Issue #301

OUR 25th ANNIVERSARY YEAR!

October 1985
$2.50 USA
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73 for Radio Amateurs®

A CWC/P Publication

International Edition

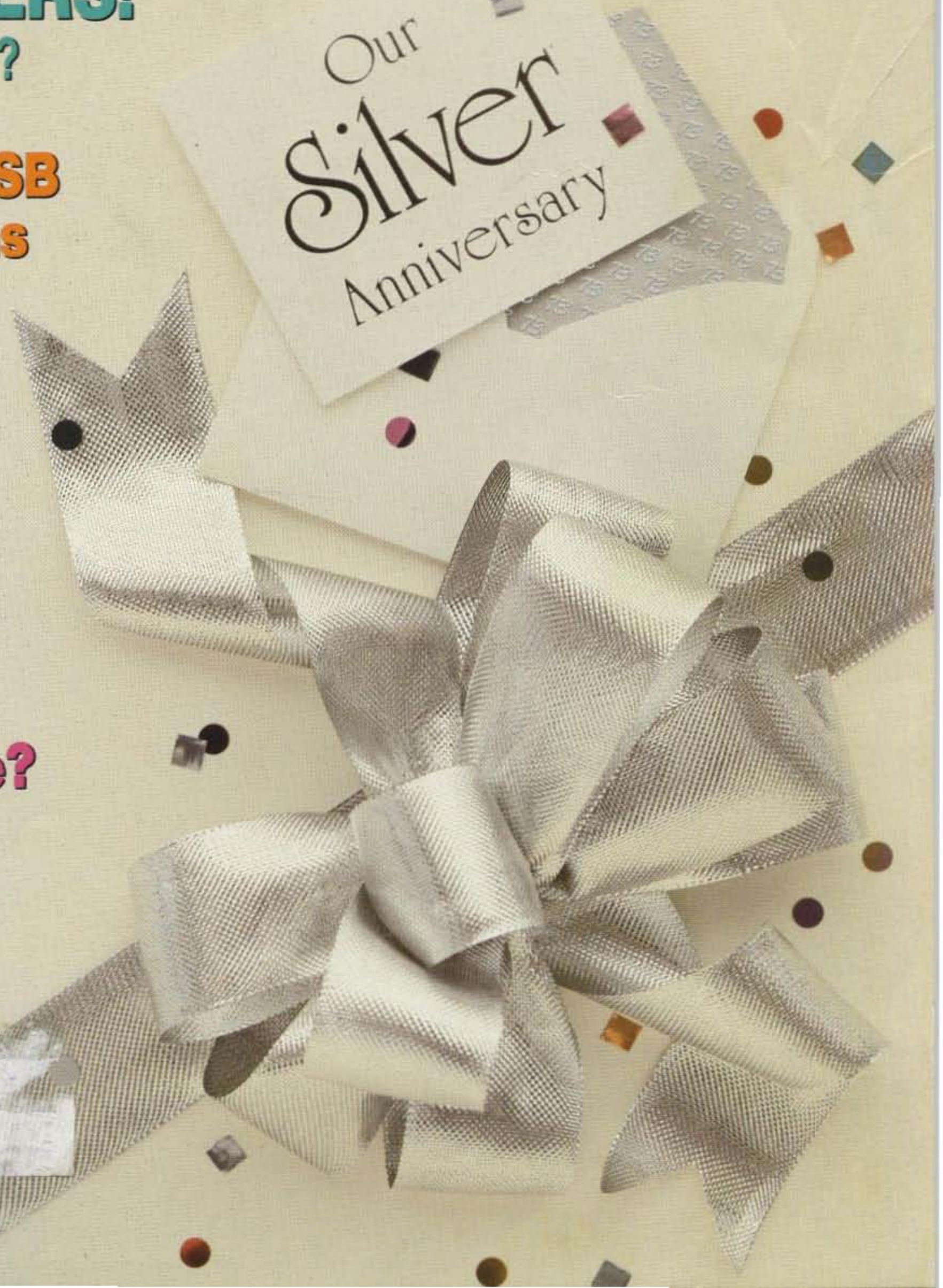
ANNIVERSARY PRIZE-WINNERS!
Is Your Name Inside?

1985 15/20m SSB World Champions

Old Tubes Never Die!

High-Flying OSS Radio

Floppy Disks: Worth The Price?



Read "What?"
Page 4

ICOM HF Transceiver IC-751

The Standard of Excellence in HF Base Stations

The IC-751 is the most advanced transceiver available today. It's a competition grade ham receiver, a 100KHz to 30MHz continuous tuning general coverage receiver AND a full-featured all mode solid-state ham band transmitter. The IC-751 also covers the new WARC bands, MARS frequencies, and is AMTOR compatible.

Important Standard Features. Compare these important standard features in this "top of the line" base station:

- 100KHz - 30MHz Receiver
- 105dB dynamic range
- QSK — full break-in CW (nominal speed 20WPM)
- FM Mode Standard
- High-grade FL-44A 455KHz SSB filter
- 32 tunable Memories with lithium battery backup
- 100% Duty Cycle Transmitter
- Passband Tuning
- 12V DC operation
- Adjustable AGC
- Adjustable Noise Blanker
- RIT/XIT with separate readout
- IC-HM12 Microphone with Up/Down Scan
- Continuously adjustable transmit power

Options. IC-EX310 speech synthesizer, internal IC-PS35 power supply, external IC-PS15 or IC-PS30 system supply, IC-SM8 two-cable desk mic, IC-SM6 desk mic, RC-10 external controller, and a variety of filters.

FILTER SPECIFICATIONS

Filter	Model	Center Freq. (KHz)	-6dB (KHz) Width
STANDARD FILTERS			
AM Ceramic	CFW 455 IT	455	6.0
SSB (PBT) XTAL	FL-30	9011.5	2.3
FM Filter	9M15A	9011.5	15 (-3dB)
SSB Narrow (Hygrade Crystal)	FL-44A	455	2.4
OPTIONAL FILTERS			
CW Narrow	FL-52A	455	0.500
CW Narrow	FL-53A	455	0.250
SSB Wide	FL-70	9011.5	2.8
CW Narrow	FL-32	9010.6	0.500
CW Narrow	FL-63	9010.6	0.250
AM	FL-33	9010.0	6.0

Operating From 12V, the IC-751 is also available with an optional internal AC power supply, the IC-PS35...for the winning edge in field day competition.


Shown with IC-PS35

The IC-751 provides superior performance for all amateur radio operators...from novice to extra class. See the IC-751 at your local ICOM dealer.

Now with a ONE YEAR Warranty!

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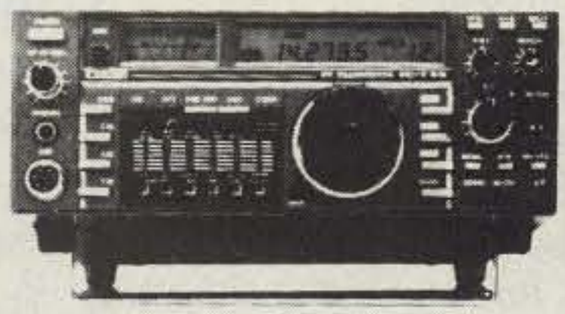

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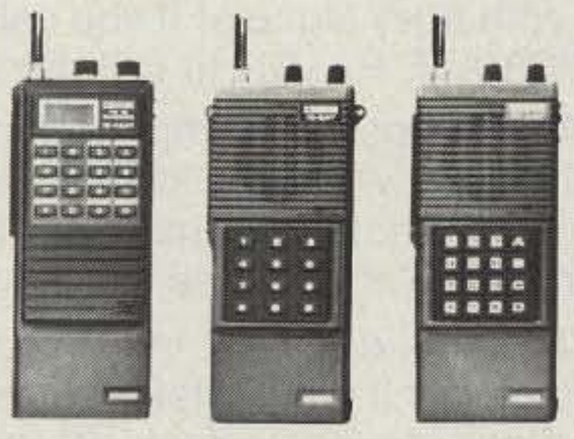

IC-02AT IC-2AT IC-3AT
IC-04AT IC-4AT

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Prices, specifications, descriptions subject to change without notice. Calif. and Arizona residents please add sales tax

THINGS TO LOOK FOR *(AND LOOK OUT FOR)* IN A PHONE PATCH

- A patch should work with any radio. AM, FM, ACSB, relay switched or synthesized.
- Patch performance should not be dependent on the T/R speed of your radio.
- Your patch should sound just like your home phone.
- There should not be any sampling noises to distract you and rob important syllables. The best phone patches do not use the cheap sampling method. (Did you know that the competition uses VOX rather than sampling in their $1000 commercial model?)
- A patch should disconnect automatically if the number dialed is busy.
- A patch should be flexible. You should be able to use it simplex, repeater aided simplex, or semi-duplex.
- A patch should allow you to manually connect any mobile or HT on your local repeater to the phone system for a fully automatic conversation. Someone may need to report an emergency!
- A patch should not become erratic when the mobile is noisy.
- You should be able to use a power amplifier on your base to extend range.
- You should be able to connect a patch to the MIC and EXT. speaker jack of your radio for a quick and effortless interface.
- You should be able to connect a patch to three points inside your radio (VOL high side, PTT, MIC) so that the patch does not interfere with the use of the radio and the VOL. and SQ. settings do not affect the patch.
- A patch should have MOV lightning protectors.
- Your patch should be made in the USA where consultation and factory service are immediately available.

ONLY
PRIVATE PATCH III
GIVES YOU ALL
OF THE ABOVE

BEWARE OF INFERIOR IMITATIONS

NEW

PRIVATE PATCH III
SIMPLEX SEMI-DUPLEX INTERCONNECT

NEW

With an amazingly low price, the all new PRIVATE PATCH III is the most powerful personal phone patch system available. You can use it simplex, repeater aided simplex (from your base) or semi-duplex (at the repeater). That's right, you will never have to buy another patch. PRIVATE PATCH III does it all! There are many new and important features which were formerly only available in our top commercial models.

With a flick of the new connect switch you can patch your friends on the repeater into the phone system. One of them may need to report an emergency!

No hassles with busy signals! If you call a number that is busy, just put your MIC down and relax. PRIVATE PATCH III will disconnect automatically.

The new CW ID keeps you completely informed as to patch status. ID occurs when you access and again when you disconnect. ID is also sent after toll call attempts, all automatic disconnects, manual disconnect and when timeout is imminent. And of course your CW ID chip is free.

PRIVATE PATCH III does not interfere with the normal use of your base radio. A new audio pre-amp permits audio take off before the VOL. control. As a result, the VOL. and squelch settings do not affect patch operation. Of course you can also connect PRIVATE PATCH III to the MIC and EXT speaker jacks as before.

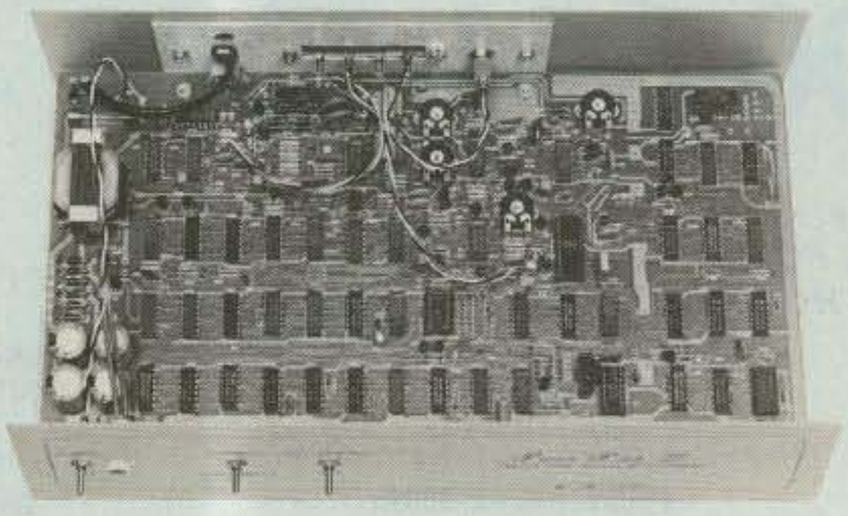
A new digit counting system makes the toll restrict positive even in areas where you do not have to dial "1" first. A secret five digit code disables the toll restrict for one toll call. Re-arm is automatic.

Additional new features: MOV lightning protection — Three digit access code (eg.*93) — Spare relay position on board — Plus former features: 3/6 minute timeout timer — Digital fast VOX (pat. pend.) — 115 VAC supply — Modular Jack and cord plus much more!

Please write or call for our four page brochure to get the complete story.

Options:
FCC approved coupler
12 VDC or 230 VAC power

Warranty? Yes, one full year!



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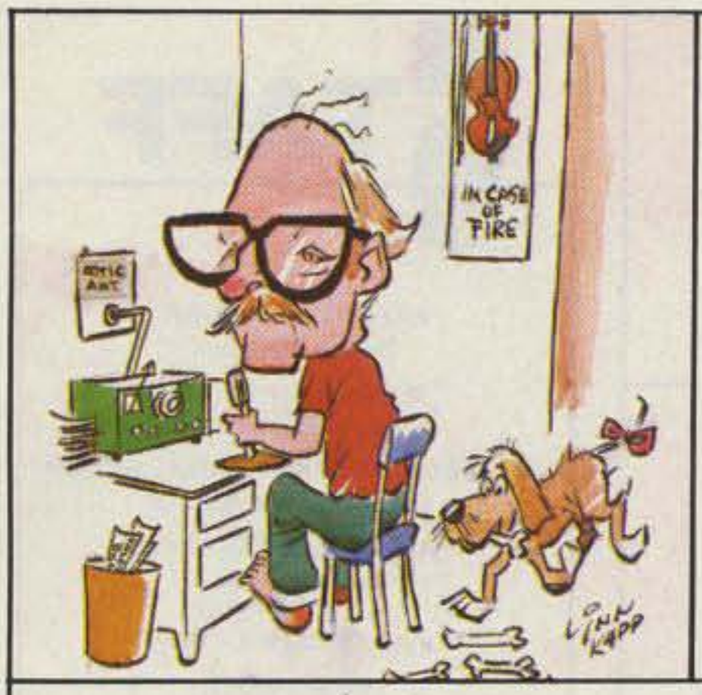

73® for Radio Amateurs

ISSUE #301 OCTOBER 1985

On the Cover:
Photography by Frank Cordelle, Bennington, New Hampshire. Design by Dianne Ritson. **Above:** Bandel "Pappy" Linn K4PP is one of our Silver Eagle winners. We asked him for a self-portrait.

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WHAT?

News from the Publisher

Welcome to our 25th Anniversary issue. There they are—the words very few ever get to write and print. Even though I'm a hardened veteran of almost eleven of these crazy twenty-five and know a lot about the other fourteen, I get soft when I try to describe what this issue means in itself and what it has in it as well. I don't mind saying that I've been brought to tears this year—me, a big rugged guy—when thinking about the people and efforts that have made *73* a go.

Why don't we start with some *73* stats. Only one of every 100 new magazines lasts for more than 10 years; those lasting 25 years are approximately .007 *percent* of new starts, at best. *73* has printed more than 43,510 pages so far. If one person—ONE PERSON—worked full-time for 25 years, that's 52,000 hours, minimum. We recently purchased article #11582. We have paid more than $1.62 million to our authors, columnists, artists, and photographers.

Scary. Just like trying to narrow down our Silver Eagle winners (page 18). Before you turn there, I want you to know that Wayne W2NSD wasn't even considered. (He already has one, anyway.) As I explained to Wayne in August when he was about to make applesauce (for the recipe, see "Never Say Die," October, 1979), no way. "What do you have in mind?" asked Wayne. "Not telling *you*, that is for sure." When you're the founder and heart and soul of a magazine for 25 years, you deserve the best sort of surprise. That's what Wayne will get. We will let you know what it is as soon as it's done. Think video and thank SWAT (Secret Wayne Appreciation Team).

Thank, too, our advertisers. Without their daring and dollars over the years, you never would have had the opportunity to buy what you did and do. You never would have been able to see the kinds of reviews and new product announcements (including some weird ones this month) you regularly expect. Thank, too, companies whose products are good, operations small, and dreams unlimited. Thank again the biggies such as ICOM, Kenwood, and Yaesu who strive to beat one another and in so doing engineer another miracle.

How about advertising heroes. One group is made up of purchasers of the postcards bound into the middle of this issue. We thought this would be a relatively cheap, really revolutionary way to reach buyers quickly—and to get a response.

The second bunch is really simple to name but hard to describe: advertisers who were with us in 1960 and are still with us in 1985. Barry Electronics. Fair Radio. International Crystal. Radio Amateur *Callbook*. Slep Electronics. Do me a favor, please, and get in touch with these people—if only to say thanks for supporting *73*. They have as much of a share in helping celebrate our 25th as anyone else—and probably more.

And then there's you, our reader, last in line you think. Wrong. My monthly calls to letter-writers went out this month to Ohio, Maine, Kansas (randomly selected), and to a country overseas. I hope *that* writer can get back to us at some time, by the way. When you carefully reach the right name at the right address and the amateur who's contacted *you* says, "No, wrong number!", something is wrong. As part of our 25th year, I'd like to let everyone around the world know that *73* appreciates hams who care enough about their hobby to contact us, whether they agree or disagree with what we're doing.

We had one goal when we started to put this issue together: Be truthful, the rest be damned. We ended up with more. To dedicate it to Wayne Green W2NSD. To do some special things for randomly-selected readers representing DX (1), DC (1), and the fifty states (50). Here they are:

1. Rune Eriksson SM6BNE, Sweden
2. Walter Scott W3UTJ, District of Columbia
3. Francis Dole KB4FHR, Alabama
4. Lew M. Williams, Jr., Alaska
5. W. Philip Sawyer WD4FAK, Arizona
6. Joe Karr, Arkansas
7. Jimmie Hardy, California
8. Raymond Elsner, Colorado
9. Eugene Modzelewski, Connecticut
10. Dave Stepnowski KC3AM, Delaware

Continued on page 62

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- Digital VFO's. 50-Hz, 500-Hz or 5-kHz steps. F. LOCK switch.
- Ten memories store frequency, band, and mode data. Each memory may be tuned as a VFO.
- Lithium batt. memory back-up.
- Memory scan.
- Programmable band scan.
- Fluorescent tube digital display of frequency (100 Hz resolution) or time.
- Dual 24-hour quartz clocks, with timer.
- Three built-in IF filters with NARROW/WIDE selector switch. (CW filter optional.)
- Squelch circuit, all mode, built-in.
- Noise blanker built-in.
- Large front mounted speaker.
- RF step attenuator. (0-10-20-30 dB.)
- AGC switch. (Slow-Fast.)
- "S" meter, with SINPO scale.
- High and low impedance antenna terminals.
- 100/120/220/240 VAC operation.
- RECORD output jack.
- Timer REMOTE output (not for AC power).
- Muting terminals.

R-1000 High performance receiver • 200 kHz-30 MHz in 30 bands • AM, CW, SSB • 3 IF filters • noise blanker • RF attenuator • S-meter • 120-240 VAC • muting terminals • built-in speaker • digital display/clock/timer

R-600 General coverage receiver • 150 kHz-30 MHz in 30 bands • AM, CW, SSB • IF filters • noise blanker • RF attenuator • S-meter with SINPO scale • front mounted speaker • 3 antenna inputs • 100-240 VAC operation • record jack • muting terminals • digital display

Optional accessories:

- VC-10 VHF converter for R-2000 covers 118-174 MHz
- YG-455C 500 Hz CW filter for R-2000
- HS-4 Headphones
- HS-5 Deluxe headphones
- HS-6 Lightweight headphones
- HS-7 Micro headphones
- DCK-1 DC cable kit for 13.8 VDC operation
- AL-2 Lightning and static arrester
- Service manuals are available for all receivers and most accessories.

Additional information on Kenwood all-band receivers is available from authorized dealers.

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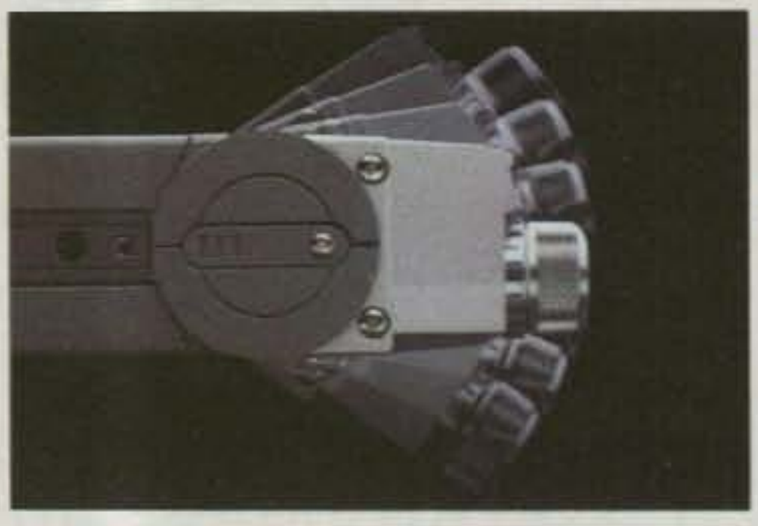
Incredible Flexibility!

TM211A/411A

The TM-211A 2 m and the TM-411A 70 cm transceivers combine ultra-compact size with an impressive array of features to give you maximum flexibility in mobile operations. The TM-211A and the TM-411A may be *stacked* for even more operating flexibility!

- **External speaker.**
  A high-quality external communications speaker is provided for the best sound quality.
- **5-channel memory with multiple scanning functions.**
  The transceiver can scan the memory channels or can be programmed to scan all or a portion of the band.
- **25 watts high power.**
  5 (adjustable to approx. 15 watts) low.



- **7-position, tilting control panel.**
  The unique control panel is designed to increase operating and installation ease. The panel may be moved to provide the best viewing angle and handiest access to controls.
- **DCS—Digital Code Squelch.**
  Program your transceiver to respond only to a specific digital code—much more secure than CTCSS.
- **Priority Watch.**
  The "Priority Watch" mode lets you keep an eye on an important channel when monitoring other frequencies.
- **Extended frequency coverage on 2 m.**
  TM-211A covers 142-149 MHz—includes most MARS and CAP frequencies.
  TM-411A covers 438-450 MHz

Optional accessories:

• CD-10 call sign display • PS-430 DC power supply • KPS-7A power supply • MC-42S regular UP/DOWN hand microphone • MC-55 (8-pin) mobile microphone with time-out timer • MA-4000 dual band mobile antenna with duplexer • SWT-1/2 2 m/70 cm 100 W antenna tuners • SW-100A/B SWR/power meters • PG-3A noise filter • MB-201 extra mobile mount • SP-40 compact mobile speaker

CD-10 DCS call sign display

CD-10 maximizes your use of Kenwood's new signalling concept, Digital Code Squelch. DCS uses a data string to open squelch on a receiver that has been programmed to accept the transmitted code. The transmitting station's call is programmed in ASCII. The CD-10 displays the station's call sign, and stores it in memory. Twenty calls may be stored. The CD-10 may be used with **any** receiver to display calls heard.

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

More product information is available from authorized Kenwood dealers.

KENWOOD

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Compton, California 90220

QRX. . .

EDITED BY PERRY DONHAM KW1O

Change-Up

BILLING IT AS THE BIGGEST CHANGE in its 65-year history, **Herb Nelson W9IGL** of the **Radio Amateur *Callbook*** has announced a new look for the 1986 edition. Published on December 1st, 1985, the new *North American Callbook* will list amateurs not only in the United States, but also those in Canada, Mexico, Central America, the Caribbean, and Greenland. Also published on December 1st, the 1986 *International Callbook* contains the call, name, and address of amateurs everywhere else. Both books include the *Callbook*'s "extras": international postal information, worldwide QSL bureaus, a census of hams, abbreviations, and so forth. A third publication, available June 1, 1986, is the *Callbook Supplement*. Instead of producing three supplements per year per *Callbook*, this single volume will be offered—it contains new licensees, address changes, and call changes for both the North American and the International editions. Anyone who has spent an hour digging through three supplements to find a new call will appreciate having everything in one book. The new format will also allow it to be sold through dealers, something that was difficult at best with the old supplements. It isn't too early to think about Christmas! You can get information about *Callbook* products by writing Radio Amateur Callbook, Inc., 925 Sherwood Drive Box 247, Lake Bluff IL 60044.

Free Passage

NASA IS LOOKING for a few good hams to participate in an experiment involving a geostationary satellite. Volunteers will be given free access for two years to the transponder, which has an uplink of 28–30 GHz and a downlink of 18–20 GHz; the bird is scheduled for launch in 1989. You'll need a ten-foot dish and an "expression of intent" on file with NASA to play. Complete details are contained in a brochure available from Ron Schertler, MS54-6, NASA Louis Research Center, Cleveland OH 44135.

What A Guy!

A SECRET CONTEST has been running on the *73* computer bulletin board—we've been looking for the 1000th caller. And the winner is (drum roll): **Jean Faguy VE2AKJ** of Quebec city. Jean unwittingly won himself a one-year subscription to his favorite ham rag. *73*, of course! The RBBS is rapidly closing in on caller number 2000, and with good reason. On it you can find scads of software for your microcomputer, current news including electronic editions of the *W5YI Report* and *The ARRL Letter*, DX news, bulletins, and plenty of people to talk to via the personal mail system. You can even submit your latest article for consideration, or tell the staff how wonderful you think we are! The number is (603)-924-9809, 300 or 1200 baud. Send a carriage return or two to get things rolling.

Empty Shelves

AN AMAZING THING HAPPENED in Derry, New Hampshire. Hundreds of rabid hams waving fistfuls of money converged on **Rivendell Electronics** during what looked like a run on the bank. The occasion? **ICOM Day!** I caught up with **Evelyn Garrison KA7LPK** of ICOM; from the throng surrounding her I thought perhaps she was giving away IC-02ATs as party favors. Alas, there were no freebies, and Evelyn was standing in front of an empty table—a table which had held stacks of ICOM HTs and low-band rigs (including the new IC-735—review next month). She recounted the story of one fellow who had driven 600 miles just to get a deal on his favorite rig! He went home happy. Standing next to Evelyn were **George N7EZJ and Annie Buxton** of AEA, demonstrating their new software to an enraptured crowd. Short ad: Look next month for a new packet-radio controller from AEA for the Commodore 64. It will be a plug-in module that includes a software-selectable HF or VHF modem, a menu-driven terminal program, and a hardware HDLC. Just run a cable from the cartridge to your radio and you're on packet! Don't miss ICOM Day at your local dealer—tell him *73* sent you.

Think Space!

WHAT DO YOU THINK the United States should be doing in space? The **National Space Institute** has launched **Space Outreach '85**, a program designed to solicit ideas from the general public as to potential uses of space for social and economic benefit. The rules are pretty simple. Suggestions may be no longer than 750 words. You should not submit scientific or exploration projects such as a moon base or a Mars mission, since these ideas are already being looked at by the government. And your proposal should be creative, innovative, and feasible. Each entry will be reviewed by a panel of judges which includes Walter Boyne, Director of the Smithsonian's National Air and Space Museum, Evert Clark, Technology Editor of *Business Week*, former astronaut Michael Collins, and Robert Cowen, science writer for *The Christian Science Monitor*. Outstanding submissions will be acknowledged with an award, and the person who submits the best idea will receive an all-expense-paid trip to see a space-shuttle launch. All of the proposals submitted will be compiled and presented to Congress, NASA, and the newly-created National Commission on Space. To get more information on Space Outreach '85, or to send in an idea, contact The National Space Institute, West Wing #203, 600 Maryland Ave SW, Washington DC 20024; (202)-484-1111. The deadline for entries is November 15, 1985.

Smilin' Island

THE ARRL's DX ADVISORY COMMITTEE has voted to add the **Pribilof Islands** to the DXCC country list. The ten-year effort to put KL7/P on the list boiled down to one issue: While the Pribilofs are 260 miles away from mainland Alaska, they are only 200 miles from the Aleutian Islands. Does "separation by water" apply in this case? In a document titled "Guidelines for Interpreting the DXCC Country Criteria," paragraph 2.6(b) states, "Islands. . .which are geographically located adjacent to an island or island group which have a common government will be considered as separate entities provided there is at least 500 miles of open water separation between the two areas in question." This seems to say that the Pribilofs do *not* qualify for DXCC country status. But given the seemingly willy-nilly method of filling the DXCC list used in the past, it will come as no surprise if the ARRL Awards Committee votes to accept the DXAC's recommendation.

Stringers

AS ALWAYS, we had help in putting "QRX" together. This month it came from the *W5YI Report, The ARRL Letter, Westlink,* N2BFG, W1QMS, *Amateur Satellite Report*, Charles Kelsey, and Tony Reichardt. Don't forget to send your news items to *73* Magazine, Editorial Department, 80 Pine Street, Peterborough NH 03458, Attn: "QRX."

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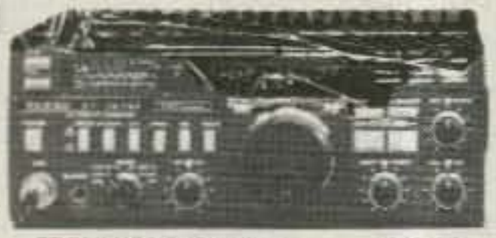

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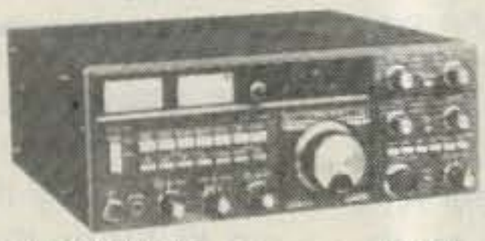

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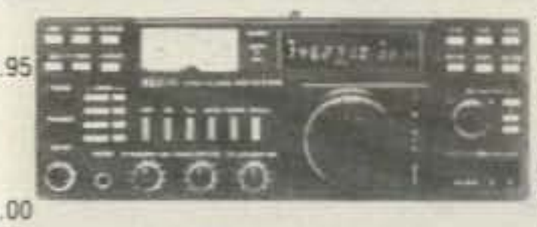

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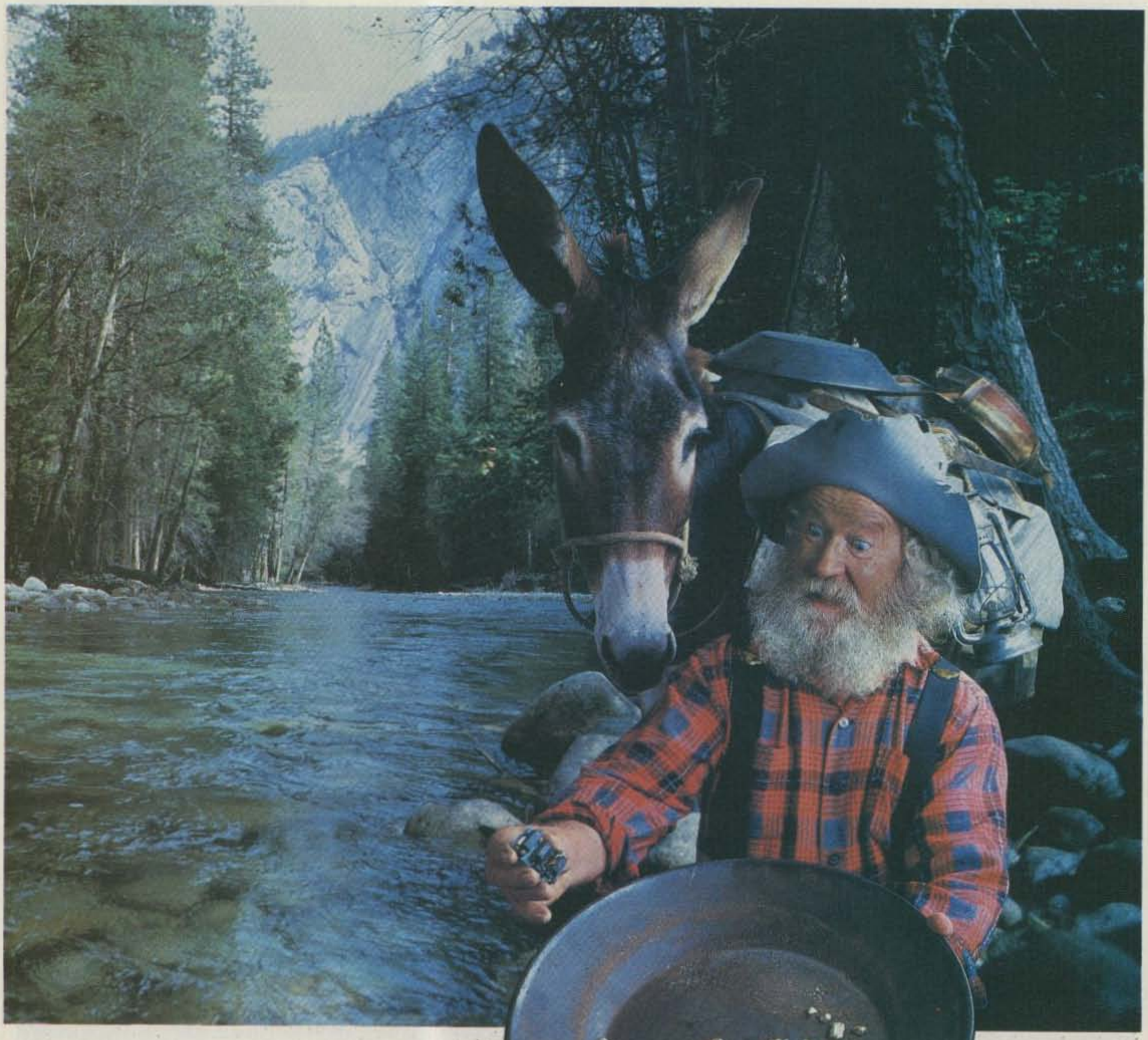

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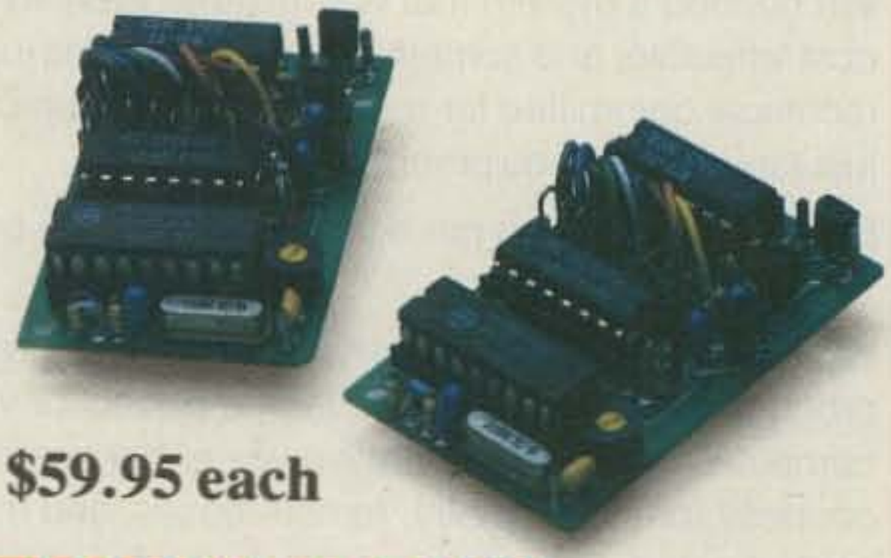

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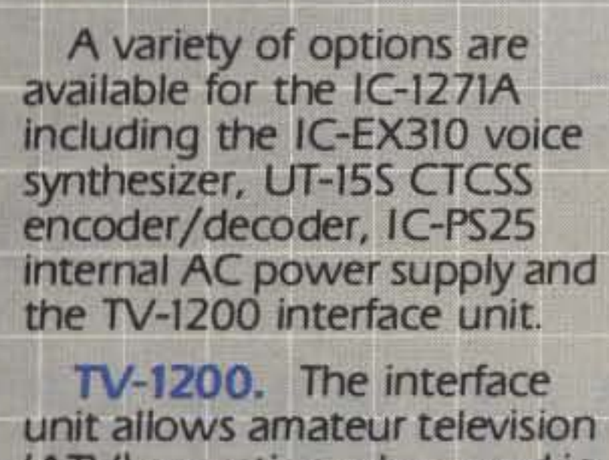

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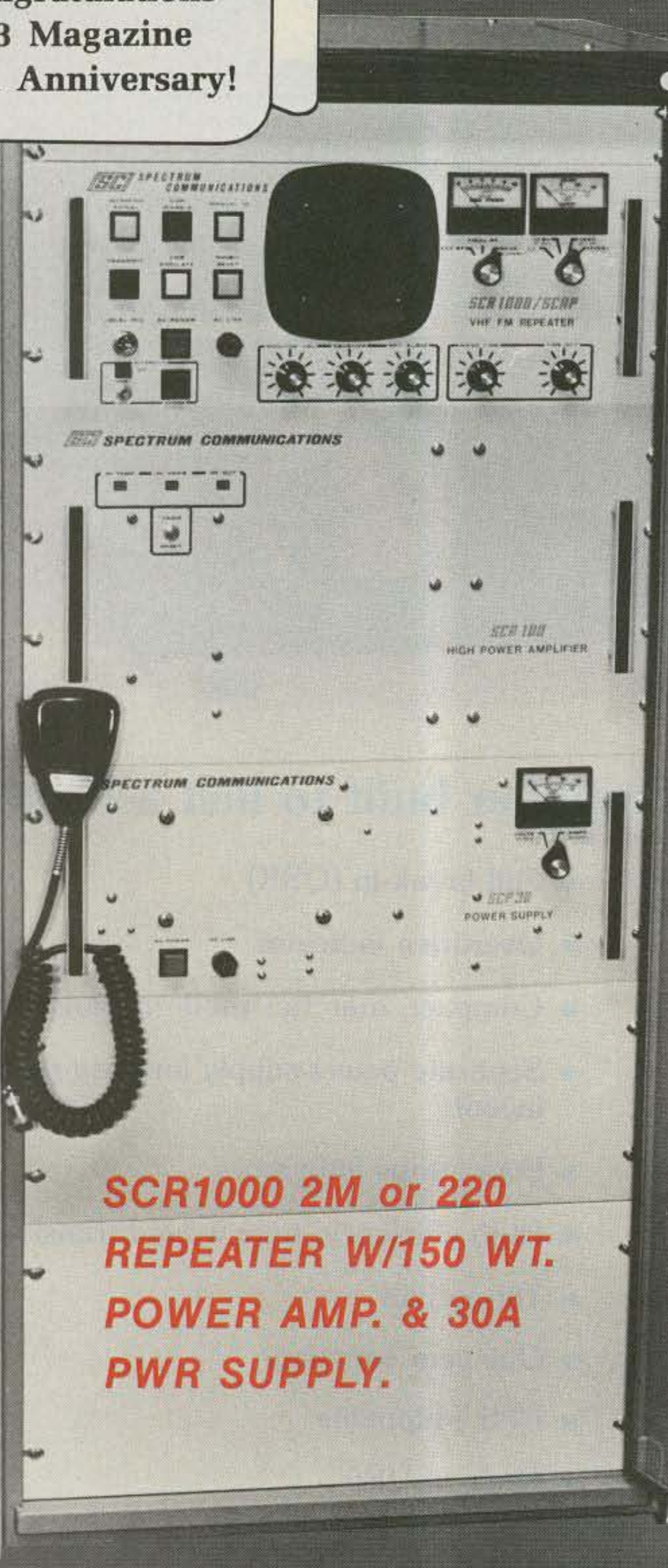

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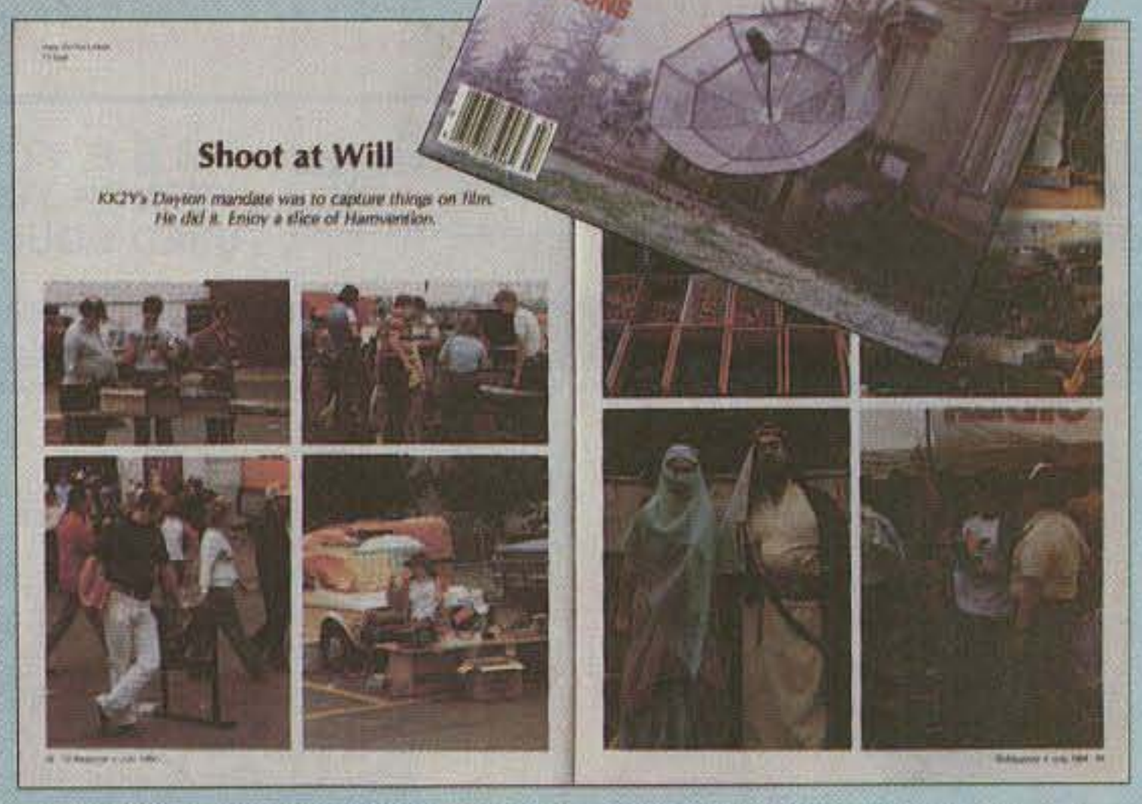

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Silver Eagle AWARDS

We wanted to do something special in this issue to recognize some special people who have made *73* possible during the past 25 years, so in February we started sending out quiet feelers to longtime observers. "Our 25th Anniversary issue is coming up in October—name a name." By the middle of June, we had 98 nominees. By the first week of July, we had gotten the list down to 37 finalists. By the end of July, we had chosen the 25 winners of Silver Eagle mikes made by Astatic.

What are the criteria? We don't know, even though they've been discussed for months. "For service above and beyond the call of duty." "Outstanding contributions to *73*." "For helping *73*." "Continuous loyalty." "Excellent quality of work." "A care." None of these descriptions covers everyone, though, so here's the official reason why we recognize the Silver Eagle winners: "Because we want to."

These people are *73*'s 25th Anniversary all-stars. They're special. Some are hams and some aren't. Some can put a Silver Eagle to use and some can't. Two are Silent Keys. So what? *73* doesn't forget. We are very proud of all of them.—Eds.

Bill Pasternak WA6ITF. Part of the original "Brooklyn gang" which helped *73* at its birth. Longtime Looking West columnist (1973–1981). Patron of repeaters and repeater coordination. Lives and breathes amateur radio. Champion of *Westlink*. Once was being paid $12 a month and offered to work for less. No publication anywhere—ever—has had a finer friend. (Our continuing thanks, Sharon, for putting up with him.) (1962–Present)

Jim Allen N4DEE, Columbia SC. A randomly-selected recent letter-writer. Represents more than 61,000 others, minimum, as best we can conservatively estimate.

Nancy Salmon. Intense and overly department-defensive. Hard worker. Charged with the impossible task of organizing and administrating the dramatic changes in our burgeoning production efforts of the early 1980s. Successfully did it. Quietly nominated by former frontline antagonists who said, basically, separately, "We should think about Nancy Salmon." (1979–1984)

Knud Keller KV4GG/1. An honest, class, crazy guy. His careful accounting kept *73* in business more than once. Ex-player at Caribbean piano bars. Wore out more than one adding machine. Always positive. (1973–1984)

Bill Heydolph. Produced high-quality commercial photography—for years, always—under primitive conditions not believable. Leapt from horizontal to vertical shooting. Always willing to stay late or do whatever it took to get things done—with a "yes" and a tired smile. Once had an assistant who put a road-kill bird in his sandwich as a measure of respect and way of keeping his senses going one more day. (1974–1982)

Bill Morello. One of the great unsung electronics draftsmen in the United States. Combines great technical skill with a degree in electrical engineering. Impeccable products. Has stuck with *73* through thick and thin. Now heads Techart Associates in Amherst, New Hampshire. Has had more pages of his work published during *73*'s first 25 years than any other contributor, including Wayne. (1969–Present)

Virginia Londner. Involved with *73* in the early days. Returned to help save it in the mid-1970s. Hyper-energy. Responsible for hiring many key people during critical, crucial times. (1960–1964, 1974–1976)

Marc Leavey WA3AJR. Mr. RTTY Loop. Gone out of his way many times to encourage *73* to help spread the gospel. Was micro'd before it counted. Loves strange queries from readers. Otherwise, regular semi-normal TTY fanatic. (1977–Present)

Barbara Walker Latti. Head of our typesetting department when she *was* our typesetting department. Fierce. Dedicated to quality and quality only. Worked with Stone-Age systems. Loved by all. (1974–1982)

Bandel Linn K4PP. Permanent artist and gadfly. Has had his work appear in every important issue of *73*, starting with #1. Signs his letters with "The Great Linn." (1960–Present)

Eric Shalkhauser W9CI (1893–1983). Recorder of events. Saver of evidence. Carer for making sure hams would see it. Excellent, wandering writer. Author of "The History of Ham Radio" series in *73* (1977–Future), originally published in the *QCC News*. Still owes Lee Knirko W9MOL for shepherding his work. Known to and remembered by all as "Shaw." (1977–Future)

Dave Ingram K4TWJ. SSTV columnist (1972–1982) and aficionado when no one even cared except *73*. Prolific author. Well-known for single-spaced manuscripts with typos. A servant of scores of thousands of hams. (1972–1982)

Bob Baker WB2GFE, ex-WA1SCX. Founder of *73*'s modern-day Contests column. Famous for always being on time and for always sending the cleanest copy. Has been known to associate with microcomputers. (1975–Present)

Jim Joyce VK3YJ. Represents our *73* International correspondents. Since 1983, we have had more than 60 people send more than 1000 columns, sometimes at personal risk. (1983–Present)

Bill Barry. One of the award-winners everyone who has ever worked at *73* loves. Basically a mailroom operative and roving spirit-keeper-upper. Saved canceled stamps for nuns. Started working in the 1930s as a caretaker at what would later become our Pine Street building. Modest, successful lightweight amateur fighter. Set world record in 1980 by wearing long-johns more than 42 weeks a year for five consecutive years. (1973–1983)

Lynn Panciera-Fraser. Never would settle for less than the best. Would and did back up words with action by spending many long nights at the light table, at doing and checking paste-up, at showing that the impossible could be done. Respected before she left, revered after. Instigator of a corporate vegetable garden. (1972–1979)

Peter Stark K2OAW. Outstanding long-term author and consultant. One of the first in ham radio to recognize and grasp the link with computers and its possibilities. Equally adept at writing about theory or construction. Possibly brilliant. (1973–Present)

Bill Gosney KE7C. Awards columnist for six years. Founder of *73*'s award-certificate programs. Originator and coordinator of *73*'s World SSB Contests. Knows a little about IRCs. Puts international operations together with fake apparent ease. (1979–Present)

Robert Reed WB2DIN, Wantagh NY. Represents our lifetime subscribers. Like many others, put his money where Wayne's mouth was. (1978–Present)

Randy Peckenpaugh WB0SMX, Garden City KS. Represents every one of our new subscribers over the years. Signed up this summer. We thank you all—very much—every day. (1985–Present)

John Nelson (1903 – 1984). "This is Nelson. Tell people I see some flares tomorrow and Friday. Things look good for 20." John, our readers have had this issue in their hands for two weeks. "And I think something's happening next Wednesday, too!" We checked. It did. Our beloved, amazing Propagation Wizard. (1963–1984)

Bill Hoisington K1CLL. One of the fathers of esoteric, fun building, particularly for six meters. Assumed you know more than you do. Assumed you could get the parts he could. Made you think in order to enjoy. (1963–1975)

Ed Ferman WA1UFY. With an obnoxious-to-many flair, brought high-tech state-of-the-art production techniques to Peterborough. "We can do this stuff ourselves—why farm it out?" (1980–1982)

Sherry Smythe. Canny, bizarre, but genuinely big-hearted. Contributed to *73* by going out of her way to try different marketing procedures. Well-known for being a hard-core businesswoman. Widely respected for taking a sincere personal interest in the personal interests of employees. A surprise nominee/survivor of the Eagle elimination process. (1976–1983)

Dotty Gibson. One-person effective circulation department for years. One-person stand-up-and-browbeat-Wayne department for years, if something was wrong. One-person do-everything department, carefully and nicely. A finer lady doesn't exist. (1966–1980)

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Over 723 amateurs can't be wrong! That's how many have now built our 2 meter kit in just a few months. Many letters & phone calls have praised the project. In fact a number of customers said they didn't really need another 2m tranceiver, they simply built it for the sheer fun of making something again. The 'Commander' has specs which more than match most commercial tranceivers selling for much more. It covers the full 144-148 MHz band in 10KHz channels (with 5KHz offset) with full repeater facilities built in. And it delivers around 10-15 watts with a receiver sensitivity of 0.5uV or better! The DSE Commander comes complete with a comprehensive step by step construction manual plus microphone & mounting bracket. Nothing more to buy!! Imagine the satisfaction of owning & operating the set you built....

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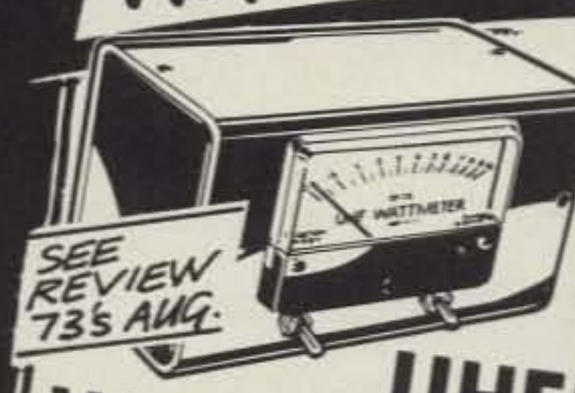

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It wasn't too long ago that speech synthesis was nothing but science fiction. Now, due to technological advances in the large-scale integration industry and speech analysis, it has become possible to put a complete voice synthesizer on one integrated-circuit chip. Several manufacturers have come out with single-chip synthesizers. Votrax has come out with the SC-01, Silicon Systems, Inc., has come out with the SSI263, and Radio Shack is selling the General Instruments SPO256 Narrator chip.

What these chips have in common is that they do not store just a limited vocabulary of preformed words—they contain the individual sounds that make up every spoken English word. This means that with the proper selection of these parts of speech, any word can be formed by the chip.

I selected the SPO256 chip from Radio Shack because it was only $12.95; the others were in the $60–$80 range. The chip can be found at most Radio Shack stores as part no. 276-1784. When you look for this chip, make sure you do not get it confused with part no. 276-1783. This also is a voice-synthesizer chip, but it uses an external ROM chip to produce 36 words. It also does not come with the comprehensive technical data booklet which accompanies part no. 276-1784. The chip included in 276-1784 will have SPO256-AL2 stamped on it.

Speech Synthesis Basics

There are 3 major techniques used to synthesize the human voice. These are formant synthesis, linear-predictive coding (LPC), and waveform digitization.

Formant synthesis is the electronic modeling of the natural resonances of the vocal tract. The vocal spectrum is formed of bands of resonant frequencies which are called formants. These are generated electronically and passed through variable filters.

One variation of formant synthesis is known as phoneme synthesis. This technique derives the spectral parameters from basic sound units which make up

		Labial	Labio-Dental	Inter-Dental	Alveolar	Palatal	Velar	Glottal
Stops:	Voiceless	PP			TT		KK	
	Voiced	BB			DD		GG	
Fricatives:	Voiceless	WH	FF	TH	SS	SH		HH
	Voiced		VV	DH	ZZ	ZH*		
Affricates:	Voiceless					CH		
	Voiced					JH		
Nasals	Voiced	MM			NN		NG*	
Resonants	Voiced	WW			RR, LL	YY		

* These do not occur in word-initial position in English.

Labial: Upper and lower lips touch or approximate.
Labio-Dental: Upper teeth and lower lip touch.
Inter-Dental: Tongue between teeth.
Alveolar: Tip of tongue touches or approximates alveolar ridge (just behind upper teeth).
Palatal: Body of tongue approximates palate (roof of mouth).
Velar: Body of tongue touches velum (posterior portion of roof of mouth).
Glottal: Glottis (opening between vocal cords).

Fig. 1. Consonant phonemes of English.

	Front	Central	Back
High	YR		
	IY		UW#
	IH*		UH*#
Mid	EY	ER	OW#
	EH*	AX*	OY#
	XR		
Low	AE*	AW#	AO*#
		AY	OR#
		AR	
		AA*	

* Short Vowels
\# Rounded Vowels

Fig. 2. Vowel phonemes of English.

```
0800                1       PAG
0800                2 ;
0800                3 ******************************
0800                4 *     CHEAP-TALKER           *
0800                5 *  DRIVER SOFTWARE FOR       *
0800                6 * SPO-256 VOICE SYNTHESIZER   *
0800                7 *  BY THOMAS C. JOHNSON      *
0800                8 *       WB6NOF               *
0800                9 *     DEC 7, 1984            *
0800               10 ******************************
0800               11 ;
0300               12         ORG $300
0300               13 ;
0300               14 ;
C09E               15 PIADPRB  EQU $C089E+$30      ; SLOT 3 DATA DIRECTION AND OUTPUT BUFFER
C09F               16 PIACRB   EQU $C089F+$3F      ; SLOT 3 CONTROL REGISTER
0340               17 SOUNDS   EQU $340            ; ALLOPHONE BUFFER- $340 CONTAINS NO. OF ALLOPHONES TO FOLLOW
0300               18 ;                            ; $341-$3CF CONTAIN THE ALLOPHONES TO BE SPOKEN
0300               19 ;
0300               20 ;
0300               21 INIT:
0300 A9 00         22         LDA #0
0302 8D BF C0      23         STA PIACRB           ; ENABLE DATA DIRECTION REGISTER
0305 A9 3F         24         LDA #$3F
0307 8D BE C0      25         STA PIADPRB          ; BITS 0-5=OUTPUTS, BITS 6-7 INPUTS
030A A9 2C         26         LDA #$2C
030C 8D BF C0      27         STA PIACRB           ; CB2 IN PULSE MODE
030F               28 ;
030F               29 ;
030F               30 SPEAK:
030F A2 00         31         LDX #0
0311 BD 40 03      32         LDA SOUNDS,X         ; LOAD THE NUMBER OF ALLOPHONES TO SPEAK
0314 A8            33         TAY                  ; USE Y REG TO COUNT
0315 E8            34         INX                  ; USE X REG TO POINT TO NEXT ALLOPHONE
0316 BD 40 03      35 ^1      LDA SOUNDS,X         ; LOAD THE NEXT ALLOPHONE
0319 20 26 03      36         JSR PRONOUNC         ; SEND IT TO THE SYNTHESIZER
031C E8            37         INX                  ; MOVE POINTER TO NEXT ALLOPHONE
031D 88            38         DEY                  ; DECREMENT THE COUNTER...ALL DONE YET?
031E D0 F6         39         BNE <1               ; NO, DO THE NEXT ONE
0320 A9 00         40         LDA #0               ; YES, SEND A PA1 TO THE SYNTHESIZER TO END THE WORD
0322 20 26 03      41         JSR PRONOUNC         ; SEND IT
0325 60            42         RTS                  ; DONE
0326               43 ;
0326               44 PRONOUNC:
0326 48            45         PHA                  ; HOLD DATA ON STACK
0327 AD BE C0      46 ^1      LDA PIADPRB          ; SYNTHESIZER READY FOR NEW DATA YET?
032A 30 FB         47         BMI <1               ; NO, CHECK AGAIN
032C 68            48         PLA                  ; YES, GET THE DATA
032D 8D BE C0      49         STA PIADPRB          ; SEND IT TO THE SYNTHESIZER
0330 60            50         RTS
0331               51 ;
0331               52         END
```

Listing 1. Synthesizer-driver source code.

