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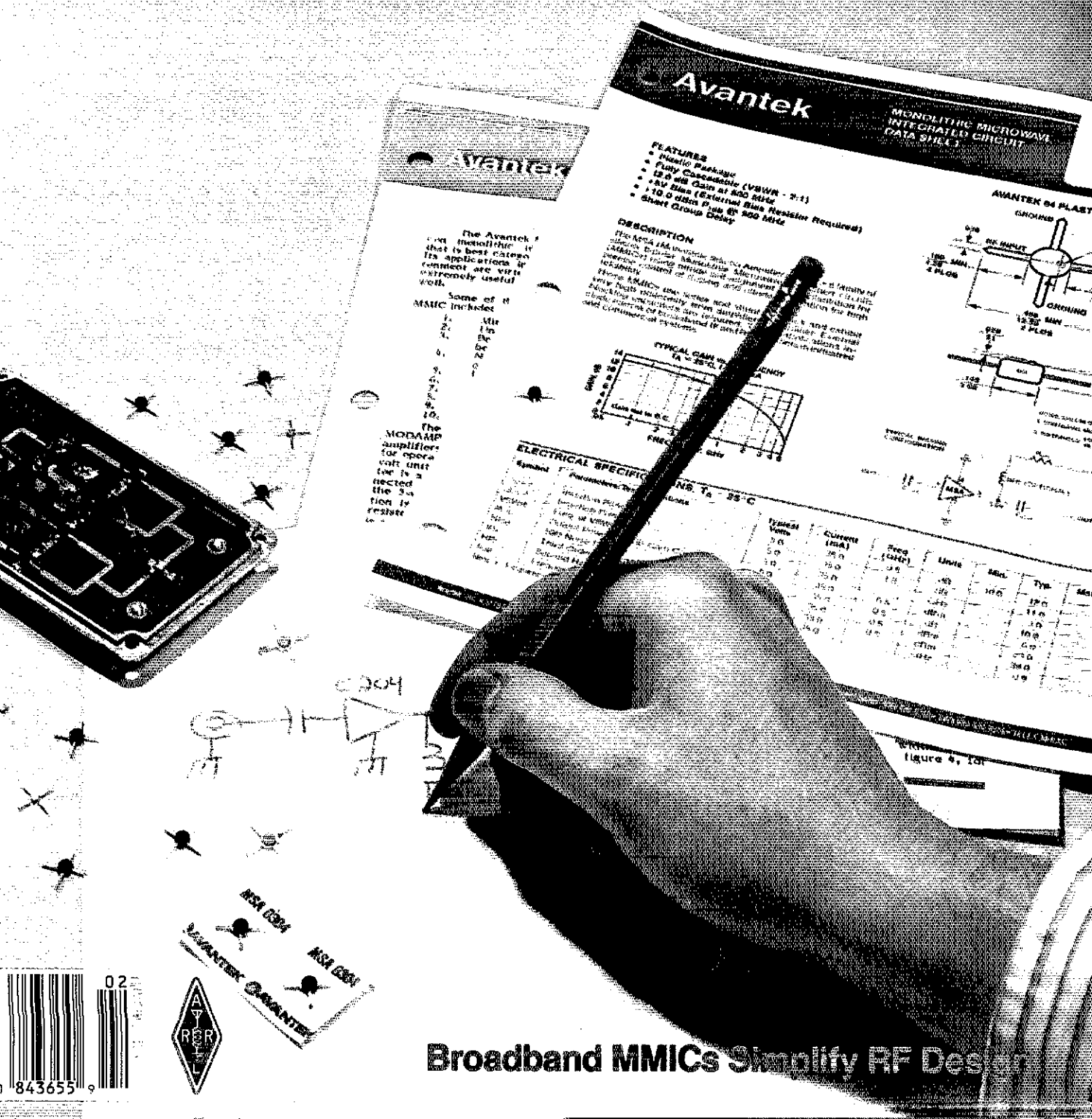
February 1997 $3.00



Broadband MMICs Simplify RF Design

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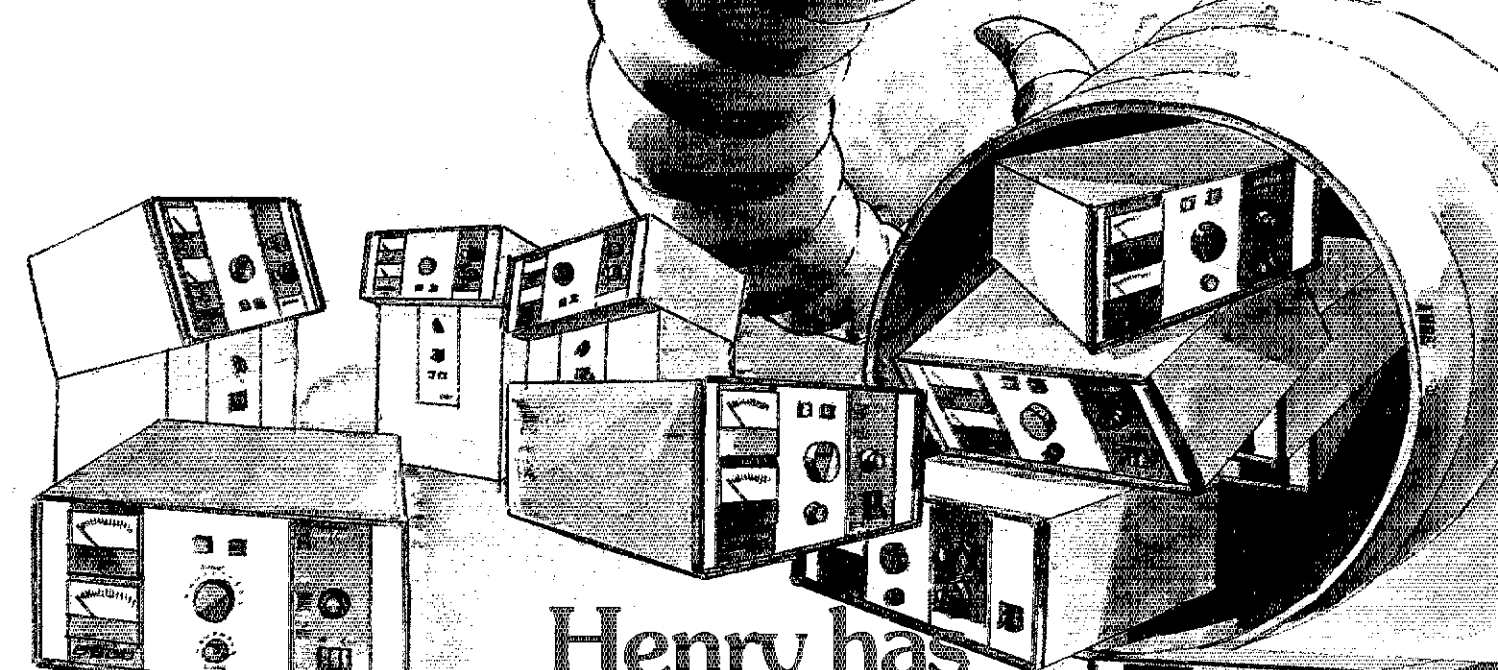


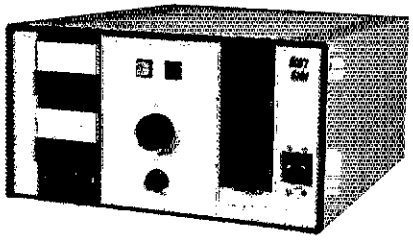
Henry has the amplifier you want!

Take your choice. The world famous 2K Desk Classic, 2K Console Classic and 3K Console Classic HF amplifiers speak for themselves. Now to complete your range of choice, the superb new 3002-A and 2002-A for 146 MHz and the 3004-A and 2004-A for 440 MHz.

Now a veritable cornucopia of superb amplifiers. Just make your choice!

2K Classic...the culmination of more than fifteen years of developing the 2K series into the world famous line that sets the standards for top quality HF linears. A true "workhorse", built to loaf along at full legal power, trouble free, for years of hard service. Operates on all amateur bands, 80 through 15 meters (export models include 10 meter)

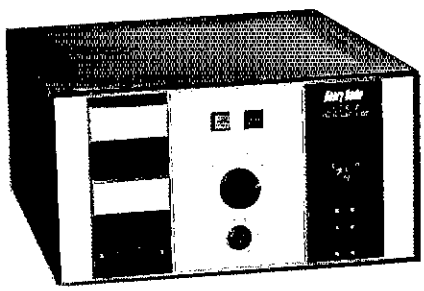
2K Classic "X"... We can't think of any way to make this magnificent 2000 watt amplifier better. Rugged, durable...the last amplifier you may ever need to buy.



2KD Classic...a desk model designed to operate at 2000 watts effortlessly, using two Eimac 3-500Z glass envelope triodes, a Pi-L plate circuit and a rotary silver plated tank coil. We challenge you to find a better desk model for even a thousand dollars more.

3K Classic MkII...uses the superb Eimac 3CX1200A7 tube. More than 13db gain. We believe the 3K to be the finest amateur linear available anywhere...the amplifier of every amateur's dreams.

Henry amateur amplifiers are available from select dealers throughout the U.S. and are being exported to amateurs all over the world. Henry Radio also offers a broad line of commercial FCC type accepted amplifiers for two way FM communications to 500 MHz, as well as special RF power generators for industrial and scientific users. Call or write Ted Shannon or Mary Silva for full information.



2002-A...a bright new rework of our popular 2002 2 meter amplifier. Uses the new Eimac 3CX800A7. The RF chassis uses a ¼ wave length strip line design for extremely reliable approach. It provides 2000 watts input for SSB and 1000 watts input for CW. Because this tube is rated at an unheard of 15dB gain, only about 25 watts drive is required for full output.

2004-A The 400 MHz version of 2002-A. Write for full specifications.

3002-A A superb new 2 meter full power amplifier using the 8877 for 1500 watts output. You can't buy a better VHF amplifier.

3004-A Identical to the 3002-A except re-designed for UHF 1000 watts output...430-450 MHz.

We stock these plus many other fine names.
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3 Choices 70 W/45 W/25 W

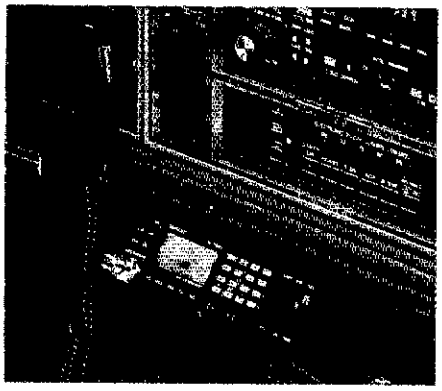
Three Choices for 2m!

TM-2570A/2550A/2530A

Feature-packed 2m FM transceivers

The all-new "25-Series" gives you three RF power choices for 2m FM operation: 70 W, 45 W, and 25 W. Here's what you get:

- Telephone number memory and autodialer (up to 15 seven-digit phone numbers). **A Kenwood exclusive!**
- High performance GaAs FET front end receiver
- 23 channel memory stores offset, frequency, and subtone. Two pairs may be used for odd split operation
- 16-key DTMF pad with audible monitor
- Extended frequency coverage for MARS and CAP (142-149 MHz; 141-151 MHz modifiable)
- Center-stop tuning—**a Kenwood exclusive!**

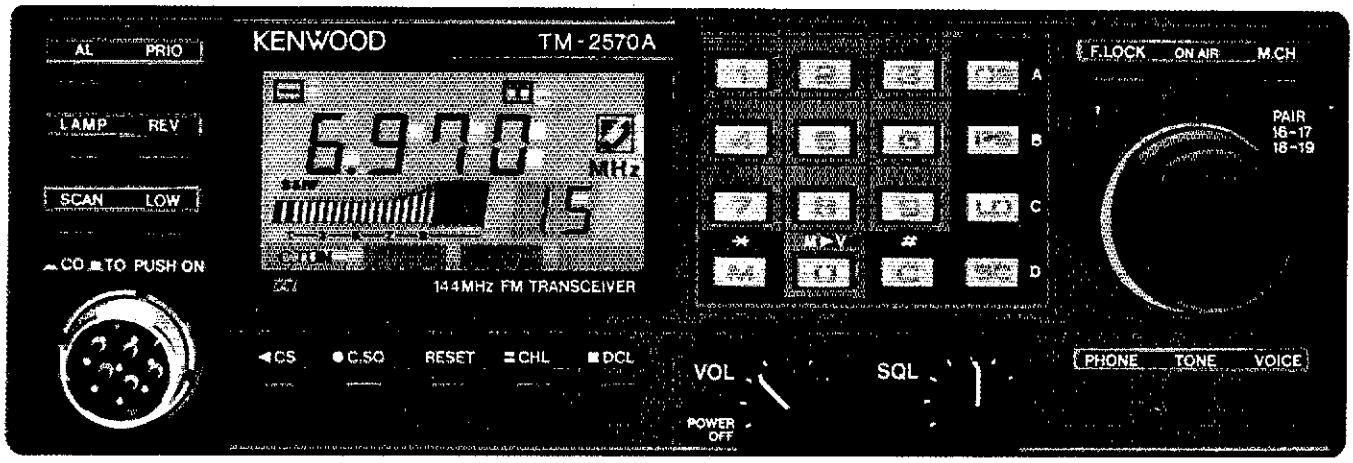


- New 5-way adjustable mounting system
- Automatic repeater offset selection—**another Kenwood exclusive!**
- Direct keyboard frequency entry
- Front panel programmable 38-tone CTCSS encoder **includes** 97.4 Hz (optional)
- Big multi-color LCD and back-lit controls for excellent visibility
- The TM-3530A is a 25 watt version covering 220-225 MHz. The first full featured 220 MHz rig!

DCL **Introducing... Digital Channel Link**

Compatible with Kenwood's DCS (Digital Code Squelch), the DCL system enables your rig to **automatically** QSY to an open channel. Now you can automatically switch over to a simplex channel after repeater contact! Here's how it works:

The DCL system searches for an open channel, remembers it, returns to the original frequency and transmits control information to another DCL-equipped station that switches **both** radios to the open channel. Microprocessor control assures fast and reliable operation. The whole process happens in an instant!



Optional Accessories

- **TU-7** 38-tone CTCSS encoder
- **MU-1** DCL modem unit
- **VS-1** voice synthesizer
- **PG-2N** extra DC cable
- **PG-3B** DC line noise filter
- **MB-10** extra mobile bracket
- **CD-10** call sign display
- **PS-430** DC power supply for TM-2550A/2530A/3530A
- **PS-50** DC power supply for TM-2570A
- **MC-60A/MC-80/MC-85** desk mics.
- **MC-48B** extra DTMF mic. with UP/DWN switch
- **MC-43S** UP/DWN mic.
- **MC-55** (8-pin) mobile mic. with time-out timer
- **SP-40** compact mobile speaker
- **SP-50B** mobile speaker
- **SW-200A/SW-200B** SWR/power meters
- **SW-100A/SW-100B** compact SWR/power meters
- **SWT-1** 2m antenna tuner

Actual size front panel

Complete service manuals are available for all Trio-Kenwood transceivers and most accessories
Specifications and prices are subject to change without notice or obligation
Specifications guaranteed on Amateur bands only

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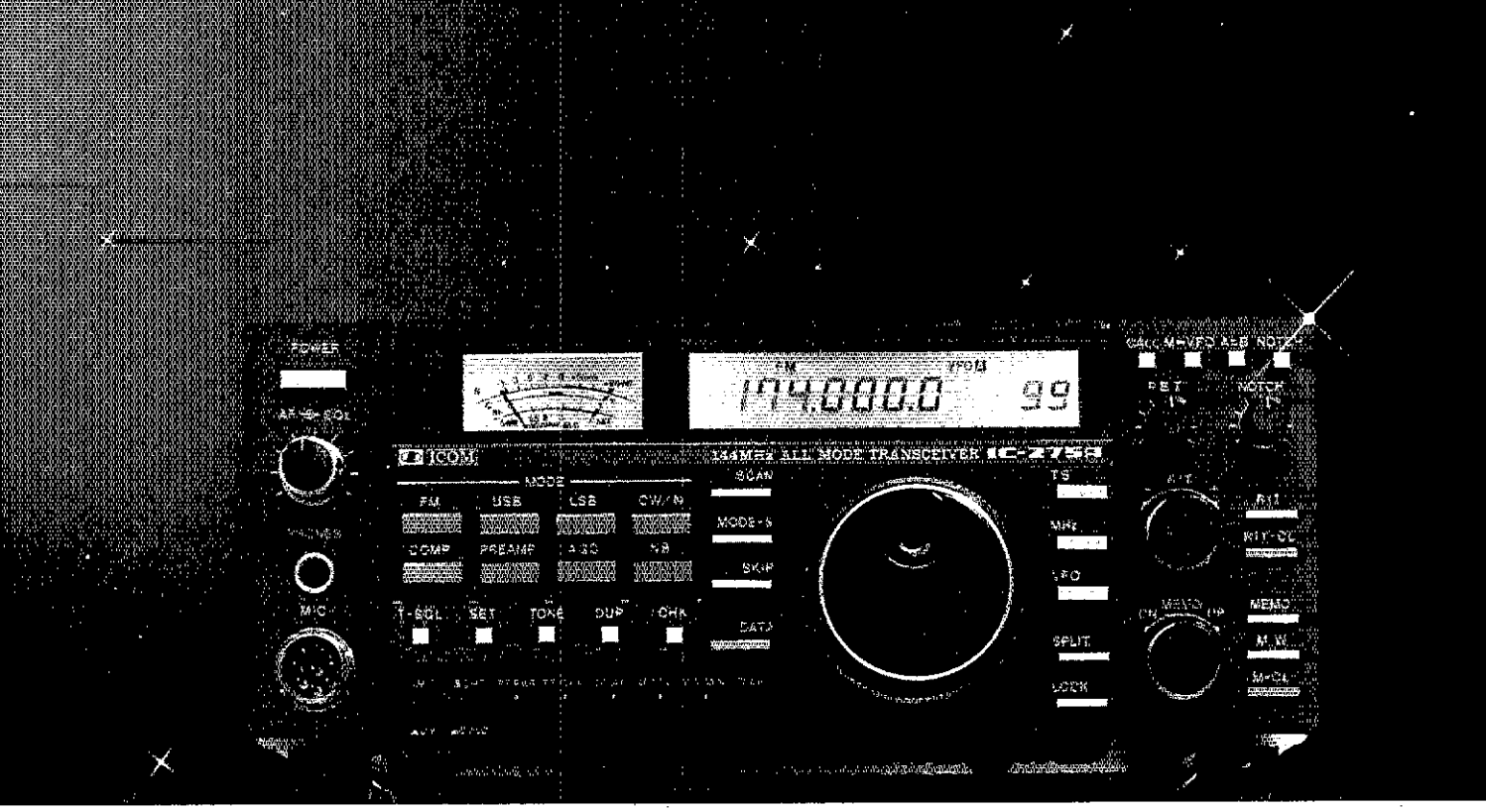

ICOM IC-275
THE VHF SUPERSTAR!

- **All Mode Operation: FM, SSB, CW, Packet**
- **Wideband Reception (from 138 to 174MHz)**
- **Packet Compatible (with front panel DATA switch)**
- **2-Meter Transceiver with the features of an HF**
- **DDS (Direct Digital Synthesizer)**

When you're ready to experience all the multimode excitement 2 meters offers today's amateur, you're ready for the glamorous new IC-275. Its FM capabilities are unlimited, its wideband receiver coverage (138 to 174MHz, Tx 140.1 to 150MHz) includes public services and NOAA weather bands, plus CAP and MARS, and its SSB/CW operations are an OSCAR enthusiast's and VHF DX'ers delight. No other VHF transceiver is comparable to the IC-275 in features, performance, reliability and ease of operation.

Outpacing the Competition. The IC-275 includes dual VFOs, 99 tunable full function memories, true passband tuning, crystal resonant notch filter, noise blanker, built-in SWR bridge, semi or full CW break-in, multifunction meter, velvet-smooth tuning knob and an easy-to-read amber LCD readout with variable backlight.

Four Scanning Modes. Full spectrum, programmable limits, mode scan and memory scan with selectable lock-out (scans 99 memories in five seconds!).

An FM'ers Dream Rig. Separate knobs for band tuning and memory selection. Standard repeater splits built-in; odd splits programmable. Includes 32 built-in subaudible tones, and actual subaudible frequency is displayed. Unit supplied with HM-12 up/down scanning mic and DC cord.

It's Packet Ready with rear connector for audio input/output and front panel data switch that reduces switching time to less than 5 ms and mutes the mic.

Two Versions to Fit Your Needs. The **25 watt IC-275A** includes a built-in AC supply. The **100 watt IC-275H** uses an optional external AC supply. Both units are the same size as the ultra compact IC-735 HF rig, and are DC cord interchangeable. You can alternate their fixed or mobile use!

The Matching ICOM IC-475 UHF Transceiver is also jam-packed with deluxe multimode features, and it's the ultimate OSCAR mate for the IC-275. Two versions, the 25 watt **IC-475A** and the 75 watt **IC-475H**, are available to suit your needs.

Exciting New Options include a tone squelch unit, speech synthesizer, an OSCAR module that allows tracking with a companion IC-475, FL-83 500Hz 10.7491MHz CW filter and an AG-25 mast mounted preamp.

ICOM
First in Communication

ICOM America, Inc., 2380-116th Ave NE, Bellevue, WA 98004 **Customer Service Hotline (206) 454-76**
3150 Premier Drive, Suite 126, Irving, TX 750
ICOM CANADA, A Division of ICOM America, Inc., 3071 - #5 Road, Unit 9, Richmond, B.C. V6X 2T4 Canad

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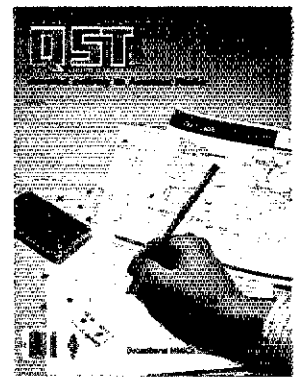
OUR COVER

Broadband monolithic microwave integrated circuits ((MMICs) are rapidly replacing discrete transistors in many low-level RF amplifier circuits. These low-cost gain blocks work from HF through the microwave region and require no tuned circuits. To learn more about these state-of-the-art devices, turn to page 23. *(cover photograph by Meyers Studio)*



CONTENTS

TECHNICAL

NEWS AND FEATURES

OPERATING

DEPARTMENTS

Or This Inexpensive

It Really Shouldn't Be This Easy

Remember just a few years ago, how it took a roomful of equipment just to work RTTY. And if you wanted more than one mode it took a dedicated computer system costing thousands of dollars. The new AEA Pakratts are proving it doesn't take lots of equipment or money to enjoy working all bands in five different modes.

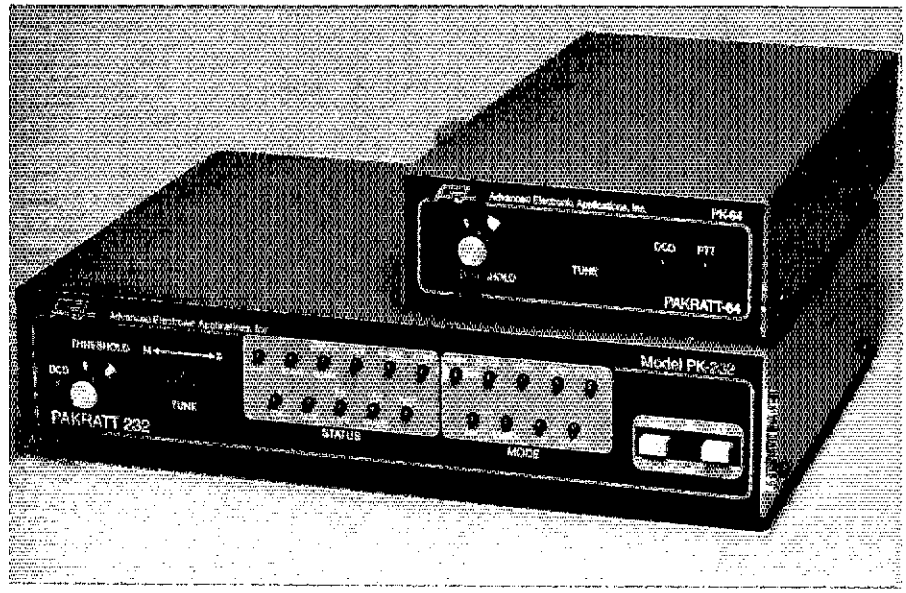
First, A Good Idea

The idea behind the Pakratt is very simple. One controller that does Morse, Baudot, ASCII, AMTOR, and Packet, and works both HF and VHF bands. Of course the decoding, protocol, and signal processing software must be included in the unit, and connection to the computer and transceiver have to be easy. The unit also has to be small and require only 12 volts, so it will work both in the shack and on the road.

Second, Computer Compatible

It doesn't matter what kind of computer you have, we have a Pakratt for you. The PK-64 works with the popular Commodore 64 or 128, and the PK-232 works with any other computer or terminal that has an RS-232 serial port. The PK-64 doesn't require any additional programs. Simply connect to the computer and transceiver and you're on the air. The PK-232 needs a terminal or modem program for your computer. The one you're using with your telephone modem will work just fine.

PAKRATT™ Model PK-64



PAKRATT™ Model PK-232

Third, Performance and Features

The real measure of any data controller is what kind of on-air performance it gives. While the PK-64 and PK-232 use different types of modems, both give excellent performance on VHF. The optional HF modem of the PK-64 uses independent four-pole Chebyshev filters for both Mark and Space tones, and A.M. detection. The HF option can be factory or field installed.

The PK-232 uses an eight-pole bandpass filter followed by a limiter discriminator with automatic threshold correction. The internal modem automatically selects the filter parameters, CW Fc = 800 Hz, BW = 200 Hz; HF Fc = 2210 Hz, BW = 450 Hz; VHF Fc = 1700 Hz, BW = 2600 Hz.

The PK-64 uses on screen indicators to show status, mode, and DCD (Data Carrier Detect) while the PK-232 uses front panel indicators. Both units use discriminator style tuning for HF operation. And that's just the tip of the iceberg. Features like multiple connects on packet, hardware HDLC, CW speed tracking, and other standard AEA software features are included in both the PK-64 and PK-232.

Fourth, AEA Quality and Price

Not many manufacturers like to discuss quality and price at the same time. AEA thinks you want high quality and low price in any product you buy, so that's what you get with the Pakratts. Ask any friend who owns AEA gear about our quality. The people who buy our products are our best salespeople. As for price, the PK-64 costs $219.95, or $319.95 with the HF option. The PK-64A, an enhanced software unit with a longer flexible computer cable, costs $269.95 or $369.95 with the HF option. The PK-232 costs $319.95 with the HF modem included. All prices are Amateur Net and available from your favorite amateur radio dealer. For more information contact your local dealer or AEA.

Prices and specifications subject to change without notice or obligation.

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P.O. Box C-2160, Lynnwood, WA 98036-0918
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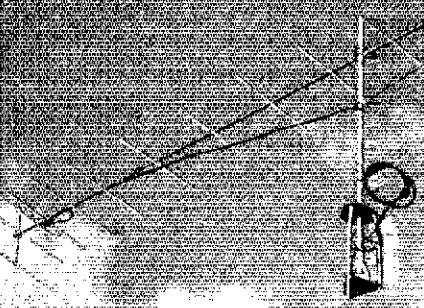
THE BIGGEST IMPROVEMENT IN YOUR SHACK

4218XL
2 METER BOOMER



Boomer XL is "the antenna for 2 meter DX". More than 3 years of design, antenna range tests, and on-the-air contesting have been combined to produce the 4218XL's higher gain and cleaner pattern. This antenna is designed to survive. It features step tapered boom, tubular support braces and all stainless steel hardware. The new 4218XL is the only antenna with this great combination of features to make your 2 meter activity more successful and satisfying.

SPECIFICATIONS

frequency range 144-145 MHz, 18 elements, boomlength 28.8 ft., typical SWR 1.2:1, 50Ω T-match, beamwidth 2 x 13°,

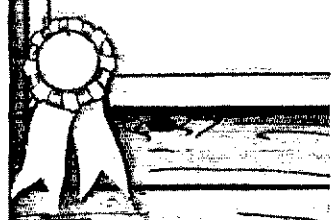
turn radius 16.7 ft., windload 3.5 ft.^{2}, weight 14.3 lbs., Excellent gain,

SHOULD BE ON THE TOWER

ANT FACTS

SWR

SWR is easy to measure. This has led to an improper interpretation of the importance of SWR. In most cases, any SWR of less than 2:1 is satisfactory. Lower SWR may not yield increased performance. When you make your measurements be sure your SWR bridge is designed to work on the frequencies involved. Many are unreliable above 30MHz. Connecting the bridge close to the antenna by using a short jumper cable will increase the accuracy of your measurements. The shorter the jumper the better your readings will be. Move away from the antenna when taking readings.



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NEW! computer interface!

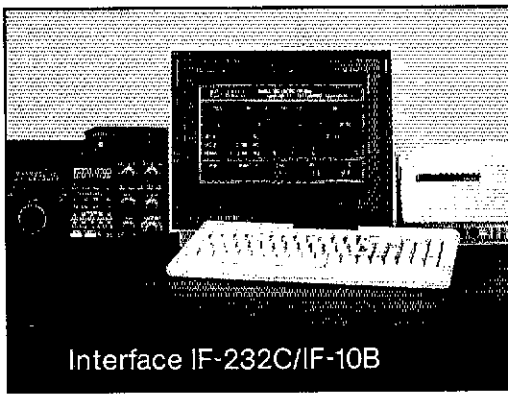
"DX-cellence!"

TS-940S

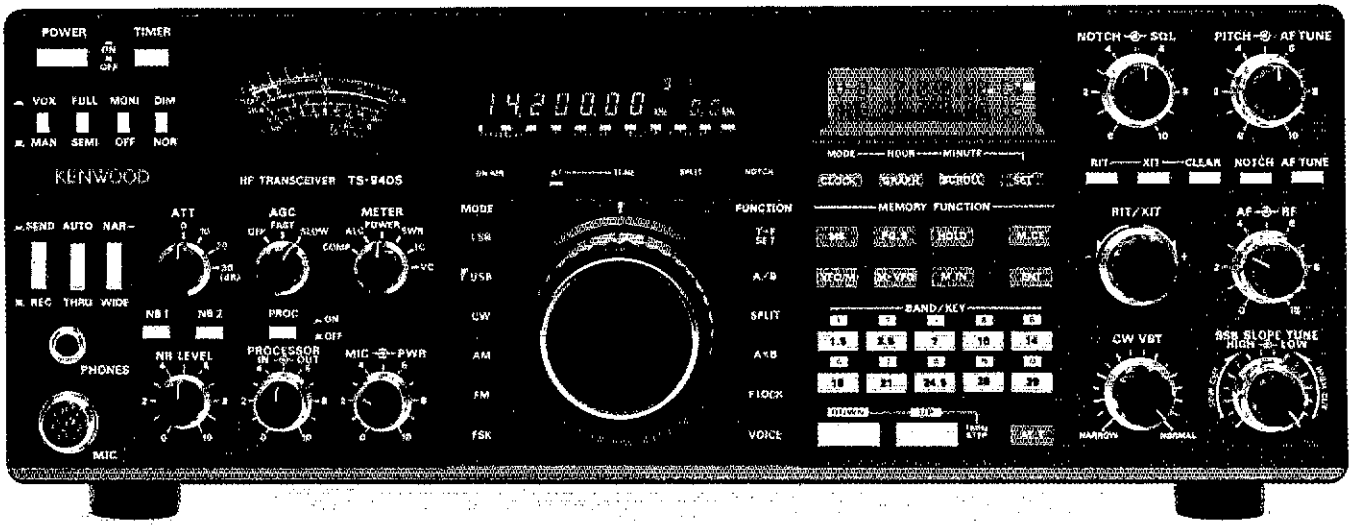
The new TS-940S is a serious radio for the serious operator. Superb interference reduction circuits and high dynamic range receiver combine with superior transmitter design to give you no-nonsense, no compromise performance that gets your signals through! The exclusive multi-function LCD sub display graphically illustrates VBT, SSB slope, and other features.

- **100% duty cycle transmitter.** Super efficient cooling system using special air ducting works with the internal heavy-duty power supply to allow continuous transmission at full power output for periods exceeding one hour.
- **High stability, dual digital VFOs.** An optical encoder and the flywheel VFO knob give the TS-940S a positive tuning "feel."
- **Graphic display of operating features.** Exclusive multi-function LCD sub-display panel shows CW VBT, SSB slope tuning, as well as frequency, time, and AT-940 antenna tuner status.
- **Low distortion transmitter.** Kenwood's unique transmitter design delivers top "quality Kenwood" sound.
- **Keyboard entry frequency selection.** Operating frequencies may be directly entered into the TS-940S without using the VFO knob.
- **QRM-fighting features.** Remove "rotten QRM" with the SSB slope tuning, CW VBT, notch filter, AF tune, and CW pitch controls.
- **Built-in FM, plus SSB, CW, AM, FSK.**
- **Semi or full break-in (QSK) CW.**
- **40 memory channels.** Mode and frequency may be stored in 4 groups of 10 channels each.
- **Programmable scanning.**
- **General coverage receiver.** Tunes from 150 kHz to 30 MHz.
- **1 yr. limited warranty.** Another Kenwood First!

Optional accessories:
• AT-940 full range (160-10m) automatic antenna tuner • SP-940 external speaker with audio filtering • YG-455C-1 (500 Hz), YG-455CN-1 (250 Hz), YK-88C-1 (500 Hz) CW filters; YK-88A-1 (6 kHz) AM filter • VS-1 voice synthesizer • SO-1 temperature compensated crystal oscillator • MC-43S UP/DOWN hand mic. • MC-60A, MC-80, MC-85 deluxe base station mics. • PC-1A phone patch • TL-922A linear amplifier • SM-220 station monitor • BS-8 pan display • SW-200A and SW-2000 SWR and power meters.



SEE THE TS-940S PRODUCT REVIEW IN THE FEBRUARY 1986 ISSUE OF QST



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 TS-940S information is available from authorized Kenwood dealers.

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NEW

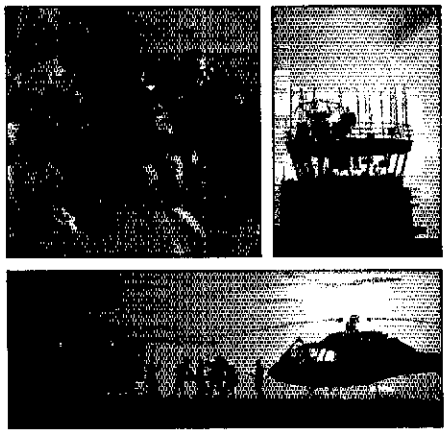
Hear it All!

R-5000

High performance receiver

***THE* high performance receiver is here from the leader in communications technology—the Kenwood R-5000. This all-band, all mode receiver has superior interference reduction circuits, and has been designed with the highest performance standards in mind. Listen to foreign music, news, and commentary. Tune in local police, fire, aircraft, weather, and other public service channels with the VC-20 VHF converter. All this excitement and more is yours with a Kenwood R-5000 receiver!**

- **Covers 100 kHz-30 MHz in 30 bands, with additional coverage from 108-174 MHz (with VC-20 converter installed).**
- **Superior dynamic range.** Exclusive Kenwood DynaMix™ system ensures an honest 102 dB dynamic range. (14 MHz, 500 Hz bandwidth, 50 kHz spacing.)



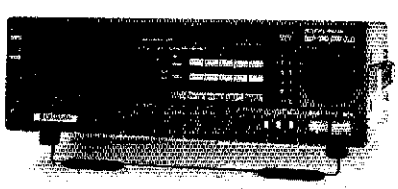
- **100 memory channels.** Store mode, frequency, antenna selection.
- **Voice synthesizer option.**
- **Computer control option.**
- **Extremely stable, dual digital VFOs.** Accurate to ±10 ppm over a wide temperature range.
- **Kenwood's superb interference reduction.** Optional filters further enhance selectivity. Dual noise blankers built-in.
- **Direct keyboard frequency entry.**
- **Versatile programmable scanning, with center-stop tuning.**
- **Choice of either high or low impedance antenna connections.**
- **Kenwood non-volatile operating system.** Lithium battery backs up memories; all functions remain intact even after lithium cell expires.
- **Power supply built-in.** Optional DCK-2 allows DC operation.
- **Selectable AGC, RF attenuator, record and headphone jacks, dual 24-hour clocks with timer, muting terminals, 120/220/240 VAC operation.**

Optional Accessories:

• VC-20 VHF converter for 108-174 MHz operation • YK-88A-1 6 kHz AM filter • YK-88S 2.4 kHz SSB filter • YK-88SN 1.8 kHz narrow SSB filter • YK-88C 500 Hz CW filter • YK-88CN 270 Hz narrow filter • DCK-2 DC power cable • HS-5, HS-6, HS-7 headphones • MB-430 mobile bracket • SP-430 external speaker • VS-1 voice synthesizer • IF-232C/IC-10 computer interface.

More information on the R-5000 and R-2000 is available from Authorized Kenwood Dealers.

R-2000 150 kHz-30 MHz in 30 bands • All modes • Digital VFOs tune in 50 Hz, 500 Hz, or 5 kHz steps • 10 memory channels • Programmable scanning • Dual 24-hour digital clocks, with timer • 3 built-in IF filters (CW filter optional) • All mode squelch, noise blanker, RF attenuator, AGC switch, S meter • 100/120/220/240 VAC operation • Record, phone jacks • Muting terminals • VC-10 optional VHF converter (118-174 MHz)



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The American Radio Relay League, Inc, is a noncommercial association of radio amateurs, organized for the promotion of interest in Amateur Radio communication and experimentation, for the establishment of networks to provide communications in the event of disasters or other emergencies, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

ARRL is an incorporated association without capital stock chartered under the laws of the State of Connecticut, and is an exempt organization under Section 501(c)(3) of the Internal Revenue Code of 1954. Its affairs are governed by a Board of Directors, whose voting members are elected every two years by the general membership. The officers are elected or appointed by the Directors. The League is noncommercial, and no one who could gain financially from the shaping of its affairs is eligible for membership on its Board.

"Of, by, and for the radio amateur," ARRL numbers within its ranks the vast majority of active amateurs in the nation and has a proud history of achievement as the standard-bearer in amateur affairs.

A bona fide interest in Amateur Radio is the only essential qualification of membership; an Amateur Radio license is not a prerequisite, although full voting membership is granted only to licensed amateurs in the US and Canada.

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"It Seems to Us . . ."

Another Kind of Challenge

Last month, we talked about the challenges to our continued access to the radio spectrum that we're likely to face in the coming months and years. This time, let's look at another, more positive sort of challenge: the challenge to take full advantage of the opportunities being presented to us by dramatic advances in technology.

Amateur Radio exists because it's in the public interest for ordinary people to be able to earn access to the radio spectrum for noncommercial communications and experimental purposes. You can't buy this access by writing a check; you get it by showing that you're qualified to use it for the betterment of society, with "betterment" interpreted broadly and nonjudgmentally.

The FCC cites several basic purposes of the Amateur Radio Service. They are, to supply a voluntary noncommercial communication service, particularly with respect to providing emergency communications; to contribute to the advancement of the radio art; to advance individual skills in both communications and technical phases of radio; to provide a reservoir of trained operators, technicians and electronic experts; and to enhance international goodwill. These aren't mutually exclusive; there is a lot of overlap, and the more the better. For example, if you look at the first two, taken together they imply that we should take advances in the state of the art and *apply* them to providing the best possible communication services.

Are we doing this? Absolutely! And we can do more.

One example is packet radio. The proliferation of store-and-forward bulletin boards, VHF-to-HF packet gateways and imaginative software, coupled with rules changes to permit at least limited automatic operation, has made possible the development of a national (and, potentially, an international) network for the accurate and rapid handling of message traffic with a minimum of operator intervention. The League's Committee on Amateur Radio Digital Communication has been spearheading the effort to make this an organized, efficent network. A painstakingly detailed application for a limited number of stations to operate on HF under automatic control, by special temporary authority, is in the final stages of preparation; the experience gained would be used to assess the interference potential of such a network and to find ways of minimizing the impact on other HF users. Other experimenters are looking beyond the store-and-forward bulletin board system to more efficient ways of transferring data through a chain of relays. Another promising area for further investigation is in adaptive modems for packet radio, particularly for the noisy and ever-changing HF environment, which would automatically adjust the transmission speed, packet length, and possibly even the frequency band and transmitter power to reflect circuit conditions. Another field in which additional work would pay great dividends is in the processing of the received signal; techniques exist which, if applied to HF packet communication, would make for a highly robust and efficient network. To judge the potential for HF packet communication on the basis of present practices is a bit like judging the potential of aviation on the basis of Kitty Hawk.

Let's take another example: UHF and higher frequencies. Thanks to advances in semiconductors, extremely low-noise receivers are inexpensive and widely available, and it's possible to generate an appreciable amount of RF power without relying on government surplus. Even antennas and feed lines have improved. These developments are reflected in ever-increasing activity in the bands above 148 MHz, and in the extending of distance records in the "line-of-sight" bands to far beyond what the experts thought possible just a few years ago. Commercial and military work in the UHF and microwave field generally concentrates on the problem of improving the reliability and security of communications circuits; in these circles, exceptional propagation is more likely to be regarded as a nuisance than as a phenomenon worth exploring for its own sake. Our unique contribution to the understanding of radio-wave propagation comes from the wide dispersion of amateur stations, each attempting to communicate beyond its "normal" range, and from relating extraordinary propagation to phenomena such as weather patterns and air traffic routes (yes, Virginia, there is such a thing as "airplane scatter"!) The lessons the experimenters among us learn in the next couple of years will be applied to a communications opportunity having even greater potential: geosynchronous Amateur Radio satellites.

Something that is likely to have a more immediate impact on your own operating patterns is the ability, now being included in many rigs, to control most of the functions of your home station from a remote location. Can you imagine working 20-meter DX while strolling the supermarked aisles with a 440-MHz handheld? For an increasing number of hams it's an everyday occurrence! And it's more than just a novelty: such capability could have enormous emergency-communications implications, not to mention what it could mean for apartment dwellers. There's no need to sit, like passive consumers, waiting for full-feature remote control to come out of the factory; with a bit of ingenuity (which we hope you'll share with the rest of us!) you can probably add it to your station right now.

Or would you rather ragchew? That's fine, too. Maybe we've given you something to talk about besides the weather!—*David Sumner, K1ZZ*

Announcing the HF/VHF/UHF base station you'll hear about on the air.

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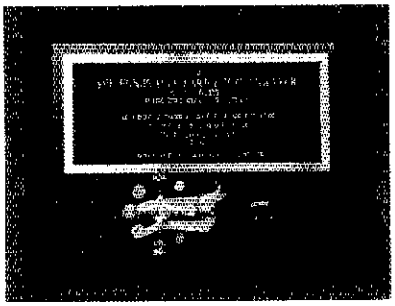
UP FRONT in QST

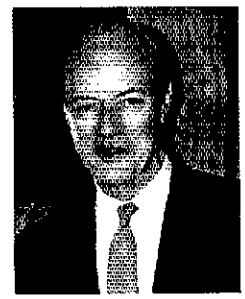
A Fond Farewell to Barry: Members of the Capitol Hill Amateur Radio Society wanted to give US Senator Barry Goldwater, K7UGA (left), a special send-off on his retirement from public office. After all, the Senator and the club go way back together. Thanks to Barry, CHARS was able to get a small room in the Russell Senate Office Building to house the club station, W3USS. Also, it was Barry who generously provided much of the club's station equipment. To show the club's appreciation, President George Stephens, WB3DAC (center), presented this Morse code key plaque to Barry in a special ceremony in the Senator's office on December 17. Fittingly, the bottom line on the plaque says "It took awhile Senator, but the Nation finally tuned into your signal!" Looking on is ARRL Washington Area Coordinator Perry Williams, W1UED (right). No doubt, hams are going to miss the presence of the honorable "Senator from Amateur Radio" in Congress, but they'll likely be hearing a lot of him on the amateur bands. *(W3DTN photos)*



Voyager Piloted by Hams

While the *Voyager* was making its way into aviation history as the first airplane to fly around the world nonstop without refueling, radio amateurs had their own good reason to cheer. The pilot and copilot of the craft are radio amateurs. Intensive flight preparation didn't leave time for **Dick Rutan, KB6LQS, and Jeana Yeager, KB6LQR,** to upgrade from Novice, so no amateur operation took place. The *Voyager* crew did operate as AFS6VO on 6.550- and 13.312-MHz USB and on MARS frequencies 11.407 and 17.847 MHz, however, to stay in touch with a ground crew throughout the 26,000-mile flight. In honor of their achievement, President Reagan presented Dick and Jeana with Presidential Citizen's Medals in a ceremony in Los Angeles December 29. Congratulations, *Voyager* and crew!

K6IR Receives Sarnoff Award

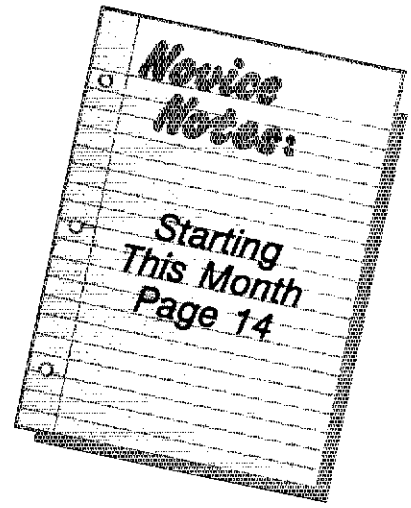


Kenneth Miller, K6IR, of Rockville, Maryland, has received the Sarnoff Award, given annually by the Radio Club of America, Inc to the person who has made the most significant contribution to the advancement of electronic communication. Through the years, Ken has been involved in many technological innovations, including co-developing the first 8-track tapeplayer and developing the first automatic pilot for general aviation use and the first solid-state automatic direction finder for planes. A member of the DXCC Honor Roll, Ken has been licensed for more than 40 years. Congratulations, Ken!

The PRB Has a New Starting Team

The FCC's Private Radio Bureau, which oversees the Amateur Radio Service, has a new Chief and Deputy Chief. **Michael T. N. Fitch** is PRB Chief, replacing Robert Foosaner, who has left the FCC to join a private law firm. **Ralph Haller,** also known to amateurs as N4RH, is the new Deputy Chief. Both come to their new posts with extensive backgrounds in communications. An exclusive interview with Fitch and Haller appears on page 48.

Novice Series Premieres



Beginning this month, *QST* will be dedicating space within its pages just for Novices. Our hope is that through **Novice Notes** you'll learn the things you need to know—in language you can understand—to help make your Novice experience a rewarding one. Over the course of all this, don't be afraid to write to us, in care of Novice Notes, to tell us if we're going too fast, or about other topics you want covered. That's what we're here for.

Head of the Class: Middle and high-school teachers across North America became students for awhile last December, with Amateur Radio being the tutor. Through *The Shoulders of Giants,* a television course conducted by the Talcott Mountain Science Center in Avon, Connecticut and the University of Hartford, several amateurs demonstrated practical ways in which ham radio can be used to teach math and science-related material in school. The program was aired via a satellite hookup and over many amateur FM and ATV repeaters. Among the instructors featured in the 90-minute program were Roy Neal, K6DUE, a science consultant with NBC News (center) and Carole Perry, WB2MGP (left), a middle-school teacher from Staten Island, New York. The moderator was Bill Dunkerley, WA2INB (right). See this month's Happenings for details.

Three Scholarships Available

Are you in need of some financial assistance for college? The Atlanta Radio Club has up to three $1000 scholarships available to young hams. Applicants must be licensed amateurs who are graduating from high school and entering an accredited college or university for the first time as a freshman in 1987. Candidates will be judged on their high school grades, citizenship and leadership qualities, ham radio achievements and financial need. Residents of Georgia and its contiguous states will be given extra consideration. For an application form, write to Phil Latta, W4GTS, 259 Weatherstone Pkwy, Marietta, GA 30067.

Postscript to Christmas

The whereabouts of Santa Claus's home has been discovered—and he's a ham! According to *USA Today,* December 19, 1986, Santa lives in a log cabin—with a new workshop and radio station—on the edge of the Arctic Circle, courtesy of Finnish tourism officials. In case you want to get your Christmas list in early for next year, his address is Korvatunturi SF-99999, Finland. His call letters are OH9SCL.

RSGB Offers Packet Newsletter

Here's another publication to add to your packet radio reading list. The Radio Society of Great Britain publishes *Connect International,* which includes full-length technical articles; discussions on packet hardware, software and protocols; operating news; and more. Annual subscriptions for North America are £9.24. Check with your local bank for information on purchasing checks in British pounds. The newsletter's address is Radio Society of Great Britain, Lambda House, Cranborne Rd, Potters Bar, Herts EN6 3JW, UK.

DXCC's 50th Update

Here's an addendum to last month's report on the DXCC 50th anniversary commemorative stickers that are available to hams. If you haven't already ordered stickers, you can help speed up the process by mentioning the style number: 186. The stickers are available in quantities of 1000; you should call for prices. Again, the manufacturer is the Stephen Fossler Company, 439 South Dartmoor Dr, Crystal Lake, IL 60014, tel 1-800-762-0030.

JOTA Down Under: When members of the Western Radio Club, of Blacktown, New South Wales, Australia, were asked by local Scouts to help in the Jamboree on the Air, they jumped at the chance. In addition to introducing some young people to Amateur Radio, the hams helped Scouts and Guides from the Tartoola District earn their Communications badges. During the October event, the Scouts spent some time operating, built various projects, and passed a written exam on basic electronics and safety. On the air, the Scouts talked with amateurs and other Scouts from around the world, including Fiji, Japan and the Soviet Union. One participant went home particularly happy, being perhaps the first Scout to have a two-way via Fuji-OSCAR 12 from a JOTA station. Shown here is VK2XKK, demonstrating packet radio and satellite communications for Scouts at the Western Radio Club's JOTA station in Blackheath.

League Lines

Novice Enhancement is coming! FCC is expected to release its final decision this month on the new rules allowing expanded operating frequencies and new modes for Novices. Michael Fitch, new Chief of the FCC's Personal Radio Bureau, says in an interview on page 48 that the Report and Order "may even be out by the time this interview is printed." See "FCC Issues Novice Enhancement NPRM" in June *QST* (p 48) and the Happenings column in September *QST* (p 67) for further details of the proposal. W1AW, *The ARRL Letter* and upcoming issues of *QST* will carry full details about the expected announcment.

Written Examination Credit. There is ***none***—yet. As of January 1, FCC had still not received the go-ahead from the Office of Management and Budget (OMB) concerning the proposed changes in the FCC Form 610 needed to implement the proposal. The new rules for written exam credit do ***not*** go into effect until OMB approval is secured. FCC has had to correct earlier notices it had issued on this subject.

Question Pools. In PR Docket 85-196, the FCC announced that it was turning over maintenance of question pools for the amateur examinations to the Volunteer Examiner Coordinators (VECs), as of January 1, 1987. Under the FCC decision any VEC could, if it wished, have its own question pool independent of other VECs, and it could be easier (or harder) than others in use. The League, feeling that the Amateur Service would suffer if candidates could "shop around" for an easy exam, in September filed a petition for reconsideration; similar petitions were filed by others. No answer to that petition having been received by late December, the ARRL then filed a petition for Stay. Just before year-end, the FCC released a further Public Notice, encouraging VECs to use the existing pool throughout 1987 and to cooperate in creating a new one. The League is evaluating the latest announcement to determine whether it goes far enough to render the ARRL petitions moot. Stand by for further information.

Now that 1987 is here, so is the ***Golden Jubilee of DXCC Award!*** Throughout the year, the bands will be busy with activity as award hunters begin the quest to work 100 DXCC countries. The rules are simple: Any mode or band (except 10 MHz) may be used for contacts. No QSL cards are required—just a special application form, MCS-555, available from HQ for an SASE. An attractive certificate embroidered in gold (see September *QST*, page 12, for a full-color view) will be sent to each qualifier. The application fee is $5 US cash or check, or 12 IRCs from overseas.

When the DXCC award was first announced in 1937, there were five charter members—and it had taken each of them several years to accumulate their country totals. How long will it take *you* to replicate their feat 50 years later, at the bottom of the sunspot cycle?

Is the Volunteer Examiner program working? Yes, says FCC. In a recent news release, the Commission said that between the start of the VEC program, December 1, 1983, and October 31, 1986, VECs had coordinated 6784 sessions, in which a total of 86,533 persons took an amateur examination. Approximately 60% of the applicants passed at least one examination element. The FCC also noted that VECs and VEs were doing outstanding work in screening the applications sent to FCC. Between October 1985 and October 1986, less than 0.5% of the applications were defective. Also, 97% of the applications were forwarded to FCC within the 10-day time period allowed.

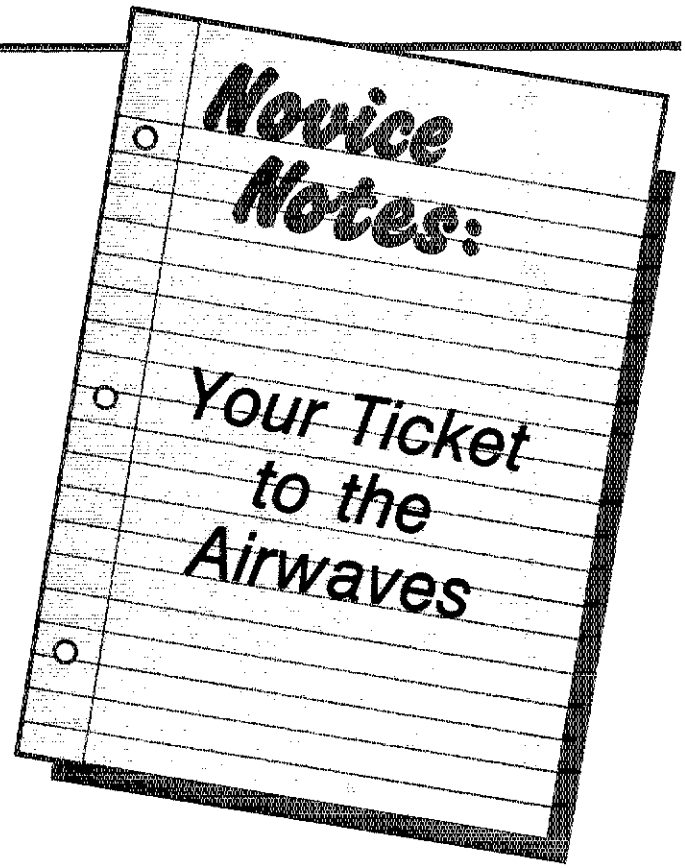
The ARRL Board of Directors was to meet January 16-17 in Hartford. Complete details and minutes of the meeting will appear in March *QST*.

Patience is a virtue. . . FCC processing of amateur licenses at its Gettysburg, Pennsylvania facility is running 6-8 weeks behind as of the beginning of the year.

The ARRL has filed comments ***against*** the FCC's notice of proposed rule making, PR Docket 86-397, which would authorize additional frequencies in the 40-meter band to Novices and Technicians in Alaska, Hawaii, Region 2 Pacific and Caribbean insular areas. Amateurs who operate 40 meters at night know that communications above 7100 kHz is difficult because of interference from HF broadcast stations transmitting in Regions 1 and 3. The ARRL said that it had previously endorsed authorizing telephony operation at 7075-7100 kHz for United States amateurs adjacent to Region 3 and in the Caribbean. This authorization would allow them to avoid the broadcast interference and, in time of emergency, to take part in the various regional and international nets that operate in that band. However, there is no similar compelling reason to make another special exception in the case of Novices and Technicians. Nighttime communications on 7100-7150 kHz for Novices and Technicians in Alaska, Hawaii, and the Pacific and Caribbean insular areas are no greater than those faced by Novice and Technician operators in the contiguous United States. In conclusion, the League commented that since Novice privileges may be significantly increased because of Novice Enhancement, it was not the proper time to consider expanding their privileges, even in these outlying areas.

CQ 100th Congress! Are there any hams who are members of the 100th Congress? Any who are staff or committee staff members? Please call the ARRL Washington office at 202-296-9107 and leave your name, position, Capitol Hill address and phone number. ARRL Washington Area Coordinator W1UED wants to meet you!

Life After the License



Need a hand putting that Novice ticket to use? Help is as close as your nearest club.

By Lee G. Hayford, AH2W

The chilly bite of this mid-December morning didn't bother Matt as he made his way through the freshly fallen snow. Spotting a coworker, Matt packed a handful of fluffy snow into a ball and threw it at Jack, who was huddled at the bus stop, breathing on his bare hands. The snowball crumbled in midair. Jack hadn't even noticed.

Four weeks ago, Jack had passed both the written and code parts of the Novice test. Carl, a local electronics technician, had given him the test and said the FCC would issue a license in four to six weeks. Though Jack had spent the past month dreaming of making his first contact, he dreaded trying to copy those first code signals through other signals and noise—what Carl called QRM and QRN. Nonetheless, he smiled at the thought of those reams of scrap paper piled in his desk drawers, testimony to the hours he'd spent on code-practice sessions.

"Ground control to Jack," yelled Matt, finally getting his friend's attention.

"Oh, hi, Matt. I was thinking about getting my Novice ticket and what my call sign will be."

"Yeah, I know how you feel. Too bad you don't have an antenna and a rig yet. You won't be able to get on the air when you get your ticket...unless you go over to Carl's shack."

"I know. But what really bothers me is I don't know what antenna would work the best on 15 meters—or even how to put one up. Not to mention finding a radio in my price range. There are so many kinds available."

"How about asking Carl for some help?"

"I've thought of that, but Carl has a tight schedule. Probably doesn't have the time."

"Then why not come over to the club meeting tonight? I'm sure you'll find someone there who'll be glad to lend you a hand putting up an antenna. You gotta admit, it sure would be nice having a station to get on the air with as soon as your license arrives."

"What kinda club is it?"

"A repeater club."

"Will a ham who's into repeaters be willing to help me put up an HF antenna?"

"I don't see why not...but there are plenty of other clubs. Last week, I called the American Radio Relay League and got hold of the Club Services Department. They sent me a computer printout of all the ARRL clubs in my area."

"Yeah?" Jack wondered, stamping his feet to keep warm.

"Sure. They also sent me a list of instructors in my area. I've been putting off upgrading to Advanced, and maybe an instructor will give me the push I need."

"Okay, so I can get a list of ARRL clubs. But why should I join one? All I wanna do is get on the air, have a few QSOs and maybe build up my code speed."

Matt thought for a moment before answering. "There are lots of reasons. You've already said you need help putting up an antenna...and advice on buying a rig. You might even find a club member who has some gear to lend you."

"Hmm," thought Jack, not totally convinced.

"I had a blast at last month's club meeting. Club members gave me a plaque for being ham radio's worst cook. I tried to cook lasagna for a club dinner—and promptly learned that I should stick with contesting. It's nice to be part of the gang. This weekend, I'm using my 2-meter hand-held at a checkpoint in the Christmas parade. Our club always sends a bunch of us to help coordinate communications during a few public-service events each year."

"Okay, okay, I get the idea," said Jack.

"If I join a club, I get all kinds of support and help, make new friends, and have fun while I learn about ham radio and make myself useful in the community. The only way to start is to go to a meeting—and you've just sold me on that idea."

That evening, Jack was roused by the shrill ring of the telephone. Browsing through the *ARRL Operating Manual*, he was looking for tips on making his first on-the-air contact. How will I ever learn all those Q signals, thought Jack. It's hard enough not being nervous about making a mistake during a contact. But Jack's fears gradually gave way to his growing excitement.

Matt's enthusiasm for ham radio spilled through the telephone receiver. "Jack, you comin'?"

"You mean to the club meeting?"

"Yeah. Carl just told me that the club finished putting up a six-element triband beam yesterday, and tonight they have a sked with Pitcairn Island, of *Mutiny on the Bounty* fame."

"Great, Matt. Count me in. You drivin'?"

"Sure, I'll be over in a few minutes to pick you up."

Jack marveled at the large number of people crammed into the tiny electronics workshop at the community college. The buzz of people talking reminded him of the boarding area of a busy airport. He generally didn't like crowds and was about to lose himself in a corner when a hand firmly clasped his back.

"Glad you've come to the meeting, Jack." Carl's pleasant voice eased his nervousness. "The club president usually begins the meeting by introducing all visitors, so don't run away." Jack smiled at the gentle tease.

"Matt told me this is a repeater club, Carl. Why is a DX contact on the agenda?"

"We have a club repeater, sure, but this is really a general-interest club. We're into all kinds of things. For example, Bill over there and a few other club members are working on an intercom system for the hospital in their spare time. Mary and Joe work a lot of the traffic nets, passing messages. The club even has a local net on 10 meters.

Jack was impressed. "Does the club hold classes for people interested in getting a license...or upgrading?"

Carl's eyes wrinkled in a warm smile. "Why, Jack, don't you remember your own introduction to ham radio came when you asked me what that long pole was doing on my roof?"

"I sure do, Carl. But I never thought of you as being a teacher."

"From now on just call me 'Teach,' " whispered Carl as the club president called the meeting to order.

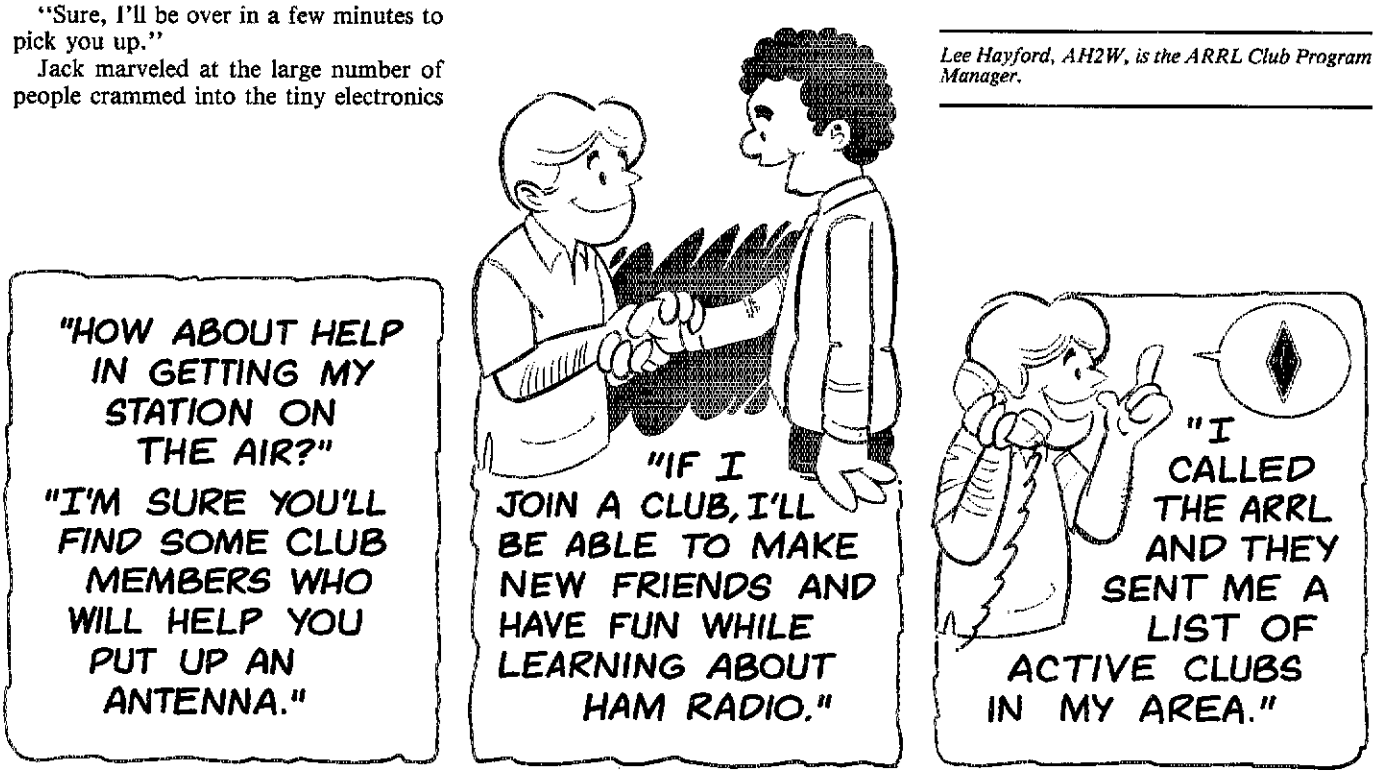
Lee Hayford, AH2W, is the ARRL Club Program Manager.

Help Is Just a Phone Call Away

If you're like most Novices and beginners, you'd appreciate a little help putting that new ham license to use. More than likely, you don't have an experienced amateur operator in the family, so you'll have to look elsewhere. A radio club is one of the best sources for help in setting up a station, locating gear, and even when an antenna project goes awry. It's also a good place to learn more about operating: contesting, DXing, handling traffic, repairing equipment, and more. And don't forget fellowship—getting to know the people behind the call signs. Many are the special personal rewards for joining those who have helped you get that Novice ticket, and by helping others in turn.

Radio clubs are as varied in purpose and scope as the members themselves. There are repeater, school, DX, general-interest, contest, VHF and public service clubs, to name a few. Finding the club that matches your interests is easy to do, and will greatly increase your enjoyment of Amateur Radio. As a newcomer, you can bring enthusiasm and a new perspective to any club—and add to the collective strength of the Amateur Service.

Well, what are you waiting for? There are nearly 1800 clubs across the country that are actively affiliated with the ARRL. Why not call or write to the Club Services Department, 225 Main St, Newington, CT 06111, tel 203-666-1541. We'd like to put you in touch with a club near you today.



• *Under Construction*

Understanding and Constructing RF Chokes

Part 16: RF chokes shouldn't be taken for granted. They can become hot, burn out or work perfectly. Some simple rules for ensuring good performance are given here.

By Doug DeMaw, W1FB
ARRL Contributing Editor
PO Box 250, Luther, MI 49656

Where can I buy a plate choke for my homemade linear amplifier? Can I construct my own choke? How much inductance do I need? These common queries are sometimes heard while monitoring the ham bands, or read when answering my mail. I think more needs to be known about RF chokes by those who are new to Amateur Radio, or those who haven't taken the time to learn how RF chokes operate. This article is aimed especially at those of you who want to know how to choose or build an RF choke for best performance.

Types of RF Chokes

Fig 1 shows three common formats for RF chokes. A single-layer or solenoidal choke is shown at A. A pi-wound choke is shown at B, and a solenoidal toroid RF choke is depicted at C. Each of these chokes can do the same job if they are designed and applied correctly.

Chokes A and B of Fig 1 may be air wound or on insulating, nonmagnetic forms, such as ceramic or high-dielectric plastic. When a large amount of inductance is needed, versus choke physical size, we may use ferrite or powdered-iron forms to increase the inductance over that which will occur with an air-core coil of equal turns and size. The pi-wound choke of Fig 1B also provides a means by which greater inductance (many wire turns per pi) can be obtained.

RF chokes come in many sizes and shapes (Fig 2). Some are encapsulated to protect the windings from abrasion, dirt and moisture. Others are simply dipped in glyptol or similar varnish, while many chokes are without any exterior protective coating. Some chokes are wound with Litz wire (several strands of fine enameled wire in a silk or cotton outer sheath), and others contain plain enameled, single-strand copper wire. Generally, the Litz-wire chokes exhibit a higher Q when many turns are required. Some RF chokes are self-supporting, air-core devices. These are made from heavy gauge enameled wire (solenoidal wound), and require no solid coil form to help them retain their shape. This type of choke is used at VHF and UHF, where small values of inductance are common.

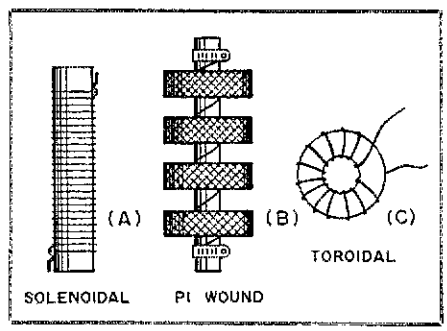


Fig 1—Formats for RF chokes. A single-layer, solenoidal winding is shown at A. Chokes with multilayer pi windings appear as shown at B. Toroidal RF chokes (C) are also suitable, and offer a self-shielding property that is helpful in discouraging circuit instability.

What Does an RF Choke Do?

The word "choke" is self-explanatory. But, what does an RF choke hold back? The answer is "RF energy." If we have a signal path to which dc must be added, we do not want the RF energy to become misrouted to the dc voltage source. Rather, the RF energy must be allowed to continue on its intended course. An RF choke permits the flow of dc, but will block the flow of ac or RF energy. Not any RF choke will provide this service: It must be of the correct inductance and current-carrying capability. This depends upon the type of circuit in which it is used.

Basically, an RF choke may be regarded as a resistance (impedance) against ac energy. The only dc resistance through the choke is the ohmic value of the wire in the winding. The higher the inductance (impedance) of the choke, the more effective it is for blocking the flow of ac or RF energy.

Circuit Examples

Two typical examples where RF chokes are used appear in Fig 3. Example A is for a transistor class-C amplifier. An RF choke is found in the collector circuit of Q1. It allows the RF current to flow into the pi-section filter, but not to the power supply via the V_{CC} line. However, the dc voltage will reach the collector via RFC1. A similar set of circumstances is found at B of Fig 3, where a vacuum-tube RF power amplifier is illustrated.

Choose the Right Choke Inductance

There is no universal RF choke that we may buy or build for circuits such as those in Fig 3. First, the choke must be able to handle the direct current that flows through it when the amplifier is conducting. The current should flow with minimum voltage drop, which means the choke should have the least dc resistance possible. Check the current rating of the choke you buy, or use a large enough wire gauge to handle the current if you wind your own RF choke. The wire table in *The ARRL Handbook* may be consulted for gauge versus current rating. Always select a current rating that exceeds the expected current by at least 20%.

Choke inductance is dependent on the

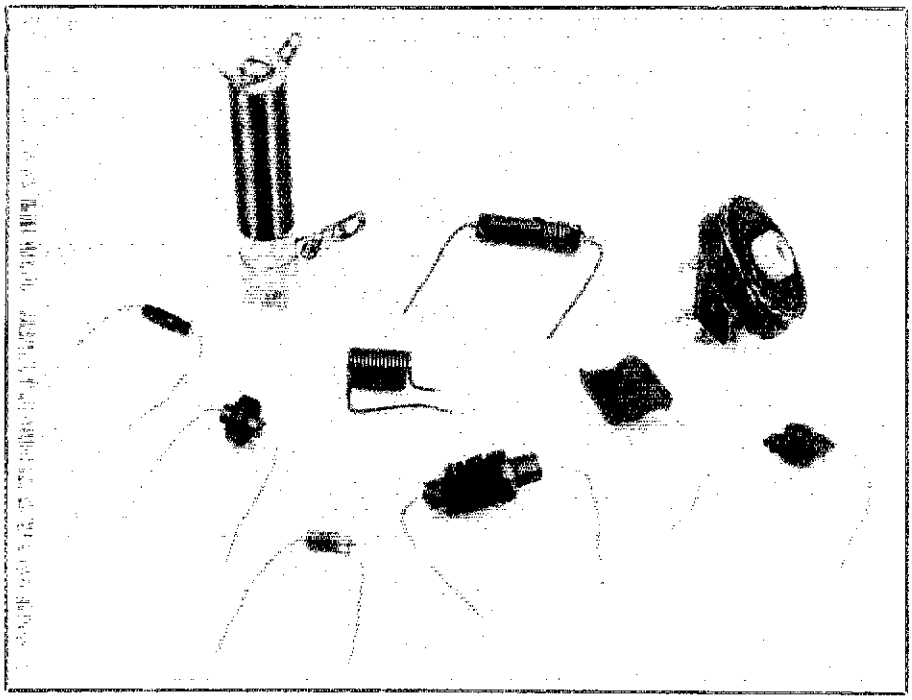


Fig 2—A collection of manufactured RF chokes to illustrate the many formats used in choke construction.

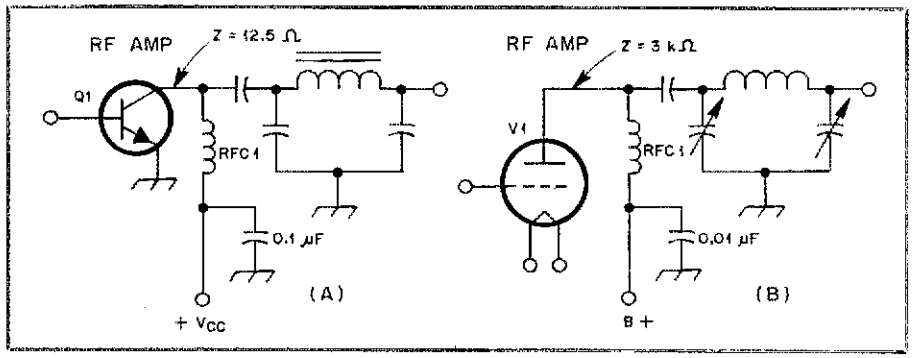


Fig 3—Circuit examples that show RF chokes as collector (A) and plate (B) impedances to allow the flow of dc while blocking the passage of RF current.

characteristic impedance of the circuit in which it is used. An industrial guideline for solid-state circuits calls for a choke reactance (X_L in ohms) that is approximately four times the impedance of the circuit to which it connects. Fig 3A indicates a collector impedance of 12.5 ohms. This means that the RF choke should have an X_L of 50 ohms at the lowest planned operating frequency. Assume that our amplifier will be used on 3.5 MHz. How may we find the required inductance for RFC1? Here is how it is done:

$$L\ (\mu H) = \frac{X_L}{2\pi f\ (MHz)} \qquad \text{(Eq 1)}$$

$$L\ (\mu H) = \frac{50}{6.28 \times 3.5} = 2.27\ \mu H$$

You may be asking, "How do I learn the transistor collector impedance?" That is also a simple procedure:

$$Z\ (coll) \approx (V_{CE})^2/2P_o \qquad \text{(Eq 2)}$$

where

Z is in ohms

V_{CE} is the collector-to-emitter voltage

P_o is the output power in watts

Thus, if Q1 of Fig 3 has a 12-V supply and 5¾ watts of output, the collector Z is 12.5 ohms, as shown.

The situation at B of Fig 3 is about the same as for A of the same figure. In this example, we find an arbitrary 3000-ohm plate impedance. Assume that our lowest operating frequency is 28 MHz. If we were to use the ×4 rule for reactance stated earlier, the ideal choke inductance will be based on 12,000 ohms of choke reactance. This equates to an inductance of 65.8 μH at 29 MHz, using the procedure in Eq 1. However, it is more practical to use a different procedure for vacuum-tube choke design. More on this later.

What if the Inductance Is too Low?

We must keep in mind that an RF choke is in parallel with the characteristic impedance of the circuit with which it is used. This can be thought of as two resistors in parallel, wherein the combined value will always be less than that of the smallest value. If the RF choke reactance is too low, say, a 5-ohm X_L in parallel with a 25-ohm collector impedance, the choke is not effective at blocking the flow of RF current, and some RF energy will reach the power-supply line. Also, this low choke reactance will cause a mismatch at the collector circuit if fixed-value networks are used. This will prevent proper power transfer from the amplifier to its load. In this undesirable situation, the choke will have to accommodate some RF current along with the dc current that flows through it. Choke heating or destruction can result.

RF chokes come in many sizes and shapes

It becomes impractical to follow the ×4 rule with tube types of amplifiers, owing to the high plate-impedance values. Most commercial high-power amplifiers contain plate chokes of fairly low reactance, respective to the plate impedance. The designers tend to adopt a different rule than is used in the semiconductor industry. The effective *parallel resistance* of the choke is the matter of concern rather than the X_L. A mismatch caused by low choke reactance can be tuned out by the adjustable network in a vacuum-tube amplifier. High-Q plate chokes are chosen to provide an acceptable parallel resistance. This characteristic can be measured with a laboratory instrument called an RX meter. A choke with a parallel resistance of 100 kΩ or greater would be suitable for use in the circuit of Fig 3B. Such a choke might have only 100 μH of inductance for use at 1.8 MHz. Multilayer pi-wound plate chokes were once used in place of solenoidal ones. This was done to obtain high values of choke inductance. Typically, a 1-mH choke was used for 80-m amplifiers. Pi-wound chokes can cause problems (more on this later).

Another example of an RF-choke application is shown in Fig 4. RFC1 permits the base of Q1 to have a dc return to ground, but it prevents RF energy from being lost to ground. A typical RF power transistor, when excited, has a base impedance of less than 10 ohms. Therefore, the RF choke may be of very low inductance. Let's assume the transistor in Fig 4 has a base impedance of 5 ohms. The operating frequency is 7 MHz. Knowing

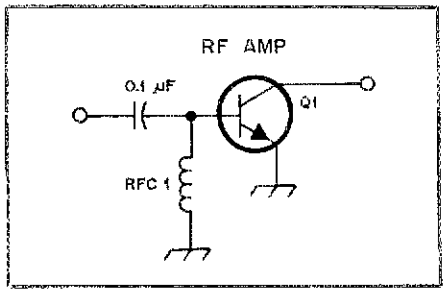


Fig 4—RFC1 is used as a base impedance for Q1. This provides a dc return for the base circuit while keeping the RF energy above ground.

these facts we find that Eq 1 calls for a minimum choke inductance of 0.45 μH. Therefore, a very small solenoidal choke may be used.

Problems with Series Resonance

If you're an old-timer, I'm sure you recall the shock of turning on, for the first time, a homemade RF power amplifier, only to hear a loud bang and see tendrils of smoke rise from the RF plate choke! On inspection you discovered that two or more of the multilayer pi coils of the choke had turned dark and slammed together with a shotgun-blast sound. Why did this happen? The culprit is called "series resonance." Fig 5A shows an RF choke across which some parasitic capacitance exists. All inductors are affected by stray capacitance across the turns. This sets up a self-resonant condition, such as that shown at Fig 5B. This parallel resonance can be troublesome at certain frequencies, especially in a broadband amplifier; the frequency response of the circuit will not be flat, as desired.

We are not concerned so much with parallel resonance in our narrow-band RF amplifier circuits, but *series resonance* in an RF choke can quickly cause choke destruction (shotgun effect mentioned earlier). A good RF choke will not exhibit a series resonance at any amateur frequency within the operating range of the amplifier. You may test your RF choke for series resonances by placing a shorting wire across the choke terminals (keep the wire short), then checking the choke with a dip meter. If the resonances fall outside the ham bands, no problems should be encountered.

A series resonance within or near a ham band will allow the RF current to rush through the choke to ground, via the bypass capacitor at the B+ end of the choke. This will heat the choke and set up a field that can cause the pi windings to slam together with a bang! A solenoidal RF choke, on the other hand, may end up with a blackened, sagging winding. I have known amateurs that blamed this type of malady on parasitics. It's true that high-magnitude parasitic oscillations can cause a choke to burn up, but only if the choke happens to be series-resonant at or near the frequency of the parasitic. The rule is to make sure that (1) your amplifier is stable, and (2) that the

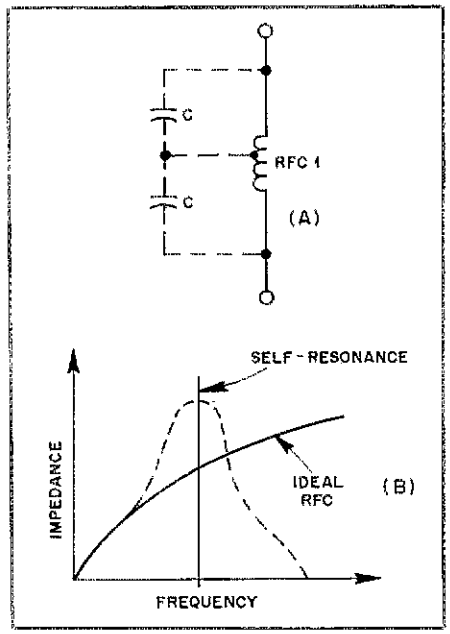


Fig 5—Stray capacitance exists across any coil winding, as shown at A. This can cause an unwanted parallel resonance for RF chokes (self-resonance) as indicated by the dashed curve at B.

plate RF choke has no series resonances at any planned operating frequency.

Other Choke Problems

Under some conditions, the RF chokes in an amplifier can set up an unwanted self-oscillation event. Fig 6A shows a circuit in which this might occur. RFC1 and RFC2 have relatively high Q values. Furthermore, they are of the same inductive value. These chokes, in combination with stray circuit capacitances, happen to be resonant (Fig 5B) at the same frequency. Here we have a perfect tuned-base, tuned-collector situation. Although the amplifier may be designed for 3.5-MHz operation, self-oscillation takes place at, for example, 800 kHz. The frequency of oscillation may be anywhere in the spectrum, depending on the parallel resonance of the chokes. If the self-oscillation is strong enough, it may destroy the transistor because of high peak voltages and currents.

How might we prevent this dangerous situation from existing? First, chokes of different inductance values should be used. Secondly, we can spoil the Q of one of the chokes (Fig 6B) by placing a low-value resistor in parallel with the choke, or by using an 850-mu ferrite bead in series with the RF choke. A resistor could be bridged across RFC2 of Fig 6B to lower the Q, but part of the amplifier power would be dissipated in the resistor. This is not an efficient road to travel.

Some Practical Homemade Chokes

Should we buy or build our RF chokes? Being the tightwad I am, and generally wanting "instant delivery" of component parts when I place an order, I prefer to make my own chokes. Certainly, a home-built RF choke is simple and inexpensive to fabricate. Let's examine first a high-power plate choke for a tube type of RF amplifier, such as two 3-500Zs in parallel for 2 kW PEP.

The photograph of Fig 7 shows an RF choke that I developed for my personal use. Several attempts were made to design a

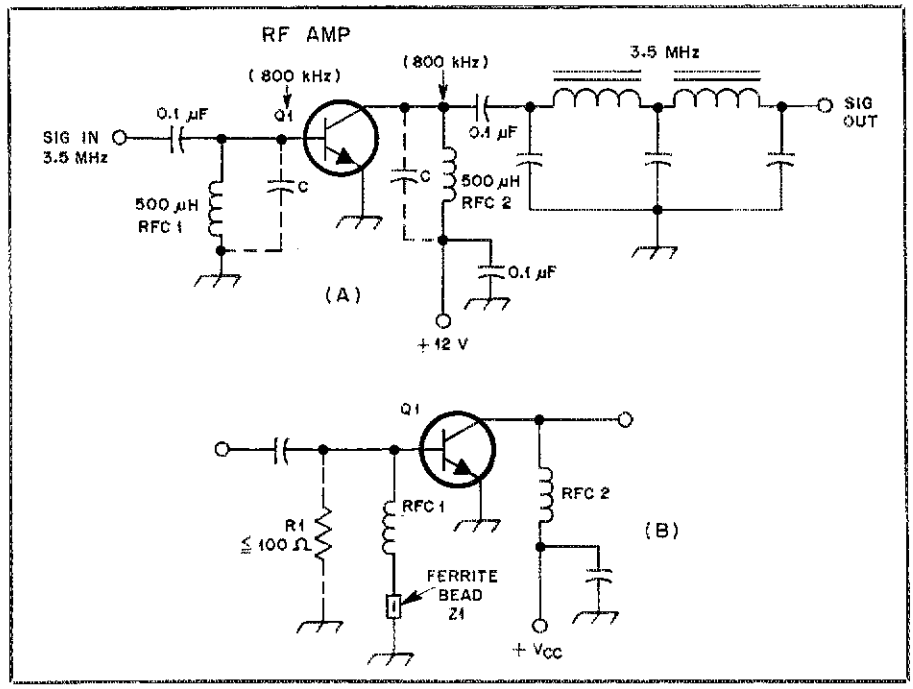


Fig 6—Unwanted parallel resonance of RFC1 and RFC2 at A can cause a tuned-base tuned-collector self-oscillation that may destroy a transistor. The circuit at B includes some Q-spoiling devices (R1 and Z1) that aid in preventing self-oscillation and the peaking response of self-resonance (see text).

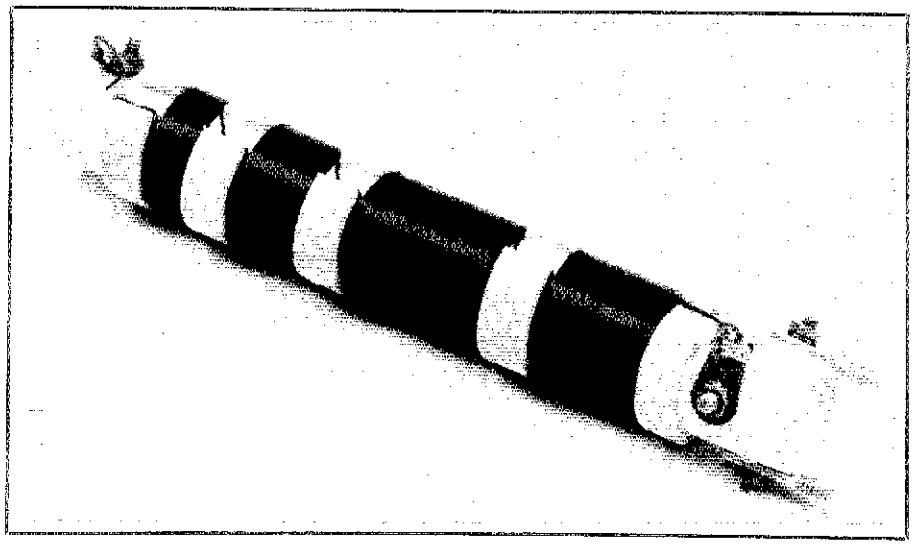


Fig 7—Photograph of the W1FB high-power RF plate choke. Unwanted parasitic capacitance is reduced by adding spacers along the coil winding.

choke that had no series resonances in or near any of the HF-band amateur frequencies. The 12-meter band presented the major problem in this effort: Series resonances kept popping up in a range from 23 to 27 MHz while working with a continuously wound solenoidal choke. I was able to increase the frequency of the unwanted resonance by making the choke winding smaller, but this sacrificed performance at 3.5 MHz. Finally, I reverted to the old method of placing individual single-layer windings on the coil form (see Fig 7) to break up the distributed capacitance. I knew this would raise the series-resonant frequencies of the choke. As indicated in Table 1, the resonances did indeed move higher (36, 43 and 64 MHz, as checked with my dip meter after placing a shorting strap across the RF choke). When the resonance existed at 26 or 27 MHz, the effective parallel resistance of the choke was only 5000 Ω at 24.9 MHz.

I chose no. 22 enameled wire for the choke winding. This size wire will handle up to 900 mA of current if it is not confined in a transformer case or other hot environment. We may assume that our RF chokes will be located where there is a flow of air (cooling fans) in a linear amplifier.

Fig 8 shows a small bobbin-wound choke that has an inductance of 3 mH. I wound this unit on an Amidon B-72 ferrite bobbin (permeability = 2000). The bobbin is filled with no. 30 enameled wire, scramble wound. The unloaded Q is 50 at 250 kHz. The parallel resistance is 125 kΩ at 500 kHz, and 100 kΩ at 1.9 MHz. These bobbins are ¾ inch long and have an OD of 3/8 inch. A collar is located at each end of the bobbin, and this makes it easy to scramble-wind and contain the wire. A wire pigtail protrudes from each end of the coil form to permit attachment of the coil winding. This choke was wound mainly to illustrate how easy it is to wind your own high-inductance RF chokes. Smaller ferrite forms (with pigtails) are also available for winding homemade VHF and UHF RF chokes.

Practical Aspects of the RF Plate Choke

Fig 9 shows the winding data for the plate RF choke of Fig 7. In practice, the number of turns per separate winding is not especially critical. Normally, I use progressively larger windings per section, but the lower winding of this choke had to be pruned in order to resolve the series-resonance problem mentioned earlier. Otherwise, there would be more than 36 turns on the bottom winding.

My coil form is a 5½-inch piece of high-impact polystyrene tubing with an OD of ¾ inch. The dividers between the winding sections are ¼-inch slices of ¾-inch PVC tubing. Each divider is cut with a hacksaw to provide an expansion gap when the dividers are mounted on the coil form. The resulting slots in the rings allow the wire to be routed through them to the succeeding winding. One length of wire is used for the entire choke.

No. 4 screws and nuts are used to affix the two solder lugs, and a pair of no. 6 spade bolts at the bottom of the coil form. The spade bolts may be used for attaching the RF choke to a chassis. A generous coating of polyurethane varnish is applied to the coil winding and divider rings. This protects the winding from abrasion while

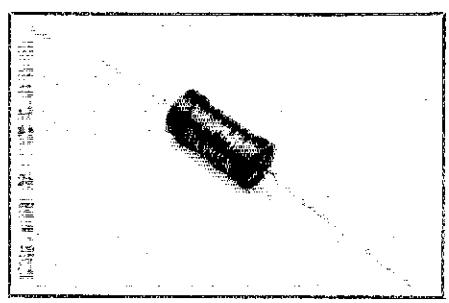


Fig 8—Photograph of a homemade 3-mH RF choke that is wound on an Amidon ferrite bobbin (see text).

Table 1

Homemade RF Plate Choke Performance

Freq (MHz)	*Parallel Resistance (kilohms)*	*RX Meter Reading*
28.0	100	$X_L = 3$
24.9	125	$X_L = 2$
21.0	125	$X_L = 1.5$
18.0	100	$X = 0$
10.1	100	$X_C = 1$
7.0	125	$X_C = 6$
3.5	100	$X_C = 30$

These values were measured by means of a Boonton Radio Corp 250-A RX meter. X_L is a plus reactance and X_C is a minus reactance. Series resonances for this RF choke are approximately 36, 43 and 64 MHz. The choke inductance is 65 μH and the Q_L (unloaded Q) is 120. Although the RF choke shows a parallel resistance of approximately 100 kΩ at 1.8 MHz, the capacitive reactance was off scale at this frequency. Therefore, the data were not included in the table. The choke should, however, perform satisfactorily at 160 meters.

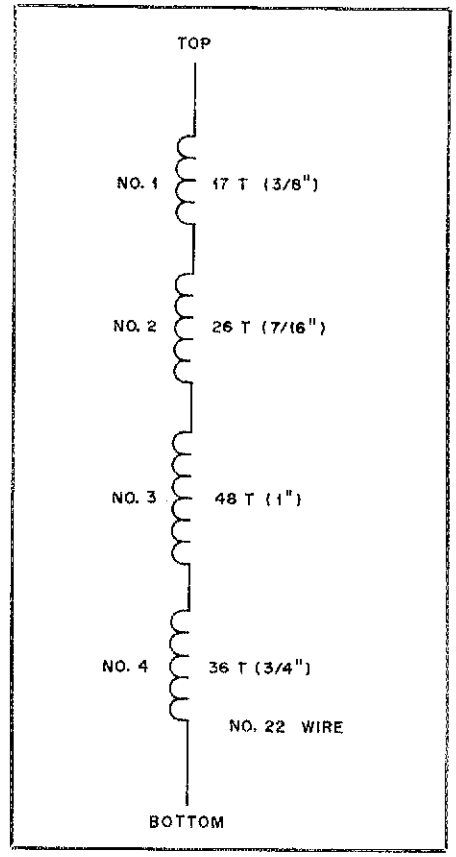


Fig 9—Details of the plate RF choke shown photographically in Fig 7. A continuous winding is broken up into four sections to reduce the effects of stray capacitance. Dimensions are included for the lengths of the four close-wound windings.

(continued on page 22)

Using *QST*s to Choose an Old HF Rig

Want to buy a used HF transceiver? *QST*'s Product Reviews can be a big help.

By George F. McCanless, Jr, KA4GSQ
3218 Panorama Dr
Huntsville, AL 35801

The Product Reviews in old *QST*s are invaluable in selecting a used HF transceiver. Product Reviews replaced the previous Recent Equipment articles beginning in January 1976. The change in the column title accompanied a change to more extensive laboratory testing in that year. The laboratory testing of Amateur Radio equipment is a highly beneficial service performed by ARRL for members. Although the "experts" may differ over the best method of testing, the approach used in the ARRL Lab has the virtue of being a standard procedure. It has been applied to most of the HF transceivers introduced in the last 10 years.

In preparing this article, Product Reviews appearing over the last 10 years were analyzed. Table 1 digests the information appearing in those reviews.

No transmitter data are given. The ARRL tests show that all transmitters complied with existing FCC regulations on spurious and harmonic emissions. However, in some cases modifications were necessary. A problem that is sometimes encountered in transmitters is distortion. SSB transmitters are not noted for high fidelity. Some transmissions are difficult to understand, and this may be complicated by phase distortion from a synthesized local oscillator. Read the laboratory testing portion of the Product Review and the on-the-air comments. Probably the best way to evaluate transmitter distortion is to listen on the air. A transmitter that sounds good when used by others usually will sound good when you use it, if used correctly. Try to choose a rig that is relatively distortion free.

In addition, such features as passband tuning, IF shift, notch filters, dual VFOs, digital readout, memory, scan capability, FM and FSK have not been included. Generally, later equipment and higher prices indicate more features. The review equipment may or may not have included options. Specific information about a particular rig can be obtained by reading the review.

Table 1 Format

Make and Model

The first column lists the make and model of 44 HF transceivers reviewed in *QST* from January 1976 through October 1986. The equipment is listed in the order that the reviews appeared—earliest review first, latest review last. All units generate a nominal output power of approximately 100 W, unless noted otherwise. Exceptions are the low-power transceivers produced by Heath (HW-8 and HW-9) and by Ten-Tec (Argosy, Century 21, Century 22). All the reviewed transceivers are solid-state designs, unless noted. The all-solid-state rigs have the advantage of easy tune-up and band changing. In addition, mobile or portable operation may be facilitated. The disadvantages are an optional power supply is usually required, and an antenna matching network of some type may be necessary.

QST Issue

This column lists the issue of *QST* in which the review appears. This information is the most significant information presented in this article. If you are considering purchase of a particular used rig, read its review carefully. Then check the next few months of the Technical Correspondence and Hints and Kinks columns for additional information (Feedback or updates). If you have a problem in locating the particular issue, try radio clubs, or the local public or university library. Many hams have saved all issues over a long time—try them, or check the flea market at your next hamfest. Also, the ARRL will furnish a back issue or a copy of the review for a nominal charge.

Bands and Modes

All of the transceivers cover the 80- through 10-meter amateur bands. This column shows any exceptions. Most of the transceivers are capable of CW and SSB operation. The Heath HW-8 and HW-9 transmit and receive CW only, and the Ten-Tec Century 21 and 22 transmit CW only. This column also shows additional bands and modes, such as 160 meters, WARC bands, general coverage capability and AM operation.

Receiver Performance

Three columns are devoted to describing the performance characteristics of the receiver sections. The tests performed in the ARRL Lab are patterned after those described by Hayward and covered in some detail in the *ARRL Handbook*.[1] A recent *QST* article describes the Product Review process, and the procedures that ARRL uses to maintain the integrity of the process.[2] Unless otherwise noted, the column heading 80 m-20 m indicates the test results that were obtained on 80 meters and 20 meters, respectively.

Minimum Discernible Signal

Minimum discernible signal (MDS), or noise floor, is the lowest level signal that can be detected by the receiver. It is the signal level equal to the internally generated noise in the receiver. Seven of the units contain preamplifiers that can be switched in or out of the signal chain. In six cases, the data were obtained with the preamplifier activated. In the testing of the Yaesu FT-102, the preamplifier was inactive. Preamplifiers reduce the MDS. The values in the table range from −144 to −125 dBm. (The lower-level values generally indicate better performance: −144 dBm is better than −125 dBm.) The lower values of MDS only improve performance up to a point, however. In the bands from 160 through 20 meters, reductions below about −132 dBm do not

[1]Notes appear on page 22.

