	1.5/2.5W <sup>3</sup>	M	TH	0	No	Fixed	D	BNC	\$339.00	
ICOM	IC-04AT	440-449.995	3/5W <sup>3</sup>	M,K	LCD	10	M,P,Y	Prog.	D,C	BNC	\$449.00	
ICOM	IC-12AT	1260-1299.99	1W	M,K	LCD	10	M,P,Y	Prog.	D,C	TNC	\$459.00	
Kenwood	TH21BT	141-150.995	1W	M	TH	0	No	Fixed	D,C <sup>2</sup>	THL	\$259.95	Mini HT
Kenwood	TH31BT	220-225	1W	M	TH	0	No	Fixed	D,C <sup>2</sup>	THL	\$269.95	Mini HT
Kenwood	TH71BT	440-450	1W	M	TH	0	No	Fixed	D,C <sup>2</sup>	THL	\$269.95	Mini HT
Kenwood	TH205AT	142-148.995	2.5/5W <sup>3</sup>	M	LCD	3	B	Fixed	D,C <sup>2</sup> ,S <sup>2</sup>	BNC	\$259.95	Rx 141-163 MHz
Kenwood	TH405AT	440-449.995	2/5W <sup>3</sup>	M	LCD	3	B	Fixed	D,C <sup>2</sup> ,S <sup>2</sup>	BNC	\$269.95	
Kenwood	TH215A	141-151	2.5/5W <sup>3</sup>	M,K	LCD	10	M,P,Y	Prog.	D,C,S <sup>2</sup>	BNC	\$349.95	Rx 141-163 MHz
Kenwood	TH415A	141-151	2.5/5W <sup>3</sup>	M,K	LCD	10	M,P,Y	Prog.	D,C,S <sup>2</sup>	BNC	\$359.95	Rx 141-163 MHz
Santec	ST-20T	142-150.995	3/5W <sup>3</sup>	M,K	LCD	10	M,P,Y	Prog.	D,C	BNC	\$369.95	
Yaesu	FT209R/RH	144-147.995	2.5/5W	M,K	LCD	10	M,P,Y	Fixed	D,C,S <sup>2</sup>	BNC	\$359.00	RH price given
Yaesu	FT109RH	220-224.995	5W	M,K	LCD	10	M,P,Y	Fixed	D,C,S <sup>2</sup>	BNC	\$379.95	
Yaesu	FT709R	440-449.957	4.5W	M,K	LCD	10	M,P,Y	Fixed	D,C,S <sup>2</sup>	BNC	\$359.95	
Yaesu	FT23R	144-148	2/5W <sup>3</sup>	M	LCD	10	B,Y	Fixed	D <sup>2</sup> ,C <sup>2</sup> ,S <sup>2</sup>	BNC	\$269.95	Mini HT
Yaesu	FT73R	440-450	2/5W <sup>3</sup>	M	LCD	10	B,Y	Fixed	D <sup>2</sup> ,C <sup>2</sup> ,S <sup>2</sup>	BNC	\$279.95	Mini HT
Yaesu	FT727R	144-148/440-450	5W	M,K,Y	LCD	10	M,P	Prog.	D,C <sup>2</sup> ,S <sup>2</sup>	BNC	\$499.95	CAT System input

Note 1: AEA's DX Handy covers any two 50 kHz segments of the 10-meter band. Requires crystals.

Note 2: Available as an option.

Note 3: Higher power output with an optional battery pack or DC power supply.



# A History of Hand-Held Communications: Their Place In Western Civilization



*A partial transcript of a pseudo-scientific study of man's never-ending quest for hand-held personal communications, presented by the alleged Dr. Fosman at a recent meeting of S.C.A.M. in Paris.*

Numerous experts and scholars agree that one of man's instinctive needs is communication with other members of his species. This fundamental need is grouped with other essentials such as thirst, hunger, sex and home video. Indeed, research in this area has revealed that even the higher primates have demonstrated an amazing capacity to grasp the concepts of speaker microphones and flex antennas.

## The Beginnings

Cave drawings from the Stone Age have revealed, upon closer inspection, a central figure coordinating the group hunt of a Mastodon with a ram's horn strapped to his left wrist. Other scholars have uncovered similar drawings in Asia Minor. One group from a leading East Coast university claims to have found evidence of the world's first repeater. The drawing in question depicts members of the hunt some distance from the leader with ram's horns attached to one ear apparently repeating instructions through their wrist units.

Studies of the so-called "Golden Age" period in the fertile crescent point to an interesting development. The growth of metropolises

such as Baghdad and Babylon are coupled to the simultaneous rise in the use of personal horn units, each with individualized low-level resonance, or "sub-tone" characteristics. The latter was determined by the shape of the horn and the length of time it lay bleached in the sun. There has been conjecture that the legend of the Tower of Babylon may have arisen because ground stations were all creating different "sub-tones" and the repeater attendants atop the tower couldn't understand the hundreds of messages bombarding their receiving horns.

---

***"Evidence exists  
of experiments via  
tropospheric scattering  
using horn blasts  
across the Nile."***

---

The Egyptians were believed to be the first in developing the principal of a reflector with gain characteristics to aid in carrying messages over longer paths than previously attained. Indeed, the pyramidal design of these massive structures lends itself very well to this function, and evidence exists of experi-

ments via tropospheric scatter using horn blasts across the Nile. These often occurred before intense thunderstorm activity, and may have been crude attempts at using a repeater system to warn of impending severe weather.

## Further Advancements

The Romans carried the Egyptian research a step further by siting their repeaters along the extensive aqueduct system crisscrossing Gaul. They discovered that very large horns placed strategically along these routes could capture weaker signals using the reflective characteristics of the walls of the duct, allowing more distant spacing of the manned repeaters. This effect was later called "aqueducting", and many references are made of the phenomenon in writings of that period. The Romans are also credited with using bronze and copper horns to replace the more fragile ram's horn.

Memory storage came into being with the introduction of mynabirds into Europe by African traders. A typical repeater with memory storage might employ up to 10 horns placed along the focus of several aqueducts. Each horn would employ a mynabird in a cage placed at the focus of the horn. With suitable prompts, the attendant would be able to record messages sent from distant ground units of up to 5 words. By placing the apparatus on a revolving platform, the attendant could scan the various messages as needed.



Or, by placing a cloth over any particular mynabird's cage, he could lock out any undesired channels by causing the bird to go to sleep.

During the epoch of the Holy Roman Empire, alchemists of the period developed a technique by which mynabirds and parrots could be trained to repeat their messages into an adjacent horn for automatic retransmission. When no further transmissions were needed or desirable, two intertwined strands of rope could be pulled from below to release covers over each cage. History thus credits them with inventing the fully automatic unmanned repeater station with "twisted pair" control. Further development came when the Saxons employed the turntable concept of the Romans to further speed up the process.

### Hand-Held Advancements

Developments in hand-held horns were keeping pace. As stated earlier, the fragile ram's horn had been replaced by units weighing a few ounces which were made from copper or bronze. These latter types were preferred by Hannibal's army when he invaded the Alps, due to more stable dimensional qualities in colder temperatures. Copper models came equipped with more than one horn to allow multi-channel operation. Some deluxe models were made for members of the ruling classes and high officials of the Roman Catholic Church by expert goldsmiths and metalworkers. These luxury models incorporated a tiny sundial to tell time, and up to four discrete horns.

At this time, contacts made with Asian civilizations revealed that they were also working on advanced hand-held horn units, cast entirely from ceramic to withstand high temperatures and the effects of salt air. These units found immediate favor with Portuguese and Italian traders, replacing the corrosion-prone copper and bronze models used on ships. Another development came when larger horns with more gain were installed alongside the major piers and docks of European seaports for ships in port using conventional small horns with limited range. The user would place the opening of his small horn near the focus of the larger fixed horn, resulting in a louder signal. These "docking boosters", as they became known, revolutionized sea travel.

During the Middle Ages, the popularity of these hand-held units became immense, and it followed that a profusion of repeaters sprang up in major metropolitan areas. In many cases, the outputs of these repeaters were so close to each other that users experienced considerable interference. Attempts by the repeater attendants to increase the horn size and thus the power of the signal proved fruitless, and resulted in interference to other nearby repeaters. Regional leaders agreed to meet on a voluntary basis at a site near present-day Paris to annually discuss the location and operation of their repeaters, thus originating "repeater councils". Penalties for violators were stiff, including execution and exile.

Experiments were being conducted by the leading scientists of the time to improve mes-

sage storage and capacity. One of these was Da Vinci, who experimented with various forms of parrots as opposed to mynabirds. He claimed that East African parrots offered over 256K of storage as opposed to the 128K found in the common mynabird. Opponents argued that the parrot would prove more temperamental and less reliable in automatic repeater service. Other experiments involved the use of mockingbirds for night-time transmissions. Hand-held designs continued, with a wide variety of models offered for sale. One of the more popular units employed a clever scheme, mounting a smaller horn coaxially inside a larger unit.

This allowed simultaneous transmissions on two different channels, giving rise to "full duplex" operation. However, existing repeaters could only handle one message at a time, so use was limited to loosely organized clusters of fishermen who passed weather information among themselves while in port.

These groups, known as "fishermen's nets", proved an efficient means to conduct discussions among two or more users.

---

### *"The Court of Louis XIV favored an elaborate model manufactured in Italy."*

---

As in most societies, secrecy of communications was of paramount importance both in times of war and in everyday transmissions between government agencies. It is not known who actually discovered the technique, but writings recovered from Greece, Malta and Carthage show a scheme employing the honeycomb of bees inserted in horns to purposely distort the audio for all but a similarly-equipped horn. The effect to the average listener would sound like a distorted "buzz". However, this "cellular" technique was never perfected and fell out of favor.

Attempts were made to ensure secrecy by attaching sections of pipe between adjacent buildings so that users could talk in confidence. This technique became known as "private line" and continued for many years, and indeed was the standard method for communications between adjacent villas in the Vatican. However, long range security remained a problem, as the only reliable method in use involved "carrier" pigeons, which could easily be downed in flight and any messages read. Some innovative attendants evolved a scheme wherein the parrots used in a repeater could be released in flight to travel to another distant repeater site. In this way, they could retransmit their stored messages over greater distances. Again, a sharpshooter could down the flying bird and "capture the repeater", precluding its use by others.

### Time Marches On

Repeaters aided in navigation. On Colum-


bus' initial voyage, his lookout climbed to the crow's nest and, using a small, lightweight ceramic hand-held horn from Japan (which was popular at that time) made contact with the repeater on San Salvador Island in the Bahamas Chain, leading to his now-famous discovery of America. John Cabot explored and mapped the northern coast of the continent by using a large co-linear array of multiple horns to produce echos. Henry Hudson introduced repeaters and bronze hand-held horns to Native Americans. He is credited with installing the first repeater sites in New York City.

Hand-held units continued their evolution. The Court of Louis XIV favored an elaborate model manufactured in Italy, which incorporated two sundials, 6 horns, and numerous tiny bells which served no apparent function except as a decoration. To get the attention of a repeater attendant several miles distant, a whistle was attached to be used prior to each series of transmissions, thus originating the term "whistle-up the repeater". This is also the first documented appearance of "bells and whistles" on hand-held units.

Ornate hand-held units also found their way to the colonies of America, and many of these were pressed into service during the Revolutionary War. Ben Franklin, who was fond of tinkering with gadgets, developed a system of linking several horns and birds together at a repeater location to allow multiple channel operation simultaneously.

This solved a technological puzzle that had existed since the Middle Ages when multi-channel horns became popular. Using a system of elastic bands to suspend a homemade acoustic chamber resembling a cross, Franklin then focussed four repeater horns so that the received audio could cross-over through the center port and go out any of the others, depending on which ports were closed or open. This technique, which Franklin named "cross-band linking", was an overnight sensation.

One common problem with all horn repeaters was their susceptibility to vandalism. Young boys bent on a prank would often stuff the horns with any number of objects. Some even dumped pots of homemade berry preserves into the ports (much to the delight of the birds). This action was the source of the expression "jamming the repeater". Fortunately, they usually ate some of the jam themselves and were quite sloppy about it. The telltale stains gave them away, so finding these jammers was simply a matter of being observant.

NOTE: Reprints of the unabridged transcript of Dr. Fosman's presentation are available from WIFF (The World Is Flat Foundation). 

---

*Professor Fosman's professional interests include psycho-historical studies of ancient cults and their followers. His latest monograph, The ARRL 1932-35: The Golden Years, will appear at booksellers in the spring.*



# FUN!

## Ham Radio's Lighter Side

John Edwards KI2U  
P.O. Box 956  
Mt. Laurel NJ 08054

### FUN POLL: HOW HAMS VIEW THEMSELVES

OSCAR 1, the Benton Harbor Lunch Box, The Dayton Hamvention, W1AW—all ham radio legends. And now you can add the FUN! Poll to that august list.

Look at it this way, you do anything long enough and it becomes a legend. Since this is the seventh FUN! Poll, I say it's long enough and declare this venture a legend.

The questions are below. Answer them and help me track the trends in this hobby. Send your responses to the address at the top of this column. If you have a modem-equipped computer, you can also respond via CompuServe (70007,412), The Source (CPA117) or MCI Mail (JEDWARDS).

Have fun. After all, how often do you get to participate in something legendary? **73**

#### Element 1—Background

- 1) Sex:
  - A) Male
  - B) Female
- 2) Age:
  - A) 15 or below
  - B) 16-21
  - C) 22-39
  - D) 40-59
  - E) 60 or above
- 3) License class:
  - A) Novice
  - B) Technician
  - C) General
  - D) Advanced
  - E) Extra
- 4) Number of years licensed:
  - A) 1 year or less
  - B) 1-5 years
  - C) 6-10 years
  - D) 11-20 years
  - E) 21 years and up
- 5) Do you have a new (post-March '78) call?
  - A) Yes
  - B) No
- 6) How many hours a week do you devote to amateur radio?
  - A) 0-1 hours
  - B) 2-5 hours
  - C) 6-10 hours
  - D) 11-20 hours
  - E) 21 hours or more
- 7) Which HF band do you use most?
  - A) 80/75 meters
  - B) 40 meters
  - C) 20 meters
  - D) 15 and/or 10 meters
  - E) Don't operate HF
- 8) Which VHF/UHF band do you use most?
  - A) 6 meters
  - B) 2 meters
  - C) 220 MHz
  - D) Higher frequencies
  - E) Don't operate VHF/UHF
- 9) Which mode do you use most?
  - A) SSB
  - B) CW
  - C) FM

- D) RTTY
- E) Other

- 10) How much money have you spent on amateur radio within the past year? (Include QSL expenses, magazine subscriptions, and club and other incidental expenses.)
  - A) \$0-\$250
  - B) \$251-\$500
  - C) \$501-\$1,000
  - D) \$1,001-\$2,500
  - E) \$2,501 and up

#### Element 2—Social Characteristics

- 11) On the whole, hams are:
  - A) Too young
  - B) Too old
  - C) Just the right age
- 12) Do you like rock music?
  - A) Yes
  - B) No
- 13) Politically, how would you define yourself?
  - A) Conservative
  - B) Middle-of-the-road
  - C) Liberal
- 14) Should we get rid of the ARRL?
  - A) Yes
  - B) No
- 15) How old were you when you first became a ham?
  - A) 15 or below
  - B) 16-21
  - C) 22-39
  - D) 40-59
  - E) 60 or above
- 16) Should the FCC increase the speeds on amateur CW examinations?
  - A) Yes
  - B) No
- 17) Do you own a home computer?
  - A) Yes
  - B) No
- 18) If you answered "yes" to question 17, which brand?
  - A) Apple
  - B) IBM
  - C) Radio Shack
  - D) Commodore
  - E) Other

- 19) Do you think that home computing is siphoning people (including youngsters) away from amateur radio?
  - A) Yes
  - B) No
- 20) Are hams getting dumber?
  - A) Yes
  - B) No
- 21) Do business interests deserve some of our virtually abandoned bands?
  - A) Yes
  - B) No
- 22) Should ham licenses have a minimum age requirement?
  - A) Yes
  - B) No
- 23) Should ham licenses have a maximum age requirement?
  - A) Yes
  - B) No
- 24) Should hams be subject to periodic retesting?
  - A) Yes
  - B) No

#### Element 3—Habits

- 25) If the users were restricted to data communication only (no phone or CW operation), would you be in favor of a no code 220-MHz Digital-class license?
  - A) Yes
  - B) No
- 26) Would you be in favor of such a no-code 220 MHz Digital class ticket if it permitted phone operation in addition to data transmission?
  - A) Yes
  - B) No
- 27) Have you ever used a personal computer in connection with your amateur radio activities?
  - A) Yes
  - B) No
- 28) Is it time to completely deregulate amateur radio by having the FCC turn over all responsibility for ham operation to the amateur community?
  - A) Yes
  - B) No
- 29) What do you think of CW keyboards?
  - A) Love them
  - B) Hate them
- 30) Should we get rid of, or reduce in size, the CW bands?
  - A) Yes
  - B) No
- 31) Do you think DX nets have a place in ham radio?
  - A) Yes
  - B) No
- 32) Do you think nets in general have a place in ham radio?
  - A) Yes
  - B) No
- 33) The next time a ham operates from space, which band should he/she use?
  - A) 2 meters
  - B) 220 MHz
  - C) 450 MHz
  - D) An even higher band
  - E) Shouldn't bother to operate
- 34) If, while tuning across a band, you heard a net called "Jammers International" in progress, would you:
  - A) Jam it
  - B) Ignore it
  - C) Complain to the FCC or some other organization
  - D) Listen
  - E) Join it

- 35) If required, could you solidly copy CW at the speed at which you were licensed?
  - A) Yes
  - B) No
- 36) If required, could you pass the FCC theory test for your license class?
  - A) Yes
  - B) No
- 37) Have you ever purposely operated in an amateur sub-band you weren't licensed to use?
  - A) Yes
  - B) No
- 38) Are you fluent in any computer language(s)?
  - A) Yes
  - B) No
- 39) If you answered "yes" to question 38, which language(s)?
  - A) BASIC
  - B) Pascal
  - C) Assembler
  - D) Machine
  - E) Other
- 40) Do you feel yourself competent to write a short BASIC program?
  - A) Yes
  - B) No
- 41) Do you feel yourself competent to replace the finals in a transistor-type rig?
  - A) Yes
  - B) No
- 42) Do you solder together your own coax connectors?
  - A) Yes
  - B) No
- 43) Do you smoke while operating?
  - A) Yes
  - B) No
- 44) Do you operate a packet radio system?
  - A) Yes
  - B) No
- 45) What do you think of contesting?
  - A) Great
  - B) Good
  - C) Okay
  - D) Don't like it
  - E) Despise it
- 46) What do you think of DXing?
  - A) Great
  - B) Good
  - C) Okay
  - D) Don't like it
  - E) Despise it
- 47) What do you think of repeaters?
  - A) Great
  - B) Good
  - C) Okay
  - D) Don't like them
  - E) Despise them
- 48) What do you think of traffic handling?
  - A) Great
  - B) Good
  - C) Okay
  - D) Don't like it
  - E) Despise it
- 49) If you heard an emergency net in progress, would you immediately join in and offer your services?
  - A) Yes
  - B) No
- 50) Have you ever secretly hoped for a minor disaster to strike your community so you can demonstrate your radio skills?
  - A) Yes
  - B) No

#### Response Form

Instructions: Read each question and mark your response by circling the appropriate letter next to the number of the question.

- |                   |                   |               |                   |               |               |
|-------------------|-------------------|---------------|-------------------|---------------|---------------|
| <b>Element 1:</b> | 9) A B C D E      | 16) A B       | <b>Element 3:</b> | 33) A B C D E | 42) A B       |
| 1) A B            | 10) A B C D E     | 17) A B       | 25) A B           | 34) A B C D E | 43) A B       |
| 2) A B C D E      |                   | 18) A B C D E | 26) A B           | 35) A B       | 44) A B       |
| 3) A B C D E      | <b>Element 2:</b> | 19) A B       | 27) A B           | 36) A B       | 45) A B C D E |
| 4) A B C D E      | 11) A B C         | 20) A B       | 28) A B           | 37) A B       | 46) A B C D E |
| 5) A B            | 12) A B           | 21) A B       | 29) A B           | 38) A B       | 47) A B C D E |
| 6) A B C D E      | 13) A B C         | 22) A B       | 30) A B           | 39) A B C D E | 48) A B C D E |
| 7) A B C D E      | 14) A B           | 23) A B       | 31) A B           | 40) A B       | 49) A B       |
| 8) A B C D E      | 15) A B C D E     | 24) A B       | 32) A B           | 41) A B       | 50) A B       |



# QUIET POWER!

“ Linear here is a 230A, OM...”

When the word gets out, we expect you will be hearing this frequently. Two years in development, the 230A represents a new dimension in linear amplifier technology and operating convenience. Fully microprocessor based, the RF/power supply deck is remotely controlled via a small “microcontroller”. No noisy, large enclosures at your operating position. The 230A provides maximum legal power on all amateur bands with no time limit in any mode.

Drive frequency is continuously monitored by the processor and adjustments made to ensure maximum amplifier output at all times. As you talk, the amplifier’s tuning is constantly adjusted as required. Powerful gearhead motors drive the bandswitch, tuning, and loading capacitors.

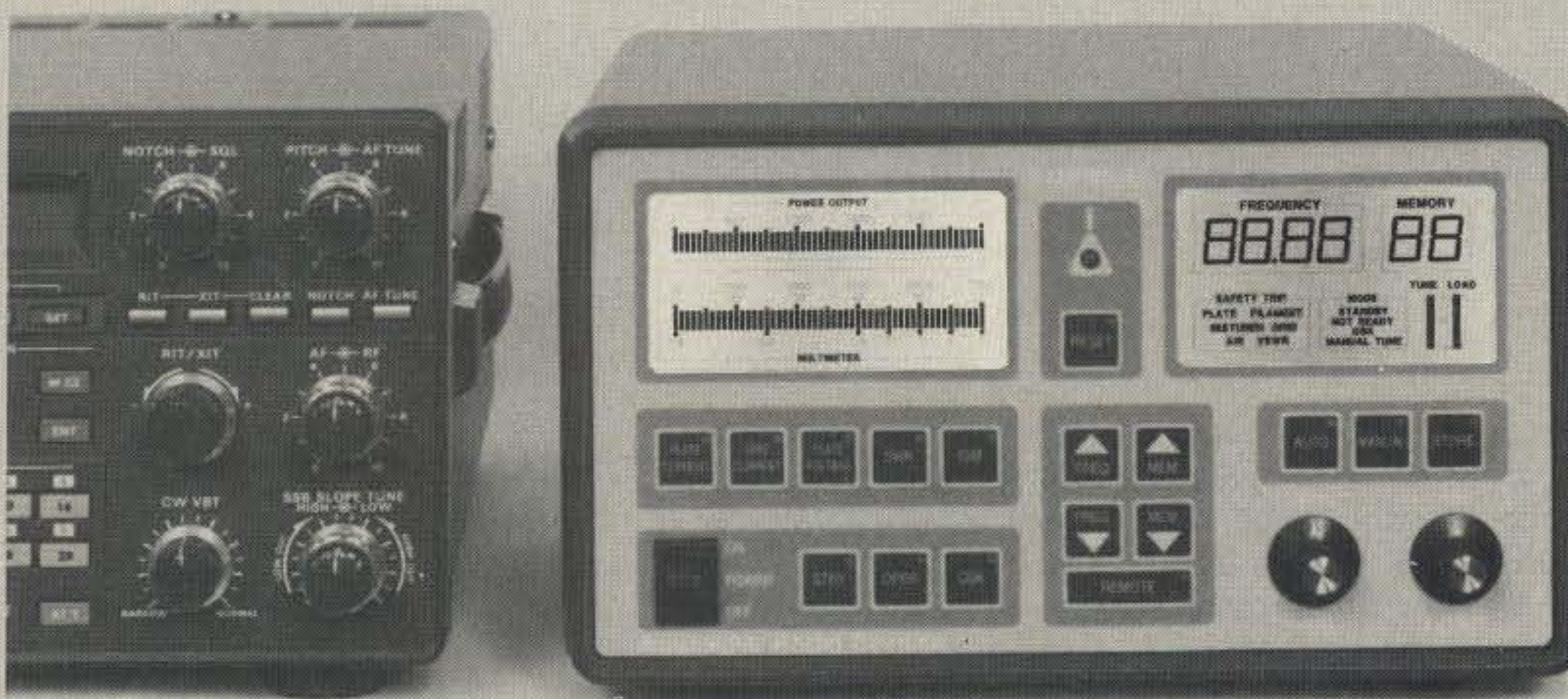
**HIGH QUALITY.** The 230A is manufactured to the same standards as the 230C, the commercial/military version.

**VERSATILITY.** The RF/power supply may be remotely located near your AC source and/or antenna cables. The small microcontroller takes little room at the operating position.

**PROTECTION.** The processor monitors tube parameters to ensure ratings are not exceeded. The operator is alerted if any parameter is getting close to a safety trip point.

**FULL QSK.** Choose QSK operation and our unique design allows “real QSK” with complete safety...no worries about burned vacuum relays, etc.

Pair of EIMAC 3CX800A7’s for high efficiency, low distortion operation. Pi-L output for high harmonic suppression.



230A Microcontroller by  
**ADVANCED RADIO DEVICES**

Remote RF/power supply  
deck is not shown.

TS 940 courtesy of EEB, Vienna, Va.

## FEATURES

- Two custom, easy-to-read, back-lighted LCD displays which provide all metering, alarm and status information.
- Built-in VSWR computer with readout on the LCD display.
- Accessory connectors for RS-232C control and antenna switching.
- HEAVY DUTY hypersil power transformer with full wave rectification and Radio Switch 86 series bandswitch.
- Automatic safety monitoring for VSWR, grid and plate current, airflow, filament voltage, and efficiency.
- Easy modification for 10 meters if you qualify.
- Remote control. Place RF/power supply deck up to 250 feet from the microcontroller with optional cable. (15 foot cable furnished.)
- Modular construction for ease of maintenance.

Factory direct sales for lowest cost.

Introductory prices: 230A, \$3695. 230C, \$5500.

1 year guarantee.

## SPECIFICATIONS

**FREQUENCY.** All amateur bands from 1.8 to 21 Mhz (to 30Mhz for export)

**DRIVE.** 50-80 watts for full power.

**INPUT VSWR.** 1.5:1 or less on all amateur bands. Slightly higher for WARC.

**HARMONIC SUPPRESSION.** -55dB

**INTERMOD PRODUCTS.** -35dB down.

**DUTY.** Continuous on all modes including RTTY.

**ALC.** Full ALC with exciter to prevent exceeding power limits.

**INPUT POWER.** 220-250VAC, 60Hz, 20 amperes max.

**DIMENSIONS.**

Microcontroller: 10 wide x 6 high x 8 deep (inches).

RF/power supply deck: 14 wide x 22 high x 13 deep (inches)

All interconnect cables are furnished for ease of set up.

In addition to the above, the 230C provides continuous frequency coverage from 1.8 to 30 Mhz with a no time output rating of 2250 watts PEP. Three 3CX800A7's are utilized.

*Please call or write for additional information. We love to talk about these amplifiers!*

# ADVANCED RADIO DEVICES

103 Carpenter Drive, Sterling, Virginia 22170 (703) 478-3100 FAX (703) 478-3105

CIRCLE 83 ON READER SERVICE CARD

MADE IN  
THE U.S.A.



**73 Review**

by Pete Putman KT2B

# Power Play Comparison

## RF Concepts RFC 2-23 and Tokyo Hi-Power HL-37V 30-Watt 144-MHz Power Amplifiers



Tokyo Hi-Power Labs  
Subsidiary of Encomm, Inc.  
1506 Capital Ave.  
Plano TX 75074  
Price Class: \$100



RF Concepts  
2000 Humboldt St.  
Reno NV 89509  
Price Class: \$112

What would an issue about hand-helds be without a review of the most popular hand-held accessory? Here I've chosen two representative models of hand-held amplifiers (one US-made and one from Japan), each designed to take a nominal 2-watt input and amplify it about 10 dB. In addition, both feature GaAsFET preamplifiers for weak signal reception.

### Background

Hand-held amplifiers aren't new. Over the past ten years design refinements have brought us from 10-watt power levels up to the current 25- and 35-watt units, which are nesting in ever-increasing numbers under car seats and in gloveboxes.

RF Concepts is a relatively new company, founded by Everett Gracey and Ken Holladay in early 1987. Both originally founded Mirage Communications in the early '80s, which was later purchased by KLM. RF Concepts offers a wide range of power amplifiers for 2 and 220 MHz, and new models for 432 MHz will appear soon. All employ GaAsFET preamplifiers.

Tokyo Hi-Power is the amplifier subsidiary of Encomm, a Texas-based importer and distributor of a wide range of VHF/UHF products, including Santec handhelds, Welz SWR meters, and Kenpro antenna rotors. They, too, have a wide range of power amplifiers to cover 144 and 432 MHz, and most of their designs use GaAsFETs.

### Description

Photo A shows the two amplifiers side by side. Both are small enough to stash just about anywhere. The RFC 2-23 measures 1 $\frac{3}{4}$ " H x 3 $\frac{1}{2}$ " W x 5 $\frac{3}{4}$ " D, and the HL-37V measures 1 $\frac{1}{2}$ " H x 4" W x 5 $\frac{3}{4}$ " D. The RFC 2-23 is finished in a satin black, while the HL-37V comes in a brushed aluminum shade.

Front panel layouts differ somewhat. Controls for DC POWER, SSB/FM mode and PREAMP ON/OFF are rocker switches on the RFC 2-23. LEDs indicate when the amplifier is on, when the preamp is enabled, and when in transmit. On the HL-37V, pushbutton switches turn POWER on and enable the preamp, marked RX. The mode setting for SSB/FM is located on the rear panel. In addition, the HL-37V features a slider control for RX GAIN (more on this in a moment), and a bargraph LED display to show power output level.

Both radios use standard SO-239 connectors. The RFC 2-23 has a detachable DC power cord with Molex connector, while the HL-37V power cord is hard-wired. The former's power cord is somewhat heavier, using #16 wire as opposed to the #18 wire on the HL-37V. It shouldn't make much of a difference if you install with the supplied cords. Failing that you should use heavier wire where possible (#16 or better).

Photo B shows the interior of the RFC 2-23. The power device is a Motorola SRF3961, which works in a 12-dB configuration. Work-

### PERFORMANCE MEASUREMENTS

Specification	RFC 2-23	HL-37V
Rf Power/DC Current: Input/Output	.3W/6W@2.0A 1.5W/25W@3.7A 2.5W/35W@4.4A	.5W/20W@3.8A 1.0W/25W@4.4A 2.0W/30W@4.6A
Measured SWR at input:	1.2:1	1.5:1
Preamplifier Gain:	14.5 dB	13.0 dB
1-dB Compression, output:	-11.0 dB	+2.0 dB



manship is of the highest quality, and there are only two tuned circuits using ARCO trimmers. The design is very similar to Mirage amplifiers, as you might expect. RF-sensed keying is used exclusively, with the SSB/FM switch setting the drop-out delay. This is largely due to the primary market for these amplifiers, FM hand-held users. Protective diodes are used around the GaAs FET, a CF300 device with nominally 20-dB gain at a noise figure of about 1 dB. In addition, an automatic SWR protection circuit will kick in at about 3:1 VSWR. RF Concepts rates the maximum RF input at 5 watts, which I could not verify. Minimum input is specified at 200 mW, with approximately 30 watts output for 2 watts drive.

Photo C shows the inside of the HL-37V. The active device is a 2SC1946A, also running about 10-12 dB gain. The amplifier does not use tuned circuits, but rather etched inductors and small fixed-value capacitors. Workmanship here is also very high quality. The PC layout is considerably more open than the RFC 2-23, but this is no comment on the engineering design.

The unit also uses RF VOX keying on both SSB and FM modes. No other provision is made for hard-keying, again for the reason that the majority of buyers will operate FM only. A 3SK121 GaAsFET provides a nominal +14 dB gain, and a unique slider control allows continuous adjustment of the RX gain from -20 dB to +14 dB. Protective diodes also isolate the GaAsFET.

Why the slider? Apparently in some places in Japan, there is so much RF on and near the 2-meter band that preamps tend to go berserk in the intense RF fields. The average unaided front end of a hand-held is similarly

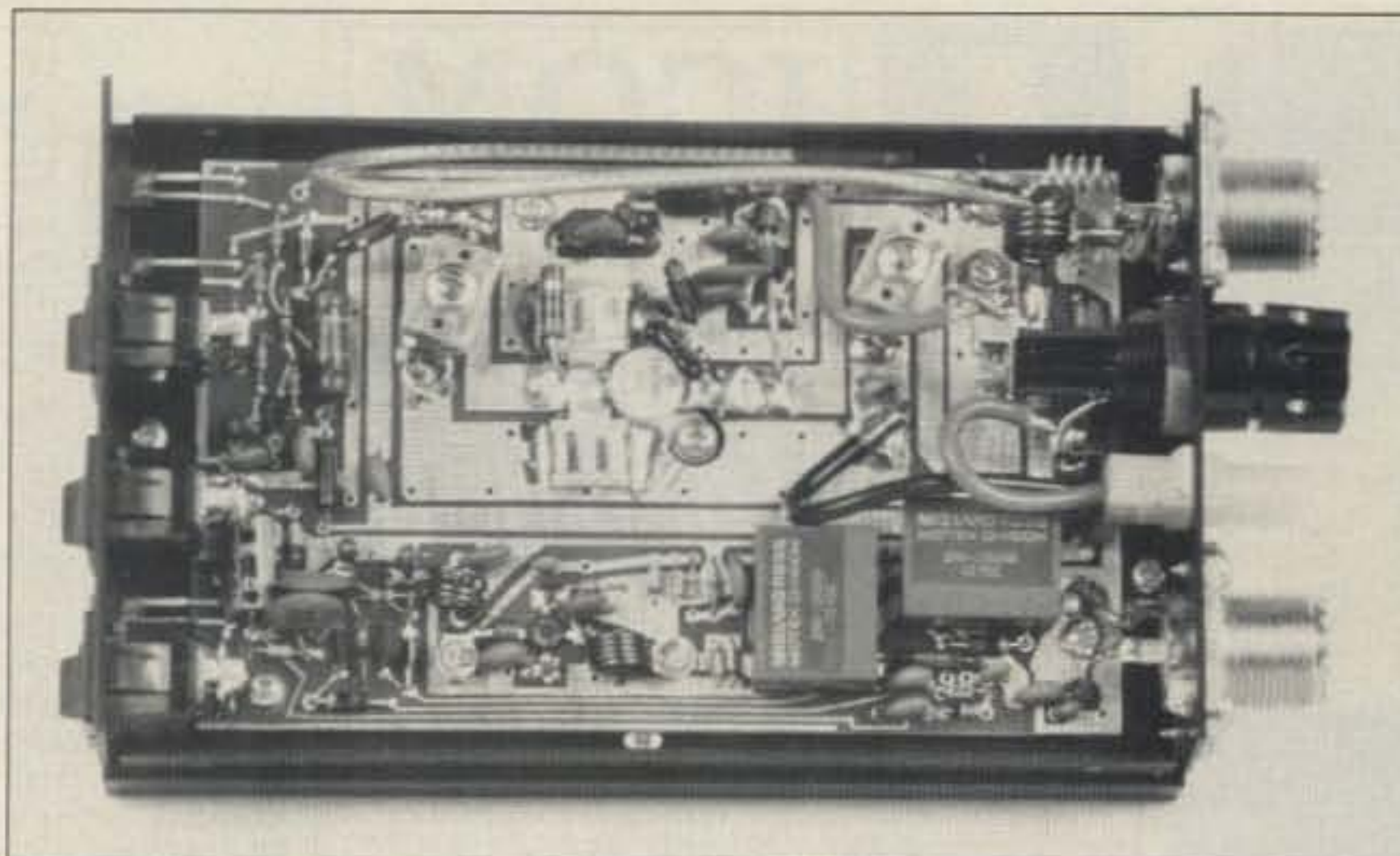


Photo B. Interior view of the RFC 2-23 amp.

affected, so having a variable attenuator is a great help!

In practice, the adjustment to give unity gain is nearly 80% of full setting.

In contrast to the RFC 2-23, the Japanese unit affords no VSWR protection. The manual strongly cautions that you should have a low (1.3:1 or better) VSWR reading before using the amplifier. In practice, it probably wouldn't make much difference until at least 2:1 or better. Most modern solid-state power devices use ballasted emitter protection to guard against excessive collector current.

#### Performance

Check the table for performance measurements. All tests were performed using an IC-2AT with different battery packs as the exciter. Bird 43 wattmeters and a Bird Terminate dummy load were also used to measure power input and output. For receive measurements, an HP 608F with Boonton 92 millivoltmeter was employed.

Some observations regarding the data. First of all, the variance in input VSWR of each amplifier caused the power input levels themselves to vary during the power tests. This is due to the impedance mismatch as

shown by the Bird 43. If the VSWR approaches 1.5:1, the impedance looks more like 75 or 37 ohms. The readings for input and output power are close to the manufacturers' specifications in each case since both specify a

maximum output of 30 watts.

The pre-amplifier in the RFC2-23 didn't come close to the claimed spec of 20 dB. However, 14.5 dB is more than adequate for normal FM work. The HL-37V was much closer to its rating of +14 dB, which again is more than enough for an amplifier of this type.

As far as compression tests go, the HL-37V passed with flying colors. I've stated in the past that a well-designed GaAsFET for 2 meters ought to exhibit a 1-dB compression point at better than 0-dB

output, and +2 dB is fine. The RFC 2-23, however, exhibited such a poor compression characteristic that I called Ken Holladay of RF Concepts. He suspected that the Schottky diodes used to protect the GaAsFET were causing the compression, and this makes sense. Ken also suggests that users switch the preamplifier off in high-level RF areas. The manual also recommends this.

When do you know you are near a high-intensity RF field?? It may not be apparent, but you could be the victim of intermodulation products caused by a nearby repeater or commercial radio installation while otherwise engaged in normal point-to-point communications. This could also happen if an amateur in your neighborhood operated with high power on 2-meter SSB while you were on an FM simplex net, for example. From the data above, it stands that a signal level of -24 dB will cause the preamp to go into compression. (-24 dB corresponds to about 12 millivolts, a fairly strong level but not unusual.)

#### Conclusions

You can place both radios into your car as you wish. Both manufacturers recommend mounting the amplifiers with the supplied brackets to allow sufficient airflow over the heatsink, which will get warm to the touch in extended FM use. Keep in mind the slider option on the HL-37V. You may wish to tailor the front-end performance to suit your tastes in areas with plenty of RF.

Both of these amplifiers are of the set-it-and-forget-it variety. Just hook them up and hide them under your seat, under the dash, in the trunk, or wherever. The power output display on the HL-37V is not a guide. You'll run over 20 watts output with half a watt input and close to the maximum output with 1 watt.

Some additional thoughts: to get the most out of these amplifiers, use heavy-duty wire for the DC lines, and low-loss coax, such as Belden 9311, RG-58, or RG8X, between the amplifier and your HT. You may encounter a slight mismatch with the HL-37V and have to experiment with cable lengths. The input impedance of the RFC 2-23 is close enough to 50 Ohms, so lengths aren't critical. **73**

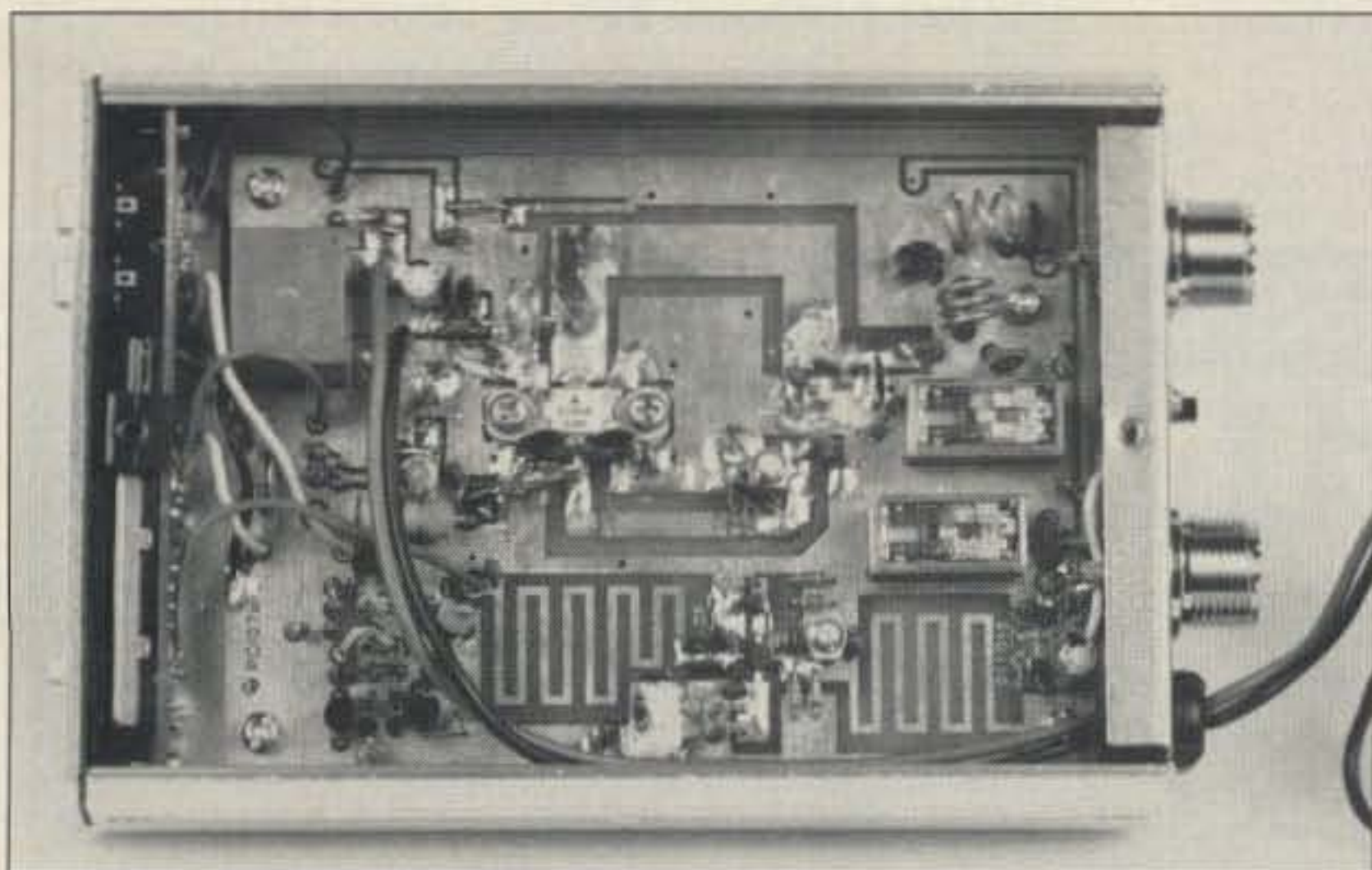


Photo C. Interior view of the THL HL-37V amp.





HF Equipment	Regular	SALE
IC-761 HF xcvr/SW rcvr/ps/AT	2499.00	2149
HM-36 Scanning hand microphone	44.50	
SP-20 Ext. speaker w/audio filter	149.00	139 <sup>95</sup>
FL-101 250 Hz 1st IF CW filter	69.95	
FL-53A 250 Hz 2nd IF CW filter	108.00	99 <sup>95</sup>
FL-102 6 kHz AM filter	56.00	
EX-310 Voice synthesizer	46.00	



IC-751A 9-band xcvr/.1-30 MHz rcvr	1649.00	1399
PS-35 Internal power supply	199.00	179 <sup>95</sup>
FL-32A 500 Hz CW filter (1st IF)	66.50	
FL-63A 250 Hz CW filter (1st IF)	54.50	
FL-52A 500 Hz CW filter (2nd IF)	108.00	99 <sup>95</sup>
FL-53A 250 Hz CW filter (2nd IF)	108.00	99 <sup>95</sup>
FL-33 AM filter	35.25	
FL-70 2.8 kHz wide SSB filter	52.00	
RC-10 External frequency controller	39.25	



IC-735 HF transceiver/SW rcvr/mic	999.00	869 <sup>95</sup>
PS-55 External power supply	199.00	179 <sup>95</sup>
AT-150 Automatic antenna tuner	445.00	349 <sup>95</sup>
FL-32A 500 Hz CW filter	66.50	
EX-243 Electronic keyer unit	56.00	
UT-30 Tone encoder	17.50	

Other Accessories	Regular	SALE
IC-2KL 160-15m solid state amp w/ps	1999.00	1699
PS-15 20A external power supply	169.00	154 <sup>95</sup>
PS-30 Systems p/s w/cord, 6-pin plug	299.00	269 <sup>95</sup>
MB Mobile mount, 735/751A/761A...	24.50	
SP-3 External speaker	61.00	
SP-7 Small external speaker	49.00	
CR-64 High stab. ref. xtal for 751A...	63.00	
PP-1 Speaker/patch	179.00	164 <sup>95</sup>
SM-6 Desk microphone	44.95	
SM-8 Desk mic - two cables, Scan...	78.50	
SM-10 Compressor/graph EQ, 8 pin mic	136.25	124 <sup>95</sup>
AT-100 100W 8-band auto. antenna tuner	445.00	389 <sup>95</sup>
AT-500 500W 9-band auto. antenna tuner	559.00	489 <sup>95</sup>
AH-2 8-band tuner w/mount & whip	625.00	549 <sup>95</sup>
AH-2A Antenna tuner system, only	495.00	429 <sup>95</sup>
GC-5 World clock	91.95	89 <sup>95</sup>

VHF/UHF base multi-modes	Regular	SALE
IC-275A 25W 2m FM/SSB/CW w/ps	1199.00	1049
IC-275H 100W 2m FM/SSB/CW	1389.00	1229
IC-475A 25W 440 FM/SSB/CW w/ps	1399.00	1249



IC-475H 75W 440 FM/SSB/CW	1599.00	1429
IC-575A 25W 6/10m xcvr w/ps	1399.00	1249



IC-471A* 25W 430-450	CLOSEOUT	979.00	749 <sup>95</sup>
PS-25 Internal power supply		115.00	104 <sup>95</sup>
AG-1* Mast mounted preamplifier		99.50	
IC-471H* 75W 430-450	CLOSEOUT	1399.00	989 <sup>95</sup>
PS-35 Internal power supply		199.00	179 <sup>95</sup>
AG-35* Mast mounted preamplifier		95.00	

\*Preamp \$9<sup>95</sup> with 471A or 471H Purchase

Accessories common to 271A/H and 471A/H	Regular	SALE
SM-6 Desk microphone	44.95	
EX-310 Voice synthesizer	46.00	
TS-32 CommSpec encode/decoder	59.95	
UT-15 Encoder/decoder interface	14.00	
UT-15S UT-15S w/TS-32 installed	92.00	

VHF/UHF mobile multi-modes	Regular	SALE	
IC-290H 25W 2m SSB/FM	CLOSEOUT	639.00	549 <sup>95</sup>
IC-490A 10W 430-440	CLOSEOUT	699.00	399 <sup>95</sup>

VHF/UHF/1.2 GHz FM	Regular	SALE
IC-27A Compact 25W 2m FM w/TTP mic	429.00	379 <sup>95</sup>
IC-27H Compact 45W 2m FM w/TTP mic	459.00	399 <sup>95</sup>
IC-37A Compact 25W 220 FM, TTP mic	499.00	439 <sup>95</sup>
IC-47A Compact 25W 440 FM, TTP mic	549.00	489 <sup>95</sup>
PS-45 Compact 8A power supply	139.00	129 <sup>95</sup>
UT-16/EX-388 Voice synthesizer	34.99	
SP-10 Slim-line external speaker	35.99	
IC-28A 25W 2m FM, TTP mic	459.00	399 <sup>95</sup>
IC-28H 45W 2m FM, TTP mic	489.00	429 <sup>95</sup>
IC-38A 25W 220 FM, TTP mic	489.00	429 <sup>95</sup>
IC-48A 25W 440-450 FM, TTP mic	489.00	429 <sup>95</sup>
HM-14 Extra TTP microphone	55.50	
UT-28 Digital code squelch	37.50	
UT-29 Tone squelch decoder	43.00	
HM-16 Speaker/microphone	34.00	

IC-900 Transceiver controller	589.00	529 <sup>95</sup>
UX-29A 2m 25W unit	295.00	269 <sup>95</sup>
UX-29H 2m 45W unit	339.00	309 <sup>95</sup>
UX-39A 220MHz 25W unit	349.00	319 <sup>95</sup>
UX-49A 440MHz 25W unit	339.00	309 <sup>95</sup>
UX-59A 6m 10W unit	339.00	309 <sup>95</sup>

IC-3200A 25W 2m/440 FM w/TTP	599.00	529 <sup>95</sup>
UT-23 Voice synthesizer	34.99	
AH-32 2m/440 Dual Band antenna	37.00	
AHB-32 Trunk-lip mount	34.00	
Larsen PO-K Roof mount	20.00	
Larsen PO-TLM Trunk-lip mount	22.00	
Larsen PO-MM Magnetic mount	22.00	

RP-3010 440MHz 10W FM repeater	1229.00	1089
IC-1200 10W 1.2GHz FM Mobile	699.00	629 <sup>95</sup>
IC-1271A 10W 1.2GHz SSB/CW Base	1229.00	1089
AG-1200 Mast mounted preamplifier	105.00	
PS-25 Internal power supply	115.00	104 <sup>95</sup>
EX-310 Voice synthesizer	46.00	
TV-1200 ATV interface unit	129.00	119 <sup>95</sup>
UT-15S CTCSS encoder/decoder	92.00	
RP-1210 1.2GHz 10W 99 ch FM xcvr	1479.00	1299
RP-2210 220MHz 25W repeater	1499.00	1329



Hand-helds	Regular	SALE
IC-2A 2-meters	279.00	249 <sup>95</sup>
IC-2AT with TTP	299.00	259 <sup>95</sup>
IC-3AT 220 MHz, TTP	339.00	299 <sup>95</sup>
IC-4AT 440 MHz, TTP	339.00	299 <sup>95</sup>
IC-02AT 2-meters	365.00	299 <sup>95</sup>
IC-02AT/High Power	399.00	339 <sup>95</sup>
IC-03AT for 220 MHz	449.00	389 <sup>95</sup>
IC-04AT for 440 MHz	449.00	389 <sup>95</sup>
IC-u2A 2-meters	299.00	269 <sup>95</sup>
IC-u2AT with TTP	329.00	289 <sup>95</sup>
IC-u4AT 440 MHz, TTP	369.00	329 <sup>95</sup>

Accessories for micros - CALL \$

IC-12AT 1W 1.2GHz FM HT/batt/cgr/TTP	459.00	399 <sup>95</sup>
A-2 5W PEP synth. aircraft HT	499.00	449 <sup>95</sup>
A-20 Synth. aircraft HT w/VOR	599.00	529 <sup>95</sup>

Accessories for all except micros	Regular
BP-7 425mah/13.2V Nicad Pak - use BC-35	74.25
BP-8 800mah/8.4V Nicad Pak - use BC-35	74.25
BC-35 Drop in desk charger for all batteries	74.50
BC-16U Wall charger for BP7/BP8	20.25
LC-11 Vinyl case for Dlx using BP-3	20.50
LC-14 Vinyl case for Dlx using BP-7/8	20.50
LC-02AT Leather case for Dlx models w/BP-7/8	54.50

Accessories for IC and IC-O series	Regular
BP-2 425mah/7.2V Nicad Pak - use BC35	47.00
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	37.50
BP-4 Alkaline battery case	15.25
BP-5 425mah/10.8V Nicad Pak - use BC35	58.50
CA-5 5/8-wave telescoping 2m antenna	18.95
FA-2 Extra 2m flexible antenna	11.50
CP-1 Cig. lighter plug/cord for BP3 or Dlx	13.00
CP-10 Battery separation cable w/clip	22.50
DC-1 DC operation pak for standard models	23.25
MB-16D Mobile mtg. bkt for all HTs	24.50
LC-2AT Leather case for standard models	54.50
RB-1 Vinyl waterproof radio bag	34.95
HH-SS Handheld shoulder strap	16.95
HM-9 Speaker microphone	47.00
HS-10 Boom microphone/headset	23.25
HS-10SA Vox unit for HS-10 & Deluxe only	23.25
HS-10SB PTT unit for HS-10	23.25
ML-1 2m 2.3w in/10w out amplifier	SALE 99.95
SS-32M Commspec 32-tone encoder	29.95

Receivers	Regular	SALE
R-71A 100kHz to 30MHz receiver	\$949.00	799 <sup>95</sup>
RC-11 Infrared remote controller	67.25	
FL-32A 500 Hz CW filter	66.50	
FL-63A 250 Hz CW filter (1st IF)	54.50	
FL-44A SSB filter (2nd IF)	178.00	159 <sup>95</sup>
EX-257 FM unit	42.50	
EX-310 Voice synthesizer	46.00	
CR-64 High stability oscillator xtal	63.00	
SP-3 External speaker	61.00	
CK-70 (EX-299) 12V DC option	12.25	
MB-12 Mobile mount	24.50	
R-7000 25MHz to 2GHz scan rcvr	1099.00	949 <sup>95</sup>
RC-12 Infrared remote controller	67.25	
EX-310 Voice synthesizer	46.00	
TV-R7000 ATV unit	131.95	119 <sup>95</sup>
AH-7000 Radiating antenna	89.95	(6)

HOURS • Mon. thru Fri. 9-5:30; Sat. 9-3

Milwaukee WATS line: 1-800-558-0411 answered evenings until 8:00 pm Monday thru Thursday.  
WATS lines are for Quotes & Ordering only, use Regular line for other Info & Service dept.

All Prices in this list are subject to change without notice.

Order Toll Free: 1-800-558-0411 In Wisconsin (outside Milwaukee Metro Area) 1-800-242-5195

**AMATEUR ELECTRONIC SUPPLY<sup>®</sup> Inc.**

4828 W. Fond du Lac Avenue; Milwaukee, WI 53216 • Phone (414) 442-4200

**AES<sup>®</sup> BRANCH STORES**

**Associate Store**

**WICKLIFFE, Ohio 44092**  
28940 Euclid Avenue  
Phone (216) 585-7388  
Ohio WATS 1-800-362-0290  
Outside Ohio 1-800-321-3594

**ORLANDO, Fla. 32803**  
621 Commonwealth Ave.  
Phone (305) 894-3238  
Fla. WATS 1-800-432-9424  
Outside Florida 1-800-327-1917

**CLEARWATER, Fla. 34625**  
1898 Drew Street  
Phone (813) 461-4267  
No In-State WATS  
No Nationwide WATS

**LAS VEGAS, Nev. 89106**  
1072 N. Rancho Drive  
Phone (702) 647-3114  
No In-State WATS  
Outside Nevada 1-800-634-6227

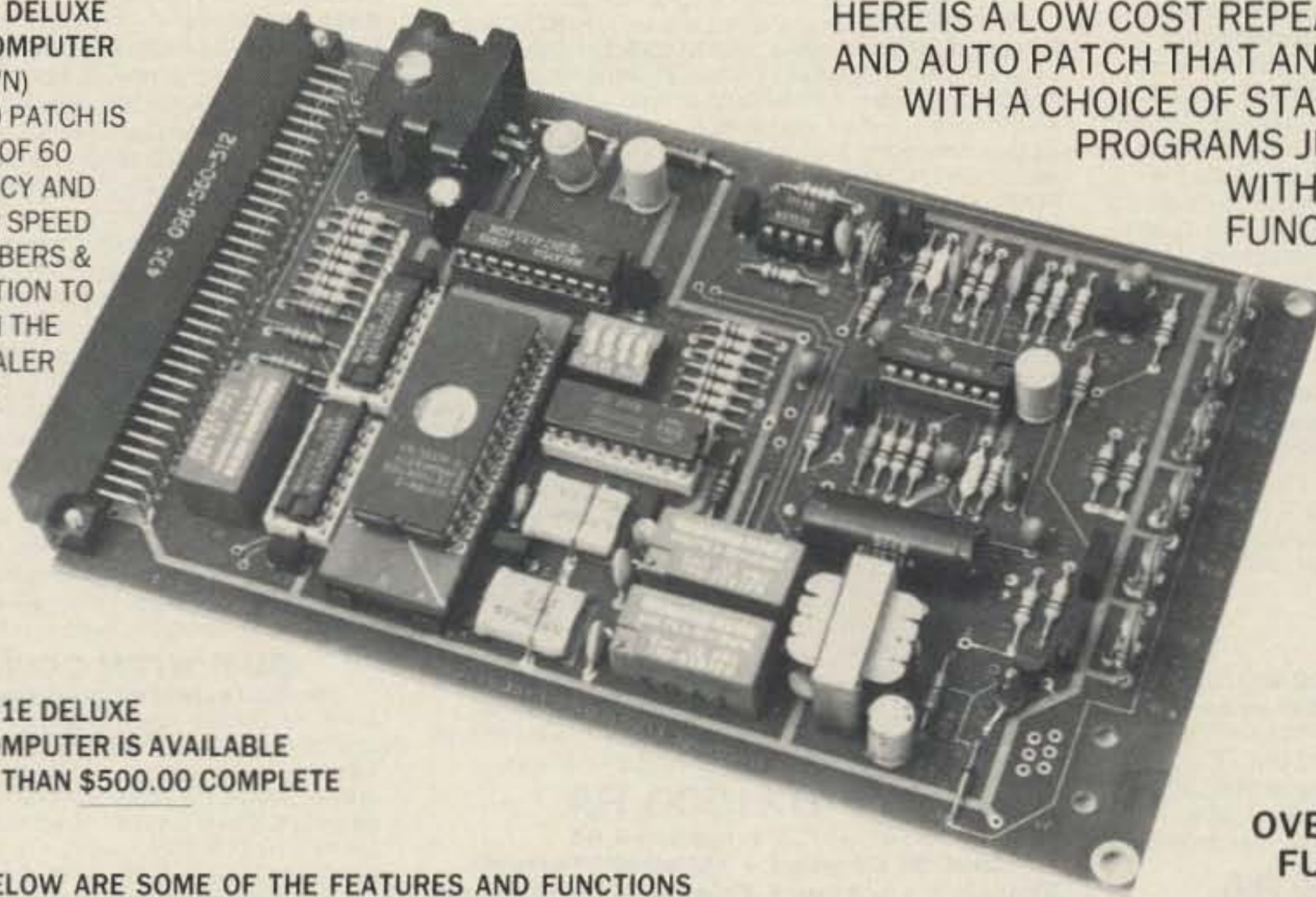
**CHICAGO, Illinois 60630**  
ERICKSON COMMUNICATIONS  
5456 N. Milwaukee Avenue  
Phone (312) 631-5181  
15 min. from O'Hare!



Manufacturers of Quality Communications Equipment

## Hi Pro HPC201 MICROPROCESSOR REPEATER CONTROLLER & AUTO PATCH

HPC201E DELUXE  
MICRO COMPUTER  
(AS SHOWN)  
THE AUTO PATCH IS  
CAPABLE OF 60  
EMERGENCY AND  
300 USER SPEED  
DIAL NUMBERS &  
INFORMATION TO  
PROGRAM THE  
SPEED DIALER  
SUPPLIED  
WITH  
ORDER.



THE HP201E DELUXE  
MICRO COMPUTER IS AVAILABLE  
FOR LESS THAN \$500.00 COMPLETE

HERE IS A LOW COST REPEATER CONTROLLER  
AND AUTO PATCH THAT ANYONE CAN AFFORD  
WITH A CHOICE OF STANDARD OR DELUXE  
PROGRAMS JUST JAMM PACKED  
WITH OWNER AND USER  
FUNCTIONS. THE SMALL  
SIZE ALONG WITH  
LOW CURRENT  
DRAIN AND  
STATE OF THE ART  
DESIGN WITH  
ALL FEATURES  
REQUIRED FOR  
TODAY'S  
DEMANDING  
REPEATER  
OWNERS AND  
OPERATORS.

OVER 80 USER  
FUNCTIONS

LISTED BELOW ARE SOME OF THE FEATURES AND FUNCTIONS  
OF THE HP201E DELUXE CONTROLLER & AUTO PATCH

- #1 MICROPROCESSOR CONTROL WITH 16 DIGIT DECODER
- #2 USER PROGRAMMABLE CODES BY RADIO OR TELEPHONE
- #3 USER PROGRAMMABLE I.D. BY RADIO OR TELEPHONE
- #4 REPEATER RINGUP AUTO PATCH WITH ON OFF CODES
- #5 UNIVERSAL PULSE DIALER WITH ADJUSTABLE SPEED
- #6 SINGLE OR MULTI DIGIT AUTO PATCH ACCESS CODE
- #7 AUTO PATCH TIMER TIME OUT WARNINGS
- #8 CALLER CONTROLLED REVERSE AUTO PATCH WITH USER PROGRAMMABLE ACCESS CODES
- #9 EXCUENT AUTO PATCH AUDIO WITH ADJ. INPUT & OUTPUT LEVELS
- #10 SMART AUTO PATCH
- #11 DIAL 9 FIRST, PBX FEATURE
- #12 SEPARATE REVERSE AUTO PATCH ON/OFF COMMAND
- #13 COMPUTER PRINTOUT OF SPEED DIALER NUMBERS
- #14 TOLL RESTRICT WITH ON/OFF COMMAND AND ADJ. MIN. AND MAX. NUMBER OF DIGITS TO BE DIALED
- #15 COURTESY TONE NOTIFICATION OF A.P. STATUS
- #16 USER AND EMERGENCY SPEED DIALER INHIBIT
- #17 REDIAL CAPABILITY OF LAST NUMBER DIALED
- #18 EXPANDABLE TO OVER 800 SPEED DIAL NUMBERS
- #19 INPUT TO DISABLE AUTO PATCH WHEN LINE IS IN USE, ALLOWING MULT. USE OF PHONE LINE
- #20 TRANSMITTER SHUTDOWN WITH PRESENCE OF TONE
- #21 UNIQUE TONE NOTIFICATION OF A P DISCONNECT
- #22 ADJUSTABLE AUTO PATCH TIME OUT TIMER
- #23 DTMF TONE MUTE AND COVER TONE MASKING
- #24 REPEATER TIME OUT TIMER WARNINGS
- #25 PROGRAMMABLE IDENTIFIER OVER THE AIR AND OVER THE PHONE LINE
- #26 SEVEN DIGIT CONTROLLER COMMAND CODES
- #27 SMART CW IDENTIFIER, IDENTIFIES AFTER INPUT CARRIER DROPS AND AFTER FINAL Q50
- #28 O.K. NOTIFICATION OF VALID FUNCTION CHANGE
- #29 BATTERY BACKUP NOTIFICATION WITH BATTERY BACKUP CAPABILITY.
- #30 CAN BE ORDERED TO USER INITIAL POWER UP FUNCTIONS AND MASTER CODE AND IT ALL WILL LISTED ON THE SUPPLIED COMPUTER PRINT OUT.
- #31 BURGLAR AND FIRE ALARM INPUT WITH SPECIAL ALERT FUNCTION
- #32 SEVEN 500 MA OPEN COLLECTOR CONTROLLER OUTPUTS
- #33 TONE PAD TEST

ASK ABOUT OUR REPEATERS, LINKS,  
RECEIVERS, TRANSMITTERS, C.O.R.'S AND  
COMPLETE REPEATER SYSTEMS

**PLUS**  
MUCH — MUCH — MORE

**Maggiore Electronic Laboratory**

600 WESTTOWN RD. TELEX: 499-0741-MELCO  
WEST CHESTER, PA 19382 PHONE 215-436-6051

WRITE OR CALL FOR OUR COMPLETE CATALOG



# NEW! CB Radios & Scanners

Communications Electronics™, the world's largest distributor of radio scanners, introduces new models of CB & marine radios and scanners.

## NEW! Regency® TS2-RA

Allow 30-90 days for delivery after receipt of order due to the high demand for this product.

List price \$499.95/CE price \$339.95  
**12-Band, 75 Channel • Crystalless • AC/DC**  
Frequency range: 29-54, 118-174, 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 won't 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® Z60-RA

List price \$299.95/CE price \$148.95/SPECIAL  
**8-Band, 60 Channel • No-crystal scanner**  
Bands: 30-50, 88-108, 118-136, 144-174, 440-512 MHz.  
The Regency Z60 covers all the public service bands plus aircraft and FM music for a total of eight bands. The Z60 also features an alarm clock and priority control as well as AC/DC operation. Order today.

## Regency® Z45-RA

List price \$259.95/CE price \$139.95/SPECIAL  
**7-Band, 45 Channel • No-crystal scanner**  
Bands: 30-50, 118-136, 144-174, 440-512 MHz.  
The Regency Z45 is very similar to the Z60 model listed above however it does not have the commercial FM broadcast band. The Z45, now at a special price from Communications Electronics.

## Regency® RH256B-RA

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-RA is available for \$459.95. A UHF 15 watt, 10 channel version of this radio called the RU150B-RA is also available and covers 450-482 MHz. but the cost is \$439.95.

## Bearcat® 50XL-RA

List price \$199.95/CE price \$114.95/SPECIAL  
**10-Band, 10 Channel • Handheld scanner**  
Bands: 29.7-54, 136-174, 406-512 MHz.

The Uniden Bearcat 50XL is an economical, handheld scanner with 10 channels covering ten frequency bands. It features a keyboard lock switch to prevent accidental entry and more. Also order the new double-long life rechargeable battery pack part # BP55 for \$29.95, a plug-in wall charger, part # AD100 for \$14.95, a carrying case part # VC001 for \$14.95 and also order optional cigarette lighter cable part # PS001 for \$14.95.

## NEW! Scanner Frequency Listings

The new Fox scanner frequency directories will help you find all the action your scanner can listen to. These new listings include police, fire, ambulances & rescue squads, local government, private police agencies, hospitals, emergency medical channels, news media, forestry radio service, railroads, weather stations, radio common carriers, AT&T mobile telephone, utility companies, general mobile radio service, marine radio service, taxi cab companies, tow truck companies, trucking companies, business repeaters, business radio (simplex) federal government, funeral directors, veterinarians, buses, aircraft, space satellites, amateur radio, broadcasters and more. Fox frequency listings feature call letter cross reference as well as alphabetical listing by licensee name, police codes and signals. All Fox directories are \$14.95 each plus \$3.00 shipping. State of Alaska-RL019-1; Baltimore, MD/Washington, DC-RL024-1; Chicago, IL-RL014-1; Cleveland, OH-RL017-1; Columbus, OH-RL003-2; Dallas/Ft. Worth, TX-RL013-1; Denver/Colorado Springs, CO-RL027-1; Detroit, MI/Windsor, ON-RL008-2; Fort Wayne, IN/Lima, OH-RL001-1; Houston, TX-RL023-1; Indianapolis, IN-RL022-1; Kansas City, MO/ KS-RL011-2; Los Angeles, CA-RL016-1; Louisville/Lexington, KY-RL007-1; Milwaukee, WI/Waukegan, IL-RL021-1; Minneapolis/St. Paul, MN-RL010-2; Nevada/E. Central CA-RL028-1; Oklahoma City/Lawton, OK-RL005-2; Pittsburgh, PA/Wheeling, WV-RL029-1; Rochester/Syracuse, NY-RL020-1; Tampa/St. Petersburg, FL-RL004-2; Toledo, OH-RL002-3. A regional directory which covers police, fire ambulance & rescue squads, local government, forestry, marine radio, mobile phone, aircraft and NOAA weather is available for \$19.95 each. RD001-1 covers AL, AR, FL, GA, LA, MS, NC, PR, SC, TN & VI. For an area not shown above call Fox at 800-543-7892 or in Ohio 800-621-2513.

## 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-RA is ideal for truckers and is only \$249.95. The new INF2-RA is a deluxe model and has ham radio, a weather alert and other exciting features built in for only \$324.95. For base station use, the INF5-RA is only \$199.95 and for those who can afford the best, the INF3-RA at \$249.95, is a state-of-the-art, receiver that spells out what service you're listening to such as Military, Airphone, Paging, State Police, Coast Guard or Press.

## Regency® HX1500-RA

List price \$369.95/CE price \$218.95  
**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.

## Bearcat® 100XL-RA

List price \$349.95/CE price \$178.95/SPECIAL  
**9-Band, 16 Channel • Priority • Scan Delay**  
Search • Limit • Hold • Lockout • AC/DC  
Frequency range: 30-50, 118-174, 406-512 MHz.  
Included in our low CE price is a sturdy carrying case, earphone, battery charger/AC adapter, six AA ni-cad batteries and flexible antenna. Order your scanner now.

### ★★★ 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-RA Uniden 40 Ch. Portable/Mobile CB. . . \$85.95  
NINJA-RA PRO310E with rechargeable battery pack, \$99.95  
B-10-RA 1.2V AA Ni-cad batt. for Ninja (set of 10) . . . \$20.95  
PRO520E-RA Uniden 40 channel CB Mobile . . . \$59.95  
PRO540E-RA Uniden 40 channel CB Mobile . . . \$119.95  
PRO710E-RA Uniden 40 channel CB Base . . . \$119.95  
PC22-RA Uniden remote mount CB Mobile . . . \$99.95  
PC55-RA Uniden mobile mount CB transceiver. . . \$59.95

### ★★★ Uniden Marine Radios★★★

Now the finest marine electronics are available through CEI. The Unimetrics SH66-RA has 50 transmit and 60 receive frequencies with 25 or 1 watt power output. Only \$169.95. The Unimetrics SH 88-RA is a deluxe full function marine radiotelephone featuring 55 transmit and 90 receive channels and scanning capability for only \$259.95. The Unimetrics SH3000-RA is an excellent digital depth sounder, good for 300 feet. It has an LCD continuously backlit with red light display and a 5 ft. or 10 ft. alarm. Only \$189.95. Order today.

## Bearcat® 800XLT-RA

List price \$499.95/CE price \$289.95/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 9 1/4" x 4 1/2" x 12 1/2".

### OTHER RADIOS AND ACCESSORIES

Panasonic RF-2600-RA Shortwave receiver. . . \$179.95  
RD55-RA Uniden Visor mount Radar Detector. . . \$98.95  
RD9-RA Uniden "Passport" size Radar Detector. . . \$169.95  
NEW! BC 70XLT-RA Bearcat 20 channel scanner. . . \$168.95  
BC 140-RA Bearcat 10 channel scanner. . . \$92.95  
BC 145XL-RA Bearcat 16 channel scanner. . . \$98.95  
BC 175XL-RA Bearcat 16 channel scanner. . . \$156.95  
BC 210XLT-RA Bearcat 40 channel scanner. . . \$196.95  
BC-WA-RA Bearcat Weather Alert™. . . \$35.95  
R1080-RA Regency 30 channel scanner. . . \$118.95  
R1090-RA Regency 45 channel scanner. . . \$148.95  
UC102-RA Regency VHF 2 ch. 1 Watt transceiver. . . \$117.95  
P1412-RA Regency 12 amp reg. power supply. . . \$189.95  
MA549-RA Drop-in charger for HX1200 & HX1500. . . \$84.95  
MA518-RA Wall charger for HX1500 scanner. . . \$14.95  
MA553-RA Carrying case for HX1500 scanner. . . \$19.95  
MA257-RA Cigarette lighter cord for HX12/1500. . . \$19.95  
MA917-RA Ni-Cad battery pack for HX1000/1200. . . \$34.95  
SMMX7000-RA Svc. man. for MX7000 & MX5000. . . \$19.95  
B-4-RA 1.2 V AAA Ni-Cad batteries (set of four). . . \$9.95  
B-8-RA 1.2 V AA Ni-Cad batteries (set of eight). . . \$17.95  
FB-E-RA Frequency Directory for Eastern U.S.A. . . \$14.95  
FB-W-RA Frequency Directory for Western U.S.A. . . \$14.95  
ASD-RA Air Scan Directory. . . \$14.95  
SRF-RA Survival Radio Frequency Directory. . . \$14.95  
TSG-RA "Top Secret" Registry of U.S. Govt. Freq. . . \$14.95  
TIC-RA Techniques for Intercepting Comm. . . \$14.95  
RRF-RA Railroad frequency directory. . . \$14.95  
EEC-RA Embassy & Espionage Communications. . . \$14.95  
CIE-RA Covert Intelligenc. Elect. Eavesdropping. . . \$14.95  
MFF-RA Midwest Federal Frequency directory. . . \$14.95  
A60-RA Magnet mount mobile scanner antenna. . . \$35.95  
A70-RA Base station scanner antenna. . . \$35.95  
MA548-RA Mirror mount Informant antenna. . . \$39.95  
USAMM-RA Mag mount VHF ant. w/ 12' cable. . . \$39.95  
USAK-RA 3/4" hole mount VHF ant. w/ 17' cable. . . \$35.95  
Add \$3.00 shipping for all accessories ordered at the same time.  
Add \$12.00 shipping per shortwave receiver.  
Add \$7.00 shipping per radio and \$3.00 per antenna.