Allophone	Dec	Hex	Guidelines
SILENCE			
PA1	00	00	Before BB, DD, GG, and JH
PA2	01	01	Before BB, DD, GG, and JH
PA3	02	02	Before PP, TT, KK, CH; between words
PA4	03	03	Between clauses and sentences
PA5	04	04	Between clauses and sentences
SHORT VOWELS			
IH *	12	0C	sItting, strandEd
EH *	07	07	extEnt, mEn
AE *	26	1A	Acting, cAt
UH *	30	1E	cOOkie, bOOk
AO *	23	17	tAlking, sOng
AX *	15	0F	dUck, instrUct
AA *	24	18	pOttery, cOt
LONG VOWELS			
IY	19	13	trEAt, pEEk
EY	20	14	skAte, grEAt
AY	06	06	kIte, skY
OY	05	05	nOIse, tOY
UW1	22	16	after clusters with YY: compUter
UW2	31	1F	in monosyllabic words: twO, fOOd
OW	53	35	zOne, clOse
AW	32	20	sOUnd, dOWn
EL	62	3E	littLE, gentLE
R-COLORED WORDS			
ER1	52	34	lettER, fURnitURe
ER2	53	35	monosyllables: bIRd, fERn
OR	58	3A	fORtune, stORe
AR	59	3B	fARm, alARm
YR	60	3C	hEAR, IRresponsible
XR	47	2F	hAIR, stARe
RESONANTS			
WW	46	2E	We, Warrant
RR1	14	0E	initial position: Read, wRite
RR2	39	27	initial clusters: bRown, cRane
LL	45	2D	Like, heLLo
YY1	49	31	clusters: cUte, compUter
YY2	25	19	initial position: Yes, Yarn
VOICED FRICATIVES			
VV	35	23	Vest, proVe
DH1	18	12	word-initial position: THis, THey
DH2	54	36	word-final and between vowels: baTHe, baTHing
ZZ	43	2B	Zoo, phaSe
ZH	38	26	beiGE, pleaSure
VOICELESS FRICATIVES			
FF *	40	28	these may be doubled for
TH *	29	1D	initial position and singled
SS *	55	37	for middle or final position.
SH	37	25	SHirt, leaSH
HH1	27	1B	before front vowels: YR, IY, IH, EY, EH, XR, AE
HH2	57	39	before back vowels: UW,UH, OW, OY, AO, OR, AR
WH	48	30	WHite, WHim
VOICED STOPS			
BB1	28	1C	final position: riB; between vowels: fiBBer; in clusters: Bleed, Brown
BB2	63	3F	initial position before a vowel: Beast
DD1	21	15	final position: playeD
DD2	33	21	initial position: Down; clusters: Drain
GG1	36	24	before high front vowels: YR, IY,IH,EY, EH,XR
GG2	61	3D	before high back vowels:UW,UH,OW,OY,AX; and clusters: Green, Glue
GG3	34	22	before low vowels: AE, AW, AY, ,AR, AA, AO, OR, ER; and medial clusters: anGer; and final position: peG
VOICELESS STOPS			
PP	09	09	Pleasure, amPle
TT1	17	11	final clusters before (ts): iTs, neTs
TT2	13	0D	all other positions: Table, TargeT
KK1	42	2A	before front vowels: YR, IY, IH, EY, EH, XR, AY, AE, ER, AX; initial clusters: Cute, Clown
KK2	41	29	final position: speaK, final clusters: tasK
KK3	08	08	before back vowels: UW, UH, OW, OY, OR, AR, AO; initial clusters: Crane, Quick
AFFRICATES			
CH	50	32	CHurCH, feaTure
JH	10	0A	inJure, eDGe
NASAL			
MM	16	10	Milk, alarM
NN1	11	0B	before front and central vowels: YR, IY, IH, EY, EH, XR, AE, ER, AX, AW, AY, UW; final clusters: earN
NN2	56	38	before back vowels: UH, OW, OY, OR, AR, AA
NG	44	2C	striNG, aNger

* These allophones can be doubled. (One after the other with no pause between them.)

Fig. 3. Allophone guidelines.

English words, called phonemes. Each phoneme is given a numeric code and the synthesizer circuit generates these sounds when given the codes. A word is formed by stringing various phoneme codes together. As will be seen, the SPO256 chip uses a variation of phoneme synthesis called allophone synthesis.

Linear-predictive coding is similar to the formant-synthesis technique because it also is based on the frequencies found in human speech and uses similar hardware to simulate the vocal tract. The difference is that LPC uses stored filter coefficients, excitation frequencies, and amplifier gain settings. The name LPC refers to the programmed activities of the multistage lattice filters which produce the desired bands of resonant frequencies.

Waveform digitization is a technique which digitally records speech and then plays it back when desired. The speech is sampled by a D/A converter and stored. Then, when the sounds are to be spoken, the digital data is sent to an A/D converter and a low-pass filter. All the original inflections and intonations are intact, but the process requires large volumes of storage space to hold a vocabulary of any usable size.

In the case of allophone synthesis, which is what this project involves, when dealing with human speech and English text relationships, it is important to remember three things. First of all, there is no one-to-one relationship between the individual sounds which make up a word and the individual letters which make up the text of the word. Second, speech sounds are acoustically different depending on the position they hold in a word. And third, the same individual sound may be perceived differently by the ear, depending on the relationship it holds with different sounds.

As mentioned before, the individual sounds which make up spoken words are called phonemes. Each language has a set which differs in some ways from that of other languages. Fig. 1

shows the consonant phonemes of English and Fig. 2 shows the vowel phonemes of English. Phonemes are acoustically different depending on their location in a word. Each acoustic variation of a phoneme based on its position is an *allophone* of the phoneme. Each allophone is a different manifestation of a basic phoneme and is the basis of speech synthesis in the SPO256 chip.

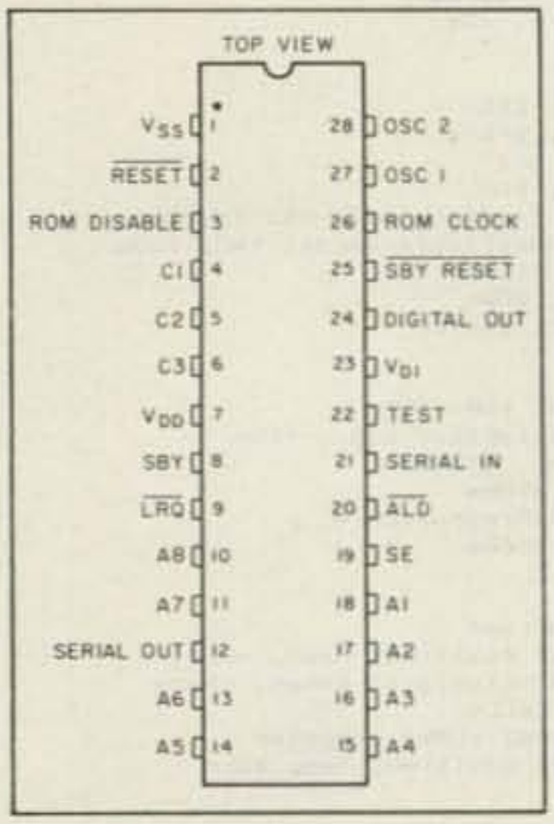

Fig. 4(a). Pin configuration.

The repertoire of sounds for the SPO256 is called the allophone set. It contains 59 allophones and 5 pauses of various lengths. These allophones, their associated codes, and examples of usage are shown in Fig. 3. In this table, the associated letter or letters in the example word are shown capitalized. Some phonemes have two or three allophones. These variations are position- and context-dependent, as indicated in the associated examples. For example, KK1 will sound good before LL as in "club," and KK2 will sound good before WW as in "squid." Remember, we are dealing with sounds, not letters. Some allophones sound better when preceded by a short length of silence, such as PP, BB, TT, DD, KK, GG, CH, and JH.

Project Construction

The SPO256 chip is shown with pinouts in Fig. 4(a) and the block diagram is shown in Fig. 5. The chip contains a software-programmable digital filter used to model the human vocal tract, an internal 16K ROM containing the allophone construction algorithm, a microcontroller, ALU, and a pulse-width modulator to generate the output sounds. It is possible to use an external ROM instead of the internal one to generate speech using custom LPC or formant-synthesis techniques, but I did not use this in this project. I used the internal ROM with the provided allophone set. The chip uses a single +5-V supply and is TTL-compatible.

I constructed Cheap-Talker on a Vector Graphics wire-wrap prototype board. The circuit is so simple, however, that it would be no problem to hand etch a board using a good etch resist pen and some ferric chloride solution. Either way, there are no special design or layout considerations to be made, just good common electronic construction techniques.

The schematic for the circuit is shown in Fig. 6. I used an MC6821 parallel interface chip to interface the synthesizer chip to the Apple bus. I used this chip because I happened to have some left over from another project and I am familiar with its operation. Port B in the PIA is used to allow the use of the CB2 line for handshaking.

The synthesizer-chip design is such that it is possible to connect it directly to a Centronics-compatible parallel interface. The A1–A6 lines would be connected to the D1–D6 lines, the ALD pin would connect to the Data Strobe line, and the SBY pin would connect to the Busy line.

Software

The other beauty of this project is that no highly sophisticated software is required to make the chip work. The entire driver program and allophone buffer fits in just 208 bytes. The program alone is only 49 bytes. This is shown in Listing 1. This program, when called at location $300 (768 decimal), will send the allophone codes in the allophone buffer located in locations $341–$3CF (833–975 decimal) to the synthesizer one at a time. Location $340 (832 decimal) contains the number of allophones to

Pin Number	Name	Function
1	VSS	Ground
2	RESET	A logic 0 resets that portion of the SP powered by VDD. Must be returned to a logic 1 for normal operation.
3	ROM DISABLE	For use with an external serial speech ROM, a logic 1 disables the external ROM.
4, 5, 6	C1, C2, C3	Output control lines for use with an external serial speech ROM. Refer to the SPR016 data sheet for details.
7	VDD	Power supply for all portions of the SP except the microprocessor interface logic.
8	SBY	STANDBY. A logic 1 output indicates that the SP is inactive and VDD can be powered down externally to conserve power. When the SP is reactivated by an address being loaded, SBY will go to a logic 0.
9	LRQ	LOAD REQUEST. LRQ is a logic 1 output whenever the input buffer is full. When LRQ goes to a logic 0, the input port may be loaded by placing the 8 address bits on A1–A8 and pulsing the ALD output.
10, 11, 13, 14, 15, 16, 17, 18	A8, A7, A6, A5, A4, A3, A2, A1	8-bit address which defines any one of 256 speech entry points.
12	SER OUT	SERIAL ADDRESS OUT. This output transfers a 16-bit address serially to an external speech ROM.
19	SE	STROBE ENABLE. Normally held in a logic 1 state. When tied to ground, ALD is disabled and the SP will automatically latch in the address on the input bus approximately 1 μs after detecting a logic 1 on any address line.
20	ALD	ADDRESS LOAD. A negative pulse on this input loads the 8 address bits into the input port. The negative edge of this pulse causes LRQ to go high.
21	SER IN	SERIAL IN. This is an 8-bit serial data input from an external speech ROM.
22	TEST	This pin should be grounded for normal operation.
23	VD1	Power supply for the microprocessor interface logic and controller.
24	DIGITAL OUT	Pulse-width-modulated digital-speech output which, when filtered by a 5-kHz low-pass filter and amplified, will drive a loudspeaker.
25	SBY RESET	STANDBY RESET. A logic 0 resets the microprocessor interface logic and the address latches. Must be returned to a logic 1 for normal operation.
26	ROM CLOCK	This is a 1.56-MHz clock output used to drive an external serial speech ROM.
27	OSC1	XTAL IN. Input connection for a 3.12-MHz crystal.
28	OSC2	XTAL OUT. Output connection for a 3.12-MHz crystal.

Fig. 4(b). Pin functions.

What you DO get is one compact package that TURNS ON *RTTY READY* — No program load, "SYS" commands, or rats nest of external wiring to enjoy the best in CW/RTTY operation. (AMTOR too, if added.)

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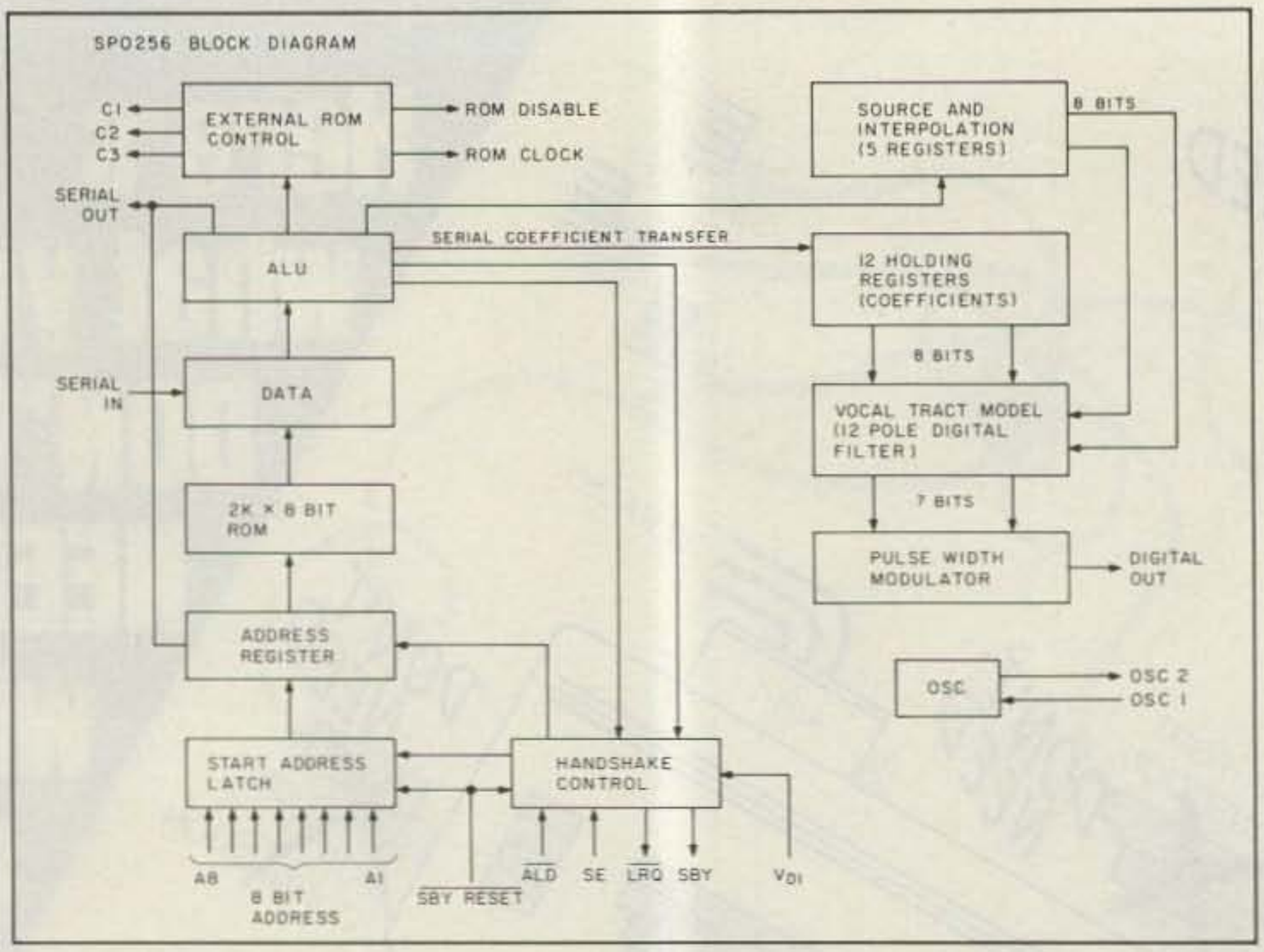

Fig. 5. SPO256 block diagram.

be sent. This allows 142 allophone codes to be sent to the synthesizer. This is more than enough for most messages composed of a number of words. Most words contain less than 20 allophone codes.

The INIT portion configures port B of the 6821 chip to have bits 0–5 in the output mode and bits 6–7 in the input mode. Bit 7 is used to monitor the LRQ (Load Request) pin on the synthesizer to find out when it is ready for another allophone. The CB2 pin on the 6821 is put in the "pulse on write" mode, which sends a negative pulse out when data is written into port B. This signals the synthesizer that the allophone data is ready. Please note that the addresses for the PIACRB (Control Register B) and PIADPRB (Data Direction and Peripheral Register B) registers are offset in lines 15 and 16 for use in slot 3 of the Apple. If you are using an assembler which uses similar nomenclature, you could change the slot by changing the $30 to $x0, where x is the slot number. If you are typing in the hexadecimal values for the program, you would change the $BF in locations $303 and $30D to $8F + $n0, where n is the slot number. You would also change the $BE in locations $308, $328, and, $32E to $8E + $n0.

The SPEAK routine takes the allophones and sends them to the synthesizer via the PRONOUNC routine. SPEAK uses the value in location $340 to initialize the Y register as a counter to keep track of the number of allophones sent. The X register is used as a pointer to the various values in the allophone buffer.

The PRONOUNC routine saves the allophone data in the accumulator on the stack while it checks the LRQ line to see if the synthesizer is ready for the next allophone. It does this by reading the value in bit 7 of Peripheral Register B which, as was mentioned earlier, is set up as an input. If bit 7 is a 0, then the synthesizer is ready to receive data via Peripheral Register B.

Right now you might be wondering how to get the proper allophone codes put into the buffer to get the thing to say what you want it to. There are basically two ways to do this. One is to create a dictionary of words with the associated allophone codes needed to generate each word. Then, by selecting the desired word, the appropriate allophone codes can be loaded into the buffer and spoken. The other method would be to utilize some sort of text-to-allophone algorithm which would analyze a word and generate the proper allophone codes to speak the word.

The dictionary method is by far a simpler method, but it has two drawbacks. First of all, the memory required to have enough words in the dictionary to speak all of the most-used words in the English language would be above the capabilities of most microcomputers. The second disadvantage is the large amount of time which needs to be invested in order to create the dictionary.

The text-to-allophone algorithm is by far the best in terms of flexibility and economy of memory. All that is necessary to use it is to send the word text to the algo-

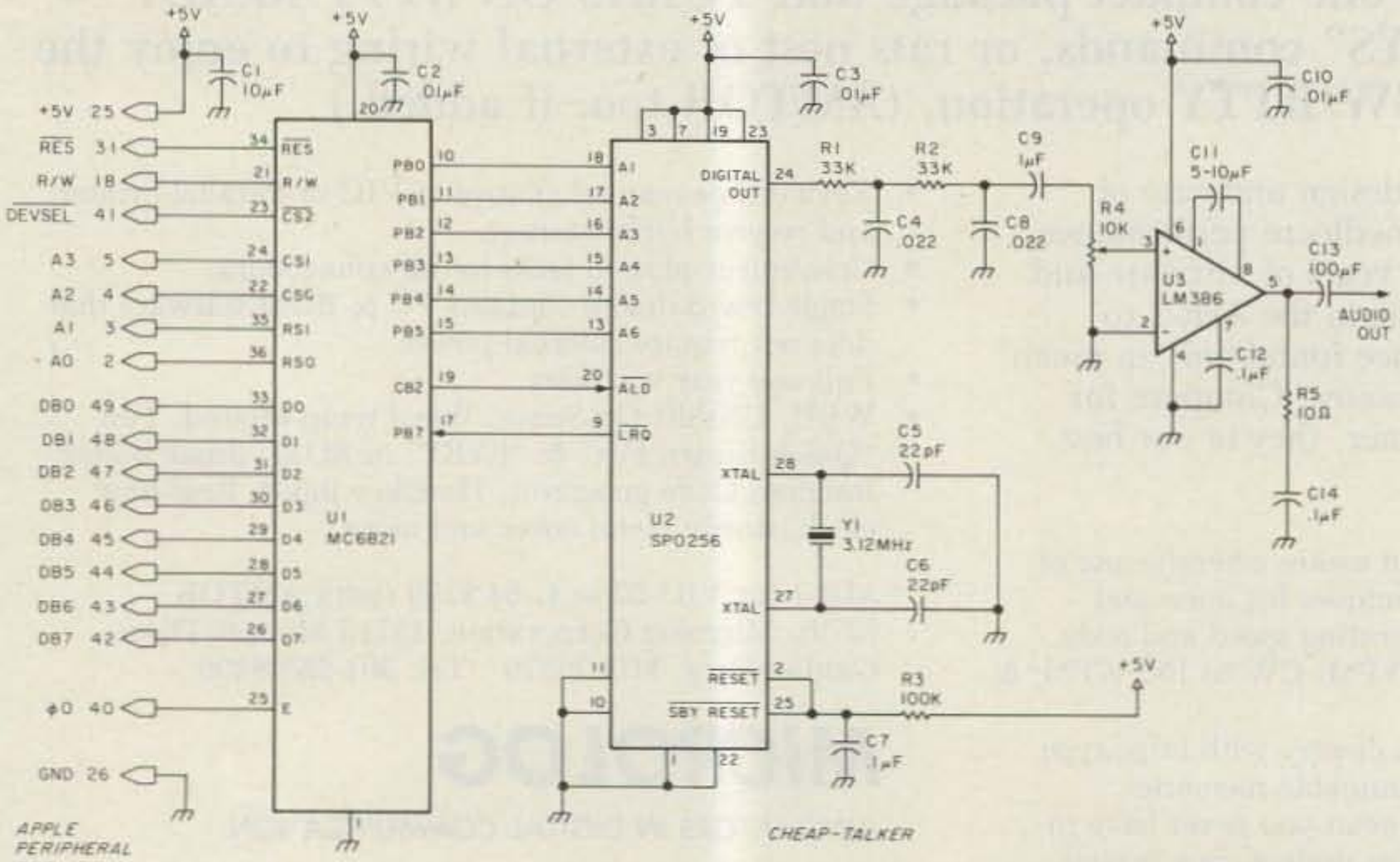

Fig. 6. Schematic.

```
1  REM  ************************************
2  REM  * CHEAP-TALKER VOICE SYNTHESIZER *
3  REM  * BY THOMAS C. JOHNSON  WB6NOK   *
4  REM  ************************************
5 D$ =  CHR$ (4)
10  DIM M%(100,16)
15  REM     MESSAGE ARRAY: 100 MESSAGES W/ 16 WORDS EACH
20  DIM W%(200,32)
25  REM     DICTIONARY CODES: 199 WORDS W/32 ALLOPHONES PER WORD/W%(0,0)=#
     OF WORDS IN FILE/W%(W,0)=#OF ALLOPHONES FOR WORD X
30  DIM W$(200): REM   DICTIONARY TEXT
50  DIM AL$(63): REM  ALLOPHONE TEXT
60  DATA PA1,PA2,PA3,PA4,PA5,OY,AY,EH,KK3,PP,JH,NN1,IH,TT2,RR1,AX,MM,TT1,D
    H1,IY,EY,DD1,UW1,AO,AA,YY2,AE,HH1,BB1,TH,UH,UW2
70  DATA AW,DD2,GG3,VV,GG1,SH,ZH,RR2,FF,KK2,KK1,ZZ,NG,LL,WW,XR,WH,YY1,CH,E
    R1,ER2,OW,DH2,SS,NN2,HH2,OR,AR,YR,GG2,EL,BB2
80  FOR I = 0 TO 63: READ AL$(I): NEXT
90  GOSUB 900
99  GOTO 1000
100  REM  READ DICTIONARY FILE
110  PRINT D$;"OPEN ";DF$
120  PRINT D$;"READ ";DF$
130  INPUT W%(0,0):J = W%(0,0)
135  IF J = 0 THEN 170
140  FOR I = 1 TO J: INPUT W%(I,0):L = W%(I,0): REM  INPUT A WORD. J IS #
     OF WORDS
150  FOR K = 1 TO L: INPUT W%(I,K): NEXT : REM  INPUT ALLOPHONE CODES. L I
     S # OF CODES
160  NEXT I
170  PRINT D$;"CLOSE"
180  RETURN

200  REM  WRITE DICTIONARY FILE (DF$ IS FILE NAME)
210  PRINT D$;"OPEN ";DF$
220  PRINT D$;"WRITE";DF$
230  PRINT W%(0,0):J = W%(0,0)
240  FOR I = 1 TO J: PRINT W%(I,0):L = W%(I,0): REM   WRITE A WORD. J IS #
     OF WORDS
250  FOR K = 1 TO L: PRINT W%(I,K): NEXT : REM   WRITE ALLOPHONE CODES. L
     IS # OF CODES
260  NEXT I
270  PRINT D$;"CLOSE"
280  RETURN

300  REM  READ MESSAGE FILE (MF$ IS FILE NAME)
310  PRINT D$;"OPEN ";MF$
320  PRINT D$;"READ ";MF$
330  INPUT M%(0,0):L = M%(0,0): REM   INPUT # OF MESSAGES
335  IF L = 0 THEN 370
340  FOR I = 1 TO L: INPUT M%(I,0):M = M%(I,0): REM  INPUT MESSAGE. M=# OF
     WORDS IN MESSAGE
350  FOR J = 1 TO M: INPUT M%(I,J): NEXT : REM   INPUT WORD CODES
360  NEXT
370  PRINT D$;"CLOSE"
380  RETURN

400  REM  WRITE MESSAGE FILE (MF$ IS FILE NAME)
410  PRINT D$;"OPEN ";MF$
420  PRINT D$;"WRITE";MF$
430  PRINT M%(0,0):L = M%(0,0): REM   PRINT # OF MESSAGES
440  FOR I = 1 TO L: PRINT M%(I,0):M = M%(I,0): REM   WRITE MESSAGE. M=# O
     F WORDS IN MESSAGE
450  FOR J = 1 TO M: PRINT M%(I,J): NEXT : REM     WRITE WORD CODES
460  NEXT
470  PRINT D$;"CLOSE"
480  RETURN
500  REM  READ WORD TEXT FILE (WF$ IS FILE NAME)
505  IF W%(0,0) = 0 THEN  RETURN
510  PRINT D$;"OPEN ";WF$
520  PRINT D$;"READ ";WF$
530  FOR I = 1 TO W%(0,0): INPUT W$(I): NEXT
540  PRINT D$;"CLOSE"
550  RETURN
600  REM  WRITE WORD TEXT FILE (WF$ IS FILE NAME)
610  PRINT D$;"OPEN ";WF$
620  PRINT D$;"WRITE ";WF$
630  FOR I = 1 TO W%(0,0): PRINT W$(I): NEXT
640  PRINT D$;"CLOSE"
650  RETURN

700  REM  ENTER ALLOPHONE CODES
703 CR = 1
705  REM  W=CURRENT WORD
710 A = 1: REM  ALLOPHONE POINTER
720  PRINT "PRESS RETURN TO TERMINATE ";A$
730  INPUT "ENTER ALLOPHONE: ";A$: IF A$ = "" THEN 770
740  GOSUB 780: IF X = 64 THEN  PRINT "INVALID ALLOPHONE...REENTER": GOTO
     730
750 W%(W,A) = X:A = A + 1: IF A > 32 THEN W%(W,0) = 32:W%(W,A - 1) = 2: RETURN

760  GOTO 730
770 W%(W,0) = A - 1: RETURN
780  FOR X = 0 TO 63: IF A$ = AL$(X) THEN  RETURN
790  NEXT : RETURN
800  REM  FORM A MESSAGE
803 CR = 1
805  REM  M IS MESSAGE NO.
810 X = 1: REM  WORD POINTER
815  PRINT "PRESS RETURN TO TERMINATE MESSAGE # ";M
820  INPUT "ENTER WORD: ";A$: IF A$ = "" AND X <  > 1 THEN M%(M,0) = X - 1
     : RETURN
825  IF A$ = "" AND X = 1 THEN 820
830  GOSUB 860: IF Z > W%(0,0) THEN  PRINT "WORD NOT IN DICT.": GOTO 820
840 M%(M,X) = Z:X = X + 1: IF X > 16 THEN M%(M,0) = 16: RETURN
850  GOTO 820
860  FOR Z = 1 TO W%(0,0): IF A$ = W$(Z) THEN  RETURN
870  NEXT : RETURN
900  REM  OPEN FILES
910  HOME : PRINT  TAB( 10)"CHEAP-TALKER EDITOR"
920  VTAB 5: INPUT "ENTER DICTIONARY NAME: ";A$: IF A$ = "" THEN A$ = "WOR
     DS"
930 DF$ = A$ + ".COD":WF$ = A$ + ".TXT"
940  VTAB 7: INPUT "ENTER MESSAGE FILE NAME: ";A$: IF A$ = "" THEN A$ = "M
     ESSAGES"
950 MF$ = A$ + ".COD": GOSUB 100: GOSUB 300: GOSUB 500

960  RETURN
1000  REM  MENU
1005  PRINT D$;"NOMONC,I,O": POKE 33,40
1010  HOME : PRINT  TAB( 5)"CHEAP-TALKER EDITOR"
1020  VTAB 5: HTAB 15: PRINT "OPTIONS:"
1030  VTAB 7: PRINT  TAB( 5)"1> ENTER NEW WORDS TO DICTIONARY"
1040  PRINT  TAB( 5)"2> VIEW/CHANGE A WORD"
1045  PRINT  TAB( 5)"3> DELETE A WORD"
1050  PRINT  TAB( 5)"4> PRINT DICTIONARY"
1060  PRINT  TAB( 5)"5> CREATE MESSAGES"
1070  PRINT  TAB( 5)"6> VIEW/CHANGE A MESSAGE"
1075  PRINT  TAB( 5)"7> DELETE A MESSAGE"
1080  PRINT  TAB( 5)"8> PRINT MESSAGES"
1090  PRINT  TAB( 5)"9> SPEAK MESSAGES"
1095  PRINT  TAB( 4)"10> QUIT"
1100  VTAB 20: HTAB 10: INPUT "ENTER CHOICE => ";A$: IF A$ = "" THEN 1100
1110 A =  VAL (A$): IF A < 1 OR A > 10 THEN 1100
1120  ON A GOSUB 2000,3000,3500,4000,5000,6000,6500,7000,8000,1140
1130  GOTO 1000
1140  GOSUB 200: GOSUB 400: GOSUB 600: END
2000  REM  ENTER WORDS IN DICTIONARY
2003  HOME : PRINT  TAB( 10)"ENTER NEW WORDS"
2005 W = W%(0,0)
2010  INPUT "ENTER WORD TEXT: ";A$: IF A$ = "" THEN  RETURN
2015  GOSUB 860: IF Z <  = W%(0,0) THEN  PRINT "WORD ALREADY IN DICT.": GOTO
     2010
2020  PRINT A$;" CORRECT ";: INPUT X$: IF X$ = "N" THEN 2010
2025 W = W + 1: IF W <  = 300 THEN W%(0,0) = W
2030 W$(W) = A$
2040  GOSUB 700
2050  GOTO 2010
2070  RETURN
3000  REM  VIEW A WORD
3010  HOME : PRINT  TAB( 10)"VIEW A WORD"
3030  VTAB 5: HTAB 5: INPUT "ENTER WORD TO VIEW: ";A$: IF A$ = "" THEN 303
     0
3040  GOSUB 860: IF Z > W%(0,0) THEN  PRINT "WORD NOT IN DICT.": GOTO 3030

3050 W = Z
3060  PRINT
3070  PRINT W$(W): FOR I = 1 TO W%(W,0): PRINT AL$(W%(W,I));"/";: NEXT I: PRINT

3080  PRINT
3090  INPUT "IS THIS WORD CORRECT Y/N";X$: IF X$ = "N" THEN  GOSUB 700: GOTO
     3060
3100  INPUT "VIEW ANOTHER WORD? ";A$: IF A$ <  > "N" THEN 3030
3110  RETURN
3500  REM  DELETE A WORD
3505  IF W%(0,0) < 1 THEN  RETURN
3510  HOME : PRINT  TAB( 10)"DELETE A WORD"
3520  VTAB 5: HTAB 5: INPUT "ENTER WORD TO DELETE: ";A$: IF A$ = "" THEN 3
     520
3530  GOSUB 860: IF Z > W%(0,0) THEN  PRINT "WORD NOT IN DICT.": GOTO 3520

3540 W = Z: PRINT
3550  PRINT W$(W): FOR I = 1 TO W%(W,0): PRINT AL$(W%(W,I));"/";: NEXT : PRINT

3560  PRINT : INPUT "DELETE THIS WORD ";A$: IF A$ <  > "Y" THEN 3580
3570 W$(W) = W$(W%(0,0)): FOR I = 0 TO W%(W%(0,0),0):W%(W,I) = W%(W%(0,0),
     I): NEXT :W%(0,0) = W%(0,0) - 1
3580  INPUT "DELETE ANOTHER? ";A$: IF A$ = "Y" THEN 3500
3590  RETURN
4000  REM  PRINT DICTIONARY
4010  PRINT D$;"PR#1"
4020  PRINT  CHR$ (9)"135N"
4025  PRINT  CHR$ (27);"N"; CHR$ (8);
4030  PRINT  CHR$ (14)"DICTIONARY FOR FILE ";DF$
4040  PRINT  CHR$ (15)
4050  FOR I = 1 TO W%(0,0)
4060  PRINT I,W$(I),"";
4070  FOR J = 1 TO W%(I,0): PRINT AL$(W%(I,J));"/";: NEXT : PRINT
4080  NEXT
4090  PRINT D$;"PR#0"
4100  RETURN
5000  REM  ENTER MESSAGES
5003  HOME : PRINT  TAB( 10)"ENTER NEW MESSAGES"
5005 M = M%(0,0) + 1: IF M > 100 THEN  POP : POP : RETURN
5010  HOME : GOSUB 800
5020 M%(0,0) = M
5030  INPUT "ENTER ANOTHER MESSAGE ";A$: IF A$ = "N" THEN  RETURN
5040  GOTO 5005
6000  REM  VIEW A MESSAGE
6010  HOME : PRINT  TAB( 10)"VIEW A MESSAGE"
6020  INPUT "ENTER MESSAGE NO.: ";A$: IF A$ = "" THEN 6020
6030 M =  VAL (A$): IF M < 1 OR M > M%(0,0) THEN 6020
6040  PRINT : PRINT "MESSAGE NO. ";M
6050  FOR I = 1 TO M%(M,0): PRINT W$(M%(M,I));" ";: NEXT : PRINT "."
6060  PRINT : INPUT "IS THIS MESSAGE CORRECT? ";A$: IF A$ = "N" THEN  GOSUB
     800
6070  PRINT : INPUT "VIEW ANOTHER MESSAGE ";A$: IF A$ <  > "N" THEN 6020
6080  RETURN
6500  REM  DELETE A MESSAGE
6510  HOME : PRINT  TAB( 10)"DELETE A MESSAGE"
6520  INPUT "ENTER MESSAGE NO. TO DELETE: ";A$: IF A$ = "" THEN 6520
6530 M =  VAL (A$): IF M < 1 OR M > M%(0,0) THEN 6520
6540  PRINT : PRINT "MESSAGE NO. ";M
6550  FOR I = 1 TO M%(M,0): PRINT W$(M%(M,I));" ";: NEXT : PRINT "."
6560  PRINT : INPUT "DELETE THIS MESSAGE? ";A$: IF A$ <  > "Y" THEN 6580
6570  FOR I = 0 TO M%(M%(0,0),0):M%(M,I) = M%(M%(0,0),I): NEXT :M%(0,0) =
     M%(0,0) - 1
6580  PRINT : INPUT "DELETE ANOTHER MESSAGE?";A$: IF A$ = "Y" THEN 6500
6590  RETURN
7000  REM  PRINT MESSAGE TEXT
7010  PRINT D$;"PR#1"
7020  PRINT  CHR$ (9);"135N"
7030  PRINT  CHR$ (14)"MESSAGE TEXT FOR FILE ";MF$
7040  PRINT  CHR$ (15)
7050  FOR I = 1 TO M%(0,0)
7060  PRINT I,"";
7070  FOR J = 1 TO M%(I,0): PRINT W$(M%(I,J));" ";: NEXT : PRINT "."
7080  NEXT
7090  PRINT D$;"PR#0"
7100  RETURN
8000  REM  SPEAK THE MESSAGES
8010  HOME : PRINT  TAB( 5)"SPEAK MESSAGES"
8020  PRINT "PRESS RETURN FOR MENU"
8030  VTAB 5: HTAB 10: INPUT "ENTER MESSAGE NUMBER: ";A$: IF A$ = "" THEN
     RETURN
8040 A =  VAL (A$): IF A < 1 OR A > M%(0,0) THEN 8010
8050  GOSUB 8210
8060  GOTO 8030
8200  REM  SPEAK MESSAGE A
8210  FOR W = 1 TO M%(A,0): REM  WORDS IN MESSAGE
8220 I = M%(A,W): REM  WORD CODE
8230  GOSUB 8310
8240  NEXT W
8250  RETURN
8300  REM  SPEAK WORD I
8310 K = W%(I,0): REM  #OF ALLOPHONES IN WORD
8320  FOR J = 0 TO K: POKE 832 + J,W%(I,J): NEXT
8330  VTAB 10: HTAB 5: PRINT "                              ": VTAB 10: HTAB 5: PRINT
     W$(I)
8340  CALL 768
8350  RETURN
10000  REM  INIT FILES
10010 D$ =  CHR$ (4): PRINT D$;"MONC,I,O"
10020  INPUT "ENTER DICTIONARY FILENAME";A$
10025  IF A$ = "" THEN A$ = "WORDS"
10030 DF$ = A$ + ".COD"
10060  PRINT D$;"OPEN";DF$
10070  PRINT D$;"WRITE"DF$
10080  PRINT 0
10090  PRINT D$;"CLOSE"
10093  INPUT "ENTER MESSAGE FILE NAME: ";A$
10095  IF A$ = "" THEN A$ = "MESSAGES"
10097 MF$ = A$ + ".COD"
10100  PRINT D$;"OPEN";MF$: PRINT D$;"WRITE ";MF$: PRINT 0: PRINT D$;"CLOS
    E"
10105  PRINT D$;"NOMONC,I,O"
10110  GOTO 5
```

Listing 2. Editor program.

rithm, and it will then generate the proper codes to be spoken. The program necessary to achieve this end, however, is very complicated and requires a rule table containing around 300–600 rules to handle all the contextual arrangements letters have in the various words in the language.

The program I have included in this article is based on the first method, the dictionary method. The reason I did this, in spite of its limitations, is because its simplicity allowed me to generate a small dictionary of words to experiment with until I could come up with a text-to-speech algorithm. When I get it going I will write a second article on that and share it with you.

The program shown in Listing 2 is the program I call the Editor. This program uses 3 text files which are stored on disk and read into memory when required to generate speech. One file contains the allophone codes for all the words in the dictionary. The second contains the text of the words in the dictionary, and the third is a file of messages made up from the words in the dictionary. By giving different file names to the files, one can generate several dictionaries and several message files to give an unlimited vocabulary to the machine. The only drawback is that only 200 words with 32 allophones each, and 100 messages with 16 words each, can be stored in memory at a time and still leave enough memory for

1	0	ZZ/YR/OW/	66	DISCONNECTED	DD2/IH/SS/PA3/KK1/AX/NN1/EH/PA2/KK1/PA3/TT2/IH/PA1/DD1/
2	1	WW/AX/AX/NN1/	67	STATUS	SS/SS/PA3/TT2/AE/PA3/TT2/AX/SS/
3	2	TT2/UW2/	68	LOGGED	LL/AO/PA2/GG3/PA2/DD1/
4	3	TH/RR1/IY/	69	MEMORY	MM/EH/MM/OW/RR2/IY/
5	4	FF/FF/OR/	70	DIAL	DD2/AY/LL/
6	5	FF/FF/AY/VV/	71	PLEASE	PP/LL/IY/ZZ/
7	6	SS/SS/IH/IH/PA3/KK2/SS/	72	ENTER	EH/NN1/PA3/TT2/ER1/
8	7	SS/EH/EH/VV/IH/NN1/	73	CODE	KK3/OW/DD1/
9	8	EY/PA3/TT2/	74	NUMBER	NN1/AX/MM/PA2/BB1/ER1/
10	9	NN1/AA/AY/NN1/	75	FREQUENCY	FF/FF/RR2/IY/PA3/KK3/WW/EH/NN1/SS/IY/
11	TEN	TT2/EH/EH/NN1/	76	ALERT	AX/LL/ER1/PA3/TT2/
12	ELEVEN	IH/LL/EH/EH/VV/IH/NN1/	77	KILO	KK1/IH/LL/OW/
13	TWELVE	TT2/WH/EH/EH/LL/VV/	78	PA1	PA1/
14	THIRTEEN	TH/ER1/PA2/PA3/TT2/IY/NN1/	79	PA2	PA2/
15	FOURTEEN	FF/OR/PA2/PA3/TT2/IY/NN1/	80	PA3	PA3/
16	FIFTEEN	IH/FF/PA2/PA3/TT2/IY/NN1/	81	PA4	PA4/
17	SIXTEEN	SS/SS/IH/PA3/KK2/SS/PA2/PA3/TT2/IY/NN1/	82	PA5	PA5/
18	SEVENTEEN	SS/SS/EH/VV/TH/NN1/PA2/PA3/TT2/IY/NN1/	83	MEGA	MM/EH/GG2/AX/
19	EIGHTEEN	EY/PA2/PA3/TT2/IY/NN1/	84	RESET	RR1/IY/SS/EH/PA3/TT2/
20	NINETEEN	NN1/AY/NN1/PA2/PA3/TT2/IY/NN1/	85	OF	AX/VV/
21	TWENTY	TT2/WH/EH/EH/NN1/PA2/PA3/TT2/IY/	86	BAND	BB2/AE/AE/NN1/PA2/DD1/
22	THIRTY	TH/ER2/PA2/PA3/TT2/IY/	87	METER	MM/IY/TT2/ER1/
23	FORTY	FF/OR/PA3/TT2/IY/	88	AND	AE/NN1/PA2/DD1/
24	FIFTY	FF/FF/IH/FF/FF/PA2/PA3/TT2/IY/	89	FORWARD	FF/FF/OR/WW/ER1/PA1/DD1/
25	SIXTY	SS/SS/IH/PA3/KK2/SS/PA2/PA3/TT2/IY/	90	ANTENNA	AE/NN1/PA3/TT2/EH/EH/NN1/AX/
26	SEVENTY	SS/EH/VV/IH/NN1/TT2/IY/	91	SYNTHESIZER	SS/SS/IH/NN1/TH/AX/SS/AY/ZZ/ER1/
27	EIGHTY	EY/PA3/TT2/IY/	92	TRANSMITTER	TT2/RR2/AE/AE/NN1/ZZ/PA3/MM/IH/PA3/TT2/ER1/
28	NINETY	NN1/AY/NN1/PA3/TT2/IY/	93	VOX	VV/AA/PA3/KK1/SS/
29	HUNDRED	HH2/AX/AX/NN1/PA2/DD2/RR2/IH/IH/PA1/DD1/	94	COMPUTER	KK1/AX/MM/PP/YY1/UW1/TT2/ER1/
30	THOUSAND	TH/AA/AW/ZZ/TH/PA1/PA1/NN1/DD1/	95	CONTROL	KK1/AX/NN1/PA3/TT2/RR2/OW/LL/
31	MILLION	MM/IH/IH/LL/YY1/AX/NN1/	96	PHONE	FF/FF/OW/NN1/
32	A	EY/	97	RECEIVER	RR1/IY/SS/IY/VV/ER1/
33	B	BB2/IY/	98	STATION	SS/SS/TT2/EY/SH/AX/NN1/
34	C	SS/SS/IY/	99	SORRY	SS/SS/AO/PA1/RR1/IY/
35	D	DD2/IY/	100	THANK	TH/AE/NG/PA2/KK2/
36	E	IY/	101	INVALID	IH/NN1/PA2/VV/AE/AE/LL/IH/PA1/DD1/
37	F	EH/EH/FF/FF/	102	ACCESS	AE/AE/PA3/KK2/SS/EH/SS/
38	G	JH/IY/	103	CHANGE	CH/EY/NN1/JH/
39	H	EY/PA2/PA3/CH/	104	HERTZ	HH1/ER1/TT1/SS/
40	I	AA/AY/	105	FROM	FF/FF/RR2/AX/MM/
41	J	JH/EH/EY/	106	IS	IH/ZZ/
42	K	KK1/EH/EY/	107	WAS	WW/AX/ZZ/
43	L	EH/EH/EL/	108	CAN	KK1/AE/NN1/
44	M	EH/EH/MM/	109	GIGA	GG1/IH/GG2/AX/
45	N	EH/EH/NN1/	110	THE	DH1/AX/
46	O	OW/	111	AN	AE/NN1/
47	P	PP/IY/	112	AM	AE/MM/
48	Q	KK1/YY1/UW2/	113	WERE	WW/ER1/
49	R	AR/	114	WILL	WW/IH/LL/
50	S	EH/EH/SS/SS/	115	REMOTE	RR1/IY/MM/OW/PA3/TT2/
51	T	TT2/IY/	116	THEY	DH1/EY/
52	U	YY1/UW2/	117	THEM	DH1/EH/MM/
53	V	VV/IY/	118	HELLO	HH1/EH/LL/OW/
54	W	DD2/AX/PA1/BB1/EH/LL/YY1/UW1/	119	TEMPERATURE	TT2/EH/MM/PA3/PP/RR2/AX/PA3/CH/ER1/
55	X	EH/EH/PA3/KK2/SS/SS/	120	CORRECT	KK3/OR/EH/KK3/TT2/
56	Y	WW/AY/	121	INCORRECT	IH/NN1/PA3/KK3/OR/EH/PA3/KK3/TT2/
57	Z	ZZ/IY/	122	CANNOT	KK1/AE/NN1/AA/PA1/TT2/
58	TIME	TT2/AY/MM/	123	RECOGNIZE	RR1/EH/PA3/KK1/AX/PA1/GG3/NN1/AY/ZZ/
59	DATE	DD2/EY/PA2/TT2/	124	HAS	HH1/AE/ZZ/
60	SYSTEM	SS/SS/IH/SS/TT2/AX/MM/	125	BEEN	BB2/EH/NN1/
61	NOW	NN2/AW/	126	UNDER	AX/NN1/PA3/DD2/ER1/
62	PATCH	PP/AE/PA3/CH/	127	OVER	OW/VV/ER1/
63	ON	AA/AA/NN1/	128	HOOK	HH2/UH/UH/KK2/
64	OFF	AO/AO/FF/FF/	129	HAVE	HH1/AE/VV/
65	CONNECTED	KK1/AX/NN1/EH/PA2/KK1/PA3/TT2/IH/DD1/	130	DO	DD2/UW2/

Fig. 7. Sample words for ham-oriented applications.

an application program. This, in spite of its limitation, seems to be versatile enough for most experimental applications.

The routines shown in Listing 3 are the routines which would be added to another Basic program to allow it to use the dictionaries and message files created using the Editor program.

Using the Editor Program

The first thing that needs to be done when dictionary and message files are created is to initialize them. This is done by typing "RUN 10000" from the Basic prompt (]). The program will ask you for the dictionary file name you wish to create. Enter this name. If you do not enter anything except the Return key, the default file name will be WORDS. The new file will be initialized and then will ask you for the file name of the message file you wish to create. The default file name is MESSAGES.

Once the files are created, the program restarts automatically. The program asks for the file names of the dictionary and message files you wish to use. Enter these and wait for the files to be loaded. The bigger the dictionary, the longer it takes to load.

The main menu then appears. Select the desired option. *Please remember:* Do not exit the program after an editing session without using the QUIT option. Otherwise, you will lose all the changes and entries you have made for that session. The QUIT option writes the files back out to the disk.

Enter New Words: This option allows you to enter the text and the allophone codes for the words and store them in the dictionary. The first thing to be done is to enter the text of the word. Then, after you verify that the word is as you wish it to be, the program will check to see if it is already in the dictionary. If it is, you will see the prompt, WORD ALREADY IN DICT., and the word text will be re-requested. If it is not, you will then be able to enter, one at a time, the individual allophones needed for the word. When all of the allophones have been entered, just press Return. The program will request the text for the next word. If all of the words desired have been entered, just press Return at this point and the program will return to the menu. For example, to enter the word HELLO into the dictionary, you would type H E L L O Return for the text entry. The program will prompt HELLO CORRECT? If so, press Return. If not, enter N and Return and reenter the word. If correct, the program will begin asking for the allophones. To do this you would enter HH1 and Return. The program would then verify the allophone to make sure it was a valid one. If it wasn't, it would prompt INVALID ALLOPHONE... REENTER and re-request it. If it was correct, it would request the next. You would then enter the next one, EH. Then LL, AX, and OW. For the last entry (since there are no more allophones to be entered) you would just press the Return key. You would then get the prompt for the text for the next word. This process can continue until 200 words have been entered or you press Return in response to the word text entry.

Remember when creating your dictionary to take advantage of words/letters/numbers which sound the same. For example, if you enter "for," you can then use it in place of 4, four, fore, etc. Fig. 7 contains some sample words which I have come up with for general ham-oriented applications.

View/Change A Word: This option allows you to call up a word in the dictionary and view or change the allophone associated with it. If the word is not in the dictionary you will see a prompt, WORD NOT IN DICT. Remember, the word must be spelled exactly as it was first entered, including spaces. Once the word is found, the program displays the word and its associated allophones. If they are not correct, you can reenter them in the same manner you initially did. If they are, you can view another word or return to the menu by answering the prompts accordingly.

Delete A Word: This option allows you to get rid of unwanted words from the dictionary. Simply type in the word you wish to delete from the dictionary. The routine will check to see if it is in the dictionary, and if it

```
131   NOT          NN2/AA/TT2/
132   THAT         DH1/AE/TT2/
133   BUT          BB2/AX/TT2/
134   AT           AE/TT2/
135   POINT        PP/OY/NN1/TT2/
136   THIS         TH/IH/SS/
137   EMERGENCY    IY/MM/ER1/PA2/JH/EH/NN1/SS/IY/
138   SHUTDOWN     SH/AX/TT2/PA4/DD1/AW/NN1/
139   LOG          LL/AO/PA2/GG3/
140   DIRECT       DD2/AY/PA2/RR1/EH/PA2/KK2/PA2/TT2/
141   REDIAL       RR1/IY/PA1/DD2/AY/AX/LL/
142   ANSWER       AE/AE/NN1/SS/ER1/
143   MODE         MM/OW/PA2/DD1/
144   AUDIO        AO/AO/PA1/DD1/IY/OW/
145   IN           IH/NN1/
146   RADIO        RR1/EY/DD2/IY/OW/
147   NET          NN1/EH/TT2/
148   MODULATION   MM/AA/DD1/JH/YY1/UW1/LL/EY/SH/AX/NN1/
149   UPPER        AX/PP/ER1/
150   LOWER        LL/OW/ER1/
151   SIDEBAND     SS/AY/DD1/PA1/BB2/AE/NN1/DD1/
152   PROCESSOR    PP/RR2/AA/SS/EH/SS/ER1/
153   BATTERY      BB2/AE/TT2/ER1/IY/
154   MIC          MM/AY/KK2/
155   SPEAKER      SS/PP/IY/KK1/ER1/
156   CONTEST      KK1/AA/NN1/PA2/TT2/EH/SS/TT2/
157   WAVE         WW/EY/VV/
158   TRANSMIT     TT2/RR2/AE/NN2/ZZ/MM/IH/TT2/
159   RECEIVE      RR1/IY/SS/IY/VV/
160   DEGREES      DD2/AX/GG2/RR2/IY/ZZ/
161   REPEATER     RR1/IY/PP/IY/TT2/ER1/
162   SINGLE       SS/IH/NG/GG3/EL/
163   QUARTER      KK3/WW/OR/TT2/ER1/
164   HALF         HH1/AE/FF/
165   LINEAR       LL/IH/NN1/IY/ER2/
166   PHASE        FF/EY/ZZ/
167   PRE          PP/RR2/IY/
168   WATT         WW/AA/TT2/
169   WATTS        WW/AA/TT1/SS/
170   ALPHA        AE/LL/FF/AX/
171   BRAVO        BB1/RR2/AA/VV/OW/
172   CHARLIE      CH/AR/LL/IY/
173   DELTA        DD2/IH/EH/LL/PA3/TT2/AX/
174   ECHO         EH/PA3/KK3/OW/
175   FOXTROT      FF/AA/KK2/SS/PA3/TT2/RR2/AA/PA3/TT2/
176   GOLF         GG2/AA/AX/LL/FF/
177   HOTEL        HH2/OW/PA3/TT2/EH/LL/
178   INDIA        IH/NN1/PA3/DD2/IY/AX/
179   JULIET       JH/UW2/LL/IY/EH/PA3/TT2/
180   LIMA         LL/IY/MM/AX/
181   NOVEMBER     NN2/OW/VV/EH/MM/PA2/BB2/ER1/
182   OSCAR        AA/SS/PA3/KK1/ER1/
183   PAPA         PP/AA/PP/AX/
184   QUEBEC       KK1/YY1/UW1/IY/PA2/BB2/EH/PA3/KK2/
185   ROMEO        RR1/OW/MM/IY/OW/
186   SIERRA       SS/IY/EH/PA1/RR1/AX/
187   TANGO        TT2/EY/NG/PA2/GG2/OW/
188   UNIFORM      YY1/UW1/NN1/IH/FF/OR/MM/
189   VICTOR       VV/IH/PA3/KK2/PA3/TT2/OW/OR/
190   WHISKEY      WH/IH/SS/PA3/KK1/IY/
191   XRAY         EH/KK2/SS/PA3/RR1/EY/
192   YANKEE       YY2/EY/NG/PA3/KK1/IY/
193   ZULU         ZZ/UW2/LL/UW2/
194   CARRIER      KK1/XR/IY/ER1/
195   AMPLITUDE    AE/MM/PA3/PP/LL/IH/PA3/TT2/UW2/PA3/DD1/
```

```
1 D$ =  CHR$ (4)
2  DIM MX(100,64): REM   MESSAGE ARRAY:100 MESSAGES W/64 WORDS EACH
4  DIM WX(200,32)
6  REM  OPEN FILES
8  HOME
10  VTAB 5: INPUT "ENTER DICTIONARY NAME: ";A$: IF A$ = "" THEN A$ = "WORD
    S"
12 DF$ = A$ + ".COD"
14  VTAB 7: INPUT "ENTER MESSAGE FILE NAME: ";A$: IF A$ = "" THEN A$ = "ME
    SSAGES"
16 MF$ = A$ + ".COD": GOSUB 20: GOSUB 40
18  GOTO 1000
20  REM  READ DICTIONARY FILE
22  PRINT D$;"OPEN ";DF$
24  PRINT D$;"READ ";DF$
26  INPUT WX(0,0):J = WX(0,0)
28  IF J = 0 THEN 36
30  FOR I = 1 TO J: INPUT WX(I,0):L = WX(I,0): REM  INPUT A WORD. J IS # O
    F WORDS
32  FOR K = 1 TO L: INPUT WX(I,K): NEXT : REM  INPUT ALLOPHONE CODES. L IS
    # OF CODES
34  NEXT I
36  PRINT D$;"CLOSE"
38  RETURN
40  REM  READ MESSAGE FILE (MF$ IS FILE NAME)
42  PRINT D$;"OPEN ";MF$
44  PRINT D$;"READ ";MF$
46  INPUT MX(0,0):L = MX(0,0): REM   INPUT # OF MESSAGES
48  IF L = 0 THEN 56
50  FOR I = 1 TO L: INPUT MX(I,0):M = MX(I,0): REM  INPUT MESSAGE. M=# OF
    WORDS IN MESSAGE
52  FOR J = 1 TO M: INPUT MX(I,J): NEXT : REM   INPUT WORD CODES
54  NEXT
56  PRINT D$;"CLOSE"
58  RETURN
1000  REM  TEST
1010  FOR MSG = 1 TO 10: GOSUB 60000: NEXT
1020  FOR WD = 1 TO 100: GOSUB 61000: NEXT
1030  END
60000  FOR X9 = 1 TO MX(MSG,0):WD = MX(MSG,X9): GOSUB 61000: NEXT : RETURN
    : REM  SPEAK MESSAGE MSG
61000  FOR AL = 0 TO WX(WD,0): POKE 832 + AL,WX(WD,AL): NEXT : CALL 768: RETURN
    : REM  SPEAK WORD WD
```

Listing 3. Application routines.

is, it will display the text and allophone data for that word. If after verification you wish to delete the word, just press Y in response to the prompt. The next prompt asks you if you wish to delete another word. If so, enter Y. Any other response will return the program to the menu.