Table 1
Summary of HF Transceiver Product Reviews

Make and Model	QST Issue	Bands and Modes	Noise Floor (dBm)		Receiver Performance Blocking Dynamic Range (dB)		IMD Dynamic Range (dB)	
			80 m	20 m	80 m	20 m	80 m	20 m
Heath HW-8	Apr 76	No 10m	—	—	—	—	—	—
Kenwood TS-820*	Sep 76	160	—	−136	—	114	—	85
Yaesu FT-101E*	Sep 76	160, AM	—	−141	—	108	—	81
Heath HW-104	Dec 76		—	−125	—	94	—	71
Yaesu FT-301D	Oct 77	160, AM	—	−133	—	100	—	75
Ten-Tec Cent 21	Dec 77	—	—	—	—	—	—	—
Kenwood TS-520S*	May 78	160	—	−133	—	104	—	69
Yaesu FT-901DM*	Nov 78	160, AM	−137	−137	114	118	85	90
ICOM IC-701	Apr 79	160	−133	−133	120	120	89	87
Drake TR-7/DR-7	May 79	GC, AM, 160	−133	−133	120	120	84	90
Swan 100MX	Jun 79	—	—	—	—	—	—	—
Ten-Tec 554	Jul 79	—	—	—	—	—	—	—
Yaesu FT-101ZD*	Dec 79	160	—	−139	—	112	—	78
Ten-Tec Omni D	Jan 80	160	−128	−139	115	125	94	90
Kenwood TS-120S	Feb 80	—	−139	—	108	—	75	—
Yaesu FT-7B	Mar 80	AM	—	—	—	—	—	—
Kenwood TS-180S	May 80	160,W	−139	−139	112	114	82	83
Swan Astro 150	Jul 80	—	−127	−131	114	118	84	86
Yaesu FT-107M	Apr 81	160,W, AM	−133	−133	NL	NL	82	90
Kenwood TS-830S*	May 81	160,W	−136	−136	129	NL	83	82
Yaesu FT-707	Jun 81	W, AM	−126	−127	NL	NL	76	80
Kenwood TS-130S	Jul 81	W	−138	−138	109	110	79	78
Cubic Ast 102BXA	Dec 81	160,W	−125	−129	NL	NL	90	84
Kenwood TS-530S*	Mar 82	160,W	−135	−136	112	120	88	90
ICOM IC-720A	Aug 82	GC, AM, 160	−132	−132	NL	NL	97	92
Collins KWM-380	Oct 82	GC, AM, 160, W	−131	−131	NL	NL	NL	NL
Ten-Tec Argosy	Oct 82	(10 MHz)	−133	−133	99	98	64	64
ICOM IC-730	Dec 82	W, AM	−140	−140	NL	NL	NL	96
Yaesu FT-One	Aug 83	GC, AM, W	−133	−138	NL	NL	NL	NL
ICOM IC-740	Sep 83	W, 160	−141	—	125	—	94	—
Yaesu FT-102*	Oct 83	160,W	−127	−127	NL	NL	97	97
Yaesu FT-77	Nov 83	W	−139	−139	99	99	92	94
Kenwood TS-930S	Jan 84	GC, AM,W	−139	−139	NL	NL	88	87
Heath SS-9000	Feb 84	160	−138	−140	119	118	88	91
Kenwood TS-430S	Mar 84	GC, AM,W	−138	−137	NL	NL	95	90
Heath HW-5400	Oct 84	W	−135	−133	110	112	82	90
Yaesu FT-980	Nov 84	GC, AM, W	−138	−138	NL	NL	NL	NL
Yaesu FT-757GX	Dec 84	GC, AM, W	−140	−137	NL	NL	90	89
ICOM IC-751	Jan 85	GC, AM, 160	−142	−138	NL	NL	91	93
Ten-Tec Cent 22	May 85	W(10 MHz)	−131	−128	112	109	82	81
Heath HW-9/HWA-9	Jul 85	W	−130	−128	124	122	99	88
ICOM IC-745	Sep 85	GC, AM, W, 160	−140	−144	115	116	92	94
ICOM IC-735	Jan 86	GC, AM, W, 160	−134	−133	NL	NL	92	88
Kenwood TS-940S	Feb 86	GC, AM, W, 160	−140	−139	141	138	93	97

*Indicates solid-state design with tube final amplifiers. 160 = 1.8-2.0 MHz. W = WARC bands. GC = General coverage. AM = Amplitude Modulation. NL = Noise limited. IC-730, IC-740, IC-751, IC-745, IC-735 and FT-757GX data are with preamplifiers active. FT-102 data are with preamplifier inactive. Test bands for HW-104, FT-301D and IC-740 are not given.

provide better performance because the natural atmospheric noise dominates. Lowering the noise floor in these bands may actually complicate other facets in the design. However, on 10 and 15 meters, lowering these values does indeed help.

Blocking Dynamic Range

Blocking dynamic range is a measure of the receiver's ability to copy a weak signal in the presence of a nearby, strong signal. (By nearby, we mean close in frequency.) The receiver is tuned to a weak signal, (typically −110 dBm), and another signal, 20 kHz away, is fed into the receiver input. The level of the close by signal is increased until the original audio output signal drops by 1 dB, indicating the onset of the collapse of the receiver's ability to process the original weak signal. The strength of the blocking signal is then referenced to the MDS to derive the blocking dynamic range. Thus, if a blocking signal is −25 dBm, and the MDS is −133 dBm, the difference between the two is the blocking dynamic range: 108 dB. The higher this figure is, the better.

Six tests were conducted with the preamplifiers in, and one with it out. Turning on the preamplifiers generally changes the values by −2 dB. The blocking dynamic range values in Table 1 run from 94 dB to 141 dB.

Sixteen of the transceivers show that blocking dynamic range is "noise limited." This is a problem that has arisen with the advent of synthesized local oscillators used in the newer equipment. A synthesized local oscillator operates by sampling the output of a voltage-controlled oscillator. The sample is fed to a frequency divider. This is a digital integrated circuit that divides by a number, N, chosen by the operator. Thus, a subharmonic is generated. The subharmonic is compared with the output of a crystal oscillator in a phase/frequency detector. Depending on whether the subharmonic is too low or too high, a dc signal

is produced that regulates the voltage-controlled oscillator that generates the oscillator output. Filters are also incorporated. The net result is that the output frequency is N times the frequency of the reference crystal. Detailed descriptions of these phase-locked loops can be found in Helfrick, Williams and in recent editions of the *ARRL Handbook*.[3,4]

Synthesized circuits provide excellent frequency stability on the average. However, they tend to hunt for the proper frequency and generate what is referred to as "phase noise". In attempting to perform the ARRL blocking tests, loud noise sometimes occurs long before the 1-dB compression drop is obtained. It is sometimes referred to as phase noise, as hash, or as reciprocal mixing. The problem is discussed in the reviews of the FT-101ZD, FT-107M, TS-930S and KWM-380.

Thousands of the transceivers that are noise limited in the blocking tests have been purchased and are in use. This noise is a potential problem that buyers should be aware of. It points out the importance of thoroughly reading the reviews and testing equipment on the air.

Intermodulation Distortion

The intermodulation distortion (IMD) test determines to what extent two nearby signals can combine and produce energy in the passband of the receiver. In these tests, signal generators produce two fundamental signals that are of equal strength and 20 kHz apart. The two signals are fed simultaneously into the input of a receiver in the CW mode, and incorporating CW filters. When these two signals encounter nonlinear devices, or more specifically, mixer stages, various combinations of the signals are generated at discrete frequencies. The "third-order" frequencies are troublesome to the receiver because they are very close to the fundamental test signals. A detailed description of the phenomenon is given by Kerwin.[5]

The frequencies of the two third-order terms are determined by subtracting one fundamental frequency from twice the other fundamental. The example given in recent editions of the *Handbook* uses two fundamental frequencies at 14.040 and 14.060 MHz. These two frequencies yield third-order products at 14.020 and 14.080 MHz. During testing, the receiver is tuned to one of the third-order frequencies, for example 14.080 MHz, and then the two nearby, equal-strength signals at 14.040 and 14.060 MHz are increased from a very weak level while the audio output from the receiver is monitored. The strength of the two signals is recorded at the point where the audio output rises 3 dB above the internally generated noise. This level is referenced to the noise floor, and is defined as the IMD dynamic range. The higher the dynamic range, the better the receiver.

Again, six tests were conducted with activated preamplifiers and one without. The preamplifiers generally alter the results by 2 dB. Tests with two transceivers were noise limited because of the synthesized local oscillators. Values of IMD dynamic range in Table 1 vary from 64 dB to 99 dB.

Anomalies

Another consideration, not indicated in Table 1, is that of anomalies. About 20% of the equipment tested exhibited some sort of malfunction. Most were minor, but some were quite significant. Admittedly, most of the units tested were among the first off the production line. Most of their problems have been corrected, no doubt. Nevertheless, anomalies are a matter of concern. In buying a used rig, a warranty covering some time period is desirable. If that isn't feasible, checking the rig out at your QTH is a good idea. Using the rig at the seller's QTH is another alternative. At any rate, be aware that anomalies do exist and protect yourself as well as you can.

Prices

How much should you pay for a used rig? When you read the Product Reviews, check that issue of *QST* for advertised new prices. Remember that the transceiver was current-production equipment at that time. This will give you a good base to compare the relative values of two or more different rigs. Look through the used-equipment ads that appear in the current issues of *QST*—they'll give you an idea of values at present. Remember that most advertised prices do not include options—try to determine the value of such things as CW filters, built-in or optional power supplies, and so forth. They should be factored into your cost-value decision.

Conclusion

There is a lot of good, used equipment available. People have worked the world with all sorts of equipment. You first need to decide whether you must have an all-solid-state rig or will settle for tube finals. Decide what features you need, or will probably use. Check the noise floor, blocking dynamic range and IMD dynamic range of your candidate rigs. Remember that these figures come from tests on just one production item. There can be a variance among units in the same or different production lots. Next, take a look at price considerations. This process should narrow your choices.

From this point on, read Product Reviews, Technical Correspondence and Hints and Kinks. Listen on the air and find out how your candidates sound. Then, when you have located *your* rig, see what warranty or on-the-air testing you can arrange. Bear in mind that anomalies could be a potential problem.

Remember that there is no substitute for doing your homework. Following these procedures should provide you with an excellent used HF rig at a very reasonable price.

Notes

[1]W. Hayward, "Defining and Measuring Receiver Dynamic Range," *QST*, Jul 1975, pp 15-21.
[2]Bruce O. Williams, "The Product Review Process," *QST*, Dec 1985, pp 22-24.
[3]A. Helfrick, "The Universal Synthesizer," *QST*, Sep 1981, pp 18-23.
[4]F. Williams, "A Digital Frequency Synthesizer," *QST*, Apr 1984, pp 24-30.
[5]K. Kerwin, "Intermodulation Distortion: A Mystery Solved," *QST*, Jan 1984, pp 26-29.

RF Chokes

(continued from page 19)

it secures the wire and the dividers to the main coil form.

Polystyrene tubing will melt and become deformed in the presence of excessive heat.

PVC tubing* should not *be used as the main coil form, owing to its poor RF properties.

Therefore, this choke should be used only in a cooled amplifier compartment. Locate the choke at least 3 inches from the power-tube envelope. A piece of Delrin® rod can provide a more heat-resistant coil form (check with your local plastics dealer for this material). PVC tubing *should not* be used as the main coil form, owing to its poor RF properties.

In Closing

All too often I hear amateurs complaining about being unable to locate a commercially made RF choke of some specified value. Not only does it take time to find sources of supply for specific chokes, but the chokes can cost a fair amount of money. We can often build a good plate choke for under a dollar, whereas we might spend upwards of $10 (material plus shipping) to buy a commercial equivalent. Homebuilt RF chokes are not only less expensive, they can be made in a single evening!

One more tip is in order: Do not use a metal clamp at each end of the choke winding for attaching the coil wires. A closed conductor of that type is equivalent to a shorted coil turn. This will destroy the coil Q. I checked to learn the actual effect of a shorted turn on the plate choke of Fig 7. The unloaded Q dropped from 120 to 30 with only one closed conductor at the top end of the RF choke. A metal clamp can be used, provided it is not a complete conductor. That is, it can be circular to, say, 300 degrees. A nonconductive screw and nut are then used to compress the clamp for a tight fit on the coil form.

Monolithic Microwave Integrated Circuits

Part 1: Wait! Even if you're not interested in microwaves, you can still use these low-level gain blocks in your next RF project. They work from dc to nearly daylight!

By Al Ward, WB5LUA
Rte 9, Box 132
McKinney, TX 75069

Monolithic microwave integrated circuits (MMICs) are sure to revolutionize receiver and transmitter design, just as low-noise GaAsFET devices did 10 years ago. Just what is an MMIC? The field is expanding so rapidly that the answer to that question changes every month. In this article, I will concentrate on low-level amplifier MMICs, useful in many ham projects, that are available in small quantities to individuals. This type of MMIC is a chip that contains a single-stage, Darlington-connected bipolar transistor pair with internal biasing. A combination of series and shunt feedback establishes input and output impedance, sets the device gain and ensures stability. The chip is contained in one of a variety of standard low-power, stripline transistor packages.

The state of the art is progressing rapidly in the fabrication of single-package RF ICs, and the term MMIC applies to devices other than single-stage amplifiers as well. Manufacturers have demonstrated that complete receiver front-end assemblies—including RF amplifier, mixer and even the local oscillator—are possible on a single chip. With current technology, MMICs are usable to 18 GHz!

The MMICs that I've used in my projects are from a family of silicon MODAMP™ MMICs manufactured by Avantek. Similar devices are available from NEC, Siemens (MSC) and others. The MODAMP is a modular gain-block amplifier with nominal 50-ohm input and output impedance. With the exception of one special series, these devices are unconditionally stable. Some versions provide usable broadband gain at frequencies above 4 GHz. Low-frequency performance is limited only by the value of the series blocking capacitors used at the input and output of the device.

An MMIC chip can replace an entire amplifier stage that uses the standard hybrid approach with discrete transistors, capacitors and resistors. Size is reduced dramatically, as is manufacturing assembly time. An MMIC chip is merely mounted to the case housing, and small bond wires tie the input and output to the appropriate pins on the device case. Since inductive elements and large bias decoupling capacitors are sometimes best done "off chip" because of their physical size, these are generally the only additional components needed to build a complete MMIC amplifier stage.

A Typical Circuit

The schematic of a typical MMIC amplifier stage is shown in Fig 1. A circuit like this is usable with most MMICs over a frequency range from dc to 3 or 4 GHz. The only thing that changes with frequency is the value of C1, C2 and RFC1.

Everything inside the shaded lines is contained inside the MMIC package! Series and shunt feedback resistors are shown as R_E and R_B, respectively. R1 and R2 are used in addition to R_E and R_B to set the quiescent operating point of each device.

The standard MODAMP MMIC requires an external resistor, R3, to complete the bias network for the device. An external RF choke, RFC1, is often used to isolate R3 from the RF path. Some versions of the MODAMP MMIC include R3 inside the device. While at first this may seem convenient, the external resistor/RF choke combination offers greater bandwidth and gain capability.

Choosing the right values for RFC1 and R3 is important to obtain maximum gain and power output from the MMIC. The combination of RFC1 and R3 should have a high reactance, greater than 500 ohms, at the frequency of operation. Carbon resistors work fine for R3. The RF choke is important—depending on the value of R3, amplifier gain can drop as much as 1 dB if RFC1 is eliminated. This is caused by the parallel loading of the resistor across the nominal 50-ohm output impedance of the MMIC.

The value of R3 can be calculated from a simple equation:

$$R3 = \frac{V_{cc} - V_{MMIC}}{I_{MMIC}} \qquad \text{(Eq 1)}$$

where V_{cc} is the available supply voltage.

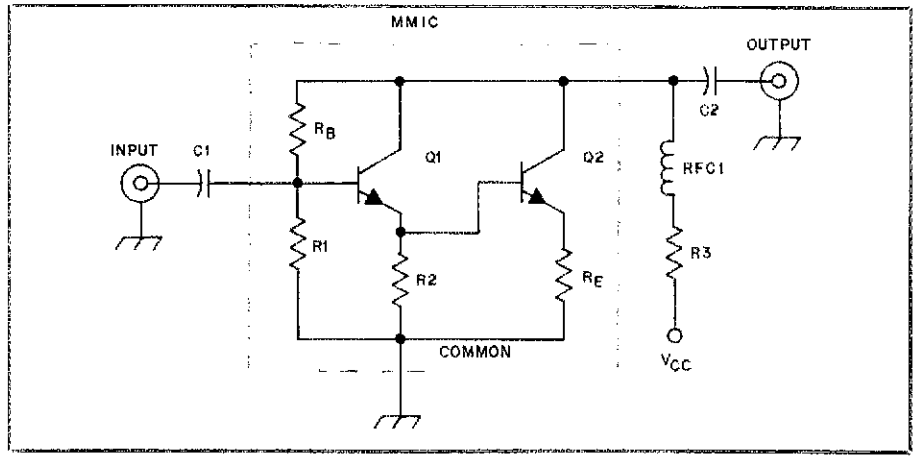


Fig 1—A complete MMIC amplifier stage uses only a few parts and no tuned circuits. Everything inside the shaded lines is contained inside the MMIC package.

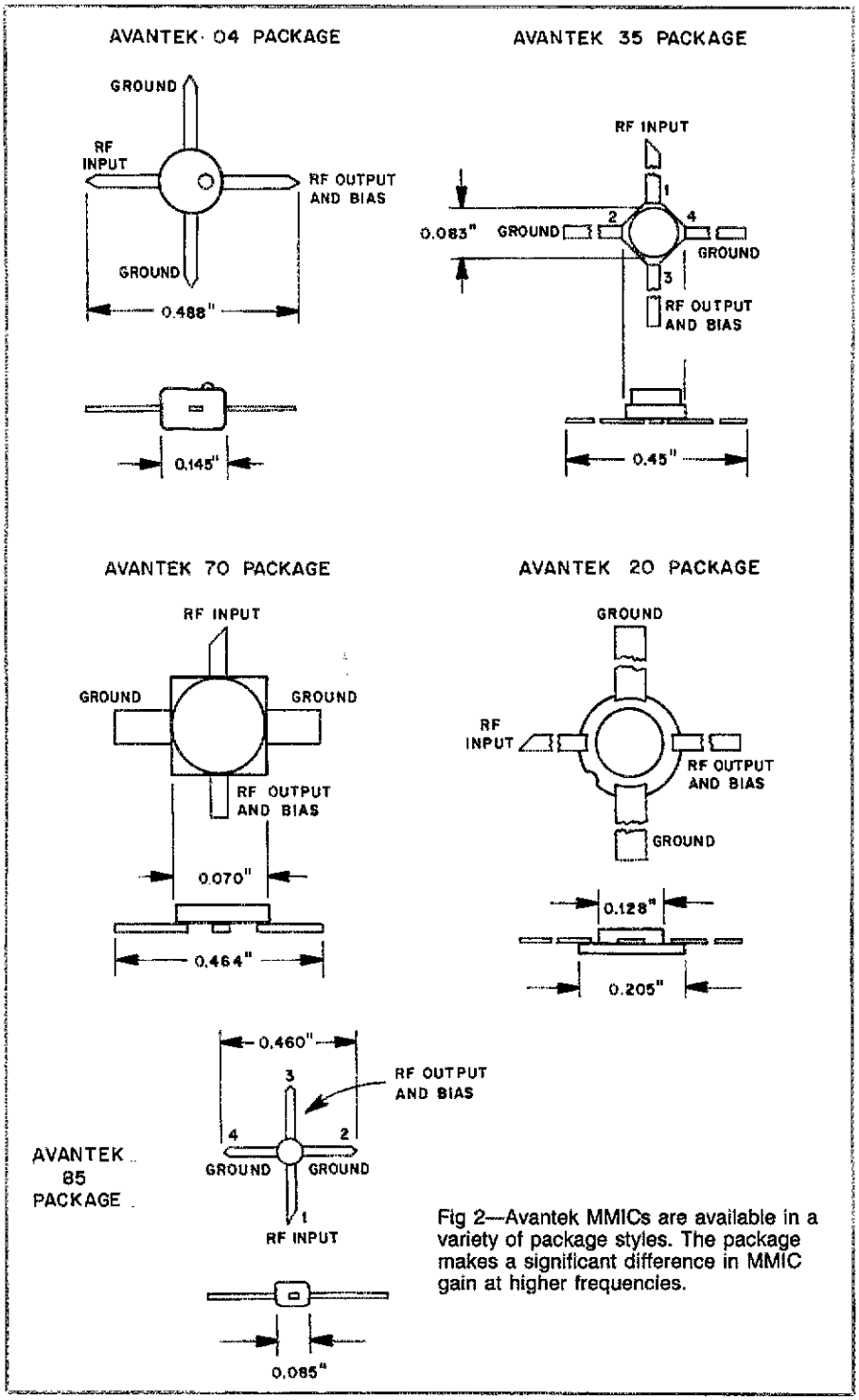


Fig 2—Avantek MMICs are available in a variety of package styles. The package makes a significant difference in MMIC gain at higher frequencies.

V_{MMIC} and I_{MMIC} are specified on the data sheet for the specific device being used.

As Eq 1 indicates, the higher the supply voltage, the higher the value for R3. This is advantageous from the standpoint that a higher value for R3 will load the output of the MMIC less and allow the MMIC to produce greater gain.

R3 also serves as a temperature-compensating element for the MMIC. As the device beta (β) increases with temperature, collector current will increase. Increased collector current causes an increased voltage drop across R3, which tends to decrease the voltage to the MMIC. This in turn decreases MMIC current. An additional advantage of using an external carbon resistor is that the carbon resistor has a positive temperature coefficient, whereas an MMIC with the internal resistor for R3 has a negative temperature coefficient. (A positive-temperature-coefficient resistor is one whose value increases with temperature.)

The manufacturer suggests a 2-V differential between the MMIC operating voltage and the supply voltage for best gain performance over a wide range of temperatures. If V_{cc} was applied directly to the MMIC, with R3 equal to 0, the device would self-destruct when the ambient temperature was increased to +100°C. Even though a 2-V differential is optimum, a differential of up to 7 V is still acceptable, especially when you consider the relatively narrow temperature range over which typical amateur equipment operates.

The only other components needed to complete the amplifier circuit are C1 and C2, which act as dc blocking capacitors. C1 and C2 should be chosen for low reactance at the frequency of operation, preferably several ohms. For an HF or VHF MMIC amplifier, silver-mica capacitors will work fine. For frequencies above 1 GHz, however, good low-loss ceramic chip capacitors are a must.

MMIC Device Families

The part numbers established by Avantek categorize MODAMP devices by performance. A typical Avantek MMIC has a part number like this: MSA-AABB-CD. Table 1 shows the various Avantek device types and explains how MMIC characteristics are given by the part number.

Outline drawings for some popular Avantek MMIC packages are shown in Fig 2. Generally, the plastic 04 package may be most desirable for commercial or amateur applications where temperature extremes vary from −25°C to +75°C. The "micro-x" 35 package is an industry standard for microwave transistors. It is hermetically sealed and offers acceptable performance over a wider temperature range (−55°C to +125°C). The "micro-x" package also offers improved RF performance above 2 GHz because the package parasitics are lower than those of the plastic 04 package. Recently introduced by Avantek, the 85 "micro-plastic" package combines the low cost advantages of the 04 package with the high-frequency advantages of the 35 package. The thermal resistance, θ_{jc} (the ability of the device to dissipate power), is rated at 200°C/W for the 04 package and 140°C/W for the "micro-x" package. For the 85 package, θ_{jc} is rated at 150°C/W. Single-unit prices are in the $8, $3 and $4 price range for the 35, 04 and 85 packages, respectively.

For more rugged environments that require military screening, the Avantek 0.200-inch-square disc package (type 20 package) or the 70-mil stripline package (type 70) are available. The 20 package has a θ_{jc} of 65°C/W, making it capable of greater power dissipation and hence greater power output than the other package types. For the 70 package, θ_{jc} is 130°C/W. Prices for these "high rel" parts start at $30, so they are generally not used for amateur applications.

Another new release that probably won't see much amateur use is the 86 style package. This one takes advantage of

Table 1
MMIC Nomenclature

The Avantek MODAMP MMICs each have a part number like the following: MSA-AABB-CD. The part number gives some important information about the device. Here's a guide to some characteristics of the various device families.

The number designated by AA defines which MODAMP die is used. The primary differences among the die types are maximum power output, gain and noise figure (NF). The performance numbers given here are approximate and will vary with package style and frequency. Presently there are six available types:

Type	*Characteristics*
01	Low power (+1 dBm), high gain (18 dB) and moderate NF (5 dB)
02	Medium power (+4 dBm), medium gain (10 dB) and moderate NF (6 dB)
03	High power (+10 dBm), medium gain (10 dB) and moderate NF (5.5 dB)
04	Highest power (up to +17 dBm), low gain (8 dB) and moderate NF (6 dB)
07	Similar to 02 except lower operating voltage and lower NF (4.5 dB)
08	Highest gain (30 dB at 100 MHz), medium power (+12 dBm) and low noise figure (3 dB) (Note: This device is not unconditionally stable and care must be given to bias decoupling design.)

BB designates package configuration. Presently there are five available package options.

Style	*Package*	*Comments*
04	Plastic	145-mil-diameter package, low cost; reduction in high-frequency performance
20	BeO	200-mil-square beryllium-oxide package (ceramic); excellent thermal conductivity for higher power applications
35	Micro-x	100-mil-square, economical glass-sealed package with excellent high-frequency performance
70	Stripline	70-mil-square, gold-plated package for "high rel" applications
85	Micro-plastic	85-mil-diameter, low-cost package with excellent high-frequency performance; similar to the micro-x package
86	Surface-mount	Version of 85 package with leads formed for surface-mounting techniques; decreased high-frequency performance

Options

Some of the ceramic-style MMIC families have a suffix (-CD) tacked on to the end of the part number. An example is the MSA-0335-21. A -1 for the first number of the suffix indicates that the series-bias resistor (R3 of Fig 1) is built in. The -1 series require an operating voltage of about 12 V. A -2 indicates that an external bias resistor is required, and the operating voltage is typically 5 to 6 V. In the -1 series with the built-in bias resistor, one of the common leads is a V_{cc} terminal. In the -2 style, there are two ground leads.

The second digit of the suffix is used to designate a premium part which typically has a better high-frequency response. For example, the gain of the MSA-0235-11 is 1 dB less at 1 GHz than it is at 100 MHz. For the MSA-0235-12, however, the frequency at which the gain is 1 dB lower is 800 MHz. This is quite a difference in performance!

These options apply to the 01, 02 and 03 geometries in the 35 and 70 packages. The 04 series (for example, the MSA-0470 or MSA-0435) has no bias or frequency-response options and therefore no suffix.

The 04 and 85 package styles are designed such that both common leads are grounded for best high-frequency performance. Dc is then fed in via the bias network arrangement discussed earlier, and there is no internal-bias-resistor option. This is the standard arrangement, so these styles have no suffix after the package style (for example, MSA-0104).

surface-mount technology, but generally requires mounting to a ceramic substrate to attain adequate heat sinking.

For most amateur applications the 04, 35 and 85 packages are most appropriate. Later in this article I will describe amplifiers that use the 04 and 85 packages since they are the least expensive and are readily available from local distributors in any quantity desired.

MMIC Manufacturing Processes

MMIC chip manufacturing processes are very similar to those for silicon bipolar transistors. An excellent series on these manufacturing processes appeared in *QEX*.[1] The technology necessary for building MMIC chips didn't exist until a few years ago. For example, state-of-the-art nitride self-alignment and ion-implantation techniques are used for precise doping control. This guarantees a high degree of uniformity among wafers of MMIC chips. Nitride passivation assures high reliability by minimizing oxidation buildup on the chip. Precision thin-film resistors are fabricated directly onto the chip so that on most versions only one external resistor is needed to set the bias point. The small reactances associated with the internal feedback resistors enhance the high-frequency characteristics of the MMIC. All of these factors result in high-volume production and low manufacturing cost.

[1]Notes appear on page 32.

Performance

There are so many different MMIC versions that sometimes it's not easy to decide which to use for a given application. In Tables 2 through 4, I have summarized typical gain and 1-dB-gain-compression performance data for the various MMIC families. The data, which covers popular amateur frequencies, was obtained from Avantek specification sheets and represents performance at optimum current for continuous operation.

Performance figures for the popular MSA-0104 through MSA-0404 plastic-package MMICs are shown in Table 2. Since it's often necessary to cascade or parallel units for additional gain or power output, I've included information on various combinations as well.

Table 3 shows performance data for several of the "micro-X" 35 versions. By comparing these figures with those of Table 2, it is evident that the microwave packages do offer superior performance above 2 GHz and should even be considered for work in the 1296-MHz band.

Table 4, for devices with the 85-type package, shows that this series is a good compromise between price and performance at higher frequencies. It's readily apparent that gain above 902 MHz is approximately 1 to 2 dB greater with the 85 package than the 04 package. The 85 and 35 packages offer similar gain above 902 MHz. The 85 package is certainly the choice for economy, yet it still retains the high-frequency performance of the 35 package style.

Input and output SWR is typically less than 2:1 for all of the MMICs. Noise figure ranges from about 5 to 7.5 dB for the 01 through 04 series, with the 01 having the lower noise figure. The 08 series devices have minimal internal feedback and therefore have a lower noise figure—typically 3 to 4 dB up to 3 GHz. Gain of the 08 series is the highest of any of the MODAMP MMICs, but care must be taken in the layout and bias network design since this series is not unconditionally stable. This point will be covered in the practical construction section.

Applications

These MMICs can find many uses in receiving and transmitting equipment in both the RF and IF sections. Since they require no tuned circuits and the 01 through 04 series are unconditionally stable, MMIC amplifiers can be built quickly and easily in a minimum of space. In a test setup, for example, an MMIC can be used as a broadband scope or counter preamplifier when low-level gain is needed. In a receiver, MMICs can be used as RF and IF amplifi-

Table 2

Typical Gain and 1-dB Compression Point (P_{1dB}) Performance for 04 Style Avantek MMICs

Type	*Frequency (MHz)*									
(MSA-)	*30*	*50*	*144*	*220*	*432*	*902*	*1296*	*2304*	*3456*	
0104	19	19	19	18	17	14	12	9	6	dB Gain
	+8	+8	+7	+6	+4	†	†	†	†	dBm P_{1dB}
0204	13	13	13	13	12	11	10	8	6	dB Gain
	> +7	> +7	> +7	> +7	+7	+5	+4	+2	†	dBm P_{1dB}
0304	13	13	13	13	12	11	10	8	6	dB Gain
	> +13	> +13	> +13	> +13	+13	+11	+10	+5	†	dBm P_{1dB}
0404	8	8	8	8	8	8	7	6	5	dB Gain
	> +13	> +13	> +13	> +13	> +13	+13	+13	+13	†	dBm P_{1dB}
For Cascaded 04 Type Devices:										
02/03	26	26	26	26	24	22	20	16	12	dB Gain
	> +13	> +13	> +13	> +13	+13	+11	+10	+5	†	dBm P_{1dB}
02/03/04	34	34	34	34	32	30	28	††	17	dB Gain
	> +13	> +13	> +13	> +13	+13	+13	+13	††	†	dBm P_{1dB}
03/04/04	†††	†††	†††	†††	†††	†††	†††	22	16	dB Gain
	†††	†††	†††	†††	†††	†††	†††	+13	†	dBm P_{1dB}
For Four 0404 Devices in Parallel:										
4-0404	> +19	> +19	> +19	> +19	> +19	+19	+19	+19	†	dBm P_{1dB}

†Not specified.
††Not recommended for 2304 MHz because of compression of the 03 stage.
†††Not analyzed.
Note: This information was obtained from Avantek data sheets and represents typical performance at the current specified for continuous operation.

Table 3

Typical Gain and 1-dB Compression Point (P_{1dB}) Performance For 35 Style Avantek MMICs

Type	*Frequency (MHz)*				
(MSA-)	*902*	*1296*	*2304*	*3456*	
0135	17	15	11	9	dB Gain
	†	†	†	†	dBm P_{1dB}
0235	12	11	10	8	dB Gain
	+11	+9	+6	†	dBm P_{1dB}
0335	12	12	10	7	dB Gain
	+12	+10	+6	†	dBm P_{1dB}
0435	8	8	7	5	dB Gain
	+12	+10	+6	+5	dBm P_{1dB}
0835	24	20	15	12	dB Gain
	+13	+14	+12	+10	dBm P_{1dB}

†Not specified.
Note: This information was obtained from Avantek data sheets and represents typical performance at the current specified for continuous operation.

ers. For applications where a low noise figure is not critical, an MMIC can be used as a front end. In transmitters, MMICs can be used for all low-level stages up to 50 mW or so, depending on the device chosen.

Practical Construction

This part of the article is for those of you who have a practical application for an MMIC amplifier or just want to experiment to see how they really behave. Here, I will describe the construction of single and cascaded MMIC amplifiers and show the measured performance of several popular combinations.

Since there are so few parts in an MMIC amplifier, it won't take too long to gather them and it won't break the bank either. Study Tables 2 through 4 and pick the MMIC best suited for the frequency range and power level you need. For most appli-

Table 4

Typical Gain and 1-dB Compression Point (P_{1dB}) Performance for 85 Style Avantek MMICs

Type	*Frequency (MHz)*									
(MSA-)	*30*	*50*	*144*	*220*	*432*	*902*	*1296*	*2304*	*3456*	
0185	18	18	18	17	17	15	14	10	7	dB Gain
	> +7	> +7	+7	+5	+4	+3	+2	†	†	dBm P_{1dB}
0285	12	12	12	12	12	12	11	10	8	dB Gain
	> +9	> +9	+9	+7	+5	+5	+5	†	†	dBm P_{1dB}
0385	12	12	12	12	12	12	11	10	7	dB Gain
0485	8	8	8	8	8	8	8	7	6	dB Gain

†Not specified.
Note: This information was obtained from Avantek data sheets and represents typical performance at the current specified for continuous operation.

cations, I'd recommend the 85 series because they work well and cost only a few dollars each. Avantek components are available through a number of distributors nationwide. Contact Avantek for the name and address of the distributor for your area.[2] You should have no trouble buying MMICs in small quantities from any distributor.

You'll also need some small-diameter wire, around no. 26 or 28, to make the RF chokes. For the external bias resistor, you'll need an assortment of ¼- and ½-W resistors with values of up to about 400 ohms. The circuit also contains a few capacitors for bypassing and dc blocking. The dc blocking capacitors can be good-quality silver-mica or ceramic units for frequencies through the VHF range. Ceramic chip capacitors are highly recommended for UHF work and above, though. One source of ceramic chips in small quantities is Microwave Components of Michigan.[3] Last, you'll need to decide what type of connectors to use to mate your amplifier to the outside world. I prefer SMA connectors because they are small and they work well at 900 MHz and above, where I do most of my experimenting these days. You can put the finished unit in an enclosure if you wish.

A Simple VHF Amplifier

A simple VHF test amplifier using an MSA-0204 and MSA-0304 can be built from the schematic of Fig 3. C1 through C7 are all common silver-mica or miniature-ceramic capacitors. The 0.1-μF capacitors are used along with the 0.001-μF bypass capacitors to suppress low-frequency oscillations occurring in the bias decoupling network. Remember that the MMICs have a significant amount of low-frequency gain, so good bypassing is a must.

R1 and R2 are ½-W carbon types. The exact value will depend on the type of device used. Table 5 shows typical bias-resistor values (for a 12-V supply) for popular MMICs. These values assume continuous operation at the specified current level. If you use a different supply voltage, you can calculate the resistor value from Eq 1. The optional RFC for each MMIC was not used in this circuit.

I built one version of the amplifier on a piece of 0.015-inch-thick hobby brass bolted to the inside of a standard aluminum box, as shown in Fig 4. Both MMIC common leads are soldered directly to the brass ground plane.

Another version was built using a scrap piece of double-sided, 0.062-inch-thick, glass-epoxy circuit-board material instead of the brass sheet. To assure a good ground for the MMIC common leads, drill a hole in the board and solder them to the ground plane side (which is pressed flat against the case ground). The best way to do this is to use the lead of a 1-W resistor as a bending fixture so that the leads don't break off.

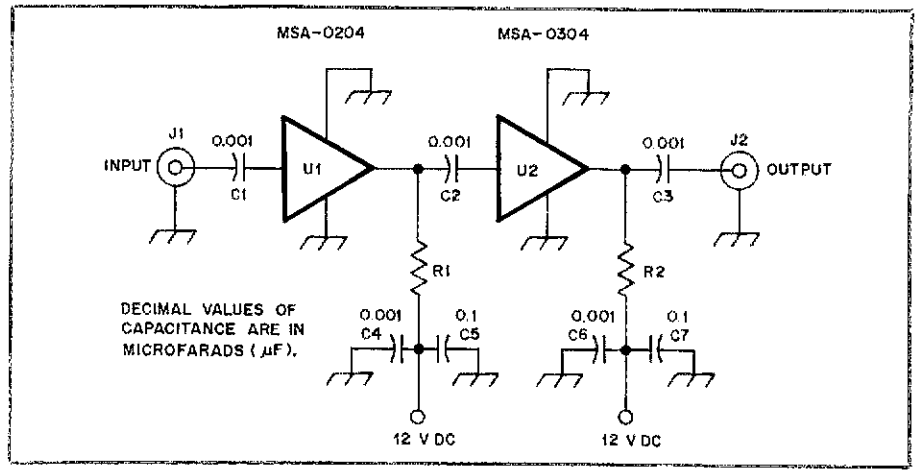


Fig 3—Schematic diagram of the simple HF and VHF MMIC amplifier. Capacitors are silver-mica or ceramic types, and values are expressed in μF. The resistors are ½-W carbon units.

J1, J2—Female, chassis-mount BNC connector.
U1—Avantek MSA-0204.
U3—Avantek MSA-0304.

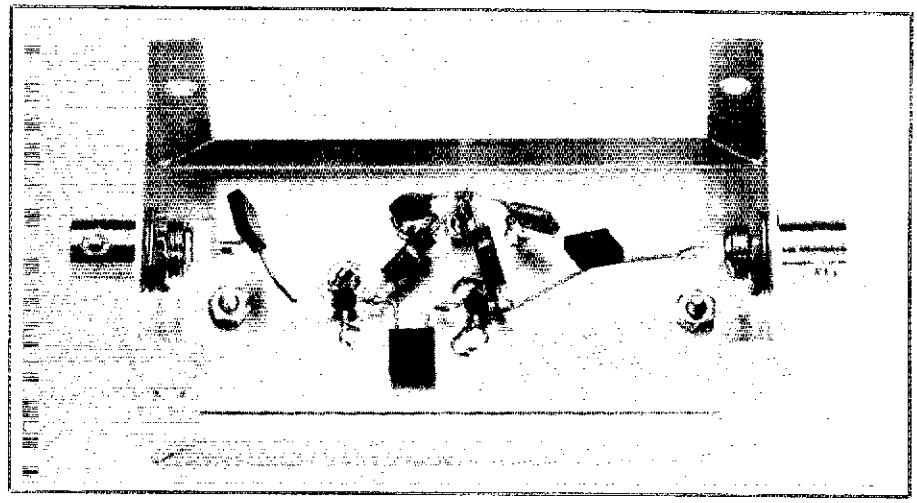


Fig 4—The amplifier of Fig 3 is built on a brass sheet inside a small aluminum box. All ground points are soldered to the brass sheet.

Table 5
Bias Resistor Information For Various Avantek MMICS

Type (MSA-)	Optimum Current (mA)	Resistor Value for V_{CC} = 12V dc (Ohms)	Resistor Dissipation (Watts)
0104	20	330	0.13
0204	30	220	0.20
0304	40	180	0.29
0404	50	130	0.33
0135	22	270	0.13
0235	40	150	0.24
0335	50	120	0.30
0435	50	130	0.33
0835	35	120	0.15
0185	17	410	0.12
0285	25	280	0.18
0385	35	200	0.25
0485	50	140	0.35

Bend the common leads down and then away from the package so the device will lay flat when soldering to the groundplane. See Fig 5. Other construction details are the same as for the amplifier shown in Fig 4.

The gain plots in Fig 6 show that both versions have usable gain well above 1 GHz. Measurements were made on a swept network analyzer. Curve A is for the brass-sheet amplifier, while curve B is for the PC-board version. Lead lengths were purposely made longer on the brass-sheet version (3/8 inch versus 1/4 inch) to see the effect on high-frequency performance.

Since the swept network analyzer plots only characterized the amplifier down to 50 MHz, additional point-by-point data was taken to evaluate performance at specific HF frequencies. This data is shown in Table 6. The 0.001-μF blocking capacitors begin to roll off the gain below about 7 MHz. For improved gain performance at

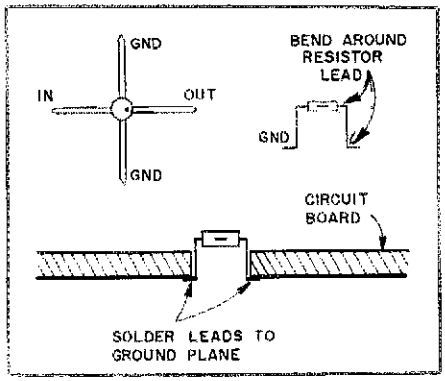


Fig 5—Mounting details for the MMIC. Double-sided PC board material is used instead of brass sheet for the amplifier of Fig 4.

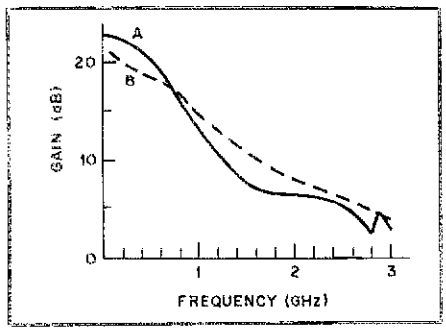


Fig 6—Gain versus frequency for the simple VHF MMIC amplifier. The curve at A is for an amplifier built with brass sheet for the ground plane, while curve B is for the PC-board version. See text.

low frequencies, the blocking capacitors were changed to 0.1 μF. Calculations predict a 1-dB gain reduction to occur at a frequency below about 100 kHz when using 0.1-μF capacitors. High-frequency performance above 50 MHz may suffer, depending on capacitor parasitics.

The basic test amplifier will find many uses around the amateur station. Some possibilities include use as an IF amplifier for a converter or receiver or as an IF amplifier for an automatic noise figure meter. With the 0204/0304 combination, noise figure will be around 6 dB below 1 GHz and 1-dB gain compression at the output will typically be +10 dBm or greater.

Techniques for Using MMICs at UHF and Above

To realize the total gain potential of MMICs at frequencies above 902 MHz, microstripline techniques are required. A cross-sectional view of a microstrip transmission line is shown in Fig 7. The actual impedance of the microstripline depends on the line width (W), the height of the line above the ground plane (h), and the dielectric constant (ϵ_r) of the material separating the line from the ground plane. Microstripline impedance calculations are beyond the scope of this article, but you can learn more about them from several good articles that have appeared in the amateur literature.[4-6]

The microstripline PC board can be etched, or you can use a sharp knife and hot soldering iron to create isolated pads on any piece of scrap board. Common glass-epoxy material is fine for most applications below 2 or 3 GHz; we'll cover this in detail later.

An amplifier built on microstripline is shown in Figs 8, 9 and 10. Standard 0.062-inch-thick, double-sided, glass-epoxy PC-board material has a dielectric constant about 5.0. A microstripline with a characteristic impedance of 50 ohms is about 0.10 inch wide on this material. The line lengths needed for an MMIC amplifier are short enough that the loss of glass-epoxy material is acceptable, even at 3456 MHz.

The board layout shown in Figs 9 and 10 lends itself rather nicely to using 2- or 4-hole flange-mount SMA-type connectors. Gold-plated SMA connectors can be easily soldered to the bottom ground plane. Remember to clear away a circle of copper 0.150 inch in diameter around each SMA center pin on the ground-plane side of the board. This will prevent the center pin from shorting to the ground plane and also ensures a smooth RF transition between the connector and the board.

To ensure a low-loss, low-inductance path to ground for the common leads of the MMIC, pieces of thin copper or brass foil (preferably no greater than 0.005 inch thick) are used to tie the ground areas on the top of the board to the bottom ground plane. First wrap the edges of the board. Then drill a hole where the MMIC mounts that is big enough to wrap a piece of this foil under the common leads, through the hole, down to the ground plane. Solder the foil on both sides of the board. Alternatively, drill a small hole through the board under the ground leads of each device. Bend the leads down, through the small holes, and solder them to the top and bottom ground areas.

In the UHF amplifier, good-quality 0.050-inch- or 0.100-inch-square ceramic-chip capacitors are used as dc blocks. These capacitors are necessary for good gain performance at frequencies around 1 GHz and higher. Use a 15-W soldering iron when installing the chip capacitors to avoid removing the metallization during assembly. An excellent article on the selection and use of chip capacitors appeared in *QEX*.[7]

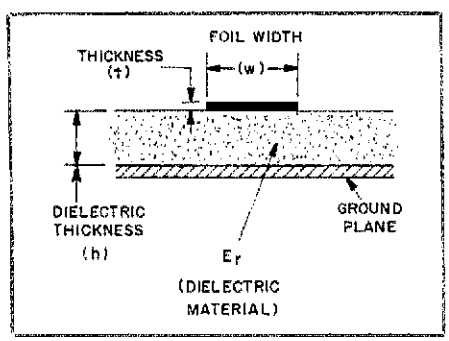


Fig 7—Cross-sectional view of typical microstripline construction.

Table 6

MMIC Amplifier Performance at HF

With 0.001-μF Blocking Capacitors:

Frequency (MHz)	*Gain (dB)*
28	21.4
7	20.6
3.5	19.0
1.2	19.0

With 0.1-μF Blocking Capacitors:

Frequency (MHz)	*Gain (dB)*
28	21.7
7	21.4
3.5	21.5
1.2	22.0

Table 7

Performance of Various Microstripline MMIC Amplifiers

MMICs Used (MSA-)	*Frequency (MHz)*	*Gain (dB)*
0104/0104	500	30.42
	900	28.07
	1300	24.75
	2300	16.65
	3400	11.25
	4000	7.15
0204/0304	500	22.70
	900	21.52
	1300	19.50
	2300	14.40
	3400	10.00
	4000	8.49
0404/0404	500	14.45
	900	14.48
	1300	12.46
	2300	10.80
	3400	6.65
	4000	5.79

RFC1 and RFC 2 are made from no. 26 or 28 enameled wire. The chokes offer a high impedance to RF at UHF and microwave frequencies. At lower VHF frequencies, the reactance of the RF chokes is rather small, and R1 and R2 appear as terminations for low frequencies.

Bypassing is similar to that used in the VHF amplifier. The 0.1-μF capacitors can be used to reduce low-frequency oscillations in the bias decoupling network. When cascading two or more MMICs in a typical receiver or transmitter strip, it may be advantageous to use additional decoupling. Remember that MMICs, especially the 01 and 08 series, have significant gain at low frequencies (several megahertz). If the bias decoupling is not adequate, the amplifier may oscillate from feedback in the bias network. If you experience low-frequency oscillations, try adding a 1-μH RF choke in series between V_{cc} and each bias resistor, and then bypassing each end of the 1-μH choke with a 0.001-μF capacitor.

I built several amplifiers with combina-

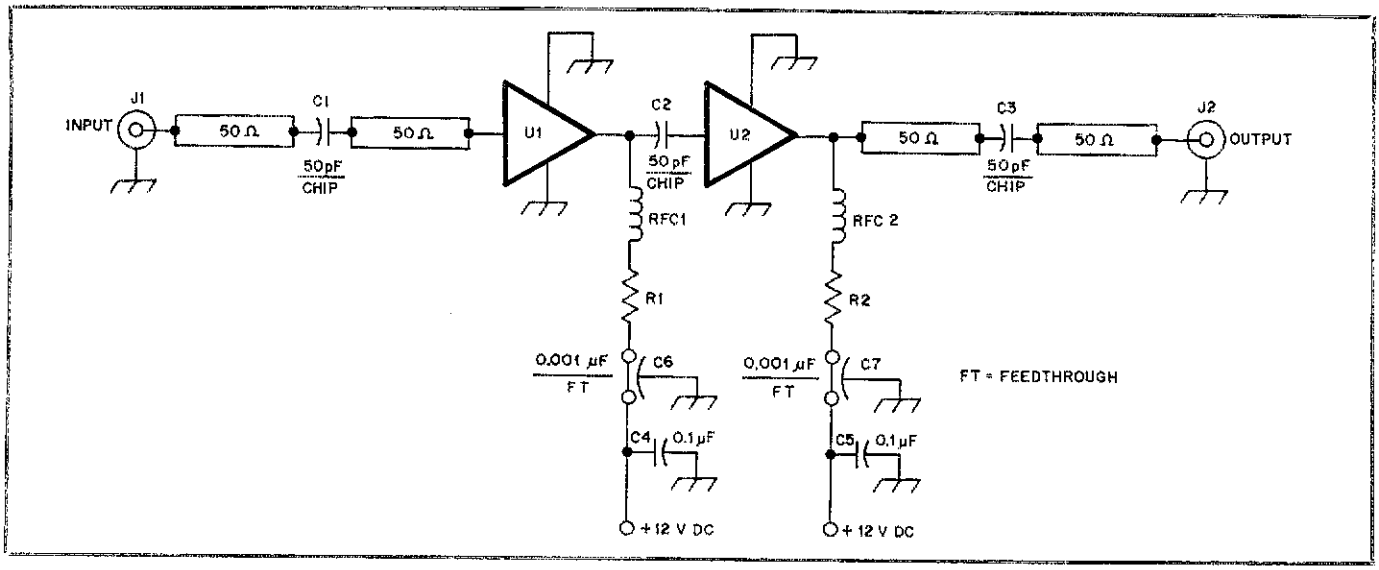


Fig 8—Schematic diagram of the microstripline MMIC amplifier.

C1-C3—50- to 100-pF ceramic chip capacitor. Good quality, 50-mil- or 100-mil-square units are preferred. See text.

C4, C5—0.1-μF, 25-V ceramic disc.

C6, C7—470- to 1000-pF feedthrough capacitor.

J1, J2—Female, flange-mount SMA connector.

R1, R2—Carbon bias resistors. See text and Table 5 for values.

RFC1, RFC2—4 turns no. 26 or 28 enam wire, 0.125-in ID, spaced 1 wire diam.

U1, U2—Avantek 04 series MMIC. See text.

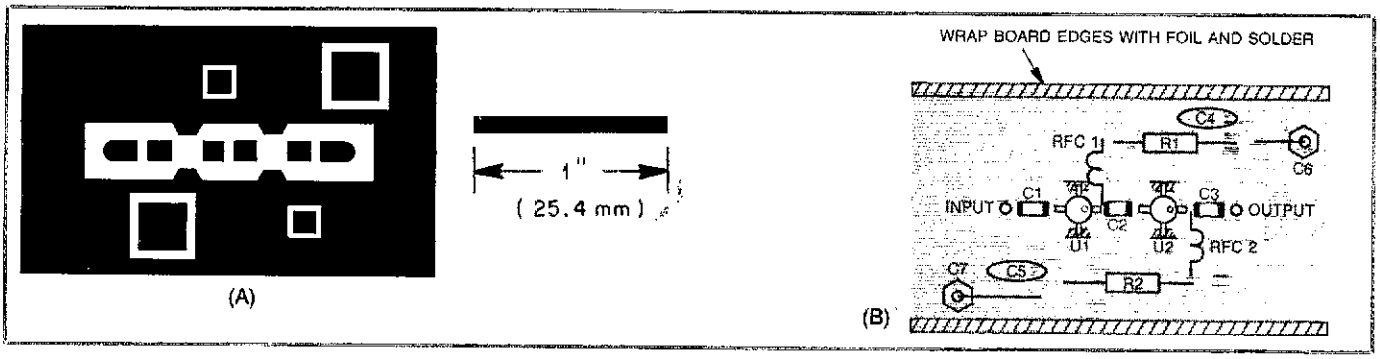


Fig 9—Etching pattern and PC-board layout information for the microstripline MMIC amplifier of Fig 8. All components mount on the circuit-trace side of the board. A PC board can be etched from the pattern shown at A, or a sharp knife and hot soldering iron can be used to clear away unwanted copper. Black areas represent unetched copper.

tions of the 04 series MMICs and measured the performance of each. The configurations are: (1) 0104 driving 0104; (2) 0204 driving 0304; and (3) 0404 driving 0404. Gain for these amplifiers is shown in Table 7.

Notice the vastly improved performance of the microstrip 02/03 combination as compared to the VHF version shown in Fig 3. This is because the 50-ohm transmission lines match the MMIC to its 50-ohm source and load. The gain obtained was slightly less than advertised in the data sheets, but is probably caused in part by the use of lossy glass-epoxy material. It is possible to enhance the high-frequency performance above 2 GHz by using low-loss, Rogers® 5880 circuit-board material. For 0.031-inch-thick board with a dielectric constant of 2.17, a 50-ohm line would be about 0.10 inch wide. For 0.062-inch-thick board, a 50-ohm line is about 0.20 inch wide.

Some gain reduction can be attributed to mismatch loss caused by SWR interactions between the output port of one MMIC and the input port of the second MMIC. This effect is more pronounced at higher frequencies where SWR is typically higher. This subject will be covered in Part 2 of this article.

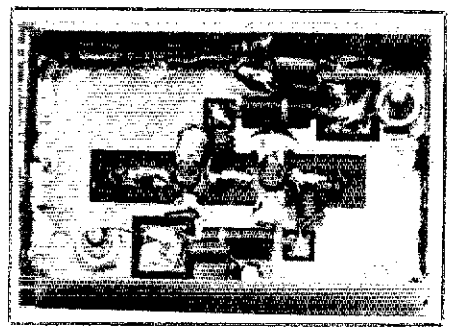


Fig 10—Here is the completed MMIC amplifier, ready for testing. If desired, it can be mounted in an enclosure such as an aluminum box, or you could solder together side and bottom plates made from scrap circuit-board stock or from sheet brass.

Noise figure for the 0104/0104 configuration was measured at 4.7 dB at 1296 MHz and 5.3 dB at 2304 MHz. Noise figure below 1296 MHz will typically be 4.5 dB. The 1-dB-gain-compression point of the 02/03 combination was measured at +10 dBm at 1296 MHz and +5 dBm at 2304 MHz, referenced to the output port. For the 04/04 combination, the 1-dB-gain-compression point was +13 dBm at 1296 MHz and +12 dBm for 2304 MHz. Slightly improved gain performance can be expected by using the 85 package style MMICs.

A High-Gain, Low-Noise MMIC Amplifier

A similar microstripline test amplifier was built using a single MSA-0835 MMIC. Since this particular series is not unconditionally stable, there are a few special considerations. I chose a 200-ohm, ½-W carbon resistor to bias the MMIC at 25 mA for the lowest possible noise figure.

(continued on page 32)

The Miniaturized, Simplified London Tone Alert

If you thought the original control decoder was an innovative project, try this modified version!

By Ced Tanner, VE3BBI
548 Upper Queen St
London, ON N6C 3T9, Canada

After my article on the London Tone Alert appeared in *QST*, the correspondence I received seemed to dictate a need for a small, easy-to-build pocket-sized tone alert.[1] Using the basic idea described in the original text, I have developed a simple unit that works with a single DTMF (dual-tone, multi-frequency) audio tone, is not subject to falsing, is built on one board and can fit into a tiny box. Other features, such as visual indicators to display that the unit is operating correctly, can be added. This information is offered in my first article.

[1]Notes appear on page 32.

The London Tone Alert

The London Tone Alert is a special circuit that plugs into a 2-m transceiver. It is one of the most important tools a civil-emergency-preparedness group can use during an emergency. When such a situation arises, the responsible group member presses an assigned numerical button on the transceiver's DTMF pad for two seconds. In turn, this procedure enables the tone alert to sound in those members' 2-m transceivers that have been silently monitoring the frequency. The group is now alerted

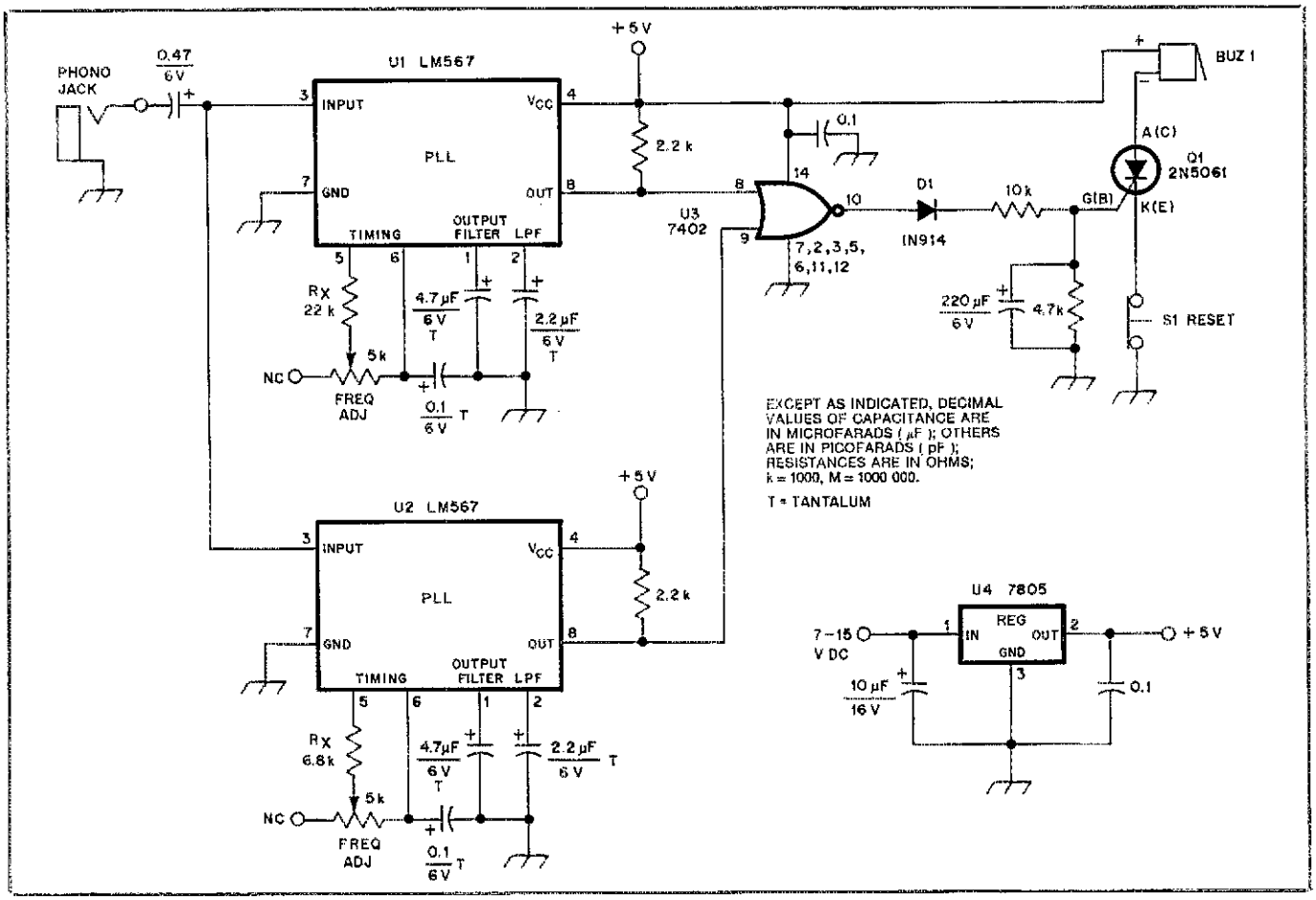


Fig 1—The schematic for the simplified, miniaturized London Tone Alert. All resistors are ¼-W, 5% carbon types.
D1—Diode, 1N914.
LS—6-V buzzer (RS part no. 273-054 or equiv).
Q1—SCR, 2N5061.
S1—Normally closed push-button switch.
U1, U2—Tone decoder, LM567.
U3—Quad 2-input NOR gate, 7402.
U4—Voltage regulator, 7805.

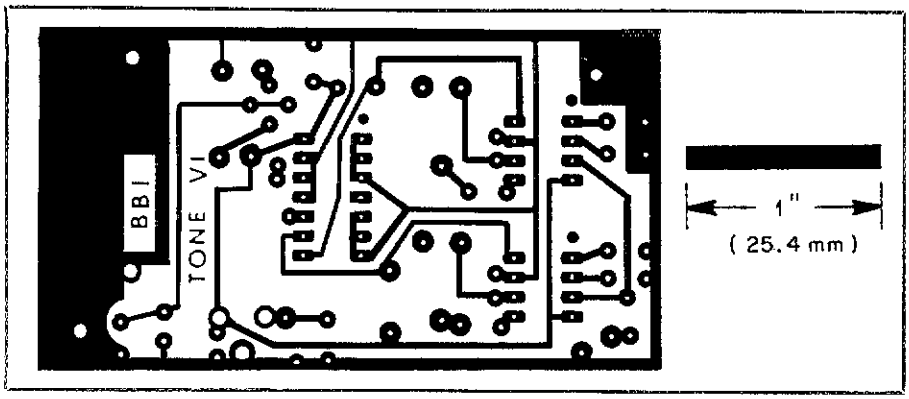


Fig 2—Circuit-board etching pattern for the Mini London Tone Alert. The pattern is shown full-size from the foil side of the board. Black areas represent unetched copper foil.

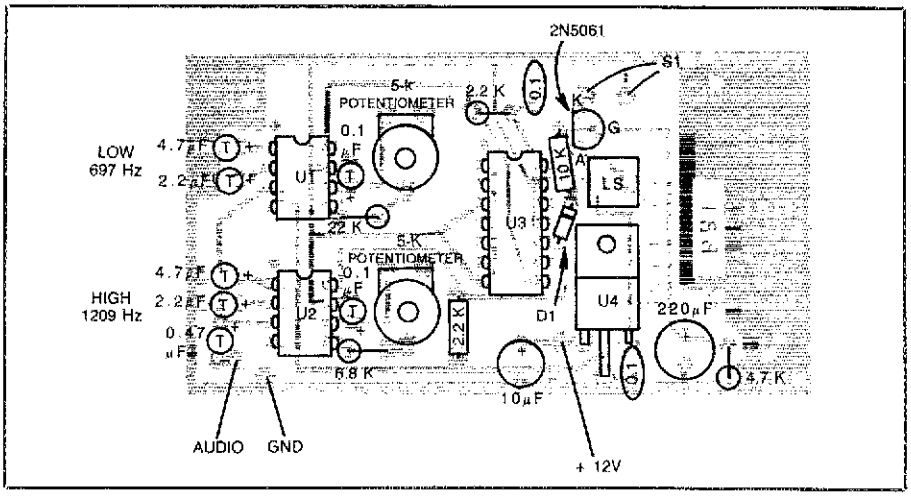


Fig 3—Parts-placement guide for the Mini London Tone Alert. Parts are placed on the nonfoil side of the board; the shaded areas represent an X-ray view of the copper pattern. Gray areas represent unetched copper.

that help is needed and voice communications can commence.

How the Unit Works

A three-wire cable plugs into the accessory socket of the 2-m transceiver. Here, the cable connects to the + 12 V line, ground and the audio output. (Using this connection configuration, the transceiver's speaker is not disabled.) The cable enters the small box that will hold your circuit; the box should have a normally open push-button switch on its top, and side holes to pass the sound of the buzzer.

When a remote station senses an emergency situation, button no. 1 on the 2-m rig's DTMF pad is pressed for 2 seconds or more to activate the buzzer in the tone-alert circuit. The sound is loud enough to be heard throughout the house. Then, by simply pushing the button on the box top, the buzzer is disabled and the device is reset. The circuit continuously monitors for an alert tone when it is plugged into an activated receiver.

When the decoder is tuned to the no. 1 tone, it serves as a personal alert and also responds to the general tone alert, which is 1-4-7 in London. In each case, a delay is incorporated in the first digit to eliminate falsing. My circuit has been in operation for several months and it continues to work fine.

The Mini-London Tone Alert's main function is to alert individuals in times of emergency or emergency-preparedness tests. But, we may not be using the device to its full potential. Imagine a group of friends who commonly share an interest in ATV. Each member could be assigned a personal calling number and alerted individually when operating conditions are just right. There are many possibilities, limited only by the imagination.

How the Circuit Works

Fig 1 is the schematic diagram of the London Tone Alert. The speaker output of a receiver is fed into the audio input jack that connects to the input terminals (pin 3) of the two LM567 PLLs. Valid tones are detected by two 567 PLLs, producing a logic "low" at their outputs (pin 8). When this level is applied to U3, a positive pulse appears at the output. This signal is directed through a diode and resistor to the gate of the 2N5061 SCR which immediately conducts to sound the buzzer. (An NPN transistor can be substituted in place of the SCR for a short-burst tone alert. More on this later.) To prevent the SCR from being triggered by voice transients, a short delay is introduced by the 220-µF capacitor. This means that the transmitted tone must last for two seconds or more. Each button on the DTMF pad produces two tones. Though we are interested in using only one tone, both tones help to prevent falsing. The 4.7-kΩ resistor between the SCR's gate and ground stabilizes the circuit, further preventing false triggering.

Note that only one of the four sections available in the 7402 is used. The other three sections are connected to ground. These include pins 2, 3, 5, 6, 7, 11 and 12 and are shown on the schematic.

By using a 7805 voltage regulator, input voltages from 8 to 14 can be used. The voltage, of course, depends on what your equipment can supply. A 9-V battery can also be used, but is not recommended for extended periods of operation. The regulator can be eliminated if a 5-V power supply is available. The buzzer is disabled by pressing the reset button (S1).

Construction

Use ¼-W resistors; stand them on end, if necessary, to conserve board space. Low-voltage capacitors can be used which need not be rated at more than 6 V. Tantalum capacitors are used throughout the circuit because they are small and very stable. The buzzer is from Radio Shack (273-054) and is suitable for this application. Fig 2 shows the circuit board from the foil side; Fig 3 is the parts placement diagram.[2] Use no. 3-48 × ¼-inch machine screws for mounting the board in an enclosure.

I found a carton of small plastic boxes with sliding tops at a local surplus store. My find proved ideal for this project and each cost less than $1. Metal boxes were used for several other tone-alert circuits I built—the boxes were unique and also inexpensive.

Tuning

Every tone produced by a single key press on a DTMF pad is actually composed of two tone frequencies; it is necessary to detect both. I used two LM567 decoders, one for each note, that must be tuned to respond to the required frequencies.

My unit responds to DTMF pad button no. 1 and uses the frequencies shown on the diagram in *The 1987 ARRL Handbook* (697 and 1209 Hz).[3] The frequencies assigned to the other pad buttons may also be found there.

To tune an LM567 to the desired frequency, apply power and connect a frequency counter to pin 6, or to the appropriate end of the 5-kΩ potentiometer. Another 2-m rig can be used as the signal source. Turn the potentiometer from one end to the other to determine if it covers

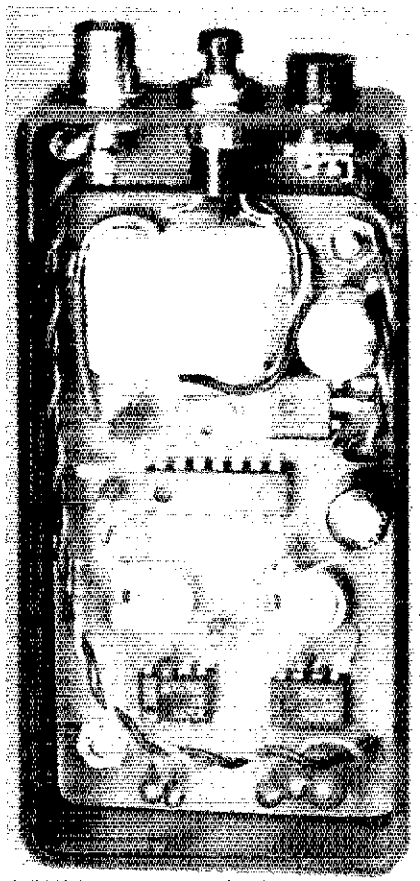


Fig 4—An internal view of the Tone Alert's circuit board.

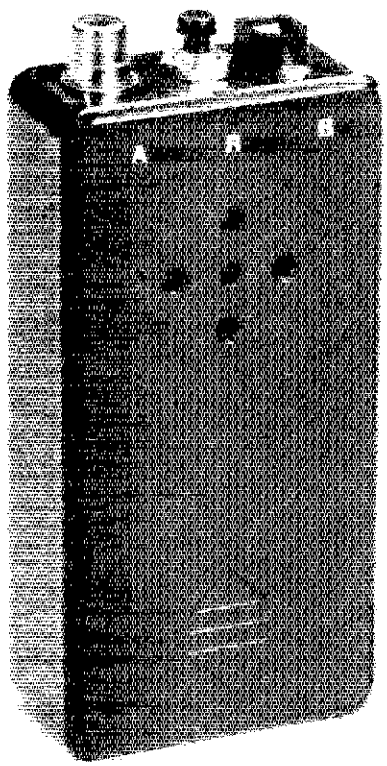


Fig 5—The completed circuit board is housed in a 2- × 4-inch plastic enclosure. The letters A, R and B label the audio socket, reset button and battery plug.

the frequency you want. Then, set the potentiometer accurately. Once this is done, tune the second 5-kΩ potentiometer to the other desired frequency in the same manner.

If the frequency you want does not lie within the potentiometer's range, R_x must be changed. Use a higher resistor value to lower the frequency and a lower value to raise it.

Testing

When the PC board is complete, but not yet mounted in its enclosure, connect the power and the audio input from the jack on your 2-m transceiver. On the base-station transceiver, transmit the tone you are tuned to. After 2 seconds, the buzzer in your circuit should sound. If nothing happens, check that the push button is connected—it is necessary to complete the circuit.

Further checks could be done with an ordinary 20-kΩ/V voltmeter on the 5- or 10-V scale. A positive voltage should be present on pin 8 of each LM567, with the reading dropping to nearly zero when the tone is applied. Now connect the meter to pin 10 of U3; a positive voltage (about 5 V) should appear whenever the tone is applied. If the diode is connected properly, this positive voltage should trigger the SCR and sound the buzzer.

Conclusion

Fig 4 is a photograph of the completed PC board. Fig 5 shows the board mounted in a 2- × 4-inch plastic enclosure. Several throughholes in the casing allow for passage of the buzzer's sound. The letters A, R and B label the audio socket, reset button and battery plug.

Suppose you want the buzzer to utter a short burst, rather than remain activated until the reset button is pushed. Simply change the SCR to an NPN transistor and mount it so that the base mounts in place of the SCR's gate; the collector resides in place of the anode and the emitter rests where the cathode would be. The buzzer will now stop as soon as the transmitted tone subsides. No reset button is necessary. About a 2-second delay still remains to discourage falsing.

Here's an idea for you to work on: See if you can eliminate one of the LM567s and the SN7402 and their associated parts, and still have the circuit work! It can be done, but you will find that it responds to any one of four button tones. Incidentally, this change makes room for a 9-V battery and the complete device fits in a shirt pocket! I would be interested to hear about other novel uses this project suggests.

Notes

[1]T. C. Tanner, "The London Tone Alert," *QST*, Nov 1983, p 35.
[2]The author will supply circuit boards for $5, US funds, plus $1 shipping and handling. The ARRL and *QST* in no way warrant this offer.
[3]M. Wilson, ed, *The 1987 ARRL Handbook* (Newington: ARRL, 1986), p 34-3.

Monolithic Circuits

(continued from page 29)

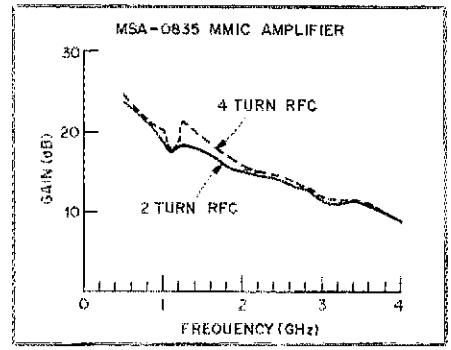


Fig 11—This graph compares the gain of a single-stage MSA-0835 amplifier with 2-turn and 4-turn RFCs. Although the use of a 4-turn choke enhances gain, a 2-turn choke is preferred for amplifier stability.

The RF choke was made from 2 turns of no. 28 wire, 0.125-inch ID, spaced one wire diameter. When the 2-turn RF choke was added in series with the bias resistor, the amplifier exhibited a slight increase in gain in the 500-2500 MHz frequency range without compromising stability. Experimentation with up to 6-turn RF chokes yielded greater gain, but stability was marginal. The 2-turn choke is a good compromise for maximum gain and stability. Depending on the inductance of the bias resistor, the series RF choke may need to be deleted to ensure stability under all circuit conditions.

Actual measured gain response with 2-turn and 4-turn RF chokes in place is shown in Fig 11. Gain (for a single device!) is 24 dB at 500 MHz, while the gain at 3500 MHz drops to 9 dB. Gain was not measured above 3500 MHz. Noise figure as measured at 2304 MHz is in the vicinity of 4 dB with an associated gain of 13 dB—not bad for an untuned microwave amplifier using glass-epoxy PC board material! Gain performance comparable to that shown in Table 3 may be achieved if a lower-loss dielectric material such as Rogers Duroid® were used.

In Part 2 of this article, I will show how to combine MMICs in parallel for increased power output. I will also discuss important parameters such as gain, compression point, third-order IMD products and noise figure and how they should be considered when designing MMICs into your next project.

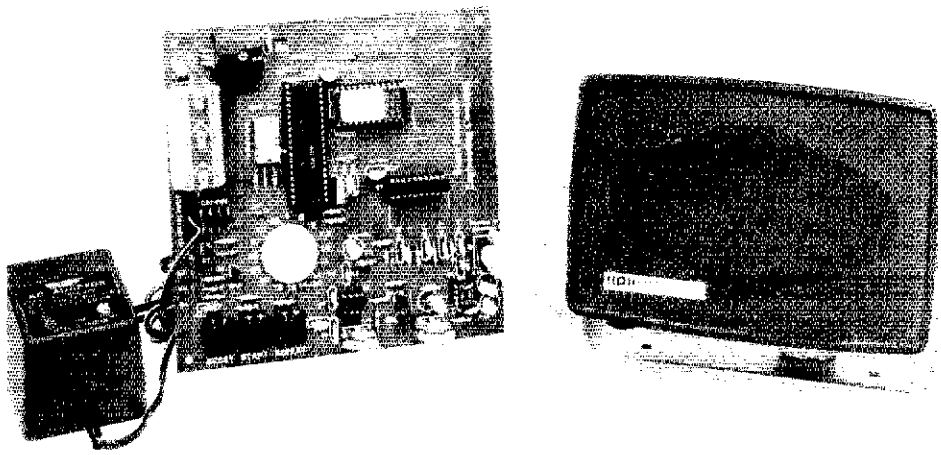
Notes

[1]B. Olson, ">50: Focus on Technology above 50 MHz," *QEX*, Apr 1986, pp 12-15; May 1986, pp 12-14; June 1986, pp 10-11.
[2]Avantek, 3175 Bowers Ave, Santa Clara, CA 95051, tel 408-727-0700.
[3]Microwave Components of Michigan, 11216 Cape Cod, Taylor, MI 48180, tel 313-941-8469 (evenings).
[4]D. Mitchell, "Microstrip Impedance Program," *Ham Radio*, Dec 1984, pp 84-86.
[5]J. Fisk, "Simple Formulas for Microstrip Impedance," *Ham Radio*, Dec 1977, p 72.
[6]J. Fisk, "Microstrip Transmission Line," *Ham Radio*, Jan 1978, pp 28-37.
[7]B. Olson, ">50: Chip Capacitors," *QEX*, Sep 1986, pp 14-15.

Build the Morsemaster II

Learning Morse code can be difficult. This deluxe code trainer will help prepare you for the VE code exams from Novice through Amateur Extra.

By Mike Huddleston, KJ4LN
5440 O'Quinn Ct
Stone Mountain, GA 30088



We hams are proud of our demonstrated ability to use Morse code for communicating. Often criticized as anachronistic in today's world of automatic high-speed digital communication, our use of Morse code remains the single outstanding feature that distinguishes us from most other users of the airways.

On the other hand, the code requirement is also given as the reason many would-be hams never get licensed. It's also the reason so many of us seem to be frozen in the Technician class.

The first Morsemaster was built so that I might, after numerous tries, finally struggle past the 5-WPM code test and get a ham ticket. After getting the Novice license and joining the local club, I realized that lots of people have the same problem with the code. The Morsemaster got passed around. With its help many hams upgraded, and offered many worthwhile suggestions and criticisms that were incorporated into the Morsemaster II. It combines virtually every feature desirable in a Morse-code trainer, and can be built for a modest cost.

The Morsemaster II is self-contained. You can keep it in your desk drawer at the office to practice your code during lunch or other breaks. The pleasant audio quality makes practice sessions less tedious. A virtually endless reservoir of pseudorandom lessons is available—13,107 in each of 15 lesson types. Lessons can be selected for the beginner as well as for the Amateur Extra candidate at crystal-controlled speeds of 4 to 33 WPM. The lesson can be stopped at any time and repeated exactly, even at a slower speed, so you can verify your copy. A built-in printer interface can print out each character as it is sent, and a built-in iambic keyer trainer permits sending practice. And the best part is that you can build it yourself in a few hours from readily available parts—and for less than $50!

Theory Behind the Morsemaster II

Dots and Dashes

The timing of Morse code is based on the dot as the shortest time element. Given that a dot has a certain duration, proper code will have a dash duration three times that of the dot. I personally use "dit" and "dah" in preference to the better-known "dot" and "dash" because the former method mimics the actual sounds of the elements better. Learning the code is a process of identifying the sounds of the characters, and it is important to speak of, and think of, the characters in terms of their sound.

A dot or a dash is called an "element." The space, in time, between successive elements in a character is one dot duration. The spacing between characters is three dot periods, and the spacing between words is seven dot periods. This is the timing you can expect on the 13- and 20-WPM Volunteer Examiner (VE) tests.

The Novice test, however, differs. The characters are generally sent at a rate of about 13 WPM, but the spacing between them is stretched so that only five words are sent in one minute. The reasoning is that characters sent at less than 13 WPM sound artificially long and drawn out. And the good part is that you only need to be able to recognize characters at 13 WPM to get through both the 5- and the 13-WPM code tests. For this reason, the Morsemaster uses 13-WPM characters for every speed from 4 to 13 WPM, and from 14 to 20 WPM it uses 20-WPM characters, adjusting the spacing between them to achieve the 14, 16 and 18-WPM rates. In this manner, the student need only be able to recognize Morse characters at two rates—13 and 20 WPM—to be able to pass all code tests up to Amateur Extra.

Timing and Speed

A Morse-code word consists of five characters. If we choose our characters randomly from the English alphabet and numbers, we will find that there is an average of 60 dot periods, including spacing, in our hypothetical word. On the other hand, if we choose our word content based on commonly used letters and characters, we find only 50 dot periods. This is because the Morse alphabet uses its shortest possible characters for the most common letters. For example, the letter "E," the most frequent in English usage, is the shortest Morse character, being only a single dot. And so on, for most of the characters. The word "Paris" is taken to be a representative common-usage five-character word for timing Morse transmissions. It has 50 dot periods, including spaces. This is the basis for FCC and VE testing for code speed. The word "Codex," with 60 dot periods, is representative of random letters and numbers, with no regard for usage frequency.

The Morsemaster bases its timing on the "Paris" word, as do the amateur code tests. For example, at 13 WPM, the word "Paris" could be sent 13 times in a single minute. In this minute, then, would be $13 \times 50 = 650$ dot periods. No matter what characters are sent, this is their rate. When the Morsemaster sends code at a rate of less than 13 WPM, the 650 dots/minute rate is preserved for the characters themselves, but the spacings between them are elongated.

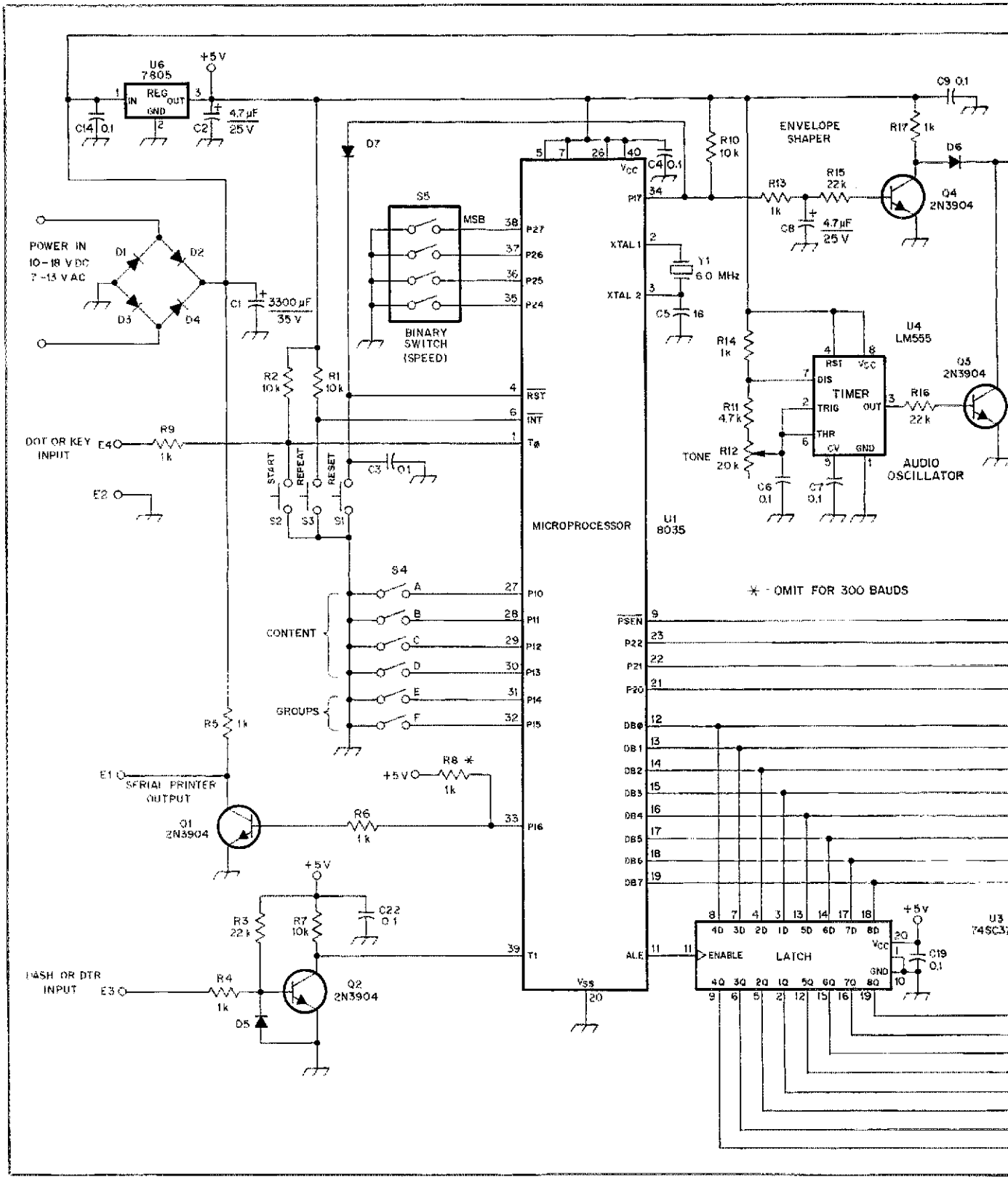
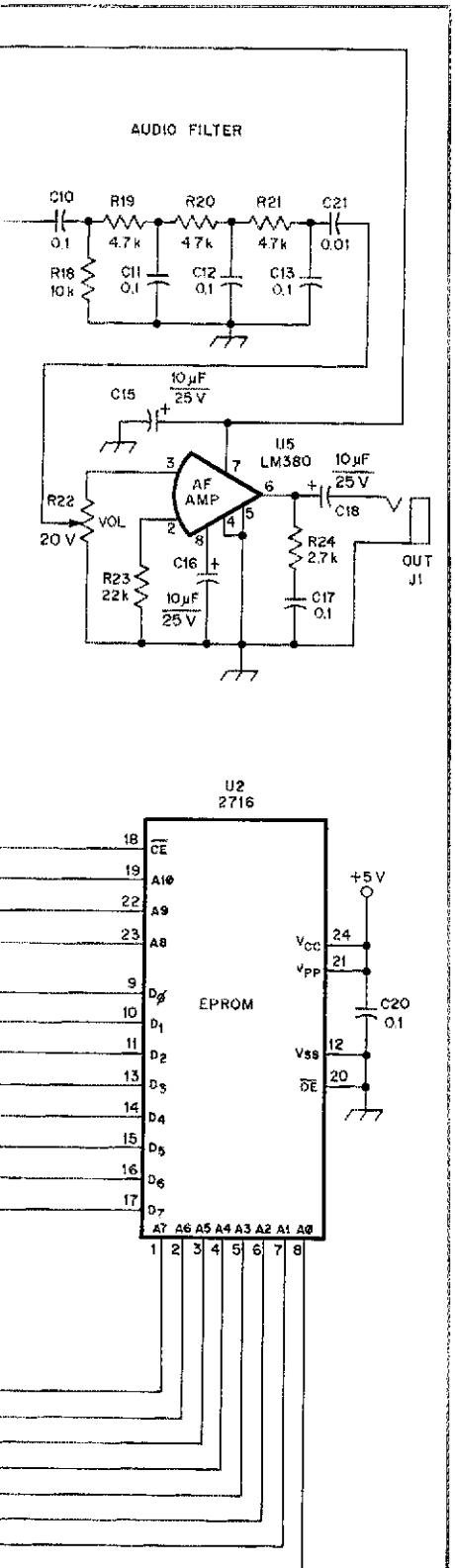


Fig 1—Schematic diagram of the Morsemaster II. Parts source identification: RS is Radio Shack, DK is Digi-key, AMP is AMP Inc.[2,3]

D1-D4, incl—1N4001 rectifier diodes.
D5-D7, incl—1N914 diodes.
J1—3.5-mm miniature phone jack, RS 274-297.
Q1-Q4, incl—2N3904 NPN transistors.
S1-S3, incl—PC-mount push-button switches, DK PN P9951.
S4—Six-pole DIP switch, DK PN CT2086.
S5—16-position BCD rotary switch, AMP PN 1-435167-1.
U1—8035 family microprocessor, DK INS8035LN-6.
U2—2716 EPROM. (Programmed device available; see note 2.)
U3—74SC373, 74HCT373 or 74LS373 latch, DK 74LS373N.
U4—LM555 timer, DK LM555CN.
U5—LM380N-8 audio amplifier, DK LM380N-8.
U6—LM7805T 5-V voltage regulator, DK LM7805CT.
Y1—6.0-MHz series resonant crystal, DK X026.

Miscellaneous

40-pin DIP socket, DK C8940.
24-pin DIP socket, DK C8924.
20-pin DIP socket, DK C8920
8-pin DIP socket, DK C8908 (2 req).
Heat sink for U6, DK HS111.



In all cases, however, the 3:7 ratio of intercharacter spacing to interword spacing is retained.

A further note on code speed is in order. The Morsemaster uses a crystal-controlled microprocessor to provide the critical timing necessary for accurate code-speed settings. Code-speed selection is not infinitely variable, but only those speed settings required for the most efficient learning process are made available. This is not a disadvantage; rather, you as the student are assured of "textbook" code rates—to better than 1% accuracy. These are the same rates and weightings used by Volunteer Examiners for amateur code testing.

Circuit Operation

Refer to Fig 1. The heart of the Morsemaster II is an 8035 single-chip microcomputer. The device has its own internal read/write memory, and supports external program memory in the form of a 2716 (2048 × 8) EPROM. The 74SC373 is used as an address latch for the multiplexed address/data bus. Additional information on this configuration may be obtained by consulting an 8035 data book.

The microprocessor decodes the switch inputs and generates the Morse output. This output, at pin 34, is an inverted-voltage Morse signal that turns on Q4 when there is no tone output, and turns it off when there is. The combination of C8, R10 and R13 provide the 5-ms rise and fall times for the Morse signal, reducing low-frequency "thumping." Increasing the value of C8 will increase the rise/fall time of the tone, and vice versa. The LM555 audio oscillator, U4, runs all the time. Its square-wave output is gated by the smoothed Morse signal through Q4 and D6, and then applied to a conventional passive filter. The low-pass portion of the filter consists of R19, C11, R20, C12, R21 and C13; it removes the harmonics of the square wave produced by U4. The high-pass portion of the filter consists of C10, R18, C21 and R22; its job is to eliminate any low frequency thumping which C8 didn't completely remove. This process is illustrated in the oscilloscope traces in Figs 2 and 3.

As soon as the Morsemaster II is powered up, it begins generating 16-bit pseudorandom numbers at the rate of one new number every 100 microseconds. It continues this until the START button is pressed, at which time it transfers the latest number into a storage register, and begins to output the pseudorandom code sequence called for by the programming switches. After each code character is output, five new numbers are generated, and the last is used for the next character. This allows a total of 32 possible choices for the next character in the sequence of 13,107 characters for each lesson type.

At the completion of a lesson, or if the RESET switch is pressed, code output ceases and the microprocessor resumes its pseudorandom number calculations. If the START switch is then again pressed, the activity described above again takes place. If the REPEAT button is pressed, the microprocessor retrieves the old number it stored the last time the START button was pressed, and uses it to start this new lesson. In this manner, the REPEAT button causes the last lesson to be replayed, while the START button begins an entirely new one.

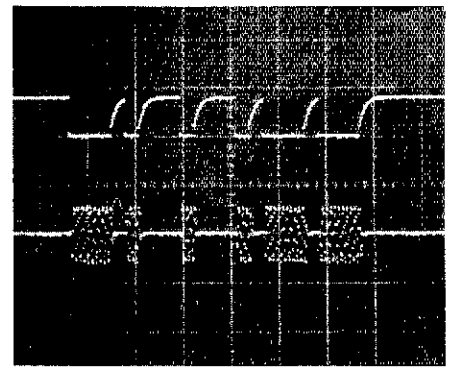


Fig 2—Storage oscilloscope trace of the Morsemaster II sending the character sequence NEW at 33 WPM. Horizontal divisions are 200 ms each. The top trace, at 5 V/div, shows the output of the microprocessor at pin 34 and the lower trace shows the audio output to the speaker at 500 mV/div. The spots on the lower trace are the digital aliases of the audio signal.

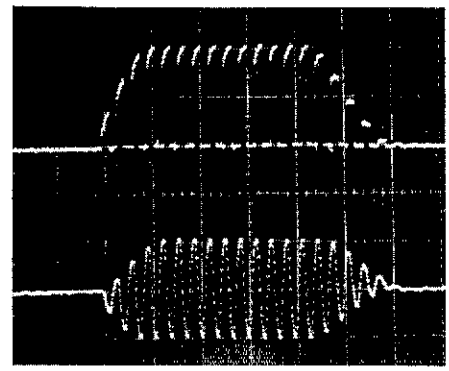


Fig 3—Storage oscilloscope trace of Morsemaster II sending a single dot at 50 WPM. Horizontal divisions are 5 ms each. The top trace shows the gated square wave at the collector of Q3 at 2 V/div. The lower trace shows the same signal at the audio output at 200 mV/div. The approximate 5-ms rise and fall times are evident in each trace. Note the nearly sinusoidal output in the lower trace.

The LM380N-8 audio amplifier is straightforward. It uses a smaller-than-usual output capacitor, C18, to act as another high-pass filter. To use the Morsemaster for maximum audio-output power, the value of C18 can be increased up to about 150 µF, and power output will increase somewhat proportionally. Since increasing the value of C18 will also enhance low-frequency response, some thumping may be heard. If this is the case, C8 may be increased up to about 10 µF, to eliminate the thumping.

Q1 and Q2 are used solely for the printer option. One of the jobs of the microprocessor is to provide a serial character to a printer or CRT after each corresponding Morse transmission. The ASCII character

corresponding to each Morse character is output on pin 33, where Q1 inverts the data and swings its output between about 0.2 and 8.0 volts. Q2 is used as a buffer for the printer's Data Terminal Ready (DTR) line, if one is used. R4 and D5 keep the DTR line from damaging Q2 if it should swing beyond maximum RS-232-C levels.

In most cases, the printer or CRT you elect to use will not require a DTR line, especially at the relatively low data rates of 300 to 600 bauds. However, if your printer does, be aware that it may cause some degradation of the Morsemaster's performance, as the Morsemaster must stop what it is doing to wait for the printer to get ready. If you plan to use a printer with the DTR line, time two identical Morse transmissions (using the REPEAT key); one with the printer attached and one without. In all likelihood there will be no difference, but if there is, you should adjust your Morse data rates to accommodate the lower data rate.

The power supply is thoroughly conventional, using a bridge rectifier input so ac or dc (of either polarity) may be used to power the unit. Permissible input voltages are from 7 to 13 V ac or 10 to 18 V dc. A large filter capacitor is employed, as is a 7805 5-V regulator.

Putting It Together

There's nothing at all critical about assembling the Morsemaster II. All of the parts are readily available and just about any construction technique may be used. If you want to go from scratch, a printed-circuit board or perfboard will be fine. A full-size PC-board pattern, with a parts-placement diagram is available, as well as a hexadecimal program for the EPROM.[1] You may either program your own EPROM (U2), or purchase one already programmed from the source mentioned in the parts list.

Because there are no "tweaks" or restrictions on parts placement, the Morsemaster II should work as soon as you have put it together, providing you used reasonable care in building it. The use of sockets for ICs is recommended, as long as you use good ones. A low-wattage soldering iron, rosin-core solder and care in handling the metal-oxide-semiconductor (MOS) ICs (U1, U2, U3) are essential. If you use the PC board, pay special attention to avoiding solder bridging across runs when you solder a connection. Finding these bridges later is tough, and they are infamous for killing an otherwise perfect project.

The lead spacing for all the resistors, diodes and jumpers on the PC board is 0.4 inch. A neat, professional appearance will result from preforming these leads around U6, the 7805 regulator, which is very close to the exact 0.4-in spacing. Be sure to observe polarity on the electrolytic capacitors, diodes, transistors and ICs. Polarity of these components is shown on the parts-placement diagram and is silk-screened on the PC board (if you elect to buy one).

The recommended order of assembly (again on the PC board) is the following: IC sockets; switches; phone jack; transistors; diodes; crystal; potentiometers; resistors; jumpers; capacitors; U6; and, finally, the power transformer. Before inserting the ICs into their sockets, plug the unit in and check the following voltages with respect to the negative lead of C1: U1, 5 V at pins 5, 7, 26 and 40; U2, 5 V at pins 21 and 24; U3, 5 V at pin 20; U4, 5 V at pins 4 and 8; and 8 to 15 V at U5, pin 7. If any voltage is more than 5% from the specified value, remove power and look for the problem. It will probably be either a cold solder joint, a solder bridge or a forgotten jumper. An unusually high voltage in the 5-V circuit may indicate that U6 is defective. An unusually low voltage in the 8- to 15-V circuit may indicate that one of the rectifier diodes (D1-D4) is defective or installed backwards. Whatever it is, find it before proceeding.

Finally, remove power and install U1, U2 and U3. All three are static-sensitive devices, so use proper antistatic precautions when inserting them. Do not touch their pins. Any problems encountered now will be in the vicinity of U1, U2 and U3, and the long circuit runs connecting them. Be especially on the lookout for any solder bridges or cold joints.

That's about it for assembly. An experienced kit builder should have it together and working in less than two hours, while a newcomer might spend an entire evening. In any event, take your time with assembly and the Morsemaster will still be working years after you've gotten your Amateur Extra ticket.

Using the Morsemaster II

In order to get going with the Morsemaster, you'll need either a speaker or a set of headphones. The headphones or speaker must be terminated with a standard miniature (3.5-mm) plug. The phone or speaker socket is located on the lower-right side of the Morsemaster circuit board. Speaker or headphone impedance is not critical, so just about anything hanging around the house will work. The power supply should be connected to the two terminals marked AC OR DC INPUT on the left center of the circuit board. Any 7 to 13 V ac supply, or a 10 to 18 V dc supply will work fine, as long as it can supply the 150 mA needed by the circuit. Suitable choices are the commonly available plug-in ac adapters offered by literally dozens of mail-order houses and electronics retailers. If you want to use your Morsemaster in the car, a cigarette lighter plug can be used. Since the unit uses a bridge-rectifier input circuit, polarity of the dc supply makes no difference.