### BUY WITH CONFIDENCE

To get the fastest delivery from CE of any scanner, send or phone your order directly to our Scanner Distribution Center™ Michigan residents please add 4% sales tax or supply your tax I.D. number. Written purchase orders are accepted from approved government agencies and most well rated firms at a 10% surcharge for net 10 billing. All sales are subject to availability, acceptance and verification. All sales on accessories are final. Prices, terms and specifications are subject to change without notice. All prices are in U.S. dollars. Out of stock items will be placed on backorder automatically unless CE is instructed differently. A \$5.00 additional handling fee will be charged for all orders with a merchandise total under \$50.00. Shipments are F.O.B. Ann Arbor, Michigan. No COD's. Most products that we sell have a manufacturer's warranty. Free copies of warranties on these products are available prior to purchase by writing to CE. Non-certified checks require bank clearance. Not responsible for typographical errors.

Mail orders to: Communications Electronics, Box 1045, Ann Arbor, Michigan 48106 U.S.A. Add \$7.00 per scanner for R.P.S./U.P.S. ground shipping and handling in the continental U.S.A. For Canada, Puerto Rico, Hawaii, Alaska, or APO/FPO delivery, shipping charges are three times continental U.S. rates. If you have a Discover, Visa or Master Card, you may call and place a credit card order. Order toll-free in the U.S. Dial 800-USA-SCAN. In Canada, order toll-free by calling 800-221-3475. FTCC Telex anytime, dial 825333. If you are outside the U.S. or in Michigan dial 313-973-8888. Order today.

Scanner Distribution Center™ and CE logos are trademarks of Communications Electronics Inc.

† Bearcat is a registered trademark of Uniden Corporation.  
‡ Regency and Turbo Scan are registered trademarks of Regency Electronics Inc. AD #080187-RA

Copyright © 1987 Communications Electronics Inc.

For credit card orders call  
**1-800-USA-SCAN**

**COMMUNICATIONS  
ELECTRONICS INC.**

Consumer Products Division  
P.O. Box 1045 □ Ann Arbor, Michigan 48106-1045 U.S.A.  
Call 800-USA-SCAN or outside U.S.A. 313-973-8888

CIRCLE 121 ON READER SERVICE CARD





# DEALERS

## Sell 73 Amateur Radio

Selling 73 Amateur Radio will make money for you. Consider the facts:

- If you carry 73 Amateur Radio it will increase your store traffic—and our dealers tell us that 73 is the hottest selling amateur radio magazine on the newsstands today.
- Increased store traffic means increased sales for you. Hams will come into your store to pick up the latest 73 and end up buying the latest all-band, all-mode transceiver (or at least a few feet of coax).
- 73 Amateur Radio guarantees each issue—you pay only for the copies that you sell. We pay for all shipping.

For information on selling 73 Amateur Radio, call Peter Murphy at 800-722-7790, or write to 73 Amateur Radio, WGE Center, Peterborough, NH 03458.

# 73 Amateur Radio

WGE Center, Peterborough, NH 03458 800-722-7790

**ANNOUNCING  
THE RADIO WHICH  
COULD SAVE YOUR LIFE!  
(OR THE LIFE OF SOMEONE ELSE)**

LIMITED  
INTRODUCTORY  
PRICE—\$995

**IT'S THE VECTOR VR-50 SSB COMMUNICATOR**



Finally there is an affordable powerful (50 W) solar powered HF-SSB transceiver for the Amateur. Works anywhere—easily deployed antenna system—built in antenna tuner—stable crystal controlled circuitry on any amateur, MARS or CAP frequency (SSB or CW) from 1.8 to 17 MHz (except 4.7-5.1)—all in a bright yellow unsinkable housing/carrying case. Many optional accessories. System available now!

Call or write for a fully detailed brochure on the unique VECTOR VR-50 today.

This equipment is currently available through

**A X M Incorporated**

11791 Loara Street  
Garden Grove, Calif. 92640  
(714) 638-8807

Note: This equipment is currently being offered for use on the amateur radio bands. A type accepted model is expected to become available before the year's end. Unlicensed use outside the amateur bands could result in imprisonment, monetary forfeitures or both. However, in an emergency involving the safety of life or property, rules may be waived at the discretion of the Federal Comm. Commission.

CIRCLE 243 ON READER SERVICE CARD

# GLB PACKET RADIO GOES PORTABLE

THE FIRST CONTROLLER DESIGNED FOR PORTABLE AND SOLAR-POWERED STATIONS



- LOW 25 mA Current Drain.
  - Miniature size - Lightweight.
  - Rugged metal, shielded case.
  - Lithium Battery backup for RAM.
  - Onboard Watchdog for reliability.
  - Standard DB25 Connectors.
  - "Connected" Status output line.
  - Remote Commands in Unattended Mode with Hardware Lockout.
  - Retains all other PK-1 features.
  - Extra I/O lines for special applications.
- NEW SOFTWARE FEATURE:**  
INTELLIGENT "BUDLIST" - Provides selective callsign filtering for Digipeating, Monitoring and Connecting.
- Model PK1-L**  
Wired/Tested  
List price—\$209.95  
Amateur net—\$179.95

Power requirement: 9 to 15 Volts DC @ 25 mA typical  
Dimensions: 4.6 X 5.9 X 1.0 inches Total Weight: 12 ozs.

Please specify Call Sign, SSID Number, and Node Number when ordering.

Contact GLB for additional info and available options.

We offer a complete line of transmitters and receivers, strips, preselector preamps, CWID's & synthesizers for amateur & commercial use. Request our FREE catalog. MC & Visa welcome.

## GLB ELECTRONICS, INC.

151 Commerce Pkwy., Buffalo, NY 14224 716-675-6740 9 to 4

CIRCLE 17 ON READER SERVICE CARD

# T.V.I. problems?

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



Model	Power (Watts)	Cut Off Frequency	Frequency of Maximum Attenuation	Minimum Attenuation	Frequency Range	Price
FL10/1500	1000	34 MHz	52 MHz	70 db	1.8 - 30 MHz	\$32.00*
FL10/100	100	44 MHz	57 MHz	60 db	1.8 - 30 MHz	\$22.50*
FL6/1500	1000	55 MHz	63 MHz	70 db	6 meter	\$36.00*
FL6/100	100	55 MHz	63 MHz	50 db	6 meter	\$25.00*

All above to match 50 ohm transmitters and antennas.

\*Add \$2 shipping and handling

ALL OUR PRODUCTS MADE IN USA



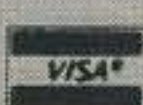
**BARKER & WILLIAMSON**

Quality Communication Products Since 1932

At your Distributors. Write or Call

10 Canal Street, Bristol PA 19007

(215) 788-5581



CIRCLE 53 ON READER SERVICE CARD



# NEW PRODUCTS

Compiled by Rebecca Niemela

## MIDLAND LMR

Midland LMR has introduced new **Wideband Frequency-Synthesized Two-Way FM Portable Radios (Model 70-254)** that cover up to 30 MHz, at full rate specifications, without returning. The portables can be programmed by an authorized technician for up to 16 channels. The new wideband Midland portables have built-in programmable tone-coded squelch, DTMF signaling and channel scanning capability. Controlled from a front key-panel, the radios can scan 20 channels per second with choice of priority and carrier, CTCSS or open channel scanning. A mode-lock key on the panel keeps the portable configured as the user sets it up. The units have diecast chassis with metal back-plates and weather-resistant seals. The price for the New Wideband 16 Channel UHF Portable Radio (Model 70-254) is \$700.

Options include a 1000 mAh battery pack, chargers, a speaker-microphone, belt clips, cases and a variety of signaling formats.

For more information contact Midland LMR, Marketing Department, 1690 N. Topping, Kansas City MO 64120 (800/643-5263 X-1690). Or circle Reader Service Card #201.

## SELECTONE

Selectone Corporation is announcing its new **ST-216 Mobile-call decoder**. It was initially developed for GE, but it now replaces both the ST-215 Two-Tone Sequential and the ST-121 Burst Tone decoders in the Selectone line. Employing the same dash-mounted control head as the ST-215 and ST-121, the new ST-216 is compatible with any two-tone format including Motorola Quick-Call II, GE Type 99, Reach, and



Midland's Model 70-254 two-way FM portable radio.

Plectron, with all functional outputs required for most selective calling applications. The new Mobilecall Universal Decoder offers field selectable frequency range, tone timing and intertone interval, compatible with all known two-tone sequential formats, and can also perform as a Burst (single) Tone decoder. The user has the choice of extended tone 1 or tone 2 for group call applications. The decoder will operate on any frequency between 275 and 3000 Hz and is field tunable.

In operation, the ST-216 mutes the speaker to block out unwanted traffic until it receives the correct tone code. Then, a latched relay output unmutes the speaker, sounds a field-selectable momentary or continuous alert buzzer, and turns on a front-panel LED indicator. The user may opt to select a horn mode which causes a 3-second horn beep. The Mobilecall Universal Decoder can be reset by an off-hook condition or by punching the Reset/Monitor switch on the control panel. The new ST-216, backed by a 5-year parts and labor warranty, is \$119.

More information is available from Selectone Corporation, 23278 Bernhardt Street, Hayward CA 94545; 415-887-1950. Or any of the authorized Selectone distributors. Circle Reader Service Card number 202.

## DAVLE TECH

This Personal Grounding Wrist Strap is an essential

part of static-proofing the electronic work station for assembly workers and laboratory personnel. It protects sensitive devices from static charges generated by the operator.

The most important feature of this wrist strap is that it is suitable for any size wrist. The coil cord offers oxidation prevention, 6 ft., 360° swivel and high function resistor. A strong grip banana plug and crocodile clip provide sure grounding. \$9.

More information is available from Davle Tech Inc., 2-05 Banta Place, Fair Lawn NJ 07410 (201/796-1720). Or circle Reader Service Card #220.

## LUDVIGSON TONEGEN

The new Ludvigson Tonegen software for the Commodore 64 turns the computer into a versatile test instrument. The program provides triangle, sawtooth, and squarewave signals from several milliHertz to 3.950 kHz with virtually flat amplitude response and better than 0.07% frequency accuracy. In addition, the software package simulates rotary dialing at 10 pps. Two-tone sequential tones are programmable by the user, and the 12-key DTMF simulator can send strings up to 40 characters long. The list doesn't stop there. The program can also generate color bars, vertical, horizontal and crosshatch lines. Motorola two-tone page tones are also featured, as well as look-up tables for Motorola and CTCSS tone equivalents. The program even calculates ERP, antenna and feedline parameters, and power conversions. Copies of the program on disk are available for \$12.

Contact David Ludvigson, 415 N. Duluth, Sioux Falls, SD 57104 for more information.

## ERGOTRON INC

Ergotron announces availability of the **Ergotron Engineering Workstation**, a suspended radial arm computer workstation designed to reclaim useable desk space by suspending the monitor and the processor above the work surface. If there isn't desk space to organize work and lay out projects, the system's effectiveness is limited. The new Ergotron Engineering Workstation takes a totally new approach to workstation ergonomics. This free-standing workstation sits alongside your desk and provides a unique



Ergotron Engineering Workstation.

arm suspension system and shelf area giving the operator the ultimate in system adjustability and space savings. This unique combination of arm and mechanism allows the user to move up to an 80 lb. monitor to any position with just a touch of the hand. The Workstation improves operator comfort by reducing glare and eye, neck and back strain and provides for far better utilization of available desk space. This combination of benefits will result in dramatic improvement in operator productivity. The suggested retail price for the Ergotron Engineering Workstation is \$500.

For more information contact Ergotron, Inc., 1621 East 79th Street, Minneapolis MN 55420 (800/328-9839 or 612/854-9116). Circle Reader Service Card #204.



ICOM's CT-16 satellite interface unit.

## NEWS FROM ICOM

Instant satellite communications are now possible with ICOM's **CT-16 Satellite Interface Unit** when used with an ICOM CI-V System Transceiver. The CT-16 features an uplink transceiver and a switch to select either normal or reverse tracking. The CT-16 may also be used in coordination with the UX-14 CI-IV/CI-5 converter. Suggested price is \$98.

For more information circle Reader Service Card #205 or contact ICOM America, Inc., 2380-116 Ave. NE, Bellevue WA 98009 (206-454-8155).



ST-216 Selectone universal two-tone decoder.





Rob, WA3QLS

# Delaware Amateur Supply



Paul, WA3QPX

71 Meadow Road, New Castle, Del. 19720

302-328-7728

**Factory Authorized Dealer!**

9-5 Daily, 9-8 Friday, 9-3 Saturday

**AEA • ALINCO • AMERITRON • CUSHCRAFT • ICOM  
• KANTRONICS • KENWOOD • MOSLEY • SANTEC  
• TELEX HY-GAIN • TENTEC • YAESU • AND MORE!**

Large Inventory, Daily UPS Service

## 800-441-7008

Katherine, KA3IYO

### New Equipment Order & Pricing

Prices are subject to change without notice or obligation. Products are not sold for evaluation.

**NO Sales Tax in Delaware! one mile off I-95  
SERVICE, USED GEAR INFO: 302-328-7728**



CIRCLE 233 ON READER SERVICE CARD

## Subscribe Today To The World's Leading Magazine For Shortwave & Scanner Listeners!

- International Broadcasting
- Utility Monitoring
- Scanners
- Shortwave and Longwave
- Satellites
- Electronic Projects
- Listening Tips
- Frequency Lists
- Equipment Reviews
- News-breaking Articles
- Feature Articles
- Exclusive Interviews
- Insights by the Experts
- New Products



Each month **MONITORING TIMES**, the first wide-spectrum listener's publication and still the best, brings you 64 giant tabloid pages of late-breaking information on every aspect of monitoring the radio spectrum.

Fast-paced and information-packed, **MONITORING TIMES** consistently scoops the publishing industry.

**ORDER YOUR SUBSCRIPTION TODAY** before another issue goes by: only \$15 per year (U.S. and Canada), \$22 per year (foreign) or send \$1 for a sample issue (foreign send 2 IRCs).

## MONITORING TIMES

P.O. Box 98

Brasstown, N.C. 28902

CIRCLE 71 ON READER SERVICE CARD

## Special

### OUTSTANDING PRICES ON IBM XT™ \* COMPATIBLE SYSTEMS!



(\* IBM IS A REGISTERED TRADEMARK OF INTERNATIONAL BUSINESS MACHINES CORP.

Seagate ST-225, 20 MHz hard drive with control card available with any system for \$319.00. Offer good thru 12/31/87. Call for customized systems.

#### SYSTEM #2 \$499.00

MOTHERBOARD WITH BIOS AND THE FIRST 256K OF RAM UPGRADABLE TO A FULL 640K OF RAM. FLIP TOP CASE. XT/AT LOOK ALIKE KEYBOARD. 150 WATT POWER SUPPLY. DUAL DISK DRIVE CARD WITH CABLES. ONE FLOPPY DRIVE DS DD 360K. A COLOR GRAPHICS CARD WITH RGB AND COMPOSITE OUTPUT. (ALL YOU NEED IS A MONITOR)

SHIPPING INFORMATION: PLEASE INCLUDE 10% OF ORDER FOR SHIPPING AND HANDLING CHARGES (MINIMUM \$2.50, MAXIMUM \$10). CANADIAN ORDERS, ADD \$7.50 IN US FUNDS, MICHIGAN RESIDENTS ADD 4% SALES TAX, FOR FREE FLYER, SEND 2¢ STAMP OR SASE

**HAL-TRONIX, INC.**

DEALER FOR  
TEN-TEC & MFJ

P.O. BOX 1101 DEPT. N

HOURS:  
12:00-6:00 EST Mon-Sat

12671 DIX-TOLEDO HWY

SOUTHGATE, MICH. 48195 PHONE (313) 281-7773



"HAL"  
HAROLD C. NOWLAND  
W8ZXH

CIRCLE 175 ON READER SERVICE CARD



# The Banker

by Paul D.A. Hoang NAlA

## An Accessory for the Kenwood TS-940S/AT

Inventron Labs  
PO Box 1881  
Brookline MA 02146  
Price: \$50

I just love my Kenwood TS-940S/AT. And from what I hear on the air, lots of people feel the same way. It seems like 25 percent of those I work on 20 meters are using one! The design of the '940 is superb in every way except one. And the "Banker" overcame this deficiency.

Although the radio itself has four banks of 10 memory channels (total of 40 memories) that store both frequency and mode, I suspect most people use only one bank. Why? Because the switch for changing banks is located under a sliding cover on top of the radio—along with such seldom-used controls as the VOX gain and FM mic gain! It's just too much hassle to get to the switch, and I was concerned about bumping the other controls. Besides, until recently, the rig sat on a desk with a shelf directly over the cover, so I couldn't even get to the switch. I just left the rig on bank 1 and sacrificed the other memories. No doubt most of the other '940 owners do the same thing.

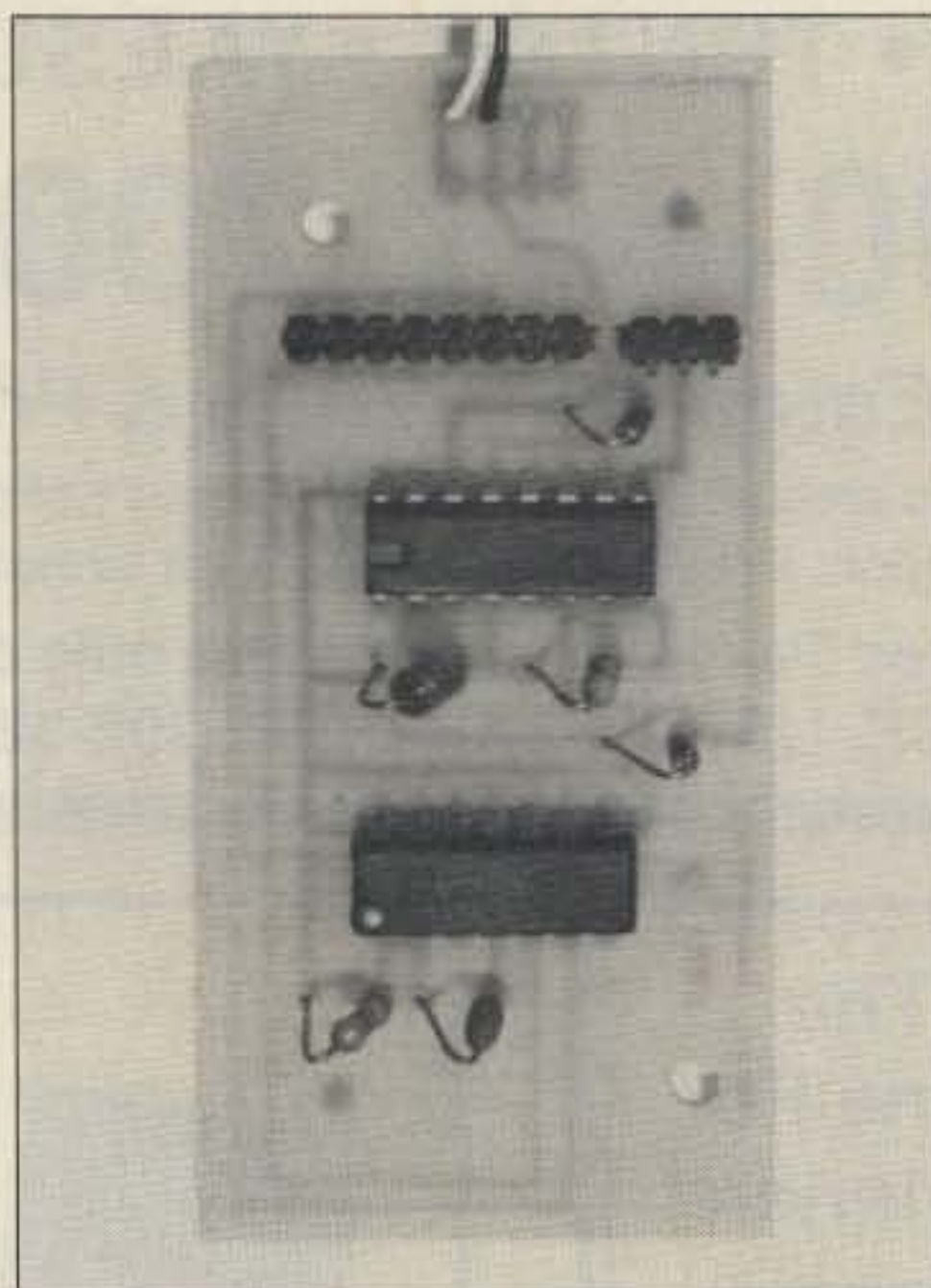
I work several modes, including RTTY and AMTOR. I was always frustrated by insufficient memory to store all the frequencies I use. When an ad appeared for The Banker, I jumped at the chance to retrieve the other 30 memories for \$50.

The product is a small board that mounts inside the rig in place of Kenwood's voice synthesizer option. Usually, the voice synthesizer is used only by sight-impaired hams—most of us don't have one. Once installed, the Banker lets you change memory banks by pressing the voice switch on the '940's front

panel. This is especially convenient, because the voice switch happens to be right next to the memory buttons.

### Installation

The unit couldn't be easier to install. It comes with extremely detailed instructions, including both schematic and pictorial diagrams. The manufacturer even tells you how to orient the rig and where to put the screws as



The Banker offers easy access to the TS-940S/AT's memory.

you work. The board goes in without a hitch. Two supplied screws secure the board, which is then plugged into the two connectors normally used for the voice synthesizer.

There is one other plug on the end of a short wire, and it connects to one in the radio about two inches from the board. This plug had me puzzled at first. It's a two-pin right-angle thing I've never seen before. It snaps into the rig's connector in an odd way, paralleling the existing wires. All together, I took about ten minutes to install the board, and the radio did not require any other changes.

Before using the product, you should set the rig's bank switch to bank 4. This lets the Banker take over and is explained in the instructions. I set my switch, closed the cover (forever!) and I was in business! Now, when I press the voice button, the memory bank advances by one each time, just as if I had moved the bank switch up a notch.

Although I don't record shortwave broadcasts, the instructions tell how to use the rig's bank switch to preset a memory for timer recording. Even though the Banker is installed, you can still use the old bank switch settings. This clever trick lets you preset the rig so the Banker doesn't have to use any backup power to remember which bank you want to appear upon power-up.

### Notes

I can't find anything negative about this product. It is simple, effective, and easy to use. It is all CMOS, so it takes practically no power when the rig is on, and none at all when it is off. I can remove it, should I ever want to, just as easily as I installed it. It comes with a one-year warranty, so I'm not worried about failure.

At last, I have easy access to all four memory banks. Inventron Labs has filled a gap, giving me convenient and complete use of all my '940's features. Now, if I could only get it to call "CQ" for me... 73

**LI INDUSTRIES, INC.**  
**LUNAR**



The **ORIGINATOR** of the VHF AMP/PREAMP COMBO!  
**YOU KNOW THE LUNAR NAME...NOW OWN THE BEST.**

- Solid State Amplifiers for 50, 144, 220, 440 MHz •

**NEW!** GaAs FET Receive Preamp Built-In!

**NEW!** UHF Models of Latest Design!

**NEW!** Model V2-500 for Two Meters...  
500 Watts Output in a Deluxe Package!

See your  
dealer or call

**LI INDUSTRIES, INC.**  
**LUNAR**  
COMMUNICATIONS & SYSTEMS DIVISION

Full line of  
separate preamps  
available

...America's Best Kept Secret!

**TEN-TEC**

For the serious  
radio operator!



### PARAGON HF TRANSCEIVER, MODEL 585

MEET AMERICA'S NEWEST FULL FEATURED, SYNTHESIZED TRANSCEIVER. GENERAL COVERAGE ALL MODE RECEIVER TUNES FROM 100 kHz TO 29,999.999MHz. TRANSMIT AT 100 WATTS OUTPUT ON ALL AUTHORIZED FREQUENCIES FROM 1.8 TO 29,999.999 MHz. SSB, CW, FSK AND OPTIONAL FM. NOISE BLANKER AND SPEECH PROCESSOR ARE STANDARD EQUIPMENT. DUAL VFO'S, RX OFFSET.

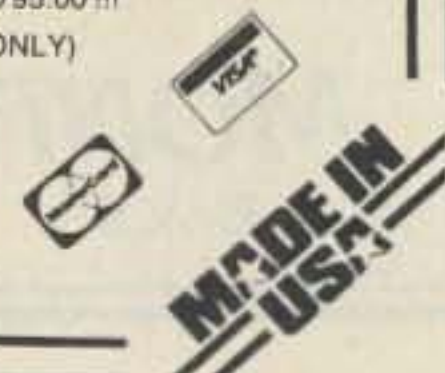
LIST PRICE \$1995.00

SALE PRICE \$1795.00 !!!

(LIMITED TIME ONLY)

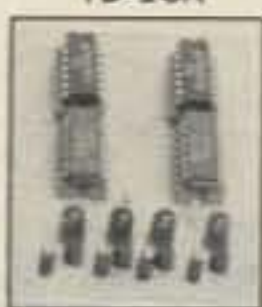
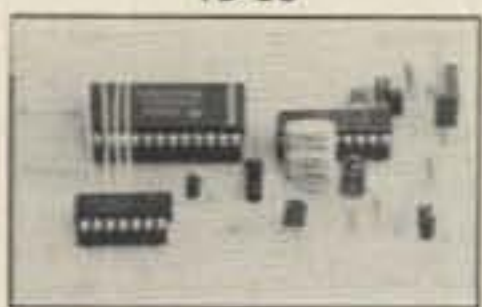
MISSION COMMUNICATIONS  
11903 Alief-Clodine Suite 500  
HOUSTON, TEXAS 77082

(713) 879-7764  
Telex 166872 MCON UT





## TOUCH-TONE\* DECODER-CONTROLLER



- TD-16 DECODES ALL 16 DIGITS PLUS ONE 4 DIGIT SEQUENCE**
- Speaker muting
  - Repeater control
  - Autopatch operation
  - Door openers, etc.
  - Crystal referenced
  - No adjustments
  - Easy hook-up: uses 12V D.C. & speaker level audio
  - COMPLETE KIT: \$44.95

### TD-16A ADDS 4 LATCHED OUTPUTS TO TD-16

- Individual 5 digit on & off codes
- Can directly drive 4 relays
- COMPLETE KIT: \$16.95

**NORCON ENGINEERING**  
P.O. Box 1607 Mooresville, N.C. 28115  
704-664-7817

Visa N.C. residents add 5% sales tax  
MasterCard \*Touch-tone is a trademark of AT&T

CIRCLE 293 ON READER SERVICE CARD

## The BRAPPER BOX Only \$49.<sup>00</sup>



### PACKET WITHOUT MESS!

The BRAPPER BOX, TNC to TRANSCEIVER interface. Avoid the hassles encountered when getting on packet! Two internal amplifiers and three front panel gain controls allow control over audio levels. Internal amplifier for your speaker. Keys HT's and other rigs directly. Directly plugs into TNC (specify type when ordering).



ELECTRON PROCESSING INCORPORATED  
P.O. BOX 708  
MEDFORD, NY 11763 (516) 764-9798  
ADD \$3.50 NY ADD 7.5% TAX CHECK / COD

## Signal Intensifier Only \$29.<sup>00</sup>

A HEARING AID FOR YOUR RECEIVER OR SCANNER!

- Hear ALL the action with your receiver!
- Make small antennas perform like BIG ones!
- The State of the Art in WIDEBAND preamps!
- Make your Counter or Scope extra sensitive!

RUGGED / FULLY ASSEMBLED / 110 VAC POWERED

RFA-16B  
50MHz - 100MHz  
"F" Connectors std.  
15DB gain

RFA-20  
300kHz - 50MHz  
"SO235" Connectors std.  
15DB gain



RC 850 / RC 85 PROGRAMMING TOOL  
EZ-SPEAK is a software package allowing owners of ACC's popular repeater controllers to program both speech and courtesy tones quickly. MS-DOS and C64 versions available. Send for more details Only \$39.95

CIRCLE 291 ON READER SERVICE CARD



IC-900A

# VHF COMMUNICATIONS

**hamtronics®**

HIGH QUALITY MODULES FOR  
REPEATERS, LINKS, TELEMETRY, ETC.

INTRODUCING W2 DRZ VHF/UHF MODULES.  
NOW AVAILABLE A 4 STAGE  
SEQUENCER  
INTRODUCTORY PRICE \$34 PREPAID  
DEALER INQUIRIES INVITED

915 North Main Street  
Jamestown, New York 14701

Western New York's finest amateur radio dealer.  
PH. (716)664-6345

CIRCLE 298 ON READER SERVICE CARD

## QSO PRO

A Easy-To-Use Logbook  
Program For Your

MS-DOS® Compatible Computer

- ★ Complete Cursor Control
- ★ Room to store complete address information
- ★ A Real-Time Log
- ★ Total QSL's by State
- ★ 900 QSO's on floppy, hard disk limited by space available



~~\$39.95~~

Introductory Offer

**\$34.95\***

\*Ohio resident must add 5% sales tax.

Makes Checks Payable To:

MORLAN SOFTWARE  
P.O. Box 2400

East Liverpool, Ohio 43920-0400

CIRCLE 153 ON READER SERVICE CARD

## GIVE YOUR EARS A BREAK! (And the XYL's too!)

The **AUTO-KALL**, AK-10, is a DTMF selective calling unit. It connects to the external speaker jack on your VHF/UHF FM transceiver, scanner, etc. Your speaker remains silent until someone sends your personal 3-digit Touch-Tone\* code. That means you (and the XYL!) don't have to listen to all the chatter all the time. But if someone wants to reach you they can. Great for families with two or more hams, activation of emergency nets, etc.

### FEATURES

- Completely assembled and ready to use.
- Easy setting of your personal code in seconds with small rotary switches. No jumpers to solder.
- Speaker resets automatically to silent-standby and leaves red LED on to let you know someone called if you were away from the rig.
- 8-15 VDC. CMOS circuitry provides for low current operation.
- Built-in speaker. External speaker jack also provided.
- Measures only 1 1/4 x 3 x 5 1/2 inches.
- Decodes all 16 digits.

\*Touch-Tone is trademark of AT&T

**XMAS  
SPECIAL**



**AUTO-KALL AK-10**  
~~\$99.95~~ **\$79.95**

Plus \$3.00 shipping & handling 117 VAC power supply and audio patch cord included.

**Motron Electronics**  
695 W. 21st Avenue  
Eugene, OR 97405  
503-687-2118  
1-800-338-9058

CIRCLE 127 ON READER SERVICE CARD

DVK-100

## Announcing The Digital Voice Keyer

Suggested Amateur  
Net Price **\$249.**

\*Microphone not included

Now for the first time you can enjoy the truly unique operation of a Digital Voice Announcement System, designed specifically for Amateur Radio communications. The DVK-100 represents the latest technology in digital audio processing.

Create your own natural voice contest calls, CQ's etc. Your voice is stored in digital memory, ready to be played back at the touch of a key. The Digital Voice Keyer is not a tape recorder or robotic sounding synthesizer but a true full fidelity natural voice record/playback system.

The DVK-100, is a must for the avid contester and great audio accessory for any Ham Shack.

### FEATURES

- Superior natural voice quality
- Selectable audio compressor
- Micro-processor controlled
- Sealed membrane keyboard
- 32 seconds of message time
- 4 independent voice memories
- PTT/VOX operation
- Positive/negative keyed PIT
- Dynamic/condensor mic input
- ESD/EMI/RFI shielding
- Selectable monitor amplifier with preset level controls
- Selectable end of transmission tone generator

The sound of the future is here today. Contact your local Amateur radio dealer or NTL for further information.

**NTL** NEL-TECH LABS INC. P.O. Box 1030  
Londonderry, NH 03053 (603)434-8234

CIRCLE 130 ON READER SERVICE CARD

## INTERFERENCE?

- ★ Interference Location
- ★ Stuck Microphones
- ★ Cable TV Leaks
- ★ Security Monitoring



- ★ VHF and UHF Coverage
- ★ Computer Interface
- ★ Speech Synthesizer
- ★ 12 VDC Operation

**New Technology** (patent pending) converts any VHF or UHF FM receiver into an advanced Doppler shift radio direction finder. Simply plug into receiver's antenna and external speaker jacks. Uses four omnidirectional antennas. Low noise, high sensitivity for weak signal detection. Call or write for full details and prices.

**DOPPLER SYSTEMS, INC.** P.O. Box 31819  
Phoenix, AZ 85046 (602) 488-9755

CIRCLE 15 ON READER SERVICE CARD



# Mobile Extender Using VOX Control

*Wire up your transceiver to jump over mountains.*

Volunteers have a history of providing quality communications in time of need. Hams were asked to provide communications in our area at several disasters, namely the Coalinga Earthquake (1984) and several forest fires. We found a critical need for hand-held units, but due to terrain and obstructions, these low-power units were occasionally unable to access the repeaters. The following adaptation of the transceiver will help to overcome the obstacles we encountered.

In reviewing our dilemma at a subsequent critique, we concluded that we needed a highly portable remote base unit capable of accessing our repeater plus the ability to work with the hand-held units.

Previous approaches in 73 have dealt with cross-band remote bases by going inside the transceiver to find the COR point to provide control of the PTT of the remote base. Yet today's transceivers are so complex due to synthesizers, CPUs and memories that the average ham would not dare to open the cover. So here is a new approach. The following circuit offers an easy solution.

## Circuit Description

Why not use VOX control instead of digging into the transceiver? This circuit centers around the LM3900 Norton op amp IC, which consists of four independent, dual input, internally compensated amplifiers which runs off a single power supply voltage. This op amp uses supply voltages from 4 VDC to 36 VDC with very low drawn current.

Looking at one section of the circuit drawing, you see where to pick off the audio speaker output from this

transceiver, which goes through a small audio transformer (T1) to provide some impedance matching. This AC voltage (about 10 V rms) must be changed to DC voltage, so the 110 Ohm resistor (R3) and diode (D1)

---

**“Volunteers have  
a history of providing  
quality communications  
in time of need.”**

---

accomplish this task. Following D1 is a capacitor/resistor network that provides a timing function to delay the input (Pin 2) of the LM3900. This prevents words from entering the circuit and being chopped off at midpoint. This network also gives a short squelch tail on the output. At 'no activity', the voltage on Pin 2 is .15 VDC, and on Pin 3 it is .5 VDC. When Pin 2 detects activity, it goes high to .6

VDC and Pin 3 goes low to 0 VDC. The output (Pin 4) goes high to about 7.2 VDC.

The original prototype consisted of an NPN transistor driving a mini relay to accomplish the keying feature. The problem was excessive current drawn via the relay of approximately 80 mA on active. The appropriate circuit was in a packet TNC manual and used a MOSFET. The final choice was a heavier duty device than normally found in TNCs, however.

The 1RF511 Power MOSFET was found at the local radio supply house. This device was about half the price of the relay. The 1RF511 has very low on-state resistance combined with high transconductance, and the capability of sinking 3 amperes. When the gate of the MOSFET is driven high, the drain goes low. The only voltage on the drain pin is supplied by the relay voltage of the transceiver. The drain pin on the 1RF511 has a maximum voltage of 60 VDC. Parallel to the drain pin on the MOSFET is an over-voltage protection circuit consisting of a Zener diode (Z1) and a .01 disc capacitor (C3) to prevent voltage spikes from destroying the MOSFET.

The circuit that comprises R10, 2N2222 NPN, LED and R13 is an indicator to tell when the channel is active. The LED is mounted on the front panel. This portion of the unit is not mandatory, but does give good visual indication of the system in use.

The transmit/audio section is not elaborate. The capacitor (C7) and resistor (R16) were chosen to give the best audio response. The speaker/audio input to the Extender is tied to the microphone input of the other transceiver through this series capacitor/resist-

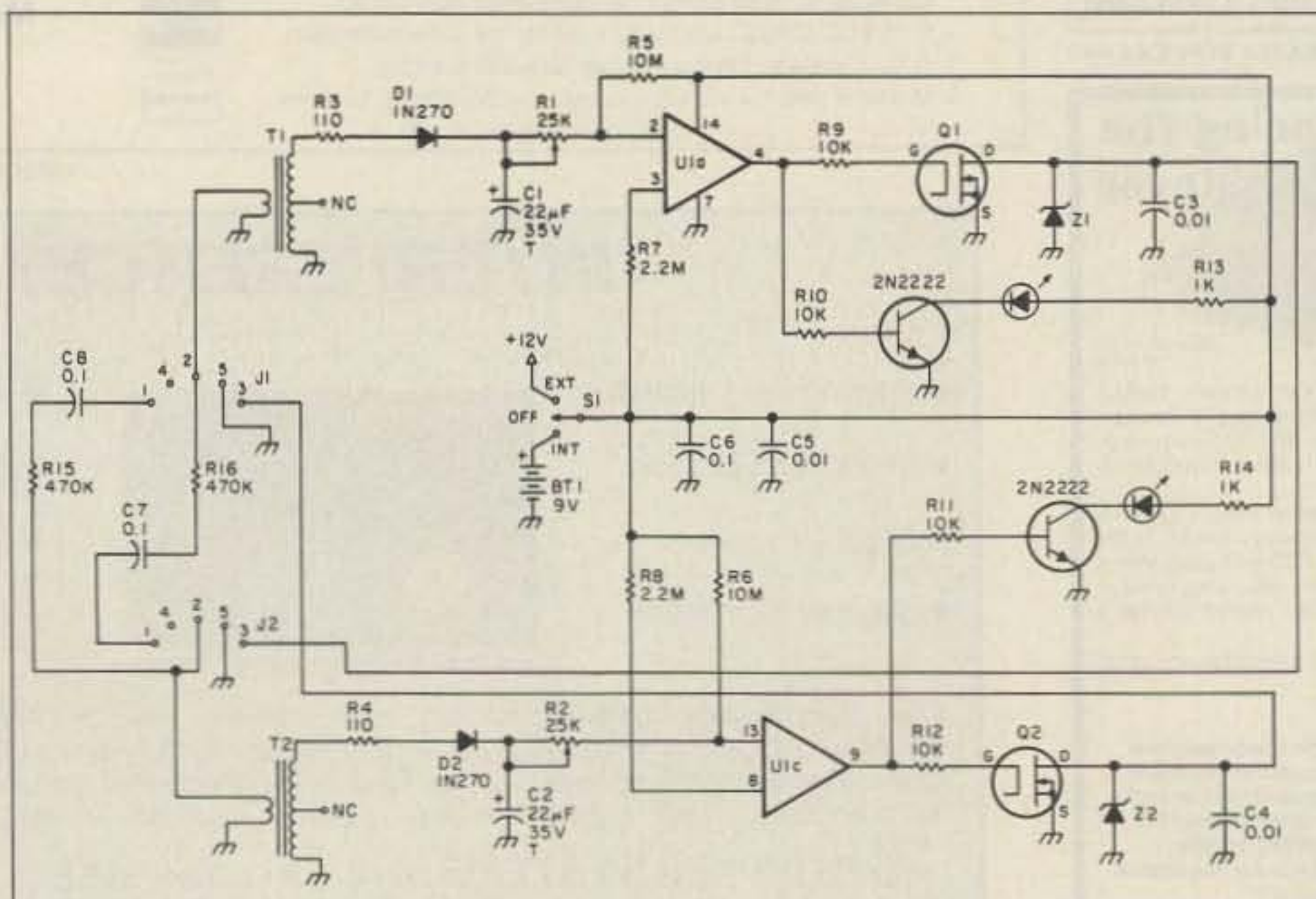


Fig. 1. Circuit diagram for mobile extender.



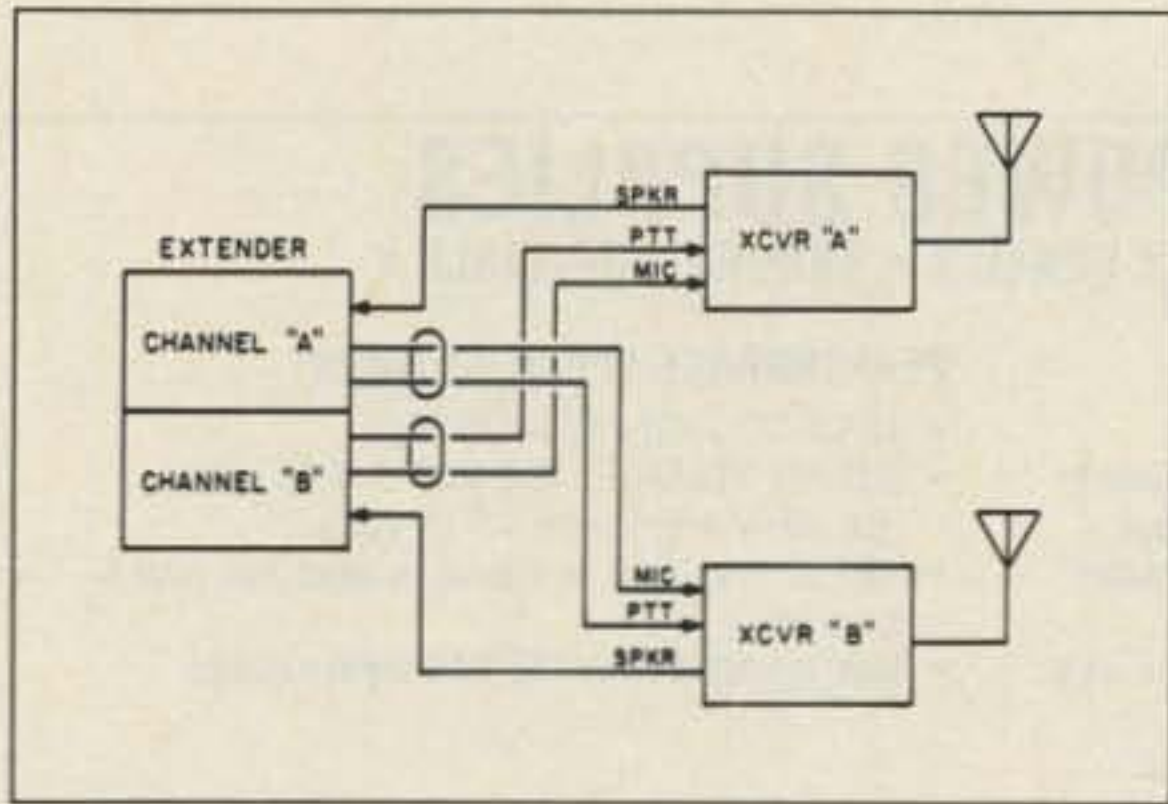


Fig. 2. Flow chart and wiring.

or network. These values may change depending on your transceiver.

### Tying It All Together

The wiring chart indicates that it is a very simple circuit to interface. XCVR "A" speaker output goes to channel "A" input. Channel "A" output (PTT/MIC) goes to XCVR "B" microphone jack (reverse for the other channel). XCVR "A" should be on your repeater channel (or can be on simplex). XCVR "B" can be on any unused Simplex Channel or on another VHF/UHF band. If XCVR "A" is on a 2-meter repeater channel, then XCVR "B" can be on either 220 or 440 mHz.

To make this circuit a repeater, set each XCVR on the frequency you want, and set the mode switch to Simplex. Disconnect the PTT/MIC cable from XCVR "A" and the Spkr plug on XCVR "B".

This version, using the power MOSFET for keying, dropped the current drain to 9 mA, active. This made it very practical to use an internal 9-volt battery supply. S1 is an On-Off-On switch for selecting either the internal or external power source.

To use this unit, plug in the appropriate cables to the transceivers. Adjust the volume controls to about half-way on each transceiver for initial tests. By selecting an active repeater frequency on XCVR "A", and listening on another receiver on XCVR "B", adjust the volume control on XCVR "A" so the audio quality is not distorted into the receiver listening to channel "B". Do the same on XCVR "B".

If you have installed the LED indicators, you will notice that when either of the receiver squelch drop out, the LED will remain on for a few seconds. This delay

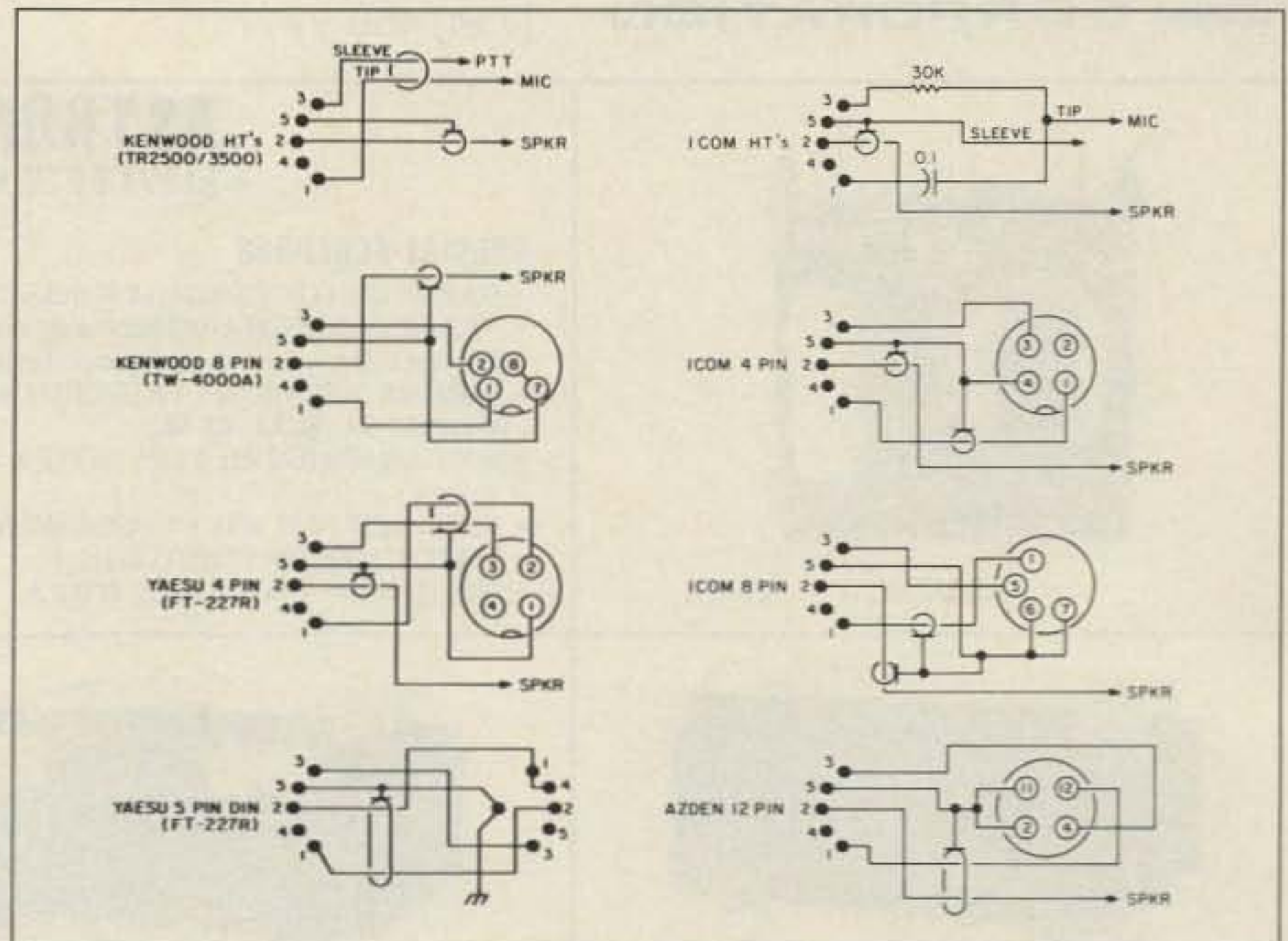


Fig. 3. 5-Pin DIN plug output to various radios.

can be adjusted by turning the 25k pot (R1/R2) to a desired setting. This changing of the hang time will also affect the timing characteristics on Pin 2 of the LM3900. You may have to adjust both the volume control on the transceiver and the 25k pot to get the timing where you want it.

I made my unit with a small 4" x 4" pre-made circuit board, using point-to-point wiring. A custom-made circuit board could be produced reducing the size by half. A box measuring 4" x 6" x 2" was used to

house the unit with the I/O jacks, power switch and external power jack on the rear panel.


When the extender is in operation you will first notice a silence upon release of the PTT on the unit you are operating. Approximately 2 seconds later, you will hear the distant repeater squelch tail, or beep tone. When you talk to the extender from your unit, it takes a short time for the extender to detect your voice and key the other unit which goes to the repeater. Remember, this is VOX. Any pause will

let the extender drop out after a second or two. A good practice is to say, Aaaah, just as you key your unit, in order to activate the extender. This will take some practice when you operate through the extender.

### Comments

This circuit has worked quite well. It has been used successfully with two hand-held units, mobile units and base stations. The diagrams for various units depict the wiring for the cable assemblies.

The project can come to good use at parades, public events, and search and rescue work. Remember, you've just created a remote base or repeater, so you must say "remote base" or "repeater" with your call sign when you use the extender.

Note: Any comments on this project are welcomed, and a SASE will be appreciated. 

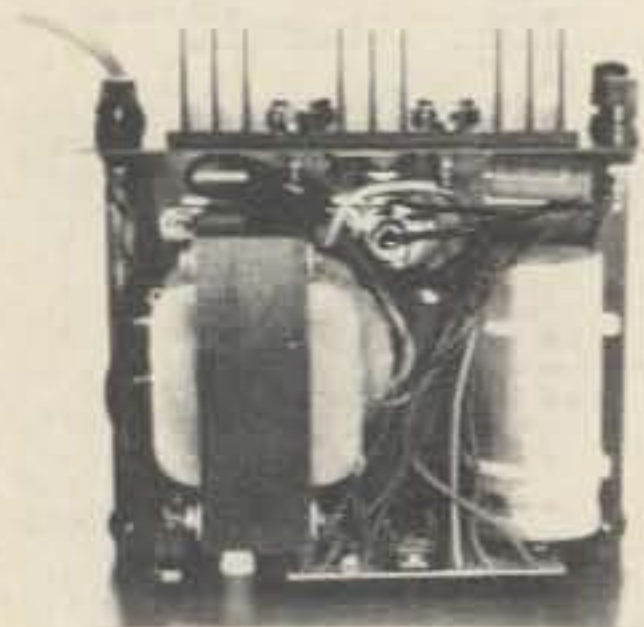
### PARTS LIST

<b>Transformers</b>		
T1, T2	8 Ohm: 1000 Ohm mini-audio xmfr	(RS273-1380)
<b>Integrated Circuit</b>		
U1	LM 3900 Norton OP Amp	(RS276-1713)
<b>Transistors</b>		
Q1, Q2	1RF511 Power MOSFET	(RS276-2072)
Q3, Q4	General Purpose NPN (2N2222, 2N3904, etc.)	
<b>Diodes</b>		
Z1, Z2	1N4752 1 watt Zener (33 v)	
D1, D2	1N270 or any diode	
<b>Resistors</b>		
R1, R2	25 kilohm mini-pot	
R3, R4	110 Ohm, 1/2 watt	
R5, R6	10 megohm, 1/4 watt	
R7, R8	2.2 megaohm 1/4 watt	
R9-R12	10 kilohm, 1/4 watt	
R13, R14	1 kilohm, 1/4 watt	
R15, R16	470 kilohm, 1/2 watt	
<b>Capacitors</b>		
C1, C2	22 mfd, 35 v Tant.	
C3-C5	.01 mfd, 50 v disc	
C6-C8	.1 mfd, 50 v disc	
<b>Jacks</b>		
J1, J2	5 pin DIN jacks	
<b>Switch</b>		
S1	on-off-on main-switch	
<b>Battery</b>		
BT1	9 volt alkaline battery	



## ASTRON POWER SUPPLIES

• HEAVY DUTY • HIGH QUALITY • RUGGED • RELIABLE •



INSIDE VIEW — RS-12A

### 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" × 5 1/4" RACK MOUNT POWER SUPPLIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RM-12A	9	12	5 1/4 × 19 × 8 1/4	16
RM-35A	25	35	5 1/4 × 19 × 12 1/2	38
RM-50A	37	50	5 1/4 × 19 × 12 1/2	50
• Separate Volt and Amp Meters				
RM-12M	9	12	5 1/4 × 19 × 8 1/4	16
RM-35M	25	35	5 1/4 × 19 × 12 1/2	38
RM-50M	37	50	5 1/4 × 19 × 12 1/2	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 × 4 3/4 × 5 3/4	4
RS-4A	3	4	3 3/4 × 6 1/2 × 9	5
RS-5A	4	5	3 1/2 × 6 1/8 × 7 1/4	7
RS-7A	5	7	3 3/4 × 6 1/2 × 9	9
RS-7B	5	7	4 × 7 1/2 × 10 3/4	10
RS-10A	7.5	10	4 × 7 1/2 × 10 3/4	11
RS-12A	9	12	4 1/2 × 8 × 9	13
RS-12B	9	12	4 × 7 1/2 × 10 3/4	13
RS-20A	16	20	5 × 9 × 10 1/2	18
RS-35A	25	35	5 × 11 × 11	27
RS-50A	37	50	6 × 13 3/4 × 11	46

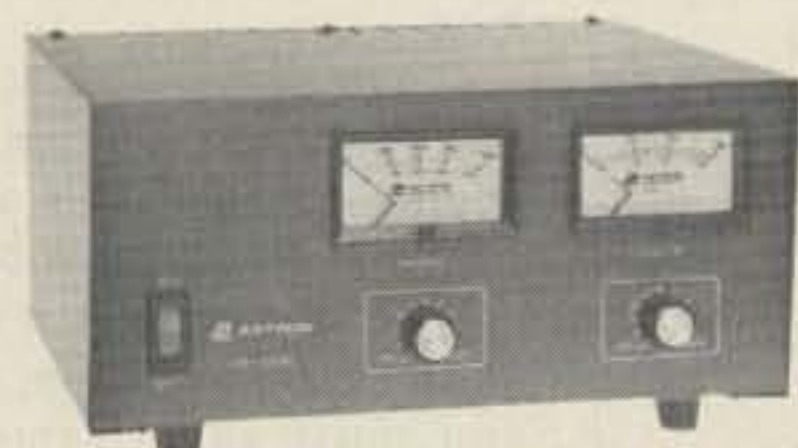
### RS-M SERIES



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	4 1/2 × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10 1/2	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13 3/4 × 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)			ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
	@13.8VDC	@10VDC	@5VDC			
VS-12M	9	5	2	12	4 1/2 × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10 1/2	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13 3/4 × 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5 1/4 × 19 × 12 1/2	38
VRM-50M	37	22	10	50	5 1/4 × 19 × 12 1/2	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 × 7 1/2 × 10 3/4	10
RS-10S	7.5	10	4 × 7 1/2 × 10 3/4	12
RS-12S	9	12	4 1/2 × 8 × 9	13
RS-20S	16	20	5 × 9 × 10 1/2	18



## Handheld Transceivers: Enjoyment Unlimited!

**H**andheld VHF and UHF FM transceivers are extremely popular units among today's radio amateurs, and with good reason. The flexible capabilities of these small "go anywhere" portables are ideal for talking with local friends and coordinating group activities in an on-the-spot manner, and their benefits during emergencies are truly invaluable. The large number of range-extending VHF and UHF repeaters located throughout our lands also assure reliable communications using low power transceivers. Since the wide variety of presently available handheld transceivers seems to make selecting a particular unit somewhat perplexing, however, ICOM wishes to share field-acquired insight via this issue's Tech Talk.

The prime considerations in any handheld transceiver are smooth operation, top-quality construction and performance, and long-run customer support. Initially, consider a unit that's comfortable to carry and operate, then review its less obvious and internal attractions. Extensive use of VHF and UHF bands, for example, always encourage high intermod immunity. That is, the ability to copy a weak signal without undue noises or squelch "falsing" when you're physically near other signal sources such as radio pagers, mobile phone relays, etc. Likewise, sincere factory-backed service is the single most important factor separating one manufacturer's products from others. **ICOM handhelds are proud pacesetters in all of the previously discussed areas: a reflection of ICOM's dedication to keep you communicating through all the exciting times ahead.** Three styles of ICOM handhelds are now available to fit your needs.

The new and exciting ICOM MICRO

(IC- $\mu$ 2AT) handheld has acquired immediate popularity, as it combines all of today's most respected assets in an easy-to-operate and extremely versatile package. Liberal use of narrowband filters plus high gain/low noise circuits ensure **maximum weak signal sensitivity, selectivity and intermod immunity.** Those designs, like all models of ICOM handhelds, are complemented by fold-out pc boards mounted inside a **steel window frame-type subcase** for physical protection and electrical shielding. The complete unit is enclosed in a high-impact case.

As supplied with its attendant BP-22 slide on/off battery pack, the ICOM MICRO (IC- $\mu$ 2AT) measures only 5.6 x 2.2 x 1.1 inches (H, W, D) and produces 1.6 watts output. Replacing that battery pack with ICOM's optional BP-21 reduces the transceiver's overall height to 4.6 inches while lowering RF output to 1.2 watts: the perfect shirt pocket or ladies' handbag companion. Alternately, substituting ICOM's optional BP-24 battery pack increases the IC- $\mu$ 2AT's height to 6.6 inches while raising RF output to 2.6 watts for fringe/remote area use. Assuming the ICOM MICRO's (IC- $\mu$ 2AT's) supplied 4-inch miniduck is then exchanged with a popular BNC-fitted gain antenna such as ICOM's optional  $\frac{5}{8}$  wave whip, **the transceiver's effective radiated power increases above that of much larger five-watt units.** Mixing and matching accessories thus allows the ICOM MICRO (IC- $\mu$ 2AT) to "change face" on a moment's notice: a truly versatile transceiver!

Operating the ICOM MICRO (IC- $\mu$ 2AT) merely involves step-tuning any of its 10 memories to a desired frequency (even 162MHz NOAA weather!) using its top-mounted rocker switches. Each memory continuously retains its

last selected frequency. The ICOM MICRO's (IC- $\mu$ 2AT's) transmitter offset is selected by a rear panel "simplex/+/-duplex" switch. If "odd split" operation is desired, hold the display's nightlight button, switch the transceiver on, then step-tune the .600 (kHz) reading to any desired separation. The ICOM MICRO's (IC- $\mu$ 2AT's) PL tone frequencies are standard and can be selected via a mini DIP switch inside its battery retaining plate. A 440MHz MICRO, the IC- $\mu$ 4AT, is also available for 70cm enthusiasts.

ICOM's IC-02AT, IC-03AT, IC-04AT and IC-12AT transceivers continue their reign of supremacy as today's most deluxe and full-featured handhelds. These advanced technology units include direct keypad operation, memory storage of frequency, standard or odd repeater splits plus PL tones. Three scanning modes and priority channel operation "round out" these popular units. Their operation may be simple or sophisticated as personally desired and/or expanding with your future interests. A pocket guide is also included with these top-quality units for initial operating convenience.

ICOM also continues producing the ever-popular and easy-to-operate IC-2AT, IC-3AT, and IC-4AT units. These "basic style" handheld transceivers are perfect for budget-conscious amateurs desiring to expand their VHF/UHF horizons using top performers of time-proven design.

ICOM handhelds are also supported by a full line of matching accessories and, excluding MICRO unit battery packs, they are **interchangeable** between transceivers. **ICOM is your full line, full-time amateur radio equipment supplier of incomparable quality, performance and service!**







# ASSOCIATED RADIO

8012 CONSER BOX 4327  
OVERLAND PARK, KANSAS 66204

VISA-MC  
AMEX-DISC.



**BUY — SELL — TRADE**  
**ALL BRANDS NEW AND RECONDITIONED**



**WE'LL BUY YOUR EXTRA RIG**  
**OR ENTIRE STATION**

Call **913/381-5900**

DISCOUNT PRICES  
**SEND \$2 FOR CATALOG**  
**AND WHOLESALE LIST**

## SPECIALIZED COMMUNICATIONS FOR TODAY'S RADIO AMATEUR!



If you are ACTIVE in FSTV  
SSTV, FAX, OSCAR, PACKET,  
RTTY, EME, LASERS,  
or COMPUTERS, then you need

**“SPEC-COM!”**

Published 10 Times  
Per Year  
By WB0QCD

(Serving Amateur Radio Since 1967!)

**SIGN UP TODAY AND GET 3 BACK ISSUES “FREE”!**

Join our growing membership at the regular \$20 per year rate and we will send you 3 back issues (of your choice) absolutely “free”! We also have 2 and 3 year discounts at just \$38 and \$56. Foreign surface and air mail subscriptions also available, please write for details. Add \$2.00 for a special 19-year “master article index” issue. Allow 2-3 weeks for your first issue. Special TRS-80C, Commodore 64, Apple, IBM Software Catalog Available!

**THE SPEC-COM JOURNAL**  
P.O. BOX H,  
LOWDEN, IOWA 52255



Credit Card Orders (5% added)

Iowa Residents Add 4% State Sales Tax

CIRCLE 69 ON READER SERVICE CARD

**800-882-1343**



	IC-735	List	Juns
IC-761 New Top of Line		2499.00	Call \$
IC-735 Gen. Cvg. Xcvr		\$999.00	Call \$
IC-751A Gen. Cvg. Xcvr		1649.00	Call \$
R7000 Gen. Cvg. Rcvr.		1099.00	Call \$
R71A Gen. Cvg. Rcvr.		949.00	Call \$
IC-28A/H FM Mobile 25w/45w	429/459		Call \$
IC-37A FM Mobile 25w		499.00	Call \$
IC-900 Super Multi Band Mobile		589.00	Call \$
IC-04AT UHF HT		449.00	Call \$
IC-48A UHF 45w		459.00	Call \$
IC-38A FM Mobile 25w		459.00	Call \$
IC-02AT FM HT		399.00	Call \$
IC-μ2AT Micro HT		329.00	Call \$

## KENWOOD



	TS-440S/AT	List	Juns
TS-940SAT Gen. Cvg. Xcvr		\$2249.95	Call \$
TS-430S Gen. Cvg. Xcvr		819.95	Call \$
TS-711A All Mode Base 25w		899.95	Call \$
TR-751A All Mode Mobile 25w		599.95	Call \$
TS-440S/AT Gen. Cvg Xcvr.		1199.95	Call \$
TM-2530A FM Mobile 25w		429.95	Call \$
TM-2550A FM Mobile 45w		469.95	Call \$
TM-2570A FM Mobile 70w		559.95	Call \$
TH-205 AT, NEW 2m HT		259.95	Call \$
TH-215A, 2m HT Has It All		349.95	Call \$
TH21BT 2M HT		259.95	Call \$
TH31BT 220 HT		269.95	Call \$
TM-3530AFM 220MHz 25w		449.95	Call \$

## YAESU



	FT 757GX	List	Juns
FT-757 GX Gen. Cvg. Xcvr		995.00	Call \$
FT-767 4 Band New		1895.00	Call \$
FT-211RH		459.95	Call \$
FT-290R All Mode Portable		579.95	Call \$
FT-23 R/TT Mini HT		299.95	Call \$
FT-209RH RM Handheld 5w		359.95	Call \$
FT-726R All Mode Xcvr		1095.95	Call \$
FT727R 2M/70CM HT		479.95	Call \$
FT2700RH 2M/70CM 25w		599.95	Call \$



**3919 Sepulveda Blvd.**  
**Culver City, CA 90230**  
**213-390-8003**

CIRCLE 272 ON READER SERVICE CARD



# Make VIC Talk

*This little chip offers big benefits.*

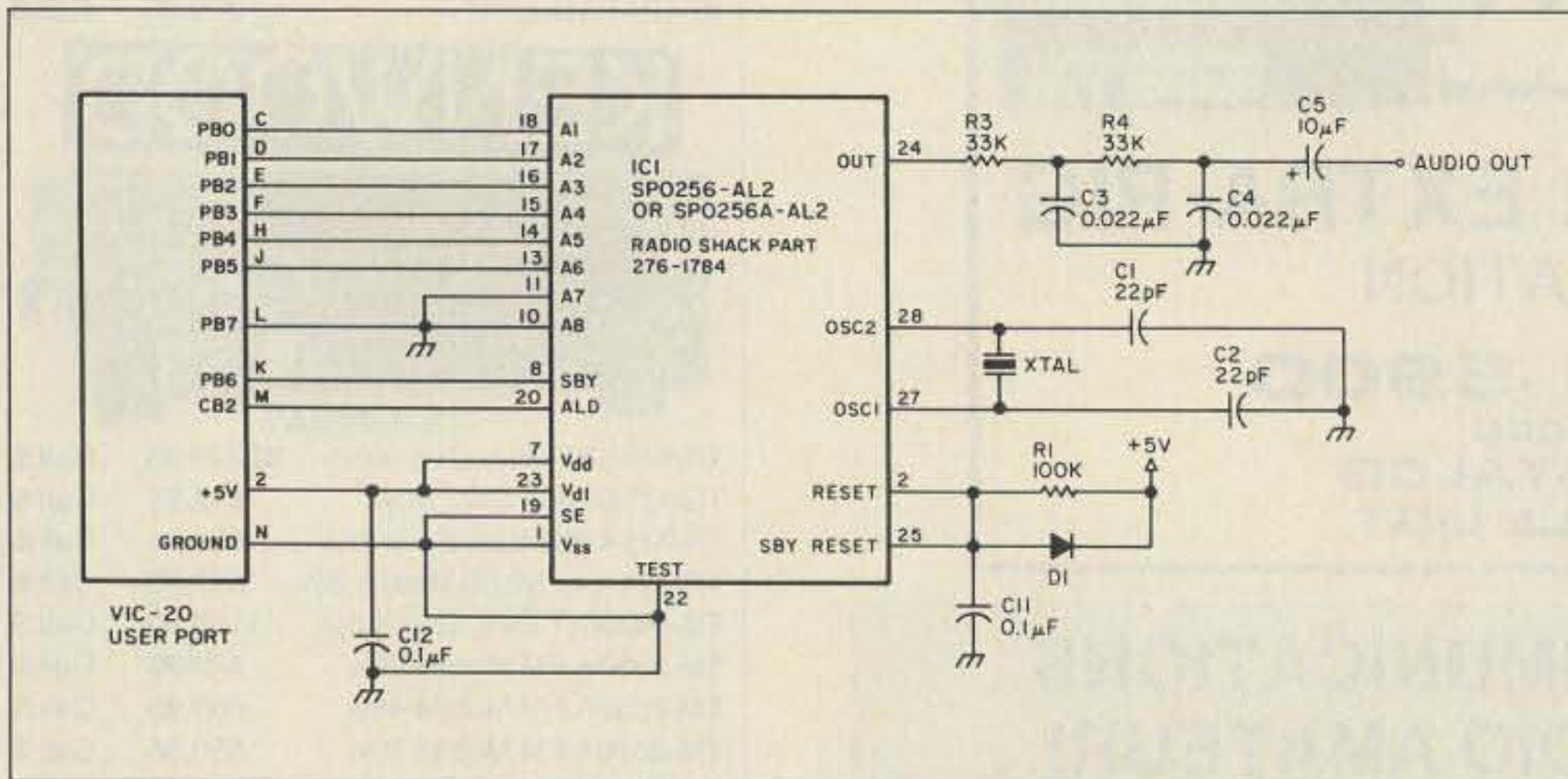
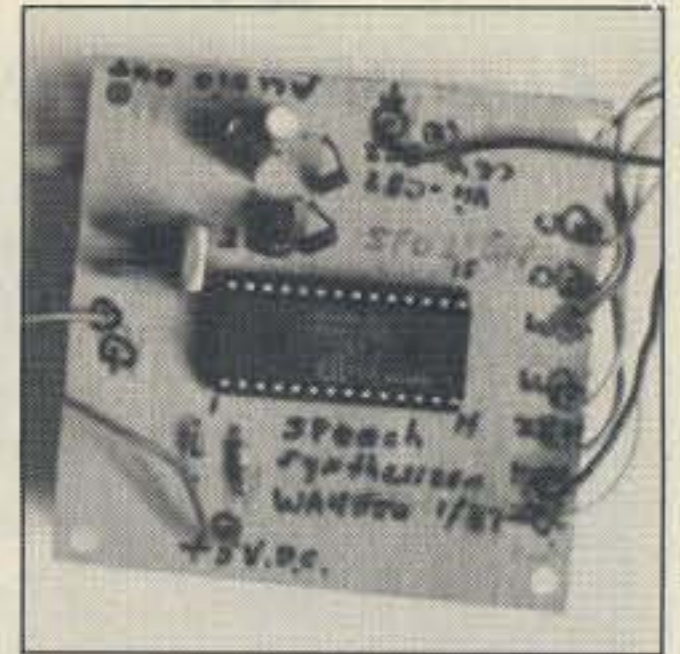


Fig. 1. Schematic diagram.

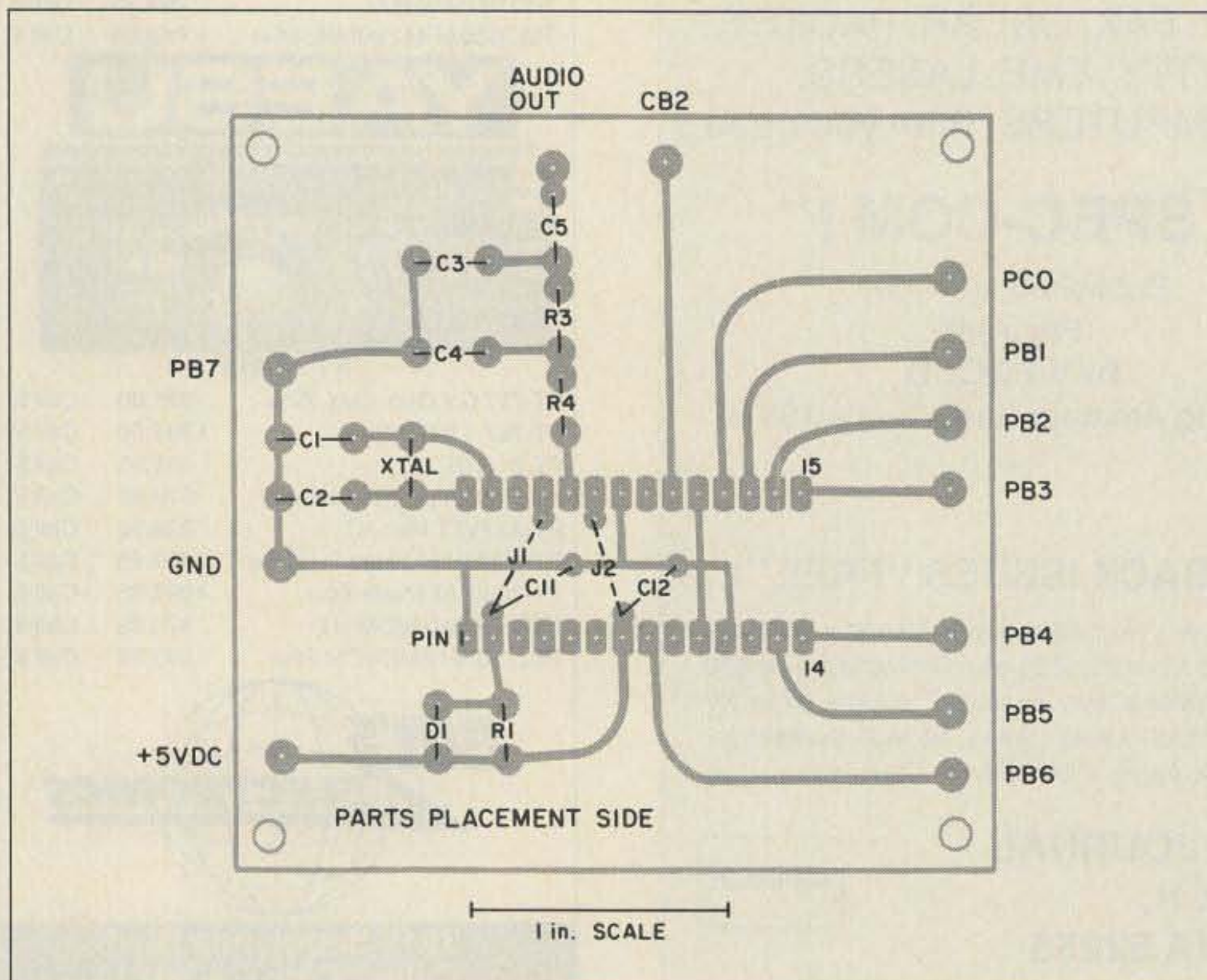


Fig. 2. Parts placement.