Print Dictionary: This option simply sends the entire dictionary to a printer. It will print the file name of the dictionary at the top of the page, the number associated with each word, the word text, and the allophones associated with it. The routine uses the CHR$ (15) code in line 4040 to put my Epson MX-80 printer in the condensed-print mode to allow the printing of 132 columns on one line. You might wish to change that code if you have different printer.

Create Messages: This option allows you to create messages using the words in the dictionary which are currently in memory. Once you create a message file, you must make sure you use the same dictionary with that file in order to make sure the proper words will be spoken.

Messages are created by entering the words desired in the message one at a time. When all the words have been entered, just press Return. You will be asked if you wish to enter another message. If so, just press Return. If not, enter N and Return. With each word entered, the routine will check to see if the word is in the dictionary. If not, it will prompt WORD NOT IN DICT. and request another word. Remember, the message is referred to by its message number. This number is shown at the top of the screen when entering the message. This number can also be obtained by using the Print Message Text option described later.

View/Change Messages: This option functions just like the View/Change Words option, only you can call up the message by the message number associated with it and see what words make it up. If a message is not correct, you can reenter the words as done above.

Delete Messages: This option allows you to delete an unwanted message. Enter the message number of the message you wish to delete. The routine will display the message text on the screen for verification. If it is OK to delete, type Y to the delete prompt. If you wish to delete another message, answer Y to the next prompt. Anything else will cause the program to return to the menu.

Print Message Text: This option will print all of the messages currently in memory. The message number and the associated words are listed.

Speak Messages: This is the most enjoyable option. When a message number is entered, each of the words in the message is printed on the screen and simultaneously spoken. This way you can verify the message and the pronunciation of the word and then go back and change anything if necessary.

Using the Application Routines

The application routines shown in Listing 3 allow you to use previously generated dictionaries and messages in other programs simply by calling the words or messages up with their access code numbers. To use the routines, the low numbered lines shown in Listing 3 (those below 100) would be merged into the program you wish to speak at the beginning of the program, before line 100. The high numbered lines would be merged after the last of the normal program lines. Then, when the program is run the dictionary and message arrays are dimentioned, file names for the dictionary and message files are entered, the data is read into memory, and the program is then ready to speak the messages and words.

This is done by setting MSG equal to the message number of the message you wish to have spoken, and then doing a GOSUB 60000. To speak an individual word in the dictionary, set WD equal to the word to be spoken and do a GOSUB 61000. Make sure MSG and WD are not greater than the maximum number of messages or words in memory.

You must also make sure that the variables used in these routines are not used in the target program in order to avoid any conflicts. Of course, these variable names and line numbers can be changed to suit the application. The important things to remember are to make sure that the proper dictionary and message arrays are dimensioned, the proper file names are entered or generated, and that the data is loaded into memory prior to calling subroutines 60000 or 61000. If it is not desirable to enter the file names from the keyboard every time the program is run, then you might wish to define them in a program line prior to reading the files.

This project has by far been the most gratifying project I have ever undertaken on the computer. It didn't cost much, it went together easily, the programming was simple, and it worked without much fiddling. I was able to take this project from a bag of parts to the finished article in 3 days. The excitement of hearing your computer talk to you will keep you busy at the keyboard for hours.

The applications of such a device are unlimited. Whether it be for assisting the handicapped, entertaining and educating the kids, or adding a unique embellishment to the ham shack, it will definitely be a worthwhile investment. Your imagination is the only limit on its possibilities. If you do not like to type in long program listings, I will be glad to send you a copy of the programs shown in this article on a DOS 3.3 disk for $20.00 postage paid.

In the meantime I will be working on a text-to-speech algorithm for this synthesizer. If you are interested in this or have any comments on this article or this fascinating technology, drop me a card or a letter, I would love to hear from you. Keep talkin'! ■

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Takin' It to the Streets — Part II

Last month's discussion was only half of the story — now discover what remote control can do when the ShackMaster's power is unleashed!

In Part I, I described the benefits of crossband linking and telephone access to your home station. The ShackMaster™ station controller connects to your HF transceiver, one or two VHF/UHF transceivers, and other station equipment. Now I'll describe some other features of the station controller that can make amateur radio more fun and useful in your everyday life.

Electronic Mailbox

Hams have handled traffic since the beginning of amateur radio. Organized traffic handling was the original basis for the formation of the American Radio Relay League. Hams relay messages from one non-ham to another non-ham and from hams to non-hams. These messages are called third-party traffic. MSOs and repeater mailboxes are examples of modern technology applied to handling traffic between hams.

Having a station at home makes it possible to relay third-party messages between you and your family conveniently. Why would you want to relay traffic to your wife and kids? Perhaps because you'll be home late from work. Or you want to let them know that everything is OK. They might want you to call to see if you need to do an errand on your way home. And since you both might not be available at the same time, it would be nice to be able to leave a message.

An electronic mailbox designed for use by the family should be easy and fun to use. Ten canned messages that cover many typical situations are available in ShackMaster. The messages may be left by the ham while away using touchtone™ commands over the air, and incoming messages may be retrieved by the family member by pressing the Read button. The mailbox message is spoken in synthesized speech to the family member. Outgoing messages to the ham can be loaded by pressing the Load button. The speech synthesizer acknowledges entry of the message.

Front-panel lights indicate the presence of incoming or outgoing mail. Mail can also be loaded and retrieved by the non-ham by calling home on the telephone.

Remotely-Controlled Intercom

Third parties are permitted to participate in amateur communications provided that a control operator is present at the control point of the station. This provision is the basis for allowing a friend to talk over your radio, and is also the basis for all phone-patch and autopatch operation.

Virtually all hams have used, or at least have heard, a repeater autopatch. You've probably used your repeater's autopatch to call home or to call the police or report a traffic accident. The patch allows amateurs, through interconnection of the repeater to the phone line, to talk with non-hams. This is a form of third-party traffic known as participation-through-phone-line interconnection. A control operator is in control (typically remote control) of the repeater during the patch.

Now imagine that instead of the phone line connected to the repeater there was a wire to a speaker and microphone at the location of the person you wanted to talk with. Now replace the repeater with your home station. You already have a speaker and microphone in your shack; add a controller to provide you, the control operator, with complete remote control of your home station — and you have ShackPatch! It's an autopatch to home without using the phone!

To activate ShackPatch, enter a touchtone command as you would to bring up a repeater autopatch. ShackPatch generates an electronic ring at home, similar to a telephone. Anyone at home can answer it just by pressing the Answer button. From there, the "patch" proceeds as an exchange of transmissions synchronized by PTT. Our friend, the control window (see Part I), keeps you in complete remote control of your home station with the ability to terminate the patch within a couple of seconds if necessary. Your response time in controlling your home station is identical to the case where you would be standing over the shoulder of a third party who was using your station.

Why have a ShackPatch if there's already a repeater au-

topatch available? Perhaps you don't, in fact, belong to a club or repeater group with autopatch facilities. Or if you do, chances are that when you want to use the patch, such as on the way home from work, typically the repeater is busy. Maybe calling home is a long-distance call from the repeater. Or perhaps you just don't want hundreds of ears listening to you and your wife conversing.

A typical electronic mailbox/ShackPatch scenario could be as follows:

- The XYL is about to go out to pick up the kids after school. Frank Ham is still at work. Before she leaves, she loads the electronic mailbox with "I will be home late," and "Please call home."
- On Frank's way home, he checks in to pick up the mail, then tries to call home by bringing up ShackPatch. The XYL isn't back yet, so Frank leaves a message "All is OK." Later, he tries ShackPatch again, talks with the XYL, and learns that he needs to pick up his daughter Julie at her friend's house.

The mailbox and ShackPatch can be used on a simplex frequency or through a repeater for greater range. And the control transceiver can be commanded to QSY, so we can move ShackMaster off frequency to handle our traffic.

Simplex Autopatch

While ShackPatch allows us to talk with family members (third parties) by direct participation, sometimes it's useful to be able to place a "real" phone call. Perhaps a repeater autopatch isn't available. Since you've already got a control link between you and your home station, a simplex autopatch simply involves controlling an interconnection to your home phone line.

PersonalPatch™, the simplex patch in ShackMaster, allows you to place outgoing calls. As with crossband linking and ShackPatch, the control window keeps you in control of your home station, allowing you the opportunity to send commands as desired every few seconds.

The patch is VOX-activated from the phone, that is, your home control transceiver transmits only when the called party is talking. If he continues to talk for several seconds, the control window allows you to interrupt or exercise control.

A phone number can be stored in ShackMaster's autodial memory and easily dialed with a touchtone command. Any phone number can be dialed as well, with a selectable-toll-restrict capability. The phone number is regenerated into the phone line as either DTMF or dial pulse signaling.

Although PersonalPatch is a "simplex patch," it can be operated through any repeater for greater range.

BSR X10 Shack Control

With ShackMaster you can turn on and off station equipment using the interface to the BSR X10 home-control system. An infrequently practiced aspect of amateur radio is radio-control operation, defined as "one-way communication for remotely controlling objects or apparatus other than Amateur Radio stations." While not the most important aspect of amateur radio, it's specifically permitted in §97.89 (Points of Communication) (b): Amateur Radio stations may transmit one-way signals to receiving apparatus while in beacon operation or *radio control operation*.

When many hams think of radio remote control they think of radio-controlled model boats and planes. But if you can radio-control boats and planes, why not other things around the house? Turn on the lights before arriving home. Turn on the porch light if you're going to be late—or the air

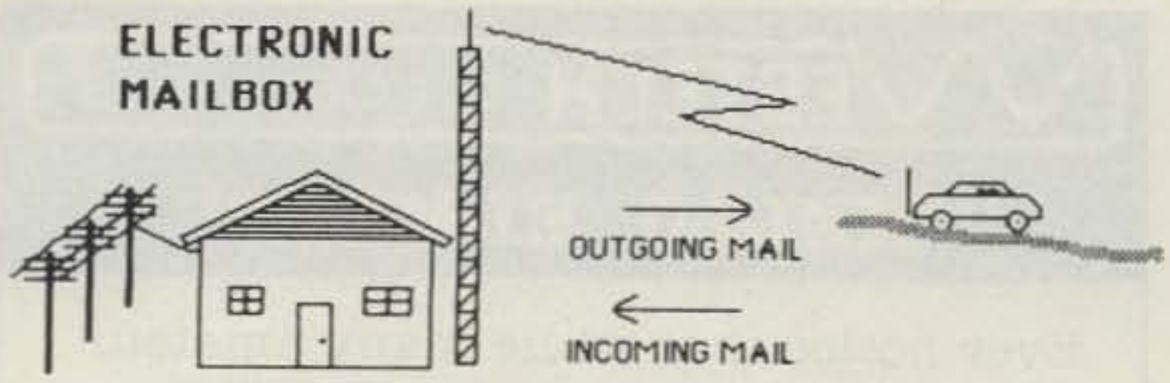

Fig. 1.

conditioner so that the house is cool by the time you get home.

The BSR system is based on a system controller which injects 100-kHz signaling directly into the power line to address lamp and appliance modules located throughout the house. The modules plug into wall outlets and then lamps and appliances plug into the modules. The modules contain relays or SCRs to control power to the appliances.

Up to sixteen independent unit codes are addressable with the BSR system. All of the lamps in one room could be addressed as one unit code, the HF rig as another, the air conditioner as another, etc. To avoid interference with neighbors who own a BSR system, an installation is assigned one of sixteen house codes (A–P).

The BSR system is usually controlled by BSR's command console. However, ShackMaster couples to the BSR system through the Heathkit® RS-232-to-BSR X10 interface. Serial data commands from ShackMaster, in response to your touchtone commands over the air, command the various pieces of equipment connected to BSR modules. ShackMaster acknowledges your commands with synthesized speech responses. The BSR system can also be controlled over the phone through ShackMaster.

A Family Affair

Amateur radio desperately needs to grow in order to justify the retention of its frequency allocations in the face of increasing competition for spectrum. The best prospects for new hams *should* be your own family members. No one else has the same level of exposure to the benefits of amateur radio or such proximity to a teacher, or "Elmer."

By their very nature, many ham-radio activities may exclude family members: club meetings, special events, and, most of all, operating. The impression may be that ham radio is something that takes up all of daddy's spare time. This often results in feeling of resentment toward amateur radio from the people who would otherwise be the best possible candidates for recruitment.

One of the intents of the third-party participation provisions in the rules is "to allow persons who are not

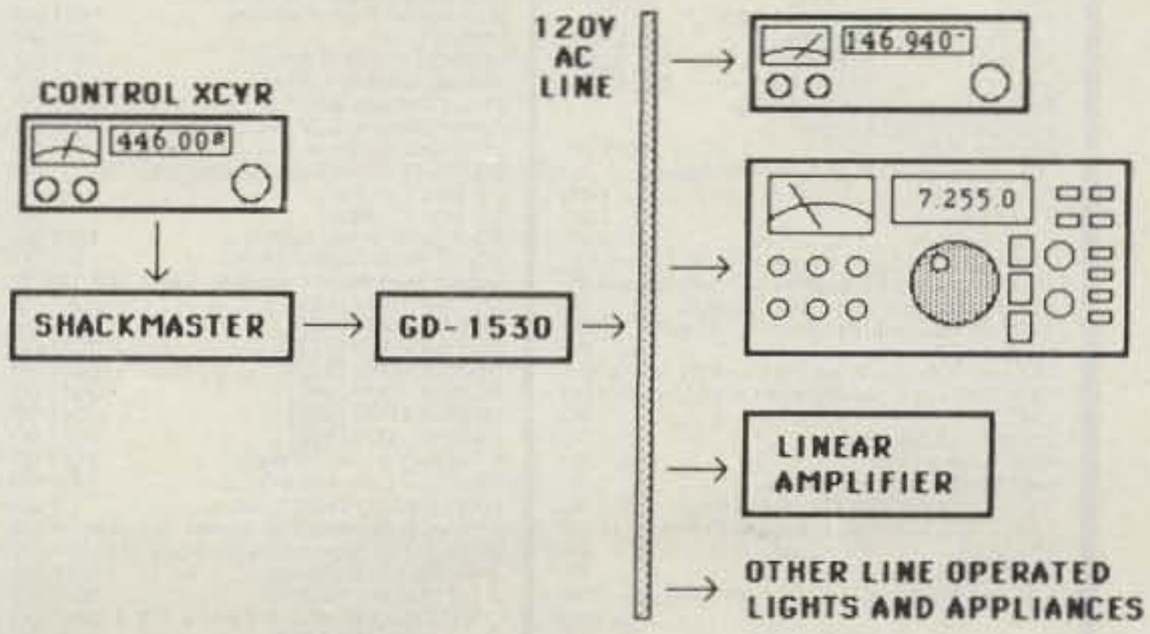

Fig. 2.

licensed Amateur Radio operators to experience the benefits of this service and to stimulate their interest in Amateur Radio" (Kowalski, FCC, 1984). Allowing a youngster to talk with his dad over ShackPatch while he's on his way to or from work gives the child an insight into the benefits of getting a license of his own. Instead of being limited to talking over the radio when his father is in remote control of the station, he *could* have a radio of his own and use it *anytime* to talk with *anyone!*

The electronic mailbox, ShackPatch, and BSR home control help create a positive impression of amateur radio and the services it offers in the minds of the amateur's family members. These features involve the family in amateur radio instead of isolating them from it.

Other Applications

ShackMaster's third-party traffic and participation features make it useful in applications other than with the home station. A transceiver and ShackMaster located at the Red Cross, weather bureau, or local hospital can provide many of the benefits of amateur radio for emergency and priority situations without the need for a ham to man the station locally.

Conclusion

Modern technology has worked its way into many aspects of amateur radio through feature-laden transceivers, computer-based communications, and highly sophisticated repeaters. The ShackMaster station controller takes a fresh approach in that it utilizes new technology to make your existing home station more valuable, both by making it available to you most of the time and by involving your family members—the best prospects to be new hams in amateur radio. ■

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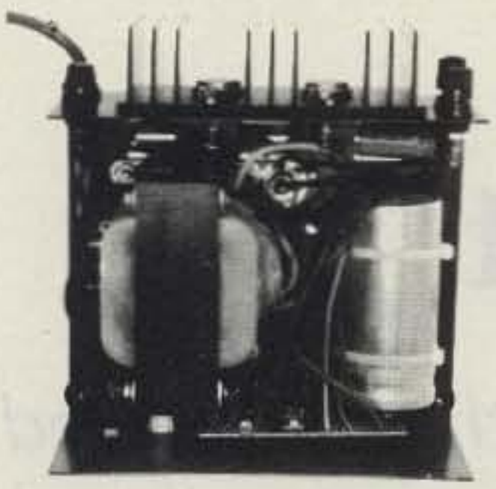

INSIDE VIEW – RS-12A

ASTRON POWER SUPPLIES

• HEAVY DUTY • HIGH QUALITY • RUGGED • RELIABLE •

RS and VS SERIES

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-4A.
- 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)

MODEL RS-50A

MODEL RS-50M

MODEL VS-50M

RM-A Series

MODEL RM-35A

19" X 5¼ RACK MOUNT POWER SUPPLIES

Model	Continuous Duty (AMPS)	ICS* (AMPS)	Size (IN) HXWXD	Shipping Wt. (lbs.)
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
• SEPARATE VOLT & AMP METERS				
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50

RS-A SERIES

MODEL RS-7A

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

RS-M SERIES

MODEL RS-35M

• Switchable volt and Amp meter

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt (lbs)
RS-12M	9	12	4½ x 8 x 9	13
RS-20M	16	20	5 x 9 x 10½	18
RS-35M	25	35	5 x 11 x 11	27
RS-50M	37	50	6 x 13¾ x 11	46

VS-M SERIES

MODEL VS-20M

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

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H x W x D	Shipping Wt (lbs)
VS-20M	16	9	4	20	5 x 9 x 10½	20
VS-35M	25	15	7	35	5 x 11 x 11	29
VS-50M	37	22	10	50	6 x 13¾ x 11	46

RS-S SERIES

MODEL RS-12S

• Built in speaker

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

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Above Intercept

It is cramped and dark and freezing cold, but the Allies need information. Has Britain's secret radio fallen into enemy hands?

It was like a return journey into the womb. The opening was so narrow that I could barely squeeze through. The new flight suit and the stiff webbing of the parachute harness made me feel as if I were a trussed turkey. The crew chief, a very helpful fellow who had braced himself firmly on the hardstand, was gleefully pushing on my rump.

Inside, the glow of my flashlight reflected from the exposed control cables, pushrods, and assorted valves reinforced my initial anatomic impression. In front of a tube-and-canvas seat there was a small steering wheel. Beyond it on a rough plywood shelf squatted "Joan-Eleanor." This was my first date with her, and I knew that we would become quite intimate during the long hours I would spend with her in this flying radio shack. You see, I was a spook for the World War II predecessor of the CIA, the OSS—the Office of Strategic Services.

The author in full flight gear by a British De Havilland Mosquito.

Let me put it on the line. Radios have always been magic to me, although they were essential to my trade. Information is a very perishable piece of goods unless it gets where it is supposed to go in a hurry, and there is nothing that can beat a radio to do that. In the old days we depended on CW and ciphers to get through. This was tedious, and every clandestine operator fully expected the other side to be tuned in to his frequency or to home in on the location of his transmitter—if they did not jam him as soon as he got on the air. This made the profession rather exciting and sometimes short-lived.

Back in the latter part of 1944, Joan-Eleanor, as this brand-new UHF set was called, had been developed to cure the problem. Two units made up the system. The ground unit was very small, no bigger than a little cigar box. Simple controls were mounted on the top and a puny dipole antenna could be attached in front. The radio was so compact that it could be hidden under a coat. Power was supplied by six miniature wet-cell batteries which could be clamped to the operator's waistline. The set was pre-tuned to a single UHF voice frequency. It was a revolutionary improvement over the sets we carried around in battered suitcases.

The airborne unit was larger, quite elaborate, and more powerful because it used the aircraft's electrical system. This radio was tunable and had conventional dials and controls. The mike input was compatible with the lip or throat microphone used by the plane's crew. In this instance, a hookup was provided to record all communications on an early recorder—one which used a thin magnetized steel wire. The recorder was mounted next to the radio. The antenna, consisting of several elements, was directional and was attached to a long steel tube which extended below the fuselage. It was retractable during takeoff and landing. The small steering wheel at the upper end served to turn the antenna in flight and to orient it for the best reception.

In addition to the electronics, the radio operator had in front of him a full display of basic flight instru-

ments, a magnetic compass, connections for his oxygen mask, and an outlet for his heated flying suit. The whole thing had been jerry-rigged in what normally was an inspection compartment in the forward part of the tail just behind the bomb bay, which now was packed with range-extension tanks.

The idea behind the equipment rested upon a peculiar propagation characteristic of UHF in which the signal reflection of the ground forms an inverted cone within which two-way communications are possible. The role of the airborne station was to locate and fly in this propagation cone at the highest possible altitude (where the orbit could be largest). The rotating antenna could be adjusted for the best signal, indicating where the propagation cone was located in space. This directional information was then passed to the flight crew in the cockpit so that they could keep the plane on station.

The aircraft selected for these airborne intelligence gathering missions was a De Havilland Mosquito, a machine built largely of wood and powered by two supercharged Rolls-Royce Merlin engines. With 1290 horsepower on each side, this was a high-performance plane capable of speeds up to 400 mph and a then-extraordinary service ceiling of 37,000 feet. It could fly well above the reach of German antiaircraft batteries, higher than their best fighters, and well beyond their top speed.

During periods of traffic between the ground and the aircraft there was practically no chance that the location of the transmitter could be DFed, and while it was conceivable that the signal from the aircraft could be picked up by a listening station on the same frequency, there was not much that the enemy could do about it. We were outside his capability to knock us out. All traffic was recorded on wire and the spools were sent by special courier to headquarters right after a mission for analysis and target designation.

It was during the latter part of November, 1944, when I was given orders to fly these missions as an operator. I had been picked because I spoke the languages of our agents behind the lines, local nationals who had volunteered to do some work for us in their occupied countries. There was another reason. I had been liberated by the Allies in northern France and knew the dangers, pressures, and gnawing fears which always come with the job.

The fact that I had had a complete flight physical and spent a claustrophobic hour in a decompression chamber to see if I was qualified for flight duty did not impress the US Navy Commander in charge of the Joan-Eleanor project or his staff of electronic wizards who made up the special unit at the Watton airbase, a field used by the 25th Bomber Group and a squadron of Mosquitoes. The latter were used to fly weather-reconnaissance and path-finder missions. Three of their ships had been assigned to the Joan-Eleanor team and were modified to take the equipment, the range-extension tanks, and nuts like me. After a welcome briefing I was introduced to the head pilot, an Air Corps flyer with lots of experience in Mosquitoes. He seemed amused when I told him that I had been up in planes only a few times (usually as either a passenger or a parachutist), so he suggested that we take a look at the bird.

The Mark XVI Mosquito had fine lines in its mottled camouflage paint, but looked ungainly on the ground because of its three-point landing system. Following the pilot into the cockpit through a hatch behind the nose, I settled into the right seat and straddled the dual controls. The dash in front of me was cluttered with all kinds of instruments and there were black-box navigation aids on my side of the cockpit which I had never seen before. From the shoulders up, visibility was excellent through the Plexiglas™ canopy. The pilot explained that most of the armor and all the weapons had been removed to lighten the plane for the sake of altitude, speed, and range.

It was, in fact, a hot machine, with but one very bad habit. During hard landings it was commonplace for the fuselage tail section to break off behind the bomb bay and turn into a pile of assorted chips, toothpicks, and skewers (because it was made of wood). This was the place where I would be sitting.

On this sour note, we strolled under the starboard wing with its huge engine nacelle to look at the radio compartment. It was indeed very small, and I had to crawl on my hands and knees to get in. Once seated, I realized that everything was within reach and that probably one could survive in this broom closet for the six to eight hours which was the length of the average mission.

Clamped under the seat was a plastic funnel attached to a flexible hose which was described as a relief tube—a one-shot affair since it never failed to freeze up at high altitude. Then came the clincher. The access hatch could be jettisoned in an emergency, but the opening was too small to bail out with the parachute on. In theory, the radio operator was supposed to jump with the chest pack in his hand, hook it on while falling, and then pull the "D" handle. I was tempted to ask if any of my predecessors had ever survived such an escape procedure, but the bar at the club was about to open and my mouth had become so parched that I could not articulate the question. Besides, I had been told that I might get to meet Major Clark Gable, who was known to patronize the same establishment during these stressful times.

The first familiarization flight came the next day, and I sat in the navigator's seat. After takeoff we climbed steeply into the clouds and I watched the altimeter and rate of climb indicator wind up like crazy. It was an astonishing performance to an earthling like me, and I was elated when we broke out into brilliant sunshine looking down upon the cumuli and the haze of the English countryside. Climbing through 10,000 feet, the pilot instructed me to go on 100% oxygen. The plane leveled off at about 30,000 as the engine controls were set to the cruise mode. The indicated airspeed settled around 320 knots, and the outside air temperature showed a chilly −40° F.

The pilot made various maneuvers and I was allowed to touch the controls lightly to get the feel of the plane. It was a thrilling but short experience, especially since from here on out I would have to ride in the aft compartment and mess around with Joan-Eleanor.

After that it was just plain work, work, work. I was drilled on procedures, on techniques, and spent hours in my small radio shack. I learned to work the sets in my bulky flight gear, the heated suit, the gloves, the helmet, and how to use the oxygen. I did this by the red glow of the overhead light and also in total darkness to simulate power failure when it would have to be a matter of feel.

Ten days later, I flew my first simulated radio mission at altitude over the airfield. The sets had been warming

up during the climb and I was ready to click the transmit switch on at the precise time.

"George, George...this is Victor. Do you copy?"

There was no reply, and after several futile attempts I asked the pilot to shift his flight path so that I could give it another try. Finally, there was an audible response from base.

"Victor, Victor...this is George. You are loud and clear. How me?"

Hands flying, I pressed a button which would flick a light in the cockpit to show that there was contact with the ground and at the same time I hit the Record switch on the wire recorder. Directly in front of me the magnetic compass began to turn slowly, showing that we were flying in a shallow bank. Tentatively, I rotated the antenna steering wheel to search out the strongest signal. I chuckled at the idea that in a manner of speaking I was flying the aircraft, but there was work to do and the time had come to get my act together.

The fellow operating the ground set was reading off some prearranged poop, and I talked just enough to keep the contact going. After about ten minutes, George signed off and I signaled the cockpit that my work was done. During the descent to base I rewound my precious wire recording and pocketed the spool. It was going to be my graduation diploma. I felt pretty good about the whole mission until the pilot decided to perform some barrel rolls for my benefit, and I experienced such weightlessness and gut-wrenching Gs that I nearly lost everything in my stomach all over the radios, flight gear, and all other equipment.

Back on the hardstand the crew chief helped me crawl out through the hatch and gave us all a lift to the debriefing room. There we discussed the actual path of the aircraft over the base, and the technicians played the wire that I had brought back with me. It was a lousy recording, with static and fading, but it was audible and could be transcribed. Apparently, we had strayed outside of the propagation cone—or something had gone wrong with the equipment. The latter was hotly denied by the humorless naval type and his aides, but I did not mind taking the blame because I did not care if I ever flew in that contraption again and I knew that it would take a lot more practice and a healthy dose of luck to bring home the bacon.

It was mid-November when I was alerted for my first real mission over German-occupied territory. Our man, code named *Bobby*, had parachuted into Holland a few weeks ago and had made contact with the Dutch underground. Through the so-called innocent messages which were regularly broadcast by the BBC, a date and place had been set for a contact with Joan-Eleanor. This was to be two days later near the German-occupied town of Zwolle, east of the Zuider Zee.

Bobby was not a complete stranger to me, even though we had never met face to face. We had talked on the telephone while he was being kept in a safe house during his training because it was important for him to know to whom he would be talking while doing his stuff. He had spoken in English with the slight guttural accent so peculiar to Hollanders, and I felt pretty sure I could recognize it through distortion, fading, and static. After some pleading, I had been given a wax Dictaphone-cylinder recording of a conversation between *Bobby* and his case officer. A few playbacks gave me some confidence that I would recognize his voice.

Bobby and I also had agreed on a rather simple emergency code by which he could tell me that he was operating under duress—if this ever came to pass. He was to talk about the weather in the early stages of the contact, and this would be my cue. What would happen then was left to improvisation.

The preflight briefing was routine. Rendezvous over the target was scheduled for 1:30 in the morning, and we were to be at 35,000 feet for the orbit. Our plane was to go in with four other Mosquitoes on a pathfinder mission over the Ruhr, but somewhere over France we were to turn north, cross the battle line in southern Holland, and make for Zwolle. The return flight from the target after the contact would be unescorted over the North Sea.

The weather over the continent had been unusually bad for this time of the year, and the Air Corps had drawn blanks on visual and photo reconnaissance. This was why recent observations taken on the ground were invaluable. The target was still obscured and navigation would have no ground reference whatever. What it boiled down to was that it would be *my* job to find *Bobby*—or, rather, his little transmitter—among the polders and canals.

We met at the aircraft to stow the gear and check out the radios, and it was not long before we started on the taxi roll and moved to the active runway. Moments later, my instruments showed that we were climbing fast, and I connected the oxygen and my heated suit. It was not uncomfortable when we cleared our departure from England with air-defense radar and continued the climb to mission altitude, but when we reached it, the outside air was down to −56° F and I could feel the cold nibble at the exposed bits of skin around the oxygen mask. As a precaution I turned on the radio and the recorder to keep them warm. The boys up front were rather terse with their exchanges on the intercom; the crew could see the black, velvety sky sprinkled with diamonds and would be keeping their heads on a swivel looking for German fighters.

I was in a bit of a daze when the navigator called to report that we were 30 miles or so out of the target and would fly a dogleg to use up the time before the contact. He sounded like bullfrog because of the thin air, and I acknowledged with a similar croak. Then I gently lowered the antenna and made sure that everything was still working. Probably, *Bobby* was standing in some wet field down below, in violation of the strict German curfew, of course, checking his gear. The minutes went by slowly—too slowly to suit me. On the dot, I switched to the transmit mode and made the first call.

"*Bobby, Bobby*...this is Victor. Do you receive?"

On the third call there was a faint response, but I was not sure, and I tried to raise him again, asking for a short count. While straining to hear him I rotated the antenna in a slow sweep to see if I could pick up a stronger signal. After a few more seconds of flight I picked him up again at the end of his call, so I flashed the pilot to begin his orbit. The plane banked gently to the left as I went on the air again.

"*Bobby, Bobby*...this is Victor. How do you receive now?"

He came back to me saying: "I can hear you fine. How me?"

What luck, I thought. Here I am flying around like an angel and I've got a five by nine contact on the third try. *Bobby* should feel pretty good, too, so I asked him how he was doing.

"Hello, old chap," he

came back. "This is *Bobby*. Had some trouble making contact with our friends at first and the weather has been terrible. It is cold, too."

It hit me like a punch in the solar plexus a fraction of a second later. Did I hear him right?

"*Bobby*, say again, You're fading." I absolutely had to verify.

He said it all over again in just about the same words—without a bit of emotion—and I had it all on the thin steel wire of the recorder. *Bobby* had been taken. Six miles below me he was working his set with a gun at his head. From here on out the best I could do was to keep him on the air—and alive.

We went on with the contact and he began to pass me information on train movements, supply dumps, and the location of German units in his area. It would have been great stuff if it had not been manufactured data, or "chickenfeed," as we call it in the trade. He transmitted for close to six minutes or so and then I asked him to set a date and time for the next contact which I would confirm in the usual manner.

Just before I signed off, I glanced at the recorder and saw that in the intense cold the wire had broken. The take-up reel was one-third full and that was all. I told the pilot that we were through on my end and that we could go home. As we headed northwest I removed my glove and with a shaking hand tried to make some notes on my knee pad. When my fingers got so stiff from the cold that they wouldn't move, I gave it up and concentrated on remembering.

We were still at altitude heading for the North Sea when I heard a dull explosion on the starboard side followed by a seat-of-the-pants sensation that the plane was slowing down. There was a quick exchange up front (which I could overhear on the intercom) to the effect that we had lost one engine and had feathered the prop. The instruments confirmed the loss of speed and the slow descent. I turned off all my electrical equipment, trusting the old flashlight.

We still had to fly above the reach of the German flak batteries along the coast, and the altimeter was winding down until it showed that we were in the denser air. Adrenaline was pumping wildly as I reached for my parachute under the seat and rehearsed the procedure for bail-out—with the chest pack in my hand, fighting the slipstream. Of course, the whole plane could blow up or be hit, and the basic question would be quite academic. Over the frigid North Sea towards which we were still slowly descending, we had become night-fighter bait. That unpleasant possibility made me wish for the relief tube until we cleared our entry with British radar and were vectored to one of their emergency airfields on the left bank of the Thames River.

It was the smoothest landing I experienced in a Mosquito and not a moment was wasted in releasing the hatch cover as we bumped over the pierced planking of the taxiway and came to a stop. My exit was about as graceful as that of a grizzly emerging from his den, and this ridiculous performance was illuminated by the spotlights which a dozen or so emergency vehicles were playing on the crippled Mosquito. Since the machine gave no indication that it would blow up, I crawled back into my hole to retrieve the knee pad with my scribbled notes and the spool of wire on which technology had etched at least a part of *Bobby*'s message to me. Then, knowing in my heart that I would rather be an old and not-so-bold flyer, our crew of three was whisked by ambulance to the base dispensary for a checkup and a double shot of medicinal spirits...the traditional remedy against airman's fatigue, the bends, loose bowels, and other impairments of the mind which invariably follow a near crash.

We stayed together through the debriefing, but while my buddies were allowed to sack out, I was flown back to home base in a little Lysander liaison plane for an early morning tête-à-tête with my naval boss and a subsequent overland trip to London. Something had to be done quickly about *Bobby*, and we also had to know if Joan-Eleanor had been compromised by his probable capture. I am not sure what the priorities were.

I was tired, and today, so many years later, I have only a coarse recollection of all that happened in that soundproof conference room on Grosvenor Street, but my story was dissected in minute detail and they played that miserable short bit of wire I had brought with me. I got a bit huffy when I had to explain again and again to these nattily-uniformed gents that it is not good for one's health to light a cigarette near a pure oxygen atmosphere in order to anneal a piece of wire before knotting it, not to speak of other difficulties like heavy gloves, the ticking seconds, the excitement, and the simple fact that standard procedure goes out the window when a man's life is about to be blown away.

As we were exploring various alternatives, *Bobby's* life expectancy became very important to me, and I volunteered to make as many flights as they wanted over Zwolle in order to make contact and extend his false value to the Germans. At the same time they were going to energize the Dutch underground in an effort to get the whole story or at least to confirm what I felt pretty sure had happened to him.

If this were a piece of fiction, all kinds of happy endings could be invented... but it isn't. There were two more flights over Holland and both drew blanks. *Bobby* remained silent then, and is to this day. It is small comfort to believe that his last transmission is still traveling in space.

I flew my allocation of missions with Joan-Eleanor, which was not compromised, and a good many were productive. The flights took me as far east as Prague, to Berlin, Hamburg, to the rocket laboratories at Peenemünde, and to other targets until Hitler's Reich collapsed. Fresh information from our men on the ground combined with aerial photography was of great value at a time when traditional intelligence channels were too slow to fit a fluid situation.

Some thirty years later I read a modest reference to Joan-Eleanor in a declassified report on the wartime activities of the OSS. It indicated impersonally that the project contributed to the war effort. That was after the fact, however. At the time of which I have written, I was concerned only about keeping the radio going while imagining the pyrotechnics on the ground through a lattice of moonlit vapor trails. ■

Editor's Note: Readers of *73* have met Victor Layton before—but didn't know it. He was the secret agent, *Citron*, referred to in "Messages from Station Charlie," *73*, January, 1982, p. 92. He and the author of that article will have had their first reunion in 41 years before you read this.

Charles Houghton WB6IGP
6345 Badger Lake Road
San Diego CA 92119

Build a 1296 Stripper

Join the fun on 1296 MHz with WB6IGP's stripline downconverter.

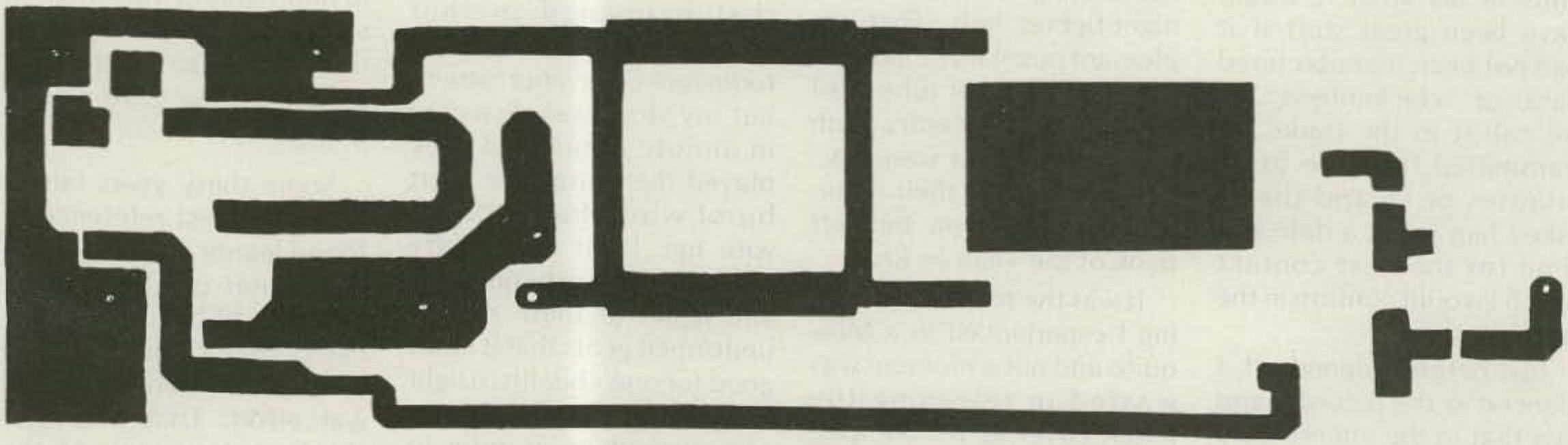


Fig. 1(a). Printed circuit foil pattern, actual size.

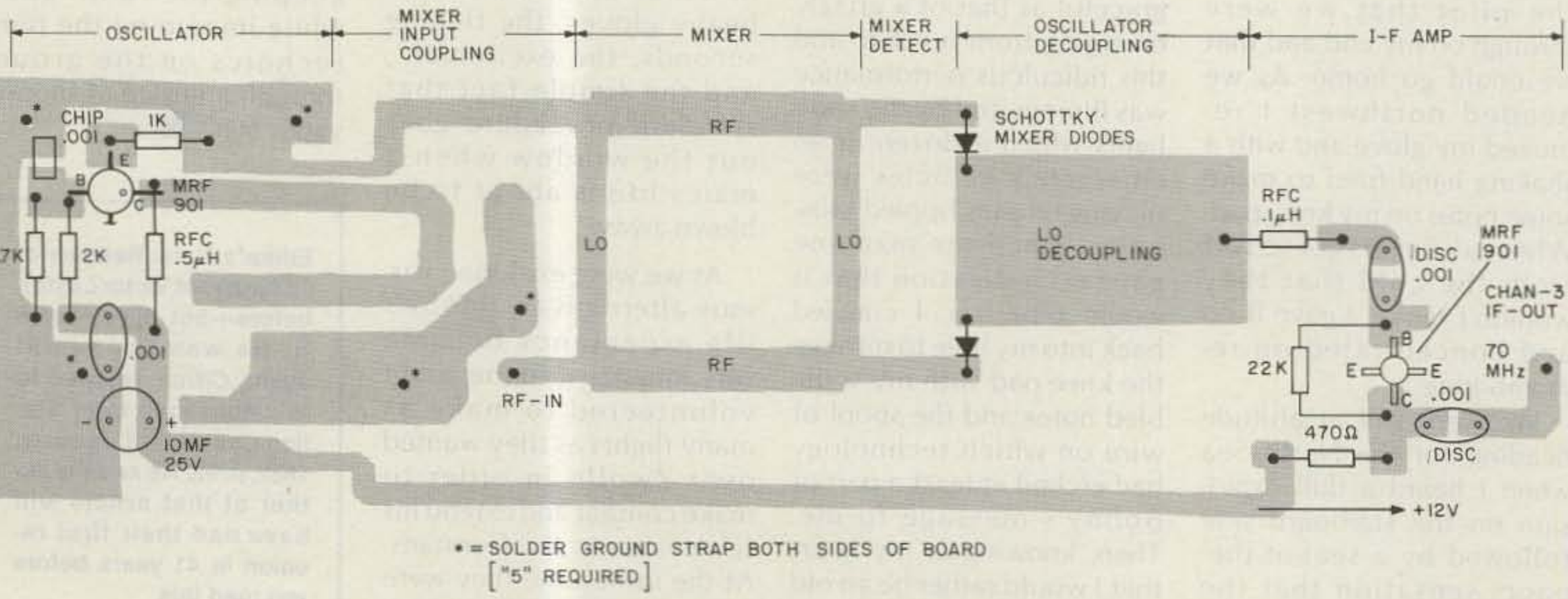
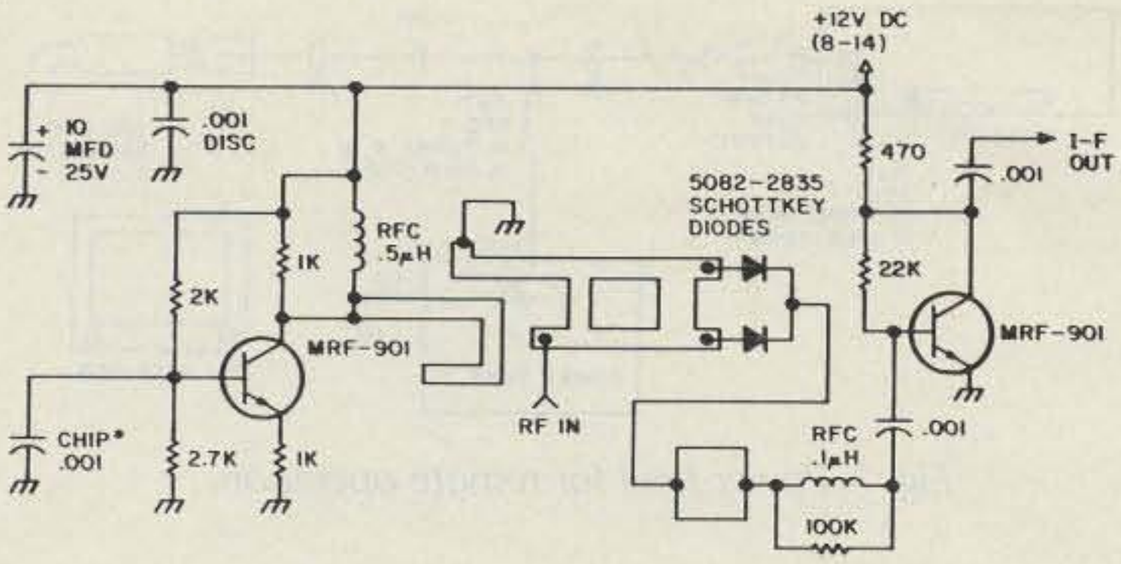


Fig. 1(b). Parts placement. Coax connectors are mounted on the ground-foil side. Provide clearance through the PC board so that center conductor does not ground out.



NOTE: MRF-901 RADIO SHACK PART # 276-2044 {OSCILLATOR / I-F AMP
5082-2835 RADIO SHACK PART # 276-1124 — SCHOTTKEY DIODES

Fig. 2. Schematic diagram.

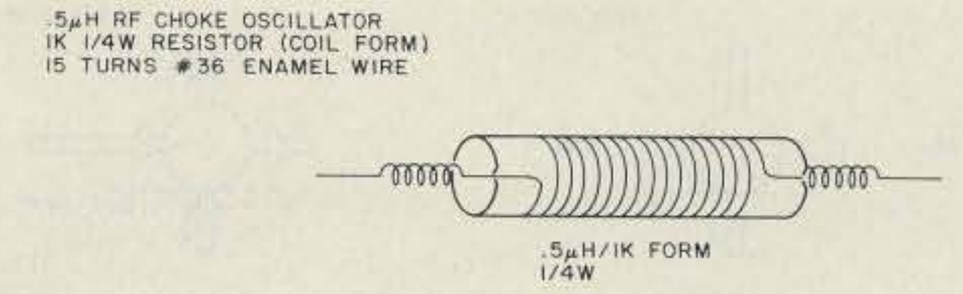


Fig. 3. Chokes.

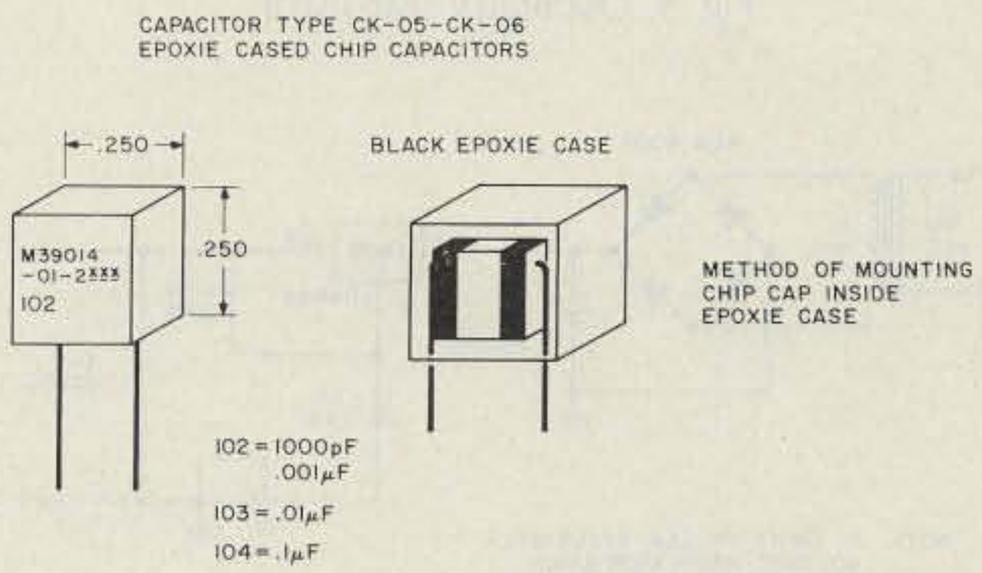


Fig. 4. Types of chips.

Here is a microwave converter that is easy to construct and operate. This design removes the bulky oscillator-multiplier requirements and places all components on a single printed circuit board in stripline fashion. In this manner all of the critical inductors are etched onto the board and do not require tuning except for the oscillator circuit. Several stations locally have constructed this unit and have found it to be trouble-free.

The design goal was to create a workable unit that could be constructed in any part of the country using local parts suppliers such as Radio Shack. The one critical component on the PCB is the chip capacitor on the base of the oscillator transistor. This capacitor is essential to the proper operation of the oscillator. I have had trouble with units constructed using other than disc-ceramic capacitors. They just don't work at this frequency, so don't substitute any other capacitor; the stability and frequency of the oscillator depend on it.

Where most capacitors fail is with the inductance in the leads and the package used to contain the capacitor. The chip capacitors are leadless, limiting the series inductance to a bare minimum. (See below for tips on how to scrounge at local swap meets to discover chip capacitors in some very unlikely spots!)

The transistors used were Motorola MRF-901 and were obtained at the local Radio Shack store along with the Schottky mixer diodes. Other devices could be substituted, such as the NEC-02136 oscillator and the NEC-02135 amplifier, depending upon suppliers available. The remaining parts can be obtained from the junk box or surplus PCBs—to hold down costs.

The resistors should be ¼ W. Either long or short leads will work just fine. There are two rf chokes that need to be wound first. Select smooth ¼-W resistors to wind the chokes on as winding on them is a lot easier than on film types, which tend to bulk the windings near the center of the resistor body and make attachment of the wire ends a little loose. If you do use film types, coat the chokes with a good quality "Q" dope to hold the windings distributed on the resistor body securely. See Fig. 3 for details.

Make sure you have removed the enamel coating on the ends of the wire so as to ensure a good connection. I have lightly held a fine grade of sandpaper and pulled the wire through it. Light pressure must be used or the wire will break. Another method is to dip the wire into some rubbing alcohol, remove the wire quickly, and hold it in a match flame to remove the enamel. While the wire end is still hot, dip it into the alcohol again and it will be bright and shiny and ready for soldering. (I used about one-half ounce of alcohol in a small tip-proof container.)

Concerning the chip capacitor, many printed circuit boards should be looked over for suitable capacitors that may be hiding chips. Look for the little square types, usually black, about one quarter of an inch square. These are capacitors embedded in epoxy with wire leads attached. With a little patience, the capacitor can be removed from this epoxy prison. I have used diagonal cutters to slowly chip away the sides and the top of the unit. The front and back can then be pried off with a sharp edge or the diagonal cutters. See Fig. 4 for details.

Mount the resistors first and then the rf chokes, checking them for continuity. Then mount the chip capacitor. You might want to hold it down with a toothpick until one side is soldered into position. Mounting the diodes and transistors last will protect them from abuse. Do not forget to connect the points marked with a dot to tie the sides of the foil together. This connects the rear ground surface to several points on the PCB; use scrap pieces of solid wire.

The transistor used for the oscillator should be modified by cutting one of the emitter tabs off close to the case of the device. (If the NEC-02136 is used, no modification is needed as it comes as a three-lead device.) See Fig. 5 for details. Do not modify the device used for the i-f amplifier. Both emitter leads are inserted into the hole between the base and collector stripline. The emitter leads are then soldered to the rear ground foil.

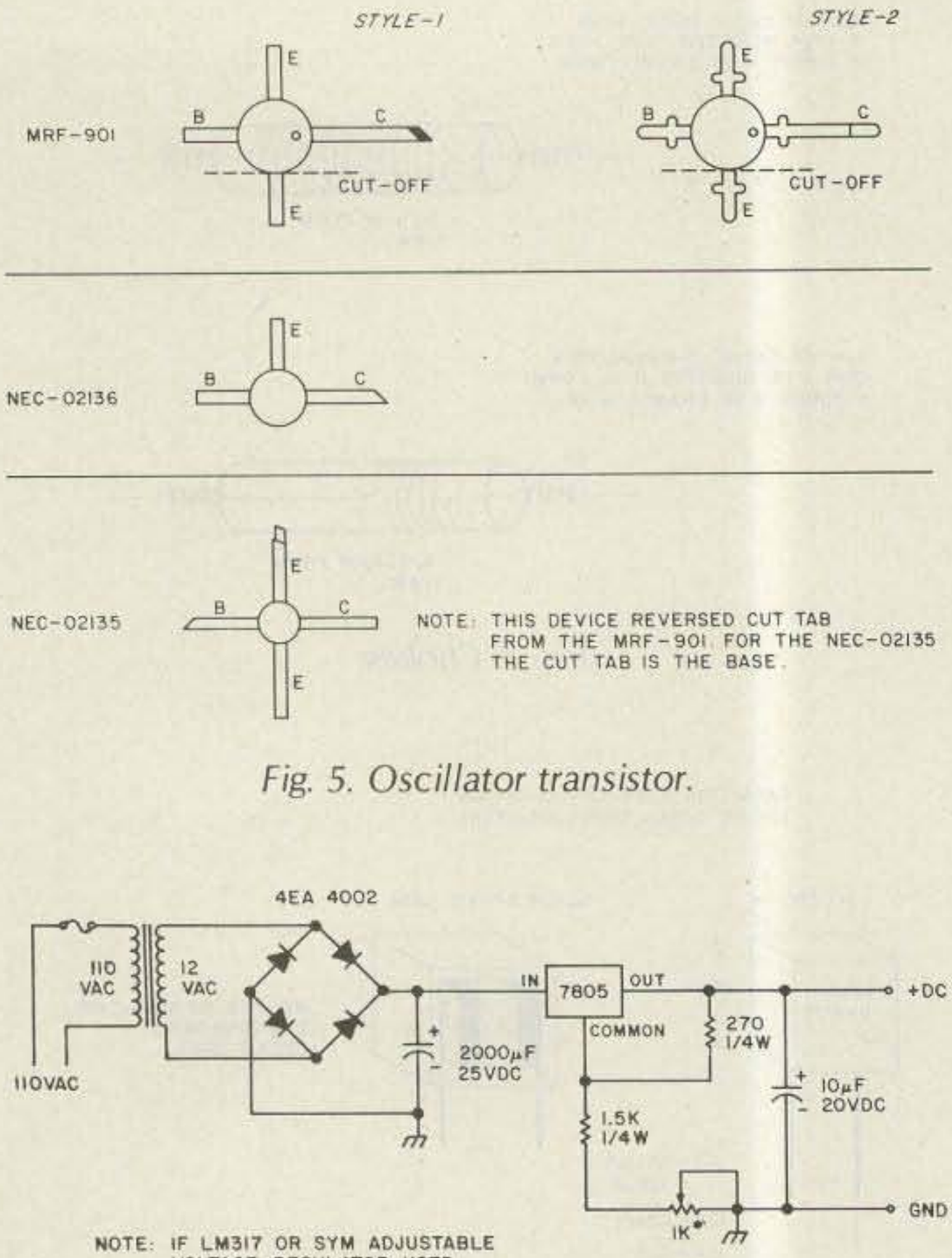


Fig. 5. Oscillator transistor.

Fig. 6. Power supply, 8–14-V-dc adjustable.

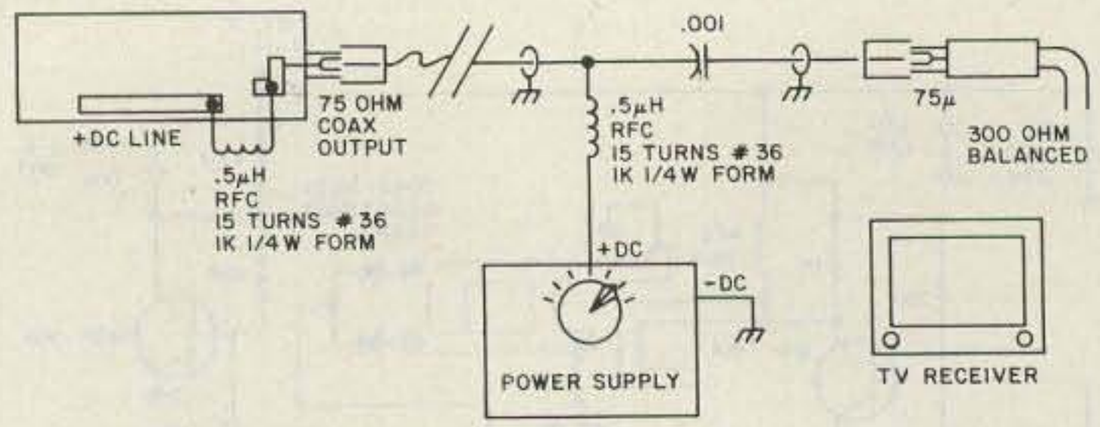


Fig. 7. Power feed for remote operation.

Construction of the power supply is all that is needed now to place the converter into operation. A printed circuit board was not used as the components were mounted on terminal strips. See Fig. 6 for details.

Operation with the fixed-voltage regulator is modified to provide a variable dc-voltage output of about eight to twelve volts. By placing a resistor in the common lead of the regulator to ground, the voltage can be adjusted from its lowest regulated voltage to some higher value. While high output current cannot be obtained with fixed regulators, they can provide the amount needed for this application. (A variable regulator could be used but they are about four times as expensive.) Ten volts will adjust the converter to the designed center frequency you desire.

The oscillator, on its fundamental, is adjusted by changing the length of the collector stripline. Output frequency depends on components used and the lead dress. Nominal frequency without changing the stripline is about 1050 MHz, and is 1400 MHz with a very short collector stipline. Coupling out of the oscillator is accomplished by a short section of transmission line (stripline) to the upper arm of a microstrip branched-arm, 30-dB, hybrid mixer. The upper arm and lower arm are resonant to the incoming rf signal, while the side left and right arms are resonant to the local-oscillator signal.