The Morsemaster's microprocessor generates low-energy discrete harmonics of 0.4, 2 and 6 MHz. When operated near AM radios or TVs tuned to low VHF channels, interference may occur. The best solution is to move to another room, although a metal case shielding the Morsemaster can be used if desired.

Controlling the Controls

The numerous switches and controls of the Morsemaster II are simple to understand and use. The VOLUME control and the TONE control are self-explanatory. The rest are used as follows:

RESET—This button stops an operation in progress, and readies the Morsemaster for the next command. As long as this button is held down, a steady tone is heard.

START—Pressing START begins the selected Morse lesson. When pressed, it turns on the tone for 0.3 seconds, waits one second, then starts outputting the selected Morse lesson.

REPEAT—Pressing this button repeats the previous lesson, whether it was completed or was terminated by the RESET button. You will find this feature a tremendous help in every phase of your learning process, whether just starting or preparing for the 20-WPM test. When you can hear the same lesson twice, you not only are reinforced, but can verify the accuracy of your work. When the REPEAT button is pressed, the Morsemaster beeps and pauses, as with the START button, then sends the previous lesson over again.

SPEED—The large rotary switch in the lower left of the circuit board controls the code speed, as shown in Table 1. The speed control may be changed at any time, even in the midst of a character being sent. With the Morsemaster, Morse code is never sent at a character rate less than 13 WPM, so this is the slowest speed rate allowed by the keyer function. Of course, the user may space the characters as appropriate for the lower rates.

DIP SWITCHES—The set of six DIP switches located to the immediate left of the microprocessor is used to select the lesson and the number of characters to be

Table 1

Rotary Speed-Control Switch Selections

Position	*Characters (WPM)*	*Words (WPM)*	*Keyer (WPM)*
0	13	4	13
1	13	5	15
2	13	6	17.5
3	13	7.5	20
4	13	10	22.5
5	13	13	25
6	14	14	27.5
7	20	14	30
8	20	16	32.5
9	20	18	35
10	20	20	37.5
11	22	22	40
12	25	25	42.5
13	27	27	45
14	30	30	47.5
15	33	33	50

[1]Notes appear on page 38.

Table 2

Lesson Selection (DIP Switches A, B, C and D)

Lesson No.	*Switch Positions* A B C D	*Lesson Description*
1	off off off off	Characters E I S T M O A N W
2	on off off off	Characters B C D G Q X Y Z 0
3	off on off off	Balanced review
4	on on off off	Characters F H J K L P R U V
5	off off on off	Weighted review
6	on off on off	Balanced review
7	off on on off	Characters 1 2 3 4 5 6 7 8 9
8	on on on off	Weighted review
9	off off off on	Balanced review
10	on off off on	Punctuation . , ? / AR SK BT
11	off on off on	Weighted review
12	on on off on	Trouble characters B 6 H 5 V 4
13	off off on on	Weighted review
14	on off on on	Balanced review of all characters
15	off on on on	Approximate "Paris" review
16	on on on on	Iambic or conventional keyer

Table 3

Lesson Length Selection (DIP Switches E and F)

Switch Position	*Length*
E off F off	Generate 1 five-character word
E off F on	Generate 5 five-character words
E on F off	Generate 10 five-character words
E on F on	Generate 25 five-character words

sent. The six switches are labeled A through F on the schematic and on the circuit board (see Tables 2 and 3). The bottommost two switches, E and F, select the number of code words to be generated from the choices of 1, 5, 10 or 25. The upper four switches, labeled A through D, select the lesson content. Referring to Table 2, Lessons 1, 2, 4, 7 and 10 are the only ones that introduce new characters. These groupings are used by the US Army training program described in *Army Technical Manual TM 11-459,* except for Lesson 10. Lesson 10 contains punctuation and procedural characters not used by the military—it is added to complete the set required of Amateur Radio licensees. Review Lessons 3, 5, 6, 8, 9, 11 and 13 are of extreme benefit when used following a lesson with new characters. They review all characters learned to that point, and Lessons 5, 8, 11 and 13 emphasize the most recent lesson. This is accomplished by generating half the characters from the most recent new-character group, and half from all the rest of the past groups.

As noted in the Army manual, and confirmed by personal experience, the characters most confused by code listeners are given in a special lesson (12) and review (13). Lessons 14 and 15 are the drill lessons. Once the characters themselves are learned, these lessons are used for speed improvement. Lesson 14 gives equal weighting for all characters—there are as many "Xs" as "Es," for example. This lesson should be used if the training lessons have been completed and the student still has some problems with the less common letters. Lesson 15 approximates English language-letter usage frequency. There are four times as many "Es" as "Xs," for example. Since the more common letters are also the shortest in terms of Morse elements, this lesson runs faster than Lesson 14. Use Lesson 15 for speed improvement after you are comfortable with all the characters.

Lesson 16, the keyer mode, differs from the rest. In the first place, the printer output is disabled. Secondly, RESET must first be pressed to leave the keyer mode, once entered. When the keyer mode is entered by selection on the DIP switch, the iambic or paddle mode is automatically selected. To use a straight key or bug, the REPEAT key must be held down while the RESET key is struck and released. The mode thus selected will remain in operation until an alternate mode is selected on the DIP switch and the RESET key is pressed. Thirdly, the code rates are different. They start at 13 WPM, include 20 WPM, and go all the way to 50 WPM. These are shown in Table 1.

Learning the Code

Generally speaking, the Morsemaster II can teach Morse code effectively with only the addition of an earphone and a power supply. A key is a great help, if you have one, as is a printer. Either or both will save you time when first learning the code.

Novice Training

For the person just starting to learn the code, there are several things to keep in mind. First, forget everything you ever learned about visual dots and dashes. Mastering Morse code is based on the concept of hearing *characters,* not elements, as they are sent. Every character has a distinct sound, and it is this that you should learn.

Beginners often make the mistake of learning the dots and dashes; then when they hear code, they must listen for these separate elements, and stop and translate them to letters. This is a two-step process, while recognizing the letters by their sound is only a single step. Frankly, either approach will work on the 5-WPM code test, but the two-step method simply will not work at 13 WPM and beyond. It is best to start out on the right foot by learning the characters by sound.

The second thing to keep in mind is that everyone gets frustrated at first. After all, Morse is a new language, and it takes some time. The good news is that if you stick with it, you *will* learn it. The Army manual says that the average student will get up to the 5-WPM plateau in 18 hours of practice. The top 5% of students learn it in about five hours, while the lowest 5% may take as long as 27 hours. The important thing is to practice every day. If you can schedule an hour a day, you are pretty well guaranteed to be able to pass your Novice code test at the end of a month, and probably much sooner.

Your first lesson should be from Lesson 1, and from there you should follow the lessons in numerical order through Lesson 15. Don't leave a lesson until you are comfortable with it. Work at 5 WPM, and revert to 4 WPM only if a particular lesson is giving you trouble. Start out each new character lesson with only one word at a time selected (DIP switch sections E and F both off). Press the START button and listen to the characters. Look at a list of Morse characters and identify the ones you have heard. Use the REPEAT button and listen to them again. Write them down as you hear them. Continue REPEATing the same group, and writing each character down until you can recognize them. Now, press the START button again for a new set from this group. Continue in this manner until you have heard all the characters of this group several times, then change the switch settings to five words. Try to copy the entire transmission. At its end, press REPEAT and write the new letters directly below the last ones. Do this as many times as it takes until you are sure you've gotten them all. Don't leave this lesson until you can copy 10 words without an error on the first try!

Use this method on each lesson with new characters in it. On review lessons, you may feel comfortable with starting out with five words per transmission, or just one. In every case, use the REPEAT button to verify your work.

At the beginning of each practice session, use the first five or ten minutes to review the last lesson learned, before starting a new one. Try to complete a lesson at each session.

Once the new character lessons have been learned, lessons 14 and 15 should be used for practice and to improve your speed. It is a good idea to be able to copy at 6 WPM for the 5-WPM test. That extra one-word buffer gives the confidence to overcome

any stage fright on test day. Always go back and repeat lessons whenever you feel the need to do so.

General Code Test

The Army code manual does not give expected learning times for exactly 13 WPM, but interpolating their data shows the average student hitting 13 WPM after about 65 hours of practice. My personal experience bears this out. The student practicing for this test should concentrate on Lesson 15, and use the keyer provision as much as possible. The review lessons will also prove helpful, as well as providing a break from Lesson 15 alone. Of course, the introductory lessons and techniques described in the Novice section may be used as well. A special speed—14-WPM characters and 14-WPM speed—is provided to give the student a little extra confidence on the code exam. Obviously, code at 14 WPM will sound slightly different than the test material, so do the bulk of your work at 13 WPM. Remember, the sound of the characters is all-important.

The Biggie: 20 WPM

The Amateur Extra is called the "expert" license, as well it should. While the 20-WPM code test has been passed by students using only the Morsemaster, this is not the recommended procedure. Once you pass the 13-WPM General (or Advanced) code test, if you haven't done so already, buy a rig and get on the air. Work CW. Learn the content of QSOs and get relaxed with code. Use your Morsemaster to augment and improve your code ability. Learn to "copy behind." This technique, the ability to write code two or three characters behind the one you are hearing, is embraced by nearly all serious high-speed CW operators. It may be helpful to repeat the Novice lesson sequence at 14 WPM to get accustomed to the different sound of 20-WPM code, then gradually increase speed. The key is to do whatever works for you. The Morsemaster's versatility will provide the means.

Using the Options

While the Morsemaster by itself is a complete Morse trainer, there are provisions for two options that can be used to enhance learning. The first permits the use of a telegraph key so that you may practice sending as well as receiving. Morsemaster II has a built-in iambic keyer, similar to those included in many of today's popular transceivers, or sold as add-ons. If you already own a key, whether it be a simple straight key, a semiautomatic bug or a squeeze paddle, by all means use it with your Morsemaster. If you plan to buy one in the near future, you may want to go ahead and get it to help in your learning. The student can often get "unstuck" on a particularly troublesome character by sending it repeatedly and listening to it. To connect a straight key or bug, merely connect one of the key's terminals to the E4 connection on the Morsemaster, and connect the other to E2. To connect a paddle key for iambic operation, connect its common leg to E2, its dot terminal to E4 and its dash terminal to E3.

The second available option is a printer output. The Morsemaster II includes a serial output that interfaces to a printer or a computer terminal, and prints out every character that it sends. While particularly helpful for beginners learning the code, printers are expensive, and unless you already own one or can borrow one, the additional help it will provide in learning the code is not worth the expense.

The printer output is serial "quasi-RS-232-C." True RS-232-C uses both positive and negative voltages, but the Morsemaster only uses positive. The majority of RS-232-C printers and terminals will accept this with no problem. I've used a Radio Shack TP-10 printer, a DecWriter terminal and a Hazeltine CRT, and they all work fine. If you do buy a printer for your Morsemaster, be sure to check it out beforehand. As delivered, the Morsemaster operates at 600 bauds, sends eight data bits and two stop bits, and no parity. It may be converted to 300-baud operation by simply removing R8 from the circuit board. Additionally, the printer must be able to generate its own line feed when it receives a carriage return. Most printers do this automatically. To connect a printer, only three lines are necessary, and perhaps only two, depending on the printer. The printer's common connection goes to E2, and its data input to E1. If it has a Data Terminal Ready (DTR) line, connect it to E3. The Radio Shack TP-10 uses a 4-pin DIN plug, with common on pin 3, data on pin 4, and DTR on pin 2.

Conclusion

The Morsemaster is an effective Morse code trainer, as proven by my personal success and that of many other hams in my area. Once you decide that you want to upgrade, and can set aside some time each day to work on the code, the Morsemaster will help you make the most efficient use of that time.

Notes

[1]A Morsemaster II data package is available from ARRL at no cost. It includes a full-sized PC-board template, a parts-placement diagram and a hexadecimal listing for programming the EPROM. Send an SASE to: ARRL Technical Dept, 225 Main St, Newington, CT 06111, and ask for the "Morsemaster II."

[2]Parts substitutions may be made if desired. Transistors and diodes may be substituted with units of higher ratings, and capacitor working voltages may be increased. The 8035-series microprocessor may be any one of the following types: 8035, 8039, 8048, 8049, 8050, 80C35, 80C39, 80C48, 80C49, 80C50, 8748 or 8749. A complete parts kit, including wall transformer and step-by-step instructions, is available from Stone Mountain Engineering, PO Box 1573, Stone Mountain, GA 30086; tel 404-879-0241 price $46.95; complete unit, wired and tested, $69.95; programmed 2716 EPROM, $5; silk-screened PC board, $12. All orders must include $2.50 shipping and handling, and applicable sales tax if shipped to a Georgia address.

[3]Digi-key Corp, Box 677, Thief River Falls, MN 56701.

AMP Inc, Harrisburg, PA, tel 717-564-0100 (call for nearest distributor).

MORSE CODE: The Essential Language—and You

As configured for this article, the Morsemaster II's EPROM-driven Morse lessons are based for the most part on the letter groupings in *US Army Technical Manual TM 11-459*. This learning method has proven highly successful. That's why the Army uses it—and why the Morsemaster II uses it as well.

You and your Morsemaster aren't restricted to lessons based on the Army method, however. ARRL's popular new publication about the code, *MORSE CODE: The Essential Language* by L. Peter Carron, Jr, W3DKV, offers a Morse learning plan based on letter groupings differing from those in the Army method. Your Morsemaster can provide you with code lessons based on the Carron book if you use an appropriately programmed EPROM. Here's how to accomplish this: If you're ordering the Morsemaster II data package mentioned in Note 1 of this article, you're all set: The package includes hexadecimal listings and DIP switch settings for the ARRL *and* Army learning methods.

A *preprogrammed* ARRL Lesson EPROM and a sheet explaining revised DIP switch settings and lesson content are available from Stone Mountain Engineering in addition to the Army Lesson EPROM. The price is the same as that shown for the Army Lesson EPROM mentioned in Note 2 of this article. Be sure to specify that you want the ARRL Lesson EPROM when ordering. In addition, purchasers of full sets of Morsemaster II parts may request that Stone Mountain Engineering substitute the ARRL lesson EPROM for the Army EPROM in their kits. Contact Stone Mountain Engineering for additional details at the address given in Note 2. (This offer includes an instruction sheet showing DIP switch settings and lesson content for the ARRL Lesson EPROM. It *does not* include a copy of the *MORSE CODE: The Essential Language* book. Because the detailed code lesson documentation in Stone Mountain Engineering Morsemaster kits is otherwise based on the Army method, you must depend on your copy of *MORSE CODE: The Essential Language* to round out your documentation on the code lessons contained in the ARRL Lesson EPROM.)

If you're unfamiliar with *MORSE CODE: The Essential Language*, take a peek at the advertisement on page 142, this issue. CW hounds and code students alike, this book is for you! Who says the code is dead? Morse code is alive and well—and living in *your* fingers.—Ed.

Product Review

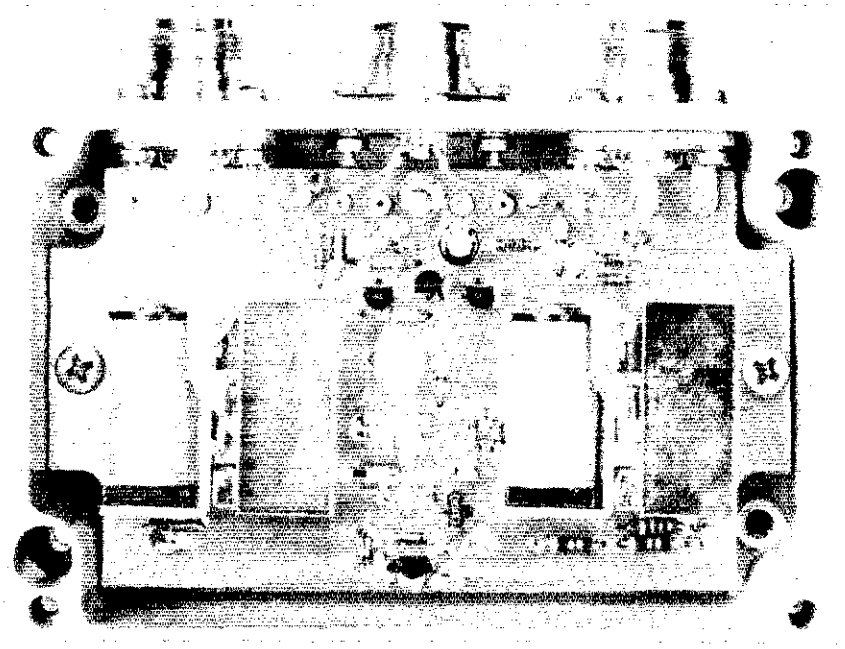
Conducted By Bruce O. Williams, WA6IVC
Assistant Technical Editor

Advanced Receiver Research MML144VDG and MM144VDG Mast-Mounted Preamplifiers and TRS04VD TR Sequencer

Serious VHF and UHF operators have long realized that the best performance can be extracted from a GaAsFET or other low-noise preamplifier only if that preamplifier is mounted at the antenna, ahead of the loss introduced by the feed line. Any loss adds directly to the noise figure of the receiver. While it's possible to operate EME or use OSCAR satellites with the preamplifier located in the station, the lowest noise figure and best results occur when the preamplifier is mounted near the antenna.

Not too long ago, mounting equipment outdoors on the tower was for diehards only. You had to find a suitable low-noise preamplifier and high-quality coaxial relays, come up with a weatherproof mounting system, and design control circuitry to switch everything around. Thanks to Advanced Receiver Research, getting the most from your low-noise receiving system is now as easy as picking up the telephone.

Three separate ARR units are reviewed here. The MML144VDG is a 2-m GaAsFET preamplifier with switching relays that will handle up to 160 W. Its big brother, the MM144VDG, is rated for 1 kW. ARR offers similar preamplifiers for 50, 220 and 432 MHz, as well. The TRS04VD provides sequentially keyed outputs to control the timing of system TR switching to protect the preamplifier and relays from accidental damage. The TRS04VD works with any of the ARR mast-mounted preamplifiers.



MML144VDG Description

The MML144VDG is housed in a rugged diecast aluminum enclosure. A rubber gasket seals the lid so the unit is both RF-tight and weatherproof. Type N female receptacles are provided for connection to transceiver and antenna. A locking DIN receptacle handles the dc connections. All connectors are located on one side of the enclosure, and the unit is installed with this side positioned toward the ground to prevent water from building up around the connectors. An aluminum and stainless-steel clamp assembly secures the enclosure to masts of 1 to 2-1/8 inches OD.

High quality components and construction techniques are evident throughout the MML144VDG. A single PC board holds all the components. A pair of Tohtsu® CX-120P PC-board-mount, RF-type relays dominate the board. The other preamplifier components are located between the relays, with the control circuitry located near the DIN connector.

The preamplifier circuitry is essentially the same as other ARR GaAsFET products. A Mitsubishi MGF-1402 is the active device. The input is tuned with an L network, while the output is matched by a broadband ferrite transformer.

The CX-120P relays are SPDT types. They are connected so that they must be energized to place the preamplifier in the line for receive, and deenergized to bypass it during transmit. There are several advantages to this system. Any time the station is not in use, the preamplifier is switched out of the line to protect it from possible damage from nearby lightning strikes. Also, should the preamplifier break or not be needed, it can be switched off and normal operation can continue as though the transceiver is connected directly to the antenna.

The control circuitry is well thought out, so the MML144VDG is essentially idiot proof. There are three options for keying the unit for transmit. The easiest is automatic RF switching. When the transmitter is keyed, this circuitry senses the presence of RF at the input to the MML144VDG and deenergizes the relays to bypass the preamplifier. It requires at least 5 W at the input to make the unit switch to transmit. This circuitry is similar to the RF-activated switching found in many solid-state VHF and UHF amplifiers. What could be simpler?

If you prefer to have more control over your TR switching, you can provide a command signal from the station to "hard key" the preamplifier. To accommodate the many different rigs on the market, you have the choice of providing a ground-for-transmit or positive-voltage-for-transmit (+5 to 16 V) command. The ARR instructions stress that to prevent preamplifier failures, you must have some type of TR-relay sequencing if you use hard keying. The TRS04VD sequencer described later in this review is ideal for that job.

The control cable from the station has, as a minimum, two conductors for + V dc and ground. A third conductor is necessary if you wish to use either of the hard keying options. The ARR instructions highly recommend the use of shielded cable for the control lead. An unshielded cable can act as an antenna, picking up sufficient induced voltage spikes from nearby lightning strikes to damage the preamplifier.

With low-noise GaAsFET preamplifiers, it is essential to have the right equipment to make meaningful noise-figure measurements. We tested the preamplifiers with a state-of-the-art HP8970A Noise Figure Meter and HP346A Noise Source recently donated to the ARRL Lab by Hewlett Packard. Gain and noise-figure performance for the MML144VDG is summarized in Table 1. With a gain of 22 dB and a noise figure around 0.5 dB, this preamplifier is more than adequate for weak-signal work at 2 meters. Power handling capability is 160 W, so this device is usable with any of the solid-state "brick" amplifiers currently on the market. We tested the review unit with a 150-W Mirage brick without incident.

The review unit was from the initial production run, and there was a minor problem with it. We noticed that low-level harmonics of any 2-meter signal transmitted

Table 1

ARR MML144VDG 2-M GaAsFET Preamplifier

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency range: 144-MHz band, 1-dB bandwidth is 7 MHz.	As specified
Noise Figure: Less than 0.55 dB.	144 MHz, 0.49 dB; 146 MHz, 0.52 dB; 148 MHz, 0.53 dB.
Gain: 22 dB.	144 MHz, 22.25 dB; 146 MHz, 22.01 dB; 148 MHz, 21.76 dB.
Compression point (1 dB): +12 dBm.	+ 5 dBm.
Power requirements: 11 to 16 V dc at 10 mA, max (transmit) and 180 mA max (receive)	At 13 V, 25 mA (transmit), 150 mA (receive).
Power handling (transmit): 160 W.	As specified.
Through-mode SWR: 1.25:1 max.	1.15:1.
Through-mode attenuation: 0.5 dB, max.	0.2 dB.
Minimum power input to activate RF-sensed switching circuitry: 5 W.	3 W
Size: 5-1/2 × 4-7/8 × 3-5/8 in (HWD), including mounting bracket and connectors.	
Weight: 1 lb 13 oz.	

through the unit appeared at the output. These harmonics were not evident when the transceiver was operated without the preamplifier. One of the harmonics was about 55 dB below the amplitude of the fundamental signal. FCC regulations require that, at 2 meters, all harmonics and spurious emissions be 60 dB below the fundamental, or lower. ARR quickly rectified this problem by changing a capacitor in the RF-activated switching circuitry. The problem did not affect operation of the unit in any way, and has been corrected in current production models.

MM144VDG Description

The MM144VDG preamplifier/relay system is definitely for the serious operator. Although it is much simpler in appearance than the MML144VDG, it's an elegant, rugged piece. The switching scheme is similar to the MML144VDG. The relay is a DPDT transfer type that switches the preamplifier in series with a single feed line between station and antenna during receiving periods, and out of the line during transmitting periods. The preamplifier and relay must be energized to receive, so the preamplifier is switched out of the line any time the station is not in use. It may also be left turned off if operation without the preamplifier is desired.

The preamplifier/relay enclosure is a custom-made two-piece affair. The relay and preamplifier are mounted to brackets that are bolted to a piece of 1/8-inch-thick aluminum plate that is bent into an inverted L shape. The mast clamp accommodates pipes of up to 2-inches OD and also mounts to this plate. The preamplifier top cover is made from aluminum sheet. All seams are welded, so there is no entry point for moisture. Four machine screws secure the cover to the main support bracket.

Three connectors protrude from the bottom of the enclosure. Two Type-N connectors that are actually part of the coaxial relay handle connections for the feed lines from the station to the antenna. The control/power connection is made through an F connector (commonly used in 75-ohm TV systems). Inexpensive RG-59 shielded cable is recommended for the control/power line. To ensure good long-term performance, all RF connectors are silver plated. The cables that connect the relay and preamplifier are made from durable RG-142B coaxial cable with silver-plated conductors and Teflon® dielectric.

The preamplifier itself is one of the standard nonswitched ARR GaAsFET units that is self-contained in its own compact, black aluminum enclosure. At the low end of the 2-m band, gain is about 25 dB and the noise figure is about 0.5 dB, as measured on the HP8970A/HP346A setup (see Table 2). These measurements were made with the relay in the line and energized, as it would be in normal operation.

The relay, custom-made for this application by Dow Key/Kilovac, is a modified type 260. The normally closed contacts are connected together internally so that the station feed line is connected straight through to the antenna when power is not applied. More significant, the normally open contacts (those used to route the signal through the preamplifier for receive) are grounded when not in use. The result is an impressive 100-dB isolation. Even during full-power transmissions the amount of RF that can leak through the relay to the preamplifier input is tens of decibels below the level that would cause damage to the GaAsFET device.

The instructions stress the point that some type of sequencing must be used with this preamplifier/relay system. Unlike the MML144VDG, there is no RF-switched keying option. You *must* provide a 12- to 14-V signal to turn the unit on for receive (this signal energizes the relay coil and supplies

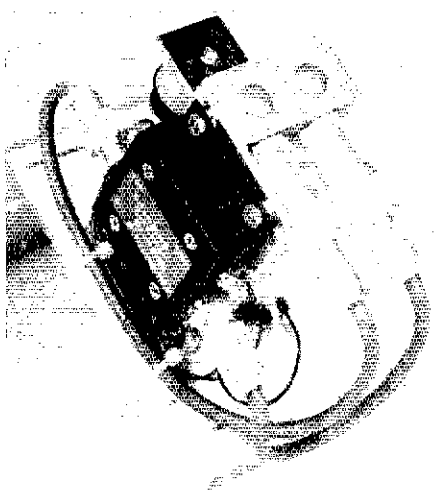


Table 2

ARR MM144VDG 2-M GaAsFET Preamplifier

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency range: 144-MHz band.	As specified.
Noise figure: Less than 0.55 dB.	144 MHz, 0.45 dB; 146 MHz, 0.43 dB; 148 MHz, 0.41 dB.
Gain: 24 dB.	144 MHz, 24.95 dB; 146 MHz, 24.66 dB; 148 MHz, 24.28 dB.
Compression point (1 dB): +12 dBm.	+10 dBm.
Power requirements: 12-V dc at 280 mA.	12-V dc at 270 mA (receive), and 10 mA (transmit).
Power handling (transmit): 1 kW.	Not tested at 1 kW power level, for lack of equipment. Operated at 500-W+ level for extended period.
Through-mode SWR: 1.15:1 max.	1.1:1.
Maximum insertion loss: 0.1 dB.	Insertion loss not detectable.
Operate time at 20°C: 25 ms.	31 ms, including 5 ms of bounce.
Size: 7-1/8 × 4 × 5 in (HWD), including mounting bracket.	
Weight: 2 lb 8 oz.	

power for the preamplifier), and you must remove this signal for transmit. The TRS04VD sequencer described later can be used to ensure that the preamplifier relay is keyed first, before the transmitter and power amplifier are keyed.

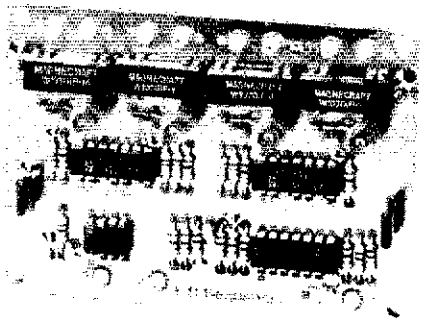
The MM144VDG is impressive because it does so much with so few parts. Operation couldn't be simpler—apply or remove 12 V. The relay will handle high power levels as long as it is not hot switched, and the preamplifier performance is fine for terrestrial, satellite or EME operation.

The weatherproof enclosure is designed so that chances of water getting into the unit are extremely remote. We purchased the unit for use on the OSCAR-10 satellite array at W1INF, the ARRL HQ station. We used it for a year before publishing this review. The performance measurements reported herein were made after the unit had been out on the tower for a year. When I removed the unit from the tower for testing, there was no trace of water in the box. The blue paint on the top cover wasn't quite as bright as when it was new and there was some oxidation on the unpainted aluminum mounting bracket, but otherwise the unit appeared and performed as it did when it was new.

Operation of the MM144VDG at W1INF was primarily for satellite work. The antenna is a KLM 22C cross-polarized Yagi fed with more than 100 feet of Belden 9913 coaxial cable. The preamplifier made a noticeable difference in reception of weak satellite downlink signals on a Kenwood TS-700S transceiver. On some signals, the preamplifier made the difference between hearing and not hearing the station.

TRS04VD TR Sequencer

The TRS04VD TR control board is important for the long life of a remotely mounted preamplifier. It provides sequentially keyed outputs to control the timing of all system TR changeovers. If you simply tie everything together and key your rig, power amplifier and relay simultaneously, you will probably start transmitting before the preamplifier relay contacts have finished switching and bouncing. When this happens, there is a good probability of arcing and ruining the relay contacts, as well as applying some transmitter power to the preamplifier.



Operation of the TRS04VD is straightforward. Once you apply the "master" TR command from your transceiver, the sequencer takes over and switches the other components in the system. The TR command can be either a ground-to-transmit or a positive-voltage-to-transmit signal. The one you choose will depend on your particular rig.

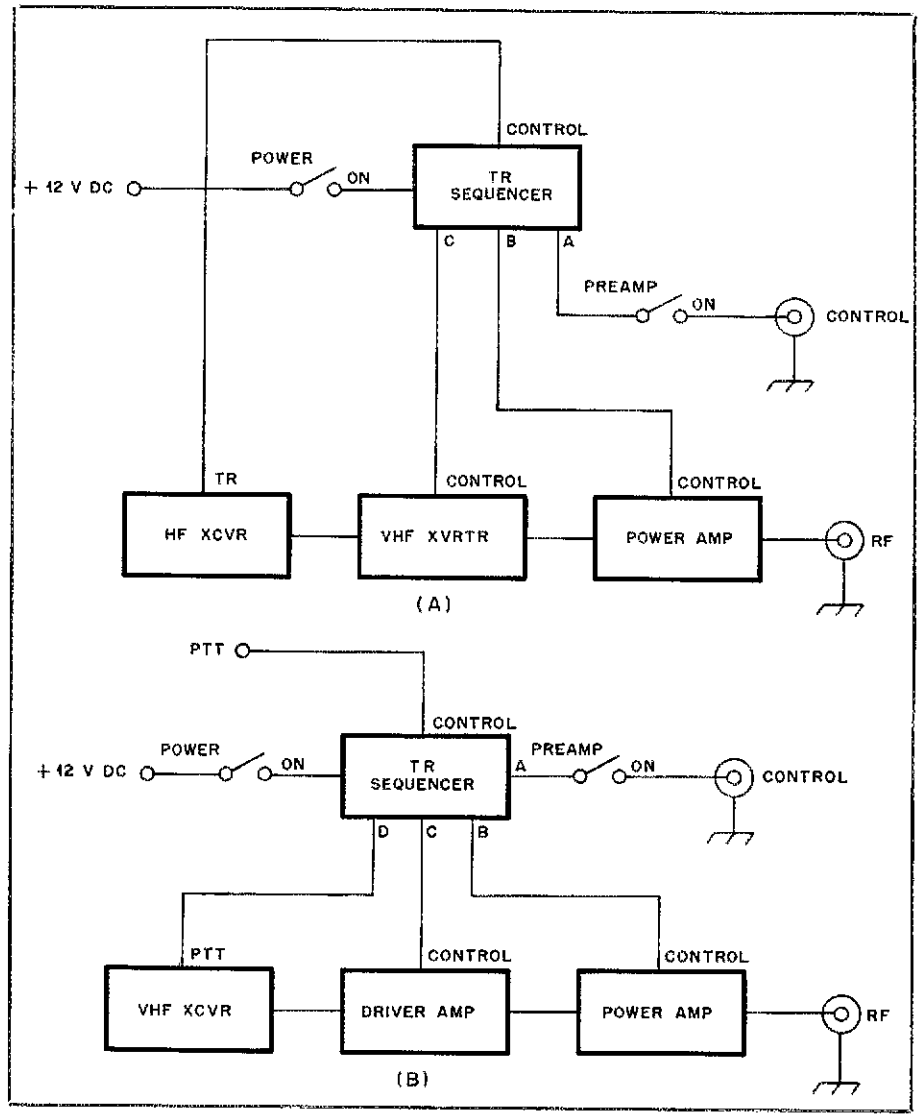


Fig 1—Two typical preamplifier/relay hookup schemes utilizing a TR sequencer.

There are four keyed outputs that can be used in several ways. Two common hookups are shown in Fig 1. For a system including an HF transceiver, VHF transverter, driver amplifier and high-power amplifier, a typical sequence of events would be something like this: Approximately 8 ms after the TR command is given, the first sequencer output is keyed, switching the mast-mounted preamplifier/relay to the transmit position. About 30 ms later, the power amplifier is keyed, and 30 ms after that the driver amplifier is keyed. Another 30 ms go by and the VHF transverter is keyed, applying RF after everything else in the system is keyed and ready to go. The whole sequence takes about 100 ms, and is reversed to get from transmit back to receive (see Table 3).

All of the TRS04VD components mount on a double-sided PC board. No cabinet is supplied, so the board can be mounted in its own enclosure or even inside a radio or amplifier. Output switching is accomplished with reed relays. Depending on your particular application, you can order the unit with any combination of relays with contacts that are normally open, normally closed or mercury wetted (for high-voltage or high-current applications).

If you want to dig a little deeper into the noise on your favorite VHF or UHF band, ARR probably has a switched preamplifier to suit your needs. Manufacturer: Advanced Receiver Research, Box 1242, Burlington, CT 06013, tel 203-582-9409. Price class: MML144VDG, $180; MM144VDG, $280; TRS04VD, $50.—*Mark Wilson, AA2Z*

Table 3

ARR TRS04VD TR Sequencer Switching Times

Output	Delay From Initial TR Command Until Output Relays Operate (ms) Key Down	Key Up
A	8	170
B	41	140
C	72	109
D	104	79

Technical Correspondence

Conducted By Paul K. Pagel, N1FB
Senior Assistant Technical Editor

The publishers of *QST* assume no responsibility for statements made herein by correspondents.

SIGNAL GENERATOR POWER CONTROL

☐ I built the signal generator described in Jan 1986 *QST* and found it to be generally a nice addition to my collection of homemade test gear.[1] There was one detail, however, that was less than satisfactory: power control. As DeMaw states, the circuit presented in Fig 3 of that article (shown here as Fig 1) leaves much to be desired.

While thinking about the problem, I came up with a simple circuit that works quite well; see Fig 2. The idea is simple, but I haven't seen it published. It's basically a slightly modified pi-section attenuator. Its advantage over the original circuit is that it preserves the source impedance of the generator near 50 ohms over the full range of power control. My calculations show that the SWR of the source output port remains less than 2:1 for the sample circuit presented here.

Although the concept of source match is not familiar to everyone, preservation of the output impedance of a generator is often very important. This is especially true when precision measurement (even in the amateur context) of gain, attenuation, return loss, and so on, of devices that are sensitive to impedance matching (filters, antennas, amplifiers, for instance), is made. Errors on the order of several decibels or more can accrue easily unless the source impedance is maintained near Z_0, 50 ohms in this case.

My basic idea is to absorb the power variation control, the potentiometer (R3), within a pi-section attenuator. That will allow varying the generator power output without wide excursions of generator output impedance. As is usually the case, however, there is a compromise. To do the job effectively, the attenuation must be fairly large, on the order of 5 to 10 dB. Larger values of attenuation are required for larger variations in output power. (See Table 1.) If you are satisfied with approximately 10 dB of variation, for example, a modified 6-dB attenuator will keep the output SWR at less than 1.6:1.

[1]D. DeMaw, "Build a Homemade Signal Generator," *QST*, Jan 1986, pp 40-43.

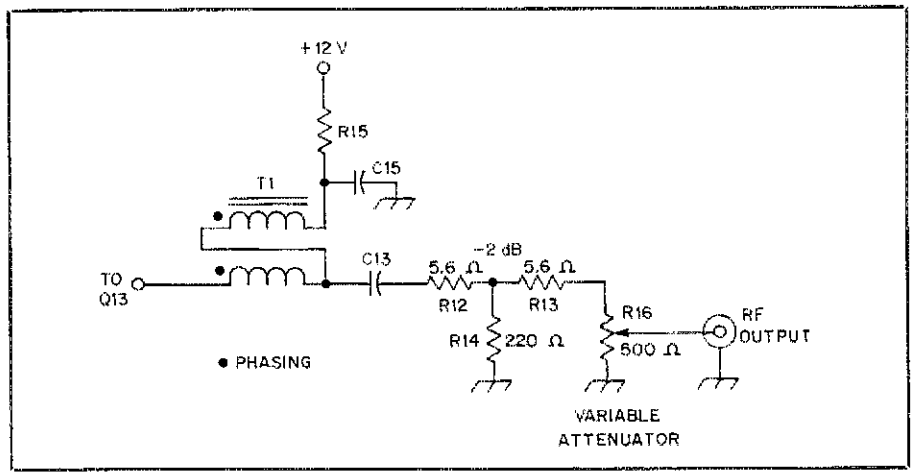


Fig 1—Original generator output-circuit suggestion.

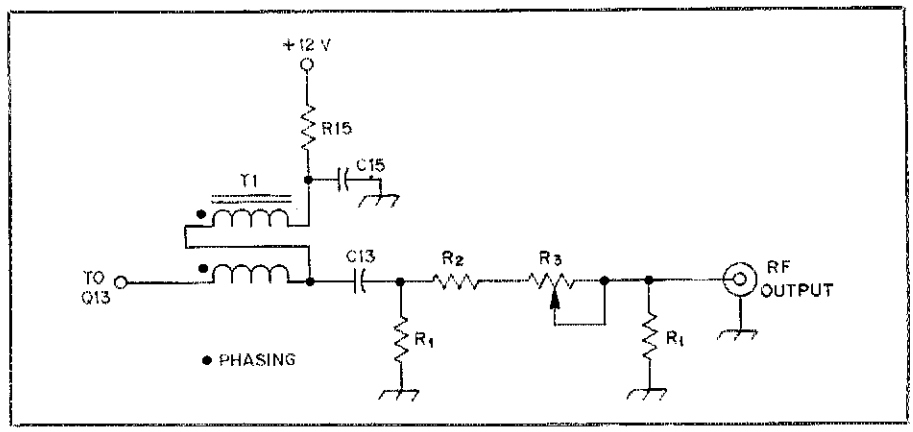


Fig 2—Schematic diagram of the adjustable power control. See Table 1 for resistor values.

Table 1

Power Control Resistor Values

Power Variation (Decibels)	R1 (Ohms)	R2 (Ohms)	R3 (Ohms)	Source SWR
10	147	39	100	1.6
20	100	39	1 k	1.8
45	100	39	10 k	2.0

Note: Power variation and source SWR are approximate values.

If you need a 45-dB range, however, you will need a modified 9-dB (or so) attenuator to maintain SWR at less than 2:1.

The circuit in the accompanying figure was breadboarded and the power variations measured by a homemade power meter. Values for the shunt resistors were chosen near values for 6 to 9 dB attenuators, but the series resistor need not be exact, since we're using a potentiometer anyway. SWR was calculated based on a generator impedance of 50 ohms before the attenuator.—*Ralph H. Fowler, N6YC, Rt 1, Box 253R, Pearl River, LA 70452*

ATARI WEFAX

☐ Atari® computer owners who also have an interest in WEFAX reception should obtain a copy of the September 1986 issue of Antic.® (This magazine is devoted entirely to Atari computer subjects.) That issue contains a few articles about WEFAX operation. Included are construction details for a PLL WEFAX demodulator, and software for the 8-bit and 16-bit computer models. If you can't locate a copy of the magazine locally, contact Antic at PO Box 1919, Marion, OH 43306, tel 614-383-314; you may be able to get a back issue or reprint.—*Paul K. Pagel, N1FB, ARRL HQ*

GOODBYE, TVI

☐ Here are a couple of experiences that may be of benefit to others. With an antenna attached to my three-band scanner, my transmitter caused TVI when operating on the 10, 15 and 20-meter bands with as little as 20-W output. There is no TVI with the

scanner's antenna disconnected and using 1 kW.

I lined the inside of my TV cabinet with aluminum foil secured with staples. Spray adhesive secured the foil to the cabinet rear. Vent holes were poked through the foil. I installed an ac-line filter and a high-pass filter grounded to the foil. This cured TVI on 80 and 40 meters.

As an added benefit, horizontal oscillator "birdies" that were S9 on 160 and 80 meters are now undetectable.—*Rick Darwicki, N6PE, 17775 Elmhurst Cir, Yorba Linda, CA 92686*

MORE ON THE 160-M SLOPER

☐ A better match (with a subsequent increase in bandwidth) can usually be had with the 160-m sloper described in my article if a quarter-wave Q section is used.[2] It appears that the feedpoint impedance approaches 100 ohms, particularly when the tower is grounded.

The Q section is made of 75-ohm coaxial cable such as RG-59 or RG-11. For solid dielectric cable with a velocity factor of 0.66, an 88-foot length of cable is used. Foam dielectric cable, with a velocity factor of 0.80, requires a 110-foot cable length. The Q section is attached directly to the antenna feed point in place of the 50-ohm feeder, and if long enough, run to the operating position. If additional feeder length is required, it should be made of 50-ohm coaxial cable attached to the Q section by means of a barrel connector.

I am still using the antenna and am very pleased with it. I have heard from others who have used it with success.—*Deane J. Yungling, KI6O, 7932 Sunset Ave, Suite J, Fair Oaks, CA 95628*

TOUCH-LAMP TRANSCEIVER

☐ When my wife told me she had bought a three-way lamp that switched on and off at the touch of any of its metallic parts, I did not realize she had purchased a transceiver! I found that my transmitted signal would cause the lamp to operate exactly as if I touched its metal parts. Later I discovered a raspy, S8 signal at 1875 kHz—it was coming from the lamp, which was located three rooms away and on a different ac circuit. The lamp signal is present at frequencies from 40 meters down. At frequencies from 20 meters up, my operation is undisturbed.

A box inside the lamp contains a circuit board through which ac line voltage is routed and which has a wire connected to the metal base of the lamp. When the lamp is plugged in, the lamp signal is present at all times, regardless of whether the lamp is on or off. In my attempts to eliminate the interference, I tried a commercial ac filter, coiling the lamp cord on some ferrite material and other such approaches without success.

To make sure the lamp my wife had was not defective, I borrowed a similar lamp from a neighbor to try it. I found it to perform in exactly the same manner except that the frequency of oscillation was somewhat different. There is no manufacturer or distributor name on the lamp or packing container. The lamp was made in Taiwan.

I am writing so that others who may be experiencing similar difficulties may have some idea of the probable source of interference. After I described what I discovered to a ham friend, he realized that such a unit had been causing interference to his station for more than a month.—*Cal Enix, W8EN, 209 S Kalamazoo St, White Pigeon, MI 49099*

[2]D. Yungling, "The KI6O 160-Meter Linear-Loaded Sloper," *QST*, Apr 1986, p 26.

METEOR-SCATTER CHECKSUM

☐ The meteor-scatter technique described in Nov 1986 *QST* can be used to send text as well as signal reports.[3] This is done by using a manual checksum technique similar to that used with computers.

In setting up your schedule, agree to assign a number to each letter of the alphabet. For example, the letter A can be assigned the number 1, and Z, the number 26. When you transmit a word, follow the word with the sum of the numbers assigned to the letters of the word. For instance, TEST64 OF21, and so on.

The receiving operator can recompute each checksum to see if the words were received correctly. If you repeat words in a meteor-scatter transmission, be sure to include a checksum with each word.—*Nick Leggett, N3NL, Apt 610, 1500 Massachusetts Ave NW, Washington, DC 20005*

[3]K. Willis, "Meteor Scatter—European Style," *QST*, Nov 1986, pp 35-39.

Feedback

☐ December's Feedback item (p 47) on "In Search of the Perfect Picture," *QST*, Jan 1986, transposed the device and pin numbers. The second and third lines from the bottom should read (in part): "...the arm of S1 and U6, pin 3."

☐ Please refer to "Electromagnetic Pulse and the Radio Amateur," Nov 1986 *QST*, p 33. The radical sign in Eq 3 should extend over the variable, SWR. In Eq 4, extend the radical over the value, 1.5. This changes the final value of V, which becomes 88.32. Also, the FCV (final clamping voltage) would then be equal to 264.96.

This error was brought to our attention by Sheldon C. Shallon, W6EL. Author Bodson, W4PWF, verified the error, which exists in the original document on pp 5-11 to 5-13.

New Products

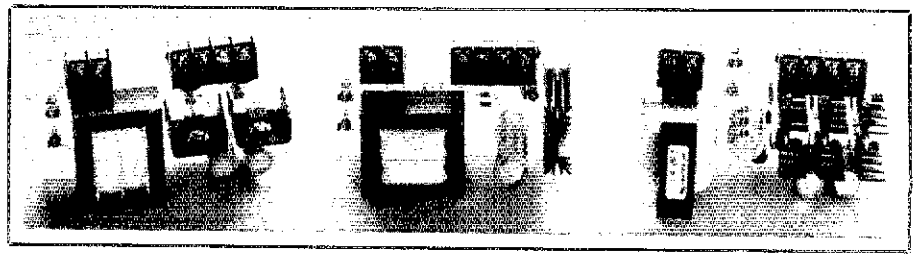
A & A ENGINEERING POWER SUPPLIES

☐ Five general-purpose power supplies are available from A & A Engineering. Created to fill the needs of hams, experimenters and electronic hobbyists, all five supplies employ three-terminal regulators with built-in overcurrent and overtemperature protection.

The power supplies are available as triple, dual and single-voltage units. The two triple-voltage supplies are rated at ±15 V at 50 mA and +5 V at 360 mA (model no. 135), and ±12 V at 60 mA and +5 V at 360 mA (model no. 133). The dual-voltage supplies have ±12 V output at 175 mA (model no. 137), and ±15 V at 150 mA (model no. 139). The single-voltage +5 V supply (model no. 130) can supply 650 mA, and also has a tap at the input to the regulator.

Each supply is equipped with a board-mounted fuse holder that accepts a 20 × 5 mm fuse rated at ½ A. Ac input and dc outputs are connected through a screw-terminal barrier strip. Separate transformer secondary windings are used for the +5 V and ±12 and ±15 V supplies in the triple-voltage units. Full-wave rectification is employed in all 5-V supplies, and full-wave bridge rectifiers are used in all dual-polarity supplies. All IC regulators are equipped with heat sinks.

These supplies are offered as assembled and tested units, complete kits, or as circuit boards, only. Prices for assembled and tested units are: model no. 130, $29.95; model nos. 133 and 135, $39.95; model nos. 137 and 139, $32.95. For other prices or information contact: A & A Engineering, 2521 W La Palma Ave, Unit K, Anaheim, CA 92801, tel 714-952-2114.—*Paul K. Pagel, N1FB*



Hints and Kinks

Conducted By Bob Schetgen, KU7G
Assistant Technical Editor

FINGERTIP BEAM HEADINGS

☐ I have a poor memory for beam headings. I once used the beam-heading references from the DX *Callbook*, but it took time to find the book and locate the country and heading. The DX station would usually contact someone else or change frequency before I found the heading, and I would lose him. My solution is a Desk Top Automatic Directory (model 43-105; $24.95) from Radio Shack® . This device is intended for fast location of telephone numbers. I use it to find beam headings rather than phone numbers. If I hear a TI call sign, I simply push the button lettered "T" and see that TI is Costa Rica and the beam heading is 199°. It's both speedy and efficient.

The directory is powered by two C-size batteries. It has a keyboard consisting of 15 buttons labeled from A to Z. It contains about 40 index cards, which can be selected by pressing the appropriate button. I listed the countries alphabetically according to their call-sign prefixes and have over 340 on the index cards. Call signs with numbered prefixes are listed under "MN" and "QR."—*George R. Golodich, K2OEK, West Haverstraw, New York*

☐ Here is a way to have beam headings and international prefixes instantly available. With this simple gadget, you can have your antenna pointed at that rare DX station before he finishes his CQ call.

Next time you go grocery shopping, buy a large can of tomato juice. I found a 46-ounce can that is 7 inches tall and 4½ inches in diameter, with no dents—just right!

1) Remove the label, empty and rinse the can through two small holes in one end.

2) Drill a hole in the exact center of each end to snugly fit a pencil-size rod about four inches longer than the can. (A 2-inch extension at each end serves as an axle for the rotating drum.) Apply a little solder or epoxy to the axle and can ends to hold the rod in place.

3) Remove the page of International Radio Amateur Prefixes from the *Callbook*, and write the beam heading for each country next to the prefix. Trim the page margins to fit the drum, and secure the page to the drum with tape.

4) Make a rack of wood or metal to hold the drum, and place the assembly near your rotator controller.

With the completed beam-heading drum you can have your beam set "right on" and ready to answer when that DX station signs "over."—*Mal Tindall, KA8GOB, Sarasota, Florida*

QSL HOLDERS

☐ While I am a photographer by profession, I rarely use 3- × 5-inch prints. So, when a recent mailing included a sample page of clear vinyl holders for ten 3.5- × 5.25-inch prints in a three-ring binder, I almost threw it out. But I suddenly thought, "Aha! QSLs!" Sure enough, a standard QSL fits quite nicely if you can spare about ¼ inch that must be trimmed from the length. The photo industry offers quite a range of mounts, albums, pages and the like for the 3- × 5-inch size, which is very common in amateur photo processing.

A wide variety of storage and viewing systems are also made for 4 × 5, a common size for professional negatives and 5 × 7, which would probably hold oversize QSLs quite nicely. Put some typical QSLs in your glove compartment and stop into a photo or department store. You might find just what you need to organize and display all those stacks of cards gathering dust.—*Fred Anderson, KØIHG, Nisswa, Minnesota*

PENCIL CONTROL FOR CONTESTERS

☐ In a CW contest, it is a terrible nuisance to keep track of your pencil, and you may have wished there was some simple way to eliminate that constant search. There is: *Wear* the pencil on your middle finger, cradled next to your forefinger. Attach the pencil to your middle finger with two rubber bands positioned between the knuckle and first joint, with the pencil point somewhat back of the middle finger tip. To write, curl your forefinger over the pencil and draw it down to be gripped between the forefinger and thumb on one side and the middle finger on the other side. (That's not how you were taught to hold a pencil, but penmanship is good enough for printing a log sheet.) After writing, curl your forefinger under the pencil and the rubber bands to lift it out of your way. Voilà! Pencils that are over five inches long don't seem to balance well.—*W. A. "Spud" Monahan, K6KH, Manhattan Beach, California*

TIDBITS FOR THE STATION AND SHOP

☐ Kodak® sells 35-mm photographic film in 50- and 100-ft bulk packs, which come in tin-plated steel cans suitable for small electronic projects. The 100-ft can is about 4 (diam) by 1¾ inches deep, while the 50-ft can is about 3¾ (diam) by 1-5/8 inches. The cans are easily soldered, and the 50-ft can nests inside the 100-ft can. Paint the cans to prevent rust.

• You can add a spring-open feature to pliers not so equipped by the maker. Spread the tool handle fully open, clean the insides of the handles near the pivot and place a big dab of silicone caulk there so that it contacts both handles. Once the plastic cures, it will cause the handles to spring back to the open position. If the return action is too strong, cut a "V" in the caulk and remove some of the material.

• I affixed a sponge to my Ungar® soldering-iron holder by putting a loop of no. 22 AWG wire through both the sponge and the holes in the holder legs.

• "Travel Pak" QSL labels are handy for labeling your radio gear. They are inexpensive and can easily be placed anywhere—like inside a hand-held (transceiver) battery pack or a cabinet. I use the same labels to identify camera gear and other valuables.

• I transport my Kenwood TS-130S transceiver and accessories in a discarded typewriter case. It came from a Smith Corona® of mid-1960s vintage, and seems ideal. A "tricked-up" mount lets the TS-130 lock in place just as the typewriter did. Since the case is much taller than the radio, I store logs, connecting cables, a paddle key, "homebrew" keyer and so on inside the case with the radio.—*Timothy N. Colbert, Burton, Ohio*

☐ With three battery packs for my hand-held transceiver, it has been a problem to keep track of which pack is charged or discharged at any particular time. A common solution is to use some kind of sticker to label the packs. Many stickers, however, are not easy to peel from the battery pack.

I found an answer in 3M® Post-it™ note pads. Post-it notes have a strip of weak wax-like adhesive along one edge. They are meant to be repeatedly placed and peeled away without damage. I cut several pieces small enough to fit inside the top of the battery pack. When a pack is discharged, I place the sticky strip so that the paper covers the battery terminals. After charging, I move the strip so that the terminals are exposed. The strips can be used repeatedly, and there is no damage to the battery packs.—*Bob Schetgen, KU7G, ARRL HQ*

☐ You can straighten short pieces of kinked-up wire by placing one end of the wire in a vise and the other in the chuck of a variable-speed hand drill. Then turn the drill motor slowly while holding tension on the wire. When done, polish the wire with steel wool and give it a coat of clear acrylic paint. I've used pieces of no. 8 and no. 10 AWG wire straightened by this method for VHF whips.—*Harold F. Keenan, KA1FJR, Danbury, Connecticut*

☐ Loose coil slugs can be tightened by removing the slug and trapping a short piece of rubber band between the slug and hole as the slug is screwed back into the hole.—*Boris Golovchenko, KB2TN, Delray Beach, Florida*

☐ A handy solder dispenser can be made from a container used for 35-mm photographic film. Wind a coil of solder to the appropriate size using a screwdriver handle as a form. Punch a hole in the container cap, insert the coil in the container and feed a few inches of solder out through the hole in the cap. I have a number of these containers—each contains a different size or formulation of solder.—*Hal Simmerman, KE4OR, Marietta, Georgia*

☐ Empty Solder Wick™ spools make excellent dispensers for small-diameter solder. Just pull a few feet from a large roll and wind it on the empty spool.—*David A. Brown, W6NBM, Wildomar, California*

☐ Fishing-tackle stores sell plastic float beads that are good element tips for home-built antennas. Simply heat the end of the element and push it halfway through the bead. The plastic beads can't prevent corona discharge

like a metal ball, but they do prevent injuries from sharp element ends.—*Jack Demaree, WB9OTX, Versailles, Indiana*

REPLACEMENT PA TRANSISTORS

☐ With winter here, I would like to pass some practical advice along to owners of the Kenwood TS-130. On a winter day in January 1983, I had left my mobile rig out in the cold for several hours at about 0°F. When I switched the rig on, the collector current rose to a very high value, and one of the PA transistors developed an emitter/collector short. I checked with an RF engineer and found that this is common failure mode for RF power transistors that are several years old. He suggested that I avoid this problem in the future by warming the rig to about 20° before applying power.

I replaced the original Toshiba 2SC2290s[1] with a pair of matched Motorola MRF-421s, which are listed as direct replacements in the Motorola manual. The replacement procedure is very straightforward: Simply install the new transistors and adjust the bias current as described in the shop manual. The results are excellent, and the new transistors produce slightly more power than the originals on 10 and 15 meters. These transistors have been in service for about three years now, with no signs of instability or other problems.—*George Hovorka, WA1PDY, Milton, Massachusetts*

A STEADY TONE FOR MAKING MIC-GAIN ADJUSTMENTS

☐ I use a recording of a steady, long (30-seconds) CW note to adjust the microphone gain on my SSB transceiver. [A code practice oscillator, or sidetone from a keyer, should also work well.—Ed.] To make the adjustment, play back the tone at moderate volume with the tape recorder speaker about two or three inches from the radio microphone, increase the microphone gain until the radio output power stops increasing, then reduce the gain a little. The CW note makes a much steadier signal than the common voice "Haaaaa Loooo" I often hear on the air.

I make frequent checks, and reports indicate that my signal is no wider than 3 kHz even when using my amplifier. Also, do use a dummy load while making transmitter adjustments.—*A. F. "Pete" Peters, KF7R, Livingston, Montana*

MORE ON USING COAXIAL FEED LINES IN PARALLEL

☐ Coaxial cables of different impedances can be operated in parallel to obtain special impedance characteristics. Cables apparently follow the same impedance and power-distribution laws as resistors. For example, if 50-Ω and 75-Ω cables are used in parallel, the resulting impedance is 30 Ω. This 30-Ω impedance may be useful for matching mobile or vertical antennas. It could also be used as a λ/4 matching section between a 50-Ω line and a Yagi antenna. Depending on the exact impedance of the cables, a wire beam that presents an impedance of 18 to 20 Ω can be nearly matched. Fig 1 shows a test arrangement for experimenting with parallel connected cables.

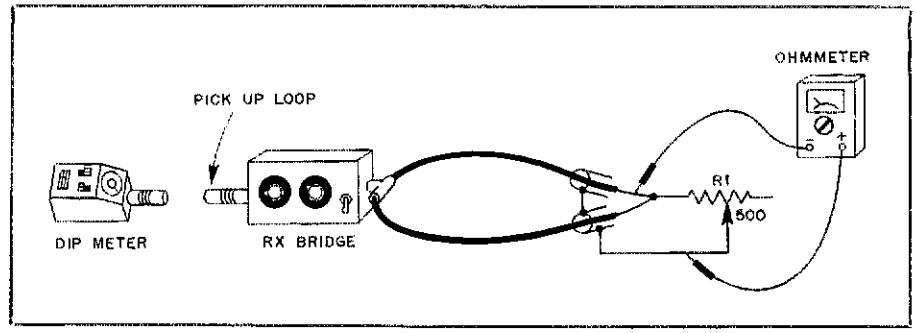


Fig 1—The test circuit for parallel-connected coaxial cables. When the potentiometer is set for 30 Ω, the RX bridge reads 30 Ω at any frequency. When the potentiometer is set for 18 Ω, the RX bridge reads 50 Ω when the frequency is such that the cables are an electrical λ/4.

When connecting coaxial cables in parallel, the electrical lengths of the lines must be equal. Different physical line lengths will result if the velocity factors of the cables differ.—*Bob Perthel, W9MWD, Elm Grove, Wisconsin*

PLATE-CAP CONNECTORS

☐ Heat-sink plate caps are nice to have, but some of us that build amplifiers don't run 3 kW. If you have gone into an electronics supply house lately and asked for a plate cap, you probably got puzzled looks and a profusion of dusty boxes flying out of a back room.

A suitable cap can be made from a block-style fuse holder. Do so by drilling out the rivet that holds the fuse clip to the plastic block, then use a hammer to form the clip completely around a metal rod having the same diameter as the plate cap. The rivet hole fits a no. 4-40 screw for connections.—*Karl Kauffman, NI6H, Morgan Hill, California*

COAX-SEAL WARNING

☐ After my experience during a hot California August weekend, I feel that potential users of Coax Seal™ should be warned that the product is temperature sensitive. Although there is no information in the directions, an inquiry to Universal Electronics, Inc resulted in a new roll of Coax Seal and a product-specification sheet. The specifications state that the material should be applied when ambient temperature is between 50°F and 90°F. I found it impossible to remove the "plastic mastic" from its container at 95°F. What a mess! [I think this problem can be avoided by refrigerating the Coax Seal for a short time before use. —Ed.]—*Don Johnson, KD6DT, Livermore, California*

ANOTHER WAY TO WEIGHT KNOBS

☐ Here is another way to weight hollow tuning knobs such as that on the TS-830S. First, purchase some lead "wool" at your local hardware or plumbing supply house. It takes two ounces (about 30 cents worth) to do one knob. Use a screwdriver with a small blade to pack the lead into the spaces on the inside of the knob. The wool can be packed very tightly with moderate hand pressure. (Lead wool packs more tightly than lead shot, so more weight can be added in less space.) If you feel the need for a sealant, cover the wool with some silicone caulk or epoxy. —*D. F. Christensen, W8WOJ, Midland, Michigan*

[1]These same PA transistors are used in many contemporary radios as well, such as the TS-430S.—Ed.]

QEX

QEX: The ARRL Experimenters' Exchange and AMSAT Satellite Journal

Did you miss the extraordinary operating conditions produced by the February 1986 aurora? Have you considered using a 5-turn helical for ATV reception? What is the purpose of RUDAK? Read about this and more in the January issue of *QEX*!

The January issue includes articles on:

- "Use of the Helical Antenna on ATV," by Domenic M. Mallozzi, N1DM
- "The Great Aurora of February 1986," by Emil Pocock, W3EP
- "RUDAK—A Status Report," by Knut Brenndorfer, DF8CA
- "Xerox 820-I Compendium—Part 6," by AMRAD

Other features include: VHF/UHF/SHF construction practices and helping to solve an antenna impedance measuring problem.

QEX is edited by Paul Rinaldo, W4RI, and Maureen Thompson, KA1DYZ, and is published monthly. The special subscription rate for ARRL members is $6 for 12 issues; for nonmembers, $12. There are additional postage surcharges for mailing outside the US; write to Headquarters for details.

1986: Reaffirming Amateur Radio's Objectives

By Paula McKnight, N1DNB
Editorial Assistant, ARRL

Our ham radio "ticket"—hard-earned, treasured, enjoyed—is our license to participate with a community of fellow amateurs. Being a part of the Amateur Radio Service brings enjoyment that comes with communicating with others, but also entails responsibilities. As stated in the beginning of FCC Rules Part 97, we have a fivefold commitment to the public (see accompanying sidebar). In reviewing the activities and developments of the past year, amateurs worldwide can take pride in their continuing adherence to these objectives.

§ 97.1 Basis and purpose.

The rules and regulations in this part are designed to provide an amateur radio service having a fundamental purpose as expressed in the following principles:

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

(b) Continuation and extension of the amateur's proven ability to contribute to the advancement of the radio art.

(c) Encouragement and improvement of the amateur radio service through rules which provide for advancing skills in both the communication and technical phases of the art.

(d) Expansion of the existing reservoir within the amateur radio service of trained operators, technicians, and electronics experts.

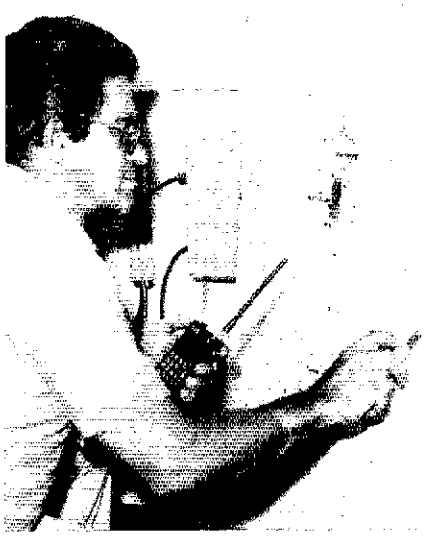
(e) Continuation and extension of the amateur's unique ability to enhance international goodwill.

"(a)...providing emergency communications."

Borrowing from the Boy Scout motto, "Be Prepared," amateurs honed their emergency-communication skills with League-sponsored operating events such as Field Day and the Simulated Emergency Test. To be even better prepared, at the January 1986 meeting of the ARRL Board of Directors, ARRL President Larry Price, W4RA, appointed the Blue Ribbon Committee on Emergency Message Traffic to review existing systems and procedures of emergency communications to improve training and efficiency. In October, the International Assistance and Traffic Net joined the National Traffic System as the Atlantic Region Net of the Eastern Area NTS. The IATN is expected to be the future primary communications clearinghouse in major overseas disaster situations.

Continuing the amateur tradition of cooperating with public-service agencies, the ARRL made overtures for possible Memoranda of Understanding with the National Weather Service and Civil Air Patrol. An MOU formalizes the ARRL's public-service commitment between the League's emergency-communications groups and public-service agencies. On the "down home" level, the ARRL Volunteer Resources Committee approved specific guidelines for Local Memoranda of Understanding between Amateur Radio Emergency Service groups and served agencies, which would facilitate cooperative efforts during emergencies.

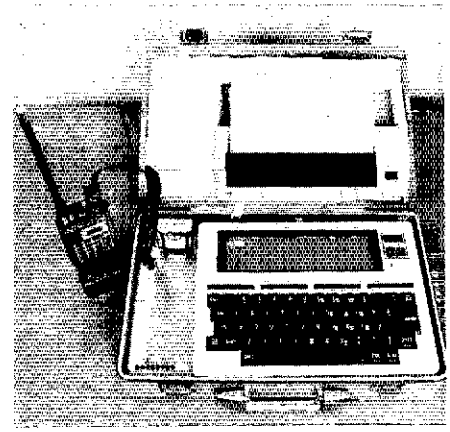
Our training at the national and local level proved itself as amateurs participated in a multitude of public-service events, including tornados in Kentucky, a plane crash in California, a chemical spill in Ohio, Hands Across America, the UNICEF torch relay and Operation Sail at the Statue of Liberty celebrations.



Joe Olekas, N8BYT, tracks the phosphorous cloud during the Miamisburg, Ohio train derailment last July. *(Curtis Cobler photo)*

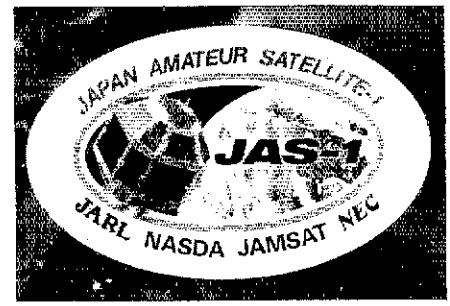
"(b)...contribute to the advancement of the radio art."

From the era of crystal sets to today's solid state rigs, amateur experimenters have always sought to improve their equipment or try new modes of communication. In 1986, this axiom held true, with developments in amateur-satellite, microwave and packet-radio activities.



Packet in your pocket? Almost! Shown here is a portable packet system designed for emergency communications. *(KT6W photo)*

Amateur-satellite communications celebrated its silver anniversary with a review of past accomplishments (beginning with the launch of OSCAR I in 1961) and of future hopes (the geosynchronous Phase 4 satellite, which will provide more reliable, full-time communications). The present featured the debut of Fuji-OSCAR 12, Japan's first amateur satellite. This joint project of the Japan Amateur Radio League, Japan AMSAT, Nippon Electric Company and the Japanese National Space Agency went into orbit



Fuji-OSCAR 12 made its debut mid-year 1986. Japan's first amateur satellite continued the challenge begun by amateur satellite communications 25 years ago.

August 12 and continues to offer amateurs the opportunity for communications via satellite.

To encourage activity and equipment developments in the microwave bands, the ARRL sponsored the First 10-GHz Cumulative Contest. Participation was enthusiastic, with high hopes for more of the same in the 2nd Annual Contest in 1987.

The melding of ham radio and personal computers via packet radio yielded over 20,000 stations worldwide. On many occasions, hams took packet radio to the field for "trial by fire" in emergency communications. Operators found the advantages were speed, accuracy, ease of use, portability, efficient frequency utilization and written transcipts of messages.

The 5th ARRL Computer Networking Conference was held in early 1986, with demonstrations of two versions of networking-level software—for virtual circuit and datagram networks using Amateur Radio. With this software, stations now communicating on a local level could become part of a much larger body of amateurs.

ARRL's monthly publication *QEX: ARRL's Experimenters' Exchange* and AMSAT's *Satellite Journal* merged, expanding from a newsletter to a magazine. Columns were added to improve coverage of microwaves, satellites and other new ideas in technology. Articles ranged from spread-spectrum communication techniques and circuits to computers and packet radio.

"(c) Encouragement and improvement of the amateur radio service through rules..."

Whether implemented by the FCC or from within the Amateur Radio Service, rules promote orderliness within the ranks. One example of order from within was the voluntary 160-meter band plan suggested and adopted by the ARRL Board of Directors at the January 1986 meeting.

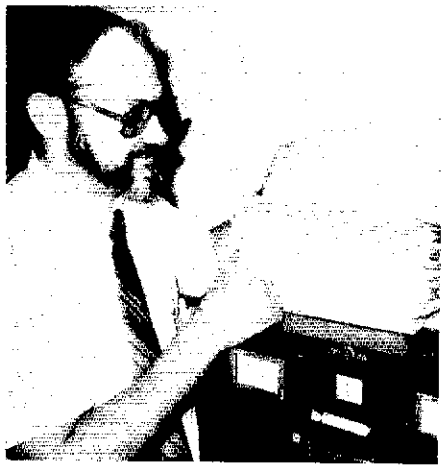
The FCC made more frequencies available to the Amateur Satellite Service by issuing the Microwave Access Docket (PR Docket 85-23), with new privileges in some microwave bands and removal/modification in other bands. Other new rules limit spread-spectrum work to domestic communication on 420 MHz and above, with complete documentation by amateur logbook.

In response to the amateur community's concern, the FCC reconsidered its position on third-party traffic via packet radio. As a result, packet stations may retransmit third-party traffic as long as the traffic was originated by a station with a control operator on duty, AX.25 (or compatible) protocol is used and no commercial traffic is being passed.

Misinterpretation of HR 3378 (the "Privacy Act") by some hams caused a flurry of concern that phone patches would become illegal. However, what finally emerged, while not an example of particularly good legislation, has no effect on the amateur bands. The bill was signed into law (PL 99-508) by President Reagan on October 21.

"(d) Expansion of the existing reservoir within the amateur radio service..."

In 1986, the Amateur Radio Service experienced an overall gain of 8495 licensees over the previous year. However, there was still some concern in the amateur community as the number of new Novices showed yet another decrease. Almost 10,000 had dropped out over a three-year period. To help reverse this trend, last year the ARRL and others petitioned the FCC for increased Novice privileges. In spring 1986, the FCC issued the crucial Notice of Proposed Rule Making, PR 86-161. Included in the proposal were expanded 10-meter Novice-band privileges (allowing digital and SSB communications), and access to the 1¼-meter band and part of the 23-cm band. With these new privileges would come the revamping of the Novice question pool, to reflect the additional technological knowledge needed for operation on these new bands, and changes in Novice testing procedures.



"I hope the top one is mine," say over 12,000 candidates who upgraded in test sessions held by the ARRL VEC in 1986. Larry Weickert of the FCC Licensing Branch in Gettysburg eyes a foot-high stack of Form 610s awaiting processing. *(K9CH photo)*

Recruitment and licensing—we can't get 'em on the air if they aren't aware of ham radio or don't have a license. The *Archie's Ham Radio Adventure* comic book, written and developed for the ARRL and several Amateur Radio businesses, as a learning tool for kids 9-15 years old, is attracting quite a following. Available just since September, over 40,000 copies have already been mailed to teachers for distribution to their students.

The ARRL Volunteer Examiner Coordinator, in its third year of activity, continued to offer frequent and convenient license testing. ARRL/VEC accounted for 56% of total elements administered nationally, with 12,033 candidates upgrading. The ARRL/VEC coordinated 1752 test sessions in 8 countries, 49 states and 4 continents, plus 1 Navy vessel in the Indian Ocean. With the adoption of PR Docket 85-196, proposed in 1986, VECs will be responsible for maintaining the exam question pools. At year end, the ARRL had filed a petition for reconsideration and petition for stay of the effective date.

Boy Scouts at a Jamboree watch Amateur Radio in action. Clubs, such as the PHD Amateur Radio Association shown here, continued their efforts to demonstrate the varied, exciting aspects of ham radio.

Also at year end, the FCC approved reexamination credit for *written* elements passed during an otherwise unsuccessful amateur examination. This entailed a revision of Form 610, which at this writing is pending approval by the Office of Management and Budget.

In conjunction with license upgrading, the ARRL published new editions of *The FCC Rule Book*, the *License Manual* series and *Tune in the World with Ham Radio*. Other publications for "continuing education," included the *Fifth Computer Networking Conference Proceedings*, *Morse Code: The Essential Language*, a new edition of the *Operating Manual*, *QRP Notebook* and the *1987 Handbook*. The *Repeater Directory* proved that great things come in small packages, with its new pocket-size edition. The nationwide resources of the ARRL Field Organization were brought under one cover with the publication of the *Field Resources Directory*.

"(e)...enhance international goodwill."

The Amateur Radio Service demonstrated its spirit of international cooperation and willingness to work together during 1986. The triennial conference of the International Amateur Radio Union Region 2, hosted by the Radio Club

(continued on page 50)

The New PRB Team: Michael Fitch and Ralph Haller

In 1987, the Amateur Radio community will be dealing with a new Chief and Deputy Chief of the FCC's Private Radio Bureau, which oversees the Amateur Service. Recently, Perry Williams, W1UED, ARRL Washington Area Coordinator, talked with Michael Fitch and his Deputy, Ralph Haller, about amateurs' major concerns. *QST* Editorial Supervisor Andrew Tripp, KA1JGG, prepared the article.

What are your primary responsibilities in the Private Radio Bureau, particularly in relation to the Amateur Radio Service?

Fitch: As Chief of the Private Radio Bureau, I am responsible for administration of the Amateur Radio Service. That includes policy, licensing, and enforcement. In all of those areas, the Bureau, under my direction, recommends courses of action to the Commissioners and implements their decisions governing the service.

Haller: Clearly, the primary duty of a deputy is to support and assist the chief in managing the bureau. As you know, the Private Radio Bureau has the responsibility for administering several radio services, including amateur. In each radio service, the bureau management team must review new policies and rules, and keep up the speed of service in licensing.

What do you see as the strengths of the Amateur Service?

Fitch: The strengths of the Amateur Radio Service are the diversity of its members, their strong interest in public service through radio operation, and their training and discipline in times of crisis or emergency.

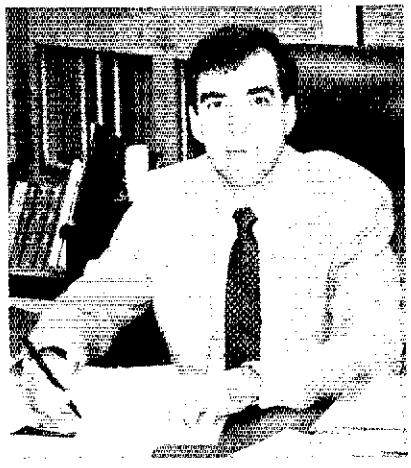
Haller: Above all, the tremendous communications resources of the amateurs would be the greatest strength of the service. Time after time amateurs have shown their ability to respond to a crisis situation and provide fast, reliable communications. Amateurs not only have the equipment to respond, they have the training and expertise to function as professional communicators. In my view, the only thing amateur about the service is its name.

Any areas need improvement?

Fitch: I am concerned that there is an increasing view of ARS licenses in terms of rights rather than privileges by some operators. These people are unwilling to be flexible in their operating practices to accommodate other operators and often create an atmosphere of contention. Disputes among licensees aired publicly and presented to the Commission for resolution can diminish the fine record of Amateur Radio. In a shared service with 420,000 licensees, there must be a very high degree of cooperation or everyone suffers.

Haller: I have a general impression that amateur radio no longer enjoys the prestigious image it once held with the public. A strong publicity campaign could be of tremendous help in reviving that image and in bringing others into amateur radio.

Mr. Fitch, under your predecessor, no-code



Michael T. N. Fitch was named Chief of the Private Radio Bureau on November 28, 1986, replacing Robert A. Foosaner, who left the Commission to join a private law firm. Fitch had served as Deputy Chief of the PRB since 1983. He joined the FCC in 1970, in the Mass Media Bureau; a year later, he became a trial attorney in the Enforcement Division of the Mass Media Bureau. In 1976, Fitch was appointed Deputy Chief of the Compliance Division of the PRB. As part of a Presidential Executive Exchange program in 1979, Fitch served a year in the private sector with the Westinghouse Corporation in the US, Europe and Asia. Upon his return to the Commission, Fitch was appointed Chief, Rules Division, of the PRB. In 1982, he was named Chief, Land Mobile and Microwave Division, PRB, where he served until becoming Deputy Chief of the PRB. He holds an electrical engineering degree from Purdue University and a law degree from Columbia University.

Ralph A. Haller, N4RH, became Deputy Chief of the PRB on December 4, 1986. He had served as Deputy Chief of the Policy and Rules Division, Mass Media Bureau, since early 1985. Haller joined the FCC in 1971 as a radio inspector in the Los Angeles District Office. In 1976, he moved to the Field Operations Bureau's Field Enforcement Division, in Washington, DC, where he worked in the Investigations Branch, and was later placed in charge of the FCC's nationwide radio-monitoring network. Haller was in charge of the FCC Office of Science and Technology's laboratory in Columbia, Maryland from 1981 to 1984, when he was named Chief of the Technical and International Branch of the Mass Media Bureau's Policy and Rules Division. He has published more than 20 technical papers, represented the US at international forums and directed several FCC studies on new technology. He holds an electrical engineering degree from the University of Kansas.

was killed "once and for all." Do you see any signs of life for a codeless license during your term as PRB Chief?

Fitch: In the no-code proceeding, the Commission heeded the expressed desires of the amateur community and dropped its proposal for a codeless class of license. I do not believe the Commission will make a similar proposal in the future unless the amateur community changes its mind and requests it to do so.

Mr. Haller, is being a ham a benefit or a hindrance as Deputy Chief?

Haller: Let me say that becoming a ham around age 10 absolutely shaped my career decisions. Amateur radio sparked an interest in broadcasting and that led to the FCC. Amateur radio provided an opportunity to learn through experimentation and to gain a practical appreciation for the operations of communications systems. I wouldn't trade that experience for anything. Setting aside that background, as Deputy Chief of the Bureau, I must make decisions that are in the public interest. Those decisions may not always favor the amateur community. To that extent, I think the only hindrance may be an expectation by the amateurs that I should be at least slightly biased in their favor.

How would you rate the performance of the Volunteer Examiner Program to date.

Fitch: The Volunteer Examination Program is working very effectively. Many more exams are being given at many more locations than prior to the program, which facilitates interested applicants becoming licensees. The record so far fully justifies our confidence that this would be a sound policy decision. It is not a perfect program and there are some abuses, but these can be dealt with while retaining the many positive results of the program.

Mr. Haller, you've logged some time in enforcement—in the Los Angeles field office and later in Washington as head of the nationwide monitoring network. How do you view the role of enforcement?

Haller: Actually, I've never liked the term "enforcement." I prefer to think of my past life as being in direct public service, not enforcement. I believe that too often, not necessarily at the FCC, enforcement occurs for the sake of enforcement without regard to the public policies being pursued. In the case of radio, the public policy is not issuing notices of violation and apparent liability for the sake of generating numbers and money for the treasury. Enforcement actions should be linked to encouraging efficient use of the spectrum. A good program also serves its clients by providing information and assistance in solving problems. I felt so strongly about this issue that, as chief of monitoring, I developed a "good guy notice" to be sent to stations found in compliance with the FCC Rules. This provided an enforcement "presence" in a community and a positive incentive to continue operating properly. Remember, at the FCC, the enforcement people are electronics engineers and technicians with interests similar to licensees. They are therefore generally anxious to help.

Communication is the key word around the FCC offices, particularly when Amateur Radio is on the agenda. In discussion here are (l-r) Ralph Haller, N4RH, PRB Deputy Chief; Perry Williams, W1UED, ARRL Washington Area Coordinator; Michael Fitch, PRB Chief; and Raymond Kowalski, Chief of the Special Services Division. Missing from this picture but an integral part of the FCC team are Roger D. Madden, Deputy Division Chief, and John Johnston, W3BE, Chief of the Personal Radio Branch. *(Julian Freret, ex-W5ECW, photos)*

With the FCC pulling more and more out of the exam scene, is self-policing going to be enough to maintain the integrity of the amateur Volunteer Examiner Program down the road?

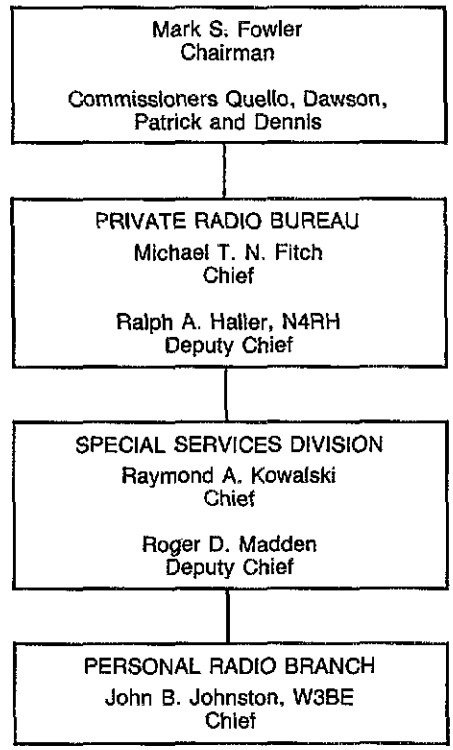
Fitch: Self-policing always has and always will be fundamental to the Amateur Radio Service. That will be the case with the Volunteer Examination Program as well. The Commission cannot make a radio service anything; that can only be done by the members of the service. As long as ARS members value integrity, self-policing will be effective. I see nothing to suggest any decline in the high degree of integrity of nearly all ARS licensees.

Is self-policing still an effective means for amateurs to keep violations off their bands?

Haller: Not only do I view self-policing as effective, I believe it is necessary. For example, cooperation and courtesy take the place of the formal frequency assignments found in most other services. Sometimes courtesy needs a nudge through peer pressure. You really can't find a more effective form of "policing" that that.

Any idea when the Commission will put out a Report and Order on Novice Enhancement?

Fitch: It should be adopted very soon and may even be out by the time this interview is printed.



The FCC organizational chart as it relates to the Amateur Radio Service.

Mr. Haller, for many years you have been closely involved in technical developments in communications. Is today's amateur the experimenter his predecessor was, or more of an appliance user?

Haller: That's not an easy question. When I started in amateur radio, over 25 years ago, it wasn't as easy to go buy a radio, hook up a microphone and antenna,

When I started in amateur radio, over 25 years ago, it wasn't as easy to go buy a radio, hook up a microphone and antenna, and be on the air. You at least had to tune the final amplifier. But, the generation before me thought we were soft because we weren't winding coils on oatmeal boxes. I would hesitate to say that experimentation has to mean something so specific that it excludes most of today's amateurs. Writing a BASIC program for logging or gaining an appreciation for VHF propagation through 2-meter mobile operation both qualify as experimentation in my view.

The issuing of exams and maintaining of question pools are two areas in which the FCC has seemingly abdicated its role. Do you see any more deregulation on the horizon?

Fitch: I do not consider these actions as the Commission "abdicating its role" at all. We are reviewing all of our regulations to see what functions are most effectively done by the Commission and what can be done more effectively by private citizens or groups. I am sure that as this review continues, there will be other activities that the Commission will turn over to the private sector and that these changes will enhance the ARS.

Mr. Haller, what innovations appeal to you today, as an amateur?

Haller: I have to admit that my current schedule doesn't permit me to be very active as an amateur operator, so I'm not directly involved with many of the innovations. I am, however, particularly intrigued by the packet switching networks that have been developed in recent years and by amateur satellite communications.

At the ARRL National Convention in September, there was some talk of the FCC turning over the issuing of second call signs to private groups. Has this gone beyond the talking stage?

Fitch: We have explored this possibility with other offices in the Commission and will soon be issuing a public document discussing possible approaches to a private special call sign program and requesting interested parties to submit proposals to us.

What areas should amateurs be addressing today to ensure the future of the Amateur Service?

Haller: I would suggest two related areas. First, young people need to be brought into amateur radio. Not only will this help the service survive and prosper, it will introduce many people to the fascinating world of communications. This should be a special emphasis area for the ARRL and amateurs in general. Second, amateurs must keep up with technology and lead the way in new developments. License upgrades, radio club "guest expert" speakers, and formal training for individual amateurs can help the service enjoy a healthy future.

After all is said and done, how would you like amateurs to remember your terms as Chief and Deputy Chief, respectively, of the PRB?

Fitch: As a Chief who understood the needs of the ARS and who promulgated deregulatory policies that promoted the long-term interests of the ARS and the public.

Haller: Although I'm not yet ready to say my farewell to the Bureau, I think I can respond to your question. Above all, I would like to be remembered for making fair and knowledgeable policy decisions that further deregulation. I have a strong, driving goal to get the government out of people's lives to the extent possible. I hope the Fitch/Haller team will be remembered for doing that.

1986: Reaffirming Amateur Radio's Objectives

(continued from page 47)

Argentino, was held in Buenos Aires. Delegates from the 34 member-societies in North and South America coordinated efforts to protect, promote, improve and advance the Amateur Service in such decisions as adopting band plans, encouraging use of 220 and 902 MHz, and coordinating emergency operating procedures.

Amateur Radio Administration courses, conducted by the IARU, gave telecommunications officials from a number of countries "hands on" knowledge of Amateur Radio's potential in their country. Classroom sites ranged from Kenya to Japan to Connecticut, USA.

Hams continued to open their homes to friends around the world as the International Travel Host Exchange expanded to 176 participants in 28 US states and 24 countries.

Operators worldwide started gearing up to celebrate 50 years of DXCC with the announcement of the DXCC Golden Jubilee Award, to be given in 1987.

What's in Store for 1987?

Is this the year the Amateur Service reverses the tide of Novice drop-outs? With the adoption of Novice Enhancement, increased Novice privileges could tap a reservoir of latent talent: inactive Novices, now eager to try new modes; drop-out Novices, ready to renew their interest in radio; and the unlicensed, curious to sample the new variety of communications Amateur Radio now has to offer to beginners. A greater Novice participation in, for example, public-service activities and new-mode experimentation would bring fresh ideas and enthusiasm to Amateur Radio's commitment to the public.

A new Novice question pool and Novice testing procedures will reflect the changes brought about by the enhanced privileges. VECs are already preparing to handle the influx of test candidates for all levels, as well as Novice.

Better coordination of emergency communications was a goal set in 1986. With the work done by the Blue Ribbon Committee on Emergency Message Traffic and the Memoranda of Understanding on the local level, improved training and efficiency will keep Amateur Radio's emergency-communications teams on the front line of service.

Newer modes of communications continue to be used by an increasing number of amateurs. With Fuji-OSCAR 12 flying high, and the anticipated launch of a Phase 3C satellite sometime this year, more amateurs can be "satellite active." Work on networking packet stations has moved ahead, widening the possible coverage offered.

On the international level, IARU Region 1 meets in the Netherlands in the spring this year. These conferences promote cooperation and international goodwill among an increasing number of member-societies. The DX Century Club Golden Jubilee Award encourages global airwave activity at a time of less-than-ideal propagation conditions.

Belated New Year's Resolution

Remember the fivefold commitment stated in Part 97.1? Take a moment to review each point and how you measured up in 1986. Fell short in providing emergency communications? Most public-service groups could always use one more operator. Join them this year. Your contribution to the "expansion of the existing reservoir within the amateur radio service" could be serving as a Volunteer Examiner or as an Elmer for the youngster next door. "Enhancing international goodwill" can be accomplished by opening your home to fellow hams by acting as an International Travel Host and by taking the time to get to know your DX contacts.

We may look back on 1986 with satisfaction of a job well-done. Let's not become complacent, but review and renew our commitment to the Amateur Radio Service in 1987.

Happenings

Conducted By Phillip Sager, WB4FDT
Manager, Regulatory Information Branch, ARRL

The New World of Amateur Radio

The New World of Amateur Radio. This is the working title of the new ARRL videotape presentation authorized by the ARRL Board of Directors last July as a replacement for the popular *World of Amateur Radio.*

ARRL Executive Vice President Dave Sumner, K1ZZ, and Roy Neal, K6DUE, who has produced many films and tapes for the League and for NBC News, met in Hartford, Connecticut on December 6 and reached agreement on a fast-paced "magazine" format for the video, which will go into production early in 1987.

The program will run about 30 minutes, and will be made available to broadcasters, to cable television and for showing to the public. It will emphasize the fun and excitement of operating amateur gear and, whenever possible, depict the new and young generation of hams in action.

The production team will include Forrest Oden, N6ENV, as Producer and Editor, and Bill Pasternak, WA6ITF, as Technical Supervisor and Field Producer. Both have worked on previous ARRL presentations, including *Amateur Radio's Newest Frontier* and *SAREX—The Shuttle Amateur Radio Experiment.*

The producers have already begun their search for interesting stories and people and professional production assistance. The search, like the television program itself, is worldwide in scope. Assistance from the Amateur Radio industry is being sought also.

If you have any suggestions or material, or if you wish to volunteer to work on this project, please write to Bill Pasternak, WA6ITF, TNWOAR, 28197 Robin Ave, Saugus, CA 91350, or via MCI Mail to BPASTERNAK.

RALPH HALLER, N4RH, NAMED DEPUTY CHIEF OF PRB

Ralph Haller, N4RH, has been appointed Deputy Chief of the FCC's Private Radio Bureau (PRB), succeeding Michael Fitch, who was appointed Chief. The Private Radio Bureau oversees numerous radio services, including the Amateur Radio Service. Haller has been with FCC since 1971, holding posts in the Field Operations Bureau, Office of Science and Technology, and the Mass Media Bureau. N4RH holds a degree in Electrical Engineering and has published over 20 technical papers and reports. He was the Chairman of the Federal Advisory Committee for Cable Signal Leakage and has directed several FCC studies of new technology. (An interview with Fitch and Haller appears on page 48, this issue.)

IRVING WESTON, K4NA, SK

Irving Weston, K4NA, passed away November 1 after a long illness. Weston had retired from the FCC as Chief of the Monitoring Division of the Field Engineering Bureau. A graduate of Northeastern University in Boston, where he became interested in Amateur Radio, and he was first licensed in 1923 as 1BHB. He entered government service as a radio inspector in 1928, and later was Engineer-in-Charge of the Allegan, MI monitoring station. Weston was a longtime member of ARRL, QCWA and OOTC.

HEYWOOD "WOODY" GERSTNER, WB2IAP, SK

It is with sadness that we report the sudden passing of New York City-Long Island Section Manager-elect "Woody" Gerstner, WB2IAP. Woody had been a very active Affiliated Club Coordinator of the NYC-Long Island Section, logging hundreds of miles on the Section's club circuit. Woody was to assume the Section Manager post on January 1.

Goldwater Scholarship Fund Contributions

The following have contributed $25 or more to the Senator Goldwater Scholarship fund: in memory of Mary Brown, W7FIZ and Daniel Kenney, N7CYE, from the Arizona Repeater Association; in memory of Ed Jaikins, WD8LRT, from Michigan Amateur Communications System; in memory of Fred Looft Jr, W8VUI, from Westpark Radiops; Robert McDonough, K4HHW, and the Veteran Wireless Operators Association, Inc.

FCC GENERAL COUNSEL LEAVES

Jack Smith, General Counsel of the FCC, is transferring to the Federal Home Loan Bank Board to become Deupty General Counsel for Operations. Smith will be responsible for the Board's litigation activities across the country. Smith has been with the FCC for 13 years and has served in two top posts: Chief of the Common Carrier Bureau from 1983 to 1984, and General Counsel from 1984 to present.

DIANE KILLORY NEW FCC GENERAL COUNSEL

FCC Chairman Mark Fowler has named Diane Killory to be General Counsel. Killory is currently Senior Legal Advisor to Commissioner Dennis Patrick, a position she has held since December 1983. Killory is a summa cum laude graduate of the University of Rochester, where she was elected to Phi Beta Kappa, and a cum laude graduate of the Harvard Law School. Before joining the Commission, Killory was an attorney with the law firm of Steptoe and Johnson, where she practiced in the area of communications law.

NARTE CERTIFICATION

In the Happenings column of December *QST*, we mentioned that NARTE, The National Association of Radio and Telecommunications Engineers, Inc, was granting credit for its commercial Technician Class IV Certificate to amateur Advanced and Extra Class licensees. The NARTE program covers not only broadcasting, but also includes commercial aspects of satellite, microwave systems, Land Mobile commercial systems and a wide range of telecommunications areas. The NARTE decision to grant its entry-level Class IV certificate provides a mechanism whereby the amateur may enter the commercial field, providing a greater pool of technical personnel for industry. For further information, contact NARTE at PO Box 15029, Salem, OR 97309, tel 503-581-3336.

HAROLD WESTMAN, W2CA, SK

A few sharp-eyed OTs have noted the name of Harold Westman, W2CA, among our list of Silent Keys in November *QST*. Westman was an early employee of the ARRL, joining the staff in 1926 to conduct the Technical Information Service. In 1927, he became Assistant Technical Editor and was Techical Editor during 1928-9. He left ARRL in 1929 to work for the IRE (now the IEEE) in New York City.

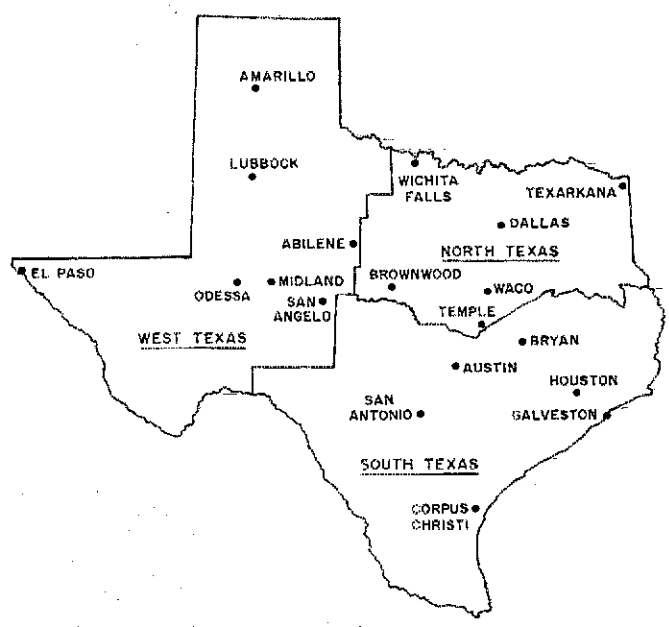
TALCOTT MOUNTAIN SCINET TV SHOW

On Saturday, December 6, Amateur Radio gained unique exposure to middle school and high school teachers all over North America. The ARRL was invited to contribute to one 90-minute show in the TV series *The Shoulders of Giants,* shown every Saturday at 2 PM (Eastern) on communications satellite Westar IV.

The Shoulders of Giants is a graduate credit course conducted by the Talcott Mountain Science Center (Avon, Connecticut) under contract with the University of Hartford. The purpose of the TV series is to help teachers

Texas Sections Defined

Headquarters has received a number of inquiries about the boundaries of the new West Texas Section and how it relates to the North Texas and South Texas Sections. This map shows the boundaries of the Sections. Below are listed the counties and major cities of each of the Texas Sections:



South Texas

Angelina, Aransas, Atascosa, Austin, Bandera, Bastrop, Bee, Bexar, Blanco, Brazoria, Brazos, Brooks, Burleson, Burnet, Caldwell, Calhoun, Cameron, Chambers, Colorado, Comal, Concho, DeWitt, Dimmitt, Duval, Edwards, Fayette, Fort Bend, Frio, Galveston, Gillespie, Goliad, Gonzales, Grimes, Guadalupe, Hardin, Harris, Hays, Hidalgo, Houston, Jackson, Jasper, Jefferson, Jim Hogg, Jim Wells, Karnes, Kendell, Kenedy, Kerr, Kimble, Kinney, Kleberg, LaSalle, Lavaca, Lee, Leon, Liberty, Live Oak, Llano, McCulloch, McMullen, Madison, Mason, Matagora, Maverick, Medina, Menard, Milam, Montgomery, Newton, Nueces, Orange, Polk, Real, Refugio, Robertson, Sabine, San Augustine, San Jacinto, San Patrico, San Saba, Starr, Travis, Trinity, Tyler, Uvalde, Val Verde, Victoria, Walker, Waller, Washington, Webb, Wharton, Willacy, Williamson, Wilson, Zapata, Zavala.

Major Cities: Austin, Corpus Christi, Galveston, Houston, San Antonio

North Texas

Anderson, Archer, Bell, Bosque, Bowie, Browm, Callahan, Camp, Cass, Cherokee, Clay, Coleman, Collin, Comanche, Cooke, Coryell, Dallas, Delta, Denton, Eastland, Ellis, Erath, Falls, Fannin, Franklin, Freestone, Grayson, Gregg, Hamilton, Harrison, Henderson, Hill, Hood, Hopkins, Hunt, Jack, Johnson, Kaufman, Lamar, Lampasas, Limestone, McLennan, Marion, Mills, Montague, Morris, Nacogdoches, Navarro, Palo Pinto, Panola, Parker, Rains, Red River, Rockwall, Rusk, Shackelford, Shelby, Smith, Somervell, Stephens, Tarrant, Throckmorton, Titus, Upshur, Van Zandt, Wichita, Wise, Wood, Young.