**D**o you want to teach your Vic-20 or Commodore 64 to talk? Here is a construction project that involves only one chip. It can be adapted to most PCs.

A talking computer offers many advantages: voiced I.D. for repeaters, talking clocks or thermometers, plus impressive games and teaching aids. All this and more is offered by a chip priced at \$13 from Radio Shack.

## Construction

The circuit can be put on a solderless breadboard. However, I have included my printed circuit pattern made from dry transfers. The parts are mounted on the non-foil side as usual, with the exception of jumper wires J1, J2 and capacitors C11, C12 which were soldered directly on the foil side (see Figure 2. Parts Placement).

The audio out requires outboard audio amplification. Fortunately, my computer monitor had an audio input. If this convenience is absent, almost any audio amp will do, including a very quick home brew using another Radio Shack chip, LM386, priced at \$1. Instructions with the speech chip include audio amplification directions. Use shielded audio line to eliminate AC hum.

All other connections go directly to the user port on the back of your VIC-20. Ribbon cable would look good here; however, I used some surplus stranded hookup wire, courtesy of Ma Bell. CB2 on the user port of the VIC-20 is the one connection that differs on the C-64. In the case of the latter, use PC2 located at Pin 8. All other connections are the same for both computers.

Connection to the user port requires the 12/24 pin card edge socket. If you don't want to wait for your mail order, then get the 12/44 from Radio Shack and modify it with a hack saw. It helps to have a small two-inch bolt at both ends to get a grip on it with your fingers for mounting and removal from the back of the computer.

Frequency of the crystal will control the voice pitch. Instructions with the chip call for 3.12 MHz. However, a 3.579545 MHz TV



colorburst crystal from Radio Shack works fine, and it's cheap.

### Using the Synthesizer

With a little basic programming it is easy to make the chip say any English word using an address table for data numbers as part of your program. The numbers must be in the form of decimal addresses. A booklet that comes with the chip offers a limited dictionary of words and details of how to make the chip speak them. It will also explain how to create more words. To help you get started, the sample program at right will teach your PC its first sentence. Notice that each line of data makes up a different word. You can change the data numbers to make new words and add more lines of data for longer sentences. Be sure to also change the "27" in line 65 to match the total of data numbers to be read.

For the C-64 you will need to change the following lines since its memory address locations controlling the user port are different from that of the Vic.

```
10 POKE 56579,63
40 POKE 56577,A
50 POKE 56577,0
60 PB=PEEK(56577) 73
```

### References:

1. "Talk Is Cheap" by Thomas C. Johnson, WB6NJK, October, 1985, 73.
2. "Speech Synthesizer" by Ricardo Jiminez and Adrian Valle, August, 1986, Radio Electronics.

### PARTS LIST

#### Resistors

R1 100,000 Ohm  
R3, R4 33,000 Ohm

#### Capacitors

C1, C2 22pF ceramic  
C3, C4 .022uF ceramic  
C5 10uF, 10 volt, electrolytic  
C11, C12 .1uF ceramic

#### Semiconductors

IC1 SP0256-AL2 Speech processor (Radio Shack 276-1784) \$12.95  
D1 1N914 Switching Diode

#### Other Components

XTAL 3.12 MHz Crystal or 3.579545 MHz (Radio Shack 272-1310) \$ 1.69  
12.24 pin card edge socket (Jameco Electronics)  
or 12/44 pin modified to 12/24 (Radio Shack 276-1551) \$ 2.99  
28 pin IC Socket (Radio Shack 276-1997) \$ .89

### SAMPLE VIC PROGRAM

```
10 POKE 37138,63
20 FOR J=1 TO 27
30 READ A
40 POKE 37136,A
50 POKE 37136,0
60 PB=PEEK(37136)
70 F=PBAND64
80 IF F>64 THEN 60
90 NEXT J
100 DATA 24,6,0:REM I
110 DATA 7,7,16,2:REM AM
120 DATA 24,2:REM A
130 DATA 13,23,23,2,42,12,44,0:
    REM TALKIN
140 DATA 42,15,16,9,49,22,13,51,1,4:
    REM COMPUTER
160 RESTORE
170 FORT=1 TO 500:NEXTT:GOTO20
200 END
```

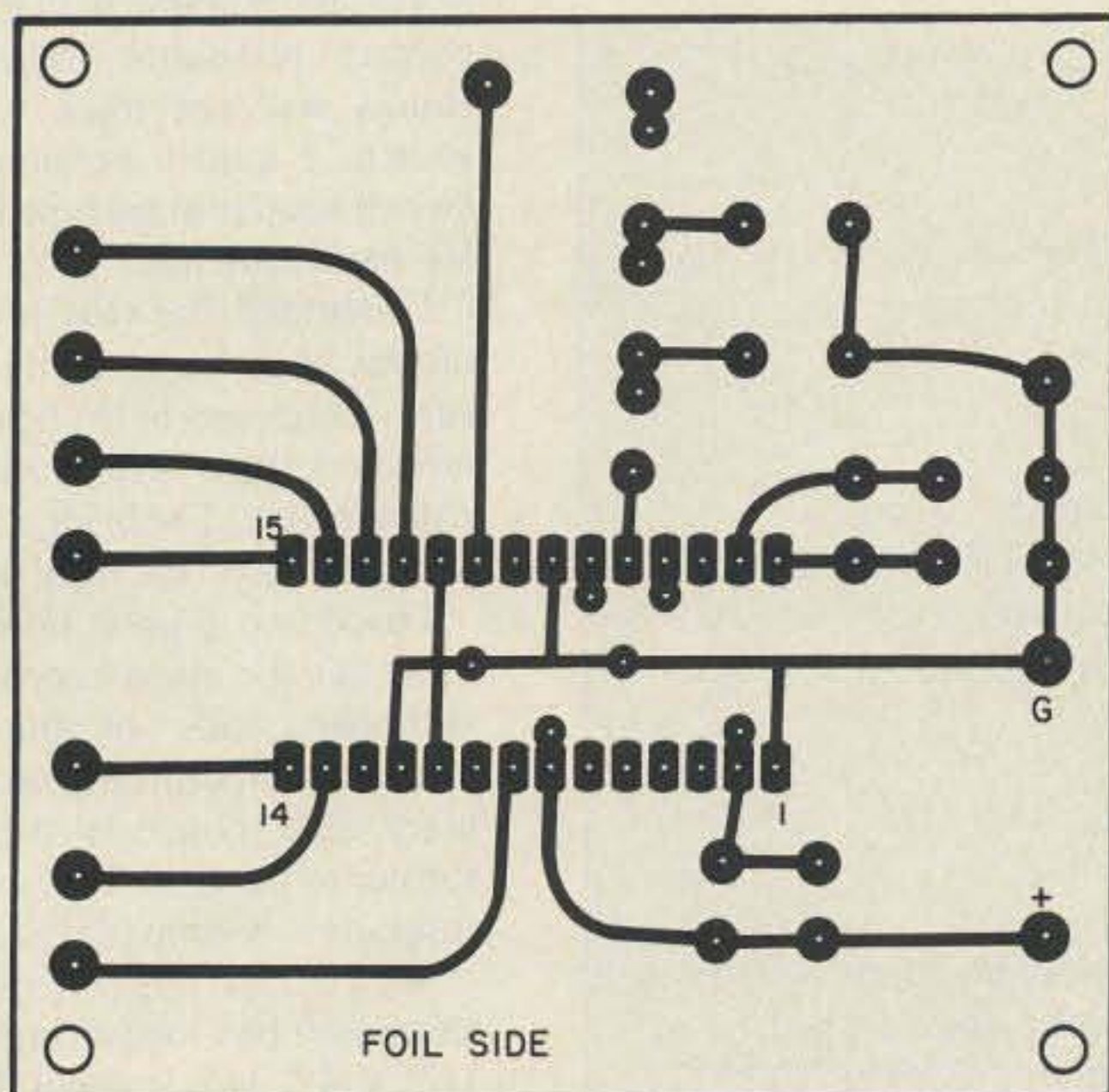


Fig. 3 Foil side.

AA	24	HOT	NN1	11	THIN
AE	26	HAT	NN2	56	NO
AR	59	ALARM	NG	44	ANCHOR
AO	23	AUGHT	OY	5	BOY
AW	32	OUT	OW	53	BEAU
AX	15	SUCCEED	OR	58	STORE
AY	6	SKY	PP	9	POW
BB1	28	BUSINESS	RR1	14	RURAL
BB2	63	BUSINESS	RR2	39	BRAIN
CH	50	CHURCH	SH	37	SHIP
DD1	21	COULD	SS	55	VEST
DD2	33	DO	TH	29	THIN
DH1	18	THEY	TT1	17	PART
DH2	54	THEY	TT2	13	TO
EH	7	END	UW1	22	TO
EY	20	BEIGE	UW2	31	FOOD
EL	62	SADDLE	UH	30	BOOK
ER1	51	FIR	VV	35	VEST
ER2	52	FIR	WH	48	WHIG
FF	40	FOOD	WW	46	WOOL
GG1	36	GOT	XR	47	REPAIR
GG2	61	GUEST	YR	60	CLEAR
GG3	34	WIG	YY1	49	YES
HH1	27	HE	YY2	25	YES
HH2	57	HOE	ZH	38	AZURE
IH	12	SIT	ZZ	43	ZOO
IY	19	SEE			
JH	10	DODGE	10ms	0	Pause PA1
KK1	42	CAN'T	30ms	1	Pause PA2
KK2	41	SKY	50ms	2	Pause PA3
KK3	8	COMB	100ms	3	Pause PA4
LL	45	LAKE	200ms	4	Pause PA5
MM	16	MILK			

Table 1. Speech Processor Addresses.



J. T. Collins NØFNF  
18 Zinzer Court  
St. Louis MO 63123

# NiCd Charger/Power Supply

*An easy two-in-one construction project.*

Since I had accumulated a number of NiCd batteries and battery packs of various voltage and current ratings, I decided to construct a flexible piece of gear that would allow me to manipulate the battery charging cycles. The unit described here does the job nicely. It also serves as a variable power supply for the test bench.

## The Circuit

To begin the project, I outlined the features and capabilities I required. I decided that 15 volts would suffice. I also needed no more than 500 mA of current for charging purposes. I found that the three-terminal, adjustable voltage regulators had a range of applications that would fit my needs.

These devices are available in several current ratings. The lowest is a 1-amp device which I would have used, except that it is in a TO-3 case. I wanted to use a TO-220 case, since it is easier to mount. I chose the National LM-317T 1.5-amp devices. The additional current capability is useful when using the unit as a power supply. I needed two regulators, one to regulate the voltage and the other to regulate the current.

Calculating the voltage required, and after factoring in the losses, I found that I would need a transformer with at least a 15-volt secondary. This would insure enough voltage for the regulator to operate properly when using the full 15-volt output. Radio Shack listed an 18-volt, 2-amp, center-tapped transformer with more capacity than needed, but the price was right. I also found later that the LM-317T, with a good heat sink, would handle almost 2 amps.

With an 18-volt transformer, the available regulated voltage is

approximately 20 V. Other users might elect to use a meter in the 20–25-Vdc range to take advantage of this additional voltage.

When I first constructed my unit, I had both regulators wired in series. This scheme worked fine as a current-limiting charger but required too much adjustment when the unit was used as a power supply. For this reason, I settled on the circuit shown here.

When used as a power supply, the current-limiting IC is switched out of the circuit. The current varies with demand up to the rated capacity. When used as a battery charger, this IC is placed in the circuit and output current is adjusted as needed.

The 2.2k resistor across the output estab-

lishes a nominal minimum load of 4 mA. Without this resistor the indicated voltage with no load is higher than the actual voltage applied to a load.

## Construction

The construction is straightforward point-to-point wiring. Due to the few components involved, I found no reason to use a circuit board.

You can find most of the components in a well-stocked junk box or purchase them at a nearby Radio Shack. The only items that may cause difficulty are the 10-turn 100-Ohm pot for adjusting current and the rotary switch used for the meter switching. The rotary switch that Radio Shack sells is not suitable with too much contact resistance. The meter shunts will not track with this switch. I used a ceramic wafer switch similar to the type found in HF band switches.

I mounted the two regulators on the back panel of the enclosure, which acts as the heat sink. I mounted them with sockets for convenience. The bridge rectifier also mounts on the back panel.

I used two 8-point tie strips to make all the connections on the secondary side of the transformer. A 5-point strip on the primary side connects the transformer to the line. This strip also supports a ½-amp pigtail fuse.

My enclosure is a home-made aluminum box measuring 6" x 3-1/2" x 4". This is about the right size to house the components with plenty of room on the front for the meter and controls.

The meter shunts shown on the schematic were made from standard value resistors. A .56-Ohm resistor allows a full-scale reading of 150 mA. Parallel .1-Ohm

## Parts List

C-1	Cap. Elect. 2200 uF 35 Vdc •
CR1	Rectifier, Bridge 6-amp, 50 PRV. •
D-1	Diode, LED 20 mA.
F-1	Fuse, ½-amp Pigtail type
M-1	Meter, 0–15 Vdc •
R-1	Resistor, 180-Ohm, ½-watt
R-2	Potentiometer, 2.5k (linear taper)
R-3	Potentiometer, 100-Ohm, 2-watt (10-turn preferred)
R-4	Shunt, Meter .056-Ohm (See text)
R-5	Shunt, Meter .57-Ohm (See text)
R-6	Resistor, 15k-Ohm, ½-watt
R-7	Resistor, 1.5k-Ohm, ½-watt
R-8	Resistor, 2.2k-Ohm, ½-watt
S-1	Switch, Toggle SPST •
S-2	Switch, Toggle DPDT •
S-3	Switch, Rotary 2-Pole, 3 or more positions
T-1	Transformer, 18 volt at 2 amps, Center-tapped •
U-1, 2	IC. Adj. Voltage Regulator (LM-317T) •

Miscellaneous, Suitable Enclosure, Tie Strips, Binding Posts, Line Cord, Knobs, Insulators and Mounting Hardware for U-1 and U-2, Hook-up Wire.

Items marked with "•" are available at Radio Shack. Some items not marked may also be available there.



**SYNTHESIZED  
SIGNAL GENERATOR**

MADE IN  
USA



MODEL  
SG-100F  
\$429.95  
delivered

• Covers 100 MHz to 199.999 MHz in 1 kHz steps with thumbwheel dial • Accuracy +/- 1 part per 10 million at all frequencies • Internal FM adjustable from 0 to 100 kHz at a 1 kHz rate • External FM input accepts tones or voice • Spurs and noise at least 60 dB below carrier • Output adjustable from 5-500 mV at 50 Ohms • Operates on 12 Vdc @ 1/2 Amp • Available for immediate delivery • \$429.95 delivered • Add-on accessories available to extend freq range, add infinite resolution, AM, and a precision 120 dB attenuator • Call or write for details • Phone in your order as fast COD shipment.

**VANGUARD LABS**

196-23 Jamaica Ave., Hollis, NY 11423  
Phone: (718) 468-2720 Mon.-Thurs.

CIRCLE 79 ON READER SERVICE CARD

**THE EXPERT'S EDGE**

HELP AT LAST FOR

Computerizing Radios:  
Faster Operation, Instant QSY's and Mode Control  
Contesting:  
Faster QSO's, Integrated Terminal, and Radio Operation  
Digital Operators:  
Novice to Extra

**FEATURES**

- Computerized radio and terminal control
- Menu driven choice selection
- 40 function keys
- Pop-up Menus
- Split screens, color windows show speeds & frequencies
- Keyboard radio frequency control
- 5000 bytes memory keyer with automatic transmit, receive transitions

**SUPPORTED EQUIPMENT**

Radios	Terminal Units	Computers
Kenwood TS-940 TS-440, TS-711, TS-811	AEA PK 232 Pakratt™ Kantronics KAM Heathkit HK-232	IBM PC & Clones, PS/2 Color or Monochrome 320K Free Ram 1 Serial Port Per Controlled Device 2 Disc Drives

**EXPERTO**

10245 Leatherwood Fort Worth, Texas 76108  
(817) 246-7410

CIRCLE 249 ON READER SERVICE CARD

**\* \* NEW \* \***



**"I learned all of my code and theory while driving to and from work, it was easy."**

If you don't have time to read books & take notes at home for the theory exams or spend hours copying code practice you can learn them by simply listening at your leisure. You will learn not only the exact questions and answers on your test but the **detailed theory** behind each one. You will thoroughly understand what you are being asked and why the answer is correct.

New Novice, New Technician/General, Advanced, Extra.  
**Theory courses on audio cassettes, \$19.95 ea.**

Learn code non stop all the way from scratch through Novice to Extra class speed (0 to 23 words per minute) with one course. Code is learned at a high rate with wide spacing between characters. A completely structured course which will take you in easy steps to your license class speed. Simply listen at your leisure.

**Code course on audio cassettes, \$19.95**  
**VEC type code General or Extra Exam tape C90 \$7.95 ea.**  
Shipping 3.00 per theory or code course, Exam tapes \$1.00. Check, MO, Visa or MC. Courses shipped same day received.

**AMATEUR RADIO SCHOOL KB6MT**  
Jerry Ziliak KB6MT (7 years instructing students)  
2350 Rosalia Drive, Dept. B, Fullerton, CA 92635  
**(714) 990-8442**

CIRCLE 288 ON READER SERVICE CARD

**FINALLY!**

**HIGH QUALITY FACSIMILE  
ON A DOT-MATRIX PRINTER.**

WRITE FOR FULL INFORMATION



WRITE FOR FULL INFORMATION

- Worldwide Press Photos
- Weather Maps and Charts
- Military & Gov't FAX
- Marine Information

**INFO-TECH M-800 ... YOUR "EYES" TO THE WORLD**

Copies all speeds and IOC's.  
Positive/Negative, R-L/L-R  
Automatic Manual, Line/Gray

**UNIVERSAL AMATEUR RADIO, INC.**



1280 Aida Drive  
Reynoldsburg, Ohio 43068  
PHONE: (614) 866-4267

**NEMAL ELECTRONICS**



- \*Complete Cable Assembly facilities MIL-STD-45208
- \*Commercial Accounts welcome- Quantity pricing \* Same day shipping most orders
- \*Factory authorized distributor for Alpha, Amphenol, Belden, Kings, Times Fiber

Call NEMAL for computer cable, CATV cable, Flat cable, semi-rigid cable, telephone cable, crimping tools, D-sub connectors, heat shrink, cable ties, high voltage connectors.

**HARDLINE 50 OHM**

FXA12 1/2" Aluminum Black Jacket.....	89/ft
FLC12 1/2" Cablewave corr. copper blk jkt .....	1.59/ft
FLC78 7/8" Cablewave corr.copper blk jkt .....	3.92/ft
NM12CC N conn 1/2" corr copper m/f .....	23.00
NM78CC N conn 7/8" corr copper m/f .....	54.00

**COAXIAL CABLES (per ft)**

1180 BELDEN 9913 very low loss .....	46
1102 RGB/U 95% shield low loss foam 11ga.....	32
1110 RGBX 95% shield (mini B) .....	15
1130 RG213/U 95% shield mil spec NCV jkt.....	36
1140 RG214/U dbl silver shld mil spec.....	1.85
1705 RG142B/U dbl silver shld, teflon ins .....	1.50
1310 RG217/U 50 ohm 5000 watt dbl shld .....	85
1450 RG174/U 50 ohm .100" od mil spec .....	14

**ROTOR CABLE-8 CONDUCTOR**

8C1822 2-18ga and 6-22ga .....	19/ft
8C1620 2-16ga and 6-20ga .....	36/ft

**CONNECTORS-MADE IN USA**

NE720 Type N plug for Belden 9913 .....	\$3.95
NE723 Type N jack for Belden 9913.....	4.95
PL259 standard UHF plug for RG8,213.....	65
PL259AM Amphenol PL259 .....	89
PL259TS PL259 teflon ins/silver plated.....	1.59
PL258AM Amphenol female-female (barrel).....	1.45
UG175/UG176 reducer for RG58/59 (specify).....	22
UG21DS N plug for RG8,213,214 Silver.....	3.35
UG83B N jack to PL259 adapter, teflon .....	6.50
UG146A SO239 to N plug adapter, teflon .....	6.50
UG255 SO239 to BNC plug adapter, Amphenol.....	3.29
SO239AM UHF chassis mt receptacle,Amphenol.....	89

**GROUND STRAP-GROUND WIRE**

GS38 3/8" tinned copper braid .....	.30/ft
GS12 1/2" tinned copper braid .....	.40/ft
GS200 1-1/2" heavy tinned copper braid .....	2.00/ft
HW06 6ga insulated stranded wire .....	.35/ft
AW14 14ga stranded Antenna wire CCS .....	.12/ft

\*Shipping: Cable \$3/100, Connectors \$3.00, Visa/Mastercard \$30 min, COD add \$2.00  
Call or write for complete price list. NEMAL's new 36 page CABLE AND CONNECTOR SELECTION GUIDE is available at no charge with orders of \$50 or more, or at a cost of \$4 with credit against next qualifying order.

NEMAL ELECTRONICS, INC. 12240 NE 14th Ave. N. Miami, FL 33161  
(305) 893-3924 Telex 6975377 24hr FAX (305)895-8178

CIRCLE 50 ON READER SERVICE CARD

**CABLE TV  
DESCRAMBLERS**

for your

**FREE  
CATALOG**

DIAL

**1-800-426-2653**

or write:

**CABLE  
DISTRIBUTORS**

116 MAIN HW

WASHINGTON, AR 71862

CIRCLE 267 ON READER SERVICE CARD



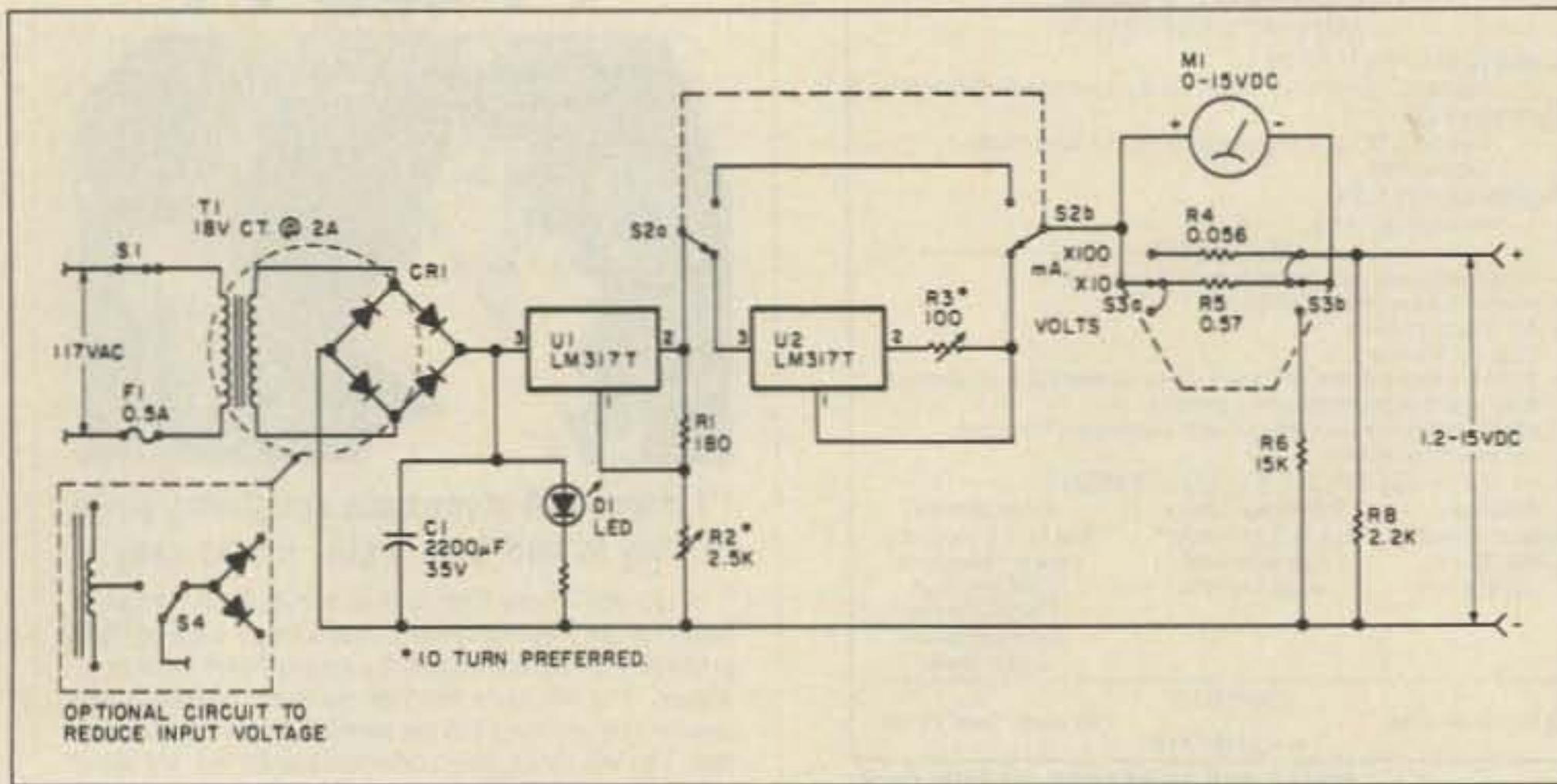


Fig. 1. Schematic for the NiCd battery charger and power supply.

and .13-Ohm resistors provide the .056-Ohm shunt for a 1.5-amp full-scale reading. There is no need for a 15-mA scale, since you cannot adjust the current below 12 mA.

This information applies to a meter with an internal resistance of 85 Ohms, such as the Radio Shack model specified. Meters of other manufacture or range may require the builder to recalculate the shunt values.

When calculating the shunts, you must consider the contact resistance of the meter switch. This is especially true of the shunt for the 1.5-amp full-scale setting.

#### Calibration

With the components listed, the meter will be within  $\pm 5$  percent. Trim the shunts and the multiplier resistor for greater accuracy. You can replace the multiplier resistor with a small variable resistor to calibrate the meter to an exact voltage near the point of greatest use. The shunts are a little harder to trim due to the small resistance required. They may be made with copper wire using a standard wire table to determine size and length. For example, 26.5 inches of #24 wire wrapped around a 100k 1-watt resistor will make the 1.5-amp (x 100 setting) shunt. The 150-mA (x 10 setting) shunt can be 66.25 inches of #30 wire on the same type of resistor. Adding an extra inch to the above lengths initially will allow you to match the shunt to the individual meter. It is also easier to shorten the wire than to lengthen it.

#### Operation

This unit allows great flexibility when used as a charger. You can select any charge rate up to capacity with the unit in the current-limiting mode. The unit will bring any battery up to full charge without fear of overcharging.

Most battery manufacturers recommend a charge rate to not exceed one-third the amp-hour rating of the battery. This would be considered a fast charge. The normal, or slow charge, is 10% of the amp-hour rating. These correspond to charge times of four and 15 hours, respectively. These figures are for the constant-current charging mode.

Although rarely mentioned in manufacturers' or vendors' literature, NiCd batteries

can be charged to a specific voltage. This would be a constant voltage mode. This mode requires some limiting to control the initial current drawn by a discharged battery. The unit really excels in the constant voltage mode.

By setting a voltage limit approximately 10% higher than the nominal voltage of the

battery and limiting the initial current to a safe level, the charging process becomes self-governing. A battery left on the charger indefinitely will not suffer any ill effects.

#### Options

The schematic shows an option that you may wish to incorporate. When the voltage requirement is low—10 volts or less—switching to full-wave center-tap grounded rectification reduces the current dissipated by the regulators, and improves their efficiency. When more than 10 volts are needed, switching to the bridge rectifier mode will supply adequate voltage for proper regulation. Obviously, this option requires a transformer that has a center-tapped secondary. A transformer with a dual-voltage primary, e.g. 110 and 220 volts, could also be adapted to this option.

Another option, although not included, would incorporate an external or internal timer to turn off the unit or reduce the charge to a holding rate. If the unit is to be turned off without disconnecting the battery, the circuit will require a blocking diode. This diode would prevent the battery from discharging through the meter circuit. **73**

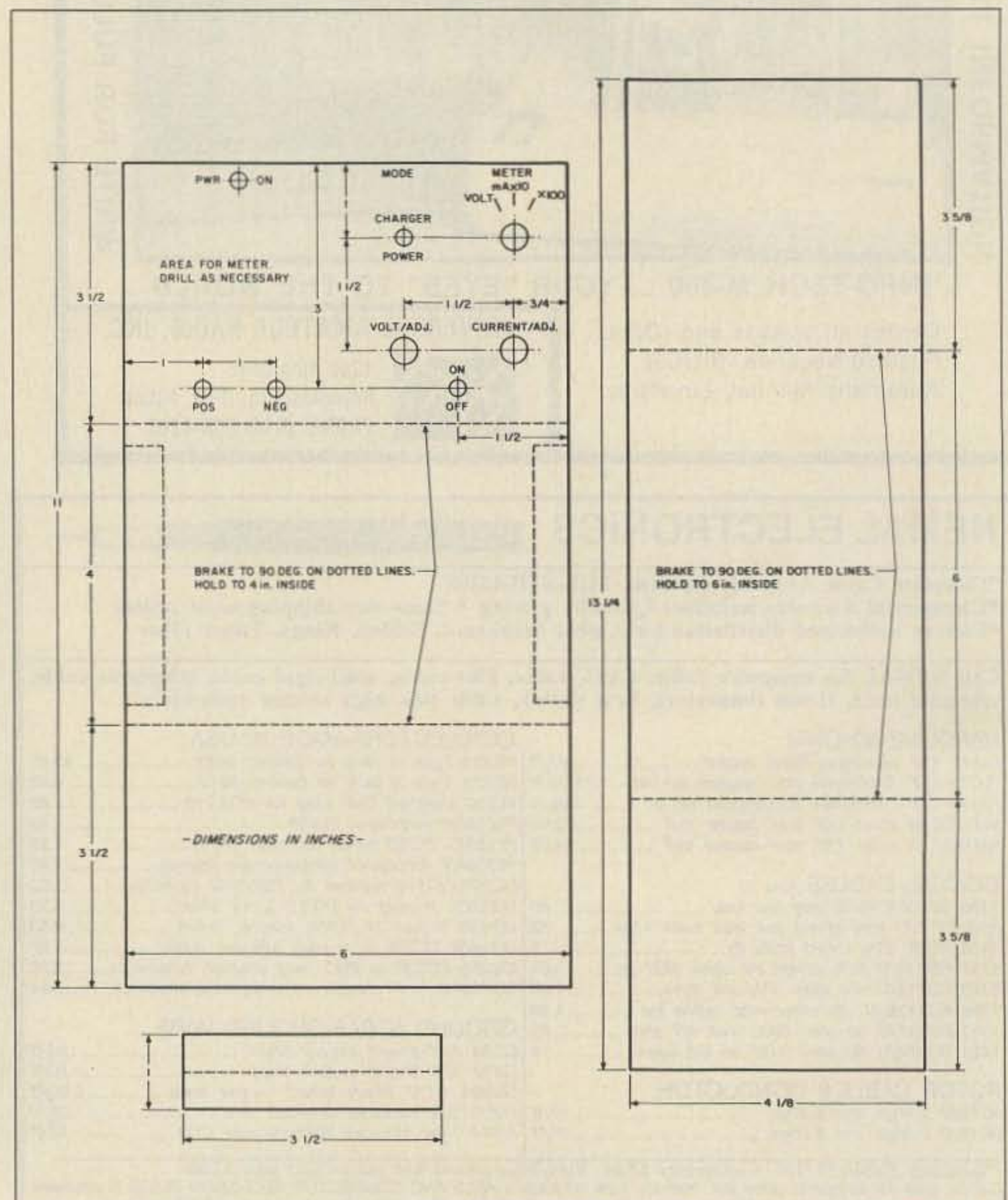


Fig. 2. The chassis template.



# Put More Punch in Your Packet

Outstanding mechanical design makes the IsoPole the only logical choice for a VHF base station, especially for Packet operation. All IsoPole antennas yield the **maximum gain attainable** for their respective lengths and a maximum signal on the horizon. Exceptional decoupling from the feed line results in simple tuning and a significant reduction in TVI potential. The IsoPole antennas are all impedance matched in the factory so that no field tuning is required. The IsoPoles have the broadest frequency coverage of any comparable VHF base station antenna. This means no loss of power output from one end of the band to the other, when used with SWR protected solid state transceivers. **Typical SWR is 1.4 to 1 or better across the entire band.**

A standard 50 Ohm SO-239 connector is recessed within the base sleeve (fully weather protected). With the IsoPole you will not experience aggravating deviation in SWR with changes in weather. The impedance matching network is weather sealed and designed for maximum legal power. The aerodynamic cones are the only appreciable wind load and are attached directly to the support (a standard TV mast which is not supplied).



## High Performance Hand-Held Antenna — The Hot Rod

The Hot Rod antenna can be expected to make the same improvement to hand-held communications that the IsoPole antennas have made to base station operation. **Achieve 1 or 2 db gain** over ANY 5/8 wave two meter telescopic antenna. The factory tuned HR-1 is 20% shorter, lighter and places far less stress on your hand-held connector and case. It will easily handle over 25 watts of power, making it an excellent emergency base or mobile antenna. In the collapsed position, the Hot Rod antenna will perform like a helical quarter wave. Three Hot Rods are available; HR-1 1/2 wave 2M Ant., HR-2 for 220 Mhz, and HR-4 for 440 Mhz. Amateur Net Price on all Hot Rods is \$19.95.

For either base station or hand-held operation AEA has the perfect VHF/UHF antenna. Put more punch in your Packet station with an AEA IsoPole or Hot Rod antenna. To order your new antenna contact your favorite Amateur Radio Distributor. For more information contact Advanced Electronic Applications, P.O. Box C-2160, Lynnwood, WA 98036, or call 206-775-7373.

### IsoPole Specifications

Model	144	220	440
Freq. Coverage (Mhz)	135-160	210-230	415-465
2.1 VSWR bandwidth	>12Mhz @ 146Mhz	>15Mhz @ 220Mhz	>22Mhz @ 435Mhz
Power Rating	1 kw	1 kw	1 kw
Gain**	3 dbd	3 dbd	3 dbd
Radiating Element Length	125.5" (3.2m)	79.25" (2m)	46" (1.2m)
Amateur Net Price	\$49.95	\$49.95	\$69.95

\*\*dbd — db gain over a dipole in free space

Prices and Specifications subject to change without notice or obligation.

**AEA** Brings you the  
Breakthrough!

CIRCLE 65 ON READER SERVICE CARD





*On the Twelfth Day of Christmas  
My True Love Gave to Me...*

*Twelve Folks Conversing  
Eleven Geezers Griping  
Ten Novices Keying  
Nine Ragers Chewing  
Eight Amateurs Arguing  
Seven Turkeys Babbling  
Six Extras Explaining  
Five Garrulous Hams  
Four Chatting Chicks  
Three Bantering Biddies  
Two Crackling Speakers  
And a Radio to Listen in With.*

***Our Thanks For Your Loyal Support  
Happy Holidays From EGE***

**ege inc<sup>TM</sup>**

**Orders & Quotes Toll Free:**  
National: 800-336-4799  
New England (except NH):  
800-237-0047  
Virginia: 800-572-4201

**EGE Virginia**  
14803 Build America Drive,  
Building B  
Woodbridge, Virginia 22191  
(703) 643-1063 & (703) 494-8750  
M-Th: 10-6; F: 10-8; Sat: 10-4

**EGE New Hampshire**  
8 Stiles Road  
Salem, New Hampshire 03079  
(603) 898-3750  
MTuWF: 10-5; Th: 12-8; Sat: 10-4

**LACOMBE**   
DISTRIBUTORS

Our Associate Store  
Davis & Jackson Road  
P.O. Box 293  
Lacombe, Louisiana 70445  
(504) 882-5355

**DISCOUNTS FOR  
AMATEURS**

©1987, EGE, Inc.

CIRCLE 133 ON READER SERVICE CARD





# Have You Been a Good Little Ham This Year?

**ege inc**™

**EGE VIRGINIA**  
14803 Build America Drive, Bldg. B  
Woodbridge, Virginia 22191  
Information: (703) 643-1063  
Service Dept: (703) 494-8750

Store Hours: M-Th: 10-6  
F: 10-8  
Sat: 10-4

Order Hours: M-F 9-7  
Sat: 10-4

**EGE NEW ENGLAND**  
8 Stiles Road  
Salem, New Hampshire 03079  
**New Hampshire Orders,\***  
Info & Service: (603) 898-3750

Store Hours: MTuWF: 10-5  
Th: 12-8  
Sat: 10-4

\*Order & we'll credit you \$1 for the call.



Our associate store:  
Davis & Jackson Rd., P.O. Box 293  
Lacombe, Louisiana 70445  
Info & Service: (504) 882-5355



**Terms:** No personal checks accepted. Prices do not include shipping. UPS COD fee: \$2.35 per package. Prices are subject to change without notice or obligation. Products are not sold for evaluation. Authorized returns are subject to a 15% restocking and handling fee and credit will be issued for use on your next purchase. EGE supports the manufacturers' warranties. To get a copy of a warranty prior to purchase, call customer service at 703-643-1063 and it will be furnished at no cost.

**ege inc**™

Winter Buyer's Guide/Catalog Available - Send \$1.

## Antennas

### Amateur HF Bands

Cushcraft, Baternut, KLM, Mosley, Hy-Gain, Mini-Products, B&W, Van Gorden, Hustler, Larsen, Antenna Specialists, Centurion, Smiley

### Antennas in Stock

for Mobiles, Base Stations, and Handhelds

Everything from mini rubber duckies to huge monobanders

ASK FOR PACKAGE DEALS ON ANTENNAS AND ACCESSORIES

### Also...

Antennas for Scanners, CBs, Marine, Commercial, and Short Wave Listening

**YAESU**

**ICOM**

**KENWOOD**



**FT 23/33/73**  
Mini HTs for 2m, 220/440 MHz

**FT 727R**  
2m/440 MHz Dual Band HT



**FT 767GX**  
All Mode Transceiver with CAT System



**NEW FT 757GX Mark II**  
HF Transceiver with General Coverage Receiver



**FRG 9600**  
Scanning Receiver for 60-905 MHz FM/AM/SSB



**IC 751A**  
HF Transceiver with General Coverage Receiver



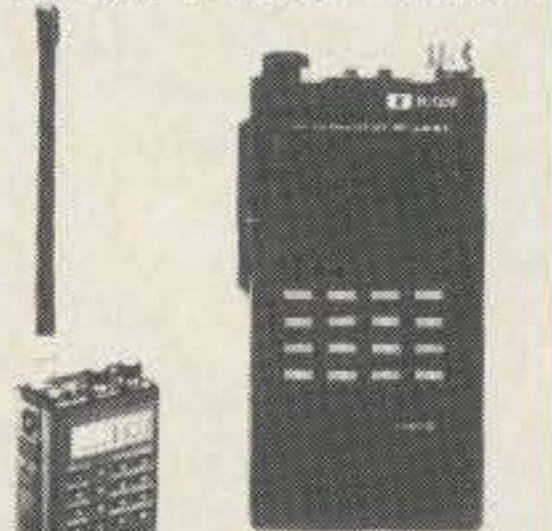
**IC 3200**  
2m/440 MHz Mobile



**IC 275A**  
All-mode Transceiver



**R 7000**  
General Coverage Receiver



**Micro 2AT**  
Mini 2m Handheld



**IC 02AT/03AT/04AT**  
Handheld for 2m/220/440



**TS 440S**  
HF Transceiver with Antenna Tuner



**TS-940S**  
HF Transceiver with General Coverage Receiver



**TM 221A/321A/421A**



**New Improved TH 215AT**  
2m Handheld

**TH 21BT/31BT/41BT**  
Mini Handhelds for 2m/220 MHz/440 MHz



**R 5000**  
General Coverage Receiver

**Order Gifts Early!**  
Provide plenty of shipping time!

**TEN-TEC**



**Corsair II Model 561**  
HF Transceiver



**Paragon**  
Amateur Transceiver with General Coverage Receiver



**ALR-22T**  
Compact 2m Mobile

## More Radios

**KDK**  
FM 240 2m Mobile

**SONY**  
Receivers

**REGENCY BEARCAT**  
Scanners

**MIDLAND**  
CB Radios

**COBRA**  
CBs, Radar Detectors, Phones

**UNIDEN**  
CBs, Radar Detectors

**WHISTLER**  
Radar Detectors

## Towers

**UNARCO-ROHN TRI-EX HY-GAIN**

Ask for package quotes on complete tower assemblies including Phillystran, guy wire, antennas, rotators, etc.

### ROTATORS

Kenpro, Alliance, Daiwa, Telex Hy-Gain

## Computer Stuff

**Packet Controllers**  
Kantronics and MFJ

**Amateur Software**  
Ham Data Software for Commodore Computers  
Ask for Descriptions

### RTTY/Morse/Amtor

Hardware and Software and packages by Kantronics, Microlog, HAL, MFJ, & more

## Accessories

**AMPLIFIERS**  
Vocom, Daiwa, TE Systems, Amp Supply, Mirage, Alinco, Ameritron, Tokyo Hy-Power, RF Concepts

**ANTENNA TUNERS**  
Amp Supply, Ameritron, MFJ

**Switches, Couplers, Filters, Connectors, Mikes, Keyers, Paddles, Headsets, Clocks, Books, Power Supplies**

**For Orders & Quotes Call Toll Free: 800-336-4799**

**In New England (except NH): 800-237-0047**

**In Virginia: 800-572-4201**

**ege inc**™





# Dynamite Discovery

Communications Specialists' latest excavation brings to light yet another dynamite discovery—our new dip switch programmable SD-1000. No need to tunnel your way through Two-Tone Sequential decoding anymore. We've mined this amazing unit! Now, for the first time, you can stock one unit that will decode all calls in a 1000-call paging system with  $\pm .2$ Hz crystal accuracy. The EEPROM on-board memory can even be programmed for custom tones, and every unit includes group call. Universal switched outputs control your call light, squelch gate and horn. The SD-1000 can

also generate CTCSS and decode Two-Tone Sequential. Its miniature size of 2.0" x 1.25" x .4" is no minor fact either, as it's a flawless companion for our PE-1000 Paging Encoder. We ensure one-day delivery and our one-year standard warranty. Tap the rich vein of Communications Specialists and unearth the SD-1000 or other fine gems.



\$59.95  
each



**COMMUNICATIONS SPECIALISTS, INC.**  
426 West Taft Avenue • Orange, CA 92665-4296  
Local (714) 998-3021 • FAX (714) 974-3420  
Entire U.S.A. 1-800-854-0547

CIRCLE 10 ON READER SERVICE CARD



# PACKET TALK

## Latest in Digital Hamming

Brian Lloyd WB6RQN  
19200 Tilford Way  
Germantown MD 20874

### A NEW FACE

Greetings fellow packeteers! I am deeply committed to the development and growth of packet radio. I hope this column will provide a forum for the discussion of the issues—technical, philosophical, and operational—surrounding packet radio and its future. But I need your help. I need the contribution of your ideas, designs, and projects. If you have used packet radio in a new and unique way, please share your experiences. Don't worry if your experiment seemed to be a failure. We often learn more from failures than from successes! To this end, please feel free to write to me in care of *73 Magazine* or to send electronic mail to me. My PBBS mail address is WB6RQN@WA3PXX. Let's work together for the growth and improvement of amateur packet radio.

### The Technical Corner

Recently I received a bulletin from Norm W2JUP. Norm pointed out a basic but critical fact that many of us in the packet community sometimes lose sight of: proper functioning of packet radio requires good, reliable radio links. In order to have effective packet operation, your bits must arrive at the receiving station without errors. Every packet that arrives at its destination is a packet

that does not need to be retransmitted.

This translates into better throughput and less channel loading. It seems like a simple and obvious subject, hardly worthy of in-depth discussion. But the fact remains that examination of several packet radio stations using test equipment has demonstrated very strongly that many of us have forgotten the basic lesson taught us by RTTY: there is no substitute for a good solid link and effective modulation/demodulation. You cannot simply take your TNC out of its box, hook it to the mike and speaker leads of your radio, and expect it to work. You are going to have to make sure that your TNC is properly adjusted for the particular radio to which it is connected.

Since the great majority of packet operations take place on the VHF/UHF bands using Bell 202 type modems and NBFM radios we perhaps need to review the basics of this type of operation.

In our standard TNC's the modulator part of the modem accepts digital data (1's and 0's) and uses it to switch between two tones, 1200 Hz and 2200 Hz. The audio spectrum required by this technique spans from about 500 Hz to about 2900 Hz. This conveniently fits within a standard voice-grade telephone line (300-3000 Hz), precisely what Bell intended when they designed the 202 modem. The demodulator discriminates between the two tones and recovers the original digital signal. Simple, huh?

When Bell developed its specification they took the characteristics of the phone line for granted. The phone company specifications say that the telephone line is flat from about 400 Hz to about 2900 Hz with minimal phase shift and at least a 30 db S/N ratio. Now let us examine our 2M FM radios and see how they stack up to the telephone line.

The "official" specification for an FM radio has a bandwidth similar to the standard telephone line. The major difference is that the transmitter is supposed to have 75 microsecond pre-emphasis while the receiver has 75 microsecond de-emphasis. This means that the transmitter should be flat to about 2100 Hz and then boost the high frequencies at a 6 db/octave rate above that. The receiver is supposed to perform the opposite operation, cutting high frequencies above 2100 Hz at a 6db/octave rate. The combined curves should be perfectly flat so that what we end up with is something that is very similar to the ideal phone line (with better signal-to-noise ratio to boot).

If all this were true then we would be seeing bit error rates (BER) of  $1 \times 10^{-5}$  (1 errored bit in 100,000) or better. For the average packet of 128 bytes this works out to about 1 packet in 85 being bad. Since we rarely see this kind of performance, even on a clear channel, there must be some sort of problem. There is. The radios really do not conform to the above specifications and the modem in your TNC tries but fails to correct for this.

The designers of NBFM amateur radios did not even begin to consider that your radio might be used to transmit data. They were concerned with how the radio performed on voice and that it met the

FCC specifications for bandwidth and spurious emissions.

The ear is also almost totally insensitive to phase errors. On the other hand a modem is extremely sensitive to these errors. The clipper/limiter and low pass filter in the usual NBFM transmitter's audio stage introduce very large levels of these distortions that are essentially undetectable by ear but which make it almost impossible for the receiving modem to decode the data. That is why a signal that sounds good may not work with your TNC.

Another characteristic of voice radios is that they boost all the high frequencies on transmit and cut them on receive, even more than would occur with a simple 75  $\mu$ s pre-emphasis/de-emphasis. This works because the energy in the human voice decreases with increasing frequency. Data transmission has a relatively even distribution of energy so such pre-emphasis is detrimental.

Since most of us must make do with voice radios we should set them up so as to give the modem the best possible chance to do its job. Here is a procedure that will extract the best possible performance from the modem in your TNC.

First, decide where to connect the output of the TNC to the transmitter. Many radios have an accessory or CTCSS (PL) input. This input usually enters the chain of audio processing after the limiter and the low-pass filter. If your radio has one of these inputs (sometimes on an accessory jack on the back of the radio but usually on an internal connector) this is where the TNC should be connected. If you connect your TNC here you do not need to worry about the damage to your signal caused by the limiter and the low-pass filter. Command your TNC to generate the high tone (use the calibrate command) and adjust the TNC output level and the deviation control in the radio for 2.5 to 3 KHz deviation.

If your accessory input injects the signal before the limiter/filter or you must put the signal in at the mike jack, you will need to use the following adjustment procedure:

- 1) Command the TNC to generate a tone (using the calibrate command). Increase the signal level coming from the TNC until the deviation of the radio no longer increases (the limiter is now limiting the signal). Reduce the level from the TNC until the deviation drops to about half of the

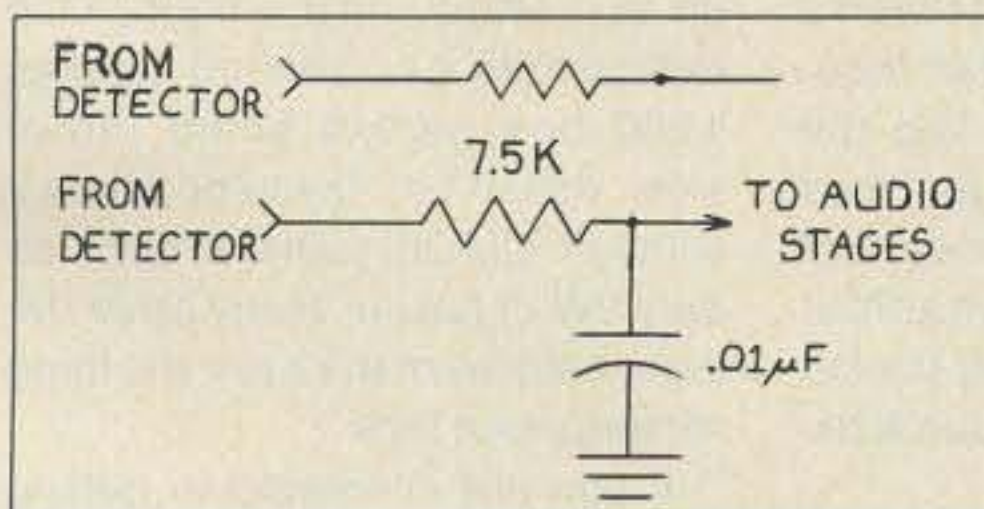


Fig. 1. 75- $\mu$ s de-emphasis network.

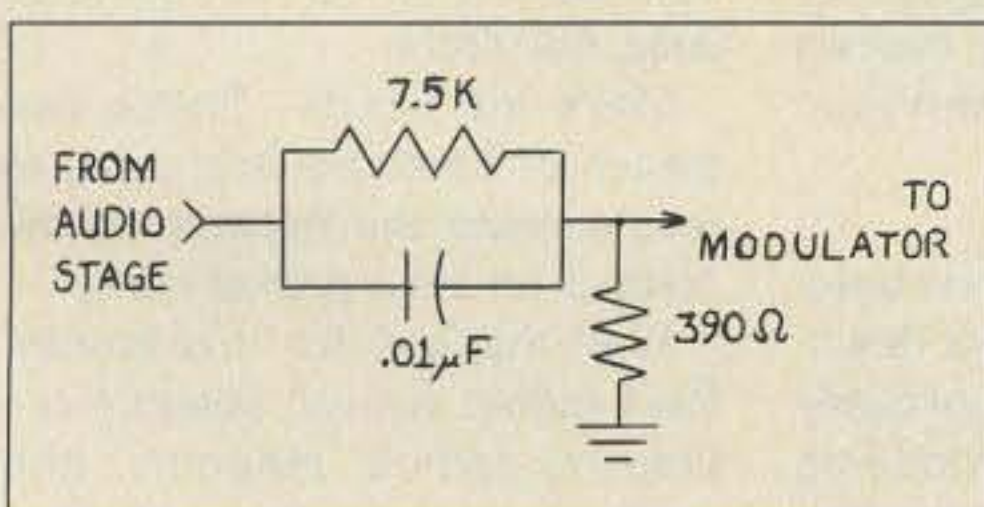


Fig. 2. 75- $\mu$ s pre-emphasis.

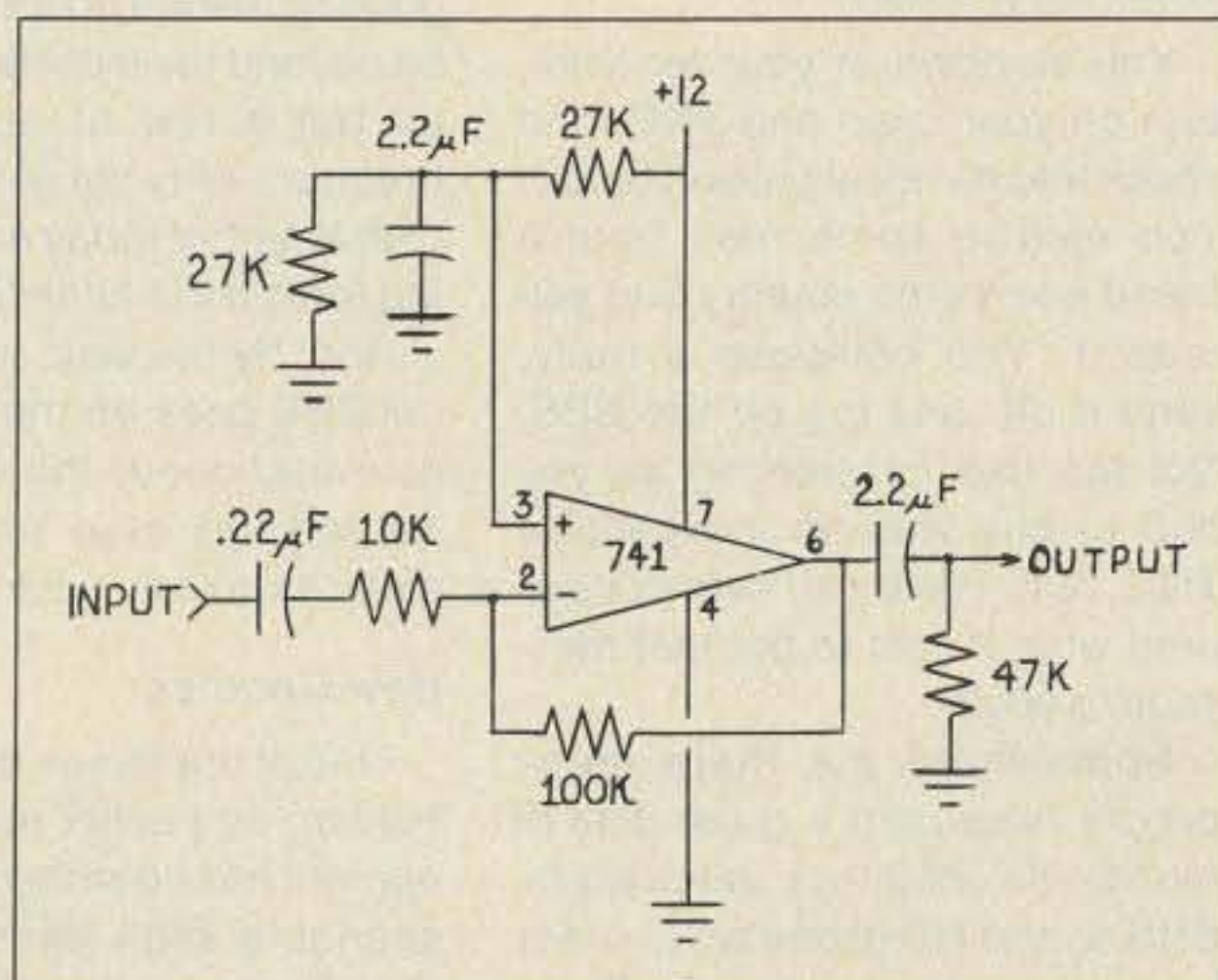


Fig. 3. Buffer amp.



maximum level you reached before (don't worry about the amount of deviation at this point). Now go into the radio and adjust the deviation control to give you 2.5 to 3 KHz deviation on the high tone.

As a final check of the transmitter check the deviation of both the high and low tone. The low tone (1200 Hz) should be between 0 db and 3 db less than the level of the high tone (2200 Hz). That means that if the high tone has 3 KHz deviation the low tone should have no more than 3 KHz deviation and no less than 2 KHz deviation.

### Now to the Receiver

Hooking the speaker jack to the input of your TNC may be easy but it is probably not the best way to make the connection. Most radio manufacturers boost the low frequencies in the audio amp to correct for the deficiencies of the cheap little 2-inch speaker they put in. This is fine for your ear but is not what you want for your TNC. The original designers of the TAPR TNC-1 and TNC-2 decided to attack the problem by designing a complementary filter that boosted the high frequencies to counteract this distortion. This works just fine if the response of the input filter in the TNC really does complement the frequency response of the radio (can you say, "fat chance?"). If you have a TNC-1 or TNC-2 clone and want to find out, use a scope to look at the output (pin 1) of the MF-10 filter chip. The two tones should be within  $\pm 2$  db of each other.

If this concept of distorting the signal first one way and then distorting it back the other way to fix it seems a bit excessive to you (as it does me) you might want to try a different approach. There is a source of perfectly good undistorted signal waiting to be tapped at the discriminator. Some radios have a center channel meter that reads the discriminator offset—a good place to look for the signal. The hot side of the volume control is usually another good place to tap into this signal.

If you are using a TNC-1 or TNC-2 clone and you wish to use this direct connection you will need to remove the MF-10 filter chip and its associated resistor pack (U17 and U18 in the TNC-2). If you have a TNC-2 clone you now jumper pin 1 to pin 8 on U17 and you are done. You may now connect the discriminator directly to the TNC through the appropriate de-emphasis network (the high and low tones should be within  $\pm 2$

### Measuring Deviation

Setting FM transmitter deviation is a critical item in amateur packet radio, yet most packet enthusiasts ignore the problem. Obviously the easiest way to measure deviation is with a deviation meter. If you are lucky enough to own one, use it. On the other hand a deviation meter is nothing more than a meter attached to the discriminator of an FM receiver. An oscilloscope or meter attached to the discriminator before any de-emphasis network will work well. If you use a meter you will need to provide some sort of buffer amplifier and peak hold circuit between the discriminator and the meter. Such a circuit is described in the *ARRL Radio Amateur's Handbook* in the section on FM.

The big problem is calibrating the meter. If you have a known reference you are in luck. Just adjust your meter to match the reference meter. If you don't have a reference you can use a linear receiver (SSB or CW) to monitor the carrier from the FM transmitter and use the Bessel function characteristics to determine the deviation.

Set up an FM transmitter with a calibrated audio generator as its input. Set the frequency of the audio generator to 2079.2 Hz and its output level to 0. Key the transmitter and tune in the FM carrier with the linear receiver set at its narrowest bandwidth (use a CW filter if you have it). Slowly increase the output from the audio generator and notice that the carrier begins to decrease. At the point where the carrier reaches its lowest level the deviation will be precisely 5 KHz (a further increase in the level of the audio generator will cause the carrier to increase again). Now use this FM signal as a reference for your deviation meter. See the *Radio Amateur's Handbook* for more details on this method.

db at the input to the demodulator in the TNC).

Should you decide to use the discriminator signal be sure that you do not load down the signal too much. The Exar 2211 demodulator used in the TNC-1 and TNC-2 clones will not load the discriminator too much and may be connected directly. If your TNC has a low impedance input network (Kantronics' TNC's come to mind here) you may need a buffer between the discriminator and the modem. Figure 3 shows a good buffer circuit for the discriminator that will happily drive just about any TNC. Build it if you are concerned.

### What's the Cost?

You sit down at your terminal, turn on your radio and TNC, and check into the local bulletin board. You receive some mail from a friend across the country and you read it. You compose a reply, send it off, and log off the BBS. Not too bad considering all you had to buy was an inexpensive TNC, huh! Have you ever considered what it cost to get that message to you?

Somewhere out there many people have paid a great deal of money to construct digipeaters, BBS's, and HF gateways in order to deliver your mail to you. If you consider that your local BBS prob-

ably consists of a PClone (that's PC+clone), one or two TNC's, and one or two radios, the price was probably between \$1200 and \$2000 for that BBS that you are using. Have you offered to help out financially to maintain this resource? You say you can't afford to kick in very much money? How about forming a packet radio club to pool your resources!

The result would be a packet community no longer dependent upon the goodwill of a few generous packeteers. It would also provide an advantage for the future when the packet switches that will make up our networks will, more than likely, cost thousands of dollars (much like the good repeaters do today) and thus be beyond the individual means of all but a few of our wealthier brethren. Why not get your packet club together today and start looking toward the future?

And, by the way, when your local BBS goes off the air because its owner needs the computer for something else or he moves away, don't say I didn't warn you.

### New Goodies

One of the things that has been holding up packet network development has been the lack of easily available high speed modems (9,600 bps and faster) and the lack of packet switch hardware to take

advantage of the fast modems when they arrive. At last both gaps have been filled.

Dale Hetherington, WA4DSY, has designed an elegant 56,000 bps modem. The modem accepts digital data at 56,000 bps in one side and generates RF at 29 MHz on the other. Likewise it accepts RF at 29 MHz and converts it into digital data at 56,000 bps. Why 29 MHz? Because you can readily acquire transverters to put your signal on the desired band. The modems have been tested extensively in Atlanta, Georgia, and work very well!

If you are interested in constructing one (or two) for yourself contact Doug Drye, KD4NC, at P.O. Box 871, Alpharetta, GA, 30239-0871. The three-board set (not a kit—boards and documentation only) costs \$75 (please add \$5 for shipping). If you can build a TNC-2 you can build one of these modems. You may have to scrounge a bit for the parts, but isn't that part of the satisfaction! The modem uses all commonly available components. Acquiring them should require little more than a visit to your local hamfest and Radio Shack.

But now we need something (besides the KISS TNC—more in a later column) to generate data at 56,000 bps to drive our fast modems.

A group of hams in San Diego have solved that problem. Mike Brock, WB6HHV, Franklin Antonio, N6NKF, and Tom LaFleur, KA6IQA, have constructed a packet switch board called the PS-186. It is powered by an Intel 80186 processor and has up to 256 Kb of ROM and up to 1 Mb of RAM. There are 4 HDLC (read "packet") ports that will each run up to 1 Mbps. That's right! One million bits per second (makes 1200 bps packet seem rather slow, doesn't it). If you populate it with all CMOS parts it requires only 2W of power. Many other design features make it just the thing for mountain tops.

If you are interested in getting one of these boards or just interested in information, send mail to Tom LaFleur at PO Box 9045, La Jolla, CA 92038.

Mark my words. These two pieces of hardware are going to revolutionize the networking aspects of amateur packet radio.

Well that's it for this month. Next month we will spend more time on radios, modems, and what is new on the software horizon. See you then. **73**



# BARTER 'N' BUY

**QSLs To Order.** Variety of styles, colors, card stock. W4BPD QSLs, PO Drawer DX, Cordova SC 29039. BNB26

**The DX'ers Magazine** Up-to-date, informative, interesting. Compiled and edited by Gus Browning W4BPD, DX-CC Honor Roll Certificate 2-4. Send for free sample and subscription information today. PO Drawer DX, Cordova SC 29039. BNB261

**Xerox MemoryWriter**—parts, assemblies, boards, manuals. Free help with service problems. W6NTH, Box 250, Benton AR 72015 (501) 776-0920. BNB404

**Ham Trader Yellow Sheets**, in our 24th year. Buy, swap, sell ham-radio gear. Published twice a month. Ads quickly circulate—no long wait for results. SASE for sample copy. \$12 for one year (24 issues). PO Box 2057, Glen Ellyn IL 60138-2057. BNB412

**QSL Cards**—Look good with top quality printing. Choose standard designs or fully customized cards. Better cards mean more returns to you. Free brochure, samples. Stamps appreciated. Chester QSLs, Dept. A, 310 Commercial, Emporia KS 66801. BNB434

**Learn Code on your IBM PC** (or compatible), Commodore C-64/128, or 512K Macintosh. CODE-PRO takes you from no knowledge to proficient copy. Specify computer. \$10 plus \$2 s&h. Trio Technology, Dept. 861, PO Box 402, Palm Bay FL 32906. BNB490

**Code Programs.** Apple/C-64 37 Modes, Graphics, Lessons, Wrdprcsr, etc. LARESCO, POB 2018, 1200 Ring Road, Calumet City, IL 60409 (312)891-3279. BNB507

**The Decoder A National monthly technical newsletter covering Satellite and Cable TV descramblers. \$18.00 a year. Sample \$2.00. VideoCipher II Manual - 120 pages...\$29.95. Oak Orion Manual - 120 pages...\$29.95. Schematics and**

Software Catalog...\$1.00. Satellite and Video Equipment Catalog...\$2.00 Telecode P.O. Box 6426, Yuma AZ 84364-0840. BNB513

**Commodore Chips.** Authorized Distributor, Factory Fresh. #6526/6510-\$9.95, #6581-\$12.85, #6567-\$14.75, #8701-\$7.25, PLA/82S100-\$12.50, 901225/226/227/229-\$10.95 and many others. Ask about quantity discount...Heavy Duty Power Supply for C64-\$27.95... VISA/MC... Call Toll Free 1-800-642-7634, 800-248-2983 (outside NY) or 914-356-3131. Kasara Microsystems, Inc. 38 Murray Hill Drive, Spring Valley, NY 10977. BNB587

**Smart Battery Charger for gell-cells or lead acid batteries, by Warren Dion W1BBH. See June 1987 QST Magazine** for circuit details. Complete kit, nothing else to buy, only \$49.95 plus \$3.50 s/h. Order #150-KIT. A&A Engineering, 2521 West La Palma, Unit K, Anaheim CA 92801 (714) 952-2114. BNB531

**Ham Radio Repair**, all makes, all models. Robert Hall Electronics, PO Box 8363, San Francisco CA 94128 (408)-729-8200. BNB558

**SB-220 Owners!**—Enhance performance—add new features. 11 step-by-step mods which include: tuned-input 6- and 160-meter operation, heavy-duty power supply mods, full QSK operation, solid-state bias control, and many more. Source of parts included. One time 50% rebate for new mods submitted and two free updates. 10 pages of tech info on the 3-500Z. Order today—\$10 per copy plus \$1 postage. SASE for info. Bob Kozlarek WA2SQQ, 69 Memorial Place, Elmwood Park NJ 07407. BNB581

**Commodore Repairs.** We are the largest Authorized Service Center in the country and we repair your Commodore computer within 3 to 4 days. (Our prices are low; eg. C64-\$39.95). "THE COMMODORE DIAGNOSITI-

CAN", an invaluable double sided laminated guide for fixing your C64/1541 drive. It diagnoses 72 variables and tells you what chips are faulty. \$6.95 plus \$1.00 postage...C-64 Power Supply \$27.95... Call Toll Free 1-800-642-7634, 800-248-2983 (outside NY) or 914-356-3131. Kasara Microsystems, Inc., 38 Murray Hill Drive, Spring Valley, NY 10977. BNB529

**Wanted:** Lafayette PrivaCom 3C, 525, 625, or GE 5813B. RADIO, 2053 Mohave Dr., Dayton OH 45431. BNB589

**Wanted:** Military radios and related equipment. Circa: WW II. Command and Field Issue. ARC-2, BC375, BC223, Etc. Complete Collections or Single Sets. Contact: KA1GON; (617) 396-9354 or write: 501 Mystic Valley Pkwy, Medford MA 02155. BNB595

**MARCO:** Medical Amateur Radio Council, operates daily and Sunday nets. Medically oriented amateurs (physicians, dentists, veterinarians, nurses, therapists, etc.) invited to join. For information, write MARCO, Box 73's, Acme, PA 15610. BNB612

**Voicegate Communications Noise Reduction**—Our exclusive "dynaspan" noise reduction, audio gated squelch, 2 notch & 1 peak active filter, automatic tape recorder activator, audio amplifier, and more! See the Bob Grove review in the 5/87 issue of Monitoring Times. An SASE gets you our free brochure or send \$3.50 (credited toward purchase) and we'll include our demonstration cassette. Voicegate \$109.95. Power pack \$9.95. JABCO ELECTRONICS, R1, Box 386, Alexandria, IN 46001. BNB613

**Kenwood 430S owners only!** Stop Scan automatically resumes the scan AFTER the transmission finishes! SASE for free brochure. Kit \$19.95. Assembled \$29.95. JABCO ELECTRONICS, R1, Box 386, Alexandria, IN 46001. BNB614.

**Wanted: Drake R7A Receiver W/ Manual MS7.** Tony Ficarra, 144 Gladstone Avenue, Wollong, NSW. Australia 2500. Phone (042) 292573. BNB615

**DX Adventure on Monserrat** only \$300/week. Details: Chod Harris VP2ML Box 4881-7, Santa Rosa, CA 95402. BNB618

**Wanted:** Equipment and Related Items The Radio Club of Junior High School 22 NYC, Inc., is a non-profit organization, granted 501(c) (3) status by the IRS, incorporated under the laws of the State of New York with the goal of using the theme of Ham Radio to further and enhance the education of young people. Your property donation would be greatly appreciated and acknowledged with a receipt for your tax deductible donation. Please contact WB2JKJ using the callbook or telephone 516-674-4072, 24 hours, seven days a week. Thank you! BNB621

**Casa Marconi, Inc.** Pre-owned communications equipment. We do repairs. CASA MARCONI, INC., 7189 SW 8th Street, Miami, FL 33144. (305) 264-8443. BNB623

**Homebrew Projects List.** SASE WB2EUF, Box 708, East, Hampton, NY 11937. BNB626.

**"QSLs & Rubber Stamps"**—TOP QUALITY! States, World Maps, USA, Key, Shuttle, Globe QSLs. Report Form Rubber Stamps. More! Samples \$1 (refundable with orders)—Ebbert Graphics D-7, Box 70, Westerville, OH 43081" BNB627

**Dead Battery Pack???** NiCd cells / Inserts / Rebuilding. AA \$1.60, (W/tabs \$1.75) 2/3AA 270MAH \$1.95, 2/3af 450MAH \$2.45, Replacement inserts, less wires: ICOM BP-2 \$17.95, BP-3 (standard) \$16.95, BP-5 \$23.95, Kenwood TR-2400/PB 24 \$18.95, PB-25 \$22.95, PB25H \$24.95, Tempo: S1/270mah \$19.95, S1 2,4,5/450mah \$22.95, Azden 300 \$18.95. Others, SASE, Info/rebuild quotes. In PA add 6%. Add \$2.00 S&H/order. CUNARD ASSOCIATES, R.D. 6, Box 104, Bedford, PA 15522. BNB628

**Antenna Traps** designed quickly and accurately with your computer. Send \$10.00 for APPLE-II program disk and manual, SASE for more information. WIHUE, 119-7 Buckland St., Plantsville, CT 06479. BNB630

**Layman's Christian Investigator Net.** Thought-provoking commentaries and recent discoveries. Monday 7:30 CST 0030 UTC 3860 for information write Albert Blau 1127 West Hwy 20, Michigan City, IN 46360 3 Stamps Please. BNB632

**Back Issues 73 Rare Price Sale.** 1977 to 1986. Each twelve issue volume costs \$50. plus \$3 postage. Send check or money order to A.E. Fant, WB5WAF/DA1FT, Schweinfurt American JHS, APO NY NY 09033. Hurry, I need the space. BNB634

**SAT TRAK II** -A complete advanced self-contained satellite tracker with AZ/EL rotor control. Enter Keplerian Data once via RS-232 with terminal or computer. Memory for 12 satellites. Accurate. Solid state AZ/EL drive. Available from ADR, P.O. Box 10184, Sarasota, FL 34230 813-378-3410. BNB636

**Wanted To Buy:** Sony CRF 320A or 330K (with tape recorder) short wave receivers. Contact Mathew Wolf 713-871-9000. BNB638

**Quality QSL Cards** and rubber stamps. Send \$.39 postage or SASE for samples. New stock designs or customer cards from your black ink artwork. Sandollar Press, P.O. Box 30726, Santa Barbara, CA 93130. BNB640

**Ten-Tec, Now Shipping New** boxed U.S.A. made, latest factory models 561 Corsair II, 525D Argosy II, and Century 22 Transceivers, RX 325 general coverage receiver, Model 2510 Mode B Satellite Station, TT920 Airband Handheld Transceiver, Model 229B 2kW antenna tuner, Model 425 Titan 1.5 kW Linear Amplifier plus accessories and antennas, also booking orders for Paragon deliveries. For best deal, write or phone Bill Slep 704-524-7519, Slep Electronics Company, Highway 441, Otto NC 28763. BNB641

Barter 'N' Buy advertising must pertain to ham radio products or services.