This frequency is about 1220 MHz when the converter is turned to 1290 MHz. Schottky diodes are used in the mixer due to their low loss and low noise figure. The rectangular stripline on the diode output decouples the microwave frequencies (1280 MHz, 1150 MHz, and 1220 MHz) and passes the i-f signal on to the preamplifier. This amplifier provides about eight dB of gain. Connection to the television receiver is made with a 75-to-300-Ohm balun.

While the converter can be kept in the station proper with a direct connection to the power supply, it also could be mounted up on the antenna with a small modification and a suitable weatherproof box. The converter is modified by placing a 0.5-microhenry decoupling choke from the positive dc strip to the i-f output connector. In the station end of the coaxial cable another 0.5-microhenry choke is placed from the center connector of the coaxial cable to the power supply. The coaxial ground sheath is tied common to the system ground and the power-supply negative output. The coupling to the television receiver is through a .001-uF-dc blocking capacitor. See Fig. 7 for details.

Testing the converter can be very easy if a signal generator or an on-frequency signal is available. If not, then you will need to set the oscillator frequency with a frequency counter. The only other method is the cut-and-try method; not too scientific, but it can work. Adjustment of the oscillator need not be difficult as long as some means is available to check frequency or observe a signal.

When power is applied to the converter for the first time (and all is well) you will observe very heavy snow on the TV screen. Confirm this by turning the power on and off to observe the difference; it should be quite apparent. Without test equipment, this is the easiest test to tell if the system is working. The snow is the result of the local-oscillator feed through the mixer and i-f amplifier.

Adjustment of the local oscillator is next. Set the power supply to mid-range (about ten volts). Then start trimming the collector stripline, 1/32 to 1/16 of an inch at a time for the first or second cut, until you get the feel of how much frequency is changed on each cut. Go slowly! When the frequency is within 50 MHz or so start trimming in 1/64-inch increments. If at any time you have used a soldering iron on the PCB, postpone frequency measurements until the board has returned to room temperature—about fifteen minutes maximum.

If you rush this step and mount the converter on the roof, you may find out later that the frequency is so far out of range that the converter is unusable. Go slowly, and the adjustment will come out right the first time.

Adjustment of the power supply should vary the voltage to the oscillator and i-f amplifier, shifting the frequency of operation plus and minus 20 MHz, depending on power supply swing voltage. The voltage swing does not affect the performance of the i-f amplifier as long as the voltage does not go below 5–6 volts. I do not recommend operation at this low

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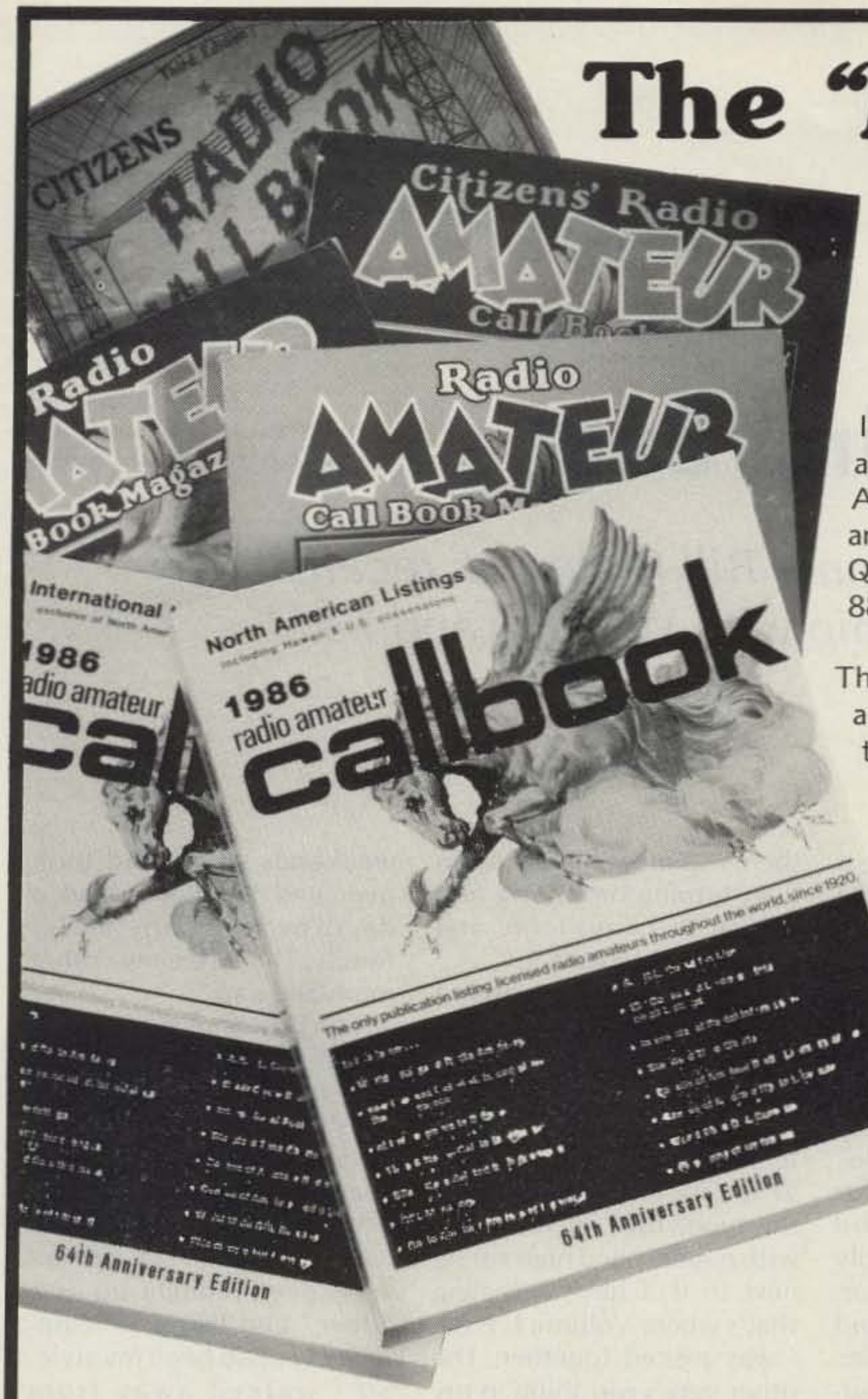
voltage as the system becomes unstable. The oscillator stability is quite good considering it is a free-running oscillator. It will drift with changes in temperature, but slight adjustment of the power supply will correct this.

A further development of this system can be to incorporate a phase-locked local oscillator providing the required stability needed for single-sideband operation on 1296 MHz. The prototype unit that I have constructed requires extensive metal work for shielding between the phase-locked circuits and the local oscillator. I am trying to provide this circuit in the same manner that this converter was constructed, possibly on a two-layer PCB to eliminate the milling work. But that is another story.

I hope that this project will provide you with the many hours of enjoyable operation that it has me. Construction of this converter is easy. Not that it will build itself, but with the stripline construction, all of the critical inductors are etched on the printed circuit board. In constructing your own PCB, the dimensions should be held to 1 to 2 percent for commercial purity. I have found that I could vary up to 5 percent (about fifty thousandths of an inch) before my equipment could detect any change in system performance at this frequency.

For those not desiring to construct their own printed circuit boards, I will provide one for five dollars plus postage.

I would like to correspond with interested parties concerning this project or other related items. Please include an SASE for a prompt reply. ■



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Looking East

Silver Eagle award-winner Bill Pasternak recalls his 25-year relationship with W2NSD and 73.

There's an old adage that says: "Time flies when you're having fun." Well, the past 25 years have gone by rather quickly, so I guess I have enjoyed them.

I first met Wayne Green W2 Never Say Die in 1960. I have told this story before, but it seems kind of apropos that I repeat it once more. It was late summer and I was at the home of my buddy Larry Levy WA2INM when John, then WA2FMF, and the red wagon showed up. John was very excited. His little wagon was going to appear in a new amateur-radio magazine. "What new amateur-radio magazine?" asked INM as he put down the glowing red Wen soldering gun.

John explained that he had just left Wayne Green W2NSD, who lived several blocks away in the Flatbush section of Brooklyn. John had been talking to Wayne on 2 meters, and since he didn't want to interrupt the QSO and he didn't have a car, he loaded his Gonset Communicator III, an automotive battery, and a halo antenna onto a kid's red wagon and wandered the mile or so over to the Green QTH. Keep in mind that this was the pre-HT era, and going portable meant taking a husky power source along with you.

As it turned out, WA2FMF happened upon Wayne at a time when W2NSD was looking for material for a new ham magazine, so out came the camera and John's "Little Red Wagon Mobile" was captured on film for posterity. John's next stop was Larry's QTH, probably because he knew that Larry's dad would drive him and his gear back home. He did.

It was the following Saturday or Sunday that I had my first visitation with W2NSD. John and I were again at Larry's house. As usual, WA2INM was busy inventing something. It was a bit after lunch when we decided to go visit Wayne. Not having vehicular transportation—Larry's father Max was out—we walked the half mile.

At that time, Wayne lived on the top floor of a two-family house, but the place had anything but the look of a home. If it had to do with the publishing business, it could be found in the W2NSD castle. If it had anything to do with amateur radio, it was there as well. It was at this point in my young life that I learned that there was more to ham radio than turning on my rig and talking to Larry, John, and several other locals.

Wayne was about a month from his self-imposed introductory date for *73*. Manuscripts were everywhere. I cannot remember if there was a desk or not. What sticks in my mind is the typewriter on the floor, with papers piled high sitting next to it. I have a feeling that's where Volume I, Issue I was pieced together. The other very vivid thing in my memory is a gigantic mosaic tile taking up the entire floor of one room. That mosaic would grace the front cover of the magazine several months later.

I suspect that much of this first meeting is so well ingrained in my memory because it transpired only a week or two before my mother passed away from a bout with cancer. During the week, my job was that of caring for her while Dad was at work or trying to get some needed sleep. I would sleep when I could, mainly in the afternoons after my younger brother got home from school. It was a waiting game, a grim one at best, and the only time I could escape from it was on the weekends when Dad took over and I would spend a day or two with Larry and his family. They were my "other mom and dad."

I lost track of Wayne and *73* for the next few years. I had promised Mom I would attend college, and I really gave it a try. I gave it two years, but that was about all I could take. I was, to say the least, bored stiff. I had always been brought up as a "doer," and being a "learner" never had been my style. So I walked away from higher education and into the business world, bumping from TV repair to TV and radio production (mainly the former).

In the meantime, I again crossed paths with W2NSD in a rather strange way. Larry was away at college and I had just become an active ham again. I was living on my own and frequently visited the Levys. It was on one of those dinner visits that Wayne passed by Larry's house to pick up something or other. For some reason, I had been on the *73* "comp list" since the first issue, and I remarked to Wayne how well I thought the magazine was coming. I really had no basis for comparison, since my subscriptions elsewhere

had lapsed long ago. I noted to W2NSD that I had just completed designing a new 6-meter converter because nothing on the market met my needs. After describing it, he said, "Write it up and I'll publish it." I did, he did, and that began an ongoing 23-year formal relationship with *73* that has lasted until this day.

In the intervening years I mainly wrote product reviews and commercial-gear modification articles, and it was not until 1971 that I began another literary aspect of my life—writing a monthly column. It all started innocently enough. Larry and I were winding down our three-year business and I was planning a move to the west coast. Larry and I had a rather strange business that developed "disco light shows," but we subsidized this by doing television and stereo repairs. Two of our customers were Wayne's parents. We had their color set in the shop for some much-needed TLC. Wayne had already moved to Peterborough several years earlier, but he came into town regularly to see his mom and dad. When he found that we had taken their TV to the shop for repairs, he wandered by to see what was up. It was in the course of our conversation that I told him I would be heading west the following month, and he said that I should document the trip and my arrival for *73*, paying special attention to the 2-meter FM activity I encountered en route.

Several months later I finally got around to writing the article he had requested. It was my first attempt at editorial journalism, and to say that it was bad would be an understatement. The article was returned with a note that simply said: "Try again—Wayne." So I tried again, but rather than write an article about the trip, I wrote about the treatment afforded a newcomer to a strange land. I titled the article "Looking West," and apparently the boss liked it. It appeared in the March, 1972, edition of *73*.

"Looking West" was never intended as a column. That's why there was no April or May version of it that year. It took that long for W2NSD to convince me to write another "episode," since it was apparent that those who read the magazine had a desire to find out what the Southwest was doing FM-wise. Well, the Southwest in general and the Los Angeles/San Diego rf corridor was doing quite a lot, and I had arrived at just the right time.

Only a week before my arrival, the Southern California Repeater Association had been born out of the ashes of the old California Amateur Relay Council, and 2-meter frequency coordination was coming to the Southwest. This was the obvious topic to follow, but I wanted to add some human interest to the "cold facts." The best way to do that was to join the Southern California Repeater Council and get to know the people involved.

I had been turned off to repeater councils several years earlier by the heavy-handed tactics of the now-defunct Northeast Repeater Association, but unlike the NRA the people running the SCRA appeared to be very warm and open-minded. I joined so that I could be a snoopy news reporter on the inside, but I wound up splitting my free time for the better part of a decade between helping to guide the SCRA and writing "Looking West."

It was directly as a result of "Looking West" and *73* that my career took a sharp turn in 1974. It happened at SAROC in Las Vegas. I was there, Wayne was there, and so was a mutual friend named Dave Bell W6BVN (now W6AQ). I had met Dave a year earlier when he called and asked if I could pass by his studio and look at a TV set. It seems that W2NSD had told Dave that I knew a bit about those beasts. I was unaware that Dave Bell was a filmmaker, even though I had seen his *Hams' Wide World* numerous times. Who ever looks at the credits, right?

Well, it was at SAROC '74 that Dave started picking my brain with regard to a new ham flick he was thinking of doing. It was the era of the CBer, and the image of hams was being smothered by "10-4, good buddy." Dave's concept was a short documentary that would explain the difference between the two services and also try to capitalize on the widespread interest in personal radio by converting CBers into hams.

SAROC was not a good place to talk, but I agreed to send Dave my thoughts on the matter. I did and became involved in the production of the film, *Moving Up To Amateur Radio*. My life would never be the same after that. In 1979, Dave asked if I would coproduce another film about amateur radio with him. I was both honored and flabbergasted. My expertise was in the technical end, not the creative, but Dave insisted that we meet for lunch and talk about it. The end result of that meeting would become known as *The World of Amateur Radio,* and within a month or two of completing that film, I literally walked out of a high-paying job I had held since my arrival in Los Angeles and reentered the broadcasting business, where I remain today.

1983 and 1984 brought the team of Dave Bell, Roy Neal, and Bill Pasternak back together again for one more ham production titled *Amateur Radio's Newest Frontier*. In this case, the positions were rearranged a bit, with Roy Neal K6DUE as the Executive Producer. A new element was added as well—videotape. Until *Amateur Radio's Newest Frontier*, all ham-radio productions had been done on 16-mm film and were eventually transferred to tape. *Newest Frontier* changed all of this by taking modern teleproduction into the field nationwide and capturing the entire story on tape.

Today I am employed as a Broadcast Engineer Specialist with the Metrotape Division of Metromedia Radio and Television in Hollywood. That's a long, long way from the streets and back alleys of Brooklyn. I continued writing "Looking West" on a monthly basis until 1982, when I became the editor of the old *H.R. Report*, which was renamed *Westlink Report*. Something had to go, and it was "Looking West." Not that it gave me much more time, since in 1979 I had taken over a small on-air bulletin service called the Westlink Radio Network from Jim Hendershot WA6VQP. It was then a local Los Angeles repeater news bulletin, designed to serve that market primarily.

Well, as most of you know, today the Westlink Radio Network is still going strong, with automated telephone distribution points nationwide and an all-volunteer staff of 44 hams around the world. Every Thursday evening a new newscast is recorded, edited, and put on-line by Friday afternoon. This happens 52 weeks a year, and with my other activities, it leaves little time for play. In fact, my on-air activity is confined these days to a pair of repeaters on 220 and 450 MHz while going to and from work, but I really don't mind it.

I really owe a lot to the Amateur Service and to *73*. Both are directly responsible for the way my life has been guided, and I consider myself successful. Yes, it's been a good 25-year relationship between this writer and *73*. Time does pass quickly when you are having fun.■

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EX-202 LDA interface; 730/2KL/AH-1	27.50	
EX-203 150 Hz CW audio filter	39.00	
EX-205 Transverter switching unit	29.00	
SM-5 8-pin electret desk microphone	39.00	
HM-10 Scanning mobile microphone	39.50	
MB-5 Mobile mount	19.50	
IC-720A 9-band xcvr/.1-30 MHz rcvr	1349.00	**799.95**
FL-32 500 Hz CW filter	59.50	
FL-34 5.2 kHz AM filter	49.50	
SM-5 8-pin electret desk microphone	39.00	
MB-5 Mobile mount	19.50	
IC-745 9-band xcvr w/.1-30 Mhz rcvr	999.00	**779.95**
PS-35 Internal power supply	160.00	**144.95**
EX-241 Marker unit	20.00	
EX-242 FM unit	39.00	
EX-243 Electronic keyer unit	50.00	
FL-45 500 Hz CW filter (1st IF)	59.50	
FL-54 270 Hz CW filter (1st IF)	47.50	
FL-52A 500 Hz CW filter (2nd IF)	96.50	**89.95**
FL-53A 250 Hz CW filter (2nd IF)	96.50	**89.95**
FL-44A SSB filter (2nd IF)	159.00	**144.95**
HM-10 Scanning mobile microphone	39.50	
SM-6 Desk microphone	39.00	
HM-12 Extra hand microphone	39.50	
MB-12 Mobile mount	19.50	

IC-751 9-band xcvr/.1-30 MHz rcvr	1399.00	**1199**
PS-35 Internal power supply	160.00	**144.95**
FL-32 500 Hz CW filter (1st IF)	59.50	
FL-63 250 Hz CW filter (1st IF)	48.50	
FL-52A 500 Hz CW filter (2nd IF)	96.50	**89.95**
FL-53A 250 Hz CW filter (2nd IF)	96.50	**89.95**
FL-33 AM filter	31.50	
FL-70 2.8 Khz wide SSB filter	46.50	
HM-12 Extra hand microphone	39.50	
SM-6 Desk microphone	39.00	
CR-64 High stability reference xtal	56.00	
RC-10 External frequency controller	35.00	
MB-18 Mobile mount	19.50	

Options: 720/730/745/751	Regular	SALE
PS-15 20A external power supply	149.00	**134.95**
EX-144 Adaptor for CF-1/PS-15	6.50	

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Options - continued	Regular	SALE
CF-1 Cooling fan for PS-15	45.00	
EX-310 Voice synth for 751, R-71A	39.95	
SP-3 External base station speaker	49.50	
Speaker/Phone patch - specify radio	139.00	**129.95**
BC-10A Memory back-up	8.50	
EX-2 Relay box with marker	34.00	
AT-100 100w 8-band automatic ant tuner	349.00	**314.95**
AT-500 500w 9-band automatic ant tuner	449.00	**399.95**
AH-1 5-band mobile antenna w/tuner	289.00	**259.95**
PS-30 Systems p/s w/cord, 6-pin plug	259.95	**234.95**
OPC Optional cord, specify 2 or 4-pin	5.50	
GC-4 World clock **(Closeout!)**	99.95	**79.95**

HF linear amplifier	Regular	SALE
IC-2KL w/ps 160-15m solid state amp	1795.00	**1299**

VHF/UHF base multi-modes	Regular	SALE
IC-551D 80 Watt 6m transceiver	699.00	**599.95**
EX-106 FM option	125.00	**112.95**
BC-10A Memory back-up	8.50	
SM-2 Electret desk microphone	39.00	
IC-271A 25w 2m FM/SSB/CW xcvr	699.00	**569.95**
AG-20 Internal preamplifier*	56.95	
IC-271H 100w 2m FM/SSB/CW xcvr	899.00	**759.95**
AG-25 Mast mounted preamplifier*	84.95	
IC-471A 25w 430-450 SSB/CW/FM xcvr	799.00	**699.95**
AG-1 Mast mounted preamplifier*	89.00	
IC-471H 75w 430-450 SSB/CW/FM xcvr	1099.00	**969.95**
AG-35 Mast mounted preamplifier*	84.95	

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PS-25 Internal power supply for (A)	99.00	**89.95**
PS-35 Internal power supply for (H)	160.00	**144.95**
PS-15 External power supply	149.00	**134.95**
CF-1 Cooling fan for PS-15	45.00	
EX-144 Adaptor for PS-15/CF-1	6.50	
SM-6 Desk microphone	39.00	
EX-310 Voice sythesizer	39.95	
TS-32 CommSpec encode/decoder	59.95	
UT-15 Encoder/decoder interface	12.50	
UT-15S UT-15S w/TS-32 installed	79.95	

VHF/UHF mobile multi-modes		
IC-290H 25w 2m SSB/FM xcvr, TTP mic	549.00	**479.95**
IC-490A 10w 430-440 SSB/FM/CW xcvr	649.00	**579.95**

VHF/UHF/1.2 GHz FM	Regular	SALE
IC-27A Compact 25w 2m FM w/TTP mic	369.00	**299.95**
IC-27H Compact 45w 2m FM w/TTP mic	409.00	**359.95**
IC-37A Compact 25w 220 FM, TTP mic	449.00	**299.95**
IC-47A Compact 25w 440 FM, TTP mic	469.00	**399.95**
UT-16/EX-388 Voice synthesizer	29.95	
IC-3200A 25w 2m/440 FM w/TTP	549.00	**489.95**
UT-23 Voice synthesizer	29.95	
IC-120 1w 1.2 GHz FM transceiver	499.00	**449.95**
ML-12 10w amplifier	339.00	**299.95**

6m portable	Regular	SALE
IC-505 3/10w 6m port. SSB/CW xcvr	449.00	**399.95**
BP-10 Internal Nicad battery pack	79.50	
BP-15 AC charger	12.50	
EX-248 FM unit	49.50	
LC-10 Leather case	34.95	
SP-4 Remote speaker	24.95	

Hand-held Transceivers		
Deluxe models	**Regular**	**SALE**
IC-02AT for 2m	349.00	**289.95**
IC-04AT for 440 MHz	379.00	**289.95**
Standard models	**Regular**	**SALE**
IC-2A for 2m	239.50	**189.95**
IC-2AT with TTP	269.50	**199.95**
IC-3AT 220 MHz, TTP	299.95	**239.95**
IC-4AT 440 MHz, TTP	299.95	**239.95**

Accessories for Deluxe models	Regular
BP-7 425mah/13.2V Nicad Pak - use BC-35	67.50
BP-8 800mah/8.4V Nicad Pak - use BC-35	62.50
BC-35 Drop in desk charger for all batteries	69.00
BC-60 6-position gang charger, all batts **SALE**	**359.95**
BC-16U Wall charger for BP7/BP8	10.00
LC-11 Vinyl case	17.95
LC-14 Vinyl case for Dlx using BP-7/8	17.95
LC-02AT Leather case for Dlx models w/BP-7/8	39.95

Accessories for both models	Regular
BP-2 425mah/7.2V Nicad Pak - use BC35	39.50
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	29.50
BP-4 Alkaline battery case	12.50
BP-5 425mah/10.8V Nicad Pak - use BC35	49.50
CA-2 Telescoping 2m antenna	10.00
CA-5 5/8-wave telescoping 2m antenna	18.95
FA-2 Extra 2m flexible antenna	10.00
CP-1 Cig. lighter plug/cord for BP3 or Dlx	9.50
DC-1 DC operation pak for standard models	17.50
LC-2AT Leather case for standard models	34.95
RB-1 Vinyl waterproof radio bag	30.00
HH-SS Handheld shoulder strap	14.95
HM-9 Speaker microphone	34.50
HS10 Boom microphone/headset	19.50
HS-10SA Vox unit for HS-10 & Deluxe only	19.50
HS-10SB PTT unit for HS-10	19.50
ML-1 2m 2.3w in/10w out amplifier **SALE**	**79.95**
SS-32M Commspec 32-tone encoder	29.95

Shortwave receiver	Regular	SALE
R-71A 100 kHz-30 Mhz digital receiver	$799.00	**659.95**
RC-11 Wireless remote controller	59.95	**49.95**
FL-32 500 Hz CW filter	59.50	
FL-63 250 Hz CW filter (1st IF)	48.50	
FL-44A SSB filter (2nd IF)	159.00	**144.95**
EX-257 FM unit	38.00	
EX-310 Voice synthesizer	39.95	
CR-64 High stability oscillator xtal	56.00	
SP-3 External speaker	49.50	
CK-70 (EX-299) 12V DC option	9.95	
MB-12 Mobile mount	19.50	

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282 250 Hz 6-pole CW filter	59.00	
285 500 Hz 6-pole CW filter	59.00	
288 1.8 KHz 8-pole SSB filter	59.00	
214 Electret desk microphone	45.00	
603 KR-1B Keyer paddle	59.00	
700C Electret hand mic w/connector	29.95	
1140 18/24.3A DC circuit breaker	10.00	

525D Argosy II 10/100w digital xcvr	599.00	**529.95**
225 9A power supply	129.00	**119.95**
217 500 Hz 8-pole CW filter	59.00	
218 1.8 KHz 8-pole SSB filter	59.00	
219 250 Hz 6-pole CW filter	59.00	
220 2.4 KHz 8-pole SSB filter	59.00	
222 Mobile mount	25.00	
223A Noise blanker	34.00	
224 Audio CW filter	34.00	
700A Electret hand microphone	29.95	
1125 DC circuit breaker w/cable	18.00	
1126 Linear amplifier switching kit	15.00	

579 Century/22 50w 6-band CW Xcvr	$389.00	**359.95**
979 5A power supply	89.00	
979/E 230v 5A power supply	99.00	
226 Crystal calibrator	29.00	
279 Mobile line filter/circuit breaker	TBA	
679 Internal keyer kit	27.00	
1179 DC circuit breaker	10.00	

Misc. accessories	Regular	SALE
214 Electret desk mic w/4-pin plug	45.00	
700A Electret hand mic, 3-cond ¼" plug	29.95	
700C Electret hand mic, 4-pin plug	29.95	
670 Single paddle keyer	39.00	
645 Dual paddle ultramatic keyer	85.00	**79.95**
209 300w dry dummy load	26.00	

HF Linear	Regular	SALE
425 Titan 1.5kw PEP output amplifier	2485.00	**2199**

Antenna tuners	Regular	SALE
229A 1.8-30 MHz 2kw PEP tuner/SWR	279.00	**249.95**
4229 1.8-30 MHz 2kw tuner/SWR kit	199.00	**189.95**

227 1.8-30 MHz 200w antenna tuner 89.00 **84.95**

Satellite	Regular	SALE
2510 SSB/CW, Mode B satellite converter	489.00	**439.95**

VHF Handheld	Regular	SALE
2591 .3/2.5w 2m HT/batt/wall cgr/TTP	319.00	**269.95**
2201 Sub-audible tone encoder	55.00	
2202 Protective case	9.75	
2425 30w amplifier	79.00	
2700 Speaker/microphone	39.00	
2991 Extra 450 ma nicad battery	39.00	
2992 5 hour desk charger	79.00	
2993 12v adapter pack	25.00	

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Old Tubes Never Die!

Discover the romance of glowing filaments.

Imagine, if you will, the interpretations of archaeologists digging through the rubble of our remote civilization some three thousand years hence. You can bet your boots they will transpose the evolutionary sequence of tubes and transistors. The intricacy, precision, and sophistication of the tube's mechanical structure will suggest itself as the product of a more mature technology; the transistor, by comparison, featuring an uninteresting pellet of impure silicon will likely be assessed as the stage immediately following the crystal and cat whisker.

As for ICs, they may well come across as the artistic artifacts of our mysterious culture and some will doubtlessly be assumed to depict long-forgotten religious symbolism. One can further speculate that the tube will be cited as evidence that we had successfully made the long transition from the pastoral to the industrial society.

Conjuring up such a scenario is not too farfetched. But, indulging again in a brief imaginative interlude, can you envisage collectors of transistors in the sense that there are *tube* collectors? Granting that the point-contact transistor and perhaps the first junction transistor must have intrinsic collector's value, the collection and display of transistors would evoke less interest than a good collection of match-box covers, bottle caps, or Burma Shave rhymes. Old tubes fairly wreak with nostalgia, and to the fervent initiates who collect them, an aura may be beheld around them and an intoxicating odor may be sniffed.

Merely holding one of these venerable devices of the past brings exotic delight to the dedicated tube collector. Thus, it is not surprising that there is no great fetish about the operational condition of these tubes. To be sure, an intact filament does enhance value, but many are available to collectors just because someone once thought the proper resting place for a defunct tube was the trash pile. An owner of a rare specimen is often quite reluctant to test it in any way. To be able to say that a tube is "probably" good often suffices in negotiations.

Although the tube collector is ever in search of an "original" De Forest audion, there are hundreds of early types which also are highly esteemed. These include both receiving and transmitting tubes. The tube collector looms up as the chief villain in the eyes of the hobbyist who gets his kicks from reviving antique radio sets. Hoarding of the O1A, 99, and other tubes used in these radios means that tube prices are continually escalating. Inasmuch as these sets are usually sold *without* tubes, their restoration expense invariably exceeds one's naive expectations. Some O1A tubes are suspiciously modern in some constructional details. Such "bootleg" tubes may not be bad for the antique radio fan, but there is the prevailing danger that the serious tube collector might pay dearly for a fake Rembrandt!

You, Too, Can Be A Tube Collector!

To get started as a tube collector, you should acquaint yourself with some of the types that are presumed to have inordinate value. This will help you avoid cluttering your collection with tubes of little value. It is not always age, per se, which dictates a tube's value. Rarity, unusual structural aspects, and a tube's impact on technology all enter into the equation.

As with automobiles, there is also an elusive factor mysteriously based on little-understood psychology. Why is a 1965 Mustang able to command four or five-thousand bucks from auto buffs while a very similar Chevy of that year generally peddles for several hundred? We find it futile to resolve such dilemmas—it is easier to just accept them. In similar fashion, some tubes appear to be more exciting to the collector than others. Whether Freudian operatives or other subliminal factors are involved is not really of great importance; it is necessary only to appreciate that, like classic paintings, some tubes perform better at the auction than others.

A wonderful book on the evolution of tubes was published by Howard W. Sams

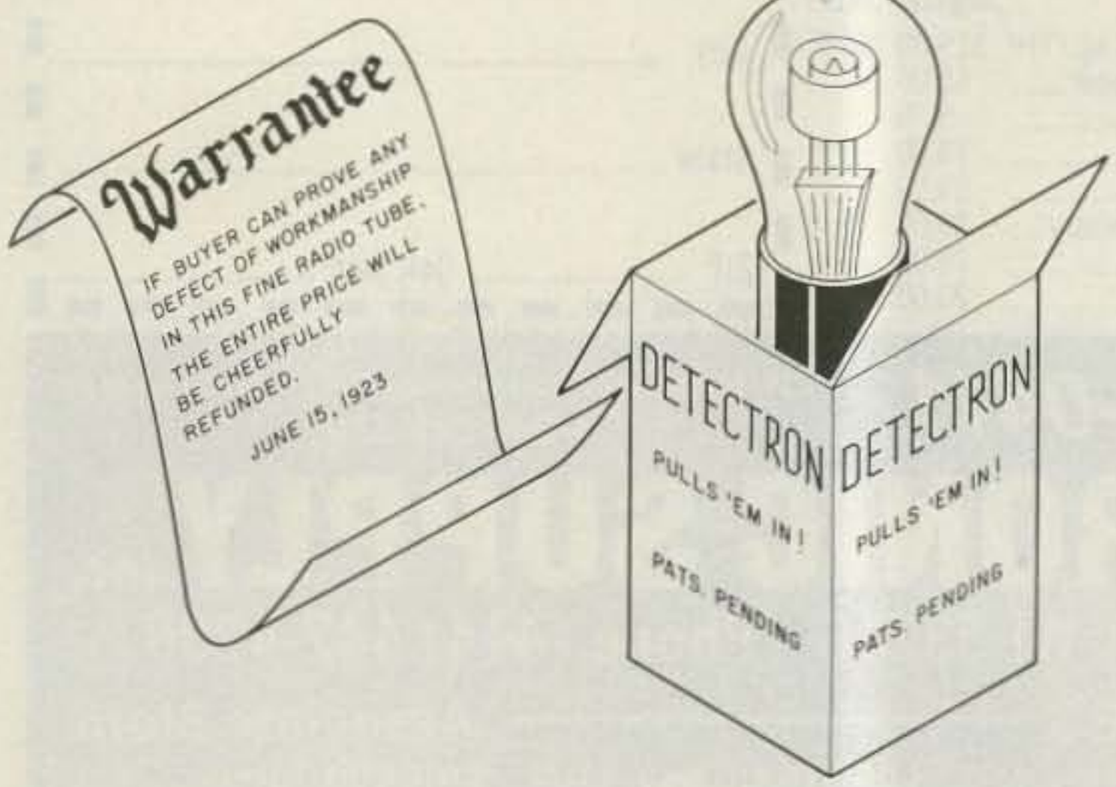


Fig. 1. Collector's delight—a "brand-new" oldie in its original carton! Like working a rare DX station, this is a hoped-for occurrence that you shouldn't hold your breath in anticipation of.

in the mid-seventies. Entitled "The Saga of the Vacuum Tube," it was written by Gerald Tyne. It contains numerous photographs, descriptions, and stories about tubes and obviously represents a masterful research accomplishment by the author. The book itself is a classic. Unfortunately, its publication occurred at a time when the electronics community found itself caught up in the overwhelming frenzy of computers and digital logic. This publisher then began cutting back on treatises dealing with such "obsolescent" topics as analog circuits and vacuum tubes and this marvelous publication was discontinued.

At ham flea markets it is a common spectacle to see strange old tubes which people gawk at but do not buy. That is because they see no use for such a tube in their present 2-meter rigs. This scenario often is recognized as a veiled opportunity by the knowledgeable tube collector; it is this because the vendor gets tired of exhibiting it to hundreds of cowards who can't muster up the courage to make a bid. If you are both a gambler and a tube collector, hold off any action until the vendor is ready to close shop. That is the time his psychological Achilles' heel will be exposed! The gamble, of course, is that someone as bright as you but a wee bit faster may beat you to the punch. At the worst, you will have had a lot of fun, and you can solemnly vow to do better next time!

Be Patient—
Wait Until the
Moon Shines Blue.

Once in a blue moon you will stumble upon a rarity of rarities, a hard-to-find antique tube in its *original* box! The inference here is that the box has never been opened and, of course, the tube never used. Whether such a near-impossible situation actually enhances the tube's value to collectors varies with the type of tube and with a collector's attitude. Always seek a number of opinions before releasing such a find at a giveaway price if you are in the hobby to collect profits as well as the tubes themselves. In some instances, an original tube carton can command a respectable cash premium.

It is also interesting to read the old literature and to contemplate the buck-and-a-half or two that many tubes originally cost. Along with gold, art, and jewels, maybe the financial wizards who tell us what stocks to buy and when should advocate a tube collection as an inflation hedge. Inasmuch as their other advice fails to make us rich, their reputations can hardly be said to be at stake.

Even if the box has already been opened, as most probably will be the case, its association with the tube is a value enhancer. Don't obey your knee-jerk impulse and toss tube boxes in the junk-mail depository. When you swap or sell, the phrase, "in, or with, its original container" has magical qualities—it strengthens your negotiatory position. This is true even though collectors generally remove tubes from boxes and mount them for display.

Darwin Would Have Gone
Bananas over Tubes

Few of life's trials are as likely to provoke the crocodile tears from the grizzly-faced old-timer as remembrance of the many fine tubes which sparkled for a time in the sun, then silently evaporated into the mists of obsolescence. As with the Pierce Arrows, Reos, Hupmobiles, and Willy-Knights, they came and they went. Although little more than mere numerical designations to many, the ham of yesteryear made the most of his 46s, 2A3s, 57s, 45s, 56s, 53s, 6J5s, etc.

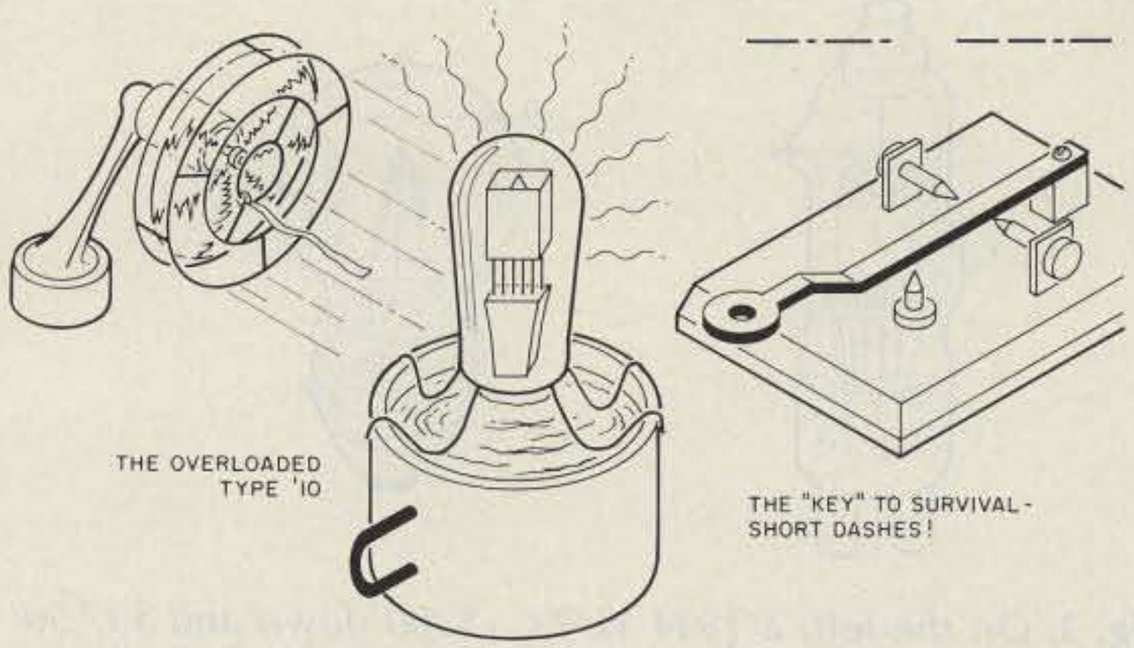


Fig. 2. CW transmitters using type 10s were sometimes hard to copy—the dashes were too short! Only short *dashes were permissible from a de-based 10 operating in a cup of transformer oil at 700 volts on the plate and nine volts on the filament. Plate current was about 10 mA below the value which could cause instantaneous destruction.*

That oblivion would be the ultimate lot of these and many other venerable bottles was unthinkable at the time, but by the time the 6L6 beam-power tube arrived on the scene, it was evident that Darwin's theories were manifesting themselves in a long succession of evolving tubes. Succeeding tubes would displace previous ones because of very specialized abilities. And there were mutations, too. For example, out of nowhere sprouted the screen-grid. This abrupt transition left no missing links. The corollary in nature would be the reptile which crawled on its belly only to give birth to flying creatures. (Or was it the other way around?)

Modern designers are wont to complain that before they get their systems off the drawing board, the ICs have been superceded by newer or more sophisticated devices. But *tubes* in their heyday moved mighty fast, too. For a while there was the O1A and its "peanut" counterpart, the 99. But you couldn't just sit on your duff and keep up with the technology, for soon there were tubes with indirectly-heated emitters which permitted ac operation. And the introduction of the screen-grid tube triggered an array of multi-electrode and multi-function tubes.

De Forest expressed delight and astonishment at the evolved versions of his original device. Pentodes, triodes, and diodes were packaged in a single envelope, and some TV tubes went considerably beyond this. A couple of class-A audio Watts from a pair of 45s was for a while the last word in sound reproduction, only to be supplanted by the 47 power pentode, which in turn gave ground to 46s in class B. And so on up the ladder until apartments groaned under the acoustic burden of many tens of Watts from cheap radios and stereos. But, although it may have been a far cry from the tacky O1A to a sophisticated pentagrid converter, mere technical fanciness does not qualify a tube as a worthwhile collector's item. It's that unique blend of vintage, rarity, technical importance, and the elusive charismatic factor previously alluded to.

Transmitting- and receiving-tube collections are generally kept separate, although not necessarily. Early transmitting tubes were not significantly distinguishable from receiving tubes insasmuch as they had power ratings on the order of five Watts. Of course, many amateurs cut their eye

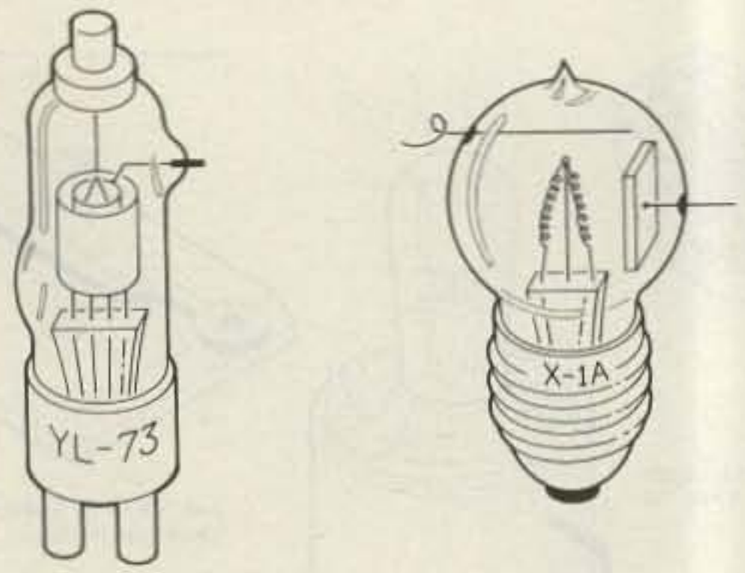


Fig. 3. On the left, a 1934 YL-73—$300 down and $37.50/month for five years. Special discounts in lots of 25. On the right, an X-1A, circa 1899, only five tubes made, pre-De Forest control element—$3.50 or best offer. Elusive factors surround tube collectors' value appraisals. Rarity, vintage, and technological level are not the only considerations influencing perceived value.

teeth on the venerable 210, a so-called 7-1/2 Watter. This tube was to transmitting what the O1A was to receiving—a universal workhorse. And *work* it did; it is almost shameful in retrospect to recount the power inputs some hams pumped into those abused but obliging bottles. But soon enough, the tube manufacturers got the message.

Response to Overloading

As may be suspected, a host of tubes became available, making it unnecessary for the ham to drive the pants off the 210, not to say anything about 45s, 46s, and various receiving tubes including even 71As and 201As. Many of the "new breed" of transmitting tubes were actually electrically-ruggedized 10s. Included therewith were the Taylor T20 with a nice isolantite base and with the plate lead eminating from a cap on top of the tube, the RCA 801 with more "realistic" specifications than the old "ten," and a Sylvania special with a long graphite plate, making it look more like a fifty Watter.

It wasn't that transmitting tubes were not available, but there was a gap in the power ratings between flea-power level and several hundred Watts. What the average ham needed was an inexpensive tube capable of filling this gap and which would allow the kind of reliable operation never really attained via the overload route. A plethora of dedicated transmitting tubes poured forth from the various manufacturers, some of whom got their foot in the marketing door this way. These tubes had power-dissipation ratings of several to many tens of Watts and featured quality insulation, hard vacuums, rugged filaments, and, often enough, shapely contours. After WWII, many of these tubes yielded their popularity to the 807 family of beam-power tubes and since then have been more common on collectors' display racks than in transmitters.

It is hard to underestimate the provocative effect that hams' overloading practices had on intermediate-power transmitting tubes. The lowly 210 wasn't the only victim of such abuse. Thus, an advertisement by the upstart Eitel-McCullough Company in the 1937 *ARRL Handbook* shows a picture of one of their 150Ts with a sizeable hole burned in the tantalum plate. The ad tells you that this damage was produced by a twenty-to-one overload factor of 3000 Watts! You are further informed that no gas was released within the tube as a consequence of this tremendous overload.

In another ad in the same publication, Taylor Tubes informs would-be ham customers that it is no longer necessary to overload 210s because of Taylor's introduction of tubes with power ratings *between* the 210 and the 203A, which can dissipate a nominal 100 Watts. Relevantly, Taylor seized the opportunity to list also its souped-up HD-203A, which sported a carbon anode and a 150-Watt dissipation spec! Finally, a more conservative ad by Heintz and Kaufman lets you know that their Gammatron transmitting tubes are just that—conservative. These ruggedized rf power tubes were built to endure the hardships of the commercial world and even to forgive the engineering sins of hams.

Did We Appreciate Tubes?

The tube collector may resemble collectors of other items superficially. It should not be supposed, however, that they see tubes as obsolescent devices stomped over by the relentless march of progress. *Individual* tubes, they will acknowledge, have been superceded by better devices, but no true-blue collector in his heart of hearts believes that vacuum-tube technology is passé. For the time being, the semiconductor fad is in full sway, but just look at the very significant advantages of tubes:

- They are extremely forgiving to overloads and abuse.
- You can see what's going on—a lit filament tells you something. A cherry-red plate tells you something. Also, you can learn from bluish glows, incandescent grids, and internal arcs.
- Plugging and unplugging tubes is a heck of a lot easier than fighting a solid-state device loose from its PC board.
- Not that it probably matters, but the "old-fashioned" tube is much more resistant to damage from an electromagnetic pulse than are solid-state devices—especially ICs.
- A circuit configured around tubes is easier to test than one with solid-state devices; even with a low-voltage ohmmeter, leakages and reverse-conduction phenomena can be hard to interpret. Damaged or "sick" semiconductors may or may not be detected with ohmmeter checks.
- Tubes exhibit fewer problems with ambient temperature variations.
- Tubes have done things not yet really duplicated by solid-state devices. Consider the electron-coupled oscillator, the transitron oscillator, the tuning-indicator tube, the cathode-ray tube, or the gated-beam tube.
- Although it cannot be measured, weighed, otherwise quantified, or even proven, tubes can be *charismatic*, and often exude mystique and romance! If this contention sounds foolish, it would smack of greater foolishness yet if it were made about semiconductor devices. Many a ham has called a faint DX station while hypnotically watching the dots and dashes form in the eerie blue glow of his 866s, or in the varying light emission from his final-amplifier filament. And there is something about watching your modulated amplifier plate change color as you whistle into the mike that bespeaks of an intimate relationship between man and machine.

No Dog Forgives Better

Of all of the foregoing attributes of tubes, the first is probably the most important to the tube enthusiast turned tube collector. Consider, for example, the use of full-wave rectifier tubes in a typical power supply. Tubes that quickly come to mind are the old type 80 and its descendants, the 5Y3 and the 5Y4. If a filter capacitor shorted out in such a supply,

the plates of these tubes would become red-hot and solid hunks of oxide material might be torn from the surface of the filament. The filament might even be bent out of shape from the force of the inordinately heavy current demand.

All this time the power transformer is smoking and exuding odors suggestive of the last burned steak served at your favorite restaurant, and by the time you turned off the power, that poor tube would show unmistakable visual evidence of having been through the mill. And it would rattle when shaken, like a bad light bulb. But, surprise of surprises, it willingly resumed operation once you replace the defective filter capacitor.

What does that tell you? Nothing, until you compare the situation with what happens to semiconductor rectifiers under similar circumstances. Of course, such abuse does not prolong tube life and it cannot be truthfully said that tubes are zap-proof. But it may very well be that we really didn't fully *appreciate* the true worth of tubes when they were more commonplace!

It is popular to allude to the numerous transistors that can be real-estated on a single IC chip and to tout the multi-functional accomplishments of ICs, but the tube collector recalls all of the fancy things done with multi-element tubes. And, of course, there were multi-tube tubes, too. These culminated in the compactrons used in TV sets. When you gazed down at the chassis of such a TV receiver, the large tube complement common to older sets was conspicuous by its absence. What you saw was just a few compactrons and a few conventional tubes. The compactron, in other words, was a vacuum-tube integrated circuit in its own right! If you are tube collecting, be sure to keep an eye open for some of these specimens!

Remember that Silicon Can't Do Everything!

Now and then one sees semiconductor circuits which are alleged to be solid-state versions of some unique vacuum-tube circuit. Upon closer inspection, the claimed analogy becomes quite tenuous, however. A case in point involves several references to "electron-coupled oscillators" appearing in the ARRL *Radio Amateur's Handbook*. If you refer to Fig. 10-B on page 6-6 of the 1980 edition, you will see a JFET Hartley oscillator so-labeled and described in the text.

By no stretch of the imagination do you have the desirable situation here that was forthcoming from a "true" electron-coupled oscillator using a screen-grid or pentode tube. In the tube circuit, output was taken from the plate but the oscillation was produced in the screen-grid, control-grid, cathode portion of the tube—the plate merely picked up the rf-modulated electron beam. This meant that the plate circuit was not load-sensitive. It was very much like taking the rf output from a good class-A buffer amplifier. Contrarily, the "hot-cathode" Hartley oscillator shown would require an actual buffer amplifier to prevent its frequency from being pulled by load variations.

There are other things you can't do with semiconductor devices even though they are loosely spoken of as the equivalents of certain tubes. For example, the VR (voltage-regulator) tubes could be used in simple relaxation-oscillator circuits for generating sawtooth waveforms in the audio-frequency range. Zener diodes simply will *not* serve this purpose, however. The VR tubes were filled with various noble gasses and exhibited hysteresis—that is, ionization and de-ionization voltages were different. In the zener diode such a difference is not encountered.

Admittedly, this is advantageous for the intended function—it precludes the possibility of inadvertent relaxation-type oscillations. Those who have had experience with VR tubes will recall such behavior. (It may also be recalled that earlier VR tubes were sometimes reluctant to start in the dark.) Even when not "relaxing," VR tubes produced a lot of noise that often fouled sensitive circuits. Maybe they would have suffered extinction prior to the solid-state invasion.

Notwithstanding the shortcomings of VR tubes, they have become game for tube collectors. Their eerie pink or purple glows are sometimes demonstrated by actuating a push-button switch on the collector's mounting board. But one can anticipate a blue-glowing moon when collectors pridefully display their array of zener diodes!

Perpetual Motion and Inventing a New Tube

Anyone who has played around with tubes to any extent has a number of pregnant inventions gestating in his deep subconscious. The only trouble is that you will invariably find that these ideas were most probably already given serious attention during past eras. Even worse, it is most difficult to conjure up any tube innovation without infringing on patents, even at this late day. For example, don't waste your time besieging the patent office with an electromagnetically-controlled tube. The idea of substituting the electrostatic control element, i.e., replacing the grid, with an external solenoid for controlling the electrons has long-ago come and gone. Indeed, if you are lucky, maybe such a tube will become part of your collection!

Likewise, the use of an external plate, that is a collector electrode mounted on the *outside* of the tube has also been tried—and, of course, found wanting. If you ever had any thoughts about room-temperature cathodes, your pursuits might lead to great rewards. However, be aware that a fairly good tube of this type was actually given serious consideration by the armed forces, and not too long ago. It seems that the inventor didn't ask himself how such a tube stacked up against the more reliable and more versatile solid-state devices.

However, if you are fascinated by tubes and your soul is responsive to the inventor's pulse beat, you might try to come up with the tube version of a PNP transistor. Of course, such an invention would have been far more timely before semiconductors upset the reign of King Tube. Nonetheless, there are still some tube applications and it still would be nice to have opposite-polarized tubes so that complementary-symmetry circuits could be devised. There would be other circuitry reasons which would make "PNP" tubes welcome. (All tubes ever constructed or marketed are analogous to NPN transistors becaue the plate is always *positive* relative to the filament or cathode.)

What you must do is to emit *positrons* instead of electrons and collect these with a negatively polarized plate. You have some advantages in your favor; the positron *has* been proven to exist. And it need only endure long enough to make the transit from its emitter to the plate. Inasmuch as it will be moving through a vacuum, maybe you can get enough lifetime out of it to do the job. Finally, you won't be belatedly competing with already-patented devices. Good luck!

Make Hay While Silicon is Here!

With mixed feelings of

nostalgic sadness and technological enthusiasm, hams, radio bugs, hobbyists, and experimenters have watched the encroachment of semiconductor devices on the sacred domain of tubes. Today, this usurper continues to relentlessly obsolete transmitting tubes of ever higher power and frequency. What can't be economically achieved in any single bipolar or FET output device is often readily implemented by various power-combining techniques. Although we have not yet heard of cherry-red collectors or incandescent drains, it must be conceded that rf power transistors are far from fragile if operated in intelligently-designed circuitry and if reasonable intelligence is manifested in tune-up and in operation.

Rather than bemoan the all-engulfing aspect of our solid-state era, take joy in the realization that the silicon revolution has been the tube *collector's* best friend. Tubes that once littered the landscape like beer bottles have become emotional gems and are priced accordingly. At this writing, the once mundane 99 peanut tube exchanges ownership for a non-peanut price—in the vicinity of twelve bucks. Its rival, the WD-12, commands fifty dollars if you are so lucky as to uncover one. And the asking price of the O1A, once a glut on the market, has recently been moving up, too. If you can still acquire any for four dollars, consider yourself lucky. More likely, you won't get back much change from a ten-buck bill! Other tubes have various worths, all depending on how much some other collector wants it. But, unlike diamonds, old-tube prices have been on a steady ascendancy. Maybe *now* would be a fruitful time to start your collection! ■

Give Your Disks a Physical

Are you getting what you pay for? Use this simple technique to quality-inspect your valuable floppies.

Kenneth S. Kraska
11 Yeager Drive
Cheektowaga NY 14225

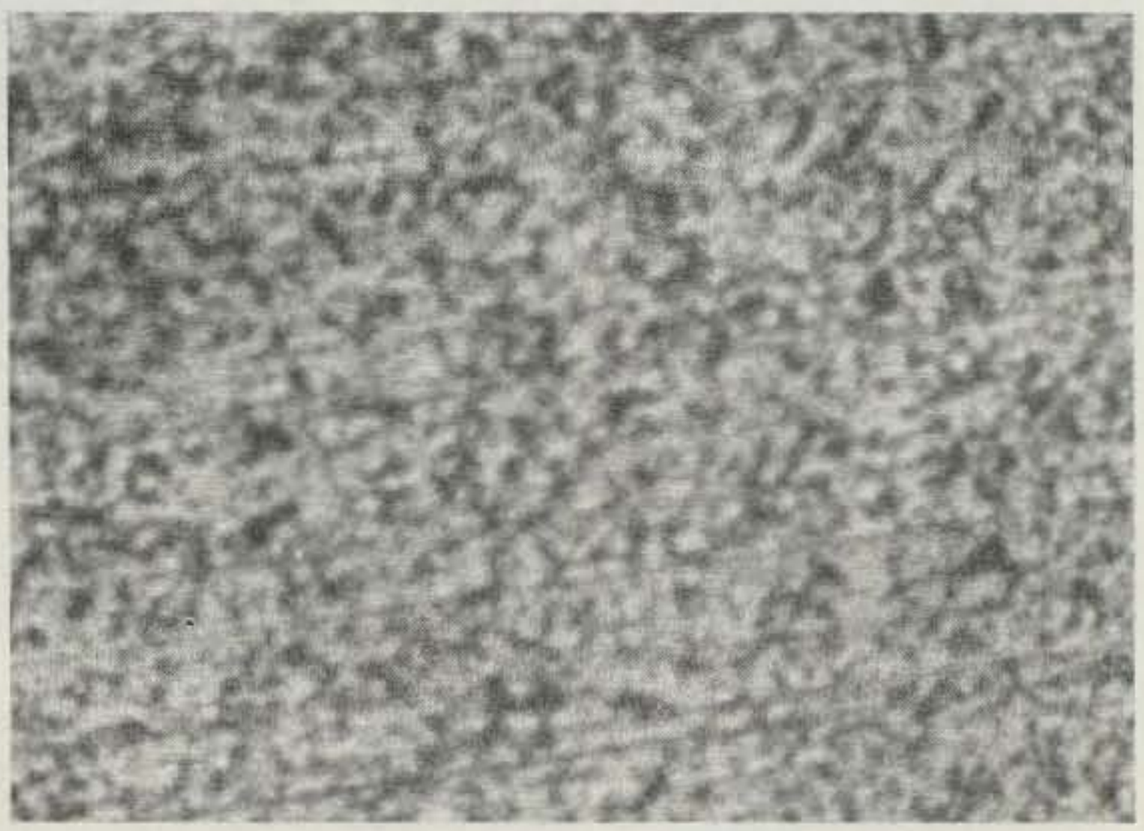
I recently had difficulty with my computer's disk drive. Fortunately, it only required cleaning and some adjustment, and the work was covered by warranty. When I picked up my computer, I was asked about the floppies I used. It so happens that the brand I used was not sold by the dealer who had my disk drive fixed. Well, the suggestion was made that I was using the wrong disks and that the ones the dealer had were more appropriate. Over the next few days I grew more curious about which disks were truly better, and I decided to find out for myself since I have some lab facilities available to me.