Major Cities: Dallas, Ft Worth, Texarkana, Waco, Wichita Falls.

West Texas

Andrews, Armstrong, Bailey, Baylor, Bordon, Brewster, Briscoe, Carson, Castro, Childress, Cochran, Coke, Collingsworth, Cottle, Crane, Crockett, Crosby, Culberson, Dallam, Dawson, Deaf Smith, Dickins, Donley, Ector, El Paso, Fischer, Floyd, Foard, Gaines, Garza, Glasscock, Gray, Hale, Hansford, Hardeman, Hartley, Haskell, Hemphill, Hockley, Howard, Hudspeth, Hutchinson, Irion, Jeff Davis, Jones, Kent, King, Knox, Lamb, Lipscomb, Loving, Lubbock, Lynn, Martin, Midland, Mitchell, Moore, Motley, Nolan, Ochiltree, Oldham, Parmer, Pecos, Potter, Presidio, Randall, Reagan, Reeves, Roberts, Runnels, Schleicher, Scurry, Sherman, Sterling, Stonewall, Sutton, Swisher, Taylor, Terrell, Terry, Tom Green, Upton, Ward, Wheeler, Wilbarger, Winkler, Yoakum.

Major Cities: Abilene, San Angelo, El Paso, Lubbock, Midland, Odessa, Amarillo.

enhance their ability to teach science and math—areas where the nation's educational system is considered to be deficient. This Amateur Radio show in particular demonstrated some practical ways in which our hobby can be used to teach science-related material, and also to show that Amateur Radio is useful to facilitate other nontechnical areas of students' cognitive and social development.

The show was moderated by former HQ staffer Bill Dunkerley, WA2INB, now an independent consultant. The primary guest on the show was Roy Neal, K6DUE, now a science consultant to NBC News. Two educator/hams also appeared on portions of the show: Pete Kemp, KZ1Z, of Bethel (CT) Middle School, and Carole Perry, WB2MGP, a middle-school teacher from Staten Island, New York. Both Carole and Pete have developed extensive lesson-books plans for integrating Amateur Radio into classroom teaching; these were shown on the TV show so that nonham teachers will know that such materials are available. Roy showed the League's Novice study guide *Tune in the World*, and all correspondence about the show is being routed to the ARRL HQ address, "Attn: SCISTAR," for processing by the Club Services Department staff.

Included in Saturday's program were several segments of videotape excerpted from the ARRL's A/V library: portions of *Amateur Radio's Newest Frontier* and *SAREX* (about the Shuttle missions of W5LFL and WØORE), as well as *OSCAR and the Ham*, a tape made several years ago about OSCAR 6 and shot at Talcott Mountain.

The program ran 90 minutes, but will probably be edited down to just under 60 minutes for distribution through the ARRL's Audio/Visual Library.

FCC DENIES EMP PETITION

In July, two individuals submitted a petition to the FCC requesting a Notice of Inquiry on the subject of Electromagnetic Pulse (EMP) and possible countermeasures. This included a possible FCC requirement that some civilian communications be shielded and bypassed against EMP. On December 5, the FCC denied the petition. The FCC said that comments it had received on the petition pointed out that the President had established the National Security Telecommunications Advisory Committee (NSTAC) in 1982. NSTAC has established an EMP task force to examine the EMP threat. At the urging of the task force, the American National Standards Institute is developing standards for implementing the EMP task-force recommendations.

In denying the petition the Commission stated, "Although the issues raised by Petitioners are topical and important, they do not warrant examination by the Commission at this time. A comprehensive study of these issues is in progress and should be permitted to proceed unimpeded...based on the number of comments received, the EMP issue does not appear to require an immediate public forum."

FCC DECLINES TO FINE ELECTRIC COMPANY

In August, ARRL Counsel Chris Imlay filed a Petition for Imposition of Forfeiture and Other Relief against the Pacific Gas and Electric Co (PG&E) on behalf of two ARRL members living in Anderson, California. WB6SXL and W6VLE had both experienced noise from the PG&E's power lines of up to

10 dB over S9 on the 160- through 20-meter bands.

Richard Santos, WB6SXL, had first complained of heavy power line noise to PG&E in 1977, but no action was taken by the utility company. More complaints were made in 1978, and finally in 1979 PG&E began a serious investigation of the noise. After many tests, the source of the noise was found to be high-voltage lines a half mile away from the Santos's home. Since then PG&E has refused to eliminate the interference, claiming high replacement costs. Complaints to the FCC Field Office in San Francisco have produced an unsatisfactory response.

Another amateur, W6VLE, is also receiving high noise levels, and has written letters to PG&E and FCC, without the problem being solved. In both cases, there has been no reduction in interference, despite PG&E's claims that over $20,000 has been spent trying to solve the problem. Having exhausted all other remedies, the ARRL filed its request for imposition of forfeiture before the FCC. It asked that the Commission issue a notice of violation against PG&E as the result of their repeated refusal to rectify the interference.

On November 21, the FCC Chief Scientist, Dr Thomas Stanley, denied the petition. "The Field Operations Bureau [he wrote] has found that the radio noise is due to the Corona effect (an electrical discharge resulting from a partial electric breakdown in a gas, such as that which happens in the air surrounding a wire of a high potential). This is typical of the old chain-like cable that is used in this transmission system. The FOB has further determined that the only way to eliminate completely the remaining interference would be by replacing the existing conductors of the facilities.

"The Commission's past policy with regard to this type of interference," Dr Stanley said, "has been to require power companies to correct problems if the RFI is caused by defective line insulators, loose/unbounded hardware, discharges from defective lighting arrestors, or defective transformers. However, the commission has not required power companies to correct RFI on properly installed transmission lines, if the interference is caused by Corona, if the interference is to only a few individuals, and if correcting the problem would constitute a major financial burden to the power company, which would be passed on to the public."

At press time, WB6SXL and W6VLE are undecided about pursuing other remedies.

Amateur Radio Call Signs

Amateur Radio operators often ask the FCC what call signs have been assigned lately. This list shows the last call sign in each group to be assigned for each district as of December 1, 1986.

Radio District	*Group A Amateur Extra*	*Group B Advanced*	*Group C Tech/Gen*	*Group D Novice*
0	NV0C	KE0JK	N0HPE	KA0YXI
1	NI1J	KC1BF	N1EMS	KA1PEV
2	NU2X	KD2WX	N2GUY	KB2BYC
3	NE3M	KC3ZY	N3FFW	KA3QHL
4	AA4XT	KK4DN	N4PDR	KB4VOH
5	WT5H	KF5SZ	N5JZH	KB5BGX
6	WZ6R	KI6NK	N6DOH	KB6OZK
7	NY7N	KE7VY	N7ITZ	KA7ZZO
8	NU8P	KE8IT	N8HXP	KB8AOV
9	NO9Z	KE9AZ	N9GEW	KA9WHX
Alaska		AL7IM	NL7JM	WL7BLY
Hawaii		AH6HN	NH6HT	WH6BMS
Puerto Rico	WP4V	KP4LP	WP4AY	WP4CKR
Virgin Is	KP2Q	KP2BA	NP2BY	WP2AFG

Are You a Lawyer? Amateur Radio Wants You!

Your legal expertise is needed in the Amateur Radio community to help build and maintain the legal foundations for our hobby. The League's Volunteer Counsel (VC) Program is designed to help stem the tide of overly restrictive regulations on Amateur Radio. You can help if you have an interest in this exciting area of communications law, are a reputable member of the bar of at least one state and are a League member, please contact us. As a Volunteer Counsel, you will be kept well informed about areas of law affecting Amateur Radio. For further information, write to the ARRL Volunteer Counsel Program, 225 Main St, Newington, CT 06111.

If you live in one of the following ARRL Sections, your legal experience is especially needed: Alaska, Arkansas, North and South Carolina, North and South Dakota, North Florida, Idaho, Maine, Mississippi, Montana, Nevada, Utah and West Virginia.

SECTION MANAGER ELECTION NOTICE

To all ARRL members in the Nevada, Rhode Island, Northern New Jersey, San Joaquin Valley, Utah, Maryland-DC, New Hampshire, West Texas and NYC-LI Sections: You are hereby solicited for nominating petitions pursuant to an election for Section Manager. Incumbents (except for West Texas) are listed on page 8 of this issue.

To be valid, a petition must contain the signatures of five or more FULL ARRL members residing in the Section concerned. Photocopied signatures are not acceptable. No petition is valid without at least five signatures *on that petition*. It is advisable to have a few more than five signatures on each petition.

Petition forms (FSD-129) are available on request from ARRL Headquarters but are not required. The following is suggested:

(Place and date)
Field Services Manager, ARRL
225 Main Street, Newington, CT 06111

We, the undersigned FULL members of the...ARRL Section of the...Division, hereby nominate...as candidate for Section Manager for this Section for the next two-year term of office.

(Signature...Call...City...Zip...).

Any candidate for the office of Section Manager must be a resident of the Section, a licensed amateur of Technician class or higher, and a FULL member of the League for a continuous term of at least two years immediately preceding receipt of a petition for nomination.

Petitions must be received at Headquarters on or before 4 PM Eastern Local Time March 6, 1987.

Whenever more than one member is nominated in a single Section, ballots will be mailed from Headquarters on or before April 1, 1987. Returns will be counted May 19, 1987. SMs elected as a result of the above procedure will take office July 1, 1987.

If only one valid petition is received for a Section, that nominee shall be declared elected without opposition for a two year term beginning July 1, 1987.

If no petitions are received for a Section by the specified closing date, such Section will be resolicited in July *QST*. An SM elected through the resolicitation will serve a term of 18 months.

Vacancies in any SM office between elections are filled by the Field Services Manager.

You are urged to take the initiative and file a nomination petition immediately.

Richard K. Palm, K1CE
Field Services Manager

SECTION MANAGER APPOINTMENT

In the Oregon Section, Randy Stimson, KZ7T, has been appointed to complete the term (until July 1, 1988) of William R. Shrader, W7QMU (resigned).

SECTION MANAGER ELECTION RESULTS

The following Section Managers will begin a two year term of office April 1, 1987:

Uncontested

Arizona	James E. Swafford, W7FF
North Dakota	Roger "Bill" Kurtti, N0AFP
Northern Texas	Phil Clements, K5PC
Orange (CA)	Joe H. Brown, W6UBQ
Wyoming	James E. Raisler, N7GV

Correspondence

Conducted By John C. Hennessee, KJ4KB
Regulatory Information Assistant, ARRL

All letters will be considered carefully. We reserve the right to shorten letters selected in order to have more members' views represented. The publishers of *QST* assume no responsibility for statements made herein by correspondents.

THANKS FOR THE MEMORIES, GIL!

☐ I read with pleasure the letter of remembrance in November Correspondence from Gil's daughter, Barbara Gildersleeve Tripoli. It prompted me to write, too, having received a copy of *The Gil Cartoon Book* from my XYL.

Gil's cartoons so represented the fun and spirit of Amateur Radio. Years ago I wrote an article for *QST*, and Gil illustrated it with three wonderfully creative cartoons. The article was "Working WLP," which was published in June 1958 *QST*. I don't know why I didn't sit down at that time and write a letter of thanks to Gil. In a sense, I am doing so now.

Dick Baldwin, W1RU, then Managing Editor of *QST*, sent me all three originals. They have graced the walls of my shack for 28 years. I was delighted more than I can say that two of them appear in Gil's book one of which occupies page one. Thanks for the memories.—*Ed Hayden, K3OKL (ex-K2TFV), Annapolis, Maryland*

A QSL FROM VK4WT, SK

☐ I worked VK4WT on May 31, 1985. I sent a QSL with SASE and I later sent another when I received no reply. What I finally received was a two-page letter from VK4WT's widow informing me that her husband had passed away July 30, 1986. The letter was as friendly as one from my own family. She apologized for not answering sooner. She said that she had been ill recently. Included were two blank QSLs, an obituary notice, and a collection of postcards from Brisbane.

Would the living QSL as conscientiously as this Silent Key?—*Brice A. Wightman, VE3EDR, Ottawa, Ontario*

QRZ STARSHIP *ENTERPRISE*

☐ There have been many letters recently in *QST* recalling the use of CW and other amateur subtleties in old cartoons and movies. Apparently the trend of "hamming it up" on film is returning. I recently saw *Star Trek IV* and noticed familiar sounds during a few scenes involving communications.

What first caught my attention were some 300-baud packet sounds. Toward the end of the movie were a few mistuned AMTOR chirps. Did I hear part of a "KA" call during a distress signal? CW in the 23rd Century? —*Thomas C. Weeden, WB9HME, Madison, Wisconsin*

A LABOR OF LOVE

☐ A three-alarm fire in Anaheim on Saturday night, October 26, caused many ham operators to lose sleep. These were members of the N6ME Repeater Western Amateur Radio Association, members of ARES and the Red Cross. This is just another example of how important ham radio operators are to the public service.

Other major fires in Anaheim and Fullerton saw these devoted and dedicated hams leave the serenity of their homes to spend hours in helping the victims of these disasters. The worst was the Mexican airliner tragedy in Cerritos. Unfortunately, many members of the public see these people and think that they are city or county employees. Rarely do the hams receive the acknowledgment or recognition they so rightfully deserve. Because of our dedication, we hams carry on as though we were being paid and very few people realize that our equipment, expenses and time are a donation of love to our fellow man.—*Irv Lans, KA6SOP, LaMirada, California*

VEC WORKS!

☐ In August of 1986 at the Warren, Ohio Hamfest, I was given my General class amateur examination by the VE team from the Portage Amateur Radio Club. In September, I was given a higher class examination by the same VE team.

I was impressed by the manner in which these examinations were conducted. The team's dedication and professionalism is a credit to the ARRL and to Amateur Radio. This made a favorable impression on me as a newcomer to Amateur Radio.—*James Hudson, N3FDM, Sharon, Pennsylvania*

THE MAGIC OF RADIO

☐ Over the past few years, I have been watching with interest your editorials regarding the numbers of new amateurs being licensed and, more generally, the direction Amateur Radio is taking. It seems evident to me that most people who have retained their amateur licenses for years and have upgraded their licenses all have one thing in common: They seem fascinated by the "magic" of radio.

At any given point our culture can spawn a limited number of people who are sufficiently fascinated with radio. We can and should encourage people, especially the young, to develop their interests in radio. Indeed an interest can only be sparked by exposure. However, only a limited number of people are true radio enthusiasts. I am not sure, therefore, that the present concern over numbers of amateurs is entirely warranted. Perhaps quality is more important than quantity when considering this issue. Certainly recruitment efforts are valid, but we should not overreact to a cultural glitch.

The computer revolution has diverted the attention of nearly everyone involved with electronics as a hobby or a profession. For at least the last decade, the majority of electrical engineering students have concentrated on digital and computer science. The result has been a pronounced shortage of RF and analog engineers. This shortage comes at a time when RF and high speed data communications is booming.

RF engineers are in great demand. Amateur Radio is an excellent training ground for careers in radio and analog engineering. Perhaps this should be mentioned to our young potential licensees.

The preponderance of microprocessor and digital development has had a great influence on Amateur Radio. It is my hope that in the midst of this development and evolution of radio, we do not lose track of the real purpose of Amateur Radio: the development of the radio art. I think it is foolish to let a computer have my fun for me. To conclude, I believe that the future of Amateur Radio is bright, as is the future of radio technology generally. The two have always and should continue to complement each other. We should continue to recruit people into our ranks who are serious about radio. If we can license the bulk of people fascinated by radio at any given time, then our task will have been achieved.

Once the radio is diminished to a computer peripheral, we will lose Amateur Radio. The trend can be seen in the "bells and whistles" now offered on many transceivers while the actual radio performance is often mediocre or poor.—*Robert J. Zavrel, Jr, W7SX, Mountain View, California*

☐ I have noticed over the past couple of years concern expressed in *QST* and other ham magazines over the slow growth in Amateur Radio. I offer a possible partial explanation. The extremely rapid advancement in the electronics technology which most magazines emphasize is perhaps outstripping the interest of some would-be hams. My career is that of a professional petroleum geologist, and I participate in ham radio as a recreation and diversion. I did manage to learn enough electronics to squeak by the Advanced class examination some 15 years ago, but I have now been left in the dust by the technological explosion. That is okay, though. I still get my kicks on 20-meter CW and by building some simple gadget or kit. What about the nonham who picks up a ham magazine and sees complex articles on the new technologies such as AMTOR, packet and the like? This is heavy stuff, and I am sure it is daunting to the casual interest.

Don't get me wrong; I am not suggesting that the solution is to reduce the number of high-tech articles. I do enjoy skimming them at least to see what is new. What I am saying is that the prospective ham should somehow be made to realize that he doesn't have to understand all of this advanced technology to enjoy ham radio. If he has an interest in electronics as a career, then ham radio is an excellent avenue to that end, but if not, he will find a lot of company as a dilettante. I think the ARRL is doing a fine job of keeping an eye on the newcomers as well as those of us left behind and I urge you to maintain that balance. After all, one of the great things going for Amateur Radio is the fact that one can dive in as deep as one wants. Personally, I am having fun in the shallow end, and I enjoy watching the swan divers at the other end. —*Howard Sahl, WBØIWN, Lakewood, Colorado*

How's DX?

Conducted By Ellen White, W1YL/4
19620 SW 234 St, Homestead, FL 33031

6K86AG—Asiad, The 10th Asian Games

6K86AG was the very first Korean Amateur Radio League, Inc special-events station. 42 operators (including 3 YLs) participated and amassed a total of 9368 contacts/102 countries on 3.5-430 MHz—despite extremely poor conditions. Special thanks to Kwak Bae Sook, HL1ATL, KARL Editorial Director, for insights into Asiad.

The Asian Games Village, sprawled on a large tract of land in southwestern Seoul, was a temporary home for 5000 Asian athletes in 18 buildings with 1356 apartments and other facilities. Within the village, 6K86AG was located on the fourth floor of the four-story Medical Center and was open 24 hours a day for use by licensed participants.

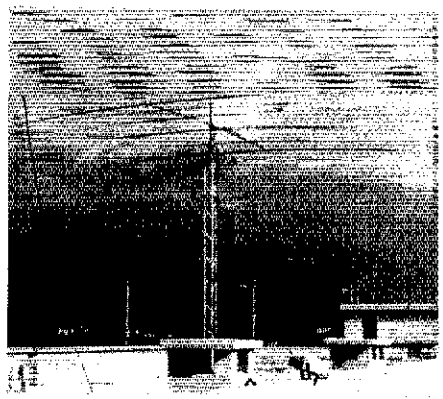
All bands 1.8-430 MHz were provided for, as were all modes, including RTTY and OSCAR. Rigs were the latest: TS-940S TS-530S TS-811 TS-711 FT-757 (courtesy JARL) and 30L1 KWM 2A C-5000. Supporting computers were used with appropriate logging software. Topping the building were 3-el and 6-el tribanders, other beams for 2 meters and satellite, as well as dipoles for the low bands.

The first contact took place on 15 meters at 1212Z Aug 24. Propagation was particularly poor during Asiad, with only a few small openings into Asia and the Pacific on 15 and 40, and almost nothing into Africa and the Americas. No contacts were possible on both 160 and OSCAR—a big disappointment to the crew.

Aug 24-Sep 5: "It couldn't be described, just great," Moon said, when 6K86AG began transmitting for the first time. Conditions were uncertain: 15/40 fairly good, but only to JA; 20 going out and 10/80 dead. Twenty was only able to be worked at night with a 6-el beam; in the daytime, most of the contacts were with JAs, using the 3-el array. Until September, we didn't even hear signals from most of Asia, the Pacific, USA and most of Europe.

Sep 6-19: The village itself opened Sep 6, under tight security. Only 20 was open at night, just briefly. All bands closed down around the middle of the month. The first contacts on 80 were made on Sep 11, with eight JAs.

Sep 20-30: The Seoul Asiad, with a total of 4787 athletes from 27 Asian countries, had a beautiful opening ceremony. At about this time, propagation peaked and they ran exciting pileups from Europe. Jon and Moon added 325 contacts on 20 with a six-hour run, mostly Europeans. Their luck lasted four nights; along with thousands of JAs they worked Egypt, Tahiti, New Caledonia, W/E Malaysia, the Carolines, Thailand, Singapore, India, Sri Lanka, Papua New Guinea, Norfolk, Faroes and the Solomons. Even on 10 they had a short JA pileup, resulting in 70 contacts. Nothing yet from Africa and America, possibly as a result of several of the village buildings being in those directions. After the HL9s joined their group, their English proficiency resulted in increased W contacts, thanks to Cal's 40-meter CW and Jeff, Steve and Kent's 20-meter sideband.



6K86AG's 6-el tribander, located on the roof of the four-story building.

Oct 1-8: Again, poor conditions. OTs like Seo, Park and Jon were nostalgic for the good old days (and good old conditions!). Their 90 contacts with W stations by the end of September is proof enough of poor propagation.

They had planned to leave by Oct 8. Despite frustration, they stuck to the rigs. 45 days after the start, the village was almost vacant and 20 came alive to Europe, 15 to Asia. Around 2300Z Oct 7 there was a small W opening, but only a few contacts resulted. The final 20-meter CQ occurred at 0228Z Oct 7. There was a W pileup, but signals were unreadable. W6NGZ did his best, but only seven stations were copied.

6K86AG closed down at 0312Z Oct 8, with joy (and sighs), and with special thanks by the operators for the interest of the Amateur Radio group. Card requests for 6K86AG go via the Korea Amateur Radio League Bureau (KARL), CPO Box 162, Seoul, Rep of Korea.

Top-Ten Country Contacts

Japan	6219	USA	221
Korea	604	Italy	92
USSR	500	New Zealand	82
Indonesia	499	Philippines	77
Australia	493	W Germany	52

The most active of 6K86AG's HL members include (l-r) HLØR (Moon), HL1AUQ, HL1RE, HL2ING, HL1EJ, HL1LW, HL1ATL, HL1IE, HL1XZ and HL2HY.

HL9s who helped to operate 6K86AG (seated, l-r): HL9OB/N4MBT, HL9YG/KD5YG, HL9AV/N6HSX and HL9EP/WF5W (president of the HL9 club).

AULD MUG AWARD

In VK6, Australia is to defend the right to hold the most coveted trophy in yachting, the America's Cup. In celebration of this important sporting event, the Western Australian Division of WIA (the Wireless Institute of Australia) is offering an attractive award. To qualify, stations outside Australia must obtain four points by communicating with either four VK6 stations or the VK6CUP special-event station—all bands/modes. Contacts made after Oct 5, 1986 until the final deciding race will be eligible. A report must show date, time, band/frequency and RST. SWLs are eligible. Application must be certified correctly and sent to the Awards Manager, WIA (VK6 Division), Box 10, West Perth, Australia 6005.

ST LUCIA/DOMINICA

It's that time of the year again! K4LTA and XYL N4FKO are planning their eighth DXpedition to the Caribbean, from Feb 19 (for 10 days on St Lucia), followed by a stopover in Dominica the first 10 days of March. Other operators will include NF5Z, W5PWG and WE5P. Plans are to operate the ARRL DX Contest on CW from St Lucia (probably with the call J6LTA, unless a new-prefix double-numeral call sign is granted them). On Dominica they'll use J70A, with the assistance of J73LC. CW activity will be 25-30 kHz from the low end, plus 7005, 3505 and 1833. You can catch Ruby for a YL sideband QSO after their schedules back home at 2200Z weekdays on 14,257, and just before their schedule for Novices and slow-speed CW operators at 2230Z weekdays on 21,123. QSL routing to be announced later.

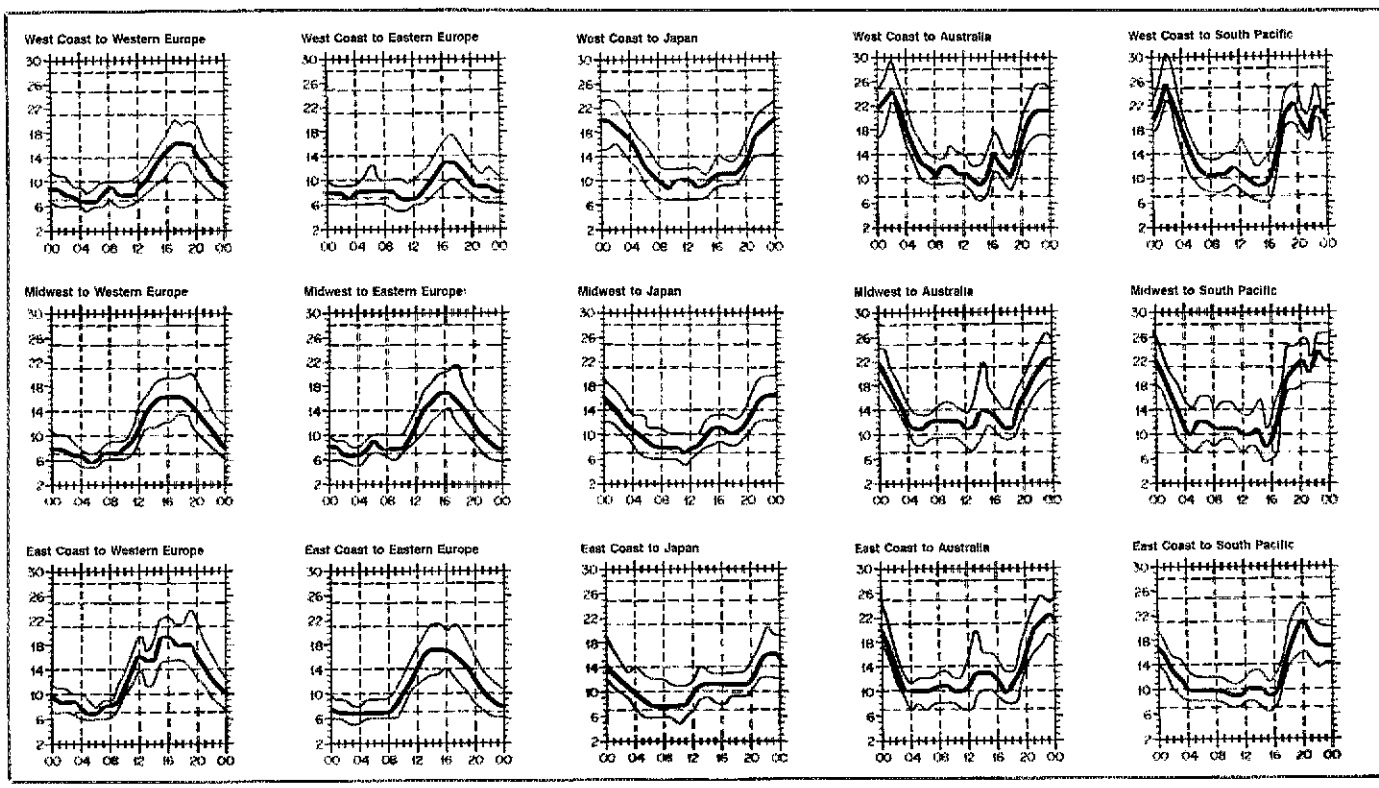
1986 ARRL Phone DX multi-single winner, ZF2HI, at 6+ million points (l-r): standing are WA8CZS, XYL of WA8CZS, WD4KXB, XYL of W2HPF, N4MZJ, and KZ2E; seated are XYL of WD4KXB, and W2HPF.

THE CIRCUIT

☐ **Peter 1:** The Norwegian DX group, along with the NCDXF, should have two operators on this new country this month. This operation is in addition to the planned 24-hour 1986 year-end event.

☐ **DXAC:** The new representative for the West Gulf Division is John Hawkins, K5NW.

☐ **Libya:** Thanks to the persistent efforts of G3JKI, supporting documentation has been received by the ARRL DXCC Desk for the '80 and '81 operations from Libya by G3JKI/5A.



When are the bands open? These charts predict this month's average propagation conditions for high-frequency circuits between the U.S. and various overseas points. One chart for East Coast to West Coast is also included. On 10 percent of the days of the month, the highest frequency propagated will be at least as high as the uppermost curve (highest possible frequency, or HPF). On 50 percent of the days of the month, it will be at least as high as the middle curve (maximum usable frequency, or MUF). On 90 percent of the days of the month, it will be at least as high as the lowest curve (optimum traffic frequency, or FOT). See April 1983 *QST*, page 63, January 1977

Troster's Tips for Easy Listening: QSY

You are the DX station operator, having a great, raging pileup going that you're chewing away at. Great fun! But, about every four minutes, someone will ask you, "When are you going to 20 phone" or "160 RTTY?" or some other needed band/mode. If you are racing through 3-4 contacts per minute and don't wish to break stride, you can ignore the question, or you can say "later" and keep going.

About every 15 minutes you might take a breather, and announce your plans: "40/0200, 80/0400," or whatever. If you give this information on a periodic basis, you may surely ignore the questions, or be polite with your "later" when asked to interrupt your routine.

But, be *sure* to follow your announced schedule. If you give time/frequency, be there! Of course, there could be exceptions, such as if you're on 20 and the band is wide open while you're churning out 4 contacts/minute. You could, and probably should, keep that rate up on 20. But you might say periodically, "QSY to 40 after 20," or something like that.

In short, keep your listening public informed. They'll appreciate it. Indeed, you're a good guy!

Cards have been acceptable since last Nov 1.

☐ **Syria:** The Technical Institute of Radio announces new officers: President YK1AO, Vice President YK1AN, Secretary YK1AM. Address is Box 245, Damascus, Syria. Outgoing president YK1AA, the founder of Amateur Radio in Syria, stays on as honorary chief of TIR. (The new president published the first book in Arabic about Amateur Radio.) Late this year, the 40th anniversary of TIR will be celebrated with special-event stations 6C40 TIR, O, M, RJ.

☐ **K3TW:** The peripatetic Tom Warren will be in New Delhi until May 1988, and has been operating from 9N1MM (cards via N7EB) and HSØA (via the bureau in Bangkok). You can contact Tom via (USA/VE) Thomas J. Warren, AD/ESC New Delhi, Department of State, Washington, DC 20520, or (DX) Thomas J. Warren, American Embassy, Shanti Path, Chanakyapuri, New Delhi, India 110021.

☐ **5H3RB:** NM2R will be spending 3-4 years in Dar es Salaam, less than 200 feet from the Indian Ocean. Contact Roel Bouwman via Box 9534, Dar Es Salaam, Tanzania, or via Box 20061, 2500 EB, The Hague, The Netherlands.

☐ **JH1VRQ/LU:** ARRL International Programs Manager N1CIX/JH1VRQ worked 26 JAs on 15 sideband from Buenos Aires at the recent IARU region meeting.

☐ **VIØCC/Heard Island:** W7AM is thrilled to have been Colin's only North America contact, the most exciting event in Allen's 55 years of hamming, particularly since he missed the two previous Heard Island operations while vacationing in KH6.

☐ **A4XND:** Mid-November saw A4X licensees in the Sultanate of Oman join with their Society's HQ station by signing /ND (National Day), commemorating Oman's 16th National Day. Award info via ROARS, Box 981, Muscat, Oman.

☐ **N3JT/HKØ:** Cards go via W2GHK/4ever, Stu Meyer.

☐ **VI3PVA:** This late-year special-event station commemorated the Australian visit of Pope John Paul II (Papal Visit Australia), manned by the Amateur Radio Club Polonia, VK3CRP.

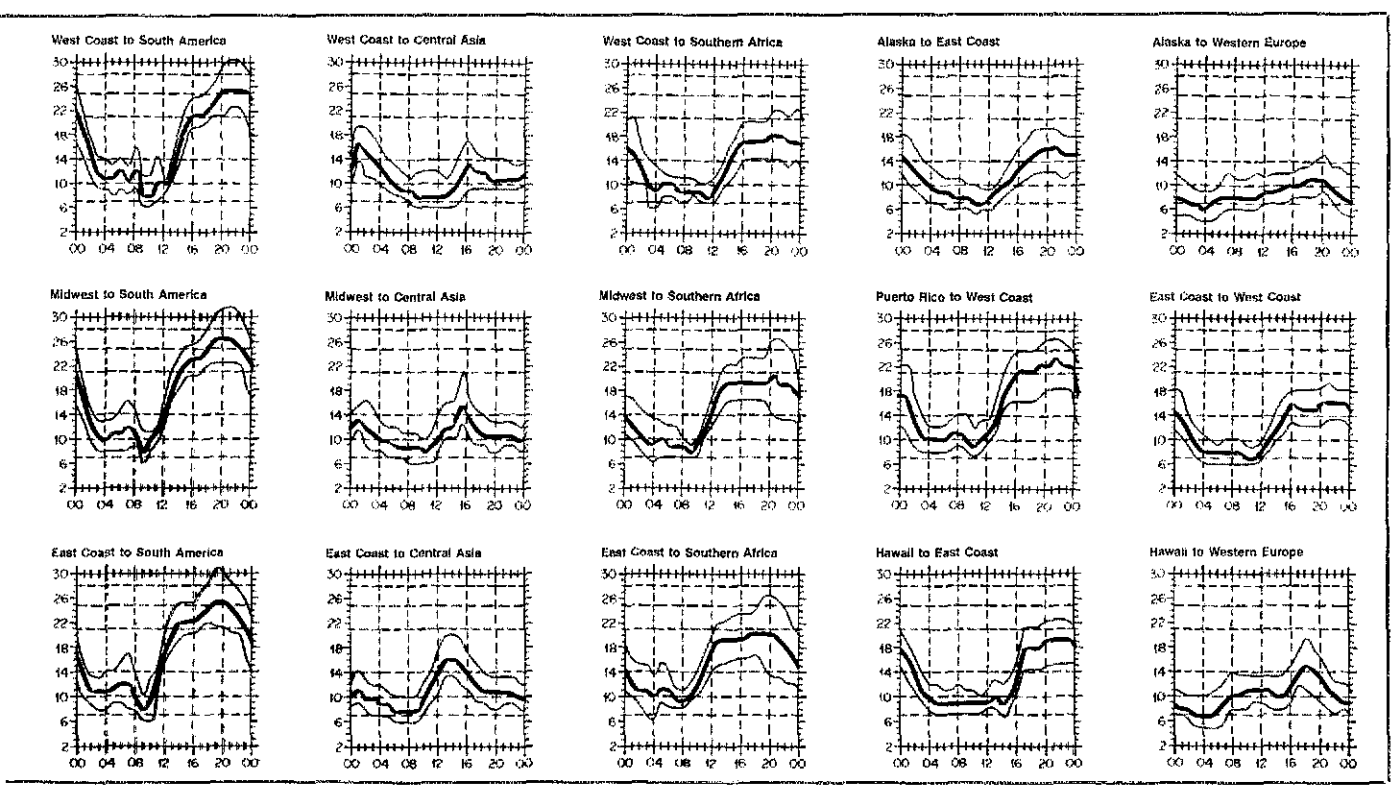
☐ **FR/W6QL:** The Colvins closed down their Reunion operation with over 8k contacts in 148 countries. Next anticipated stop was Mayotte, FH/W6KG. QSL via Yasme, Box 2025, Castro Valley, CA 94546.

☐ **Hamboree:** Miami's Feb special will feature an all-day DX session by the So Florida DX Association: DXpeditions, QSL Etiquette, Antennas and QRP DXing. The club will sponsor a hospitality suite at the airport Ramada Inn beginning at 6 PM Saturday.

☐ **CXØXY:** The Uruguayan DX Group, Box 20063, Montevideo, Uruguay, should open up on all bands/modes during their DXpedition to King George Island in the South Shetlands in mid-March. QSL via CX2CS.

☐ **4U41UN:** Commemorating the 41st anniversary of the founding of the UN, this call was used on Oct 24 for about 8 hours on 20 sideband by K7ICW. Use W2MZV's 1986 *Callbook* address.

☐ **Aruba:** The DXAC vote on separate status for P4 ended in a tie and, according to DXCC rules, this defeats the motion. Aruba continues to count for the Netherlands Antilles listing, which includes Curacao and Bonaire. QST



QST, page 58, September 1977 *QST*, page 35, and January 1979 *QST*, page 11, for a complete explanation. The horizontal axis shows Coordinated Universal Time (UTC); the vertical axis, frequency in MHz. Data are provided by the Institute for Telecommunication Sciences, Boulder, Colorado. These predictions, for February 16 to March 15, 1987, assume a sunspot number of 11, which corresponds to a 2800-MHz solar flux of 73.

DX Century Club Awards

Administered By Don Search, W3AZD

The ARRL DXCC is awarded to amateurs who submit written confirmations for contacts with 100 or or more countries on the offical ARRL DXCC list. You may also submit cards to endorse your award in 25-country increments through 250, 10-country increments through 300 and 5-country increments above 300. The totals shown below are exact credits given to DXCC members from November 1 through November 30, 1986. An SASE will bring you the rules and application forms for participation in the DXCC program.

New Members

Mixed

CT4NQ/109	HB9ARY/115	JJ1CWX/104	TR8CR/239	W1CTM/149	AA4VB/109	KA5DOB/157	KI7H/161	WD9DUE/100
DF3CB/216	IK4FDQ/111	JG3QZN/256	VE3LNI/101	W1TRC/316	K4LHH/114	KE5PO/103	KD8SY/103	NØFWX/104
F6ITY/103	I8OQK/156	JA8EJO/223	XE1VE/103	NR2W/120	K4MEF/144	K6TAR/102	KD8YM/104	NF0F/110
G4UXG/103	JA1MYW/142	SKØMT/117	N1AUR/102	WB2JFJ/103	KF4AU/103	N6ADK/149	KV8U/106	WØET/103
HA3HE/111	JF1JEQ/165	SP5INQ/111	N1CWA/118	AA4FS/106	W4PSJ/196	WA8HYB/102	NJ9K/107	

Radiotelephone

DK2WV/132	IK4FDQ/111	JG3QZN/232	TR8CR/232	YCØBAC/109	KB1U/249	NR2W/103	KA5D0B/147	KD8SY/103
DL9SC/11O	I8OQK/156	LX1CW/110	VK8TM/100	YCØEJG/104	W1TRC/311	KU3Q/104	N5ITG/117	KD9RD/101
F6EWK/307	JA1MYW/142	SKØMT/107	VQ9SS/C/101	YCØSY/107	W1WXV/126	KI4SR/109	NY5Y/100	NJ9K/107
IK2ANI/154	JF1JEQ/165	TI2TEB/102	VU2NP/162	KA1CVM/287	KD2DN/100	NQ4K/108	W5UYD/311	KØSBH/110
IV3TRS/128	JJ1CWX/103	TR8AHO/118	YB8VM/104					

CW

CT4NQ/101	DF3PN/122	EA4BWN/158	LA6YN/104	K4KH/117	WG6P/104	NQ7M/101	NF0F/107	WØJS/132
DF3CB/187	DF8SV/107	JA8EJO/208	OZ1JNR/131	WB4AKE/124				

RTTY

DF2ME/113	KC8EU/101							

160 Meters

G4AAW/103	SP5INQ/111	UR1RWX/105	N4IN/102					

5BDXCC

FE6CYV	EA1BDB	K2POF	HA8XX	ON4AAC	OH1XX			

Endorsements

Mixed

DF3AO/295	JA7FS/325	ZL2HP/340	W1WAI/300	WA2MID/305	W4DRK/347	W5CWQ/311	W7SFF/287	NJ9Q/175
DF2ME/131	JAØCAK/315	ZS6YQ/349	K2AGZ/336	WB2QMU/320	W4VOS/205	W5JE/290	WA7GQA/226	W9FR/323
DJ0MW/283	OE2YGM/188	9H4G/322	K2AX/228	AE3T/324	WA4PYF/247	W5KL/146	AI8M/305	W9IT/319
EL2AY/154	OK1KRS/299	K1NJE/328	K2POF/203	K3SEW/282	WA4TLI/319	K6QH/341	K8MC/296	W9NYW/279
G3AAG/202	SM4CTT/317	KB1JU/228	K2UU/326	KY3U/258	WB4CSK/280	K6WD/315	N8AXY/301	W9POC/200
G3EZZ/208	SMØDBR/306	KB1U/286	KA2OOG/127	KY3V/179	WB4UBD/305	KA6DXY/250	N8BC/251	WA9EKA/308
HA8XX/200	UP1BZO/318	KN1I/225	KC2YI/200	WB3FMA/125	WD4FZ0/196	KF6A/290	W8CT/340	WA9VGY/315
HK1HHX/169	VE2GHZ/177	KT1O/160	KV2Y/290	AG4S/296	AD5N/337	W6DH/281	W8GMH/285	NØFYM/201
HKØBKX/323	VE3KWW/135	N1CPC/182	KY2Q/338	KF4YB/286	AI5B/311	W6ERS/344	W8ZN/148	NIØG/201
I7IEH/273	VE5RU/354	W1CUH/250	N2DL/315	KI4UZ/125	K5BLV/315	WK6E/269	WA8FEN/251	WØJCB/306
ISØRZW/277	XE3ABC/174	W1GME/346	NK2W/149	N4AVB/310	K5GH/327	W7AM/309	WA8SXM/175	WØLYI/328
JA3CSZ/313	YU2AKL/312	W1GX/337	W2RSJ/320	N4SA/330	K5JG/315	W7BCT/312	K9BWQ/323	WØYK/311
JJ3AFV/273	YU2TW/320	W1HSB/310	W2UP/288	NQ4K/125	K5OLJ/205	W7BKR/318	KF9D/282	WAØJYJ/309
JA5IU/320	Z23JO/278	W1LQQ/333	WA2LWA/199	NX4N/267	W5CPI/324			

Radiotelephone

DF2IS/203	I0ER/291	ZS6BBP/328	KC2JA/256	K4ADN/154	WA4TLI/314	K7FE/305	N8AXY/300	K9MGF/300
DF3AO/289	JA3CSZ/300	ZS6YQ/347	KV2Y/285	K4HV/200	WB4UBD/305	W7BCT/311	N8BSB/235	KA9MOM/175
DK3PZ/301	JA5IU/316	9H4G/322	W2IJB/309	KE4VU/251	K5GH/326	W7BKR/318	W8GMH/267	KA9TNZ/150
DL2XN/216	JAØCAK/297	K1NJE/326	WA2MID/305	KE4YD/270	KA5CQJ/233	W7DSZ/304	W8TIV/142	KC9ZZ/167
DL8UI/320	OA4JR/324	W1LQQ/325	WB2QMU/316	KF4M/296	NI5D/172	W7KEU/201	WA8FEN/241	W9ROK/175
EA5CTP/211	OE2YGM/168	W1VKQ/313	K3SEW/261	N4AVB/308	WD5DBV/310	WA7GQA/181	WB8KLC/271	WA9EKA/305
EL2AY/154	SV8CS/291	WA1WMS/218	KY3V/152	W4KHW/300	N6DHX/225	AI8M/294	WD8IPJ/278	WA9VGY/311
HA8XX/181	VE2GHZ/176	WB1BVQ/242	W3EKN/306	W4PSJ/194	W6DH/272	K8ZR/321	K9BWQ/323	WØJCB/282
I5ENL/283	VE5RU/353	K2UU/325	W3EYF/296	WA4GRZ/124	W8SN/307	KC8KE/261	K9GX/312	WØLYI/324
I7SGZ/249	XE3ABC/154	KA2PHQ/194	AA4KA/292	WA4PYF/247	K7BCX/319	KD8KY/166	K9HEK/138	WØYK/306
I8LEL/317								

CW

DK5PR/270	HB9BQB/164	LA9XG/226	N1CPC/133	W3EKN/298	KW4V/195	WK6E/156	W8TIV/136	W9IT/267
DL1LD/225	JA3CSZ/299	VE3BX/299	W1JR/300	W3EYF/280	W4VQ/309	N8AXY/252	W8ZN/168	WB9EEE/200
G3EZZ/177	JJ3AFV/249	YU2TW/300	W1LQQ/275	AA4KA/273	WF4I/126	W8GMH/227	K9AJ/309	NIØG/177
HA8XX/133	JA7FS/267	KB1U/142	WA1AER/303	AA4U/153	K6WD/263	W8ELE/251	KF9D/272	WØYK/291
HB9BNB/203	JAØCAK/299	KT1O/137	K3SEW/141	AG4S/280	W6DH/130			

RTTY

LA7AJ/129	WA6PJR/151							

160 Meters

W1JZ/154	F6BKI/129							

DXCC Notes

Annual Listing Corrections

Mixed: WA2UZB/239, KB3OQ/300, W3KV/334, W3VRT/322, WB5HBR/181, W6SN/353, W7CSW/346.
Phone: W1FZ/353, KB2XP/250, W2QWS/343, N3AKT/103, K4YYL/339, N4NX/316, W4LMX/350, W5LLU/286, K6TEH/177, N6OC/316, W8GUS/305, W9DC/335, KØBUR/335, WØYDB/330.
CW: K1MEM/309, WA2ASQ/125.
RTTY: WB5HBR/170.
160 Meters: K2CL/101, W2FP/100.

Exploring Ham Radio

Conducted By John Foss, W7KQW
Training Manager, ARRL

Our New Accent

This marks the beginning of a new *QST* column, "Exploring Ham Radio." In this space we'll cover what's new in ham radio—both completely new techniques and new ways of using older techniques. We'll discuss Amateur Radio practices intended to make communication faster, more accurate, more enjoyable and, above all, more reliable. We'll be looking at those techniques from the standpoint of those who want to learn them *and* those who want to teach them.

Exploring Ham Radio is for newcomers, instructors, experienced hams—anybody! If you're thinking about a different aspect of radio communication, this column is for you. Pass along to us your ideas and suggestions for column topics. We'll do our best to explore ham radio with you.

TOWARD ERRORLESS COMMUNICATION

To those of us struggling toward the mystical, faraway goal of perfection in communications, medieval times seem a million light-years behind us. Seldom do we stop to remember that the same communications problems facing us today faced those who lived a thousand years or more ago. Furthermore, the ploys they used to solve their problems suggest more than vaguely some solutions we can attempt today. For instance, consider the following scenario:

The late autumn wind brings a wet snow that shows no sign of letting up. Below the cliffs, the sea pounds hard at the shore, the roar drifting upward over the precipice. Seventy-four men occupy the compound. Although this is the sixth day of the siege, the fortifications stand fast.

The year is 1214 AD; the place is the south coast of England. King John's forces thought they'd take Carlisle Castle easily. But six days have passed without a sign of surrender.

Thirty miles northwest, beyond Canterbury, Cressin Castle stands alone in the center of croplands now brown with the beginning winter. The worried duke hopes the political turmoil will blow away with the season. Must John really be overthrown, or can he be persuaded to give a bit in his battle for monarchical supremacy?

The duke climbs the parapet and looks southward toward the Channel. The darkening sky warns him of the approaching storm, the first of the winter. He knows not that his best friend, the Earl of Carlisle, is besieged. In his mind's eye he sees Carlisle Castle as it was in August, with the late summer sun streaming through the battlements and warming the pavement. Should Carlisle fall, Cressin would be hard pressed to hold out.

The duke sighs and returns to the comfort of the fireside. Dusk is near, and tea will soon be served. All is quiet at Cressin.

Not so at Carlisle. The earl searches out his commander, Douglas Bass. "How goes it?" he asks.

"Well, my Lord. They cannot ford the moat, and they lack the engines to damage the wall. As long as our food holds out..."

"Ten days, Bass."

"Will John's forces continue to press the attack?"

"I fear so."

"Then we'll need help."

"I can send a rider to Cressin."

"He'd have an even chance of getting through John's lines."

"If I send more than one?"

The commander began calculating the odds. "Should you send four, there'd be a 94% chance of at least one's getting through."

"Will four volunteer? I dislike ordering men to ride out in weather like this."

"Good my Lord. Methinks at least four will volunteer."

"Very well, Bass. Prepare four riders. I'll write to the duke."

"Yes, sir."

But has this castle hassle anything to do with telecommunications today? You bet it has!

The Problem of Diminishing Returns

The earl can send as many men as he chooses—all 74 if he desires. Each man sent will decrease the defending force by the same amount as will each other man sent. But each additional man sent will produce an ever smaller increase in the chance of at least one rider's getting through King John's lines and reaching Cressin Castle. The chance of one rider's reaching Cressin is 50%; one of two riders, 75%; one of three riders, 88%; one of four, 94%; one of five, 97%, one of six, 98%; one of seven, more than 99%. Thus, the earl quickly arrives at the point of diminishing returns. Furthermore, no matter how many riders he sends, a chance always exists, no matter how tiny, that *none* will reach Cressin Castle.

The Problem of Reliability

But hold on! Here's another complication. Certainly the earl hasn't time to write every one of the messages. So he has scribes make copies of his letter to the Duke of Cressin. But what if a scribe makes a mistake, and the copy does not say what it should? Then even if that message does reach Cressin, it will do no good. If two riders get through, one with a correct message and one with an incorrect one, how will the Duke of Cressin know which message is correct? Will he send the reinforcements? There's no way to know. The more messages that are sent, the greater the chance of one's getting through, but also the greater the chance that an error has been made in one or more of the messages. Thus, the greater the chance that the duke will receive an incorrect message.

Cost vs Effectiveness

All this boils down to a question of cost versus effectiveness. As the designer of electronic equipment adds more and more circuits, each will increase the cost of manufacturing the product by the same amount as did the previous circuit. But the effectiveness of the equipment increases by an ever-diminishing amount. The very last circuit added might increase the effectiveness by only 0.000002%. Yet the equipment that now is 99.999998% effective requires 16 more circuits than that which is only 99.900000% effective—and therefore costs many times as much. How much are you, the consumer, willing to pay for that additional 0.099998% effectiveness?

Effectiveness vs Reliability

Furthermore, with each additional circuit, there is one more component that can malfunction and shut down the entire operation. Thus the more circuits there are, the less likely it is that the equipment will work when needed most. This is so even though it will work better and better—when it works at all—with each added component. Again, where are you willing to draw the proverbial line?

Is There a Solution?

The goal, of course, is to improve effectiveness without sacrificing reliability and without materially increasing the cost of the product. The Earl of Carlisle accomplishes this objective by inventing something new—perhaps better armor or even a tank to replace the horse!

Now the effectiveness—the chance of one rider's reaching Cressin Castle—is improved far beyond the original 50%. Also, the number of men left to defend Carlisle Castle is diminished by only one instead of by several. Yet the reliability has not deteriorated, for only one letter has been prepared, eliminating the chance of error associated with copying.

In other words, the earl, through his ingenuity, has markedly improved both the effectiveness and the reliability of the communications. He has done so without greatly increasing the cost. (That is, he has not greatly diminished the strength of the force defending Carlisle Castle.)

And Now...

The modern equivalent, of course, is just what telecommunications engineers have been trying to do—and often have succeeded in doing—ever since the science of telecommunications began.

During this series of columns, we'll look at the ways in which both the effectiveness and the reliability of telecommunications have been improved. During our investigation, we'll refer occasionally to the parallel plight of the Earl of Carlisle and his progress toward securing reinforcements from the Duke of Cressin.

FOR INSTRUCTORS ONLY

Thus far I've resisted the temptation to name this part of the column "The Ivory Tower." Maybe in future months I'll succumb to that—unless one of you suggests a better title!

Last fall, the Dayton Amateur Radio Association sponsored and underwrote an instructors' forum and lecture in Dayton. The Dayton/Miami River area harbors a live-wire bunch of hams, and several had suggestions worth passing on to our readers.

In DARA-sponsored courses, the "buddy system" has worked wonders! At the first class session, each student is paired with a "buddy." Each member of the pair sends code to his buddy throughout the course and helps him/her with the theory, too. As a result, learning speed and retention have improved markedly. Please, you instructors who try this system, let us know how it works for *you*.

Watch our next column for more ideas from Dayton.

On Line

Conducted By Stan Horzepa, WA1LOU
75 Kreger Dr, Wolcott, CT 06716
CompuServe ID no. 70645,247

Computer-Controlled Radio Revisited

In November, I wrote about controlling my Kenwood TS-440S transceiver from the keyboard of my Apple Macintosh computer by means of the optional Kenwood IF-232C interface. In response to that column, I received a number of letters asking for more information concerning the system. So, here it comes.

The Interface Function

The interface is a signal level converter. It converts between the RS-232-C signals used by a computer (−12 to +12 V dc) and the TTL signals (0 to +5 V dc) needed by the radio. It is designed for the Kenwood TS-940S, TS-811A/B/E, TS-711A/E and the TS-440S, and is connected to the computer RS-232-C serial port and to the transceiver interface port. Besides interfacing a computer to a transceiver, the IF-232C also electrically isolates the computer and transceiver in order to prevent computer-generated noise from interfering with the transceiver.

Once the interface is properly connected, you may simply run a terminal program on your computer to control your transceiver. You may use the same terminal program that you use to communicate over the telephone lines with a modem as long as that program is able to operate with the parameters required by the interface unit: asynchronous (start-stop) operation at 4800 bits per second, with 1 start bit, 8 character bits, 2 stop bits and no parity.

From the terminal program, you may use a set of 23 commands to perform the following functions (certain transceivers have additional commands):

- Select the operating mode (AM, CW, FM, FSK, LSB, USB)
- Enable and disable the transmitter and receiver
- Program and recall the frequency of the transceiver VFOs
- Tune up and down frequency
- Enable and disable split-frequency operation
- Enable and disable RIT and XIT
- Select RIT and XIT frequency
- Enable and disable the frequency lock switch
- Select a transceiver memory
- Program and recall the frequency and mode of the transceiver memories
- Enable and disable memory scanning
- Review the status of the transceiver manually or automatically

For example, to set VFO B of the transceiver to 28.6 MHz, the FB command is used by typing "FB00028600000;" at the computer keyboard (without the quotation marks). After you type the semicolon, VFO B is set to the desired frequency. To read the frequency of VFO B, the FB command is used again by typing "FB;" at the computer keyboard. After you type the semicolon, the computer displays "FB00028600000;"

Software?

As I mentioned above, you may simply use a terminal program to send commands through the interface to control the transceiver. If you do this, however, you are only scratching the surface of the potential this system has to offer. In November, I spoke of using this system within a contest logging and duping program. Using such a program, you could perform all of the contest chores from the keyboard of your computer. You could enter a call sign and contest exchange at the keyboard and have the computer check the call sign for a duplicate, recalculate the running score and change the multipliers worked/needed status. When the band dried up, a command entered at the keyboard could change the transceiver frequency.

Unfortunately, such a program does not yet exist for most computers and operator applications. Chances are, you are now using a logging and duping program on your computer. If that program is written in a language you know, you may be able to modify the program for transceiver control. Or, you may choose to write a complete logging, duping and transceiver-control program from scratch. In either case, let me know of your accomplishments so I can pass along the news to the readers of this column. (Perhaps you will even be willing to share your programming efforts.)

If you own an IBM PC, XT, AT or "compatible," however, and are a fan of the ARRL Sweepstakes Contest, MJC Technologies (3704-1/2 Foothill Blvd, Suite 524, La Crescenta, CA 91214) has a program called SCORE that logs and dupes Sweepstakes while controlling a Kenwood TS-940S or TS-440S transceiver (the program will also control a Heath SS-9000 transceiver and a Pro-Search antenna rotator). If I discover any other applicable programs, I will let you know in this column.

VK COMMODORE PACKET-RADIO PACKAGE

In November, I wrote about a packet-radio hardware and software package for the Commodore 64 and 128 computers developed by the Australian Amateur Packet Radio Association (AAPRA). It turns out that after the bank charges for conversion of the US funds to Australian funds are subtracted, the announced price of $33 in US funds is insufficient. $33 US minus bank charges converts to $49 Australian, whereas $55 Australian is actually required. To make matters simpler, AAPRA asks that you send a bank draft for the $55 Australian for the Commodore packet-radio package.

In a related matter, AAPRA has announced the availability of an EPROM cartridge version of their AX.25 Version 2 program for Commodore 64 owners who do not own disk drives. The price of this unit is $80 Australian. All orders and inquiries should be sent to Barry White, VK2AAB, AAPRA, 59 Westbrook Ave, Wahroonga, NSW 2076, Australia.

HAM RADIO BBS UPDATE

The correct telephone number for the Flagship Express BBS, listed in November *QST*, is 404-934-4515; for the MassHam BBS, listed in April *QST*, the number is 617-429-1784.

The Timex Sinclair Amateur Radio Users Group (TSARUG) BBS, also listed in April, has a new telephone number (505-522-7081) and a new East Coast edition (704-547-4185), which is available 1700-0900 Eastern Time on weekdays and all hours on weekends. Both TSARUG bulletin boards are FIDO-type (net 15 node 6 and net 18 node 9, respectively). For more information about TSARUG, their bulletin boards or their monthly newsletter *(QZX)*, send a large SASE to Alex F. Burr, K5XY, 2025 O'Donnell Dr, Las Cruces, NM 88001.

PX: A New Quintet

Five new programs have been added to the PX Library.

Program 140: a BASIC 300, 450 and 1200-baud terminal emulator for the Commodore 64 by Robert Davis, KØFPC (56 cents postage).

Program 141: a packet-radio simulator for the Heath H-89 running CP/M and MBASIC 5.2, by Luis E. Suarez, OA4KO/YV5.

Program 142: a BASIC receiver-performance calculator by Andrzej Kusiak, SP2HLS.

Program 143: a BASIC receiving-system noise-figure calculator, also written by SP2HLS.

Program 144: a BASIC antenna-bearing calculator for the Digital Research Big Board (and Xerox 820) running CP/M, by Gordon P. Batey, WA4FJC.

To obtain a listing of any PX program, send a business-size SASE with 39 cents postage (unless noted otherwise) to ARRL, Dept PX, 225 Main St, Newington, CT 06111 (CRRL members can send their SASEs to CRRL, PO Box 7009, Stn E, London, ON N5Y 4J9). Use a separate SASE for each program request and write the PX program number of the desired program at the lower left-hand corner of the SASE. Please do not send correspondence other than PX requests to Dept PX.

A list of all 144 programs in the PX library is also available by sending a business-size SASE with 22 cents postage to ARRL, Dept PX, 225 Main St, Newington, CT 06111.

The New Frontier

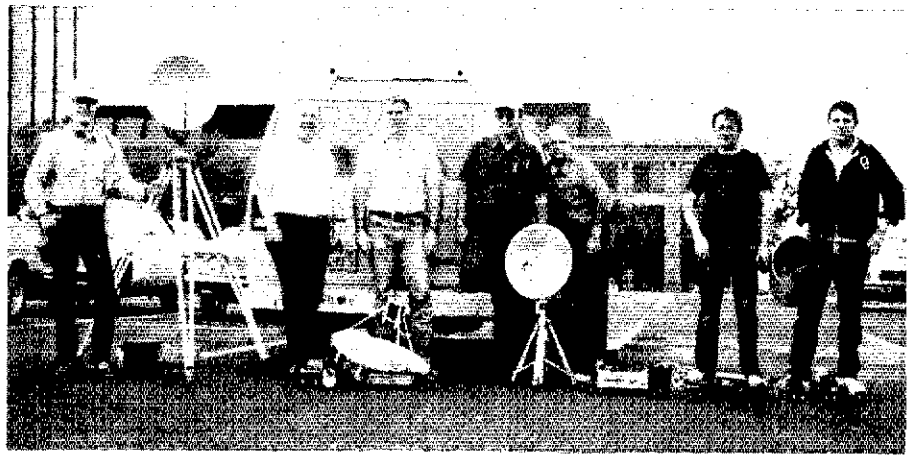
Conducted By Bob Atkins, KA1GT
103 Division Ave, Millington, NJ 07946

More Record QSOs

1986 will be remembered as a banner year for amateurs operating above the 23-cm band. October and November added even more to the year's excitement, with some remarkable DX on the 2304- and 3456-MHz bands.

New US Record on 3456 MHz

The North Texas Microwave Society, from the Dallas area, has attacked 3456 MHz in a big way. In September 1986, we reported on five members of that group who earned VUCC on this band. In October, we showed some of the gear they use. The New Frontier for December carried news of a record 228-mile QSO between WA5TNY/5 and W7CNK. This month, Al Ward, WB5LUA reports on an expedition that netted seven QSOs, two states, five grid squares and a new US record in one morning of operation!



Last month, I reported on the exploits of the North Texas Microwave Society during the ARRL 10-GHz Contest. This photo shows a number of Society members assembled for activity on the second contest weekend. Shown (l-r) are KD5HM, W5ETG, WA5DBY, KA5JPD, W5HES, KF5PE (ex-G3RRF) and WA5VJB.

Dave Hallidy, KD5RO, Marcus Wagner, N5GEJ, and I set out for Mena, Arkansas on Oct 18, 1986 to attempt a new US distance record on 3456 MHz. The plan was to attempt a Sunday morning QSO with Rick Fogle, WA5TNY, who would be operating portable south of Fort Worth, Texas. Bill Winscott, N6CHA, arranged for temporary use of a 60-ft US Forest Service fire lookout tower on a hill 2600 ft above sea level.

The week before the trip was hectic. We had just finished checking out a new solid-state power amp using one Avantek IM2935-3 IMFET to drive a pair of the same devices to 10-W output. I still needed a 70-mW driver, so I spent most of the week building a string of MMIC amplifiers with a Siemens CGY-40 GaAs MMIC as the final stage. A business trip kept me from installing the IMFET amplifiers in my transverter until the night before we left.

Needless to say, the first time I fired up the transverter the amplifiers did not work. The problem turned out to be a shorted pass transistor in the special IMFET power supply that WA5TNY designed and KD5RO built. After fixing the problem, I worked KD5RO to make sure everything worked.

Before we left on Saturday, I worked Les Whitaker, W7CNK, at about 160 miles for a final check. We arrived at Queen Wilhelmina State Park in Mena late that afternoon. Finding no unusual band conditions on 432 MHz, we went to bed in anticipation of a 5 AM departure for the hilltop.

We were set up at the fire tower and operating on 432 MHz by 7:30 AM. WA5TNY/5 was already trying to contact W7CNK on 3456 MHz, but conditions were not too good. Our first attempt to contact WA5TNY/5 in EM11 was a flop. He could hear our 10 W fine, but we couldn't hear him. The problem seemed to be in the GaAsFET preamp. I had to hold my finger against the preamp input terminal during the first two QSOs. At 8:22 AM, we worked Gerald Handley, WA5DBY, in Fort Worth, at 223 miles (just shy of the old record), at 8:43 AM, we finally worked WA5TNY/5, east of Hico, Texas, at 275 miles, for a new record.

At this point, I had to figure out what was going on with the receiver. The receiver chain consisted of an Avantek ATF10135 GaAsFET driving an MSA0835 MMIC, in turn driving a pair of MSA0404s. The active devices were followed by a band-pass filter and a doubly balanced mixer. I thought that the MSA0835 stage might be oscillating, so I removed it from the circuit and used just the GaAsFET and the MSA0404s. Although this degraded the noise figure from 2 dB to 3 dB, the receiver appeared to be working much better.

At 9:06 AM, we worked Dan Osborne, WB5AFY, in EM04, at 285 miles, for another record. At 9:44, we worked KD5RO's home station, operated by Bob Gormley, WA5YWC, and at 9:56 AM we QSOed W7CNK. WA5TNY was on the move again. At 10:23 AM, we worked him in Fairy, Texas, at 288 miles—another record! Band conditions were about average.

Many thanks to Bill Winscott, N6CHA, and Paul Smith, K5PS, of the Ouachita ARA, and the US Forest Service for their help and splendid hospitality.

Equipment used by the stations mentioned in Al's report was as follows:

Call Sign	*Antenna*	*Transmit Power*
WB5LUA/5	4-ft dish	10 W (solid state)
WA5TNY/5	6-ft dish	1.5 W (solid state)
KD5RO	4-ft dish @ 50 ft	1.5 W (TWT)
W7CNK	6-ft dish @ 20 ft	2 W (TWT)
WA5DBY	7-ft dish @ 25 ft	10 W (TWT)
WB5AFY	6-ft dish	0.5 W

2304-MHz Activity

Lewis Munford, W8YIO, called in with a report of long-haul 2304-MHz QSOs during the tremendous tropo opening at Thanksgiving time. On the evening of Nov 28, Lew worked WB5LUA and KD5RO in the Dallas, Texas area from his QTH in Manchester, Michigan. The station at W8YIO is about 50 W to a pair of loop Yagi antennas at 20 ft. At about 9 PM, Lew contacted WB5LUA, who was running about 300 W from a klystron amplifier. An hour later, W8YIO worked KD5RO in Plano, TX, about 15 miles south of WB5LUA. KD5RO was running only about 0.5 W to a 5-ft dish, which is quite surprising since the distance between Plano and Manchester is about 950 miles!

Although the contact took about 30 minutes to complete, it does show what can be achieved with relatively modest equipment, good operator skill and persistence. WB5LUA also reports that he and KD5RO worked Frank Miller, K9HMB, in the Chicago area during the same opening. QST

The World Above 50 MHz

Conducted By Bill Tynan, W3XO
Send reports to PO Box 117, Burtonsville, MD 20866,
or call 301-384-6736 to record late-breaking information.

Deserving of Our Support

Ever notice how often a VHF-oriented newsletter is cited in The World Above 50 MHz as the source for an account of an opening, a successful EME operation or a new station on the air from some rare QTH? A few of these newsletters are produced by organizations devoted to the promotion of a specific facet of VHF. Some are the organs of local or regional clubs that specialize in VHF. Still others are put out by one or several individuals. Regardless, these newsletters almost invariably represent the work and dedication of one or a few people devoted to a particular band or mode of propagation.

The fact that these publications contain so much material useful in writing The World Above 50 MHz attests to their extensive and timely coverage of their specific areas of interest. This suggests that VHFers especially interested in those facets of our hobby covered by one or more of these newsletters, or the sponsoring organizations, would do well to subscribe to the newsletter or join the organization. In so doing, they will be availing themselves of a great deal of information, too extensive to be fully covered in the *QST* space available to this column, and, at the same time, helping promote the part of the world above 50 MHz that particularly interests them.

At the risk of inadvertently forgetting one or more deserving publications and organizations, let's review the field just to refresh our memories and stress their continued existence.

Probably the oldest, and certainly the largest, of the VHF organizations is the Six Meter International Radio Klub, or SMIRK. Total SMIRK membership tops the 5000 mark, in some 81 countries throughout the world. Unfortunately, only about 500 have paid dues over the past year and thus are eligible to receive the organization's newsletter, *The Six Shooter*. Annual dues are a paltry $3, which barely covers the cost of printing and mailing the newsletter. Ray Clark, K5ZMS, SMIRK's founder and a continuing driving force, wants it understood that the organization has not gone away, as some seem to have thought, but that too many people have deserted it in recent years. In addition to publishing *The Six Shooter* several times per year, SMIRK sponsors an annual 6-meter contest and a number of awards for accomplishments on the band. It has also been instrumental in securing equipment for DX operators needing help in getting set up to provide us with interesting contacts. Anyone interested in our 50-MHz band would do well to join SMIRK or, if already a member, to send in a renewal. For more information, write to 7158 Stone Fence Dr, San Antonio, TX 78227.

Not to be outdone, 2 meters boasts its own organization called SWOT, which stands for Sidewinders on Two. Like SMIRK, SWOT puts out a newsletter, which is now being edited by Len Hoops, KC5IJ, one of the organization's founders. SWOT also sponsors an annual contest and provides awards. Information about joining can be obtained from Howard Hallman, WD5DJT, 3230 Springfield, Lancaster, TX 75134.

There are a number of regional organizations specializing in particular aspects of VHF/UHF, or in some cases the whole spectrum above 50 MHz, that put out newsletters. Many of these are worth joining just to get the newsletter even if one does not live in the section of the country served by the club. Some of these are:

The Mount Airy VHF Radio Club, the famous Pack Rats, is a general-interest VHF-oriented club serving the southeastern Pennsylvania and southern New Jersey area. Anyone who follows VHF contests is familiar with this organization's many accomplishments. In addition to their contest participation, they sponsor an annual VHF conference the first weekend of October. The club's newsletter *Cheese Bits*, makes for lively and informative reading. Their address is 2087 Parkdale Ave, Glenside, PA 19038.

The perennial rival to the Pack Rats in the January VHF SS is the Rochester VHF Group. This is a very active VHF organization serving western New York. It too puts out an interesting newsletter. Those interested in learning more may write to 6484 Rte 96, Victor, NY 14564.

The Southern California Six Meter Club publishes a very good newsletter. This group is devoted to promoting 6-meter operation, including the sponsorship of several weekly nets and other activities in the Southern California area. For information, write to PO Box 448, Cypress, CA 90630.

Another California group, this one specializing in the other end of the spectrum, is the San Bernardino Microwave Society. As the name implies, this organization, which has been in existence for over 30 years, is devoted to promoting the use of the higher-frequency amateur bands. They were very active in the recent ARRL 10-GHz Contest and operate a beacon on 13 cm. For information about the club and its newsletter, contact Chuck Swedblom, WA6EXV, PO Box 605, Ridgecrest, CA 93555.

Also specializing in the UHF and higher bands is the recently formed, but rapidly growing, North Texas Microwave Society. This group has just published its first newsletter, which looks to be very useful to those interested in that aspect of our hobby. For information, contact Kent Britain, WA5VJB, 1626 Vineyard, Grand Prairie, TX 75052.

Serving the New England area and nearby portions of the US and Canada is the Northeast VHF Association. This group sponsors a first-class VHF conference each May and puts out a quarterly newsletter edited by Lew Collins, W1GXT. In the most recent issue, Lew is threatening to drop those who have not renewed, so this may be a timely reminder. Their address is 10 Marshall Terrace, Wayland, MA 01778.

In addition to these club-sponsored newsletters, there are several published by one or two individuals. Two of these are devoted to moonbounce operation. These are especially worthwhile for anyone particularly interested in that mode. For 2 meters, there is the *2-Meter EME Bulletin*, published by Gene Shea, KB7Q, 417 Staudaher St, Bozeman, MT 59715. The Bulletin carries news of 2-meter EMEers all over the world, information on new circuits, array configurations, as well as moon-tracking data.

The corresponding newsletter for 70 cm and above EME has been put out for many years by Al Katz, K2UYH. In addition to the coverage described for the *2-Meter EME Bulletin*, the *432 and Above EME News*, carries a list of monthly schedules. Those truly interested in moonbounce on 70 cm and above may write to Al in care of the Electrical Engineering Department, Trenton State College, Trenton, NJ 08625.

These are two very fine general-interest regional VHF newsletters. The *Midwest VHF Report*, edited and published by Roger Cox, WBØDGF, is loaded with news of openings on all bands, especially those involving the Midwestern part of the country. Also included is news of upcoming grid-expeditions and contest operations. The address is 3451 Dudley St, Lincoln, NE 68503. The other regional letter, the *West Coast VHFer*, is a general-interest VHF publication with an emphasis, as the name implies, on the West Coast. The address is 560 West Yucca St, Oxnard, CA.

If you write to any of the organizations or individuals for information, an SASE would be most appreciated.

TWO WELL-KNOWN VHFers PASS FROM THE SCENE

It is with great regret that I report the loss of two well-known and accomplished VHFers:

Henry Blogett, W2UTH, a resident of the Rochester, New York area, helped put that part of the country on the VHF map in the years following World War II. Hank was very active on 6 meters during the past solar peak, making contacts all over the world and piling up an impressive country total. In company with his daughter, Karyn, WD2AKA, he saw to it hundreds received their much-sought-after ZB2BL QSLs. W2UTH will be missed by all of his many friends, including this conductor.

John White, W5UKQ, of Wakefield, Louisiana, was an early participant in meteor-scatter work on 2 meters and in recent years had turned his noteworthy skills and great enthusiasm to 70 cm. For that band, John had constructed a first-class station consisting of a high-power transmitter, state-of-the-art receiver and an array of sixteen 19-element K2RIW Yagis. With this setup, he was active on both tropo and EME. As one of his major efforts, he held protracted

schedules with K2RIW on Long Island in an effort to bridge that path via terrestrial means. The world above 50 MHz will sorely miss W5UKQ.

ON THE BANDS

6 Meters—The following might be called the "You thought you had it rough department." Quite a bit of column space has been devoted in the last few months characterizing the 1986 E_s season, and the consensus appears to indicate a pretty good year. One area not previously heard from, however, provides an entirely different perspective. It is the far north. KL7NO Fairbanks, AK relates his experiences over the year in a letter to WØETT, which Ken has kindly passed along. In it, Al lists the openings he caught since May, and they can almost be counted on fingers of one hand. In late May, there were two short openings to the Portland, OR area, on July 1 a 7-minute opening to Arizona, and on the 19th, a roughly half-hour opening to several Western states. September brought the "biggie" for the year: a three-hour, aurora-induced E_s opening to Colorado, Kansas and Michigan (K8WKZ previously reported working KL7NO on this one). It was on this occasion that WØETT and neighbor NØEOQ worked him also. The final shot was a 20-minute exchange with a VE7 on September 23. I think that most 6-meter devotees will agree with KL7NO's assessment of "pretty grim" to describe the 1986 E_s season in our 49th state. I think we all owe Al and his compatriots in Alaska, and other far northern locations, a debt of gratitude for sticking with the band in the face of such meager pickings.

In another part of the world, where conditions seem to be considerably better, JA1VOK writes relative to several October and November openings between Japan, VK and ZL. Hatsuo's log shows VK4FXX, VK2DDG and VK2XJ on October 26 and VK8ZMA the following day. He adds that his friend, JE1BMJ, hooked up with VK6YA on October 21 and ZL2TPY on November 6. The ZL contact, which was on 51.1 MHz, came at 0450, after the ZL TV audio at 50.74 and 50.75 MHz had been in.

2 Meters and Up—The major news this month is the widespread tropo conditions that began Thanksgiving Day and lasted into Saturday, and made the season anything but a turkey for VHFers who were on the ball and caught it. According to several reports received, the opening produced extremely strong signals and covered a large portion of the Midwest and East. K5SW writes from Muskogee, OK EM25 that he worked East Coast stations on all bands from 2 meters through 23 cm. On 2 meters, Sam's best DX was WA1VRH Connecticut FN31, at 1262 miles. States worked on that band, in addition to Connecticut, were New York, New Jersey, Pennsylvania, West Virginia, Ohio, Michigan, Kentucky, Tennessee, Indiana, Illinois, Wisconsin, Iowa and Missouri. On 1¼ meters, his best DX was K2SMN New Jersey FN20 at 1141 miles. Also nabbed on that band were stations in New York, Pennsylvania, West Virginia, Ohio, Michigan, Indiana, Illinois, Iowa. On 70 cm, Sam encountered similar good fortune, with best DX represented by K3QM/2 New Jersey FN20, at 1166 miles. On 23 cm, his best DX was W2DRZ western New York, FN02, at a distance of 984 miles. Stations in Michigan and Ohio were also worked on that band.

The VHF/UHF Century Club Awards list appears on page 79.

K3QM/2 Budd Lake, NJ thinks this session may go down as "the great tropo opening of 1986." Max believes that it started in his area about noon Thanksgiving Day, but says that he did not catch it until that evening. He stayed up until 4 AM (0900Z) the following morning, and for some hours was the only station in his area in on the propagation. He credits his 1200-ft-above MSL elevation and location in the far northwest corner of New Jersey for his good fortune. In any case, his fortitude was rewarded with many contacts in the Midwest, including KEØBX Iowa EN31, WBØYSG Topeka, KS EM28. One very noteworthy contact was with NJØH near Kansas City EM29, who was running 8 W but held a consistent 5 × 6 during their 40-minute QSO. After four hours sleep, Max was at it again, then joined by his wife, KA3ETI, alternating the operating chores. By then, the opening had spread, enabling them to work stations farther to the north and south. Contacts were made in EN53 and EM17. In addition, other New Jersey stations were finally able to participate. By Friday evening, conditions extended farther to the south, with K5SW putting in a very loud signal on both 2 meters and 70 cm, along with N5DZQ Arkansas on 2 meters and NØAC1 southern Missouri on 70 cm, both in EM36. Max says that by Saturday morning the opening was mainly into EM67, with a contact with Kentucky station AA4FQ; but by 1500Z that morning, it was all over. Altogether, he worked 130 stations in 38 hours and picked up 31 new grids on 2 meters and 21 on 70 cm. The equipment at K3QM/KA3ETI consists of 400 W to a 16LBX at 85 feet for 2 meters and 100 W to 21 elements at 75 feet for 70 cm.

W2DRZ near Jamestown, NY thinks, based on the very high signal strengths received, that he was at one end of the major portion of the opening. Tom says that it began about noon Thanksgiving Day with stations from the Midwest coming in on 2 meters. After returning from dinner, he got in on it in a big way, working 55 grid squares on 2 meters, 14 on 1¼, 45 on 70 cm and 21 on 23 cm, including contacts with WB5LUA and K5SW, who were very loud on 23 cm. Tom thinks that the rapid motion and path of the jet stream, sweeping up moisture from the Pacific off Mexico and carrying it northeast, accounts for this opening.

The ATVers also took advantage of the superb conditions. WA8SAJ Cleveland reports exchanging T5 pictures with KØIWA Burlington, IA the evening of November 25.

The West Coast put on a tropo show of their own. As is usually the case, that means an opening to Hawaii. K6QXY near Santa Rosa, north of San Francisco, reports that he discovered the conditions by observing the KH6HME 2-meter beacon pounding in Sunday evening, the 23rd. He immediately got word to W6PJA, who relayed the news of the opening to KH6HME. That evening, K6QXY was able to work KH6FOO, located near sea level in the Hilo area. Two nights later, Bob worked KH6CC, another sea-level station in the same vicinity. But the big thrill was working KH6HME at the beacon site on the slope of Mauna Loa on 23 cm.

1¼ Meter Standings

For WAS holders, listing is WAS number, call, state, call areas worked and grids worked. For others, call, state, US states worked, call areas worked and grids worked. Call areas are the 10 US call areas plus KH6 and KL7, plus each VE and XE call area, plus DXCC countries not located within the continental limits of the US, Canada or Mexico. In order to make the standings a true reflection of stations currently active on 1¼ meters, those not reporting activity within the past two years are subject to being dropped. They will be reinstated upon written presentation of continuing activity. It is not necessary to have worked additional states or grids in order to remain in the standings or be reinstated. Merely indicate that you are still on the band. WAS holders are listed in any case. Compiled December 6, 1986. Deadline for next update is June 5, 1987.

WAS Holders

1	WØVB*	MN	13	—
2	WØSD*	SD	—	—
2	WBØTEM*	IA	—	—
4	K5FF*	NM	14	—
5	W5FF*	NM	13	—
6	WB5LUA*	TX	—	—
7	VE3EMS*		14	—
8	W3GPY*	PA	12	—
9	K9KFR*	IN	6	—

W1JR*	MA	44	14	72
W2SZ/1	MA	23	9	55
K1FO	CT	23	7	—
K1PXE	CT	18	6	—
W1GXT	MA	17	9	—
W1QXX	MA	15	5	21
K1LPS	VT	12	6	—
WA1JOF	MA	11	5	15
KA1DHO	MA	11	4	14
W1RIL	MA	9	4	15

W2PGC	NY	22	10	23
K2GK	NY	20	8	47
N2BJ	NY	16	6	29
N2WK	NY	15	9	42
W2DWJ	NJ	15	6	—
WB2IEY	NY	14	7	41
K2YCO	NY	14	7	—
WA2FGK	NJ	14	6	—
WA2FUZ	NY	14	5	—
W2WW	NY	13	5	19
K3HZO	MD	22	10	17
N3CX	PA	18	—	—
W3XO	MD	17	6	19
W3RUE	PA	16	9	12
KB3QM	DE	16	—	68
W3UJG	MD	15	8	—
AC3T	DE	15	6	13
W3IP	MD	13	6	—
WA3JUF	PA	12	5	—
WA3FYJ	PA	8	6	14
KA3B	PA	7	4	9

WA4PCS	KY	32	7	—
WD4DGF	TN	31	9	63
WA4COG	AL	26	8	—
WA4NMA	GA	25	8	—
W3IY/4	VA	23	10	—
KC4EG	KY	23	7	—
K4LHB	VA	21	9	—
N3AHI/4	GA	20	8	—
WS4F	GA	20	7	28
WA4SBC	VA	17	6	—
K4GL	SC	14	6	—
WA4MVI*	SC	12	7	—
K4CKS	GA	11	2	—
WA4LYS*	FL	6	6	6
K4IXC	FL	5	3	—
W5RCI	MS	30	7	—
K5UR	AR	27	7	64
K5SW	OK	25	8	60
W5HN	TX	22	6	19
K5CM	OK	22	—	—
WA5VJB	TX	13	5	—

W5NZS	OK	12	—	25
K5JL	OK	7	4	—
WB5AFY	TX	5	3	26
WA5DBY	TX	3	1	3
WB6NMT*	CA	10	6	—
W6WSQ	CA	6	4	—
N6AMG*	CA	3	3	—
W4WD/7*	UT	37	10	25
K7NII*	AZ	16	11	—
W7JF	MT	8	5	—
K7ICW	NV	4	2	—
WB8BKC	MI	31	9	55
WA8TXT	OH	28	10	—
W8IDU	MI	26	8	—
WB8PAT	OH	16	8	—
W8VO	MI	11	7	—
K9MRI*	IN	34	9	—
K9XY*	WI	28	13	—
K9HMB*	IL	23	10	—
WB9SNR	IL	22	9	—

WØUC/9	WI	6	2	7
KB9NM	WI	5	4	—
KAØY*	IA	32	11	—
KØDAS	IA	29	10	—
KØALL	ND	23	10	—
KØTLM	MO	21	7	41
WØPW*	CO	20	8	—
KCØQR	NE	19	6	38
KFØM	KS	16	5	28
WØRT	KS	12	5	—
WAØNOK	MO	6	2	—
WBØZKG	IA	5	2	—
VE1UT	NS	7	4	—
VE2DFO		7	8	—
VE3DSS		13	7	—
VE3LNX		13	5	29
VE3AIB		10	12	—
XE2BC*		2	3	—

*some contacts made via EME —information not supplied

FM/RPT

Conducted By Stan Horzepa, WA1LOU
75 Kreger Dr, Wolcott, CT 06716
CompuServe ID no. 70645,247

FCC Advice on Dueling Frequency Coordinators

In a recent letter, Raymond A. Kowalski, Chief of the FCC's Special Services Division, set forth the FCC's position concerning competing interests that are coordinating repeaters in the same geographical area. According to the letter, if there are competing frequency coordinators in the same geographical area, the legitimate coordinator is the one who has the "support of a majority of those eligible to establish repeaters" in that area. Recognition by the state and/or regional repeater council is evidence of such support.

The case in question occurred in the Kansas City metropolitan area, where the repeater coordinator is appointed jointly by the Kansas Amateur Repeater Council (KARC) and the Missouri Repeater Council (MRC), which are themselves members of a Midwest regional repeater council, the Mid-America Coordination Council (MACC). Two years ago, KARC and MRC appointed a new Kansas City coordinator; however, the former coordinator claimed that he was the legitimate Kansas City coordinator. As a result, there were two Kansas City coordinators, with the expected confusion among those who needed coordination.

Joe Eisenberg, WAØWRI, a member of the MACC board of directors, wrote to the FCC seeking their advice in the Kansas City matter. The following excerpted letter from Ray Kowalski was the FCC's response.

"We have been giving considerable thought to your letter about repeater coordination in the Amateur service in Kansas City. You indicate that the Kansas City coordinator which had originally been appointed by the Missouri and Kansas repeater councils had lost the support of these councils and been replaced. However this coordinator has declared itself independent and continued to function, with resultant confusion and prospects for interference. You seek advice on how to resolve this conflict."

Repeater Licensees at Risk

"We appreciate your concern. Two active coordinators in the same large metropolitan area which do not take each other's coordination into account may soon cause repeaters in the area to experience interference. And it is the licensees of these repeaters—not the coordinator—who risks sanctions if interference occurs.

"In PR Docket No. 85-22, the FCC adopted new rules concerning frequency coordination of repeaters in the Amateur service. The FCC decided against requiring a national coordinator. The FCC also decided not to assume the role of a 'super-coordinator' itself, in the process choosing not to set up any appeal process to the FCC on coordination matters. But the FCC recognized that exactly the situation you describe could arise. Thus the FCC said 'we encourage local coordinators to participate in a regional or umbrella entity.'

"In your area a regional entity exists. You state that it recognizes a single new Kansas City coordinator appointed by two state councils. This is the mechanism the FCC envisioned in PR Docket No. 85-22 to determine the legitimate local coordinators. The FCC intends to rely upon state and regional councils to recognize legitimate local coordinators. The FCC will support their determinations. Thus, in this case the local coordinator recognized by the regional entity appears to be the sole legitimate coordinator for Kansas City. Revocation of regional and state council recognition of the other local coordinator is *prima facie* evidence that that coordinator no longer has the support of a majority of those eligible to establish repeaters in the area it claims to coordinate. Stations which operate with illegitimate repeater coordination do so at their peril."

SEISMIC DISCUSSION NET

Southern California hams have always been active in nets that handle traffic and exchange diverse kinds of information. One repeater, W6FXN/R (145.460 MHz), near Covina, California, is generating new areas of interest by hosting the Seismic Discussion Net (SDN) at 10:30 PM (local) Fridays. (SDN convenes unofficially the remaining six nights of the week, with reduced levels of participation.) Bringing together amateurs with varied backgrounds ranging from seismic scientists to curious listeners, the net collects and discusses data derived from homemade seismic motion detectors and from the telemetry of the many low-power 160-175 MHz VHF US Geological Survey seismic detectors located throughout Southern California.

Apart from SDN traffic, with 25 to 100 amateur stations reporting perceived intensity and direction of local quakes (whenever significant quakes are felt), epicenters and damaged areas have been estimated or pinpointed long before the commercial news media have been able to report quake locations, especially those which might require supplemented emergency communications.

SDN participation, despite the late hour of the net, has come from hams in San Diego, San Bernardino, Riverside, Orange and Los Angeles Counties. ARRL Southwestern Division Director Fried Heyn, WA6WZO, has become interested and involved in this interesting application of a ham net, and SDN was a topic of conversation at the recent ARRL National Convention in San Diego.

Beyond this, the W6FXN/R machine itself transmits telemetry tones when either local or distant seismic motion in excess of 3.5 on the Richter scale is detected in the local area. Thanks to this system, Southern California hams, especially veterans of the 1971 Sylmar disaster, really know what's shaking.—*Keith Higgins, WA6IYL*

REPEATER LOG

According to October 1986 reports received, repeaters were involved in the following public-service events: 238 vehicular emergencies, 27 drills/alerts, 27 medical emergencies, 14 criminal activities, 11 fire emergencies, 7 public-safety events, 6 power failures, and 2 search-and-rescue operations.

The following repeaters were involved (followed by the number of events): W2VL 33, NK2W 15, WA2ZWP 8, W4YJG 16, WA6BJY 7, W6FNO 223, W6NBJ 17, K8DDG 13.

Strays

***QST* congratulates...**

☐ Ronnie Milsap, WB4KCG, on winning the Country Music Association Album of the Year award.

Mini Directory

As a convenience to our readers, here is a list of items of particular interest and when they most recently appeared in *QST*.

Advisory Committee Members	May 1986, p 48	Information	Jan 1987, p 58
Club Challenge for the '80s Rules	Sep 1986, p 58	Major ARRL Operating Events and Conventions—1987	Jan 1987, p 57
Club Contest Rules	Jan 1987, p 81	Novice-Enhancement NPRM	Jun 1986, p 49
Frequency/Mode Allocations	Jan 1987, p 58	QSL Bureaus Incoming	Dec 1986, p 57
Golden Jubilee of DXCC Award	Sep 1986, p 60	Outgoing	Sep 1986, p 73
Hamfest Calendar Rules	Sep 1986, p 84	Reciprocal-Operating Agreements	Dec 1986, p 53
Ham Radio-Related Landline BBSs	Nov 1986, p 58	Spread-Spectrum Rules	Apr 1986, p 45
International DX Contest Rules	Dec 1986, p 80	Third-Party-Traffic Agreements	Dec 1986, p 53
License-Renewal			

Canadian NewsFronts

Conducted By Harry MacLean, VE3GRO
500 Riverside Dr, London, ON N6H 2R7
Tel 519-473-1668

CRRL Officers and Directors

President: Thomas B. J. Atkins, VE3CDM
Vice President and Secretary: Harry MacLean, VE3GRO
Treasurer: William Loucks, VE3AR
Honorary Vice President: Noel B. Eaton, VE3CJ

Directors: G. Andrew McLellan, VE1ASJ
Albert G. Daemen, VE2IJ
Raymond W. Perrin, VE3FN
William A. Gillespie, VE6ABC
William Kremer, VE7CSD

Counsel: B. Robert Benson, QC, VE2VW
Suite 1600, 2020 University Ave
Montreal, PQ H3A 2A5

CRRL Headquarters Office: Box 7009, Station E
London, ON N5Y 4J9, Tel 519-225-2188
General Manager: Raymond Staines, VE3ZJ
CRRL Outgoing QSL Bureau: Box 113, Rothesay, NB E0G 2W0
Bureau Manager: Donald Welling, VE1WF

Thinking of Merger

It happens at every club meeting, hamfest or Amateur Radio convention. Someone buttonholes us and asks, "When are CRRL and CARF going to merge?"

Now, we really don't know. Both the CRRL and CARF Boards of Directors are on record as being in favour of a merger in principle, and, to us, it has always seemed like a good idea. CRRL would contribute *QST*, the Section organizations with their traffic nets and emergency groups, the incoming QSL bureaus and the international representation through IARU. CARF would contribute *TCA (The Canadian Amateur* magazine), the national symposiums, and the Canadian awards and contests. Services now offered by both organizations—outgoing QSL bureaus, the news bulletins and representation to DOC—would be combined. There would be one Board of Directors and one Headquarters office, resulting in savings of time, effort and money. Canadian amateurs would be able to speak with one voice.

Unfortunately, there are obstacles to overcome. Many CARF members still have a negative perception of CRRL. They see CRRL as a branch of ARRL, divided in its loyalties. A few even believe that ARRL uses CRRL to sneak pro-American views past Canadian amateurs and sell them 5000 copies of *QST*. They won't admit that CRRL has changed or that some of their beliefs about CRRL never were right. Many CRRL members still distrust CARF. They are troubled by years of rough treatment, of CRRL and CRRL people, on the pages of *TCA*. That's all in the past now; but for them, forgiving and forgetting is taking time. For them, it's just too early to think of a merger.

Other CRRL members note that CRRL is still in transition. It has been looking after its membership records and accounts for only one year. It has just begun to service its Section organizations. They feel that CRRL's house should be in order—totally—before beginning any negotiations.

There would be many items to negotiate: the size of the new Board, how the principal officers would be chosen, what the new organization would be called, where its Headquarters would be located, what its organizational structure would be like, what its financial structure would be like, what it would charge for membership with *QST*, with *TCA*, or with both, and more. We're sure that on each and every item, there would be two points of view. Negotiations could not be rushed. There would need to be time: time to build trust, time to consider options and time to consult with people and even the memberships of the two organizations.

These negotiations would certainly be complicated by the fact that CRRL and CARF are not equal. As we write, CARF has 3850 members, while CRRL has 5420. And only CRRL has a substantial financial reserve.

A word of explanation is in order. CRRL membership dues are not accepted as revenue for the year in which they are received. They are accepted as revenue *for the term of each member's membership*. Thus, members' monies are always being deferred into the future. These deferred monies, which are always being spent, but are always being replaced as membership renewals come in, have created a financial reserve. (This "reserve" gives CRRL great financial stability by providing a "cushion" to fall back on if adjustments are ever needed to cope with unexpected changes in revenues or expenses. It will also allow CRRL to meet its obligations to every CRRL member in the unlikely event of a "wind-down.") In contrast, CARF membership dues are basically accepted as revenue for the year in which they are received. No financial reserve similar to CRRL's has ever been created.

There would be a sense, then, in which the start-up of a merged organization would be financed more by those who were past CRRL members than those who were past CARF members. Knowledge of this would place a special responsibility on the CRRL Board. They would certainly want to feel comfortable with every decision that was made in the course of negotiations.

At the moment, a CRRL-CARF merger is under active consideration. As recorded in the minutes of the 1986 CRRL Board Meeting (see Sep 1986 *QST*), Bill Loucks, VE3AR, was appointed to work with Art Blick, VE3AHU, of CARF, to check out "the lay of the land." Their findings, for CRRL at least, are being supplemented by the findings of an internal CRRL committee, which will report to the CRRL Board at its 1987 Meeting. *In the meantime, you can help.* How do you feel about a merger? Please let your nearest CRRL Board member know. It's your organization.

SECTION MANAGER ELECTION NOTICE

To all CRRL members in the Alberta Section: You are hereby solicited for nominating petitions pursuant to an election for Section Manager. Name of the incumbent appears on page 8 of this *QST*. A petition, to be valid, must carry the signatures of five or more Full members of the League residing in the Alberta Section. It is advisable to have more than five signatures. Photocopied signatures are not acceptable. Signatures must be on the petition. Petition forms, FSD-129-C, are available from the CRRL Headquarters office in London, Ontario, but are not required. The following form is acceptable:

(Place and date)

The CRRL Secretary
Box 7009, Station E
London, ON N5Y 4J9

We, the undersigned Full members residing in the Alberta Section, hereby nominate. . .(Name and call sign) as Section Manager for this Section for the next two-year term of office.
. . .(Signatures and call signs). . .(Addresses including postal codes)

A Section Manager must be a resident of his or her Section and a licensed radio amateur holding a Canadian Amateur Certificate or higher, and have been a CRRL Full member for a continuous term of two years at the time of nomination. Petitions will be received at the CRRL Headquarters office until 1600 EST 1987 March 06. If only one valid petition is received by that time, the person nominated will be declared elected. If more than one valid petition is received, a balloted election will take place. Ballots will be mailed from CRRL Headquarters on or before 1987 April 01. Returns will be counted after 1987 May 19. A Section Manager elected as a result of these procedures will begin a two-year term of office on 1987 July 01.

If no valid petition is received, the Alberta Section will be resolicited in 1987 July and August *QST*. You are urged to take the initiative and file a nominating petition immediately.

Harry MacLean, VE3GRO
CRRL Secretary

SECTION MANAGER ELECTION RESULTS

Congratulations to Larry Thivierge, VE3GT, who was recently re-elected Section Manager, Ontario Section. Larry ran unopposed, eliminating the need for a balloted election. His new two-year term of office begins April 01.

NOTES FROM ALL OVER

☐ Before the end of last year, CRRL contacted DOC, once again asking for early access to the 18- and 24-MHz bands, and for implementation of a CRRL proposal that would allow a committee of amateurs to screen requests for special call-sign prefixes. DOC advised that we would have to be patient. They are short staffed and preoccupied with regulations changes for certain commercial services.

☐ Thanks and best wishes to Brit Fader, VE1FQ, who has retired as Manager of the CRRL VE1 Incoming QSL Bureau. Brit looked after this bureau for 50 years—since 1937. New Bureau Manager is Andy McLellan, VE1ASJ, Box 51, Saint John, NB E2L 3X1.

IARU News

Conducted By Richard L. Baldwin, W1RU
HC 60, Box 60, Waldoboro, ME 04572

President: Richard L. Baldwin, W1RU
Vice President: Carl L. Smith, WØBWJ
Secretary: David Sumner, K1ZZ
Assistant to the Secretary: Naoki Akiyama, N1CIX/JH1VRQ

Regional Secretaries:
John Allaway, G3FKM
Secretary, IARU Region 1
10 Knightlow Rd
Birmingham B17 8QB
England

Alberto Shaio, HK3DEU
Secretary, IARU Region 2
9 Sidney Lanier La
Greenwich, CT 06830
USA

Masayoshi Fujioka, JM1UXU
Secretary, IARU Region 3 Association
PO Box 73, Toshima
Tokyo 170-91
Japan

The International Amateur Radio Union—since 1925 the federation of national Amateur Radio societies representing the interests of two-way Amateur Radio communications.