- Individual (noncommercial) ..... 25c per word
- Commercial ..... 60c per word

Prepayment required. Count only the words in the text. Your address is free. 73 cannot verify advertising claims and cannot be held responsible for claims made by the advertiser. Liability will be limited to making any necessary corrections in the next available issue. Please print clearly or type (double-spaced).

---



---



---



---



---

No discounts or commissions are available. Copy must be received in Peterborough by the fifth of the second month preceding the cover date. Make checks payable to 73 Magazine and send to: Suzanne Des Rochers Barter 'N' Buy, 73 Magazine, WGE Center, Peterborough NH 03458.







#1 Source of PACKET Info

# CTM

## The Magazine

For Amateur Radio and Computerists  
**Why You Should Subscribe!**  
 Read what our subscribers say!

It's in the fine print!

•Your magazine is the finest innovation that I have seen in ham radio since 1953—except... maybe the all-solid state transceiver. **Carl Soltesz, W8PFT** • ...have most certainly received my money's worth in software... **Michael Regan, K8WRB** • ...you have found a nice niche for CTM in packet... you have me getting interested... **Charlie Curle, AD4F Chattanooga, TN** • The packet computer info convinced me to subscribe. **John Skubick, K8JS** • Enclosed is my check for renewal of my subscription. I enjoy the down to earth and homey style of your magazine and the many fine computer articles... **Andy Kosiorek, Lakewood, OH** • I was both pleased and dismayed upon becoming acquainted with your magazine at HAM-COM. Pleased that I discovered your magazine—dismayed that I didn't long before now. **Bill Lathan, AK5K** • ...CTM gives the finest coverage to packet radio that I have seen in any of the computer or amateur radio magazines. It would appear that CTM has just the right blend of packet amateur radio articles and computer articles. **Barry Siegfried, K2MF** • Of the three HAM magazines I received each month CTM is the only one I read from cover to cover and carry with me during my travels abroad. Most of the time it remains in that country. **Buck Rogers, K4ABT**

U.S.A. \$18.00 1 Yr—\$10.00 6 Months (Limited Offer) \$33.00 2 Yr

Mexico & Canada \$32.00 1 Yr (Surface)

Other Countries (Air) \$68.00 (Surface) \$43.00 1 Yr

U.S.FUNDS ONLY

Sample Copy & Back Issues—\$3.50

Mail to:  
 Circulation Manager  
 1704 Sam Drive  
 Birmingham, AL 35235  
 (205) 854-0271

Name \_\_\_\_\_  
 Call Sign \_\_\_\_\_  
 Address \_\_\_\_\_  
 City \_\_\_\_\_ ST \_\_\_\_\_ ZIP \_\_\_\_\_  
 Date \_\_\_\_\_  
 Signature \_\_\_\_\_

CIRCLE 11 ON READER SERVICE CARD

## SPECIAL BUY ON VIDEO REWINDERS



Saves Time  
 And VCR  
 Motor  
 Wear!

### A SOLIDEX® VCR AID

**Free-Up Viewing Time** that used to be spent rewinding tapes. And, take the work "load" off your VCR's motor with a VHS or Beta Video Cassette Rewinder by Solidex®. Our special arrangement with the manufacturer makes this a great buy at a remarkably **LOW liquidation price!**

**3 Big Benefits!** This "must" device quickly rewinds video cassette tapes. Extends the life of your VCR's motor. And, helps you avoid costly VCR repairs. Act NOW! Put this unit to work for you!

- Reduces Costly Wear on VCR Motor.
- Cuts Delays. Lets You Spend More Time Viewing Tapes, and Less Time Waiting on Rewinds.
- Fast, Efficient Operation. Auto Shutoff. Auto Soft Eject.
- Compact, Space Saving Size: 2½"H x 5"W x 11½"D. LED "On" Light.

**1-Year Limited Factory  
 Warranty Parts/Labor.**

Mfr. List . . . . . **\$29.99**

Liquidation  
 Priced At . . . . . **\$19**

VHS: Item H-2990-7152-291  
 Beta: Item H-2990-7226-798  
 Shipping, handling: \$4.00 each  
 Plus 50¢ Ins. Charge Per Order.

Credit card customers can order by phone, 24 hours a day, 7 days a week.  
**Toll-Free: 1-800-328-0609**

SEND TO:  
**COMB** Authorized Liquidator  
 1405 Xenium Lane N/Minneapolis, MN 55441-4494  
 Please send the item(s) indicated below. (Minnesota residents add 6% sales tax. Sorry, no C.O.D. orders)  
 Send \_\_\_ VHS Video Rewinder(s) Item H-2990-7152-291 at \$19 each, plus \$4 each for ship, handling.  
 Send \_\_\_ Beta Video Rewinder(s) Item H-2990-7226-798 at \$19 each, plus \$4 each for ship, handling.  
 My check or money order is enclosed. (No delays in processing orders paid by check.)

PLEASE CHECK:  VISA  MasterCard  Discover  American Express

Acct. No. \_\_\_\_\_ Exp. / \_\_\_\_\_  
 PLEASE PRINT CLEARLY

Name \_\_\_\_\_  
 Address \_\_\_\_\_ Apt. # \_\_\_\_\_  
 City \_\_\_\_\_  
 State \_\_\_\_\_ ZIP \_\_\_\_\_  
 Phone (\_\_\_\_) \_\_\_\_\_  
 Sign Here \_\_\_\_\_

CIRCLE 129 ON READER SERVICE CARD  
 73 Amateur Radio • December, 1987 63



## Great Ideas From Our Readers

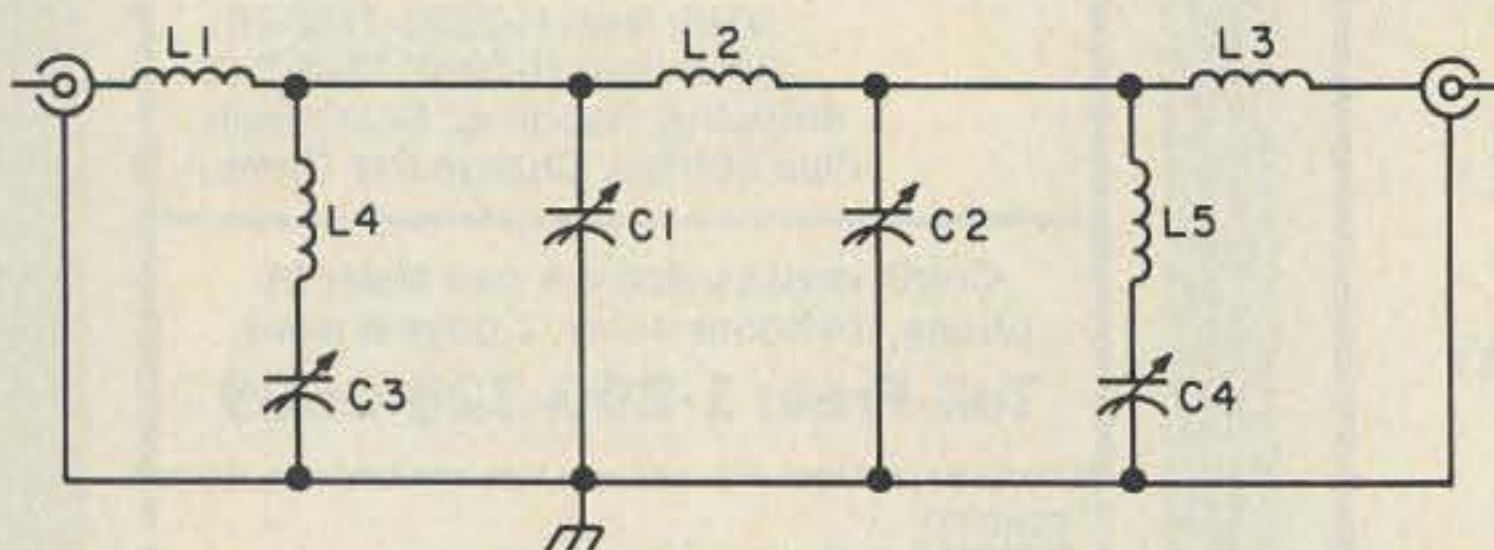
Many readers will recognize the revival of this regular feature, which has been absent from the pages of 73 for several years. We welcome brief contributions of circuits. If your idea is published, you will receive a free subscription or a renewal. Clearly indicate that your submission is for this column and not a manuscript for an article.—Ed.

**CHEBYSHEV FOR SIX:** When I recently got back on six meters SSB with a Swan 250, I discovered a number of images, spurs, and other unwanted signals. One of these is handy. It has a stable signal locally on about 50.113 MHz, which can be used like a beacon to judge band conditions from day to day. However, a strong FM station on 89.7 MHz also splatters into the Swan, beating with the second harmonic of the injection frequency. There are two ways to deal with the problem: attenuate the incoming signal or attenuate the oscillator harmonic. The preferred way is to put a filter between the rig and the antenna, because that also attenuates radiation from the transmitter that might cause TVI. What kind of filter?

A Chebyshev is easy to design, and it can be adjusted without elaborate instruments. Suck-out traps were added to degrade the unwanted incoming signal.

coils, because leads add inductance at these frequencies. I used the familiar APC capacitors (first used in the plug-in coils of the 1930s Hammarlund receivers) but any will do. For good shielding, I built it on the tight-fitting lid of a can that once held Christmas candy. (Tea canisters are also good.) Tune-up requires only a grid dipper or tunnel dipper.

Tune the middle coil (L2) to 55 MHz, using the same capacity setting on each side. Temporarily connect the two trap circuits (C3 L4, C4 L5) as parallel circuits and rough-tune to the frequency you want to reject. (They can be two different frequencies, if desired.) Then connect the trap circuits as series-resonant circuits and solder to the rest of the filter as shown in Figure 1. Insert the device in the line and find the unwanted image. Adjust the trap



- L1, L3 3 1/2 TURNS No.14 1/2 in. DIAMETER TRIPLE SPADED
- L2 5 TURNS No.14 1/2 in. DIAMETER TRIPLE SPADED
- L4, L5 4 TURNS No.14 1/2 in. DIAMETER TRIPLE SPADED
- C1, C2 75 TO 100pF APC VARIABLE CAPS
- C3, C4 50pF APC VARIABLE CAPS
- ALL CAPS WILL TUNE ABOUT HALF-MESHED.

Fig. 1.

I will skip the math, because if you can do that yourself you don't need this article. The coils are oriented 90 degrees apart to reduce mutual inductance. Beyond that, construction is what you find convenient. Keep short leads to the

nearest the antenna to reject it. The other trap can be tuned to the same frequency or a slightly different one if there is another station you need to chop out. Enjoy—

Wm. Bruce Cameron WA4UZM,  
Temple Terrace, FL.

### Parts List for Oscillator

- R1 100k, 1/2 watt
- R2 33k, 1/2 watt
- R3 68k, 1/2 watt
- R4 40-Ohm pot (I pulled mine from an old TV convergence board—value of R4 not critical)
- IC NE555
- D1-D5 any signal diode (silicon)
- Q1 2N2222 or any NPN small signal transistor
- C1 .01 ceramic,
- C2 4.7 uF, 16V
- B+ 9-volt battery
- Any loudspeaker

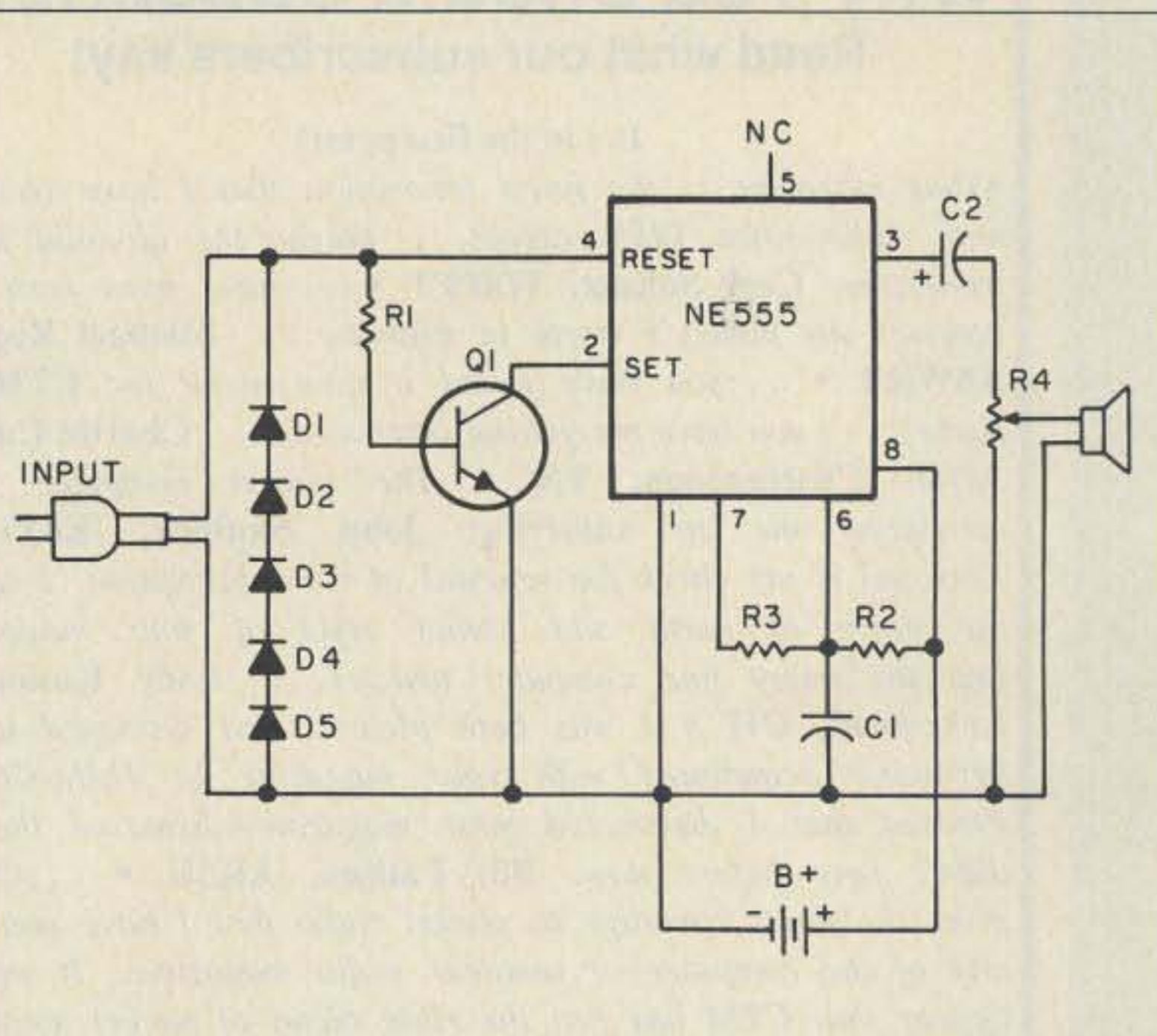


Fig. 2. This circuit will follow any frequency of audio tone.

**CLEAR COPY OSCILLATOR CIRCUIT:** I have a Commodore 64 computer I wanted to use in teaching Morse code. But the audio chip in the 64 has a pop when it comes on or goes off a tone. This makes code harder to copy and almost impossible to record for practice or giving tests. I tried many combinations of settings to alter attack, sustain, and decay, but found no settings to eliminate this problem. I decided to make an audio processor to clean up this troublesome noise.

The circuit design is as follows. The heart of this audio processor is a 555 timer IC. By feeding the audio tone to

the trigger input and the reset input, the 555 can be used as a flip-flop with a husky buffer and can drive a speaker with enough volume to cover a large auditorium, or can be reduced using either a wire-wound pot

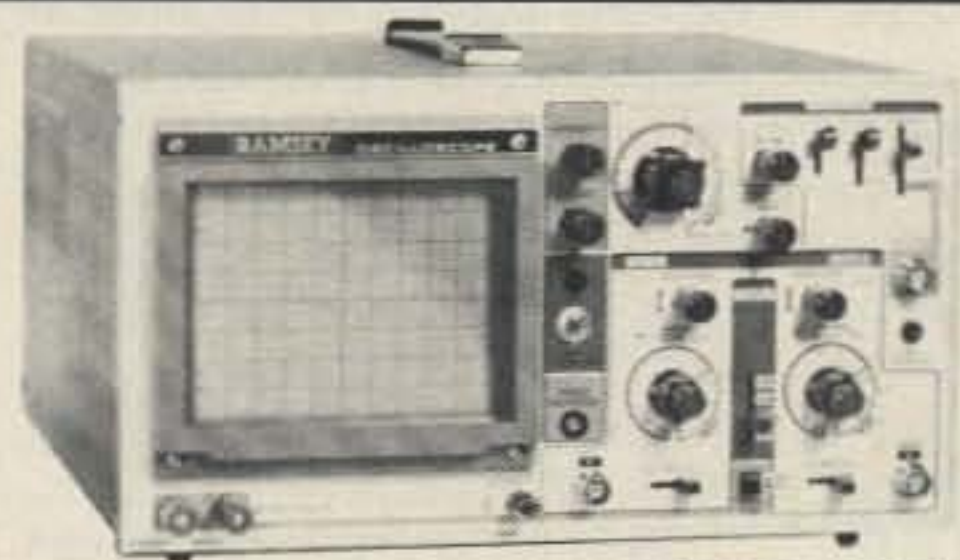
or a smaller output capacitor.

The audio input can use either an RCA jack, to use with a monitor cord, or about a three-foot cord with a DIN plug when using a TV set as a monitor. Pin 2 is the high side and Pin 3 is common or ground. The input is shunted with 5 small signal diodes that clip the audio signal to a usable level. I put the anode side of the diode string to common or circuit ground. To get the IC to toggle, it is necessary to invert one input. I used an NPN transistor to invert the signal on Pin 2 of the IC. There is a 100k resistor from the audio source to the base, the emitter is grounded, and the collector goes directly to Pin 2, the set input. Audio input goes directly to Pin 4, the reset input.

If you wish to record the output, just hook a 100k resistor to the output side of C2 to a shielded lead to the mike input on your recorder.

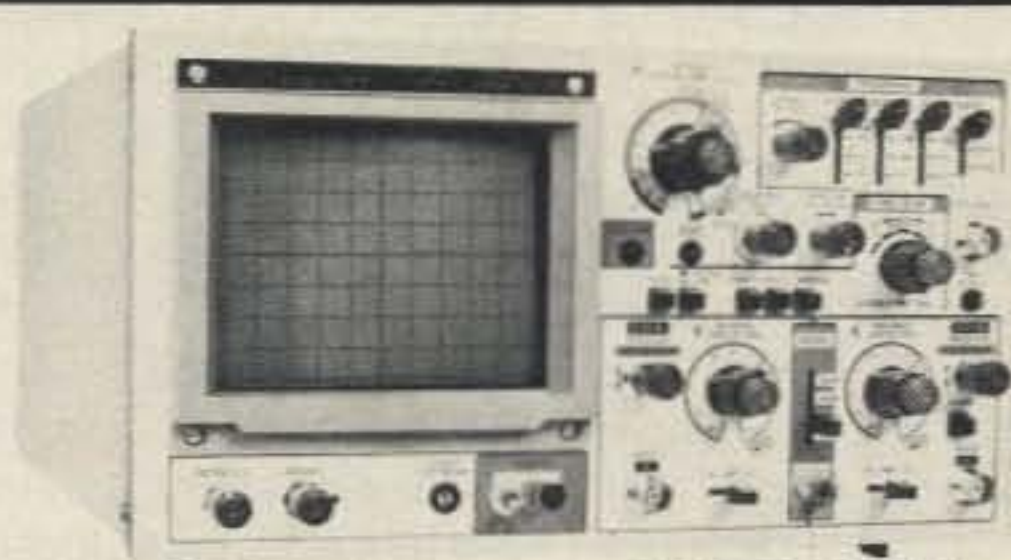
—Leonard Bauman, Sr. K9RMN,  
Rhineland, WI.





**\$369.95\***  
**20 MHz DUAL TRACE**

Features component testing circuit for resistors, capacitors, digital circuits and diodes—TV sync filter—high sensitivity—Z axis—XY mode—built-in calibrator—5X horizontal magnifier



**\$499.95\***  
**35 MHz DUAL TRACE**

wide frequency bandwidth—optimal sensitivity—delayed triggering sweep—hold off—ALT trigger—single sweep TV sync 5X magnification—XY or XYZ operation—HF/LF noise reduction

## NEW COM-3.



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

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

\*Add an additional \$10.00 for each unit for shipping.

### UNSURPASSED QUALITY • SUITABLE FOR HOBBY, SERVICE & PRODUCTION

MODEL	BAND WIDTH	# TRACES	CRT SIZE	VERTICAL SENSITIVITY	MAXIMUM TRIG FREQ	USEABLE MAXIMUM BANDWIDTH
2200	20 MHz	(2)	8x10CM	5 mV per div	35 MHz	30 MHz
3500	35 MHz	(2)	8x10CM	1 mV per div	50 MHz	60 MHz

All include high quality 1:1, 10:1 hook on probes, instruction/service manual with schematic and component layout, 1 year warranty.

### MINI-100 COUNTER



**\$119.95** CHARGER, NICAD BATTERIES, AC ADAPTER INCLUDED

### CT-70 7 DIGIT 525 MHz



**\$139.95** WIRED INCLUDES AC ADAPTER

### CT-90 9 DIGIT 600 MHz



**\$169.95** WIRED INCLUDES AC ADAPTER

### CT-50 8 DIGIT 600 MHz



**\$189.95** WIRED INCLUDES AC ADAPTER

### CT-125 9 DIGIT 1.2 GHz



**\$189.95** WIRED INCLUDES AC ADAPTER

MODEL	FREQ RANGE	SENSITIVITY	ACCURACY	DIGITS	RESOLUTION	PRICE
MINI-100	1-500 MHz	Less than 250mv	1 PPM	7	100 Hz, 1 KHz	119.95
CT-70	20 Hz-550 MHz	< 50mv To 150 MHz	1 PPM	7	1Hz, 10Hz, 100Hz	139.95
CT-90	10 Hz-600 MHz	< 10mv To 150 MHz < 150mv To 600 MHz	1 PPM	9	0.1Hz, 1Hz, 10Hz	169.95
CT-50	5 Hz-600 MHz	LESS THAN 25 mv	1 PPM	8	1Hz, 10Hz	189.95
CT-125	10 Hz-1.25 GHz	< 25mv @ 50 MHz < 15mv @ 500 MHz < 100 mv @ 800 MHz	1 PPM	9	0.1Hz, 1Hz, 10Hz	189.95
CT-90 WITH OV-1 OPTION	10 Hz-600 MHz	< 10mv To 150 MHz < 150mv To 600 MHz	0.1 PPM	9	0.1Hz, 1Hz, 10Hz	229.90

## RAMSEY FREQUENCY COUNTERS

Ramsey Electronics has been manufacturing electronic test gear for over 10 years and is recognized for lab quality products at breakthrough prices. Our frequency counters have features and capabilities of counters costing twice as much.



### RAMSEY D-4100 COMPACT DIGITAL MULTITESTER

**\$24.95**  
 test leads and battery included



Compact sized reliability and accuracy. This LCD digital multitester easily fits in your pocket, you can take it anywhere. It features full overload protection • 3 1/2 digit LCD readout • recessed input jacks • safety probes • diode check function • 2000 hours battery life



### RAMSEY D-5100 HANDHELD DIGITAL AUTORANGING METER

**\$49.95**  
 Includes Probes 1 Year Warranty

Provides distinctive audible chirp after contact has been made and meter reading has stabilized. Has TOUCH-HOLD feature to allow readings to be logged or referred to before making the next reading. Up to 10 AMP current capability and a continuity function which beeps on zero Ohms.



### PR-2 COUNTER PREAMP

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

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



### PS-2 AUDIO MULTIPLIER

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

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



### PS-10B 1 GHz PRESCALER

**\$89.95**  
 wired includes AC adapter

Extends the range of your present counter to 1 GHz • 2 stage preamp • divide by 1000 circuitry • super sensitive (50 mV typical) • BNC connectors • 1 GHz in, 1 MHz out • drives any counter

## MINI KITS—EASY TO ASSEMBLE—FUN TO USE—FOR BEGINNERS, STUDENTS AND PROS

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

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

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

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

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

**40 WATT 2 mtr PWR AMP**  
 Simple Class C power amp features 8 times power gain 1 W in for 8 out, 2 W in for 15 out, 5 W in for 40 W out. Max output of 50 W, incredible value, complete with all parts, less case and T-R relay.  
 PA-1, 40 W pwr amp kit **\$22.95**  
 TR-1, RF sensed T-R relay kit **6.95**

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

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

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

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

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

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

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

**TELEPHONE TRANSMITTER**  
 Low cost with professional performance. Features include: self phone line powered, tunable from 76 to 100 MHz, polarity antisensitive, compact size (1/2" x 1 1/4"), easily installs anywhere on the phone line or inside the instrument itself.  
 PB-1 KIT **\$14.95**

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

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

### ACCESSORIES FOR RAMSEY COUNTERS

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



PHONE ORDERS CALL **716-586-3950**



TELEX 466735 RAMSEY CI  
 FAX 716-586-4754

TERMS: • satisfaction guaranteed • examine for 10 days, if not pleased, return in original form for refund • add 6% for shipping and insurance to a maximum of \$10.00 • foreign add 15% for surface mail • CDD add \$2.50 (CDD in USA only) • orders under \$15.00 add \$1.50 • NY residents add 7% sales tax • 90 day parts warranty on all kits • 1 year parts & labor warranty on all wired units.

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



# WEATHERSATS

Number 37 on your Feedback card

## View On Video Processing

Dr. Ralph E. Taggart WB8DQT  
602 S. Jefferson  
Mason MI 48854

### SATELLITE IMAGES

Last month I promised some discussion of video processing. Video processing is quite a fascinating and complex subject that will take more than a month to cover, so we had better get started!

Any weather satellite image consists of a range of brightness values represented by a range of subcarrier amplitudes between 4% (black) and 100% (white). No matter what kind of display we use—an analog CRT monitor, a FAX recorder, or a scan converter—we first want to reproduce this range as accurately as possible to display the original image. In practice we rarely achieve a 1:1 correspondence between the original image brightness values and those of our displayed image or print. Without knowing it, we all engage in some degree of image processing. We do so whenever we adjust the brightness and/or contrast of our display system. In most cases we are simply trying to make the picture "look good"—increasing video contrast to bring out more detail in a dark area of an image, reducing contrast to reveal more structure in bright clouds, compensating for display response at the black or white ends of the grayscale, etc.

Assuming a good distribution of brightness values in the original image, such "low-level" video processing is usually adequate for a satisfactory display. WEFAX images, which are already processed by ground computers, fall into the category of "easy-to-display" images with excellent results with simple adjustments of

contrast and/or brightness controls. Once you have your display system set up, you can print or display endless WEFAX images and get excellent results. This pleasant situation falls apart, however, when you start to play with polar orbit satellite data! Let's look at an excellent example of the kind of problems we have to face.

### A Problem to Consider

Figure 1A shows a hypothetical oscilloscope display of the video detector/filter output with an image from a typical winter daylight pass from one of the TIROS/NOAA polar orbiting spacecraft. For the sake of illustration, let us assume that the detector will deliver a signal ranging from 0V for black to +5V for white, and that the rest of our display system is set up to deliver a good contrast image when driven by signals in this range. Unfortunately, this sample of image data will give us some problems since the first half of the APT line (the visible light data) will reproduce very dark. All the video data are in the low end of the dynamic range, while the IR channel (the second half of the APT line) will probably look pure white.

When you first look at data like this you might wonder why we can't build a satellite that will produce decent pictures! Look at the problems faced by the folks who design these spacecraft. Both the visible and IR sensors in the spacecraft imaging system have a very wide dynamic range. In terms of visible light, the sensors have to be able to provide usable data under brightness conditions ranging from the murk of polar regions in the middle of winter to the brightest cloud illumination at equatori-

al latitudes. The IR sensors have to provide a usable response over a temperature range that encompasses the Sahara at noon to the polar ice caps in midwinter. They really do accomplish this, as the visible and IR mosaics transmitted by WEFAX demonstrate, but that doesn't help us with our display problems! In the case of our NOAA image, all the usable visible light data is crammed at the black end of the grayscale while the IR data are all clustered at the white end of the dynamic range. Since any display system has a finite dynamic range, the result in this case is an overly-dark visible light segment and an overly-bright IR channel with neither providing sufficient detail to be labeled anything close to satisfactory.

### An Easy Solution

In the case of the visible light data, we could simply increase the system contrast until we got a satisfactory display—a situation illustrated in Figure 1B. Increasing the contrast has expanded the range of variation in the visible channel to produce a nice display. Although this is an *easy fix*, it is not without its problems. First, without a scope, you would probably have to print or display the image several times until you got it just right. You will also have to readjust the contrast again to display METEOR or WEFAX data.

Finally, the IR data was already quite close to the upper end of the system dynamic range (Figure 1A), and our contrast increase simply raised the system gain enough to clip out all IR variation at the +5V white limit (Figure 1B)! For openers, you might think that a contrast reduction contrast improves the IR display by sliding some of the incoming data down toward the black end of the dynamic range. The results will depend very much on where you live and the season of the year. At low latitudes or at mid-latitudes during

the summer you may get a usable display, but mid- and high-latitude stations will not get much in the winter months. There is simply too little subcarrier variation to yield more than a few tantalizing patterns. Figure 1C shows a possible result. The IR data are now well within the 0-5-V range, but "blackest" and "whitest" signal levels differ by very little, so our low-contrast image will be a dingy gray!

Given these problems, we can see why most polar orbit stations use the visible light data, despite the fact that IR data are available during evening passes when most of us are at home!

To avoid constant fiddling with display settings, we must resort to full-blown video processing. In the case we have discussed so far, we want simple *contrast enhancement*. For the visible light data we would like to take the relatively small range of variation near the black end of the dynamic range and expand that to yield a full black to white range on our display. Granted, we can do that with display contrast manipulation, but ideally, we want to simply adjust the display for the best possible display of subcarrier data in the 4% to 100% range and leave it there. Similarly, we want to take the small range of variation at the white end of the IR data range and expand that to increase contrast. Prior to looking in detail at how to accomplish these operations, let's examine some very general requirements and approaches to image processing in general and contrast enhancement in particular.

### Analog versus Digital

Most analog display systems, such as CRT monitors and FAX recorders, have no capacity to store image data. They simply accept subcarrier data at the input and transfer it to the CRT trace or FAX paper. Such a system requires "on the fly" adjustments. Real-time processing can be extremely effective, but if the results are unsatisfactory we must print the image again. Without an oscilloscope to aid in level adjustments, replaying and readjusting display recordings can consume a lot of time.

Digital scan converters store the image data in numerical form in a solid-state memory. In such a case, we have the potential to process the image data *after* storage without having to reload the image with each attempt. Not all scan

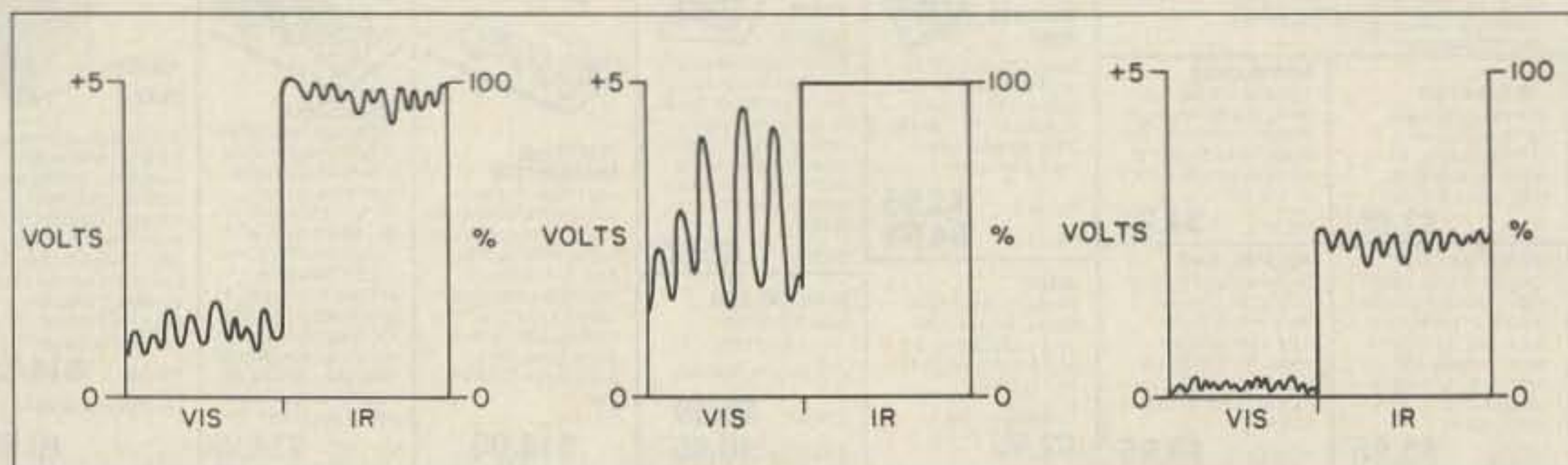


Figure 1. 1A is normal signal output. VIS image is dark and low-contrast. IR image is white and low-contrast. 1B shows increased contrast. VIS has good contrast, but the IR image is clipped white! 1C shows decreased contrast—no VIS image, IR image is gray, and contrast is low.



converters actually have such capability, however. Some scan converters employ dedicated or "hard-wired" designs that do not incorporate internal image processing capabilities. Dedicated scan converters of this type (such as the Wrasse 665) do not allow manipulation of the memory's contents or of changing the numerical value of pixels in their passage from memory to display. So we change the video values at the input. Even some computer-driven scan converters have this problem. The ones in question are those that use minimal bit coding for the data in memory. This will take a bit of explaining, so let's get to it.

Most experimenters will agree that it takes a minimum of 16 grayscale steps (4-bit video) to provide an acceptable TV display. Fewer steps results in a very "digital"-looking image with unacceptable contouring, or a "paint-by-numbers" appearance. Any scan converter that stores pixel data in a 4-bit format (range of 0-15) will have a problem with image enhancement, and this includes the *Weather Satellite Handbook (WSH)* and Clay Abrams designs when used with a 64K computer. Both designs store pixels in the same 4-bit format used for display. Let's look at the problems that might occur if we had a picture in which all of the video variation is in the upper 50% of the dynamic range. All of our image data would be in the range of 8-15, resulting in a very washed-out image. As we shall see later, it is no problem to re-scale these pixel values so that the original brightness distribution of 8-15 was shifted to a range of 0-15, and we would gain plenty of contrast in the bargain. The problem is that we only had 8 useful steps (8-15) to start. Our new pixel distribution would still have only 8 steps (values of 0, 2, 4, 6, 8, 10, 12, and 14 or 15, depending on how we did the transformation) so that our new image, while possessing full contrast, would be highly contoured and would look pretty bad. The problem gets even worse with greater expansion. With winter IR data, all the 4-bit variation might be in steps 14 and 15. No matter how we "stretched" the contrast, we only have two useful steps available, and the more we stretch the range, the worse the picture will look!

### The Solution

The solution is to have more

video bits available than we actually need for display. Let's say that the same image data are stored in 6-bit form (64 grayscale steps), but that we are using 4 bits (16 steps) for display. In the case of our first example, with video variation in the upper 50% of the dynamic range, the usable data would all be in the range of 32-63—a total of 32 steps of image data. Since this far exceeds the 16 steps actually used for display, we can stretch or otherwise manipulate the *display* dynamic range without any increase in contouring. In fact, we could expand anything down to 25% of the dynamic range and still retain the normal display! Assuming 4 bits minimum for display, at least 6 bits are required for pixel storage in memory to have any real processing options available without degrading the quality of the displayed image. If your display uses 6 bits, then you should use 8-bit storage (1 byte/pixel) to achieve similar flexibility.

So what do you do if the memory isn't available to allot 6 bits per pixel? One answer is to perform a 6-bit A/D conversion of the video and then convert it to the desired 4-bit format prior to memory storage. That works just fine, but it is an "on the fly" technique with its associated problems. Also, the clock speed on a standard CoCo 1 or 2, for example, will barely permit a 6-bit software A/D conversion and allows precious little time for complex 6- to 4-bit conversion algorithms. One solution would use a fast hardware A/D to leave enough time left for processing. The new CoCo 3, however, will do a 6-bit conversion in half the time as the earlier models with its faster clock. The decreased conversions time also allows plenty of time to manipulate the 6-bit pixel data.

Breaking the 64K memory barrier provides you with lots of new options and flexibility. Use of the 512K CoCo 3 with the Version 4 software for the WSH scan converter allows the storage of 768 lines of image data with 1024 4-bit pixels/line, providing the flexibility for the ultimate in high resolution display via "zoom" routines. The latest software development (Ver. 4.5) incorporates a host of "on the fly" processing routines, which permit image processing while retaining full resolution. Since storage of a 1024 x 768 4-bit image requires 380K of the 512K of available RAM, there is no room for 6-bit pixel storage

needed for enhancement routines operating straight from memory. I did write a program that incorporated "from memory" enhancement with the image stored at 512 x 512. While the enhancement flexibility was nice, I did miss the extra resolution. Since I rarely find the need to enhance WEFAX or METEOR imagery, and the enhancements for NOAA are seasonal and generally predictable, "on the fly" conversions lose very little in light of the advantages of full resolution.

In summary, "on the fly" processing *must* be used with analog display systems and some scan converters. Similar approaches may be useful with other scan converters where memory is limited in terms of the desired level of resolution. "From memory" processing requires ample RAM for video storage. If you want both high resolution *and* the capability to process from memory you will need a lot of *video* RAM. Memory management requirements, which stem from execution of display options, further complicate the situation. The 1025 x 768 storage for the Version 4.X software

for the *WSH* scan converter was chosen on the basis of memory management/display option criteria. Storage of 4-bit pixels in this format requires 380K of video RAM. Optimum bit packing for 6-bit pixels at that resolution requires 576K of RAM and lots of software overhead for formatting pixel data. Storing one 6-bit pixel per byte simplifies the software, but that increases RAM requirement to 768K. This translates to elaborate extended memory options for a PC or a class jump to super Macs or AT+ class computers.

### How To Do It

In effect, video processing involves purposely distorting image brightness relationships in to get the specific display we need or want. There are many ways to accomplish this, but to keep the discussion manageable I will focus on three basic approaches— analog processing, something I will call "transparent digital processing," and strictly digital techniques. These will take a bit of space to discuss, however, so I defer them until next month.



Picture of the month: The above beauty is a submission from Don Shelley (KD7BU) from Glendale, Arizona. This represents a NOAA 5-pass (visible light data) taken back in May of 1977 using 35mm film and a CRT monitor. The image is superb and shows off that arid western countryside to good advantage. The California coast and Baja California show up beautifully and there is some nice sun-glint off the Pacific south of Baja. **73**



# UNCLE WAYNE'S BOOK SHELVES

**The World** Is Your's  
**\$5.00** For Only



Yes, places you've never even heard of! Nearly 400 DX countries gleaned from the Awards Lists of dozens of IARU members—more countries than any other map available anywhere! ARRL's DX-CC map doesn't even come close!

73 Magazine offers readers our giant DX Map of the World for the absurdly low price of only \$5.00, shipping and handling included.

**Order now....**

## Code Tapes

We've had so many phone calls from people wanting our famous 73 code tapes that we've decided to bring them back!

### "Genesis"

**5 wpm**—This is the beginning tape, taking you through the 26 letters, 10 numbers and necessary punctuation, complete with practice every step of the way. The ease of learning gives confidence even to the faint of heart.

### "The Stickler"

**6+ wpm**—This is the practice tape for those who survived the 5 wpm tape, and it's also the tape for the Novice and Technician licenses. It is comprised of one solid hour of code. Characters are sent at 13 wpm and spaced at 5 wpm. Code groups are entirely random characters sent in groups of five—definitely not memorizable!

### "Back Breaker"

**13+ wpm**—Code groups again, at a brisk 13+ wpm so you'll be really at ease when you sit down in front of a steely-eyed volunteer examiner who starts sending you plain language at only 13 per. You'll need this extra margin to overcome the sheer panic universal in most test situations. You've come this far, so don't get code shy now!

### "Courageous"

**20+ wpm**—Congratulations! Okay, the challenge of code is what's gotten you this far, so don't quit now. Go for the Extra class license. We send the code faster than 20 per. It's like wearing lead weights on your feet when you run; you'll wonder why the examiner is sending so slowly!

## Classics From 73's Library

• *The Magic of Ham Radio*, by Jerold Swank W8HXR, begins with a brief history of amateur radio and Jerry's involvement in it. Part 2 details many of ham radio's heroic moments. Hamdon's close ties with the continent of Antarctica are the subject of Part 3. In Part 4 the strange and humorous sides of ham life get their due. And what of the future? Part 5 peers into the crystal ball. Only \$4.95.

• *The Contest Cookbook*, by Bill Zachary N60P. One of ham radio's winningest testers lets you in on the tips and techniques of the Big Guns. You'll learn which duping method to use, find out what equipment you'll need, and discover the secret of building a pileup. Includes separate chapters on DX and domestic contests. \$5.95 while they last!

• *The Giant Book of Electronics Projects*, by the Editors of 73 Magazine, a 500-page compendium of dynamic projects that includes something for everyone! Only \$12.95.

*The Practical Handbook of Amateur Radio FM & Repeaters*, by Bill Paternak WA61TF. With Mike Morris WA6ILQ Technical Advisor. Solid advice on how to use, design, and build a ham radio repeater. A bargain at \$9.95.

• *Master Handbook of Ham Radio Circuits*, by the Editors of 73 Magazine. A rich collection of more than 100 practical, unique, tested circuits created by hams for hams. A mere \$8.95!

• *Software for Amateur Radio*, by Joe Kasser G3ZCZ. Here's a treasure trove of practical, useful computer programs and applications ideas that will prove invaluable to any amateur radio enthusiast. A wealth of information for \$15.95.

• *VHF Antenna Handbook*, edited by Alex Barvicks WB4RVH, a 73 Publication. If you've been bitten by the ham bug, you'll be wanting to whip together these antennas for most of the VHF bands. Fun Stuff for only \$5.95!

### Books

The Magic of Ham Radio	\$4.95	-----
The Contest Cookbook	\$5.95	-----
The Giant Book of Electronics Projects	\$12.95	-----
The Practical Handbook of Amateur Radio FM Repeaters	\$9.95	-----
Master Handbook of Ham Radio Circuits	\$8.95	-----
Software for Amateur Radio	\$15.95	-----
VHF Antenna Handbook	\$5.95	-----

**Postage and Handling \$1.00**

### Code Tapes

Genesis	\$6.95	-----
The Stickler	\$6.95	-----
Back Breaker	\$6.95	-----
Courageous	\$6.95	-----

**Postage and Handling \$1.00**

**Giant DX Map of the World** \$5.00 -----  
**Postage and Handling \$1.00** Total Enclosed -----

Please print!

Name \_\_\_\_\_ Call \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

AE       MC       VISA       Check/MO

Card # \_\_\_\_\_ Exp. Date \_\_\_\_\_

### ORDER FORM

Mail your order to 73 Magazine, WGE Center, Peterborough NH 03458, Attn: Uncle Wayne.



# THE MOST AFFORDABLE REPEATER

ALSO HAS THE MOST IMPRESSIVE PERFORMANCE FEATURES  
(AND GIVES THEM TO YOU AS STANDARD EQUIPMENT!)

BAND	WIRED	KIT
6M, 2M, 220 UHF	\$880	\$630
	\$980	\$730

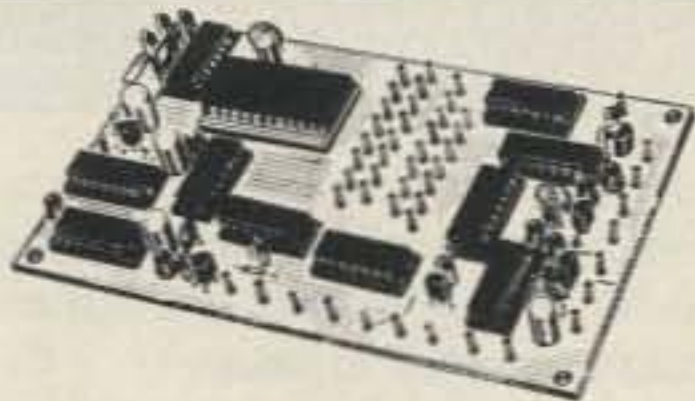
(Also available for commercial bands!)



## FEATURES:

- SENSITIVITY SECOND TO NONE! 0.15uV Typ.
- SELECTIVITY THAT CAN'T BE BEAT! Both 8 pole xtal filter & ceramic filter for > 100dB at ±12kHz. Helical resonator front end to combat desense & intermod.
- Flutter-proof squelch, Automatic frequency control, separate spkr amplifier.
- CLEAN, EASY-TUNE TRANSMITTER, up to 20W output, 50W with additional PA.

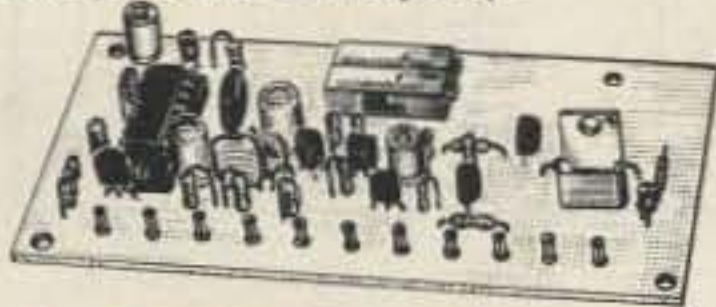
## ACCESSORIES



- TD-2 DTMF DECODER/CONTROLLER kit only \$78. Full 16 digits, 5 functions, toll call restrictor, programmable. Much more. Great for selective calling too!
- AP-1 AUTOPATCH kit only \$78. Reverse patch & phone line remote control std.
- AP-2 Simplex Autopatch. Use with above.



- CWID kit, new low price \$48. Field programmable, timers, the works!
- COR-2 kit, \$38. Audio mixer, local spkr amplifier, tail & time-out timers.
- COR-3 kit, \$48, with courtesy beep.



- MO-202 FSK DATA MODULATOR kit \$38. Run up to 1200 baud digital or packet radio signals through any FM transmitter.
- DE-202 FSK DATA DEMODULATOR kit \$38.

## GaAs FET PREAMPS at a fraction of the cost of comparable units!

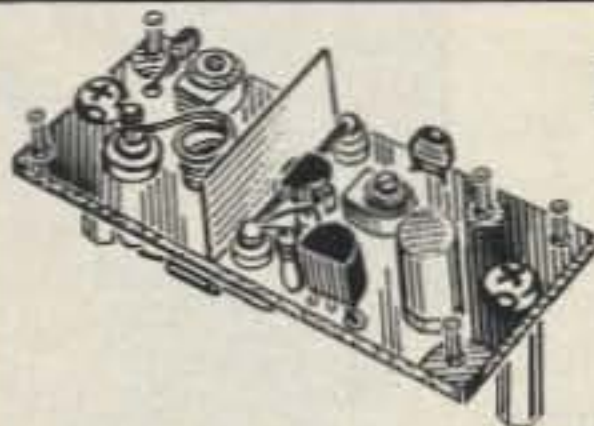
### LNG -(\*) GaAs FET PREAMP

ONLY \$49!  
WIRED/TESTED



#### FEATURES:

- Very Low Noise: 0.7dB VHF, 0.8dB UHF
  - High Gain: 13-20dB, depending on freq
  - Wide Dynamic Range: to resist overload
  - Stable: new-type dual-gate GaAs FET
- \* Specify tuning range desired: 26-30, 46-56, 137-150, 150-172, 210-230, 400-470, or 800-960 MHz.



### LNW -(\*) MINIATURE GaAs FET PREAMP

Unbelievably Low Price ---  
ONLY \$19/kit,  
\$34 Wired/tested

GaAs FET Preamp similar to LNG, except designed for **low cost & small size**. Only 5/8"W x 1-5/8"L x 3/4"H. Easily mounts in many radios.

\* Specify tuning range desired: 25-35, 35-55, 55-90, 90-120, 120-150, 150-200, 200-270, or 400-500 MHz.

### LNS-(\*)

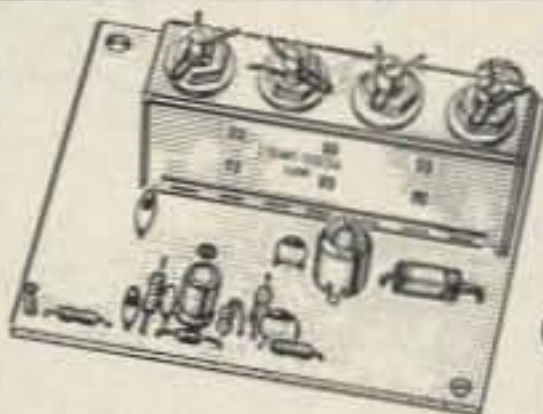
#### IN-LINE PREAMP

ONLY \$59/kit,  
\$79 wired/tested



GaAs FET Preamp with features similar to LNG series, except **automatically switches out of line during transmit**. Use with base or mobile transceivers up to 25W. **Tower mtg. hardware supplied.**

\* Specify tuning range desired: 120-175, 200-240, or 400-500 MHz.



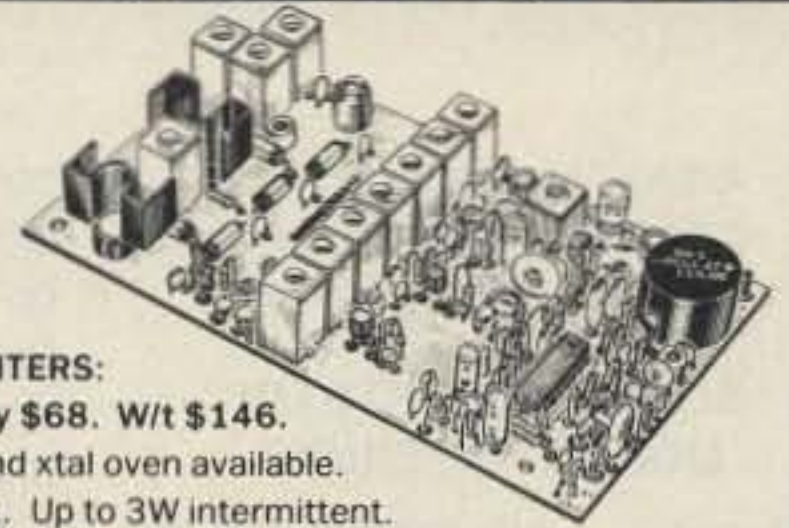
### HRA -(\*) HELICAL RESONATOR PREAMP

ONLY \$49 VHF or \$64 UHF

Low-noise preamps with helical resonators **reduce intermod & cross-band** interference in critical applications.

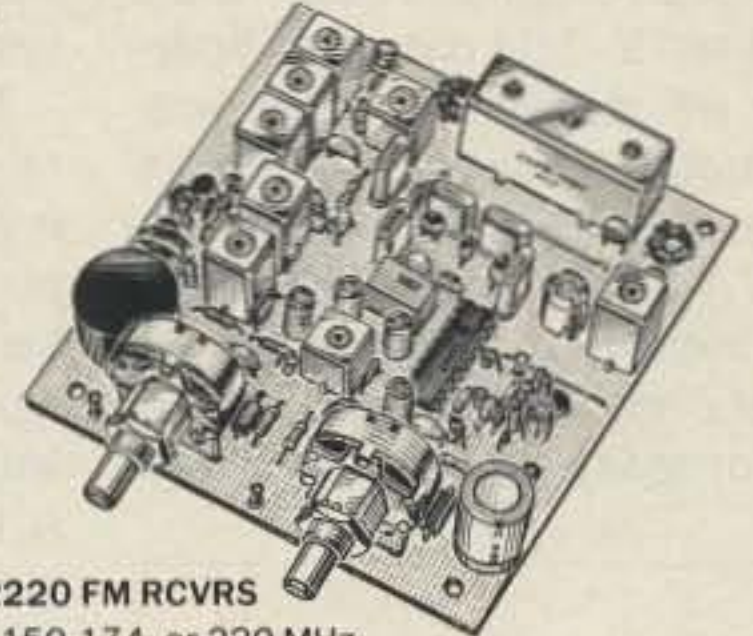
\* Specify tuning range desired: 143-150, 150-158, 158-162, 162-174, 213-233, 420-450, 450-465, or 465-475 MHz.

## HIGH QUALITY XMTR & RCVR MODULES FOR REPEATERS, LINKS, TELEMETRY, ETC.



#### •FM EXCITERS:

- Kits only \$68. W/t \$146. TCXO and xtal oven available. 2W cont. Up to 3W intermittent.
- TA51 for 10M, 6M, 2M, 150-174, 220 MHz.
- TA451 for uhf. FCC TYPE ACCEPTED FOR COMMERCIAL BANDS.
- VHF & UHF LINEAR AMPLIFIERS. For FM or SSB. Power levels from 10 to 45 Watts. Several models, kits starting at \$78.



#### •R144/R220 FM RCVRS

- for 2M, 150-174, or 220 MHz. 0.15uV sens, 8-pole xtal & 10 pole ceramic i-f filters, helical resonator front end for exceptional selectivity, > 100dB at ±12kHz (best available anywhere!) Flutter-proof squelch. AFC tracks drifting xmtrs. Xtal oven avail. Kit \$138, w/t \$198.
- R451 FM RCVR. Same as above but UHF. Tuned line front end. 0.2uV sensitivity. Kit only \$138, w/t \$198.
- R76 VHF FM RCVR for 10M, 6M, 2M, 220. As above, but w/o AFC or hel.res. Kits only \$98 to \$118.
- R110 VHF AM RCVR for VHF aircraft or ham bands or UHF. Kit only \$98.

**NOW—FCC TYPE ACCEPTED TRANSMITTERS, RECEIVERS, AND REPEATERS AVAILABLE FOR HIGH-BAND AND UHF. CALL FOR DETAILS.**

## RECEIVING CONVERTERS

VHF MODELS	Antenna Input Range	Receiver Output
Kit with Case \$49	28-32	144-148
Kit less Case \$39	50-52	28-30
Wired w/case \$69	50-54	144-148
	144-146	28-30
	145-147	28-30
	144-144.4	27-27.4
	146-148	28-30
	220-222	28-30
	220-224	50-54
	222-224	28-30
	432-434	28-30
	435-437	28-30
	432-436	144-148
	432-436	50-54
	439-25	81-25
	902-928	422-448
	902-922	430-450

## TRANSMIT CONVERTERS

For SSB, CW, ATV, FM, etc. Can be linked with receive conv for transceiver. 1 to 2 W out. Linear PA's available up to 50W.	Exciter Input Range	Antenna Output
For VHF, Model XV2 Kit \$79 Wired \$149 (specify band)	28-30	144-146
	28-29	145-146
	28-30	50-52
	27-27.4	144-144.4
	28-30	220-222
	50-54	220-224
	144-146	50-52
	144-146	28-30
For UHF, Model XV4 Kit \$79 Wired \$139	28-30	432-434
	28-30	435-437
	61-25	439-25
	144-148	432-436

## HAMTRONICS, INC.

65-D Moul Rd.; Hilton NY 14468-9535

High quality equipment at reasonable prices surely appeals to me; but I want more details before I buy! Rush my copy of the 40-page Hamtronics catalog by return first class mail. I enclose \$1 (\$2 for overseas air mail).

Name \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ State/ZIP \_\_\_\_\_

- Order by phone or mail • Add \$3 S&H per order (Electronic answering service evenings & weekends)
- Use VISA, MASTERCARD, Check, or UPS COD.

# hamtronics, inc.

65-D MOUL ROAD • HILTON NY 14468-9535

Phone: 716-392-9430

Hamtronics® is a registered trademark



# AERIAL VIEW

## Antenna News

Arliss Thompson W7XU  
7314 SW 28th Avenue  
Portland OR 97219

### SOME THOUGHTS ON MOBILE ANTENNAS

Recently, while loading the car for a vacation trip, my wife commented that my mistress is coming with us. My "mistress" is my radio gear, and in this case "she" was the TS-130 I use when operating HF mobile. My affair with HF mobile, however, involves something of a love-hate relationship—I love to keep schedules with friends on 75 meters as we motor along, but I hate the frustration of trying to maintain those

contacts in the face of QRN and QSB. I don't often have difficulties on the receiving end, but it can be tough to make yourself heard when mobile, especially on the 80/75- and 40-m bands. So why do I (and other HF mobilers) sometimes have difficulty making contacts when the same transceiver at home produces solid contacts? The answer lies in the antenna system.

The typical home station antenna for the lower HF bands is an inverted vee or horizontal dipole constructed of wire. The efficiency of such an antenna is typically 98% or better; i.e. 100 watts in, 98-plus watts radiated. A typical 75-m mobile employs a whip 8 to 9 feet long and a coil for loading it to resonance. Make a guess about its efficiency. 50%? 30%? 10%? Try 3-5%. That means for every 100 watts of output from your transceiver, fewer than 5 watts are actually radiated. The other 95 watts dissipate as heat. No wonder that mobile signal is "wimpy, wimpy, wimpy."

Why is a mobile antenna so inefficient, and what can we do about it? If you hadn't guessed it by now, that's what this month's column is about.

### Just a Little Theory

I'll discuss some practical ways to improve mobile antenna efficiency a little later on, but first we should understand why the efficiency of these antennas is so low.

We all know that resistors absorb power. Antennas have a characteristic known as "radiation resistance." Power "dissipated" in the radiation resistance,  $R_R$ , is the power radiated. Antenna systems have other resistances associated with them, including the resistance present in the ground,  $R_G$ , and the resistance due to any loading coils,  $R_C$ . The total resistance,  $R_T$ , can be expressed as:

$$R_T = R_R + R_G + R_C \quad (1)$$

The power applied to the antenna is divided among these various resistances, so you can see that having a low radiation resistance in the face of high  $R_G$  or  $R_C$  makes for a poor radiator. In fact, we can define

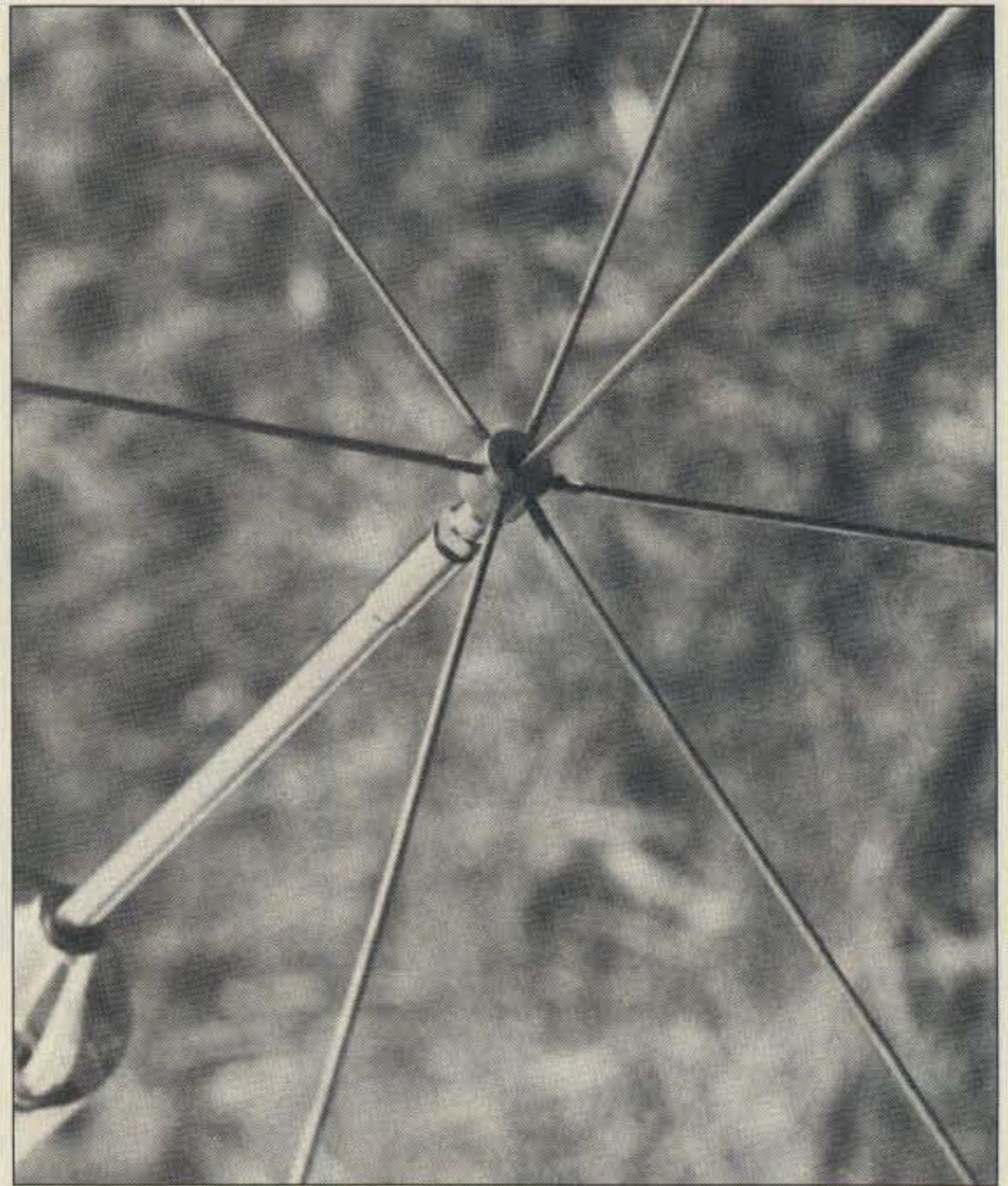


Photo A. Close-up view of a top-hat, approximately 2 feet in diameter. It is fashioned from 6 stainless steel bicycle spokes and a piece of scrap aluminum. Spoke threads are 2-56. (Not all spokes are that size!) Set screws in the aluminum collar hold the top hat in place.

the percent efficiency,  $n$ , of the antenna as:

$$n = R_R/R_T \times 100 \quad (2)$$

I won't give you the equations that allow you to calculate the radiation resistance of a given antenna

here. Suffice it to say that for short vertical whips,  $R_R$  is proportional to the square of the antenna's length. (1, 9)

We have a number of theoretical terms floating around now, so on to a concrete example. Let's

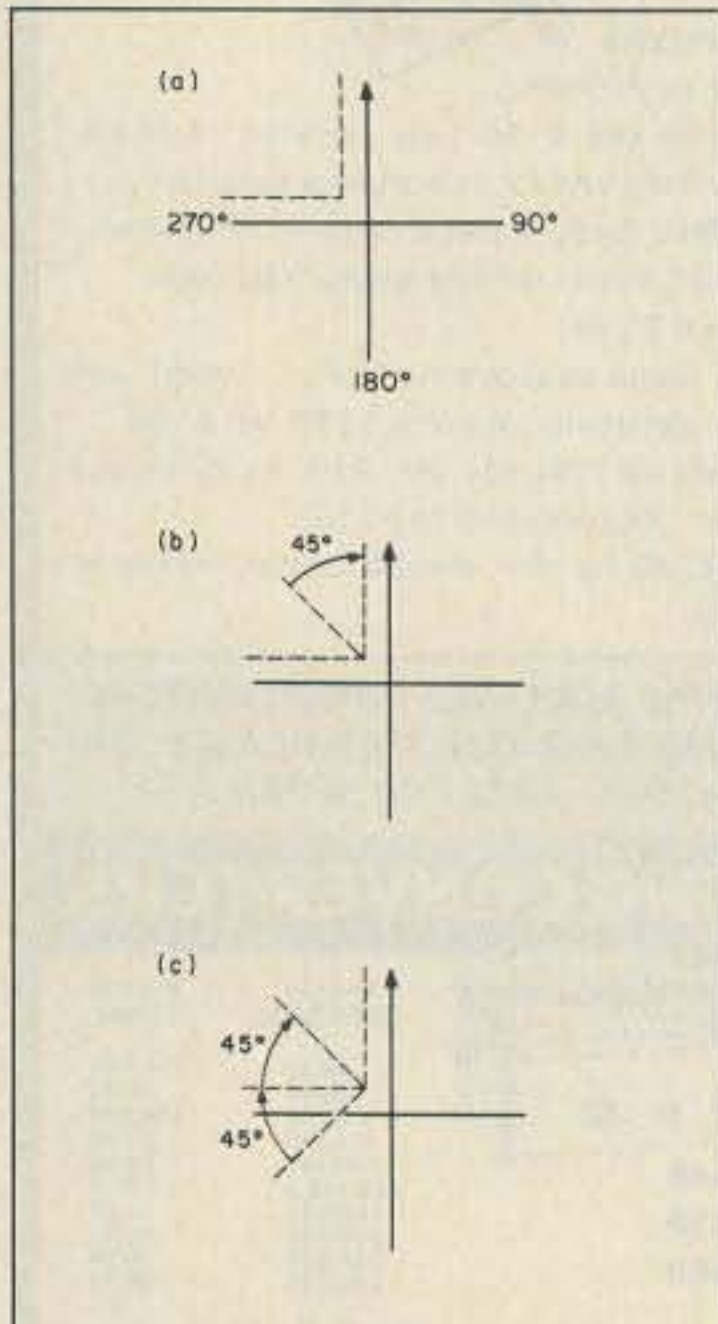


Fig. 1. Orientation of radials added to mobile at rest to maximize received signal strength. All radials were 33 feet long, bare copper, laid on the earth's surface. The near ends were attached to the body of the vehicle to achieve good electrical contact. In all cases, the vehicle faces in the direction of the arrow, with the signal arriving from the left (270°). (a) Two-wire case. Signal strength improvement is 1-2 dB. (b) Three-wire case, with improvement of about 2 dB. (c) Four-wire case, with 3-dB improvement. Numerous combinations were tried. As more wires were added, their orientation became less critical. Depending on antenna placement on the vehicle, other radial patterns may prove more effective for other installations.

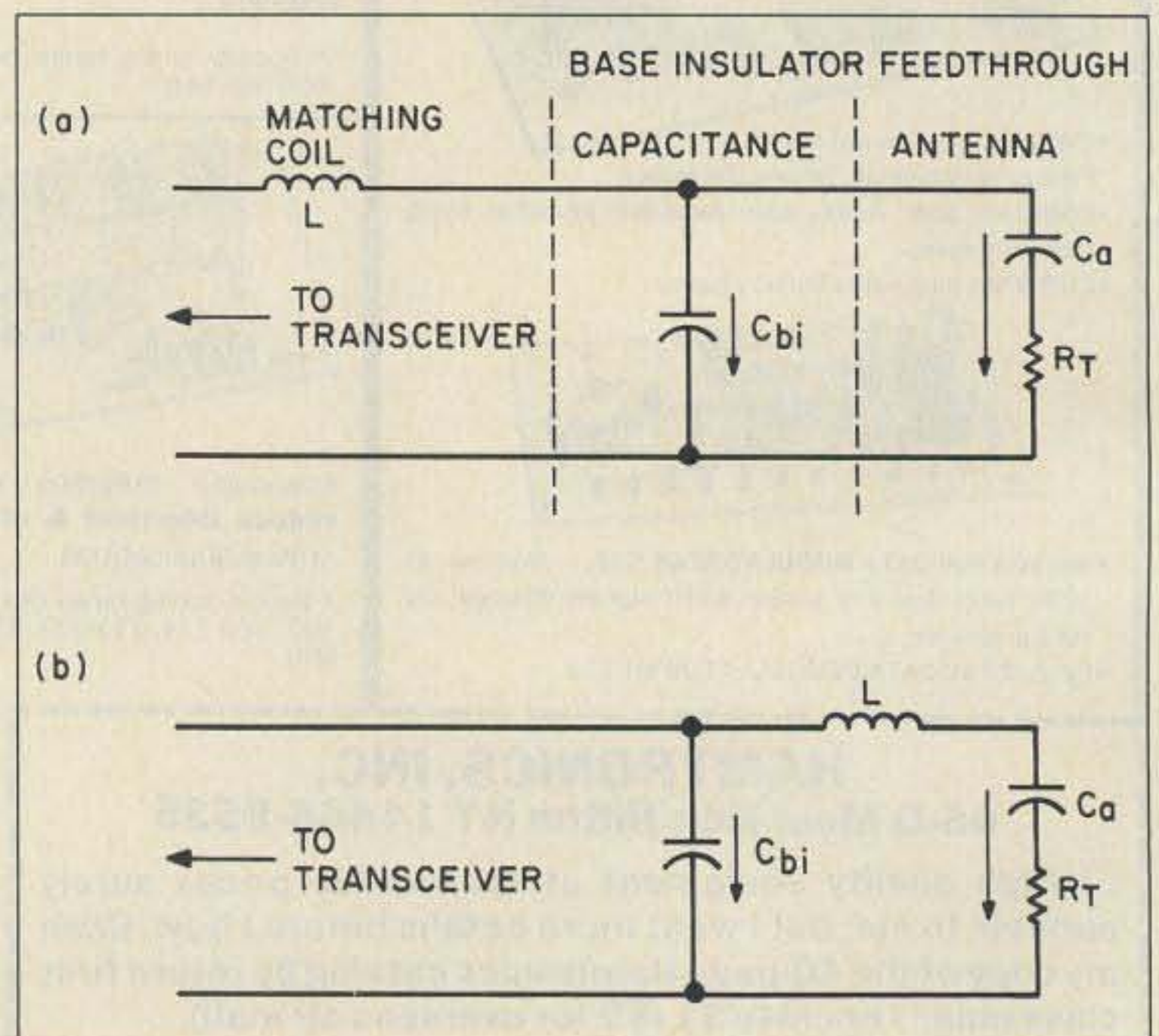


Fig. 2. Less desirable (a) and preferred (b) methods of positioning base-loading coil. When  $L$  is placed inside a metal vehicle (a), significant non-radiating current can flow through the base insulator feedthrough capacitance,  $C_{bi}$ . (From Belrose, Ref. 1).



assume our antenna is 8-feet long, center-loaded, and that we'll operate at 3.8 MHz.  $R_R$  for this antenna is about 0.8 Ohms. A typical value for  $R_G$  at this frequency is 10 Ohms. The resistance of the coil to produce resonance will vary with its quality (Q). A good coil (Q = 300) for this antenna would have a resistance of about 12 Ohms, (1, 9) while a coil of lesser quality (Q = 50) might have a resistance of 70 Ohms. (9) Putting the above values into equation (2),

$$n_1 = 0.8 / (0.8 + 10 + 12) \times 100$$

$$n_1 = 3.5\%$$

$$n_2 = 0.8 / (0.8 + 10 + 70) \times 100$$

$$n_2 = 1.0\%$$

where  $n_1$  = the efficiency of the antenna with the low-loss coil, and  $n_2$  = antenna efficiency with the higher-loss coil. You can see that the power out from the lower-loss system is up 5.4 dB. Now you know why some of us drive around with "oversize" resonator coils, even though we are only running 100-W! Typical efficiencies for a base-loaded 102-inch whip antenna appear in Table 1. (Table 1 also contains inductance values that will allow you to make an inexpensive amateur mobile antenna from a 102" CB whip).