Background

My first thought was that since I knew very little about disks, I might want to know what standard they must comply with, that is, what sort of quality they must have. The American National Standards Institute (ANSI) has a standard for 5¼-inch floppy disks, known by the designation ANSI X3.82-80. On reviewing this standard, it became clear that this spec had only one quality level. No method existed for grading disks, one against another. Discussion with some technical people at a couple of large software publishers indicated that even within their industry there isn't one universal set of criteria for disk testing.

I decided that examination of disk surfaces by microscope might show details which would be relevant. The type of microscope used was an inverted-stage metallograph. It has a built-in light source, so that the light travels through the optical system to the surface being examined and is reflected back into the microscope to form the optical image. Also, because the floppy surface is so polished that it would produce considerable specular gloss (highlights and reflections), polarized light was used to unmask details. Photos of the microscope images (photomicrographs or "micros") were taken at various magnifications from 100× to 1000×. I examined a number of brands of unformatted disks right out of the package, as well as disks with programs on them (commercially available) such as word-processing or statistics programs. In an effort to get information on some of the physical properties, I measured the surface resistivity of the various disks. The ANSI standard specifies a maximum for this property (5×10^9 Ohms/

Plane polarized light at 100× magnification. A well-polished disk with good oxide distribution.



Plane polarized light at 100× magnification. This disk has many scratches and some ripples. Note the less even distribution of oxides.

square), and I felt that it would be an indicator of the relative read/write capabilities of a disk. After all, Ohm's Law should still determine the signal strength based on the conductivity (although this is a simplification and other factors should be considered).

Results

The resulting survey showed significant differences in both surface-finish quality and the (coated) oxide distribution. Further, the surface resistivity of disks varies greatly between brands (and even from one side to another on some disks). It turns out that my word-processing disk had just about the worst surface of any of the disks (maybe that's why the drive goes "grunge, grunge, grunge" when I use that disk!). The disks with the best surface finish and most uniform distribution had resistivities around 1 × 10^9 Ohms/square. Disks which were scratched, rippled, or non-uniform either had surface resistivities of around 1 × 10^6 or very high resistivities of about 4 × 10^9 Ohms/square.

By the way, the designation Ohms/square is the unit in the ANSI standard. The ANSI standard for disks references an ASTM (American Society for Testing and Materials) specification for surface-resistivity test method, known by the designation ASTM D257-78 (re-approved 1983), "Standard Test Methods for DC Resistance or Conductance of Insulating Materials." It seems that surface resistivity can be considered physically equal to the resistance (Ohms) measured over a gauge length of one inch. My word-processing program disk had a surface resistivity of about 690,000 Ohms/square. I guess it has to be so conductive to make up for the extraordinarily uneven surface (otherwise the signal from the track might be too weak to read). Also, the oxide particles aren't very uniformly sized.

I've included photomicrographs of two disks and I'm sure that it's easy to see why some disks are noisier (and more troublesome) than others. The disks which are visually the best are the ones producing the least trouble (for myself and some others I spoke with). On the other hand, the disks looking rather like a grating, or a washboard, are those which have caused some trouble (i.e., excessive noise, won't format, *won't* run).

Inspecting for Quality

I would suggest that to examine your own disks it is adequate to have a 50 × magnifier. These are obtained without much difficulty or expense, and the level of magnification is minimally suitable to reveal the disk surface. Also, measuring surface resistivity is done easily. Use a digital multimeter (which has a range of a couple of megohms). Rig a parallel resistor (at least one megohm) to the contacts going to the disk surface. Using the rule for parallel resistances will provide the resistance, and therefore the resistivity, of the disk surface. Of course, a Wheatstone bridge may also be used. I was apprehensive of measuring surface resistivity of a disk which contained a program, because I wondered if some sectors might be damaged (good-bye, program!), but so far this has not happened. Be mindful of this possibility with disks containing programs.

If you examine a disk by the methods just mentioned, and very few if any scratches or ripples are found, and the resistivity is around 2 × 10^8 to 2 × 10^9 Ohms/square, then the disk should be OK.■

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WANTED; radios, tubes, pre-1939 for my collection. Howard Stone, HCR-3, Box 418, Deer River MN 56636. BNB332

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. $10.00 for one year (24 issues). PO Box 356, Wheaton IL 60189. BNB335

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RADIO TRANSCRIPTION DISCS WANTED. Any size, speed. W7FIZ, Box 724—WG, Redmond WA 98073-0724. BNB347

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TRICK OR TREAT! No candy or apples but your unwanted equipment sure would be appreciated by the crew learning English through amateur radio at Junior High School 22 on Manhattan's Lower East Side. Send it today, feel better tomorrow, and get the tax advantage for 1985. Contact WB2JKJ. BNB372

SELLING: TS-830S, Morse keyboard, EV664 mike, Turner mike, Gentec dummy, Mosely beam. Box 623, Coventry RI 02816. BNB373

SATELLITE-TRACKING programs for the Commodore 64. Hi-res graphics program for antenna angles and ground track. $19.95 postpaid for disk and manual. Includes program for tracking two satellites in real time. David Eagle, 7952 W. Quarto Dr., Littleton CO 80123; (303)-972-4020. BNB374

LET THE WORLD KNOW what you would really rather be doing! Get your "I'd rather be DXing" bumper sticker with amateur radio written down the sides. Red and black, vinyl, and removable so it won't hurt your car. $2.00 plus 50¢ postage to: Bumper Sticker, PO Box 6349, Evansville IN 47712. BNB375

MOBILE PACKET RADIO—operate your TAPR or Heath TNC from 11–14 V dc for emergency or mobile operation. No TNC modifications required! Info for an SASE or complete kit $20.00. Gary Field WA1GRC, 5 Pluff Ave., N. Reading MA 01864. BNB376

WANTED: Regency XL2000, 10-channel 148-162-MHz transceiver, or Wilson WH2510. Also 1702A EPROMs. PO Box 929, Blacksburg VA 24060-0929; (703)-382-4458. BNB377

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WANTED: Kenwood TR-7625. Royce N. Sawyer, 547 Boston Post Rd. #71, Marlborough MA 01752. BNB379

TR-7 USERS—NB-7 noise blanker, new, $65 ppd. SL-300 CW fitter, new, $50 ppd. HS-75 headset by Drake, new, $14 ppd. Tony Musero K3UKW, (215)-271-8898. BNB380

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QSL CARDS: 50/$5.00 or 100/$8.00, postpaid. For a sample send an SASE to Kenneth Hand WB2EUF, Box 708, East Hampton NY 11397. BNB384

SPECIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received by 73 Magazine *by the first of the month, two months prior to the month in which the event*

LOUISVILLE KY
OCT 4-6

The 1985 National ARRL Convention will be held on October 4-6, 1985, at the Kentucky Fair and Exposition Center (Exit 12 off of I-264), Louisville, Kentucky. Admission is $5.00 in advance and $6.00 at the door (12 and under are free). Features include a 200,000-square-foot indoor exhibitors' and flea-market area, ARRL forums, packet radio, AMSAT, FCC, National Weather Service, and alternate activities. For more information, contact the Greater Louisville Hamfest Association, PO Box 34444, Louisville KY 40232; (502)-368-6657.

TORRINGTON CT
OCT 5

The CQ Radio Club of Torrington will hold its annual flea market on Saturday, October 5, 1985, from 9:00 am to 3:00 pm, at the East Albert Street Recreation Building, Torrington CT. Admission is $1.00. Tailgating space is $5.00 and dealer tables are $7.00 each. Talk-in on 146.955. For more information, contact Donald Taylor KA1GKJ, PO Box 455, Watertown CT 06795.

SYRACUSE NY
OCT 5

The Radio Amateurs of Greater Syracuse are pleased to announce the 30th RAGS Hamfest to be held on Saturday, October 5, 1985, at the New York State Fairgrounds off Route 690, one mile east of Thruway Exit 39. Hours are 9:00 am to 6:00 pm, with flea-market setup beginning at 7:30 am. Rental for a large table in the indoor flea market is $6.00, and outdoor tailgating will cost $3.00. Features include VE exams (pre-registration required), an ARRL forum, and free parking. Admission is $3.00. Talk-in on 146.31/.91 and 147.90/.30. For further information, contact Viv Douglas WA2PUU or Ed Swatlowski WA2URK at PO Box 88, Liverpool NY 13088.

DEERFIELD NH
OCT 5

The Hosstraders will hold their annual fall tailgate swapfest on Saturday, October 5, 1985, at the Deerfield NH Fairgrounds. Admission is $2.00 per person, sellers included. Profits will benefit the Shriners' Boston Burn Center. Talk-in on 146.52 and 146.40/147.00. For further information, send an SASE to Norm Blake WA1IVB, RFD Box 57, West Baldwin ME 04091.

WARRINGTON PA
OCT 5-6

The Pack Rats of the Mt. Airy VHF ARC cordially invite all amateurs and friends to the 9th annual Mid-Atlantic VHF Conference on Saturday, October 5, 1985, at the Warrington Motor Lodge, Route 611, Warrington PA, and our 14th Pack Rat Hamarama on Sunday, October 6, 1985, at the Bucks County Drive-In Theater, Route 611, Warrington PA. Admission to the flea market is $5.00, with selling spaces $8.00 each. The gates will open at 6:00 am. Advance registration for the Conference is $4.00. For further information, write to Hamarama 85, PO Box 311, Southampton PA 18966, or call Lee A. Cohen K3MXM at (215)-635-4942.

YONKERS NY
OCT 6

The Yonkers Amateur Radio Club will sponsor its Electronics Fair and Giant Flea Market at the Yonkers Municipal Parking Garage, corner of Nepperhan Avenue and New Main Street, Yonkers NY, on Sunday, October 6, 1985, from 9:00 am to 4:00 pm, rain or shine. Admission will be $3.00 per person, with children under 12 free. For sellers, parking spaces will be $7.00; bring tables. There will be live demonstrations all day long, including amateur radio, computers, mini-theater, satellite TV, CB radio, etc., and a giant auction at 2:00 pm. There will be unlimited free coffee all day, plus free parking. For more information, call (914)-969-1053.

COLUMBIA MD
OCT 6

The Columbia Amateur Radio Association will hold its 9th annual hamfest at the Howard County Fairgrounds (15 miles west of Baltimore, just off I-70 on Route 144, 1 mile west of Route 32) on Sunday, October 6, 1985, from 8:00 am to 3:30 pm. Admission is $3.00 (spouses and children are free). Outdoor tailgating will be $5.00; tables $6.00. Fee for indoor tailgating will be $6.00 if received by September 30 and $8.00 after September 30. Food will be available. Talk-in on 147.735/.135 and 146.52. For table reservations or information, write Mike Vore W3CCV, 9098 Lampskin Lane, Columbia MD 21045; (301)-992-4953.

WEST LIBERTY IA
OCT 6

The Muscatine Amateur Radio Club and the Iowa City Amateur Radio Club will cosponsor the Southeast Iowa Hamfest on Sunday, October 6, 1985. Doors open at 7:00 am at the West Liberty Fairgrounds in West Liberty IA. There is an indoor and outdoor flea market. ARRL/VEC exams will start at noon; pre-registration is suggested, as walk-ins will be accepted on a space-available basis. Talk-in is on 146.25/.85 and 146.52. For further information, contact Tom Kramer KE0Y, 905 Leroy Street, Muscatine IA 52761; (319)-264-3259.

SPRINGFIELD OH
OCT 6

The Independent Radio Association of Springfield OH will hold the 1985 Springfield Hamfest and Computer Expo on Sunday, October 6, 1985, from 8:00 am to 4:00 pm, at the Clark County Fairgrounds in Springfield OH. Admission is $2.00 in advance, or $3.00 at the door. For further information, call Ric Walsh WD8MSJ at (513)-322-8263, or write the Independent Radio Association, PO Box 523, Springfield OH 45501.

ST. CHARLES MO
OCT 11-12

The St. Charles Missouri ARC will operate WB0HSI on Friday and Saturday, October 11 and 12, 1985, at Frontier Park, to commemorate Discover St. Charles Days and the Boy Scout 75th Anniversary Camporee. Operation will be on 7.235 and 14.235. Other bands will also be worked if open. A commemorative certificate will be available for an SASE sent to St. Charles ARC, PO Box 1429, St. Charles MO 63301.

ST. PETERSBURG FL
OCT 12-13

The Florida Gulf Coast Amateur Radio Council, Inc., will sponsor the 10th annual ARRL Suncoast Convention on Saturday and Sunday, October 12 and 13, 1985, at the National Guard Armory in St. Petersburg FL. There will be a QCWA luncheon on Saturday, a luau on Saturday night, and a ladies' luncheon on Sunday. A special feature will be a demonstration of packet radio. Amateur examinations will be given on Saturday morning. Tickets are $3.00 in advance and $4.00 at the door. Hotel rooms are $34.00. Make all requests for tickets and hotel rooms to FGCARC, 1556 56th Ave. N., St. Petersburg FL 33703.

CONDORDIA KS
OCT 12-13

The Kansas State ARRL and MARS convention will be held at Concordia KS on Saturday and Sunday, October 12-13, 1985, at the Cloud County Community College. On Saturday, October 12, the State MARS meeting registration will begin at 11:00 am. ARRL VEC examination registration will begin at 10:00 am. There will be exhibits, forums, and a banquet (limited seating). Banquet tickets are $9.50 each in advance. Registration is $3.00; there will be free flea-market tables. For more information and VEC exam registration, contact Wendell Wilson W0TQ, 717 2nd Avenue Box 462, Concordia KS 66901; (913)-243-2872.

PARAMUS NJ
OCT 13

The Bergen ARA will be holding a Swap and Sell on Sunday, October 13, 1985, from 8:00 am till 4:00 pm, at the Bergen Community College, 400 Paramus Rd., Paramus NJ. Bring your own tables. Amateur license examinations will be given. Admission for sellers is $5.00; for buyers, free. Talk-in on 147.79/.19 and 146.52. For more information, contact Jim Greer KK2U, 444 Berkshire Road, Ridgewood NJ 07450; (201)-445-2855, nights only.

LANSING MI
OCT 13

The Central Michigan Amateur Radio Club and the Lansing Civil Defense Repeater Association will sponsor Ham Fair

85 on Sunday, October 13, 1985, from 8:00 am to 3:00 pm, at the Michigan National Guard Armory, 2500 S. Washington Avenue, Lansing MI. Admission will be $3.00; tables will be $.75/foot. FCC examinations will be offered at 1:00 pm with registration for examinations by September 13. Talk-in frequencies are 145.390 and 146.940. Additional information and reservations can be arranged with Rowena Elrod KA8OBS, 111 Lancelot Place, Lansing MI 48906; (517)-482-9650.

LIMA OH
OCT 13

The Lima Hamfest will be held at the Allen County Fairgrounds, Lima OH, on Sunday, October 13, 1985. Directions: one mile east of I-75, Exit 125A, on Route 309 and Route 117. Advance tickets are $3.00; $3.50 at the door. Tables are $6.00; half tables $3.50. For reservations, send an SASE and check to NOARC, PO Box 211, Lima OH 45802. License exams will be given. For exam information, contact NC8F at the above address.

WAUKESHA WI
OCT 13

The Kettle Moraine RAC will sponsor its annual ham/computer/video fest at the Waukesha Expo Center, Highways F & FT, Waukesha WI, on October 13, 1985. Tickets are $2.50 in advance and $3.00 at the door. Tables are $3.00 for each 4 feet of length. All facilities are indoors, so the event will be held rain or shine, beginning at 8:00 am. For reservations, send a check payable to KMRA Club to Kettle Moraine RAC, PO Box 411, Waukesha WI 53187.

SUNBELT AG EXPO
OCT 15-17

The Colquitt County Ham Radio Society will operate club station WD4KOW from the site of the eighth annual Sunbelt Agricultural Exposition on Tuesday through Thursday, October 15-17, 1985, from 9:00 am to 5:00 pm daily. The Sunbelt Expo is held each year at Spence Field Air Base, located near Moultrie GA, and is the largest agricultural show in the south. Operations are in the General portion of the HF bands. Members will also be listening for visiting hams on 146.19/.79. A special QSL card is available. Send an SASE to PO Box 813, Moultrie GA 31776.

CHELSEA MA
OCT 16

The Chelsea Civil Defense Office is sponsoring classes beginning on October 16, 1985, for those interested in obtaining a Novice, Technician, or General amateur-radio license. Both electronic theory and Morse code will be taught. There is a small charge covering the cost of materials. For more information, contact Frank Masucci, 136 Grove Street, Chelsea MA 02150. Please include your telephone number.

GRAY TN
OCT 19

The Johnson City and Kingsport Amateur Radio Clubs are sponsoring their Fifth Annual Tri-Cities Hamfest on Saturday, October 19, 1985, at the Appalachian Fairgrounds, Gray TN, located five miles south of I-81 on Highway 23. Features will include a flea market, forums, dealers,

SATELLITES

USING THE AO-10 APOGEE PREDICTIONS

Apogee predictions for the month of October are provided for three sections of the United States: Washington DC at 39N 77W, Kansas at 39N 95W, and California at 38N 122W. Times are in UTC and apogee in this case is mean anomaly 128 rounded to the nearest whole hour. Use the chart as a guide in aiming your antenna, then fine-tune the azimuth and elevation values to peak the satellite's beacon signal. If you require more accurate orbital predictions, contact AMSAT at PO Box 27, Washington DC 20044.

			WASH		KANSAS		CALIF	
ORBIT	DAY	TIME	AZ	EL	AZ	EL	AZ	EL
2060	1	0400	193	23	173	24	154	16
2062	2	0300	180	25	160	22	135	11
2064	3	0300	174	22	155	18	131	6
2066	4	0200	162	21	144	15	123	0
2068	5	0200	157	18	140	10		
2070	6	0100	146	14	131	5		
2072	7	0000	136	9				
2074	7	2300	127	4				
2079	10	1000					235	0
2081	11	0900					227	7
2083	12	0900					221	9
2085	13	0800			234	0	212	15
2087	14	0700			226	7	202	20
2089	15	0600	232	3	217	13	191	23
2091	16	0600	226	5	211	14	184	22
2093	17	0500	218	12	201	19	172	23
2095	18	0400	208	17	190	22	160	21
2097	19	0400	202	18	183	21	155	17
2099	20	0300	191	21	171	21	145	14
2101	21	0200	179	22	160	20	135	9
2103	22	0200	173	20	155	16	132	4
2105	23	0100	161	19	144	12		
2107	24	0000	150	16	135	7		
2109	24	2300	140	12	126	1		
2111	25	2300	136	7				
2113	26	2200	128	1				
2118	29	0800					230	4
2120	30	0800					225	6
2122	31	0700					216	13

and RV hookups. Talk-in is on 146.37/.97 and 147.87/.27. For further information, write Tri-Cities Hamfest, PO Box 3682 CRS, Johnson City TN 37601.

OPELIKA/AUBURN AL
OCT 19

The Society for the Promotion of Amateur Radio Communications will sponsor its first annual swap meet and packet exhibit at the Lee County Fairgrounds on US 431 just north of the US 29 junction, from 10:00 am to 5:00 pm. Space is $5.00 per vehicle in advance, $7.00 at the gate. Admission is $1.00. There is free parking, and refreshments are available. Talk-in on 147.06/.66. To make reservations, contact Ray Dodge, PO Box 2423, Opelika AL 36803-2423; (205)-745-2838.

MANCHACA TX
OCT 19

The Austin Amateur Radio Club will sponsor its fall swapfest on Saturday, October 19, 1985, from 8:00 am to 1:00 pm, at the Manchaca Fire Hall, Manchaca TX (located on Farm Road 1626, west of IH-35). Admission is free. A limited number of indoor tables will be available for $2.00 each. Refreshments will be available. Dealers are welcome. Talk-in on 146.19/.79 or 146.34/.94. For more information, please contact Jim Strohm KA5UXC, 1743 Cricket Hollow Drive, Austin TX 78758; (512)-837-5423 or (512)-837-4352. Send an SASE for a map.

BAR-B-QSL
OCT 26

The Healing Springs Mountain VHF Society, Inc., will operate special-event station WD4BBQ at the second annual Lexington (NC) Barbecue Festival on October 26, 1985, from 1300 UTC to 2100 UTC, on 40, 20, and 15 meters. Phone activity will be 25 kHz up from edge of the General-class bands. Novice activity will be on 7125 kHz, as time permits. Also area 2m repeaters. For a special Bar-B-QSL, send an SASE to Healing Springs Mountain VHF Society, Inc., PO Box 41, Lexington NC 27293-0041.

POQUONOCK CT
OCT 26

The Tri-City Amateur Radio Club will sponsor its third annual auction on Saturday, October 26, 1985, at the St. James Parish Hall, Poquonock CT, 1-1/2 miles east of Route 12 on Route 2A (south of Norwich). Setup will begin at 9:00 am, and the auction will be from 10:00 am until everything is gone. Admission is free and there will be food available. Bring your equipment to be auctioned. Talk-in on 146.52 simplex. Call WA2RYV at (203)-464-6555 for further information, or contact Bob Dargel KA1BB, 8 Willow Lane, East Lyme CT 06333; (203)-739-8016 or (203)-446-7325.

CHATTANOOGA TN
OCT 26-27

The Seventh Annual Hamfest Chattanooga Amateur Radio and Computer Convention will be held on Saturday and Sunday, October 26-27, 1985, at the new Convention and Trade Center, Chattanooga TN. Admission is free. Eight-foot flea-market tables are available for $6.00 per day, or $10.00 for both days. Amateur licensing exams will be given. Talk-in on 146.19/.79. For further information, write Hamfest Chattanooga, PO Box 3377, Chattanooga TN 37404, or call Nita Morgan N4DON at (404)-820-2065.

LAKE TEXOMA OK
OCT 26-27

An introduction to amateur radio for the potential ham and Dutch-oven cooking for the traveling amateur are part of the special program features of Hamarama '85, held on Saturday and Sunday, October 26-27, 1985, at the Lake Texoma Lodge overlooking Catfish Bay, near Kingston OK. This ARRL-sanctioned hamfest will feature forums on severe weather and emergency operations, radio-club organization, traffic handling, and current FCC and ARRL matters. A banquet will be held on Saturday night. For further information, contact the Texoma Hamarama Association, PO Box 610892, DFW Airport TX 75261.

DANIEL BOONE HOME
OCT 26-27

The St. Peters ARC will sponsor a special-event station from 1700 UTC October 26, 1985, to 1700 UTC October 27, 1985, at the Daniel Boone Home in Femme Osage Valley MO (St. Charles County) to commemorate where Boone spent the last two decades of his life. KB0J will operate on approximately 3.915, 7.240, 14.280, and 21.420 MHz. A coonskin cap will be given to the first operator making contact with KB0J on all four bands. Certificates are available for an SASE from Bob Goin KA0IKU, 3112 Powder Horn Trail, St. Charles MO 63301.

FRAMINGHAM MA
OCT 27

The Framingham Amateur Radio Association will sponsor its annual flea market and exams on Sunday, October 27, 1985, at the Framingham Civic League Building, 214 Concord Street (Rt.126), in downtown Framingham. The doors will open at 10:00 am. Admission will be $2.00. Tables will cost $10.00, which includes one free admission. Pre-registration is required for both tables and exams. Talk-in on 147.75/.15. To reserve tables, contact Jon Weiner K1VVC, 52 Overlook Drive, Framingham MA 01701; (617)-877-7166. To register for license exams, send a completed Form 610, a copy of your ham license, and a check for $4.00 payable to ARRL/VEC to FARA, PO Box 3005, Framingham MA 01701.

LANCASTER PA
OCT 27

The third annual Red Rose Computerfest will be held on Sunday, October 27, 1985, at the Guernsey Sales Pavilion, located on Route 30 east, Lancaster PA, at the intersection of Route 896. Admission is $3.00 per person; children under 14 are free when accompanied by a paying adult. Doors will open at 9:00 am. Features will include computers and electronic equipment, a large indoor exhibit area, tailgating, hardware, software, and computer supplies. For more information, write to Computerfest Committee, PO Box 5029, Lancaster PA 17601.

MARION OH
OCT 27

The Marion Amateur Radio Club will sponsor its 11th annual Heart of Ohio Ham Fiesta on Sunday, October 27, 1985, from 8:00 am to 4:00 pm, at the Marion County Fairgrounds Coliseum. Tickets are $3.00 in advance, or $4.00 at the door. Tables are $5.00. Talk-in on 146.52 or 147.90/.30. For further information, contact Ed Margraff KD8OC, 1989 Weiss Avenue, Marion OH 43302; (614)-382-2608.

KALAMAZOO MI
OCT 27

The third annual hamfest and electronics flea market will be held at the Kalamazoo County Fairgrounds, Kalamazoo MI, on Sunday, October 27, 1985, from 9:00 am to 4:00 pm, with dealer setup beginning at 8:30 am. Admission will be $2.00 per person in advance, and $2.50 at the door. 8-foot table spaces are available at a cost of $6.00 per space. For further information on admission and table reservations, contact Ken KA8RUA, 2825 Lake Street, Kalamazoo MI 49001. Ham license testing will begin at 10:00 am. Limited walk-ins will be possible. Address inquiries to ARRL-VEC, Al Nelson K8OQB, 10603 Cora Drive, Portage MI 49081; (616)-323-3812.

SELLERSVILLE PA
OCT 27

The RF Hill Amateur Radio Club will hold its ninth annual hamfest on Sunday, October 27, 1985, at the Pennsylvania National Guard Armory, Route 152, Sellersville PA. Doors open at 8:00 am. Tickets are $3.00, with accompanying non-ham spouses and children free. Indoor space is $8.00, and tailgating is $6.00 on a first-come, first-served space basis. Food and beverages are available. Talk-in station W3AI will operate on 144.71/145.31 (Almont), 146.28/.88 (Hilltown), and 146.52. Sellers should call Robert Garland WB3AIG at (215)-674-4800, Ext. 515 to reserve indoor space only.

WIA 75TH ANNIVERSARY

The Wireless Institute of Australia, the world's first radio society, will celebrate its 75th anniversary during 1985. The WIA 75 Award will be available during the period from March 1, 1985, to December 31, 1985. To qualify, amateurs (and SWLs) need to contact (log) 75 members of the WIA. A contact will be valid only if the WIA member's individual membership number is logged. No more than 30 WIA members may be logged in any one callsign area. Send a log extract of the 75 members contacted and $2.00 (Australian) to WIA 75 Award Manager, Wireless Institute of Australia, 412 Brunswick Street, Fitzroy 3065, Victoria, Australia.

from page 4

11. William Hord W4WIJ, Florida
12. E. R. Nagy WA4CTY, Georgia
13. Wayne Carvalho KH6TZ, Hawaii
14. Donald Dunn W7GNU, Idaho
15. Daniel Noncek WB9FBO, Illinois
16. James Holicky WB9MAS, Indiana
17. Patrick McPherson WD9HTJ, Iowa
18. Robert Duncan N0EJF, Kansas
19. Charles McGinty WD4DLA, Kentucky
20. Greg Bain KA5QPI, Louisiana
21. William Condon KA1AZN, Maine
22. A. P. Fagan, Maryland
23. Bill Ross N1AZL, Massachusetts
24. Dr. Arnold Podolsky KR8S, Michigan
25. E. R. Van de Loo KA0DBO, Minnesota
26. Bill Boyer, Mississippi
27. Ed Bestmann WA0GEU, Missouri
28. Francis Shepard W7HAH, Montana
29. Willis Bengston WD0DXA, Nebraska
30. Gustave Lundquist, Nevada
31. Stuart Cowan W2LX, New Hampshire
32. Clark Magness N2EEY, New Jersey
33. M. L. Levy, New Mexico
34. Timothy Constable, New York
35. Carl Crumley N4VD, North Carolina
36. Donald Schroeder K0FUP, North Dakota
37. Guy Weaver, Ohio
38. H. B. Wortham N5BW, Oklahoma
39. Michael Heltborg WA7NPA, Oregon
40. Ralph Hartzell KC3KM, Pennsylvania
41. John Ambrose K1EW, Rhode Island
42. Lewis Cooke K4IQM, South Carolina
43. George Smith WD0BJH, South Dakota
44. E. L. Sanderlin W4RCE, Tennessee
45. E. V. Johnson, Texas
46. Jon Hunter K7JH, Utah
47. Charles Watson WA1NBU, Vermont
48. Charles Johnson KC4UQ, Virginia
49. G. F. Mitchelmore W3EYC, Washington
50. Sidney Jackson, West Virginia
51. Carl Woelfl, Jr. N9AAM, Wisconsin
52. Eugene Masserini, Wyoming

Each will get a complete set of 1986 *Callbooks* as soon as they're off the press (see "QRX").

Some Final Notes:

1. To KA5QPI—Please give my very 73 to old friend Mayor Jones. And let me know, please, if he doesn't do everything possible to help hams in Bossier City.
2. Make no mistake about it. Again, this issue is dedicated to Wayne Green W2NSD—"Never Say Die."

Jack Burnett

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
6 Jenny Lane
Pikesville MD 21208

Well, for those of you who have been holding your breath for the last month, you can relax now; the wait is over. This month I shall begin to look at all the information all of you have sent me on the various ways to get this or that microcomputer onto RTTY. I will try to put whatever information I can lay my hands on into a unified whole each month, covering one computer per issue. If I write about your computer and don't mention your favorite RTTY program, it is not that I am being biased—it is because I have not heard of it! So—and manufacturers take note of this—watch for your computer type and feel free to comment on what I have to say. I guess I will have to break down and follow this series with an appendix of all the "forgotten" systems I left out. Then again, if I get the information—even late—it will still be a pleasure to print it. Enough of the prologue; let's push on!

The first machine I asked about (last January) was the Texas Instruments TI-99/4A. Although not many of these machines were sold initially, the deep discounts available when Texas Instruments closed out the model provided more than a few hams with their first taste of microcomputing. Because of the so-called "closed architecture" of the machine, however, there just is not an overwhelming supply of RTTY programming available for the TI-99/4A. Hmmm. Manufacturers of other "closed" systems would do well to take note!

Anyway, the name that kept coming up again and again was, of course, Kantronics. Their "Hamsoft" program seems to be about the only commercial program available for this computer. A formal review of Hamsoft was published in the April, 1983, issue of *73*, but let's see what some of you had to say about it.

Richard Dyer W5TCC and Art Lane W0DKN are two hams using the Hamsoft program with other vendors' interface units (more on that later). Art feels that the Hamsoft program performs "as advertised."

Mark Nelson AJ2X, another Hamsoft user, says that it "...seems pretty good, though I have cassette-loading problems for storing canned messages."

I presume you have cleaned and demagnetized your recorder heads, Mark. It seems that we often forget that cassette tape used on computers is only a little different than the stuff we use on the stereo. I mention that because I never cease to be amazed at the number of folks I hear who would not think twice about cleaning their audio-tape heads every few weeks, but never think even once about the computer cassette recorder they use many times a day. Just a thought.

Wayne Novack K3GBV, the Air Force MARS State Director for Maryland, notes that he is using the "Kantronics Interface and Hamsoft module for RTTY, CW, and to interface a Gemini-10X printer. All work well after you learn how to use them." Right!

I have a rather long letter here from William Maddock WA0AIZ, from Florissant, Missouri, detailing some of his experiences with the Hamsoft module for the TI-99/4A. In part, he writes, "I use the Kantronics software module. So far as I know, Kantronics is the only company to ever manufacture software for the TI-99. I would very much like to know, and I'm sure others would, too [know I would!], if anyone has come up with a decent program of any type, module, disc, or tape, which will even work with the TI."

Bill goes on to look at a comparison of the TI-99/4A Hamsoft with that for the VIC and C-64. Most notably, although the modules for the Commodore machines were less expensive, the TI-99/4A module included a parallel port, which apparently could be addressed through regular system calls. I won't get into a head-to-head here—we will be looking at other systems' available material as time goes by. (Hmmm...another song cue!)

And then there were the bits and pieces. For example, Jim Ketcham KA4AFI, from Ozark, Alabama, notes that he is using PTERM-99 and a modem but will be getting the Kantronics UTU (that's Universal Terminal Unit to those in the know) in a few months. How's it going, Jim? Let us all know what you think about this "computer-independent" piece of equipment.

Or Bill Davidson KW4J, in Birmingham, Alabama, who may be the only person in the country, for all I know, using (as he puts it) "a $15 program that...requires the Minimem module and is capable of both transmit and receive." Details, details! Where do these things come from? Are they for sale or do good friends just pass them around? I don't know—do you?

Now, I promised to say a little something about interfaces. You've read that some folks use the AEA CP-1 interface, some use the MFJ-1224 interface, and some are using one or another of the Kantronics interfaces. My gut feeling is that they are all good units. Look—you get, in this case, pretty much what you pay for. The more expensive units have features you may or may not want, at an additional price. Look over the specs and decide which one is right for you. If you want to home-brew, or use an older terminal unit with compatible outputs, that should be fine, too.

I was at a ham/computer get-together this past weekend and ran into a reader who related a story which warmed my heart. It seems that Larry Cisenfeld (not a ham but a friend of quite a few) was asked to help get some computers on the air. Trouble was, these systems were running under versions of CP/M, and the only programs he could find were on other CP/M systems, none of which were accessible. So he used an old 6800-program, published here many moons ago, to put a Smoke Signal Broadcasting 6800 system on-line, and used that to download the software. I believe he even translated the 6800 code itself for use on 8080 machines. Way to go, Larry!

Is there enough interest in Teletype Model 33s to devote a tutorial to the subject? I have been getting questions here and there on how to hook them up and have answered them directly. Please drop me a note and let me know if you would like to see more on this subject.

Regards to John Petrisin K2SSH, of Spring Lake, New Jersey. John is another CoCo user who is using this versatile machine on RTTY. I hope the one-chip terminal unit detailed here a few months back helps him get onto RTTY in an efficient manner. Let me know, John.

Hi to Sidney Smith KB1ST, up in New Canaan, Connecticut. Sidney is a new ham looking to get his Apple II+ onto RTTY. Well, in a little bit we will look at some of the programs your fellow hams have told me about for their Apple computers, but in the meantime I am happy to send you the list of "RTTY Loop" reprints you have asked for. Yes, folks, that list is still available, for a self-addressed, stamped envelope. It describes all the reprints I have put together to date, many of which are based on material printed in this column over the past eight or nine years, with suitable updating when necessary. Feel free to ask for your copy and add whatever comments you like as long as you are scribbling a request.

The electronic connection is still active, with more than a few hams receiving a prompt reply via CompuServe EasyPlex (E-Mail). If you have a question that can be answered that way, go ahead and address it to me via ppn 75036,2501. I'll try to reply as soon as I can, often right after reading the text of your question! Will wonders never cease?

Now, before I get all kinds of flack for mentioning all the wonderful equipment above and giving no way to get ahold of the manufacturers, here is a list of products and manufacturers mentioned in this month's exploration of RTTY equipment for the TI-99/4A microcomputer.

- *Hamsoft Communication Program*, Kantronics, 1202 E. 23rd Street, Lawrence KS 66046.
- *MJF-1224 Terminal Unit*, MFJ Enterprises, Inc., Box 494, Mississippi State MS 39762.
- *CP-1 Terminal Unit*, AEA, Inc., PO Box C-2160, Lynnwood WA 98036.

Now, I shouldn't have to remind you all of this since we have been through it so many times before, but if you contact any of these fine folk about their RTTY equipment, pleae tell them that it was in *73*'s "RTTY Loop" that you saw it mentioned, OK? You understand, it's not for me, but to allow the manufacturers to know where the amateur community gets its information, so that they might tailor the direction for their next product line. And, of course, where else to read about that new and exciting piece of RTTY gear? Right here, in "RTTY Loop!"

BE MY GUEST

Guest Editorial by Arthur Reis K9XI

THE NEW NOVICE

A year ago, no one would ever have thought it possible. Now, all of a sudden, it's two steps away from reality. The concept of the Novice license may be changing and with it, hopefully, the improvement of the chances for survival of the amateur-radio hobby.

You'll never find a better example of an idea for which the time has come. And it seems that a lot of hams realize it, too. With the ranks of the hobby dropping, the past year has seen a major turnaround on the collective attitude of the brethren, and with the release of RM-5038 by the ARRL on June 6, the other shoe has finally been dropped. Though the comment cutoff date for this Petition has long gone, look for it to resurface as an NPRM—and fairly soon.

So why even talk about such an issue? At this point, it may even be an apple-pie subject, right? No, and for two reasons. First, there is indeed a lot of opposition to RM-5038 within the hobby, especially among some 220-MHz operators. Some League members were upset that the Newington folks didn't consult them first. (Hogwash! Why duplicate the effort? That's what the FCC comments process is for.) Others were saying, "But not on *my* band!" That attitude doesn't even deserve to be dignified with a reply. (Another comment is, "Why bother? The hobby is dying anyway." Seriously, folks, I have heard that with my own ears, and on a Chicago area on-the-air forum held on this very subject!)

Second, there *are* some improvements which can be made to the ARRL's Novice Enhancement proposal, and they will be dealt with presently.

As one who some in the hobby refer to (mistakenly) as a mover and shaker of the 220-MHz band, I have been kept fairly well informed of the opinions of many of the present 220 users since RM-5038 came out, and I find that about 80 percent of them support the proposal. If this is true of the entire 220-MHz population, then it's a dramatic turnaround in just a little over a year. Why? It seems to be a combination of two things: one, a realization of the sniping that will always be happening against 220 until we get more activity on that band in all parts of the country, and two, what the Novice license is doing to amateur radio, and why.

We are now coming to the realization that the CW-only privilege is extraordinarily stifling to the Novice today. RM-5038 explained it very well when it referred to dead-band conditions on 10 and 15 meters, broadcast-station interference on 40, and interference from Canadian telephone on 80, especially during the evening hours at the time of the greatest Novice activity. But it goes beyond that. CW is at its best at traffic handling, contest work, DXing, and in some phases of emergency work.

However, *as an encouragement to upgrade,* especially by one's peers and role models, there is no way that CW at 5 to 15 wpm as practiced on the Novice bands can possibly cut it. I've heard of upgrade classes being held on VHF FM, but on 80-meter-Novice CW? No way! To learn, you have to communicate as fast as you can think, and in the interference-plagued environment of the Novice bands, a new ham is doing well just to communicate his call-sign, name, QTH, and a signal report.

One friend of mine, active on 220 for many years, told the Chicago on-the-air forum, "In my three years as a Novice, I never *once* heard a bit of encouragement to upgrade aimed at myself or at anyone else on the bands." Without that peer/role model encouragement to upgrade, *on the air*, a Novice, more often that not, is a seed cast upon a rock.

The Novice license as presently structured effectively eliminates from the entry level of amateur radio the residents of apartment houses, condominiums, and townhouse developments. To ask a Novice, with limited operating and technical experience, to limit his power, his antennas, and even his operating hours because of where he lives, is inviting the exact kind of frustration which will send him straight to stamp collecting. That

means that we are losing a lot of good potential operators, especially those in urban areas, not to mention the young who have virtually no control over where they live.

Another ramification of the present Novice structure has an indirect bearing on the future of VHF/UHF operation. The Novice who survives the ordeal of the present privilege structure intact will, more often than not, be an operator predisposed to low-band DX-chasing. Only the most competitive survive, it seems, and there is almost nothing more competitive than the hunt for DX. To put it bluntly, it seems to a lot of us within the hobby that the present Novice-license structure has bred a generation of American DX musclemen which has done too little to enhance the cause of "international goodwill through amateur radio."

On the other hand, the desire to explore the frequencies outside of the low bands has been stunted by the selective weeding out of those who might be interested in modes other than low-band CW or phone DX-chasing and contesting, which has resulted in a decided lack of activity, per capita, on all bands above 15 meters except two meters. I would suggest that the changes proposed in RM-5038 and its hoped-for successor NPRM will go a long way toward correcting that inequity and as a by-product, will help us keep all the amateur VHF and UHF bands "all amateur."

Oh? Why, certainly! You must realize that 220 MHz is not the only amateur band in danger of being lost due to under-activity. We've already lost 420–430 MHz near Canada (for a number of reasons, really), 1215–1240 MHz, 2310–2390 MHz, and as the press for frequencies by the commercial interests moves upward, other VHF/UHF bands are or will become targets. To foster a love for all VHF work, not just 2-meter FM, you have to have a taste of that VHF experience early. So, why not Novice privileges on 220 MHz, 1250 MHz, or both? If we don't, we will soon be finding ourselves fighting the same sort of rear-guard actions that we've been fighting on 220 MHz for the rest of our amateur-radio lives. The thought is indeed depressing.

The present trend of emergency and public-service communications is away from low-band-CW work and toward the VHF hand-held radio. CW is used in times of real disasters as a liaison between the disaster area and the outside world, but the experience needed to handle that sort of traffic is often beyond the range of the typical Novice licensee. Thus Novices who are involved in emergency and public-service work may handle *off-the-air* chores, while it is *on the air* where they are most often needed, and it is from there that they are summarily excluded under the present circumstances. Not only is a mind a terrible thing to waste, but so is talent and so is a desire to serve when needed. All are wasted if a Novice cannot be used as needed in a communications emergency simply because of legal or political considerations.

I know of maybe a half-dozen people in my life who would be on the air three months from today if they could get there using their computers and not have to worry about anything else. I would suggest that many of them may even be willing to learn the Morse code if the Novice license would allow them to do more than just pound brass to an upgrade. And that's just the people I know. How about your circle of friends? Sound like a good potential for growth in the hobby?

Now, while a lot of Chicago area hams who participated in the On-Air Forum on the Novice-license proposal agreed that the time for Novice enhancement is right, there were some constructive criticisms heard as well, and in the main, I agree with them.

For one, the length and renewability of the Novice license should be reexamined in light of the ARRL proposal. Just as surely as enhanced Novice privileges will allow for more exposure to the wide variety of activities which make up the Amateur Service, and as surely as the Novice licensee will receive more assistance in his or her efforts to upgrade as a result, it is in the best interests of the hobby to provide yet one more incentive to upgrade: The Novice license should be good for a period of less than ten years and the license should be nonrenewable. Several hams who spoke in the On-Air Forum mentioned a license term of two years. I would suggest that that is *too* short. Four or five years sounds much more ideal to me. But nonrenewable? Yes. These are heady privileges being proposed here. Under the circumstances, a forever-Novice license is not really in the best interests of the hobby.

I also wonder about the wisdom of grandfathering present Novice licenseholders into these new privileges, since under the terms of the Petition new Novices would have new questions covering the new privileges which were never asked of the older Novices. The problem with my feelings on this, however, is that in a practical sense, differentiating the old Novices from the new Novices would be an almost impossible task. Besides, the number of old Novices compared with the new may become vanishingly small anyway. Mind you, this comes from a writer whose wife and older son are both "old Novices." They won't even speak to me if they see this in print!

Another thing: If the Novice license is enhanced, this would be a good time to put Novice testing under the VEC program. With these new privileges in hand, the stakes on the Novice really knowing what he or she is doing will be even higher than ever. The VEC program has proven itself by now over most of the country to be a trustworthy one, and as such is superior to the present method of Novice testing. I suggest therefore that it is time to let the VECs do it all. Both they and the hobby deserve it.

As I said at the outset, RM-5038 will be dead for filing comments long before you read this. But you'd best believe that it will be back soon, at an NPRM near you. There are other ramifications of this Petition that I have not gone into here, so it's time to read up on it and decide. I know that this phrase is grossly overworked, but I'll say it again, and with a twist this time: The future of amateur VHF/UHF, and especially of 220 MHz, may well rest on what the FCC does with RM-5038 and with the NPRM which comes out of it. And what the FCC does with THAT will depend a lot on what you say *or what you DON'T say* to the FCC when the time to comment on this proposal again comes around.

Mr. Reis is the publisher of 220 Notes, The National 220-MHz Newsletter.

LETTERS

THANKS, DAVE

Congratulations to the *73* staff on completing 25 years of amateur-radio publishing. When *73* was founded, the first OSCAR satellite was just a dream. Now, the second manned operation from space is already history, complete with live color SSTV pictures! The next 25 years should be even more exciting. 73, and best wishes.

David Sumner K1ZZ
Executive Vice President
American Radio Relay League

HUZZAH 2

I read the guest editorial in the March, 1985, issue of *73* and thought that I would write to whole-heartedly commend and support you in your remarks. I have operated DX and semi-DX at club station VS9MB and at my home station GW4VBN, and most recently portable in 4X—I really know the frustration of wanting to have a rag-chew with someone when the QRM is at intolerable levels. I do not see why any of your suggestions would be impractical other than in the minds of the very people who are causing the situation.

Thanks, and let's wish for the demise of the "5NN NH 73" brigade.

Graham Sorenson GW4VBN/4X
Haifa, Israel

LAX HR IS...

Your idea of a Ham-Day was a good one that I hope was widely participated in by your readers.

On March 24, 1985, I invited 2 friends who are active in CB radio to my ham shack. When I sent out a CQ, a Japanese ham came back and my friends were very impressed by what ham radio could do with less than 100 Watts. A month ago I gave one of them a Novice test and he now has his ticket and is happily pounding the brass.

It was so easy and pleasurable to introduce others to this exciting hobby. I wonder why our ranks are shrinking when there are quite a few people out there who will get hooked like I did once they see what it is all about.

I soon realized that if every US ham would take the time to introduce others to hamming, we could double our ranks within a very short time.

If only these rag-chewing old-timers on SSB would talk about how many Novice tests they gave last month rather than what brand of laxative they use, this hobby would be a lot better off.

Michael Nowicki N6LUU
San Jose CA

DISPLAY REPLAY

Hurrah for Thomas Miller WA8YKN and his frequency display, "What You See Is Where You're At," in the July, 1985, *73*. This project was just what I was looking for. However, I am one of the sorry fellows with a backward vfo. As the dial is turned up, the vfo frequency goes down. I suggest using 74192 counters instead of the 74196 counters and counting down instead of counting up. I will be trying this idea on my Heathkit HW-101.

Carl Anderson WB0DFH
Minneapolis MN

This letter is prompted by an article in the July, 1985, issue of *73* entitled "What You See Is Where You're At." Unfortunately, it isn't.

The single-input display described will not be accurate on any ham-radio transceiver, not even the Ten-Tec Argonaut, because the bfo changes frequency when using CW and the opposite sideband position of the mode switch. This will put the display out by approximately 750 Hz in CW and 3 kHz in the opposite sideband position. In fact, the display may not even be accurate in the normal SSB position because Ten-Tec uses a different procedure than most to set its bfo crystals—they position the bfo on the skirt of the crystal filter by voltage, not by frequency.

The readout scheme described in the article works on only one well-known ham receiver, the Drake R-4. It will work because of the unique bandpass system the R-4 series uses. This is the only case where our digital display has only one input to count against a preset.

To display the frequency of Collins S-line, FT-101 (all), TS-520, TS-900, R-599, HW-101, SB-102, and all similar types, you must count all three of the frequencies that make up the operating frequency (hfo, bfo, and vfo). There is no way around this.

For the Argonaut, Atlas 210X, Swan 700CX, and all of the other similar radios that use a premix system (vfo and hfo mixed for first mixer injection—Swan uses a vfo only for premix), you must count both the premix and the bfo. In some radios the bfo is added to the premix on some bands and subtracted on other bands. Swans 350 through 700 work this way.

The only possible use for the article's display is on an old AM-only receiver like the DX-160 shown, using three digits only. When we supply a display for an older superheterodyne receiver that is capable of SSB reception, it both counts the direct mix vfo and subtracts the bfo. When the bfo is off (AM reception), our unit recognizes this and puts the missing bfo frequency into its calculators for a full six-digit automatic readout on an old Hallicrafters.

Unfortunately, your article leads readers to believe that they can duplicate the circuit and get an accurate digital readout to 100 or even 10 Hz. I am already receiving comments from people inquiring and mentioning the article. They imply that if my unit costs too much, they can always build their own. I suggest that you run some type of follow-up article to let your readers know what type of radio this display will and will not work on.

Roger Grandbois VE7LB/W7
President, Grand Systems
Blaine WA

I've received quite a bit of interesting mail from readers who enjoyed reading my article on the simple digital frequency display (July, 1985). Today, however, I heard a discouraging word in the form of a copy of a letter sent to *73* by a Mr. Roger Grandbois. It seems that Mr. Grandbois is a manufacturer of digital frequency dis-

plays. Since his letter was so far from the spirit of my article, I thought I'd write and give you my reaction to his claims.

I'm sure that the display sold by Mr. Grandbois is a fine unit. It should be, since it costs nearly as much as my Argonaut. The fact is, however, that my display was just not designed to do the same job, because that job simply wasn't required. My display only needs to count the vfo because its job is to increase the *resolution* of the dial, which it does very well. Mr. Grandbois doesn't seem to realize the difference between resolution and accuracy. Resolution is, by definition, making details visible. By programming an offset equal to the fixed oscillators in a transceiver, my display will not correct for inaccurate alignment or error in these circuits. It was not intended to do so.

The Argonaut has a slide-rule dial and a knob skirt with little marks, each mark representing 1000 Hertz. The Argonaut, therefore, has 1000-Hertz resolution. Try this trick. Tune in an SSB station perfectly, then turn the audio gain all the way down. Spin the knob a few turns and then come back to the *exact frequency*. Turn up the audio and what do you hear? Donald Duck? With my simple digital display, I can return to within *ten Hertz* of that frequency. Every time. That is 10-Hertz resolution. The true accuracy of the display will depend on the accuracy of the frequencies generated within the transceiver and their agreement with the value programmed into the display. Please note that the little marks on the knob skirt didn't take these things into consideration, either!

If the inaccuracy due to changing sidebands bothers anyone, it's a simple matter to add a switch to select a different pre-load for the kHz digit when on USB. Anyone who understands the circuit well enough to consider building it will have no trouble with that.

Let me just say that I'm sure Mr. Grandbois has a nice product which will turn any rig into a lab-quality frequency standard. Anybody with the need for superior frequency measurement with the bucks to get it might consider it. They might also consider trading the old rig for a new PLL job, too. But for much less money and a few evenings of tinkering, my display will increase the *resolution* of the analog dial by *one hundred times*. That was its intended purpose, and it does it very well indeed.

I'm not out to deprive anyone of a market for his product. However, I don't feel that any ham should be forced to buy an expensive solution to a simple problem. Many of us can't afford to do so. I simply provided a low-cost alternative, simple enough to be of interest to a great many hams, and by the mail I've received, a lot of people appreciated it.

By the way, the DX-160 with the digital display works well with the Argonaut for split-frequency operation. On Armed Forces Day last May 18th, I worked many military operators with this setup using all modes, including RTTY (yes, all the stations read out exactly on the published frequencies!).

Thomas M. Miller WA8YKN
Mansfield OH

REVIEW

YAESU FT-780R

When Yaesu brought out the original FT-780R all-mode 430-440-MHz transceiver, it was among the first radios on the market which relied on a microprocessor for control. Yaesu used a 4-bit NMOS micro to control every function on the transceiver—from frequency synthesis to memory selection, mode selection, and frequency display. At the time of its introduction a couple of years ago, it was at the leading edge of the radio art.

And, while it isn't at the cutting edge of technology—other rigs have passed it by in terms of bells and whistles—it is still a very creditable rig which should make a good addition to anyone's shack, especially if that operator is interested in satellite work.

Don't think, though, that this rig is strictly limited to satellite work, because it isn't. It can be used for 70-cm weak-signal work such as CW or SSB, and in this role it performs very well (as a recent effort in a terrestrial VHF/UHF contest showed).

If I were to classify the FT-780R, I would have to call it a tank. After powering it up from a 13.8-V-dc supply, it performed flawlessly. All of its features were easy to use and the built-in CW sidetone was good. Even the vswr protection circuit received a workout when a catastrophic antenna failure knocked the vswr of my antenna system sky high. The diode detector correctly sensed the mismatch and the drive to the finals was cut. When the problem was corrected, everything worked beautifully.

Features and Specs

The FT-780R is a feature-packed rig, and while it may not have 32 memories and other bells and whistles, it has enough functions to keep any operator happy. For starters, the NMOS micro controls frequency synthesis in 10-Hz, 100-Hz, 1-kHz, 25-kHz, and 100-kHz steps. It features 1- and 10-Watt output, selectable at the press of a button. With 10 Watts of drive, the FT-780R should be able to serve as the exciter for any 70-cm amplifier on the market.

The FT-780R I tested was the A/B or 430-440-MHz model. Model X covers 440-450 MHz. As I tested this unit I found that the lower portion of this UHF band is very nice for long CW rag-chews, something which you really can't say about the low end of 80 or 40 meters these days.

The CW note was well-shaped, and thanks to the clarifier control I was able to easily zero-beat other stations. This rig will work with most electronic keyers, the keyer being attached via a miniature plug to a jack on the rear of the transceiver. The key jack for CW has a key-up voltage of 8 volts and a key-down current of 1 mA. Just above the key jack is the external speaker jack.

As I operated the transceiver, I found that it is very stable. Frequency stability is specified as 10 ppm. This translates to a rig which can be placed on a frequency and left there hour after hour, which is what I did several times. I could detect no discernible changes in frequency, even after the rig sat for more than 12 hours in a hot shack.

The FT-780R model A/B is an all-mode transceiver, capable of CW, sideband, and FM, although there's admittedly very little FM activity on this portion of the band. Because of this I monitored my own tests using a scanner. My observations confirm that the audio is strong with an emphasis on mid-range frequencies. The high and low frequencies are rolled off fairly well. The audio is punchy and crisp.

In operation, carrier suppression is better than 40 dB down and unwanted sideband suppression in SSB operation is better than 40 dB. Spurious emissions are at least 60 dB down and frequency response is 400 to 2600 Hz at −6 dB. FM deviation is 5 kHz, although as I have noted, I only tested this feature briefly because I was more interested in using this rig for weak-signal work. Power consumption is 500 milliamps on receive and 4 Amps on high-power transmit.

The receiver has an SSB/CW sensitivity of 0.5 μV for a 20-dB S/N and a 12-dB Sinad of 0.35 μV on FM. Its FM sensitivity is 1 μV for an S/N of 35 dB. These sensitivity figures are quite respectable, although I suspect the serious UHF enthusiast will want to improve things with a good GaAsFET preamp mounted at the antenna. Selectivity for SSB/CW is 2.2 kHz at 6 dB down and 4.8 kHz at 60 dB down. FM selectivity is 14 kHz at 6 dB down and 25 kHz at 60 dB down. Image response is better than 60 dB.

One thing about the FT-780R is that it's not lightweight. Weighing 3 kilograms and measuring 60 × 180 × 250 mm, it is a fair-sized rig. You should realize these limitations if you are thinking of installing such a rig in a compact or subcompact car because you may not have the room for it. In a shack, though, its size isn't really a problem.

Operating

Overall, the Yaesu FT-780R is a pleasure to use. All of the key controls are either on momentary contact switches or standard push-buttons on the front panel. Other controls are on rotary switches.

For example, the FM squelch control is on a concentric rotary switch surrounding the on-off/volume control. The step control, which adjusts the frequency coverage per step (10 Hz to 100 kHz, depending on the mode), is next to the on-off/volume control. The step control is surrounded by the memory-selection rotary switch—up to four frequencies can be programmed in memory. Next to these controls is the main tuning knob, which is used to control the receive and transmit frequencies over the rig's coverage range. Next to the main tuning knob is the mode-selection switch for CW, LSB, USB, and FM. For those who opt for the model X, the mode switch offers the standard ±5-MHz repeater split, as well as simplex. An eight-pin connector is used for the microphone, a low-impedance unit which can also control band or memory scanning.

The top half of the front panel contains an LED bar-graph signal-strength indicator which doubles as a power-out indicator, as well as LEDs to indicate transmit, receive, clarifier engagement, and high or low power. Next to these indicators is the digital frequency display, which also indicates whether the rig is in memory or priority mode.

Interestingly, the FT-780R has dual vfos which allow split-frequency operation using vfos A and B. This allows you to work nonstandard repeater splits on the model X. Another interesting feature is the priority mode which allows scanning of the main dial and one memorized frequency every 7 seconds. This allows you to watch a frequency, such as the calling frequency of 432.100 MHz, while working or watching another frequency.

In operation, the clarifier, which actually functions as a superset of the frequency display, works well. Actually an RIT, it allows up to a 10-kHz offset from the received frequency and is very valuable in zeroing in on a station. The way the clarifier works is this: When you activate it, you begin at the frequency you were operating, which then changes as you turn the tuning dial. But if you deactivate the clarifier, you'll see that the transmit frequency remains the same. And reactivating it brings back the received frequency. The frequency display overlays and is a superset of the main transmit frequency.