Tokyo—November 1986

There was a lot going on in Japan during the month of November. For instance, sumo-wrestling championships were underway, Japanese baseball managers held their annual meeting to negotiate player trades, and Mrs Aquino [Philippines president] came to town. But wait, there was more—the Japan Amateur Radio League celebrated its 60th anniversary, and the course in Amateur Radio Administration was held under the auspices of the ITU and the Japanese administration.

JARL's 60th Anniversary

This was a gala occasion, done as probably only the Japanese can do it. There was a formal ceremony at which the president of JARL, the Japanese minister of communications and the president of IARU all made brief speeches in Japanese. This was followed by a JARL movie depicting their activities in preparing for the recently launched Fuji-OSCAR 12 satellite. The film was enthusiastically received by the several hundred JA amateurs and overseas visitors in the audience. Afterwards, there was a press conference at which the foreign guests had an opportunity to talk about the state of Amateur Radio in other parts of the world.

The next evening, there was a lavish buffet banquet, a great opportunity to mingle with a great number of distinguished Japanese amateurs who have played influential roles in the success of JARL. JARL now represents more amateurs than any other national society. Its president, Shozo Hara, JA1AN, although having many other interests as well, spends a sizable percentage of his time very actively serving JARL and its members. There were foreign guests present, representing their various national societies, from the United States (ARRL First Vice President Jay Holladay, W6EJJ), the Federal Republic of Germany, Australia, New Zealand, South Korea, Thailand, France, the People's Republic of China and Taiwan.

A group of the foreign visitors to JARL's 60th anniversary, along with some of their Japanese hosts.

Amateur Radio Administration Course

This was offered in Tokyo during the second week of November, the fourth in what we expect will be a continuing series of presentations around the world. The course is aimed at helping national telecommunications regulatory personnel understand the International Radio Regulations as they apply to Amateur Radio. This will help bring better domestic regulations, which will be to the advantage of both the amateurs and their government administration.

This was the largest class yet, including 20 students from 17 Asian and Pacific countries. Those 17 countries included the People's Republic of China, South Korea, Malaysia, Singapore, Thailand, the Cook Islands, the Solomon Islands, Nepal, India, Pakistan, Tonga, Vanuatu, Kiribati, Iran, Bangladesh, the Philippines and Sri Lanka. The instructors for this course included W1RU, ZL2AMJ, JA1KAB and JM1UXU. Special lectures were given by distinguished Japanese administrators and scientists. It all went very smoothly and there now are, we think, 20 more people who better understand the Amateur Radio Service and its value to the public, and how to regulate it properly.
—*W1RU/7J1ACQ*

Listening attentively during a lecture at the Amateur Radio Administration course are (l-r) Wang Xun, Huang Yongliang and Qin Duxun, all of the Chinese Radio Sports Association; and Masayoshi Fujioka, JM1UXU, assistant instructor of the course. In the foreground is student Krishna B. Khatry, of Nepal.

Sharing the communal shabu-shabu pot are Qin Duxun, president of the Chinese Radio Sports Association (left), and W1RU.

YL News and Views

Conducted By Joan Gibson, KG1F
RR 1, Box 1465, Waterbury, VT 05676

1986 YLRL YL-OM Contest Results

Phone

YL		OM
KA6ZYF	Gold Cup	K4JRB
YU3AN	2nd Place	K2LFG
W2GLB/7	3rd Place	W9LNQ

CW

YL		OM
CR1YL	Gold Cup	W7ULC
YU3AN	2nd Place	W1HOZ
K5YL	3rd Place	W2SAW

KA6ZYF—Mady Langdon won the Gold Cup for the SSB segment. She learned of her win when she returned from a five-week visit to China.

CR1YL—Lucia S. Tome's Gold Cup for her CW win is just one of many awards she has won for contesting. First licensed in 1952, CR1YL has been active on all the bands and heard in many contests, and a member of YLRL.

YL Phone		OM Phone		YL CW		OM CW	
KA6ZYF	13,650	K4JRB	3,190*	CR1YL	21,933*	W7ULC	446*
YU3AN	12,960*	K2LFG	675*	YU3AN	18,281*	W1HOZ	380*
W2GLB/7	8,384	W9LNQ	675*	K5YL	12,325*	W2SAW	340*
K8ONV/4	7,631*	W1HOZ	405*	WA8FSX/J3	9,638	W6ZT	285
DF9YY	5,475	LZ1YE	391	K8ONV/4	7,619*	HP1AC	210
NØDPX	4,883*	W4KFB	383*	YU6ZMM	4,650*	W9LNQ	210*
LZ1KVZ	4,752	NJ8N	375	VE7YL	3,658*	K9WA	195*
N2EVZ	2,701	KØETA	260*	WA2WHE	3,023*	HB9MX	143
CR5YL	2,070*	LZ1KOZ	248*	HA8KAX	2,958*	K7BLU	143
WB3EFQ	1,650	W5EW	240	KA5GIS/1	2,835*	K2LFG	135*
N8DPH	1,430	K4BNC	120	WA8YPY	1,537*	VO1AW	117
KU7F	1,410*	W9CA	96*	W8YL	1,435*	W1BEM	113*
KD8SC	1,380*	OK1KZ	60*	KAØAMX	1,418	VE2RO/W4	81
GM4YMM	1,300	SP5EVN	60*	N2EVZ	1,118	VE3ST	80
DLØXYL	1,254*	VE6UP	44*	OZ7YL	880	W1OPJ	79*
OK2BBI	1,238*	VE6ZT	42	EA7FQH	831*	OZ1TL	61*
KØEPE	920*	OK3YK	35	VK3KS	553*	W2AAU	56
YU8YL	825*	SP6DVP	25*	WA2NFY	375*	W9CA	53*
WA2NFY	800*	YO3ZR	20*	J87BO	298*	LU1EWL	45*
N3DZG	775*	F6BVB	18	N9AIB	234*	VE6UP	45*
F6ISN	731*	FD1HWB	16	SP2FF	124*	W7RD	31*
DF3BN	315*	I2LVN	15*	W3CDQ	45*	SM5AHK	30*
WA8YPY	315*	WA7NWL	15*	JA7PCH	30*	W8DM/4	20*
KB8RT/7	225*	YU7SF	15			WB4ZTR	15
DK9ZL	61*	JK1MAZ	10*			VK3XB	11*
N8GKA	42	W4XT	9*			LZ1BJ	9
JQ1WHK	6*	SP5NHV	3*			PA3DKX	5*
VK3KS	1*	SP2ZCD	3*			YO4BEX	5*
		LZ1ZF	1*			W8TSF	4
		K3NTD	1*			JH8JYV	1

Check logs: W5AWT, N5IAY, OK1DXW, OZ2JI, SP9MZH, YU7ORQ, YU7SF.
*Low-power multiplier. HA8KAX/YL, a club station, was operated by HA8IQ and HA8LKJ. CT1YH operated as CR5YL and CR1YL. J87BO was operated by K1IJV.

Operation: All bands may be used. No cross-band operation. Net contacts and repeater contacts do not count. A station may be counted only once in each contest for credit. Participants may work only 24 hours of the time. Operating breaks must be indicated in the log.

Exchange: Station worked, QSO number, RS or RST, state/province/country. Entries in log must also show time, band, date and transmitter power.

Scoring:

A) Phone and CW will be scored as separate contests. Submit separate logs for each contest.

B) One (1) point is earned for each different station worked; YLs count only OMs, and OMs count only YLs.

C) Multiply the number of QSOs by the total number of different states/provinces/countries worked.

D) Contestants running 150 W or less on CW and 300-W PEP or less on SSB, at all times, may multiply the results of C. by 1.25 (low-power multiplier).

Logs: All logs must show your state/province/country to qualify for awards. Do not send copies of logs. Please print or type. Logs must be signed by the operator and no logs will be returned. Remember to file separate logs for each contest. Logs must show claimed score, and be postmarked by March 16, 1987 and be received no later than March 31, 1987 or they will be disqualified. Please send logs to: YLRL Vice President, Mary Lou Brown, NM7N, 504 Channel View Dr, Anacortes, WA 98221, USA. For each duplicate contact that is removed from the log by the Vice President, a penalty of 3 additional and equal contacts will be subtracted.

Awards: 1st place phone: YL cup, OM cup; 1st place CW: YL cup, OM cup. The 2nd and 3rd place YL and OM winners in each contest will receive certificates. Certificates will be awarded to the high YL and OM phone and YL and OM CW winners of each US and VE call districts and countries, provided there are at least 2 logs from the district or country. In addition there must be a minimum of 10 contacts (QSOs).

Suggested Frequencies: CW—80 m, 3.540-3.570; 40 m, 7.040-7.070; 20 m, 14.040-14.070; 15 m, 21.040-21.070; 10 m, 28.180- 28.210. SSB—80 m, 3.940-3.970; 40 m, 7.240-7.270; 20 m, 14.280-14.310; 15 m, 21.380-21.410; 10 m, 28.580-28.610.

K5YL—Ruth Chance proved again that she is one fine contester with CW expertise. Ruth has also won the CW Gold Cup four times, and has placed high in numerous contests.

1987 YL-OM CONTEST RULES

Phone: 1400Z Feb 14-0200Z Feb 16, 1987
CW: 1400Z Feb 28-0200Z Mar 2, 1987

Eligibility: All licensed men and women operators throughout the world are invited to participate.

Procedure: OMs call "CQ YL" and YLs call "CQ OM."

Strays

I would like to get in touch with...

☐ hams interested in computer/electronic music. Al Trautman, K5MZG, PO Box 172, Lydia, LA 70569.

Silent Keys

Administered by Nancy A. Slipski

It is with deep regret that we record the passing of these amateurs:

W1ABZ, Henry Kulikowski, Orange, CT
W1AY, Ellery E. Estes, Hanson, MA
W1DFT, Irving E. Rivenburgh, Waterford, CT
W1EPW, John D. Harrow, Norwell, MA
W1JNN, Alfred O. Bagnati, Saybrook, CT
W1JNV, Albert Burnett, Milton, MA
KA1JPN, Frank D. Barcellos, Wilmington, MA
W1KIA, Charles J. Bean, Braintree, MA
WA1LMW, Samuel D. Sohn, New Britain, CT
K1LON, Lucy I. Noddin, Forestville, CT
KA1NA, George Flood, Plymouth, MA
KA1NJO, Edward M. Armstrong, Haddam, CT
WA1PAO, Fenton C. Fowler, Gilford, NH
W1QHP, Carmine Casciano, Easton, MA
KD2BC, Joseph R. Gitz, Springfield, NJ
W2CMK, Kenneth A. McGrath, Cranford, NJ
WA2FWR, Percy H. Lain, Dresden, NY
W2GPI, Irving W. Littlefield, Angola, NY
WB2IAP, Heywood "Woody" L. Gerstner, Long Beach, NY
K2KAQ, Robert M. Davis, Moonachie, NJ
KA2LCT, George F. Vollmer, Elmira, NY
W2SKL, Herbert Scully, Toms River, NJ
KA2SMY, Floyd W. Trickey, Watertown, NY
WB2VTR, Joseph E. Hennessey, Dunkirk, NY
WB2WOQ, Merlin H. Shofstahl, Niagara Falls, NY
W2YJC, John A. Herr, Garwood, NJ
WA3CAL, Karl T. Weber, Rawlins, WY
W3FFK, Rennick Bailey, Philadelphia, PA
W3GNR, N. Gary Boucher, DuBois, PA
KC3LY, David Crum, Albrightsville, PA
K3TFL, James E. Albert, DuBois, PA
K4CQT, Francis J. Sachse, Orlando, FL
W4EHP, James H. Jeffreys, Decatur, AL
N4EOQ, James L. Peyton, Jr, Savannah, GA
WB4EXX, William R. Bowden, Decatur, GA
K4FRN, Eustis L. Palmer, Tifton, GA
N4FUJ, Theodore J. Wildman, Clearwater, FL
K4GL, Jack T. Woodruff, Liberty, SC
WA4GVA, Richard Chitwood, Athens, GA
N4IW, John H. Geyer, USN, Virginia Beach, VA
KE4JZ, Ben L. Norris, Loxahatchee, FL
KA4KDW, Richard D. Webner, Tavares, FL
W4KEB, W. Herbert Combs, Jensen Beach, FL
W4LOH, Hinton A. Stoudemire, Ridgeway, VA
WA4MRG, A. G. Davis, Lexington, KY
KA4MUH, Virginia Leach, Bonaire, GA
WA4OFM, Hollins Montgomery, Augusta, GA
WD4RVS, Martin R. Maurer, Hendersonville, NC
W4TEJ, Garland L. Callis, Jr, Hartwell, GA
W4TLJ, Charlie J. Reeves, Tullahoma, TN
KA4UKN, Oscar Siegel, Neptune Beach, FL
K4UZV, A. W. Philbrick, Portsmouth, VA
W5BHD, Ernest Baucum, Altus, OK
WA5DUG, Walter P. Vick, Hemphill, TX
N5ELU, Alben C. Bergstrom, Whitney, TX
WA5IJO, Bill Gordon, Denison, TX
W5KFB, Ruvel E. Bright, Hope, AR
W5KNC, Max L. Kingsley, Austin, TX
W5VIN, Hewlett I. Crist, Houston, TX
W6DVC, George W. Moore, Fillmore, CA
WD6EKH, John W. Risley, San Luis Obispo, CA
*WB6EST, Eric Keener, Salt Lake City, UT
K6EX, Robert L. Daniel, Studio City, CA
K6GJH, Robert Folck, Cupertino, CA
WA6GWH, Arthur Chodrof, Los Angeles, CA
W6KTI, Irvin D. Martin, San Leandro, CA
K6LO, Harry Gross, Van Nuys, CA
W6MXF, Ralph Eggleston, Twenty-Nine Palms, CA
K6OBP, Carlton F. Borchert, San Diego, CA
W6PDD, Robert J. Street, Burlingame, CA
K6SIX, Gustav L. Hirsch, Los Angeles, CA
KA6SSB, G. E. Burkman, Westwood, CA
WA6UBU, Esther M. Gardner, Long Beach, CA
KB6UI, Richard E. Smith, Simi, CA
N7BS, Walker Knotts, Eugene, OR
WB7CLD, Gene W. Paxton, Sr, Cottonwood, AZ
W7ENO, Ole J. Vine, Vida, MT
W7GLU, Charles Butt, Eugene, OR
K7SMS, Alden T. Klovstad, Malta, MT
W7SQR, Lewis J. Smith, Eugene, OR
WB7SVM, Forrest M. Kirk, Boring, OR
KD7XI, D. M. Smothers, Centerville, OH
W7YT, William B. Moore, Seattle, WA
W7ZVN, John Donahue, Reno, NV
W8ALW, Elmer H. Schubert, Cincinnati, OH
W8BKL, Darford Sisson, St Joseph, MI
N8DPB, Thomas F. Maher, Warren, MI
KA8EDR, Howard R. Downing, Columbus, OH
WD8IFB, Charles G. Hays, Washington Court House, OH
W8JUM, Richard O'Connell, Columbus, OH
WD8KML, Raymond V. Lett, Huntington, WV
WD8NGQ, Herman E. Kingery, Huntington, WV
KA8OBL, Rudolf Six, Roseville, MI
KA8QNC, James L. Gergotz, Sr, Euclid, OH
WD8RFI, Mario J. Cardaci, Huber Heights, OH
W8RI, David J. Gaede, Sr, North Ridgeville, OH
W8TPC, William Gardner, Dayton, OH
W8VJW, Jay Leibach, Sandusky, OH
K9CZX, Jack F. Hudson, DeKalb, IL
W9DZT, Parker S. Gates, Quincy, IL
WA9GCJ, Marvin C. Hill, Normal, IL
W9HXV, Charles N. Cooke, LaPointe, WI
W9JSF, Carl J. Lindstrom, Rhinelander, WI
W9KXC, D. L. DeRusha, Dolton, IL
WA9LJF, Vernon L. Edwards, Virginia, IL
W9OCV, Howard H. Wehmhoefer, Beecher, IL
W9SA, George G. Postels, Middleton, WI
WAØAPY, Irvin E. Brownell, Columbus, NE
KØBKO, Dan S. Geis, Salina, KS
WØGA, Richard A. Bischoff, Burlington, IA
NØHBT, Bernard M. Nickles, Waterloo, IA
KAØLBK, Sheldon Ploeger, Charles City, IA

*Life Member, ARRL

In order to avoid unfortunate errors in the Silent Keys column, reports of Silent Keys are confirmed through acknowledgment only to the family of the deceased. Thus, those who report a Silent Key will not necessarily receive an acknowledgment from HQ.

Note: All Silent Key reports sent to HQ must include the name, address and call sign of the *reporter* as well as the name, address and call of the Silent Key in order to be listed in the column. Please allow several months for the listing to appear in *QST*.

50 Years Ago

February 1937

☐ The Communications Department is organizing a special message-relay exercise to commemorate the passing, a year ago, of our founder, Hiram Percy Maxim. Further, HPM's son and daughter have established the Hiram Percy Maxim Award, to be given each year to the most outstanding young amateur. And F.C.C. has agreed to re-issue "The Old Man's" call sign, W1AW, to the new League Hq. station now being built in his memory.

☐ A year ago amateurs in the San Francisco Bay Area formed the Society of Amateur Radio Operators with the objective of an organization which could function as a unit in the event of a major disaster. W6GPY outlines the club's plans and progress in building extensive emergency gear, with special attention to independent power.

☐ W1JPE built improved suppressor-grid keying into his shielded tri-tet oscillator, then added a pentode amplifier with suppressor modulation for a more versatile unit.

☐ Official Observer W1EAO is finding many stations emitting harmonics outside the ham bands, often relying too heavily on the pi-network coupler. Ray points out this setup works as a low-pass filter only when adjusted properly, and then supplies us with remedies.

☐ Extensive amateur reports of high-frequency radio fadeouts were among those which assisted Dr. J. H. Dellinger of the National Bureau of Standards to correlate the phenomena with visible eruptions on our sun.

☐ W4DLH, VU2CQ, SU1CH, HK1Z, G5ML and VK4LO in December completed the amazing feat of an all-continent round-the-world relay—and on voice, yet! Each station was able to hear each of the others, and with satisfactory signal strength.

☐ Bell Labs' new "Doherty" linear amplifier circuit has some advantages over the standard Class B system, says W9AHH, but requires advanced techniques in design and adjustment, and so is not for the beginner.

☐ Outstanding DXer W6CUH believes that flexibility can accomplish more than 10 kw. ever could in the way of DX, QSOs and general fun. He describes his own setup, which permits 1 kw. with either crystal or electron-coupled oscillator control on any of three bands, all selected from the operating position.

☐ The mini craze for high-power, beam-tube crystal oscillators has prompted W8QKT (of Bliley) to enumerate the technical parameters involved in such circuits, with particular attention to protecting the crystal.

25 Years Ago

February 1962

☐ This is the "OSCAR" issue—the story of our amateur satellite launched in December piggyback on an Air Force Discoverer vehicle, the first nongovernment satellite ever in orbit.

☐ Bill Orr, W6SAI, provides an overview, complete with flashbacks of historical high points interspersed with an exciting account of the tension as the countdown progressed through liftoff.

☐ Congratulations roll in—from the Vice President of the U.S., government agencies such as FCC, the military departments, professional associations. The Correspondence section separately is full of additional enthusiastic bouquets.

☐ Tom Lott, VE2AGF, describes the worldwide system of rapid and reliable ham networks set up to ensure immediate verification of OSCAR achieving orbit. KC4USB at the South Pole and KL7EBM in Alaska, in turn, confirmed the feat.

☐ Designing and building a 140-milliwatt transmitter and keyer was not so difficult, says W6HEK, but the real challenge was a unit physically rugged enough to withstand the rigors of a rocket launch, and then operate without anyone around to retune or adjust! The "breadbox" outer shell was curved, to fit the circumference of the launch vehicle.

☐ Back to earth, W1ICP's article inspires Novices to upgrade to General so they can use the variable-frequency oscillator he describes in easy-to-build style.

☐ We hams use a wide variety of antenna coupling systems, often "cut-and-try until they work." K2CU outlines for us the basic principles of couplers and shows how we can build one to work efficiently with our own antenna.

☐ W2YM finds that TV sweep tubes, though designed for horizontal scanning use, work nicely as zero-bias modulators.

☐ Hurricane Carla was the worst in Texas history, but amateurs again rose to the challenge and provided emergency communication for officials and relief agencies.

☐ The 1961 ARRL Merit Award went jointly to W1FZJ, of the Rhododendron Swamp VHF Society, and W6HB, of the Eimac Gang Radio Club, "for outstanding work. . . in making the first amateur two-way contact via moonbounce propagation."—*W1RW*

Amateur Satellite Communications

Conducted By
Vern "Bip" Riportella, WA2LQQ
PO Box 177, Warwick, NY 10990

Waves in Rotation: The Challenge of Circular Polarization

Few topics in Amateur Radio elicit the intense fascination of antennas. But the "field" really becomes interesting when antennas designed for space communication are factored in.

In space communications, the earth's magnetic field can dramatically affect radio waves traveling over long distances. The effect is to rotate the plane of polarization. To reduce the adverse effects of this polarization rotation, antennas designed for space communication often employ a special form of polarization called "circular polarization" (CP), a combination of the familiar vertical and horizontal polarization generated by common antennas. What makes CP desirable for space communications?

It was known early in the 19th Century that some substances are optically active; the plane of polarization of light passing through these substances is rotated. In 1845, Michael Faraday discovered that some substances, which normally show no optical activity, can be made to rotate by subjecting them to a strong magnetic field. This came to be known as the "Faraday Effect."

Radio waves and light waves are basically the same phenomenon. Early radio experimenters soon found that the Faraday Effect was detectable in low-frequency radio waves where the geomagnetic field works to rotate polarization. The amount of rotation of the wave's plane of polarization depends on its frequency, how far the wave travels in the magnetic field, how strong the field is, and the wave's angular relation to the magnetic field lines. Briefly, the degree of wave plane rotation *increases* with:

1) increasing magnetic field strength

2) increasing path length the wave travels along the field lines

3) increasing alignment of the wave plane and field lines.

The degree of wave plane rotation *decreases* with increasing frequency, ie, VHF is affected less than HF, UHF less than VHF, SHF less than UHF, and so on.

To someone watching TV Channel 7 at a range of 50 miles, the Faraday Effect is negligible. But take roughly the same frequencies (around 200 MHz) and stretch the path over 10,000 or 20,000 miles, and Faraday Effect rotation (or simply Faraday Rotation, FR) can greatly affect received signal polarization.

The problem arises when, owing to random incoming wave polarizations, the wave and the receive antenna are not in the same plane. The result is a widely varying received signal strength because of cross-polarization losses. Cross-polarization losses are familiar to anyone who has had difficulty using a horizontal Yagi to access a vertically polarized repeater antenna. An orbiting spacecraft transmitting to earth over a long path using UHF could very well originate a signal using horizontal polarization only to have it arrive vertically polarized. Frequently, the case is that the arriving wave's polarization is essentially random and changing at any instant.

The solution most often used for reliable space communications is two-fold. Since FR is less of a problem with increasing frequency, space communications are best accomplished at the highest practical frequency. And, when FR at the chosen frequency can still be a problem, CP is used.

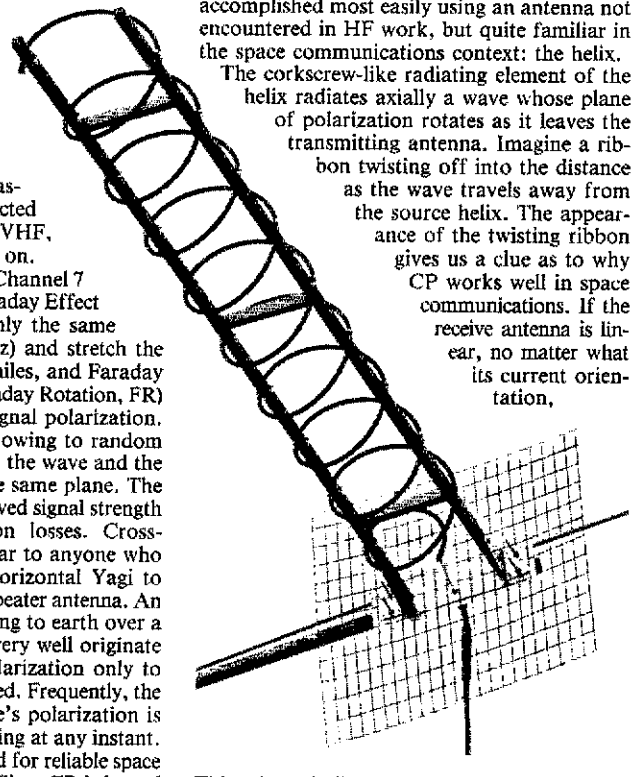
In a practical sense, the frequencies between 0.1 to around 2.0 GHz is the range where CP finds its greatest utility. Frequencies below 0.1 GHz are seldom used for space communications; frequencies above 2.0 GHz are affected by FR only minimally. But, since many of the OSCAR users' prime frequencies lie in the area where FR is significant (0.1 to 2.0 GHz), CP antennas must be employed for best results.

The CP antenna puts equal amounts of RF in each plane. The result is that the effects of FR are nullified. The price paid, however, is that the power in any given plane is less than if linear polarization were used. If one knew what the polarization would be all the time, one would use linear polarization and ensure the receive antenna was well aligned with it. But since the factors that control FR may all be varying at once, putting power into all planes with CP assures that when the signal is received on a CP antenna, the *average* received signal power will be higher than if linear polarization had been used.

Moreover, with OSCAR satellites in particular, the additional QSB caused by the spinning of the spacecraft most often makes CP doubly desirable. Indeed, many antennas built into OSCAR satellites are specifically designed for CP to reduce both FR and spin caused by QSB.[1]

CP is somewhat more difficult to generate than linear polarization. A CP antenna combines vertical and horizontal components in a particular time relation or "phase." This is accomplished most easily using an antenna not encountered in HF work, but quite familiar in the space communications context: the helix.

The corkscrew-like radiating element of the helix radiates axially a wave whose plane of polarization rotates as it leaves the transmitting antenna. Imagine a ribbon twisting off into the distance as the wave travels away from the source helix. The appearance of the twisting ribbon gives us a clue as to why CP works well in space communications. If the receive antenna is linear, no matter what its current orientation, the wave will never be cross polarized for very long. If the receive antenna is CP, the wave is always in the "right" plane as it's received. In other words, a CP antenna "hears" equally well in all planes.



This 70-cm helical antenna can be used as part of a switchable system that provides both types of circular polarization.

The direction the ribbon twists is called the "sense" of the wave. Right Hand CP (RHCP) rotates clockwise as seen from behind the source antenna, and Left Hand CP (LHCP) rotates counterclockwise. Thus, the twist of the imaginary ribbon is either clockwise or counterclockwise, corresponding to RHCP or LHCP, respectively. The rate of twist is one complete turn (360 degrees) per wavelength. For best results, both the transmitting and receiving antennas should have the same sense.

Helices may be the easiest way to generate CP and one of the most popular types of home-brewed satellite antennas. It's not the only way to get CP, by far. Many OSCAR users employ a pair of specially phased Yagis to generate CP in the 2-m through 24-cm bands. The two identical Yagis have their elements mounted orthogonally (at right angles; thus "crossed Yagis"), either in two separate antennas side by side or two separate Yagis sharing a common boom.

CP can be generated by a variety of antenna types. The use of CP antennas for space communications is essential in many cases. Moreover, the bizarre shapes and configurations used to generate CP serve to enhance the already entrenched mystique that antennas enjoy with amateurs.[2]

[1]The QSB caused by the spinning of the satellite is called "spin modulation." On frequency, it sounds like rapid amplitude modulation, or flutter, of the downlink, and depends on the angular velocity of the spacecraft about its spin axis and the specific antenna pattern involved.

[2]To learn more about some of the interesting aspects of Amateur Radio space communications, write to AMSAT for free information about getting started with OSCARs. An SASE to AMSAT, PO Box 27, Washington, DC 20044 will do the trick.

Strays

I would like to get in touch with...

☐ anyone with an instruction manual for a Spectronics Digital Display DO-1. Ernest Brown, K2BWK, 1 Coville St, Victor, NY 14564.

☐ anyone who has cured a noisy Ten-Tec Argosy II digital frequency display. Dan Holloway, 9V1VB (K6KMD), 20 Toh Ave, Singapore 1750.

☐ former members of the 60th Signal Service Co, Fort Lewis, Washington 1946-1950 and Korea until mid-1951. Ray Kleinbert, WAØWKS, 6502 Starshine Dr, Huntington Beach, CA 92647.

Hamfest Calendar

Administered By Bernice Dunn, KA1KXQ
Convention Program Manager

Attention: The deadline for receipt of items for this column is the 5th of the second month preceding publication date. Hamfest information is accurate as of our deadline; contact sponsor for possible late changes. For those who send in items for Hamfest Calendar and Coming Conventions: Postal regulations prohibit mention in *QST* of prizes of any kind and games of chance such as bingo.

California (Van Nuys)—Feb 21: The PT Barnum Amateur Radio Transmitting Society of Southern California is sponsoring the San Fernando Valley Hamorama 6 AM-2 PM at the San Fernando Valley Teen Center, 17400 Victory Blvd (between White Oak Ave and Balboa Blvd). Free admission. Food available. Talk-in on 145.52. (This event will occur every 3rd Saturday of each month.)

Connecticut (Norwich)—Feb 28: The Radio Amateur Society of Norwich is sponsoring an auction held at the Montville VFW Hall. Directions are Rte 395 to exit 79 to Rte 32N about 1½ miles to left at Raymond Hill Rd, ¼ mile on right in back of the Wonder Bread Store. Talk-in on 13/73. Set-up 9 AM. The gavel drops at 10 AM. For more info, contact KA1IFG at 203-848-9670.

Connecticut (Putnam)—Mar 15: The ECARA will hold their 13th annual flea market at the Elks Hall located just off exit 96 on Edmond St, just a minute from Highway 395. Talk-in on 825/225 and 52. Tables $7, so reserve as early as possible. For further info, contact Don Amirault, K1APE, 66 Labonte Rd, RR 1, Box 310, Thompson, CT 06277, tel 203-923-2727, or Richard Spahl, K1SYI, Lake Parkway, Webster, MA 01570, tel 203-943-4420 after 7 PM.

Florida (Brooksville)—Feb 28: The Hernando County ARA will hold its annual Hamfest at the County Fairgrounds on US Hwy 41, about 2 miles south of Brooksville. Free parking and food available. Admission $3 at door, $2 in advance. Tables $6 each. For advance tickets, send an SASE with check to PO Box 1721, Brooksville, FL 33512, tel 904-796-4840 or 904-796-1177.

Florida (Ft Myers)—Mar 7: The City of Palms annual hamfest will be held at the Moose Hall on Parkmeadow Dr 9 AM-4 PM. Talk-in on 28/88. Dealers, forums, tables and food available. For info, contact Harry Arnold, K9ALX, 5414 Brandy Cir SW, Ft Myers, FL 33907, tel 813-482-3113.

Illinois (Sterling)—Mar 15: The Sterling Rock Falls ARS 27th annual Hamfest will be held at the Sterling High School Fieldhouse, 1608 45th Ave. Dealers, distributors, flea market and overnight camping space available. Doors open 7:30 AM. Food available. Admission $3 in advance, $4 at the door. Commercial tables and tables requiring electricity $5, all others $3. Talk-in on 25/85. For info, tables or tickets, contact Sue Peters, PO Box 521, Sterling, IL 61081, tel 815-625-9262.

Indiana (Indianapolis)—Mar 8: The Indiana Hamfest sponsored by the Morgan County Repeater Assn will be held at the Indiana State Fairgrounds Pavilion Building. Doors open 8 AM to the public. Admission $5. Tables (8 ft) $5 each. (No space without table will be sold.) Advance reservations suggested first-come basis. Setup on Sat March 7 3 PM-9 PM, Sunday from 6 AM-8 AM. Overnight security provided. All vehicles out of the building by 7:50 AM. Free parking. Talk-in on 145.25. For table reservations or info, send SASE before Feb 25 to Aileen Scales, KC9YA, 3142 Market Pl, Bloomington, IN 47401, tel 812-339-4446.

†**Indiana (Winchester)—Mar 1:** The Randolph ARA will hold their Hamfest at the National Guard Armory 8 AM-3 PM. Admission $3 in advance, $4 at the door; under 12 free with adult. Includes electronics and Amateur Radio exams. Food and free parking available. Table space $5 for 3- × 8-ft (tables limited). Space only $3. Setup 6 PM-8 PM on Feb 28 and 6 AM-8 AM on Mar 1. Talk-in on 90/30 and 224.90/223.30. For info, contact RARA, c/o Kedrick Robbins, W9QUH, Box 389, Parker City, IN 47368, tel 317-468-6568, or Jake Life, W9VJX, 407 High St, Winchester, IA 47394, tel 317-584-9361.

†**Iowa (Davenport)—Feb 22:** The Davenport Radio Amateur Club is sponsoring their Hamfest at the Davenport Masonic Temple 8 AM-3 PM. Admission $3 at the door, $2 in advance. Talk-in on 28/88. Food and forums available. For more info, contact Dave Johannsen, WBØFBP, 2131 Myrtle, Davenport, IA 52804.

Massachusetts (Chicopee)—Mar 1: The Annual MTARA Fleamarket will be held at the C Elder Council 69 Hall, Granby Rd. Admission $2; spouse and kids free. Tables $10 at the door, $8 in advance. Tailgating $5. Vendor setup 7 AM-10 AM. Doors open to the public 10 AM-3 PM. Food available. Talk-in on 34/94 and 52. For more info, contact MTARA, Box 3494, Springfield, MA 01101, or call Bob, WB1EQS, at 413-532-4891 days, or Mickey, N1CDR, at 413-562-1027 evenings.

Michigan (Dearborn)—Feb 22: The Livonia ARC is sponsoring their 17th Annual Swap & Shop 8 AM-4 PM at the Dearborn Civic Center. ARRL/VEC examinations will be given. Tables, food and free parking available. Talk-in on 144.75/145.35 and 52. Reserved table space of 8-ft minimum available. For further info, send SASE (4 × 9) to Neil Coffin, WA8GWL, c/o Livonia ARC, PO Box 2111, Livonia, MI 48151.

Michigan (Plainwell)—Mar 1: The First Annual State Technical Institute Hamfest will be held on the school grounds at 33 Alber Dr, located 15 miles northeast of Plainwell on Pine Lake. Doors open 8 AM-4 PM. Admission $2; tables $3. Talk-in on 146.46. For more info and table reservations, write to Robert Mousseau, KA8VVM, State Technical Institute, 33 Alber Dr, Plainwell, MI 49080, or call the school at 616-664-4461.

Michigan (Traverse City)—Feb 14: The Cherryland ARC announces its 14th annual Swap & Shop to be held at the Immaculate Conception Middle School gymnasium, 218 Vine St, 8 AM-2:30 PM. Admission $2.50; tables $3 each. Talk-in on 52 and 146.85. For more info, contact Mick Glasser, N8DBK, 4102 Peninsular Shrs Dr, Grawn, MI 49637, tel 616-276-9203.

Minnesota (Medina)—Feb 21: The Robbinsdale ARC is sponsoring their 6th Annual Mid-Winter Madness Hobby Electronics Show. Doors open 8 AM-2 PM. VE testing 9 AM. Location is the Medina Ballroom, Hwy 55, 3½ miles west of 494 (western suburb of Minneapolis). Admission $3 in advance, $4 at the door. Tables $8 for 8 ft, $4 for ½ size. Booth $35 for 8 × 10. Talk-in on 147.00/00 and 52. For registration, send SASE and fees to Robbinsdale ARC, PO Box 22613, Robbinsdale, MN 55422, or call Bob at 612-533-7354. For exam registration, send completed 610 Form, photocopies of current license and code credit with $4.35 payable to ARRL/VEC c/o Ron Schulz, NAØU, 6308 Peacedale Ave, Edina, MN 55424. Walk-ins are limited.

†**Missouri (Kansas City)—Feb 15:** The Mid-America FM Assn is sponsoring their FM Bash at the National Guard Armory, 7600 Ozark Rd. Doors open 10 AM-4 PM. Free admission. Talk-in on 34/94. For more info, contact Bob Atkeisson, WØAT, PO Box 188, Raymore, MO 64083.

New Jersey (Livingston)—Feb 13: The Irvington RAC is sponsoring their Hamfest 7 PM-11 PM. Admission $2. Talk-in on 52 and 146.415. For more info, contact Walt Heineman, W2QR at 201-429-0504.

New York (Melville)—Feb 15: The Long Island Mobile ARC is sponsoring their Long Island Hamfair at 41 Pinelawn Rd. Doors open 9 AM-3 PM. Admission $3.25 in advance, $4 at the door. Food and free parking. Talk-in on 25/85. Tables $12 for 4 × 6 ft, or bring yours at $1.50/ft, $8 minimum. (Table orders must be made in advance, limited to one only). For advance tickets, send SASE to LIMARC, c/o Mark Nadel, NK2T, 22 Springtime La E, Levittown, NY 11756. For table reservations, write to Hank Wener, WB2ALW, 53 Sherrard St, East Hills, NY 11577, tel 516-484-4322 (evenings only).

New York (Newburgh)—Mar 1: The Mt Beacon ARC will hold its first annual winter hamfest 8 AM-3 PM at the State Armory off the intersection of Interstates 84 and 87. Doors open for sellers 7 AM. Amission $3. Table space $4. Table provided for $5 with advance reservation; otherwise bring your own. Food available. Talk-in on 37/97 and 52. For reservations and info, contact Stan Disbrow, WA2KQY, c/o Mt Beacon ARC, PO Box 841, Wappingers Falls, NY 12590, tel 914-876-1659.

New York (Valhalla)—Mar 8: The Westchester Emergency Communications Assn is sponsoring their "WECAFEST '87" Hamfest at the Westchester Community College. Featuring new equipment dealers, forums and FCC license exams. Doors open 9 AM-3 PM. Dealer setup 7 AM. Admission $3; under 16 free. Talk-in on 66/06, 52, 222.80/224.40 and 442.475/447.475. Dealer inquiries should be addressed to WECAFEST '87, PO Box 348, Millwood, NY 10546.

†**North Carolina (Elkin)—Feb 15:** The Foothills ARC and Briarpatch ARC are sponsoring their tenth annual Hamfest held at the National Guard Armory, two miles off I-77 at exit 85. Food available. Talk-in on 144.77/145.37, 69/09 and 52. Doors open 8 AM. For table reservations and info, contact Ed Mulholland, KA4WWV, Rt 4, Box 424-H, N Wilkesboro, NC 28659, tel 919-667-1568 or 919-838-2171, ext 2427.

Ohio (Mansfield)—Feb 15: The Mansfield Mid-Winter Hamfest/Computer Show will be held at the Richland County Fairgrounds. Doors open at 7 AM. Forums include DX by K8CW, packet, and more. Tickets $3 in advance, $4 at the door. Tables $5 in advance, $6 at the door. Half tables available. Talk-in on 34/94. Advance ticket/table orders must be received and paid by Feb 5. For info and advance orders, send SASE to Dean Wrasse, KB8MG, 1094 Beal Rd, Mansfield, OH 44905 tel 419-589-2415 after 4 PM.

Ohio (Tallmadge)—Feb 22: The Cuyahoga Falls ARC will sponsor its 33rd annual Auction-Fest at the Tallmadge High School, 1 mile east of Tallmadge Circle on East Ave, or 2.3 miles west of I-76 at exit 31. Doors open 8 AM, auction begins 11 AM. Tables available for $6 in advance. Deadline for tables Feb 9. Admission $4 at the door and $3 in advance. Talk-in on 87/27. For more info, send an SASE to Cuyahoga Falls ARC, PO Box 614, Cuyahoga Falls, OH 44222.

Oregon (Salem)—Feb 21: The Salem and Oregon Coast Emergency Repeater Assn will sponsor the 1987 HAMFAIR at the Polk County Fairgrounds. Doors open 9 AM. Admission $4 in advance, $5 at the door. ARRL/VEC testing, exhibits and dealers included. Talk-in on 26/86. For more information, write to Salem Repeater Assn, PO Box 784, Salem, OR 97308.

Pennsylvania (Rostraver Gardens)—Mar 8: The Two Rivers ARC is sponsoring their Two Rivers Swap & Shop 9 AM-3 PM. Free admission. Tables $5 each. Talk-in on 13/73. Food available. For more info, contact Mike Kowalcheck, Jr, PO Box 184 Greenock, PA 15047.

Tennessee (Morristown)—Mar 7: The Lakeway ARC is sponsoring their annual Swapfest at the Tally Ward Recreation Center. FCC and VE Exams will be given. Lunch available. Talk-in on 63/03. Vendor setup 7 AM. For more info, send an SASE to Dennis Livesay, KB4LSX, 3214 Horner Dr, Morristown, TN 37814.

†**Texas (San Antonio).—Feb 21:** The San Antonio Spring Amateur Radio and Computer Equipment Swap-meet will be held 6 AM-4 PM at the Unique Experience Ballroom, 1434 Callaghan Rd (Callaghan Rd and Culebra Rd, inside Loop 410, northwest San Antonio). Parking and swap area easily accessible. Talk-in on 34/94. Admission $2; tables $5 each. For information and advance reservations, send SASE to SARC Inc, PO Box 690648, San Antonio, TX 78279-0648. For additional info, call Andy Anderson, WB5NOL, 512-698-1712.

Vermont (Milton)—Feb 28: The Burlington ARC and Essex ARC is sponsoring their Northern

(continued on page 84)

†ARRL Hamfest

Public Service

Conducted By Michael R. Riley, KX1B
Public Service Manager, ARRL

The Nuts and Bolts of NTS

Several years ago, I wanted to talk with an old friend (he was another 16-year-old amateur) in Louisville, Kentucky. As a Novice living in western Kentucky, my options were limited. I could either scan the 50 kHz available to me on 80 meters for a couple of days or pick up the telephone. As a teenager with limited financial resources (my father has always been a wise man), I searched for another avenue. During the past few weeks, I had been quite an active member of the Kentucky Novice Training Net (KNTN). The net always had a station checking in from Louisville. Wheels began to turn. I was going to send my first radiogram!

To make a long story short, the radiogram was sent to another Novice in Louisville, and my friend was on the air within 15 minutes! I was happy, my friend was happy, my father was happy and I still had enough money to go to the high-school sock hop on Friday night!

My first attempt at sending a message involved a half hour of research, a pencil and paper, and nerves of steel! After I sent the message, I felt a sense of accomplishment and pride. Section nets were, and still are, fun!

Times have changed since that cold, winter evening in 1970. Sock-hop chaperones no longer walk among the gravity-defying, gyrating youngsters, checking to see that shoes don't scratch the gymnasium's polished floor. The National Traffic System (NTS) and its Section and local nets, however, still provide a real service to amateurs and the public in a time-honored tradition.

Try it! You'll like it! This short discussion of the purpose of Section and local nets submitted by Roger A. Laroche, N6FOU, will provide you with the essentials. Additional information on NTS can be found in the ARRL *Net Directory* (available from ARRL HQ for $1) and the *Public Service Communications Manual* (available in limited quantities from ARRL HQ, your ARRL Section Manager [listed on page 8] or your NTS Net Manager). Only by checking into a net can you gain a working knowledge of how NTS can help you—and how you can help NTS. Give it a try!

NTS Principles of Operation

The National Traffic System consists of four different levels of nets that operate in an orderly time sequence to effect a definite flow pattern for traffic from point of origin to point of destination. A message flows through the National Traffic System in a manner similar to an airline passenger who starts out in a small, residential town with a destination across the continent in another small town. He has to change carriers many times in the process, starting with a local ground conveyance to a feeder airline, to a transcontinental airline, to another feeder air line, then local transportation to deliver him to his destination. In a very similar manner, the transcontinental message starts with the originating station in a local net, is carried to the Section net, the region net, the area net, via Transcontinental Corps (TCC) to a distant area net, then back down the line to delivery.

Of course the message, like the passenger, can "get on" or "get off" at any point if that's its origin or destination. Thus, a message from, say, New York to Detroit would never get on TCC, but would "get off" at area level. A message from San Francisco to Los Angeles would not go beyond region level, and one from San Antonio to Houston would remain inside the Section net.

What does my local or Section NTS net provide?

Local and section traffic nets function as a clearinghouse for formal, written traffic coming into or going out of a locality or ARRL Section. These nets maintain a cadre of experienced Net Control Stations and traffic handlers who provide a service to their Section and the public through liaison with Region Nets and affiliation with the National Traffic System.

Local and Section nets allow a timely exchange of formatted messages to, from and within Sections by dedicated amateurs who perform net control and liaison functions within each Section.

What do these NTS nets I hear on my local repeater do?

Because some ARRL Sections are geographically large, and also because there may be no hams in a particular small town (Livia, Kentucky, for example, which has a population of 50, if you count those stopping to ask directions), it is sometimes difficult to provide coverage to every city and town at the Section level. Thus, the local net can provide the necessary coverage and liaison to the Section net. Usually, the local net operates on a VHF repeater and has the grassroots coverage provided by Technician class amateurs and those who enjoy operating on VHF.

The number of local NTS nets in the Section and cycles of operation are usually determined by geography and population density. Requirements for local nets are left to the discretion of the Section Traffic Manager.

So, what do these Section nets do that local nets can't?

The Section net is an ARRL Section's traffic connection to the world. Within the National Traffic System, Section nets provide liaison between local and the region nets. In some sections, where the geographical area permits, local nets may not be required. For example, when a Section has a repeater strategically located to provide coverage of all populated areas in the Section, the net can operate on the repeater, fulfilling the Section's needs. Consequently, there would be no need for a local net. Section nets also provide operators with training and experience necessary for participation in upper echelon nets of NTS.

Okay, I'll check into a net. What should I know before I take the plunge?

Here are a few pointers. In order to provide orderly flow of traffic from one station to another, the net must be disciplined. Net Control Stations and Net Liaison Stations play important roles in a disciplined operation. To maintain organization of net activity and provide direction for net participants, net management becomes a necessity. The National Traffic System has established guidelines for net organization as well as net operation. (They are found in the *ARRL Public Service Communications Manual.*)

Net organization, whether at the local or Section level, is headed by a Net Manager, who oversees general net operation. This includes establishing time of operation on a daily, weekly or biweekly basis (depending on the amount of traffic handled by the net), assigning Net Control and Liaison Stations, while maintaining net discipline. The Net Control Station conducts the net and coordinates the exchange of traffic in an orderly and expedient manner. He/she acknowledges all stations checking into the net and excuses stations not needed to handle traffic. The Liaison Stations provide the outlet for traffic going out of or coming into the section or local area. These stations bring in traffic and take it out to Section or Region nets. Liaison Stations are the life blood of the traffic net in that they provide access to the outside world. Other stations participating in the net provide the function of taking traffic to its final destination, the recipient or bringing replies and other messages to the net for relay. This is probably the most important function of traffic handling in that it promotes goodwill for Amateur Radio and provides a public service to the community.

Checking into a net was easy. The manager of the net even said hello and asked me to check in more often. What does this "manager" do?

Quite a bit! The NTS local Net Manager (NM) is appointed by the Section Traffic Manager or the Section Manager, and, as with all ARRL Leadership Official appointments, must be an ARRL member. The NM's responsibilities are to maintain a traffic-net operation according to the guidelines set forth by the ARRL and the National Traffic System. The Net Manager develops and implements the net operating criteria and formats for use by the Net Control Stations. He maintains a record of net traffic and check-ins and reports net activity to the Section Traffic Manager on a monthly basis. If the Net Manager so desires, he may unofficially appoint a net recorder to perform these duties. However, the Net Manager is still

fully responsible for the activities and conduct of the net.

Other Net Manager responsibilities include issuing net certificates and endorsements to participants in good standing, and welcoming new stations into the net. He also exchanges information with the Section Manager, Section Traffic Manager and the Section and Region nets and maintains a current net roster. In order to effectively discharge these responsibilities, the NM may perform net control duties, check into the net regularly, and provide an example of good traffic handling and operating procedure.

In short, an NTS Net Manager has made a commitment.

A good Net Manager will set up his/her organization with a dedicated staff so the manager won't have to be there each and every time the net is in session. The Net Control Stations, Liaison Stations and net members should be able to conduct the net efficiently when the manager is not there.

Who is this Net Control Station?

This person is recruited and appointed by the Net Manager to conduct the traffic net on a regular basis. The Net Control (NCS) directs the net. The first and foremost responsibility of an NCS is to dispense traffic in an expedient manner.

The following are the obligations of a Net Control Station in the conduct of a net.

The Net Control Station:

- Is the absolute authority while the net is in session.
- Will immediately excuse any station offering unsolicited comments regarding the way the net is conducted.
- Excuses stations not needed to handle traffic after reasonable time has elapsed since checking in.
- Excuses stations handling traffic as soon as they are no longer needed.
- Welcomes new stations to the net and invites them to discuss net operations and traffic handling after the net is closed.
- May accept information pertinent to net operations or of general interest to the group. However, these must be brief, and discussions deferred until after the net is closed.
- Informs the Net Manager of any problems with net conduct so that solutions and improvements can be made in a timely manner.
- Prepares a net report and submits it to the Net Manager or designated representative as quickly as possible.
- May request another Net Control Station to conduct the net for him. However, once the net has started he does not relinquish net control except in an emergency.
- Always starts the net on time.

The Net Control Station keeps a record of stations bringing traffic to the net and Liaison Stations taking traffic out of and into the net. Also, a record of all stations checking in is maintained on the particular session for which the NCS is responsible. These records are then submitted to the NM or net recorder as quickly as possible. These reports should be compiled and the totals submitted to the Section Traffic Manager at the end of each month.

What do these Liaison Stations do?

Liaison Stations keep the traffic coming into and going out of nets from the outside world. Liaison Stations volunteer their services to the net and are usually appointed by the Section Manager as Official Relay Stations. Some double up as Net Control Stations on Local, Section and Region nets. Other Liaison Stations include those representing MARS, ARES and independent nets.

With the advent of packet and digipeaters in almost all of our highly populated ARRL Sections, this mode of message relay has gained considerable and justifiable attention recently. Digipeaters having store and forward capability have proven quite effective and efficient in moving traffic into and out of ARRL Sections. Liaison Stations with packet capability have repeatedly demonstrated the proficiency and error-free capability of this mode of message handling at several hundred words-per-minute. Although CW and voice are still time-honored modes of message handling, packet radio shows great promise for the not-too-distant future.

Therefore, anyone aspiring to become a Liaison Station should practice handling messages in all available modes so as not to be handicapped by an in-depth knowledge of simply one of the many modes available to our Service under routine or emergency conditions.

I don't have a title. I just check into the net. Where do I fit in?

You are an essential spoke in the biggest wheel of NTS. Nets could not function without stations to deliver messages. Message delivery is an extremely important function of the net, and net participants are the heart of its operation.

The traffic net is probably the only net in a locality where amateurs can learn and practice proper written traffic handling procedures. The National Traffic System procedures are recognized nationwide. The ARRL radiogram format is also recognized by ARRL-affiliated ARES nets, MARS and most independent nets.

The net is meeting in a few minutes, and I'm tuned up on their frequency. Do you have any last-minute words of advice?

I'm glad you asked that question! Every net has established standards which maintain net discipline. So when you check into a net, you should be aware of these standards, keeping in mind that the net's purpose is to handle traffic. The standards are:

- Check into the net on time.
- List your traffic correctly.
- Never transmit without the NCS's permission except in an emergency.
- Call the NCS only if you must. If you need to be excused, don't give the reason, just ask to be excused.
- Never, never "jump in" and call the NCS to advise him that another station has traffic. Ask to be recognized by the NCS first.
- Don't leave the net unless excused.
- If you are questioned by the NCS, make your reply as brief as possible. Yes or no is usually satisfactory.
- Discussions and questions about net operation and how traffic is handled are not condoned while the net is in session. These discussions are conducted after the net is closed.
- Do not correct the NCS while he is conducting the net. It is discourteous, confuses everyone and delays traffic activity.
- Exercise courtesy and obey the NCS's instructions when participating on a traffic net.

Finally, Net Control Stations have complete authority over net operations. Participating stations need to observe the discipline required by the NCS so that traffic can be dispensed as efficiently and quickly as practical. Stations who regularly participate in a traffic net are often asked to help when messages must be sent to distant locales when an emergency is declared. The reason is obvious. The ARRL Emergency Coordinator can rely on these stations to handle the emergency traffic as required efficiently, without question as to how or why, because these operators are disciplined, knowledgeable of NTS procedures, can choose the most efficient mode of communication available and have past experience in handling messages.

Stations participating in a NTS-affiliated net are a valuable asset to their communities. Not only do they regularly provide a public service, but they are ready and able to perform in emergency drills and provide effective communications for their neighbors and friends when emergencies occur.

The National Traffic System needs more volunteers. If you're interested, contact the ARRL Leadership Official in your area or do as I did more than 16 years ago—close your eyes and jump in with both feet! You'll land on solid ground, and the Net Manager or Net Control Station will be waiting to say hello and thank you for checking in. These Net Managers and Net Control Stations have made a commitment to help you and the public. Give 'em a chance!—*Robert A. Larouche, N6FOU, and Michael R. Riley, KX1B, Public Service Manager, ARRL*

SPOTLIGHTS ON SERVICE

Simulated Emergency in Mexico

A surprise simulated emergency test in Mexico last August sparked the interest of many radio amateurs in and around Mexico and beyond, and laid groundwork for future exercises. The test was a Field Day-type activity and was organized by the Mexicali, Baja California, Mexico Radio Club. The operation was conducted on the weekend of August 16 from La Rumorosa, a high vantage point west of Mexicali.

Two Amateur Radio stations, powered by a gasoline-driven generator, were set up to make contacts and acquaint fellow radio amateurs with the simulated emergency test. Both SSB and CW were used. Many stations in Mexico were very interested in conducting the same type of exercise and on-the-air explanations were in order.

More than 15 club members participated in the event, and they were very enthusiastic. Notes were made regarding the lacks and needs of the overall operation so that the next one would run smoother. Suggestions were also received and welcomed from the Imperial Valley Amateur Radio Association in California.

The weekend was highlighted by a visit from the Regional Technical Secretary for Civil Emergency Services, Dr Arturo Guerra-Flores. He was delighted with the group's determination and courage to do something never done before in Mexico and promised support in emergency preparedness. The club plans to repeat the simulated emergency test again. Congratulations to the club for their effort and concern for the well-being of others in case of an emergency. —*Tony Franc, NR7O/XE2CM*

Field Organization Reports November 1986

ARRL Section Emergency Coordinator Reports

Thirty-three SEC reports were received, denoting a total ARES membership of 16,204. Section reporting were: AB, AR, EMA, IA, KS, MDC, ME, MI, MN, MO, NE, NFL, NH, NLI, NNJ, NV, OH, ONT, OR, PAC, SCV, SD, SDG, SFL, SK, VA, VT, WI, WA, WMA, WNY, WPA, WV.

Transcontinental Corps

Area	Successful Functions	% Successful	TCC Function Traffic	Total Traffic
Cycle Two				
TCC Eastern	111	90.9	658	1351
TCC Central	81	90.0	337	750
TCC Pacific	105	87.5	492	841
Summary	297	89.4	1487	2942
Cycle Four				
TCC Eastern*	222	92.5	810	1679
TCC Central	72	90.0	311	646
TCC Pacific	113	94.2	610	1200
Summary	407	92.2	1731	3525

*TCC Eastern operates both cycles 3 and 4.
TCC Certificates issued: WA4JDH

TCC Roster

KA1AE N1BHH N1CE N1DMU N1EFW K1EIC K1EIR WA1FCD K1GRP W1ISO KN1K KA1MKJ W1NJM KT1Q W1QYY KA1T KW1U WB2EAG WA2FJJ W2FR W2GKZ NN2H KB2HM N2IC W2LWB KU2N W2RQ KA2UED N2XJ N3COY N3DPF KK3F WB3GZU W3PQ KQ3T KB3UD AA4AT N5BB WA4CCK W4CKS N4EXQ WD4FTK N4GHI WB4HML WA4JDH W4JL WA4JTE N4KB WN4KKN WB4PNY WB4UHC W4UQ K4ZK N5AMK N5BT W5CTZ N5DFO K5GM AE5I W5JOV AJ5K W5KLV KD5KQ K5OAF KD5RC KA5SPT ND5T N5TC W5TFB K5TL W5TNT W5VMP KB5W NQ5W KV5X WB5YDD W6EOT KU6D W6INH K6LL K6UYK W6VZT WF6O KA7CBT W7EP KB7FE W7GHT NN7H W7LYA KA7MUL KF7R W7TGU W7VSE WD8LDY W8PMJ W8QHB AF8V N8XX WB8YDZ W9EHS W9FC W9JUJ KA9RII WB9UYU AD0A KC0D KJ0G K0DJ KA0EPY K0EZ W0HI N0IA WA0OYI KS0U VE3AWE VE3FAS VE6CHK

National Traffic System

Net	Sess	Tfc	Avg	Rate	% Rep	% Rep to Area
Cycle Two						
Area Nets						
EAN	30	1129	39.60	.799	96.7	
CAN	30	619	20.60	.526	100.0	
PAN*	57	551	9.66	.485	94.4	
Region Nets						
1RN	60	680	11.33	.476	97.0	100.0
2RN	52	292	5.60	.386	62.7	100.0
3RN	30	233	7.80	.470	94.0	96.6
4RN	60	708	11.80	.425	83.8	100.0
RN5	60	687	11.45	.507	89.0	100.0
RN6	56	246	4.39	.290	100.0	98.2
RN7	60	484	8.10	.462	91.7	100.0
8RN	56	357	6.37	.317	81.0	96.6
9RN	60	304	5.00	.337	91.0	100.0
ECN						86.6
TEN	60	608	10.10	.398	80.9	100.0
TWN	60	421	7.02	.450	71.3	100.0
ARN	30	49	1.63	.067	100.0	
TCC						
TCC Eastern	111	1351				
TCC Central	81	750				
TCC Pacific	105	841				
Cycle Three						
Area Net						
EAN	30	383	12.77	.652	90.9	
Region Net						
1RN	30	121	4.03	.370	67.0	83.3
2RN	29	185	6.40	.366	82.9	90.0
3RN	22	22	1.00	.149	62.1	81.8
4RN						86.6
8RN						90.0
ECN						
Cycle Four						
Area Nets						
EAN	30	1209	40.30	.994	91.9	
CAN						
PAN	30	893	29.77	.912	98.3	
Region Nets						
1RN						100.0
2RN	57	205	3.60	.271	78.9	80.0
3RN	54	149	2.76	.280	95.5	96.6
4RN	60	578	9.63	.390	100.0	100.0
RN5	30	658	10.97	.627	80.1	
RN6	60	346	5.80	.561	97.0	98.3
RN7	60	344	5.73	.569	82.8	95.7
8RN	49	270	5.51	.308	72.0	100.0
9RN	60	441	7.40	.470	89.6	
TEN	60	364	6.10	.490	77.0	
ECN	59	130	2.20	.278	73.5	100.0
TWN	58	366	6.30	.415	91.3	100.0
TCC						
TCC Eastern	222	1679				
TCC Central	72	646				
TCC Pacific	113	1200				

*PAN operates both cycles one and two.
TCC functions not counted as net sessions.

ARRL Section Traffic Managers reporting: AL, AR, AZ, CT, DE, EB, ENY, GA, IA, IL, IN, KS, KY, MDC, MI, MN, NC, NH, NLI, NTX, OH, OK, ON, OR, ORG, RI, SB, SC, SDG, SF, SFL, SJV, SNJ, STX, SV, TN, UT, VA, VT, WA, WIN, WMA, WNY, WPA, WV.

Public Service Honor Roll

This listing is available to amateurs whose public-service performance during the month indicated qualifies for 60 or more total points in the following nine categories (as reported to their SM). Please note maximum points for each category: (1) Checking into CW nets, 1 point each, max 30; (2) Checking into phone/RTTY nets, 1 point each, max 30; (3) NCS CW nets, 3 points each, max 12; (4) NCS phone/RTTY nets, 3 points each, max 12; (5) Performing assigned NTS liaison, 3 points each, max 12; (6) Delivering a formal message to a third party, 1 point each, no max; (7) Handling an emergency message, 5 points each, no max; (8) Serving as Emergency Coordinator or net manager for the entire month, 5 points max; (9) Participating in a public-service event, 5 points, no max. This listing is available to Novices and Technicians who achieve a total of 40 or more points. Stations that qualify for the Public Service Honor Roll 12 consecutive months, or 18 months out of a 24-month period, will be awarded a special PSHR certificate from HQ.

353
KC9CJ
142
KA3DLY
138
KA0EPY
136
N4GHI
129
KA9FFO
128
WX4H
127
N4EXQ
124
WB2VUK
123
KC4VK
121
WA2FJJ
K5MXQ
120
NQ2H
W0IKT
119
W7VSE
116
WB2OWO
VE4AJE
115
WB2IDS
WB7WOW
K4NLK
114
NN2H
W9YCV
113
WA4QXT
KB4WT
112
VE4LB
WB2EAG
KD0CL
KD7ME
111
W2MTA
110
WB6DOB
KT1Q
WD8LDY
109
KA8TIK
108
WF6O
107
N9BDL
WA4JDH
106
N3EMD
N2XJ
W2RRX
K4JST
K6YA
105
WD5GKH
KA1JXH
AA4MP
AA4AT
KW1U
K8UQY
104
W9JUJ
WB5YDD
WD4KBW
102
N5AMK
KA2MYJ
K2ZVI
NC9T
AG9G
WA1FCD
K2KBT
W8FPA
101
K6UYK
KQ3T
K4ZK
WB4HRR
K4JHF
WB8SIW
N4KSO
N8EFB
K6YA
100
NE2W
N3DPF
WA4PFK
KB0Z
99
KA2UBD
W3FA
KA1GWE
NW7K
NG1A
98
KV5X
W4PIM
WD8KQC
97
K0GP
W0OYH
96
N2EIA
95
KB4LB
W9HBI
WB1HIH
KA1ON
94
N3EGF
WB5SRX
N7BHL
W7GHT
93
ND2S
N2ABA
N0FOO
WB4WQL
W4CKS
WD8KWC
92
K2YAI
W9CBE
VE3GT
WA2ERT/1
W9EHS
WB8JGW
91
VE3ORN
AJ5K
WA6ZUD
N7FXJ
90
W7LBK
N6MCY
KB1AF
N8EVC
89
N1CPX
VE3DPO
WA4RUE
WA4EIC
N3COY
NO0A
W4ANK
88
KK3F
N3AZW
W9DM
WB1CBP
87
VE2EDO
W1RWG
86
W5CTZ
W6VOM
W7LG
KI4YV
85
WB2UVB
VE4IX
N2EQM
WA4CCK
N2EQM
KA4MTX
KD8WI
84
KN7U
WB5EPA
K2VX
WD0GUF
KA0NLI
KT9I
83
WB2RBA
WA2VJL
K2ZM
KA5SPT
KA7AID
82
K3RXK
W6FRC
KA0ARP
N6AWH
WB4ZTR
81
AA4HT
N4PL
WA0TFC
N6CVF
W0KK
80
AC5Z
N2DXP
K9CNP
WB8SYA
N1BGW
WA1JVV
79
KB9LT
WB4WII
78
KC3Y
KA1MKJ
K4EV
WA6WJZ
W5VMP
77
NG2T
VE3WM
K8JDI
W6NJR
76
N1NH
K9ZBM
KA0SBY
WA9VLC
WD9DZU
KB5UL
NT4S
75
N0CLS
NJ4L
KI4BR
WA1TBY
74
KA9RNY
KC0HF
KA0ODQ
N7GGJ
KB5ADE
N8AHA
KA8CPS
W8MVE
73
K3JL
K0SI
W3YVQ
KA4GUS
WA4LLE
KA4TLC
WD6BZQ
N7BGW
NK8B
WD8QXT
72
WB5FQU
W9NXG
N8AEH
71
K0ERM
70
KU2N
ND0N
WA6QCA
KJ3E
WA4EYU
KA1KTH
WD8RHU
69
VE2FMQ
W6INH
KA9RII
WA3UNX
VE3CYR
W4SME
KF4FG
WA4RNP
KA8KHS
68
W2ZQJ
KC2TF
NT8G
NN4I
67
WA3YLO
KA4YHS
N1EDD
KB4JPN
W4HON
N4JRE
WB8YDZ
AA4GL
W4FMZ
66
W1TN
WB6QBZ
N0GCC
WB2QMP
KA1MDM
KA5QYV
NJ8R
N1DHT
WD8KBW
KD8KU
KB2ATJ
65
K0PCK
AI0O
N6HYM
KA0BCB
KP4DJ
64
WB2NLU
KA7MUL
W5KLV
W2PKY
W4JLS
K4ZN
63
W0OUD
K6UXO
WG5S
WA8DHB
N1CVE
K8ND
62
W2FR
WB9PFZ
VE3POJ
KD0NH
61
KA1LMR
W0MZI
WA4MNR
KC8UZ
KA0FSM
KA4BZA
60
N1AKS
VE3GSQ
KA4FZI
K4BAI
AE1T
NR8C
N8FWA
KA8TNT
KD8XL
N0DZA
55
WB4HXS/T
54
KA1HPO/T
N4MMM/T
53
WB0GPM/T
48
KA2CQX/T
W1YOL/T
47
WA8DYS/T
46
N2EVG/T
WA2MGV/T
44
KA6HJK/T
KA6TND/T
42
KA9CTW/T
WB5VUL/T

Brass Pounders League

The BPL is open to all amateurs in the United States, Canada and US possessions who report to their SM a message total of 500 or a sum of originations and delivery points of 100 or more for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in the standard ARRL form.

Call	Orig	Rcvd	Sent	Dlvd	Total
W3CUL	643	1064	1115	93	2915
N0BQP	34	1209	47	794	2084
WB9YPY	0	708	59	410	1177
WA4JDH	1	520	559	6	1086
W3VR	339	310	374	44	1067
KA0TXX	30	476	224	252	952
K0JAN	0	294	30	575	899
WA0HJZ	0	515	26	341	882
KA7MUL	1	363	391	9	764
W9JUJ	0	370	367	3	740
N4GHI	75	301	303	55	714
N4PL	110	236	341	27	714
N4EXQ	17	320	245	63	645
KT1Q	4	325	289	9	627
K6UYK	47	286	270	12	617
KW1U	—	—	—	—	608
N3AZW	56	237	269	39	601
KK3F	0	300	290	10	600
N1CPX	19	254	316	5	594
W7VSE	39	287	253	14	593
WF6O	2	290	258	7	557
WA4QXT	67	187	262	12	528
WD4IIO	254	8	254	8	524
WX4H	3	261	255	3	522
W7AMM	35	220	243	16	514
K0DKM	173	74	234	25	506

BPL for 100 or more originations plus deliveries:

N1NH	216
W0BMA	208
WD0BSZ	122
WB2IDS	107

Independent Nets

Net Name	Sess	Tfc	Check-Ins
Amateur Radio Telegraph Society	46	678	230
Central Gulf Coast Hurricane Net	30	195	3240
Clearing House Net	30	402	468
Early Bird Net	30	769	769
Empire Slow Speed Net	30	100	378
Golden Bear Amateur Radio Net	30	135	1903
Hit and Bounce Net	29	199	508
IMRA	25	951	1735
Mission Trail Net	30	66	776
New England Novice Net	30	33	62
NYSPTEN	30	61	640
Southwest Traffic Net	30	198	1504
West Coast Slow Speed Net	30	101	474
20ISSBN	25	817	277
75 Meter Interstate SB Net	30	407	1299
7290 Traffic Net	43	690	2806

Results, 1st IARU HF World Championship

By Robert J. Halprin, K1XA
Deputy Manager, ARRL
Membership Communications Services

and Billy Lunt, KR1R
Assistant Contest Manager,
ARRL

While Ted Turner's Goodwill Games—an off-year Olympics, perhaps—were going full throttle last summer, Amateur Radio had its own version of a world-class track meet—the first running of the IARU HF World Championship.

The HF World Championship is a slimmed-down version of the IARU Radiosport Championship, which had been an annual July event for the past nine years (itself having its genesis in the 1976 Bicentennial Celebration). The International Amateur Radio Union (IARU), which is the Amateur Radio equivalent of the United Nations, took some steps to streamline the event and increase the international flavor in 1986, first by the new name (which by definition no longer credits VHF activity), second by adjusting the contest period to 24 hours, and third, by providing a bonus-multiplier system for working IARU member-society HQ stations. These enhancements seemed to have worked, since activity and enthusiasm (and log entries—1397 this year vs 1297 last year!) increased significantly. Even with the abridged operating-manhours, scores were quite respectable, indeed. We don't know for sure how the Goodwill Games did, but we know that the IARU HF World Championship was a resounding success. Radiosporting,

The crew of OHØMD/OJØ racked up over 1100 QSOs during the 1986 IARU HF World Championship. From left to right: OH2BAZ, K8MFO, OHØRJ, OHØNA, OH2BH, W6EUF and K8MN.

IARU Headquarters Stations

Y61HQ (Y21YK,Y23EK,Y24UK,Y42s LK,MK, NK,oprs) 2,167,488-4496-159
YOØA (YO3s AC,CD,FU,JW,QK,YO4s ASV,ATW,BEX,BQV, FM,HW,PX,UC,XF, YO8s AHL,BAM,YO9AGM,oprs) 1,767,568-4186-166
OH7C (OH7s KA,MA,RS,UE,VR,XI,YF,oprs) 1,589,947-3439-131
W1AW (AK4L,AK7M,K1KI,KA1CV,KA2MXO, KB9NM,KH6CP,KJ4KB,KU7G,N1CIX,N7IAL,NJ2L, W1QD,WB1CRI,oprs) 1,196,520-2651-156
HG6N (HA6s ND,NF,NN,NQ,NY,ON,OQ,PF,oprs) 1,108,200-2326-150
TIØRC (TI2s CCC,IY,KD,LC,LCR,TI4BGA,oprs) 746,235-1899-105
VP2MU (K2s MFY,OVS,KD2SX,W2JGR,oprs) 526,419-1591- 81
HSØA (HS1s ALV,AMH,AOL,BG,BKA,oprs) 360,542-1041- 91
JA3RL (JA3AQF,JF3AXZ,JG3s RPL,VOD,JI3s OYM, XNQ,XOK,JR3FRF,oprs) 301,052-1952- 73
GB3RS (G3s JKS,RTE,UJV,ZAY,G4s DJX,JKS, PUR,WKJ,WLG,WSL,WVM,G0s AMG,EAC, EOW,oprs) 197,145- 962- 65
SP5PZK 122,130- 886- 59
4U1ITU (G4s BWP,GIR,oprs) 120,175- 872- 55
4DØP (DU1KT,DV1PX,oprs) 105,420- 510- 42
HI6ØRCD (HI8s DDC,LC,oprs) 27,408- 306- 24
9J2RSZ (9J2BO,opr) 12,064- 264- 32
EIØRTS (EI2CL,opr) 4,602- 69- 26

Top W/VE Scores

Mixed

Call	Score
K3NA	534,016
K9ZO	434,304
WB9JKI	381,546
AA4NC	329,564
AA4S	271,327
AC8Y	222,327
KZ5D	192,894
KU6J	148,960
N4BP	148,616
WZ4F/9	137,122

CW

Call	Score
N2IC/Ø	590,426
K1XA	536,263
K4VX/Ø (KM9P,opr)	487,620
N6TR	470,184
W5XZ	458,352
AA5B	422,940
KZ2S	409,584
W3GG	404,495
N6ND	396,021
K1VUT	385,000

Phone

Call	Score
VE1NG	361,872
N4UH	237,330
ADØO	198,740
VE1CBF	156,364
KC3EK	128,104
N4MM	118,698
ND1X	97,344
N5ECT	95,546
W1GD	77,325
WA7VYJ	71,442

Multioperator

Call	Score
KM3T	807,396
NR5M	752,400
N4WW	703,080
WB8JBM	544,096
W8LT	440,610
N8CXX	386,204
K9SD	275,595
WA3SPJ	244,866
KT5X	215,634
W8IMZ	179,962

Top World Scores

Mixed

Call	Score
OHØAM (OH6UM,opr)	1,282,677
RB5IM	1,098,377
UAØQA/6	1,067,419
EK9AD (UA9CIU, opr)	1,011,381
UA1DZ	966,910
RL7GA	870,772
UA9YX	825,285
RB5FF	814,590
IO2UIY	684,087
OK3CSC	647,010

CW

Call	Score
AZ8DQ	985,782
RB5GW	845,759
UA9SA	752,640
OH8PF	658,770
UL7CW	623,480
UW3AA	606,080
HAØMM	584,784
UAØSAU	574,188
UA1ZX	479,160
UB4EL	386,610

Phone

Call	Score
RB5MF	796,671
OH1AF (OH1EH,opr)	664,210
ZP5JCY	544,530
UM8MO	443,798
RB5DX	410,595
DL8PC	403,208
PP2ZDD	335,736
RW9UR	314,817
UA9YP	311,055
HA5NP	299,524

Multioperator

Call	Score
4J4F	2,551,379
RL8PYL	2,186,688
UZ2FWA	2,159,820
LZ2KTS	2,046,240
UB3IWA	1,606,143
UZØAXX	1,577,996
UZ9AYA	1,394,640
UL8LWZ	1,342,009
HG5A	1,285,550
UZ6LWZ	1,166,185

by any name, is an avid, worldwide pursuit.

DX entries numbered 1150 (plus a host of checklogs): Of those, 475 were CW only, 263 were phone only, 212 were mixed mode and an even 200 were multioperator, single transmitter. For W/VEs, 104 were CW only, 72 were phone only, 53 were mixed mode and 18 were multioperator, single transmitter, for an overall total of 247.

Although the name of the contest has changed, one feature has remained constant: the continued and total domination by LU8DQ (this year operating under the nom de plume of AZ8DQ) of the single-op category. Operating code only, Jorge has reigned supreme for each of the 10 years in the July event.

The number-one world phone-only entry was that of RB5MF, followed by OH1AF (OH1EH op), ZP5JCY and others. OHØAM (operated by OH6UM) took the top spot in the world mixed-mode category, followed closely by RB5IM, UAØQA/6 and EK9AD (UA9CIU, op), all of whom reached the megapoint range! The multioperator, single transmitter winner was 4J4F, leading the way with 2.5M points. In hot pursuit were RL8PYL (2.18M), UZ2FWA (2.15M) and LZ2KTS (2M), who was last year's winner in this category.

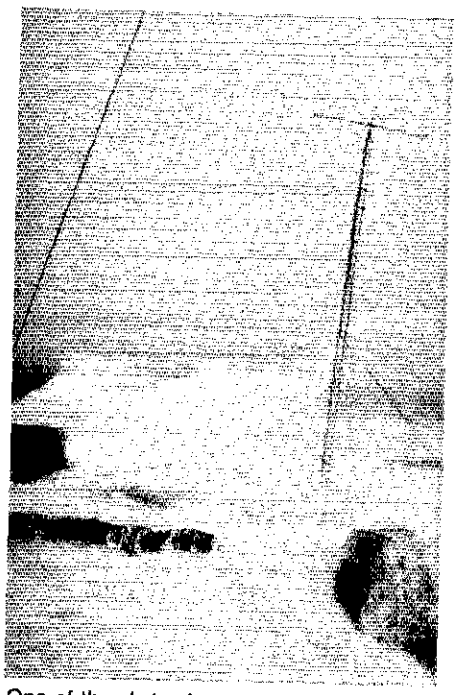
In the special IARU HQ station class, there were 16 entries, with five of them breaking the 1-megapoint barrier. Congratulations in particular to the GDR station, Y61HQ, whose 2.1M score was alone at the top of the pyramid, followed by YQØA, OH7C, W1AW and HG6N, all with fine scores. It was great having so many of the society stations on the air, particularly on relatively short notice. Undoubtedly, more will participate in the 1987 event.

For W/VE single-ops, CW-only seemed to be the way to go. All of the top-ten CW-only finishers had higher scores than the number one phone-only competitor, and were higher than all but two of the mixed-mode entrants. N2IC/Ø prevailed in the CW-only category by a margin of approximately 10 multipliers over the second-place finisher (A word to the wise: Don't forget to hunt down those crucial multipliers!), while VE1NG and K3NA, respectively, mastered the phone and mixed categories. The multioperator prize was claimed by KM3T, who managed to outlast NR5M by about 50k points.

At least on this side of the Atlantic, the HF Championship was essentially a two-band contest—20 meters during the day and 40 at night. Conditions on those two bands were excellent. Contacts made on the other bands were limited, sort of like going through the motions, which is totally understandable based on the time of year and the lackluster conditions at this point in the sunspot cycle. It does help, therefore, to have some kind of enhanced antenna system for 40 meters. Armed with a 2-element 40, it was possible to manage in the neighborhood of 400 CW contacts from the East Coast into Europe between 0000 and 0400Z. Without a 40-meter twirly, it's like being in a different contest. It's still a fun contest, nevertheless, but requires an adjustment in strategy.

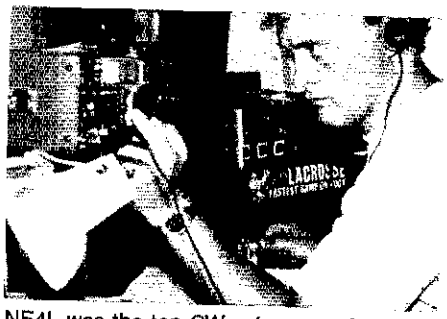
Also, it was a bit disconcerting when the curtain came down at 1200 UTC Sunday, when band conditions and one's adrenalin flow were at their peak. However, the revised rules represent a compromise that benefits the *entire* international community. Overall, the IARU negotiators did a most commendable job in defining the parameters of this excellent operating event. International communication goes to the heart of what Amateur Radio and the IARU HF World Championship are all about.

Don't miss the 1987 event; it promises to offer even better conditions and increased activity. The IARU HF World Championship is scheduled for July 11-12. Be there!



One of the skyhooks used at OHØMD/OJØ was located on the "DXCC Shelf." This shot was taken just minutes before the tower and beam were washed into the sea.

HB9CSA managed 910 QSOs and just under 100 mults for top honors in Switzerland. Fri plans to be very active in the 1987 event.



NE4L was the top CW-only scorer from Alabama.

FEEDBACK

Please refer to February 1986 *QST*, p 86, for the following correction. In the Southern Florida Section, Section leader was WB4BBH.

Scores

Scores are listed by ITU zone and then by country within that zone. The line score (example—KL7Y 625,878-1460-109-A) indicates the call sign used, the total score, the number of valid contacts, the number of multipliers and the entry class. The entry class letters indicate: A—single operator, mixed mode; B—single operator, CW only; C—single operator, phone only; D—multioperator, single transmitter.

ZONE 1

Alaska

KL7Y	625,878-	1460-	109-	A
WL7E	287,660-	927-	74-	B
KL7UR	106,288-	424-	62-	B

ZONE 2

Alaska

KL7PK	10,975-	101-	25-	B

Alberta

VE6DZ	71,288-	290-	67-	A

ZONE 4

Quebec

VE2XL	2,982-	60-	14-	C

Ontario

VE3XN	102,784-	431-	64-	A
VE3KP	114,456-	500-	57-	B
VE3IY	90,678-	527-	42-	B
VE3AXV	35,485-	321-	35-	C

ZONE 5

Greenland

OX3SG	9,880-	80-	26-	C

ZONE 6

W6

East Bay

WE6G	11,160-	112-	30-	A
K6CSL	7,967-	83-	31-	B
KI6EZ	26,208-	204-	39-	C

Los Angeles

K6EID	32,844-	187-	42-	A
W6OK	9,925-	87-	25-	C
W6CN	2,990-	50-	15-	C
W6VPZ (AJ6F,K6s IIE,KH,KA6EFI, KG7E,N6s AXQ,JSX,W6s CHU, CN,GC,WB6QPO,WD6EZQ, WN6CND,opns)	35,796-	279-	38-	D

Orange

NX6M	7,291-	109-	23-	A
NM6L	15,776-	128-	32-	C
KA6ALF (+W6MI)	186-	11-	6-	D

Santa Barbara

WA6FGV	95,403-	475-	59-	A
N6MA	58,212-	291-	49-	B
KA6VRW	45-	3-	3-	C

Santa Clara Valley

AC8Y	222,327-	1013-	83-	A
N6NF	120,428-	587-	68-	A
N6UW	3,247-	83-	17-	A
WO6I	47,647-	262-	53-	B

San Diego

N6ND	396,021-	1025-	101-	B
W6KUT (NI6W,opr)	331,837-	917-	97-	B

W6UQF 103,380- 499- 60-B
AA4M 33,435- 217- 45-B
AA6EE 10,175- 119- 25-B
K6NA 6,426- 86- 27-B

San Francisco

KU6J 148,860- 536- 76-A
WB6SRM 3,781- 61- 19-A
K6LRN 52,735- 257- 53-B
WA6JRB/6 14,196- 137- 28-B

San Joaquin Valley

WC6U 15,318- 108- 37-B
KD6FW (+KI6BN) 82,040- 456- 56-D

Sacramento Valley

KV6H 39,468- 236- 39-B
K6SG 18,928- 159- 32-C

W7

Arizona

NN7A 3,330- 60- 18-B

Montana

KS7T 44,712- 310- 36-A
W7KZK 58,425- 336- 57-B
KW7I 2,716- 66- 14-C

Nevada

WB7VVH 3,021- 43- 19-C

Oregon

N6TR 470,184-1105-104-B
AD7T 22,173- 91- 57-B
K7DBV 29,416- 194- 32-B
KS7P 9,575- 74- 25-B
KA7FEF 3,591- 59- 21-B

Utah

WA7VYJ 71,442- 331- 54-C

Washington

KT7G 37,674- 208- 46-A
WA7EGA 154,703- 605- 67-B
W7QN 11,178- 90- 27-B
WB7CLU 32,670- 202- 38-C
N7DKD 9,570- 101- 30-C
KE7C (+WB7OJV) 7,392- 50- 33-D

W5

Arkansas

W5EU 2,898- 61- 14-B
N5ECT 96,546- 678- 43-C

Louisiana

K2SD 192,894- 682- 78-A
NJ8Z/5 8,328- 115- 24-A
W5XZ 458,352-1120-108-B

Mississippi

WA5OYU 90,584- 415- 67-A

New Mexico

N5DVY 71,060- 453- 55-A
AA5B 422,940-1116-105-B
KI3U/5 46,289- 298- 41-B
W6SX 36- 6- 3-B
N5HH 60,768- 304- 48-C
KT5X (+AG5S,N5EPA,W5KH, WA6OTU) 215,634- 743- 83-D

Northern Texas

K5MR 40,986- 286- 46-A
WM5K 39,990- 313- 42-A
K5NW 266,256- 880- 86-B
KA5W 220,884- 765- 79-B
W5PLN 35,120- 290- 40-C
NI5M 27,600- 155- 40-C
K2SCU/5 3,080- 40- 20-C

Oklahoma

NW5H 44,842- 444- 34-C
KF5DA 33,615- 239- 45-C

Southern Texas

N5IVF 73,461- 525- 47-A
W5PWG 44,914- 427- 34-A
N2SV 24,696- 250- 36-A
N5JJ 7,695- 151- 19-A
W5NR 6,620- 100- 20-B
WN4KKN 1,625- 39- 15-B
NR5M (+K2TNO,KE5IV,KG5U,N5DU, NM5M,NT5D) 752,400-1831-120-D

Wyoming

K7MM 10,192- 100- 26-A
KB7M 402- 25- 6-C

W8

Colorado

W6IZV 6,438- 67- 29-A
N2IC/8 590,426-1468-107-B
AC8S 154,301- 685- 67-B
N8FFZ 7,852- 100- 26-B
AD8O 198,740- 813- 76-C
W8BWJ 1,343- 25- 17-C
K8JVZ 840- 34- 10-C
KC8HH (+N8EKK,WA8AAU) 139,840- 674- 64-D

Iowa

KE8Y 26,280- 162- 36-B
W8PPF 360- 16- 6-C

Kansas

K8VGB 29,110- 260- 41-A
KB8U 9,296- 79- 28-C

Minnesota

NK8L 30,618- 263- 43-C
WA2HFI/8 10,472- 113- 28-C

Missouri

K4VX/8 (KM9P,opr) 487,620-1489-105-B
W8KKF/8 31,198- 303- 38-C
WA8NTU 4,845- 103- 17-C
K8LIR (KA8DQI,KB8KK,oprs) 6,615- 91- 21-D

Nebraska

AK8G 25,194- 275- 34-A
K8GW 20,088- 224- 31-B
WB8SYV 3,040- 116- 10-B

ZONE 8

W1

Connecticut

KB1XD 2,604- 79- 12-A
K1XA 536,263-1398- 91-B
K8HVT 190,350- 685- 81-B
W1BWS 151,956- 521- 81-B
WB1ADR 16,472- 188- 29-B
W1VH 13,080- 137- 24-B
N1DKQ 2,112- 74- 12-B
ND1X 97,344- 504- 48-C
K1EFI 48,676- 274- 43-C
KA1YP 47,502- 275- 58-C
W1KKG 4,460- 113- 20-C

Eastern Massachusetts

K5ZD/1 45,201- 269- 57-A
K1VUT 385,000-1074- 88-B
NA1R 112,104- 465- 72-B
KA1DWX 61,152- 307- 56-B
K1XM 60,450- 298- 50-B
W1HN 42,738- 297- 34-B
W1OPJ 1,903- 39- 11-B
W1BET 1,595- 39- 11-B

Maine

K1MZB 30,960- 198- 40-A
K1SA (+KB1U,KQ1V,KY1K,N1AFC, W1OO,KA3OPR) 93,398- 445- 67-D

New Hampshire

W2UP 5,760- 85- 18-B
W1END 396- 20- 9-B

Rhode Island

KA1GQW 111,476- 466- 62-B
KS1J 98,780- 457- 55-B

Western Massachusetts

KR1R 29,575- 265- 35-A
KZ1M 9,044- 110- 34-B

W2

Eastern New York

W2DW 35,646- 220- 39-B

New York City-Long Island

W2GKZ 21,844- 148- 43-A
K2SX 143,336- 572- 78-B
KD2HE 5,200- 103- 18-B
KC2KU 62,800- 376- 40-C
KS2G 9,048- 114- 26-C
K2RYI 4,440- 82- 15-C
K2KTT 1,335- 25- 15-C

Northern New Jersey

K8DI 109,678- 550- 58-A
K2BK 43,440- 232- 48-A
KZ2S 409,584-1008-106-B
WA2ASQ 9,858- 108- 22-B
KW4E 7,872- 124- 24-B
W1GD 77,325- 263- 75-C
K3FNW 24,276- 116- 51-C
KC2NF 3,655- 93- 17-C

Southern New Jersey

W2CFB 15,000- 185- 25-B
N2FJQ 5,593- 93- 17-C

Western New York

KW2J 42,354- 292- 39-B
W2TZ 26,260- 208- 36-B
W2FUI 7,436- 98- 26-B

W3

Eastern Pennsylvania

W3BGN 10,604- 110- 22-A
W3GM 342,147- 868- 93-B
K3IPK 144,000- 667- 60-B
KQ3F 129,114- 563- 54-B
W3ARK 53,067- 294- 49-B
N3DRM 4,270- 96- 14-B
K3LUE 43,549- 303- 37-C
WA3DMH 13,068- 106- 27-C
K3DYX 4,693- 69- 19-C
K3ZPG 3,164- 66- 14-C
WA3SPJ (+K3s DTD,WGR,KS3F, W3UM,WB3CAC) 244,866- 869- 74-D
KQ3V (+K3ZLK,KA3s OJW,NJA,PKN, N3s CIX,CHL,WB3s EPW,FPA) 57,912- 340- 57-D

Maryland-District of Columbia

K3NA 534,016-1106-128-A
W3GG 404,495-1079- 91-B
W3HXI 49,020- 282- 10-B
WA3VPL 40,964- 300- 49-B
W3FQE 406- 12- 7-B
KC3EK 128,104- 496- 67-C
WB4FTU 35,560- 183- 58-C
KM3T (+KC8C,N8II) 807,998-1689-122-D

Western Pennsylvania

KA3HIE 23,940- 230- 30-B

W4

Alabama

NE4L 162,412- 705- 76-B

Georgia

W4GLS 25,388- 235- 44-A
K4UEE 4,986- 81- 18-B
KJ4SB 24,250- 171- 50-C
K4GKV 11,900- 102- 35-C

Kentucky

N4XM 74,200- 434- 53-B

North Carolina

AA4NC 329,564-1063- 94-A
AA4S 271,327- 967- 83-A
N4AA 127,908- 585- 68-A
N4ZC (WA8MAZ,opr) 265,620- 989- 76-B
K4PD 59,450- 305- 58-B
N4UH 237,330- 807- 90-C
KA4RVS 62,272- 411- 56-C
KJ4TI 10,362- 126- 33-C
KB4LFD 9,020- 227- 22-C
KF4MZ 3,312- 70- 23-C
WD8BOQ 1,160- 32- 10-C

Northern Florida

WC4E 174,300- 736- 75-B
W4WKQ 22,656- 311- 32-C
KV4AM 1,573- 29- 13-C
N4WW (+NX4N,K4LUZ/4) 703,080-1654-126-D

Southern Florida

N4BP 148,616-1108- 52-A
WB4TDH 241,546- 770- 89-B
WD4AHZ 58,255- 359- 53-B
N8NB 39,960- 353- 40-B
W4YN 20,176- 120- 38-B
W4PZV 31,883- 205- 43-C
WK4F 15,885- 131- 45-C

Tennessee

AA4DO 106,865- 503- 67-A
N4ZZ 264,887-1070- 79-B
N4IR 49,358- 422- 37-B
NU4B 5,375- 93- 25-B
K4JHT 33,793- 205- 47-C

Virginia

K4FPF 16,950- 131- 30-A
W4XD 14,336- 140- 32-B
N4MM 118,698- 420- 73-C
WU4G 45,073- 287- 47-C

W8

Michigan

N8CQA 10,240- 108- 32-A
K8DU 99,072- 466- 64-B
K8CV 32,718- 353- 38-B
N8CXX (+NE8T) 388,204-1249- 91-D

Ohio

W8LNO 300,958-1002- 83-B
WD8AUB 209,124- 754- 74-B
KV8Q 196,710- 728- 83-B
KQ8M 196,490- 682- 80-B
KR8Y 110,088- 437- 72-B
N8BC 98,525- 374- 65-B
WB8KKI 46,110- 268- 53-B
NA8W 2,126- 44- 14-C
WB8JBM (KA8ETK,KC8MK,KV8M, KW8N,N8s ATR,DCJ,WD8IJP,oprs) 544,096-1409-112-D
W8LT (K3JT,NZ4K,KD8s KY,NS, WD8IXE,oprs) 440,610-1154-114-D
W8IMZ (+N8BJQ,WB8MRU) 179,962- 770- 79-D

West Virginia

WA8YTM 78,060- 346- 60-A
KE8AZ 25,830- 263- 35-C
W8VEN 6,831- 95- 27-C
WB8BMX 2,072- 34- 14-C

W9

Illinois

K9ZO 434,304-1204-116-A
WB9JKI 381,546-1215- 94-A
N9AEJ 39,950- 395- 34-A
WD9DGE 21,522- 267- 34-A
K9MMS 19,825- 207- 25-B
KD9WK 3,111- 45- 17-C
W9REC 1,152- 22- 16-C
K9SD (+K9BGL,KF9F,K9FU,KA9GGI, W9HBH) 275,595-1075- 95-D

Indiana

K9JS 10,725- 107- 26-C

Wisconsin

WZ4F/9 137,122- 699- 74-A
KD9Q 57,300- 405- 60-A
NI9C 40,300- 308- 50-A
NF9S 38,465- 241- 49-A
NB9C 51,984- 394- 36-B

ZONE 9

Maritimes-Newfoundland

VE1ASJ 126,084- 786- 42-B
VE1NG 361,872-1080- 84-C
VE1CBF 156,364- 676- 62-C

ZONE 10

Mexico

XE86OX 185,814- 807- 74-C
XE2EBC 66- 8- 3-C

ZONE 11

Haiti

HH2WL 42,250- 230- 50-C

Dominican Republic

HI3AMF 8,848- 169- 16-C
HI8LC 1,992- 50- 12-C

Panama

HP1AC 31,450- 208- 37-B

St Vincent and Dependencies

J87CD 39,698- 217- 46-C

Netherland Antilles

PJ2A (PJ2s FR,ILR,L,WG,PJ9AR, oprs) 206,388- 810- 52-D

Nicaragua

YN8RC 4,095- 87- 15-B

ZONE 12

Ecuador

HC1OT 285,606- 748- 81-C

Colombia

HK3MAE 52,635- 213- 55-C

Peru

OA4ZV 197,762- 654- 81-B

Venezuela

YW5G 36,342- 445- 27-B
YV1DWQ 64,764- 364- 36-C

Guyana

8R1RPN 11,288- 75- 34-C

ZONE 13

Brazil

PY1AJK 3,900- 80- 10-B

ZONE 14

Argentina

LU6KG 312,857- 737- 89-A
AZ8DQ (LU8DQ,opr) 985,782-1486-138-B
LU1EWL 12,250- 104- 25-B
LU9JTC 28,584- 164- 36-C
LU1FTU 10,355- 111- 19-C

Paraguay

ZP5JCY 544,530-1074-105-C

ZONE 15

Brazil

PY2RLQ 3,692- 60- 13-B
PP2ZDD 335,736- 955- 72-C

ZONE 17

Iceland

WA2OMN/TF 5,406- 88- 17-B

ZONE 18

Norway

LA8DY 69,720- 526- 42-A
LA1XDA 6,980- 91- 20-A
LA4YW 50,144- 402- 48-B
LA2EG 3,870- 90- 15-B
LA2AD 2,156- 80- 11-C

Finland

OH2PM 58,800- 298- 50-A
OH7XE 30,456- 276- 27-A
OH6NEV 10,152- 119- 24-A
OH7NW 2,926- 39- 22-A
OH1PY 450- 14- 9-A
OH2KI 207- 9- 9-A
OH8PF 658,770-1708-105-B
OH6YF 278,894- 974- 77-B
OH7EU 32,670- 208- 45-B
OH1AB 10,318- 260- 14-B
OH3MP 1,958- 64- 11-B
OH5OZ 276- 16- 6-B
OH1AF (OH1EH,opr) 664,210-1409-127-C
OH3TY 3,425- 45- 29-C
OH1ZAA 216- 9- 8-C
OH6AC (OH6s CS,WZ,oprs) 490,854-1505- 93-D

Aland Island

OH0AM (OH6UM,opr) 1,262,677-2421-141-A

Market Reef

OH0MD/OJ0 (OH2s BAZ,BH,OH0s NA,RJ,W6EUF,K8s MFO,MN,oprs) 268,092-1144- 66-D

Denmark

OZ7JZ 41,880- 285- 40-A
OZ1APA 21,944- 118- 52-A
OZ5KU 48,776- 237- 56-B
OZ5PA 31,080- 138- 70-B
OZ4DZ 6,643- 145- 22-B
OZ1DXX 4,185- 146- 9-B
OZ1AXG 10,999- 200- 17-C
OZ1DYI/P 5,076- 90- 5-C

Sweden

SM5JBM 303,110-1058- 85-B
SM5BAX 49,464- 236- 54-B
SL0FRO (SM5AHK,opr) 17,168- 160- 29-B
SM0COP 12,243- 148- 21-B
SM1BDA 6,648- 65- 24-B
SM7LAZ 4,356- 60- 22-B
SM0KV 2,470- 65- 10-B
SM0BDS 2,205- 45- 15-B
SM3RAB 1,098- 45- 9-B
SM5IWC 59,892- 424- 46-C
SM7CVW 2,596- 70- 11-C

ZONE 19

European Russian RSFSR

UA1DZ 986,910-2046-133-A
RA1NA 44,626- 264- 57-A
UA1ZX 479,160-1418- 88-B
UA1ZGD 100,827- 599- 51-B
UA1OAM 98,600- 482- 58-B
UW1ZA 51,414- 369- 41-B
UA1OB 35,217- 274- 39-B
UA1CFF 17,425- 223- 25-B
UA1NAV 7,384- 178- 14-B
RA1AA 243,144- 817- 88-C
UW1BM 32,172- 244- 42-C
EK1NBR 3,256- 82- 11-C
UZ1AWT (RA1CA,UA1s ALZ,ARF, oprs) 595,794-1330-109-D
UZ1NWA (+oprs) 134,862- 687- 57-D
UZ1OWA (RA1s OAL,OAP,-113-778, oprs) 132,489- 612- 63-D
UZ1OWR (UA1s OFT,-113-17, -113-15,oprs) 98,832- 613- 48-D