Play a little with equation 2 and your calculator and you'll realize why mobile antennas can be so inefficient in the lower HF range. It's not that the radiation resistance is low, but rather that  $R_R$  is low in relation to the other losses— $R_G$  and  $R_C$ . To increase the amount of signal radiated, we can: 1) add an amplifier; 2) increase  $R_R$ ; 3) decrease  $R_G$ ; 4) decrease  $R_C$ ; 5) some combination of the preceding four. I'll leave it to you to deal with an amplifier, while I'll discuss the other avenues of approach.

#### Increase $R_R$

As I mentioned earlier,  $R_R$  increases with the square of the antenna length. If we increase the length of the whip in the example above from 96" (8') to 144" (12'),  $R_R$  will increase from 0.8 Ohms to 1.9 Ohms. If we keep other losses constant, the efficiency would rise from the 3.5% given above to nearly 8%. The antenna still radiates only 8 out of every 100 watts, but that's 2.6 times, or 4.15 dB, better than before. Actually, the increase in efficiency would be even greater, since the longer antenna would require a smaller loading coil (lower  $R_C$ ). The wrench in the works: keeping a

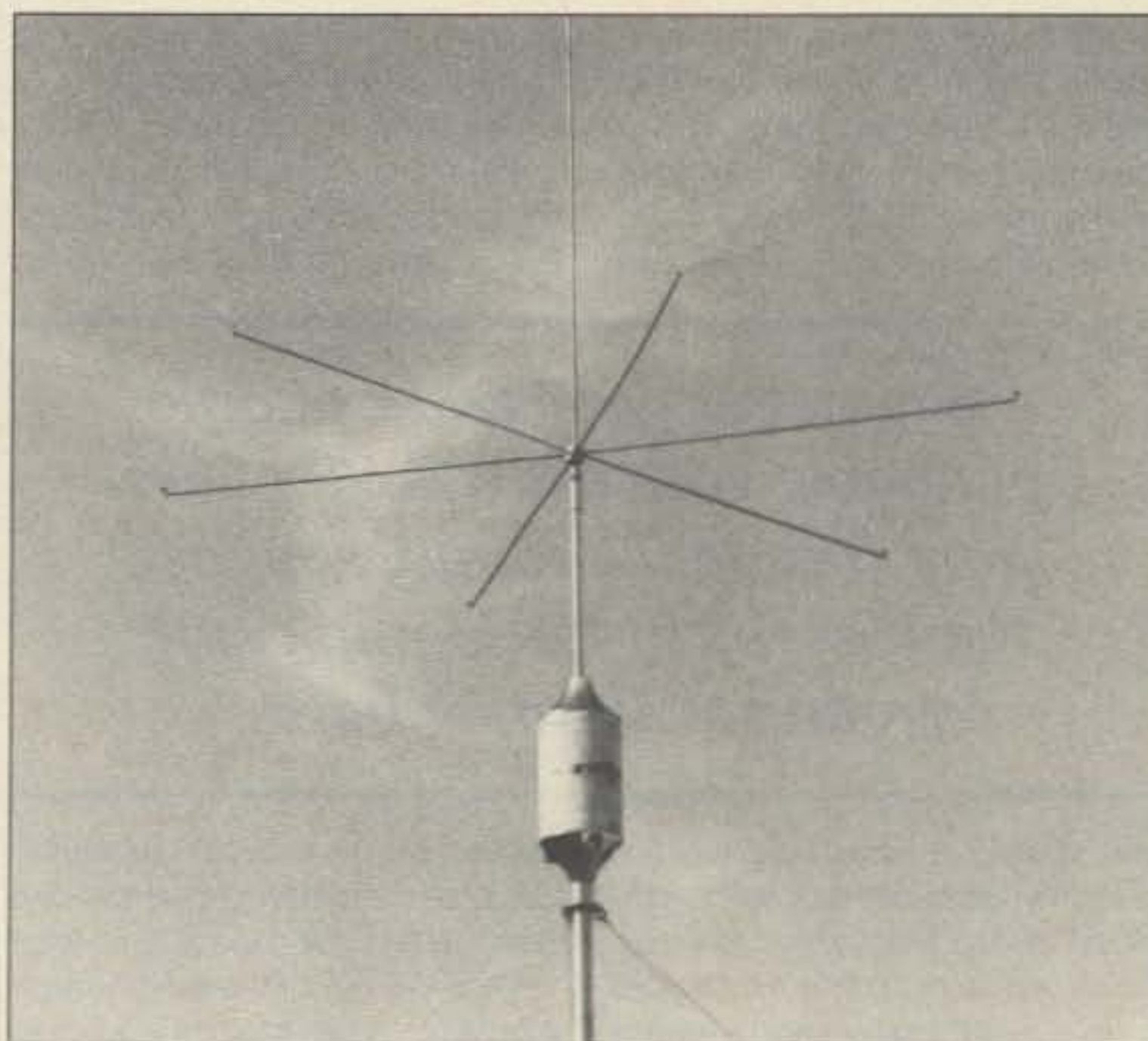


Photo B. A Hustler 20-m resonator with a top hat two feet in diameter. The system resonates in the 30-m band.

12-foot-long antenna attached to your vehicle at freeway speeds. You'll also have to figure out how to negotiate the low power lines and trees along your local streets, and to be legal in this part of the country you have to keep the maximum vehicle height below 14 feet. If you want to build an efficient mobile antenna (and antennas such as this are roaming the highways), this is one approach to consider.

If the mechanical problems associated with a long whip seem too formidable, or if you want to stick with commercially-made antennas when going mobile, you can still increase  $R_R$ , and thus the efficiency of your system. Pull off to the side of the road, remove that resonator, and attach enough wire to the remaining mast so that you have a full quarter-wave on the frequency of interest.  $R_R$  is now approximately 35 Ohms, while  $R_C$  has disappeared.

The efficiency may climb to 75% if you find a high end support. There will be less, although still worthwhile, improvement, if the antenna runs more horizontally. I have used this approach with good success. You can even use multi-conductor cable, such as rotor control cable, to make "parallel monopoles" for multi-band operation. True, it's not strictly a mobile antenna, but if you can arrange your schedules to coincide with your rest stops, or vice versa, it can mean the difference between a solid contact and being told you're + "20 under."

What if you pull into a rest stop and find no room to string the wire? I know of a W6 who uses a mobile antenna that can be retracted for use on the highway, or considerably extended for improved operation when at rest. I have replaced the resonator (only) of my Hustler antenna with a 102-inch CB whip (Photo A).

f(MHz)	1.8	3.8	7.2	10.125	14.2	21.25	24.95
$R_R$ ( $\Omega$ )	0.11	0.47	1.7	3.5	7.3	19.1	29
Loading L ( $\mu$ H)	273	61	16	7.7	3.4	0.9	0.3
$R_C \Omega$ (Q = 50)	61	29	14	9	6	2.4	2
$R_C \Omega$ (Q = 300)	10	5	2.4	1.5	1.0	0.4	0.3
Q = 50	0.2	1.2	6.6	17	40	85	91
Q = 300	0.5	3.0	12	27	55	93	96

Table 1. Approximate values for a 102-inch mobile whip with base-loading and average diameter of 3.16 inch (equivalent to a CB whip).

The addition of a top hat two feet in diameter (photo B) makes this antenna resonate in the 20-m band with no need for a loading coil. Mechanically, this arrangement leaves something to be desired, but received signals are 5 to 10 dB better than with the stock Hustler. So it is not without potential.

#### Reducing $R_G$

As long as you are moving, you have little control of ground losses. However, you can increase the efficiency of a mobile antenna at rest by laying out ground wires attached to the vehicle's frame. Since only a few radials are used, they need not be a full  $\frac{1}{4}$  wavelength long—I have used 33-foot long ( $\frac{1}{2}$  wavelength) radials while operating on 75 meters with good results. Some people (1) have reported significant (10 dB) increases in transmitted signal strength with a single radial laid out in the direction of propagation. I have not noticed an improvement when using a single radial in that manner (frequency of 3.8 MHz, radial length 66', stock Hustler 75-m antenna, car parked in a wheat field). However, I did note a small (1 to 2 dB) increase in received signal strength when I added a second wire, and a 3-dB improvement when I used four radials. The maximum benefit requires proper orientation of the radials—see figure 1. I would expect greater improvement with the use of radials when parked over ground of less conductivity than the farmland I used when I did these tests.

#### Reducing $R_C$

If you aren't quite convinced that the loading coil on your expensive commercial mobile antenna can actually dissipate over half of your transmitter's output power as heat, give a long transmission sometime and then step outside and feel how warm the coil is. Or you could do as an acquaintance of mine (who shall remain nameless) did and apply the output of a kilowatt amplifier to your low-power resonator and watch the coil catch fire. A low-loss coil is a high-Q coil and will be wound of large diameter wire on a low-loss form with a relatively large diameter-to-length ratio. Such a coil is not difficult to make on the bench, but incorporating it into a mobile antenna system while maintaining structural integrity is not so easy.

You can compare the quality of



coils you wind yourself against one another or with commercial versions by noting the antenna SWR at resonance, with no matching devices in place. If two coils each resonate the antenna at 3800 kHz, for instance, the coil that produces the highest SWR will be the most efficient one. (9) How can that be? Look again at equation 1. In this case only the coil ( $R_C$ ) is being changed, so  $R_R$  and  $R_G$  are constant. Decreasing the value of  $R_C$  causes  $R_T$  to decrease, and so the SWR rises. Recall that SWR is proportional to  $Z_0/R_T$ , where  $Z_0$  is the impedance of the feedline. At home or mobile, whenever you have a simple monopole with a low SWR over a wide frequency range, suspect high losses in the loading coil, ground system, or both.

If you shy away from winding your own coils, there's still hope for reducing  $R_C$  losses while using commercial resonator coils. You can use a coil for a higher band by adding a capacitive top hat and increasing the length of the whip above the resonator. Photo C shows how I could resonate a Hustler 20-m resonator on the 30-m band by the use of such a top hat. From time to time, I at-

tempt to resonate my 40-m system in the 75-m phone band by adding a large top hat and increasing the length of the whip above the resonator, but I have yet to come up with a combina-

creased efficiency, which is the opposite of what you want.

Speaking of matching, if your antenna uses base loading, install the loading coil on the outside of the vehicle. (1) With the coil in-

***"Whenever you have a simple monopole with a low SWR over a wide frequency range, suspect high losses in the loading coil, ground system, or both."***

tion that is a satisfactory compromise between mechanical stability and downright ugliness. Such an arrangement should give a worthwhile improvement when compared with the standard 75-m system, however, since  $R_R$  is increased by the increased antenna length, while  $R_C$  is decreased due to the smaller size of the loading coil.

Regarding top hats: If they are placed too near the loading coil, they can actually increase coil losses. (9) As I discussed above, increased losses can mean lower antenna system SWR due to de-

stalled inside the car, a significant, non-radiating, current can flow through the capacitance (typically 3–15 pF) of the feedthrough insulator. When the coil is located outside the vehicle, the feedthrough capacitance is unimportant. See Figure 2. Also, you should avoid the combination of bumper-mounting and base-loading if it places the loading coil in close proximity to the car's metal body.

Another method to decrease the amount of inductance, and hence  $R_C$ , for a given length of antenna is to increase the antenna's diameter. For example, a 102-inch whip with a diameter of 3.16" requires about 61  $\mu$ H to resonate it on 3.8 MHz when base-loaded. An antenna of the same length but of 1½" diameter will resonate on the same frequency with only 37  $\mu$ H of inductance. The formula for making these calculations (for base-loaded antennas) is:

$$L(\mu\text{H}) = 60 \left( \ln \frac{h}{a} - 1 \right) (\cot G) / 2\pi f \quad (3)$$

Where:  $h$  = height of antenna in inches  
 $a$  = diameter of antenna in inches  
 $G$  = electrical height of antenna in degrees  
 $f$  = frequency in MHz

#### Combinations and Other Possibilities

As I hope you have gathered by now, mobile antenna systems for lower HF bands leave a lot of room for improvement. Achieving marked improvement over compact commercial antennas is mainly limited by structural considerations and your willingness to appreciate the "functional beauty" of your creation in the face of comments from family members and stares from passersby. If you are really adventure-

some, you might like to try a loop antenna—these have been described for mobile use in both the professional (2) and amateur (5, 6, 7) literature, and can outperform vertical whips. If you have the time to pull off to the side of the road, lay out a few radials, and extend or otherwise modify the mobile antenna temporarily, you can boost your signal strength more than if you had switched on an amplifier. Another possibility is a temporary mast-mount on a metal plate. You can construct a portable mast from inexpensive TV antenna mast section five feet long, and use it to support a wire dipole. The base plate is held secure by the weight of the vehicle. Signal strength improvement relative to common mobile whip is likely to exceed that due to adding an amplifier, also works on receive, and costs much less. To erect this system, just pull to a stop, drive a wheel up onto one end of the plate, put a few telescoping sections of tubing together, and you have a support for a dipole/inverted-vee that even at 15 feet will outperform most verticals in that situation.

Here are some ideas to start with. Check the references for some more, especially Belrose (1) for information on calculating  $R_{RV}$  and necessary matching inductance for base-, center-, and helically-loaded antennas. 73

#### References

1. Belrose, J., "VLF, LF, and MF antennas," Handbook for Antenna Design, Vol. 2, eds. Rudge, Milne, Oliver, Knight, published by Peter Peregrinus Ltd., London, 1983, pp. 559–633.
2. Burberry, R. A., "HF loop antennas for air, land, and sea mobiles," Second Conference on HF Communication Systems and Techniques, IEE, London, 1982, pp. 18–22.
3. Cloninger, W., Jr., "Four bands, one whip," 73 Magazine, April 1984.
4. Ewing, G., "Mobile Antenna Ingenuity," 73 Magazine, Feb. 1979.
5. Mitchell, "Loop-type antenna for 75-m mobile," QST, Feb. 1951.
6. Taylor, J. E., "The 'Mobiloop,'" QST, Nov. 1968.
7. Webster, "Mobile loop antenna," QST, June 1954.
8. "Four band mobile antenna," 73 Magazine, Jan. 1981.
9. ARRL Handbook, 1987, pp. 33-15 to 33-17.

## Factory-less, jumper-less, ROM-less programming.



With the new **S-COM 5K** Repeater Controller, you'll be able to configure your repeater remotely — using DTMF commands. Only the **5K** offers this capability for just \$189, wired and tested.

- Easy to interface
- Polite ID'er
- Nonvolatile Memory
- Needs only 55 mA/12 V
- Adjustable Audio
- CMOS Microprocessor
- DTMF Muting
- Control Receiver Port
- 65 control commands
- Programmable Command Strings
- Optional Audio Delay
- Optional Rack Cabinet



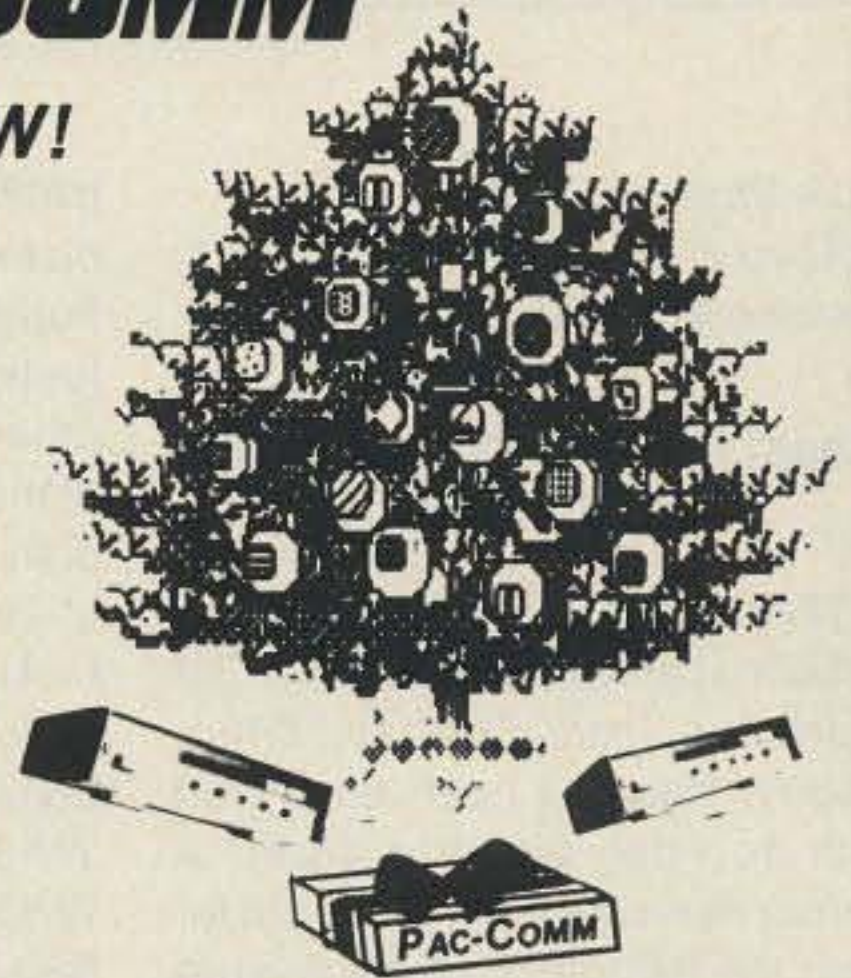
**S-COM Industries**  
 P.O. Box 8921  
 Fort Collins, CO 80525  
 (303) 493-8316

CIRCLE 95 ON READER SERVICE CARD



# NEW PACKET TOYS FROM **PAC-COMM**

THREE NEW PACKET CONTROLLERS - AVAILABLE NOW!



**TINY-2** INTRODUCTORY PRICE **\$109.95** READY TO USE - NOT A KIT  
**\$119.95 AFTER JANUARY FIRST**

- \*USES TNC-2 EPROMS INCLUDING NET/ROM. FIRMWARE VERSION 1.1.5 PROVIDED
- \*32K RAM AND 32K EPROM STANDARD
- \*SUPPORTS BOTH RS-232 AND TTL COMPUTERS, 300-9600 BAUDS
- \*EXTRUDED ALUMINUM CABINET WITH OVEN-BAKED WRINKLE FINISH. ONLY 5" x 7"
- \*WATCHDOG TIMER, MODEM DISCONNECT HEADER, 12V DC OPERATION.

## MICROPOWER-2

A VERY LOW POWER TNC-2 CLONE, PERFECT FOR PORTABLE OR SOLAR POWERED OPERATION.

- ONLY 40 MA AT 9-13 VOLTS DC
- SMALL AND LIGHTWEIGHT (5"x7"x1<sup>3</sup>/<sub>8</sub>" - 22 oz.)
- HARDWARE HDLC, BATTERY BACKED 32K RAM
- QUALITY EXTRUDED ALUMINUM CABINET WITH BAKED WRINKLE FINISH
- SUPPORTS BOTH RS-232 AND TTL COMPUTERS
- USES TNC-2 EPROMS - INCLUDING NET/ROM FIRMWARE VERSION 1.1.5 PROVIDED

**ASSEMBLED AND TESTED  
 ONLY \$179.95**

## PC-100 SERIES

SINGLE AND DUAL PORT  
 PACKET CONTROLLERS ON A  
 PC PLUG-IN CARD

- DOES AX.25 AND TCP/IP WITHOUT AN EXTERNAL TNC OR INTERFACE
- POWERFUL SOFTWARE PROVIDED ON PC COMPATIBLE DISKETTE
- SWITCHABLE FOR EITHER HF OR VHF TONES
- HARDWARE HDLC, IC MODEMS
- CONNECTS DIRECTLY TO RADIO - NO EXTERNAL INTERFACE NEEDED
- PROVISION FOR EXTERNAL HIGH SPEED MODEM

**PC-110 SINGLE PORT \$169.95**  
**PC-120 DUAL PORT \$199.95**

### THE BEST VALUE IN A VHF/HF TNC **PAC-COMM TNC-220 \$159.95**

- NOW WITH 32K RAM STANDARD, FIRMWARE VERSION 1.1.5
- CONNECT BOTH HF AND VHF RADIOS PERMANENTLY -- SELECT FROM THE KEYBOARD
- IN KIT FORM - \$129.95 INTERNAL TUNING INDICATOR -- \$44.95

#### PACKET TERMINAL PROGRAMS

PAC-PRO (PC) .....	\$29.95
DIGIPACK II (PC) .....	\$49.95
MACPACKET (MAC) .....	\$49.95
MACKET (MAC) .....	\$39.95
COMMODORE 64 .....	\$19.95

TNC-200, TNC-220 VERSION 1.1.5  
 EPROMS \$10.00

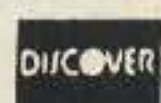
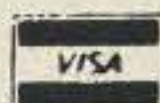
WRITE OR CALL FOR OUR NEW CATALOG OF PACKET EQUIPMENT, SOFTWARE AND ACCESSORIES.

**Pac-Comm, 3652 West Cypress St., Tampa, FL 33607**

TOLL FREE  
 (ORDERS ONLY)  
**800-223-3511**  
 EXCEPT FLORIDA

TELEX: 650-288-1526 MCI  
 FAX: (813) 872-8696

TECHNICAL INFORMATION  
 7:30 AM - 11 PM EASTERN  
**(813) 874-2980**



FLORIDA ADDRESSES ADD 5%. \$3.00 SHIPPING/HANDLING PER ORDER.



# ATV

## Ham Television

Mike Stone WB0QCD  
PO Box H  
Lowden IA 52255

### WB8ELK OHIO ATV BALLOON RECOVERED!

The WB8ELK helium-filled balloon carrying Fast Scan TV launched from Findlay, Ohio, August 15th has been recovered with its video package intact. A farmer harvesting his crops not far from the launch point discovered the balloon. The \$500 airborne ATV platform went out of sight at 100,000 feet after sending some great computerized ATV pictures at 439.25 MHz on UHF over a reported QSL distance of more than 400 miles. Hams in eight states reported reception of the signals. The balloon was lost and presumed down somewhere within a 50-mile radius, or possibly even caught in the jet stream and headed for the East Coast.

Bill Brown WB8ELK called me the other night on 3.990 MHz, over-joyous to report that the balloon and its package were found. When the farmer stopped harvesting the corn late one night, he parked the tractor where it stood and went back to his house. The next morning at daylight, he was back at it again, and noticed a white styrofoam package laying just a couple feet from his combine in the path of the harvester about to be gobbled up! He stopped at just the right time late the night before! Bill and the Findlay, Ohio, ATV gang had a return address and reward designator on the package in case someone did recover the balloon, and it really paid off. Bill ran tests on most of the electronic components, and all looked okay. His event report can be found in the September/October issue, Volume 17 Number 8 issue of The Spec-Com Journal.

This was a happy ending to the midwest's most exciting 1987 summer event. Some 100 ATV enthusiasts checked in on the 40/80 meter ATV nets, and another estimated 300-400 hams watched for the signals. Signals made it all the way to New York (W2RPO) and to the west with KB9FO and K9MTE at P3 levels and N9AB at P2. The CW ID'er was heard in St. Louis, Moline

(N9AEP), Baltimore (N3AGG) and elsewhere. It was quite a day, and hopefully you were there to participate! This was certainly yet another great innovation for the use of the ATV mode. Bill and his crew plan a similar launch in the spring of 1988. Bill states special thanks to NR8Q, WA8GAU, WA8VWY (followed the balloon by aircraft!), WB8MSJ, KA8LWR, W8VKR, WA8HDX, N8DOO, KA8WLV, W8RSK, WA3USG, the Iowa BRATS ATV GROUP, The Spec-Com Journal and W6ORG of P.C. Electronics.

### New 40/80 Meter FSTV Net Frequencies!

One of the neat things to come out of the WB8ELK FSTV balloon project was the incredible amount of people that came on regularly on 40 and 80 meters. I used to sponsor and help W9ZIH conduct a regular Saturday net on 7.290 MHz a few years ago. We had 20-40 regular participants, but it died as 40 meters did for the summer. I never got it restarted. A successful net needs commitment including regular participation and assigned net controllers. Bill WB8ELK in Findlay, Dave WB0ZJP in St. Louis, Henry KB9FO in Chicago and I have



Photo A. Bill Brown WB8ELK and the rest of the Findlay, Ohio, ATV group prepare their helium balloon and FSTV package for launch. Hams in eight states reported signals from the balloon.

forty- and eighty-meter frequencies will become the spots to listen and talk to other regional ATV enthusiasts. They will most likely be around early in the mornings between 6 and 9 AM for any DX band enhancements (while transmitting

listed 421 WORLI PBBS systems, if you need to figure out the best routings to your packet buddy. (Sample copy available for \$2.50 ppd. Specify this particular issue.) The frequencies list above, may not be cast in stone (pardon the pun).

I picked them mainly to give those who have general class licenses a chance to participate. It's a good place to start. Now just don't sit there and listen to the static when looking for ATVers on 40 or 80 meters. Tune up that dummy load and put out several calls our way, OK? An intercontinental ATV net frequency? How about 14.240 MHz just above the SSTV calling and operating area? You call it, and I'll publish it!

### Lack Of SSTV Information

The mail here at 73 has been running far ahead for FSTV comments over SSTV ones. That isn't surprising. SSTV never has had available a monumental wealth of technical information. There are very few builders in SSTV anymore, mostly "appliance operators" like myself. Buy it and hook up a camera. I have had 3 ROBOT 400's, 3 German WRAASE converters (SC-421 and 422 and SC1), 2 ROBOT 1200C's and a

## "If it sounds like I am depressed about SSTV, I am."

been giving some serious thought to start the HF ATV nets and "talk spot" frequencies going again! So, here is our official 73 magazine notification. The nets will meet on 7.230 and 3.860 MHz. These frequencies have already been mentioned in The USATVS Journal classified ad section. Fast Scanners have already started to coordinate DX contacts during band openings and just friendly HAM-TV chitchat since early October.

The frequencies may change  $\pm$  5 kHz, depending on band conditions and QRM. If someone would like to get an international or net going on twenty meters, we need volunteer net controllers. These

FSTV signals east and west on UHF), and on weekends on Saturday and Sunday. WB8ELK, WB0ZJP, KB9FO and WB0QCD have consented to take net controller positions on Sunday mornings at 0800 AM (Central time). We need your participation!

Check in and keep up with the latest news going on in HAM-TV! You active Fast Scanners pass the word about these frequencies to others, OK? Route any HAM-TV related PACKET RADIO messages to WB8ELK via N8ET PBBS in Ohio or to me WB0QCD via WA0RJT PBBS in Cedar Rapids, Iowa. We will answer them. By the way, the September/October issue of SPEC-COM also



COMMERCIAL- AVIONICS- SOLID STATE- DIPOLE- LONG WIRE- MILITARY- MARINE

"THE AMERICAN ORIGINAL"

MADE IN AMERICA BY AMERICANS

**MAXCOM**

**AUTOMATIC ANTENNA MATCHER**®

FOR ALL S.S.B. RADIOS

"ONE ANTENNA 100 KHZ. TO 200 MHZ."

MAXCOM has made Global Communications Simple!!!

TEN MODELS:

150 WATTS TO 10,000 WATTS  
\$299. TO \$1,999.

**VSWR 1.5:1  
OR LESS**

FIVE YEAR  
GUARANTY  
ON  
MOST MODELS



Absolutely no tuning with a MAXCOM system.  
Simply connect. dial your frequency and talk...  
That's it, just TALK.

OVER 4000 MAXCOM STATIONS WORLD WIDE

MAXCOM, INC. BOX 502, FT. LAUD., FL. 33302

305-527-5172 © 1988 Maxcom, Inc.

THE BOTTOM LINE: "MAXCOM WORKS"

CIRCLE 101 ON READER SERVICE CARD

# DOCKING BOOSTER

Converts Your  
HT to a Powerful  
Mobile Unit



- 30 watts output
- GaAs FET pre-amp
- Fits on car door
- 2 Meters or 70 cm
- Icom
- Kenwood
- Yaesu

**NEW!  
DUAL BANDER  
FOR FT727**

NAVAL ELECTRONICS, INC.  
5417 Jetview Circle • Tampa, FL 33614  
Phone: 813-885-6091 • Telex: 289-237 (NAVL UR)

CIRCLE 151 ON READER SERVICE CARD

## AMATEUR TELEVISION

HAMS SHOULD BE SEEN  
AS WELL AS HEARD!

**TVC-4G 70cm ATV**

Downconverter  
Now only \$99

Delivered UPS surface  
in cont. USA



- See live action color & sound like broadcast TV
- Many areas have ATV Repeaters (call us or see the 87/88 ARRL Repeater Directory pg. 328 for your area)
- Most ATVers use home cameras and VCRs to show the shack, projects, home video tapes, public service events like parades, races, etc.
- Some repeaters also have weather radar, Space Shuttle video, BBS, & computer video

It's easy to start watching: 70cm antenna, a TVC-4G and any TV set tuned to ch2, 3 or 4. Our TVC-4G tunes the whole 420-450 MHz band & includes GaAsfet preamp & mixer, AC/12vdc wall plug, attractive shielded 4x2.5x7 cabinet. We also have wired & tested boards for the builder starting at \$39. See ARRL Hbk chapter 20. When you are ready to try transmitting, we have transmitters, transceivers, antennas, and all your ATV needs for the 70, 33 & 23cm bands.

Hams, Call or Write for our full catalog of ATV gear!  
(818) 447-4565 m-f 8am-5:30pm pst.

**P.C. ELECTRONICS**

2522 Paxson Ln Arcadia CA 91006



Tom (W6ORG)  
Maryann (WB6YSS)

CIRCLE 112 ON READER SERVICE CARD

★ QUALITY PARTS ★ DISCOUNT PRICES ★ FAST SHIPPING! ★

**SEND FOR FREE 1987 CATALOG... 48 PAGES!**

**ALL ELECTRONICS CORP.**

<p><b>BLACKLIGHT ASSEMBLY</b></p> <p>Complete, functioning assembly includes ballast, on-off switch, power cord, sockets and F4T5-BL blacklight. Mounted on a 7 1/8" X 3 1/8" metal plate. Use for special effects lighting or erasing EPROMS. CAT# BLTA \$10.00 EACH</p>	<p><b>1mA METER</b></p> <p>Modutec 0-1 mA signal strength meter with KLM logo. 1/4" X 1 3/4" X 7/8" deep. CAT# MET-2 \$2.00 each</p>												
<p><b>SWITCHING POWER SUPPLY</b></p> <p>Compact, well regulated switching power supply designed to power Texas Instruments computer equipment. INPUT: 14-25 vac @ 1 amp OUTPUT: +12 vdc @ 350 ma. +5 vdc @ 1.2 amp -5 vdc @ 200 ma. SIZE: 4 3/4" square. CAT# PS-30 \$3.50 each</p>	<p><b>VIC 20 MOTHERBOARD</b></p> <p>26 IC's including 6502A and 6560. Not guaranteed but great for replacement parts or experimentation. CAT # VIC-20 \$15.00 each</p>												
<p><b>THIRD TAIL LIGHT</b></p> <p>Sleek high-tech lamp assembly. Could be used as a third auto tail light, emergency warning light, or special-effects lamp. Red reflective lens is 2 3/4" X 5 1/2" is mounted on a 4" high pedestal with up-down swivel adjustment. Includes 12 V replaceable bulb. CAT# TLB \$3.95 each</p>	<p><b>LED'S</b></p> <p>Jumbo T 1-3/4 (5 mm) RED CAT# LED-1 10 for \$1.50</p> <p>GREEN CAT# LED-2 10 for \$2.00</p> <p>YELLOW CAT# LED-3 10 for \$2.00</p> <p>TWO PIECE HOLDERS FOR ABOVE L.E.D.S. CAT# HLED 10 for 65c 100 for \$5.00</p>												
<p><b>MINI PUSH BUTTON</b></p> <p>S.P.S.T. momentary. Push to make. CAT# MPB-1 10 for \$3.25</p>	<p><b>TELEPHONE COUPLING TRANSFORMER</b></p> <p>Stancor # TTCP-8 600 ohms C.T. to 600 ohms C.T. P.C. board mount. 3/4" X 5/8" X 3/4" CAT# TCTXS \$2.50</p>												
<p><b>NI-CAD CHARGER/TESTER</b></p> <p>Will charge most every size Ni-Cad battery available. CAT# UNCC-N \$15.00</p>	<p><b>RECHARGEABLE NI-CAD BATTERIES</b></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td>AAA SIZE 1.25V 180mAh</td> <td>\$2.25</td> </tr> <tr> <td>AA SIZE 1.25V 500mAh</td> <td>\$2.00</td> </tr> <tr> <td>AA WITH SOLDER TABS</td> <td>\$2.20</td> </tr> <tr> <td>C SIZE 1.2V 1200mAh</td> <td>\$4.25</td> </tr> <tr> <td>SUB-C SIZE SOLDER TABS</td> <td>\$4.25</td> </tr> <tr> <td>D SIZE 1.2V 1200mAh</td> <td>\$4.25</td> </tr> </table>	AAA SIZE 1.25V 180mAh	\$2.25	AA SIZE 1.25V 500mAh	\$2.00	AA WITH SOLDER TABS	\$2.20	C SIZE 1.2V 1200mAh	\$4.25	SUB-C SIZE SOLDER TABS	\$4.25	D SIZE 1.2V 1200mAh	\$4.25
AAA SIZE 1.25V 180mAh	\$2.25												
AA SIZE 1.25V 500mAh	\$2.00												
AA WITH SOLDER TABS	\$2.20												
C SIZE 1.2V 1200mAh	\$4.25												
SUB-C SIZE SOLDER TABS	\$4.25												
D SIZE 1.2V 1200mAh	\$4.25												

**TOLL FREE ORDERS**  
800-826-5432  
INFO • (818) 904-0524  
FAX • (818) 781-2653

**OUR NEW ADDRESS IS:**  
P.O. BOX 567  
VAN NUYS, CA 91408

QUANTITIES LIMITED  
MINIMUM ORDERS \$10.00  
CALIF. ADD SALES TAX  
U.S. \$1.00 SHIPPING  
NO C.O.D.  
FOREIGN ORDERS  
INCLUDE SUFFICIENT  
SHIPPING

CIRCLE 194 ON READER SERVICE CARD



host of "interfaceless" low-resolution, computer SSTV programs for the TRS80C CoCo, the C64 Commodore and the IBM PC Clone (Tandy 640K 1000SX). Every once in awhile I get enthused about SSTV, get on-the-air, then listen to the bunch of malarky from several self-esteemed operators on how great they think they are. I get turned off and get involved in something else. Recently I had been off the air on SSTV for about 6 months. I put AC to the 1200C, tuned up on 14.230 MHz and the first thing I heard was a chap out east still pushing for dues the dead IVCA Club to those newcomers who unfortunately checked into their net. Some things never change. If it sounds like I am depressed about SSTV, I am. It seems to be going nowhere.

Yes, the color and high resolution is great. I marvel at most of the pictures being sent. But how often do you see a live shot? You know, a mug shot? Hardly ever. "Here comes a (illegal) picture that I just snatched of the TV, Bill, 5-4-3-2-1," says one SSTVer. You see, I have a 525 line, NTSC,



Photo B. Henry Ruh KB9FO and Mike Stone WBOQCD show off with Dr. Tony England W00RE at the Peoria, Illinois, Superfest in September. Dr. England sent SSTV pictures from Space Shuttle Mission 51H more than two years ago.

allotted space for SSTV, yet he gets little response. I would be glad to devote more SSTV comments, articles and pictures to this column each month. Send some material, please! Otherwise read about all the neat things going on in Fast Scan TV.

---

***"Please go back through your SSTV tapes, snatch a good color or black and white shuttle picture, and reprocess it onto a new tape."***

---

excellent resolution picture already in my shack of that sent SSTV frame. Why am I suppose to get a kick out of seeing it again—even at half-resolution across the country? SSTV today lacks originality. Originality might make up for the lack of technical experimentation that SSTV endures today. To me, it's more fun looking for those new guys who just picked up a ROBOT 400 black/white converter for \$100 at the local hamfest. They appreciate live pictures. OK, I'll grant you that a national column editor about ATV (all modes of HAM-TV) shouldn't be so depressed about one of the represented modes.

So impress me! How about some of you out there taking pens in hand and submitting some material to publish in 73 or SPEC-COM? Fred Sharp W8ASF in Cleveland has regular monthly

#### **SSTV Shuttle Tape Request by W00RE**

Where did everyone go after Tony and crew flew the Challenger into SSTV history? 14.230 is once again smothered to death with the power hungry, DXers and their 5 by 9 reports on what else but prearranged "telephone lists." Speaking of NASA's Tony England W00RE, I had a chance to meet and talk with him at the Peoria Superfest on September 19th and 20th. Surprisingly, he has seen very little of the captured SSTV pictures sent to all of us here on earth.

I asked Tony if he would like an assembled cassette of many SSTV pictures sent to all of us here on earth. I asked Tony if he would like an assembled cassette of many SSTV pictures from space and he said that it would be very nice. In the

November issue of SPEC-COM, we announced a call for Mission 51H Space Shuttle SSTV pictures sent to earth from one of the last flight of the Challenger. Please go back through your SSTV tapes, snatch a good color or black and white shuttle picture and reprocess it onto a new tape. Document time, date, location of shuttle and orbit if possible. Send it to us. We will transfer and combine these captured pictures into one C30 or C60 tape package and present it to Tony probably at Dayton. Your submitted pictures will be accredited. I can't promise, but Tony had extra 8 x 10 color photos of himself at Peoria that he would probably be willing to part with.

If I can't get any from NASA, Tony or Lou W5DID at JSC ARC, then I'll ask Wayne Green for a few of his before he lost weight. You're right. Since he is running for Vice-President, Wayne probably got rid of all of those ones for the new, thinner prints. NOTE: Send along an extra blank tape, and I will make a copy of the final version for you at no charge! There is one catch though...don't be in a hurry to get them back. This project will no doubt take months to complete. So be patient and the tape will find it's way back to your mailbox sometime in 1988. OK? I knew I could count on you. Tony says thanks too!

#### **More Questions and Answers!**

We got a lot of response the last time we did a Question and Answer session about HAM-TV. So here goes another one.

**Question:** I am new to FSTV on

UHF. What type of coax should I use? I have a friend who has some 75 Ohm CATV stuff, 1/2 inch I think - is that OK?

**Answer:** Free is free, I guess, and you get what you pay for. If that is the best you can afford, then use it. The 70-75 ohm impedance mismatch isn't too bad for receive only. However, if you can afford to get a chunk of Belden 8214 or preferably 9913 (or an equivalent like Columbia 1180) then do it. There is a tremendous amount of loss on UHF through connectors, the coaxial transmission line, etc. Do it wrong, and you'll pay for it on the other end!

**Question:** Should I use vertical or horizontal polarization on my ATV antenna?

**Answer:** Look around you (out to several hundred miles) and see what polarization others in your area use. Which way you go makes little performance difference. Getting the right polarization for the operators in your area IS important. The wrong polarization can lose 20 dB of signal strength! Find the other operators on two meters, or take a look at the FSTV antenna polarization map in The North American FSTV Guide Booklet (\$5.95).

**Question:** Color has always been a problem passing through our ATV Repeater. Yet, our color bar display from the remote transmitter works just fine on our 426.25 MHz output. What gives?

**Answer:** It is tough to troubleshoot by letter. Check your repeater's TV set or TV demodulator processor board. This is the circuit that takes an incoming signal, processes it and sends it out again in video form. At our system in Davenport, we passed color in what we called MODE-A (remote transmitter) position but passed poor color on none at all in the MODE-B Fast Scan TV Repeater. I set up an independent, known, good color TV set and a receive downconverter and began adjusting the pots in our Motorola Quasar VCR tuner TV receiver board and brought nearly 3 years worth of frustration to an end! My other electronic companion buddy was always afraid to mess with it since we didn't have much information about the unit. I got brave and lucky. We now pass great color and audio subcarrier sound. Experiment intelligently. That is what the hobby is all about. 73's until next column, gang! de Mike WBOQCD. **73**



## BASEBALL HATS

with your Name & Call



# \$4.00 PER HAT

Shipping & Handling Included

- RED
- ROYAL BLUE
- BLACK
- TAN Camouflage (Oak Leafs Not Available)

OAK LEAFS-ADD \$50 each HAT

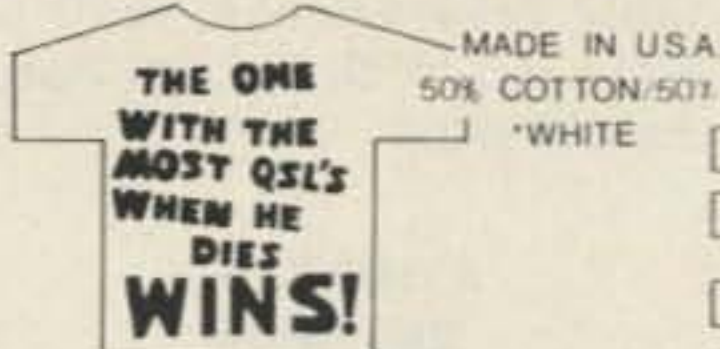
1st QUALITY

GUARANTEED

## Custom T-SHIRTS

# \$5.00 PER SHIRT

Shipping & Handling Included



MADE IN U.S.A.  
50% COTTON/50% POLY  
\*WHITE

- NAME & CALL (left breast)
- I'M RADIOACTIVE  
AMATEUR RADIO OPERATOR
- THE ONE WITH THE MOST QSL'S WHEN HE DIES WINS (shown at left)
- AMATEUR RADIO COMMUNICATIONS (shown below)

ADULT SIZES: S-M-L-XL  
XXL-ADD \$100ea.

GOLF SHIRT\*-\$7.50  
Breast-size Designs S+H Inc.

SWEATSHIRT\*-\$8.50  
S+H Inc.

## MAGNETIC DOOR SIGNS



# \$6.00 PER SIGN

Shipping & Handling Included

QUANTITY DISCOUNT  
20+-\$5.50 each S+H Inc.

MAIL YOUR ORDER TO: R P I, Fleming Route, Aitkin MN 56431

10% OF ALL SALES GO TO COURAGE HANDI-HAM SYSTEM

MN residents add 6% sales tax

## Brighten Up Your Holidays

The world's most wanted microphone, the Astatic Silver Eagle, is now available as a limited edition desk and table lamp. This elegant conversation piece, handcrafted from quality production parts at the original Ohio factory, comes complete with chrome finish base and moving switches (no microphone element).



Quantities of this unique conversation piece are limited. Order now for delivery before the holidays. Please send your name and street address, plus money order for \$88.00 (includes shipping and insurance - Ohio residents add \$5.28 sales tax) to:

### ASTATIC

CTI/Astatic  
Collector Lamp  
P.O. Box 120  
Conneaut, OH 44030

Each lamp includes the classic Silver Eagle insignia.



Write for information about the new Silver Eagle Plus microphone with 1-kHz tone.

CIRCLE 237 ON READER SERVICE CARD

## ANTENNES TONNA

# The X Shack

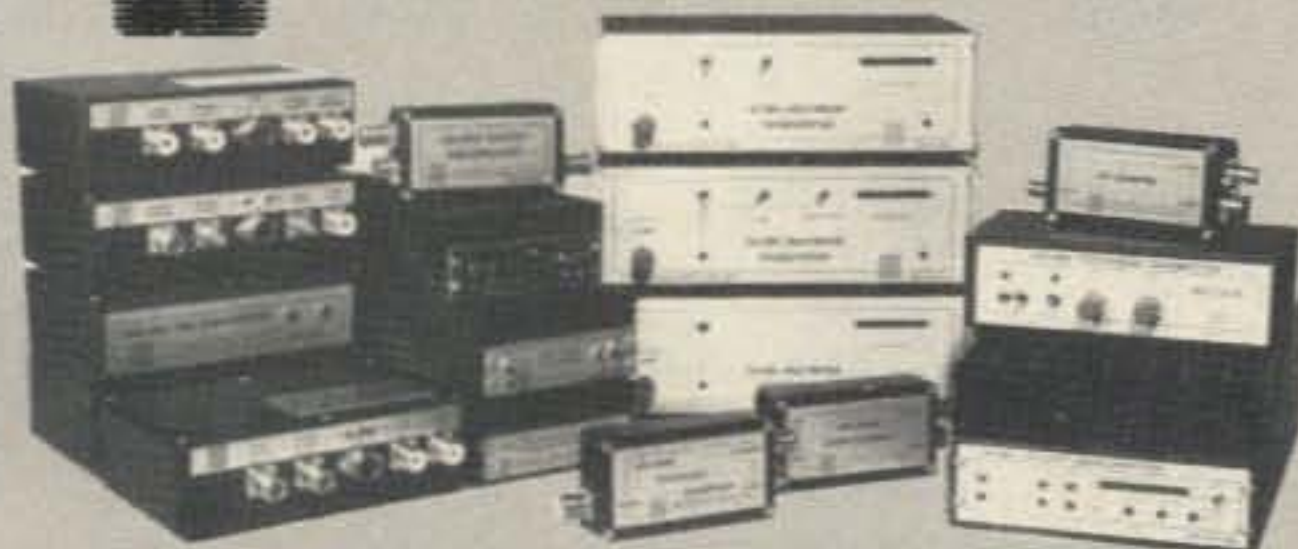
DEALER INQUIRES INVITED

52 Stonewyck Drive  
Belle Mead, New Jersey 08502

IVARS - KC2PX  
MARA - SALES

MON-SAT (201) 874-6013  
10AM - 3PM ORDERS  
7PM - 10PM ORDERS/TECHNICAL

MICROWAVE MODULES LTD.



A Connoisseurs Choice  
CALL FOR CATALOG VISA/MASTERCARD

CIRCLE 29 ON READER SERVICE CARD

## RF VACUUM RELAYS

BRAND	MODEL NUMBER	CONTACTS	CURRENT in RF amps	RF KILOVOLTS	COIL VOLTS	TYPE	PRICE
DELTRON	100 RF	SPDT gold	6	4	12 vdc	open frame	\$2.50 ea
DELTRON	100 RF	DPDT gold	10	4	12 vdc	open frame	\$10 ea
DOWKEY	156-48	SPDT gold	300 watts	N / A	48 vdc	BNC 2pin coaxial	\$48 ea
DOWKEY	DK-119	SPDT gold	200 watts	N / A	32 vdc	SMC 2.4gc	\$75 ea
DOWKEY	DK-137	SPDT gold	1500 watts	N / A	28 vdc	BNC 500mc coaxial	\$95 ea
DOWKEY	DK-140	SPDT gold	1000 watts	N / A	28 vdc	12" RG-58 40 mhz	\$40 ea
JENNINGS	RF-41	SPST N/C	12	3.6	26.5 vdc	VACUUM	\$39 ea
JENNINGS	RF-42	SPST N/O	12	3.6	26.5 vdc	VACUUM	\$39 ea
JENNINGS	RF-43	SPST LATCHING	12	7	26.5 vdc	VACUUM	\$55 ea
JENNINGS	RF1E	SPDT	8	2	26.5 vdc	VACUUM	\$45 ea
JENNINGS	RF1J	SPDT LATCHING	12	3.6	26.5 vdc	VACUUM	\$65 ea
JENNINGS	RB2A	SPDT	50	12	26.5 vdc	VACUUM	\$125 ea
JENNINGS	RB2A	DPDT	20	20	26.5 vdc	VACUUM	\$175 ea
KILOVAC	H-26	4PDT	20	15	115 vdc	VACUUM	\$225 ea

POWER PIN DIODES: UNITRODE UM 9137 100 PIV 100 WATT RF Switch to 500 MHz \$4 each or 4 for \$15.

### Shipping Instructions:

Enclose \$2.50 for UPS  
We accept Personal Checks (allow 2 weeks)  
VISA, MASTERCARD, AMERICAN EXPRESS.  
Add \$2 for COD UPS or \$3 for COD Parcel Post US Mail.

### GAS VARIABLE CAPACITOR JENNINGS CHV1 - 45

\$54 EACH

High Q Low Inductance  
EXCELLENT FOR VHF/UHF APPLICATIONS  
Includes a drive mechanism

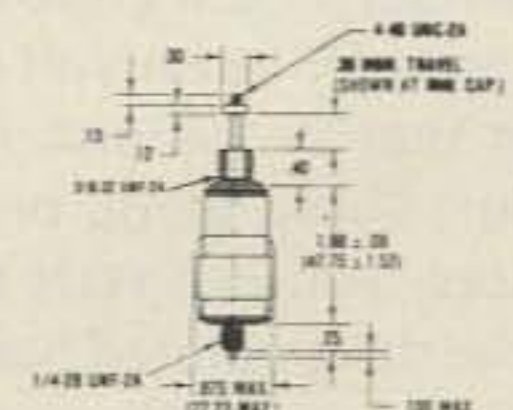
Capacitance 1.5 - 45 pf  
Voltage 5 kv max test  
Voltage 3 kv max wv  
Current 18 amps max

### SURPLUS SALES OF NEBRASKA

2412 CHANDLER RD.  
BELLEVUE, NE 68005

402-733-9190 24 hours

Surplus Sales will purchase your excess Vacuum Capacitors & Relays, RF Connectors and NEW Tubes. Write for our quote.



CIRCLE 266 ON READER SERVICE CARD



# 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.

Hamfest will be held Saturday, December 5, 1987, at the Eagles Club in Faribault, Minnesota starting with registration at 9 AM. There will be a Handi-Ham Equipment Auction, dinner at noon and a program. Amateur radio license exams will also be given. Talk in on 19/79. For more information contact Don Franz W0FIT, 1114 Frank Avenue, Albert Lea MN 56007.

available for testing of gear before purchase. The Hamfest is located on the rodeo grounds at the NW corner of Brown Road and Meridian, 1½ miles north of US 60 on the west side of Apache Junction. Primary Talk-in is 147.12 RPT and 223.5 MHz simplex. Other area repeaters include 146.72, 146.74, 145.41, 146.94, 223.82 and 224.94 MHz. For more information contact Superstition Amateur Radio Club, Inc., P.O. Box 1551, Apache Junction AZ 85217-1551 (602/986-2298—ask for Larry).

### MILFORD MI DEC 6

The Hazel Park Amateur Radio Club will hold its 22nd Annual Swap and Shop on December 6, 1987, at the Hazel Park High School, 23400 Hughes. General admission is \$2 advance, \$3 at the door. Children under 11 years are free. Plenty of free parking. Talk-in from the 9-mile and I-75 area on 146.52 simplex. For tickets and table reservations, mail to H.P.A.R.C., P.O. Box 368, Hazel Park MI 48030.

### BETHLEHEM CT DEC 1-31

For the whole month of December the Hen House Gang Amateur Radio Club will be holding the Bethlehem Christmas Special. All ages welcome. And the frequencies will be on 10-80 meters and Novice on 40 CW. For more information send a first class stamp (only) to W1FHP, Hard Hill Road, Bethlehem CT 06751.

### FARIBAULT MN DEC 5

The Annual Handi-Ham Winter

### APACHE JUNCTION AZ DEC 5-6

You are cordially invited to spend a weekend in Apache Junction Arizona on the weekend of December 5-6, 1987, at SUPERSTITION HAMFEST 87, sponsored by the Superstition Amateur Radio Club. There will be free camping on the grounds Friday and Saturday nights (self-contained), with swap and shop opening at 7 AM Saturday and closing at 2 PM Sunday. A test booth with 120 VAC and antennas will be

### NEWCASTLE DE DEC 5-6

The First State ARC will operate special event station, K200QBD from The Old State Capitol in Newcastle, Delaware, on December 5-6 in celebration of the 200th anniversary of Delaware's signing of the Declaration of Independence. Look on the 80-15 meter bands and the 25 kHz ± QRM up from the lower end of General Novice phone band. For certificate send QSL and large SASE to FSARC, P.O. Box 1050, Newark DE 19720.

### ATHENS OH DEC 12-13

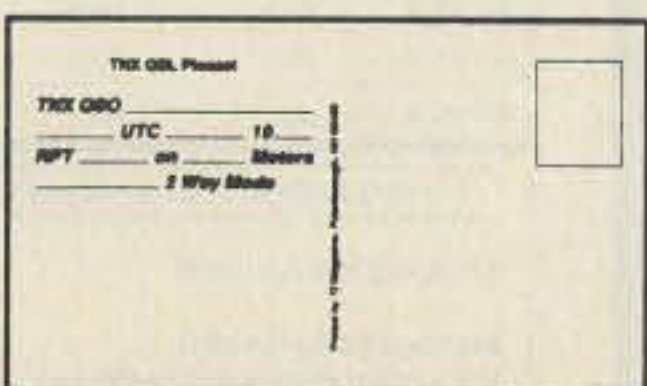
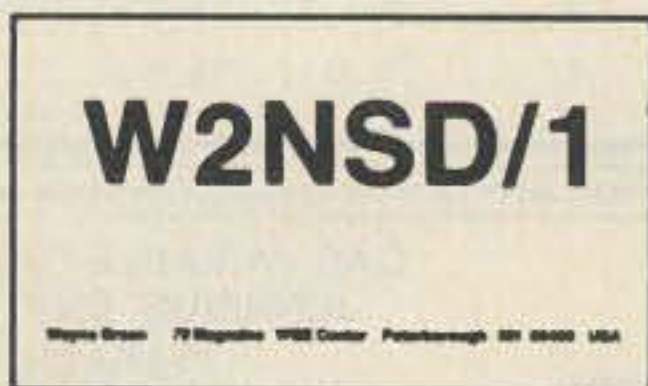
The Athens County Amateur Radio Association will operate special event station, WD8OXX, on December 12th and the 13th, to celebrate the 200th anniversary of the Northwest Ordinance from the home of Ohio University, first public university in the territory. Operation from 1500Z till 2300Z each day. Suggested frequencies: lower portions of the General 80, 40, 20, 15 and 6-meter bands. Novice phone: ± 28.400. For certificate, send QSL and large SASE to: Jeffrey White WD8OXX, P.O. Box 73, Athens OH 45701-0073.

# QSL Cards

Style W



Style X



Style Y

Reverse

## QSLs

Now you can get the highest quality QSL cards without spending a fortune! We put these cards on our press as filler between jobs; it gives the pressmen something to do and lets us print QSLs for you at an absurdly low price.

Not that we skimp: All three styles are produced in two colors (blue globe or satellite with black type). At these prices, you can start the new year out right by QSLing all those disappointed hams who've been waiting for your card. Tell 'em the card was printed by Wayne!

## Order Form

### QSL Cards

- Style:  W  X  Y  
 Quantity:  100 @ \$8.97  
 250 @ \$19.97  
 500 @ \$39.97

Postage and Handling \$1.00

Please print!

Name \_\_\_\_\_ Call \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

AE  MC  VISA  Check/MO

Card # \_\_\_\_\_ Exp. Date \_\_\_\_\_

Mail your order to 73 Magazine, WGE Center, Peterborough NH 03458, Attn: Uncle Wayne.

Permission granted to photocopy



# Getting Rich In The Ham Market

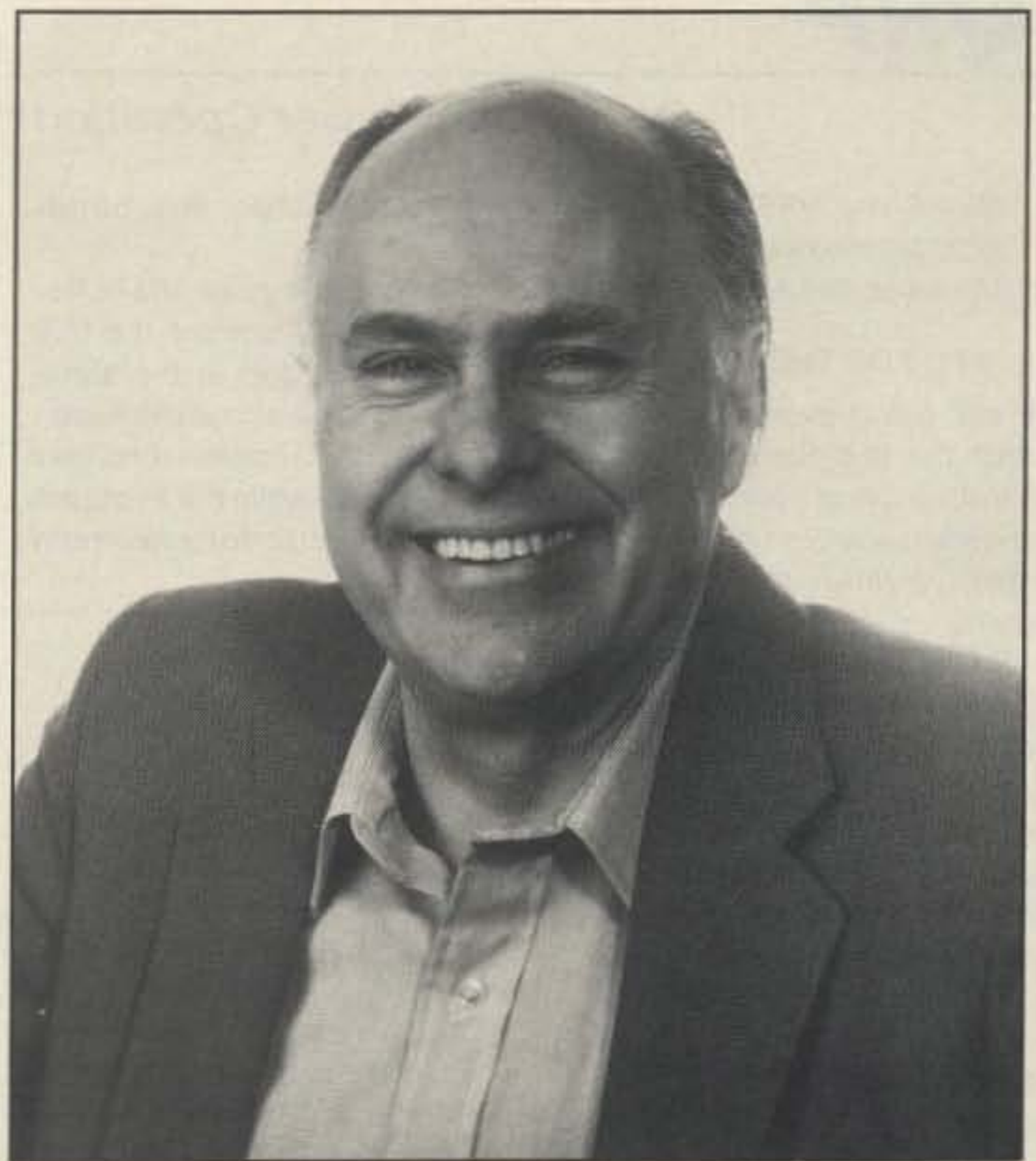
Every time two hams get together at least one says how about if we were to make this great product to sell to hams—not realizing that the ham “industry” is probably one of the best possible ways to guarantee poverty.

No, not all hams are cheap—not all are living on starvation retirement payments—the fact is that some ham firms are doing remarkably well selling to those few hams who are alive and well—and to the handful of newcomers who blunder into our hobby.

The whole trick to survival in the ham market is in getting your sales message to your potential customers—this is called marketing. Marketing includes making sure your literature is as good as (or even better than) your product—and that your sales pitch reaches those few live hams who are your best potential customers.

I'll bet you thought I was never going to mention 73. Advertising is going to be one of your biggest sales expenses, so give it the serious thought it rates. Advertising is a very well-developed art—billions have been spent on research to find out what works and what doesn't. Indeed, I'm working on a video just on how to advertise. In the meanwhile, if you can take it, I'll mercilessly criticize your literature and your ads—a service no other ham magazine can provide at any price because none of them have anyone with anything even remotely like the 35 years I've had in advertising to hams. Unless you fall in it, it's unlikely you're going to find an ad agency able to help you sell to hams—which is, to be kind, a unique group.

Presuming that sales are of some importance to you,



where do you think you'll do best? There are four ham magazines—one for advanced builders—one for contest fanatics—one for ARRL fans—and then there's 73—which appeals to active hams with small construction projects, with the only world DX column, with columns and news about all of the new ham activities such as packet, RTTY, Oscar and so on. The 73 readers buy circles around other magazine readers because they're active and motivated.

So if you decide to try and fight the odds with a ham product, give it your best shot with 73—and let me help you win with powerful, sales-oriented literature and ads. A little mail order business at home is a great way to become independent—millions are doing it. Remember, small business is the real strength of America . . . and it's about the only practical way to have a crack at making big money these days.

Write or call the 73 advertising people—Sam or Ed—and let's get you started with power ads which will make you money.

. . . Wayne  
W2NSD/1

73 Amateur Radio • WGE Center • Peterborough, NH 03458 • (603) 525-4201.







or contact him via CompuServe ID 73230,626. As well, Michael Hopkins WD5GMP has been busy putting together a collection of modifications for the Heath HW-16. While not exactly a QRP radio, the HW-16 can easily be turned down to QRP levels. A no-part QRP conversion for the HW-16 was described by Ade Weiss, WØRSP, in his book, *The Joy of QRP, Strategy for Success*. At today's hamfest prices, an HW-16 can be had for 10-30 dollars. The matching HG-10B VFO will cost more than the main rig! If you have done some QRP work with this radio, let us know.

I have been starting to collect information on a second book—solar power for the ham operator. I have mentioned before that I operate my complete station—several computers, Packet digi, and yes, even a 200-watt HF transceiver—from the sun's energy. If you are running your shack from the sun's energy, how about helping out in this effort?

Do you own or operate a NCG-15? Have you made any modifications to it? If so, drop a line to me about it. I've had some requests on the subject. Since I

have never operated one, I was unable to help.

Looks like there is considerable interest in the Two-Fer. I was able to get some more boards made up. If you have not sent for the info kit by now, it may be too late. Again, if I can get the minimum number of interested people, I'll reorder the boards.

That's a very handsome-looking plaque that Fred Trupin had made for the Two-Fer contest. I would like to see a major QRP award given away—something akin to Ade's Milliwatt DXCC trophy. I'm talking about a trophy from me for the best QRPer in the land. I want to see someone whom has been a dedicated QRPer win a nice-sized trophy—it could be for Field Day, Sweep Stakes, 6L6 Special contacts, or what have you.

Coming up next month will be the 6L6 Special update with a lot of photographs and circuits. My QRP 5er will be showcased soon, as will other projects. If you build, or modify your commercial equipment, share your work with others here in the QRP column.

The Christmas season is upon us... everyone have a safe and happy holiday season! **73**

## Look at our MOBILE MARK™

### "ON WINDOW" Line

PATENTED

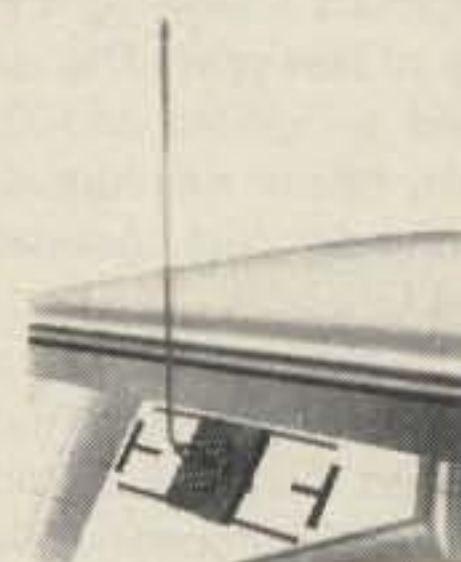
- VHF (140-175)**
- No Hole
  - Easy to Mount
  - Rugged
  - Superior Performance
  - Radiator Snaps On and Off
  - Competitively Priced



- UHF (420-520)**
- 3 db gain
  - No Hole
  - Easy to Mount
  - Rugged
  - Superior Performance
  - Radiator Snaps On and Off
  - Competitively Priced

### Cellular/Trunking (800-895 MHz)

- 3db Gain
- No Hole
- Easy to Mount
- Rugged - Goes through Car Wash Without Removal
- Superior Performance
- Broad Bandwidth
- Small Size
- Competitively Priced

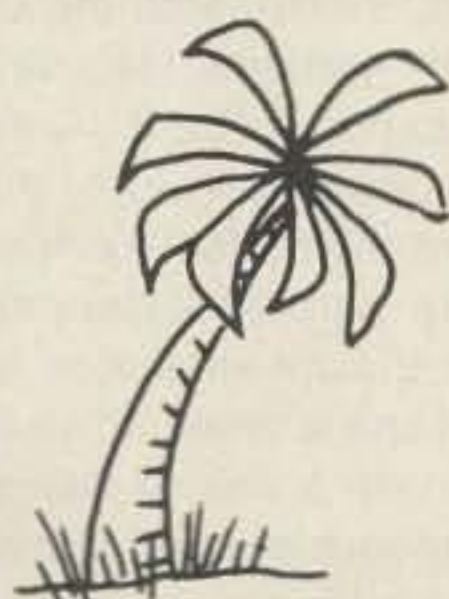


MOBILE MARK, INC. • COMMUNICATIONS ANTENNAS

3900-B River Road  
Schiller Park, IL 60176  
312-671-6690

*brings imagination and innovation to antennas ..... and has been since 1948 !!*

CIRCLE 163 ON READER SERVICE CARD



# 28th ANNUAL TROPICAL HAMBOREE

## ARRL HAMFEST OF THE AMERICAS

### FEBRUARY 6-7, 1988



DADE COUNTY YOUTH FAIR GROUNDS  
Tamiami Park, 10901 S.W. 24 Street (Coral Way), Miami, Florida

- FREE PARKING 15,000 VEHICLES
- 1,000 INDOOR SWAP TABLES
- 300 CAMPSITES WITH FULL HOOKUPS
- 200 COMMERCIAL EXHIBIT BOOTHS
- COMPUTERS & SOFTWARE
- HAMBOREE DEALER SPECIALS

- LICENSE EXAMS
- PACKET RADIO PROGRAMS
- DX FORUM
- RCA FLORIDA SECTION LUNCHEON
- TECH TALKS
- ACTIVITIES FOR NON-HAMS

Registration: \$5.00 Advance — \$6.00 Door. Valid both days. (advance deadline Jan. 30th)  
Swap Tables, 2 days: \$16.00 each. Power: \$10.00 per user.  
All swap table holders must have registration ticket.  
Campsites: \$12.00 per day, includes water, power, sanitary hook-ups, showers.  
(All RV vehicles, tent campers, vans, trailers welcome — no ground tents, please.)  
Headquarters Hotel: Miami Airport Hilton, 5101 Blue Lagoon Drive.  
Special Hamboree Rates: \$55.00 Single or Double.  
Reservation forms available through Dade Radio Club December 1st.

Exhibit Booth Information:  
Evelyn D. Gauzens,  
W4WYR, Chairman  
2780 N.W. 3rd St.  
Miami, FL 33125  
Telephone:  
(305) 642-4139

Make checks for Registration, Swap Tables & Campsites payable to:  
DADE RADIO CLUB, P.O. BOX 350045, MIAMI, FL 33135

4-Page Brochure Available . . .  
December 1st



## Amateur Radio Via Satellite

Andy MacAllister WA5ZIB  
2310 Romayor Court  
Pearland TX 77581

### PHASE 3

The AMSAT Phase 3C Launch Campaign officially began September 16, 1987, with the successful resumption of Ariane missions by the European Space Agency (ESA). Their launch program has been on hold since the disastrous Ariane flight V18 in late May of last year. The third stage failed to ignite, and the range safety officer was forced to transmit the destruct command to the vehicle.

The September V19 launch of an Australian communications satellite, AUSSAT 3, and the EUTELSAT (European Telecommunications Satellite Organization) ECS 4, brings the European consortium Arianespace back on a launch schedule that hopes for 44 more satellites in orbit via Ariane rockets over the next three to four years.

Phase 3C waits among those future satellites for the chance to become an OSCAR. Only when it achieves orbit does the title "Orbiting Satellite Carrying Amateur Radio" apply. Gordon Hardman KE3D in Colorado installed the new radiation-hardened memory chips, donated by the Harris Corporation, in the Integrated House-keeping Unit (IHU). The finished unit was then sent to West Germany for integration into the satellite by AMSAT DL. Phase 3C is ready for launch, and mission V22 may come as early as January 1988.

### Ariane's 8th Anniversary

The Ariane program celebrates the eighth anniversary of the first Ariane 1 test flight this month. After a flawless launch in December 1979, Mission LO-1 concluded without a hitch. For the ESA, which was barely four and a half years old, this was quite an achievement.

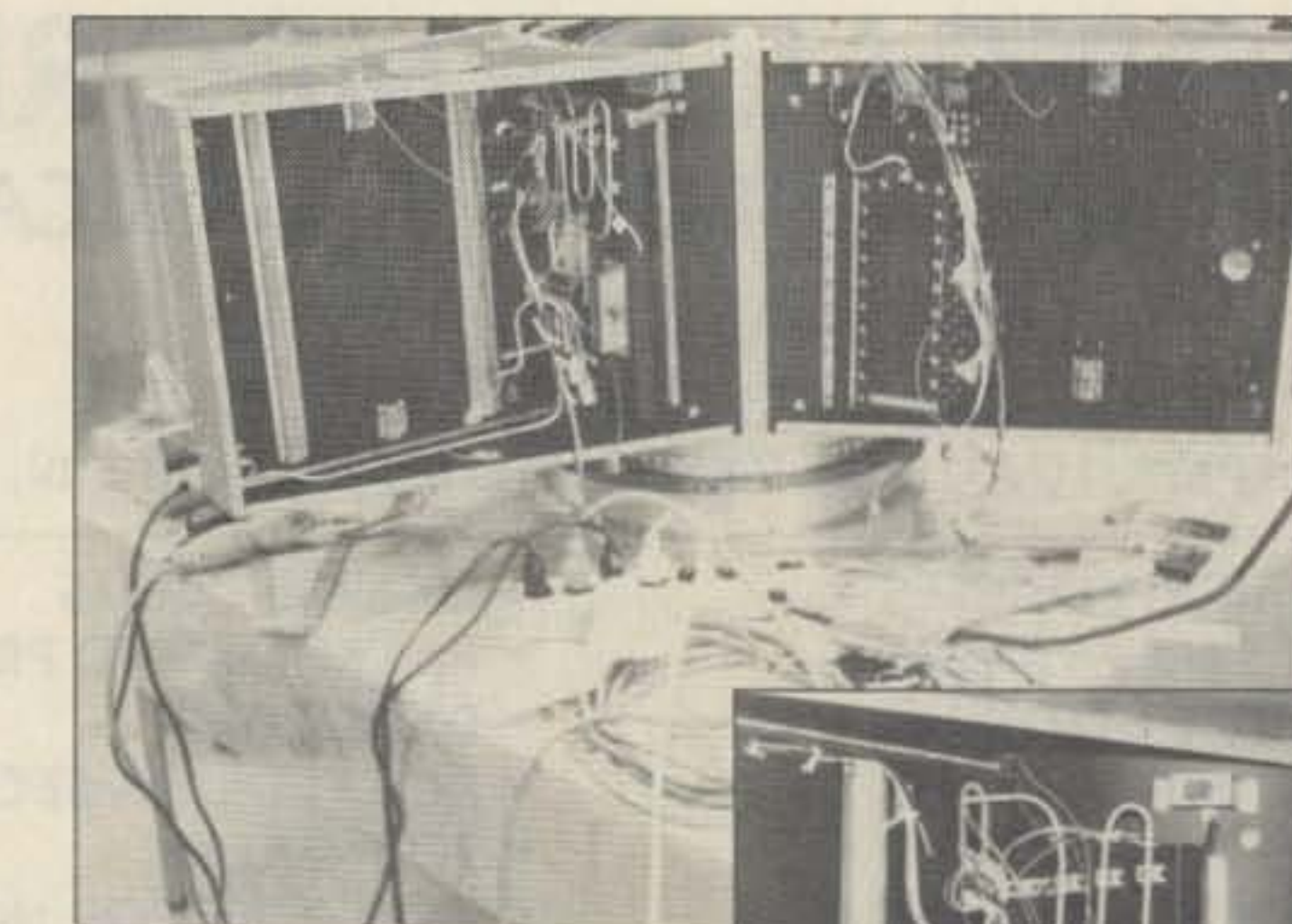
Mission LO-2, the first launch to carry satellites in lieu of ballast, didn't go as well. On May 23, 1980, known as Black Friday to amateur satellite enthusiasts, an experiment called Firewheel, and a hamsat, Phase 3A, became casualties of ESA and Ariane-space's first launch failure.