As you would expect, the FT-780R is equipped with an N-type connector, which is far less lossy than the standard PL-259 with which we are all familiar. And while we're on the topic of connectors, the rear apron also contains a two-pronged power connector which mates with the power cable provided by Yaesu. Also on the rear panel near the massive heat sink is the memory backup switch. In the on position, dc power is supplied to the memory circuit and the frequencies that have been entered in memory will be retained.

On the bottom are two miniature connectors, one of which is for an optional 32-tone CTCSS encoder and the other of which supplies outputs for an external signal/power meter and a standby/control line for external amplifier control.

If you look at the bottom of the FT-780R, you'll see something different about it. It has a forward-facing speaker. Because it is angled in this manner, audio output is sent toward the front panel rather than into the floor or operating bench, which keeps the audio output from being swallowed by either a car's carpeting or your operating bench. In a car, this presents no problem because you can angle the mounting bracket to accommodate it. But in your shack, it means you must use the bail provided by Yaesu.

This bail, which kept slipping out on the model I reviewed, also provides protection for three important switches: scan selection, tone-burst activation, and satellite operation. The scan-selection and tone-burst switches provide rather obvious functions, but the satellite switch needs a fuller explanation.

When the satellite switch is activated, it allows you to shift your operating frequency while you are transmitting, much like the XIT control on an HF rig. This feature is particularly useful when in satellite operation because it allows the operator to zero in on the proper frequency within the satellite passband. However, it disables the clarifier and dual vfos when it is selected.

Overall, I found the FT-780R to be a good performer. It was easy to operate, and once I learned my way around the control panel—which didn't take long—it worked quite well. Its sensitivity seemed on a par with other 70-cm rigs on the market, and while I didn't have a GaAsFET preamp handy, I think it would even be hotter if you installed one at the antenna. CW operation was easy, as was SSB. The only limitation is the fact that I was unable to fully test the FM capabilities of this rig, although from monitoring myself during testing I can say that the audio was good with no sign of clipping.

This rig is a good choice for the satellite operator because of its capabilities as well as its ability to take into account the Doppler shift of satellite signals with the SAT switch. In fact, when it was offered, the FT-780R could be purchased with a console that fit a matching Yaesu 2-meter all-mode rig. This combination makes a superb satellite station.

As is the case with other Yaesu documentation, the instruction manual which came with the rig was complete and contained not only complete schematics of the rig, but also a good primer on theory of operation as well as service and troubleshooting hints. It's well worth the time spent reading it.

The Yaesu FT-780R was one of the first microprocessor-controlled, multimode UHF rigs on the market and it still represents a good value for the current price of about $500. For more information, contact *Yaesu Electronics Corporation, 6851 Walthall Way, Paramount CA 90723; (213)-633-4007.*

Marc Stern N1BLH
Framingham MA

KANTRONICS PACKET COMMUNICATOR

You can tell that an idea is becoming popular when the number of products available starts to increase. For well over a year, *73* has been telling you about the latest developments in packet-radio technology. Until quite recently, your choice of a packet-radio controller was somewhat limited. That is beginning to change.

The people at Kantronics have been cranking out some very fine software and hardware packages for radioteletype, CW, and AMTOR for several years, and I wondered when they would join the move toward packet radio. The wait is now over with the introduction of the Packet Communicator.

The first thing I noticed was the styling of the Packet Communicator. It looks like a telephone modem! It's the same style cabinet used by Kantronics for their UTU (Universal Terminal Unit), very low profile and sleek. Operationally it accepts the same commands as other TAPR-type units—welcome news for those of us already used to a particular command structure. Not all packet units can make this claim. The GLB board, for example, has a language all its own.

The Kantronics unit is based on the original TAPR (Tucson Amateur Packet Radio) TNC (terminal node controller) circuitry. Like the AEA PKT-1 and the Heath HD-4040, the Packet Communicator is manufactured under license from TAPR. Significant changes have been incorporated into the unit, however, making it a unique entry.

Numerous changes have been made to the TAPR program. For example, the Calibrate command implements a special calibration procedure that requires another Kantronics unit in order to be of use. Gone are the TAPR-implemented calibration procedures. That might be considered a problem, except that I have found the

WHAT DO *YOU* THINK?

Have you recently purchased a new product that has been reviewed in *73*? If you have, write and tell us what *you* think about it. *73* will publish your comments so you can share them with other hams, as part of our continuing effort to bring you the best in new product information and reviews. Send your thoughts to Review Editor, *73 Magazine*, Peterborough NH 03458.

Kantronics unit to be more stable than other TNCs I have used. It therefore doesn't need the calibration routines. Still, I wish there was an easy way to check the calibration without another Kantronics TNC. Also missing are many of the debugging tools available in the other TAPR units. The Trace command has disappeared. For most applications this presents no problems. I use the Trace function on other units to determine the paths used by other stations. There doesn't appear to be a way to do this with the Kantronics unit.

It appears that Kantronics designed this unit to encourage packet *operation* rather than being as concerned about packet *experimentation*. You would not expect a telephone modem to provide you with tracing and debugging commands. You only expect solid, reliable operation. As a packet-radio modem or TNC, the Kantronics Packet Communicator delivers all that it promises.

Some hardware modifications are also implemented on the Kantronics TNC. Rather than using the Exar Corporation demodulator chip set, Kantronics chose to use a "modem on a chip" with some attendant advantages. With most TNCs, it is necessary to make hardware and software modifications to switch from standard Bell 202 specifications normally used on VHF and UHF to Bell 103 standards used for HF and OSCAR packet transmissions. With the Kantronics Packet Communicator, it's as simple as using the Bell command. Another function of the new chip allows an Equalize command to be implemented. Some radio filters do not pass the mark and tone signals at an equal level. A certain fixed degree of compensation can be switched in and out utilizing the Equalize command.

A final change to the TAPR design allows you to select with a single jumper either standard RS-232 voltages or TTL-compatible voltages for use with your computer. This is particularly useful for the many Commodore owners who do not have a true RS-232 port on their computer. Normally an adapter that can cost $50 or more is needed, but because of Kantronics' foresight, this need is eliminated. Like the AEA PKT-1, the Kantronics unit does operate off of 12 volts dc rather than 110 volts ac. And it does come with its own power supply—a nice touch these days!

I've had my unit in operation since the day I got back from the Dayton Hamvention and have found that it does an excellent job. There were a few software bugs in early ROMs (read only memories), so be sure you are getting the latest version. If somehow you do come up with an old one, I'm assured that you will receive the latest version simply by requesting it. Kantronics has done an excellent job in the past at keeping their customers happy.

Now is the time to join in on the fun and utility of packet radio. The Packet Communicator and a VHF FM radio are all you need to get in on the ground floor.

The Kantronics Packet Communicator retails for $219. Further information is available from *Kantronics, 1202 East 23rd Street, Lawrence KS 66046; (913)-842-7745.*

Jim Grubbs K9EI
Springfield IL

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

CALIFORNIA QSO PARTY
Starts: 1600 UTC October 5
Ends: 2159 UTC October 6

Sponsored by the Northern California Contest Club. Single-operator stations may operate only 24 hours of the contest period; off times must be clearly marked in the log and must be at least 15 minutes long. Multi-operator stations may operate the full 30 hours. Stations may be worked only once per band per mode. Mobile stations may be reworked as they change counties. All contacts must be simplex and all CW contacts must be made in the CW subbands.

EXCHANGE:

CA stations send QSO number and county. Others send QSO number and state, province, or ARRL country.

FREQUENCIES:

CW—1.805 and 50 kHz up from the low end of the bands. Phone—1.815, 3.850, 7.230, 14.250, and 28.500. Try CW on the half hour, 160 meters at 0500 UTC, and 75 meters at 0700 UTC.

SCORING:

Each completed phone contact is worth 2 QSO points. Each completed CW contact is worth 3 QSO points. For multipliers, CA stations use the number of states and Canadian call areas (58 possible). Others use the number of CA counties worked (58 possible). The final score is the number of QSO points multiplied by the total number of multipliers.

ENTRIES:

All logs and summary sheets must be sent by November 10 to: Alan Brubaker K6XO, 3675 El Grande Drive, San Jose CA 95132. Please include a business-size SASE with your entry for results and awards.

ILLINOIS QSO PARTY
Starts: 1800 UTC October 6
Ends: 0100 UTC October 7

Sponsored by RAMS, the Radio Amateur Megacycle Society, this year's contest has a new date, a new 7-hour length, and the addition of club/team competition. Additionally, IL stations can now work each other for county credit. Use all bands, CW and phone. The same station may be worked on each band and mode; IL mobiles may be reworked in each county. No repeater contacts are allowed.

K4XS turned in an excessive score to capture the World Championship on 15 meters.

EXCHANGE:

RS(T) and state, province, country, or IL county.

FREQUENCIES:

CW—3.550, 7.050, and 14.050. Phone—3.890, 7.290, and 14.290. Obviously, other bands may be used.

SCORING:

One point per phone QSO; 2 points per CW QSO. Illinois stations multiply QSO point total by the total number of states, IL counties, VE provinces, and a maximum of 5 DX countries worked. Additional DX contacts count for QSO points but not for additional multipliers. Illinois mobiles may add 200 to final score for each county of operation from which 10 or more contacts were made.

Non-Illinois stations multiply QSO points by the number of Illinois counties worked. Only Illinois stations may be counted for QSO points.

All stations may earn one extra multiplier for every 8 QSOs made with the same IL county.

AWARDS:

Certificates to the top 10 Illinois fixed stations; the top 5 Illinois mobile stations; the highest score in each state, province, and country; the highest club/team aggregate score.

ENTRIES:

Entrants shall submit a log containing times in UTC, call, RST, state or province, IL county, band, and mode. Circle new multipliers as worked. IL mobiles must indicate county changes in log. Any station with over 100 QSOs must submit a dupe sheet. All stations must submit a summary sheet. Entries must be postmarked by November 1 and addressed to: RAMS, c/o Joe LeKostaj WB9GOJ, 9134 Ewing Avenue, Evanston IL 60203.

RIO CW DX PARTY
Starts: 1500 UTC October 12
Ends: 1500 UTC October 13

Sponsored by the Pica-Pau Carioca (Rio Woodpeckers CW Group), PO Box 2673,

CALENDAR

Oct 5-6	ARRL QSO Party—CW
Oct 5-6	California QSO Party
Oct 6-7	Illinois QSO Party
Oct 12-13	Rio CW DX Contest
Oct 12-13	ARRL QSO Party—Phone
Oct 19-20	ARRL Simulated Emergency Test
Oct 19-20	Jamboree On The Air
Oct 19-20	Worked All Y2 Contest
Oct 19-21	Rhode Island QSO Party
Nov 2-3	ARRL Sweepstakes—CW
Nov 2-3	ARRL EME Competition—Part 1
Nov 16-17	ARRL Sweepstakes—Phone
Nov 23-24	ARRL EME Competition—Part 2
Dec 7-8	ARRL 160-Meter Contest
Dec 14-15	ARRL 10-Meter Contest
Dec 26-Jan 1	QRP Winter Sports—CW
Jan 11-12	Hunting Lions In The Air Contest
Jan 11	5th Annual *73* 40-Meter World SSB Championship
Jan 12	5th Annual *73* 75-Meter World SSB Championship
Jan 18	8th Annual *73* 160-Meter World SSB Championship
Jan 25	2nd Annual *73* 15-Meter World SSB Championship
Jan 26	2nd Annual *73* 20-Meter World SSB Championship

1985 RESULTS
20-METER WORLD SSB CHAMPIONSHIP CONTEST

Indicated are callsign, QTH, QSOs, States/Provinces worked, DX worked, and total score.

** World Champion * State, Provincial, or Country Champion

W/VE Single Operator

**NR5M	TX	1,690	59	51	1,082,950
*KA1GG	MA	924	50	65	814,775
W1BR	MA	904	54	58	775,040
*W5FO	TX	913	57	48	572,250
KA1XN	MA	563	48	59	441,375
*N7BES	WA	1,023	53	28	425,655
*K4XS	FL	436	46	29	296,825
*NI7T	OR	636	52	24	296,400
*WA6FGV	CA	782	57	7	268,800
*WB0WHB	KS	491	45	25	191,100
*VE1BDT	NS	330	41	44	164,900
*KV0I	NE	520	44	14	158,050
*N8CXX	MI	246	42	40	145,140
*W4WJJ	VA	342	37	22	117,410
WC4E	FL	323	53	13	113,190
*AC3T	DE	200	25	23	60,672
WT4G	FL	217	38	8	52,900
*AF1T	NH	238	33	8	50,840
*KD0HY	IA	151	31	17	41,520
K6AWW	CA	157	35	8	36,550
*W0IZV	CO	151	36	4	34,400
WB0YJT	KS	185	29	3	30,880
*N3AOE	MD	108	24	21	29,250
K1DII	CT	99	26	6	18,400
WD5GSL	TX	95	30	3	16,005
N0EKK	CO	105	11	6	15,725
K2SCU/5	TX	63	25	6	12,865
WE6G	CA	60	27	4	10,695
WK4F	FL	59	29	4	10,395
NE6I	CA	49	24	4	7,700
WA5IYX	TX	43	22	4	6,370
W3SOH	VT	39	17	6	5,175
KB4JSS	GA	44	20	2	5,060
W0NGB	MN	27	13	1	2,040
NE2W	NY	24	15	1	2,000
KR2K/1	ME	25	15	0	1,875
NN3SI	DC	19	12	2	1,470
KB0C/9	IN	20	9	3	1,380
KA9GHT	NH	15	10	0	750
VE3FEA	ONT	12	8	0	480
K5GN	TX	3	2	0	30

W/VE Multi-Operator

**K5LZO	TX	1,473	56	57	932,815
*KE7C	WA	1,171	55	29	559,860
*KA1YR	CT	501	46	54	360,500
*KD5RW	LA	411	46	13	133,045
*WB0OIZ	KS	343	39	14	96,460
*KB7M	WY	111	33	2	20,125

DX Single Operator

**OK1TN	Czech.	534	46	56	445,230
*LZ1YE	Bulgaria	358	36	67	272,480
*AH6FL	Hawaii	415	51	14	268,450
*EA6VQ	Balearic Is.	433	41	29	222,950
*I4UFH	Italy	343	29	36	164,125
*JE4VVM	Japan	231	20	42	138,880
JA6BIF	Japan	137	16	21	50,320
*EA4BKE	Spain	145	25	21	49,450
VK2BQS	Australia	85	11	9	16,500
HR1FC	Honduras	86	27	2	15,225
JA2YDC	Japan	77	11	7	12,780
JR3BOT	Japan	57	9	12	11,550
SM7NJJ	Sweden	46	20	1	9,450
4U1UN	UN NY	60	15	1	4,880
GM4WEW	Scotland	30	9	11	4,600
JE1ARQ	Japan	27	11	2	3,510
OK2QX	Czech.	28	2	13	2,325
JA1ASO	Japan	17	12	0	2,040
JR1ZTT	Japan	14	11	0	1,540
CT1TM	Portugal	16	4	9	1,300
LZ1KKZ	Bulgaria	15	1	10	935
DL8AAM	Germany	3	0	3	45

DX Multi-Operator

**JA7YCQ	Japan	160	16	11	38,340

Multi-Op Participants

JA7YCQ	JR7MZC, H. Ikeda
KA1YR	KJ1D, K1WNT
K5LZO	K5LZO, KE5IV, NM5M, KA5SBS
KD5RW	KD5RW, ??????
KE7C	KE7C, WB7OJV
KB7M	KB7M, KB7WN

Check Logs: W3ARK, N4NW/ZS, LZ1L73 (SWL)

20001 Rio de Janeiro, RJ, Brazil—with the cooperation of all other Brazilian CW groups. The purpose is to promote 2-way CW contacts between Brazilian and DX stations, enabling DX stations to obtain QSLs valid for several Brazilian awards. The event is held twice each year on the last full weekend in March and the second full weekend in October.

The general call is "CQ RIO DX PTY." Use all HF amateur bands within your own station license authority. Exchange RST, name, and QTH. There are no logs, but quick QSLing (via bureau or direct) is essential.

Reference frequencies are as follows: 3.510/3.520, 7.020/7.030, 14.030/14.050, 21.030/21.050, 21.130/21.150, and 28.030/28.050.

JAMBOREE ON THE AIR
Starts: 0001 Local October 19
Ends: 2400 Local October 20

JOTA is the annual Scouting/ham-radio event held during the third weekend of October. This is the 28th year it has been held with thousands of stations around the globe participating. If propagation is right, it is common to work Scouting DXCC. In past JOTAs, Scouts in some remote areas like Antarctica, Ascension Island, Christmas Island, Gough, and Seychelles were heard.

In the USA, many Scout Councils and Districts hold camporees to coincide with JOTA—hams set up Field Day-type operations, giving campers a chance to exchange greetings with Scouts everywhere.

Generally, the exchanges include typical information like name, QTH, Scout rank, hobbies, etc., with some leading to long-lasting pen-pal friendships and the exchange of photos, badges, and patches. SSTV and ATV give some a chance to have a look at the other guy. Other QSOs reported were via RTTY, EME, and even OSCAR.

Look for K2BSA, the BSA Headquarters station in Dallas TX, and for HB9S, the World Scout Headquarters in Switzerland, and for other special callsigns from many countries.

Boy Scouts and Girl Scouts of all ages, Scouters, former members, ham-radio operators, or anyone interested in doing a good turn for Scouting and ham radio is invited to participate. The contest period is given in local time, though some activity flops over from Friday to Monday to take advantage of DX time differences.

Suggested frequencies are 3.590, 7.030, 14.070, 21.140, and 28.190 on CW; 3.940, 7.290, 14.290, 21.360, and 28.990 on voice; RTTY, SSTV, and ATV on usual frequencies. Check the Novice frequencies and please move off these calling frequencies to avoid QRM.

No reports in the form of logs are necessary—this is really not a contest. Exchanges should be relaxed and relate to Scouting and ham radio as much as possible. Brief reports, however, are appreciated giving Scout unit numbers, ham calls used and heard/worked, numbers of participants, interesting incidents and exchanges, etc. Photos with captions are especially welcome for the BSA report to the World Bureau. Send them to JOTA Coordinator, W2GND, 216 Maxwell Avenue, Hightstown NJ 08520.

Ham-radio amateurs are encouraged to invite Scouts or even Scout units to their shack. If you do not know any, contact your local Scout office for the name of the unit leader in your area. You or your radio club may volunteer to participate in a district or council camporee that weekend. Phone books list council offices as Boy Scouts of America. Call "CQ JAMBOREE" or respond to such calls and observe all FCC regulations. Consider a fox hunt for more fun.

If you are not a ham or do not have one in your unit, contact one in your area for help. If you need help finding one, contact Leo Kluger, American Radio Relay League, 225 Main Street, Newington CT 06111. Make reports as indicated above, coordinating with your ham helper.

Certificate cards, the size of a postcard, are available to anyone participating in any way. They may be ordered beforehand for presentation during JOTA, or they may be awarded at Scout or club meetings later. Send requests to: Jamboree On The Air, 1325 Walnut Hill Lane, Irving TX 75033-3096, along with a self-addressed, stamped envelope large enough to hold the cards ordered. Affix postage at 22 cents for the first 10 cards and 17 cents for each 10 cards thereafter.

A temporary insignia to wear on the Scout uniform or on a jacket is available at $1.50 each from the TX address above. Separate orders for certificates and patches will get them to you faster.

WORKED ALL Y2 CONTEST
Starts: 1500 UTC October 19
Ends: 1500 UTC October 20

The Radioclub of the German Democratic Republic (RKDDR) is pleased to invite radio amateurs all over the world to participate in commemorating the anniversary of the founding of the German Democratic Republic. Operating sections include single- or multi-operator stations as well as SWLs. Each Y2 station may be worked once per band on phone and once per band on CW.

EXCHANGE:

RS(T) plus serial number starting at 001. Y2 stations will send a two-digit number of "Kreiskenner" instead of a QSO number.

FREQUENCIES:

Use all amateur bands, 3.5 through 28 MHz, with the first 10 and last 25 kHz of the 3.5- and 14-MHz bands to remain contest-free.

SCORING:

Count 3 points per Y2 QSO. Multiplier is the sum of the number of different Y2 districts worked on each band (maximum 15 per band). The districts are indicated by the last letter of the call. Final score is the sum of QSO points multiplied by the total multiplier.

SWLs count 1 point on phone and 3 points on CW for each Y2 call with sent RS(T), 2-digit number, and call of station worked with the Y2.

AWARDS:

Certificates awarded to the leading stations in each section of each country.

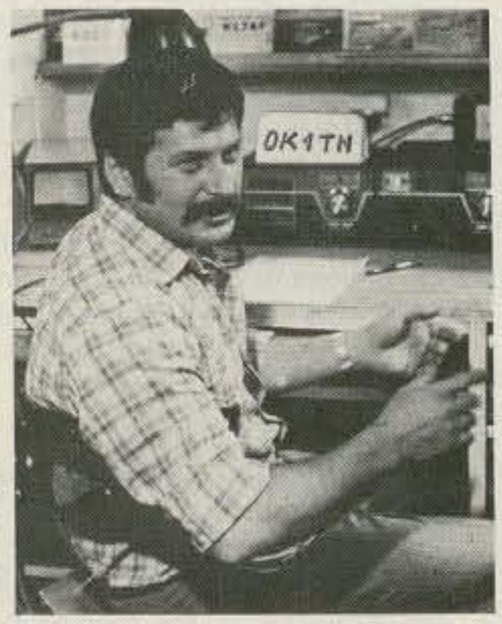
ENTRIES:

Separate logs are required for each band. Summary sheet showing multiplier and QSO worked on each band also required. Each log must be accompanied by the following signed and dated declaration: "I declare that my station was operated in accordance with the rules of the contest and in accordance with the requirements of my amateur-radio license." Logs should be mailed within 30 days following the contest to: Y2 Contest Bureau, RKDDR, Hosemannstrasse 14, DDR 1055 Berlin, German Democratic Republic. In the case of any dispute, the decision of the Y2 Contest Bureau shall be final. Applications for awards issued by the RKDDR fulfilled in the contest may be sent together with the contest log and indicated fee.

RHODE ISLAND QSO PARTY
1700 UTC October 19
to 0500 UTC October 20
1300 UTC October 20
to 0100 UTC October 21

Sponsored by the East Bay Amateur Wireless Association. RI stations work other RI stations and rest of the world. All

RESULTS



20m Single-Op DX Champion OK1TN.

EA6VQ reflects on his 20m victory.

NR5M, K5LZO, AND OK1TN: 1985 WORLD 20-METER SSB CHAMPS

In its first year, the 20-meter SSB World Championship Contest encountered adverse band conditions in most parts of the world. That didn't stop NR5M, however. In less than 16 hours of operation, the 1985 World Champion averaged 105 Qs per hour, totaling 1,690 contacts! Just imagine what the score would have been like with improved propagation. Would we have seen nearly 3,000 Qs? Probably so. An unbelievable job!

From Czechoslovakia, popular contest station OK1TN took single-operator World Championship honors for DX stations. Despite poor propagation in and out of Europe, 534 contacts were made in 46 states and provinces with 56 DX multipliers.

Multi-op station K5LZO became the unchallenged World 20-Meter Champion for that operator class. Tallying 1,473 Qs, 56 states and provinces, and 57 DX countries, the station took a commanding lead with a total of 932,815 points.

Here are the stats for total QSOs:

20-Meter World QSO Records
Single Operator

1.	NR5M	1985	1,690
2.	N7BES	1985	1,023
3.	KA1GG	1985	924
4.	W5FO	1985	913
5.	W1BR	1985	904
6.	WA6FGV	1985	782
7.	NI7T	1985	636
8.	KA1XN	1985	563
9.	OK1TN	1985	534
10.	K4XS	1985	436

In the multi-op category, the QSO counts were not as plentiful. Only 6 entries were received, so the field of competition was not as great. This being the first year for the 20-meter event, a transition to the multi-operator category can be expected by many stations wishing to compete.

20-Meter World QSO Records
Multi-Operator

1.	K5LZO	1985	1,473
2.	KE7C	1985	1,171
3.	KA1YR	1985	501
4.	KD5RW	1985	411
5.	WB0OIZ	1985	343
6.	KB7M	1985	111

There are 61 possible US state (48) and Canadian provincial (13) multipliers. Stations working 50 or more in the contest included NR5M (59), KA1XN (57), WA6FGV (57), K5LZO (56), KE7C (55), W1BR (54), N7BES (53), WC4E (53), NI7T (52), AH6FL (51), and KA1GG (50).

If you were from the south-central or eastern states, your DX multiplier count could have been respectable. At least when compared to the West Coast. European stations were more plentiful than the 6s, 7s, and some 0s were able to claim. Stations with 40 or more countries included KA1GG (65), KA1XN (59), W1BR (58), K5LZO (57), KA1YR (54), NR5M (51), W5FO (48), VE1BDT (44), and N8CXX (40). For DX stations, only three contestants managed to work 40 or more DX countries: LZ1YE (67), OK1TN (56), and JE4VVM (42).

On 20 meters, it's not uncommon for most competitors to fill the skies with an aluminum overcast. Championship stations are no exception. When it comes to equipment and antennas, the trend is to have the biggest and the best. Let's review the top five stations in each operating class, and you'll see what I mean:

Single Op:

NR5M	TX	TS-930S	Alpha 77D	6-element KLMs at 75' and 145'
KA1GG	MA	TS-830	Home-brew 8877	4-element yagis at 80' and 120'
W1BR	MA	TS-930S	Alpha 78	
W5FO	TX	TS-930S	Collins 30S-1	4 els at 120', 3 els at 40'
OK1TN	CZ	Drake TR4C	Home-brew	6-element yagi at 72'

Multi-Op:

K5LZO	TX	TS-930S	Alpha 77D	6-el KLM at 120', 4 els at 50'
KE7C	WA	FT-101ZD	MLA-2500	Twin 5-element KLMs at 70'
KA1YR	CT	FT-102	Alpha 78	4-element yagi
KD5RW	LA	FT-901	Heath SB200	KLM tribander at 100'
WB0OIZ	MO	IC-730	Tempo 2001	Ground-mounted vertical

While we are analyzing the entries, let's see what contestants were using for antennas:

ANTENNAS USED (%) IN THE 20-METER TEST

24.6	4-element triband yagi
20.4	3-element triband yagi
20.1	6-element monoband yagi
9.4	Vertical
7.5	Inverted vee or dipole
4.0	5-element monoband yagi
2.7	4-element monoband yagi
2.3	3-element monoband yagi
1.8	2-element triband yagi
1.8	Wire beam
1.8	Delta loop
1.8	Log periodic
1.8	2-element quad

As we leave the summer season behind, I can't help but wonder if the longer daylight hours of summer wouldn't be a better time to hold this event and other high-band contests as well? Would we have to compete with other summertime activities (vacations, antenna projects, etc.)? I'm not sure how propagation would be affected by a change of season in 1987 but it certainly couldn't get any worse, could it? Should we keep the January contest dates as they are, or should we move the 15-, 20-, and proposed 10-meter events to the summertime when longer daytime hours prevail? If you have an opinion one way or the other, why not write me (KE7C) and share your thoughts.

In the meantime, I encourage every contester who follows this World Championship program to share his enthusiasm with his fellow hams. The contesting trend for these events is well established. When they first begin, there are those who sit on the sidelines and merely watch the activity. With increased competition, we see more and more well-known stations appear on the scene. Stations are able to work that much-needed state or earn another DX country contact. This contest is no exception.

For obvious reasons, the low-band contests are setting new world QSO records. Once the sunspot cycle reverses its trend, this 20-meter contest should become the leader among all the single-band events. Keep the faith and for gosh sakes, tell those DX stations you contact to join in on the competition! In most cases they'd be automatic award winners so long as they make a minimum of 100 Qs!

With the 1986 season quickly approaching, you are encouraged to obtain your contest rules and forms as soon as possible. This year we've made the process a lot simpler. When you request forms for a single-band event, you'll receive rules and forms for all of our World Championship SSB Contests. Send an SASE to *Contest Rules and Forms, Attn: Billy Maddox KA6JJK/3, 1162 Bayview Vista Drive, Annapolis MD 21401.*

As we conclude the 1985 season, it's only fitting that we thank our 20-meter contest chairman Chuck Ingram WA6R for all his efforts. In the background, I am sure, is his wife Linda KG6MO also in there pitching away. To this very dedicated husband-and-wife team we owe our gratitude. It may seem easy now, but stand by in the next few years! These are the growing years. The best is yet to come. See you in the January pileups!—*Bill Gosney KE7C.*

20-Meter Soapbox

VE1BDT	It was interesting working VK6IT at 1213 UTC while beaming over the north pole!
OK1TN	Good contest but poor conditions. I hope to see more stations on the band next year!
VK2BQS	It was an enjoyable contest.
W3SOH	Poor conditions. Had to rely on 5s, 6s, 7s, and 0s for most of my contacts. Hope there's more publicity next year. *(Ed. note: 6 months before the contest was held, announcements were mailed to every major radio magazine in the world. 1986 announcements have already been sent.)*
EA4BKE	I hope next year the conditions are better and that the XYL will let me do the contest!
JE4VVM	I enjoyed the contest.
I4UFH	Good contest but no good propagation.
W5FO	I think you may have a winner with this contest.
WD5GSL	Wasn't even planning on being in this one. Made 95 QSOs in the last 35 minutes of the contest.
WA5IYX	With low power and a vertical, it just isn't a viable place to be when its crowded.
KE7C	European DX is at a premium in the Pacific Northwest. East Coast stations nearly doubled our DX multipliers here. Can't work 'em if they're not heard! In 3-5 years, I expect this event to be among the most popular.
NI7T	I enjoyed the contest but we could have used a good European opening.

1985 RESULTS
15-METER WORLD SSB CHAMPIONSHIP CONTEST

Indicated are callsign, QTH, QSOs, States/Provinces worked, DX worked, and total score.
** World Champion * State, Provincial, or Country Champion

W/VE Single Operator

**K4XS	FL	706	53	44	514,100
*KM5X	TX	583	47	50	379,755
*K4VX@ (KM9P)	IL	434	36	49	229,245
*K7QQ	WA	463	39	22	175,070
*WA6FGV	CA	511	45	7	151,840
*N8CXX	MI	268	36	31	102,510
KA6SWI	CA	263	39	7	70,380
*AC3T	DE	137	19	32	50,235
N8FEH	MI	192	25	16	40,795
*W9RE	IN	119	23	19	39,270
*W9XT	WI	148	23	17	32,600
*N4UH	NC	114	1	27	31,080
*KD@HY	IA	109	24	20	29,040
*VE1BDT	NS	117	22	14	22,680
WE6G	CA	63	22	6	10,220
WB@OIZ	MO	54	17	13	9,750
WA5IYX	TX	55	27	5	9,340
KC3AM	DE	47	19	12	9,300
WK4F	FL	47	21	10	8,990
K2SCU/5	TX	27	14	7	3,465
W@IZV	CO	29	15	4	3,135
KB4JSS	AL	34	8	7	2,700
KB7M	WY	40	12	1	2,665
W5EIJ	AR	24	7	6	1,755
W3SOH	VT	23	8	3	1,540
KB@C/9	IN	22	8	4	1,440
K8KUH	MI	18	8	5	1,235
WB2TKD	NY	12	7	3	800
W@NGB	MN	12	4	3	490
K5GN	TX	3	2	0	60

DX Single Operator

**VP9KA	Bermuda	306	36	13	71,530
*N4NW/ZS	South Africa	111	21	4	38,675
EA6VQ	Balearic Is.	84	26	3	23,780
*LZ1KOZ	Bulgaria	132	0	27	18,900
*4U1UN (HB9RS)	UN NY	107	15	8	13,225
*JM1FHL	Japan	105	1	16	12,240
HR1FC	Honduras	72	23	8	11,160
I4CSP	Italy	30	14	8	6,490
CT1TM	Portugal	25	17	3	4,900
LZ1YE	Bulgaria	36	0	22	4,180
EC4BIR	Spain	21	4	12	2,320
HL1ABR	Korea	25	0	8	1,200
JH7EAY	Japan	35	3	3	1,200

W/VE Multi-Operator

**K5LZO	TX	759	51	45	457,960
*WD5GSL	TX	394	41	38	194,340
*KD5RW	LA	295	47	21	109,140
*KE7C	WA	206	30	13	57,405
*WC4E	FL	190	38	7	46,060

DX Multi-Operator

**JA3YBF	Japan	126	12	9	23,205
*JG1ZKO	Japan	106	10	17	22,545

Multi-Op Participants

WC4E	WC4E, AK4C
WD5GSL	WD5GSL, WB@TEV, WD5ABC
K5LZO	K5LZO, KE5IV, NM5M, KA5SBS
KD5RW	KD5RW, ??????
KE7C	KE7C, WB7OJV
JG1ZKO	JN1NDY, JM1HJG, JL1MWI, JQ1ITD
JA3YBF	JR4AGT, JA9TOZ

others work only RI stations. The same station may be worked twice on each band, once on phone and once on CW.

EXCHANGE:

RS(T) and state, province, country, or RI city.

FREQUENCIES:

Phone—1.850, 3.900, 7.260, 14.300, 21.360, 28.600, 50.110, 144.2, and 146.52. CW—1.810, 3.550, 3.710, 7.050, 7.110, 14.050, 21.050, 21.110, 28.050, and 28.110. Use FM simplex; no repeaters.

SCORING:

All stations score 2 points per phone QSO, 3 points per CW QSO, and 5 points for QSOs with Novices and Technicians. RI stations multiply QSO points by the number of states, provinces, and countries worked. Others multiply total QSO points by the number of different RI cities and towns worked (39 maximum).

AWARDS:

Certificates awarded to top-scoring station in each state, province, country, and RI county, plus top-scoring Novice and Technician in RI and out of state. There will also be a certificate for the top RI multi-op station.

ENTRIES:

Logs must show date/time in UTC, call, exchange, band, and mode. Include your name, call, mailing address, total QSO points, multipliers claimed, and final score. Entries must be postmarked no later than November 30, 1985, and addressed to: East Bay Amateur Wireless Association, PO Box 392, Warren RI 02885. Include an SASE for results.

RESULTS

K4XS, K5LZO, VP9KA, AND JA3YBF 1985 WORLD 15-METER SSB CHAMPS

This 1st annual event was a true test of perseverance. The band was almost shut down entirely. Stations in Europe and Asia thought they had the contest dates wrong—they heard but a few stations on the band. Contrary to the outcome, there *was* in fact a contest held! The problem was, someone decided to invite Murphy to join in the fun. Seems like Murph was the only one succeeding—the propagation was lousy!

Leave it to the stations in the south-central and eastern states; they managed to work a bit of DX and accumulate a fairly respectable score. Of course, not as good as they could have had if old Sol had been on our side.

In the single-operator category, K4XS from Florida and VP9KA on Bermuda Island won the World Championship for W/VE and DX stations, respectively. K4XS had 706 Qs with 53 states and provinces, and 44 DX countries. VP9KA tallied 306 Qs, 36 states/provinces, and 13 countries.

In the multi-operator class, K5LZO took a commanding lead and JA3YF took DX honors to become World Champions in their respective divisions. From Texas, K5LZO and crew worked 759 stations, 51 states/provinces, and 45 DX countries. JA3YBF tallied 126 Qs, 12 states/provinces, and 9 DX countries.

Stations with 40 or more states/provinces were in the minority. They include: K4XS (53), K5LZO (51), KD5RW (47), KM5X (47), WA6FGV (45), and WD5GSL (41).

Working DX wasn't much better! Only 7 stations worked over 30 countries. Can you imagine that? It sounded like 10 meters! The fortunate few included: KM5X (50), K4VX/@ (49), K5LZO (45), K4XS (44), WD5GSL (38), AC3T (32), AND N8CXX (31).

The majority of participating stations didn't bother to turn in their scores. Most were convinced their scores were too low to win. Wrong! As the results show, most of those who took the time to turn in an entry managed to earn an award! Next year, keep that in mind.

Speaking of next year, mark down the 2nd Annual 15-meter Contest on your calendar. Be sure to tell all of your contest friends about it. If propagation is in our favor, 15 meters could surprise you with more DX than you could ever begin to realize in 1985! Remember, the 2nd Annual 15-Meter World SSB Championship Contest will be held 0000-2400 UTC on January 25, 1986. A 24-hour extravanganza that could surpass them all! Why not join us? 1986 contest rules and forms are now available. Send an SASE to the following address and you'll receive the rules and forms for all the World SSB Championship events: *1986 Contest Rules and Forms, Billy Maddox KA6JJK/3, 1162 Bayview Vista Drive, Annapolis MD 21401.*

Though all the aluminum in the world couldn't have helped, it still is interesting to survey the contestants to see the antennas they used. After analyzing the entries, here is what we found:

ANTENNA USED (%) IN THE 15-METER CONTEST

Tribander	41.0
4-element monobander	11.4
Vertical	11.4
6-element monobander	6.8
2-element quad	4.6
3-element monobander	4.6
5-element monobander	4.6
Inverted vee/dipole	4.6
Log periodic	2.2
6-element quad	2.2
Rhombic	2.2
Delta loop	2.2
Doublet	2.2

On 15, even with all of the firepower, big arrays, and full-power amplifiers, not even brute force could overcome the elements of Murphy's contest conditions. But as tradition has it, there is always next year.

On behalf of Gary Vest WA3KCY/5, our new 15-meter contest chairman, thank you one and all for giving this year's event your best effort. While it may have been frustrating to most of us, your contesting spirit is admirable, and your continued support makes the whole effort worth our while. Keep the faith—the sunspot cycle is like a yo-yo, now the only way is up! See you all again this coming January!—*Bill Gosney KE7C.*

15-Meter Soapbox

WD5GSL	Propagation? What propagation? Very lousy conditions this year. This event will top them all when the band comes back.
WA5IYX	Very slow Friday evening. Spotty all weekend.
KE7C	It may seem dead now, but look out in 3-4 years! The band will bust wide open. In the meantime...
EC4BIR	Not many USA stations. *(Ed. note: Don't feel bad, not much of anything anywhere. Stations were there but not the propagation, hi!)*
JM1FHL	Conditions to the USA very poor. *(Ed. note: Roger that, West Coast boys didn't get their JA strings either.)*
JR4AGT	Want more activity. Band very poor.
VP9KA	Thanks for the new contest. Lots of fun and I look forward to next year's event.
4UIUN	See you again next year. *73* Magazine, thank you!

HAM HELP

We are happy to provide Ham Help listings free, on a space-available basis. We are not happy when we have to take time from other duties to decipher cryptic notes scrawled illegibly on dog-eared postcards and odd-sized scraps of paper. Please type or print your request (neatly!), double spaced, on an 8½" × 11" sheet of paper and use upper- and lowercase letters where appropriate. Also, please make a "1" look like a "1," not an "l," which could be an "el" or an "eye." and so on. Hard as it may be to believe, we are not familiar with every piece of equipment manufactured on Earth for the last 50 years! Thanks for your cooperation.

I am compiling a list of biographies of radio engineers, inventors, and radio operators from the early days to the present time. Please send me the name of the book, the author's name, the publisher's name, the copyright date, and a brief description of the story. For an SASE I will send you a copy of the list.

W. Clem Small KR6A
26530 Parkside Drive
Hayward CA 94542

I need an RIT circuit for my NCX-3 transceiver and any other mods for this rig. I also need a schematic for the Heath VH-1 vfo. Thanks for your help.

Steve Jones KA7UAN
Box 865
Port Orford OR 97465

I need help from someone who is familiar with the Hallicrafters HT44 and its PS150-120 power supply. My supply puts out about 100 volts more than it should and the tubes and transistors are cooking! I'll pay the postage if somebody can help.

George Kitts
3807 North Garden
Roswell NM 88201

I am looking for a Kenwood TR-7625 2m transceiver.

Royce Sawyer N1BPU
547 Boston Post Road
Marlborough MA 01752

I need to buy a fold-over crank-up tower so that I can get my rotary antenna on the air. Any help?

George Stingel KM1W
649 Oakwood Drive
Glastonbury CT 06033
(203)-633-0334

I would like information on how to modify an ICOM IC-27H to receive signal outside of the normally 2-meter band.

Stanley Sines WA3QGA
15703 Bradford Drive
Laurel MD 20707

I have every issue of *73* Magazine from the first month to the present and would like to sell them for a reasonable price.

Joseph Strolin
21 Ellen Street
Norwalk CT 06851

I need information on how to increase the memory-scan rate of the Kenwood TW-4000A transceiver. Also, I'd like to know how to operate from 150–160 and 450–460 MHz without losing the normal 2m and 70-cm segments.

Charles Kelsey WB2EDV
RD #2 Box 63 Elmwood Ave.
Mayville NY 14757

THE MOST AFFORDABLE REPEATER

ALSO HAS THE MOST IMPRESSIVE PERFORMANCE FEATURES

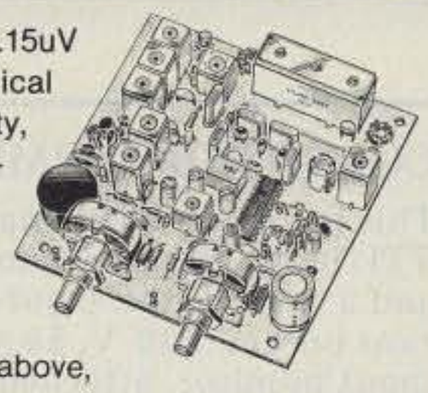
(AND GIVES THEM TO YOU AS STANDARD EQUIPMENT!)

Band	Kit	Wired
10M,6M, 2M,220	$680	$880
440	$780	$980

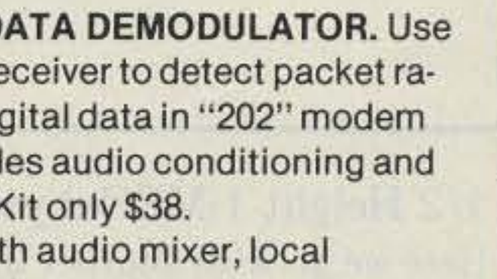
FEATURES:

- SENSITIVITY SECOND TO NONE; 0.15 uV (VHF), 0.2 uV (UHF) TYP.
- SELECTIVITY THAT CAN'T BE BEAT! BOTH 8 POLE XTAL FILTER & CERAMIC FILTER FOR > 100 dB AT ± 12KHZ. HELICAL RESONATOR FRONT ENDS TO FIGHT DESENSE & INTERMOD.
- OTHER GREAT RECEIVER FEATURES: FLUTTER-PROOF SQUELCH, AFC TO COMPENSATE FOR OFF-FREQ TRANSMITTERS, SEPARATE LOCAL SPEAKER AMPLIFIER & CONTROL.
- CLEAN, EASY TUNE TRANSMITTER; UP TO 20 WATTS OUT (UP TO 50W WITH OPTIONAL PA).

HIGH QUALITY XMTR & RCVR MODULES FOR REPEATERS, LINKS, TELEMETRY, ETC.



- **R144/R220 FM RCVRS** for 2M or 220 MHz. 0.15uV sens.;8 pole xtal filter & ceramic filter in i-f, helical resonator front end for exceptional selectivity, > 100 dB at ± 12 kHz, best available today. Flutter-proof squelch. AFC tracks drifting xmtrs. Xtal oven avail. Kit only $138.
- **R451 FM RCVR** Same but for uhf. Tuned line front end, 0.3 uV sens. Kit only $138.
- **R76 FM RCVR** for 10M, 6M, 2M, or 220. As above, but w/o AFC or hel. res. Kits only $118. Also avail w/4 pole filter, only $98/kit.
- **R110 VHF AM RECEIVER** kit for VHF aircraft or ham bands or Space Shuttle. Only $98.



- **T51 VHF FM EXCITER** for 10M, 6M, 2M, or 220 MHz. 2 Watts continuous, up to 3 W intermittent. $68/kit.
- **T451 UHF FM EXCITER** 2 to 3 Watts. Kit only $78. Xtal oven avail.
- **VHF & UHF LINEAR AMPLIFIERS.** For either FM or SSB. Power levels from 10 to 45 Watts to go with exciters & xmtg converters. Several models. Kits from $78.

NOW—FCC TYPE-ACCEPTED TRANSMITTERS & RECEIVERS AVAILABLE FOR HIGH-BAND & UHF. CALL FOR DETAILS.

RECEIVING CONVERTERS

Models to cover every practical rf & if range to listen to SSB, FM, ATV, etc. NF = 2 dB or less.

VHF MODELS

Kit with Case	$49
Less Case	$39
Wired	$69

Antenna Input Range	Receiver Output
28–32	144–148
50–52	28–30
50–54	144–148
144–146	28–30
145–147	28–30
144–144.4	27–27.4
146–148	28–30
144–148	50–54
220–222	28–30
220–224	144–148
222–226	144–148
220–224	50–54
222–224	28–30

UHF MODELS

Kit with Case	$59
Less Case	$49
Wired	$75

432–434	28–30
435–437	28–30
432–436	144–148
432–436	50–54
439.25	61.25

SCANNER CONVERTERS Copy 806 MHz band on any scanner. Wired/tested ONLY $88.

TRANSMIT CONVERTERS

For SSB, CW, ATV, FM, etc. Why pay big bucks for a multi mode rig for each band? Can be linked with receive converters for transceive. 2 Watts output vhf, 1 Watt uhf.

For VHF, Model XV2 Kit $79 Wired $149 (Specify band)

Exciter Input Range	Antenna Output
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
50-54	144-148
144-146	28-30

For UHF, Model XV4 Kit $99 Wired $169

28-30	432-434
28-30	435-437
50-54	432-436
61.25	439.25
144-148	432-436*

*Add $20 for 2M input

VHF & UHF LINEAR AMPLIFIERS. Use with above. Power levels from 10 to 45 Watts. Several models, kits from $78.

LOW-NOISE PREAMPS

Hamtronics Breaks the Price Barrier!

*

No Need to Pay $80 to $125 for a GaAs FET Preamp.

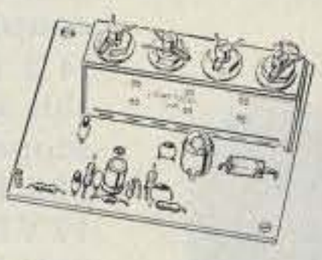
FEATURES:

- Very Low Noise: 0.7 dB VHF, 0.8 dB UHF
- High Gain: 18 to 28 dB, Depending on Freq.
- Wide Dynamic Range for Overload Resistance
- Latest Dual-gate GaAs FET, Very Stable

MODEL	TUNES RANGE	PRICE
LNG-28	26-30 MHz	$49
LNG-50	46-56 MHz	$49
LNG-144	137-150 MHz	$49
LNG-160	150-172 MHz	$49
LNG-220	210-230 MHz	$49
LNG-432	400-470 MHz	$49
LNG-800	800-960 MHz	$49

HELICAL RESONATOR PREAMPS

Low-noise preamps with helical resonators reduce intermod and cross-band interference in critical applications. 12 dB gain.



Model	Tuning Range	Price
HRA-144	143-150 MHz	$49
HRA-220	213-233 MHz	$49
HRA-432	420-450 MHz	$59
HRA-( )	150-174 MHz	$54
HRA-( )	450-470 MHz	$64

ACCESSORIES

- **MO-202 FSK DATA MODULATOR.** Run up to 1200 baud digital or packet radio signals through any FM transmitter. Automatically keys transmitter and provides handshakes. 1200/2200 Hz tones. Kit only $45.
- **DE-202 FSK DATA DEMODULATOR.** Use with any FM receiver to detect packet radio or other digital data in "202" modem format. Provides audio conditioning and handshakes. Kit only $38.
- **COR-2 KIT** With audio mixer, local speaker amplifier, tail & time-out timers. Only $38.
- **COR-3 KIT** as above, but with "courtesy beep". Only $58.
- **CWID KITS** 158 bits, easily field programmable, clean audio. Kit only $68.
- **A16 RF TIGHT BOX** Deep drawn alum. case with tight cover and no seams. 7 × 8 × 2 inches. Designed especially for repeaters. $20.
- **DTMF DECODER/CONTROLLER KITS.** Control 2 separate on/off functions with touchtones®, e.g., repeater and autopatch. Use with main or aux. receiver or with Autopatch. Only $90
- **AUTOPATCH KITS.** Provide repeater autopatch, reverse patch, phone line remote control of repeater, secondary control via repeater receiver. Many other features. Only $90. Requires DTMF Module.
- **SIMPLEX AUTOPATCH.** Use with your FM transceiver. System includes DTMF & Autopatch modules above and new Timing module to provide simplex autopatch and reverse autopatch. Complete patch system only $200/kit. Call or write for details.

- **Send $1 for Complete Catalog**
  (Send $2.00 or 4 IRC's for overseas mailing)
- **Order by phone or mail • Add $3 S & H per order**
  (Electronic answering service evenings & weekends)
- **Use VISA, MASTERCARD, Check, or UPS COD,**

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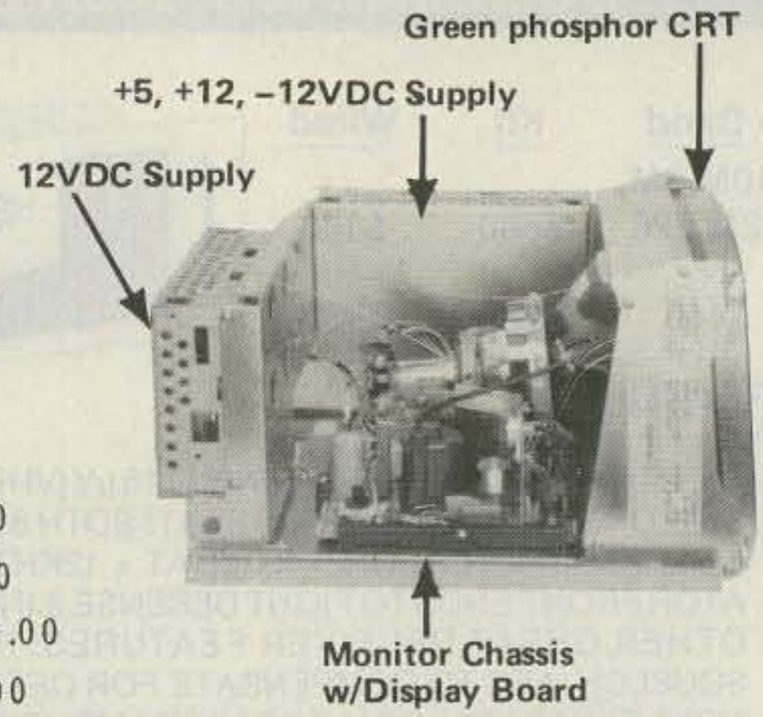
65-D MOUL ROAD • HILTON NY 14468
Phone: 716-392-9430

John J. Meshna Jr., Inc.

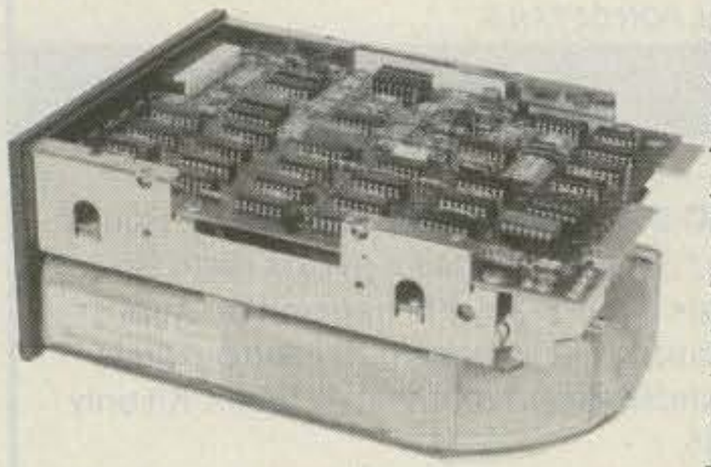
P. O. Box 62 19 Allerton St. E. Lynn, Ma. 01904 Tel: (617) 595-2275

COMPUTER TERMINAL BUILDING BLOCK $50.00

This is a great beginning for a computer terminal. It is a brand new, Panasonic, 9" TTL input monitor complete with its own self-contained, switching power supply, and a removeable (four screws) triple output power supply. The whole assembly runs on 115/230 V, 50/60 Hz. Now for some specifics: 9" green phosphor, TTL input monitor, attached regulated 12 VDC, 1.5 A power supply used exclusively to run the monitor and an attached triple output switching power supply with outputs of 5 VDC @ 3.5 A, +12 VDC @ 500 ma, and −12 VDC @ 500 ma. The assembly has mounting feet and should be a snap to make a case for. Comes with hook up data. New, factory boxed. We are offering this to you 4 ways:



* COMPLETE SET-UP AS SHOWN, including monitor, low voltage supply and triple output supply. SPL-116-38, 14 Lbs., $50.00, 5/$225.00
* TRIPLE OUTPUT SUPPLY ONLY, SPL-117-38, 3 Lbs. $15.00
* 9" MONITOR ONLY, (you supply low voltage input) SPL-114-38, 10 Lbs. $25.00
* 9" MONITOR W/LOW VOLTAGE SUPPLY ONLY, SPL-115-38, 12 Lbs. $40.00



SEAGATE TECHNOLOGY ST 506 5¼" HARD DRIVES

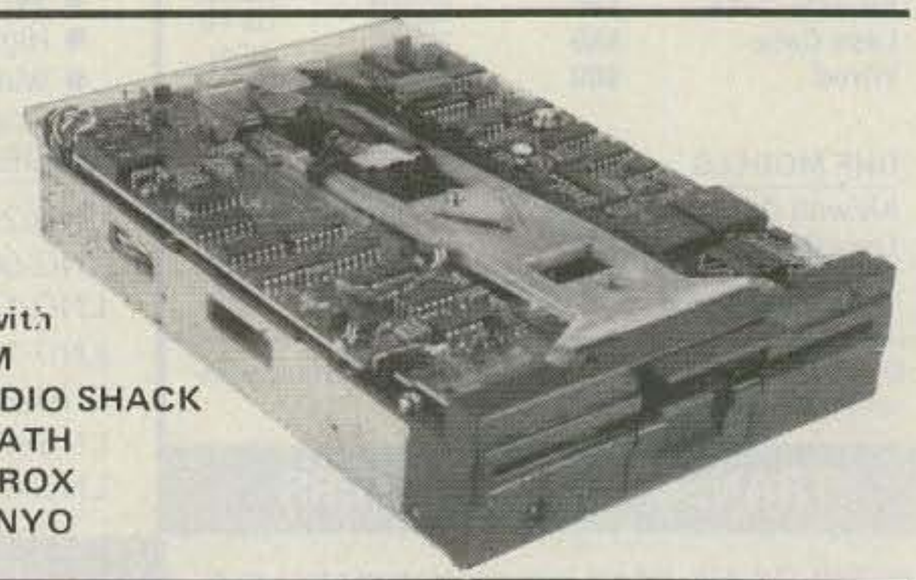
The Seagate Technology ST 506 hard disc drive utilizes proven Winchester teacnology for reliable storage of up to 5 megabytes of formatted data. Some features of this very popular drive are: 5 megabit/second data transfer rate, simple floppy like interface, high speed band actuator & stepper head positioning, requires only +5 & +12 vdc, and same physical size and mounting paramters as a mini floppy drive. This Shugart compatible drive is the same as used on many home personal computers. Each drive is checked out prior to shipment. Comes with data. Only a few on hand, so order early.
Shpg. wt. 8 lb. ST-506 ~~$225.00~~ REDUCED! now only $175.00

TI 99/4A Owners: *We are in the process of developing a Winchester Hard Drive subsystem for the Texas Instruments 99/4A. Please call or send SASE for further info.*

1/2 Height 1 MEGabyte Disc Drives

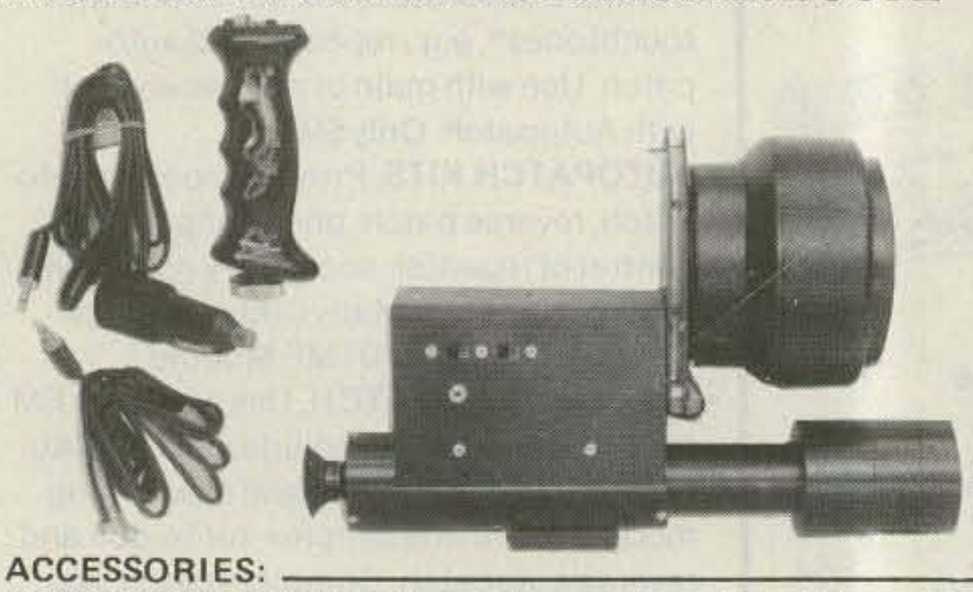
Here we go with another blockbuster buy on disc drives which should make the competion's head spin! We are offering brand new, Mitsubishi no. 4853, 1/2 height, 1 megabyte, mini floppy disc drives. These drives are beautiful. They are fully Shugart 34 pin compatible. All are double side, double density, 80 tracks per side units. Each runs on +5 vdc, .5 A and +12 vdc, .7 A. Just the drives to use with your IBM, Sanyo or other computer. Each order will come with schematics and pin out data.
SPL-85C-35 $175.00 each $175.00 each, 2/$325.00, 5/$725.00

New, 75 watt power supply. +5vdc 5.5amps, +12vdc 4amps, −12vdc .3amps 115/230 input. Made by GI, fully enclosed, with schematic.
Shpg. wt. 4 lb. PS-10 $50.00



Use with
* IBM
* RADIO SHACK
* HEATH
* XEROX
* SANYO

HIGH POWER SURVEILLANCE IR SCOPE



This Infra-Red scope was designed specifically for long range surveillance use. The built-in, totally invisible, 50 watt halogen lamp IR source is coupled with a premium grade type 6032 image converter tube, 265 mm f4.2 lens, and 16 power military spec., color corrected eyepiece make this an ideal unit for viewing of clandestine activities or animals. The scope is capable of detection at more than 300 feet, recognition at 300 feet and positive facial identification at 150 feet. It runs on 12 VDC which makes it ideal for mobile use. It comes with a removeable hand grip which allows for tripod mounting, 2 power cords for cigarette lighter or battery terminals, instructions and a 90 day warranty. Listed below are accessories which make this a very versatile instrument. The scope and accessories are new and guaranteed functional. Net wt. 5-1/4 Lbs.
IR Scope part no. ELD Shpg. Wt. 7 Lbs. $735.00 ea.