ZONE 20

Asiatic RSFSR

UA9XR 346,368- 927- 82-B
UA9KBY 127,743- 575- 49-B
UA9XS 107,219- 481- 53-B
UA9KK 66,550- 320- 50-B
UA9XBV 62,228- 299- 47-B
UA9CAQ 1,899- 53- 9-B
UA9XL 84,304- 421- 44-C
UZ9CWG (UA9s CPL,-154-894, UV9CC,oprs) 205,200- 642- 72-D
UZ9YWI (RA9JD,UA9s JAF,JEE,oprs) 151,185- 716- 49-D
UZ9XXM (+UA9KO) 70,212- 340- 47-D

ZONE 21

Asiatic RSFSR

RA9JR 562,700-1274-100-A
UA9CCK 127,134- 661- 42-B
UA9BDW 32,828- 260- 29-B

ZONE 22

Asiatic RSFSR

UA9BEO 70,560- 376- 42-B
UA9SZ 75- 5- 5-B

ZONE 23

Asiatic RSFSR

UA9CDL 268,309- 867- 71-B
UA9QF 169,840- 585- 70-C
UZ9CWT (3 oprs) 161,101- 793- 61-D
UZ9CWE (UA9s QQ,QJ,-098-187,oprs) 130,104- 569- 52-D

ZONE 24

Asiatic RSFSR

UA9QGY 6,510- 63- 30-B

ZONE 26

Asiatic RSFSR

UA9KA 19,275- 192- 25-A
UA9KBV 43,792- 292- 34-B

ZONE 27

Andorra

C31LDL (C31s LFM,LK,ON,oprs) 49,080- 354- 45-D

Ireland

EI4DW 33,668- 276- 38-A
EI7DJ 21,912- 189- 33-C

France

F6EPQ 52,577- 390- 37-B
F8TM 14,432- 107- 44-B

F9BB 402- 15- 6-B
F8WE 63,312- 400- 48-C
FE8DRP 12,306- 160- 21-C
F6BVB 12,025- 179- 25-C
F6FHA 7,896- 111- 22-C
FD1LMG 1,859- 43- 13-C

England

G3SJX 149,550- 614- 75-A
G0AEV 131,108- 566- 73-A
G3XTT 51,260- 270- 55-A
G4ZFE 14,544- 254- 18-A
G3TXF 287,023- 896- 97-B
G4DRS 131,897- 1031- 41-B
G3ESF 107,008- 503- 64-B
G0EOW 55,713- 383- 49-B
G0/KB4GID 52,668- 302- 57-B
GB6AR 260,988- 826- 91-C
G4WZA 81,315- 408- 65-C
G3NT 14,511- 214- 21-C
G3WKS/P (G4s KIU,MXL,OTV,UPI, G8ZXC,oprs) 93,940- 509- 61-D
G8OI (G4s IEB,XOM,YBT,G6VAT, G0AGH,oprs) 62,434- 531- 38-D
G0AOJ/A (+G0s CMK,ECS,G1MXL) 20,524- 501- 14-D

Scotland

GM8SQ 3,780- 57- 20-A
GM4ELV 22,578- 301- 29-C
GM4WEW 14,352- 169- 23-C

Luxembourg

LX1JP 7,865- 167- 11-B
LX1EA 142,044- 593- 76-C
LX2QR 37,510- 384- 31-C
LX1AW 5,885- 131- 15-C

Belgium

ON4AWK 75,186- 396- 59-C
ON6WN 54,702- 341- 54-C
ON5KY 43,648- 201- 64-C
ON6CR 19,320- 155- 40-C
ON4GO (ON5s AV,IQ,ON6s AH,MH, QR,oprs) 256,084- 988- 73-D

Netherlands

PA3AIK 32,331- 257- 39-A
PA2NJN 18,964- 114- 44-A
PA0INA 78,012- 385- 66-B
PA6VHS 61,533- 347- 53-B
PA3CWL 44,856- 263- 58-B
PA3BLU 26,136- 163- 44-B
PA3BNT 17,571- 116- 47-B
PA0LKR 2,625- 61- 15-B
PA3EJR 63,394- 359- 58-C
PA0QX 42,439- 423- 31-C
PA0DUO 4,524- 134- 13-C
PA3COA 4,410- 97- 15-C
PB0AGS 1,215- 47- 9-C
PA0KHS (+PA3DQW,PE1LBX) 375,840- 1174- 90-D

ZONE 28

Federal Republic of Germany

DL6RAI 358,668- 1012- 123-A
DL7YS 54- 12- 3-A
DL7MAE 333,396- 1012- 108-B
DL3HAH 222,042- 1095- 66-B
DL1TH 53,928- 300- 59-B
DL1ZQ 24,309- 259- 37-B
DK7OB 6,160- 210- 11-B
DF5WN 4,994- 92- 22-B
DL4BBO 1,341- 43- 9-B
DL3ME 272- 28- 4-B
DL8PC 403,208- 1150- 104-C
DL5ZBA 21,664- 223- 32-C
DJ4FU 10,991- 151- 29-C
DF3IS 3,864- 94- 12-C
DL2RG 574- 30- 7-C

Hungary

HA8UB 435,645- 1211- 105-A
HA7UI 226,548- 929- 87-A
HA9RG 205,221- 982- 67-A
HA5HH 58,272- 409- 48-A
HA0IS 48,816- 299- 48-A
HA9RT 48,412- 314- 52-A
HA9TA 33,056- 329- 32-A
HA1UB 29,400- 297- 28-A
HA8EN 27,755- 252- 35-A
HA6IAR 10,926- 181- 18-A
HA0MM 584,784- 1430- 131-B
HA6VK 228,201- 854- 87-B
HA5LZ 192,090- 572- 95-B
HA6NL 144,560- 662- 80-B
HA3NU 108,498- 483- 78-B
HA8IB 95,082- 464- 78-B
HA0DV 91,016- 500- 62-B
HA7PF 88,614- 543- 54-B
HA7RI 53,880- 256- 60-B
HA9PN 49,358- 366- 46-B
HA0NAR 48,620- 351- 55-B
HA9OA 32,600- 281- 40-B
HA0HG 28,766- 267- 38-B
HA6OZ 24,180- 253- 30-B
HA0DD 21,830- 211- 30-B
HA8AT 16,148- 238- 22-B
HA6XG 14,098- 343- 19-B
HA9SU 10,832- 315- 76-B
HA8LKB 8,303- 211- 19-B
HA6IAM 5,328- 232- 12-B
HA5NP 299,524- 926- 103-C
HG5AAS 590- 40- 5-C
HA5AGP 530- 38- 5-C
HG5A (HA5s FM,GF,LN,MK,RY,SU, UA,WE,oprs) 1,285,550- 2164- 175-D
HG9R (HA9s PP,PV,RB,RP,RU,RX, oprs) 1,042,136- 2288- 142-D
HA5KDB (HA5s AIY,KQ,MY,OL,oprs) 673,900- 1798- 115-D
HG1Z (HA1s DRD,RS,RT,XR,XY,ZE, oprs) 516,200- 1390- 100-D
HG6V (6 oprs) 493,218- 1592- 106-D
HG1S (6 oprs) 406,080- 1291- 90-D
HA5KFL (6 oprs) 370,458- 1174- 89-D
HA3KNA (HA3s FTA,NS,NU,OU,oprs) 316,834- 1134- 98-D
HA0KLC (3 oprs) 173,054- 650- 94-D
HA3KHC (+oprs) 57,255- 414- 55-D
HA7KMP (2 oprs) 49,000- 323- 49-D
HA8KHQ (HA0s NAE,NAQ,oprs) 33,858- 357- 38-D
HA6KNX (4 oprs) 32,040- 322- 40-D

Switzerland

HB9QA 973- 45- 7-A
HB9CSA 279,104- 910- 98-B
HB9DX 32,214- 325- 42-B
HB9DDZ 12,270- 181- 30-B
HB9CXR 6,800- 124- 20-B
HB9AAA 62,350- 310- 50-C

Italy

IO2UIY 684,087- 1706- 129-A
IØKHP 67,275- 381- 69-A
IK6CGO 32,718- 268- 42-A
IØZUT 27,093- 253- 33-B
IK6ASR 25,026- 200- 43-B
IV2AVH 231,920- 901- 80-C
I8BYG 181,424- 806- 92-C
I2KYM 179,740- 679- 76-C
IK8HRB 65,000- 432- 52-C
I8VJB 56,202- 351- 58-C
I5JHW 52,946- 375- 46-C
I4CSP 30,447- 218- 51-C
IKØEIE 16,523- 253- 31-C
IKØFEX 15,456- 361- 14-C
IK2FDV 5,040- 109- 16-C
IV3BLQ/IL3 (+IV3XLS) 74,580- 583- 44-D

Sardinia

IS0OMH 40,443- 545- 39-B

Bulgaria

LZ2KHB (LZ2RM,opr) 357,175- 1159- 91-A
LZ2PT 64,413- 441- 51-A
LZ2DU 9,740- 255- 26-A
LZ2EV 101,304- 750- 42-B
LZ1YQ 38,590- 291- 34-B
LZ2SL 20,628- 220- 27-B
LZ2XD 17,425- 231- 25-B
LZ1IT 6,540- 266- 13-B
LZ2AG 5,124- 120- 21-B
LZ1MC 4,384- 112- 16-B
LZ1NM 4,318- 112- 17-B
LZ1FW 2,592- 84- 16-B
LZ2SD 388- 82- 4-B
LZ2KK 206,319- 621- 97-C
LZ1AT 15,876- 232- 21-C
LZ2KTS (LZ2s CC,DF,HE,PO,UA, -E-41,-E-72,oprs) 2,046,240- 2796- 196-D
LZ1KNP (2 oprs) 175,392- 721- 87-D
LZ1KKI (3 oprs) 140,752- 575- 78-D
LZ2KSU (2 oprs) 49,500- 308- 55-D
LZ2KOT (2 oprs) 47,760- 432- 40-D

Austria

OE9SLH 23,716- 170- 44-A

Czechoslovakia

OK3CSC 547,010- 1633- 117-A
OK2RU 194,184- 675- 93-A
OK1AJN 142,575- 660- 75-A
OK1KZ 83,544- 527- 59-A
OK1CK 70,366- 412- 64-A
OK1AGA 61,440- 346- 60-A
OK2BTI 55,000- 508- 44-A
OK3CDZ 7,638- 96- 19-A
OK1DKW 125,496- 551- 83-B
OK2QX 89,124- 355- 84-B
OK1AWH 74,710- 421- 62-B
OK3THM 53,580- 348- 60-B
OK2PLH 51,016- 355- 56-B
OK2BNX 49,240- 341- 40-B
OK3CEL 33,497- 285- 41-B
OK1AYO 26,544- 217- 42-B
OK2PCF 22,924- 163- 44-B
OK3CWF 20,031- 607- 33-B
OK1QH 19,080- 272- 36-B
OK1MZO 18,389- 211- 37-B
OK3CSF 11,804- 149- 26-B
OK1DRY 6,944- 88- 28-B
OK2BMA 6,534- 92- 33-B
OK1MHI 5,448- 68- 24-B
OK3CSQ 3,575- 119- 13-B
OK2BGR 2,717- 35- 19-B
OK1DRU 2,548- 105- 12-B
OL5BPH 1,220- 64- 10-B
OL9CTG 1,134- 69- 9-B
OK1DWJ 1,080- 54- 10-B
OL4BOR 930- 57- 10-B
OK5MVT/P 784- 36- 7-B
OK1DZD 616- 26- 7-B
OK3CXS 230- 38- 5-B
OK2PKN 212- 31- 4-B
OK3CPY 195- 24- 5-B
OK1DRQ 60- 20- 3-B
OK2BOL 85,392- 374- 72-C
OK2KNP 35,598- 343- 34-C
OK2HI 22,506- 272- 33-C
OK2BSI 21,648- 172- 44-C
OK1CRH 16,962- 182- 33-C
OK2PCL 11,400- 123- 24-C
OK2MAJ 10,010- 169- 22-C
OK2BXA 5,516- 120- 14-C
OK2BSQ 3,838- 64- 5-C
OK3KV 2,710- 105- 10-C
OK3KAG (+oprs) 707,397- 1758- 141-D
OK2KMI (OKs FD,JS,PTW,PZW,oprs) 513,416- 1361- 116-D
OK1OAZ (OK1DFP,OL1BLN,oprs) 394,119- 1221- 99-D
OK2OSN (+oprs) 273,408- 868- 96-D
OK2RAB (OK2s PEM,PDK,oprs) 154,700- 693- 65-D
OK1ORA (OK1s AYD,-22310,-23662, oprs) 119,262- 615- 66-D
OK3RMB (+oprs) 107,350- 604- 50-D
OK2KPS (+oprs) 34,425- 322- 45-D
OK3KSQ (+oprs) 13,040- 117- 40-D
OK2OSU (+oprs) 4,176- 190- 12-D

Poland

SP6CIK 111,881- 500- 77-A
SP3BYZ 76,164- 391- 66-A
SP3PL 75,260- 313- 71-A
SP6BFK 66,906- 375- 63-A
SP7NJX 50,787- 338- 57-A
SP2AYC 37,952- 416- 32-A
SP3BGD 14,688- 154- 36-A
SP9BRP 11,874- 152- 22-A
SP9EEE 2,016- 52- 18-A
SP6HEK 79,722- 548- 43-B
SP6JTR 75,518- 354- 61-B
SP9FER 70,070- 334- 55-B
SP9DWT 67,728- 354- 51-B
SP9ADY 61,050- 340- 50-B
SP9BBH 57,255- 363- 55-B
SP4EAK 55,029- 411- 39-B
SP2GUB 52,065- 204- 45-B
SP9HC 45,648- 322- 48-B
SP2BMX 17,790- 231- 30-B
SP4AVG 14,256- 124- 36-B
SP1AEN 12,380- 181- 20-B
SP6AUI 5,355- 96- 17-B
SP9MY 4,634- 66- 14-B
SP5GBJ 3,570- 75- 15-B
SP2BKF 1,704- 32- 12-B
SP9DH 1,520- 36- 19-B
SP4GFG 729- 25- 9-B
SP3AOT 204- 23- 4-B
SP6CYV 50,440- 269- 65-C
SP9BMQ 15,425- 201- 25-C
SP9MQE 13,340- 189- 23-C
SP6PAZ (SP6DVP,opr) 12,210- 107- 37-C
SP6DMI 10,800- 178- 20-C
SP3IBS 8,867- 105- 27-C
SP5FKW 8,280- 120- 20-C
SP4HKN 7,875- 135- 21-C
SP3OEH 7,266- 145- 21-C
SP9AVZ 4,152- 140- 12-C
SP3JHY 3,173- 59- 19-C
SP9MRO 3,026- 45- 17-C
SP9FTJ 1,768- 28- 17-C
SP7FQI 808- 39- 8-C
SP1NQQ 244- 33- 4-C
SP3HD 210- 24- 5-C
SP2ZFJ (SP2s ASJ,FAP,oprs) 287,370- 971- 93-D
SP9PDF (SP9NRD,SP92420,oprs) 127,725- 627- 65-D
SP5PBE (SP5s ELA,LCT,oprs) 99,636- 539- 76-D
SP1PBW (+oprs) 77,968- 456- 67-D
SP3PLD (SP3NYS,SP-0078-ZG,oprs) 51,156- 345- 58-D
SP5PEN/4 (2 oprs) 29,304- 336- 36-D

Greece

SV1RP/SV7 448- 82- 4-B

German Democratic Republic

Y25TO 175,940- 683- 95-A
Y58ZA 97,020- 586- 60-A
Y45RN 71,991- 428- 57-A
Y33UJ 66,843- 416- 63-A
Y36SG 66,112- 396- 64-A
Y32PI 64,812- 377- 66-A
Y53YN/P 55,708- 243- 76-A
Y27HL 52,305- 414- 55-A
Y23RJ/A 52,071- 392- 51-A
Y42XF 48,570- 433- 45-A
Y22HF 41,820- 250- 60-A
Y51XH 41,256- 273- 54-A
Y24YH 33,055- 226- 55-A
Y36VN 31,406- 322- 41-A
Y22RU 27,300- 236- 42-A
Y66YF 26,281- 254- 41-A
Y51TG 23,552- 170- 46-A
Y21TL/A 20,340- 193- 36-A
Y48YN 18,570- 205- 26-A
Y42YG 15,542- 182- 38-A
Y46WA 13,528- 123- 38-A
Y26JD 12,788- 239- 23-A
Y35WF 12,412- 161- 29-A
Y32QD 8,991- 148- 27-A
Y64ZF 8,866- 140- 22-A
Y27AL/A 6,369- 85- 33-A
Y39XL 4,550- 57- 26-A
Y39SH 4,256- 66- 14-A
Y59ZF 1,815- 39- 15-A
Y25PE 30- 6- 3-A
Y31MO 256,872- 1043- 77-B
Y47VM 239,436- 795- 81-B
Y51ZE 186,138- 762- 81-B
Y25FF/A 140,832- 739- 72-B
Y25TG 103,600- 499- 74-B
Y26BH 63,988- 307- 68-B
Y21DG/A 51,191- 227- 71-B
Y53TA 34,071- 280- 41-B
Y22UB 32,346- 203- 54-B
Y25QE 31,201- 309- 41-B
Y53XN/P 25,628- 211- 43-B
Y52TE 24,645- 216- 37-B
Y27NM/A 23,750- 167- 50-B
Y33YA 21,420- 212- 34-B
Y24JJ 13,770- 200- 27-B
Y24SH/A 12,996- 158- 36-B
Y23CM 12,716- 102- 34-B
Y21EA 12,224- 152- 32-B
Y22PM 11,320- 218- 20-B
Y42WB 9,016- 102- 23-B
Y48RJ 8,606- 143- 26-B
Y23WO 7,936- 86- 31-B
Y31XN 7,920- 92- 33-B
Y37RB 6,463- 105- 23-B
Y62QH 5,522- 120- 22-B
Y25PA 5,160- 152- 12-B
Y31NJ 4,242- 72- 21-B
Y53XM 1,080- 51- 12-B
Y23OH 990- 50- 11-B
Y53ED 840- 24- 12-B
Y26VG 638- 30- 11-B
Y21HE 384- 34- 6-B
Y24HG 14- 3- 2-B
Y38YK 57,285- 365- 57-C
Y41NK 28,728- 178- 56-C
Y53VL 16,687- 153- 41-C
Y41OH 15,170- 143- 41-C
Y48ZA 14,724- 167- 36-C
Y57ED 10,800- 212- 24-C
Y22VI 7,498- 132- 23-C
Y25ML 5,082- 95- 22-C
Y65ZF 3,850- 54- 25-C
Y44WA 2,899- 105- 13-C
Y26YM 2,717- 53- 19-C
Y32ZF 1,650- 55- 11-C
Y38WE 504- 20- 9-C
Y24PM 30- 4- 3-C
Y44ZI (+Y26DI,Y44UI) 704,704- 1779- 121-D
Y33ZL (+Y26IL,Y33VL) 527,078- 1410- 133-D
Y63ZI (+Y25KI,Y26s KI,UI) 474,718- 1553- 97-D
Y41ZF (+Y61UF) 384,642- 1266- 102-D
Y56ZF (Y23PF,Y24VF,Y56YF,oprs) 345,352- 1145- 98-D
Y62ZI/P (Y23FI,Y62s WI,YI,oprs) 325,583- 1068- 103-D
Y54ZA (Y25JA,Y54s TA,VA,oprs) 319,960- 1214- 95-D
Y54ZL (Y41RM,Y54QL,oprs) 283,101- 1064- 91-D
Y86EST (Y25IE,Y32s KE,ZE,oprs) 263,520- 1194- 72-D
Y43ZO (+Y21RO,Y43GO) 225,432- 989- 93-D
Y47ZN (+Y47s MN,ON) 169,428- 731- 84-D
Y43ZD (Y21ID,Y25ID,Y43WD,oprs) 156,528- 931- 72-D
Y76ZH (+Y24ZH,Y28QH) 130,560- 799- 68-D
Y44ZN (+Y44TN) 104,725- 552- 71-D
Y36ZM (+Y36VM) 101,925- 422- 75-D
Y37ZO (Y28GO,Y37s KO,MO,oprs) 101,864- 579- 68-D
Y55ZA (Y55s JA,KA,NA,oprs) 54,855- 391- 53-D
Y33ZB (+Y33TB) 47,840- 336- 52-D
Y54ZE (Y54s TE,YE,Y2-76691E54, oprs) 29,133- 317- 38-D

Romania

YO2AQB 43,150- 353- 50-A
YO5AAT 38,710- 271- 49-A
YO2ARV 31,680- 354- 36-A
YO4CAH 29,068- 508- 26-A
YO8BDQ 10,480- 220- 20-A
YO2CMI 5,434- 84- 26-A
YO2DFA 5,008- 161- 16-A
YO3ZM 426- 27- 6-A
YO4BEW 60,424- 360- 56-B
YO8CIB 56,790- 424- 45-B
YO9ASS 43,516- 438- 45-B
YO4ZF 41,949- 263- 59-B
YO3AAQ 32,065- 240- 53-B
YO8DOH 17,516- 274- 29-B
YO6EZ 17,500- 265- 28-B
YO9DAF 13,851- 277- 19-B
YO8DHC 13,015- 281- 19-B
YO8CAQ 12,510- 293- 18-B
YO9YE 12,480- 256- 20-B
YO4DCF 10,640- 253- 16-B
YO5NU 7,750- 157- 31-B
YO5ALH 7,518- 103- 21-B
YO3BWK 6,952- 80- 22-B
YO3BFJ/5 3,910- 81- 17-B
YO5QCI 3,096- 47- 18-B
YO6AW 2,651- 69- 11-B
YO6HQ 2,628- 74- 9-B
YO6MK 1,872- 80- 12-B
YO2CGU 1,800- 80- 10-B
YO9HG 1,043- 65- 7-B
YO4CLC 812- 42- 7-B
YO8KGH 270- 25- 6-B
YO6BTY 51- 17- 3-B
YO2AOB 80,650- 494- 70-C
YO9DIA 38,001- 241- 53-C
YO2BEH 22,720- 285- 24-C
YO9CEB 20,396- 311- 21-C
YO9BVG 14,400- 132- 32-C
YO9CZW 13,048- 228- 28-C
YO6FN 11,077- 264- 19-C
YO9AHX 10,098- 139- 27-C
YO6BQT 9,724- 186- 17-C
YO9DHY 7,222- 114- 23-C
YO6CFB 6,770- 251- 22-C
YO9KPM 5,856- 67- 24-C
YO2ASJ 4,968- 145- 18-C
YO9FL 4,950- 93- 22-C
YO3DCO 3,450- 50- 23-C
YO2CBF 2,928- 108- 16-C
YO3YB 2,592- 54- 16-C
YO9HP 2,100- 51- 12-C
YO9BXE 2,028- 76- 14-C
YO9CUF 1,456- 35- 16-C
YO6CRO 128- 24- 4-C
YO5AXB 66- 13- 3-C
YO6KAL (YO2CJX,YO6s BZH,EV,EX, oprs) 175,064- 860- 79-D
YO5KDW (YO5s AXM,BRZ,BYV,oprs) 54,648- 348- 66-D
YO6KBM (YO6s AHP,DDF,oprs) 26,884- 224- 47-D
YO6KKK (YO6s CCO,UF,oprs) 832- 56- 8-D

Yugoslavia

YU1LM 27,269- 234- 37-A
YU3XJ 23,958- 1089- 22-A
YU7SF 114,967- 492- 77-B
YU4EJC 103,785- 639- 55-B
YT7KW 26,800- 444- 25-B
YU2AKL 19,920- 281- 30-B
YU7MGU 17,175- 195- 25-B
YT3AM 8,364- 187- 17-B
YU3TW 6,368- 117- 16-B
YU3HR 195,534- 776- 71-C
YU1EXY (YU1s LA,WR,oprs) 934,740- 1955- 135-D
YT3L (YU3s BG,OH,oprs) 566,091- 1688- 93-D
YT2B (YU2s NK,SD,RS881,RS805, oprs) 398,820- 1317- 102-D
YU4IEF (+YU2KI) 283,536- 1046- 88-D

Malta

9H3DX 48,914- 455- 37-C

ZONE 29

Kaliningrad

UA2EC 56,994- 378- 59-A
RA2FC 27,432- 408- 24-A
UA2FFA 7,575- 69- 25-B
UZ2FWA (UA2s FF,FJ,FM,FX,FZ, FGA,RA2FA,oprs) 2,159,820- 3189- 195-D

European Russian RSFSR

UA9QA/6 1,067,419- 2212- 151-A
UA3RAR 341,040- 1020- 98-A
RW3AU 238,359- 773- 93-A
UA1QQ 193,952- 818- 88-A
RV3WW 147,700- 670- 70-A
RA1AL 120,960- 643- 63-A
RW3DR 107,569- 453- 77-A
UA4ANO 82,766- 465- 58-A
UA4LDJ 76,815- 452- 45-A
RA6AR 75,691- 364- 77-A
UA3ADG 46,596- 409- 44-A
OK3IA/UA3 39,861- 283- 43-A
RA3DX 33,423- 326- 39-A
UA4ANZ 32,481- 255- 41-A
UA3PB 25,615- 215- 47-A
RA3EA 24,570- 264- 35-A
UA3DQS 23,961- 216- 49-A
UA4LCL 22,166- 649- 66-A
UA3RFZ 17,394- 255- 26-A
UV4CD 8,477- 139- 27-A
RA4AA 8,175- 83- 25-A
RV6AF 7,385- 83- 35-A
UA6AG 6,720- 86- 21-A
UA3DNV 2,940- 60- 14-A
UW3AA 606,080- 1444- 128-B
UA3QDX 256,553- 1054- 83-B
RV6AZ 208,390- 809- 91-B
UA6ECH 162,120- 749- 70-B
UA3DVS 155,210- 604- 85-B
RA3RN 107,096- 350- 88-B
UW3UO 103,183- 521- 71-B
UA6ALV 92,772- 556- 54-B
UA3YAO 90,148- 481- 62-B
UA6YCI 85,540- 558- 52-B
UA3UDK 82,089- 451- 63-B
UA3DIJ 81,816- 511- 56-B
UA1ANA 81,084- 577- 58-B
UA3PGZ 75,200- 428- 60-B
UA6PDF 72,846- 415- 57-B

UW3TU 72,354- 365- 62-B
UA6BPU 71,295- 521- 49-B
UA1AFM 68,324- 401- 62-B
UA1NA 62,244- 468- 57-B
RZ3AW 61,752- 330- 62-B
RW3AI 60,720- 251- 66-B
UA4ALI 60,420- 395- 57-B
UA3QAI 57,478- 321- 58-B
UA3RFV 56,868- 356- 42-B
UA4AO 55,620- 311- 60-B
UW3AO 44,840- 454- 40-B
UA3WW 42,420- 308- 43-B
UW4CN 41,800- 282- 50-B
UA4LX 41,262- 271- 48-B
UA3XBB 41,250- 244- 55-B
UA3ART 40,474- 311- 49-B
RA3SB 39,775- 319- 43-B
UA3LDZ 39,702- 297- 39-B
RA3AOD 38,924- 216- 51-B
RA3GJ 34,755- 300- 35-B
RA3VX 33,559- 310- 37-B
UA3GEC 32,895- 321- 32-B
UA4CHK 32,637- 295- 43-B
UA3TFZ 27,626- 255- 37-B
UA4YZ 27,280- 262- 31-B
UA4FEU 27,222- 268- 39-B
UA3GGF 26,379- 348- 27-B
RA4HW 24,076- 277- 26-B
UV6AY 24,012- 252- 29-B
UA4YCK 22,688- 277- 32-B
UA3ECQ 21,774- 263- 38-B
UA1CED 19,616- 282- 32-B
UA3LAR 19,360- 114- 55-B
UA6HCE 18,096- 222- 26-B
RW3AX 17,402- 349- 22-B
UA3XAZ 15,630- 181- 30-B
UA3XCC 13,311- 121- 29-B
UA3TU 11,424- 54- 51-B
RA3DNC 11,154- 177- 26-B
RA3DUU 8,180- 157- 24-B
UA1WAK 7,182- 193- 18-B
UA3MED 6,660- 163- 20-B
UA4LAF 6,162- 171- 13-B
UA4CGR 3,780- 62- 21-B
UA1WEJ 3,773- 241- 11-B
UA3MBE 2,873- 79- 17-B
UZ3DWX 2,068- 50- 12-B
UA3IAK 1,275- 29- 15-B
UA3XCM 45- 5- 5-B
UA6ADC 172,640- 610- 83-C
UA6LG 127,236- 557- 69-C
UA3TN 92,080- 351- 80-C
UA4CO 87,934- 377- 77-C
UA4NC 80,480- 360- 80-C
RW4CA 72,064- 390- 64-C
UW3EQ 53,092- 305- 52-C
UA1CK 50,765- 251- 85-C
UV3TE 47,196- 274- 46-C
UA6HCK 33,429- 343- 26-C
UA3DKT 22,540- 805- 28-C
UA4ACP 21,504- 149- 44-C
UV3FD 19,400- 177- 40-C
RA3AC 14,187- 189- 31-C
UA8XT 13,440- 267- 21-C
UW3DX 10,224- 140- 18-C
UA8WS 9,618- 93- 28-C
UA3TEP 6,600- 194- 15-C
UV3NB 5,253- 83- 17-C
4J4F (UA4s FAO,FB,FDS,FEF,FER, FZ,oprs) 2,551,379-3596-199-D
UB3IWA (RB5s ID,II,UB5s IFZ,IKF, IML,IOK,oprs) 1,606,143-2448-187-D
UZ8LWZ (UA6s LV,-150-1163, -158-1240,UB5ITW,UW8OE,oprs) 1,166,185-1978-179-D
UZ8LWA (UA6s LCT,LDX,LE,LF,LN, MN,oprs) 762,846-1905-123-D
UZ8LZB (UA6s LCJ,LCN,LTI,LFO, -156-1319,oprs) 519,480-1352-120-D
UZ4WWB (+ oprs) 436,810-1301-110-D
UZ6AWF (UA6s AB,CQ,UW6CA,oprs) 425,844-1178-108-D
UZ3DXW (UA3s DDB,DFO,-142-1916, -142-1944,oprs) 305,718-1130- 87-D
UZ1TWB (UA1s TAE,TEI,-144-380, oprs) 252,535-1029- 85-D
UZ6WWA (UA6s WAW,WD,WG,oprs) 241,244-1015- 82-D
UZ8LWY (+ oprs) 216,296- 858- 83-D
UZ4YWW (UA4s YBN,YDZ,YES, -087-403,oprs) 194,072- 839- 38-D
RA4HX (UA4s HHA,HRZ,oprs) 189,872- 745- 84-D
UZ3AYR (RA3AUU,UV3s ABN,ACX, oprs) 175,968- 723- 76-D
UZ4FWD (UA4s FAT,FCJ,oprs) 175,028- 559- 98-D
UZ3RWM (UA3s RFS, -157-619,-157-842,oprs) 165,199- 835- 73-D
UZ6LWM (RA6s LEK,LFJ,LM,UW6LI, UA6-158-959,oprs) 156,185- 764- 85-D
UZ3DWH (UA3s -142-618,-142-1254, oprs) 130,235- 663- 61-D
UZ3AZG (3 oprs) 127,710- 641- 86-D
UZ4FWX (UA4s FFB,FMV,-148-644, oprs) 123,918- 733- 57-D
UZ3AWP (RA3ALA,UA3s AKR,ASG, UB5KBG,oprs) 114,960- 751- 80-D
UZ3AXH (3 oprs) 111,810- 498- 62-D
UZ6HXK (UA6s -108-1736,-198-1834, oprs) 89,440- 573- 52-D
UZ3XWM (UA3s XEC,XEQ,XEU,oprs) 87,269- 615- 49-D
UZ3EXA (UA3s EHV,EIW,EZ,oprs) 86,645- 515- 45-D
UZ3RZZ (UW3RR,UA3s -157-49, -157-69,-157-78,oprs) 64,866- 396- 57-D
UZ3DZD (RA3DSY,UA3s DTQ, -142-916,oprs) 63,996- 458- 42-D
UZ3PWJ (UA3s PLS,PNN,PNO,oprs) 62,040- 372- 56-D
UZ3QWM (RW3QA,UA3s QLJ, -121-3184,oprs) 60,019- 425- 47-D
UZ3DXF (RA3DLA,UA3-142-242, UA4-133-1268,oprs) 51,699- 312- 57-C
UZ3QWX (UA3s QSC,-121-59,-121-61, oprs) 49,385- 572- 57-D
UZ3MWL (UA3s MDL,-158-532, -168-551,oprs) 46,736- 415- 46-D
UZ3TWL (3 oprs) 31,744- 354- 32-D
UZ8AXF (RA6AIN,UA6s AOC,ARQ, oprs) 30,555- 268- 35-D

Ukraine

RB5IM 1,098,377-1698-173-A
RB5FF 814,590-1898-135-A
RB5IJ 455,750-1138-125-A
UB5MDA 341,289- 903-117-A
RT4UF 225,308-1069- 79-A
UT4UX 184,238- 731- 76-A
UB5MLP 158,860- 570- 94-A
RB5WW 142,384- 526- 88-A
RT5UY 98,072- 345- 82-A
UT5UCR 81,396- 359- 76-A
UB5WDD 73,131- 417- 57-A
UB5IIA 70,028- 304- 82-A
RB5IA 68,708- 295- 68-A
RB5SA 63,196- 398- 61-A
UY5PC 61,888- 286- 84-A
UB5MQF 53,704- 292- 49-A
UB5IBM 45,910- 223- 68-A
RB5MP 35,464- 161- 52-A
UB5IFN 35,389- 295- 43-A
RB4IRO 33,891- 319- 39-A
RB5AE 30,800- 263- 55-A
RB5ICY 20,429- 336- 31-A
RB5AT 14,875- 138- 35-A
RB5QR 13,860- 106- 35-A
UB5UCH 13,702- 75- 62-A
UB5KW 10,488- 196- 19-A
UB5AFI 8,208- 130- 27-A
UY5YY 5,290- 133- 14-A
UT5EW 2,744- 55- 24-A
RB5IIU 1,001- 31- 11-A
RB5GW 845,759-1858-157-B
UB4EL 386,610-1083-105-B
RB5OP 172,640- 771- 80-B
UB5IJA 167,245- 651- 83-B
UB5IAN 92,008- 566- 56-B
UB5TN 78,678- 290- 93-B
UB5FAN 76,126- 580- 52-B
UB5DW 75,396- 374- 61-B
UB5QJI 75,225- 518- 51-B
UB4LAA 75,048- 428- 59-B
UB5MMP 72,163- 383- 61-B
UB5UHJ 70,364- 550- 32-B
UB5MIF 67,368- 301- 56-B
UB5MQS 63,180- 456- 45-B
UT5PI 63,150- 425- 50-B
RT4UN 60,225- 361- 55-B
UB5AEO 58,300- 352- 53-B
UT4UB 58,232- 309- 58-B
UB8YR 57,478- 314- 58-B
RB5QB 56,140- 209- 70-B
UB5ZR 44,064- 295- 54-B
UB5QBC 43,660- 337- 37-B
UT5UIW 43,428- 273- 44-B
UA4NE 41,924- 361- 47-B
RB5QL 40,700- 316- 44-B
RB5MU 39,776- 320- 44-B
RB5VR 39,424- 302- 44-B
UB5VKO 37,222- 376- 37-B
UB5ZCW 36,244- 334- 41-B
UB5CCP 34,844- 438- 31-B
UB4MM 34,263- 275- 47-B
UB5IPH 32,880- 267- 40-B
UB5QMO 31,001- 425- 29-B
UB5ZA 30,426- 278- 33-B
UB5PAG 29,564- 361- 32-B
RA4CLZ 27,073- 443- 48-B
UB1RR 26,650- 364- 26-B
UY5WA 26,528- 297- 32-B
UB5IOD 25,857- 199- 39-B
UB5LEE 23,976- 230- 37-B
UB5MEH 22,256- 264- 26-B
RB5LTZ 22,074- 267- 26-B
UB5RCA 21,514- 93- 62-B
UB5IHQ 21,046- 192- 34-B
RB5LV 19,647- 138- 37-B
UB5EW 12,558- 179- 26-B
UB5VK 7,400- 106- 20-B
UB5IBV 6,600- 87- 20-B
RB5EIN 6,480- 180- 18-B
UB5EEP 5,180- 100- 20-B
UB5VY 2,640- 63- 16-B
RB5EKB 2,070- 41- 18-B
UB5QKO 1,133- 33- 11-B
UB5SBR 861- 35- 13-B
RB5MF 798,671-1552-153-C
RB5DX 410,595-1358- 93-C
UB5EOU 208,924- 805- 76-C
RB5HT 146,468- 554- 82-C
RB5TW 129,888- 576- 72-C
UB4JO 81,930- 390- 55-C
RB5EG 59,625- 257- 75-C
RB4EE 51,180- 294- 60-C
RB5IO 47,687- 359- 43-C
UB7QA 42,976- 291- 44-C
UT5RY 25,056- 216- 36-C
UB2JWS (+ oprs) 725,160-1788-120-D
UT4UXW (UB5XCM,UT4UZ,oprs) 598,864-1680-112-D
UB4WZA (UB5s WCX,-868-453,oprs) 513,042-1418-111-D
UB4QWW (RB5QD,UB4QG, UB5-864-886,oprs) 417,894-1274-102-D
UB4JWP (+ oprs) 264,508- 983- 89-D
UB4HWB (+ oprs) 251,655- 876- 95-D
UB4FWC (UB5s BZ,FBV,oprs) 202,048- 891- 82-D
UB4WWA (R55WW,UB5s -868-517, -868-844,oprs) 176,820- 887- 70-D
UB4IXZ (3 oprs) 163,050- 678- 75-D
UB4MZL (UB4MAH,UB5MVX,oprs) 130,620- 639- 70-D
UB4VWA (+ oprs) 99,008- 474- 68-D
UB4LWY (+ oprs) 76,802- 454- 51-D
UB4IWI (RB5IQO,UB5s INT,IQW,oprs) 66,192- 453- 48-D
UB4EYB (2 oprs) 52,080- 366- 42-C
UB4SWK (+ oprs) 29,682- 330- 34-D
UZ4FWZ (RA4s FEE,FET, UA4-148-464,oprs) 26,480- 256- 40-D
UB4QXU (3 oprs) 20,460- 276- 31-D
UB4WWU (UB5WDS,UB5-868-398, oprs) 10,440- 273- 15-D
UB4QXD (3 oprs) 6,888- 98- 21-D

Byelorussia

UC2AIU 105,861- 558- 71-A
RC2AR 88,614- 611- 54-A
UC2OP 38,148- 370- 33-A
UC2OBB 164,933- 878- 71-B
UC2WAZ 90,060- 375- 76-B
UC2ODW 48,546- 273- 58-B
UC2WBM 38,880- 286- 45-B
UC2WM 21,085- 225- 35-B
UC2SD 14,937- 122- 39-B
UC2AAD 65,726- 390- 59-C
UC2AIG 56,750- 353- 50-C
UC2IDC 10,416- 194- 24-C
UC1AWZ (UC2s -168-48,-168-123, -188-172,oprs) 58,752- 376- 48-D
UC1WWT (2 oprs) 224- 26- 4-D

Azerbaijan

UD6DZ 40,204- 300- 38-A
UD6DKW 29,785- 283- 37-B
RD6DAB 1,360- 82- 6-B
UD6DKZ 420- 18- 5-B
RD6DJ 46,420- 303- 55-C
UD6DR 17,408- 92- 64-C
UD7DWZ (3 oprs) 157,122- 948- 58-D

Georgia

UF7FWA (UF6s BN,FBB,FBI,oprs) 86,265- 674- 43-D

Armenia

UG6JJ 10,620- 102- 30-A
UG7GWA 812- 51- 4-B
UG7GWL (UG6s LQ,-864-124,oprs) 463,463-1389- 91-D

Moldavia

UO5ODA 64,568- 389- 58-A
UO5OO 57,770- 402- 53-B
UO5OJM 24,165- 431- 27-B
RO5OO 95,327- 525- 63-C

Lithuania

UP2BBF 195,234- 982- 78-A
UP2BN 276,200- 910-100-B
UP2DM 165,804- 803- 76-B
UP3BU 155,595- 825- 69-B
UP2BO 91,910- 493- 70-B
UP2PAQ 80,448- 496- 64-B
UP2BEL 77,504- 378- 64-B
UP2BZ 65,240- 366- 56-B
UP2BNC 42,266- 319- 46-B
UP2BGP 36,532- 303- 38-B
UP2BFE 34,605- 275- 45-B
UP2BRJ 26,474- 405- 31-B
UP2BPO 22,386- 211- 42-B
UP3BA 20,677- 324- 29-B
UP2DT 18,984- 255- 22-B
UP2BPI 15,064- 252- 28-B
UP2BB 13,616- 179- 23-B
UP2BKM 12,600- 314- 18-B
UP2BNL 696- 56- 6-B
UP3BK 265,824- 865-104-C
UP2AV 19,116- 206- 36-C
UP2NO 7,220- 142- 19-C
UP2BI 6,486- 110- 23-C
UP2BQQ 116- 19- 4-C
UP1BWW (UP2s BIJ,BKW,BMW,BO, -838-892,-838-1052,oprs) 618,205-1558-119-D
UP1BXB (RP2s BHY,BIT, UP2-838-1289,oprs) 31,752- 435- 28-D
UP1BZM (UP2s -838-1744,-838-1751, oprs) 19,800- 461- 18-D

Latvia

UQ2GKL 111,957- 663- 67-A
UQ2GHB 2,706- 121- 11-A
UQ2PO 313,832-1151- 99-B
UQ2GMR 203,688- 927- 82-B
UQ2GD 174,707- 555- 89-B
UQ2GJV 105,138- 538- 66-B
UQ2GCV 33,125- 223- 53-B
UQ2GQ 18,122- 180- 41-B
UQ2GEO 11,350- 120- 25-B
UQ2GFU 3,008- 132- 16-B
UQ2HO 11,236- 152- 26-C
UQ2GLW 345- 19- 5-C
UQ1GWW (UQ2s GDW,-837-116, -837-221,oprs) 917,202-1899-143-D
UQ1GXT (2 oprs) 197,120- 768- 88-D
UQ1GXJ (UQ2s -837-436,-837-462, oprs) 41,360- 339- 40-D

Estonia

UR2RND 312,930- 928- 95-B
UR2RKQ 12,402- 215- 26-B
RR2RR 188,966- 806- 78-C

ZONE 30

European RSFSR

RA4PC 81,548- 397- 58-B
UA4HFK 55,327- 277- 61-B
UA4HTZ 32,208- 294- 33-B
UA4HTT 31,748- 281- 33-B
UZ4WWC (UA4s WCF,WEJ,WES, -895-564,-895-683,oprs) 215,634- 797- 83-D
UZ4PXW (RA4PJA,UA4s PJP, -894-541,oprs) 94,556- 592- 44-D
UZ4WWO (UA4s -895-682,-895-685, oprs) 35,008- 352- 32-D
UZ4PZL (UA4s PMY,-894-1094, -894-1099,oprs) 1,632- 179- 4-D

Asiatic RSFSR

EK9AD (UA9CIU, opr) 1,011,381-1790-119-A
UA9FAR 432,450-1090- 90-A
UA9ALD 124,558- 453- 62-A
UW9AG 105,910- 357- 70-A
UA9CBO 88,855- 338- 65-A
RA9FA 82,720- 431- 47-A
UA9QA 66,864- 355- 42-A
UW9AO 41,616- 151- 68-A
UA9SG 39,390- 303- 30-A
UW9AZ 38,151- 343- 27-A
UA9SA 752,640-1374-120-B
UW9WW 306,348- 848- 84-B
UW9SW 220,334- 606- 82-B
UA9ACV 210,750- 616- 75-B
UA9CBR 116,672- 430- 64-B
UA9AEH 96,228- 364- 59-B
UV9WR 59,942- 395- 34-B
UA9FGJ 49,148- 259- 44-B
UA9ALI 30,580- 136- 55-B
UA9AOV 1,976- 67- 8-B
UA9CE 253,770- 824- 86-C
UV9FM 115,344- 362- 72-C
UW9QA 100,788- 350- 74-C
UV9FR 29,536- 258- 26-C
UA9AKO 2,562- 70- 11-C
UZ9AYA (UA9s AKG,AKI,AOG, UL7LCZ,UW9s AN,AR,oprs) 1,394,840-2218-130-D
UZ9WWH (RA9s WR,WZ,RW9s WA, WC,WW,UA9s WD,WFG,WFM,WKY, UW9WK,oprs) 1,071,504-2135-112-D
UZ9WWS (UA9s WFV,WGM,WIT, UV9WN,UB5UER,oprs) 802,240-1553-115-D
UZ9FWR (UA4WA,UA9s FAL,FGO, FM,oprs) 799,011-1651-101-D
UZ9SWY (UA9s SGW,SHD,TS, RA9SVT,oprs) 764,982-1452-121-D
R9AL (+ oprs) 615,322-1490- 54-D
UZ9FWW (UA9s FIQ,FKU,FLN,FW, oprs) 386,848-1095- 77-D
UZ9CWA (UA9s CFV,154-5,154-2063, oprs) 353,475-1031- 75-D
UZ9CYP (UA9s CON,CUA,-154-2105, oprs) 183,978- 731- 54-D
UZ9MWO (UA9s MBM,MFY,-146-329, oprs) 4,920- 103- 12-D

Turkmenistan

UH8ED 158,117- 545- 71-B

Uzbekistan

UI8IAJ 195,212- 830- 74-B
UI8QAZ 43,819- 255- 37-C
UI9AWD (UI8s AA,-189-061,-189-065, oprs) 443,072-1668- 64-D

Tadzhikistan

UJ8XA 25,481- 264- 27-C

Kazakhstan

UL7CW 623,480-1232-110-B
UL7EDR 65,920- 369- 40-B
UL7LBI 43,560- 311- 33-B
UL7LFL 40,432- 325- 28-B
RL7CT 8,118- 98- 23-B
UL7TT 563- 17- 7-C
RL8PYL (UL7s PAE,PAZ,PCZ,RL7s PHO,PHL,PKF,RL8s PA,PY,oprs) 2,186,688-2698-192-D
UL8LWZ (UL7s LEG,LER,LEZ,LO, -826-177,oprs) 1,342,009-2375-127-D
UL8LWO (UL7LFB,RL7LFA,oprs) 52,832- 555- 32-D
UL8PWW (RL7BPH,UL7s PEQ, -823-442,oprs) 44,642- 317- 34-D

Kirghizia

RZ8MS 456- 25- 7-B
UM8MO 443,798- 898-118-C
UM8NBG 34,888- 304- 28-C

ZONE 31

Asiatic RSFSR

UA9YX 825,285-1658-111-A
RW9UA 262,080- 792- 78-A
RA9YG 245,861- 734- 77-B
UA9ZAA 48,488- 468- 38-B
UA9URF 47,223- 328- 33-B
RV9UAE 33,263- 347- 31-B
RW9UR 314,817- 765-101-C
UA9YP 311,055- 813- 89-C
UZ9HWW (+ oprs) 448,896-1231- 84-D
UZ9OWD (+ oprs) 202,578- 848- 57-D
UZ9YXO (UA9s YIH,YJP, -899-616, oprs) 117,200- 527- 54-D

Kazakhstan

RL7GA 870,772- 454- 76-A
UL7JW 352,180-1010- 80-B
UL7DA 37,856- 254- 32-C
UL8GWW (RL7GN,UL7s GAP,-81899, oprs) 360,390- 999- 82-D
UL8QWG (UL7s QBJ,QBX,QCG,oprs) 131,955- 476- 95-D

Kirghizia

UM8DX 113,738- 438- 58-A
UM8MIZ 84,480- 346- 60-B
UM8MZ 68,092- 232- 62-B
UM8MBA 6,204- 100- 14-B
UM8MIG 17,748- 264- 19-C
UM9QWC (+ oprs) 187,036- 547- 78-D

ZONE 32

Mongolia

JT1BG 7,006- 60- 31-C

Asiatic RSFSR

UA8SAU 574,188-1113-118-B
UA8SMM 203,278- 625- 74-B
UA8BL 54,698- 390- 34-B
UA8SR 98,567- 376- 67-C
UZ8AXX (UA8s AAA,AFC,AMA, -163-239,-163-712,-163-729,oprs) 1,577,998-2134-166-D
UZ8WWA (3 oprs) 29,100- 258- 25-D

ZONE 33

Asiatic RSFSR

RA8JD 53,985- 258- 59-B
UA8DA 40,320- 290- 35-B
UA8JDQ 19,208- 178- 28-B
UA8JDE 15,456- 157- 23-B
UA8JDD 9,387- 130- 19-B
UZ8JWA (RA8s JJ,JY,UA8JDY,oprs) 243,660- 932- 60-D

ZONE 34

Asiatic RSFSR

UA8LCZ 92,580- 396- 60-A
UA8FDX 38,622- 260- 41-A
UA8LH 150,903- 529- 81-B
UA8LJ 33,255- 217- 45-B
UA8LT 4,944- 60- 24-B
UW8CF 157,640- 789- 56-C
UA8FF 99,712- 495- 64-C
UW8CW 30,303- 109- 63-C
UZ8LWO (UA3QKV,UA8s LD,LT, UW8MF,oprs) 572,985-1481-107-D
UZ8LWQ (UA8s LCJ,LDI,LEN,oprs) 83,785- 415- 59-D
UZ8LWX (+ oprs) 50,884- 469- 48-D

ZONE 35

Asiatic RSFSR

UA8ZZ 26,381- 197- 37-A
UA8ZF 153,999- 523- 71-B
UA8ZBP 130,178- 416- 72-B
UA8ZDD 136,959- 458- 71-C

ZONE 36

Canary Islands

EA8LD 17,520- 146- 24-C

EA8AMX 6,672- 60- 24-C

ZONE 37

Portugal

CT1CWT 3,357- 104- 25-B
CS2DIZ 34,944- 280- 42-C
CT1QF 5,526- 91- 18-C
CT1BWW 3,488- 52- 17-C
CT1TM 1,066- 28- 13-C

Spain

EA1CIM 153,975- 521- 75-A
EA2CR 24,376- 182- 44-A
EA5FWU 177,385- 865- 65-B
EA1NZ 57,456- 268- 63-B
EA3DXD 55,396- 377- 44-B
EA3EYB 3,638- 60- 17-B
EA5TX 2,856- 119- 8-B
EA7FUR 51,414- 353- 41-C
EA2BUF 48,914- 438- 37-C
EA7AVU 41,545- 376- 35-C
EA3ERT 37,800- 333- 35-C
EC3CJE 32,688- 439- 24-C
EA4CTU 15,813- 253- 21-C
EC3CGJ 10,635- 241- 15-C
EA1AHA 7,975- 106- 25-C
EA5EFV 6,480- 84- 13-C
EA5DIT 5,278- 51- 29-C
EA3FQV 1,808- 73- 8-C

Balearic Islands

EA6WX 16,080- 262- 20-A

ZONE 39

Israel

4X4FL 7,965- 71- 27-C
4X6IF (+4Z9BAA)
41,004- 232- 36-D

Cyprus

OH1RY/5B4 222,420- 708- 66-C

ZONE 44

Korea

HL4RW 10,440- 346- 10-A
HL1ABR 79,086- 625- 42-C
HL1AQB 33,694- 655- 17-C
HL5VC 13,668- 268- 17-C
HL9K (HL2IDN,HL3EAT,oprs)
113,092- 766- 49-D

ZONE 45

Japan

JH1YDT (JH4UTP,opr)
466,410- 990-105-A
JA2YKA (JF2DQ,opr)
342,804- 907- 84-A
JH4UYB 209,948- 756- 73-A
JA6BIF 150,146- 548- 74-A
JO1NZT 93,555- 373- 63-A
JA9RPU 76,960- 302- 65-A
JA2UOT 72,704- 324- 84-A
JE1AER 70,556- 308- 62-A
JA7FAS 31,380- 255- 30-A
JA2YDC (JI2RIQ,opr)
21,294- 177- 42-A
JA6BCV 10,230- 86- 31-A
JA6IP 9,731- 83- 37-A
JH6TYD 5,016- 69- 24-A
JG3SVP 3,808- 66- 16-A
JA3UWB 3,744- 90- 18-A
JH0XUP 3,538- 82- 17-A
JA0PIF 1,260- 56- 9-A
JH7BMF 448- 22- 7-A
JO1OYI 264- 22- 4-A
JH7LVK 341,040- 818- 98-B
JA8DAI 217,086- 510- 97-B
JR3BOT 134,826- 498- 69-B
JA1BNW 67,158- 380- 41-B
JA3EA 62,985- 233- 65-B
JA1KFX 60,769- 255- 67-B
JE6JRY 60,062- 230- 59-B
JH3AIU 55,476- 262- 48-B
JH1SWD 45,680- 260- 40-B
JA3ARM 39,034- 163- 58-B
JR3WXA 36,006- 210- 51-B
JH3JYS 19,760- 156- 38-B
JA1OP 19,264- 122- 43-B
JH7XGN 14,178- 80- 51-B
JA1WYQ 10,990- 84- 35-B
JH1MTR 9,975- 73- 35-B
JA2KPV 9,744- 86- 29-B
JA7ASD 7,700- 73- 28-B
JN1VUB 6,250- 72- 25-B
JA1AAT 5,934- 61- 23-B
JA2SAP/1 5,575- 43- 25-B
JG2LGM 5,359- 55- 23-B
JR4ISK 3,717- 65- 21-B
JR3XEX 2,788- 45- 14-B
JA1NYV 2,108- 28- 17-B
JS1OSP 1,830- 30- 15-B
JA8EJO 1,300- 29- 10-B
JE7IVP 1,030- 23- 10-B
JA1OYB 56- 6- 4-B
JR6PGB 156,262- 513- 79-C
JA1YFG 96,816- 529- 48-C
JH3DPB 90,504- 384- 54-C
JA2IVY 76,368- 339- 48-C
JA7YFB 53,391- 305- 37-C
JA0AD 25,515- 169- 35-C
JA1KTR 14,065- 119- 29-C
JA2FSM 12,672- 126- 22-C
JH7XWT 9,504- 101- 32-C
JA2BEY 9,030- 68- 30-C
JE4NOI 7,800- 128- 24-C
JR7XYW 6,177- 73- 29-C
JA1IT 3,111- 39- 17-C
JQ1WJP 2,223- 29- 19-C
JL3WSL 1,656- 40- 12-C
JE4MYY 960- 24- 10-C
JA6TIT/1 580- 14- 8-C
JA3SSB/1 544- 24- 8-C
JH6FTJ 472- 21- 8-C
JR3KAH 355- 21- 5-C
JG6LGE 350- 20- 7-C
JA3RBC 180- 15- 4-C
JF4ECI 168- 10- 6-C
JH2WHS 162- 9- 6-C
JS1XNJ/1 148- 9- 4-C
JE1TTO 8- 2- 2-C
JF2LTH 4- 2- 2-C
JF6FWT 3- 1- 1-C
JA1YWX (JG1IMM,JI1QQI,JJ1HJR, JM1s CAX,LPN,MCF,JO1s BMV, NAH,JF2IWL,JI2GUT,JR4NIV, JE6MII,JH7PKU,JA6-9336,oprs)
860,002-1410-143-D
JA3YBF (JA3-30356,JE6BXJ,JH9s GRM,JFH,oprs)
512,246-1251- 98-D
JA9YBA (JA9s QWJ,VDA, -19148,-19150,JH7UJR,oprs)
366,113- 981- 83-D
JA1YAD (JN1HYU,JP1DMX,JS1s KNE,PAQ,JH5GHM,JH7UCC, JH8UYB,JH9AMJ,oprs)
206,809- 689- 73-D
JR2YYN (JH4XWI,JH7s FZI,IMX,oprs)
73,219- 286- 59-D

ZONE 48

Djibouti

J28DS 6,448- 100- 13-B

ZONE 50

Philippines

DU1DP 5,681- 51- 23-B
DV1TV 1,628- 30- 11-B
4D9RG (DU9RG,opr)
224,640- 858- 54-C
WA7CQE/DV2
152,496- 576- 54-C
DX9HT 129,352- 580- 46-C
K4YT/DU1 89,052- 448- 41-C
DX1CW (DU1FP,DV1s AAR,ANX, AOC,AOT,ARC,ASM,ATB,AXK, DMD,FZ,oprs)
92,352- 500- 37-D

ZONE 53

Tanzania

5H3ZR 4,876- 48- 23-A

ZONE 54

Indonesia

YB2FEA 22,072- 144- 31-B
YB4FNN 17,689- 189- 19-B
YB2SV 66,892- 345- 52-C
YC0EMJ 26,514- 297- 18-C
YC0SY 24,498- 274- 18-C
YC7DF 8,736- 112- 16-C
YB2EJB 4,460- 49- 20-C

ZONE 55

Australia

VK4XA 69,550- 288- 50-B
VK4TT 7,150- 67- 22-B

ZONE 59

Australia

VK2APK 164,289- 483- 63-B
VK5AGX 31,500- 183- 36-B
VK2KL 147,735- 522- 63-C

ZONE 60

New Zealand

ZL1AIZ 3,440- 40- 20-B
ZL1AAS 75,488- 279- 56-C

ZONE 61

Hawaiian Islands

KH6JAT 9,060- 93- 20-A

ZONE 63

Cook Islands

ZK1XV 15,465- 205- 15-C

ZONE 64

Guam

NY6M/KH2 75,992- 285- 56-A
KG6DX 85,949- 289- 61-B

ZONE 65

Wake Island

NH6FU/KH9 93,240- 473- 40-C

ZONE 75

Franz Josef Land

RZ1OWA 38,208- 400- 32-A
UV1OO 7,980- 250- 14-B

ZONE 90

Minami Torishima

7J1ACH 30,600- 130- 51-A

Checklogs

AA2Z, CE4ETZ, CT3DL, DK9EA, GI5TK, GM3AKM, HA0BB, HA6BD, HA8IH, HK3JJH, IK0DWN, LA7SI, LA8CE, LZ1KIA, LZ1OT, LZ2KSK, N3CZB, OE1IPP, OE6IPA0PUR, OH5FA, OK1US, ON5FV, OZ1JLX, OZ1JNR, OZ2JI, OZ3FC, OZ3Q, PA0UV, PA3BTH, PY1OL, RA3PA, RA6AJQ, RA6AP, RB5JX, RB5LM, RT5JH, RT5UE, RV9UV, RW3AZ, RZ9CZZ, SM3CVM, SM6GOR, SM6KMD, SM6OLL, SM7KWE, SP1CGP, SP1JWY, SP2GJV, SP2GWH, SP4BY, SP4GFG, SP4LDT, SP5AHY, SP5BNB, SP5ENA, SP5ZIM/4, SP8JZB, SP8DIP, SP8GSC, SP8JMA, SP9AZL, SP9ENV, SP9JPA, UA0WDF, UA1AOB, UA1APJ, UA1NCO, UA1OGA/3, UA3DAO, UA3DLD, UA3DTT, UA3EDF, UA3QQQ, UA3RDG, UA3TBW, UA4HJL, UA4HLX, UA4HPN, UA4LCH, UA4YAQ, UA6AJ, UA6AK, UA6HNZ, UA6HOF, UA6JBQ, UA6JDE, UA9ADG, UA9FFE, UA9MA, UA9MRA, UA9XM, UB4CWW, UB4JCV, UB4LAT, UB4LDD, UB5CJI, UB5DED, UB5EFA, UB5GDN, UB5IMD, UB5NQ, UB5QK, UB5VAA, UB5XBD, UB5ZY, UC2ADX, UC2LAR, UC2OR, UF6FFF, UL7ACI, UL8AWL, UM8MGO, UM9MWE, UP2BEF, UP2BPK, UQ2GKR, UQ2GKT, UR2QD, UV3DN, UV9UFP, UW3EG, UW3GL, UW8HS, UY5GG, UZ0KWC, UZ0WWJ, UZ1AXB, UZ1OWZ, UZ1TWC, UZ3WWO/P, UZ6HWW, UZ9XWA, W8VUV, Y21NE, Y21UD, Y22CF, Y23BF, Y23YE, Y24KG, Y24LA/P, Y25MG, Y26LG, Y26WM/A, Y28GC/A, Y39YM, Y43VF, Y49ZD, Y52ZE/A, Y53ZL, Y54OL/P, Y59YM, Y61XM, Y62SM, Y66ZN, Y75YL, YB8ZEA, YO2KJI, YO8MH, YU2CAH

Strays

I would like to get in touch with...

☐ hams who are graduates of the University of Notre Dame. Tim McKeogh, N8HFS, 116 Maple Ridge Rd, Chagrin Falls, OH 44022.

☐ anyone with a service manual for a Nelson-Ross Electronics Model PSA-532A/MF spectrum analyzer. Kirk Bailey, N7CCB, PO Box 1702, Corvallis, OR 97339.

☐ anyone with a schematic diagram for a Galaxy MK-V. Hugo Coscio, CP5EC, PO Box 690, Cochambamba, Bolivia.

☐ anyone with information on band-switching coils for a Hammarlund Comet Pro receiver. Edward Cambra, N9GBS, 3225 Pipers Glen Dr, Lafayette, IN 47905.

☐ any submarine veteran/hams interested in starting a net. Greg Ocfemia, KM3I, 419 Brooks Ct, Glen Burnie, MD 21061.

VHF/UHF Century Club Awards

The ARRL VUCC numbered certificate is awarded to amateurs who submit written confirmations for contacts with the minimum number of Maidenhead grid-square locators indicated in italics for each band listing. Initial qualifiers are shown first, followed by those with endorsements, for October 21, 1986 through December 18, 1986. An SASE will bring you the rules and application forms.

6 m (50 MHz)
100

185 K4DZP
186 K5MA
187 WB0VZW
188 KC9NV
189 N7DB
190 AA4FS
191 N4AVV
192 K3QM
193 WA9FIH
194 N9CC

N3BBI 250
N4MW 150
W4OO 250
K4RWP 175
W5OZI 175
WB6KLL 125
N7DB 200
W7HAH 225
WB8BKC 250
WD8CTX 175
K8GQB 150
K8WKZ 375
WA9FIH 125
WA9FYB 150
WA0DYU 175

2m (144 MHz)
100

137 N5HYV
138 KD9JQ
139 NC9F
140 K8UC
141 W2GU
142 HB9RUZ
143 NB9F
144 W0FY
145 AA4FQ

G6DZH 125
WA1OUB 150
K5YY 250
WB8BKC 125
K9MRI 275
W9FY 125
W0IZ 125

1.25 m (220 MHz)
50

13 WB2NPE
14 K5UR

WB8BKC 70

70 cm (432 MHz)
50

63 N4MW
64 KC0OG
65 KA0ABA
66 K8UC
67 KB8ZW
68 N0EKT
69 WB9UQE

AA4FS 60
WB4NXY 90
K5YY 100
WB8BKC 100
NC9F 60
W0RAP 150
W0RRY 120

23 cm (1296 MHz)
25

30 W5DFU
31 W5NZS
32 NI8O
33 K0SMI

WB5AFY 40
WB8BKC 40
K8WW 40

2.3 GHz
10

13 W5DFU
14 K7AUO
15 WB2NPE

3.4 GHz
5

11 WB5AFY
12 K7AUO
13 WB5LUA/5

5.7 GHz
5

8 K7AUO

WA5ICW 10
K5PJR 15
W5UGO 10

10 GHz
5

11 WB2ELB
12 KS2Z
13 W7UDM
14 K7AUO

K2DNR/7 10
(DM42)

Results, Fourth ARRL VHF/UHF Spring Sprints

By Mike Kaczynski, W1OD and Billy Lunt, KR1R
Contest Manager, ARRL HQ Assistant Contest Manager, ARRL HQ

Excellent! That's what many participants echoed of the 1986 Spring Sprints. The total of 448 logs received certainly confirmed that the Sprints are gaining interest. In fact, the total number of entries was up over 14% from last year. We even topped the previous record of 446 logs we received in the first running of this annual VHF/UHF event.

The 144-MHz Sprint (April 14) cut the ribbon on this year's mini contests. With cool temps in the Western mountains, snow, sleet and rain in the Midwest to the clear and cool in the East, 161 entrants saw K2SMN beat out WB2NPE (N2SB) by 27 QSOs and only four grid squares. In the West, competition was close as WA6AZP held off K6GSS and the recently transplanted K9AKS for top honors.

Eight days later, on 220 MHz, with weather conditions offering light rain and cool temperatures to the Northeast and heavy rains in the Northwest, there was no doubt that WB2NPE had it wrapped up. Of the 37 entrants, Rick's 64 QSOs and 23 grids were enough to outshoot Dave, N3CX, with his 51 Qs and 19 grids.

For the 432-MHz Sprint (April 30), a record 95 entrants submitted their logs with the goal of being number one. After a hearty battle and once the dust cleared, the 1986 432-MHz Sprint superstar was WB2NPE. A Sprint cannot be won with Qs alone! This fact was evident by K1FO's 122, compared to the 107 QSO total of WB2NPE. The grid chase was won by 'NPE, 28 to 23. On the Western front, QSOs were to determine the leaders of the pack. When it was over, KE6ZE topped K6GSS. W6RXQ and K6LMN tied for third.

On May 8, we again saw K2SMN win top honors on the VHF/UHF bands, this time on 23 cm. Of the 34 entrants, Roger's 35 Qs and 12 grids were enough to hold off WB2NPE. Just east of the Rockies, the battle was close, as NOØY topped WAØTKJ/m by one QSO and one grid to take the high score in Ø-land.

Last, but certainly not least, we had the 6-meter event on May 17. A record 122 participants were "going for the gusto" on one of the best 4-hour, 50-MHz band openings to date. "CQ E-Skip" could be heard from one end of the band to the other. Not always does the Northeast supply us with the winners, as was evident this time with WA4NJP's 40-plus-QSO romp over his nearest competitor, WA1OUB. Many in this Sprint highlighted it as the best opening ever. Scores were very close in 5-land, with KD5RO outlasting his Texas companions, N5JJ, WB5RUS, N5HHS and WA5VJB. This fine group was within 4k points of the leader.

In summary, the 1986 Spring Sprints again showed that the VHF/UHF bands are alive and well. Ending as they should have, 6 meters gave us a slugfest that will long be remembered.

Many commented that the local time contest period, especially on 6 meters, was very unfair to those who could only hope that the opening remained when the contest period began for them. Well, we heard your suggestions and agree. *Therefore, be it proclaimed, the 1987 6-Meter Sprint shall run from 2300Z May 23 to 0300Z May 24, 1987.*

With this time change we have also moved the Sprint one weekend to allow for the addition of a 902-MHz Sprint. The 902 Sprint will be held on Friday evening, May 8, 1987, from 7 PM to 11 PM (local time). The remaining Sprints will be held on the following dates: 144 MHz, April 13; 220 MHz, April 21; 432 MHz, April 29; and 1296 MHz, May 14.

Remember: April is just around the corner! Good luck!—*Bart Jahnke, KB9NM*

Score Leaders

50 MHz

WA4NJP	24,500
WA1OUB	22,127
K1TOL	19,380
WA3FYJ	16,900
KD5RO	16,878
K3ZO	16,625
N2CEI (N2BOW, opr)	14,880
N5JJ	14,742
WB5RUS	14,644
N5HHS	14,256

144 MHz

K2SMN	7,350
WB2NPE (N2SB, opr)	5,673
WB2QOQ	4,440
AA2Z	4,128
WA2TIF	3,944
N2AHN	3,888
W1XX/2	3,744
WA3HMK	3,556
WA3FYJ	3,500
N3CX	3,348

220 MHz

WB2NPE	1,472
N3CX	969
AA2Z	918
W1XX	742
K2GK	703
W2EIF	688
N2BJ	518
K4JSI	270
K1DS	240
K8DIO	234

432 MHz

WB2NPE	2,996
K1FO	2,806
WA2TIF	1,420
NI8O	1,026
KB9NM/1	884
VE3LNX	882
WA3TTS	840
N2BJ	832
K3QM	750
N2AHN	741
AB1U	231

1296 MHz

K2SMN	420
WB2NPE	240
N3CX	196
KD5RO	176
WA3JUF	162
WA2EUS	150
WB8BKC	144
W3IY	98
NOØY	77
N2BJ	75

SOAPBOX

50 MHz

Wow! What an opening (WA1OUB). With the opening yielding 17 new grids and great conditions, this contest was short but very sweet (K1DAT). Fantastic conditions on 6 meters. The most fun I've ever had in the sprint. W1AW and 34 grids (NI1ABY). Wow! (KJ4KB). VUCC in 4 hours ain't bad (WA3FYJ). You sure picked the right days for the Sprints this time. Plenty of double-hop E-skip to the West Coast. Unfortunately, the contest hadn't yet started there when we worked our 6s and 7s, so they couldn't claim contest credit for the QSOs (K3ZO). Giving three people their 50th state on 6 meters made my trip worth it (KA3B/3). Simply unbelievable! I don't know who you guys have connections with but conditions could not have been better here in Kentucky. The band was hot from Maine to Southern California. This Sprint is a testimony to the health of 6 meters (N4KCM). Best contest I've ever worked (KB4DFK). Great Sprint! Best band opening in 10 years (WA5DJJ/4). My first 6-meter contest; lotsa fun. I certainly enjoy VHF more than HF (KY9Y). While on my way to Expo 86 in Vancouver, BC, Canada, I decided to drive over to the relatively rare CN99. Despite the pouring rain, the poor QTH (deep valley with 10,000-ft peaks to the south) and only a 2-meter 5/8th-wave whip, I was able to work Southern California, with good reports (K6LMN/VE7).

144 MHz

Can't wait until June (KA2WKA). Excellent contest with lots of people operating and very good propagation (K4HWG). Really enjoy the sprints. Wish they were held in the fall too! (WD4GSM). I finally got grid number 100, thanks to VE3DWW (N4KCM). Short contests are best! (WA6AZP). Once I found a place to operate, I had a good time. The mountain that I was going to was closed. So, I parked in the Mt Pinos parking lot and radiated the California condors. There was still snow at 8500 ft, with 20-degree cold in the car (NS6X). I worked 3½ hours using only 3 W. What a chore (KA6VVD). Short operating time coupled with a bad antenna equals low score. Grid-square format is the best "shot in the arm" VHF/UHF has seen in 20 years. Very glad to see the Sprints surviving (K9LCR). I worked more stations in 3½ hours than I usually work in the entire June contest (VE3FHM).

220 MHz

Conditions were from poor to terrible. Twenty-five degrees, snow static and everyone trying to use the calling frequency (K2GK). This was a usual slow Tuesday activity night (KC4EG). Is 220 the forgotten band? Not at my house! (K6GSS). Rain was so bad that we couldn't even work the British Columbia stations (K7HSJ). Sprints should be on Saturday evenings. Bad weather and bad band conditions were supplemented by very low activity (KFØM).

432 MHz

Activity was good, but the number of active grids was down. Would you believe that the morning after there was a big tropo duct from New England to Florida? (K1FO). Sprints are great! (WA2TIF). What lousy conditions! Had a hard time hearing stations which are usually S9+ (WA3UJE). The band has been open here since 5 days before the Sprint. Glad it hung in there for the contest (WD4AHZ).

1296 MHz

This band was as dead as the proverbial door-nail! (K2SMN). We don't even spend four hours in front of 1296 at one time in a major contest! This time there was just enough action to keep everybody hopping. Band conditions were above normal (WB2NPE). Weather hurt the results as thunderstorms shut everybody down (K5IS). With lightning scatter and tropo enhancement I was able to make contacts over 350 miles into the Dallas/Ft Worth metro area with only 10 watts and a 45-element loop Yagi (NOØY). Ten watts and an 23-element F9FT in the back of a pickup truck can yield good results also (WAØTKJ/m). Very poor activity with eight regulars not on the air. QSOs should count 100-1000 points per QSO to eliminate low scores (WØKJY).

Scores

Scores are listed by call sign, number of QSOs, number of grid squares and ARRL Section. Scores are arranged by band, from 50 MHz through 1296 MHz. Under each band heading, the scores are arranged by call area. Within each call area, scores are listed in descending numerical order.

50 MHz

1

WA1OUB 22,127-203-109-NH
K1TOL 19,380-190-102-ME
W1WHL 8,136-113- 72-CT
K1DAT 6,660-111- 60-EMA
N1ABY 5,858-101- 58-CT
W1GRW 5,830-106- 55-CT
W1AW (KJ4KB,opr)
4,400- 80- 55-CT
K1VSC 2,964- 78- 38-CT
K1SRZ 2,880- 72- 40-EMA
K1ISW 2,204- 58- 38-WMA
AC1J 1,782- 66- 27-NH
AB1U 1,518- 46- 33-CT
WA1NQV 1,518- 46- 33-EMA
W1XM 1,323- 49- 27-EMA
AA2Z 1,148- 41- 28-CT
K1GPJ 725- 29- 25-ME
WA1TBV 258- 17- 15-VT
K1VZI 56- 8- 7-EMA

2

N2CEI (N2BOW,opr)
14,880-155- 96-NNJ
N2WK 6,534- 99- 66-WNY
N2AHN 5,390- 98- 55-SNJ
K3QM 3,869- 73- 53-NNJ
K2GK 2,898- 69- 42-WNY
K4BNC 2,379- 61- 39-NNJ
W2EIF 1,350- 45- 30-SNJ
WB2BPY 1,107- 41- 27-NNJ
KU2A 620- 31- 20-WNY
WV2ZOW 459- 27- 17-NNJ
N2BJ 378- 21- 18-ENY
W1XX/2 9- 3- 3-WNY

3

WA3FYJ 16,900-169-100-WPA
K3ZO 16,625-175- 95-MDC
KA3B/3 7,656-116- 66-DE
WB3JYO 6,890-106- 65-EPA
WB2DNE 6,300-100- 63-MDC
WA3YON 4,558- 86- 53-EPA
K3LOM 4,539- 89- 51-EPA
W3IY 2,665- 65- 41-MDC
W3CL 1,998- 54- 37-EPA
K3ACR 450- 25- 18-EPA
WB3IGR 450- 25- 18-EPA

4

WA4NJP 24,500-245-100-GA
AA4JI 13,490-142- 95-NFL
W3EP/4 11,523-167- 69-GA
WQ4V 11,100-148- 75-SC
W4WHK 10,570-151- 70-NFL
N4MM 9,384-122- 77-VA
N4KCM 8,768-137- 64-KY
WD4FAB 7,680-128- 60-NFL
KF4FL 7,259-119- 61-TN
N4FFO 6,600-132- 50-KY
WB4WTC 6,016-128- 47-NC
WB4CTW 5,439-111- 49-TN
KB4DFK 5,400-100- 54-VA
KS4S 5,368- 88- 61-NC
K4CKS 5,353-101- 53-GA
N4VA 4,830- 85- 58-VA
AA4FQ 3,388- 77- 44-KY
WA4GBE 2,800- 80- 35-TN
WA5DJJ/4 2,780- 69- 40-NC
WB4GFO 2,601- 61- 41-AL
WB4NNY 2,223- 57- 39-SC
WS4F 2,052- 54- 38-GA
N4MW 1,995- 57- 35-TN
N4NVP 1,344- 42- 32-VA
N2CJP 1,014- 39- 26-NC
AD4F 704- 32- 22-TN
K3KTY 432- 24- 18-SFL
W4LMJ 240- 16- 15-VA
WB1CUA 238- 17- 14-SFL
WA4MMP 63- 9- 7-VA

5

KD5RO 16,878-194- 87-NTX
N5JJ 14,742-189- 78-STX
WB5RUS 14,644-193- 76-STX
N5HHS 14,256-176- 81-STX
WA5VJB 13,050-174- 75-NTX
KI3L/5 9,398-127- 74-NM
WB5MTU 8,976-136- 68-NTX
W5FF 3,969- 81- 49-NM
WA5IYX 1,568- 49- 32-STX
AE5H 1,566- 54- 29-MS
WD5BJT/5 1,377- 51- 27-MS
K5IS 195- 15- 13-NTX

6

N6NB 4,796-109- 44-SB
W6RXQ 555- 37- 15-SCV
WA6OSX 300- 30- 10-SV
WB7UJY 180- 20- 9-ORG
WA6LLY/6 130- 13- 10-SF

7

KD7IY 984- 41- 24-ID
NF7X 903- 43- 21-WA
WB7OHF 390- 26- 15-AZ
W9SE 30- 8- 5-AZ

8

WB8BKC 4,628- 89- 52-MI
K8WW 2,600- 65- 40-OH
N8DEJ 728- 28- 26-MI
WB8TGY/m 399- 21- 19-MI
KA9QFL 2,772- 66- 42-IN

9

WD9IIX 2,442- 66- 37-IL
K9RO 2,337- 57- 41-IL
WD9FSA 1,280- 40- 32-IL
NC9F 1,250- 50- 25-IL
AF9L 684- 36- 19-IN
K9LCR/9 463- 27- 19-IL
KY9Y 300- 20- 15-IL

0

WA0TKJ 9,724-143- 68-KS
W0ETT 6,776-121- 56-CO
N0LL 5,871-103- 57-KS
WB0ZKG 5,673- 93- 61-IA
W0JRP 4,346- 82- 53-MO
W0RT 4,128- 86- 48-KS
N0FQW 3,212- 73- 44-MO
KA0CRI 2,665- 65- 41-NE
WA0DCB 2,574- 66- 39-IA
KC0QR 1,976- 52- 38-NE
WA7WDJ 1,590- 53- 30-CO
KA7TYU 1,508- 52- 29-CO
W9MHL 1,470- 49- 30-CO
WD0BQM 616- 28- 22-NE
W0KAV 504- 24- 21-NE
W0KEA 425- 25- 17-CO

VE

VE3VN 2,684- 61- 44-ON
VE2TH 1,684- 52- 32-PQ
K8LMN/VE7 378- 27- 14-BC
VE5LY 110- 11- 10-SK

144 MHz

1

AA2Z 4,128-172- 24-CT
KB9NM/1 2,628-146- 18-CT
K1WHS 2,530-115- 22-ME
WA1HYN 1,748- 97- 18-CT
K5MA 1,620-108- 15-EMA
K1DS 1,488- 93- 16-RI
W1GRW 1,246- 89- 14-CT
AF1T 844- 59- 16-NH
K1ISW 936- 72- 13-WMA
AB1U 897- 69- 13-CT
K1VSC 638- 58- 11-CT
AC1J 594- 54- 11-NH
W1AIM 476- 34- 14-VT
W1GXT 320- 40- 8-EMA
AI1K 252- 36- 7-RI
WA1NLD 245- 35- 7-CT
K1DAT 238- 34- 7-EMA
WA3EEC 105- 15- 7-WMA
KA1DHO 72- 12- 6-EMA
KB1XD 63- 21- 3-CT
K1VZI 24- 12- 2-EMA

2

K2SMN 7,350-210- 35-SNJ
WB2NPE (N2SB, opr)
5,873-183- 31-SNJ
WB2QOQ 4,440-148- 30-NNJ
WA2TIF 3,944-136- 29-ENY
N2AHN 3,888-144- 27-SNJ
W1XX/2 3,744-156- 24-ENY
K3QM 2,278-134- 17-NNJ
WB2YEH 2,139- 93- 23-SNJ
K2GK 2,080- 80- 26-WNY
W2HRW 1,965-131- 15-SNJ
WA2ONK 1,921-113- 17-SNJ
W2VO 1,836- 68- 27-WNY
WB2ODH 1,656- 72- 23-WNY
N2BKS 1,350- 54- 25-WNY
K2JIQ 1,296- 54- 24-WNY
W2EIF 1,275- 75- 17-SNJ
N2EK 1,064- 56- 19-ENY
N2WK 1,081- 47- 23-WNY
W2WGL 880- 43- 20-WNY
K4BNC 754- 58- 13-NNJ
WB2JFL 735- 49- 15-WNY
WA2MJP 704- 44- 16-ENY
KA2WKA 680- 80- 11-SNJ
K2JF 580- 58- 10-SNJ
K2OVS 564- 47- 12-NLI
WB2BPY 468- 52- 9-NNJ
NA2A 450- 30- 15-WNY
NA2O 330- 30- 11-WNY

3

WA3MHK 3,556-127- 28-EPA
WA3FYJ 3,500-100- 35-WPA
N3CX 3,348-124- 27-EPA
N3DOU 2,392-104- 23-MDC
W3IP 2,354-107- 22-MDC
WA3TTS 1,914- 66- 29-WPA
W3AUN (N3BAI,opr)
1,826- 83- 22-MDC
K3JFL 1,518- 69- 22-EPA
KR3V 1,430- 55- 26-WPA
WA3UJE 1,377- 81- 17-MDC
KB3PD 1,155- 77- 15-DE
WB2DNE 1,065- 71- 15-MDC
KA3KHZ 930- 62- 15-DE
W3XO 845- 65- 13-MDC
WA3WBU 806- 62- 13-EPA
WA3YON 585- 39- 15-EPA
KB3HH 561- 51- 11-MDC
W3GN 387- 43- 9-MDC
KA3KZF 350- 25- 14-WPA
N3DUE 234- 39- 6-MDC
W3CL 224- 32- 7-EPA

4

W5HUQ 1,827- 63- 29-NFL
K4HWG 1,460- 73- 20-VA
K4CKS 1,224- 51- 24-GA
K4JSI 1,136- 71- 16-VA
WB4CTW 901- 53- 17-TN
AA4FQ 874- 38- 23-KY
KB4EUZ 753- 57- 13-VA
W3EP/4 741- 39- 19-GA
N4JGQ 560- 56- 10-VA
WD4GSM 510- 30- 17-VA
WB4RUA 459- 27- 17-GA
N4KCM 391- 23- 17-KY
W4LMJ 342- 38- 9-VA
WD4AHZ 341- 31- 11-SFL
WB4TBF 315- 21- 15-SC
N4JNL 280- 28- 10-VA
KB4CMF 264- 33- 8-VA
WA4MMP 250- 25- 10-VA
WA4LDU 150- 15- 10-SC
K1FJM/4 140- 20- 7-SFL
K4RWP 135- 15- 9-TN
WB4WXE 80- 10- 8-GA
WL7AZB 80- 10- 8-GA

5

K5SW 1508- 58- 26-OK
KE5EP 1100- 55- 20-NTX
WA5VJB 588- 46- 13-NTX
N5HHS 458- 36- 12-STX
WB5YDE 408- 34- 12-LA
W5FYZ 385- 35- 11-LA
K5IS 117- 13- 9-NTX
N5GQB 40- 10- 4-STX

6

WA6AZP 737- 67- 11-SCV
K6GSS 702- 54- 13-SCV
K6AKS 600- 50- 12-LAX
NS6X 407- 37- 11-SB
W6RXQ 336- 42- 8-SCV
KI6O 248- 31- 8-SV
KK6C 228- 38- 6-SCV
WF6J 175- 25- 7-SV
KA6VVD 36- 9- 4-SB
WE6G 8- 6- 1-EB

7

N7ALX/7 190- 19- 10-NV
N6ENU/7 130- 13- 10-NV
NF7X 125- 25- 5-WA
K6LMN/7 120- 15- 8-UT
KD7IY 65- 13- 5-ID
WB7OHF 65- 13- 5-AZ
NJ7A 4- 2- 2-UT

8

WB8BKC 2214- 82- 27-MI
KT8W 2156- 83- 26-WV
K8NWD 1976- 76- 26-MI
K8DIO 1118- 43- 26-OH
K8NTK 1092- 52- 21-MI
WB8AAX 646- 34- 19-MI
W8NJR 486- 27- 18-OH
WB8TGY 336- 28- 12-MI
KC3CL 231- 21- 11-OH
WA8SVV 170- 17- 10-OH
K8CQA 36- 9- 4-OH
W9YT (WD9IAB,opr)
24- 6- 3-WI

9

K9HMB 4484-118- 38-IL
KA9QFL 2516- 74- 34-IN
KU9L 1292- 58- 24-IL
WD9FSA 1275- 61- 25-IL
W9UB 1240- 62- 20-WI
WD9IIX 1159- 61- 19-IL
NC9F 1134- 63- 18-IL
K9LCR 960- 64- 15-IL
KA9CAI 912- 57- 16-IL
N9EEE 874- 46- 19-WI
W9CBE 252- 21- 12-WI
K1TMM 162- 18- 9-WI
KA9QIK 124- 19- 7-IL
N9HYQ/9 102- 17- 6-IL
K9RRS 63- 9- 7-WI

0

WA0TKJ 1710- 57- 30-KS
W0VB 1150- 50- 23-MN
WB0ZKG 1128- 47- 24-IA
N0FQW 600- 30- 20-MO
KB0OW 589- 31- 19-KS
KC0QR 558- 31- 18-NE
KF0M 480- 30- 16-KS
KA0JAW 462- 33- 14-IA
NO0Y 406- 29- 14-KS
N0ADL 325- 25- 13-MN
KC0ZR 242- 22- 11-KS
KC0JI 210- 21- 10-KS
W0JRP 140- 14- 10-MO
W0KEA 30- 10- 3-CO

VE

VE3EDDW 3309-103- 33-ON
VE3FHM 1425- 57- 25-ON

220 MHz

1

AA2Z 918- 54- 17-CT
W1XX 742- 53- 14-CT
K1DS 240- 30- 8-RI
AB1U 231- 21- 11-CT
WA1HYN 198- 22- 9-CT
W1JR 126- 18- 7-EMA
AF1T 72- 12- 6-NH
W1GRW 45- 9- 5-CT
AC1J 36- 9- 4-NH
K1VZI 12- 6- 2-EMA

2

WB2NPE 1472- 64- 23-SNJ
K2GK 703- 37- 19-WNY
W2EIF 688- 43- 16-SNJ
N2BJ 518- 37- 14-ENY
NA2O 40- 8- 5-WNY

3

N3CX 989- 51- 19-EPA
W3XO 140- 20- 7-MDC
W3IP 98- 14- 7-MDC
W3CL 24- 12- 2-EPA

4

K4JSI 270- 27- 10-VA
KC4EG 70- 10- 7-KY
WD4GSM 45- 9- 5-VA
K4HWG 15- 5- 3-VA

5

K5SW 143- 13- 11-OK
WA5VJB 88- 22- 4-NTX
K5IS 1- 1- 1-NTX

6

K6GSS 60- 12- 5-SCV
W6RXQ 32- 8- 4-SCV

7

K7HSJ 18- 6- 3-OR

8

K8DIO 234- 18- 13-OH
KC3CL 9- 3- 3-OH

9

NC9F 144- 16- 8-IL
K9LCR 18- 6- 3-IL

0

KC0QR 30- 6- 5-NE
KF0M 25- 5- 5-KS
W0KJY 4- 2- 2-CO
WD0BQM 4- 2- 2-NE

432 MHz

1

K1FO 2806-122- 23-CT
KB9NM/1 884- 68- 13-CT
WA1HYN 671- 61- 11-CT
K1WHS 528- 48- 11-ME
W1JR 460- 46- 10-EMA
W1GRW 344- 43- 8-CT
AB1U 300- 30- 10-CT
K1ISW 268- 32- 9-WMA
AC1J 270- 30- 9-NH
WA1UPB 270- 30- 9-NH
WA1AYS 261- 29- 9-EMA
K1VSC 256- 32- 8-CT
AF1T 95- 19- 5-NH
K1VZI 60- 15- 4-EMA
KA1DHO 48- 12- 4-EMA
AA2Z 40- 8- 5-CT

2

WB2NPE 2996-107- 28-SNJ
WA2TIF 1420- 71- 20-ENY
N2BJ 832- 64- 13-ENY
K3QM 750- 50- 15-NNJ
N2AHN 741- 57- 13-SNJ
K2GK 578- 34- 17-WNY
W2EIF 484- 44- 11-SNJ
K2QIE 405- 27- 15-WNY
WV2ZOW 180- 30- 6-NNJ
K2QR 112- 14- 8-WNY
NA2O 35- 7- 5-WNY

3

WA3TTS 840- 42- 20-WPA
K3JFL 377- 29- 13-EPA
KB3PD 232- 29- 8-DE
WB2DNE 224- 32- 7-MDC
W3CL 203- 29- 7-EPA
N3DOU 184- 23- 8-MDC
WA3UJE 168- 24- 7-MDC
W3XO 126- 21- 6-MDC
WA3FYJ 117- 13- 9-WPA
WA3YON 105- 15- 7-EPA
KB3HH 102- 17- 6-MDC
W3GN 28- 14- 2-MDC

4

WS4F 522- 29- 18-GA
N4KCM 308- 22- 14-KY
K4HWG 256- 32- 8-VA
WD4FAB 198- 18- 11-NFL
WB4CTW 170- 17- 10-TN
WD4AHZ 170- 17- 10-SFL
W3IY 150- 25- 6-VA
K4CKS 150- 15- 10-GA
K4JSI 135- 27- 5-VA
WB4RUA 108- 12- 9-GA
WB4GFO 91- 13- 7-AL
KB4EUZ 84- 16- 4-VA
WA4MMP 18- 6- 3-VA
WQ4V 16- 4- 4-SC

5

KD5RO 392- 28- 14-NTX
K5SW 187- 17- 11-OK
N5HYV 180- 18- 10-LA
WD5BJT 128- 16- 8-LA
K7CW 88- 11- 8-NTX
WA5VJB 70- 14- 5-NTX
K5IS 35- 7- 5-NTX
K5JL 30- 6- 5-OK

6

KE6ZE 216- 27- 8-SCV
K6GSS 184- 23- 8-SCV
K6LMN 168- 21- 8-LAX
W6RXQ 168- 21- 8-SCV
N6ICV 126- 21- 6-SCV
KK6C 75- 15- 5-SCV

7

WB7UUP 48- 12- 4-WA
NF7X 21- 7- 3-WA
WB7UNU 18- 9- 2-OR
K7HSJ 12- 6- 2-OR
WB7OHF 12- 4- 3-AZ

8

NI8O 1028- 38- 27-OH
WB8BKC 589- 31- 19-MI
K8WW 560- 28- 20-OH
K8DIO 494- 26- 19-OH

9

K9LCR 85- 17- 5-IL
KR9G 60- 12- 5-IL
KA9QFL 55- 11- 5-IN
K9RRS 50- 10- 5-WI
KA9QIK 24- 6- 4-IL

0

WA0TKJ 560- 28- 20-KS
NO0Y 308- 22- 14-KS
KC0QR 204- 17- 12-NE
WB0ZKG 195- 15- 13-IA
W0RAP 180- 15- 12-IA
N0LL 150- 15- 10-KS
W0RT 150- 15- 10-KS
WD0BQM 63- 9- 7-NE
KF0M 48- 8- 6-KS
W0KJY 45- 9- 5-CO
W0VB 12- 6- 2-MN
W0JRP 9- 3- 3-MO

VE

VE3LNX 882- 42- 21-ON

1296 MHz

1

W1JR 18- 6- 3-EMA
W1XX 6- 3- 2-VT
K1VZI 3- 3- 1-EMA

2

K2SMN 420- 35- 12-SNJ
WB2NPE 240- 30- 8-SNJ
WA2EUS 150- 30- 5-NLI
N2BJ 75- 15- 5-ENY
W2EIF 20- 10- 2-SNJ

3

N3CX 196- 28- 7-EPA
WA3JUF 162- 27- 6-EPA
W3IY 98- 14- 7-MDC
WA3TTS 42- 7- 6-WPA
WB3JYO 38- 19- 2-EPA

4

WS4F 48- 8- 6-GA
WQ4V 20- 5- 4-SC
WD4GSM 9- 3- 3-VA

5

KD5RO 176- 22- 8-NTX
WA5VJB 36- 12- 3-NTX
K5IS/5 4- 2- 2-NTX

6

W6RXQ 36- 12- 3-SCV
K6LMN 36- 9- 4-LAX
KG6MN 33- 11- 3-SCV

7

K7HSJ 18- 6- 3-OR
WB7UNU 8- 4- 2-OR

8

WB8BKC 144- 16- 9-MI
NI8O 60- 10- 6-OH
K8WW 42- 7- 6-OH

0

NO0Y 77- 11- 7-KS
WA0TKJ/m 60- 10- 6-KS
W0RAP 16- 4- 4-IA
W0VB 12- 6- 2-MN
KC0QR 8- 4- 2-NE
W0KJY 4- 2- 2-CO

VE

VE3LNX 12- 4- 3-ON

Checklogs

K6PHE,WA6PZL, N6BQW, N6KV/6

ARRL International DX Contest Awards Program

Listed below are all of the plaques that will be awarded in the 1987 ARRL International DX Contest. Sponsors as of October 17 are shown adjacent to the corresponding category. If you are interested in sponsoring one or more of these awards, contact the Contest Branch at ARRL HQ.

The list of sponsored plaques may change because of *QST* lead time, so please call us for a list of what is available before sending payment. Additionally, the Kenwood Employees Amateur Radio Club, WD6DJY, has agreed to sponsor all plaques that are still available by results time. We salute all who have helped make the Awards Program such a success!