Three years later on June 16, 1983, Ariane statistics rose from three successes for five attempts to four for six. A new European satellite, ECS-1, and OSCAR 10 were safely in orbit.

Although OSCAR 10 is the most powerful and highest hamsat, it didn't achieve the desired orbit, nor did it escape unscathed from the upper stage of the launch vehicle. After being bumped or incorrectly released from the SYLDA (dual satellite deployment canister), the satellite was left in the wrong orientation with respect to the sun and spinning in the opposite direction the onboard computer expected. Due to the poor sun angle, some parts of the satellite were dangerously cold and there was little available power.

The spin direction was not corrected, since it was easier to adjust the software.

When it was time to fire the motors to correct perigee and inclination, all of the fuel escaped in one long burst during the perigee burn. The problem was later traced to a drawing error in the AMSAT-built liquid ignition



unit. The end result was an orbit with a low inclination and a very high perigee. This meant users in the northern hemisphere received 60% less operating time than originally planned. The spacecraft also spends more time in the hostile Van Allen radiation belt.

When Phase 3C is launched, we hope for a smoother ride. Mission V22 will be the first to use an Ariane 4 vehicle. This test or qualification flight will also carry ESA's Meteosat P2 weather satellite and

the U.S. PANAMSAT communications satellite.

There are six possible variations on the Ariane 4 design to allow each launcher to be tailored to the payload requirements. The simplest configuration can lift 4200 pounds to geostationary transfer orbit, while the most complex version, with four external liquid-fueled, strap-on boosters, can lift nearly 9300 pounds to the same orbit. By comparison, Ariane 1, which took OSCAR 10 into space, was rated for 3750 pounds. Ariane 4 carries fifty percent more liquid propellant in the first stage than Ariane 3 and sports a new multiple satellite fairing (container) for heavy geostationary payloads. The second and third-stage engines are unchanged from the Ariane 2 and 3 launchers.

### Insurance

AMSAT NA (North America) and AMSAT DL (West Germany) are working together to purchase launch insurance for Phase 3C. The goal for AMSAT NA is \$10,000. As part of the launch campaign, the insurance would cover the loss of the spacecraft if the worst should occur.

Donations of \$10.00 or more to the insurance fund will be acknowledged with a special Phase

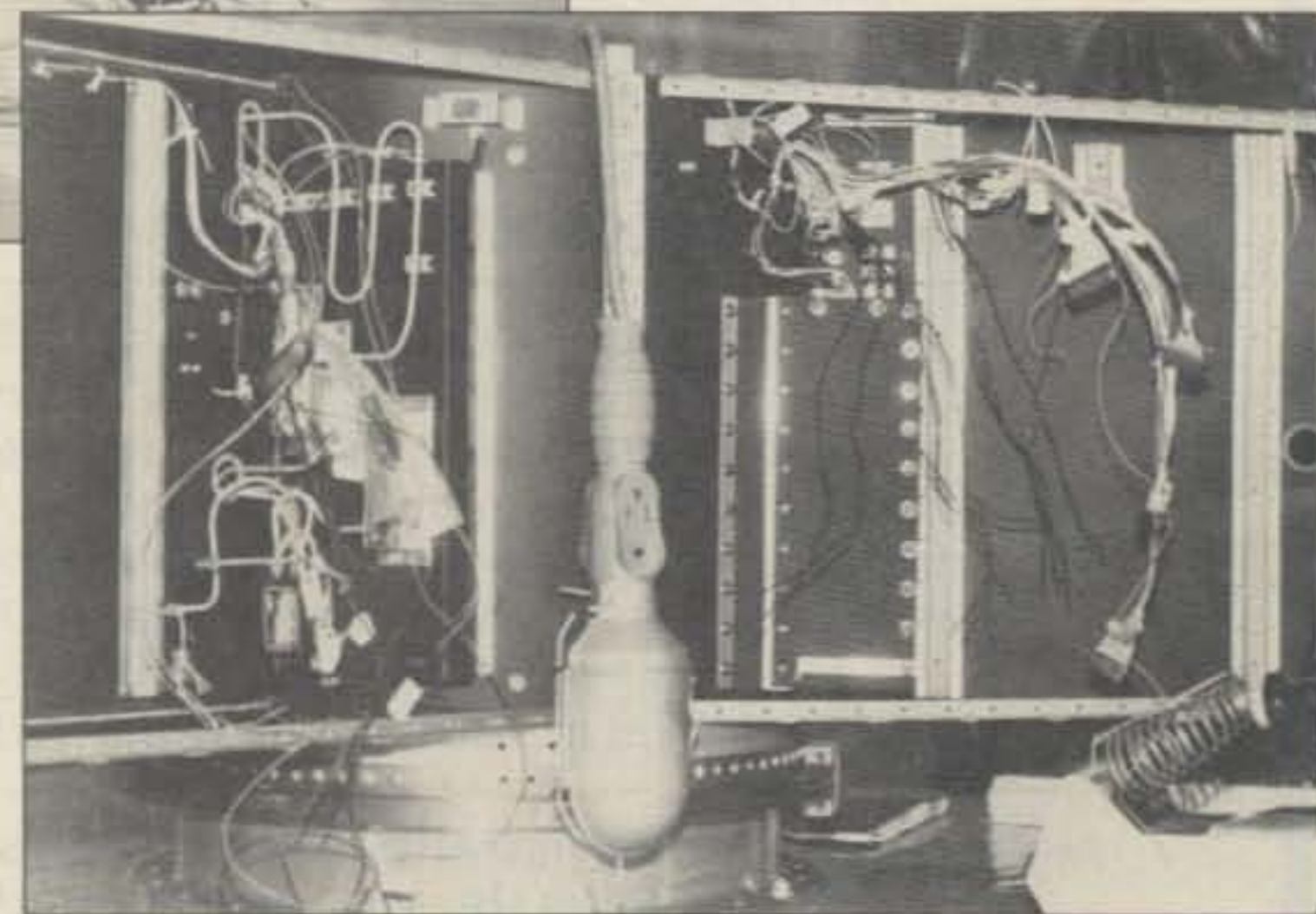
3C QSL card and recognition in ASR, the Amateur Satellite Report. Donations of \$30.00 or more will bring an AMSAT certificate showing the donor's name and callsign over an image of a Phase 3 spacecraft. Further perks are offered for amounts of \$100 and \$1,000. AMSAT is a non-profit, scientific, educational corporation and is treated as a charitable organization for tax purposes. Inquiries or donations should be sent to Phase 3C Insurance Fund, AMSAT, PO Box 27, Washington, DC 20044.

### European Rockets

With so much attention on the Soviet space station, Mir, or studying shuttle recovery efforts and our own plans for the 1990s, we discount or ignore the efforts of others dealing in the business of space. Among the newer contenders, Europe leads the way with a serious cost-effective program.

The European Space Agency was created in 1975 to consolidate the resources and activities of the European Launcher Development Organization and the European Space Research Organization. Member countries are: Belgium, Denmark, France, Ireland, Italy, Netherlands, Spain, Sweden, Switzerland, the United Kingdom, and West Germany.

The purpose of the ESA, as stated in its Convention, is to "provide and promote, for exclusively peaceful purposes, cooperation among European states in the fields of space research and technology, with a view to their scientific purposes and for operational space application systems." Financial backing is largely French (60 percent) followed by West Germany (20 percent).



Photos A and B. The Phase 3C spacecraft under construction at the AMSAT lab in Boulder, Colorado.



Ariane rockets are launched from the Guiana Space Center near Kourou, French Guiana, just north of Brazil. The center is on nearly 400 square miles along 37 miles of Atlantic coast at the equator. This location uses the earth's spin to give Ariane launchers a 17 percent payload advantage over operations from the Kennedy Space Center. Also, it's easier to achieve a geostationary transfer orbit when a rocket is launched from the equator. Launches from the Kennedy Space Center must go through complicated maneuvers to achieve the correct trajectory. With two pads in operation, the Guiana Space Center can launch up to 11 missions per year. The tentative schedule calls for ten for 1988.

The ESA and its commercial launch service operations company, Arianespace, appear to be only in the satellite launching business.

The ESA Ministerial Council was due to have a summit meeting in November. Depending on the results of this conference, the future funding and ambitions of Europe's space program may be expanded. Projects waiting for the green light are: the Ariane 5 launch vehicle; the Hermes manned mini shuttle; and the Columbus orbiting lab, designed to interface with the U. S. shuttle program. These endeavors are not cheap. The estimate of more than 12 billion U.S. dollars over the next ten years is likely to be low. Cooperation between the

Ariane Launcher		
Type	Length (feet)	Payload to GTO (pounds)
Ariane 1	154	3750
Ariane 2	161	4300
Ariane 3	161	5700
Ariane 4	192	4200-9300(*)

Table 1. Overall launcher length and vehicle lifting capabilities to GTO (Geostationary Transfer Orbit).

\* Depends on strap-on booster configuration.

## "Phase 3C waits among those future satellites for the chance to become an OSCAR."

The Ariane system is a three-stage vehicle based on known and proven technology. The Ariane 1 was designed in six years at a cost of 1.2 billion dollars. It stands 154 feet tall, is 12.5 feet in diameter, and weighs nearly 230 tons on the launch pad. All three stages use liquid propellant. The first two have a mixture of UDMH (Unsymmetrical DiMethyl Hydrazine) for fuel and nitrogen tetroxide as the oxidizer. The third stage uses liquid hydrogen and oxygen. This was the first cryogenic engine designed in Europe, but is based on existing expertise from Germany and France.

ember countries is essential, or the 13-member consortium may end up as a French-German operation.

Where does the amateur radio satellite program fit into this picture? In addition to Phase 3C, already scheduled and waiting for launch, the German Phase 3D project and AMSAT NA's Phase 4 geostationary satellite program both depend on the Ariane vehicle. These projects are currently proposing to modify the adapter ring between the launch vehicle and one of the main satellite payloads to accommodate a hamsat. If this is acceptable, the active amateur satellite would be

about three feet high, ten feet in diameter, and weigh nearly 900 pounds. Studies and designs have already begun on both projects. The future has incredible possibilities.

### Satellite Updates

AMSAT-OSCAR-10 may not be back in operation until the first of December, but as of this writing, we still hope for activity in November. The ground-control stations around the world will assess the situation carefully before allowing even guarded transponder operation.

Fuji-OSCAR-12 enthusiasts were surprised in mid-September when the satellite did not show up in the correct mode. In fact it was off! The previous operating schedule was just too ambitious and overloaded the battery. Later in the month, all was back to normal. The new schedule includes plenty of mode JA and JD activity. While the analog transponder mode is usually on for two continuous days when it is activated, the rules for the digital system continue with a two-hour on/off cycle during a single day of activity. Sufficient recharge time has been allowed to avoid the problems of September. Check the AMSAT nets and publications

for updates.

RS-10/11 continues to do well, but an operating schedule is still not known. After two months of continuous KA mode on RS-10, from August through early October, many would like to try more T-mode activity on RS-11.

I have received several calls and letters from you with questions about small antennas for RS chasing. The October Hamsats column gave several potential operators the needed push to try out mobile satellite activity, or to listen for the new satellite pair on simple antennas. Apartment dwellers and others with stringent deed restrictions have found that with reasonable receiver gain, indoor or attic-mounted antennas can work very well. Bob WA5PCD has made ROBOT contacts with RS-10 using a dipole for ten meters and a Ringo (no Ranger) on two meters. The uplink power was 12 watts, the antennas were in the attic, and the receiver was a Drake 2B with no preamp. Bob admits that a preamp would help, but for now he is at least on the air. Come on up and check the activity on these hamsats. New countries and new operators seem to show up every day. **73**



**Toroid Cores.  
Iron Powder  
& Ferrite.  
Ferrite Beads.  
Ferrite Rods.**

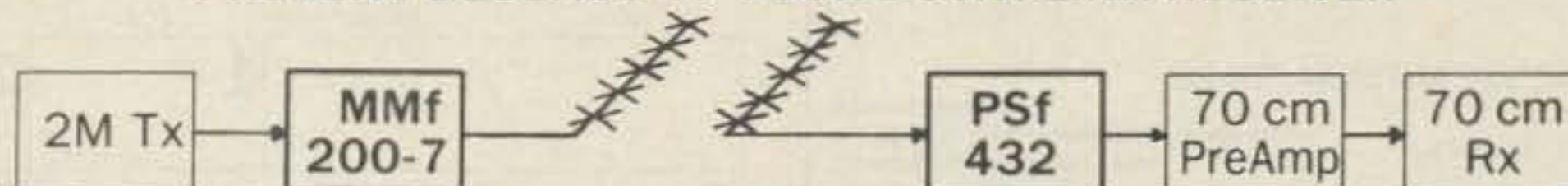
Free catalog and winding chart on request.

# PALOMAR ENGINEERS

Box 455, Escondido, CA 92025  
Phone: (619) 747-3343

## OSCAR MODE-J FILTERS

PREVENT DESENSE OF YOUR DOWN-LINK RECEIVER



MMf200-7 (usually sufficient) I.L. @ 145 MHz Loss @ 435 MHz	\$50.00  0.5dB 40 dB min	PSf432 (for extra protection) I.L. @ 435 MHz Loss @ 145 MHz	\$90.00  0.1 dB 70 dB typ
--	-----------------------------------	--	------------------------------------

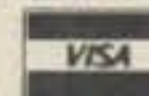
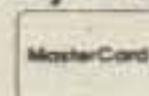
Send 66¢ (3 stamps) for detailed specs on all VHF & UHF products. Shipping FOB Concord, MA



**SPECTRUM INTERNATIONAL INC.**

P.O. Box 1084S, Concord, MA 01742, USA

**(617) 263-2145**



CIRCLE 183 ON READER SERVICE CARD



# ALL BAND ANTENNAS

## ALL BAND DIPOLE



- Only 135 feet overall length
- Perfect match for your Antenna Tuner with balanced line output
- Handles Full Power
- Works with all transmitters, transceivers, etc.
- Completely Factory assembled—Ready to install—NO adjustments necessary
- INCLUDES 100 feet of 450Ω Feedline
- Feedline can be shortened
- Works ALL Bands 160 thru 10 Meters
- Perfect for ALL classes of Amateurs
- Install as Flat-top, Sloper, Inverted "V", or almost any configuration
- Provides excellent SWR on all bands
- Utilizes Heavy 14 gauge stranded CopperClad (CopperWeld) antenna wire, (30% copper; 70% high-strength steel) NO rust. Will not stretch like copper
- Instructions included

Model A-10 \$34.95 (U.S. Postpaid)

## 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":\*

Model	Bands	Traps	Length	Price
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

## 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:

1 1/4" Diameter  
Completely Sealed & Weatherproof - Solid brass terminals - Handles Full Power - NO jumpers - NO Soldering. Instructions included. 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.

SEE YOUR DEALER, OR ORDER DIRECT FROM FACTORY.  
All orders shipped US Postpaid.  
VISA / MC - give card #, Exp. date, Signature

SPI-RO MANUFACTURING, INC.  
Dept 105, P.O. Box 1538  
Hendersonville, NC 28793  
Dealer Inquiries Invited

CIRCLE 134 ON READER SERVICE CARD

# PROPAGATION

Jim Gray W1XU

## EASTERN UNITED STATES TO:

	GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7A	7	7	7	7	7A	14	14	14	14	
ARGENTINA	21	14	14	7A	7	7	7A	14	14A	21A	21A	21	
AUSTRALIA	21	14	7A	7B	7B	7B	7	7	7	7B	14	14A	
CANAL ZONE	14	14	7A	7	7	7	7A	14	14	14	21	21	
ENGLAND	14	7A	7	7	7	7A	14	14	14	14A	14A	14A	
HAWAII	21	14	14A	7	7	7	7	7	14	14	14	21	
INDIA	14	14	7B	7B	7B	7B	7A	14	14	14	14	14	
JAPAN	14	14	14B	7B	7B	7B	7B	7B	14B	14	14	14	
MEXICO	14	14	7A	7	7	7	7	14	14	14	14A	14	
PHILIPPINES	14	14	14B	7B	7B	7B	7B	14B	14	14	14	14	
PUERTO RICO	14	14	7A	7	7	7	14	14	14	14	14A	14A	
SOUTH AFRICA	7	7	7	7	7B	14	14	14	14	14A	14	14	
U. S. S. R.	7A	7	7	7	7	7B	14	14	14	14A	14A	14	
WEST COAST	14A	14A	14	7	7	7	7	14	14	14	14A	14A	

## CENTRAL UNITED STATES TO:

	GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	14	7	7	7	7	7	7A	14	14	14	
ARGENTINA	21	14A	14	7A	7	7	7A	14	14A	21A	21A	21	
AUSTRALIA	21	14	7A	7B	7B	7B	7	7	7	7B	14	14A	
CANAL ZONE	21	14	7A	7	7	7	7A	14	14	14	14A	21	
ENGLAND	14	7A	7	7	7	7	7A	14	14	14	14A	14	
HAWAII	21	14	14A	7	7	7	7	7	14	14	14	21	
INDIA	14	14	7A	7B	7B	7B	7B	7A	14	14	14	14	
JAPAN	14	14	14	7B	7B	7B	7B	7B	14B	14	14	14	
MEXICO	14	14	7	7	7	7	7	7	14	14	14	14	
PHILIPPINES	14	14	14	7B	7B	7B	7B	14B	14	14	14	14	
PUERTO RICO	14	14	14	7	7	7	14	14	14	14	14A	14A	
SOUTH AFRICA	7	7	7	7	7B	7B	14	14	14	14	14A	14	
U. S. S. R.	7A	7	7	7	7	7B	14B	14	14A	14	14	14	

## WESTERN UNITED STATES TO:

	GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7A	7	7	7	7	7	14	14	14	14	
ARGENTINA	21	14A	14	14	7	7	7	14	21	21A	21A	21	
AUSTRALIA	21A	14A	14	14	7A	7A	7	7	7	7B	14	21	
CANAL ZONE	21	14	7A	7	7	7	7A	14	14	14	21A	21	
ENGLAND	14	7A	7	7	7	7	7B	7A	14	14	14	14	
HAWAII	21A	14A	14	14	7A	7	7	7	14	14	21	21	
INDIA	14	14	14	7A	7B	7B	7B	7A	14	14	14	14	
JAPAN	14A	14A	14	14	14B	7B	7B	7B	14B	14	14	14	
MEXICO	14	14	7A	7	7	7	7	14	14	14	14A	14A	
PHILIPPINES	14A	14	14	14	14B	7B	7B	14B	14	14	14	14	
PUERTO RICO	14A	14	7A	7	7	7	14	14	14	14	14A	14A	
SOUTH AFRICA	7	7	7	7	7B	7B	7B	14	14	14	14A	14	
U. S. S. R.	7B	7B	7	7	7	7	7B	14B	14	14	14	14	
EAST COAST	14A	14A	14	7	7	7	7	14	14	14	14A	14A	

A = Next higher frequency may also be useful.

B = Difficult circuit this period.

First letter = night waves. Second = day waves.

G = Good, F = Fair, P = Poor. \* = Chance of solar flares.

# = Chance of aurora.

NOTE THAT NIGHT WAVE LETTER NOW COMES FIRST.

HF conditions for DX are a mixed bag this month. In general, HF DX always suffers at the solstices, especially in the winter when days are short and nights are long in the northern hemisphere.

Look for an active-to-disturbed geomagnetic field around the first of the month, and again about the 10th, the 20th and 30th. Be aware of some possibilities of much larger disturbances between the 19th and 23rd, when geologic disturbances may be expected as well as geomagnetic ones. When the earth's magnetic field is active, HF paths near the poles are very uncertain, and often impossible. However, trans-equatorial paths can be quite useful. These disturbances can take place within a few days before or after the predicted days. The chart will assist you in picking the days which ought to be Good (G), Fair (F), or (P) Poor. A January preview: look for very disturbed conditions between the 6th and 9th.

DECEMBER						
SUN	MON	TUE	WED	THU	FRI	SAT
		1	2	3	4	5
			P	F	G	G
6	7	8	9	10	11	12
	G	F-G	G-F	F-G	G	G
13	14	15	16	17	18	19
	G	G	G-F	F-P	P	P
20	21	22	23	24	25	26
	P	P	P	P	P-F	F-P
27	28	29	30	31		
	F	F-P	P	P	P-F	



here is the next generation Repeater

# MARK 4CR

The **only** repeaters and controllers with REAL SPEECH!

No other repeaters or controllers match Mark 4 in capability and features. That's why Mark 4 is the performance leader at amateur and commercial repeater sites around the world. Only Mark 4 gives you Message Master™ real speech • voice readout of received signal strength, deviation, and frequency error • 4-channel receiver voting • clock time announcements and function control • 7-helical filter receiver • extensive phone patch functions. Unlike others, Mark 4 even includes power supply and a handsome cabinet.

Create messages just by talking. Speak any phrases or words in any languages or dialect and *your own voice* is stored instantly in solid-state memory. Perfect for emergency warnings, club news bulletins, and DX alerts. Create unique ID and tail messages, and the ultimate in a real speech user mailbox — only with a Mark 4.

Call or write for specifications on the repeater, controller, and receiver winners.



2 meters 220 440

TELEX: # 4932256 KENDECOM  
FAX: # 6173737304



**MICRO CONTROL SPECIALTIES**

Division of Kendecom Inc.  
23 Elm Park, Groveland, MA 01834 (617) 372-3442

CIRCLE 295 ON READER SERVICE CARD

## Gordon West's **Great Gift Idea!** **21 DAY NOVICE**



**\$19.95**

Plus \$2.<sup>50</sup>  
Postage and  
Handling

INSTRUCTOR  
DISCOUNT  
AVAILABLE



**CODE TAPES • 112 PAGE BOOK • BANDS CHART • ALL FCC FORMS  
SAMPLE TESTS • HOTLINE • PLUS MORE!**

STEREO THEORY TAPES COULD BE SUBSTITUTED FOR THE BOOK FOR THE VISUALLY IMPAIRED. PLEASE ASK US!

- \$70 in equipment certificates from ICOM, KENWOOD, & YAESU.
- Ham radio equipment "Wish Books". • Laminated world map.
- ARRL membership forms. • Free CQ Magazine coupon.
- Hotline for student questions. • Dealer distributor list.
- School pen. • Course completion certificate. • License holder.

**GORDON WEST RADIO SCHOOL**

2414 College Drive • Costa Mesa, CA 92626 • (714) 549-5000

CIRCLE 273 ON READER SERVICE CARD

FOR THE BEST IN LINEAR AMPLIFIERS, ANTENNA TUNERS, TRANSCEIVERS, METERS ETC. REPLACEMENT PARTS, FACTORY SERVICE, NEW PRODUCT INFO. DOMESTIC, INTERNATIONAL DEALER INQUIRIES INVITED.

PO Box H  
E. Rockaway, LI  
NY 11518, USA  
TLX 4758244  
516/536-2620

*the New* **Dentron**  
Radio Co. Inc.

CIRCLE 263 ON READER SERVICE CARD

**THIS MONTH'S GOODIE FROM THE CANDY STORE:**  
**RDC KENWOOD TS-430S**

**KENWOOD SM-220**  
**\$379.90 All L.T.O.**

OVER 4780 HAM RELATED ITEMS IN STOCK. ALL PRICES FOR PRESTON  
Send SASE for HF PRICE LIST. More specials in classifieds.

**ROSS DISTRIBUTING COMPANY**

P.O. Box 234, 78 South State Street, Preston, Idaho 83263  
Telephone (208)852-0830 We Close at 2:00 on MON. & SAT.

CIRCLE 254 ON READER SERVICE CARD

\*\*\*\* **SCRAMBLING NEWS** \*\*\*\*  
**Pay TV and Satellite Descrambling**

Schematics, theory, bypasses. 13 cable, 7 satellite. New SA turn-on, MLD-1200-3, \$14.95. Experiments With Videocipher, Cloning, musketeering \$14.95. Cable TV. Security, design \$12.95. MDS/ MMDS Handbook. Microwave hacking \$9.95. Build Satellite Systems Under \$600. \$12.95. Any 3/\$27. Scrambling News. Monthly. Feature articles, product reviews, law history, patents. \$24.95/yr., Sample \$5. Winter catalog \$1.

**Shojiki Electronics Corp., 1327K**  
Niagara St., Niagara Falls, NY 14303. COD's 716-284-2163

CIRCLE 192 ON READER SERVICE CARD



# HAM PROFILES

Number 31 on your Feedback card

Janette LeBlanc

Tom LeBlanc NX7P  
979 Young Street Suite E  
Woodburn OR 97071

## SHE DID IT

Janette was born on June 15, 1976, in Bakersfield, California, with the umbilical cord wrapped tightly around her neck. We got to see her about two hours later. A specialist was called to observe her. Later, doctors instructed us to do a special range of motion exercises with her and we did these for years. We were very thankful to see Janette grow up to be a normal, healthy girl who can enjoy life and meet interesting challenges.

One of Janette's first challenges was amateur radio. She expressed an interest in the hobby in the third grade. In a special assignment, her teacher instructed the students to do a project with dad. Any project would be fine, as long as it was with their dad. After kicking around some possibilities, Janette decided she wanted to learn the Morse code. When the project was due, she demonstrated to her class how messages can be sent and received through Morse code. Her classmates wrote words on a board hidden from Janette's view. I sent the code, and Janette decoded and told the class what words they had written on the hidden board. She also read a report she had prepared on the history of Morse code. The teacher encouraged her to continue on to get her ham license someday.

## Becoming a Novice

About two years later, at age 10, she decided to get her Novice license. She attended a Novice preparation class offered by Clackamas Amateur Radio Club, in Oregon City. She took her test in November of 1986, shortly before the Novice enhancement came.

Janette became KB7AEZ and worked several states on 40 meters. When Novice enhancement came, she made some contacts on 10 meters, but did not work

the 220 MHz band. She liked the idea of getting on two meters where more repeaters and auto-patch equipment are available.

She decided in late June to go for an upgrade. She wondered, "Do you think I can do it?" We worked together off and on from that point. During the last two weeks of July, we picked up the pace. Studying just before bed proved profitable. She read my study sheets during the day and answered questions that I pre-

**"Success and accomplishment are good for us all."**

pared. It was almost like learning a new language. So many things were totally foreign to Janette. At times we felt like giving up. The challenge of this project required hard work from both of us. During the last week before the exam, I took two afternoons off work and we studied together at the library. Breaks were fun, as was dinner out together those two nights. Those were fun times for both of us, since we spent time together and got to know each other a little better.

The first of August came, and she was ready but very nervous. We went to Portland Com-

munity College for the test. On the way to the test, I told her several times that the volunteer examiners are her friends. I encouraged her to ask questions if she did not understand any instructions. I tried to help her to understand that the VEs are on her side, because they want to see more young hams. After the test, we sat in tense anticipation as the examiners graded it. A VE looked up at me and held up one finger. I wondered if he meant that she missed it by one point. He said, "No, she only missed one question!" She passed with a 96% score. While she waited for her temporary papers, I presented her with a micro handheld, carefully



fitted with a bow on its battery pack. She was embarrassed, proud and relieved, all at the same time.

She did it! Success and accomplishment are good for us all. When we succeed in one thing, it transfers to other areas of our lives, making it easier to succeed. Our Incentive Licensing Program offers several levels of challenges and opportunities for success.

Janette monitors the Mt. Hood repeater, and we often talk on simplex to sharpen up her operating skills. We use our handhelds to keep in touch when my XYL Karen and I are away from

home. On one occasion, I went deep sea fishing with my dad. Janette maintained contact with us through the coastal repeaters, while she and the rest of the family went shopping. Ham radio was especially helpful that day because the fishing boat was unexpectedly delayed (three hours) coming back to port. This information gave the family more flexibility in shopping and sight-seeing. They knew exactly when to pick us up at the dock.

## A Special Accomplishment

A couple of humorous things came up in the early stages of Janette's technician preparation. When I explained about simplex operation, she seemed satisfied that that was pretty simple to understand. After I explained the use of split input-output frequency separation in repeater operation, she guessed, "That's called complex right?" I said, "No, duplex." When we first discussed the ionosphere, I told her that is where there are a lot of free ions and electrons. Janette responded, "You mean Free-ons?". Helping my daughter into ham radio has been a very enjoyable and memorable experience. Neither of us will ever forget the hard work, the feeling of accomplishment or the joy of doing something special together.

I have heard several people say that we need younger hams. Well, the Novice Enhancement will certainly help to make this possible. The new Technician-General split test makes the Technician test a lot easier than it used to be. This will encourage more people to upgrade. Even young people with no background in electronics can grasp the concepts with some help. Concepts can be rephrased into more understandable vocabulary. Various quick-learning tricks can be used in other places. Young people are smart. If we encourage them and help them, perhaps we will realize our goal of adding more young hams to our ranks. **73**

Tom LeBlanc NX7P lives in Oregon with his XYL and three children. He has just completed a licensing study guide for radiotelephone operators.



**SOMETHING NEW UNDER THE SUN**  
CAROLINA WINDOM

84-2K Balun | 132' overall length

**RADIO WORKS**

Vertical Radiator  
C1-2K

\*NEW\*

New G5RV SuperLoop  
BigSig Loop  
In-Tree-Vert  
Universal Antenna  
BALUNS: Utility  
Remote & High Power  
Precision 1:1 & 4:1

Discover  
**The RADIO WORKS**

It's all here in our informative new catalog  
\$1 (refundable)

Box 6159, Portsmouth, VA 23703 (804) 484-0140

Mobile, VHF, B&W, Alpha-Delta, Connectors, Wire & Cable,  
Synthetic Rope, Spi-Ro, MFJ, Heil, Metz, Smiley ducks.

Introductory Price  
Assembled \$60  
Kit \$45

CIRCLE 150 ON READER SERVICE CARD

**Take full advantage of your Reader Service Numbers!**

## Above and Beyond AR2002

PROFESSIONAL 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:

Cradled mobile mounting bracket  
Trunk lid mobile antenna with 12 ft cable  
Discone base antenna with 30 ft cable  
RS-232C interface unit

**Please: No Dealer Inquiries**

### AR2002

Professional Monitor Receiver

**\$455.00**

(California res. add \$27.30 tax)

Visa and MasterCard accepted  
Prices includes shipping & handling  
C.O.D. slightly higher

22511 Aspan Street, Lake Forest, CA 92630-6321  
Calif./Alaska (714) 581-4900  
Facsimile (714) 768-4410 (not a phone)  
**TOLL FREE 1-800-523-6366**

**ALE communications, inc.**

CIRCLE 279 ON READER SERVICE CARD

73 Amateur Radio • December, 1987 87

**Say you saw it in 73!**

### Multiband QRV 160-10 Emergency Pack

Built for repeated deployment and storage, wet or dry, the Emergency Pack contains QRV 160-10 all band kink-proof sealed antenna, rapid launch kit, 70' RG-8x, 160 meter adapter, all band counterpoise, 200' rotproof dacron. Nothing more needed to be QRV fast. One person installs in 15 mins.

1971 N. Oak Lane 1300 E.  
Provo, UT 84604-2138

**Fastest Antenna in the West**



Info: 39c s.a.s.c.  
**Antennas West**  
(801) 374-1084

CIRCLE 236 ON READER SERVICE CARD

## • SUPERSCAF •

(A Switched-Capacitor Audio Filter)



SuperSCAF is a versatile switched-capacitor filter for eliminating interference and noise on CW, SSB, RTTY, AMTOR, PACKET and other narrow band modes. Extremely steep filter skirts remove adjacent clutter and noise to enhance weak signal reception and greatly increase intelligibility and listening comfort.

SuperSCAF incorporates a switched-capacitor bandpass filter, an economical implementation of digital filter technology. Extreme sharpness, stability, accuracy and complete freedom from ringing characterize this design approach. Bandwidth is adjustable from a minimum of 30 Hz to a maximum of 3700 Hz, allowing optimum passband tailoring under widely varying conditions. Skirt slope is 150 dB per octave (about twice as steep as a good crystal filter), and stopband attenuation is at least 51 dB. SuperSCAF is connected via the receiver's speaker or headphone output and provides 1.5 Watts to drive a 3, 2 to 8 Ohm speaker. SuperSCAF operates from 105 to 130 VAC.

SuperSCAF is available as an easy to assemble kit. No adjustments, calibration, or test equipment are required. The kit can be completed by most builders in one or two evenings. SuperSCAF is available for \$129.95 plus \$7.00 shipping and handling. Order from AFtronics, Inc., PO Box 785, Longwood, FL 32752-0785. Florida residents should include state sales tax.

**AFTRONICS, INC.**

P.O. BOX 785  
LONGWOOD, FLA 32752-0785

CIRCLE 251 ON READER SERVICE CARD



**Crystal Filters**

### YEAR-END CLEARANCE

All starred (★) items 20% off; all others 10%.  
Prices are each except as noted. All filters 8-pole.  
Sale ends December 31, 1987.

**FILTERS FOR KENWOOD - Reg. \$60 except as noted.**  
8.83MHz IF for models: TS120 through TS940  
Bandwidths: 250, 400, 1800, ★ 2100, 6000Hz  
TS440 ★ Pair (400Hz CW, 2.1KHz SSB) ..... Reg. \$120  
TS430 ★ Triple (Both above plus AM) ..... Reg. \$180

455KHz IF for R820, TS830/930/940 ..... Reg. \$110  
Bandwidths Available: CW ★ 400Hz; SSB ★ 2.1KHz

**Matched Filter Pairs for Above ..... Reg. \$170 pr.**  
(8.83MHz and 455KHz) SSB: ★ 2100Hz, CW: ★ 400Hz

3.395MHz IF for TS520, TS511, R599.  
Bandwidths Available: 250, 400, ★ 1800, 2100Hz

**Filter Cascade Kits with Filter and Amplifier**  
For ★ TS430 \$85; ★ TS520 \$80; ★ TS820 — Reg. \$70

**FILTERS FOR YAESU ..... Reg. \$60 except as noted.**  
3.18MHz IF for FT-101 Series except Z/D.  
BWS: 250, 500Hz, 1.8, ★ 2.1, ★ 2.4, 6.0KHz

8.2MHz IF for FT-102, FT-757/767.  
Bandwidths Available: ★ 250, 500, 2100Hz  
454KHz IF for FT-102 (★ 250, 500Hz) ..... Reg. \$75  
455KHz IF for FT-102 (★ 2.1KHz) ..... Reg. \$110

8.9MHz for FT-101ZD/107/707/901-2, FT-980, FT-77  
BWS: 250, 500Hz, 1.8, 2.1, ★ 2.4, 6.0KHz  
10.76MHz IF for all but 980: BWs: 2.1, ★ 2.4KHz  
455 IF for FT980 only: BW ★ 2.1KHz ..... Reg. \$110  
455.8 IF for FT-980, FT726: BW ★ 500Hz ..... Reg. \$ 75

9.0MHz IF for Tempo I (or FT-200), FT-301, FT-7/B  
BWS: ★ 250, 500Hz, 1.8, ★ 2.1, 2.4, 6.0KHz  
**NOTE:** Above are our "homebrewers' favorites"!

**FILTERS FOR ICOM (exact replacements)**  
455 IF for IC730/740/745/751, R70/71, etc.  
Bandwidths: FL44A (SSB ★ 2.4KHz) ..... Reg. \$109  
FL52A (500Hz); FL53A (250Hz) ..... Reg. \$85 ea.

**FILTERS FOR HEATH - ALL MODELS ..... Reg. \$65**  
Bandwidths Available: 250, 400Hz ★ 1.8, 2.1KHz  
For SB-104 Only: ★ 400Hz (3395.7 IF)

**FILTERS FOR DRAKE R-4C ..... Reg. \$65 exc. as noted**  
GUF1 — Replaces original 1st IF 4-pole unit  
2nd IF 125 (\$75), 250, 400Hz, 1.8, ★ 2.1KHz

**FILTERS FOR DRAKE TR7/R7, etc. .... Reg. \$65**  
BWs Available: 250, 400Hz, 1.8, ★ 2.1KHz

### LIMITED QUANTITIES - ORDER NOW!

Sales prices are based on our present stock. Orders for any exhausted type of filter are subject to a 6-week delay. Order by phone to check availability!

SPECIFY: Make and Model Number of your Rig.  
Frequency and Bandwidth of filter(s)

ORDER by Mail or Phone — VISA/MC or COD OK.  
SHIPPING: \$5 US and Canada, \$13 elsewhere.

**GET THE BEST 8-POLE FILTERS FOR LESS!**

**FOX-TANGO Corp.**

Box 15944, W. Palm Beach, FL 33416  
Telephone: (305) 683-9587

CIRCLE 58 ON READER SERVICE CARD



# RTTY LOOP

## Amateur Radio Teletype

Marc I. Leavey, M.D. WA3AJR  
6 Jenny Lane  
Pikesville MD 21208

### RTTY CHEER

The end of the year is a funny time. With various giftgiving opportunities, the urge to shop is upon us. With the end of the calendar year, the urge to clean up loose ends is here. And with a new year about to dawn, one always hopes to get a glimpse of something new. This month, I think RTTY Loop will satisfy all!

### Queries

Dennis Roy, of Detroit, Michigan, writes that he has been a longtime short wave listener, who does not own "any fancy equipment, just an old Hallicrafters S-38C." He is curious about monitoring press and other commercial RTTY signals, and asks the universal questions:

(1) What is the cheapest equipment available to monitor commercial RTTY, including the cheapest receiver, terminal unit, and computer?

(2) What is the best equipment available?

(3) Are there any decent world news services to monitor? Are some of them scrambled and, if so, should I just give up on the idea?

(4) What is a good reference manual for frequencies to monitor?

First off, any receiver stable enough to receive single sideband is, in general, stable enough for RTTY. Extra money does buy some nice features, such as filters that can strip off an offending CW signal or digital readout. These, however, aren't really necessary.

What kind of money are we talking about? You can buy a new serviceable receiver for a couple of hundred dollars or spend some time at a local hamfest and spend a whole lot less. Go with a knowledgeable amateur. There are gems among the rubble at hamfests. What you will be looking for is a stable, general-coverage receiver with easy frequency readout and adjustable BFO. I can't think of a hamfest I've ever been at where there haven't been a few receivers that would fill the bill. Lacking a 'fest, you might check the used equipment shelves at a

local ham store. The price might be a tad higher, but you won't feel as rushed to buy as at a flea market. Still no? Find a local ham, through him or her a local club, and make your needs known. You never know who has a boat anchor lying in the basement.

The cheapest terminal unit? There are none! You mentioned computers—there are programs for several of them which decode RTTY audio directly. They're not as facile as a dedicated piece of hardware, but they're cheaper.

If you insist on hardware use simple little one-chip demodulators. This is just another name for terminal units, which can be built for a few dollars. See back issues of RTTY Loop for details.

The best? If I have to blue-sky it, I have a spec sheet on a RTTY demodulator here that would knock your socks off, and there is this receiver that will drag signals up out of the mud like a new detergent. The important thing to remember, however, is this: If you can hear them, you can copy them with most any RTTY setup. If used as a terminal, the computer type is irrelevant, anyway, save for the communications program that runs on it. The software

features is the salient point here.

I've seen lots of books on press frequencies, and reviewed or commented on them in the column. My main approach, however, is to scan the 8 MHz to 15 MHz frequencies slowly, and look for copiable signals. Sometimes it's English, sometimes Spanish or Italian, and occasionally a language I can't directly identify. But that's the best way to know what you can hear, from where you are, with what you're listening on.

### What's New in RTTY Gear

One tradition of RTTY Loop's December edition has been a look at current items of interest to RTTYers. I want to stress that I derive the information presented in this segment of the column, unlike my usual material, from ads, not equipment. You are on your own—let me know what happens!

Kenwood features the TS-440S HF transceiver, complete with a FSK mode, although it is called "AFSK" in the ad. Even with the statement "AMTOR compatible", it sounds like they're talking to us.

There are various interfaces in the Barry Electronics Corporation's ad. It looks like they have a selection of Kantronics, Microlog, MFJ, and AEA equipment on hand. Nothing much detailed, just all kinds of alphabet soup. QSL?

Another ham dealer featuring AEA, MFJ, and Kantronics is

Northeast Electronics Supply Company, Inc. There is again only sparse details, but worth a shot.

AEA's PK-232, an item which has had more than a passing notice in this column, is prominent in our tour. With new programs said to display FAX on Commodore and IBM-compatible screens directly, this bears another look.

More complete lines, including some HAL equipment, is featured in the EGE, Inc. ad. They seem to have nearly everything.

Hamtronics has an interesting little board in its ad for an FSK data modulator and demodulator board. They sell for under forty bucks a piece, for up to 1200 bauds. With "202" in the model number, I wonder what standard they follow?

Michigan Radio is another purveyor of fine goods, including AEA, Kantronics, and MFJ. Maybe you should use carbon paper for the postcards?

GLB Electronics features a portable packet controller. Sitting next to a nine-volt battery, the battery looks big! Low-current drain and standard features make this package look very attractive.

A communications program for IBM PC compatibles is described by ExpertQ. Supporting many Kenwood transceivers, most multi-mode terminal units, and PC-type computers.

FAXers please note the ad placed by Elmer Schwittek K2LAF for an updated FAX receive program for IBM PC compatibles. Dan Diehlman AE6G offers yet another full-featured IBM PC type communications program.

RTTYers, be sure to check out Austin Amateur Radio Supply. They carry what by now is a familiar assortment of RTTY items. Another Texas dealer to investigate is Madison Electronics Supply. They have a RTTY line that is becoming a "standard" today.

Finally, there is the Brapper Box. Here is a device to couple a transceiver to a TNC. Why? Because some modern transceivers have more than mike and PTT on their mike connectors, and interfacing them can be a nightmare. I've yet to do it myself! Drop Electron Processing, Inc., a note about this unit.

I encourage you to look for the ads in the October, 1987, issue of *73 Magazine* for pictures and additional information. When writing to any of these folks for information (or even to order!), be sure to tell them you saw them mentioned here, in *73's* RTTY Loop.

### Teletype Supplies

Kenwood USA Corporation  
2201 E. Dominguez Street  
Long Beach CA 90810

Barry Electronics  
Corporation  
512 Broadway  
New York NY 10012

Northeast Electronics  
Supply Company, Inc.  
PO Box R-G  
Whitehall PA 18052

AEA  
2006 196th Street SW  
Lynnwood WA 98036

EGE, Inc.  
14803 Build America Drive  
Building B  
Woodbridge VA 22191

Hamtronics, Inc.  
65-D Moul Road  
Hilton NY 14468-9535

Michigan Radio  
28360 South River Road  
Mt. Clemens MI 48405

GLB Electronics, Inc.  
151 Commerce Parkway  
Buffalo NY 14224

ExpertQ  
10245 Leatherwood  
Fort Worth TX 76108

Elmer W. Schwittek K2LAF  
429 N. Country Club Drive  
Atlantis FL 33462

Dan Diehlman AE6G  
5748 N. Bond  
Dept. 73 (RL)  
Fresno CA 93710

Austin Amateur Radio  
Supply  
5325 N. IH 35  
Austin TX 78723

Madison Electronics Supply  
3621 Fannin  
Houston TX 77004

Electron Processing  
Incorporated  
P.O. Box 708  
Medford NY 11763



**Loose Bits**

In the loose ends department, a few notes. In the October '87 edition of RTTY Loop, I relayed a large list of FAX stations for those interested. The call sign of the seventh station, however, is not printed. I assume a glitch in data transmission between here and 73HQ is responsible. We transfer this column electronically! The line should read:

KVM70 HONOLULU, HI, USA  
9982.5, 11090, 16135, 23331.5

Also missing is proper credit for the source of this list. My flying fingers forgot to type the name of Wally Vance, KW5N, of Meridian, Mississippi, as the originator of this massive work. Thanks, Wally, for passing it along.

Here's my promised peek at next month. One of the all time most popular columns was the RTTY program for the TRS-80® Color Computer presented in the July 1987 column. January's column should go one better with another program for the CoCo that includes many, if not all, of the features you have been asking for.

In the meantime, I remain as accessible as ever, via mail, at the above address, CompuServe (ppn 75036,2501), or Delphi (username: MARCWA3AJR). Remember to enclose a stamped, self addressed envelope if you wish a return response by mail. The complete index to RTTY Loop is still available, detailing over ten years of this column. Just send a SASE with postage for two ounces to the above address, and I'll be happy to send one to you. In the meantime, all the best for a wonderful holiday season to each and every reader of RTTY Loop! **73**

Low Prices Low Prices

**THE SPECTRUM**

617 West Elk Avenue • Bemberg Center  
Elizabethton, Tennessee • 37643

**TENNESSEE'S NEWEST CD STORE  
"CHECK IT OUT"**

✓ This month's Special—Paragon .....  
at unbelievable ..... **\$1710.00**

Authorized Dealer For—TenTec, Astron,  
MFJ, and Larsen

(FOB Elizabethton)  
add 5% Visa & Mastercard  
\$2.00 COD Fee

Call Toll Free  
**1-800-338-0804**

Tennessee Volunteers (615) 543-5688

CIRCLE 100 ON READER SERVICE CARD

\* **OMAR ELECTRONICS** \*

FOR ALL YOUR AMATEUR NEEDS  
*SPECIAL PRICES* on all

**MFJ PRODUCTS \* A.R.R.L. PUBLICATIONS**  
and other Ham Radio equipment!

**404-466-3241**

**OMAR ELECTRONICS** • Omar Pupo WA8FON  
RTE 1 HIGHWAY 81 SO. • LOGANVILLE, GA 30249

CIRCLE 292 ON READER SERVICE CARD

**RADIO SALES INC.**

IN MINN.: (612) 535-5050  
SERVICE: (612) 535-7533  
TELEX NO.: 650 329 9719  
MCI MAIL: TNT

1-800-328-0250

AMERITRON • BUTTERNUT • LARSEN • WELZ • NYE VIKING • PALOMAR • MIRAGE • KANTRONICS

TEN TEC • ICOM • KENWOOD • TELEX HY-GAIN • HUSTLER • ROHN • ALINCO • BENCHER • AEA

When You Want the BEST  
...CALL TNT FOR THE QUOTE!



**ICOM IC761**

New ICOM superior HF transceiver. Built-in AC supply. Built-in automatic antenna tuner. 160-10M/general coverage rcvr. Passband tuning plus IF shift. QSK up to 60 WPM.

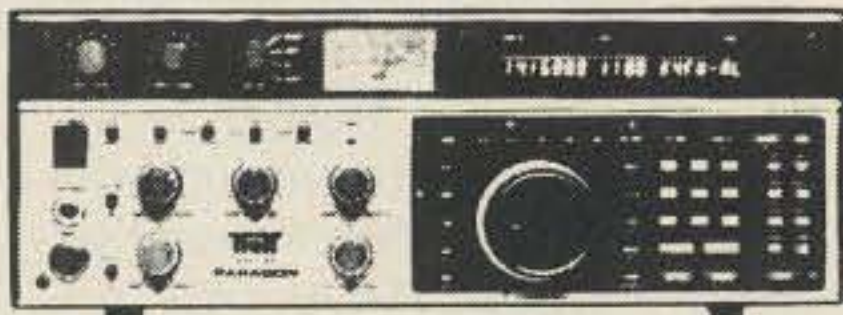
**CALL TNT FOR QUOTE!**



**KENWOOD TS 940S**

Dx-celence! Top of the line transceiver for the serious operator. 100% duty cycle xmtr. High stability dual digital VFO's. Graphic display of operating features. 40 memory channels.

**CALL TNT FOR QUOTE!**



Model 585

Made in U.S.A.

**TEN-TEC PARAGON**

New 200 watt full featured HF. Digital transceiver for the operator who needs the ultimate! Gen. coverage rcvr. Microprocessor controlled. 62 memory channels. QSK for CW.

**CALL TNT FOR QUOTE!**

SEE THE  
NEW ALINCO  
DUAL BANDER!  
It'll knock your socks  
off for the \$\$\$.

SASE FOR  
"Cherry" previously  
owned equipment.

SERVICE  
Once you buy your  
new rig . . . who will  
take care of it  
for you?  
**TNT SERVICES  
WHAT WE SELL!**

VISA/MASTER CARD  
FREE SHIPPING  
ON MOST RIGS FOR CASH!



S.A.S.E. FOR OUR  
"BENCH-TESTED"  
USED EQUIPMENT LISTING

MON-FRI 9 AM - 6 PM CENTRAL TIME  
SATURDAY 9 AM - 5 PM

4124 West Broadway, Robbinsdale, MN 55422 (Mpls./St. Paul)

CIRCLE 238 ON READER SERVICE CARD

CALL LONG DISTANCE ON YOUR HANDHELD

35 WATT and 75 WATT 2-METER AMPLIFIERS

The **MODEL 335A** will deliver 35 watts of power using the latest state-of-the-art circuitry. The amplifier will operate SSB or FM and is compatible with most handheld transceivers, including the TR2400, TR2500, TR2600, IC-2AT, Yaesu, Santec, and TenTec. Only 300 mw input will deliver 5 watts out; 3 watts in will deliver 35 watts out. Maximum input level is 5 watts.

We specialize in carrying a complete parts list for the 140 and 300 watt HF amplifiers as described in the **MOTOROLA** Bulletins EB-27A, AN-758, EB-63, AN-762 and as described in the **ARRL** Handbook. We also carry a line of **ATV** equipment for 70 and 33 CM. For detailed information and prices, call or write for our free catalog.

**VISA**

**CCI** Communication  
Concepts Inc.

121 Brown Street • Dayton, Ohio 45402 • (513) 220-9677

MODEL 335A (35watt) Kit \$ 79.95  
MODEL 875A (75watt) Kit \$119.95  
(add \$2.00 Shipping and Handling)

CIRCLE 99 ON READER SERVICE CARD



# DEALER DIRECTORY

## CALIFORNIA

### Burbank

New HAM store open and ready to make a DEAL. We carry all lines, ship UPS, and are open Sunday. **A-TECH ELECTRONICS**, 1033 Hollywood Way, Burbank CA 91505; (818)-845-9203.

### San Jose

Bay Area's newest amateur radio store. New & used amateur radio sales & service. We feature Kenwood, ICOM, Azden, Yaesu, Ten-Tec, Santec & many more. **Shaver Radio, Inc.**, 1775A S. Winchester Blvd., Campbell CA 95008; 408-370-6665.

## DELAWARE

### New Castle

Factory authorized dealer! Yaesu, ICOM, Ten-Tec, KDK, Kenwood, AEA, Kantronics, Santec. Full line of accessories. No sales tax in Delaware. One mile off I-95. **Delaware Amateur Supply**, 71 Meadow Road, New Castle DE 19720; 302-328-7728.

### Wilmington

Delaware's friendliest ham store. Also Shortwave supplies. **Amateur & Advanced Communications**, 3208 Concord Pike, Wilmington DE 19803; 302-478-2757.

## FLORIDA

### Miami

Casa Marconi, Inc. Pre-owned communications equipment. We do repairs. Send SASE for prices. **Casa Marconi, Inc.**, 7189 SW 8th Street, Miami FL 33144; 305-264-8443; 305-264-8443.

## HAWAII

### Honolulu

Kenwood, ICOM, Yaesu, Hy-Gain, Cushcraft, AEA, KLM, Tri-EX Towers, Fluke, Belden, Astron, Etc. **HONOLULU ELECTRONICS**, 819 Keeaumolu Street, Honolulu HI 96814; 808-949-5564.

## IDAHO

### Preston

Ross WB7BYZ has the largest stock of amateur gear in the Intermountain West and the best prices. Call me for all your ham needs. **Ross Distributing**, 78 So. State, Preston ID 83263; 208-852-0830.

## MASSACHUSETTS

### Littleton

Reliable hamstore servicing New England. Full line of kenwood and ICOM stocked and serviced. AEA, ARRL Publications, Anphenol, Alpha Delta, Austin, Avanti, Alinco, Ameco, Venture, B&W, Cushcraft, Carol Cable, Daiwa, Hustler, KLM, Kenpro, Larsen, Rohn, RF Concepts, Tokyo Hy-power, Trac Keyers, Vibroplex, Welz, etc. **Tel-Com, Inc.**, 675 Great Road (Rt. 119) Littleton MA 01460; 617-486-3400, (3040).

## MINNESOTA

### Robbinsdale

Kenwood, ICOM, Ten-Tec. Mon.-Fri. 9a.m.-6p.m., Sat. 9a.m.-5p.m. **TNT Radio Sales**, 4124 West Broadway, Robbinsdale MN 55422 (MPLS/ST. PAUL); Toll Free 800-328-0250, In MN 612-535-5050.

## NEW HAMPSHIRE

### Derry

Serving the ham community with new and used equipment. We stock and service most major lines: AEA, Astron, B&W, Cushcraft, Encomm, Hy-Gain, Hustler, ICOM, Kenwood, KLM, Larsen, Mirage, Mosley; books, rotors, cable and connectors. Business hours Mon.-Sat. 10-5, Thursday 10-7, Closed Sun./Holidays. **Rivendell Electronics**, 8 Londonderry Road, Derry NH 03038; 603-434-5371.

## NEW JERSEY

### Lyndhurst

Finally a ham store in NJ. Located ¼ mile south of Rt. 3. Mon.-Wed. 11:30-7:30, Thursday 11:30-9, Friday 11:30-7:30, and Saturday 9-3. Visa/MC. **Abaris Systems**, 276 Oriental Place, Lyndhurst NJ 07071; 201-939-0015.

## NEW YORK

### Jamestown

Western New York's finest amateur radio dealer featuring ICOM-Larsen-AEA-Hamtronics-Astron. New and used gear. **VHF Communications**, 915 North Main St., Jamestown NY 14701, (716) 664-6345.

## New York

New York City's Largest Full Service Ham and commercial Radio Store. **BARRY ELECTRONICS**, 512 Broadway, New York NY 10012; 212-925-7000.

## NORTH CAROLINA

### Greensboro

9a.m. to 7p.m. Closed Monday. ICOM our speciality-Sales & Service. **F&M ELECTRONICS**, 3520 Rockingham Road, Greensboro NC 27407; 919-299-3437.

## OHIO

### Columbus

Central Ohio's full-line authorized dealer for Kenwood, ICOM, Yaesu, Ten-Tec, Info-Tech, Japan Radio, AEA, Cushcraft, Hustler, and Butternut. New and used equipment on display and operational in our 4000 sq. ft. store. Large SWL department, too. **Universal Amateur Radio**, 1280 Aida Drive, Reynoldsburg (Columbus) OH 43068; 614-866-4267.

## PENNSYLVANIA

### Trevoze

Same Location for over 38 years. **Hamtronics, Div. of Trevoze Electronics**, 4033 Brownsville Road, Trevoze PA 19047; 215-357-1400.

## TENNESSEE

### Memphis

M-F 9-5; Sat 9-12; Kenwood, ICOM, Ten-Tec, Cushcraft, Hy-Gain, Hustler, Larsen, AEA, Mirage, Ameritron, etc. **MEMPHIS AMATEUR ELECTRONICS**, 1465 Wells Station Road, Memphis TN 38108; Call Toll Free: 800-238-6168.

## TEXAS

### Dallas

In Dallas since 1960. We feature Kenwood, ICOM, Yaesu, AEA, Butternut, Rohn, amateur publications, and a full line of accessories. Factory authorized Kenwood Service Center. **Electronic Center, Inc.**, 2809 Ross Ave., Dallas TX 75201; 214-526-2023.

### Houston

Christmas?? Now?? **MADISON ELECTRONICS SUPPLY**, 3621 Fannin, Houston TX 77004; 713-520-7300.

**DEALERS:** Your company name and message can contain up to 25 words for as little as \$199 yearly (prepaid), or \$50 for three months (prepaid). No mention of mail-order business permitted. Directory text and payment must reach us 60 days in advance of publication. For example, advertising for the January '88 issue must be in our hands by November 1st. Mail to 73 *Amateur Radio*, Suzanne DesRochers, WGE Center, Peterborough, NH 03458.



by Larry Ledlow, Editor-in-Chief

## Small is Beautiful

I know the story all too well. I've been there. You've come back from the East-West FM ATV DX Society Region 4 Hamvention about \$1500 lighter than when you left. You've just bought the latest Q-Radio Model BFD-4000XS pico-sized, 10-band handie. In your hurry to get home and charge the selenium-thorium battery pack—you *knew* you should have bought the car roof solar power unit—you got two speed warnings and a ticket for going through a red light. And by the way, you forgot to close the car door and turn out the headlights when you ran into the house. Boy, oh, boy, you just can't wait to fire that little beast up and rap with the guys on the local repeater. Well, at least you *think* there's a local repeater on 10 GHz.

You scatter the box, wrappings, and radio instruction manual in the wind. You don't notice the cat bat the crumpled sales receipt under the refrigerator. You absolutely *must* show this new rig to your better (and perhaps more rational) half. This is called the retail sales chain game. The salesman sold it to you (or did you sell it to yourself?), and now you have to sell it to someone else. After all, this little radio has come to share your household. It will add enormous dimension to your hamming lifestyle, and it's only right to properly introduce it to your other loved ones: the HF rig, the computer, and your XYL. But where is she? Ah, that's right. She said she'd be

home late from closing a multi-national merger deal. Then you'll *both* have something to celebrate.

### Alone in the Dark

Make sure you don't lose track of the real priorities, though. The first order of business is to charge the batteries. Now, where did that manual go? Oh, never mind. You'll just use the optional, drop-in quick charger. That should only take about a minute. Who needs the manual for charging, anyway? You drop the rig in, turn the charge rate knob to the MAX position, and flip the switch. ZAP! Your house lights go out. So you fumble around groping for that flashlight you bought a couple of years ago. Ouch! Wrong drawer. You wonder if you're bleeding much. Ah hah! Got it! You fill with disappointment at the flip of the flashlight switch. Dead D-cells. Nothing worse than dead D-cells. Blasted ancient technology! Suddenly, you blind yourself with a flash of brilliance. You can use the car headlights to illuminate the garage and find the circuit breaker box. Then you sigh when you see the headlights and dome lamp glowing in death like embers in the moonless night. Borrow a flashlight from the neighbors? Nah, it's a half-mile walk. After all, you bought this hilltop house in the country to get away from neighbors. You have to be self-reliant in the country. No, the rain isn't a problem. You could walk a mile in the rain if you wanted.

You really only take half an hour

to restore power. All those antennas in the garage make the breaker box pretty hard to find in the dark. Look in the mirror. All those scratches on your face from extruded aluminum make you look like you cut yourself shaving. That's what you can tell everyone at work tomorrow. Except you don't shave your forehead. Ah, well, never mind. The Model BFD-4000XS beckons your attention.


You inspect the drop-in charger, and it looks unscathed. Take a real close look at the battery pack. Funny how the rig looks two-toned now with a dark brown battery pack. You don't *think* it was that way when you bought it. Oh, well, it's probably covered by the warranty, right? Just slip those batteries off and replace it with the extra heavy duty power pack. Heat sink? Nah, no need to screw that on. You just want to try the radio out for a few minutes. There you go. No muss, no fuss. The full-charge ready light comes on in 48.273 seconds, according to the nifty, multifunction, LCD VOM-timer on the charger.

### Now You're Cookin'

Great! You're in business now. Get out the repeater directory and start loading up some of the 4096 memories. Isn't that pico-sized HT just amazing. It's got more memory cells than the average domesticated goldfish. At least that's what the ad said. OK, OK. So the League doesn't list a 10 GHz repeater in your state. That's probably because most repeaters in that band are "uncoordinated." No problem. Just put the handie in scan, and go make yourself a cup of coffee. After five minutes of scanning you still haven't heard any signals. No problem. Just pop down to 2300 MHz and listen. In a

few seconds the rig's voice synthesizer announces, "Signal detected! Awaiting command!" "Receive," you order. Hey! This could be fun! The squelch breaks open, and you hear a funny tone. Hmmmm. All these years of synthesized rigs, and they still haven't fixed all the intermodulation problems. Forget 2300 MHz. You head for two meters instead.

The rig scans, and the squelch opens again on what must be a local repeater. You request a signal report. A voice comes back in a funny language. Probably a little tropospheric ducting. Check that frequency again. Hey, wait a minute! You've just transmitted out of band. You still don't know you just had a brief chat with a Soviet cosmonaut. And you gave your callsign, too! Maybe you won't get a pink slip.

You hear a car in the driveway. Now's your chance to justify the little radio's existence in your household. Quick! Tune to a repeater you *know* is active. You key the mike at the moment your wife steps inside. You *must* show her how happy this little radio makes you. And then you notice a small puff of smoke from the back of the rig. The display winks twice and disappears. Keep smiling! "Hi, honey," she says with open arms. "Did I have a rough day closing that deal." Keep smiling! That smell? Oh, nothing. You just burned some coffee on the stove, right? Keep smiling! Then show her the rig. Ta dah! Doesn't she think it's beautiful? "I think it's cute," she says, and you flinch. Cute? It's a *beautiful* piece of engineering. "Whatever you say, dear. As long as you're happy with it." Mission accomplished! She's accepted it, and you breathe a sigh of relief. Now what happened to that sales receipt? 

### ENDS AND ODDS

#### Special Thanks:

KT2B deserves a big hand for his contributions to this issue. Keep up the good work.

#### Correction:

Everyman's Microwave Amp (KT2B), 73 October: Figure 1—For power supply, use 3-wire AC connection instead of 2, and ground the chassis for safety. Fuse and AC power switch should be in the same leg (not in opposite legs) and should switch the hot side of the AC line. Also, in the schematic of the 23cm cavity amp plate current will be easier to read if the milliammeter is inserted in series with the HV line.

## K2RAG Antenna Products PERFORMANCE +<sup>®</sup>

### K2RAG Balun \$24.95

Models:  
RAG-1.1 (50/75 balanced - 50/75 unbalanced)  
RAG-4.1 (300/200 balanced - 75/50 unbalanced)

- Broadband 1.8 to 30 MHz
- 2000 watt PEP rating
- Exclusive ANTENNA FEEDLINE PROTECTOR<sup>®</sup> eliminates damaged coax connections

Handbook of Ham Radio Antennas  
also available for \$4.95 -  
FREE if you order product now.

Please send check or money order. Add \$3.00 for postage and handling. Visa, MC also accepted. Dealer inquiries invited.

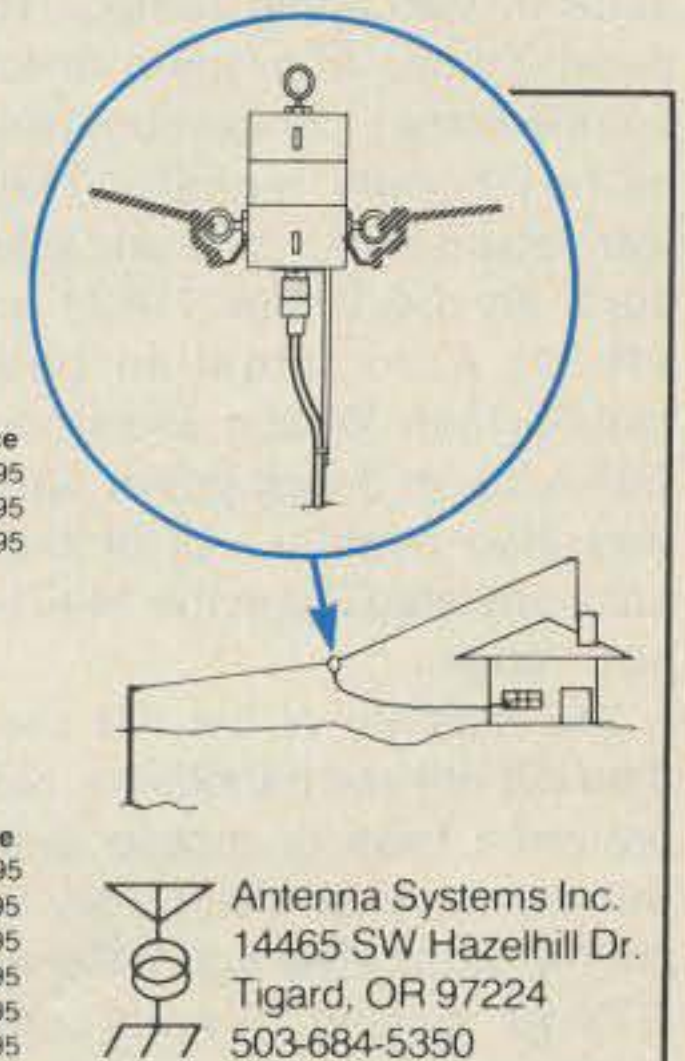
### K2RAG Hi-Gain End Fed Antennas

Model	Band	Length	Price
RAG-EF20	20	155'	\$69.95
RAG-EF15	15	130'	\$69.95
RAG-EF10	10	120'	\$69.95

- Precut to exact phone frequency
- Easy to change center frequency
- Includes K2RAG Balun
- Can be installed as a sloper

### K2RAG Matched Dipoles

Model	Band	Length	Price
RAG-D160	160	234'	\$59.95
RAG-D80	80	120'	\$49.95
RAG-D40	40	65'	\$45.95
RAG-D20	20	33'	\$35.95
RAG-D15	15	22'	\$35.95
RAG-D10	10	13'	\$35.95

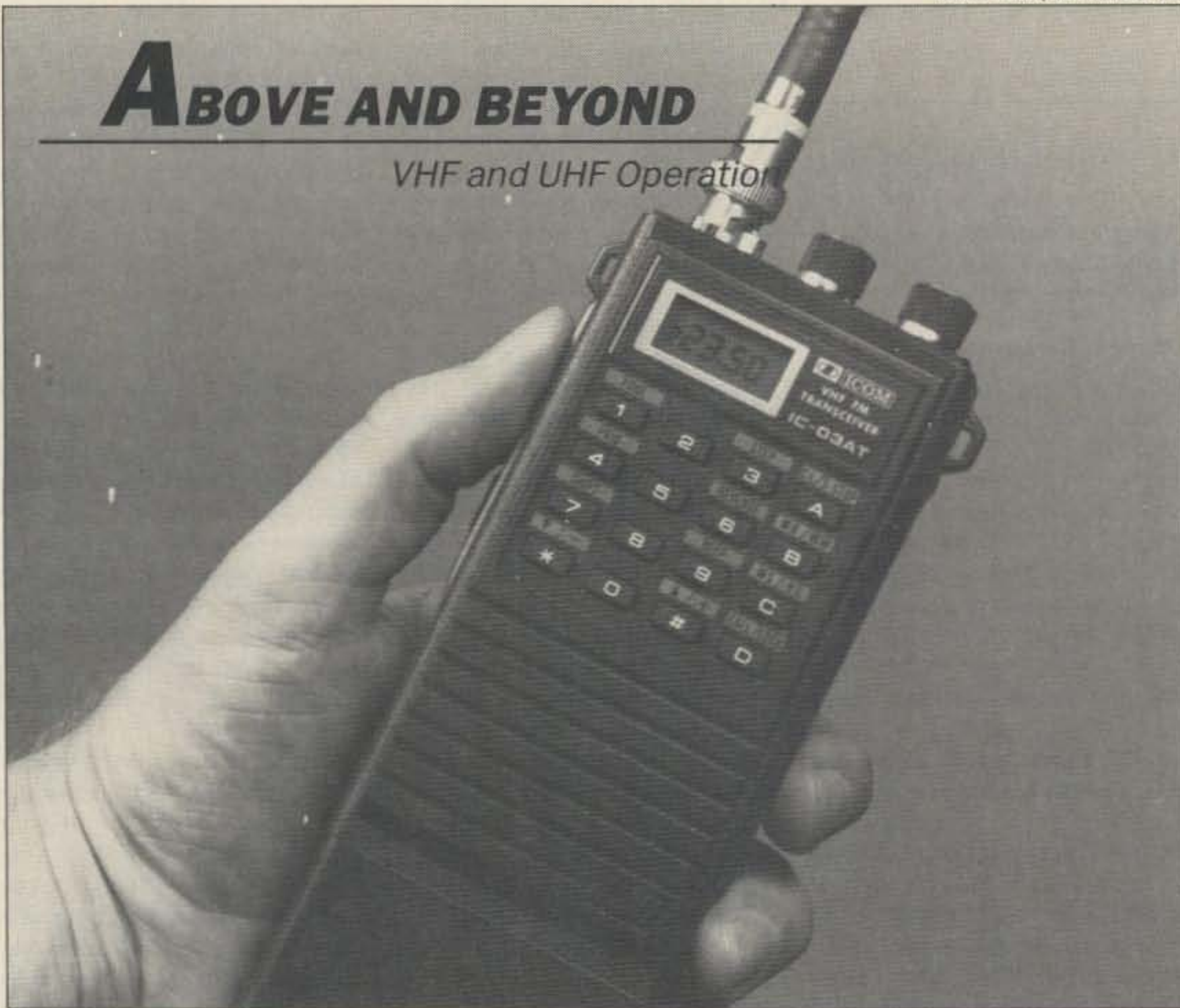


CIRCLE 122 ON READER SERVICE CARD



# ABOVE AND BEYOND

VHF and UHF Operation



The ICOM 03AT handheld.

Pete Putman KT2B  
3335 Fieldstone Dr.  
Doylestown PA 18901

## A LITTLE HT HISTORY

This month's column deals with the world of hand-held radios. I've chosen the IC-03AT as a typical example for two reasons: It covers 220 MHz, a band very much in the news recently, and it's made by a company that produces more models of handhelds than anyone else in the world.

Let's look back 10 years at the state of hand-held radios. You could choose from three or four cumbersome, crystal-controlled, battery-hungry models. There were also some hybrid portables, such as the Drake TR-22 and TR-33. A combination base/mobile from Wilson Electronics with a 10- or 3-watt power option was also popular. All of these units operated FM in the 144-148 MHz range.

The majority of 2m FM users then did not use handhelds. Most preferred base or mobile radios with 20-30 watts output. My first 2m FM transceiver was a Genave GTX-10, running 10 watts output on 10 crystal-controlled channels, which I bought in December,

1975. At the time, Genave also made a cute 3-channel 2-watt handheld intended for the commercial market, but it was adaptable to ham needs.

Several events revolutionized the hand-held market in the late '70s. First, the FCC deregulated repeaters, making them considerably easier and cheaper to install. Then, the FCC designated a second repeater sub-band in the 145.100-145.500 MHz region, further encouraging the repeater explosion. Finally, Wilson Electronics introduced the now-immortal MKII and MKIV handhelds. Although crystal-controlled, they were extremely small and offered quick-change battery cases.

Now we had no excuse to buy a handheld! My bank account was \$250 lighter after buying my first MKII in mid-1978, and others followed suit. Around the country thousands of MKII and MKIV (4-watt version) transceivers came on the airwaves. Repeaters abounded! Hams took their handhelds everywhere, operating from skyscrapers, boats, cars, mountaintops, and even commercial airline flights. The latter operation resulted in a flurry of incidents that led to serious re-

strictions on HT operation aboard airliners.

The next step up was the synthesized HT. Henry Radio dropped the Tempo S-1 synthesized 2-meter handheld on the market, followed closely by the Yaesu FT-207R. Hamdom reacted predictably. The demonstrator

---

***"Hams took their handhelds everywhere . . . skyscrapers, boats, cars, and even commercial airline flights."***

---

FT-207 disappeared from the booth at Dayton (despite being secured with a chain) and all dealer units sold out quickly on Friday morning. Now, you "weren't anybody" unless you had the latest handheld!

The next handheld then turned out to be the ICOM IC-2AT, followed closely by the Kenwood TR-2400. "No fair!" cried the

hordes. Hundreds of hams rushed out to put the latest synthesized radios in their shack, delegating piles of old Wilsons, Motorolas, Genaves, and newer MKII radios to flea market tables. Others put them up for sale in the Yellow Sheets, and some were donated to clubs and local civil defense organizations.