ACCESSORIES:

12 VDC GELL BATTERY for above. Shpg. Wt. 6 Lbs. $35.00

BIOCULAR EYEPIECE which can be used in place of the standard eyepiece. This allows the scene being produced by the IR viewer to be seen by the operator up to 4 ft. away. 2 Lbs. $89.95

MALE "T" f1.6 CAMERA DAPTER for SLR cameras Shpg. Wt. 1 Lb. $129.00

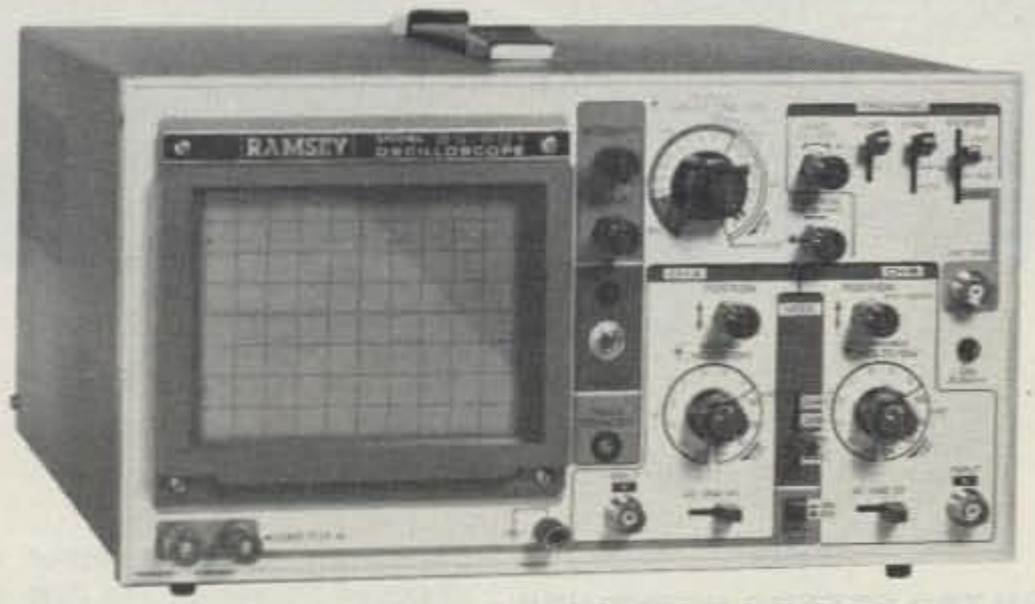
MALE "C" to FEMALE "T" ADAPTER for CCTV, requires use of above male "T" f1.6 adapter. Shpg. Wt. 1 Lb. $29.95

Free 72 page catalogue available or send $1.00 for 1st class service to P. O. Box 62 E. Lynn, Ma. 01904.

Phone (617) 595-2275 to place your order by phone. MC, VISA, or American Express charge cards accepted.

RAMSEY

THE FIRST NAME IN ELECTRONIC TEST GEAR



20 MHz DUAL TRACE OSCILLOSCOPE

Unsurpassed quality at an unbeatable price, the Ramsey oscilloscope compares to others costing hundreds more. Features include a component testing circuit for resistor, capacitor, digital circuit and diode testing. • TV video sync filter • wide bandwidth & high sensitivity • internal graticule • front panel trace rotator • Z axis • high sensitivity x-y mode • regulated power supply • built-in calibrator • rock solid triggering

$399.95* high quality hook on probes included

* USA—Add $10.00 per unit for postage, overseas orders add 15% of total order for Insured Surface Mail

NEW

45 MHz DUAL SWEEP OSCILLOSCOPE

The Ramsey 625 is a dual time base, delayed sweep unit that includes a built-in signal delay line to permit clear viewing during very short rise times of high frequency waveforms. Other features include; variable trigger holdoff • 20 calibrated sweep time ranges from 0.5 s/div to 0.2 µS/div. • fully adjustable sweep time • X5 sweep magnification • five trigger sources; CH1, CH2, LINE EXTernal and INTernal (V mode) • front panel x-y operation, Z axis input • sum difference of CH1, and CH2 waveforms displayed as single trace • sweep gate and sweep output • auto focus • single sweep

$799.95* high quality hook on probes included

* USA—Add $10.00 per unit for postage, overseas orders add 15% of total order for Insured Surface Mail.

RAMSEY D-1100 VOM MULTITESTER

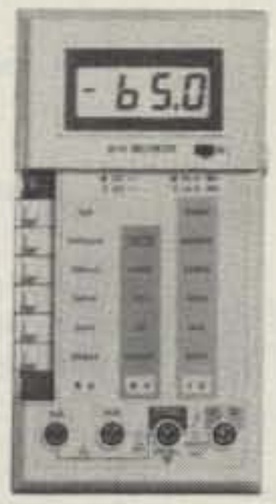
Compact and reliable, designed to service a wide variety of equipment. Features include • mirror back scale • double-jeweled precision moving coil • double overload protection • an ideal low cost unit for the beginner or as a spare back-up unit.

$19.95 test leads and battery included

NEW RAMSEY 1200 VOM MULTITESTER

Check transistors, diodes and LEDs with this professional quality meter. Other features include; decibel scale • 20K volt metering system • 3½" mirrored scale • polarity switch • 20 measuring ranges • safety probes • high impact plastic case

$24.95 test leads and battery included



RAMSEY D-3100 DIGITAL MULTIMETER

Reliable, accurate digital measurements at an amazingly low cost • in-line color coded push buttons, speeds range selection • abs plastic tilt stand • recessed input jacks • overload protection on all ranges • 3½ digit LCD display with auto zero, auto polarity & low BAT. indicator

$49.95 test leads and battery included

CT-70 7 DIGIT 525 MHz COUNTER

Lab quality at a breakthrough price. Features • 3 frequency ranges each with pre amp • dual selectable gate times • gate activity indicator • 50mV @ 150 MHz typical sensitivity • wide frequency range • 1 ppm accuracy

$119.95 wired includes AC adapter

CT-70 kit $99.95
BP-4 nicad pack 8.95

CT-90 9 DIGIT 600 MHz COUNTER

The most versatile for less than $300. Features 3 selectable gate times • 9 digits • gate indicator • display hold • 25mV @ 150 MHz typical sensitivity • 10 MHz timebase for WWV calibration • 1 ppm accuracy

$149.95 wired includes AC adapter

CT-90 kit $129.95
OV-1 0.1 PPM oven timebase 59.95
BP-4 nicad pack 8.95

CT-125 9 DIGIT 1.2 GHz COUNTER

A 9 digit counter that will outperform units costing hundreds more. • gate indicator • 24mV @ 150 MHz typical sensitivity • 9 digit display • 1 ppm accuracy • display hold • dual inputs with preamps

$169.95 wired includes AC adapter

BP-4 nicad pack 8.95

CT-50 8 DIGIT 600 MHz COUNTER

A versatile lab bench counter with optional receive frequency adapter, which turns the CT-50 into a digital readout for most any receiver • 25 mV @ 150 MHz typical sensitivity • 8 digit display • 1 ppm accuracy

$169.95 wired

CT-50 kit $139.95
RA-1 receiver adapter kit 14.95

DM-700 DIGITAL MULTIMETER

Professional quality at a hobbyist price. Features include 26 different ranges and 5 functions • 3½ digit, ½ inch LED display • automatic decimal placement • automatic polarity

$119.95 wired includes AC adapter

DM-700 kit $99.95
MP-1 probe set 4.95

PS-2 AUDIO MULTIPLIER

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

$49.95 wired

PS-2 kit $39.95

PR-2 COUNTER PREAMP

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

$44.95 wired includes AC adapter

PR-2 kit $34.95

PS-1B 600 MHz PRESCALER

Extends the range of your present counter to 600 MHz • 2 stage preamp • divide by 10 circuitry • sensitivity: 25mV @ 150 MHz • BNC connectors • drives any counter

$59.95 wired includes AC adapter

PS-1B kit $49.95

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

VISA MasterCard

PHONE ORDERS CALL 716-586-3950

TELEX 466735 RAMSEY CI

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 • overseas add 15% for surface mail • COD add $2.50 (COD 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

RAMSEY ELECTRONICS, INC.
2575 Baird Rd.
Penfield, N.Y. 14626

NEW PRODUCTS

1962

WORLD SB-175

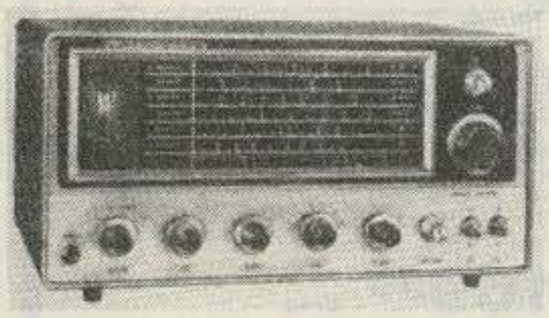
It is encouraging that World has been encouraged by the reaction of their DSB-100 to come out with a new double-sideband rig which covers all bands from 80 through 10 meters. This one, the SB-175, sells for under $100! It runs 100 Watts AM and 175 Watts CW. The cathode-grid block keying gives a nice clean CW signal. This small unit will be popular for mobile work, too, since it is small and doesn't require any difficult bias voltages. Send for info to *WRL, Council Bluffs, Iowa,* and mention that you read somewhere about it, you think.

1962—World Radio Lab's DSB-100.

1966

LAFAYETTE HA-500 HAM RECEIVER

The new Lafayette HA-500 ham-band receiver tunes the 80- through 6-meter amateur bands in six tuning ranges. It's a 10-tube double-conversion superheterodyne. Among its features are tuned rf and first mixers, two mechanical filters, product detection, "always-on" oscillator filament, built-in 100-kHz calibrator, illuminated slide-rule dial, S-meter, automatically switched agc for AM or SSB, and less than 1-μV sensitivity. Size: 15″ W × 7½″ H × 10″ D. Price is $149.95.



1966—Lafayette's new HA-500 receiver.

1970

HI-POWER BALUN

The *Big Signal* W2AU balun comes in either 1:1 or 4:1 conversion ratios, and boasts a full kilowatt (the California kind) capability, built-in lightning arrester, and a bandwidth of 3 to 40 MHz. Manufactured and distributed by Unadilla Radiation Products.

1970—The Big Signal W2AU balun.

1975

VHF ENGINEERING CW ID KIT

A CW ID kit for commercial or amateur repeaters has just been announced by VHF Engineering of Binghamton, New York. The CW ID kit consists of high-grade components, drilled epoxy-glass circuit board, programming diodes, and can be built in approximately one evening by amateurs with nominal building experience.

This new CW ID from VHF Engineering presents a price breakthrough for the amateur. The kit price is $39.95, plus postage. Sufficient diodes are included to permit programming of virtually all repeater calls. Programming is accomplished in an easy manner by soldering diodes directly to the matrix board. Diodes are placed on the board in a straight-line fashion using three diodes for a dash, one diode for a dot, and no diodes for a space. Programmed calls may be changed at will merely by rearranging diodes on the board. Additional flexibility is provided since the unit may be programmed in either CW or RTTY code—thus this IDer may be used for automatic identification of any RTTY station.

The CW ID is also available wired and tested for $49.95, plus postage.

1980—Ten-Tec's Omni-C transceiver.

1980

TEN-TEC OFFERS NEW THIRD GENERATION OF THEIR POPULAR "OMNI" TRANSCEIVER

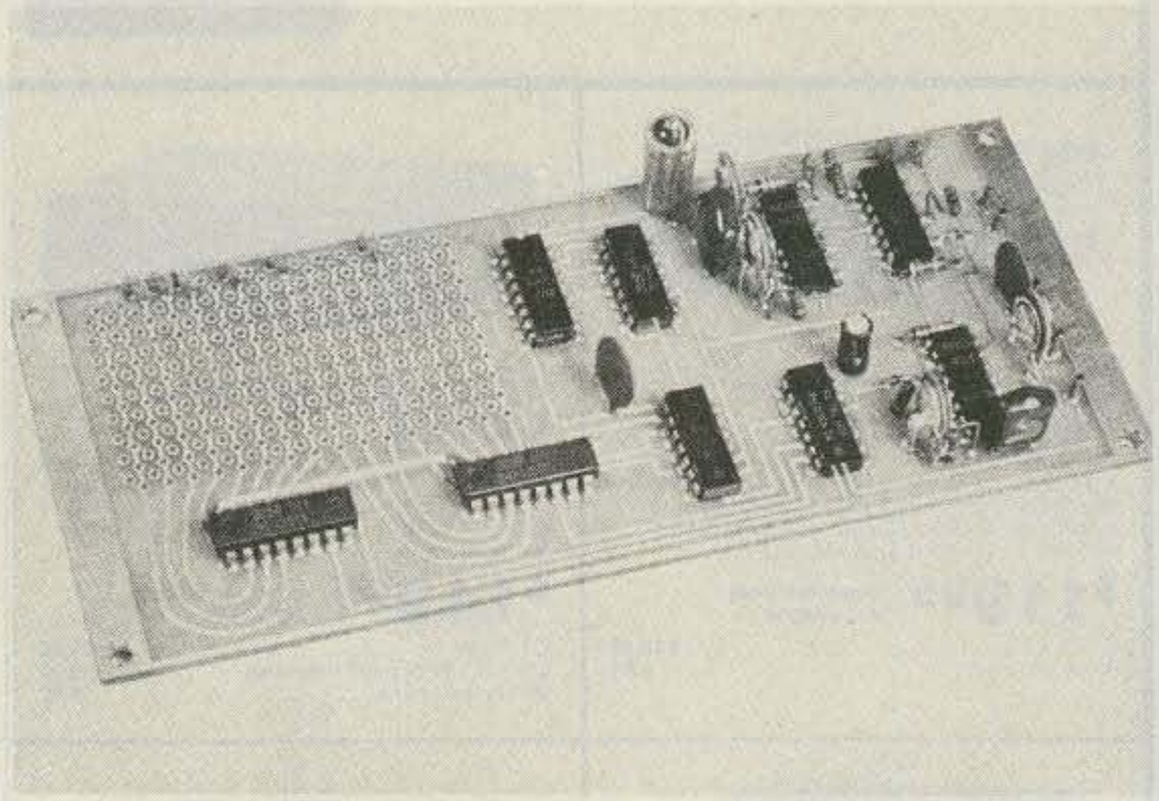
In addition to some interesting new performance features, Ten-Tec's new Omni Series C transceiver is one of the first amateur transceivers to have capability for all nine HF bands.

The Omni-C covers all amateur bands from 160 through 10 meters. Crystals are included for seven of the nine bands (crystals for the 18- and 24.5-MHz bands will be ready when the bands are).

Another unique new feature of the Omni-C is its three-mode, two-range offset tuning capability. It's the first to offer a choice of offset tuning for the receiver section, the transmitter section, or the combined transceiver. The three modes offer complete offset tuning flexibility for all needs, fine tuning interfering signals or chasing DX. The two ranges are ±500 Hz or ±4 kHz.

The Omni-C also offers new ease in using the seven response curves of its optimized bandwidth capability. New switching is provided for selecting the standard 2.4-kHz 8-pole SSB filter, the optional 1.8-kHz 8-pole SSB filter, the optional 250-Hz or 500-Hz 8-pole CW filters, cascading them for 16 poles of filtering or putting them in the signal path along with 450- and 150-Hz active audio filters.

New "hang" agc for smoother operation and a standard equipment noise-blanker (2-pole monolithic crystal filter) are other new features.



1975—VHF Engineering CW ID kit.

1985

ICOM's IC-R7000 receiver.

ICOM IC-R7000

ICOM has announced a new continuous-coverage receiver. The IC-R7000 will receive AM, FM, and SSB signals from 25–2000 MHz, including aircraft and marine communications, government agencies, emergency services, television, and of course amateur-radio VHF/UHF activity. Other features include 99 memory channels, direct keyboard entry of frequencies, several scanning modes with an adjustable scanning speed, narrow and wide filters, five tuning speeds, an optional infrared remote-control unit, and an optional voice synthesizer.

Complete information about the IC-R7000 is available from *ICOM America, Inc., 2380 116th Avenue NE, PO Box C-90029, Bellevue WA 98009-9029.*

CENTURION EAR COM

Centurion International, Inc., has acquired the Ear Com line of communications devices from Lear Siegler.

Ear Com is a miniature earpiece transducer that permits the wearer to send and receive voice messages through a radio set or intercom system in high-ambient-noise environments. The Ear Com permits hands-free communication, an important feature in hazardous occupations such as law enforcement, fire fighting, and industrial machinery operation. It can be used while wearing protective clothing such as a gas mask or a hearing protector.

Centurion's Ear Com communications system.

Novice study package by Radio School.

The complete Ear Com system consists of the earpiece, control module, and an interface cable which connects the control module to a radio or intercom unit. The Ear Com picks up voice signals through the user's otolaryngeal tract, amplifies and filters the signals, and sends them to the radio or intercom. Received messages are routed through the control module to the earpiece.

For more information about Ear Com, contact *Centurion International, Inc., PO Box 82846, Lincoln NE 68501, Attn: Sales Department; (800)-228-4563* or in Nebraska *(402)-467-4491.*

WINNER'S EDGE CONTEST SOFTWARE

Winner's Edge Software has announced The Contester, a fully-integrated program package for the amateur-radio contester. The Contester manages all of the contest paperwork, keeping track of up to 3,000 contacts on up to 6 bands, including a fast dupe-checking algorithm. The program will transmit pre-programmed messages and real-time text in 5–50-wpm Morse code.

The Contester is available for the Radio Shack Model 100, the Commodore 64, and the Commodore 128. For more information, write *Winner's Edge Software, 2003 Sarazen Place, Reston VA 22091.*

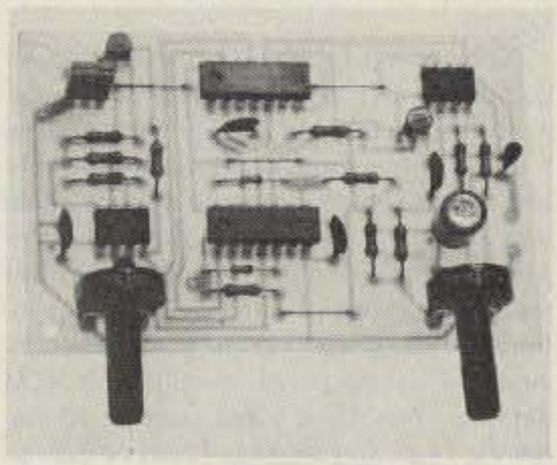
RADIO SCHOOL'S NOVICE STUDY PACKAGE

Gordon West at Radio School has put together a comprehensive study package for the prospective Novice. The material, collectively called "The Complete Novice," includes: four stereo code-learning cassettes in a vinyl holder, two Novice theory tapes in a holder, the ARRL's *Tune In the World* study book, the ARRL's *FCC Rule Book*, a brass telegraph key, a solid-state code-practice oscillator and battery, 200 Novice test questions, an FCC Form 610, a list of Volunteer Examiner Coordinators, a confidential written examination, and ten 5-wpm code tests.

Further information is available from *Radio School, Inc., 2414 College Drive, Costa Mesa CA 92626.*

BEL-TEK CMOS KEYER KIT

Bel-Tek has introduced an inexpensive keyer kit incorporating state-of-the-art circuitry and low-power CMOS digital integrated circuits. The keyer provides jam-proof spacing and can be operated at any speed between 5 and 50 wpm. The built-in 800-Hz sidetone has an adjustable volume control. A high-voltage keying transistor reliably switches loads of up to 250 mA and is compatible with grid-block, cathode, and solid-state inputs.



Bel-Tek's CMOS keyer kit.

The CMOS keyer kit includes a 2.3" × 3.5" printed circuit board and all of the components necessary to build the unit.

For complete details, write *Bel-Tek, PO Box 125, Beloit WI 53511.*

ABOVE AND BEYOND

Peter H. Putman KT2B
84 Burnham Road
Morris Plains NJ 07950

THE GAIN GAME

Two beams, or not two beams, that is the question. Or rather, two beams, four beams, eight beams—we could go on forever. What's the point of all this? Simply that a bit of confusion exists regarding the stacking of beams.

Here's a typical scenario. A newcomer to 432 MHz invests in an IC-471, Mirage 100-Watt amplifier, and 20-element KLM beam. After chasing DX and working numerous grid squares, he decides to improve his station's performance by stacking another 20-element beam above the first, under the premise that, "if one is good, two must be twice as good!" Uh, not *exactly*.

Gain, which is a much-misunderstood and much-discussed quantity, *does* behave in a logical and orderly manner: It is a logarithmic function, unquestionably and irrevocably. Simple calculations show that doubling transmitter power results in 3 decibels (dB) of gain. Halving that power results in a loss of 3 dB of gain. Our intrepid UHFer doesn't quite grasp this concept yet as he pores through the KLM catalog. "Hmm. . .if I add another 20 elements, I can add another 17 dB of gain to my existing 17 dB of gain!" Whoa, Charlie. If it was *that* simple the CIA would be using it already, and amplifier makers would be out selling apples or pencils!

Refer to the previous rules of gain: Doubling your transmitter power results in only 3 dB of gain. So doubling your antenna size results in only (you guessed it) 3 dB of gain also! Not fair, you say? Those are the laws of physics and, while they can't be changed, there are some useful aspects to stacking your antennas, as well as constructing multiple-yagi arrays. For one thing, the more antennas you use in your array, the smaller the capture area, or "aperture," becomes. This can be very handy when chasing weak stations.

Of course, it goes without saying that the front lobe of the antenna is sharper, and the beamwidth somewhat smaller (assuming that we treat the entire multi-yagi array as one electrical antenna in space). The side lobes become smaller along with the inherent side-lobe rejection characteristics of sharper antennas. And the front-to-back ratio will increase as well. There certainly are many compelling reasons to start stacking those beams!

Now our intrepid UHFer has dropped another $100 on a 20-element yagi, and the necessary power divider has been procured. After installation, providing the correct spacing rules of one-half the boom length have been observed, he should see about 3 dB more gain on both transmit and receive. Assuming half his power was making it up the feedline previously, he now has an erp of about 5000 Watts as opposed to approximately 2500 Watts before (50 Watts × power gain of 100, or about 20 dB).

That's certainly a respectable signal, but he isn't satisfied. Now he thinks he'll add two more yagis and get another 6 dB of gain. Whoops! Remember the rule of gain: Doubling the previous array will buy another 3 dB. So by using four antennas instead of one, he's been able to add another 6 dB on transmit and receive. His total investment is about $300 dollars for another 6 dB. Is it worth it? Of course. Any gain you can pick up at 432 MHz, or any VHF/UHF band for that matter, is a bonus. Whether you choose to accomplish it by using more power or bigger arrays is the choice you've got to make.

Purchasing a Henry 2004 isn't going to reduce your capture area and make your antennas sharper. On the other hand, a four-element array isn't going to give you 9 dB of gain, either! This is why station improvements generally cover all bases, from preamplifiers to power amplifiers *and* bigger arrays (not to mention lower-loss transmission lines!).

I can almost anticipate your next question: What's the practical limit for stacking arrays?

There are several limitations to consider as you start to approach the monster yagi configurations. The first is the quality of the connectors and phasing lines. Consider an array of sixteen 20-element 432-MHz yagis. The theoretical system gain is on the order of 28–29 dB, assuming a single yagi has 17 dB of gain. That would certainly give anyone a whopping signal, for with 100 Watts of drive the erp would be on the order of almost 100 kW! This is a common array for moonbounce (EME) work, and it has a very sharp pattern as well as a small aperture—two important requirements for moonbounce.

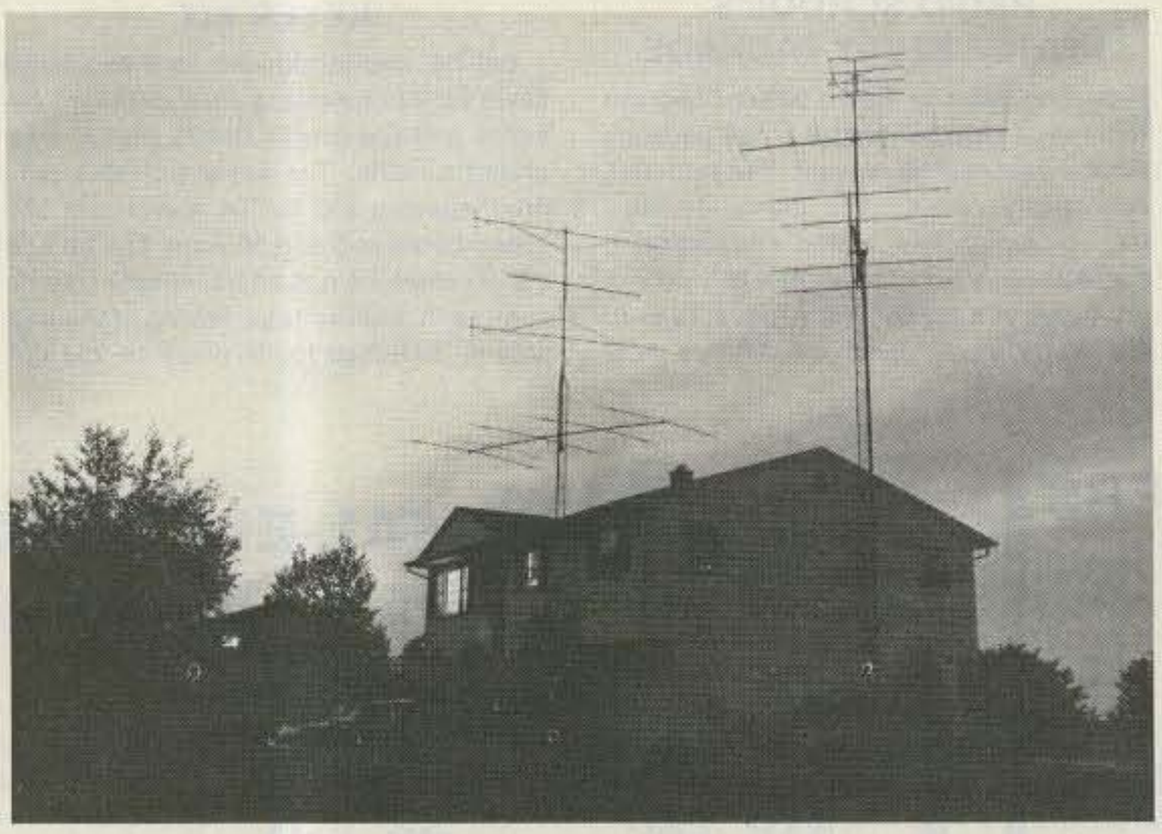


Photo A. The antenna farm at KC2PX.

Photo B. Ivars KC2PX at his command post.

But before you buy sixteen yagis, you need a few other things. Like five four-way power dividers. And *twenty* separate phasing lines. Not to mention a bit of room to put the whole thing up in. And it wouldn't be a bad idea to own some stock in a coaxial-cable manufacturer, either!

Imagine: Twenty separate but electrically identical feedlines. The first takes your main feed and splits it to the other four dividers, which in turn each feed four yagis. Alignment must be precise. Connectors must have very low loss. So must the power dividers themselves, and most commercially-manufactured units exhibit loss figures of under .1 dB. The Parabolic four-way dividers from Germany, for example, claim .07 dB insertion loss per unit.

But enough of the ideal; let's move into the real world. Assuming the average ham is assembling such an array with reasonably good connectors (type N) and high-quality cable (8214 or 9913), it would be not at all unrealistic to assume an individual insertion loss of .5 dB at each four-way junction. Since there are five junctions, this works out to .5 × 5 = 2.5 dB total insertion loss. Even if we were able to get this down to 1.5 dB total, that still means that by going from eight to sixteen yagis the net gain isn't even 3 dB—only 1.5 dB. If another sixteen yagis and the requisite twenty additional phasing lines and five extra power dividers were added, the theoretical gain would be another 3 dB but the theoretical insertion losses would *also* be 3 dB! And there you have it—the break-even point.

Of course, there are many EME types that are using monster arrays. Many of them take pride in their master craftsmanship when fabricating such arrays. But all face the same problem of gain vs. insertion losses. The other benefits of such big arrays are not lost, however. You still have narrow beamwidths, small apertures, high forward gain, and possible lawsuits from your neighbors (who regard all EME fans with a certain suspicion!).

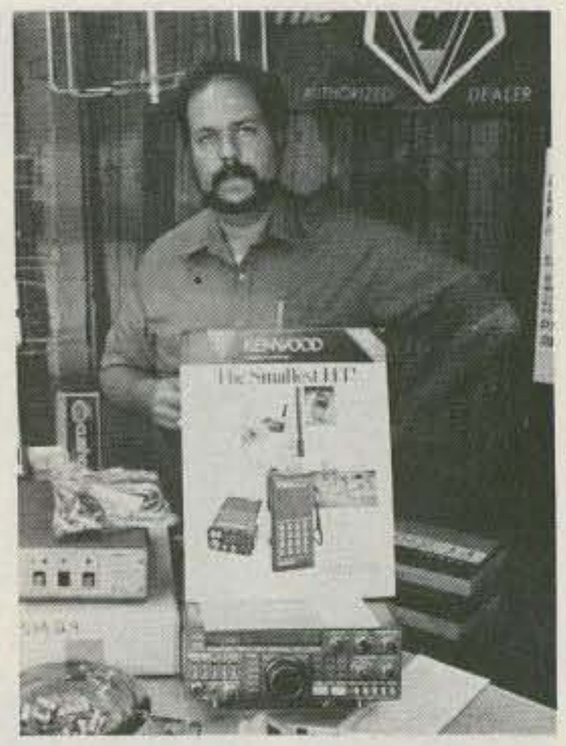


Photo C. Tom Waldron KQ3R behind the counter at the VHF Shop.

You could spend a few more dollars and use a power-amplifier/preamplifier combination to effect more system gain while reducing the size of your array to a more manageable system. In fact, most serious VHF and UHF operators have settled on the four-bay (four-yagi) system as the most practical and economical. Such arrays offer a system gain of between 18 and 22 dB typically. The money saved on the extra antennas can be put into a medium-power amplifier and preamplifier, as well as lower-loss feedline.

As I stated earlier, spacing is also paramount. The rule of thumb for most antennas is half the boom length in vertical spacing. With some of the new "monster" long-boom antennas from KLM, Cushcraft, and Tonna, spacing may be up to a full wavelength or more. The antenna manufacturers will usually be quite happy to advise you on the proper spacing for what you might have in mind.

Always use the best grade of soft coax you can for phasing lines. Times FM-8, Belden 8214 or 9913, and Saxton 8285 come to mind readily. Make sure all of the lines are as close to being identical in length as you can make them—otherwise, you'll have phasing problems and signal cancellation. Use the best type-N connectors you can, as UHF connectors will significantly increase insertion loss (for example, how about 1.5 dB in *one* UHF connector at 1296 MHz!). The extra time spent here will result in many more enjoyable hours operating a true high-performance antenna system, and some day you just might snag that rare grid you've only dreamed about!

Profile

As I stated when this column began, I'd like to hear from you! About your station, operating habits, antennas (including those 16-yagi arrays!), and anything you've built. Send along pictures if you can! Black and white are best, but I can work from slides or color prints if I need to. Make sure that your shots are clear and sharp.

This month, our feature is on Ivars Lauzums KC2PX of Belle Mead, New Jersey. Ivars has been active for twenty-five years and is a real VHF/UHF enthusiast! Refer to the photos and you'll see what I mean. Photo A shows his QTH with its twin 40-foot towers of Rohn 25 supporting the fol-

lowing: On the left, two 19-element Cushcraft Boomers at 50 feet and a KLM 14-element yagi in the center for 220 MHz (which is being upgraded to 22 elements). Below that is a Wilson Tribander for 20, 15, and 10 meters.

On the right tower, we see four 21-element F9FT Tonna yagis for 1296 MHz at 55 feet and below that a single 7-element KLM beam for 50 MHz. Finally, at rotor level are four 19-element RIW 432-MHz yagis. GaAsFET preamps are used on the tower for 144, 432, and 1296 MHz.

Inside, the station lineup includes Kenwood TS-820 and TS-830S transceivers which, in addition to being used as low-band rigs, also serve as transverter drivers. On 50 MHz it's the 830S feeding the new Mutek TVVF50 transverter driving a Henry 6N2 linear at a kilowatt. On 144 MHz the 830S drives a Microwave Modules MMT 144/28 transverter, which also feeds the Henry 6N2 for about 700 Watts. On 220 another Microwave Module transverter (MMT 220/28) drives a Mirage C1012 to about 130 Watts output.

Finally, on 432 MHz a TS-820 drives still another Microwave Modules MMT 432/28S, which feeds a Mirage D1010 for about 140 Watts output. And 1296 operation is achieved by using an ICOM 251 with a Mutek front end to drive an SSB Electronics LT23S transverter, which runs 10 Watts output. By the time you read this, Ivars will no doubt have added an amplifier on this band.

Does he get out? You bet, and good enough for a second-place national single-operator finish in the June, 1984, VHF QSO Party—not to mention a third-place national single-operator spot in the January, 1985, VHF Sweepstakes! Ivars says that experimenting with VHF and UHF propagation as well as contesting are his two big interests in ham radio. He still wonders how he was able to get all of that aluminum up in the air without his wife Mara leaving him! Seriously, though, Mara is a big supporter of Ivars' hamming endeavors, although not a ham herself. Ivars is currently teaching his son Andris (age 2) the code and some theory. Well, you might as well start 'em off early.

Another Profile

I'd also like to use this space to introduce our readers to Tom Waldron KQ3R, who recently took over the VHF Shop of Mountaintop, Pennsylvania. Tom is a dedicated VHF/UHF enthusiast and a member of the famous K3YTL VHF/UHF contest team heard each summer from eastern Pennsylvania—all the way up to 10 GHz! Although the store isn't in the best place for walk-in customers, they sure do a whopping phone-order business, based on the number of calls that came in while I was visiting with Tom and his wife Donna.

He has a large inventory to select from, is the exclusive US distributor for SSB Electronics of Iserlohn, Germany, and also carries F9FT/Tonna, Parabolic, Mutek, and Microwave Modules—all from Europe. He's an authorized dealer for Kenwood, Yaesu, Mirage, Astron, and Henry Radio. So the VHF Shop is well stocked for the VHF/UHF crowd. The SSB Electronics line in particular stands out as an exceedingly well-engineered line of preamps, converters, transverters, and amplifiers, some of which are available as kits. You'll be hearing more about this company in the future as I intend to review several of their products. One of them that is gathering a lot of attention is the LT23S 1296 transverter, which is the first attempt I've seen at a self-controlled transverter for this band that takes a wide range of power input (10 mW to 10 W at either 144 or 28 MHz) and produces 10 Watts out at 1296 MHz. It features a GaAsFET front end and built-in switching for a mast-mounted preamp. Quite a few are in service already locally.

The VHF Shop's hours are 10:00 am to 4:00 pm Monday through Friday, and 10:00 am to 1:00 pm Sunday. The toll-free number is (800)-HAM-7373 (in Pennsylvania (717)-474-9399), and their address is 16 South Mountain Boulevard, Mountaintop PA 18707. See you on the high bands!

FUN!

John Edwards KI2U
PO Box 73
Middle Village NY 11379

SATELLITE TV

Yesterday was a big day for me. After months of planning and saving, I finally took the plunge and had a satellite-TV system installed.

I'll admit, I took the coward's way out. Instead of doing it myself, I assigned the job to a local satellite-TV company. I designed the layout of the system but elected to leave the dirty work to others. If there's anything I hate more than 20 meters on a Sunday afternoon, it's back-breaking work.

Still, having the system installed was not easy. After all, I live in New York City where nothing is easy.

In most areas of the country, putting up a satellite system involves little more than coughing up the bucks, finding a suitable location for the dish in your backyard, and setting up the equipment. Installing a system in New York, like getting to work in the morning here, is an adventure.

My house is located on a lot that's a whopping 25 by 100 feet in size. That's barely enough room for a decent size house, not to mention an 11-foot dish and associated equipment. So, after a preliminary site survey, I decided the best spot for the dish would be on the roof of my garage—which is located on the back perimeter of my ludicrously small backyard.

When S-Day arrived and the installation team arrived, my neighbors sprang into action. "I don't like it. It's ugly!" shouted one burly neighbor who bears more than a slight resemblance to Andre the Giant. "And it's going to sterilize us!"

Attempts to assuage the fears proved fruitless, and "Andre" waddled away muttering vague threats of lawsuits and complaints to the FCC.

Other neighbors came over alternately to congratulate and curse at me. Andre called the cops in an attempt to halt the installation (they wouldn't come) and called in inspectors from the New York City Buildings Department and Office of Telecommunications, both of whom said, in effect, "You are out of your mind."

So now I have access to some 16 satellites but no communications with that neighbor, who just sort of stands around muttering noises while watching my beautiful parabola scanning the heavens.

But a break may be in the offing. A friend of Andre's, a Franklin Pangborn type, asked me this morning if he could come over to watch a ball game that would be blacked out on local TV. I'm still pondering the matter. Heh-heh!

ELEMENT 1 MULTIPLE CHOICE

1) Which of the following satellite-equipment manufacturers was *not* a ham-equipment maker at some time?
   1) Wilson Systems
   2) KLM Electronics
   3) Chaparral Communications
   4) R. L. Drake
2) On what date was AT&T's TELSTAR I launched?
   1) July 10, 1959
   2) July 10, 1960
   3) July 10, 1962
   4) July 10, 1964
3) How much power does the typical satellite put out?
   1) 5 milliwatts
   2) 5 Watts
   3) 50 Watts
   4) 500 Watts
4) Canadian satellites are named:
   1) ANIK
   2) CANADASAT
   3) TELECAN
   4) There are no Canadian satellites
5) What is the approximate altitude of the average communications satellite?
   1) 2.3 miles
   2) 230 miles
   3) 2,300 miles
   4) 23,000 miles

ELEMENT 2 TRUE-FALSE

		True	False
1)	The belt in which communications satellites are located is named after noted science fiction author Arthur C. Clarke.	_____	_____
2)	Distorted red color on a received picture is commonly called "sizzling."	_____	_____
3)	The feedhorn is positioned at the focal point of the antenna.	_____	_____
4)	TV satellites operate in the frequency range of 3.5 to 6 GHz.	_____	_____
5)	Approximately 200 telephone channels can be crammed into a single satellite-TV transponder.	_____	_____
6)	The newer satellites carry 12 TV transponders.	_____	_____
7)	Low-noise amplifiers (LNAs) are usually rated in decibels.	_____	_____
8)	A "feedhorn" is a type of amplifier.	_____	_____
9)	WOR-TV is based in New York City.	_____	_____
10)	Home satellite installations require an FCC license.	_____	_____

ELEMENT 3 MATCHING

Match the service in Column A with the satellite/transponder in Column B.

Column A	Column B
1) WPIX-TV	A) GALAXY 1, 2
2) MTV	B) GALAXY 1, 9
3) Nashville Network	C) COMSTAR D4, 19
4) WOR-TV	D) SATCOM F4, 19
5) Odyssey Channel	E) TELSTAR 302, 12
6) ESPN	F) SATCOM F4, 12
7) American Extasy	G) SATCOM F3R, 15
8) WGN-TV	H) SATCOM F3R, 11
9) VH-1	I) GALAXY 1, 3
10) The Playboy Channel	J) SATCOM F4, 23
	K) GALAXY 1, 15

ELEMENT 4 FILL IN THE BLANK

1) RCA operates satellites named _____
2) Western Union operates satellites named _____
3) Popular satellite-TV mono audio subcarrier frequencies are _____MHz and _____ MHz.
4) COMSTAR satellites are operated by _____
5) The first premium movie channel to appear on satellite (in 1976) was _____

THE ANSWERS

Element 1:
1—3, 2—3, 3—2, 4—1, 5—4.

Element 2:

1—True	Clarke, an electrical engineer, was an early proponent of communications satellites.
2—False	"Sparklies."
3—True	Where else?
4—True	Commonly known as the C-band.
5—False	More like 2,000.
6—False	24.
7—False	In degrees (Kelvin).
8—False	Antenna.
9—False	Secaucus, New Jersey.
10—False	Not any more.

Element 3:
1—D, 2—H, 3—A, 4—K, 5—J, 6—B, 7—C, 8—I, 9—G, 10—F.

Element 4:
1—SATCOM
2—WESTAR
3—6.2, 6.8
4—COMSAT
5—Home Box Office (HBO)

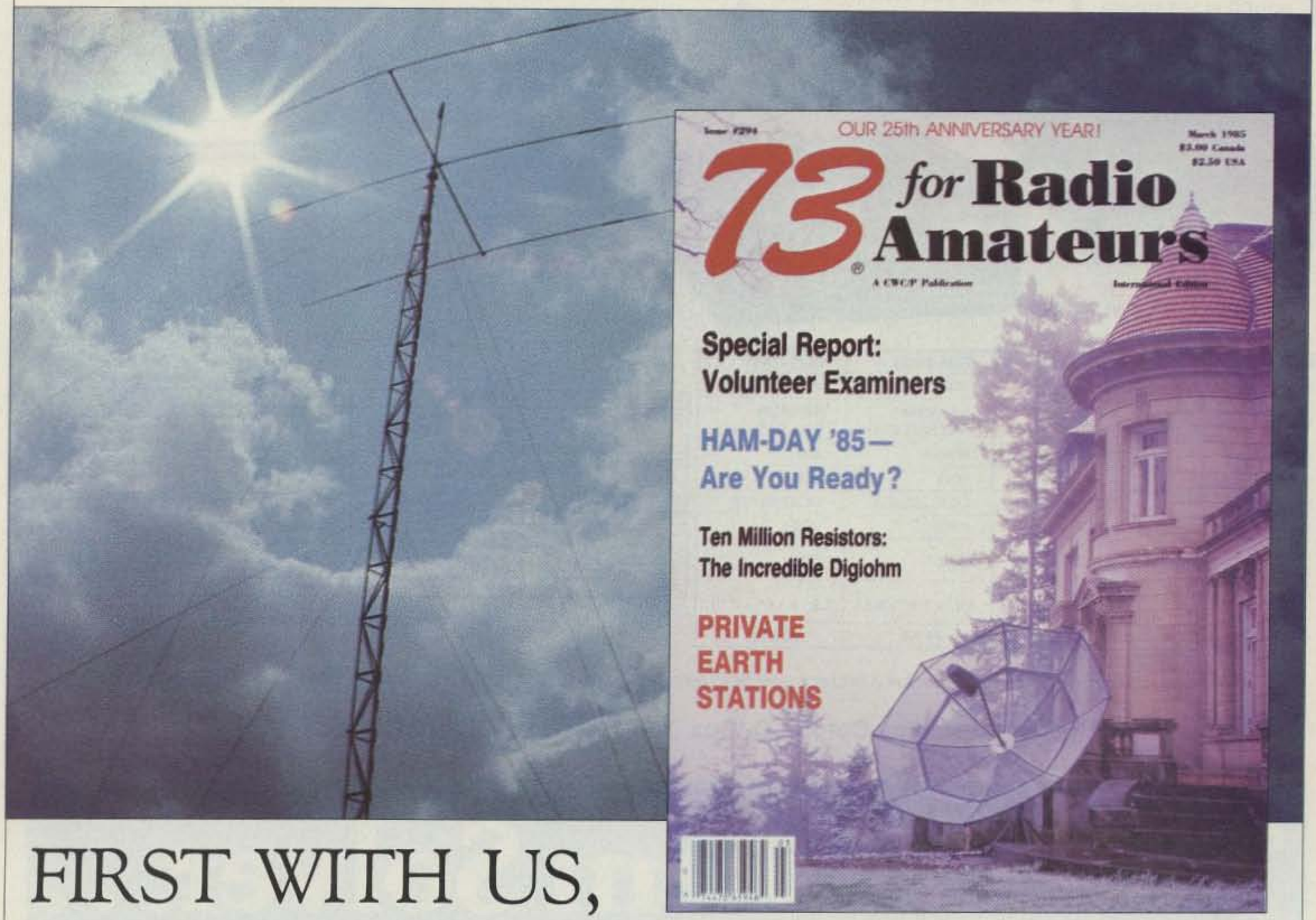
SCORING

Element 1:
Five points for each correct answer.
Element 2:
Two and one-half points for each correct answer.
Element 3:
Two and one-half points for each correct answer.
Element 4:
Five points for each correct answer.

How did you do?

1–20 points—	You're still listening to the Philco.
21–40 points—	You think a dish is something you eat off of.
41–60 points—	You pirate HBO with an MDS downconverter.
61–80 points—	You opted for a seven-foot dish and love GALAXY 1 because that's all you can receive.
81–100 points—	You *uplink* to the satellites from your home-based production facility.

COMMUNICATE



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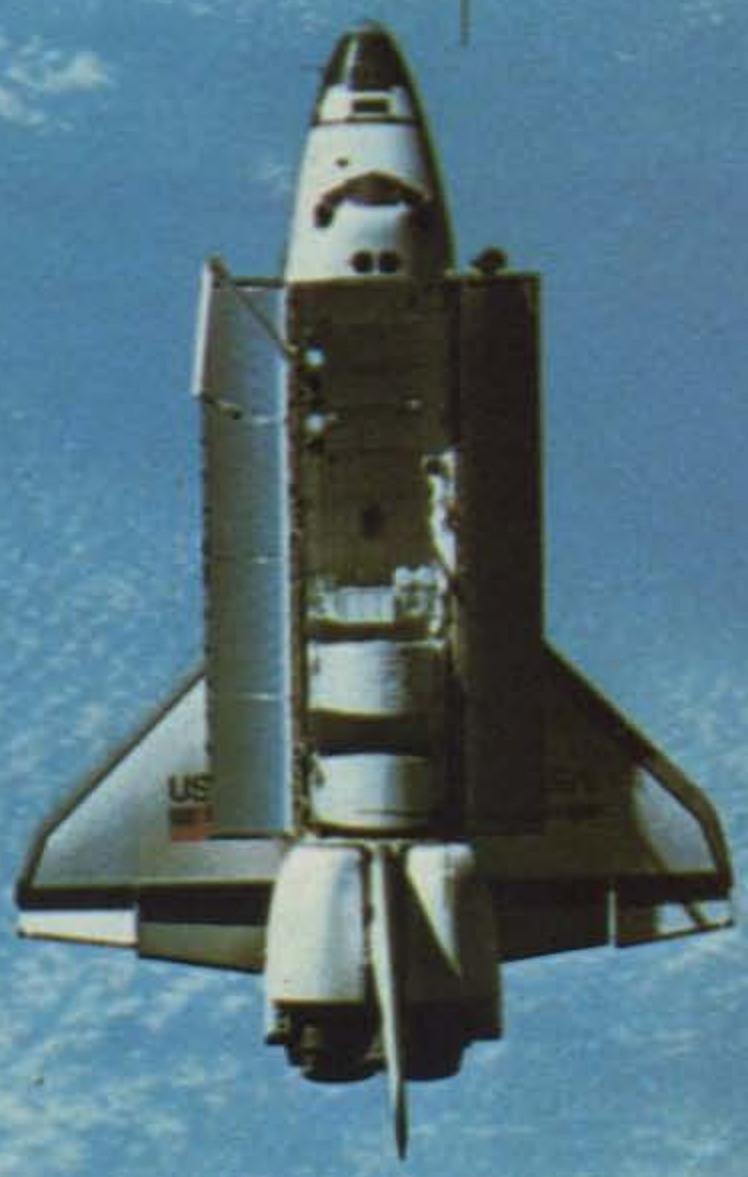

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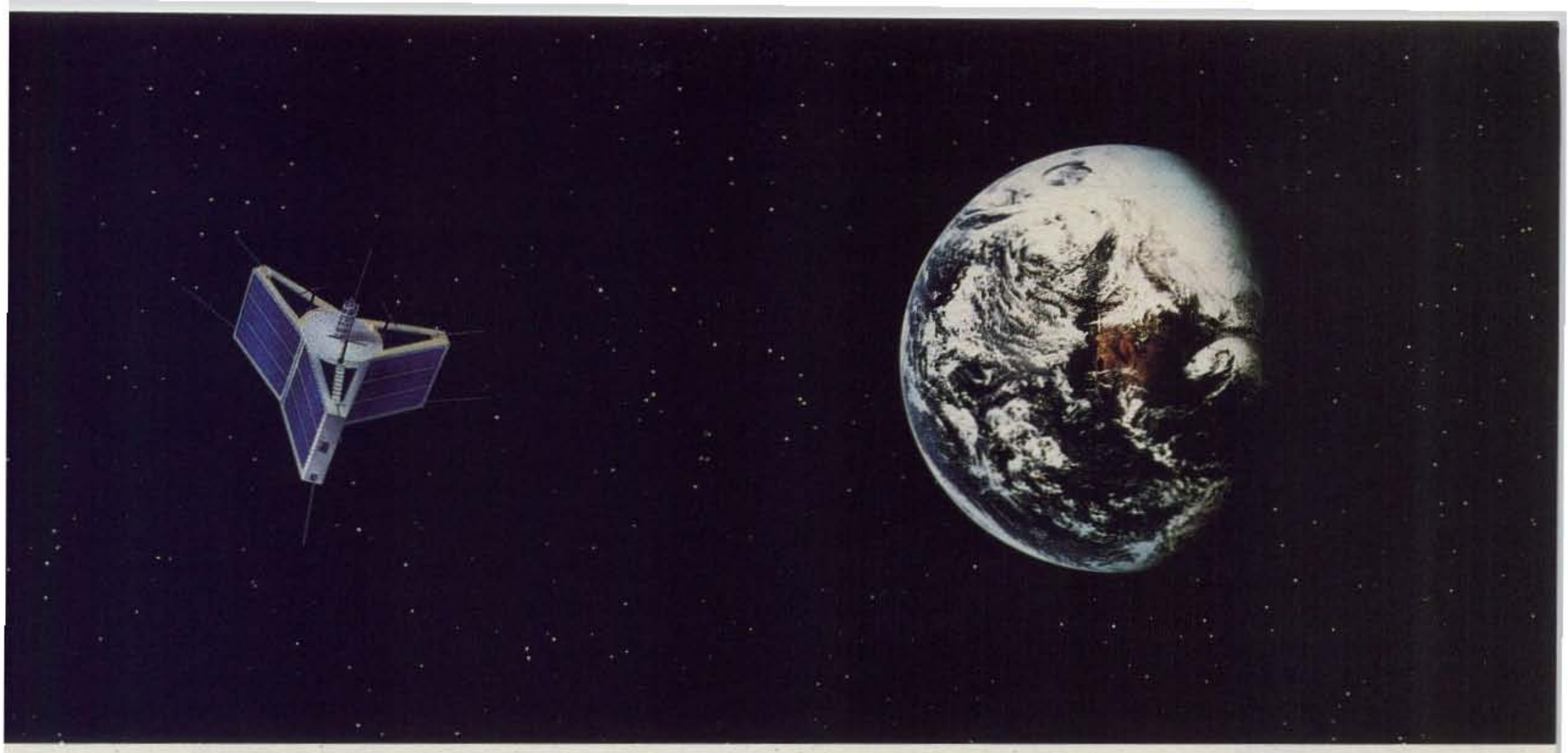

The DX is better out here. Ask anyone who owns an FT-726R.

It's true. Linking up to OSCAR 10 is the one sure way to bring the world into your ham shack. No matter where your shack is.

FT-726R owners know. You'll find them working the world from their apartments. Attics. And from their antenna-restricted neighborhoods.

They'll even boast of a signal quality and DX potential that would make any 20-meter operator envious. Regardless of where we are in the sunspot cycle.

In fact, the FT-726R is the world's most popular link to OSCAR 10.

And for good reason. This 2-meter, 10-watt rig gives you full cross-band duplex capability. Simply plug in two optional modules, one for 435-MHz operation, another for cross-band duplex.

You can set up your earth station just about anywhere. All you need is the 726 and two Yagi antennas: 435-MHz for transmit and 2-meters for receive.

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Then store your preferred frequencies and modes into the eleven memories for instant recall. With pushbutton transfer capability to either of two VFO registers. And versatile scanning functions you'd expect from a Yaesu radio.

Plus you get a lot more extras, including a built-in speech processor, all-mode squelch and a noise blanker.

So no matter where your shack is, let Yaesu's FT-726R introduce you to OSCAR 10. The world is waiting.

YAESU

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Yaesu Cincinnati Service Center
9070 Gold Park Drive, Hamilton, OH 45011
(513) 874-3100

Prices and specifications subject to change without notice.

73 INTERNATIONAL

Each month, 73 brings you ham-radio news from around the world. In this collection of reports from our foreign correspondents, we present the latest news in DX, contests, and events, as well as keep you abreast of the technical achievements of hams in other countries.

If you would like to contribute to your country's column, write to your country's correspondent or to 73 Magazine, Pine Street, Peterborough NH 03458, USA, Attn: Perry Donham KW1O.

AUSTRALIA

J. E. Joyce VK3YJ
44 Wren Street
Altona 3018
Victoria
Australia

SPECIAL PREFIX—VT

All Australian radio amateurs will be able to use the alternative prefix of Victor India (VI) from June 1 to December 31, 1985, to celebrate the Wireless Institute of Australia's 75th Anniversary. This will be the first time VI has been available for use throughout VK—although the prefix was used for a short period for a local event in VK3. The WIA is encouraging radio amateurs to use VI only if they intend to QSL with a card bearing the prefix.

SO MOTE IT BE

How often have we as amateurs heard only years later of the passing on of one of our on-air mates of many years standing? These contacts sometimes extend over half a century, but we get the news of this long-time amateur's passing too late to reflect on what they have done for amateur radio.

Peter VK3CIF was one such amateur. Born October 14, 1917, Peter became a Silent Key on March 3, 1985, after a short illness.