W/VE Phone—Single Operator

Category	*Donor*
All Band	Frankford Radio Club
1.8 MHz	Butch Greve, W9EWC, Memorial
3.5 MHz	Lance Johnson Engineering, KØCS
7 MHz	David L. Thompson, K4JRB
14 MHz	Dayton Amateur Radio Assn
21 MHz	Kenwood Employees Amateur Radio Club, WD6DJY
28 MHz	Windsor Amateur Radio Club
QRP	Woodbridge Wireless Club—N4MZJ and KZ2E

W/VE Phone—Multioperator

Single Transmitter	Kenwood Employees Amateur Radio Club, WD6DJY
Two Transmitter	Kenwood Employees Amateur Radio Club, WD6DJY
Unlimited	Western New York DX Assn—W2RR

W/VE CW—Single Operator

Category	*Donor*
All Band	Frankford Radio Club
1.8 MHz	Billy Lunt, KR1R and Mike Kaczynski, W1OD
3.5 MHz	Dayton Amateur Radio Assn
7 MHz	Northern Arizona DX Assn
14 MHz	Fox Cities ARC, W9ZL, Appleton, WI
21 MHz	Carl Luetzelschwab, K9LA
28 MHz	W5MYA
QRP	David Newkirk, AK7M

W/VE CW—Multioperator

Single Transmitter	W9BW Memorial—Northern Illinois DX Assn
Two Transmitter	Kenwood Employees Amateur Radio Club, WD6DJY
Unlimited	Colorado Contest Conspiracy

DX Phone—Single Operator

Category	*Donor*
World	North Jersey DX Assn
Africa	Kenwood Employees Amateur Radio Club, WD6DJY
Asia	Acadiana DX Assn
Europe	Gerald Griffin, MD, W8MEP/6
North America	Chod Harris, VP2ML
Oceania	Oregon Chordal Corps with Doc Sayre, N7AVK
South America	Kenwood Employees Amateur Radio Club, WD6DJY
1.8 MHz	Fred Race W8FR in Memory of DL1FF, a 160 Pioneer
3.5 MHz	Kenwood Employees Amateur Radio Club, WD6DJY
7 MHz	Central Arizona DX Assn
14 MHz	Don Wallace W6AM Memorial, Central California DX Club
21 MHz	
28 MHz	
QRP	

DX Phone—Multioperator, Single Transmitter

World	Gloucester County ARC
Africa	Kenwood Employees Amateur Radio Club, WD6DJY
Asia	Kenwood Employees Amateur Radio Club, WD6DJY
Europe	Metro DX Club
North America	Nick G. Lash, K9KLR
Oceania	Society of Midwest Contesters
South America	Kenwood Employees Amateur Radio Club, WD6DJY

DX Phone—Multioperator, Two Transmitter

World	Kenwood Employees Amateur Radio Club, WD6DJY
Asia	Kenwood Employees Amateur Radio Club, WD6DJY
Europe	Tom Middleton, WB4CKY and Joyce Middleton, KB4OMW
North America	John Brosnahan, WØUN
South America	Kenwood Employees Amateur Radio Club, WD6DJY

DX Phone—Multioperator, Unlimited

World	H. J. "Hoppy" Hopkins, W4SHJ Memorial—Phil Sager, WB4FDT
Asia	Kenwood Employees Amateur Radio Club, WD6DJY
North America	Willamette Valley DX Club

DX CW—Single Operator

Category	*Donor*
World	North Jersey DX Assn
Africa	
Asia	Alamo DX Amigos
Europe	Clarke V. Greene, K1JX
North America	Potomac Valley Radio Club
Oceania	Robert J. Halprin, K1XA
South America	Herbert Hoover, W6ZH, Memorial
1.8 MHz	Jim Dionne, K1MEM, and Bill Poellmitz, K1MM
3.5 MHz	Mad River Radio Club
7 MHz	Dr William R. Staples, W4SME
14 MHz	Bencher, Inc
21 MHz	Southern New England DX Assn
28 MHz	Douglas J. Woolley, N4PW
QRP	Woodbridge Wireless Club—KZ2E and N4MZJ

DX CW—Multioperator, Single Transmitter

World	George Schultz, WØUA and John Brosnahan, WØUN
Asia	Kenwood Employees Amateur Radio Club, WD6DJY
Europe	Gerald Grittin, MD, W8MEP/6
North America	Kenwood Employees Amateur Radio Club, WD6DJY
Oceania	
South America	Kenwood Employees Amateur Radio Club, WD6DJY

DX CW—Multioperator, Two Transmitter

World	Tom Frenaye, K1KI
Asia	Kenwood Employees Amateur Radio Club, WD6DJY
Europe	Kenwood Employees Amateur Radio Club, WD6DJY
North America	John C. Kanode, N4MM

DX CW—Multioperator, Unlimited

World	H. Stephen Miller, NØSM
Asia	Kenwood Employees Amateur Radio Club, WD6DJY
Europe	Texas DX Society
North America	Willamette Valley DX Club

Special Plaques

Single Operator

Category	*Donor*
W/VE Operator Combined Score	National Contest Journal
W/VE Low Power, Combined Score	Rochester DX Assn
Africa, Combined Score	N4NW, AL7EL and KC4NC
Division (CW)	K2NY Memorial—Salt City DX Assn
Call Area (CW)	Red Stick DX Assn
Great Lakes Division (Phone)	Livonia Amateur Radio Club
Great Lakes Division (CW)	Livonia Amateur Radio Club
Japan (Phone)	Western Washington DX Club
Southeastern Division (Phone)	Robert Garlough, KB4WU Memorial
USSR All-Band (Phone)	AA6BB, K1KI, KA6V, NE8Q, W2MIG, W3XU
USSR All-Band (CW)	AA6BB, K1KI, KB1FK, KA6V, NE8Q, SVØAA, W1FJ,W3XU, W5BOS, WB4TDH

Multioperator

Caribbean Multi-Single (Phone)	W5MYA
Caribbean Multi-Single (CW)	The YASME Foundation
Multi-Multi Combined World	W2PV Memorial—Schenectady ARA

Contest Corral

Conducted By Billy Lunt, KR1R
Assistant Contest Manager, ARRL

FEBRUARY

Jan 24-Feb 1

ARRL Novice Roundup, Jan *QST*, p 80.

Jan 31-Feb 1

YL-ISSB QSO Party, CW, Jan *QST*, p 83.

1-2

Classic Radio Exchange, Jan *QST*, p 83.

3

West Coast Qualifying Run, 10-35 WPM, at 0500Z Feb 4 (9 PM PST Feb 3). W6OWP prime, W6ZRJ alternate. Frequency is approximately 3.590 MHz. Underline one minute of the highest speed you copied, certify that your copy was made without aid and send to ARRL for grading. Please include your full name, call sign (if any) and complete mailing address. A large SASE will help expedite your award or endorsement.

7-8

Vermont QSO Party, Jan *QST*, p 84.

New Hampshire QSO Party, Jan *QST*, p 84.

RSGB 7-MHz Contest, phone, sponsored by the Radio Society of Great Britain, from 1200Z Feb 7 until 0900Z Feb 8. Phone only (CW, Feb 28-Mar 1). Single operator only. Exchange signal report and serial number starting with 001. Suggested frequencies: phone—7.040-7.100; CW—7.000-7.030. Non-European stations count 15 points per QSO with G, GD, GI, GJ, GM, GU, GW stations (not GB). Multiply by number of G prefixes worked. Mail by Mar 30 (Apr 27 for CW) to RSGB HF Contest Committee, PO Box 73, Lichfield, Staffs WS13 6UJ, England.

8

North American Sprint, CW, Jan *QST*, p 84.

11

W1AW Qualifying Run, 10-40 WPM, at 0300Z Feb 12 (10 PM EST Feb 11). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 147.555 MHz. See Feb 3 listing for more details.

14-16

YL-OM Contest, phone, Jan *QST*, p 84.

PACC Contest, Jan *QST*, p 84.

15

North American Sprint, phone, Jan *QST*, p 84.

20

W1AW Qualifying Run, 10-35 WPM at 2100Z (4 PM EST) Feb 20. See Feb 11 listing for more details.

21-22

ARRL International DX Contest, CW, Dec *QST*, p 80.

***CQ* World Wide 160-Meter DX Contest,** phone, Jan *QST*, p 84.

Feb 28-Mar 1

REF French Contest, phone, Jan *QST*, p 84.

RSGB 7-MHz Contest, CW, see Feb 7-8 listing for more details.

Rats Nest & Crooked Stick Contest Sprint, sponsored by the Issaquah ARC, from 2300Z Feb 28 until 0400Z Mar 1. Phone and CW. Work stations once per mode, exchange name, QTH, type of antenna, IARC member (yes or no). Max 250 W dc input. Antenna—homemade wire antenna, in any configuration as long as it includes a crooked stick support. QSO points: CW—5 pts; SSB—2 pts. Multiply by 2 for each state, province, or country. Bonus: To encourage "Elmering," contacts made with apprentice's assist +2 pts; contacts made by apprentice +5 pts. Frequencies: CW—7.075 to 7.150; phone—7.225 to 7.300. Send log to Steve Pack, WB7VAS, 4609 158th Ave SE, Bellevue, WA 98006.

Feb 28-Mar 2

YL-OM Contest, CW, Jan *QST*, p 84.

MARCH

7-8

ARRL International DX Contest, phone, Dec *QST*, page 80.

4

West Coast Qualifying Run, 10-35 WPM at 0500Z Mar 5 (9 PM PST Mar 4). See Feb 3 listing for more details.

12

W1AW Qualifying Run, 10-35 WPM, at 0300Z Mar 13 (10 PM EST Mar 12). See Feb 11 listing for more details.

14-15

Maine QSO Party

Iowa QSO Party

Continued on next page.

Exam Info

ARRL/VEC
225 Main St, Newington, CT 06111

WRITTEN-ELEMENT CREDIT AVAILABLE!

The FCC has begun allowing credit for written elements passed toward Amateur Radio licenses. Also, according to FCC staff, there will be a new Form 610 placed into circulation later this year to reflect changes resulting from both this decision and the issue on Novice Enhancement, which should be resolved sometime in the coming months.

Since the inception of the VE Program in 1984, a candidate who passed a code test but who failed a written test was issued a Certificate of Successful Completion of Examination (CSCE). The CSCE gives candidates credit for the code element passed at that test session. Also, a candidate who wanted to take *only* a code element could do so and then be issued a CSCE marked for that code element. Unfortunately, during the first two years of the VE Program, candidates could not be issued CSCEs for written elements passed.

This limitation hindered hundreds of candidates (and many would-be hams!) in upgrading because the written element(s) they had passed could not be honored at subsequent test sessions. The ARRL/VEC office has fielded hundreds of telephone calls and letters from candidates who wondered why they could not take any (or all) written-element tests and get them "out of the way" before taking code tests. They *could* take the code tests and be issued CSCEs for them without having to take a written test.

The new written-element credit provision now affords exam candidates more flexibility in arranging their study habits. Candidates can now concentrate on the written elements and "save" the code tests for later studying, or they may continue working on complete upgrades that require successful completion of both a code and written element.

ARRL/VEC VE Teams will continue, however, to administer code elements in descending order (ie, from the highest speed to the lowest speed), and will administer the written elements in ascending order (ie, from lowest element to the highest).

An unlicensed person who has already passed both the code and written elements for his/her Novice license should photocopy both sides of the Form 610 after the application has been completed and signed by both the candidate and examiner. Since CSCEs are not available for a candidate testing under the Novice exam program (one examiner), the photocopied Form 610 can be presented to the VE Team where the candidate wishes to upgrade. It is sufficient documentation that the candidate has successfully completed the elements necessary to earn the Novice class license.

Test Fee: FCC has set the maximum permissible 1987 test fee at $4.37. Test fees may be collected only to offset necessary expenses incurred in the program. For ARRL/VEC-coordinated sessions held during 1987, the test fee is $4.35. Checks or money orders are preferred and should be made payable to "ARRL/VEC." (VE Teams are not responsible for making change for test fees tendered in cash.)

What to Bring to the Session: Bring the *original* plus a photocopy of your current FCC-issued Amateur Radio license (an FCC requirement). Duplicates of lost licenses are available through the FCC's Gettysburg office. Also bring the *original* plus a copy of any temporary upgrade certificate(s) issued by VE Teams less than one year prior to the date of your exam. Two forms of positive identification (including a photo ID, if possible) and at least two pencils and a pen will be needed as well. Scratch paper and answer sheets are provided at the session.

Exam Format: Written-element exams are four-choice multiple-answer tests. A score of 74% or better is required to pass a written-element exam. Most VECs assemble their exams based on the ARRL/VEC-issued multiple-choice question pools. However, since some VECs do not, be sure that you study the material that will be the foundation of the exam(s) you will be taking. Code-test transmissions are played from an audio tape prepared by the ARRL/VEC with message contents similar in format to a typical on-the-air Amateur Radio QSO. The code test is fill-in-the-blank style, and may be passed by correctly answering at least seven out of 10 comprehension questions, *or* by copying at least one continuous minute of perfect copy from the code-test transmission. Based on the FCC's recommendation, the ARRL/VEC does not require a code sending test. Code tests may be copied on typewriters, but prior arrangements *must* be made with the VE Team so other candidates are not disturbed.

Virginia State QSO Party, sponsored by the Sterling Park ARC, from 1800Z Mar 14 until 0200Z Mar 16. Exchange QSO number beginning with 001 and QTH (county for VA stations; state, province or DX country for others). Score one point per phone QSO; two points per CW, RTTY and SSTV QSOs. No cross mode QSOs. VA stations multiply QSO points total by the sum of states, Canadian provinces, DX countries and VA counties worked. Others multiply total QSO points by number of VA counties worked. Work the same station on each band and mode for QSO credit. VA stations may contact in-state stations for both QSO and multiplier credit. Mobile stations may be worked in each county they operate for both QSO and multiplier credit. County-line stations count for only one QSO. CW frequencies are 60 kHz up from the low end of 10-80 meters, anywhere on 160 meters and Novice bands. Phone frequencies are 3.930 7.230 14.285 21.375 28.575, and anywhere on 160 meters except DX windows. Other modes in usual frequencies. Follow ARRL Standard Contest logging guidelines. Plaques and certificates will be awarded to the top scoring stations. Mail logs by April 1 to Virginia QSO Party, c/o George Foy, N4DLR, 413 N Argonne Ave, Sterling Park, VA 22170.

Wisconsin QSO Party, sponsored by the West Allis RAC, from 1800Z Mar 15 until 0100Z Mar 16. CW and phone. Work stations once per band and mode. Work mobiles again as they change county. No repeater QSOs. Exchange signal report and QTH (county for WI stations; state, province or country for others). Suggested frequencies: CW—3.550 3.725 7.050 7.125 14.050 21.150; phone— 3.890 7.290 14.290. Count 1 point per phone QSO, 2 points per CW QSO. WI stations multiply by total WI counties, states and provinces worked. Others multiply by total WI counties worked (max 72). WI mobiles may add 500 points to their score for each county outside of their home county that they make 15 QSOs from. Mail logs by April 15 (include large SASE for results) to WARAC, PO Box 1072, Milwaukee, WI 53201.

15

Zero District QSO Party

17

W1AW Qualifying Run, 10-35 WPM.

21-22

YL-ISSB QSO Party, phone.

B.A.R.T.G. Spring RTTY Contest

28-29

CQ World Wide Prefix Contest, phone.

Deadline: The deadline for receipt of items for this column is the 1st of the second month preceding the publication date. For example, your information would have to reach HQ by **Mar 1** to make the **May issue.** Please include name of contest, dates, times (Z) and complete rules. Send to Contest Corral, 225 Main St, Newington, CT 06111.

Special Events

Conducted By Billy Lunt, KR1R
Assistant Contest Manager, ARRL

Marshall Islands: Kwajalein ARC will operate KX6BU from 0600Z **Jan 31** until 0600Z **Feb 9** to commemorate the 43rd anniversary of the Battle of Kwajalein and Roi-Namur. Frequencies: SSB—14.250 21.350 28.550; CW—7.025 14.050 28.050. QSL and certificate via KX6BU, Box 444, APO San Francisco 96555-0008.

Cadiz, Ohio: The Harrison ARC will operate N8TF **Feb 1,** 1400Z-2200Z, from the birthplace of Clark Gable. Operation will be 3.875 and 7.230. For a special QSL, send QSL and SASE to Mike Mihelarakis, KC8XS, PO Box 362, Cadiz, OH 43907.

Punxsutawney, Pennsylvania: The Punxsutawney ARC will operate W3QOS **Feb 1,** 1300Z-2200Z, and K3HWJ **Feb 2,** 1300Z-2200Z, to commemorate the 100th anniversary of Groundhog Day. Suggested frequencies are 7.235 and 14.235. Certificate for SASE to W3QOS, PO Box 20, Big Run, PA 15715.

Vernon, British Columbia: The North Okanagan RAC will operate VE7NOR **Feb 6-15** to commemorate western Canada's largest winter carnival. Suggested frequency is 14.230. For commemorative certificate and QSL, send QSL and 2 IRCs via NORAC, Box 1706, Vernon, BC V1T 8C3, Canada.

Gettysburg, Pennsylvania: The Adams Co ARS will operate member stations **Feb 7-8, Feb 14-15 and Feb 21-22,** 1600-2000Z each day, to celebrate the 200th anniversary of the founding of the community. Suggested frequencies: CW—3.725 7.125; phone—3.875 7.225 14.275. For a beautiful certificate, send QSL and large SASE to Walter B. Lane, W3KGN, 34 York St, Gettysburg, PA 17325.

Libertyville and Mundelein, Illinois: The Libertyville and Mundelein ARS will operate W9HOQ **Feb 14,** 0000Z-2400Z, to commemorate 21 years of club activity. Operation will be in the Novice and General bands. Send QSL and SASE to Jim McKinnon, N9FDT, 1808 Victoria Ave, North Chicago, IL 60064.

Newburgh, New York: The Orange Co ARC will operate KB2WB **Feb 14,** 1500Z-2200Z, to commemorate George Washington's birthday. Suggested frequencies: 3.860 7.230 14.260. Also, local 2-meter repeaters and packet will be active for contacts. For certificate, send QSL and 9- × 12-in SASE (39 cents) to OCARC, c/o A. Maroney, 4 Barr Ave, Cornwall-on-Hudson, NY 12520.

Valentine, Texas: The Big Bend ARC will operate K5FD **Feb 14,** 0000Z-2400Z, on Valentine Day. Suggested frequencies: 3.922 7.240 14.290. For certificate, send QSL and SASE to Bob Ward, WA5ROE, 1402 North 5th, Alpine, TX 79830.

Taylor, Arizona: The Kachina ARC will operate WA7GWG 1500Z-2300Z **Feb 14** to commemorate the 74th anniversary of Arizona and Valentine Day. Suggested frequencies: phone—40 and 20 General bands; CW—Novice and 15 General bands. QSL via Kachina ARC, WA7GWG, PO Box 87, Taylor, AZ 85939.

New York, New York: The Telephone ARC of Manhattan will operate W2FWG **Feb 14-15** commemorating their 25th anniversary. Suggested frequencies: phone—3.950 7.250 14.250 21.400; CW—3.725 7.125 14.050 21.185. For certificate, send QSL and no. 10 SASE via Lionel Riley, K2EEL, 28 Alabama Ave, Hempstead, NY 11550.

Indian Mound, Tennessee: The Clarksville ATS will operate WD4DBJ **Feb 14-15,** 1600Z-2200Z, to celebrate the 125th anniversary of the Battle of Fort Donelson. Operation will be in the 20, 40 and 80 General phone bands. For certificate, send QSL and SASE to Nadine Burns, KB4EFW, Box 162A, Indian Mound, TN 37079.

George, Washington: W7WMO/7 will operate during George Washington's birthday party, 1800Z-2400Z **Feb 16.** Suggested frequencies are 3.950 7.250 14.295 21.425 28.600. Certificate for 9- × 12-in SASE via Eugene Bye, W7WMO, 18 J St NE, Ephrata, WA 98823.

Apache Junction, Arizona: The Superstition ARC will operate WB7TJD **Feb 20-21,** 1500Z-2400Z, to commemorate the Lost Dutchman Days. Suggested frequencies: CW—40, 15 and 10 Novice bands; phone—40, 20 and 15 General bands. For certificate, send QSL, QSO number and 9- × 12-in SASE (39 cents) to SARC, PO Box 1551, Apache Junction, AZ 85217-1551.

Deadline: The deadline for receipt of items for this column is the 1st of the second month preceding the publication date. For example, your information would have to reach HQ by **Mar 1** to make the **May** issue. Please include the name of the sponsoring organization, the location, dates, times(Z), frequencies and call sign of the special-event station. Requests for donations will not be published.

QSLing Special-Event Stations: To get your QSL or certificate from any of the special-event stations listed here, follow these simple guidelines. (1) After working the station, carefully fill out a QSL card for the QSO. Show the date and time accurately using UTC. (2) Prepare a self-addressed, stamped envelope. If sending for a certificate, use a 9- × 12-in envelope if you want an unfolded certificate, or a no. 10 envelope if folds are okay. Include enough postage for return of your envelope. (3) Mail both your QSL and your SASE to the address listed, or to the address given on the air by the station you QSO. Be patient. Special-event stations will often print their cards and/or certificates after the operation is over so they will know how many to order.

Coming Conventions

February 7-8
Florida State, Miami

February 14-15
Mississippi State, Jackson

March 13-15
Southeastern Division, Orlando, Florida

March 20-21
Michigan State, Muskegon

March 21-22
Roanoke Division, Charlotte, NC

March 28-29
Nebraska State, Kearney

March 28-29
Kentucky State, Elizabethtown

April 10-12
Missouri State, Kansas

ARRL NATIONAL CONVENTIONS

July 10-12, 1987—Atlanta, Georgia

July 21-24, 1988—Portland, Oregon

Hamfest Calendar

(continued from page 70)

Vermont Winter Hamfest at the Milton High School on Rte 7. Admission $2; under 18 free. Doors open 9 AM-3 PM. Talk-in on 146.61 or 145.47. Food and free parking available. Forums, flea market, auction and radio exams featured. Exams on a walk-in basis only; fee $4. (610 Forms are provided.) For more info, contact Mitch Stern, WB2JSJ, 802-879-6589 evenings.

†**Virginia (Vienna)—Feb 22:** The Vienna Wireless ARC is sponsoring their Winterfest 8 AM-5 PM. Admission $4. Food available. Talk-in on 31/91 and 085/685. For more info, contact Mitch Amos, 11601 Vale Rd, Oakton, VA 22124, tel 703-620-3265.

West Virginia (Fayetteville)—Feb 22: The Plateau ARA will hold their 8th annual Hamfest at the Fayetteville High School. Doors open 9 AM. Admission $3; under 12 free. Exhibitors, flea market and DX shows. Food available. Talk-in on 146.74 and 52. For more info, contact John Witt, W8OQC, 135 Daniels St, Fayetteville, WV 24840, tel 304-574-0532 or 574-1176.

Section News

Administered by Steven Ewald, WA4CMS

The ARRL Field Organization Forum

CANADA

ALBERTA: SM, Bill Gillespie, VE6ABC—A/SM: VE6AMM. SEC: VE6XC. OO: VE6TY. STM/DEC/SM: VE6ABC. After 21 years at my previous address I have moved to 10932-68 Ave., Edmonton. My new home telephone number is 438-2510 and the NARC Hot-Line telephone, with recorder, is 438-9205. Many thanks to all those amateurs and relatives that helped with the antennas and the move. Without their help, the job would have been near impossible. Amateur classes throughout the area are going strongly and we look forward to the new group of new amateurs in the spring. Reports a little slow with my not being on the air. Traffic: APSN QNI 1397, QTC 28, Informal 99, ATN: QNI 294, QTC 62. Personal Totals: VE6CPE 28, VE6ABC 9, VE6EJ 1.

BRITISH COLUMBIA: SM, H. Ernie Savage, VE7FB — British Columbia Emergency Net,3650 KHz. NM Fredi VE7EJU reports QNI 943 QTC 293. SNCs for BCEN check-ins for year 86 high QNI 364 goes to VE7BNI and VE7BNH. British Columbia Public Service Net, 3729 kHz. NM Ford VE7DDF High 208 Low 102 Total 5357. VE7EXPO WIND DOWN BANQUET AND AUCTION 150 guests enjoy the good food and talk. The VE7EXPO Committee awarded Certificates for outstanding service and the Operators of the station. Then came the auction of the signs used at station, Co-ax, power etc. were auctioned off. The bidding was brisk. The costs of these chattels were paid for and the balance went to The Shriner's Childrens Hospital. Dogwood QCWA Christmas Party was a great success. Tom, VE7BC, entertained the party with his slides and talk on China and amateur radio. Received nice newsletter from Richmond ARC also Surrey, thanks. Merry Christmas Happy New Year. Traffic: VE7BNI 364, VE7EJU 153, VE7EJW 114, VE7ANG 76, VE7XA 75, VE7FB 44, VE7FME 32, VE7EGM 17, VE7BZI 2, VE7BNH 1.

MANITOBA: SM, Jack Adams, VE4AJE—It is again my sad duty to report that Doug, VE4AME, became a Silent Key (November 1986). Doug will be missed by the Manitoba fraternity. As I took out the window while writing this report it is snowing, but was raining a few hours ago-December yet!! Nice to have old hams come out of the woodwork-listen for John, VE4AOR, who after 12 years off the air has been bitten by the bug so to speak-John is crippled and will be able to get back visiting world wide with his new KWD 940s & 922 (boot). WRIN-9 Sessions, 2 QTC, 462 QNI, MTN-29 sessions 50 QTC, 233 QNI, MMN-30 sessions 37 QTC, 851 QNI, MEPN-30 session 20 QTC, 1143 QNI. Traffic by individuals: VE4AJE 71, VE4RO 86, VE4IX 37, VE4TE 32, VE4BI 24.

MARITIME-NEWFOUNDLAND: ASM, Aaron D. Solomon, VE1OC—New Section Manager is VE1GA, Armdale, Halifax, N.S. eff. 1st. January 1987. Congratulations. VE1WF continues in charge of CRRL outgoing QSLs. VE-1 District QSL Bureau Manager, VE1FQ vacates position eff. 1st. January 1987 after 48 years of dedicated and faithful service. Brit has also written and published the HARC Bulletin for 34 yrs. His services will be missed by the VE-1 fraternity. Groups in Hfx. Truro, Charlottetown, Summerside, Saint John, N.B. actively engaged in using Packet Radio. Many Halifax Metro Amateurs took part in Search recently for a missing Hunter, VE1IH now VE7FWQ. Recent Hospitalizations-VE1AA, VE1DD, VE1QX. Speedy recovery. OMs. Silent Keys- VE1CAZ, VE1KL, VE1NI, VE3GTI, VE3RD.

ONTARIO: SM, Larry Thivierge, VE3GT—BM: VE3LST. PGL: VE3AR. SEC: VE3GV. STM: VE3CYR. TC: VE3EGO. NMs: VE3AJN, VE3BUO, VE3CYR, VE3DQK, VE3GSQ. The Kingston ARC was treated to what is we believe the first time that digital colour pictures have been transmitted for a talk using packet radio techniques. Led by TC VE3EGO, members of the Belleville TELIPAK group, demonstrated TELIPAK - a system which provides the capability for amateurs to exchange hires, error-free digital colour images, text speech and graphics. The novel aspect of the lecture and demo was that the pictures used for the talk were transmitted on packet from Belleville by Barry, VE3CJC, to Kingston where Syd, VE3EGO, received the pictures using digipeaters VE3TPK and VE3NFW. Canada becomes the third nation (after U.S. and West Germany) to have a reciprocal operating agreement with Japan. New 7J Japanese prefixes go to Canadians. NPARC provided communications for the Rick Hansen Man in Motion Tour with VE3s: AGE FOI HNH LJR LVJ LWF LWW NDF NKW OIF OZT participating. VE3NRP enjoyed a most interesting visit to YZ land where he was able to do some operating from YZ7XX's QTH. VE3PXY says it's never to late to learn and at age 81, is studying for his advanced. Despite horrendous band conditions, VE3GSQ advises that OQND has not missed a day in the past six months and Gail thanks all those who have helped out. VE3HSF is the new EC for Metro Toronto. At the annual convention of the Ontario Science Teachers Association in Toronto, convention exhibits chairman, VE3OGJ of the Scarborough ARC contacted the Club to enter an exhibit. The idea was very successful with about 300 science teachers and students introduced to amateur radio. These teachers are in a most favorable position to encourage students to become amateurs. VE3FN is sporting a new IC-751A while I picked up his old FT- 902DM. VE3NGZ has claimed the Windsor ARC's first 30th Anniversary Award certificate. Others who have qualified are VE3LFV, VE3PJF and VE3ACY. Traffic: VE3GSQ 241, VE3FAS 193, VE3DCX 157, VE3GNW 137, VE3CYR 124, VE3GT 97, VE3ORN 84, VE3DPO 79, VE3OCF 60, VE3BUO 55, VE3AJN 40, VE3AWE 39, VE3POJ 32, VE3BAJ 30, VE3WM 30, VE3GOL 29, VE3EAM 25, VE3KXD 22, VE3FGU 21, VE3KXB 21, VE3BCZ 11, VE3JHA 3. (Oct.) VE3AWE 75, VE3DQK 35, VE3KXB 30, VE3EFX 19. (Aug.) VE3POJ 9.

QUEBEC: SM, Harold Moreau, VE2BP—STM: VE2EDO. BM: VE2ALE. TC: VE2ED. NM: VE2EDO. Congrats to VE2's PAX, EW, RQ and FOT for their high score in the Canada day contest 1986, also to DUI, FGG, UMS and HQ in the CQ. WW, CW contest VE2HQ was first in 80 meter category. VE2AZC et son epouse ont ete choisi les meilleurs chefs de camp pour la saison 1986, par les membres du Club des camperus de St-Hyacinthe. VE2VIP (Trois-Rivieres) a ete tres actif lors du jamboree scout sur les ondes le 18-19 octobre 1986. Traffic: VE2EDO 141, VE2BP 58, VE2WH 40, VE2EC 19, VE2JN 12.

SASKATCHEWAN: SM, W.C. Munday, VE5WM—SEC: VE5CU. EC: VE5AQ, VE5FF, VE5HG, VE5ACI, VE5WM. TC: VE5GF. ATC: VE5XZ. STM: VE5HG. NM: VE5EE, VE5EX, VE5HG, VE5MML, VE5WM. BM: VE5WM. OBS: VE5CU, VE5JA, VE5WM. The Regina Amateur Radio Association has added packet radio mode of operation to their club station, VE5NN. Net reports received: SATN 19 SESSIONS 123 QNI 1 QTC. ARG-2 29 SESSIONS 642 QNI O QTC. MJARC-2 30 SESSIONS 344 QNI O QTC. SKTN-2 4 SESSIONS 29 QNI O QTC. PWXN 30 SESSIONS 863 QNI O QTC.

ATLANTIC DIVISION

DELAWARE: SM, Harold K. Low, WA3WIY—STM: KA3IXV. SEC: KC3TI. EC: KC3JM KA3LNK. DEC: K3PFW. PIO: WB3DPJ. SGL: AF3R. PSHR: K3JL. Due to heavy work-load of K3PFW, I have appointed KC3TI as SEC and K3PFW as DEC Sussex Co. 1987 officers DARC Pres. KX3E. VP WB3GLC. Treas. WB3GXD. AWARE having VE exams Feb 21, March 28 and April 25. For info contact AWARE headquarters. Sussex Co. exams are given by Nanticoke ARC. Contact KV3D for info. N3DCK of SARA has been publishing the news letter but has resigned. Sorry to hear that. DTN stations 247 Traffic 35 in 20 sessions. DEPN Stations 86 Traffic 17 in 5 sessions. SEN Stations 51 Traffic 3 in 4 sessions. Traffic: W3QQ 169, WB3DUG 28, KA3IXV 27, WA3WIY 26, K3JL 21, W3PVO 17, W3FEG 6, N3AXH 2. Late reports: W3PQ July 24, Aug. 19. Sept. 76. Oct 28.

EASTERN PENNSYLVANIA: SM, Kay Craigie, KC3LM—ASM: WA3PZO, KO3B, K3ZFD. ACC: KA3A. SEC: WA3PZO. SGL: WA3IAO. STM: KB3UD. PIO: W3AMQ. TC: W3FAF. This month the Valentine goes to ALL the ARRL Field Organization volunteers in Eastern PA. Whether your forte is NTS, ARES, bulletins, volunteer monitoring, public info, technical assistance, or Section administration, your work supports our common goal of a strong Amateur Radio Service. 73, 88, 33 (as appropriate!) from KC3LM! If you're not a volunteer now, there's a spot for you, new Novice or experienced Extra. We're glad to see more and more of our volunteers wearing the Field Organization call sign badges. For information on any aspect of the Field Organization, contact KC3LM. Welcome WA3DSP as an Assistant TC. At the club table, Penn Wireless officers are KA3LIM, WA3HWZ, N3DRM, WB3IRB, and KC3B. Delaware- Lehigh leaders are KU3K, W2CCE, KB3RI, and NB3L. Warminster's customized CW practice comes Mondays at 7 PM, 147.09/R, Phil-Mont has a similar service Tuesdays at 8 PM, 147.03/R. Both provide phone numbers to take requests if you aren't legal on 2 m. Interest in ATV seems to be rising in the York area. Did you know a percentage of the York Hamfest gate goes to charity? Civic-mindedness pays off in many ways! Thanks for the many club newsletters we receive. Your Section Manager, Affiliated Club Coordinator, and Section Emergency Coordinator appreciate knowing what's going on in your organization. From the great northwest, West Branch ARA reports good results from their VE program, and let's send a "good guy report" to Williamsport OO K3UWJ for helping half a dozen new members join ARRL. The other day our high school electronics class sawed the orchestra director in half and made a semiconductor. That's silly, but Penn Wireless Assn's round table technical net at 9 PM Thursdays on 146.715/R is no joke. Novices and the unlicensed can telephone for relay of queries to the net, anchored by KA3PIT. Maybe your group could start a technical help net like this out your way. Dist. 1 ARES was asked for backup comm for a UNICEF torch run. WB2OOB has become DEC 2. Dist. 3 ARES Net is now controlled by KO3M. KO3B is now EC for Lycoming County in District 7. Many young hams need money for school. ARRL Foundation and the Foundation for Amateur Radio offer many good scholarships they can apply for. Look out for publicity on these awards. SECTION NETS, October (QNI/QTC): EPA/490/145, EPAEPTN/578/202, PTTN/267/97. LOCAL NETS, October (QNI/QTC): MARC ARES/62/2, MARCTN/173/56. TRAFFIC (October): N3AZW 531, N3COY 174, KA3DLY 109, W4UO 88, N3DRM 87, KA3IME 83, WA3GUK 80, W3JKX 68, KB3FW 55, AA3B 52, N3EFW 40, KB3UD 35, W3DP 31, W3KAG 30, WA3CKA 23, W3AQN 20, W3TWV 18, K3WPI 18, W3CL 17, W3FAF 16, WB8KPE 9, W3VA 5, K3YD 4.

MARYLAND-DC: SM, John A. Barclet, KJ3E— Second notice! Have you nominated your choice for the next Maryland-DC ARRL Section Manager? "Happenings" column in this issue of QST has the details. Let's have several valid candidates! Packet radio, certainly on VHF, is booming in MDC. W3IWI reports his bulletin board message count passed 30,000 during the first week of December; he says his is the busiest pbbs in the world and that so far that fact is unchallenged! KJ3E, having heard much talk about integrating packet and the National Traffic System (NTS), but seeing little formal traffic in the packet networks, decided to "integrate" by loading the local bulletin boards with ARRL type radiograms. A few new packet "keyboard" operators have now discovered how to send messages around the country and PKT/NTS integration in MDC developes. K3RXK, MDC Section Emergency Coordinator, and I have asked W3ABC, the Atlantic Division Director to propose a new section-level position, that of Public Service Coordinator supported by Public Service Station appointees. We think the SEC, EC and ARES is being overworked in many places by requests for support of parades, runs, and other public gatherings. W3ABC has forwarded the proposal to Newington. Note: the proposal certainly does not restrict activity in both the ARES and public service areas! The MDC section staff desires a list of high school radio clubs, including the school name and address plus the name of the licensed ham spearheading the club. Also, a list of licensed amateur radio operator faculty members in those schools without a ham radio club. Please send the desired information to me, KJ3E. KY3R is chairman of the Montgomery ARC Antenna Ordinance Committee working against proposed antenna restrictions in that county. NB3P reports that as a result of his open house for Boy Scouts on Jamboree-On-The-Air day he now has five boys working on the radio merit badge. Laurel ARC started their holiday banquet with a free half-hour "attitude adjustment" period! ?? KA3T reports the Westlink Amateur News Bulletin is aired Tuesday at 7:15PM on KA3LAO/R, 147.18. With the nets: Net/Manager QND/QTC/QNI: MDD/W3FA 58/165/438, MEPN/N3EGF 31/141/961, MAVEN/KA3FRB 4/87/52, MSN/KC3Y 30/61/365, WRPON/WB3FK 21/18/257, FREDCARES/K3RXK 4/13/78; BCN/KA3OFS 4/2/68, MDCPON/W3OYY 4/2/50. PSHR: W3FA 99, N3EGF 94, KK3F 88, K3FXK 82, KC3Y 78, W3YVQ 73, KJ3E 70 WA3YLO 67. Traffic: KK3F 600, KC3Y 266, WA3YLO 212, KJ3E 169, NC3Z 151, WB3EFG 148, W3FA 101, K3NNI 101, N3DE 89, N3EGF 70, KT3T 55, K3RXK 50, W3YVQ 40, W3LDD 38, KA3T 36, KC3DW 35, N3RO 33, WA2WDT 24, KX3U 22 WB3BFK 19, W3DQI 17, KA3PUH 11, WB3KJT 11 KA3IID 8, WA3VPL 6, WA3GYW 3, W3ZNW 2.

SOUTHERN NEW JERSEY: SM, Richard Baier, WA2HEB—SEC: K2QIJ. STM: WB2UVB. ACC: K2IXE. TC: KA2RAF. PIO: VACANT. SGL: KA2KMU. BM: WB2UVB. OOC: WA2HEB. ATCs N2BQT, K2JF, KA2RJA and WB2MNF. Please note that Jon Pierce, WB2MNF of Medford, is now an Assistant Technical Coordinator for the section in the area of packet radio. Jon runs the very popular WB2MNF PBBS on 145.03 and occasionally gives "seminars" on the air concerning packet. Jon obviously can be reached on his BBS or at his address: 109 Pine Cone Trail, Medford 08055. Good news. The Delaware Valley Radio Assn., being a Special Service Club, is authorized to issue the following awards: Worked All States, 5-band WAS and the VHF/UHF Century Club awards. Their Awards Manager is Frank Caperello, N2AHN. For information on how to go about getting your QSL cards verified for any of these awards, contact Frank at: 56 Main Blvd.,Trenton 08618. Is your club going to be conducting Amateur Radio classes or be giving VEs in the next few months? Please either give me a phone call or drop me a line. I often get people calling me for this type of information and it would really be a help to me. Thank you. Until next month, 73. Traffic: WB2UVB 165, NG2T 30, KA2CQX 28, WA2MGV 26, WA2HEB 6.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA—CLUB OFFICERS: ARATS NO2E W2VEX WA2BYN; GRAM WB2BRW NA20 KC2QQ WB2JOD; RAWNY KA2IWJ W2CUU KA2EXI KD2V; STARS KA2RFT KA2DDP K2QNQ WA2VER KA2MJX. Appointments: (EC) N2GFW Tompkins Col, WB2MVX Cayuga; (SEC) NN2H. NN2H takes the helm of A.R.E.S. on January first. Many thanks to KB2KW for his efforts and accomplishments as SEC during 1986, Chuck will contivue as DEC in Southern District. Public Service Honor Roll: N2ABA N3DPF N2EIA N2EVG WA2FJJ VE2FMQ W2FR NN2H WB2IDS W2MTA KU2N WB2NLU WB2OWO WB2RBA ND2S KA2UBD NE2W K2YAI W2ZOJ. November BPL: WB2IDS.

NYSEMO	119	005	05	N2AGO
NYS/M*	338	297	30	WB2EAG
WDN/M*	338	149	30	WB2OWO
Mike Fd	205	062	30	VE2FMQ
NYPON*	686	402	30	WB2IDS
Q Net	318	006	29	KA2CMQ
VHF THIN	040	000	04	WB2OWO
STAR*	219	086	30	NE3B
OCTEN/E*	644	095	30	WB2HLY
WDN/E*	510	194	30	WB2OWO
NYS/E*	370	258	30	KU2N
NYSR	026	008	05	W2MTA
Blueline	290	035	29	WA2SEF
JCARCN	376	009	29	WB2HBU
NYSPTEN	638	061	30	NS2Z
ESS	378	100	30	W2WSS
BRVSN	364	005	30	WB2OFU
CNYTN	211	072	29	WA2PUU
MVTN	015	040	08	KA2OQB
OCTEN/L*	243	066	30	WB2HLY
WDN/L*	454	149	30	WB2OWO
NYS/L*	259	113	30	KU2N

*NTS Nets. NYTN October 101-26-28 KA2DQA. LCARES Nov. 084-7-6. Special Service Club Radio Amateurs of Greater Syracuse (RAGS) now has a VHF Awards Manager; KA2K will validate VUCC applications in Syracuse area. It is with deep regret that we record Hank Blodgett, W2UTH, as a Silent Key. Hank was an ARRL Assistant Director, past President of RARA and SIARC, and a Director of AWA. PACKET RADIO: KC2TF, appointed NTS Second Region Packet Manager, is working with SMs and STMs in the second call area to implement Packet integration into NTS as described in last month's column. WNY STM W2ZOJ is soliciting "dual mode" stations interested in doing liaison to the Section Node Station(s). W2ICZ elected a Director of the New York State Packet Forum. At a NYSPF meetng in Batavia, Local Area Networks (LANs) were described: 145.03 in Rochester area, 145.05 in Buffalo area, 145.07 in Binghamton-Elmira area. NYSPF adopted a six meter Packet Frequency Plan for 51.91 to 51.99 Mhz, in addition to its two meter plan for 144.97 to 145.09 and additional 2M expansion frequencies. Additional frequencies adopted were 220.55, 220.60, and 446.90 Mhz. Further expansion of the NYSPF Plan is anticipated at its next meeting on March 28 in Binghamton. Officers of New York State Packet Forum (for Upstate New York) are: President KB2HQ, Vice President W2DUC, Coordinator WB2WHD, Secretary K2VD. GB CR. Traffic: KA2UBD 484, WB2OWO 434, WA2HSB 413, WB2IDS 410, N3DPP 303, WA2FJJ 294, N2ABA 244, W2MTA 235, VE2FMQ 216, KU2N 215, NN2H 199, NE2W 192, ND2S 180, N2EIA 174, K2YAI 162, WB2QIX 128, W2FR 105, W2ZOJ 98, WA2JPB 96, KA2DBD 85, WB2IJH 84, WB2NLU 79, N2EVG 69, WB2RBA 64, W2UYE 64, WB2KCT 53, AF2K 52, W2GJ 43, WB3CUF 31, WA2DDD 30, WA2OEP 21, NE3B 16, K2IUT 6. (October) KA2DQA 81, K2VR 2.

WESTERN PENNSYLVANIA: SM, Otto L. Schuler, K3SMB—SEC: WA3UFN. STM: WN3VAW. PIO: KC3TO. OOCOOR: KJ3Q. SGL: W3DTW. TC: K3LR. BM: KR3P. ACC: AK3J.

NET	QNI	QTC	SESS	KHz	T/D	MAN
WPACW	234	136	30	3585	7:00P	WA3UNX
WPAPTN	460	90	30	3983	6:00P	WA3HLN
KFN	210	87	20	3958	1:00P	N3EMD
PFN	220	139	30	3958	5:00	WA3THT
WPA2MTN	354	121	30	146.28/88	8:00P	KA3BGC
NWPA2MTN	399	32	28	144.53/ 45.73	10.00P	

KC3NY Net Manager above net.

KSSN	71	40	20	3730	6:30P	KA3NQA.

On November 19, 1986, the Federally—ordered test of radiological emergency response plans and preparedness in support of Nuclear plants. The Beaver Valley Power station Fixed Nuclear Facility was the site selected. Amateurs in Beaver County were alerted for the test, and they had backup in Allegheny County, Butler, Washington counties. These counties had shelters set up for running decontamination tests as various schools where moved from the area endangered by the release of radio-active materials. The drill was a success and the amateurs who aided did a fine job. The Amateur Tansmitters of WPA celebrated it 60th anniversary this month. Our best wishes for its continued success. WA3HLN, the manager of the WPAPTN, was hospitalized for a couple of weeks and is now back home. I was also in for 10 days, and we want to thank everyone for their concern. Traffic is down quite low this month, and I hope it will pickup this coming month. These past months have been good ones for the section as many events took place using us for a great many. Traffic: KQ3T 291, N3EMD 147, N3AES 122, W3OKN 116,

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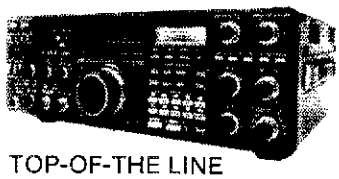

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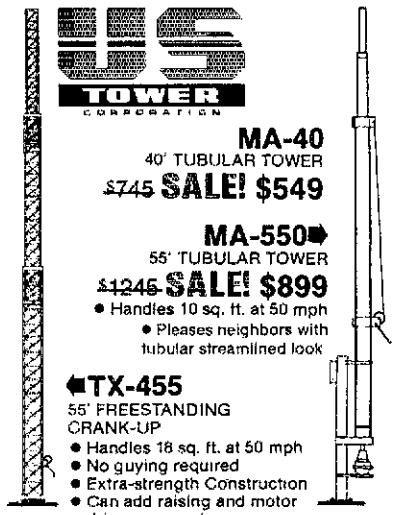

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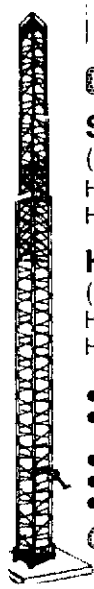

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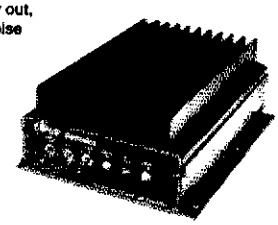

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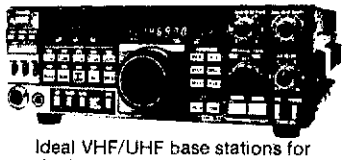

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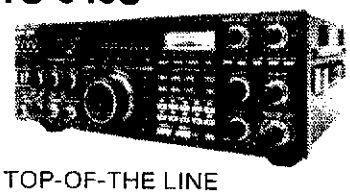

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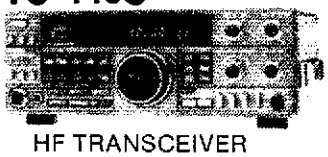

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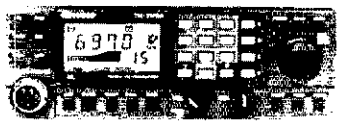

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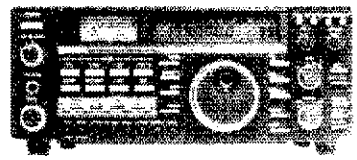

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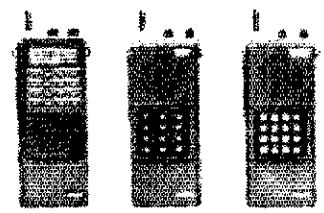

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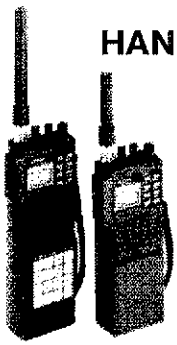

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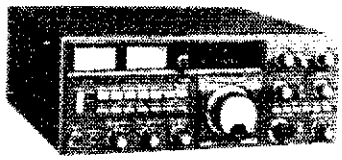

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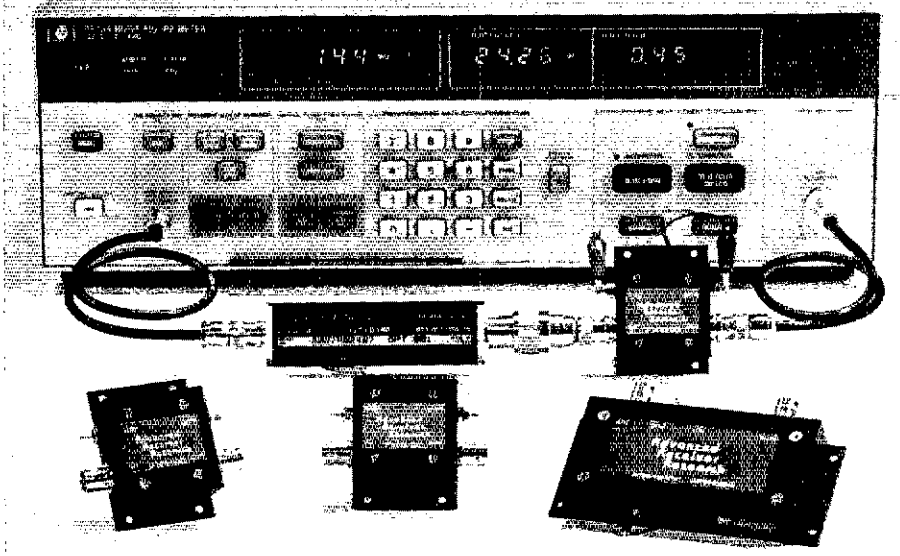

Receive Only	Freq. Range (MHz)	N.F. (dB)	Gain (dB)	1 dB Comp. (dBm)	Device Type	Price
P28VD	28-30	<1.1	15	0	DGFET	$29.95
P50VD	50-54	<1.3	15	0	DGFET	$29.95
P50VDG	50-54	<0.5	24	+12	GaAsFET	$79.95
P144VD	144-148	<1.5	15	0	DGFET	$29.95
P144VDA	144-148	<1.0	15	0	DGFET	$37.95
P144VDG	144-148	<0.5	24	+12	GaAsFET	$79.95
P220VD	220-225	<1.8	15	0	DGFET	$29.95
P220VDA	220-225	<1.2	15	0	DGFET	$37.95
P220VDG	220-225	<0.5	20	+12	GaAsFET	$79.95
P432VD	420-450	<1.8	15	-20	Bipolar	$32.95
P432VDA	420-450	<1.1	17	-20	Bipolar	$49.95
P432VDG	420-450	<0.5	16	+12	GaAsFET	$79.95
Inline (rf switched)						
SP28VD	28-30	<1.2	15	0	DGFET	$59.95
SP50VD	50-54	<1.4	15	0	DGFET	$59.95
SP50VDG	50-54	<0.55	24	+12	GaAsFET	$109.95
SP144VD	144-148	<1.6	15	0	DGFET	$59.95
SP144VDA	144-148	<1.1	15	0	DGFET	$67.95
SP144VDG	144-148	<0.55	24	+12	GaAsFET	$109.95
SP220VD	220-225	<1.9	15	0	DGFET	$59.95
SP220VDA	220-225	<1.3	15	0	DGFET	$67.95
SP220VDG	220-225	<0.55	20	+12	GaAsFET	$109.95
SP432VD	420-450	<1.9	15	-20	Bipolar	$62.95
SP432VDA	420-450	<1.2	17	-20	Bipolar	$79.95
SP432VDG	420-450	<0.55	16	+12	GaAsFET	$109.95

Every preamplifier is precision aligned on ARR's Hewlett Packard HP8970A/HP346A state-of-the-art noise figure meter. RX only preamplifiers are for receive applications only. Inline preamplifiers are rf switched (for use with transceivers) and handle 25 watts transmitter power. Mount inline preamplifiers between transceiver and power amplifier for high power applications. Other amateur, commercial and special preamplifiers available in the 1-1000 MHz range. Please include $2 shipping in U.S. and Canada. Connecticut residents add 7-½% sales tax. C.O.D. orders add $2. Air mail to foreign countries add 10%. Order your ARR Rx only or inline preamplifier today and start hearing like never before!

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Description		Boom Length	Price *
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144 MHz	4 Element	3'8"	44.00
144 MHz	9 El Portable	11'4"	60.00
144 MHz	9 Element	11'4"	55.00
144 MHz	2 x 9 Cross	11'8"	86.00
144 MHz	13 El Portable	14'6"	78.00
144 MHz	17 Element	21'6"	119.0
435 MHz	9 Element	4'1	59.00
435 MHz	19 Element	9'3"	68.00
432 MHz	21 Element	15'1"	81.00
435 MHz	2 x 19 Cross	9'6"	75.00
144/435 MHz	9/19 Oscar	9'10"	78.00

Description		Boom Length	Price *
902 MHz	23 Element	8'3"	59.00
902 MHz	4 x 23 Quad Kit	8'3"	325.00
1296 MHz	23 Element	5'9"	59.00
1296 MHz	55 Element	15'1"	69.00
1296 MHz	4 x 23 Quad Kit	5'9	325.00
1296 MHz	4 x 55 Quad Kit	15'1"	435.00
2M, 70cm	2-Port PWR Divider		68.00
35cm, 23cm	2-Port PWR Divider		58.00
2M, 70cm	4-Port PWR Divider		76.00
35cm, 23cm	4-Port PWR Divider		66.00

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WA3UNX 97, N3CZW 93, KQ3M 63, KC3YE 59, WA3DBW 49, KA3NVZ 46, N3FM 43, W3KMZ 42, K3SMB 38, W3RUL 37, K3LTV 28, N3EKJ 17, KC3JQ 14, W3SN 9.

CENTRAL DIVISION:

ILLINOIS: SM, David E. Lattan, WD9EBQ—SEC: W9QBH. STM: OOC: W9TT. BM: K9EUI. SGL: W9KPT. PIO: K9IDQ. ACC: WB9SFT. TC: N9RF. ASM: AA9D. Attention Illinois OBS appointees and others who have had trouble copying W1AW bulletin transmissions of late: Illinois Bulletin Manager K9EUI transmits the ARRL bulletins each week at 1900 CST Monday evenings on 3620 kHz, on 60 WPM Baudot RTTY. If the sked is missed, backup time is 2100 CST. If you utilize this service, drop EUI a card with your location and a reception report. OBS K9GXU has been sending hard copies of the the bulletins to 73 clubs in the St. Louis area. November 15th saw the formation of the Illinois Repeater Association by about sixty repeater enthusiasts from throughout Illinois who met in Bloomington on that date. By-laws were approved and interim officers to serve until the first official annual meeting in early were elected. By the time this goes to press all repeater owners in Illinois should have received a packet including IRA bylaws, coordination criteria, and a membership application. If you are a repeater trustee or owner and have not received this information contact WD9EBQ. Congrats to Clif, WA9MAD who is a proud new papa, with harmonic Amy making her QRM debut on November 19th. Clif also reports that PACKET and the KJ9L BBS are playing an increasing role in the delivery of NTS traffic in the Chicago area. Special thanks to all the folks who put together the RARA/EARS hamfest and Illinois state convention. The event was well attended and it was a pleasure for both SEC W9QBH and myself to attend. DuPage county EC N9CIB reports that on November 7th the Dupage Co. Chapter of the American Red Cross held a "Shelter Experience" excercise in Westmont. The dupage ARES net on 146.01/61 was opened and the shelter site manned by ARES members for the duration of the 18 hour excercise. An evaluation meeting after the event was attended by both ARC and ARES personnel. Nine pieces of traffic were originated into NTS during the excercise which served as the SET for Dupage County ARES. Traffic: W9HLX 238, KA9FEZ 164, NC9T 155, W9EHS 136, W9HOT 129, W9HBI 113, W9NXG 101, WA7MAD 95, KD9K 67, WA9VLC 76 W9LWH 60, K9CNP 54, W9KR 52, K9EUI 45, NN9M 45, W9LNQ 31, KA9BBV 19, KA9CTW/T 19, N7DOY 19, WD9DZU 18, KD9TK 14, WB9TVD 13, N9EDK 12, K9QEW 11, WD9HQW 10, W9JUM 8, W9VEY/M 8, K9WMP 5, WA9RUM 5, W9UHD 3.

INDIANA: SM, Ron Koczor, K9TUS—ASM: W9UMH. SEC: WB9ZQE. STM: W9JUJ. ACC: K9TUS. TC: K9PS. SGL: WA9VQO. BM: KC9TA. PIO: KD9DU, QIN KJ9J, ICN KW9D, VHF W9PMT, IWN KA9ERC.

Net	Freq	Time Daily UTC	QNI	QTC	QTR	Ses
ITN	3910	1330/2130/2300	3572	404	2581	90
QIN	3656	1430/0000/0300	636	363	1457	90
ICN	3705	2315	147	33	765	27
IWN	3910	1310	1590		333	30
IWN	VHF	Bloom./Kokomo	2061		305	60
Hoosier VHF Nets:			4929	79	4313	185

APPT: N9ADS, EC Allen County; N9FXT, NM Lake County ARES Net. Silent Key, KA9DMJ, Muncie. OO report revd from N9CJT. Indiana rep. 100% on D-9RN tnx to W9JUJ and N9DWU. BPL: W9JUJ, with 740 QTC...does she never sleep! The deadline for information to get into this column is the 5th of the month. ARES members responded to an acid spill in Hammond last month. Red Cross, Salvation Army and Civil Defense were assisted. Well done and thanks to N9DTG for the report! ARRL appointees: you can get ARRL name badges from several sources now in a color depending on your appointment. Write me for details. SSC of month is Porter County ARC, which celebrated its 10th anniversary recently. Newsletter is STRAIGHT KEY and is excellent! Contact person is KA9TAD. Group has about 60 members and is a general interest club operating both voice and digital repeaters. Group is active in SET, FD and offers training classes. Congrats PCARC! Club officers remember that 1987 annual report forms will soon be arriving from Hqtrs. PLEASE return them and maintain your active affiliation. Exciting things will happen when the Pan-American Games come to Indiana later this year and ham radio will be an active participant. Keep your ears open to learn how you can help. There'll be work for all! Remember that 1987 is the 50th anniversary of the ARRL DXCC program. Plan to take part in the special commemoration activities planned. See you all at the February 22 Laporte Winter Hamfest . . . my first visit to that area of the state. I'd like to meet you there. Info on Vol Exam sessions can be gotten from NCSs on ITN, QIN and ICN. All Appointees: remember that your League membership must be maintained to keep your appointment. Station reports for October: W9JUJ 740, KJ9J 251, W9JZV 132, K9WWJ 86, WD9DWD 58, KD9ER 58, WA9OLW 56, KW9D 52, WB9AWI 45, KB9HH 37, WD9HII 36,WB9PFZ 30, KA9RNY 28, W9BTZ 24, K9KTB 23, W9ZGC 22, WB9IHR 19, W9PMT 19, KA9LOM 15, K9ZBM 11, KA9QMI 10.

WISCONSIN: SM, Richard R. Regent, K9GDF—SEC: W9OAK. STM: K9UTQ. ACC: KA9FOZ. BM: WB9JSW. OCC: NC9G. PIO: K9ZZ. SGL: AG9V. TC: K9GDF. KA9JOL, a Kaukauna Police Officer, formed HAMS (Highway Amateur Monitoring System) against drunk drivers. They voluntarily report suspected drunk drivers to police, and this idea is spreading throughout the nation as local amateurs help area law enforcement agencies with the serious problem. W9MDP is a new OO and PIA in Appleton busy promoting Amateur Radio in newspapers and at schools. West Allis RAC has awarded K9WTF as their Member of the Year for 1986 and elected new officers: Pres. W9YCV; V.P. WB9HGS; Sec. K9ILV; and Treas. WA9POV. Green Fox ARC new officers are: Pres. WB9ZRE; V.P. KC9EY; Sec. KA9VOA; and Treas. N9EDV. Grafton Chamber of Commerce still complimenting the dozen Ozaukee RC members for their communications assistance at the 60-unit Chrstmas Parade, February 21st, walk-in exams begin at 9 AM at WCTI, 800 Main Street, Pewaukee, with WD9JKZ. February 28th, all amateurs and their spouses are welcome to the Ozaukee RC Post Everything Party at the Port Washington O&G Club, social at 6 PM with dinner a 7 PM; bring a grab-bag exchange gift; program will be recent slides of local ham's stations. Sheboygan County ARC members have been donating ham equipment to build their super club station and will have a Valentine Dinner February 13th at Durand's Supper Club. Like to get some free Emergency Communications training with a group that is ranked top nationwide for its programs, goals and activities? The Milwaukee ARES group is the place to be, contact EC WB9SMM for details. Milwaukee ARES Net meets Mondays, 9 PM on 146.67 MHz. Taylor County ARES members wear ARES vests at Public Service events and carry Taylor County Emergency ID cards. W9VQD and W9COG received plaque for 50 years of loyal League memebership. Special PSHR certificate to W9CBE for qualifying 12 consecutive months. Sorry to report Silent Keys W9OFL, N9BMI, W9LJY and W9RSA. Have questions about Packet Radio? Write to Wisconsin Amateur Packet Radio Association, P.O. 1215, Fond du Lac, WI 54935. Traffic: WB9YPY 1177, KA9RII 364, W9YCV 219, K9GDF 178,

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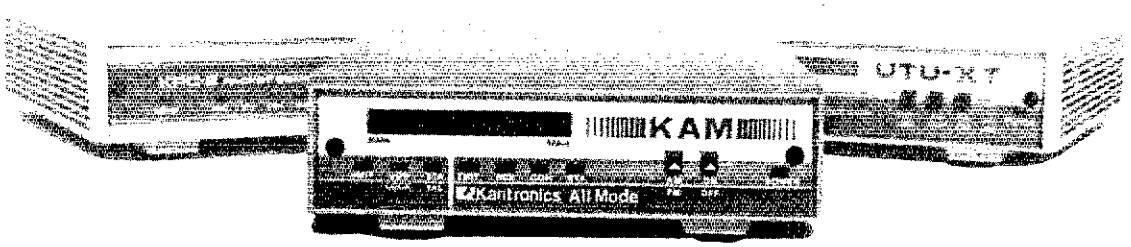

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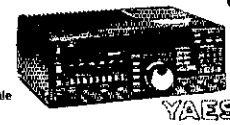

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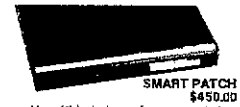

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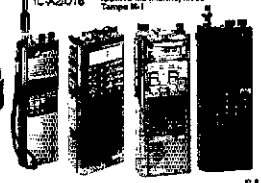

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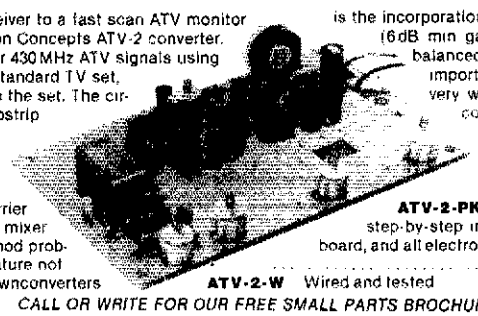

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DAKOTA DIVISION

MINNESOTA: SM, George Frederickson, Jr. KCØT—SEC: KAØARP STM: KDØCI. Hello again. The Twin City FM Club reports nearly 1700 people attended Hamfest Minnesota & Computer Expo in Richfield. This was a 50% increase over last year. Congrats to TCFMC for a job well done. WAØCEL reports the Warroad repeater is now on the air operating at 147.75/.15 MHz. ARRL membership in Minnesota is now at 2372. NET NEWS: Our public service nets are now at the mercy of mother nature during the evening hours. MSPN/E manages to get its net over by the time 75 meters falls out. Our CW nets continue to carry on. MSN/RTTY and MNAMWXNT have had the worst of it. WDØBGS has resigned as Mgr of MSPN/E effective Dec 1. KAØBFP is now Mgr, having served as Assistant Net Mgr. and NØFKU is the new Assistant Net Mgr. and NØFKU is the new Assistant Net Mgr. The Minnesota Section SKYWARN Weather Net has commenced operations for the winter months. They have set up a training net Saturday mornings at 10 AM on 3929 kHz. Look for this net to be activated at anytime during the winter if an emergency is declared. Minnesota "Ham of the Month" for November is Gloria Qvern, KAØCDC, of Bemidji. Our sympathies to the families and friends of the following Silent Keys: Verne Anway, NMØD, Robert Rysavy, KAØPPG, Louis Demortis, WBØSPF, and Tyler Rude, KØZQL. Axel Holmes, KNØP, has embarked on a new career, Editor of the Bois Forte News. This new publication serves the Bois Forte Band of Chippewa Indians at Nett Lake. Our congrats to him and good luck in his venture into journalism. By the looks of his paper, it would seem he's off to a fine start. Another Minnesota Section amateur is about to emark on a career in journalism. Dave Kleindl, KAØBFP, will succeed yours truly as editor of this column beginning next month. I want to thank all the individuals and clubs who have supported my efforts during the past four years and I hope you will give him the same support. I've enjoyed working with you all, and hope to continue to work with many of you as Section Traffic Mgr. where I will remain active for the time being. 73 de KDØCI.

NET	FREQ	TIME	QNI/QTC/SESS	MGR
MSN/RTTY	3620	6:30P	54/1/11	WAØLUT
MSN/1	3685	6:30P	470/96/30	KAØEPY
MSN/2	3685	10:00P	328/34/30	NCØE
MSPN/N	3929	12:00P	566/84/30	WBØWNJ
MSPN/E	3929	5:30P	1129/149/30	WDØBGS
MNAMWXNT	3929	6:15P	321/170/25	KØOGI
PICONET	3925	9:00A	4262/334/161	WDØBAC

EMERGENCY FREQ: 3929 BULLETINS: 3685 & 3929 MN/MSO: 3620. Traffic: WAØTFC 363, KAØEPY 269, KDØCI 237, KAØARP 174, KT9I 135, WØGRW 105, KAØODO 89, KØOGI 76, KAØSBY 73, W9DM 68, WAØNE 68, KDØCI 55, NØFOO 50, WDØGUF 48, NØCLS 46, KØBR 43, WBØWNJ 35, KAØPQW 28, KAØAJF 24, NTØB 17, KCØT 17, KAØBFP 16, NØEWA 12, KAØPDM 12, WØKYG 11, KDØNH 10, KAØCDC 4. (Oct.) KDØNH 21.

NORTH DAKOTA: SM, Lois Jorgensen, WAØRWM—The net has started on 3883. It is on 3 times each day except Sunday. The Net Controls are 1330Z NØBQW 1500Z WØCDO and 1830Z. Lets give them reports even if nice wx. Thanks a lot guys for your time and FB. CDARC of Bismarck had their annual Gateway Mall display for the public, a good way to get Novice class recruits introduced and pursuits within Amateur Radio. They will start classes in Jan. The RRRC of Fargo reports 23 students in the Novice Class. Hope you have got nominations in for SM, and everyone votes when Election comes in April.

NET	FREQ	MGR	SESS	QNI	QTC
GOOSE RIVER	1990	WØCDO	5	182	7
ND WX NET	3883	WØGFE	41	430	54
DATA	3883	KAØFSM	31	656	37
NORTH FORTY	04/64	NOØH	5	43	0

Traffic: KAØFSM 71.

SOUTH DAKOTA: SM, R.L. Cory, WØYMB—STM: NØABE SEC: KAØKPY South Dakota now has a total of 47 Packet station in the state. For a list and map send a SASE to NØABE, Ole Johnson, 1321 Costa Rd, Sioux Falls S.D. 57105. The South Dakota Section emergency test was a huge success. HF and Packet and two-meter repeaters were linked together for state coverage of WX information to the wx service for a simulated test of communication failure. All traffic was accurate with what was actually sent in on there own system. It is now official that the Lake Area Radio Klub of Watertown will host the 87 Dakota Division Convention on Sept 18-19-20. I hope that everyone has contacted their representative in the legislature and urged support for the bills to remove the $10 fee on our call letter license plates. Traffic: KØERM 164, KØZBJ 104, WØHOJ 70, WAØVRE 62, WØMZI 33, WBØOMF 32, WØYMB 19, NØABE 17, KAØUEH 6.

DELTA DIVISION

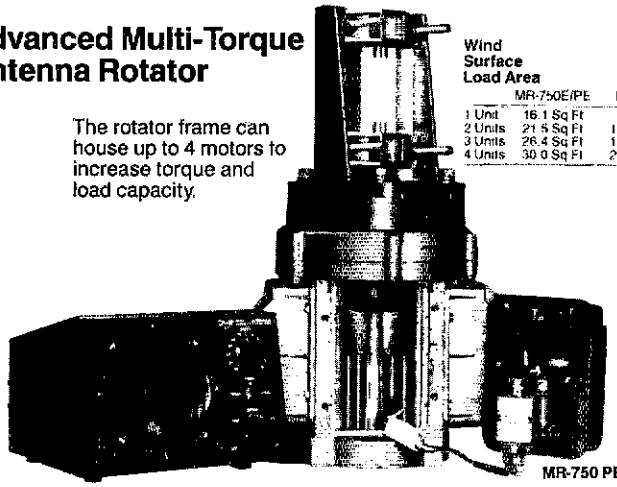
ARKANSAS: SM, Joel M. Harrison, WB5IGF— ASM:K5UR. SEC: N5BPU. STM: W9OK. ACC: NI5D. SGL: W5LCI. TC: W5FD. Repeater Coordinator: WB5FDP. Congratulations to the Northwest Arkansas ARC on becoming a Special Service Club. The 1987 Delta Division Convention in Little Rock April 4 & 5. DON'T MISS IT. The Arkansas Razorback Net now meets on 3987.5 kHz at 6:30 PM. At press time, I have just completed reviewing several newsclippings from the Ho' Springs Progress on the radio clubs installation of an amateur radio station at the Mid-America Musuem. The Hot Springs ARC is to be commended on their enthusiastic and dedicated work on this project. If you are in Hot Springs, make an effort to visit this wonderful exhibit. W5KL has recently returned from the National QCWA Convention. W5HDN in installing PACKET at his QTH. ADXA requests that you please remember the DX windows on 160/80 and please keep them clear. Traffic: W5QFU 104, W5UAU 40, W5RIT 15, W5KL 14, WB5IGF 10, W5HDN 3.

LOUISIANA: SM, John "Wondy" Wondergem, K5KR—SEC: N5ADG, ACC: K5DPG, SGL: KD5SL OOC: KE5OK, TC: N5JM. Martin—KE5QK from Bastrop is the ARRL Louisiana Section Official Observer Coordinator (OOC). He spends many hours each month monitoring the bands and notifying the offenders or good guys of their operating procedures. Additionally he makes a monthly summary for the Section Manager and ARRL Headquarters. George, W5LVX, from Greenwell Springs; Gary, NO5H, from Glenmora and Jimmy, WB5TPG from Shreveport are designated Official Observer Stations. All of the OOs have indicated that 99 percent of their fellow hams gracefully accept the descrepancy report and take corrective action. And many have framed their "atta-boy" reports when they received them. Thats the way it should be. The FCC has repeatedly indicated that they expect the amateur radio operators to keep current in knowing the rules, voluntarily abide by them and the amateurs police themselves to correct any problems. Regrettully there have been a few cases where

Superior Communications Accessories

Advanced Multi-Torque Antenna Rotator

The rotator frame can house up to 4 motors to increase torque and load capacity.



MR-750 PE

Wind Surface Load Area

	MR-750E/PE	MR-300E
1 Unit	16.1 Sq Ft	5.92 Sq Ft
2 Units	21.5 Sq Ft	11.84 Sq Ft
3 Units	26.4 Sq Ft	17.75 Sq Ft
4 Units	30.0 Sq Ft	23.67 Sq Ft

Each motor is equipped with a Super Wedge and Clutch brake system (Slip clutch type) that works independently from the main frame gear train and protects the rotator mechanism from excessive torque.

Low voltage (24VAC) motors...low-cost 6-wire control cable...can be installed on the same base as a TEXEX unit.

Specifications

■ Rotator Unit

		MR-750E/PE	MR-300E
Rotation time	60 Hz	58 seconds (60 Hz input)	33 seconds (60 Hz input)
	50 Hz	70 seconds (50 Hz input)	39 seconds (50 Hz input)
Output torque Brake power	1 motor	610 inch/lbs 5,200 inch/lbs	220 inch/lbs 1,700 inch/lbs
	2 motor	1,200 inch/lbs 9,600 inch/lbs	440 inch/lbs 3,500 inch/lbs
	3 motor	1,800 inch/lbs 13,900 inch/lbs	650 inch/lbs 5,200 inch/lbs
	4 motor	2,400 inch/lbs 18,300 inch/lbs	870 inch/lbs 7,000 inch/lbs
Rotation angle		375 degrees	
Permissible mast size		1½ - 2⅛ inch (38 - 63 mm) < diameter >	
Control cable		6-wire cable 0.5sq—1.25sq (AWG16/18/20 etc.)	
Continuous operation		5 minutes Max. permissible	
Dimensions		15.6" H x 8.43" W x 8.43" D (397 mm x 214 mm x 214 mm)	
Unit weight		16.5 lbs (7.5 kg) < with 1 motor unit fitted >	

■ Controller Unit

	CR-4 (for MR-750E/MR-300E)	CR-4P (for MR-750PE)
Power source	117 V AC (50/60 Hz)	
Power consumption	200 W (with 4 drive motors)	
Operating voltage	24 V AC	
Dimensions	4.9" H x 7.1" W x 6.9" D (125 mm x 180 mm x 175 mm)	
Weight	9 lbs (4 kg)	
Operation	Manual	Manual/Pre-set

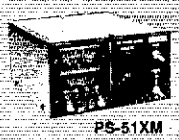
COAXIAL SWITCHES

PAT. No. 59-000803

CS-201 CS-401

	CS-201	CS-201G	CS-401	CS-401G	CS-4
	2position	2position	4position	4position	4position
Frequency:	600 MHz	1.3 GHz	600 MHz	1.3GHz	1.3 GHz
Connectors:	SO-239	N type	SO-239	N type	BNC type
VSWR:	Below 1:1.2				
Insertion Loss:	Less than 0.2 dB				

POWER SUPPLIES

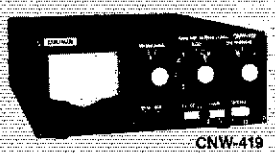


PS-51XM

Model	IMAX/ICONT	Variable Output VDC
PS-51XM	5.6A/5A	9–15
PS-120M	12A/10A	3–15
PS-30XM	31A/24A	1–15
PS-560MD*	56A/44A	13–8
PS-560W	56A/44A (Low V)	3–15 Variable
	28A/22A (High V)	6–30 Variable

*Sub-DC Outlets: 10.6A/1–15 VDC

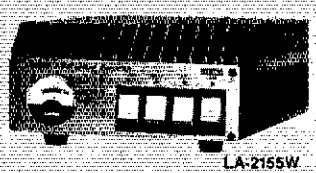
ANTENNA TUNERS



CNW-419

Frequency Range:	CNW-419 1.8-30 MHz (17 bands)	CNW-919 140–150 MHz	CL-680 (no metering) 1.8-30 MHz (17 bands)
Power Rating:	200 W CW (3.5-30 MHz) 100W CW (1.8-3.4 MHz)	200W CW	200W CW (3.5-30 MHz) 100W CW (1.8-3.4 MHz)
Output Impedance:	10-250 ohm	10–250ohm	10–250 ohm

POWER AMPLIFIERS



LA-2155W

Band:	LA-2035R 144-148 MHz	LA-2065R 144-148 MHz	LA-4040R 430-450 MHz	LA-2155W 144-148 MHz
Input Power:	0.5-3 W	0.5-5 W	10 W	10-35 W
Max. Output Power:	30 W plus	60 W plus	35 W	30-150 W

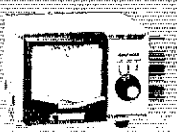
Pre-Amp (Gain) 15 dB

DK-210

ELECTRONIC KEYER

Sharpen your "fist" with Daiwa precision!

Cross Needle SWR/Power Meters for All Bands



CN-720B

Model	Freq. Range Int. Sensor	Forward Power	Connectors
CN-720B	1.8–150 MHz	20/200 W/2 kW	SO-239
NS-660PA	1.8–150 MHz	30/300 W/3 kW	SO-239
NS-663PA/N	140-525 MHz	3/30/300 W	SO-239/N Type
NS-668	900 MHz–1.3 GHz	1.5/15/60 W	N Type

MOBILE/BASE CROSS NEEDLE SWR/POWER METERS

CN-410M

NS-448

Model	Freq. Range Int. Sensor	Forward Power	Connectors
CN-410M*	3.5–150 MHz	15/150 W	SO-239
NS-448**	900 MHz–1.3 GHz	5/20 W	SO-239
CN-460M*	140–450 MHz	15/150 W	SO-239
CN-465*	140–450 MHz	15/75 W	SO-239
CN-520	1.8–60 MHz	200 W/2 kW	SO-239
CN-550	144–250 MHz	20/200 W	SO-239

*Back fit with mobile bracket **Separate sensor type

REMOTE EXTERNAL SENSORS (For indoor/outdoor use)

Permit operation over range of 1.8 MHz through 1.3 GHz.
Optional for use with NS-660 series meters.
U-66H, 1.8–150 MHz, Max 3 kW, SO-239 Connectors
U-66V, 140–525 MHz, Max 300W, SO-239 Connectors
U-66VN, 140–525 MHz, Max 300W, N Type Connectors
U-66S1, 900 MHz–1.3 GHz, Max 60W, N Type Connectors
SC-20 60 ft. Cable with connectors for use with remote sensors

U-66V

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Four stages of filtering...variable bandwidth over broad range...razor sharp CW reception...built-in speaker...PLL Tone Decoder circuitry

AF-606K

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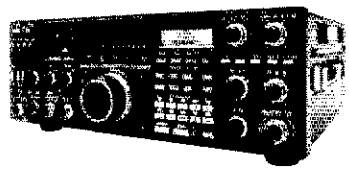
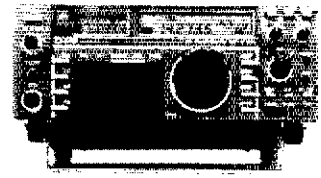
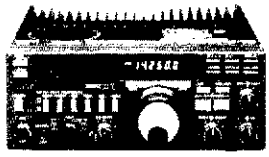
TS-940S



IC-735





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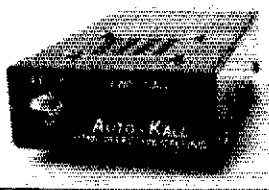
AUTO-KALL



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The *AUTO-KALL* plugs into the speaker jack on your VHF/UHF FM transceiver, scanner, etc. The built-in speaker is muted until your personal 3-digit code is received. Anyone with a Touch-Tone* pad on their rig can activate the *AUTO-KALL*. Great for families with 2 or more hams, activation of emergency nets, etc.

• Assembled ready to use. Set your personal 3-digit code in seconds with small rotary switches. No jumpers to solder. Decodes all 16 keys. • Speaker automatically resets to silent-standby and leaves red LED on to let you know someone called. • 8-15 VDC. Low current CMOS circuitry.

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*Touchtone Trademark AT&T

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Knights Inn Franklin
Knights Inn Dayton North
Knights Inn Dayton South
Knights Inn Vandalia
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Penny Pincher (L&K Troy)
Ramada Inn Downtown
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DAYTON Hamvention®

April 24, 25, 26, 1987

Early Reservation Information

- **Giant 3 day flea market • Exhibits**
- **License exams • Free bus service**
- **CW proficiency test • Door prizes**

Flea market tickets and grand banquet tickets are limited. Place your reservations early, please.

Flea Market Tickets

A maximum of 3 spaces per person (non-transferable). Tickets (for all 3 days) will be sold IN ADVANCE ONLY. No spaces sold at gate. Vendors MUST order registration ticket when ordering flea market spaces.

Special Awards

Nominations are requested for "Radio Amateur of the Year", "Special Achievement" and "Technical Achievement" awards. Contact: Awards chairman, Box 44, Dayton, OH 45401.

License Exams

Novice thru Extra exams scheduled Saturday and Sunday by appointment only. Send current FCC form 610, copy of present license and check for $4.25 (payable to ARRL/VEC) to: Exam Registration, 8836 Windbluff Point, Dayton, OH 45459

Slide Show

35 mm slide/tape presentation about the HAMVENTION is available for loan. Contact Dick Miller, 2853 La Cresta, Beavercreek, OH 45324

1987 Deadlines

Award Nominations: April 4
Lodging: April 4
License Exams: March 28
Advance Registration and banquet:
USA - April 11
Canada - April 4
Flea Market Space:
Orders will not be accepted **before** January 1

Information

General Information: (513) 433-7720
or DARA, Box 44, Dayton, OH 45401
Flea Market Information: (513) 223-0923
Lodging Information: (513) 223-2612
(No Reservations By Phone)

HAMVENTION is sponsored by the Dayton Amateur Radio Association Inc.

Lodging Reservation Form

(Please attach your name, address, and telephone number to this form.)

Dayton Hamvention - April 24, 25, 26 1987
Reservation Deadline - April 4, 1987
MAIL TO - Housing, Dayton Hamvention,
1880 Kettering Tower, Dayton, OH 45423-1880

Arrival Date _____
[ ] Before 6 pm [ ] After 6 pm
Departure Date _____
Room: [ ] Single
[ ] Double (1 bed, 2 persons)
[ ] Double Double (2 beds, 2 persons)

Lodging Preference -
See list of Lodging on adjacent page.

1 _____ 2 _____

3 _____ 4 _____

Deposit required - Room deposit must be paid directly to the hotel or motel by date shown on the confirmation form sent to you. Use canceled check for confirmation.

(PLEASE SEPARATE)

Advance Registration Form

(Please attach your name, address, and telephone number to this form.)

	How Many		
Admission (valid all 3 days)	_____	@ $8.00*	$_____
Grand Banquet	_____	@ $15.00**	$_____
Women's Luncheon			
(Saturday)	_____	@ $7.25	$_____
(Sunday)	_____	@ $7.25	$_____
Flea Market (Max. 3 spaces)	_____	@ $23.00	$_____
Admission ticket must be ordered with flea market tickets		**Total**	$_____

Make checks payable to - Dayton HAMVENTION.
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Will handle 10 sq. ft. antennas at 50 MPH winds.

MODEL NO.	HEIGHT MAX.	HEIGHT MIN.	NUMBER SECTIONS	WEIGHT POUNDS	SEC. OD Top	SEC. OD Bot.	SUGGESTED HAM PRICE
MA-40	40'	21'6"	2	242	3"sq.	4½"	$ 735.00
MA-550	55'	22'1"	3	435	3"sq.	6"	$1245.00
MA-550MDP*	55'	22'1"	3	620	3"sq.	6"	$2640.00
MA-770	71'	22'10"	4	645	3"sq.	8"	$2385.00
MA-770MDP*	71'	22'10"	4	830	3"sq.	8"	$3780.00
MA-850MDP*	85'	23'6"	5	1128	3"sq.	10"	$5090.00

Shown w/ optional MARB 550 rotor base and motor drive

*MDP models complete with heavy-duty motor drive with positive pull down.

FREE STANDING CRANK-UP TOWERS

Will handle 18 sq. ft. antennas at 50 MPH winds.

MODEL NO.	HEIGHT MAX.	HEIGHT MIN.	NUMBER SECTIONS	WEIGHT POUNDS	SEC. OD Top	SEC. OD Bot.	SUGGESTED HAM PRICE
TX-438	38'	21'6"	2	355	12½"	15"	$ 925.00
TX-455	55'	22'	3	670	12½"	18"	$1395.00
TX-472	72'	22'8"	4	1040	12½"	21¾"	$2295.00
TX-472MDP*	72'	22'8"	4	1210	12¼"	21¾"	$3695.00
TX-489	89'	23'4"	5	1590	12½"	25⅝"	$3995.00
TX-489MDPL*	89'	23'4"	5	1800	12½"	25⅝"	$5995.00

*TX-472MDP includes heavy-duty motor drive with positive pull down. TX-489MDPL comes with heavy-duty motor drive with dual level wind and positive pull down. (Both motor drive models include limit switch brackets).

FREE STANDING HEAVY-DUTY CRANK-UP TOWERS.

Will handle 30 sq. ft. antennas at 50 MPH winds.

MODEL NO.	HEIGHT MAX.	HEIGHT MIN.	NUMBER SECTIONS	WEIGHT POUNDS	SEC. OD Top	SEC. OD Bot.	SUGGESTED HAM PRICE
HDX-538	38'	21'6"	2	600	15"	18"	$1195.00
HDX-555	55'	22'	3	870	15"	21¾"	$2095.00
HDX-572	72'	22'8"	4	1420	15"	25⅝"	$3595.00
HDX-572MDPL*	72'	22'8"	4	1600	15"	25⅝"	$5495.00
HDX-589MDPL*	89'	23'8"	5	2440	15"	30⅝"	$7195.00

*Includes heavy-duty motor drives with dual level wind and positive pull down. HDX-572MDPL includes limit switch brackets only. HDX-589MDPL includes limit switches and limit switch brackets.

FREE STANDING "LOW PROFILE" COMPACT CRANK-UP TOWERS.

Will handle 18 sq. ft. antennas at 50 MPH winds. (TMM-433HD handles 24 sq. ft.)

MODEL NO.	HEIGHT MAX.	HEIGHT MIN.	NUMBER SECTIONS	WEIGHT POUNDS	SEC. OD Top	SEC. OD Bot.	SUGGESTED HAM PRICE
TMM-433SS*	33' w/o mast	11'4"	4	315	10"	18"	$ 985.00
TMM-433HD*	33' w/o mast	11'4"	4	400	12½"	20¾"	$1195.00
TMM-541SS*	41' w/o mast	12'	5	430	10"	20¾"	$1295.00

*Hy-Gain and some Alliance rotors when installed inside tower will restrict retracted height by approx. 24'. Most Kenpro models allow full retraction.

Standard bases included with all towers (except MA-770, 770-MDP and 850-MDP).

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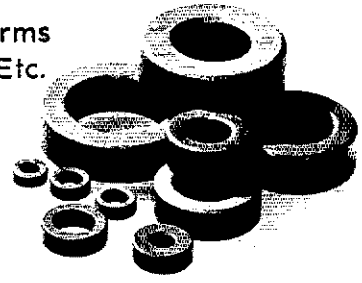

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an offender has willfully violated the rules over a prolonged period. In several recent cases the FCC has stepped in and imposed a fine and revoked a license. If you're interested in becoming an ARRL Official Observer contact Martin—KE5QK, Rt. 4 Box 684, Bastrop, La. 71220 or myself (listed on page 6 of every QST).

MISSISSIPPI: SM, Paul Kemp, KW5T—ASM: K5QNE. SEC: K4HKD. SGL: AL7GQ. ACC: KC5VD. PIO: KA5VBE. OOC: W5VMC. VHF Coord: N5DWU. BM: AJ0X. TC: WB5SXK. LAST CALL for JACKSON HAMFEST/MISSISSIPPI STATE CONVENTION February 14-15; see "Hamfest Calendar" for details! KA5VBE, Section PIO, has provided Mississippi radio and television stations with new ARRL public service announcements; watch for them (if you're in broadcasting and your station isn't running them, see if you can help). Congratulations to the 1987 officers of four Mississippi clubs... Hattiesburg ARC: K5QNE, president; N5JGW, vice president; KA5VBE, Secretary; and WB5TJK, treasurer... Mississippi Coast ARA: K5OS, president; N5JRJ, vice president; W5SWD, secretary; and KA5HOP, treasurer... Vicksburg ARC: WB5SXK, president; N5IEN and WC5J, vice presidents; and N5EZX, secretary/treasurer... and Laurel ARC; KF5AU, president; N5JKV, vice president; and N5JDC, secretary-treasurer. Mississippi's traffic nets and the RN5 sessions need your support (and they're fun, too); get details and schedules from KB5W or N5AMK on MSBN. Laurel ARC has completed installation of new VHF/UHF antenna system at local Civil Defense headquarters. Don't forget to keep the PIO up-to-date on your club or area's activities; if you tire of seeing the same folks' doings reported on these pages, why not toot YOUR horn! FACT: Only two of Mississippi's 15 ARRL-affiliated clubs hold Special Service Club status; contact the ACC for help in getting your group moving toward this distinctive recognition. Mississippi activity apparently was sparse in Sweepstakes, but W5XX and W5VSZ heard giving out HIGH numbers. CAND (W5KLV) Sessions 30 QNI 619 (Mississippi represented 100% by N5AMK, W5HKW, KA5PMK, KT5Z, KB5W, KE5EC, W5ACS and K5QNE). GCSBN (W5JHS) Sessions 30 QNI 964 QTC 18. MSBN (WJ5P) Sessions 30 QNI 2144 QTC 77. MMN (WJ5L) Sessions 30 QNI 679 QTC 8. HAEN (N5GRW) Sessions 5 QNI 90 QTC 0. Traffic: N5AMK 414, KT5Z 59, W5WZ 52.

TENNESSEE: SM, John C. Brown, NO4Q—ASM/ACC: WA4GLS. OO/AA: W9FZW. SEC: WA4GZQ. SGL: WA4GZZ. STM: NG4J & TC: W4HHK. The big item of discussion at this time seems to "PACKET" as far as many of the amateurs in the section are concerned. I must admit it is a bit of fun. My main concern is that the enthusiasm about this mode of communication will negate the use of it at the appropriate time when it is most needed. There have been and are continuing to be groups and ARES getting organized. The organization of societies and packet-radio protocol. The big problem at this time is everyone trying to stay where all the activity is. Make your contact then move off to one of the other frequencies. It also must be realized that many of the digipeaters need to be constantly checked out for operation and reliability. This can be expected until we get our system and procedures established. I guess the "OLD ADDAGE" is still good, do a lot of copy before you jump in and just clutter up the frequency. I am not suggesting that you stay off till you know how, far from it. That would be like saying stay out of the water till you know how to swim. One would think that everybody is in "packet". Not so. It is just the newest mode of communications in our fraternity. It will have its day if we have the much talked about earthquake in the West-Tennessee area. The traffic activity is still down some bit this time. Only twelve (12) stations reported their activity this report. The section traffic summary is as follows: LF - Sessions - 77, WNI-4297, QTC-96; VHF-Sessions-65 (Much low as NM's not reporting), QNI-1145,QTC-469 (same); CW - Sessions-41, QNI-260, QTC-51. The Honor Roll includes W4LVP, N4OSZ, WA4CNW, N4OZB and NG4J. Keep up the fine work fellows and gals. We are still needing help on the daily DRN5 net. K4WWQ will be glad to make room and give you a week day skedule. Give him a call. It is all done on 40 meters. Individual station activity for the period is as follows: W9FZW 140, WA4FMR 115, K4WWQ 102, W4DDK 40, NN4S 16, KA5KDB 15, W4TYV 14, W4PFP 13, KE4LS 8, W4PSN 8, K4WOP 8 and W4TYU 6.

GREAT LAKES DIVISION

KENTUCKY: SM, Dale Bennett, WA4JTE—As you know, KTN has moved to 6:30 PM CST due to poor conditions. What do you think of making this a permanent move. It would avoid having two section nets meeting at the same time. Just a thought, send comments. New digi in Williamsburg "WMB." Pack is now meeting the second Tuesday of each month in Lex. At W4AUZ's work QTH, March looks like a busy month, with Glasgow and E-Town fests. Looking forward to seeing all. 9RN for Nov 90%, TNX to K4AVX, KA4BCM, K4HOE, WD4IYI, W4OGP, KZ8Q, KI4QH, & KC4WN. D9RN 93% TNX to KA4MTX, WD4RWU, KA4MZY, KA4BCM, KJ4SU, & KA4AMA.

NET	QNI	QTC	SESSIONS	NET MANAGER
KTN	921	54	30	KA4GBZ
NKARC	62	4	4	KA4RKS
3ARES	42	1	3	KA4BCM
KNTN	234	56	40	KB4OZ
SEKEN	23	2	4	K4AVX
KYN-L	99	31	28	KZ8Q
MKPN	1344	130	30	KA4SAA
KYPON	80	9	5	WA4AVV
KYN-E	121	48	27	K4AVX
CARN	300	20	23	WB4FEW

Traffic: K4VHF 81, WD4RWU 62, KC4WN 51, K4HOE 50, KA4MTX 39, KJ4HP 33, K4AVX 31, KI4QH 25, WA4AVV 17, KA4BCM 17, W4WQV 11, WD4COF 9, KA4GBZ 8, W4PKX 7, N4HZT 6. PSHR: KA4MTX 85.

MICHIGAN: SM, James R. Seeley, WB8MTD—TC W8YZ announces four new ATC appointments: WD8AXB, N8DJP, NI8E, NK8K. Our total is now 19. He also reports, "I have been handling about one tech request by mail per week. Most are from old timers. . .retiring and. . .building or fixing that pet project that they have been gathering parts for years." Dave and staff also help with RFI and other kinds of problems. If you need technical assistance and don't know whom to contact, a call to (313) 242-5589 will get things started. New officers for the MI Area Repeater Council (MARC): 2-M Freq. Coord., N8DJP; Vice Chairman, NI8E. W8NDS continues as Chairman, and N8AGS is Board Member at Large. The mail address for the council continues to be Box 1572, Ann Arbor, MI 48107-1572. Implementation of the 20-kHz 2-meter bandplan for MI should be essentially completed by the time you read this. While not without some bumps, the road was smoother than almost anyone expected. MARC and the 2-meter community at large deserve high praise for this very significant forward step. I read with keen interest in MCRC's Dec. Bulletin about the adventures of N8GMM and his wife who sailed their 32 ft. sloop from Monroe to the Caribbean and back. It took them a year. They survived three hurricanes. And they kept in touch via thrice weekly radio skeds with K8SB the entire time. Special Service Club charters have been renewed for L'Anse Creuse ARC, Motor City RC, and Monroe Co. CA. Congrats - and thanks for the "something extra"

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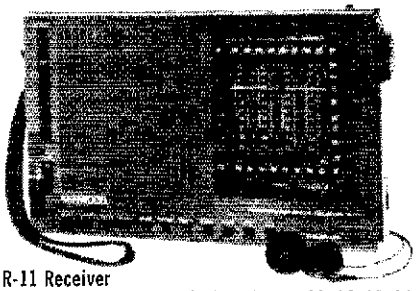

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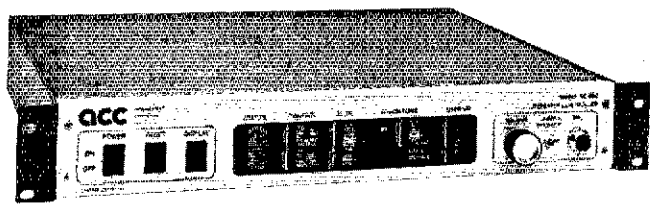

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that it takes. Hams are ingenius and imaginative in more ways than technical. I'm ever fascinated by the names we hang on our club bulletins. Some in MI that you might not know about: The R.A.G. (Marinette & Menominee - "What our members chew"). Airscoop (Delta Co. ARC). QRU (Big Rapids ARC - that one needs some explaining). The Rock (Stu Rockafellow ARS, Plymouth). Cherry Juice (Traverse City ARC). Harmonic (Saginaw Valley ARA). Tuned Circuit (L'Anse Creuse). Representative, perhaps; far from inclusive. And then there's good old Bulletin. Dismal, huh? Further achievement for SEMTN: full NTS status approved by STM WB8SIW and me. A local net can be part of NTS by meeting ARRL criteria, primarily for regular skeds and higher-echelon liaison. SEMTN qualifies in full measure. N8AHA is the charter NM appointee for the net. Nov. net summary (QNI Tfc Sess): QMN 769 235 89; MITN 517 67 29; SEMTN 307 86 26; UPN 1391 81 35; MACS 435 80 30; WSSBN 890 44 30; VHF Nets 997 10 76. Traffic: KA8CPS 247, W8QHB 175, WB8YDZ 168, K8RDN 149, WD8KQC 141, WB8SIW 105, NT8G 86, WD8MCN 83, WD8RHU 70, WA8DHB K8GXV 68, AF8V 65, K6HAP 64, N8AHA 52, W8RNQ 48, K8UPE 47, WA6YMH 43, W8SCW 42, WB8SYA 40, N8CNY 38, K8OCP 37, NJ8R W8YIQ NJ8X 26, W8URM 18, KI8Q 15, W8YZ 11, W8VIZ 7, WD8MJB K8ZJU 6, N8DSW 5.

OHIO: SM, Jeffrey A. Maass, K8ND—ASM: N8AUH. SEC: WD8MPV. STM: KF8J. BM: W8ZM. ACC: KJ3O. TC: KB8MU. OOC: AD8I. PIO & SGL: N8CVK.