## The Humble HT

The point of all of this? HTs have come a long way in a short time. Virtually unknown 10 years ago, the ubiquitous hand-held is taken largely for granted nowadays. You'll find them everywhere—in gloveboxes, atop the fridge, in purses, backpacks, you name it. Handhelds are made for 144, 220, 440, and 1260 MHz—even 10 and 15 meters! Accessories abound with docking boosters, chargers, custom battery packs, external amplifiers, antennas, VOX headsets and speaker/mikes in plentiful supply.

Unlike most equipment, the hand-held transceiver tends to be an impulse purchase. How many amateurs have you known who arrived at the latest hamfest with \$300 burning a hole in their pocket, looking to buy a new toy? With FM operation as popular as it is worldwide, look for more significant advances in hand-held technology, such as multi-band radios (already a fact with the FT-727, reviewed in this issue) and perhaps even multi-mode radios. In fact, Santec made an SSB/FM 2-meter portable for a short while but it was pulled from the market.

How about multi-mode handhelds for 6, 220, and 432? With the continuing evolution of the OSCAR, FUJI and RS satellites, a handheld with a simple turnstile antenna might soon be all you need for worldwide communications. Can't wait? Then get one of the remote base station controllers and work everything from your HT. This is a feasible solution for amateurs who live in areas with antenna restrictions and severe TVI problems. Simply locate the station atop a nearby building or mountain and link up on VHF/UHF.

Where would public service be without handhelds? The evolution of portable packet stations has radically changed traffic handling. Many times the only communications available from a remote location have been through a handheld. Think about all of the forest



# NEW!

## DISPATCH HANDSET Use a Handset Instead of a Microphone



### CES 800 STANDARD FEATURES

- Simplex and half duplex capable
- Back lighted silicone rubber tactile keypad
- Adjustable levels for any radio
- Audible sidetone
- Automatic PTT
- Off-hook speaker mute
- On-hook dialing

### CES 800 OPTIONAL FEATURES

- Auto dial of 21 digit numbers
- Programmable dial speed changes, and pauses with or without PTT
- Last number re-dial
- Decode options including — latched call light, audible alert, horn relay output

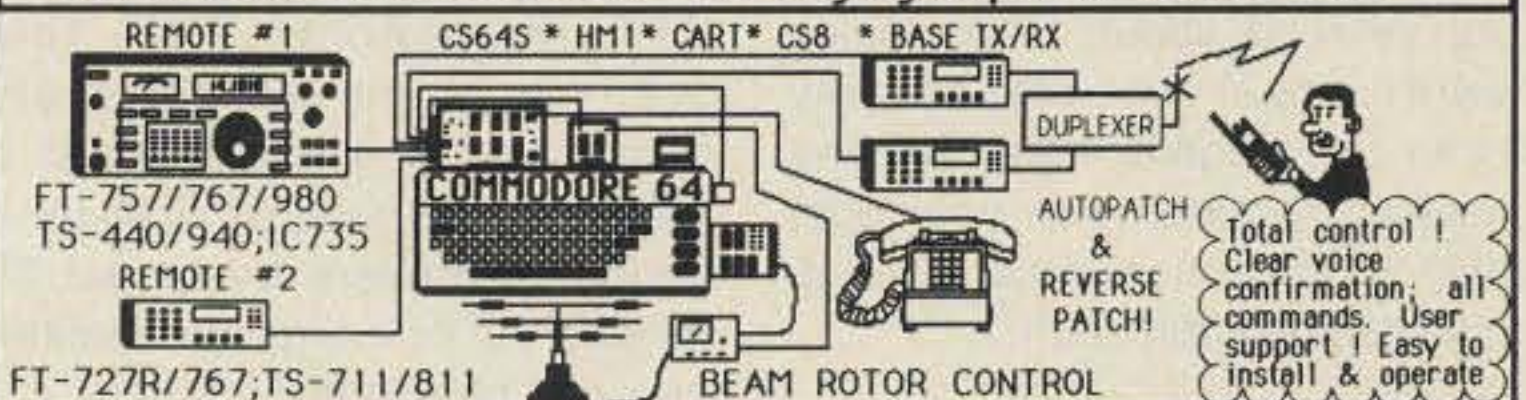
Make The **RIGHT** Connection

**CES** Communications Electronics Specialties, Inc.

803C S. Orlando Avenue  
Winter Park, FL 32789

Call us now,  
TOLL FREE  
1-800  
327-9956

## \*\*\* Super Comshack 64 \*\*\* Programable Repeater Controller/HF & VHF Remotes/Autopatch Rotor control/Voice & Sub-Tone Paging/Expandable/Low Cost



Total control!  
Clear voice  
confirmation; all  
commands. User  
support! Easy to  
install & operate

- |   |  |  |
|---|--|--|
| <p><b>REPEATER CONTROLLER</b></p> <ul style="list-style-type: none"> <li>*Change all access codes remotely</li> <li>*Synthesized male/female voice</li> <li>*Program mail box or ID tail with touchtones from HT</li> <li>*Alarm clock &amp; auto excute mode</li> <li>*Macro commands; 22 digits max</li> <li>*32 CTCSS manual &amp; auto paging</li> <li>*Code practice &amp; voice readback</li> <li>*Multifunction voice alarm clock</li> </ul> <p><b>H.F. REMOTE #1</b></p> <ul style="list-style-type: none"> <li>*10 Memories/auto mode sel.</li> <li>*Scan up/down sel. rate or step</li> <li>*Voice ack. all control commands</li> </ul> | <p><b>AUTOPATCH</b></p> <ul style="list-style-type: none"> <li>*300 Auto/quick dial mem. recall</li> <li>*300 call signs paged/32 sub tone</li> <li>*50 enable/disable tel. #'s</li> <li>*Hi/Low priority access codes</li> <li>*Directed/general &amp; reverse page</li> <li>*Full or Half duplex (level cont.)</li> <li>*Security mode/TT readback on/off</li> <li>*Store MCI/Sprint tel. #'s</li> <li>*Reverse Patch active all modes</li> <li>*Call waiting/quick dial &amp; reset</li> </ul> <p><b>V.H.F. REMOTE #2</b></p> <ul style="list-style-type: none"> <li>*Dual VFO's/Rev/Split/COB detect</li> <li>*Set Scan inc. &amp; offset/var. resume</li> </ul> | <p>Super Comshack CS64S \$349.95<br/>+ \$4.00 ship USA; incl. computer interface, disk, cables &amp; manual (simplex version inc. on request)</p> <p><b>SYSTEM OPTIONS</b></p> <ul style="list-style-type: none"> <li>*External Relay Control 3 DPDT relays + 5 open collector outputs. CS-8 \$79.95</li> <li>*EPROM Auto boot Cartridge customized with your system. CART \$99.95</li> <li>*Beam control; speaks bearing and rotates beam in 1 degree increments; &amp; voice "S" meter input. HMI \$49.95</li> <li>*Manual (Refunded). MNI \$15.00</li> <li>*Row &amp; col. freq. control RAP1 \$149.95</li> </ul> |
|---|--|--|

### MINI (BEAR CAT) COMPUTER CONTROL FT-727R

Programs and Scans 100 ch. in Ham/General coverage. Converts HT into a powerful 100 ch. scanner & programs all for field use!

- \*Digital "S" meter; stops scan from S(1-9); Auto resume
- \*Loads & programs all FT-727R parameters in less than 15 secs.
- \*Includes hardware & disk for C64 or IBM PC

MODEL 727S \$39.95

Touchtone to RS-232 (300 baud interface)  
Program your computer in basic to decode multidigit "strings" sound alarms, observe codes. Includes basic program for C64 VIC20/C128; works on all computers

MODEL DAP \$79.95

### "Audio Blaster" IC-02/04 AT;2AT;U16;FT209;FT727R

Module installs inside the radio in 15 Min. Boost audio to 1 watt! Low standby drain/Connects low audio/1000's of happy users. Miniature audio amplifier -->

Used by Police, fire, Emergency, when it needs to be HEARD!

FOR ALL H.T.'S

MODEL AB1-\$19.95

### ENGINEERING CONSULTING

583 Candlewood St.  
Brea, Ca. 92621  
TEL: (714) 671-2009  
MASTERCARD\*VISA\*CHECK\*M.O.  
CA. RESIDENTS ADD 6%

### Touchtone 4 Digit Decoder

& on/off latch with all 16 Digits

SPECIAL SALE!  
\$49.95  
TESTED!

### Repeater on/off control

- \*Low power CMOS +5 to +12 Volts
- \*User programmable 50,000; 4 digit codes
- \*Send code once to turn on, again to turn off
- \*Momentary & Latch output drives relay
- \*Wrong digit reset; no falsing; 2 to 4 digits
- \*Mute speaker audio until call is received
- \*LED displays latch state; Optional 4 digit extra custom latches (7225) IC's \$6.95 ea.
- \*Model TSD \$49.95 (sale price)
- \*Model TTK \$22.95 M957-SOCKET+XTAL

CS64S soon...Unlimited vocabulary messages; Talking packet interface! Speaks your message!



P.O. Box 4405  
220 N. Fulton Ave.  
Evansville, IN 47710

**Store Hours**  
MON-FRI: 9AM - 6PM  
SAT: 9AM - 3PM  
CENTRAL TIME

SEND A SELF ADDRESSED STAMPED ENVELOPE (SASE) FOR NEW AND USED EQUIPMENT SHEETS

WARRANTY SERVICE CENTER FOR:  
ICOM, YAESU, TEN-TEC  
FOR SERVICE INFORMATION CALL  
(812) 422-0252  
MONDAY - FRIDAY  
9:00 AM - 12:00 NOON

**TERMS:**  
Prices Do Not Include Shipping.  
Price and Availability Subject to  
Change Without Notice  
Most Orders Shipped The Same Day  
COD's Welcome



- FT-767**
- HF/VHF/UHF Base Station
  - Plug-in Modules for 6m, 2m, 440 MHz
  - Loaded with Features



- ALD-24T**
- Dual Band Mobile
  - 140-149.995 MHz/ 440-450 MHz
  - 21 Programmable Memories
  - 25 Watts Output on Both Bands
  - Loaded with Extra Features



- IC-761**
- Top-Of-The-Line High Performance HF Transceiver
  - Built-In Power Supply
  - Built-In Automatic Antenna Tuner
  - SSB, CW, FM, AM, RTTY
  - 160-10m General Coverage Receiver



- MFJ 989B**
- 3kw Roller Inductor Antenna Tuner
  - SWR/Wattmeter
  - Antenna Switch
  - Built-in 300w, 50 ohm Dummy Load
  - Matches, Coax, Balanced Lines, Random Wires, 1.8 to 30 MHz



- PARAGON**
- Full Featured Synthesized HF Transceiver
  - General Coverage Receiver
  - 100w Output
  - SSB, CW, FSK, Optional FM
  - 62 Programmable Memories
  - Made In USA



- VHF/UHF AMPS**
- High VSWR and Overdrive Protection
  - 5 Year Warranty, 6 Months on RF Transistors
  - All Units have GaAsFET Receive Pre-amps

**MERRY CHRISTMAS**  
FROM  
DAN, SANDI, LAURA, CLAIRE, RICK, MARK, STEVE AND JEFF.

For Orders and Price Checks Call 800-523-7731 Indiana and Information Call 1-812-422-0231



fires, floods, hurricanes, tornadoes and other natural disasters you've read about... handhelds were surely in use each and every time. On a lighter note, imagine keeping in touch with your buddies at Dayton without a handheld. Unthinkable, right?

#### **Trials and Tribes of HT Use**

We've come to depend very heavily on hand-held transceivers... even to the point where they are used in totally inappropriate applications. Consider that same impulse buyer who has just picked up a brand-new FB-HTX1234. After using it around the house and at nearby hamfests for a month or so, he decides to try it from the car. Hmm, not so good. That little rubber duck antenna doesn't hack it. Better get an external whip, preferably a  $\frac{1}{2}$  wavelength loaded model for some gain.

Now he hears the repeater much better, but for some strange reason, it can't hear him all that well. "Why is that?" our ham muses: "I've got a gain antenna, and the repeater is full-quieting. Doesn't make sense!". Well, it does make sense if you stop and think about the fact that (1) the repeater is likely running more than 100 watts, (2) using a gain antenna array, and (3) sited in a favorable location. Of course you'll hear the repeater's signal better than it will hear you! So, our HT-mobile fan goes to his nearby dealer to purchase a 25-watt solid-state brick to give his signal that needed boost. A preamp on receive would be handy, too.

Now the repeater hears him fine. He hears it fine, too—as well as all kinds of intermodulation products like paging services, taxi dispatchers, even the local FM radio station! Not only that, it's a real pain having to drive with one hand while holding the HT near his ear to hear above the ambient car noise. The speaker mike he bought doesn't help either, since he must hold that near his ear, also. The HT slides all over the seat, and the coax from the antenna jack to the amplifier keeps coming out of the BNC connector.

Argghhh! After a few near-collisions with another car while wrestling with the whole mess, he gets disgusted and trades everything in for a 25-watt mobile radio... with a helical resonator in the front end, built-in power module, 3-watt audio amplifier,

easy-to-read display, large tuning knob, GaAsFET front end, and PTT microphone. Well, this scenario is played out every month all over this country as a continuing wave of first-time hand-held buyers try to get 25 gallons out of a 5-gallon container. It can't be done.

Remember that the front-end design of most handhelds is mediocre at best, and you're making a bad situation worse by putting a gain antenna and preamplifier in front of them.

By worse, I mean in terms of selectivity, not sensitivity. And selectivity is accomplished by means of filtering, which translates into a certain physical size for a given filter—size that just isn't available in the average

hand-held transceiver. The well-designed mobile transceiver will typically offer dual-conversion, employing two or more stages of filtering. Such a design might employ four to six poles at the first IF and two to four poles at the second IF. Such a radio will also employ gain stages in a configuration that offers wide dynamic range to avoid spurious and intermodulation products.

ment with regard to 220-MHz base and mobile operations, and so took first place with a complete line of radios, among them the aforementioned IC-03AT and IC-3AT. Now Kenwood has rushed into the fray with a 220-MHz version of the TH-215 transceiver, adding a compact TM-321A for mobile work, to boot. Think the folks in JA land are excited about enhanced Novice privileges? You bet. How long will it be before we see an American-made 220 MHz handheld? How about it, Ten-Tec?

#### **VARIA**

Yaesu has stolen a march on everybody by introducing the FT-736R, upgrading the popular FT-726R with full VHF/UHF cover-

---

*“Virtually unknown 10 years ago, the ubiquitous handheld is taken largely for granted nowadays.”*

---

age from 50 through 1296 MHz. We'll have a review of it in the next few months (in between everything else), preferably after using it during a major contest such as the January VHF Sweepstakes. Couple this with the FT-767 design, and you can see where the future lies: A multi-band, HF/VHF/UHF superstation covering everything from 1.8 MHz to 1296 MHz on transmit, offering general coverage receive within that same range. The price? Probably around \$2,000. Might be worth it to have everything in one package, though.

#### **Hamarama '87**

Once again, October has come and gone as you read this, and that means we've had another running of the PackRats Hamarama, organized and supervised by the Mt. Airy VHF Radio Club of Pennsylvania. This year's event spanned two days: There were seminars and presentations on Saturday, October 10, and the famous flea market on Sunday. The Mt. Airy Club has been around for over 30 years, and has sponsored this weekend for quite a while. Some of you readers will recognize the club name from its continued domination of the Unlimited class in the January Sweepstakes. In fact, they have won this category every year for over 25 years! (Kind of

#### **What's New in HTs**

Kenwood finally got their act in gear with a full line of 220-MHz equipment for Novices. ICOM took a bold step by gambling on the outcome of Novice Enhance-

like the old New York Yankees... everybody keeps yelling: "break 'em up!")

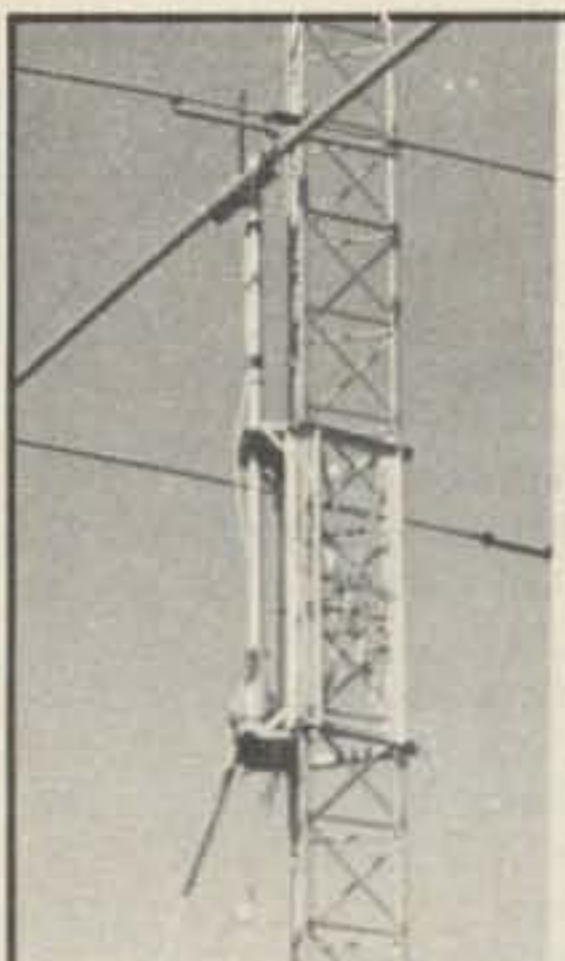
The dedication of these folks to promote VHF/UHF activity and advance the state of the art is evident not only in their contest scores, but in the series of activity nets they regularly run every Monday evening on 50 through 1296 MHz, featuring check-ins from all over the Atlantic Coast region, inland states, and even Canada. Their newsletter is a first-class effort, mailed monthly to several hundred people. Members reside in all call areas and include some pretty famous names in VHF/UHF operations.

The icing on the cake is, of course, the Hamarama. This year's run featured presentations on portable and mountaintop contesting by John Lindholm W1XX, UHF and SHF preamplifiers by Joe Reisert W1JR, amplifiers for 3.5 and 5.7 GHz by Dave Mascaro WA3JUF and Ron Whitsel, and a panel discussion regarding the adoption of a 50-MHz DX Window. Yours Truly participated in this event, along with three other amateur radio columnists: Joe Reisert, Steve Katz, and Bill Tynan. I'll have a full report on this panel in next month's issue, and all 6-meter enthusiasts should take note! The impetus for this discussion were the chaotic conditions experienced during the intense Es openings of the 1987 June VHF QSO Party, where many stations from England, Portugal and Norway couldn't break through the QRM on 50.110 MHz to make stateside contacts.

The proposal is to set aside the segment from 50.100 to 50.125 as a DX Window during all VHF contests. This would ensure that many of these DX stations (most of whom are limited to 100 watts ERP!) would have a chance to be heard and worked by US and Canadian stations. The problem will only get worse as the next sunspot cycle ascends, which officially began in September of last year. Enhanced propagation via both Es and F2 layers will result in general bedlam on six meters—unless something is done about it now. Keep in mind that whatever action taken, such as forbidding stateside-to-stateside contacts inside the window during the major contests, is likely to be in the form of a gentlemen's agreement.

See you next month with the Best and Worst of 1987! **73**





## SAVE TIME and MONEY with THE HAZER

### Bring things down for safety and convenience.

Never climb your tower again with this elevator system. Antennas and rotator mount on HAZER, complete system trans tower in verticle upright position. Safety lock system operates while raising or lowering. Never can fall.

Complete kit includes winch, 100 ft. of cable, hardware and instructions. For Rohn 20 and 25 G Towers.

Hazer 2 - Heavy duty alum. 12 sq. ft. load	\$297.00 ppd.
Hazer 3 - Standard alum. 8 sq. ft. load	\$213.00 ppd.
Hazer 4 - Heavy galv. steel 16 sq. ft. load	\$278.00 ppd.
Ball Thrust bearing TB-25 for any of above	\$49.50 ppd.

#### KENPRO Antenna Rotors

KR-400 11 sq. ft. Azimuth Rotor	\$214.95 ppd.
KR-600 19 sq. ft. Azimuth Rotor	\$299.95 ppd.
KR-2000 27 sq. ft. Azimuth Rotor	\$549.95 ppd.
KR-5400 AZ-EL. Satellite Rotor	\$399.95 ppd.

Send for free details of aluminum towers specifically engineered for use with the Hazer.

Satisfaction guaranteed. Call today and charge to Visa, MasterCard or mail check or money order.

**GLEN MARTIN ENGINEERING INC.**  
Rte. 3 Box 322  
Boonville, Mo. 65233  
816-882-2734



CIRCLE 72 ON READER SERVICE CARD

## SUPER PERFORMANCE BATTERIES



**SUPER ICOM BP-7S**, 13.2 volts, 900 ma, double the capacity of the Icom BP-7, 5w output.

**SUPER ICOM BP-8S**, 9.6 volts, 1200 ma, 50% more capacity than the Icom BP-8.

Both are base charge only. BP-7S or BP-8S \$65.00\*

Exact replacement FNB-2 Nicad pack for YAESU FT-404R/207R/208R with case. \$24.00\*

Inserts for:

Kenwood PB-25 \$25.00\* Icom BP-3 \$20.00\*

Kenwood PB-25H, PB-26 \$27.00\* Icom BP-5 (500ma) \$26.00\*

\*Add \$3 shipping & handling. CT residents add 7 1/2% tax

Complete line of NICAD packs for Icom, Kenwood, Tempo, Santec, Azden, Cordless Telephones, Alkaline, Nicad, Mercury and Lithium Cells. All battery packs include a 1 year guarantee. Commercial Radio Packs also available.

Send SASE or call today for a complete catalog. Dealer inquiries invited.

**PERIPHEx inc.**

149 Palmer Road • Southbury, CT 06488  
(203) 264-3985

CIRCLE 68 ON READER SERVICE CARD

### 'There's No Better 10 Meter or CB Antenna Made'

#### Jo Gunn Enterprises

Route 1, Box 383  
Ethelsville, AL 35461  
(205) 658-2229

Hours: Mon - Fri, 10 am - 6 pm (CST)

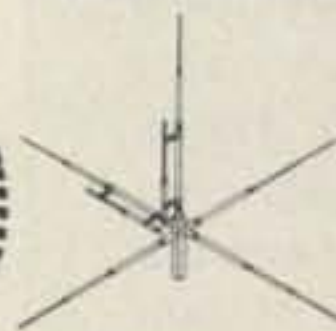
DIRECTIONAL MODELS ALSO AVAILABLE

JGAR - PISTOL



**Specifications**  
Gain: 4.75 DB  
Multiplication Factor: 12 Times  
Power Rating: 2000 CW, 4000 PEP  
Height: 10 Feet  
Weight: 8.0 Lbs.  
Materials: Anodized 6063T-6 Aircraft Aluminum Tubing  
Requires 1 Coaxial Cable for Hook-up

JGAR - HILLBILLY



**Specifications**  
Gain: Horizontal - 5.25 DB  
Vertical - 4.75 DB  
Multiplication Factors: Horizontal - 17 Times  
Vertical - 15 Times  
Horz. to Vert. Separation: 20-25 DB  
Power Rating: 2000 CW, 4000 PEP  
Height: 11 Feet  
Weight: 10 Lbs.  
Materials: Anodized 6063T-6 Aircraft Aluminum Tubing  
Requires 2 Separate Coaxial Cables for Hook-up

**NEW JO GUNN AUDIO-FLEX COAX NOW AVAILABLE FOR ANTENNAS**

Call or Send \$2.00 for Complete Catalog and Pricing of Antennas. (\$2.00 Refundable on 1st Order.)

DEALER INQUIRES, PLEASE CALL

CIRCLE 234 ON READER SERVICE CARD

### QEP's CHRISTMAS SALE

A FREE Gift to anyone who orders BELDEN or AMPHENOL products during November or December.

- BELDEN 9913 low-loss  
500 ft Roll \$185.00 or 39¢/ft.
- BELDEN 8214 (foam)  
500 ft Roll \$150.00 or 33¢/ft.
- BELDEN 8267 RG-213  
500 ft Roll \$185.00 or 39¢/ft.
- BELDEN 8268 RG-214 silver 1.35/ft.

#### AMPHENOL SPECIALS

PL-259 silver (mica filled)	\$1.25
UG-21D 'N' male cable end	2.75
UG-21D 'N' (fitted for 9913)	3.50
UG-23D 'N' female cable end	3.95
UG-29A 'N' Barrel (jack-jack)	4.50
UG-57B 'N' Barrel (plug-plug)	5.20
UG-58A 'N' Chassis receptacle	3.50
UG-83U 'N' Plug to UHF adaptor	8.00

#### Copper-clad 14 ga. (7x22)

7¢ a foot (any length)  
Identical to Belden 8000

VISA & MASTER CARD ACCEPTED  
SHIPPING IS ADDITIONAL

Call TOLL FREE

**1-800-USA-9913**

1n NJ 201-887-6424

110-4 Route 10  
East Hanover  
N.J. 07936

**QEP's**

\*\*\*\* SAME DAY SHIPPING \*\*\*\*  
TNX JIM N2GKW & BILL KA2QEP

CIRCLE 30 ON READER SERVICE CARD

## WE STOCK:

AEA, ALINCO, AMP SUPPLY CO., ARRL PUBLICATIONS, ASTRON, B & W, BENCHER, BUTTERNUT, CONNECT SYSTEMS, DEHLI TOWERS, DIAWA, HEIL, HUSTLER, ICOM, KANTRONICS, KENPRO, KLM, LARSEN, MFJ, MINI PRODUCTS, MIRAGE, MOSLEY, NYE VIKING, SOMMER, SONY, SPIDER ANTENNAS, TEN-TEC, TELEX HY-GAIN, TRYLON, WSE DOCKING BOOSTER, YAESU.



UPS SERVICE TO THE US MARKET

### COM-WEST RADIO SYSTEMS

8179 Main Street  
Vancouver, BC Canada V5X 3L2

(604) 321-1833

Credit Allowed For Toll Calls

CIRCLE 149 ON READER SERVICE CARD



## HAM RADIO SELF STUDY COURSE

NOW ONLY **\$1995**

Plus \$2.00 shipping & handling

VISA/MasterCard Accepted

Prepare for the fantastic world of amateur radio. Study at your leisure. No technical background required. Entry level amateur radio operators can now talk on the ten meter band and FM repeaters. . . even link their ham radio stations to the public telephone system and personal computers. Privileges never before available to the beginner! Complete FCC license preparation course contains everything you need to know to pass both the written and Morse code examination in a very short time. Written in easy-to-understand language. Contains fully illustrated text book, two long-play code learning cassettes, all 302 word-for-word FCC license test questions, answers. . . and much more! You can't miss! Sold with a 10 day money back guarantee. Phone orders accepted. Dealer and classroom instructor discounts available.

W5YI-VEC P.O. BOX #10101  
Dallas, Texas 75207 - Tel: 817-461-6443

73 Amateur Radio • December, 1987 95









# NEWS BULLETIN

**CALL US NOW!**

## 50<sup>th</sup> Anniversary

When it comes to **FAST DELIVERY, HONEST DEALING** and **PROMPT/DEPENDABLE S-E-R-V-I-C-E** back-up. We don't just advertise it — **WE GIVE IT!**

YOUR HAM DOLLAR GOES FURTHER AT...



"AMERICA'S MOST RELIABLE AMATEUR RADIO DEALER"

### SELL-TRADE

New & Reconditioned **HAM EQUIPMENT**

Call or Write Us Today For a Quote! You'll Find Us to be Courteous, Knowledgeable and Honest

PHONE **(605) 886-7314**

In 1937, Stan Burghardt (WØIT), because of his intense interest in amateur radio, began selling and servicing amateur radio equipment in conjunction with his radio parts business. We stand proud of this long-lasting tradition of *Honest Dealing, Quality Products and Dependable "S-E-R-V-I-C-E"!*

*Above all*, we fully intend to carry on this proud tradition with even more new product lines plus the same "fair" treatment you've come to rely on. Our reconditioned equipment is of the finest quality with **30, 60** and even **90-day** parts and labor warranties on selected pieces. *And always remember:*

### — WE SERVICE WHAT WE SELL —

AEA	BELDEN	ICOM	NYE
ALINCO	BENCHER	JSC	PALOMAR
AMERITRON	BIRD	KANTRONICS	RADIO CALLBOOK
AMPHENOL	BUTTERNUT	KDK	RITRON
AMP SUPPLY	CENTURION	KLM	ROHN
ANTEK	CES	LARSEN	TELEX/HYGAIN
ANTENNA SPECIALISTS	CUSHCRAFT	MFJ	TEN-TEC
ASTRON	DIAWA	MINI-PRODUCTS	TRIO-KENWOOD
B & W	ENCOMM	MIRAGE	UNADILLA/REYCO
	HUSTLER	MOSELEY	YAESU

*we'll treat you*

**SELECTION**

**SERVICE**

and

**SATISFACTION!**

#### STORE HOURS:

9-5 P.M. (CST)  
MONDAY thru FRIDAY  
OPEN SATURDAYS  
from 9-1 P.M. (CST)  
CLOSED  
SUNDAYS/HOLIDAYS



P.O. Box 73  
208 East Kemp  
Watertown, SD 57201

PAKRATT™ Model PK-64



PAKRATT™ Model PK-232

### AEA'S FINEST

... Now Available — Especially For You!

**CALL OR WRITE FOR SPECIAL QUOTE**

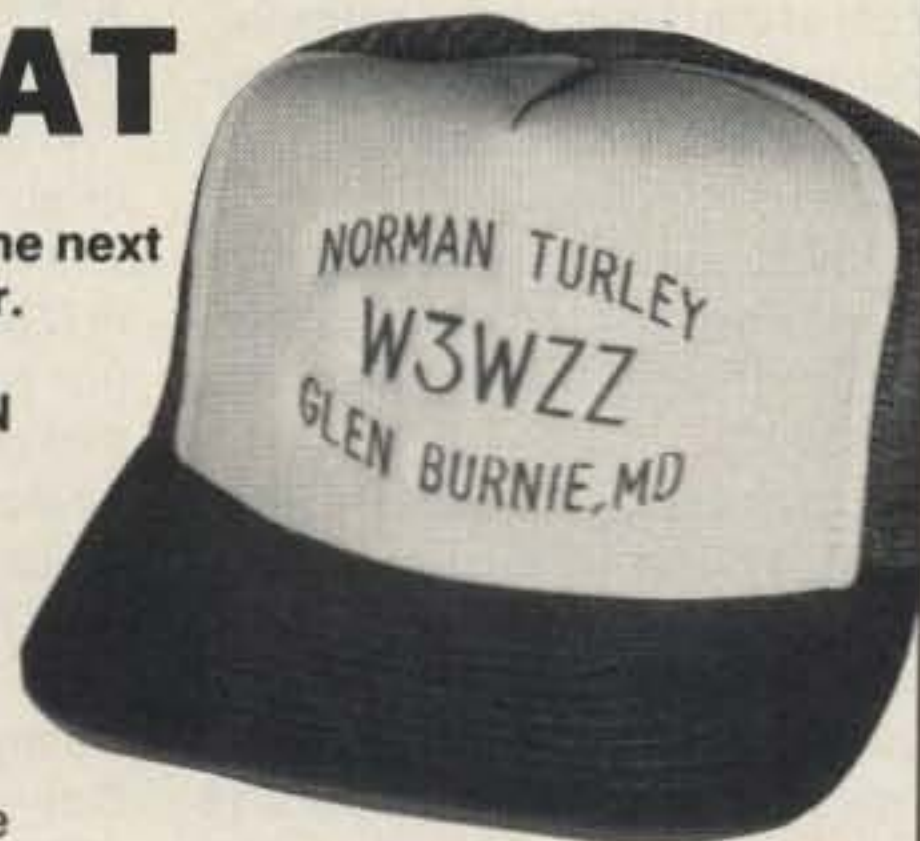
**Write today for our latest Bulletin/Used Equipment List.**

CIRCLE 92 ON READER SERVICE CARD

## Personalized Custom Embroidered

### HAM HAT

Don't be a stranger at the next Hamfest or get together. Display your **NAME, CALL, and HOMETOWN** on our attractive baseball style cap!



Our caps have a white, seamless front with colored mesh back and matching bill. They are one size fits all, with an adjustable back.

Best of all, each cap front is **CUSTOM EMBROIDERED** in a color coordinated thread.

**\$7.00** ea.

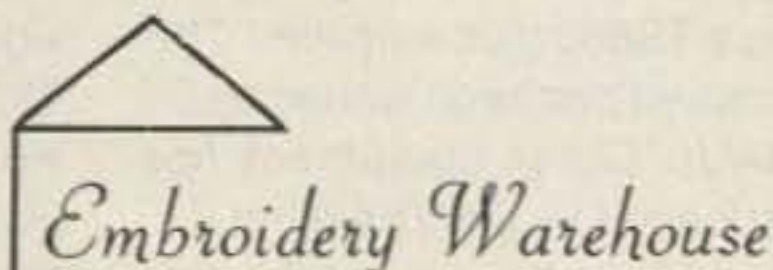
Hats come in: **ROYAL BLUE, RED, and BROWN**

#### GREAT GIFT IDEA!

**Order now for Christmas**

SEND: First and/or Last Name (max 14 letters) Call (maximum of 6 letters) City and/or State (max 14 letters)

Please send check or money order, plus \$3.00 shipping and handling per order. Add 50 cents S&H for each additional cap ordered.



P.O. Box 1476 • Severna Park, MD 21146

Allow 4 to 6 weeks for delivery. Maryland residents add 5% sales tax.

**WE WELCOME INQUIRIES FROM CLUBS**

# NEW!

## SIMPLEX OR HALF DUPLEX INTERCONNECT



#### CES 510SA-II FEATURES

- Simplex, Half Duplex, or Full Duplex Operation
- Remotely programmable from any telephone
- Powerful 'Syllabic Sampling' uses VOX circuitry to allow simplex sampling only between words
- Repeater control circuitry makes an interconnected repeater from your two transceivers
- DTMF selective signalling
- Simple installation

The 510SA-II is a full featured telephone interconnect capable of both landline and mobile initiated calls. The 510SA-II is an enhanced version of the popular 510SA Smart Patch and includes many additional features. With thousands of Smart Patches in the field already, you can be sure of the value of this outstanding interconnect.

Make The **RIGHT** Connection

**CES** Communications Electronics Specialties, Inc.

803C S. Orlando Avenue  
Winter Park, FL 32789

Call us now,  
**TOLL FREE**  
**1-800**  
**327-9956**



# 73 INTERNATIONAL

edited by Richard Phenix

## NOTES FROM FN42

And so another year is about to bite the dust, and again amateur radio operators have shown the countries of the world how to talk to each other—but nobody else seemed to be listening. As usual. Let's keep on setting an example, however. Sooner or later somebody will notice. And here's a tip for you if you want some tips about international dealings. A free information packet on the subject is available from QCI International. Write for it, or call: Ms. Cynthia Williams, Dept. 5026, International and Domestic Negotiating Institute, PO Box 882, Red Bluff CA 96080; (916) 529-0246, Extension 5026. (QCI also has offices in Helsinki, Lima, Melbourne, Paris, Sidney, and Vancouver, BC.)

To help set that example, here are the December events you can mention during those DX contacts: National Day—Central African Republic, 1st; Thailand, 5th; Bhutan, 17th. National Holiday—United Arab Emirates, 2nd; Laos, 3rd. It is Independence Day on the 6th for Finland, 7—Ivory Coast, 9—Tanzania, 11—Upper Volta, 12—Kenya, and 16—Bahrain.

Other events: 1—Anniversary Day, Portugal; 5—Discovery Day, Haiti; 10—Human Rights Day in several countries; 13—Republic Day, Malta (and on the 18th for Niger); 15—Statue Day in the Netherlands and Bill of Rights Day, United States; 16—Victory Day, Bangladesh (and on the 23rd for Egypt). On the 25th it is Christmas, Noel, Weihnachtstag 1, Navidad, クリスマス, and جو عيد الميلاد.

26—Boxing Day, Canada and Great Britain; 27—Constitution Day, North Korea; 28—King's Birthday, Nepal; and 30—Anniversary Day, Madagascar.

## ROUNDUP

**Licensing information from around the world:** Each month in 1988 you will find right here the latest dope on how to get licensed for operating elsewhere in the world. [Any changes in YOUR country recently? Let me know! —Ed.]

Here's a timely tip if you're planning a visit to the United Kingdom: A Temporary Operating Permit

can be requested by a U.K. licensed operator for a visiting licensed operator to operate under his personal callsign for a period of seven days or less. There is no cost and the permit can be obtained in about a week. The U.K. op should write: The Radio Amateur Licensing Unit, Post Office Headquarters, Chetwynd House, Chesterfield, England S49 1PF.



AUSTRALIA

Jim Joyce VK3YJ  
44 Wren Street  
Altona 3018  
Victoria, Australia

## VK0HI

At the time of writing this [September 9, 1987], Dave Shaw VK3DHF (better known to the world DX fraternity as VK0HI) is aboard the Antarctic supply ship, *Nella Dan*, headed for Heard Island. YES! He is going back down to Heard Island for a six-month stint on this rare DX spot.

Dave, who is Electronics Technical Officer with the Bureau of Meteorology, will be the radio officer for this scientific expedition by the Australian National Antarctic Research Expedition (ANARE) to Heard Island. With the anticipated upturn in propagation on the higher frequencies, Dave should be able to satisfy a big demand that still exists for Heard Island.

With what will be a heavy com-



Dave Shaw VK3DHF/VK0HI with Father Noel VK3EVN.

mitment to his ANARE traffic, it will be appreciated if, when he does come on the air, all those amateurs who have Heard Island confirmed will let others make their contacts. Last time, some—I won't call them true DXers—didn't do this although they had up to six contacts in their logs. I feel sure Dave would rather spend what precious time he has for amateur radio giving the little guy a go, instead of pandering to the ego trips of so-called "big guns."

**QSLing.** This is borne out by Dave's QSLing arrangements. Dave's father, Noel VK3EVN, has taken on the unenviable job of being QSL Manager: Mr. Noel Shaw, 64 Orana Drive, Watsonia, 3087, Victoria, Australia. QSL cards for the operation will be subject to the usual transfer via amateur modes, given propagation, if not, due to poor propagation, a delay until Dave's original logs are landed back into Australia may be necessary—so please do not expect your card via return mail, as Heard Island is one of the remotest places on Earth.

Dave has requested that, for Australian cards, an SASE will suffice, but due to the high cost of overseas postage from Australia, two IRCs plus a self-addressed envelope are requested. Personally, I feel this is quite a modest request as it will do no more than cover postage, and none of the cost of the thousands of cards this operation will generate, particularly SWLs via the bureau from one area of Europe.

This approach is a far cry from the few rip-off merchants who now seem to abuse a DX situation within amateur radio.

**Operating Frequencies.** Dave's preferred mode of operating is to stay away from nets and to operate as an independent operator. He will be on the usual DX frequencies of 80, 40, 20, and 15 meters, plus our Novice section, 21,195 MHz. His antennas will consist of dipoles, using moderate power from his transceivers. He should still put out a good signal worldwide from his location.

It also is envisioned that Dave will have six meters available with a keyer on 52,170 from his shack, using a TS660 plus amplifier. This equipment has been loaned by Gil VK3AUI. Other equipment has been loaned by the VK6 gang.

## VK6FS AWARD

Speaking of VBK6, Hugh—VK6F(lying)S(aucers)—one of the original organizers of Dave's last

expedition to Heard Island became an SK after the expedition returned to VK. He had the distinction of being the first into the log as VK0HI on Dave's last expedition. To honour his memory, the VK6 Division of the WIA, with a bequest of a small sum of money by Hugh, has created a DX achiever's award. I feel it would be fitting if Dave was to be the first to achieve this award, in Hugh's memory, not only for what he has done for the world's DX fraternity, but for his attitude of giving the disadvantaged DXer a chance to work a rare one, and his nonprofit approach to amateur radio—a refreshing approach and one within the true spirit of amateur radio.



NETHERLANDS

Jos. A. Stierhout PA0VDZ  
PO Box 265  
6950 AG Dieren-NL

## The Netherlands

[Slow but certain: In June we wrote a note to Jos in the International section (under "Notes from FN42, of course) which he received in August, and here is his response. Will he want to be a regular correspondent? Watch this space for up-to-date news only a month or so old.—Ed.]

In Holland we have a population of about 14.5 million and about 15,000 amateurs with the A, B, C, or D license. Every year the VRZA (the Netherlands ham amateur society) organizes a big Radio Campingweek in the most wooded part of Holland: Laag-Soeren, near Arnhem—well-known by soldiers in WWII. It is always held during the week of Ascension Day—so it was May 23–30 in 1987.

The "Jutberg" is a big camping and holiday park with many facilities. This year we had more than 100 calls plus their families, with caravans, tents, campers, and in about 40 bungalows. Fox-huntings and sputnik (a very small transmitter with only *bleep-bleep* signals) huntings on 3.5, 144, and 432 MHz were popular. There were a total of 17, for OMs, (X)YLs, and QRPs. There were specialities for the different days: Sunday, a puzzle-walk through the beautiful woods for the whole family and visitors, and a "Ladies Cafe" in the evening for XYLs





Model #TE144 **\$75.95**

**Features: Deluxe CMOS Electronic Keyer**

- State-of-the-art CMOS circuitry
- Self completing dots and dashes
- Both dot and dash memory
- IAMBIC keying with any squeeze paddle 5-50 wpm
- Speed, weight, tone, volume tune controls & sidetone and speaker
- Semi-automatic "bug" operation & straight keying—rear panel switch
- Low current drain CMOS battery operation—portable
- Deluxe quarter inch jacks for keying and output
- Keys grid block and solid state rigs
- Wired and tested—fully guaranteed—less battery

Send For FREE Brochure on Full Product Line

At Your Dealer or Send Check or Money Order Plus \$3.00 S/H NY Residents add tax

**TRAC**

ELECTRONICS, INC.  
1306 RAND BLDG.  
BUFFALO, NEW YORK 14203

CIRCLE 146 ON READER SERVICE CARD

**Half-Square QRV-DX Monobanders**

Work DX with No Tower and No Amplifier  
Cut noise, cut near sigs, build DX sigs, kill QRM.

10 Meters	15 Meters	20 Meters	30 Meters
\$29.95	\$39.95	\$49.95	\$59.95

Broadside Pattern, Low Profile, Coax Feed, Ready to Use

39c SASE Highest DX Gain per Dollar

1971 N Oak Lane 1300 E **AntennasWest**  
Provo, UT 84604-2138 (801) 374-1084

CIRCLE 90 ON READER SERVICE CARD

**1-800-678-COAX ORDER LINE**

BELDEN 9913 Low Loss . 185/500 Ft. or .38/ft.

**AMPHENOL Connectors**

UG-21D	N-type Male Cable End	\$3.00
UG-21D	Fitted for 9913 Cable	\$3.75
PL-259	UHF Plug (silver)	\$1.25

**COAX PLUS SAME DAY SHIPPING**

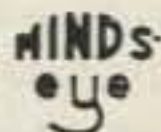
33 McKinley Ave.   
West Orange, NJ 07052 **1-800-678-2629**

CIRCLE 285 ON READER SERVICE CARD

**"INSTANT" MORSE CODE**

BEGINNERS: Deliciously Easy  
EXPERTS: Automatically Fast  
**CURLY CODE™ Manual ONLY \$6.50**

GUARANTEED



Minds eye Publications, Dept. S-26  
Suite 115-199  
1350 Beverly Rd.  
McLean, VA 22101

CIRCLE 148 ON READER SERVICE CARD

# SEE Q!

With ARI's new AR-460D, the first hand-held LCR meter that also measures Dissipation Factor. Measure a capacitor's leakage and capacitance too, thanks to the AR-460D's state-of-the-art, fast-measurement design that rivals bench meters costing up to five times more.



**INDUCTANCE**

- 0.1uH to 2H in 5 Ranges
- 1% Basic Accuracy

**CAPACITANCE**

- 0.1pF to 200uF in 7 Ranges
- 1% Basic Accuracy

**RESISTANCE**

- 0.1 ohm to 20 MegOhms in 6 Ranges
- 0.5% Basic Accuracy

If your only requirement is to accurately measure capacitance, then the AR-360D is the instrument for you. It's the only hand-held capacitance meter available that also measures leakage. Use it to measure from 0.1pF to 20,000uF in 9 ranges, with 1% basic accuracy.

For information on our complete line of quality test equipment, including PAL®, EPROM and EEPROM programmers, IC testers, DMM's, and DPM's, or for a copy of our catalog, call us at:

**(800) 654-9838**

**AMERICAN RELIANCE INC.**

ARI / VALUE BEYOND MEASURE  
PAL® is a registered trademark of Monolithic Memories, Inc.

CIRCLE 93 ON READER SERVICE CARD

# JOIN ARRL

## BENEFITS FOR YOU

QST, QSL Bureau, Awards, Low Cost Insurance, Operating Aids, Government Liaison and More—Much More!

---

**MEMBERSHIP APPLICATION**

Name \_\_\_\_\_ Call \_\_\_\_\_

Street \_\_\_\_\_

City \_\_\_\_\_ Prov./State \_\_\_\_\_ PC/Zip \_\_\_\_\_

\$25 in U.S. \$33 elsewhere (U.S. funds) Licensed amateurs, or age 65 or over, upon submitting proof of age, may request the special dues rate of \$20 in the U.S. \$28 elsewhere, in U.S. funds) Persons age 17 and younger may qualify for special rates, write for application.  
For postal purposes, fifty percent of dues is allocated to QST, the balance for membership.

\_\_\_\_\_ Expires \_\_\_\_\_

\_\_\_\_\_ Bank. No. \_\_\_\_\_ Expires \_\_\_\_\_

**The American Radio Relay League**  
225 Main St. Newington, CT. 06111 USA 73



only. Tuesday: for the OMs, an excursion to the biggest cycle factory in Holland, in Dieren, and for the ladies a demonstration and lecture for making Chinese food (Mi-Hoen). That evening everybody was eating Chinese!

On Wednesday we had another high spot: a barbecue party with a 45-person Big Brassband which later guided a children's procession with Chinese lanterns, and later, dumplings.

Ascension Day itself is always the busiest. We had a flea market, and 1,000-1,500 visiting hams came from everywhere. The General Post-office was there (they are the ones who give the licenses) with a stand from the R.C.D. (Radio Control Service), and a video was shown of their work. They demonstrated filters for avoiding BCI and TVI, and gave a complete computer report of TX and RX from hand-held 2-meter portables. In the evening there was Bingo with \$2,000 worth of prizes, such as a Philips computer, donated by many sponsors.

The crowds begin to thin out at this point, and Friday was nearly the end, with a 5-man dance band playing until early Saturday morning. Then there was a goodbye meeting over coffee, and discussions about what to do for the next Amateur Radiocamp in 1988—which will be the 25th camp.

Besides the organization crew, there were two for daily transmissions: one for the daily camping broadcast giving the results of competitions, DX news, weather forecast, etc., and the other for the daily ATV transmissions, showing what the video group had filmed in the camp during the day—with interviews, weather cards, etc. During the whole week, XYLs were making QSOs with the whole world!

Are you interested in our 1988 plans? Write to me and ask!



PORTUGAL

Luiz Miguel de Sousa CT4UE  
PO Box 32  
S. Joao do Estoril 2765  
Portugal

**EA9 DXpedition.** The Lynx DX Group of Spain organized an international DX convention in the Principality of Andorra last May. The group's chairman was Juan



Marti Laine OH2BH (L) and Juan Rosales EA9IE in Andorra. F6EXV in background. (Photo by CT4NH)

Rosales EA9IE. Among the subject discussed was a proposed DXpedition to the Saharai Republic (Spanish Sahara—Rio de Oro—EA9land) for which the call will be SØRASD. Details will be announced. Information may be obtained from the Lynx DX Group, PO Box 351, 26080 Logrono, Spain.

**New Look for REP.** The new board of directors for REP (Rede do Emissores Portugueses) is doing much to give us a whole new look. If you are in Lisbon, do not hesitate to visit this old and interesting club, at Rua D. Pedro V 7, 4th floor (telephone: 36 11 86). A personal computer has been bought for the club; and every Thursday their Radio Bulletin is transmitted on VHF (later on HF) with information about DX, awards, club news, and so on.

**CT1AVW is back.** Our good friend, Bob Arceneaux CT1AVW (K5ODD in the USA), is back in Lisbon. He works for the Ameri-

can Embassy, and came to replace Don Reibhoff exCT4AT, who died in a tragic accident in Spain. [See *Portugal in the International column for July, 1987.*] Bob has had several nice calls in the past, like 5A4TH—and 5A1TS club station—(1957/58), EL2AC (1963/65), PY1ZAZ (1971/74), and PT2ZAI (1982/86).

We also have another American Embassy friend, Joe Lutz, around; he often uses CR7DKG for contests. Among several calls, he has been W7ZQV-KG6, KG6AAY, W7LPP-DU2, and 5B4.



SWEDEN

Rune Wande SMØCOP  
Frejavagen 10  
S-155 00 Nykvarn  
Sweden



(L to R, standing) CT1UA, CT4NH, OH2BH; CT3BM and C31LD in front. (Photo by CT4NH)

This continues SMØCOP's report, begun in the November, 1987, issue.

## THE SM HAM POPULATION

The total number of ham licenses is a little over 11,000. If you leave out the club stations (SK and SL prefixes), the number of private licenses is 10,400. The 1986 increase was 2%. Sweden has four classes of license: A, B, C, and T. Class A is the highest, with all band/mode privileges and 500-Watt power input. Class T (Technician) is a no-code license for VHF/UHF.

There are thoughts of restructuring this system in order to get a better correspondence with the licensing systems in other European countries. One of the discrepancies is the code requirement. For SM Class A, a code speed of 80 letters/minute (16 wpm) is required, while most other countries require only 60 (12 wpm). The Class B would be discontinued. The remainder would be a Novice Class and an Advanced Class for HF and VHF/UHF, and a no-code Technician license for VHF/UHF.

These thoughts are just in a very early discussion stage, and have come up primarily in order to facilitate the comparison of licenses for the European visitor license according to the CEPT recommendation. The CEPT license was not implemented in Sweden this tourist season, and visiting hams from other European countries had to apply for a regular visitor license as before.

## NEW AWARDS PROGRAM

SSA (the Swedish national amateur radio league) has renewed its award program. The new awards of international interest are WASA (worked All Sweden Award), HASA (Heard All Sweden Award), and SLA (Swedish Locator Award). January 1, 1988 is the starting date for these, and in my next column I will give you details.

To give you a fair chance to finish for WASM I and WASM II, the last date for valid contacts for these two awards is December 31, 1989. This means that if you have not started hunting, you can go for both old and new awards during the coming two years! Good luck! 73





## **“I convinced my club to buy a repeater controller ACC and I’m glad I did”**

Our group decided to upgrade our repeater system and I was the one asked to investigate.

We’ve always tried to have the best system around so it was time to make some changes. We needed a control system that was reliable, easy to hook up, cost-effective, and something that would free the technical guys for more interesting projects than just keeping the equipment running.

Everyone in the club put a few bucks into the pot and it was ours!

We’ve found the voice messages and telemetry make using the repeater more fun. The convenience of remote programming and automatic scheduled

operation is remarkable. Not to mention the most sophisticated autopatch ever designed for amateur use. Later we added the Digital Voice Recorder for personalized IDs, bulletin boards, and voice mail.

ACC’s products are state-of-the-art commercial quality and built to last. Workmanship so solid even the military uses them.

What impresses me even more, though, is the support we get from the staff at ACC – both before and after the sale. And they protect our investment through simple plug-in software and hardware upgrades . . . new features and capabilities that keep our club on top.

I feel good about recommending Advanced Computer Controls’ repeater controllers. After all, it’s *my* club’s money that was spent and *my* reputation that was on the line.

**acc**

advanced  
computer  
controls, inc.

2356 Walsh Avenue • Santa Clara, California (408) 727-3330

CIRCLE 1 ON READER SERVICE CARD



# CADDELL COIL CORP.

35 Main Street  
Poultney, VT 05764  
802-287-4055

## BALUNS

Get POWER to your antenna! Our Baluns are already wound and ready for installation in your transmatch or you may enclose them in a weatherproof box and connect them directly at the antenna. They are designed for 3-30 MHz operation. (See ARRL Handbook pages 19-9 or 6-20 for construction details.)

100 Watt (4:1, 6:1, 9:1, or 1:1 Impedance—select one)	\$ 10.50
Universal Transmatch 1 KW (4:1 Impedance)	14.50
Universal Transmatch 2 KW (4:1 Impedance)	17.00
Universal Transmatch 1 KW (6:1, 9:1 or 1:1—select one)	16.00
Universal Transmatch 2 KW (6:1, 9:1 or 1:1—select one)	18.50

## Multiband QRV 160-10 Dipole/V/Sloper



Ready to Use	Tough	Full Legal Power
Fastest Install	Flexible	No Lossy Traps
Coax Feed	Kink-Proof	Low Noise
102 feet long	2300 V Insul	Never Corrodes

Info: 39c s.a.s.e.

1971 N. Oak Lane 1300 E.  
Provo, UT 84604-2138

**\$49.95 ppd.**  
incl 30p Tech Manual

**AntennasWest**  
(801) 374-1084

CIRCLE 89 ON READER SERVICE CARD

## Measure Up With Coaxial Dynamics Model 81000A RF Directional Wattmeter

Model 81000A is a thoroughly engineered, portable, insertion type wattmeter designed to measure both FWD/RFL C. W. power in Coaxial transmission lines.

81000A is comprised of a built-in line section, direct reading 3-scale meter protected by a shock-proof housing. Quick-match connectors, plus a complete selection of plug-in elements, gives the FRONT RUNNER reliability, durability, flexibility and adaptability with a two year warranty.

Contact us for your nearest authorized Coaxial Dynamics representative or distributor in our world-wide sales network.



**COAXIAL  
DYNAMICS,  
INC.**

15210 Industrial Parkway  
Cleveland, Ohio 44135  
216-267-2233  
1-800-COAXIAL  
Telex: 98-0630



*Service and Dependability...A Part of Every Product*

CIRCLE 186 ON READER SERVICE CARD

# RENO RADIO

12 Glen Carran Circle • Sparks, NV 89431  
(702) 331-7373



**rfconcepts**



## VHF/UHF Amplifiers

2-317 30w in = 170w out  
2-23 2w in = 30w out

- GaAsFET Receive Pre-amp
- American Made
- Call for LOW Introductory Prices

## KENWOOD



KENWOOD TS-440S



KENWOOD TW-4100A



YAESU FR-757GXII

**YAESU**



YAESU FT-23/73



ICOM IC-28A

**ICOM**



ICOM IC-275

**Call Toll FREE: 1-800-345-5686**

AEA • ALINCO • ALPHA DELTA • AMERITRON • AMP SUPPLY • ANTENNA SPECIALISTS • ASTRON •  
B & W • BENCHER • BUTTERNUT • CUSHCRAFT • HUSTLER • ICOM • LARSEN • KANTRONICS •  
KENPRO • KENWOOD • MIRAGE/KLM • MFJ • RFCONCEPTS • TEN-TEC • WELZ • YAESU & Many Others

CIRCLE 189 ON READER SERVICE CARD



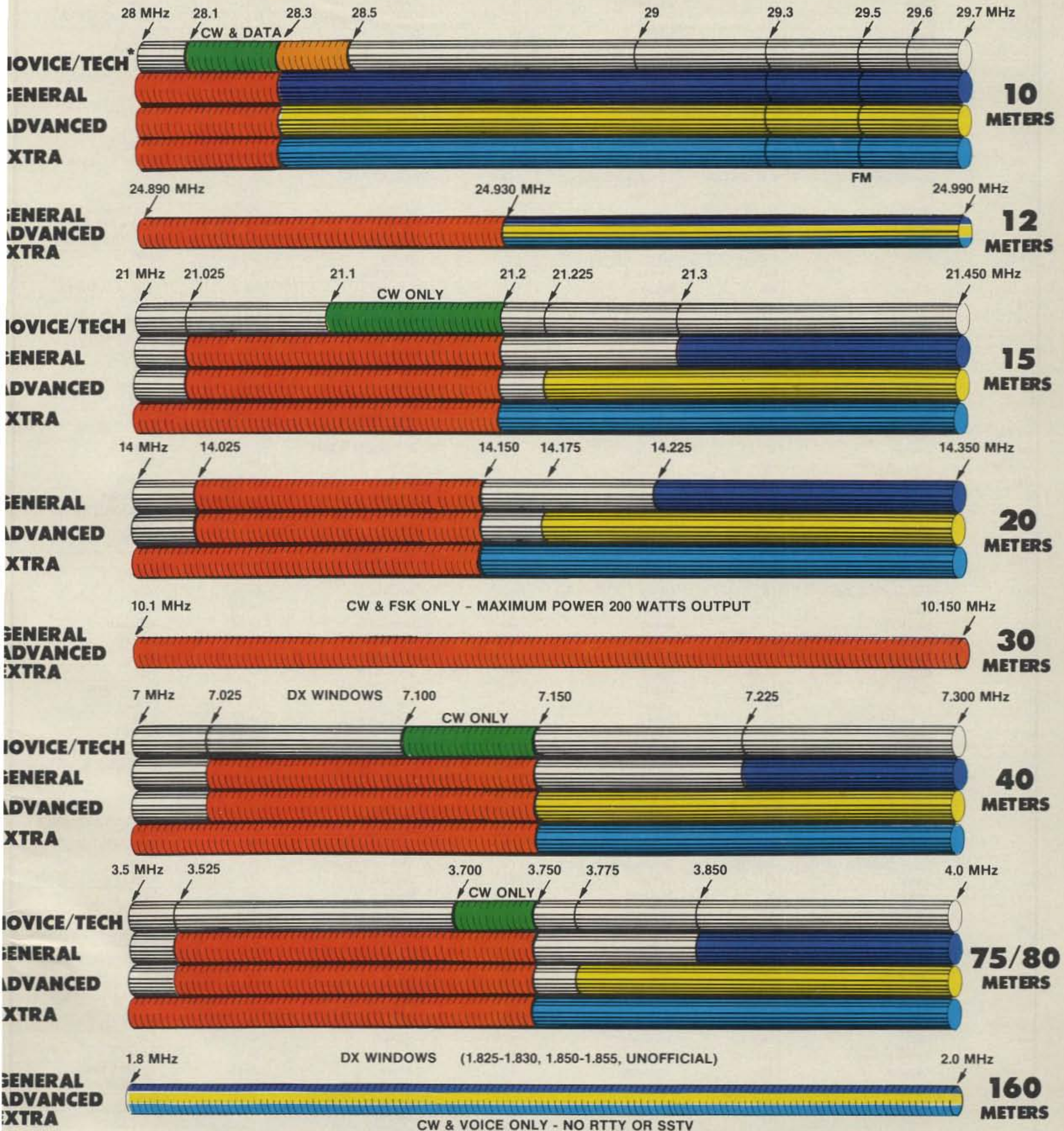


# ICOM

Developed by Gordon West, WB6NOA, Radio School, Inc., for exclusive use by ICOM America, Inc. February 1987

# Amateur Radio HF Band Limits

- NOVICE/TECHNICIAN, CW ONLY
- NOVICE/TECHNICIAN VOICE
- ADVANCED VOICE, CW, SSTV, FAX
- CW, FSK
- GENERAL VOICE, CW, SSTV, FAX
- EXTRA VOICE, CW, SSTV, FAX
- NO PRIVILEGES



\*New Novice/Technician 10 meter voice and digital privileges effective March 21, 1987.



PREFIX	COUNTRY	PREFIX	COUNTRY	PREFIX	COUNTRY	PREFIX	COUNTRY
A2	Botswana	HQ-HR	Honduras	T5	Somalia	YT-YU, YZ	Yugoslavia
A3	Tonga	HS	Thailand	T7	San Marino	YV-YY	Venezuela
A4	Oman	HV	Vatican	TA-TC	Turkey	YVØ	Aves Is.
A5	Bhutan	HZ	Saudi Arabia	TF	Iceland	Z2	Zimbabwe
A6	United Arab Emirates	I	Italy	TG, TD	Guatemala	ZA	Albania
A7	Qatar	ISØ, IMØ	Sardinia	TI, TE	Costa Rica	ZB2	Gibraltar
A9	Bahrain	J2	Djibouti	TI9	Cocos Is.	ZC4	UK Sov. Base on Cypress
AP-AS	Pakistan	J3	Grenada & Dep.	TJ	Cameroon	ZD7	St. Helena
BV	Taiwan	J5	Guinea-Bissau	TK	Corsica	ZD8	Ascension Is.
BY, BT	China	J6	St. Lucia	TL	Central African Republic	ZD9	Tristan da Cunha & Gough Is.
C2	Nauru	J7	Dominica	TN	Congo	ZF	Cayman Is.
C3	Andorra	J8	St. Vincent & Dep.	TR	Gabon	ZK1	So. Cook Is.
C5	The Gambia	JA-JS	Japan	TT	Chad	ZK1	No. Cook Is.
C6	Bahamas	JD1	Minami Torishima	TU	Ivory Coast	ZK2	Niue
C8-9	Mozambique	JD1	Ogasawara	TY	Benin	ZK3	Tokelau Is.
CA-E	Chile	JT-JV	Mongolia	TZ	Mali	ZL-ZM	New Zealand
CE9/KC4	Antarctica	JW	Svalbard	UA1, 3, 4, 6	European Russian R.S.F.S.R.	ZL7	Chatham Is.
CEØA	Easter Is.	JX	Jan Mayen	UA1	Franz Josef Land	ZL8	Kermadec Is.
CEØX	San Felix	JY	Jordan	UA2	Kaliningrad	ZL9	Auckland & Campbell Is.
CEØZ	Juan Fernandez	K, W, N, AA-AK	United States of America	UA8, 9, Ø	Asiatic R.S.F.S.R.	ZP	Paraguay
CM, CO	Cuba	KC6 (E. Caroline Is.)	Micronesia	UB, UT, UY	Ukraine	ZR-ZU	South Africa
CN	Morocco	KC6 (W. Caroline Is.)	Belau	UC	Byelorussia	ZR2-ZU2	Prince Edward & Marion Is.
CP	Bolivia	KG4	Guantanamo Bay	UD	Azerbaijan	ZR3-ZU3	(Namibia) S.W. Africa
CT	Portugal	KH1	Baker, Howland	UF	Georgia	1AØ	Sov. Mil. Order of Malta
CU, CT2	Azores	KH2	Guam	UG	Armenia	1S	Spratly Is.
CT3	Madeira Is.	KH3	Johnston Is.	UH	Turkmenistan	3A	Monaco
CV-CX	Uruguay	KH4	Midway Is.	UI	Uzbekistan	3B6, 7	Agalega & St. Brandon
CYØ	Sable Is.	KH5	Palmyra, Jarvis Is.	UJ	Tadzhikistan	3B8	Mauritius
CYØ	St. Paul Is.	KH5K	Kingman Reef	UL	Kazakhstan	3B9	Rodriguez Is.
D2, 3	Angola	KH6	Hawaiian Is.	UM	Kirghizia	3C	Equatorial Guinea
D4	Cape Verde	KH7	Kure Is.	UO	Moldavia	3CØ	Pagalu Is.
D6	Comoros	KH8	American Samoa	UP	Lithuania	3D2	Fiji Is.
DA-DL	Fed. Rep. of Germany	KH9	Wake Is.	UQ	Latvia	3D6	Swaziland
DU-DZ	Philippines	KHØ	Mariana Is.	UR	Estonia	3V	Tunisia
EA-EH	Spain	KL7	Alaska	V2	Antigua, Barbuda	3W, XV	Vietnam
EA6-EH6	Balearic Is.	KP1	Navassa Is.	V3	Belize	3X	Guinea
EA8-EH8	Canary Is.	KP2	Virgin Is.	V4	St. Christopher & Nevis	3Y	Bouvet
EA9-EH9	Ceuta and Melilla	KP4	Puerto Rico	V8	Brunei	3Y	Peter Is.
EI-EJ	Ireland	KP5	Desecheo Is.	VE, VO, VY	Canada	4P-4S	Sri Lanka
EL	Liberia	KX6	Marshall Is.	VK	Australia	4U	I.T.U. Geneva
EP-EQ	Iran	LA-LN	Norway	VK	Lord Howe Is.	4U	Hdqtrs., United Nations
ET	Ethiopia	LO-LW	Argentina	VK9	Willis Is.	4W	Yemen
F	France	LX	Luxembourg	VK9	Christmas Is.	4X, 4Z	Israel
FT8W	Crozet	LZ	Bulgaria	VK9	Cocos-Keeling Is.	5A	Libya
FT8X	Kerquelen Is.	OA-OC	Peru	VK9	Mellish Reef	5B	Cyprus
FBØZ	Amsterdam & St. Paul Is.	OD	Lebanon	VK9	Norfolk Is.	5H-5I	Tanzania
FG	Guadeloupe	OE	Austria	VKØ	Heard Is.	5N-5O	Nigeria
FG, FS	Saint Martin	OF-OI	Finland	VKØ	Macquarie Is.	5R-5S	Madagascar
FH	Mayotte	OHØ	Aland Is.	VP2E	Anguilla	5T	Mauritania
FK	New Caledonia	OJØ	Market Reef	VP2M	Montserrat	5U	Niger
FM	Martinique	OK-OM	Czechoslovakia	VP2V	Brit. Virgin Is.	5V	Togo
FO	Clipperton Is.	ON-OT	Belgium	VP5	Turks & Caicos Is.	5W	Western Samoa
FO	French Polynesia	OX	Greenland	VP8	Falkland Is.	5X	Uganda
FP	St. Pierre & Miquelon	OY	Faroe Is.	VP8, LU	South Georgia Is.	5Y-5Z	Kenya
FR/G	Glorioso Is.	OZ	Denmark	VP8, LU	South Orkney Is.	6V-6W	Senegal
FR/J, E	Juan de Nova, Europa	P2	Papua New Guinea	VP8, LU	South Sandwich Is.	6Y	Jamaica
FR	Reunion	PA-P1	Netherlands	VP8LU, CE9, HFØ, 4K1	South Shetland Is.	70	People's Dem. Rep. of Yemen
FR/T	Tromelin	PJ2-4, P4	Neth. Antilles	VP9	Bermuda	7P	Lesotho
FW	Wallis & Futuna Is.	PJ5-8	St. Maarten, Saba, St. Eustatius	VQ9	Chagos	7Q	Malawi
FY	French Guiana	PP-PY	Brazil	VR6	Pitcairn Is.	7T-7Y	Algeria
G	England	PPØ-PYØ	Fernando de Noronha	VS6	Hong Kong	8P	Barbados
GD	Isle of Man	PPØ-PYØ	St. Peter & St. Paul Rocks	VU	India	8Q	Maldives Is.
GI	Northern Ireland	PPØ-PYØ	Trinidad & Martin Vaz. Is.	VU	Andaman & Nicobar Is.	8R	Guyana
GJ	Jersey	PZ	Suriname	VU	Laccadive Is.	9G	Ghana
GM	Scotland	S2	Bangladesh	XA-XI	Mexico	9H	Malta
GU	Guernsey & Dep.	S7	Seychelles	XA4-XI4	Revilla Gicedo	9I-9J	Zambia
GW	Wales	S9	Sao Tome & Principe	XT	Burkina Faso	9K	Kuwait
H4	Solomon Is.	SA-SM	Sweden	XU	Kampuchea	9L	Sierra Leone
HA, HG	Hungary	SN-SR	Poland	XW	Laos	9M2, 4	West Malaysia
HB	Switzerland	ST	Sudan	XX9	Macao	9M6, 8	East Malaysia
HBØ	Liechtenstein	STØ	Southern Sudan	XY-XZ	Burma	9N	Nepal
HC-HD	Ecuador	SU	Egypt	Y2-9	German Dem. Rep.	9O-9T	Zaire
HC8-HD8	Galapagos Is.	SV-SZ	Greece	YA	Afghanistan	9U	Burundi
HH	Haiti	SV/A	Mount Athos	YB-YH	Indonesia	9V	Singapore
HI	Dominican Republic	SV5	Crete	YI	Iraq	9X	Rwanda
HJ-KH	Colombia	SV9	Dodecanese	YJ	Vanuatu	9Y-9Z	Trinidad & Tobago
HKØ	Malpelo Is.	T2	Tuvalu	YK	Syria	J2/A	Abu Ail, Jabal at Tair
HKØ	San Andreas & Providencia	T3Ø	W. Kiribati (Gilbert & Ocn Is.)	YN	Nicaragua		
HL	Korea	T31	C. Kiribati (Brit. Phoenix Is.)	YO-YR	Romania		
HO-HP	Panama	T32	East Kiribati (Line Is.)	YS	El Salvador		



## Hams Around the World

Chod Harris VP2ML  
PO Box 4881  
Santa Rosa CA 95402

### THE DX YEAR IN REVIEW

DX and DXers excelled in 1987. Low-band propagation was the best in years, especially on 160 meters. As expected at the bottom of the sunspot cycle, low level solar activity and a minimum of solar-generated noise kept long-haul propagation on 160 meters well above average. Even the usually-difficult polar path opened wide several days a week during the winter months. ON4UN made good use of the conditions on 160 meters (and the new 160 meter allocation in Belgium) to work more than 100 countries on the band in the first few weeks of 1987! The same low absorption and good polar propagation helped 40 and 80 meters as well, and many DXers added to their band-countries totals in 1987.

The higher bands were remarkably good, considering that we were at a solar minimum. Twenty meters often stayed open well past local sunset, and the low absorption permitted lots of long-haul QSOs. Russian signals poured over the North Pole for much of the year to the delight of oblast chasers. Fifteen meters opened occasionally with good signals on east-west paths as well as the easier north-south paths. Even 10 meters opened between the East Coast and Europe and between the West Coast and Japan a few days of the year. This will soon occur daily. Evidence mounted all year that Sunspot Cycle 22 began in September 1986.

### A Boost for Awards

The DX Century Club Golden Jubilee was an enormous success. Thousands of DXers worldwide applied for the handsome award. Pileups were fierce at the beginning of the year. DXers raced to work the easy countries all over again. Although the concept of a "fresh start" for DXCC won little support, DXers didn't hesitate to "start over" for the Golden Jubilee award. The award spurred some interesting competitions, as DXers defined their own version of the award. Some aimed for working 100 countries in the

shortest time, such as W6GO, who worked country #100 at 0042Z on Jan. 3, just over 48 hours into the new year. Other DXers set their other goals, such as QRP or single band. A few dozen dedicated DXers earned DXCC Golden Jubilee Times 2, by working more than 200 countries in 1987! More than 280 of the 317 DXCC countries were on the air in 1987.

A host of active resident (or long-term visitors) boosted DXers' country totals resident (or long-term visitor) operators. The best example of this is China, which was the Most Wanted country in the world as recently as 1980. More than a dozen active BY stations, and good polar propagation, put BY in thousands of logs. 5A0A in Libya was the most workable 5A station in years, and 7J1ACH on Minami Torishima made more than 20,000 QSOs in 1987. Other active rare stations included 9N1MM in Nepal, VK0GC on Macquarie Island, ZL8HV on Raoul Island in the Kermadecs, JX9CAA on Jan Mayen, SP5EXA/JW on Spitsbergen, and FT8ZA and FT8XA in the French Antarctic countries.

### The Year of The DXpedition

If a single word characterizes DX in 1987, it is DXpedition. Dozens of well-organized and well-run DXpeditions made hundreds of thousands of contacts with deserving DXers worldwide.

The highlight of the year was, of course, the Peter 1 Island DXpedition by 3Y1EE (LA1EE) and 3Y2GV (LA2GV). Einer and Kare braved isolation, sub-zero tem-



Photo A. Martha WN4FVU and Carl WB4ZNH Henson were among the 4M0ARV Aves Island DXpeditioners.

peratures, limited food, and enormous pile-ups, to put Peter 1 on for the first time ever. The pair made more than 15,000 contacts on all bands and modes, while operating almost non-stop. Kare actually fell asleep at the rig on more than one occasion. That's dedication!

The Aves Island 4M0ARV trip, and the Revillagigedo XF4DX DXpedition were also highly successful DXpeditions. Miss Bharathi VU2RBI led about two dozen Indian amateurs to the Andamans VU4. She worked 15,000 DXers herself during her 45-day stay. The Greeks finally managed to activate Mount Athos SY for the first time since the early 1980s.