Peter lived for 40 years in East Africa, where he was employed by the British Colonial Civil Service. During this period of his amateur-radio activities, Peter held the following callsigns: GD3PBD, VQ4PBD, VQ5PBD, VQ1PBD, G3PBD, 5H3PBD, ZD6PBD, 9J2PBD, OE1ZBW, YA1PBD, and ZL1BDC.

In his latter years in Australia, Peter was a staunch member of the WIA, and in 1971 he was elected to the position of Secretary/Manager. Peter continued as a member of the Executive of the WIA for a further 10 years. So mote it be, another old-timer, who has given so much to amateur radio and the craft, becomes a Silent Key.

QSL EUTHANASIA

At least 50,000 unclaimed QSL cards are being held at the Wireless Institute Center. These are for QSOs made as long as five years ago, and keeping them creates a storage problem. It is unfortunate, but necessary, that the unclaimed cards be destroyed later this month.

Do you have QSLs waiting to be claimed? Many limited calls would particularly be surprised to learn that they have cards, even DX cards for six-meter contacts.

NET CONTROLLER EXTRAORDINAIRE

Without doubt the most respected and experienced DX net controller within Australia and its outlying islands, including VK9 and VK0, is Percy Anderson VK3PA, who has, over the years, gained a reputation of unselfish devotion towards helping other amateurs less fortunate than himself. That is a far cry from some of the present-day DX net controllers who seem to be interested only in their own multiband DXCC or WAX.

Not so, Percy. When asked how many countries he has worked, his comment is: "I don't know how many I have worked and don't care, as long as the other people with low power and dipoles get what, to them, is a rare one!"

How often have you checked into a DX net only to have the net controller put through his checked-in-later friends, relations, or friends of friends, etc.? Then when your turn comes, the rare DX station is QRT.

Not so with Percy. If you check in as number 5, 10, or 25, that is when you will be called, regardless of all those breakers who get special privileges from less-experienced controllers, interested only in self-gain or commercialism of amateur radio.

You know the type, "QSL via my manager, or direct via the *Callbook*." They will even give their PO Box, etc., over the air, while the rest of us wait. But try not to include IRCs or green stamps with your request for a QSL card, and it somehow gets "lost in the mail." However, if green stamps are included with your QSL card, it is back in a flash.

Percy was a natural to be a net controller, with his background in radio. As a retired Senior Radio Technician with the Australian Broadcast Commission, Percy was first licensed as an amateur-radio operator in 1928 and, as such, has seen the advances in amateur radio from the spark generators of old to the new computer state-of-the-art transceivers.

But nothing gives Percy greater pleasure than his prize-winning vegetables. Recently, at the local show, some of his tomatoes were the size of grapefruits! His other love is the ANZA (Australia, New Zealand, and Africa) net that he started in 1971.

This was a natural progression from when he and several VK and ZL stations had a daily sked with several African stations. This soon expanded, with other rare stations and DXpeditions joining into this daily get-together until, at Percy's instigation, the ANZA net was formed.

This net has now been active for the last 15 years. The major frequency is 21.203 MHz at 0500 UTC during the high point of the sunspot cycle, but during the present low, the net has QSYed to 14.135 MHz at 0500 UTC.

Many VK and P29 Novice operators, not allowed to operate above 21.200 MHz, also owe their DXCC to Percy. As many as 100 at a time used to listen to Percy on his ANZA net during the last high in the sunspot cycle. When a rare station appeared on frequency, after working the full-call amateurs, Percy would ask him to go down to the Novice section around 21.195 MHz, and give them a rare station to work.

Many of the rarer stations still check into Percy's net, with stations like 5X5GK, 7Q7LW, 9J2BO, 5Z4EG, FT8XA, FH4AA, FH8CB, plus ZS stations from ZS1 to ZS6. Most of the Pacific Islands check in regularly, also. This is a compliment indeed from the rarer stations throughout the world to he whom we in VK feel is our best DX net controller: Percy VK3PA.

WIA 75TH YEAR CELEBRATIONS

As part of the WIA's 75th Anniversary activities, the Victorian Division (VK3) is gathering material for a time capsule to be opened in 2010, the centenary year of the WIA. This capsule will include QSL cards, a callbook, photographs of both present-day and past amateurs, plus other data pertinent to amateur-radio activities, both past and present.

There is also on the air, at present, the callsign VK75A. This callsign, celebrating WIA's 75th year, was issued to the WIA for use between 1st March and 31st December, 1985, and will be used from various parts of Australia, including VK9 and VK0 (we hope!!). All QSL cards are via the VK3 Bureau and should be collectors' items.

Percy VK3PA at his desk.

Minister Antonio C. Magalhaes and LABRE's President Francisco Queiroz PT2FR.

BRAZIL

Gerson Rissin PY1APS
PO Box 12178 Copacabana
20000 Rio de Janeiro, RJ
Brazil

Carlos Vianne Carneiro PY1CC
Rua Afonso Pena 49, Apt. 701
20270 Rio de Janeiro, RJ
Brazil

MINISTER OF COMMUNICATIONS

The new Brazilian Minister of Communications, Antonio Carlos Magalhaes, received in his office the president of the Brazilian Amateur Radio League (LABRE), Francisco J. Queiroz PT2FR, who came with all his staff.

Minister Magalhaes noted that for more than fifty years Brazilian hams have been able to help the people and the authorities, and that the government is thankful for all those benefits. The Minister said also that among all hobbies, our activities are the most helpful for the community, and during the time he would be heading the Ministry of Communications he would like to be always ready to help solve our problems. The Minister asked President Queiroz to transmit to our big group of 70,000 Brazilian hams his thanks for everything done and his wishes and hopes for what they would be able to do in the future for the people and for our country.

DX OPERATION IN SAO TOME AND PRINCIPE

Every year the Brazilian Navy makes trips of diplomatic nature to a few African countries. In 1984, part of the trip included a sixty-hour visit to the Democratic Republic of Sao Tome and Principe.

This time, Jose Dias Costa PS7ABT, a 46-year-old sergeant of the Brazilian Navy, was on board the battleship *Forte de Coimbra* and, as usual, he brought with him his ham equipment. That was his second trip to Africa, and the QSOs he made with his family and also between the crew and their relatives helped Jose Dias enjoy his free time.

After visiting Ascension Island and Santa Helena Island, the ship finally arrived at Principe on Monday, October 22, at 0615 UTC. The same day, during his first QSO maritime mobile, Dias discussed with his friends how important a DX operation from Sao Tome and Principe could be. After the establishment of the new government a few years ago, amateurs were forbidden to operate there.

To get a license in a foreign country usually requires time and patience. In that case, time was the main enemy. Next day, Dias contacted Karl M. Leite PS7KM (the

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Karl PS7KM and Dias PS7ABT.

vice-director of the Seccion Communication of LABRE in the state of Rio Grande do Norte) and asked him about the possibility of DX operation in Principe. Karl encouraged him to try to get the license and do everything necessary to have the operation accepted for the ARRL DXCC directory. After the QSO, Dias left the ship and went immediately to the Ministry of Transportation and Communication.

During a few hours, Dias explained to the authorities the importance of that operation—and finally they decided to give him permission for the next day. Dias returned to the ship as soon as possible and immediately turned on his radio aboard to tell his friends in Brazil the good news in order that they could QSP the information on the bands.

On the morning of October 24, Dias went to the Ministry of Transportation and Communication, where he met Mr. Joao Oliveira, representative of the Ministry. At about 1000 UTC he finally got the call PS7ABT/S9 and returned to the ship to get his equipment and antennas for the expected operation. The authorities gave him only a one-day permission, so he had to be very fast. At just 1143 UTC, on 14.152 MHz, he had his first QSO with Gerald PS7BE. Due to the strong pileup, he moved on first to 14.165 MHz and then to 21.295, up to the end of the operation.

The last QSO was with Carl N4AXR of Tennessee. After the operation, the *Forte de Coimbra* departed Principe and went to Gabon and Nigeria before returning to Brazil. The QSL manager for the PS7ABT/S9 operation is Karl PS7KM, PO Box 385, 59000 Natal, RN, Brazil.

Dias sent to the ARRL a copy of the license issued by the Ministry of Transportation and Communication of the Democratic Republic of Sao Tome and Principe, and also a declaration of the commander of the battleship, certifying his stay in Principe.

de PY1APS

CHANGES IN BRAZILIAN RADIO AMATEUR SERVICE

Until last June, 1985, anyone trying to take an examination for radio amateurs in Brazil couldn't do it unless he/she proved to be affiliated with a nationwide radio amateur association, and, according to official specifications, only LABRE fulfilled such conditions.

If this requirement resulted in special convenience for both LABRE and DENTEL (Brazilian National Department of Telecommunications) due to a perfect understanding and control of all matters concerning radio amateur interests, many newcomers to radio didn't approve of this required affiliation to a private association.

As problems were coming to DENTEL, even lawsuits, Telecommunication authorities decided to put an end to that, and so, from June 6th on, no affiliation is needed anymore, no forced membership in any association. Newcomers will have two options: they'll be able to stay free operators, not tied to any association, or else (and we cannot understand how they will practice real amateur radio as deep as it goes) they'll join LABRE by their will, to profit by all privileges an internationally-recognized association presents, especially when it is the only one affiliated with the IARU in Brazil.

The Brazilian league, LABRE, is really to be congratulated, because now it's free of all compromises towards thousands of radio amateurs who just joined it to fulfill DENTEL's requirements and never acted much as responsible members, thus bringing a very annoying situation to the association. In fact, if LABRE eliminated all these *de jure* members, DENTEL would have to annul their licenses, and this would be contrary to the government's interest in increasing the number of Brazilian radio amateurs.

Now the whole thing is over! LABRE is free to act independently, just like any private association, according to its rules. Many newcomers from CB and many "not so deep" radio amateurs were eliminated from LABRE, and from now on we expect things to be different—a better way. LABRE's branches all over Brazil are paying special attention to this moment, development being the word, jumping into microcomputers tied to radio, equipment-mounting facilities being a new goal, and new ideas are being studied. Radio amateurs are being offered a new concept of association, reviving the spirit of the radio amateur so necessary to radio.

Programs and classes according to different groups of interest are raising interest and credit to the association, bringing associates together to their hobby, and reinforcing LABRE among Brazilian hams. We think LABRE will be the winner out of all this, and what's best, radio amateurs will discover the hard way that it is impossible to practice real radio if you're not joining international associations with all their advantages, knowledge, and development.

So, after all, what first sounded as a disaster to our LABRE in fact turned out to be the best that could happen to strengthen, to reinforce, and to promote radio amateurs and the real fantastic radio we love and practice.

de PY1CC

The late Father David Reddy CE0AE, flanked by Patricio CE3GN and his XYL.

CHILE

Patricio Fernandez H. CE3GN
Ceramica Espejo S.A.
Calle Maipu 269
Casilla 14781
Santiago
Chile

FATHER DAVID REDDY CE0AE

Easter Island was for many years a rare catch amongst DXers all over the world. Today, many thousands of them are in debt to Father Dave CE0AE for having given them a new one.

Sadly, the once popular voice calling "CQ, CQ, this is CE0AE from Easter Island" will no longer be heard. Father Dave passed away on June 6th.

He was a wonderful man, a dedicated priest, and an enthusiastic DXer. David Reddy was born in New York in 1924 and had four brothers, two of them also being Franciscan priests. He was ordained as a priest in 1951, and after major studies in the USA, obtained a doctoral degree.

Back in the mid-sixties, he met a Bavarian Capuccine priest, Father Sebastian Englert, who was at that time in charge of the only church on Easter Island. Father Dave was so impressed with what Father Sebastian told him about the island—his social work among the natives, his archeological findings, the extreme isolation of that tiny spot full of Moais (stone statues) in the middle of the Pacific Ocean—that he promised that he would go there to help him sometime.

Father Sebastian Englert died in 1968, so Father Dave made arrangements with his congregation, and he was sent to Chile in 1969. He was first destined to Mafil, a small town in the south of the country, and he stayed there for almost three years, learning the Spanish language and preparing himself for his future work on Easter Island. During 1973 he was finally sent there, where he was until his death the only priest in charge of the small church at Rapa Nui.

For 11 consecutive years he dedicated himself to helping the native people, and his achievements were such that he will always be remembered by all who knew him. His burial took place on the island, and the religious services were carried out by one of his brothers, a priest of the same congregation who flew to Easter Island for that purpose.

During the many DXpeditions that have taken place to Easter in the past 10 years, Father Dave helped on each and every occasion, organizing accommodations and acting as a coordinator for the DXpeditioners during their stay. I had the privilege and pleasure of meeting him on the island for the founding of the local radio club, an event sponsored by the Radio Club de Chile, back in September, 1981. After that we became great friends and talked regularly by amateur radio. On some of his occasional visits to Santiago, he visited my QTH, where he spent hours with my family, telling stories about the island.

Our usual topic of conversation on the air was, of course, DXing and how hard it was, both for him and me, to reach the DXCC Honor Roll, as we were trying very hard at it. Unfortunately, although well over the 300 mark, he was not able to make it here on Earth, but we feel sure that now, due to his merits, he has achieved a well-deserved place in the Heavenly Honor Roll.

So long, Father Dave, your friends down here will never forget you.

COLOMBIA

Abelardo (Lalo) Santos V. HK3EQJ
PO Box 88937
Bogota 8
Colombia

NEW RADIO AMATEURS' REGULATIONS

The Colombian Communications Ministry has issued a new set of radio amateurs' regulations regarding the use of satellites as well as the easing of the requisites and paperwork for licensing formalities. To that end, Resolution 1554 of 5 June, 1985, was circulated by Ms. Maria Cristina Mejia, the Colombian Communications Vice-Minister, during the twenty-third National Assembly of the Colombian Radio Amateurs League held in Barranquilla on June 8, 1985.

By way of modifications to previous rulings in effect since 1983, the Radio Ama-

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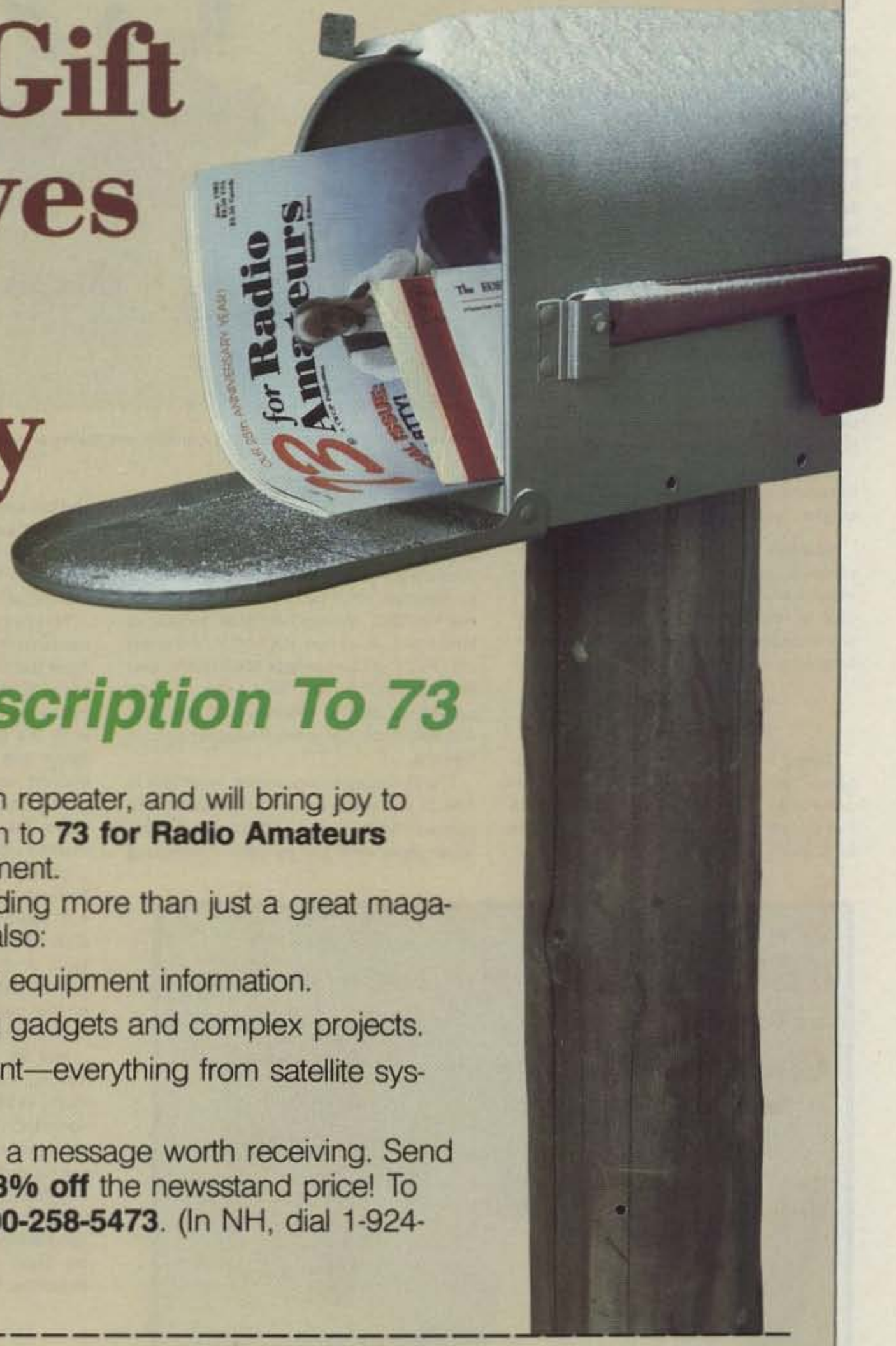

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teur license will be issued to Colombian citizens, foreigners residing in Colombia, and to nonresident foreigners, holders of their country-of-origin's license, with which countries there are reciprocal agreements—without taking into account any age limits.

For public identification of the Radio Amateur, an ID card has been created which has a renewable validity of four years for the First, Second, and Third categories (classes).

The Novice category will be accredited by the license issuance resolution which has a duration of two nonrenewable years during which the holder ought to acquire necessary experience through his/her familiarization with radio experimentation and operation techniques.

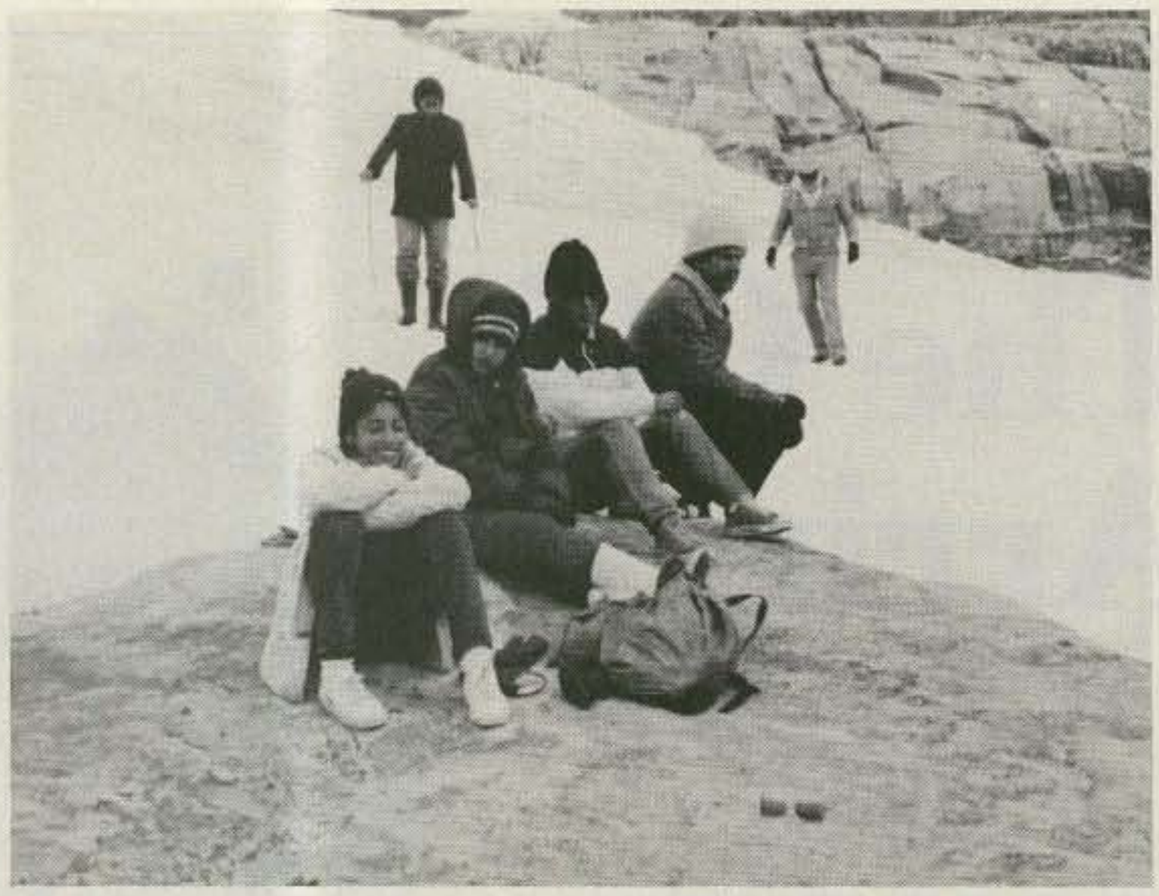
The First-, Second-, and Third-class licenses will have a permanent character, with an excellent degree of stability for the holders and a great reduction in the amount of paperwork for both the licensees and the officials of the Communications Ministry handling the documents.

There is a summation in one article of the whole matter of the operation of radio amateur stations.

However, in the application for a license, an authenticated photocopy of the individual's valid national police certificate is required to prevent, so they say, any infringements or violations of the radio amateurs' frequencies by alien persons.

A FLAG AT THE TOP; AN ANTENNA TOO!!

During the 15th, 16th, and 17th of February, 1985, a radio experimentation ascension to the 16,000-foot Cocuy peak in the Colombian Central Andean Range took place very close to the Venezuelan border, with the purpose of experimentation both on HF and VHF. It was organized by the Boyaca Province Radio Amateur Association and participated in actively by German HK7FCJ, Jorge HK7FSA, Javier HK7BNI, William HK7GQB, Milciades HK7HKU, Ricardo HK7DRV, Alfonso HK7PV/N, Al Sepulveda HK7IDO/N, and Marcos HK7IPV/N. They were accompanied by several members of the First Aid and Mountaineers Associations of Boyaca.



Some of the El Cocuy Radio Expeditioners taking a well-deserved rest on the way up.

The El Cocuy snow-capped mountain is one of the most beautiful unexploited places in Colombia; some years ago, when there were still no satellite-tracking station facilities in Colombia, great international events were relayed from Venezuela through a Marconi Wireless Telegraph Company repeater right at the summit of the El Cocuy.

This radio expedition constituted an extraordinary human and technical effort. After the first long and tiring journey, the party fixed a makeshift camp where they had some rest and exchanged information with the backup party down in Tunja, Paipa, and Sogamoso cities (Sogamoso's ancient name was Sugamuxi, or the City of the Sun) through their VHF 23-hour-watch links. The difficult march continued then till reaching the summit.

Using their specially-assigned callsign, 5K7LRD, and during six hours of continuous operation on the 18th from 1700 to 2300 GMT, they made a total of 339 contacts on 40, 20, 15, and 2 meters. The 15- and 20-meter bands were almost dead due to the poor worldwide prevailing conditions at the time.

Not all the expeditioners were bear-looking men; there was a beauty among them, Miss Ximena Soler, the daughter of German HK7FCJ, who was an excellent assistant in all the tight situations faced during such a hard climb and descent with two Yaesu FT-707s, four FT-208Rs, two FT-209s, four 12-V 190-Ah sturdy batteries, one battery charger, and one Yamaha electric plant—not to mention tents, cables, antennas, foodstuffs, etc.

Technically it proved that El Cocuy is one of the most appropriate peaks for repeater installation as well as the most advantageous place for real VHF/UHF DX traffic, and although difficult, was not left unconquered by the brave Colombian hams of Boyaca.

THE COLOMBIAN NATIONAL COMMUNICATIONS MUSEUM

Colombia was the second country in the world to have a telegraph network as well as commercial air service, and only six years after it was invented the country had its own telephone system—and the same year Marconi started the wireless communications experiments, the first commercial broadcasting station started operations in Barranquilla, a Colombian seaport in the Caribbean. Only eight years after it was commercially developed, Colombia had its first television station.

All these inventions and services, as well as their pioneers, have their technical memories, testimonies, and well-merited homages in the luxurious hall of fame of the National Communications Museum of Bogota, a place full of fantasy and charm, just like the world of communications from which it was created.

The museum is located on the third floor of the Communications Ministry Palace, which bears the name of the famous journalist, politician, and writer Manuel Murillo Toro, the twice Colombian President (1864 to 1866 and 1872 to 1874) who initiated the materialization of all those dreams.

The director of the museum is Ms. Carmen de Uribe, a multilingual, charming lady whose life has been entirely devoted to radio communications.

Among the museum's hundreds of precious relics there is the first Marconi hand key used in Colombia, one of Alexander Graham Bell's original telephones, and the first telegram transmitted between the cities of Bogota (the Colombian capital city) and Tres Esquinas (a town now renamed Mosquera, some thirty kms away) in the Cundinamarca Province.

The entrance room of the museum is an exact replica of the 1900 Necocli's (Province of Antioquia) telegraph office. The exhibition proceeds by epochs, suddenly changing in 1930 when the first telephone circuit went into operation, the telex/facsimile revolution came about, as did TV via satellite and microwave circuits, up to today's most sophisticated, fully-computerized systems. If any readers ever come to Bogota, Colombia, a visit to the National Communications Museum is a must.

QSL OF THE MONTH

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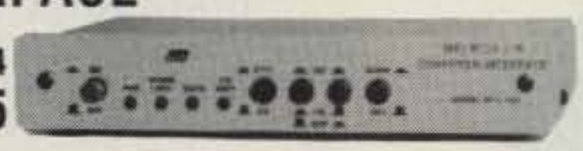

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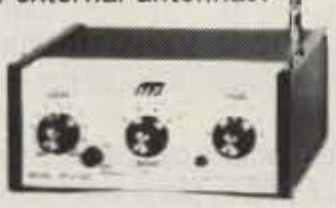

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MFJ-812 **$29.95**

Low cost VHF SWR/Wattmeter! Read SWR (14 to 170 MHz) and forward/reflected power at 2 meters. Has 30 and 300 watts scales. Also read relative field strength. 4x2x3 in.

1 KW DUMMY LOAD

MFJ-250 **$39.95**

Tune up fast, extend life of finals, reduce QRM! Rated 1KW CW or 2KW PEP for 10 minutes. Half rating for 20 minutes, continuous at 200 W CW, 400 W PEP. VSWR under 1.2 to 30 MHz, 1.5 to 300 MHz. Oil contains no PCB. 50 ohm non-inductive resistor. Safety vent. Carrying handle. 7½x6¾ in.

24/12 HOUR CLOCK/ID TIMER

MFJ-106 **$19.95** NEW

Switch to 24 hour UTC or 12 hour format! Battery backup maintains time during power outage. ID timer alerts every 9 minutes after reset. Red LED .6 inch digits. Synchronizable with WWV. Alarm with snooze function. Minute set, hour set switches. Time set switch prevents mis-setting. Power out, alarm on indicators. Gray and black cabinet. 5x2x3 inches. 110 VAC, 60 Hz.

DUAL TUNABLE SSB/CW/RTTY FILTER

MFJ-752B **$99.95**

Dual filters give unmatched performance! The primary filter lets you peak, notch, low pass or high pass with extra steep skirts. Auxiliary filter gives 70 db notch, 40 Hz peak. Both filters tune from 300 to 3000 Hz with variable bandwidth from 40 Hz to nearly flat. Constant output as bandwidth is varied; linear frequency control. Switchable noise limiter for impulse noise. Simulated stereo sound for CW lets ears and mind reject QRM. Inputs for 2 rigs. Plugs into phone jack. Two watts for speaker. Off bypasses filter. 9-18 VDC or 110 VAC with optional adapter, MFJ-1312, $9.95.

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

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MFJ TUNERS

QUALITY TUNERS THAT DELIVER MORE PERFORMANCE, MORE FEATURES, MORE VALUE FOR YOUR MONEY.

MFJ-941D 300 WATT VERSA TUNER II

$99.95 (+$4)

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 watts 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-940B, $79.95, 300 watts, SWR/Wattmeter, antenna switch on rear. No balun. 8 x 2 x 6 in. eggshell white with walnut grained sides.
MFJ-945, $79.95, like MFJ-940B with balun, less antenna switch.
MDJ-944, $79.95, like MFJ-940B with balun, antenna switch on front panel, less SWR/Wattmeter.
Optional mobile bracket for 940B, 945, 944, $5.00.

MFJ-900 200 WATT VERSA TUNER

$49.95 (+$4)

Matches coax, random wires 1.8-30 MHz. Handles up to 200 watts output; efficient airwound inductor gives more watts out. 5x2x6 in. **Use any transceiver,** solid state or tube. Operate all bands with one antenna.
OTHER 200 WATT MODELS:
MFJ-901, $59.95, like 900 but includes 4:1 balun for use with balanced lines.
MFJ-16010, $39.95, for random wires only. Great for apartment, motel, camping operation. Tunes 1.8-30 MHz.

MFJ-949B 300 WATT DELUXE VERSA TUNER II

$139.95 (+4)

MFJs best 300 watt Versa Tuner II. Matches everything from 1.8 - 30 MHz, coax, randoms, balanced lines, up to 300W output, solid state or tubes.
Tunes out SWR on dipoles, vees, long wires, verticals, whips, beams, quads.
Built-in 4:1 balun. 300W, 50-ohm dummy load. SWR meter and 2 range wattmeter (300W and 30W).
6 position antenna switch on front panel, 12 position air-wound inductor; coax connectors, binding posts, black and beige case. 10 x 3 x 7 in.

MFJ-962 1.5 KW VERSA TUNER III

Run up to 1.5 KW PEP **$229.95** (+$10)

and match any feedline continuously from 1.8 to 30 MHz; coax, balanced line or random wire. Built-in SWR/Wattmeter has 2000 and 200 watt ranges, forward and reflected power. 2% meter movement. **6 position** antenna switch handles 2 coax lines (direct or through tuner), wire and balanced lines. 4:1 balun 250 pf 6 KV variable capacitors. 12 position inductors. Ceramic rotary switch. All metal black cabinet and panel gives RFI protection, rigid construction and sleek styling. Flip stand tilts tuner for easy viewing. 5 x 14 x 14 inches.

MFJ-989 3 KW ROLLER INDUCTOR VERSA TUNER V

$329.95 (+$10)

Meet "Versa Tuner V". It has all the features you asked for, including the new smaller size to match new smaller rigs - only 10 3/4"W x 4 1/2"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 (250 pf-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.
Built-in 2% meter reads SWR plus forward and reflected power in 2 ranges (200 and 2000 watts). Meter light requires 12 VDC. Optional AC adapter MFJ-1312 is available for $9.95.
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-981, $239.95. 3 KW, 18 position switched dual inductor. SWR/Wattmeter. 4:1 balun.

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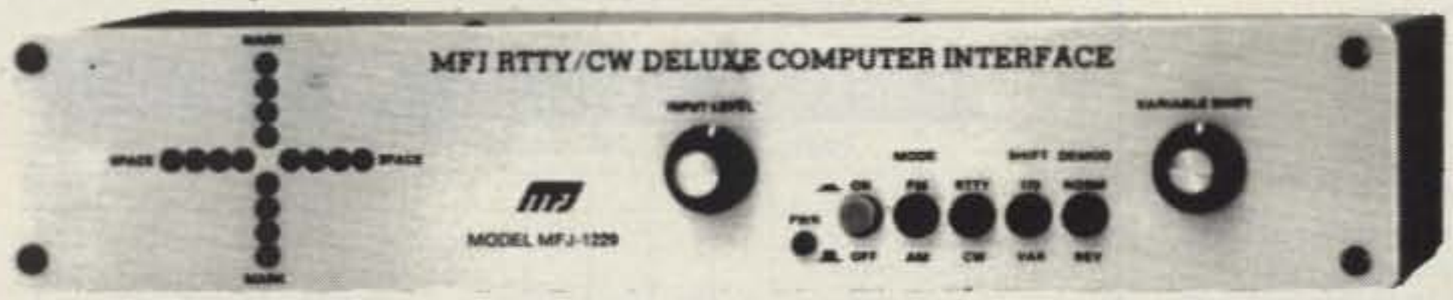
NEW FROM MFJ

MFJ'S MOST ADVANCED RTTY/ASCII/AMTOR/CW COMPUTER INTERFACE HAS FM, AM MODES, LED TUNING ARRAY, RS-232 INTERFACE, VARIABLE SHIFT TUNING, 170/850 Hz TRANSMIT, MARK-SPACE DETECTION.



MFJ RTTY/ASCII/CW software on tape, cables for C-64/VIC-20.

MFJ-1229
$179.95

Engineering, performance, value and features sets MFJ's most advanced RTTY/ASCII/AMTOR/CW computer interface apart from others.

FM (limiting) mode gives easy, trouble-free operation. Best for general use, off-shift copy, drifting signals, and moderate signal and QRM levels.

AM (non-limiting) mode gives superior performance under weak signal conditions or when there are strong nearby stations.

Crosshair mark-space LED tuning array simulates scope ellipse for easy, accurate tuning even under poor signal-to-noise conditions. Mark and space outputs for true scope tuning.

Transmits on both 170 Hz and 850 Hz shift.

Built-in RS-232 interface, no extra cost.

Variable shift tuning lets you copy any shift between 100 and 1000 Hz and any speed (5-100 WPM RTTY/CW and up to 300 baud ASCII). Push button for 170 Hz shift.

Sharp multi-pole mark and space filters give true mark-space detection. Ganged pots give space passband tuning with constant bandwidth. Factory adjusted trim pots for optimum filter performance.

Multi-pole active filters are used for pre-limiter, mark, space and post detection filtering. Has automatic threshold correction. This advanced design gives good copy under QRM, weak signals and selective fading.

Has front panel sensitivity control.

Normal/Reverse switch eliminates retuning while checking for inverted RTTY. Speaker jack. +250 VDC loop output.

Exar 2206 sine wave generator gives phase continuous AFSK tones. Standard 2125 Hz mark and 2295/2975 Hz space. Microphone lines: AFSK out, AFSK ground, PTT out and PTT ground.

FSK keying for transceivers with FSK input.

Has sharp 800 Hz CW filter, plus and minus CW keying and external CW key jack.

Kantronics software compatible socket.

Exclusive TTL/RS-232 general purpose socket allows interfacing to nearly any personal computer with most appropriate software. Available TTL/RS-232 lines: RTTY demod out, CW demod out (TTL only), CW-ID in, RTTY in, PTT in, key in. All signal lines are buffered and can be inverted using an internal DIP switch.

Metal cabinet. Brushed aluminum front. 12½x2½x6 inches. 18 VDC or 110 VAC with optional AC adapter, MFJ-1312, $9.95.

Plugs between rig and C-64, VIC-20, Apple, TRS-80C, Atari, TI-99 and other personal computers. Use MFJ, Kantronics, AEA and other RTTY/ASCII/AMTOR/CW software.

MFJ MULTI-FUNCTION TUNING INDICATOR

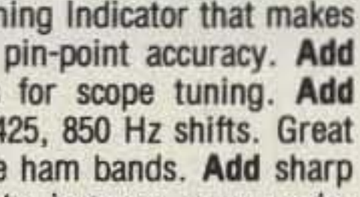
MFJ-1221
$79.95

Greatly improve your RTTY copying capabilities. Add a crosshair LED Tuning Indicator that makes tuning quick, easy with pin-point accuracy. **Add** mark and space outputs for scope tuning. **Add** LEDs that indicate 170, 425, 850 Hz shifts. Great for copying RTTY outside ham bands. **Add** sharp mark and space filters to improve copy under crowded/weak conditions. 170, 425, 850 Hz shifts. **Add** Normal/Reverse switch to check for inverted RTTY without retuning. **Add** output level control to adjust signal into your terminal unit. **Add** a limiter to even out signal variation for smoother copy.

Unit plugs between your tuner and receiver. Mark is 2125 Hz, space is 2295, 2550 or 2975 Hz. Measures 10x2x6 in. and uses floating 18 VDC or 110 VAC with AC adapter, MFJ-1312, $9.95.

24/12 HOUR CLOCK/ID TIMER

MFJ-106
$19.95



Switch to 24 hour UTC or 12 hour format! Battery backup. ID timer alerts every 9 minutes after reset. Red .6 in. LEDs. Synchronizable to WWV. Alarm, Snooze function. PM, alarm on indicators. Gray/Black cabinet. 110 VAC. 60 Hz.

MFJ ELECTRONIC KEYER

MFJ-407
$69.95

MFJ-407 Deluxe Electronic Keyer sends iambic, automatic, semi-auto or manual. Use squeeze, single lever or straight key. Plus/minus keying. 8 to 50 WPM. Speed, weight, tone, volume controls. On/Off, Tune, Semi-auto switches. Speaker. RF proof. 7x2x6 inches. Uses 9 V battery, 6-9 VDC or 110 VAC with AC adapter, MFJ-1305, $9.95.

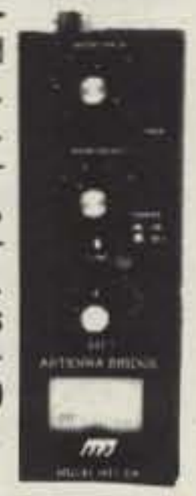
MICROPHONE EQUALIZER

MFJ-550
$49.95

Greatly improves transmitted SSB speech for maximum talk power. Evens out speech peaks and valleys due to voice, microphone and room characteristics that make speech hard to understand. Produces cleaner, more intelligible speech on receiving end. Improves mobile operation by reducing bassy peaks due to acoustic resonances. Plugs between mic and rig. 4 pin mic jack, shielded output cable. High, mid, low controls provide ±12 db boost or cut at 490, 1170, 2800 Hz. Mic gain, on/off/bypass switch. "On" LED. 7x2x6 inches. 9 V battery, 12 VDC or 110 VAC with adapter, MFJ-1312, $9.95.

MFJ ANTENNA BRIDGE

MFJ-204
$79.95



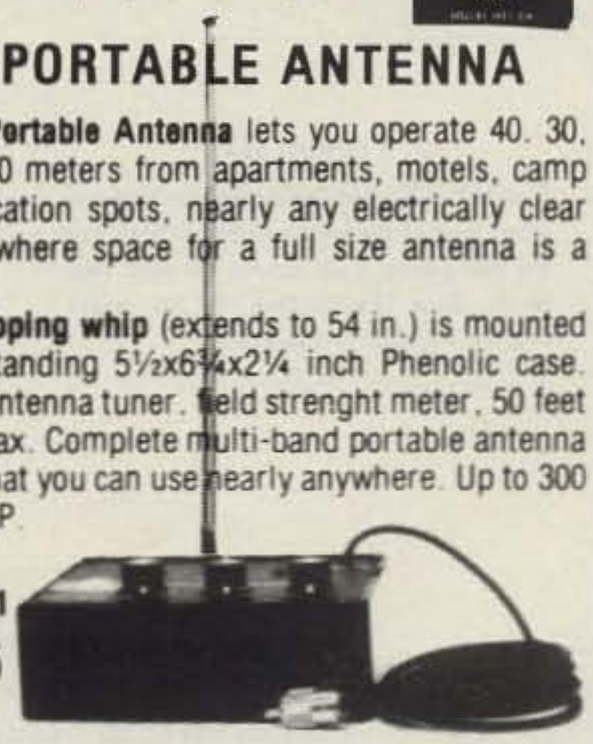
Trim your antenna for optimum performance quickly and easily. Read antenna resistance up to 500 ohms. Covers all ham bands below 30 MHz. Measure resonant frequency of antenna. Easy to use, connect antenna, set frequency, adjust bridge for meter null and read antenna resistance. Has frequency counter jack. Use as signal generator. Portable, self-contained. 4x2x2 in. 9 V battery or 110 VAC with adapter, MFJ-1312, $9.95.

MFJ PORTABLE ANTENNA

MFJ's Portable Antenna lets you operate 40, 30, 20, 15, 10 meters from apartments, motels, camp sites, vacation spots, nearly any electrically clear location where space for a full size antenna is a problem.

A telescoping whip (extends to 54 in.) is mounted on self-standing 5½x6¾x2¼ inch Phenolic case. Built-in antenna tuner, field strenght meter, 50 feet RG-58 coax. Complete multi-band portable antenna system that you can use nearly anywhere. Up to 300 watts PEP.

MFJ-1621
$79.95



MFJ 24 HOUR LCD CLOCKS

$19.95

MFJ-108

$9.95

MFJ-107

Huge 5/8 inch bold black LCD numerals make these two 24 Hour clocks a must for your shack. Choose from a dual clock that features seperate UTC and local time display or a single clock that displays 24 Hour time. **Mounted in a brushed aluminum frame,** these clocks feature huge 5/8 inch LCD numerals and a sloped face for across the room viewing. Easy set month, day, hour, minute and second function. Clocks can be operated in an alternating time-date display mode. MFJ-108, 4½x1x2 inches; MFJ-107, 2¼x1x2 inches. Battery included.

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PROPAGATION

Jim Gray W1XU
73 Staff

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA							20	20				
ARGENTINA								15	15	15	15	15
AUSTRALIA						40	20	20			15	15
CANAL ZONE	20	40	40	40	40		20	15	15	15	15	20
ENGLAND	40	40	40				20	20	20	20		
HAWAII		20			40	40	20	20				15
INDIA							20	20				
JAPAN							20	20				
MEXICO		40	40	40	40		20	15	15	15	15	
PHILIPPINES							20	20				
PUERTO RICO		40	40	40	40		20	15	15	15	15	
SOUTH AFRICA									15	15	15	
U. S. S. R.							20	20				
WEST COAST			80	80	40	40	40	20	20	20		

CENTRAL UNITED STATES TO:

ALASKA	20	20						15				
ARGENTINA										15	15	15
AUSTRALIA	15	20				40	20	20				15
CANAL ZONE	20	20	40	40	40	40			15	15	15	20
ENGLAND		40	40					20	20	20	20	
HAWAII	15	20	20	20	40	40	40					15
INDIA								20	20			
JAPAN								20	20			
MEXICO	20	20	40	40	40	40			15	15	15	20
PHILIPPINES								20	20			
PUERTO RICO	20	20	40	40	40	40			15	15	15	20
SOUTH AFRICA										15	15	20
U. S. S. R.								20	20			

WESTERN UNITED STATES TO:

ALASKA	20	20	20		40	40	40	40				15
ARGENTINA	15	20		40	40	40					15	15
AUSTRALIA		15	20	20			40	40				
CANAL ZONE			20	20	20	20	20	20				15
ENGLAND									20	20		
HAWAII	15	20	20	40	40	40	40					15
INDIA		20	20									
JAPAN	20	20	20			40	40	40			20	20
MEXICO			20	20	20	20	20					15
PHILIPPINES	15						40		20			
PUERTO RICO			20	20	20	20	20	20				15
SOUTH AFRICA										15	15	
U. S. S. R.									20			
EAST COAST		80	80	40	40	40	40	20	20	20		

G = Good, F = Fair, P = Poor.

OCTOBER 1985

SUN	MON	TUE	WED	THU	FRI	SAT
		1 G	2 F	3 F	4 G	5 G
6 G	7 F	8 G	9 G	10 F	11 P	12 P
13 F	14 G	15 G	16 G	17 F	18 P	19 F-G
20 G	21 G	22 F	23 P	24 F	25 G	26 G
27 G	28 G	29 F	30 G	31 G		

ADVERTISERS

What To Look For In A Phone Patch

The best way to decide what patch is right for you is to first decide what a patch should do. A patch should:

- Give complete control to the mobile, allowing full break in operation.
- Not interfere with the normal operation of your base station. It should not require you to connect and disconnect cables (or flip switches!) every time you wish to use your radio as a normal base station.
- Not depend on volume or squelch settings of your radio. It should work the same regardless of what you do with these controls.
- You should be able to hear your base station speaker with the patch installed. Remember, you have a base station because there are mobiles. ONE OF THEM MIGHT NEED HELP.
- The patch should have standard features at no extra cost. These should include programmable toll restrict (dip switches), tone or rotary dialing, programmable patch and activity timers, and front panel indicators of channel and patch status.

ONLY SMART PATCH HAS ALL OF THE ABOVE.

With SMART PATCH You are in CONTROL

With CES 510SA Simplex Autopatch, there's no waiting for VOX circuits to drop. Simply key your transmitter to take control.

SMART PATCH is all you need to turn your base station into a personal autopatch. SMART PATCH uses the only operating system that gives the mobile complete control. Full break-in capability allows the mobile user to actually interrupt the telephone party. SMART PATCH does not interfere with the normal use of your base station. SMART PATCH works well with any FM transceiver and provides switch selectable tone or rotary dialing, toll restrict, programmable control codes, CW ID and much more.

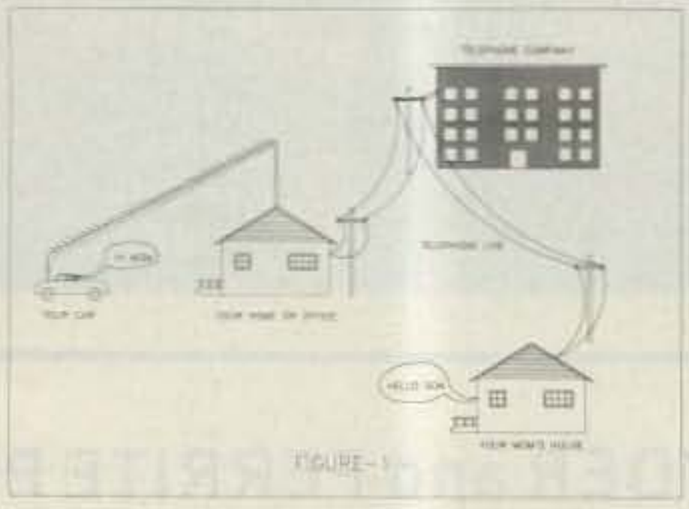
To Take CONTROL with Smart Patch – Call 800-327-9956 Ext. 101 today.

Now Mobile Operators Can Enjoy An Affordable Personal Phone Patch. . .

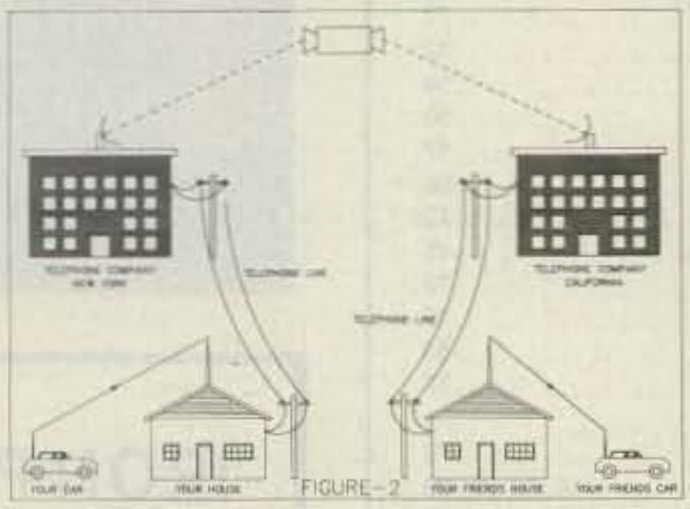
- Without an expensive repeater.
- Using any FM tranceiver as a base station.
- The secret is a SIMPLEX autopatch, The *SMART PATCH.*

SMART PATCH Is Easy To Install

To install *SMART PATCH*, connect the multicolored computer style ribbon cable to mic audio, receiver discriminator, PTT, and power. A modular phone cord is provided for connection to your phone system. Sound simple? . . . IT IS!



FIGURE–1



FIGURE–2

How To Use *SMART PATCH*

Placing a call is simple. Send your access code from your mobile (example: *73). This brings up the Patch and you will hear dial tone transmitted from your base station. Since *SMART PATCH* is checking about once per second to see if you want to dial, all you have to do is key your transmitter, then dial the phone number. You will now hear the phone ring and someone answer. Since the enhanced control system of *SMART PATCH* is constantly checking to see if you wish to talk, you need to simply key your transmitter and then talk. That's right, you simply key your transmitter to interrupt the phone line. The base station automatically stops transmitting after you key your mic. *SMART PATCH* does not require any special tone equipment to control your base station. It samples very high frequency noise present at your receivers discriminator to determine if a mobile is present. No words or syllables are ever lost.

SMART PATCH Is All You Need To Automatically Patch Your Base Station To Your Phone Line.

Use *SMART PATCH* for:

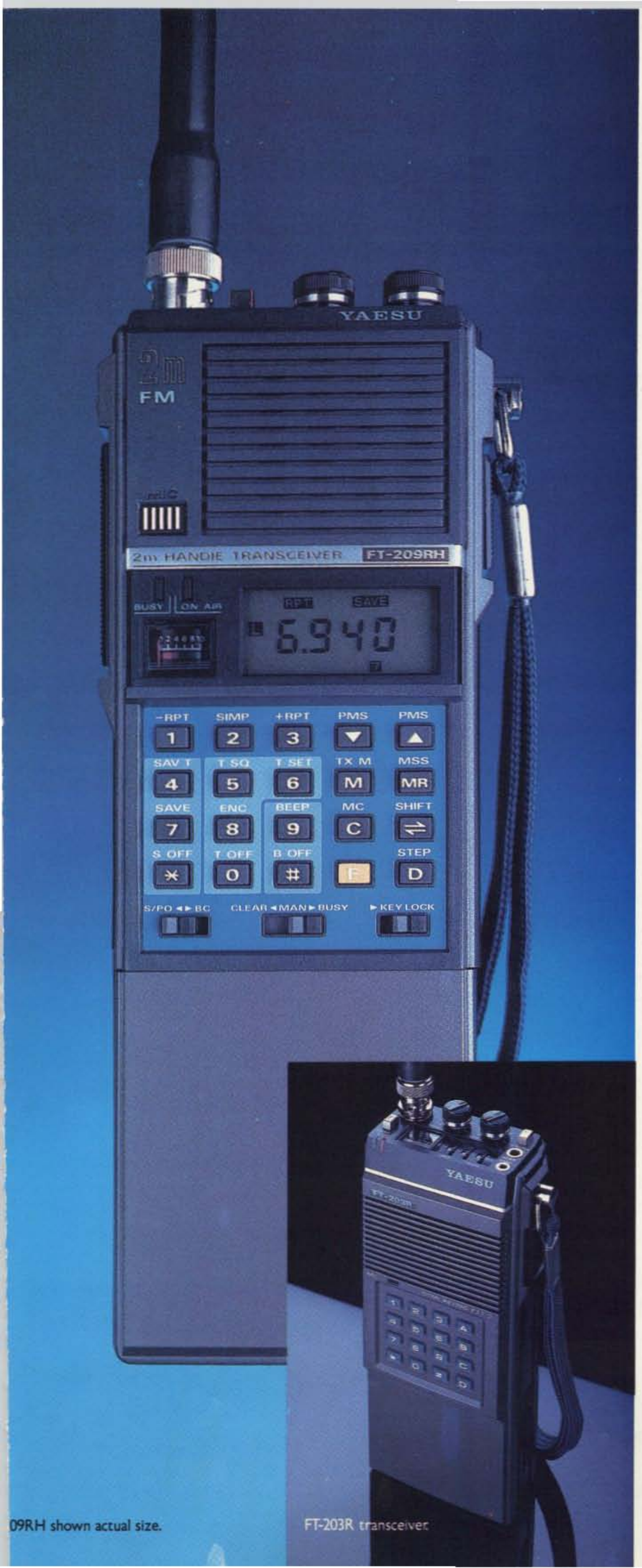
- Mobile (or remote base) to phone line via Simplex base. (see fig 1.)
- Mobile to Mobile via interconnected base stations for extended range (see fig. 2.)
- Telephone line to mobile (or remote base).
- *SMART PATCH* uses SIMPLEX BASE STATION EQUIPMENT. Use your ordinary base station. *SMART PATCH* does this without interfering with the normal use of your radio.

WARRANTY?

YES, 180 days of warranty protection. You simply can't go wrong.

An FCC type accepted coupler is available for *SMART PATCH.*

Communications Electronics Specialties, Inc.
P.O. Box 2930, Winter Park, Florida 32790
Telephone: (305) 645-0474 **Or call toll-free (800)327-9956**



09RH shown actual size.

FT-203R transceiver

The Yaesu FT-209RH. 5 watts that your batteries can live with.

Have the power you need when you need it with Yaesu's new 5-watt, 2-meter handheld. Power to get out in situations where ordinary HTs just won't make it.

We designed our HT with a unique user-programmable Power Saver that puts the rig to "sleep" while you're monitoring and "wakes it up" when the squelch breaks. So you can listen for hours and still have plenty of power to hit those hard-to-reach repeaters when you need to.

With the FT-209RH there's no need to fiddle with knobs when you change from one memory channel to another. That's because you can independently store everything you need in each of the ten memories: receive frequency, standard or non-standard offset, even tone encode/decode with an optional module. And then recall any channel at the touch of a button.

It's easy to hear what's happening on your favorite repeaters or simplex frequencies. Just touch a button and scan all memory channels, or selected ones. Or all frequencies between any two adjacent memories. Use the priority feature to return automatically to your special frequency when it becomes active.

Bring up controlled-access machines with the optional plug-in subaudible tone encoder/decoder, independently programmed from the keyboard for each channel. Listen for tone-encoded signals on selected channels—without having to hear a bunch of chatter—by enabling the decode function.

The FT-209RH, which covers 10 MHz for CAP and MARS use, comes complete with a 500-mAh battery, charger and soft case.

For those who want a basic radio without the bells and whistles, consider the compact, lightweight FT-203R. This economical HT features 2.5 watts of power and an optional DTMF keypad. Most all the accessories for the 209 work with the 203, including an optional VOX headset that gives you hands-free operation that's perfect for public service events.

So when you visit your dealer, let him know you won't settle for anything but the best. A radio built by Yaesu.

YAESU

Yaesu Electronics Corporation
6851 Walthall Way, Paramount, CA 90723
(213) 633-4007.

Yaesu Cincinnati Service Center
9070 Gold Park Drive, Hamilton, OH 45011
(513) 874-3100.

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"Digital DX-terity!"

TS-430S

Digital DX-terity—that outstanding attribute built into every Kenwood TS-430S lets you QSY from band to band, frequency to frequency and mode to mode with the speed and ease that will help you earn that dominant DX position from the shack or from the mobile!

- **Covers all Amateur bands**
  160 through 10 meters, as well as the new 30, 17, and 12 meter WARC bands. High dynamic range, general coverage receiver tunes from 150 kHz to 30 MHz. Easily modified for HF MARS operation.
- **Superb interference reduction**
  Eliminate QRM with the IF shift and tuneable notch filter. A noise blanker supresses ignition noise. Squelch, RF attenuator, and RIT are also provided. Optional IF filters may be added for optimum interference reduction.
- **Reliable, all solid state design.**
  Solid state design permits input power of 250 watts PEP on SSB, 200 watts DC on CW, 120 watts on FM (optional), or 60 watts on AM. Final amplifier protection circuits and a cooling fan are built-in.
- **Memory channels.**
  Eight memory channels store frequency, mode and band data. Channel 8 may be programmed for split-frequency operation. A front panel switch allows each memory channel to operate as an independent VFO or as a fixed frequency. A lithium battery backs up stored information.
- **Programmable, multi-function scan.**
- **Speech processor built-in.**
- **Dual digital VFOs.**
- **VOX circuit, plus semi break-in with sidetone.**

Optional accessories:

- PS-430 compact AC power supply • SP-430 external speaker • MB-430 mobile mounting bracket • AT-130 compact antenna tuner covers 80-10 meters, incl. WARC bands • AT-250 automatic antenna tuner covers 160-10 meters, incl. WARC bands • TL-922A 2 kW PEP linear amplifier • FM-430 FM unit • YK-88C (500 Hz) or YK-88CN (270 Hz) CW filters • YK-88SN (1.8 kHz) narrow SSB filter • YK-88A (6 kHz) AM filter • MC-42S UP/DOWN hand mic. • MC-60A/80/85 deluxe desk mics. • SW-2000/200A SWR/power meters • SW-100A SWR/power/ volt meter • PC-1A phone patch • HS-4, HS-5, HS-6, HS-7 headphones

KENWOOD

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