Many small groups and individual DXers showed that DXpeditions don't have to involve dozens of amateurs, nor cost tens of thousands of dollars. Bob Winn W5KNE and Jim Smith VK9NS opened Cocos-Keeling VK9Y and were followed by a host of others. Jim went on to Christmas Island VK9X, to the delight of many DXers. Some of the Reunion Is-

land hams put the tough French African islands on the air: Tromelin, Juan de Nova, and Glorioso. And, of course, The Colvins—Lloyd W6KG and Iris W6QL—spent the winter operating from that same region. Wallis Island VK9W, Cocos TI9, and Heard VK/0, were all active in 1987, thanks to DXpeditioners. Brazilian amateurs managed to activate all three PY0 islands in 1987: St. Peter and St. Paul Rocks, Trindade, and Fernando de Noronha. Even the Russians got into the act with numerous DXpeditions to rare oblasts throughout the country.

There were a few flies in the DXer's ointment in 1987. Two ground-breakers in DX are now Silent Keys: Don Reibhoff K7ZZ and Joe Ahumada LU2DX. Don was a mainstay from Southeast Asia in the '60s and '70s, and successfully promoted amateur radio throughout the region. Joe was a pioneer DXpeditioner in the 1950s, paving the way for hundreds of others in later years. They will be sorely missed. Iris Colvin slipped and broke her hip in the Maldive Islands, but was up and around at Visalia and Dayton. She is off again with Lloyd on their annual multi-country DXpedition.

### The Outlook for 1988

The DX outlook for 1988 is very favorable. Sunspots will swing back quickly to bless DXers with good 15-, 12-, and 10-meter openings. Twenty should provide DX possibilities most of the day and night. The low bands should be fair to good in 1988, before increasing solar activities raises the noise level too much. Several major DXpeditions are in the planning stages for 1988, and even if just a few of them come off, it will be another good year for DXers! Look for Bouvet 3Y, Vietnam XV, Spratly 1S, Andamans VU4, South Sandwich and South Georgia VP8, Marion Island ZS8, Laccadives VU7, and others next year.

DXers can keep up to date on current happenings in DX by subscribing to one of the weekly DX newsletters. To help at least one reader of this column improve his or her DX score in 1988, I will give away a free one-year subscription to The DX Bulletin Just send your name, call, and address (or a QSL card) to P.O. Box 4881, Santa Rosa CA 95402, before the end of 1987. On January 1, 1988, I'll pull one card out of my hat, and send that lucky DXer a free subscription. Good DXing in 1988! **73**



Photo B. Japan DX News editor JR1AIB (left) greets 1987 DXpeditioners Einer LA1EE/3Y1EE, Miss Bharathi VU2RBI/VU4APR, and Mr. Suri VU2MY/VU4APR.



Bob Heil K9EID  
Heil Boulevard  
Marissa IL 62257

# Remote Base Control

Work DX from your HT!

During the past few years, the cost of commercial VHF and UHF FM equipment for the amateur market has dropped radically. This fact, coupled with the popularity of small hand-held transceivers, has led many amateurs into building remote-base systems, which can increase the range of a hand-held from a few miles to hundreds or even thousands of miles.

## What Is a Remote Base?

A remote base is not a repeater, although the two are similar. A remote-base system (RBS) usually consists of two transceivers operating in a crossband-linked mode, as shown in Fig. 1. One of the linked stations has *complete* control over the link operation. This control station turns the link on and off and performs other control functions over the air.

In contrast, a repeater *cannot* be controlled on the input frequency. The frequencies used for a remote base are not important, except that the controlling station must operate at or above 220.5 MHz and only unoccupied simplex channels should be used (to prevent QRM to repeaters and other simplex users).<sup>1</sup>

A remote-base system can effectively turn a portable QRP transceiver into a high-power base station with high antenna gain. Many remotes use 10-meter equipment located on a mountaintop or tall building and control this remote with a UHF or VHF link; DX stations can be worked from a hand-held or mobile

station using this setup. At W9GOE/R in Marissa, Illinois, a remote 10-meter FM system is linked on 220 MHz to the 2-meter repeater, allowing the 2-meter users to enjoy the fun and thrill of working DX through the 2-meter repeater.

## Build a Simple Remote Base

Interconnection of two transceivers for remote-base operation is simple and can be accomplished without a lot of sophisticated control and audio interface circuitry. Refer to Fig. 1. The squelch circuit of transceiver A activates the PTT line of transceiver B. At the same time, speaker audio is applied to the microphone input. This is basically how a repeater operates, but, in an RBS, the repeating process is reversible. The squelch circuit of transceiver B controls the PTT line of transceiver A, and so on.

Finding the proper control voltage in the squelch circuit of each transceiver is perhaps the most difficult task in building the remote base. Many of the newer radios have an LED to indicate signal presence (open squelch). Usually, a one-transistor switch in the squelch circuit supplies positive voltage for the LED. This positive voltage can control the circuits in the remote-base interface. Fig. 2 is

the schematic diagram of the simple remote-base T-R control interface for transceivers using either positive-voltage (active high) or negative-voltage (active low) squelch circuits.

Audio coupling between transceivers is

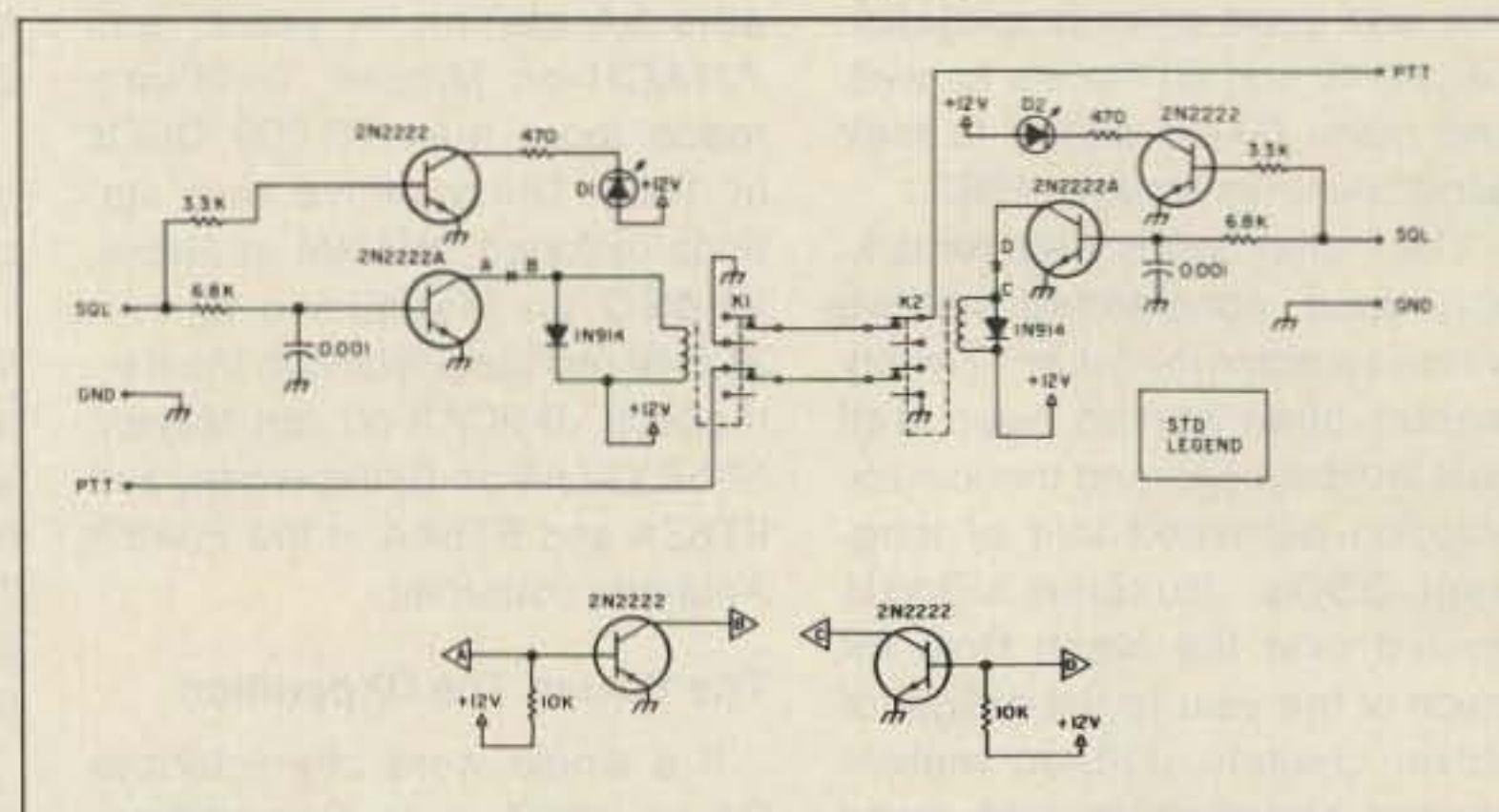


Fig. 2. Schematic diagram of the remote-base control interface. Use the circuit shown in A for transceivers that provide an "active high" from the squelch circuit; insert the components shown in B at points A, B, C, and D for "active low" squelch circuits (D1, D2—red light-emitting diodes; K1, K2—DPDT relays, 12-V coil, 2-A contacts).

achieved by connecting the speaker output of one unit through a limiting and pre-emphasis network to the microphone input of the other. Microphone output levels are on the order of 50 uV and a speaker output may provide 2 or 3 volts, so an attenuator potentiometer must be used. A 4.7-kilohm resistor and a 0.004-uF capacitor provide proper audio shaping. Fig. 3 shows a typical circuit.

## Testing

Once the circuits are wired and the transceivers are connected, testing of the circuit is simple. Rotate the squelch control of transceiver A until white noise is heard. This should activate the PTT line on transceiver B; white noise should be heard in a third receiver tuned to output frequency B. Adjust the level-control potentiometer for proper deviation. Rotate the transceiver A squelch control back to the "quiet" position and repeat the same tests for transceiver B.

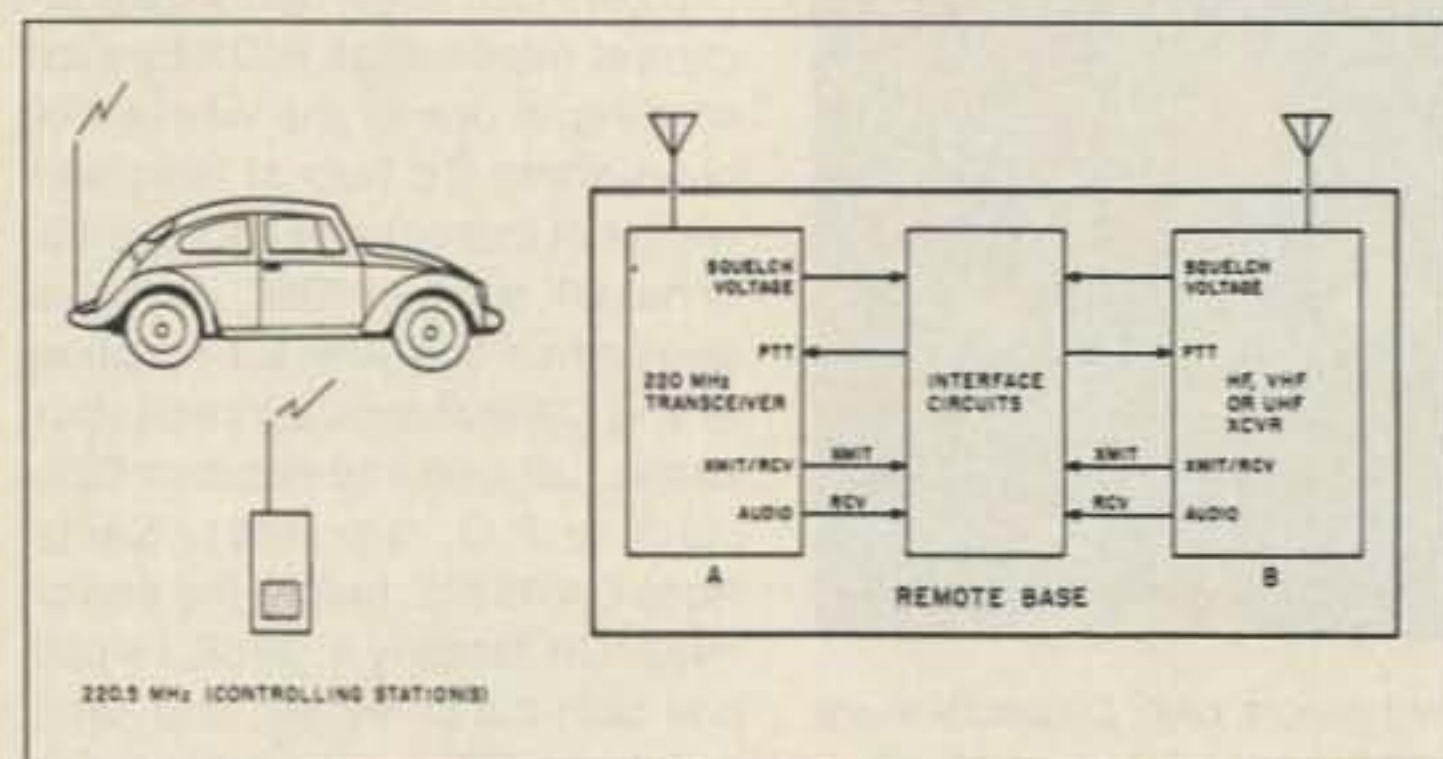


Fig. 1. Block diagram of the remote-base system.



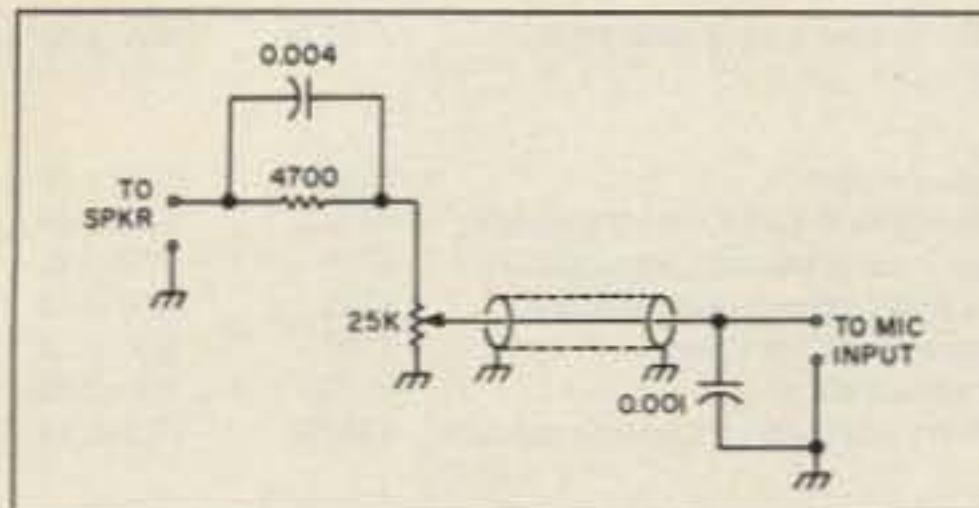


Fig. 3. Schematic diagram of the remote-base audio circuitry. This circuit must be duplicated to interface each transceiver.

### Other Thoughts

Many types of control circuitry can be added to the remote base to provide nice features. Why not use a DTMF (dual-tone multi-frequency) pad and associated decoder to change the remote-base frequencies? Should you really get carried away, you could even build circuits that would remotely turn a directional antenna.

**"A remote base is not a repeater."**

The new series of HF rigs (TS-430S, IC-740), which have active squelch circuits that operate on SSB signals, allow the remote-base control to be used between the VHF or UHF control frequency and any of the HF bands. This allows you to move around freely with a rubber ducky/HT on VHF talking on 20 or 40 meters, let's say. It is truly talking to the world with your rubber ducky!

All that is necessary is to find the point in the HF rig where that squelch circuit raises a voltage potential from 0 to 3-4 volts DC when a signal is received.

The success and fun of an RBS is limited only by the imagination and skill of the builder. Why not grab a soldering iron and build yourself a system? It will pique your interest in VHF FM! **73**

### References

1. See FCC regulations, Part 97.61(d).
2. Parts for the remote-base system are available from Heil Sound, Ltd., No. 2 Heil Drive, Marissa IL 62257.

Bob K9EID, founder of Heil Sound, Ltd., was a pioneer in VHF and UHF work in the early '60s. He was named Ham of the Year at Dayton in 1982 for attracting young people into ham radio.

### TS-940S OWNERS

ONLY USING 10 MEMORIES?  
HATE THAT HIDDEN BANK SWITCH?

THE BANKER lets you access all 40 memories from the front panel!

- \*Just press the "VOICE" button to step through all banks
- \*Board just plugs in- no modifications to your rig!
- \*Installs and removes in minutes, just like the optional voice synthesizer board
- \*Takes no power from backup batteries
- \*1-year warranty

Note: THE BANKER cannot be used if you have the optional voice synthesizer board installed.

Send check or money order for \$49.95 to:

Inventron Labs  
P.O. Box 1882  
Brookline, MA 02146

CIRCLE 61 ON READER SERVICE CARD

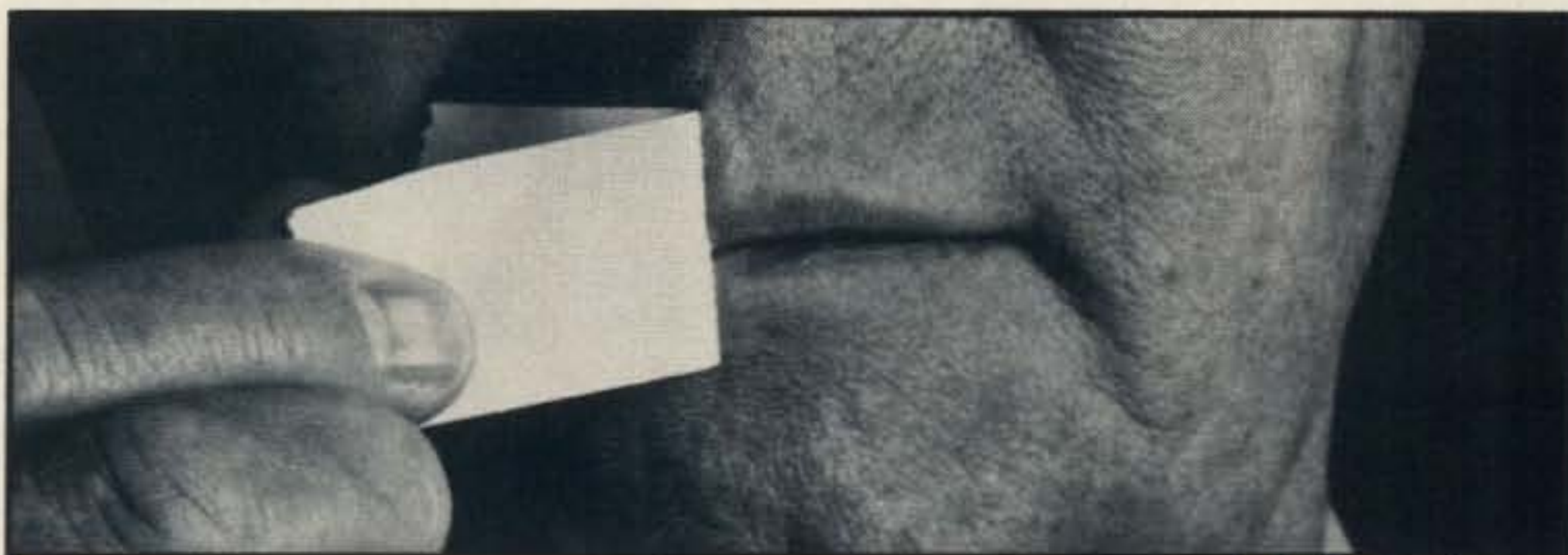
\*\*\*\*\* PRESENTING \*\*\*\*\*  
**CABLE TV  
DESCRAMBLERS**  
\*\*\*\*\* STARRING \*\*\*\*\*  
**JERROLD, HAMLIN, OAK**  
AND OTHER FAMOUS MANUFACTURERS

- FINEST WARRANTY PROGRAM AVAILABLE
- LOWEST RETAIL/WHOLESALE PRICES IN U.S.
- ORDERS SHIPPED FROM STOCK WITHIN 24 HOURS

FOR FREE CATALOG ONLY 1-800-345-8927  
FOR ALL INFORMATION 1-818-716-5914

**PACIFIC CABLE CO. INC.**  
7325 1/2 RESEDA BLVD., DEPT 1810  
RESEDA, CA 91335

CIRCLE 178 ON READER SERVICE CARD



## Now that you can speak, talk to Larsen.

Novice Enhancement opens up a whole new way for novices to communicate. To make the most of it, talk to Larsen Electronics.

We'll tell you how Larsen antennas can greatly improve your powers of communication. We'll also explain how Larsen 220 and 1296 MHz antennas are designed to give you the best performance.

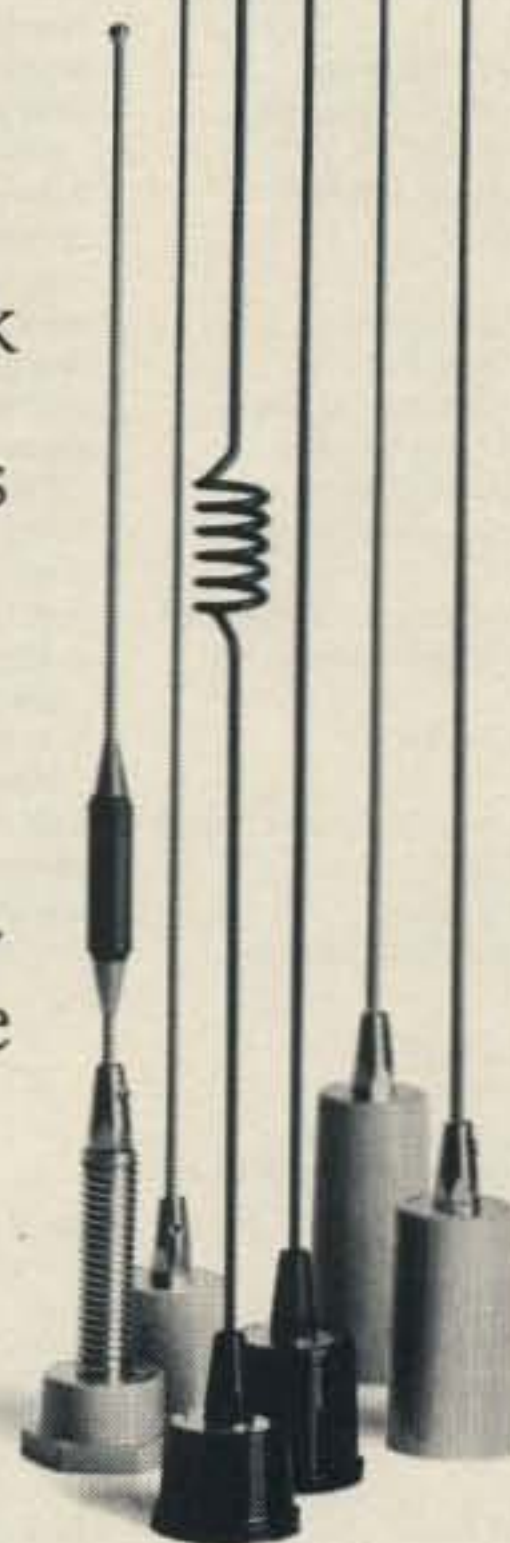
Talk to your Larsen amateur dealer today, and see if Larsen performance doesn't speak for itself.



**Larsen Antennas**  
The Amateur's Professional™

See your favorite amateur dealer or write for a free amateur catalog.

IN USA: Larsen Electronics, Inc., 11611 N.E. 50th Ave., P.O. Box 1799, Vancouver, WA 98668. 206-573-2722.  
IN CANADA: Canadian Larsen Electronics, Ltd., 149 West 6th Avenue, Vancouver, B.C. V5Y 1K3. 604-872-8517.



CIRCLE 23 ON READER SERVICE CARD



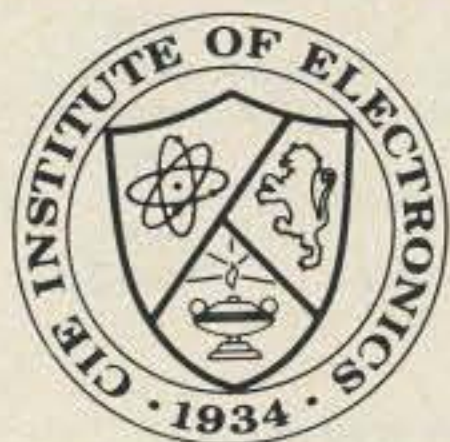
# 1987 INDEX

ARTICLE	DESCRIPTION	AUTHOR	ISSUE	I/O			
<b>AMPLIFIERS</b>							
Everyman's Microwave Amp Power Play Comparison	modification of a microwave cavity RF concepts RFC 2-23 and Tokyo Hi-Power HL 37V30 watt 144 MHz Power Amp	KT2B	OCT p.24				
<b>ANTENNAS</b>							
220-MHz Portable Pocket J-Pole 440-MHz Repeater Antenna	a low-cost quickie with more dB-gain build this antenna in the public safety and commercial spectrum	KB6MIF	SEP p.27				
A Foldover Cheapie	40-foot foldover antenna tower	WB2EDV	SEP p.41				
General Purpose VHF/UHF Antenna	build a discone	KF4BI	SEP p.19				
Non-Etched SWR Bridge	project for SWR	WA1GPO	SEP p.38				
Out-of-the-Ordinary QTHs	ideas for the portable antenna	W6IOJ	SEP p.24				
QRP Antenna Farming	work the world with a few Watts	K4IPV	SEP p.22				
Radio At Green Bank	impressive radio antennas	W0VM	APR p.36				
The Cellular Phony Antenna	two-meter mobile antenna	AJON	SEP p.16				
The L'il Fixer	ultimate in simplicity	WA2AJQ	APR p.38				
The HF Half-Sloper	low-angle radiating wire antenna	W9THN	SEP p.40				
Weatherproofed Antennas		W8DYF	SEP p.43				
		KD5UJ	APR p.40				
<b>ATV</b>							
C-64 Slow Scan	slow-scan television	WB9LYH	MAR p.34				
Satellite TV Receiver Components	collection of circuits for 23cm	KB4MDR	OCT p.34				
<b>CONSTRUCTION</b>							
220-MHz Portable Pocket J-Pole 40 Meters In A Nutshell	a low-cost quickie with more dB-gain 7-MHz transceiver	KB6MIF	SEP p.27				
Battery Charger	A handy NiCd power project	KG5B	MAR p.26				
Cubic Inch Keyer	lambic keying on the HW-8	N0FNF	DEC p.52				
Dry Cell Tester	project for the technical greenhorn	WB2EMS	NOV p.32				
Everyman's Microwave Amp	modification of a microwave cavity	W6WTU	OCT p.48				
General Purpose VHF/UHF Antenna	build a discone	KT2B	OCT p.24				
Horseflies and Grid Squares	amazing VHF/UHF DXing	WA1GPO	SEP p.38				
ICOM BP-4 Charging Adapter	Our own technical editor beats the system	KT2B	SEP p.33				
KOKO-The Kids' Own Kode Oscillator	easy code Oscillator for the kids	WB9RRT	DEC p.20				
Microwave Building Blocks:	complete plans for building	K5JRN	FEB p.48				
The Solfan Special	your own microwave rig	WB6IGP	JAN p.40				
Micro Morse	interface that fits just about any machine	WB8DQT	FEB p.40				
Microwave Building Blocks—							
The Double-Balanced Mixer	enjoy superior performance	WB6IGP	OCT p.20				
Mobile Extender Using VOX Control	Wire up your transceiver to jump over mountains	K6YDW	DEC p.44				
Non-Etched SWR Bridge	project for SWR	W6IOJ	SEP p.24				
Operators Aren't Standing By	solve your remote-control problems with a over featured DTMF decoder	Piechocki	JAN p.34				
PCBs From TEC-200 Film	make your own PCBs	K3OF	AUG p.43				
PC Infernos	consider doing a little micro surgery on a burned PC board	WB4YOD	FEB p.32				
Remote Base Control	Work DX from your HT	K9EID	DEC p.106				
Revive A Dying Swan	Swan 250 new life with a home-brew vxo	WA4UZM	MAY p.38				
Repeater Controller PC Board	build this inexpensive repeater board	KA3AAQ	NOV p.34				
Secrets of Silent Switching	say farewell to chattering, sticky relays	OA4KO/YV5	FEB p.28				
Semi-Rapid HT Charging	ICOM HT charging option	K3NXU	MAY p.34				
TV Tuner Scanner Converter	build a converter for a tuner and scanner and receive 800-900 MHz	W6WTU	OCT p.40				
Tesla High-Frequency Transformer	build this spark-excited transformer	VE7JON	NOV p.12				
The Glue Ribbon Solution	create your own conductive epoxy for low-resistance bonds	WB0NRU	JAN p.38				
The Cap Checker	build this simple analog capacitance meter	VE6BGL	MAR p.42				
The Two-Meter Transverter Project	build this VMOS transverter	W6YUY	JUL p.32				
The L'il Fixer	ultimate in simplicity	W9THN	SEP p.40				
The HF Half-Sloper	low-angle radiating wire antenna	W8DYF	SEP p.43				
VIC-20 Beam Rotor Interface	interface project for your VIC-20	N1II	NOV p.44				
<b>CONTEST</b>							
1986 15/20-Meter SSB Championships Results		KE7C	FEB p.101				
ANNOUNCING: 73 Magazine's DX Dynasty Award	join in the frenzy of DXing's newest and hottest award	Staff	JAN p.27				
DX Dynasty Award	check out 73's new DX award	Staff	MAR p.44				
The National Championships	guile wins out over gigawatts	KE7C	JUL p.30				
World SSB Championships	results of the 1986 40-meter fracas	KE7C	JAN p.53				
<b>CW</b>							
Cubic Inch Keyer	lambic keying on the HW-8	WB2EMS	NOV p.32				
KOKO-The Kids' Own Kode Oscillator	easy code Oscillator for the kids	K5JRN	FEB p.48				
<b>GADGETS</b>							
Battery Charger	A handy NiCd power project	N0FNF	DEC p.52				
ICOM BP-4 Charging Adapter	Our own technical editor beats the system	WB9RRT	DEC p.20				
Operators Aren't Standing By	solve your remote-control problems with a over featured DTMF decoder	Piechocki	JAN p.34				
Secrets of Silent Switching	say farewell to chattering, sticky relays	OA4KO/YV5	FEB p.28				
Tesla High-Frequency Transformer	build this spark-excited transformer	VE7JON	NOV p.12				
<b>HUMAN INTEREST</b>							
Dayton Digest	Dayton Hamfest	WA4BPI	APR p.32				
Future Packet	author predicts packet radio of the future	K2TKN	AUG p.24				
History of Handhelds Communications	Their Place in Western Communication	KT2B	DEC p.30				
History of ICOM 2AT	The World's Most Popular Handheld	KT2B	DEC p.18				
Horseflies and Grid Squares	amazing VHF/UHF DXing	KT2B	SEP p.33				
The Greenie	an account of a contest	K1YSD	NOV p.55				
You, Too, Can Be An SOB	join this elite society of ham radio operators	K9AZG	FEB p.44				
C-64 Slow Scan	slow-scan television	WB9LYH	MAR p.34				
Operators Aren't Standing By	solve your remote-control problems with a Piechocki	JAN	p.34				
Make VIC Talk	This little chip offers big benefits	WA4DSO	p.50				
PC Infernos	consider doing a little micro surgery on a burned PC board	WB4YOD	FEB p.32				
Packet AI	speak with TRON	KE5L	AUG p.29				
Shoestring Software	forty-five Baud on a budget	W9ODK	FEB p.34				
Tap, Tap, Tap, Clunk	VIC-to-Teletype printer	N1II	FEB p.46				
VIC-20 Beam Rotor Interface	interface project for your VIC-20	N1II	NOV p.44				
<b>MICROWAVE</b>							
A Guided Tour of 1.2 GHz	23-cm band is the least understood Novice Enhancement	KT2B	JUN p.24				
Everyman's Microwave Amp	modification of a microwave cavity	KT2B	OCT p.24				
Gunn and IMPATT Devices	safe methods for testing microwave diodes	WB6IGP	OCT p.30				
Microwave Building Blocks:	complete plans for building your own microwave rig	WB6IGP	JAN p.40				
The Solfan Special							
Microwave Building Blocks—							
The Double-Balanced Mixer	enjoy superior performance	WB6IGP	OCT p.20				
Satellite TV Receiver Components	collection of circuits for 23cm	KB4MDR	OCT p.34				
TV Tuner Scanner Converter	build a converter for a tuner and scanner and receive 800-900 MHz	W6WTU	OCT p.40				
<b>MISCELLANEOUS</b>							
Consumer's Guide to HT's	A little help from your friends at 73	NASE	DEC p.28				
Dayton Digest	Dayton Hamfest	WA4BPI	APR p.32				
Novice Enhancement Buyer's Guide	anything one might want or need for new bands and modes	Staff	JUN p.34				
PCBs From TEC-200 Film	make your own PCBs	K3OF	AUG p.43				
Radio At Green Bank	impressive radio antennas	AJON	SEP p.16				
The Ducky Doctor	heat-shrink tubing	W6APZ	APR p.44				
The Glue Ribbon Solution	create your own conductive epoxy for low-resistance bonds	WB0NRU	JAN p.38				
Tube Terror	application for every tube in the warehouse	Thompson	APR p.42				
You, Too, Can Be An SOB	join this elite society of ham radio operators	K9AZG	FEB p.44				
Holiday Buyer's Guide	cornucopia of shopping tips	Staff	NOV p.20				
<b>MOBILE</b>							
The Cellular Phony Antenna	two-meter mobile antenna	WA2AJQ	APR p.38				
<b>MODIFICATION</b>							
Micro Morse	interface that fits just about any machine	WB8DQT	FEB p.40				
Revive A Dying Swan	Swan 250 new life with a home-brew vxo	WA4UZM	MAY p.38				
Semi-Rapid HT Charging	ICOM HT charging option	K3NXU	MAY p.34				
The Banker:	A memorable accessory for the TS-940 Kenwood	NA1A	DEC p.42				
The External PTT	get on packet with ICOM IC-2AT	WB5BSV	AUG p.49				
Tuner Transformation	automatic Heath SA-2500	Ferrand	APR p.46				
TV Tuner Scanner Converter	build a converter for a tuner and scanner and receive 800-900 MHz	W6WTU	OCT p.40				
Yaesu FT 209	Expanding your HT's horizons	KD2WA	DEC p.26				
<b>NEW PRODUCTS</b>							
<b>Antennas</b>							
Antenna Elevator System	Glen Matin Engineering		JUL p.15				
CB On-Glass			FEB p.19				
Larsen AD-2/70 Antenna Duplexer			MAY p.15				
MJF New Antennas and Compact Speaker			APR p.18				
Mobile Antenna	Austin Tri-Band		SEP p.15				
NCG 900-MHz Antennas			AUG p.15				
Rotating Tower Hardware	Rotating Tower Systems, Inc.		JUN p.14				
Tri-Band 2m/1.25/70CM							
Suburban Fixed Antenna	Austin Suburban Antenna		OCT p.37				
Two New Antenna Tuners	MFJ Enterprises		SEP p.14				
Valor 2 plus 2			MAR p.18				
Wide Band Antennas	Poyntek Associates		OCT p.37				
<b>Books Catalogs and Tapes</b>							
ATC Guide			JAN p.19				
Audio IC Op-Amp Applications,	3rd Howard W. Sams & Co.		APR p.19				
Cable and Connector Guide	Nemal Electronics International		JUL p.15				
Contact East	product guide		APR p.19				
Davle Catalog			MAR p.19				
First Book of Modern Electronics							
Fun Projects and Second	by Art Salsberg		APR p.19				
Forrest Mims' Circuit Scrapbook II	from Modern Electronics' columns		APR p.19				
Free Heath Catalog			MAR p.18				
Free Midian Catalog			JAN p.19				
General Catalog from	ITT Pomona		DEC p.				
Heath Magazine			JAN p.19				
How To Read Schematics	by Don Herrington		JAN p.18				



# CIE Cleveland Institute of Electronics

Accredited Member National Home Study Council



CIE is the world's largest independent study electronics school. We offer ten courses covering basic electronics to advanced digital and microprocessor technology. An Associate in Applied Science in Electronics Engineering Technology is also offered.

Study at home — no classes. Programs accredited and eligible for VA benefits.

**CIE** Cleveland Institute of Electronics  
1776 East 17th St., Cleveland, Ohio 44114

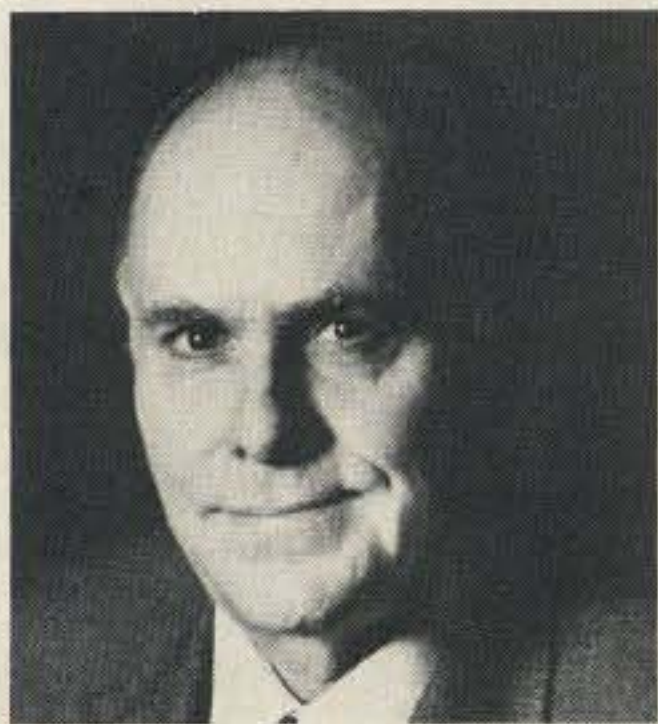
YES! I want to get started. Send me my CIE school catalog including details about the Associate Degree program.

Print Name \_\_\_\_\_  
 Address \_\_\_\_\_ Apt. \_\_\_\_\_  
 City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_  
 Age \_\_\_\_\_ Area Code/Phone No. \_\_\_\_\_  
 Check box for G.I. Bulletin on Educational Benefits  
 Veteran  Active Duty **MAIL TODAY!**

AAR84

CIRCLE 157 ON READER SERVICE CARD

## \$1,000,000 IN EXTRA SALES



## YOU CAN'T AFFORD NOT TO BUY THIS VIDEO!

Wayne Green explains how your business can generate an extra \$1,000,000 in sales. You'll get step-by-step instructions on the intelligent use of public relations as well as many tips from Green's 35 years of expertise in the publishing world.

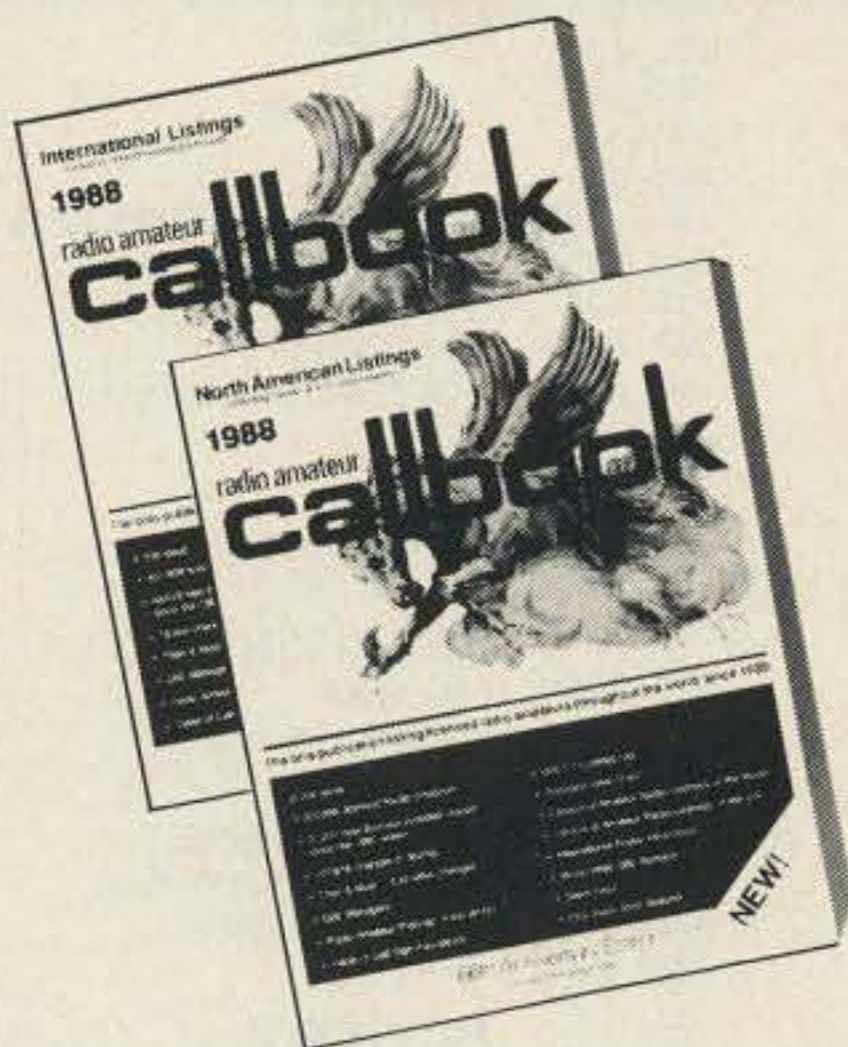
To order send \$99 (check or MC/VISA) to:

**Wayne Green Enterprises, Inc.**  
**WGE Center**  
**Peterborough, NH 03458**

or call **1-603-525-4201 x522**

CIRCLE 231 ON READER SERVICE CARD

# 1988 CALLBOOKS



## The "Flying Horse" sets the standards

Continuing a 67 year tradition, we bring you three new Callbooks for 1988.

The North American Callbook lists the calls, names, and address information for 478,000 licensed radio amateurs in all countries of North America, from Canada to Panama including Greenland, Bermuda, and the Caribbean islands plus Hawaii and the U.S. possessions.

The International Callbook lists 481,000 licensed radio amateurs in countries outside North America. Its coverage includes South America, Europe, Africa, Asia, and the Pacific area (exclusive of Hawaii and the U.S. possessions).

The 1988 Callbook Supplement is a new idea in Callbook updates, listing the activity in both the North American and International Callbooks. Published June 1, 1988, this Supplement will include thousands of new licenses, address changes, and call sign changes for the preceding 6 months.

The 1988 Callbooks will be published December 1, 1987. See your dealer or order now directly from the publisher.

- North American Callbook  
incl. shipping within USA \$28.00  
incl. shipping to foreign countries 30.00
- International Callbook  
incl. shipping within USA \$30.00  
incl. shipping to foreign countries 32.00
- Callbook Supplement, published June 1st  
incl. shipping within USA \$13.00  
incl. shipping to foreign countries 14.00

### SPECIAL OFFER

- Both N.A. & International Callbooks  
incl. shipping within USA \$55.00  
incl. shipping to foreign countries 60.00

\*\*\*\*\*

Illinois residents please add 6½% tax.  
 All payments must be in U.S. funds.

RADIO AMATEUR **callbook** INC.



Dept. B  
 925 Sherwood Dr., Box 247  
 Lake Bluff, IL 60044, USA

Tel: (312) 234-6600



CIRCLE 31 ON READER SERVICE CARD

**NEW**

## DIP METER!



**\$79.95**  
 + \$4. UPS

A DIP METER CAN BE USED FOR ADJUSTMENT OF RADIO EQUIPMENT AND ANTENNAS. WE OFFER THE DM4061 DIP METER FULLY ASSEMBLED, NOT IN KIT FORM.

- \* USE TO MEASURE RESONANCE OF ANTENNAS OVER A RANGE OF 1.5 MHz TO 250 MHz.
- \* MEASURE FIELD STRENGTH.
- \* USE AS AN ABSORPTION FREQUENCY METER TO ALIGN TRANSMITTERS.
- \* MEASURE TANK CIRCUIT RESONANCE.
- \* USE AS A SIGNAL GENERATOR TO ALIGN RECEIVERS.
- \* MEASURE AN UNKNOWN CAPACITANCE.
- \* USE A CRYSTAL IN PLACE OF COIL FOR MARKER GENERATOR/X'TAL CHECKER.
- \* MEASURE AN UNKNOWN INDUCTANCE.
- \* USE AS A CW/AM MODULATION MONITOR.

THE DM4061 COMES WITH 6 PLUG IN COILS COVERING A FREQUENCY RANGE OF 1.5 MHz TO 250 MHz. THE DM4061 USES A 9 VOLT BATTERY (INCLUDED). IN SHORT, EVERYTHING YOU NEED IN A PORTABLE HANDHELD UNIT FOR BENCH OR FIELD ADJUSTMENTS. MORE USES DETAILED IN THE RSGB HANDBOOK PAGES 18.15 TO 18.21

Price & specifications subject to change.



ELECTRONIC EQUIPMENT BANK  
 516 MILL STREET, N.E.  
 VIENNA, VA. 22180  
 VA. ORDERS: 703-938-3350

**TOLL FREE: 800-368-3170**

CIRCLE 43 ON READER SERVICE CARD



## Equipment

BVE EXFER		
Bird Model 4421	Bird Electronics Corp.	
CAE Little		
CES Model 5200 PI		
CSI CTCSS	Communications Specialists	
CSI Paging Encoder		
CSI Tone Output Switch Module	Communications Specialists	
CT-16 Satellite Interface Unit	ICOM	
Centurion Batteries		
Compact VOM		
Dash-Mounted CTCSS Encoders	Selectone Corp.	
Docking Booster	Naval Electronics	
Dual Band Docking Booster FT727	Naval Electronics	
EPI RF Amps	Electron Processing, Inc.	
Electronic Specialists Static Control		
HL-37V Compact Amplifier	Toyko Hy-Power Labs	
Hamtronics WXSAT Converter		
Heathkit Multi-Mode TNC		
ICOM IC-275		
ICOM IC-761	transceiver	
ICOM IC-375A	transceiver	
ICOM IC-1200	transceiver	
ICOM IC-900		
Jensen Stripper		
Kantronics KPC-4 Dual-Port Communicator		
Kantronics Personal Packet Mailbox		
Kantronics Dual Port Communicator	KPC-4	
Kenpro Interface		
Kenwood TR-751A		
Kenwood Dual Bander		
MFJ-1274 HF/VHF Packet TNC	MFJ Enterprises	
MFJ-931 Artificial Ground	MFJ Enterprises	
Mercer Pocket DMM		
Microphone Improved	Astatic Corp.	
Midland LMR	Two-Way FM Portable Radio Model 70-254	
Mini "Bear" Cat Scanner	Engineering Consulting	
Miniaturized DTMF-Encoders	Pipo Communications	
Miracle Flux		
Model 70-253 Portable Two-Way Radio	Midland LMR	
Model HL-725D Dual Band Amplifier	Toyko Hy-Power Labs	
Model S-4 Control Unit	Sibex	
Model TX70-1 ATV Transmitter	P.C. Electronics	
NCG Duplexers	NCG Company	
NCG Hotline-107 Hand Sets		
Net-Kall NK-1	Motron Electronics	
Nevada Caps	Nevada Communications	
Nevada Coil RC 26 "Roller Coaster"		
New All Mode ATV Receiver	Wyman Research	
News From Motron Auto Kall AK-10		
PC Weather	Technology Marketing, Inc.	
Phone Remote	Ti-Communication	
QFAX WX FAX Receive Terminal Unit	Quay Technologies	
Ramsey COM-3		
Regency Informant and Turbo-Scan 800		
Regency R-1090 Scanner		
Repeater Controller	Creative Control Products	
S-COM "5K"	Repeater Controller	
SR 100 and Smart Remote	Satellite Technology Services	
ST-216 Mobilecall Decoder	Selectone	
Scooter Standby Power Supply/ Voltage Regulator		
Simpson Probes	Mercer Electronics	
Super NiCd's for ICOM HTs	Periphex	
Super Small CTCSS Encoder	Communications Specialists	
SuperSCAF	AFtronics, Inc.	
THL HL-2K/A	Toyko Hy-Power Labs	
Teston's Checkman Mini		
The Banker	Inventron Labs	
The Regency R1080 Programmable Scanner		
Toyko Hy-Power Labs 160-W 2-Meter Amp		
Two New ICOM Base Station Transceivers		
Weller Pyropen		
Yaesu FT-109RH and FL-7000		

## Filters

Active Audio Filter	Bel-Tek	
IRI Filters	International Radio, Inc.	
New 8-Pole Crystal Lattice Filters	International Radio	

## Kits

Chip Resistor and Capacitor Kits	Communications Specialists	
DSE Field Strength Meter Kit	Dick Smith Electronics	
Jensen Tools, Inc.	service and maintenance kits	
New Heathkit Linear Amplifier Kit		
RFI-Free Choke Kit	MFJ Enterprises	

## Tools

Butane Energized Soldering Iron	Eaglestone	JUL p.15
Davle Tech Tools		JAN p.19
E.L. Jones Quick Silver	bonding paste	JUN p.15
Ergotron Inc.	Engineering Workstation	DEC p.40
Jensen TELVAC Tools		MAR p.18
Jensen Ultratorch		MAR p.19
Personal Grounding Wrist Strap	Davle Tech Inc.	DEC p.40
Rechargeable Screwdriver	Davle Tech, Inc.	FEB p.19
Rota-Lux And Rota-Tough	by Jensen Tools Inc.	NOV p.58
Soldering/Desoldering Station	by Sibex	MAY p.15
Sun-Flex Screens		MAR p.18

## Software

Commodore 64/128 Terminal Program	Kantronics	AUG p.15
HF-Link Hardware and Software		JUL p.15
Laresco Code Software		MAR p.19

JAN p.18	
FEB p.18	
JUN p.15	
JAN p.19	
MAR p.18	
JUL p.15	
MAY p.14	
DEC p.40	
MAR p.18	
JAN p.18	
MAY p.14	
JUL p.14	
NOV p.58	
MAY p.14	
MAR p.19	
JUL p.15	
MAY p.15	
AUG p.14	
JAN p.19	
JUN p.14	
JUN p.14	
JUN p.14	
JUL p.14	
FEB p.19	
MAY p.15	
JUN p.15	
SEP p.14	
JAN p.19	
JAN p.18	
SEP p.14	
MAY p.14	
OCT p.37	
APR p.18	
AUG p.14	
DEC p.40	
JUL p.14	
AUG p.15	
JUL p.15	
OCT p.38	
SEP p.14	
OCT p.37	
SEP p.14	
MAR p.19	
AUG p.14	
OCT p.38	
FEB p.19	
JUN p.15	
SEP p.14	
OCT p.38	
MAY p.14	
FEB p.18	
JUL p.14	
FEB p.18	
APR p.18	
JUN p.14	
SEP p.15	
JUL p.14	
NOV p.58	
DEC p.40	
JUN p.15	
MAR p.18	
JUL p.15	
SEP p.15	
FEB p.18	
MAR p.18	
FEB p.18	
AUG p.15	
NOV p.58	
MAY p.15	
AUG p.14	
FEB p.18	
APR p.18	

Ludvigson Tonegen Software  
Morse Code Tutor Program  
PCB Design

## PACKET

Big Time Packet

Future Packet

Packet RATS

Packet AI

Packet Directory

The External PTT

## POWER SUPPLIES

A Power Supply Primer: Part II

Battery Charger

ICOM BP-4 Charging Adapter

## QRP

QRP Antenna Farming

## RECEIVING

Cosmic QRN

The Talking Teletype

## REPEATERS

Repeater Controller PC Board

Repeater Renaissance

## REVIEWS

144-MHz Antenna Test: Three For Two  
220 Amps: Toyko Hy-Power Labs

220 Toss-up:

Alinco ALX 2T

A Tale Of Two 220 HTs:

Beginner's Luck Heil's handbook

Cadillac Of HF Rigs:

Digitize Your Dial:

First In Filtering:

Good 'n' Cheap:

Great Little Dipper:

HW-8 Replacement:

Homely On HF:

Hot It's Not:

ICOM 12-AT:

If There Only Was A 40-Meter Version:

Including The Kitchen Sink:

Inside ICOM:

It's More Micro:

Kenwood TH215A:

Kenwood 205A:

Know The Fax:

Long Time Coming:

Mellifluous Morser:

Move Fast:

New On Two:

New Life On Two:

No Vertigo:

Novice Rig:

Novices Take Note:

On Target:

Jan Crystals Booklet

Novice Voice-Class "Quick Course"  
Power Gain Systems, Build Your Own

Satellite Dish Antenna

Radio Handbook

Repeater Demo Tape

SEBHC Journal Society of Eight-Bit

Shortwave Radio Listening

with the Experts

Solid-State Projects You Can Build

The Digital Novice

Understanding Electricity and

Electronic Principles

Understanding Electricity and

Electronic Circuits

Understanding IC Operational

Amplifiers, 3rd Ed.,

Universal Electronics Publications

World Ham Net Directory

## Equipment

1.3-GHz Pocket Counter

33-CM ATV Exciter/Modulator

220 Transceiver

Ace AR-2002

Auto-Kall AK-4

for the Commodore 64  
MFJ Enterprises  
DASOFT Design Systems

control a packet station from your desk or

around the world

author predicts packet radio of the future

resume-after-transmit scanner for IC-27A

speak with TRON

packet digipeater or PBBS anywhere with

this directory

get on packet with ICOM IC-2AT

straightening out the ripples for the wall  
socket's ac

A handy NiCd power project

Our own technical editor beats the system

work the world with a few Watts

hidden messages lurking in the static!  
basic RTTY-to-voice system

build this inexpensive repeater board  
digital repeater

Cushcraft vs. Tonna vs. Cushcraft  
HL-22V and HL-102V 220-MHz Power

Amplifiers

ICOM's IC-38A and Kenwood's TM-3530A

220-MHz Mobile Transceivers

A big contender in the feather weight class

Yaesu FT-109RH and the ICOM IC-02AT

for the rank amateur

ICOM IC-781 Transceiver

Torretronics' Universal Digital Frequency

Display

AFtronic's SuperSCAF

Dick Smith Electronics Function

Generator Kit

Electronic Bank's DM-4061 Dip Meter

the HW-9 third generation QRP transceivers

Com-Rad's Hi-Rizer Antenna

Sony's AIR-8 hand-held programmable

scanner

Breaking new ground on 23 cm

The Mirage/KLM 1.2-44 LBX 44-element

1.2-GHz yagi

ICOM's IC-275A 2m Multimode

what's different about IC-751A

ICOM IC-μ2At Two-Meter HT

High-Class Hand held hammering

High-Class Hand held hammering

Alden Weatherchart FAX Recorder

Microwave Modules' MmT 220/28 220-MHz

Linear Transverter

The R.A. Kent brass CW key

Stone Mountain Engineering QSYer

Alinco's ALR-206T 144-MHz FM Mobile

Transceiver

Yaesu FT-290R II and the Tonna F9FT Yagi

Glen Martin Engineering M185A Tower

Heath HW-99 Transceiver

Ranger AR-3300 10-Meter Mobile Rig

Telex/Hy-Gain's model 218S OSCAR

antenna system

by William I. Orr

Heath Computerist Journal

by Gerry L. Dexter

by Rudolf F. Graf

QSKY Publishing

by Training & Retraining

by Training & Retraining

by Roger Melen and Harry Garland

by Mike Witowski

P.C. Electronics

Microwave Modules

Ace Communications

MoTron Electronics

DEC p.40  
SEP p.15  
FEB p.19

K1TE JUL p.44

K2TKN AUG p.24

WA3DNM MAY p.30

KE5L AUG p.29

K4NGC AUG p.33

WB5BSV AUG p.49

K4IPV JAN p.28

N0FNF DEC p.52

WB9RRT DEC p.20

W0VM APR p.36

W6HDM FEB p.50

K9EI FEB p.36



On The Bench:	OPToelectronics 1300 H Frequency Counter and Wenzel Associates Counter-Mate Frequency Standard	KT2B	APR	p.27	Consumer's Guide to HT's History of ICOM 2AT Remote Base Control Revive A Dying Swan Tune In 220	Yaesu FT-209	A little help from your friends at 73 Breaking new ground on 23 cm Work DX from your HT Swan 250 new life with a home-brew vxo convert GE MASTR-PRO receiver to 220 MHz Expanding your HT's horizons	NA5E KT2B K9EID WA4UZM W3DTN KD2WA	DEC p.28 DEC p.18 DEC p.106 MAY p.38 JUN p.32 DEC p.26
Power Play Comparison	RF concepts RFS RFC 2-23 and Tokyo Hi-Power HL 37 V 30 Watt 144 MHz Power Amp	KT2B	DEC	p.34					
Reverse Phone Patch?:	The 5000A Phone Remote	N1EJF	JUL	p.24					
Short Rave?:	Sangean ATS-803 Shortwave Receiver	N1BLH	SEP	p.30					
Six-Meter Marvels:	Microwave Modules MMT 50/144 and MMT 50/28S Transverters	KT2B	MAY	p.18					
Super Sommer:	DJ2UT XP706 Multiband Beam	N1EJF	APR	p.20					
Super Six-Meter Team:	Yaesu FT-690R II Multimode Transceiver and Tonna 50/5 5-Element Yagi	KT2B	AUG	p.18					
Table For Two?:	Kenwood TS-711A, 144-Mhz Multimode Transceiver	KT2B	APR	p.24					
Talk On Water:	sailing with ham radio	KA1MPL	JUL	p.28					
The Banker:	An accessory for the Kenwood TS-940	NA1A	DEC	p.42					
The First Duoband HT	A look at the Yaesu FT727 panel by panel	KA1HY	DEC	p.24					
The New Top Band?:	ICOM's 1.2-GHz IC-120	KT2B	FEB	p.20					
Top SCORE:	MJC's Sweepstakes Contest Results Enhancer software for the PC	KW1O	JAN	p.24					
Watt's Up:	Dick Smith VHF Wattmeter	WB6PHE	SEP	p.31					
<b>RTTY</b>									
The Fakeroo	can this kid copy RTTY by ear	K9AZG	MAY	p.32					
You, Too, Can Be An SOB	join this elite society of ham radio operators	K9AZG	FEB	p.44					
<b>TEST GEAR</b>									
Dry Cell Tester	project for the technical greenhorn	W6WTU	OCT	p.48					
The Cap Checker	build this simple analog capacitance meter	VE6BGL	MAR	p.42					
<b>THEORY</b>									
A Guided Tour of 1.2 GHz	23-cm band is the least understood Novice Enhancement	KT2B	JUN	p.24					
Linear ICs	ICs primer	K4IPV	OCT	p.26					
<b>TRANSCEIVERS</b>									
40 Meters In A Nutshell	7-MHz transceiver	KG5B	MAR	p.26					
					<b>TRANSMITTING</b>				
					The Calibrated Drake				
					avoid FCC pink slips				
					K9ARZ				
					MAR p.40				
					<b>TUTORIAL</b>				
					A Guided Tour of 1.2 GHz				
					23-cm band is the least understood Novice Enhancement				
					KT2B				
					JUN p.24				
					A Power Supply Primer: Part II				
					straightening out the ripples for the wall socket's ac				
					K4IPV				
					JAN p.28				
					Gunn and IMPATT Devices				
					safe methods for testing microwave diodes				
					WB6IGP				
					OCT p.30				
					Linear ICs				
					ICs primer				
					K4IPV				
					OCT p.26				
					The Digital Novice				
					basics of a ham's digital world				
					K9EI				
					JUN p.28				
					Troubleshooting Tips				
					tricks for testing leakage				
					W9NGP				
					OCT p.45				
					Signal Strength Reporting				
					answer to "S-9, OM"				
					W2OZH				
					NOV p.15				
					<b>VHF/UHF</b>				
					220-MHz Portable Pocket J-Pole				
					a low-cost quickie with more dB-gain				
					KB6MIF				
					SEP p.27				
					440-MHz Repeater Antenna				
					build this antenna in the public safety and commercial spectrum				
					WB2EDV				
					SEP p.41				
					General Purpose VHF/UHF Antenna				
					build a discone				
					WA1GPO				
					SEP p.38				
					History of ICOM 2AT				
					The World's most popular Hand held amazing VHF/UHF DXing				
					KT2B				
					DEC p.18				
					Horseflies and Grid Squares				
					two-meter mobile antenna				
					WA2AJQ				
					APR p.38				
					The Cellular Phony Antenna				
					ultimate in simplicity				
					W9THN				
					SEP p.40				
					The L'il Fixer				
					build this VMOS transverter				
					convert GE MASTR-PRO receiver to 220 MHz				
					W3DTN				
					JUN p.32				
					The Two-Meter Transverter Project				
					Tune In 220				
					Yaesu FT-209				
					Expanding your HT's horizons				
					KD2WA				
					DEC p.26				

# 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 (8 1/2 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.

I am looking for a code practice program for my CoCo (Radio Shack's color computer).

**Brandon Armstrong**  
635 Chamberlain #8  
El Cajon CA 92020

I am looking for modifications, additions, and improvements for the HAL ST-6 Teletype converter. Also, need manual and schematic for TS-888 Teletype test set.

**Marvin Moss W4UXJ**  
P.O. Box 28601  
Atlanta GA 30358

Need service info for the following. I will purchase or pay copy cost. Unicom Electronics Power Supply Model Ps-11R, Tandy 64K

Color Computer II Model 26-3127, EMP/GTS Manual Mini Modem Model MM-101 (manufactured by Elec and Johnson Messenger CD Model 323, Apple IIe Pro System Duo-Disk, Imagewriter, Printer Monitor II, ICOM Model 735 Ham Transceiver, Loonam Assoc. Modem Model FM30, Designers for Industry Mutual Conductance Tube Tester Model TV2CU (F.A.A.), Amplifier/Marker Jerrold Model CM-6C (F.A.A.), Signal Generator URM-64A/TS-419, and RCA Video Disc Player Model SGT-250.

Need the following. Please state price and/or condition in correspondence. Two (2) Transistors MRF 455 A; Five (5) Tubes 7868; Ten (10) lamps #12 6V for Bogen PA Amps; One (1) Each Bandswitch for Panasonic rF 2800 Receiver #RSR 98W or Equivalent; One (1) Printer and Disk Drive for the Tandy Color Computer II Model 26-3127 and One(1) each Z-80/CPM for the Apple IIe Pro System.

**Mike Adams**  
**Haney Vo-Tech Center**  
3016 Hwy 77  
Panama City FL 32405

I need schematic and service info for a Tektronics model 502 Oscilloscope. Will gladly pay copying and mailing costs.

**Gordon Fulp**  
4740 Scotch Pine Lane  
Placerville CA 95667

Can anyone supply a photostat or other copy of the Electronics Illustrated article (circa 1970) that dealt with the schematic and power supply for the micro oscilloscope featured in the January 1970 issue.

**Randy White KB4ALH**  
506 Robinhood Dr.  
Seneca SC 29678

I am seeking schematic and alignment data for a National NC-109 Communications Receiver. First submission gets payment, if not prohibitive. Submit proposal.

**Lloyd Williams KA0ZCY**  
RR 1, P.O. Box 248  
Baxter Springs KS 66713

I am looking for a manual or schematic for COMMERCIAL TRADES INSTITUTE SC 36 Scope. Needs a transformer.

**Jim Wisdom K4HCG**  
3308 Cobblestone Ct.  
Raleigh NC 27607

I am looking for other people who have built the project found in the May '80 issue of 73, called "The Beachside 2-Meter Beam"

(p. 132). I've built it, but have tried everything without success to get rid of the high SWR, and to even get some range on it. Please share your success tips with me.

**Dick Wolf N8IHN**  
1890 Big Trail Rd.  
Walled Lake MI 48088

I am looking for a manual or any information on a Gonset G-150 Business Communicator. It appears to be a single channel VHF transceiver, but I have no x-stal information. Would gladly pay costs for copying manual, or would make copy of your original and return. Thanks and 73's.

**Daron Wilson N7HQR**  
P.O. Box 714  
Toledo, OR 97391

EICO 470 o'scope power transformer needed. Anyone out there have a junker scope with a good transformer? Send price to:

**Pete Haas**  
P.O. Box 702  
Kent, Ohio 44240

I'm looking for a manual/schematic/calibration procedure for a Boonton RF Voltmeter, Model 91CA. Also a manual/schematic for a Realistic DX-150-B receiver.

**James W. Lee**  
**WB4GWX/AAV6UX**  
5004 Ridge View Court  
No. Richland Hills, TX  
76180-2521



# MISSOURI RADIO CENTER

102 N.W. Business Park Lane, Kansas City, MO 64150 816-741-8118

Call Toll Free — 9am - 6pm Mon. - Fri., 9am - 2pm Sat.  
In Missouri Call — 816-741-8118

# 1-800-821-7323

TRADE INS ACCEPTED  
MasterCard — VISA — COD Welcome

## YAESU Keeps You On Top Of The World!



**FT-757GX/II**  
"CAT SYSTEM"

- All Mode HF Transceiver
- Dual VFO's
- Full Break-in CW
- 100% Duty Cycle



**FT-767GX** HF/VHF/UHF  
BASE STATION

- Add Optional 6m, 2m & 70cm Modules
- Dual VFO's
- Full CW Break-in
- Lots More Features



**FTH-2005/7005**

- Commercial Grade HT's
- 5W Output
- Coverage 150-174 MHz  
450-474 MHz
- Call For Low, Low Prices



**FT-290R**

- 2M, All Mode Portable Transceiver
- Use Either 12V Battery (25W Output) or C-cell Battery Pack (2.5W Output)
- SSB, CW, FM
- Ten Memories, Dual VFO's
- FT-690R for 6M Operation



**FT-109RH**

- 220 MHz Handheld
- 5W Output
- Ten Memories
- Battery Saver
- Memory And Priority Scanning
- FT-209RH - 2m
- FT-709RH - 440 MHz



**FT23/73R**

- Super "Mini" HT's
- Zinc-Aluminum Alloy Case
- 10 Memories
- 140-164 MHz, 440-450 MHz
- 2W Battery Pack or Optional 5W Pack



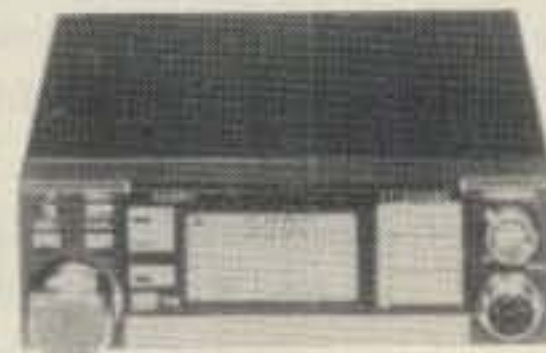
**FT-727R**

- Two Affordable Radios in One
- 2m/440 MHz Handheld
- 5W On Both Bands
- Ten Memories
- Multi-Scan Systems
- Battery Saver



**FT-211RH**

- 2m, FM, Mobile
- 45W Output
- LCD Readout
- Ten Memories
- Also, FT-711RH For 440 MHz



**FT-2700RH**

- Dual Band Mobile FM Transceiver
- 2m/70cm
- 25W Output
- True Full Duplex Operation



**FL-7000**

- Solid-State Amp For 160-15M
- Built-In Power Supply
- Automatic Tuner
- 1200W PEP Input



### YAESU ACCESSORIES

- Antenna Tuner
- Battery Packs
- Charging Units
- Power Supplies
- Microphones
- DC Car Adapter
- SWR/Power Meters
- And Lots More



**FRG-8800**

- General Coverage Receiver
- 150 kHz to 29.999 MHz
- All Mode Reception
- Multi-Scanning Feature
- Two Built-in 24 Hour Clocks



**FRG-9600**

- All Mode Receiver
- Covers 60 MHz - 905 MHz
- 100 Memory Channels
- Multiple Scanning Systems
- YAESU CAT System



**FT-726R**

- All-Mode Tribander
- 10w on 2 meters
- Choose from 10m, 6m, 430-440 MHz, 440-450 MHz
- 11 Memories

AEA  
ALINCO  
AMERITRON  
ASTRON  
AVANTI  
B & W  
BENCHER  
BUTTERNUT  
COMM SPEC  
CUSHCRAFT  
DAIWA

HUSTLER

HYGAIN

ICOM

• MOST ORDERS SHIPPED SAME DAY •

J.I.L.

KANTRONICS

KDK

CIRCLE 50 ON READER SERVICE CARD



# Yaesu's mini HTs. The smallest, smartest, toughest radios. Anywhere.

Whether you're a Novice or Extra class operator, you're sure to appreciate the high power, durability and size of Yaesu's FT-23R Series mini-HTs.

To begin with, you'll find a model that's right on your wavelength. The 2-meter FT-23R. The 220-MHz FT-33R. Or the 440-MHz FT-73R.

Whichever you choose, you benefit from incredibly small packaging. (Take a look at the actual size photo.) Aluminum-alloy cases that prove themselves reliable in a one-meter drop test onto solid concrete. And moisture-resistant seals that really help keep the rain out.

But perhaps best of all, each radio blends sophisticated, micro-processor-controlled performance with surprisingly simple operation. In fact, it takes only minutes to master all these features:

Ten memories that store frequency, offset and PL tone. Memory scan at 2 frequencies per second. Tx offset storage. Priority channel scan. Channel selection via tuning knob or up/down buttons. PL tone board (optional). PL display. Independent PL memory per channel. PL encode and decode. LCD power output and "S"-meter display. Battery-saver circuit. Push-button squelch override. Eight-key control pad. Keypad lock. High/low power switch.

The FT-23R comes with a 7.2-volt, 2.5-watt battery pack. The FT-73R with a 7.2-volt, 2-watt pack. And the FT-33R with a powerful 12-volt, 5-watt pack.



You can choose the miniature 7.2-volt, 2-watt pack shown in the photo below. And all battery packs are interchangeable, too.

And consider these options: Dry cell battery case for 6 AAA-size cells. Dry cell battery case for 6 AA-size cells. DC car adapter/charger. Programmable CTCSS (PL tone) encoder/decoder. DTMF keypad encoder. Mobile hanger bracket. External speaker/microphone. And more.

Check out the FT-23R Series at your Yaesu dealer today. Because although we can tell you about their incredible performance, toughness and small size, seeing is really believing.



## YAESU

Yaesu USA 17210 Edwards Road, Cerritos, CA 90701 (213) 404-2700. Repair Service: (213) 404-4884. Parts: (213) 404-4847.  
Yaesu Cincinnati Service Center 9070 Gold Park Drive, Hamilton, OH 45011 (513) 874-3100.

Prices and specifications subject to change without notice. PL is a registered trademark of Motorola, Inc. FT-33R shown with optional FNB-9 battery pack.

CIRCLE 165 ON READER SERVICE CARD



# KENWOOD

...pacesetter in Amateur Radio

NEW!

## Affordable DX-ing!

### TS-140S

HF transceiver with general coverage receiver.

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

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



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

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

#### Optional Accessories:

- **AT-130** compact antenna tuner • **AT-250** automatic antenna tuner • **HS-5/HS-6/HS-7** headphones • **IF-232C/IF-10C** computer interface • **MA-5/VP-1** HF mobile antenna (5 bands) • **MB-430** mobile bracket • **MC-43S** extra UP/DOWN hand mic. • **MC-55** (8-pin) goose neck mobile mic. • **MC-60A/MC-80/MC-85** disk 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).
- Pre-amplifier 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.

# KENWOOD

KENWOOD U.S.A. CORPORATION  
2201E. Dominguez St., Long Beach, CA 90810  
P.O. Box 22745, Long Beach, CA 90801-5745