NET	QNI	QTC	Sess	Time (Local)	Freq.	MGR
BN(E)	296	104	30	1845	3.577	N8EVC
BN(L)	165	58	30	2200	3.577	K8TVG
BNR	246	72	30	1800	3.605	W8EK
BSSN	512	297	58	0945,1900	3.873	K8OZ
ONN	143	19	26	1825	3.708	WD8KBW
OSN	343	77	30	1810	3.577	N8AEH
OSSBN	2211	846	90	1030,1615, & 1830	3.9725	WB8JGW
OSSN	195	137	30	0645 M-F	3.577	KA8GJV
				0800 S-Sn	3.577	KA8GJV
08MN	84	14	12	2100	50.16	WD8CTX
Ohio Section ARES Net				1500 Sun.	3.875	WD8MPV

As this is written, I don't have the exact dates for any of the hamfests in February, but the dates listed below should be correct if last year's pattern holds true; check recent issues of QST for the exact date of each hamfest, or ask on a traffic net. NOARS Winterfest, Feb 1; Mansfield Mid-Winter Hamfest, Feb 15; Cuyahoga Falls, Feb 22; and Circleville, March 1. Remember, as I announced in last month's column, I have been advised that the ARRL Convention planned for Sharonville (Cincinnati) in February 1987 has been cancelled. The Portsmouth ARC will host VE exams in southern Ohio on Februrary 14: contact KC8YW for details at (614) 778-2870. The list of Ohio Silent Keys is much too long: W8DYE, WA8FLD, K8QBY, and WB8UBR were all reported as SK during this month. The first of a new series of licencees in Ohio is Andy Medler, KB8AAA, of the Dayton area. Congratulations! The Trumbull County ARES had an opportunity to use their training in a natural gas leak, explosion, and fire in McDonald, Ohio, on Thanksgiving Day, in which many homes were destroyed and one person was injured. 18 ARES members participated. Good job! Dan Kautz, WB8EHS, active with the Mahoning Valley ARA, their newsletter editor, and the former EC of his county has accepted a job in New England. Thanks for his devoted efforts with MVARA and ARES in the Youngstown area! Due to the demands on his time, Jim Weaver, K8JE has resigned as ARES District Emergency Coordinator (DEC) of District 4 (Southwestern Ohio). Jim's service to ARES dates back to long before I was Licensed (into the 60's), and his efforts in the Cincinnati area have lead to a strong ARES and public service environment. His efforts in other club activities have been unmatched, and as time allows I expect that he will continue to contribute to the growth of Amateur Radio in SW Ohio! Thanks, Jim! The Cuyahoga ARS is holding a packet radio voice net Wednesdays at 7.30 PM on 148.82 MHz. This net will allow those intersted in packet (including those without packet equipment) to discuss this growing aspect of our hobby. Check in! New club officers-Canton ARC: Pres N8DHT; VP KK8D; Sec KE8G; Treas NN8M. Sandusky Valley ARC: Pres N8FRI; VP KA8NAO; Sec/Treas WB8NMK. Congratulations! As we approach Spring (no kidding!), it is time to begin preparing for the Tornado and severe weather season. Every Amateur should be prepared to serve the public by participating in his local SKYWARN/Weather Watch program and by joining the local ARES organization in case the worst happens. Remember, your license is a privilege that carries with it the responsibility to serve the public! If you don't know your local SKYWARN coordinator or ARES Emergency Coordinator, contact me at the address on page 8 of this QST. Traffic for NOVEMBER 1986: WD8KFN 324, WB8JGW 301, WB8MEK 271, WA8EYQ 254, K8JDI 254, W8BO 211, K8OZ 196, KA8KHS 194, K8TVG 194, K8ND 172, W8FPA 171, W8QZK 161, W8ZOL 161, KD8KU 156, WD8IKC 131, N8EFB 127, N8EVC 114, W8SKP 109, K8CMR 106, W8MVE 103, KV8Q 100, WB8BWY 87, KA8GJV 84, WA8FQW 82, W8EK 80, K8DHD 78, WD8QXT 75, KE8BE 74, N8FWA 74, N8AK8 71, KD8FW 69, WD8MIO 67, WA8SSI 67, KA8CGF 66, KA8UYM 63, WD8KBW 61, N8XX 59, WD8RIB 58, N8GEC 56, KC8UZ 52, KD8XL 49, WA8HED 47, WD8KWC 47, N8AUH 46, KC8YV 46, WB8DMF 44, NC8Q 39, KD8WI 38, NE8X 38, WA8DYS 36, K8EF 35, N8FPH 32, WD8JYE 32, KC8JV 26, WD8QZM. W8WEG 26, N8GOB 25, N2NS 25, N8GIY 24, KA8OOF 24, W9SWM 24, W9SWM 21, K3RC 21, KA8FIX 19, N8FBE 18, NK8B 18, K8CKY 18, KC8D 18, WB8HHZ 18, W8LDU 18, WB8KWD 17, KC8WH 17, K8DXZ 16, W8JLW 16, W8RG 16, N8AUH 15, NF8B 14, WD8CKK 14, WD8CTX 14, WD8CSP 13, N8HWF 13, KZ8P 13, KA8TNT 13, N8AJU 12, N8CJS 12, KA8DRR 12, KD8IC 12, KE8CV 11, N8FFK 11, WD8DKQ 10, K8IOW 10, K8LOM 10, KA8RBQ 10, K8EEN 9, NU8H 8, WB8YFD 8, KA8YIT 7, N8CB 6, WB8RSM 6, K8VOY 6. WD8ATN 5, NR8C 5, N8CW 5, N8HBF 5, WB8MRL 5, WD8EKI 4, KA8SON 4, W8BHL 4, N8FFC 3, N8HSU 3, KA8SOM 3, W8ZM 3, WB8GDM 2, N8HIL 2, KA8SZH 2, KA8VYT 2, K1LT 1, KA8MFG 1, KA8MFH 1, WD8NED 1. (Oct.) KC8XS 62.

HUDSON DIVISION

EASTERN NEW YORK: SM, Paul S. Vydareny, WB2VUK—STM/ASM: K2ZM. SEC: WA2ZYM. SGL: WB2HQ. BM: WB2EAG. TC/OO/RFI: KC2ZO. ATC: WA2VGM. NET REPORTS (QNI/QSP): CDN 550/48 Col/Grn ARES 43/3 ESS 378/100 HVN 197/62 NYSE 370/258 NYSL 259/113 NYSM 336/297 SDN 307/100. CLUB NEWS: Albany ARA will hold elections in Dec; will hear Dir.-elect and Vice-Dir.-elect speak. They report new member WB2KRS. Mt. Beacon will hold hamfest on March 1. Orange Cty ARC elected new officers Pres-WB2SON VP-K2MI Sec-WA1WTG Treas-WA1LHW Activ-KA2USN Newsletter-WB2OEE. Overlook Mt ARC elected Pres. K5NA VP-N2EK Treas-KA2QYL Sec-KA2TIP Dirs-N2EGR AK2H KU2Q. CCNR will hold elections in Dec. Saratoga RACES is planning "Home-brew Nite" in spring.

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Schenectady ARA had Tim Scrom of Nat. Wx Service speak in Nov. They report new members WA2KQG, WA2NCA, N2COX. WARA having Christmas dinner instead of Dec. meeting. WECA held North Pole Net for children at Blythedale Hospital. A very special thanks to WB2MCO for his service as STM. He has resigned due to job responsibilities. K2ZM has been appointed STM. Thanks to WA2ZYM who has been appointed as SEC. KC2TF has been appointed by Eastern Area Staff as 2RN packet coordinator to integrate packet radio w/NTS in 2nd call area. Need a volunteer to edit ENY newsletter. Any volunteers?? NOV PSHR: WB2VUK, NC2H, WB2EAG, KA2MYJ, K2ZVI, N2EQM, K2ZM, KC2TF, KB2ATJ, W2PKY. Traffic: WB2EAG 383, WB2VUK 153, KA2MYJ 105, K2ZM 101, KC2TF 90, NC2H 78, W2PKY 58, KB2ATJ 55, K2ZVI 50, N2EQM 36, N2FTR 33, KA2TQW 28, K2HNW 22, WB2OHR 12.

NEW YORK CITY-LONG ISLAND: SM, John H. Smale, K2IZ— ASM/VE: W2NL. ACC:KA2RGI. SEC:KA2LAD. OCC:NB2T. TC/RFI:WA2YNH. STC:K2MT. SGL:WA2HYS. PIO:KA2WIJ. For the past 13 years, give or take a few, I have started the column off with a listing of the traffic nets. They used to alternate with the town emergency net frequencies. These headed the column for a purpose: to get more people active in the volunteer part of amateur radio. For some of us, we "volunteer" a bit more than the rest, being active in our clubs, as Board members, officers, even just helping out with Field Day or being an instructor in the Novices and upgrading classes. For some the "Volunteer" thing goes a bit farther. We become a part of the "Field" organization of the ARRL; the pay isn't the greatest, the benefits are not anything to write home about, but we become a part of the League. For some, not many, we decide to commit ourselves to the ARRL, as Directors, Vice Directors and Section Managers, which is rather hard to explain but people do the job. Unfortunately, other things start invading our lives if we have started out at an early age as SM, as I did. A choice has to be made: either to keep a total commitment to the hobby that is enjoyed by many or to commit Heart and Soul to the family and come back to the hobby after the children have all grown and have been sent safely on their way in life. I made the commitment to family. In stepping down, I looked for someone to take over the job I had been doing, who would continue doing a good job. That somebody whom I found was H. "Woody" Gerstner, WB2IAP. The man was the father of a family that anyone would be proud to claim. He started off as the ACC for the section. The job was new at the time, and there were a lot of "grey" areas in the job description and in the ARRL itself. The job that Woody did as ACC has served as a "Benchmark" for ACCs everywhere for years to come. The ARRL can thank him for setting up this vital program. As membership chairman for LIMARC, he again did an outstanding job. With Woody, I felt very comfortable in turning over the job of Section Manager. The fact that he ran for the job unopposed says that his peers in the hobby also felt that way. On 1 Jan. 1987, WB2IAP was to have the the SM for NYC LI. On Sunday 16 Nov. 1986, WB2IAP, H. "Woody" Gerstner became a Silent Key. I, we, have lost a very dear friend, one who will be missed. Let us keep his memory alive, in our thoughts and memories, in our stories that we pass on to the newcomers in Ham radio about one very exceptional "Volunteer" "Woody," WB2IAP.

NORTHERN NEW JERSEY: SM, Robert R. Anderson, K2BJG — ASM (VE liaison): N2XJ. ASM (FO Info): N2BFG. SEC: N2FQZ. STM: KA2HNO. OO/AAC: KA2BZS. ACC: KY2S. PIO: WB2NQV. SGL: W2KB. TC: K2BLA. BM: N2CXX. Several of our leadership officials listed here will complete their term of office at the end of June 1987. At that time the SM must make a decision to either endorse their appointment, or replace them. This is the first call for your inputs to these decisions. Please forward your comments, or your nominations concerning BM, PIO, SGL, STM, and TC to me no later than June 1, 1987. D. Struebel, WB2FTX, has been appointed as Net Manager of the recently added early session of the NJ Voice Net together with his station appointment of ORS. Two new NNJ OO applications have been received. When the required AA certification process is completed their appointments will be announced. Affiliated clubs please take note that annual reports are due. If help is needed, please contact ACC Ken Hampton, KY2S, at 1119 Grassmere Ave., Wanamassa, NJ 07712, Phone 201-531-0791. Congratulations to the following who were newly licensed or upgraded during November sessions conducted by: NNJ VE Board, ARA, and Ocean/Monmouth ARC. Novice: C Lemos, G Dyke, J Bennett, M Levy, and E Kennedy. Technician: KB2BAK, KB2BCC, N Van Denboos, and KB2BRP. General: KB2AOZ, KB1AVQ, KB2BNU, N2GHU, KA2VBZ, and KB2BQD. Advanced: N2AZX, N2GAM, KA2NXA, and WB3BWR. Extra: KD2AQ, KD2UG, N2EQY, and N2FGV. Please take not that the NNJ VE Board and Bergen ARA are conducting VE test sessions on a monthly basis. Several others are also on regular schedules at two-or three-month intervals. For complete up to date information on NNJ VE test session locations, schedules, and contact information, please contact ASM Carl Felt, N2XJ, at 8 Charles Pl. Chatham NJ 07928, Phone 201-635-7686, or download files NNJVE.LST and NNJVE.SCH from the WA2SNA-1 PBBS. November Data:

Net	Mgr	Freq	Time	Sess	SES	QSP	QNI
NJM	W2RRX	3695	1000	Dy	30	132	204
NJPN	W2CC	3950	1800	Dy	35	127	456
NJN/E	AG2R	3695	1900	Dy	30	131	176
NJN/L	AG2R	3695	2200	Dy	30	80	84
OSTTN	WB2QMP	147.12	2000	Dy	30	150	282
TCETN	KA2SPH	148.685	1930	Dy	Not Rec.		
NJVN/E	WB2FTX	146.895	1930	Dy	27	32	187
NJVN/L	WB2ANK	146.49	2230	Dy	30	89	186
NJSN	WB2PKG	2735	1830	Dy	Not Rec.		
NJPTN (PBBS)		145.01	WA2SNA-1 and WB2GWD-0				

NNJ Amateur Radio Public Info Line: 201-735-8550. SAR/PSHR: N2XJ 337/106, N2DXP 120/80, W2CC 20/, WB2QMP 78/66, W2RRX 170/106, K2VX 59/84.

MIDWEST DIVISION

IOWA: SM, Rollin J. Sievers, WBØAVW—SEC: KDØBG. STM: KCØXL. OCC: WØVX. ACC: WBØQAM. BM: KØIR. TC: KØDAS. SGL: AKØQ. The 87 Davenport Hamfest will be held at the Masonic Temple on Feb 22. Plan to attend. A few recent Public Service Club Activities; Des Moines RAA, Operation Santa Claus and Love Run, Cedar Valley ARC, Witch Watch Fort Dodge ARC, Spook Patrol, Northeast Iowa RAA Red Cross 10 K run. Would like to hear from the smaller clubs of their activities. After thought, plans for a table and meeting room and hopefully Eric, KCØXL, will have his VCR tape on traffic handling ready and available in time for the Davenport hamfest. Your SM, SEC and STM will be there, weather permitting. Plans by the Big River Amateur Television Society for a live full color fast-scan ATV demonstration.

NET	QNI	QTC	Freq	Time	Day	Mgr
75 meter noon	1203	76	3970	1830	Dy	WBØJFF
75 meter eve	937	56	3970	2330	Dy	NØAEF
ITEN 4Sess.	98	9	3970	2330	Sun	KDØBG
TLCN 60 Sess.	287	107	3560	0400	Dy	WØYLS
W. Cen ARES	261		147.09	0200	M-F	KØCNM

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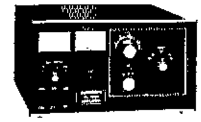

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FLEA MARKET INFO: Jeff Blyth, KA4WYC, 634 Northway Dr, Charlotte, NC 28208, 704-393-7140
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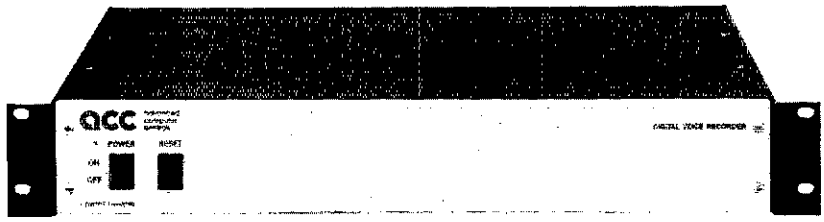

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UG83B	N Female to PL259		6.50
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UG175/6	Adapter for RG58/59 (specify)	10/2.00 or	.22
UG255	SO239 to BNC Amphenol		3.75
KA51-18	TNC RG58		4.35
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Traffic: WØSS 149, KØGP 109, WØYLS 75, KAØADF 69, KCØXL 57, KAØGSA 52, W4JL 52, W4JL 52, WBØJFF 34, WBØAVW 30, NØAEF 22, KØBRE 20, WØBW 12, KAØVBA 6 K4KUU 4. TEN Net report from WØSS, 405 messages in 62 sess. Ia. rep. 100% with KAØADF, NØCWW, WØFO, KØGP, NØSM, WØSS, WØYLS. TEN by NØGCC QNI 608, 60 sess. at rate of .398 WØHTP/50, KØIPT/39, KCØXL/20, NØHEZ/2, WDØFWB/2.

KANSAS: SM, Robert M. Summers, KØBXF—SEC: NØBLD. STM: WØOYH. ACC: KØBXF. TC: WBØNQM. BM: KØJDD. SGL: NØBLD. Net Mgrs CW- WBØZEN; WX Net-WAØHOZ; PKT R. DECs WØOAG, WØEB and WBØYJT. KDØJM now has a new rig and is back on the air. Perhaps he will be back on the KS ARRL STAFF soon. Congratulations, again to Rick, WØRT, who was awarded the KANSAS AMATUER OF THE YEAR award at the state convention Oct. 12. WØPB reports the club at Hiawatha assisted for its 20th year in Halloween Parade. Net activity for October: KSBN QNI 1351. ATC 184. KPN 408/52. KWN 1010/757. KMWN 635/563. CSTN 2310/64. QKS 271/81. QKS-SS 47/14. Ks RTTY net QNI 19 QTC 2. Many thanks to Bill, WØQBK, for a mighty fine job he has done as NCS on KWN and KSBN. Bill figures its time to retire to other duties and let the youngsters do yeoman duty for a while. Now that we are on the subject of NCS—WØFRC would like to have a few more volunteers step forward and give an assit with KSBN and KPN NCS duties. Clay pays NOTHING but top wages and fringe benefits. All CW operators should consider QNI QKS 3570 kHz daily at 7 and 10 PM. New NCS are needed there also. LET US ALL TURN OVER A NEW LEAF—VOLUNTEER—. Traffic: WØFRC 416, NØGCC 281, KSØU 164, WØFIR 155, KØBXF 152, WØOYH 124, KCØHF 104, WØHI 91, WØFDJ 68, WAØHOZ 64, WBØZEN 61, WØQMT 50, NBØZ 47, WØMYM 23, WØPB 20, WØOAG 8, WØCHJ 6.

MISSOURI: SM, Ben Smith, KØPCK— The 1987 officers of the Missouri Valley ARC are: Pres. KØJZI, VP, KAØYSI, Sec. KAØIKS, Tres. WBØHNO and elected to the board of directors were: KAØKBY, KBØDE, and KAØKCB. The S.M.R.C. has voted to change the yearly picnic, swaptest to a major hamfest, a major Hamfest. It will be held Saturday August 15, 1987, at the Downtown University Plaza Trade Center in Springfield. This will be the first large Hamfest to be held in Southwest Missouri so hope everyone will put it on their Hamfest calendar for 87. The Columbia 87 Hamfest will be held May 23 again at the Holiday Inn West. More information at later times. The Heart of America ARC provided communications for the Divided- United Footrace in Kansas City Nov. 9. The amateur participation was organized by KØUAA. Other hams assisting were: WØAIB, KAØSIB, KAØSZY, KBØBBC, WBØEJJ and his XYL, Joyce. Amateurs from four different clubs in the Kansas City area provided communications for "The Kansas City Marathon" on Nov. 16. It is a 26 mile run with over 2600 runners taking part in this years event. Amateurs from PHD, Heart of America ARC, Olathe and Southside worked together on this project. Amateurs operating were: KAØWZQ, KAØYUL, NØHKR, KØUAA, WAØPFS, KAØWZX, KAØWZK, KAØWZY, NJØX, KØTLM, WBØROQ, KAØSXY, KAØSZY, WAØKUH, NØAFM, WBØGQA, K9BD, WØCLR, WBØTGG and WBØCT. Silent Keys reported in the Missouri Section the past month were: WAØGYS, WBØBVI, N8NE and WDØDZK.

NET	SESSIONS	QNI	QTC	NM
MON	60	281	162	KØSI
MOSSB	30	723	82	KØORB
HBN	19	252	15	KØDSQ
MEOW	30	608	112	KØDSQ
MTTN	11	25	8	NØBKE
CMEN	4	51	3	KØPCK
SARN	4	44	0	WØENW
RARSBN	28	352	4	KAØLIN
TN-Co	4	43	0	KAØLO
LOZFM	4	74	0	WØRTL
LOBKC	25	381	1	WØRTL
St. Lares	4	239	3	KØWEX
ARESN	4	50	2	NØFQW
ZAEN	4	79	80	NOØE
MOFO	4	15	16	AIØO
SMARCN	4	61	1	KDØUD

Traffic:WØBMA 440, NQØG 286. WAØYJX 206, NDØN 165, AIØO 159, KØSI 101, KØPCK 81, KØORB 65, WØOUD 63, WDØELL 38, WAØHTN 37, NØBKE 29, KGØL 22, WBØCJB 17, NØSS 14, K9OCU 13, WØTF 9, NIØR 2.

NEBRASKA: SM, Vern Wirka, WBØGQM—STM: Jerry Kohn, WDØEGK. SEC: Michael Ruhrdanz, NØFER. Please make a note that all ARES reports should now go to the new SEC, Michael Ruhrdanz, NØFER, 1251 Dakota, Lincoln, NE 68502. The SEC phone number is 402-421- 2894. The Midway Amateur Radio Club of Kearney reports KAØKCM has a radio bulletin board system on line for RTTY on 146.925 MHz simplex at 100 word-per-minute Baudot. The new Net Manager for the Scotts Bluff ARES Two Meter Net is John Parmenter, NØGNP. Lloyd McElhaney, KØDKM, of Omaha qualified for a brass pounders award for November 1986. KØDKM's traffic for November 1986 was originated 173, received 74, sent 234, delivered 25, for a total of 506. Traffic: KØDKM 506, WØKK 93, WAØBOK 28, KAØBCB 9, NOØA 6, WDØCRD 6, WBØGQM 6, WBØGPM 3.

NEW ENGLAND DIVISION

CONNECTICUT: SM, John T. Ronan, K3ZJJ—STM: K1EIC. SEC: KA1ECL. ACC: KG1M. OOC: NA1I. TC: W1HAD. BM: K3ZJJ. PIO: KX1B. SGL: W1AH.

NET	SESS	QNI	TFC	NM
CPN	30	324	118	KA1BHT
WESCON	31	208	399	WB1GXZ
RATHON	30	160	65	KA1JAN
CN	51	294	162	K1EIR
NUTMEG	19	-	60	K1EC

N1DCS, DEC Dist. 8 and WHARA have established a joint Emergency Plan with the Red Cross for emergency communication. WHARA will receive Disaster Action Training and certification. Under the Disaster Plan, WHARA would provide communication within the disaster area, at Red Cross headquarters, at shelters and in mobile units as well as to provide liaison communication outside of the disaster area. On Sept 12 W1HAD and K1EIC relayed an emergency message to Puerto Rico during a telephone blackout to provide air transportation for a terminally-ill patient in Houston. Within the hour, transportation was arranged to permit the patient to spend her last hours at home with her family in San Juan. A new training net, the Connecticut Slow Net (CSN) is scheduled to start on January 12 with WB1GXZ as NM. CSN will meet 7:30 PM, M-F at 3.720 MHz. CN will run compatible 13 wpm slow sessions on 3.640 MHz at 7 PM and 10 PM on Saturdays with W1WP as NCS. FARA's Conn. Public TV program on Amateur Radio, "This is FARA" was a great success. Videotapes are available. ECARA held an organizational meeting for Dist. 3 ARES on Nov. 24 with KB1VM as DEC. ADECs and ECs: KB1H, K1VQE, K1DNW, N1EDG, NE1N, KR1U, K1APE, KA1HTX, K1ZKR, K1KKK, KA1MPI, KA1MPG, WA1HYN, and WA1RLV. ECARA/ Dist. 3 has an agreement with the Putnam Hospital to provide the medical staff with 4-wheel transportation, with radio communication, during snowstorms and other

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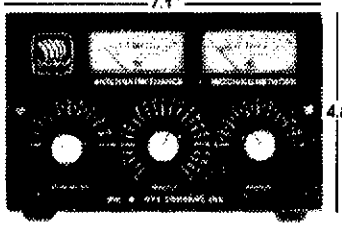

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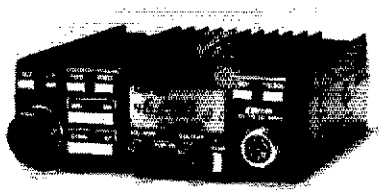

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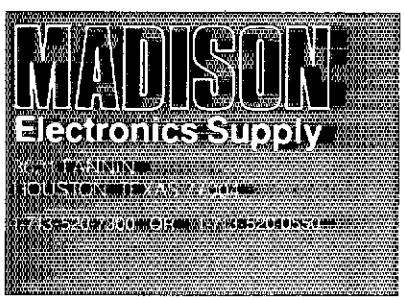
50 watts	50H	50A	50B	50C	50D	50E
100 watts	100H	100A	100B	100C	100D	100E
250 watts	250H	250A	250B	250C	250D	250E
500 watts	500H	500A	500B	500C	500D	500E
1000 watts	1000H	1000A	1000B	1000C	1000D	1000E
2500 watts	2500H					
5000 watts	5000H					



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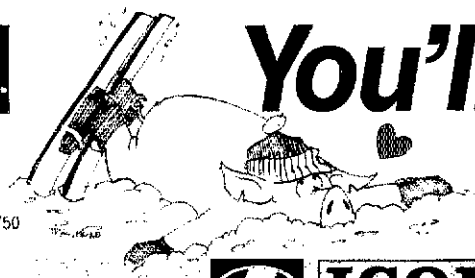

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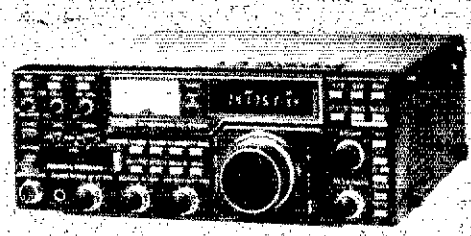

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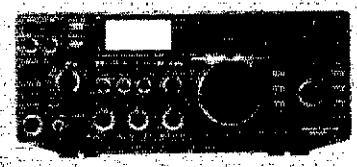

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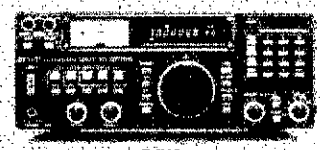

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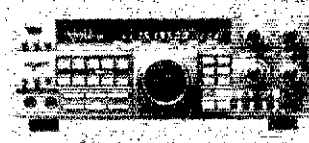

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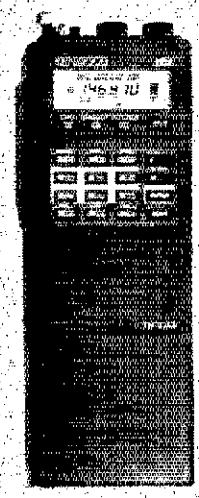

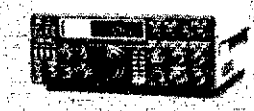

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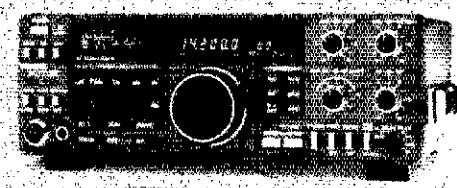

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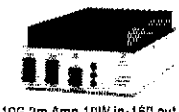

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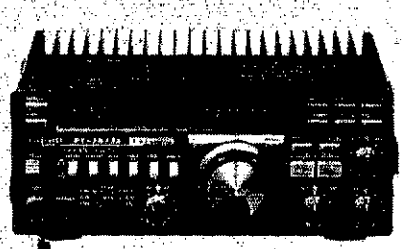

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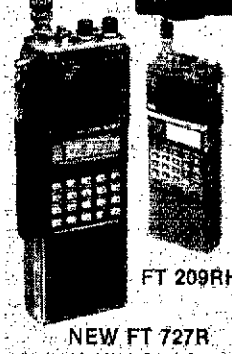

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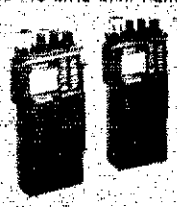

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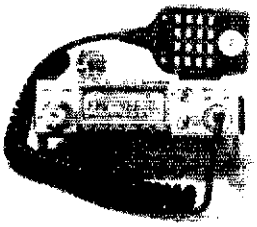

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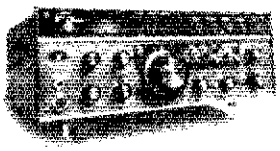

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ROTATORS

Diawa Rotators available	CALL
Alliance HD73	109.95
Hy-Gain Ham IV	CALL
Hy-Gain Tailtwister T2X	CALL
Hy-Gain Heavy-duty 300	CALL
Kenpro KR500 Elevation Rotator	199.95
Kenpro KR5400 azmth/elevat	329.95

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B23A 2m Amplifier 2-30	120.95
B1016 2m Amplifier 10-160	249.95
B3016 2m Amplifier 30-160	219.95
D1010 10-100 Amp for 430-50	299.95
D1010N UHF Amp/N connectors	299.95
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A1015 6m Amp: 10 in, 150 out	269.95

AMERITRON HF AMPS

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ATR10 Ant Tuner 1 kW	Call
RCS8 Remote Coax Switch	Call
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NEW AL80A 1200 watt Amp	Call
AL84 HF Amp 160-15	Call

AMP SUPPLY

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LK 500ZBNT HF Amp no tune	Call
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LK 500ZG 2.5 kW hipersil	Call

This is a partial list—
IF YOU DON'T SEE WHAT YOU WANT... CALL

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376 5-position Coax Switch	24.50
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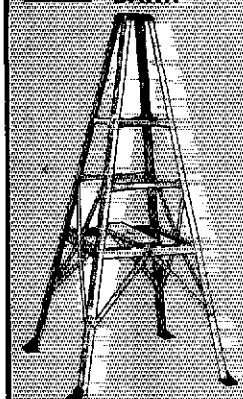

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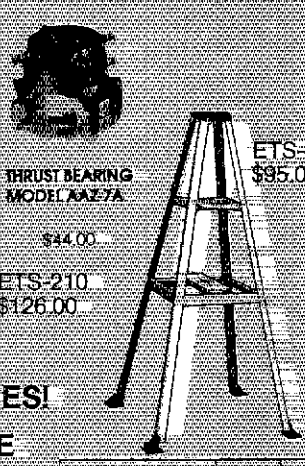

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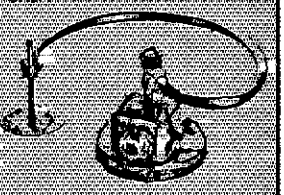
CR2A



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emergencies. The ECARA has already handled its first emergency, summoning emergency medical service for an injury at a Youth Soccer field where a teenager was knocked unconcious on an icy field. The New Haven Register printed an outstanding article on K1RH's Amateur Radio class sponsored by WHARA. Forty new students signed up. SARA is organizing communication for the April Stamford Marathon. KE1H is the new CARA 174.120 repeater trustee. The 1968 CARA Flea Market was a financial success thanks to chairman W1IDH. GNARC has set up a club station at Red Cross-Civil Prep. Headquarters. GNARC visited the Norwalk Hospital Children's Ward on Christmas to provide 2 meter phone patches to the North Pole. Congratulations to newly elected club officers: FARA-Pres. W1FDY, V.P. KA1AC, Sec. WB1FVY, Tres. KA1GGT. GNARC-Pres. AE1H, V.P. KA1MDN, Tres. KV1A, Sec. W1FKM. ECARA-Pres. KB1H, V.P. K1VOE, Sec. N1BBI, Tres. KA1LMN. CARA-Pres. N1DMQ, V.P. N1ABY, Sec. N2EFA, Tres. W1IDH. WA1CFM, W1GLQ and K3ZJJ were NCSs for the New York Marathon Runner Droup out Net. Of the 1,095 who failed to finish, 988 were processed by voice and packet radio. Congratulations to KB1T on a new 220MHz repeater coordination from TSARC. Traffic: KA1MDM 363, WB1GXZ 206, KA1MKJ 198, W1EFW 150, N1EDD 131, KA1KTH 95, KA1GWE 88, KA1BHT 64, KY1F 60, N1BOW 38, W2YOL 37, WA1NLD 33, W1BDN 31, K1AQE 41, WB1ESJ 11, W1QV 2, W1WP 45.

EASTERN MASSACHUSETTS: SM, Luck Hurder, KY1T—ASM: K9HI. SGL: K3HI. OO/AA: KA1KF. SEC: KB1PA. PIO: K1HLZ. BM: KB1AF. STM: KW1U. TC: KA1IU. ACC: KA1KCU EMASS Hot Line - 437-0111. Westlink 449-2226.

NET	MGR	FREQ	TIME(LOC)/DY	QTC	QNI
EMRI	N1AJJ	3658	1900/2200	DY 190	195
EMRIPN	N1BGW	3880	1730	DY 217	209
EM2MN	KA1AMR	145.23	2000	DY 265	316
NEEPN	K1BZD	3945	0830	SN 6	64
HHTN	NG1A	04/64	2230	DY	
EMRISS	N1CVE	3715	1600/2030	DY 87	127
CITN	KB1AF	745/045	1930	DY 139	302

Ass't Section Traffic Manager W1CE has made vy quick work out of rounding up qualified liaison people for traffic sent by packet BBS. EMASS stalwarts KB1AF WA1TBY N1BGW KN1K and KW1U have all pitched in to make this project a success. Amateur Auxiliary Coord. KA1KF reports that our Technical Coordinator KA1IU has applied for an addition appointment as Official Observer. FB—the Auxiliary can use all the qualified help it can muster! Public Information Officer K1HLZ reports that the new EMASS ARRL info phone line is now in effect at 437-0111. Give it a call to receive (and send!) Amateur Radio news to all in EMASS. OO W1NF continues to be vy active at the ripe young age of 92, having been hamming for 84 years and an Official Observer for 39 of them! Makes you sit back and think, eh? Public Information Assistant KA1LIK has been distributing the Archie Amateur Radio comix to local schools locally, and recommends that more of us investigate having our clubs purchase the 20 volume series of Leagtie publications for our local libraries. Bulletin Manager KB1AF sez that the EMASS Bulletin Stations are continuing to burn up the air waves with an astounding 323 bulletins during the month, but there are still a few areas in the Section that are not getting the benefit of hearing bulletins being retransmitted. Contact KB1AF or myself for the appointment application necessary to become an Official Bulletin Station. Section Traffic Mgr KW1U reports that congratulations are in order for WA1FCD KA1ON KB1AF N1BGW WA1TBY and N1CVE, all of whom made the Public Service Honor Roll. Nov. Tfc: KW1U 608, KB1AF 460, N1BGW 451, WA1FCD 447, WA1TBY 338, KY1T 192, W1CE 186, N1BHH 155, KA1AMR 119, W1ZHC 116, K1GRP 115, N1CVE 108, KA1EID 100, KA1ON 79, N1AJJ 78, K1ABO 76, K1SEC 71, N1BYS 40, KA1LIH 23, K1BZD 22, WA1FNM 17, WB1GIA 15, KA1LIK 15, K1LCQ 12, WA1SNH 12, KA1KCU 7. Have you expressed your opinions to your Section Manager recently?

MAINE: SM, Cliff Laverty, W1RWG—ASM: Bill Mann, W1KX. SEC: KA8UVQ. STM: AK1W. BM: W1JTH. ACC: KA1FKS. OOC: W1KX. PIO: KY1E. SGL: K1NIT. TC: K1PV. W1JTH, bulletin manager, lists the following official bulletin stations: Bill W1KX, Percy KA1JPR, Paul N1BUG, Ben W1VEH, and Win W1WCI. Send local bulletins to W1JTH. AK1W, section traffic manager, lists official relay stations: Chet W1OTQ, Ted WA2ERT, Bill W1ISO, Mel WB1CBP, Ray WB1DSM, Dave K1BZ, Dave KA1KFC, Chris AC1G, Alex NB1T, W1RWG, Bill W1KX, John NB2K, Eric WB1GLH, Scotty WA1YNZ, and Ron KW1Q; also the following net managers: Sily KA8UVQ, Win W1WCI, Jerry K1GUP, Hat ND1A. KA8UVQ, section emergency coordinator, has emergency coordinators for the following counties: Aroostook WA1YNZ, Cumberland WB1GDZ and WB1CBP asst, Franklin KA1CNG, Hancock KB1IVZ, Kennebec W1WCI, Lincoln WA1GIN, Oxford KA1LUN, Somerset N1BCE, York WA1CIM, and Harpswell area AEC W2OLV. Mid-Coast ARPC held Christmas party Dec 13 and Pem Bay ARC Dec 8. Pem Bay is sponsoring a novice class under the auspices of the SAD 28 adult education director.

NET	Sessions	Checkins	Traffic	Manager
SeaGull	24	911	130	K1GUP
PineTree	30	314	84	ND1A
CenMeEmerg	8	160	12	W1WCI
MePubSvc	5	83	6	KL7IJG
AroostookEmrg	4	79	1	WA1YNZ
RACES	5	82	17	W1RWG

Traffic: WB1CBP 128, KA1JOJ 90, ND1A 69, WA2ERT 59, W1KX 54, W1RWG 54, AK1W 37, W1VEH 34, W1JTH 17, WA1YNZ 15, WB1BMX 12, K1BME 9, KA1KFC 8, KA1ODT 6, W1OTQ 6, NB2K 2, PSHR: WA2ERT 92, WB1CBP 88, W1RWG 87.

NEW HAMPSHIRE: SM, Bill Burden, WB1BRE—TC: W1JY. SGL: N1AIX. This was the month for the quarterly NHARA state organization meeting. We met in Concord and the guest speaker was Dick Strome, NH State CD Director who commended the amateur community on the performance of ARES and the responsiveness of Hams to emergency situations. Most active clubs were represented. GBARA will now hold quarterly VEs in the Dover area. WA2MBQ sent a report on Mt Moriah RS participation in "Salem Five" road race, providing comm and safety support. Participants included K1ILB, W1PFA, KA1MLD, KA1BRB, N1CMD, WA1YEG and N1BYQ (club pres). Many Novice classes planned for beginning of 87! The Twin State club newsletter is on the move with editor Bill Wallace. Bill is a new ham and had not yet got his call at this writing, but had already volunteered to edit the newsletter! Good job, Bill! NHARA will again sponsor the NH QSO Party this year—fine up your new Novices for this one—bonus points for Novice/Tech contacts! WB1GXM reports that a Novice class is being taught in his area as part of an evening class program in a local school. Butch is also working on new promotional material. The new ARRL Archie comic books are being distributed around the state with good comments from young people! WB1BRE reported on plans to start a Ham radio/electronics enrichement program at a Junior HS in Nashua. And Dale AF1T, reports that he has a 902 MHz directory he has been working on and it is available for a business sized SASE. The GSARA newsletter has a series of good articles on Packet

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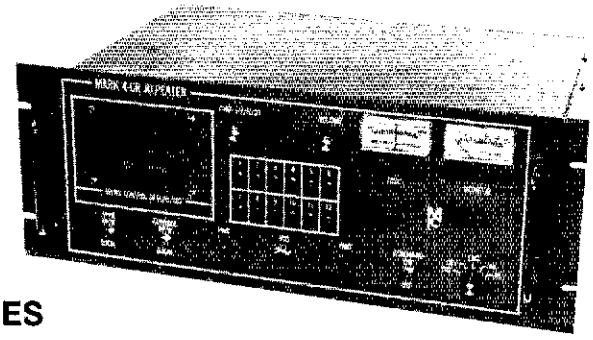

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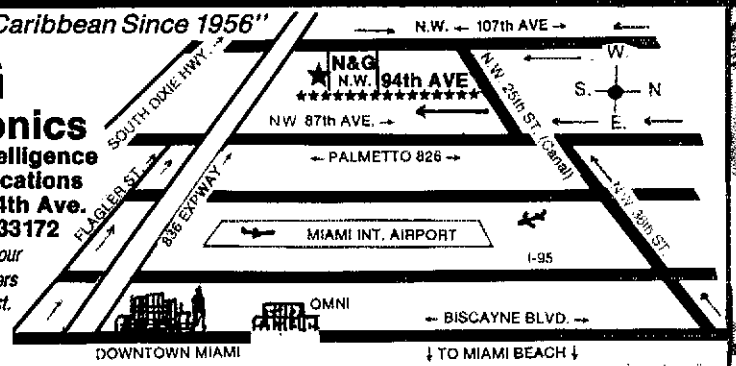

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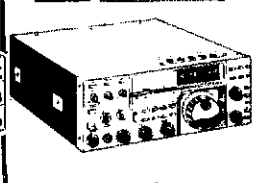

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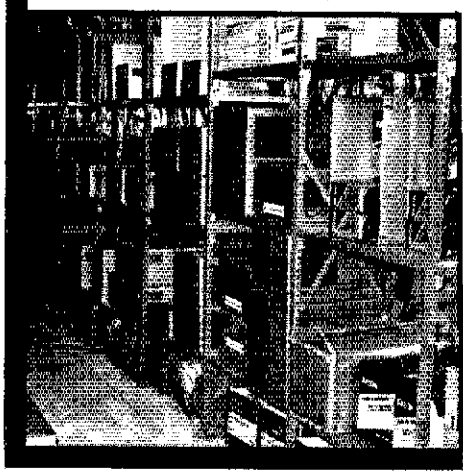

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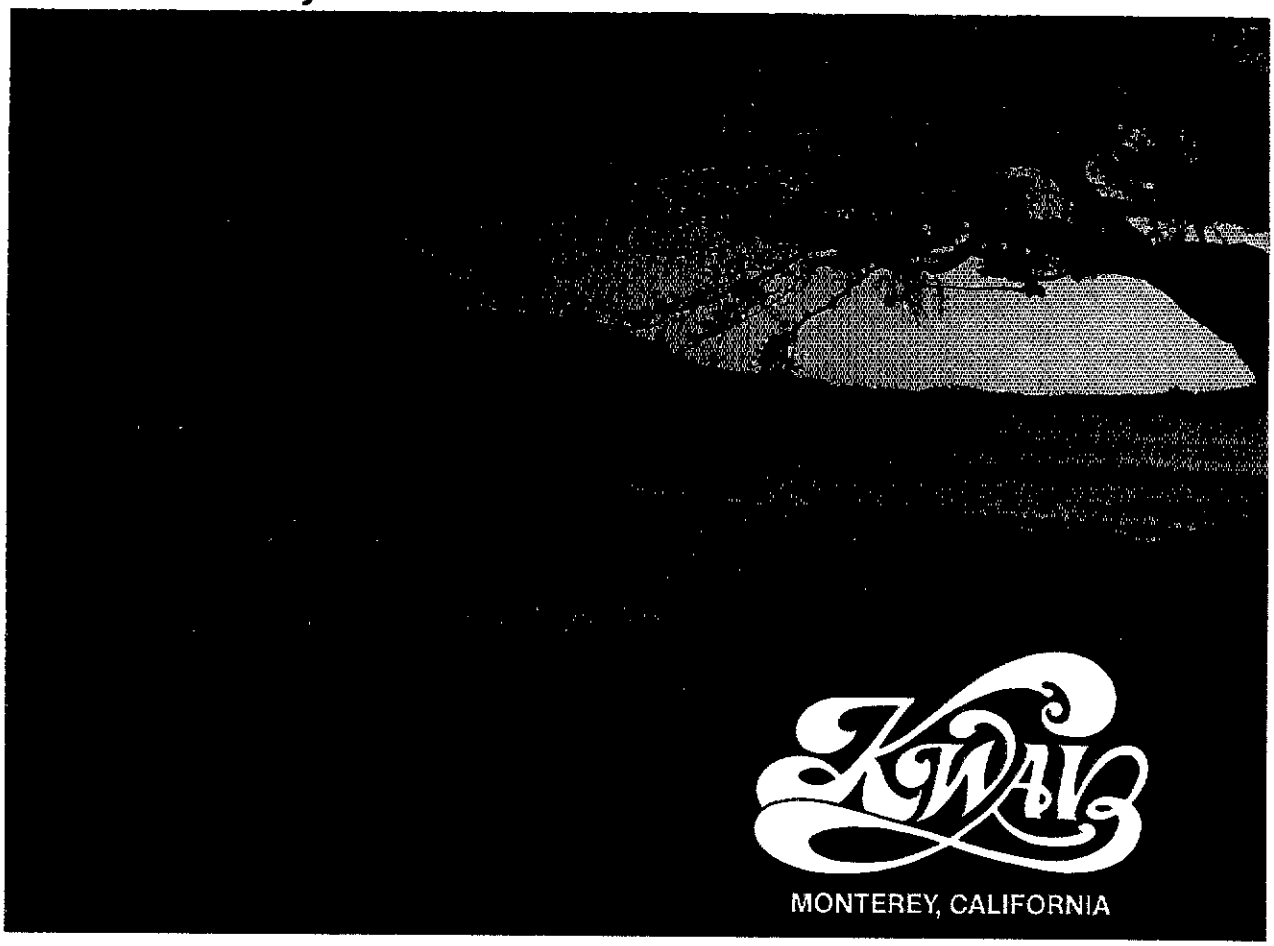

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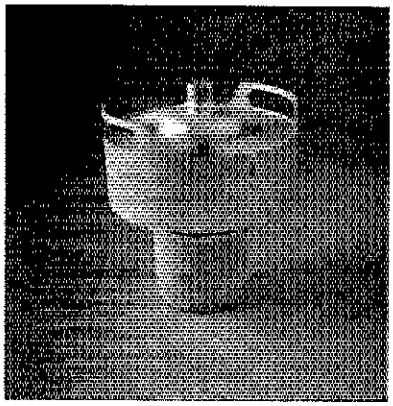

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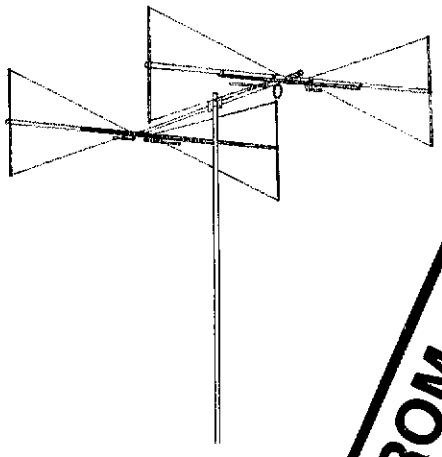

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- Turns with TV rotor
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- Designed for the low-band DXer
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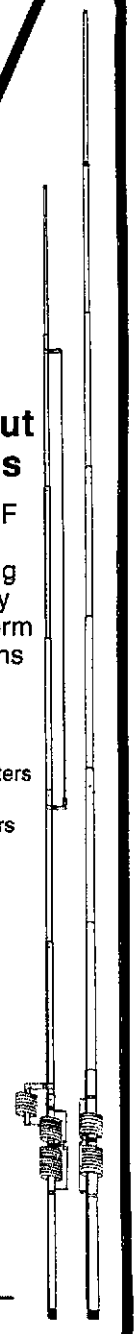
For more information see your dealer or write for a free brochure



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radio and repeaters-very radable and informative. On the traffic front, our section had 98% rep on FRN again-tnx traffic handlers! Congrats to N1CPX and N1NH on making BPL! Traffic: GSPN 356, GSFM 209, NHN 114, WB1DSW/P 108, MSOVTP 32: N1CPX 594, N1NH 337, W1PEX 324, KK1E 160, W1FYR 124, W1TN 93, WA1FHB 90, K8UXO 90, W1ALE 89, KA1LBW 89, K1PQV 85, KA1GOZ 72, N1AKS 69, KA1LMR 66, K1TQY 60, WA1YZN 51, KV1S 43, K1ACL 34, NE1J 29, KI1M 26, KA1HPO 23, WB1GXM 16, N1CAR 14, KB1XI 12, N1DQA 8, W1LQQ 5, K1OIQ 5.

RHODE ISLAND: SM, John (Bob) Vota, WB1FDY—New Officers of the N.C.R.C.: Pres. W1BIX, V.Pres N1GHH, Sect. W1IIC, Tres. WA1OSL. Corrs. Sec. W1JFF. New Officers B.V.A.R.C.: Pres. K1KYI, V.P res. KB1SC, Sect. KV1O, Tres. K1EHV, Activities NF1L. No other Newsletters were received this month. Traffic: KA1JXH 239, PSHR 105, WA1CRY 53 W1EQF 234,. New Officers Brown U. Radio Club Pres. KA1JQH. V.P. KC2MM, SECT. KA1LZ, Tres. KA1OVD.

VERMONT: SM, Frank I. Suitor, W1CTM—ASM: KD1R. STM: AE1T. SEC: W1KRV. PIO: WA1YOY. TC: W1AIM. The first ARES newsletter from SEC (W1KRV) has been sent to all known members statewide. If u did not receive one, reregister by contacting W1KRV. Ten of VT's 14 counties now have Distric Emergency Co-Ordinators (DECs) and the total state ares registrations are close to 100. Simulated Emergency Nets (SEN) are held on 146. 16/76 (Tues 7PM), 34/94 (Sun 11 AM), and 3976 (Sun 6 PM). These nets are open to all and each one of u is peronally invited. A big welcome is extended to the following new hams (N) - KA1ETB, KA1FXW, KA1OVJ, KA1OZE. GMWS VE exams on 11/8 made the following upgrades: (A) KA1OVJ; (G) KA1JNQ, KA1NQI; (T) KA1NWB, KA1NZB, KB2BCF. CVARC reports another six new tickets should have arrived by now. Novice note —look for CVARC novice practice QSOs on 28.15 MHz most evenings at 9-10 PM. Next VE exam schedule is at Milton Hamfest on 2/28—contact WB2JSJ. The VT and NH QSO parties will both be held on 2/7-8. (See Jan/Feb Contest Corral for details). Pick a suggested freq and make somebody looking for a VT QSO happy. Twin state ARC should have a warm clubhouse with all that stockpiled fuel! Chip (W1AIM) is still traveling the state with his excellent FP8 DX slide presentation—contact him if ur club is interested. The packet activity is still growing in our area with digipeaters W1KOO-1), W2UXC-1, W1BD-1, WA1TLN-1, W1HJF-1, VEZRM, VEZPAK BARC ATV Repeater (W1KOO/R-ATV) is active on 439.25/421.25 MHz. A power increase is planned for early 1987. Continued improvements in BARC repeaters are being co-ordinated thru WA1SVR. Our state PIO (WA1YOY) can now be heard chasing DX on 20 with his new tower/beam and also on 2 mtr FM (Mobile) as he travels from Orwell to work in Burlington and back daily. Congratulations to WA1UVW (Jim) who has been appointed as the Burlington Red Cross 271H at the BARC/Red Cross club station helped make up his mind—hi. BARC Novice/Tech classes started 1/28—late registrations will be accepted through 2/11. National Wx Service again wishes to say tnx for ham radio support during 1986, and is looking at ways to improve severe wx communications throughout the state in 1987. Most likely this will be accomplished thru Red Cross local chapters and their affiliated amateur radio clubs in the more populated areas plus individual hams in the more remote areas. ARES organizational efforts by SEC/Clubs/DECs/ECs should enable VT hams to be better prepared for the severe wx public service challenge in 1987. November traffic report: KT1Q 627, WA2SPL 416, N1DHT 116, K2KBT 112, WA1JVV 111, AE1T 108, W1KRV 95, W1OAK 14. November net report: VTN 30/245/223, HHN 12/76/0, SEN 4/81/5, CVFM 5/100/8, CAR 25/655/40, GMN 25/374/32. CU at Milton Hamfest!

WESTERN MASSACHUSETTS: SM, Don Haney, KA1T—PIO/ACC: K1BE. SEC/SGL: WB1HIH. OO/RFI: N1CM. STM: W1UD. TC: KA1JJM. The new year is here and we are into the middle of winter contests season, having had the VHF SS this past month and CW/SSB DX contests late this month. Hope to see several WMA calls in the scoring again. Licensing and upgrade statistics are looking very good, thanks to the classes and exams being given throughout the section. We see about 25-30 new licenses or upgrades per month in WMA. And nationally, the number of hams increased over 2% last year! MARA had 19 students in their Novice class recently. Both NOBARC and HCRA continue their regular schedules of classes and exams. Fast work by WA1YQG and WB1EUC reporting a fire in Hopkins Forest had it under control within 30 minutes. Great work! Good to see KA1OFC and KA1EXJ in the traffic totals this month. Joy, KA1EXJ, moved west from East Mass recently where she had been very active in traffic handling. PSHR: WB1HIH, N1DMU. Traffic (Oct/Nov): KA1T 180/211, W1UD 166/203, N1DMU 223/31, W1KK 66/72, WB1HIH 29/43, KA1EKQ 51/-, W1ZPB 28/8, WA1OPN 8/10, KA1EXJ-/10, KA1OFC -/4.

NORTHWESTERN DIVISION

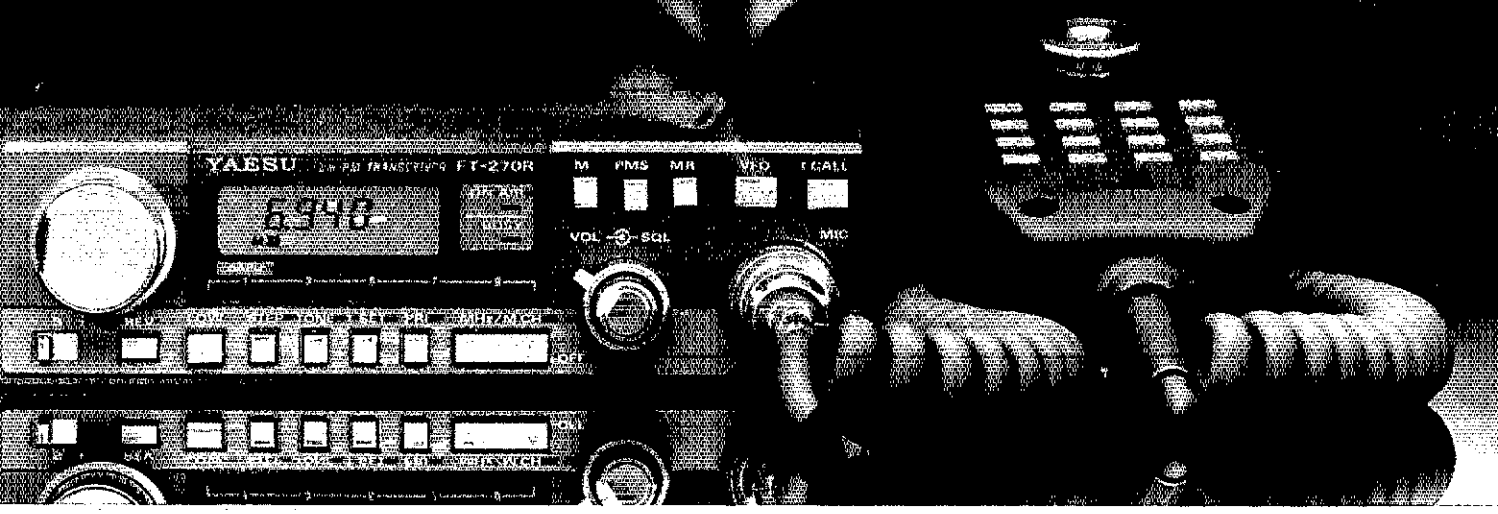
ALASKA: SM, Jim Moody, Jr., NL7C—SEC: KL7JIM. STM: KL7T. TC: AL7L. NM: KL7GID, KL7AF, KL7JKW. DEC: AL7AC, KL7WM, KL7JFT. The Arctic Amateur Radio will be sponsoring the "Alaska Novice Week" contest next month. This will be a week-long contest with awards provided by the Arctic ARC. The purposes of the event are: 1) to foster new novice activity; 2) to inform hams worldwide of QSO possibilities in the U.S. novice bands; and 3) to encourage higher class licenses to act as "Elmers" for novices who might not have the means to get on the air. The contest is scheduled for the forty-eight hours of operation during the week commencing 0000Z March 22, 1987, and ending at 2359 Z March 28, 1987, on the U.S. novice bands below 30 MHz. Inquiries should be addressed to AL7IF (P.O. Box 84531, Fairbanks, AK 99708).

IDAHO: SM, Don Clower, KA7T—The following Treasure Valley hams were involved with assisting the Meridian Winter Festival parade on 11/29/86: KA7WCO, K7OOP, WA7VPN, N7AL, N7HQT, WA7ESU, KA7KPZ, K7PKZ, W7MAI, K7CXG, KA7T, K7QEL, K7GBE, and N7FZA. Special tnxs to N7IRM and K7REX for organizing the event. The Twin Falls ARC assisted with communications during President Reagan's visit to Twin. The Idaho ARES NET meets on 3.990 MHz at 0000Z on Sunday afternoon, CONG to recent upgrades: KA7WBX, KA7ZTA, KA7ZLV, WB7PHC, WB7CIJ, KA7ZVC, N7IFD, WA6WOJ and KA7LTS.

NET	FREQ	TIME	SESS	QNI	QTC
FARM	3937	8 PM DA	30	1995	29
ID CD	399D	8:10 AM M-F	20	721	25
NWTN	146.38/98	7:30 PM DA	31	866	38

Traffic: NW7K 28, W7GHT 202, N7BHL 156, PSHR: NW7K 99, W7GHT 94, N7BHL 99.

OREGON: SM, William R.Shrader, W7QMU— ASM: KZ7T. STM: W7VSE. SEC: N7CPA. PIO: KC7YN. SGL: KA7KSK. STC: N7ENI. ACC: KB7CC. OO: N7SC. RFI: AK7T. Upgrades: KE7KH, N7FCA (Extra); KA7ZAG, KA7YXY, K7BZS, N7IQK, N7GSI (ADVANCED); KA7LSQ, KA7YUP (GENERAL); KA7HYU, KA7YIR, (TECH). New officers of the Sunset Empire ARC are: KE7NL, Pres.; NN7U, V.P.; N7HRA, Sec.;



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Once installed, you'll find the FT-270RH and the FT-2700RH equally simple to operate. Just turn the rig on, dial up a frequency, select offset or duplex split, and you're on the air.

Each rig gives you 10 memories for storing your favorite frequencies. Dual VFO capability. A clean, uncluttered LCD display for easy readout. Push-button jumps through the band in 1 MHz steps. Band scanning with programmable upper and lower limits. And priority channel operation.

You don't even have to take your eyes off the road to determine your operating frequency and memory channel. An optional voice synthesizer announces them both at the push of a button on the microphone. The FT-2700RH announces both your 2-meter and 440 MHz operating frequencies.

Also, tone encode and encode/decode capability is programmable from the front panel, using an optional plug-in board.

So when you need a lot of power in a compact mobile radio, discover Yaesu's FT-270RH and FT-2700RH. There's nothing else like them on the road.

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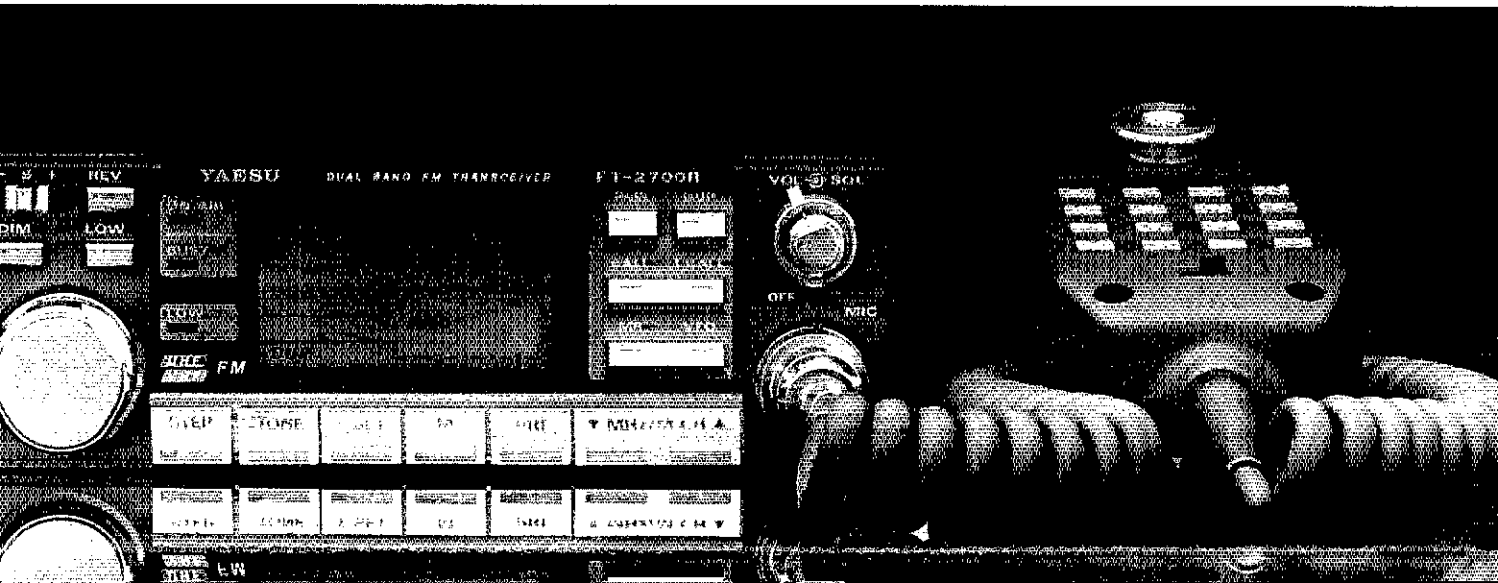

ICOM

1.2GHz: A Pioneer's Paradise!

Exploring new areas of communication is an amateur radio tradition, and ICOM supports today's pioneers with a full line of top notch equipment. It's a fascinating joint adventure: our equipment and your expertise. A prime example of this situation is reflected in the increasingly popular 1.2GHz amateur band.

ICOM produces a deluxe all-mode base station transceiver, the IC-1271A, a ten memory multi-scan handheld, the IC-12AT, a full featured compact mobile unit, the IC-1200, and a quality repeater, the IC-RP1210, for 1.2GHz operation. While propagation in this "Ultra UHF" / low microwave range is basically line of sight, modern developments set the band glowing with excitement on both local and international levels.

SSB activity is soaring among satellite operators, with future OSCARs encouraging even more 1.2GHz action. CW operations are ideal for weak signal moonbouncing while the small size, high gain and narrow beamwidth of 1.2GHz antennas also encourage radio astronomy investigation. Pinpointing a particular area in the skies and monitoring its galactic sounds can prove a unique experience. Exchanging views and brief home movies via Amateur fast scan TV is another rapidly growing 1.2GHz interest.

Finally, range extending repeaters and FM activities are the fun and glamour areas of 1.2GHz that all amateurs (including privilege enhanced Novices!) can enjoy with "go anywhere" transceivers. Initial reports from amateurs in various areas without extreme foilage indicate ranges comparable to 2 meters. With all these assets, 1.2GHz might easily be visualized as the "20 meters of UHF"!

If you're ready to experience the many facets of 1.2GHz in top style, ICOM's all mode IC-1271A offers superb performance. Its receiver's GaAsFET front end features a phenomenal .16μV sensitivity with SSB and CW bandwidth optimized for weak signal reception. The unit's dual VFOs, 32 memories, all-mode squelch and band or mode scanning keep you abreast of activities, but that's not all. Add a power amplifier, high gain antenna and optional AG-1200GaAsFET preamp, and you're ready for moonbouncing.

If you enjoy exploring ATV, cable the optional TV-1200 to the IC-1271A, connect a camera or video recorder and monitor to the TV-1200, and exchange amateur videos with friends. A full line of accessories, including the PS-25 internal AC supply further enhances the IC-1271A.

Surely today's most exciting little package of 1.2GHz technology is ICOM's IC-12AT handheld FM transceiver. Boasting ten full function memories, 32 built-in subaudible tones, DTMF pad, programmable band or memory scanning, priority and call channels plus moisture proof construction, this unit is loaded for fun. Its operation can be simple or sophisticated, depending on your preferences and expanding with your "Ultra Band" interest.

During operation, the IC-12AT's lower area mic allows the unit to be held like a telephone handset and canted back so its radiating antenna is positioned behind your ear rather than in front of your eyes. An optional HS-10 headset and VOX can also be plugged into the handheld for full remote position/hands free operation. Likewise, ICOM's numerous IC-02AT accessories are compatible with the IC-12AT.

FM enthusiasts nationwide are finding 1.2GHz mobiling a refreshing change of pace, and ICOM's versatile IC-1200 is the ideal traveling companion. Its compact size fits any auto's limited interior space.

As the experience of pioneering 1.2GHz gains momentum, visions of owning and operating an "Ultra Band" repeater become increasingly attractive. Once again, ICOM supports those aspirations by offering a frequency synthesized 198 channel quality repeater that's compact, rugged and exceptionally reliable. The field programmable IC-RP1210 is supplied with automatic ID'er, adjustable "tail" and time-out timer, selectable CTCSS operation, and a four-tone DTMF decoder for use in remote controlling special functions. It's microprocessor controlled, with an independently installed PROM used for storing user information such as call signs. The repeater can be rack mounted or installed in an optional steel cabinet. An optional antenna duplexer is also available.

Whether pioneering new frontiers on ultra high bands or working DX on classic low bands, radio amateurs appreciate top quality gear backed with uncompromising service. ICOM thrives on those high standards. Understanding your needs is important to ICOM. ICOM is not merely an equipment manufacturer; it's an active and dedicated part of the amateur radio community.

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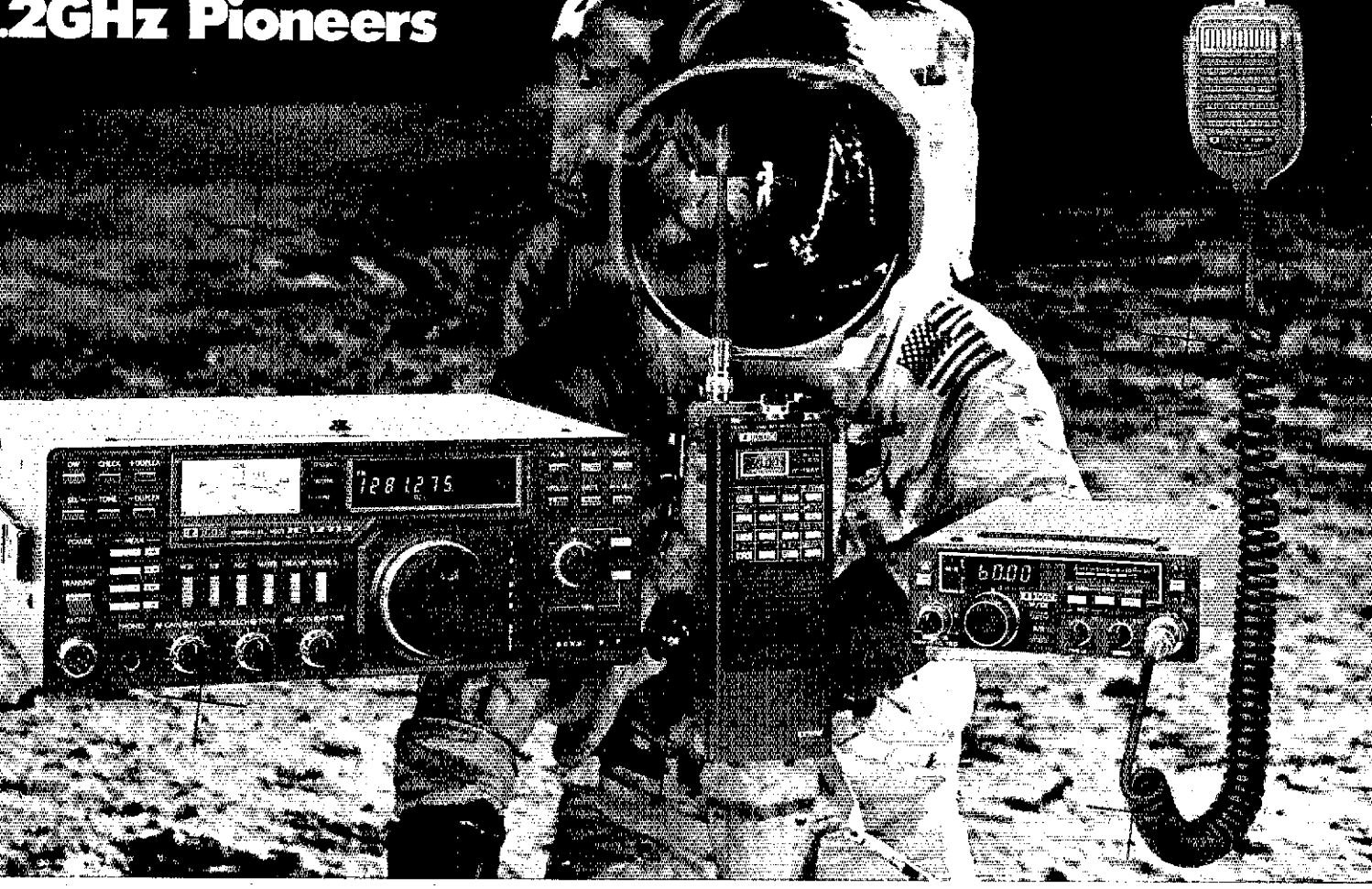

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IC-12AT Handheld
IC-120 Mobile
IC-RP1210 Repeater

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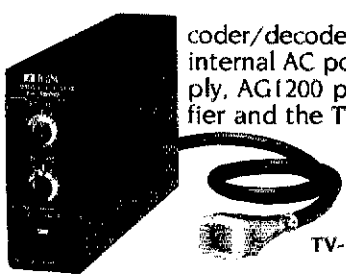
The IC-1271A 1240–1300MHz se station transceiver features 10 tts of RF output power, 32 memo-s, scanning and multi-mode opera-n including ATV (amateur TV).

A variety of options are available the IC-1271A including the IC-EX310 ice synthesizer, UT15S CTCSS en-coder/decoder, IC-PS25 internal AC power supply, AG1200 preamplifier and the TV1200 TV interface unit.

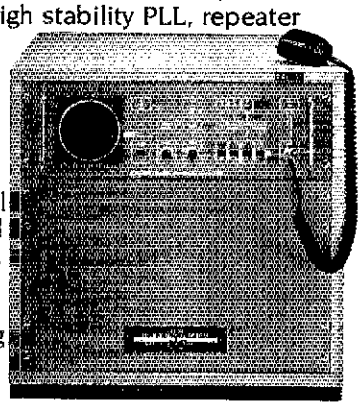


TV-1200

The new IC-12AT covers from 1260–1299.990MHz, has ten memory channels, memory scan, program scan and programmable offset. It also features an LCD readout, RIT and VXO, 32 built-in tones and a DTMF pad.

The IC-120 1.2GHz mobile transceiver has six memory channels, scanning, an HM-14 up/down scanning mic, RIT, LED readout and three tuning rates. Accessories include the ML12 10 watt amplifier and the PS45 slimline external power supply.

The IC-RP1210 completes your 1.2GHz system. It features a field programmable (198 channel, DIP switch), high stability PLL, repeater access to CTCSS, three-digit DTMF decoder for control of special functions, 10 watts, selectable hang time and ID'er.



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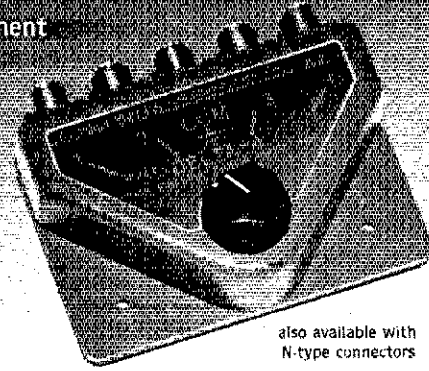

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- Positive detent ball bearing switch drive tells you which position you're in . . . without guessing . . . without looking.
- DELTA-4 handles full legal power.
- Designed and produced in the U.S.A. by Alpha Delta.

Model DELTA-4 4-position coax switch (UHF connectors) **$69.95**
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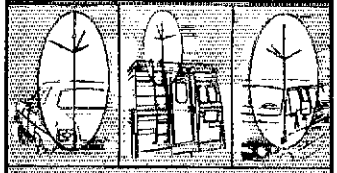
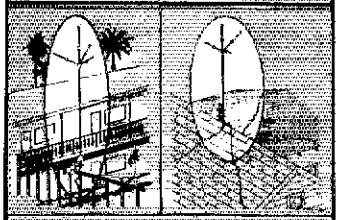


On Land Suitable for use on any motor vehicle from a compact automobile to a motor home. Work the world without stopping to change coils.

Or Sea The Spider™ Maritime™ is for use on or near the ocean. Highly polished non-magnetic stainless steel and nickel-chrome plated brass.



At Home If you live in an apartment, condominium or restricted area the Spider™ may well be the answer to your antenna problems.

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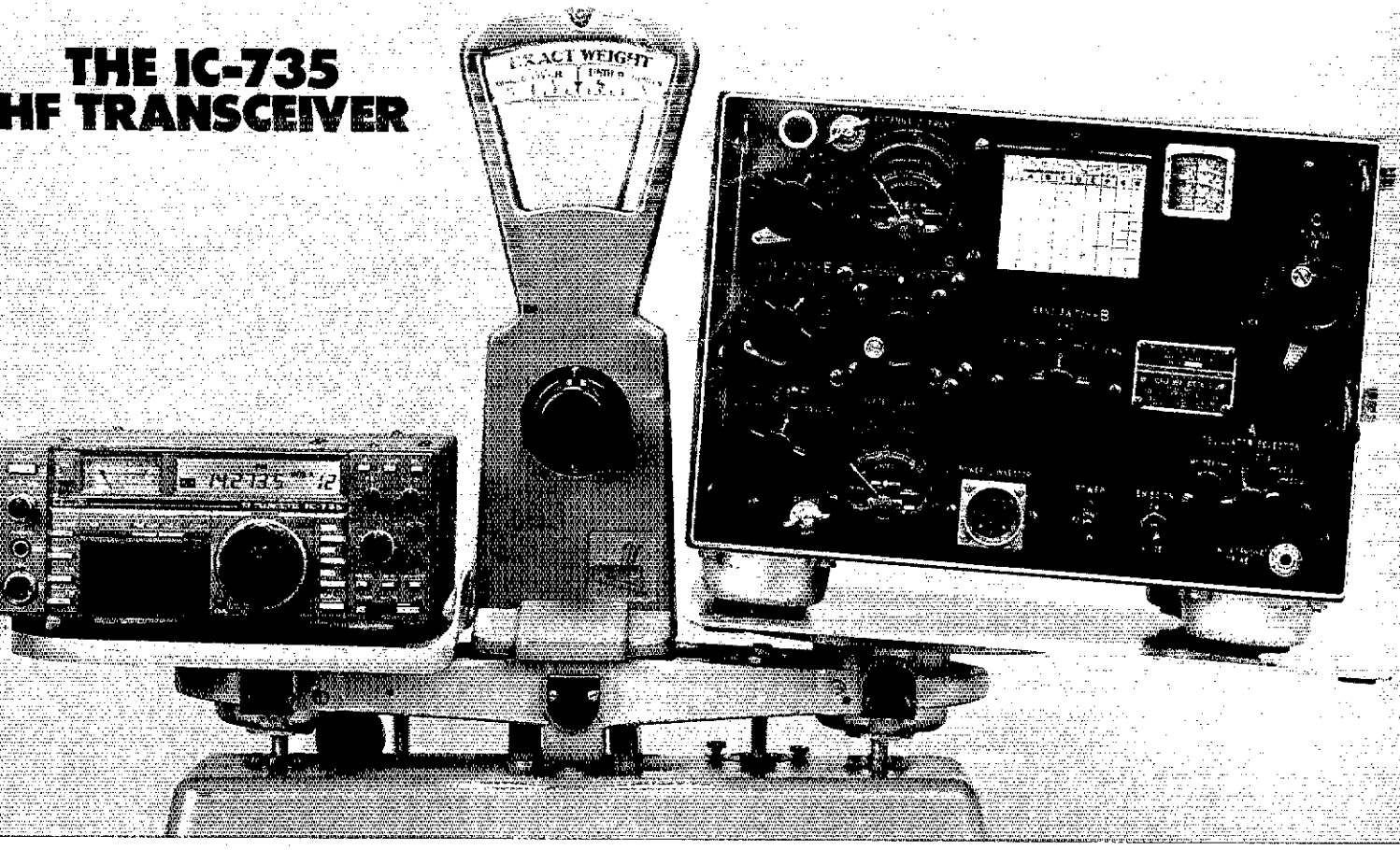
THE IC-735 HF TRANSCEIVER



BUY YOUR HF FOR PERFORMANCE, NOT BY THE POUND

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- **HM-12 Scanning Mic Included**
- **12 Memories/Frequency and Mode**
- **105dB Dynamic Range**
- **All Modes Built-In USB, LSB, AM, FM, CW**

The IC-735 is a heavyweight when you compare features and performance. Other transceivers may weigh more than the advanced IC-735 compact HF transceiver, but inch-for-inch and pound-for-pound, the IC-735 outweighs them all.

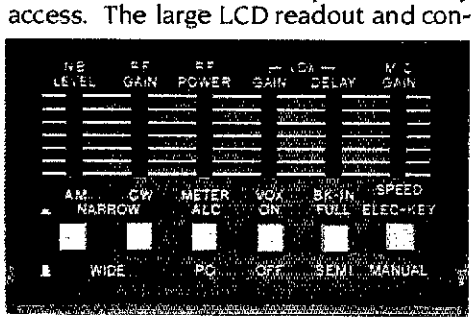
Ultra Compact. Measures only 3.7 inches high by 9.5 inches wide by 9 inches deep and weighs only 11.1 pounds. Without question, the IC-735 is the best HF transceiver for mobile, marine or base station amateur operation.

All Amateur Band Coverage. It's a high performer on all the ham bands, plus it includes general coverage reception from 100kHz to 30MHz. May be easily modified for MARS operation.

12 Memories. Frequency and MODE may be easily stored and retrieved in the 12 tunable memories.

Exceptional Receiver. To enhance receiver performance, the IC-735 has a built-in receiver attenuator, preamp, and noise blanker. PLUS it has a 105dB dynamic range and a technologically advanced low-noise phase locked loop for extremely quiet rock-solid reception.

Simplified Front Panel. Controls which require infrequent adjustment are placed behind a unique hatch cover on the front panel of the radio. The hatch cover is designed to protect seldom used controls from being accidentally knocked off line, but also provides easy access. The large LCD readout and conveniently located controls enable easy operation, especially important for the mobile environment.



More Features. FM built-in, HM-12 scanning mic, program scan, mode scan and memory scan. Switchable AGC, automatic SSB selection by band and RF speech processor. Continuously adjustable output power up to 100 watts, 12V operation, 100% duty cycle and deep tunable notch filter.

Options. A new line of accessories are available, including the AH-2 mobile antenna system, AT-150 whisper quiet automatic bandswitching antenna tuner for base station operation and the PS-55 power supply. The IC-735 is also compatible with most of ICOM's existing line of HF accessories.

See the IC-735 performance heavyweight at your local authorized ICOM dealer.

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Saturday, February 14, 1987
10:00a.m. til 5:30p.m.
San Diego 619-560-4900
Phoenix 602-242-3515

Saturday, February 28, 1987
10:00a.m. til 5:30p.m.
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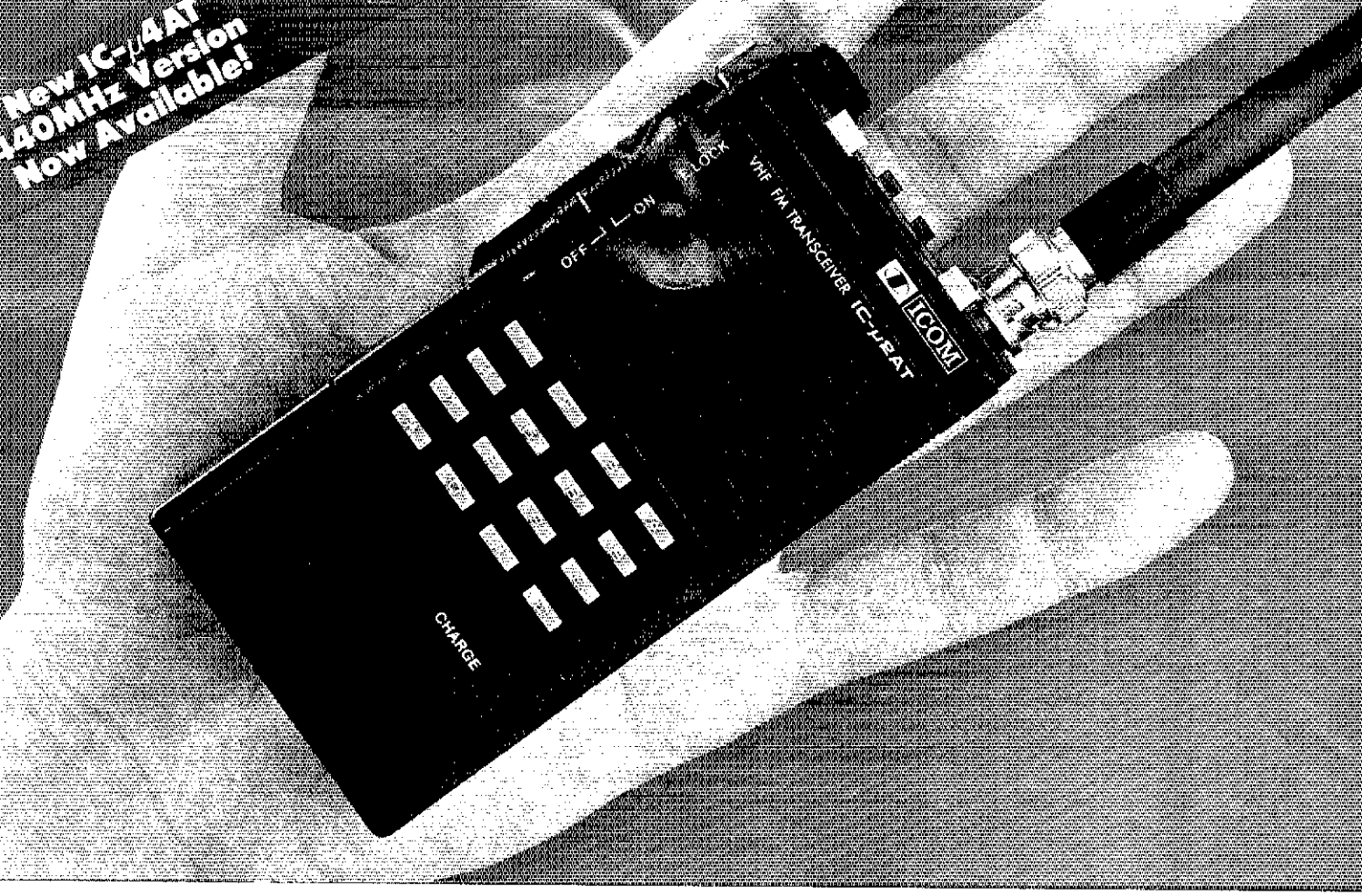

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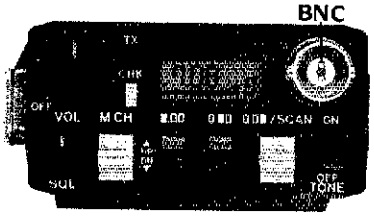

panel for easy readability, up to three watts of output (optional), 32 built-in subaudible tones AND wideband receive coverage from 138 to 162.995MHz in 5kHz steps for MARS/CAP operation and weather broadcasts. There's also a simple to use digital **TouchStep Tuning System** for fast shirt-pocket frequency adjustments. An IC-μ2A version is also available without DTMF and PL tones.

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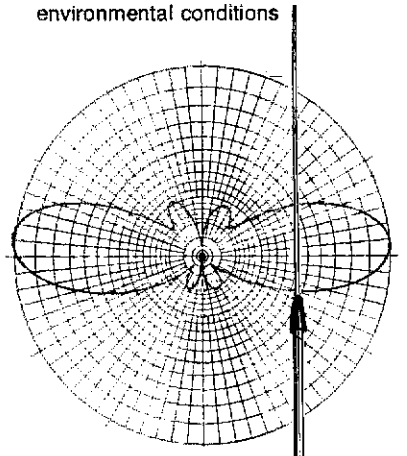

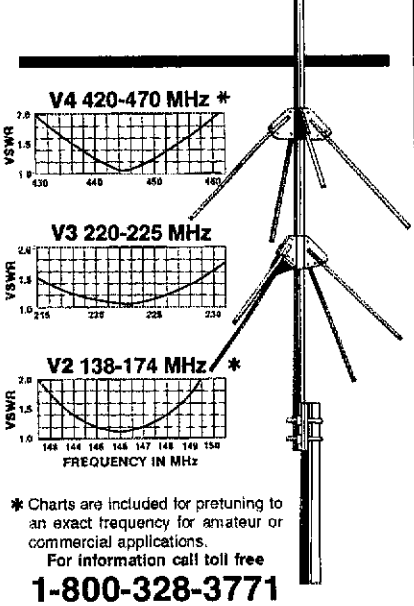

* Charts are included for pretuning to an exact frequency for amateur or commercial applications.

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W7FBM, Treas. KD7LA and xyl have a new daughter. Congratulations to all. Remind your club, that it is not too early to begin planning for next summer's Field Day. You can make it a big event in your area for the public and especially for all the new amateurs in your club. You don't have to hide on a mountain top, try a school yard or a local park so lots of people can be exposed to what amateur radio is all about. Give your club officers your input and then help make it happen. The Oregon Region Relay Council (ORRC) has made some sweeping changes in their organization which should make them more effective in managing the frequency spectrum in our area. If you are connected with a repeater operation, you should support their operation. The dues are only $15 a year. The FCC has delegated coordinating bodies like ORRC the full responsibility to coordinate frequency and site allocations. Traffic: W7VSE 593, N7BGW 239, W7ZB 123, W7HLF 60, W7ODG 54, KA7AID 50, N7FXJ 39, KA7AEE 27. (Oct.) KA7AEE 37.

WASHINGTON: SM, Brad Wells, KR7L—ACC/ASM: KC7PH. STM: KD7ME. TC: W7BUN. ASM: KD7G. SGL: KD7AC. BM N7CAK. SEC: KA7INX. OOC: N7DVR. Several staff changes effective this month. The new Section Emergency Coordinator is Ed Holloway, KA7INX, 3561 E. Spokane, Tacoma, 98404. Ed is the former EC of this job. Pat Morgan, N7CAK, 3410 S. 356th, Auburn, 98001, is the new Section Bulletin Manager. She has the capability and drive to expand the bulletin system in this section. Dan Rooks, N7DVR, 26463 Kingsview Loop NE, Kingston, 98346, is the new Section Official Observer Coordinator. Active as an OO, Dan has a strong commitment to the continued intergity of this program. 1987 is the year of recruitment for this section, with an emphasis on placing station appointments: Official Relay Station, Official Emergency Station, Official Observer, Official Bulletin Station and Assistant Technical Coordinator. These appointments are vital and necessary since more responsibility is being placed at the Section level. Washington is the 10th largest state in terms of ham population. Your support and active involvement will make us Number 1 in performance. Interested? Contact a Section Official, and ask for an FSD-187. Additionally, there are 11 counties within the state with no Emergency Coordinator. Without an EC and ARES program, there is no amateur radio to which county officials can turn in the event of an emergency. Congratulations to these new ECs: N7HHU, Yakima County; KA7UBW, Island County; K7YGX Kittitas County. W7BUN and his cadre of ATCs were busy this month handling phone calls, working on TVI and power line noise problems, helping with antennas, and providing technicial information on a wide variety of subjects. Congratulations to Evergreen Amateur Radio Services on becoming a Special Service Club. Contest News: Novice Roundup this month. Help a novice learn the fun of contesting. ARRL DX cw contest with low band emphasis this year. Need DX poop or QSL info? The WWDXC DX Net Thursday night 8:00 PM 146.40-147.00 rptr. Clubs: North Kitsap ARC meets 2nd and 4th Tuesdays, 7:30 PM, Blarney Stone restaurant, Poulsbo. Contact N7HTK; Radio Club of Tacoma meets 2nd and 4th Wednesdays, 8:00 PM, Lakewood Library, Tacoma. Contact WA7OIF. Apple City Radio Club meets 1st Saturday, 8:00 AM, Country Inn Restaurant, Wenatchee. Contact KC7QP. Traffic: WB7WOW 372, WA7CBN 212, W7LG 165, W7IGC 159, K7GXZ 151, N6EQZ 104, N7GGJ 103, W7GB 91, W7LBK 72, K7SUX 50, KR7F 46, W7IEU 40, KA7PMD 21, W7APS 19, K7AJT 18, N7GDW 7, WA7YEN 6, N7FXM 3, KD7ME (No Total). Total section reported: 1639.

PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W6RGG— Asst SMs: W6ZF, N6DHN. SEC: W6LKE. STM: K6APW. OO Coordinator: NY6Z. Technical Coordinator: N6AMG. The Hayward Radio Club welcomed new member KB6NWB and observed a moment of silence for Silent Key KA6YKZ. They held a work day at their Fire Station #6 Ham Shack and N6CKO, KG6MH, and N6DOC were among those present. The East Bay Amateur Radio Club has been named winner of the Pacific Division's "Club of the Year" award in the large club category. Congrats to their very active officers and members. The North Bay Amateur Radio Association holds a breakfast on the second Saturday of each month at the Nitti Gritti in Vallejo. Try WA6YXV/R, 145.31 (-600) for info. The Benicia Amateur Radio Club holds a weekly net on 146.565 at 2000, and an ARES net on 147.735 (-600) at 1900, both on Monday. The Mount Diablo Amateur Radio Club's "The Carrier," has K6TI as its new editor. Check W6CX/R, 147.06 (-600), each Thursday at 1930 for their net. Traffic: W6VOM 193, WB6DOB 110, WB6UZX 40.

NEVADA: SM, Joe Lambert, W8IXD—SCC FARS OFFICERS FOR 1987: Pres: NW7O, VP: N7CXD, SEC: WB5PTO, Treas: W7IZU. FARS held packet demo at December mtg. and is planning a Nevada QSO Party for May of 1987. FARS meets 1st Fri. of month at 7 PM at Scenic Airlines Fly-N-Chef coffee shop. Congrats to county hunter KB7QO. Ken has worked FROM all 3,077 U.S. counties! NW7O working more rare grid squares in Nevada on VHF & UHF. TARA's X-mas party was held at WA6SIM's QTH. NX6W's Novice classes are progressing very nicely at S. Lake Tahoe Intermediate School. LVRAC's 145.94 repeater should be ship-shape by the time you read this, with a rebuilt duplexer. There is an informal meeting of hams at the Boulder City Golf Course Clubhouse every Sat. 10-11 AM. Remember, news must be received by the first of each month to appear in this column 2 months later.

PACIFIC: SM, Army Curtis, AH6P—Aloha and hata adai to all of the Pacific. The EARC 2-meter net doing very well with 21 sessions, QNI 195. Check it out each evening at 7:00 on 146.97. Congrats to WH6BKM, WH6BLW, and NH6FO who all upgraded. More exams coming up, are you ready? With KB6ZV I attended the joint picnic on Oahu, the BIARC Xmas party in Hilo and the MARC meeting in Kahalul. Outstanding all around. Thanks folks for inviting us. HARPO (Hawaii Amateur Radio Packet Organization) was formed at the Kualoa Picnic. Planned is a weekly voice net on packet matters at 8:00 PM Wednesdays on the state-wide system (.94/.82). If you are operating packet please join us to discuss operating procedures, coordination and assistance. Traffic: KH6S 41, KH6H 28, N4ESX 4, WX4J 3, AH6J 2.

SACRAMENTO VALLEY: SM, Bob Watson, W6IEW—STM: WA6WJZ. SGL: N6IG. ACC & TC: W6RFF. SEC: KJ6R. DEC North KF6KJ. DEC Sierra KA6GHI SECTION NET: First Sunday each Month, 8 PM, on 146.085, input up, Yuba/Sutter repeater WD6AXM/R. Net Control-W6IEW or W6RFF. Congratulations to Jim Weir, WB6BHI, for his recent election win. He got sixty percent of the vote in his try for a Supervisor's seat in Nevada County. Congratulations also to Len Colton, W6DY, and especially to Barbara Brown, KB6HKO, for making EXTRA CLASS in the latest Amador County tests. The "especially" for Bobby is because she took the exam solely so she would be qualified to assist in the VE exam program. Her friends are all keeping their fingers crossed that she will get a 2 x 1 call before the 6th District runs out of them. Sorry to report that District EC Vern Wheeler, KA6GHI, is slowed down organizing the Sierra Foothill District because his MD has restricted his driving. Must mention very faithful reporting from Loren Young, WD6BZQ, and Vic Longmore, KI6GW.

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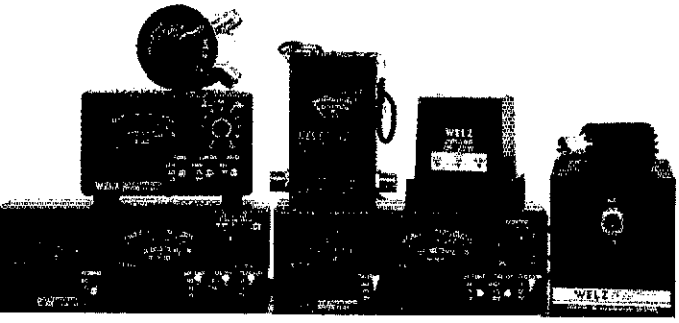

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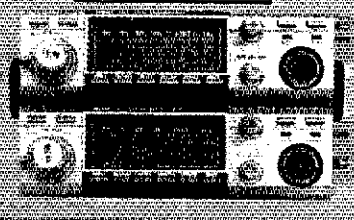

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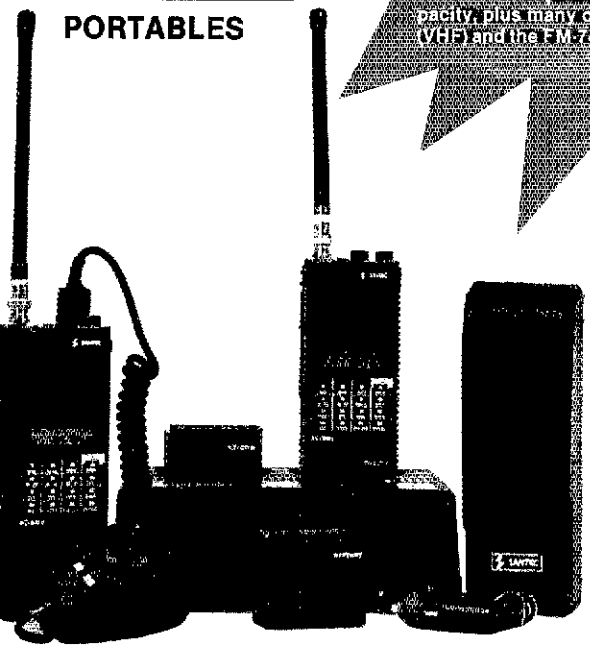

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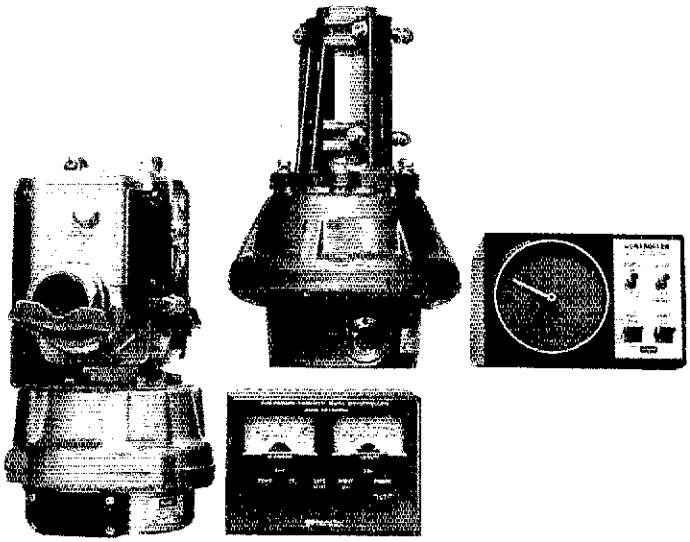

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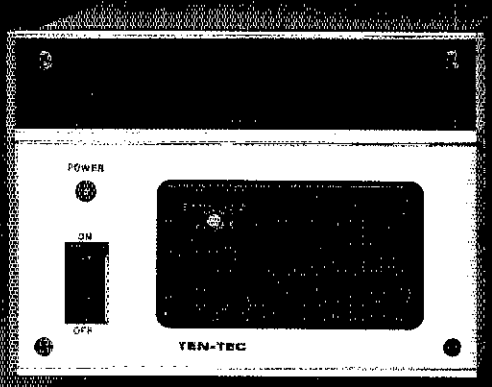
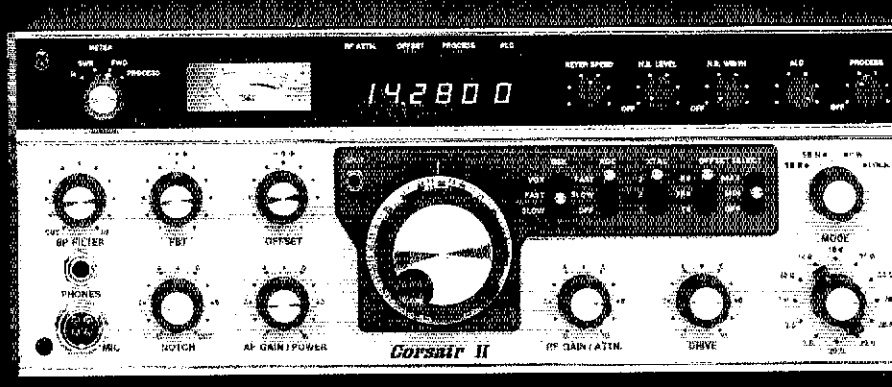


MODEL 260 POWER SUPPLY



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Receiver performance that only a permeability tuned oscillator can deliver . . . superb signal to noise ratio, outstanding adjacent signal rejection. Three, frequency tuning rates using dual range offset tuning. QSK with a changeover time of 30 ms or less for superior CW or AMTOR operation. Twelve position band switch for operation on all nine HF bands, from 1.8 to 30 Mhz, plus 40 Khz overshoot on band edges.

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Notch filter: Greater than 50 dB notch, adjustable from 200 Hz to 3 5 kHz.
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PLUS: Built-in antenna pre-amp, spot button, selectable AGC fast, slow and off and much more.

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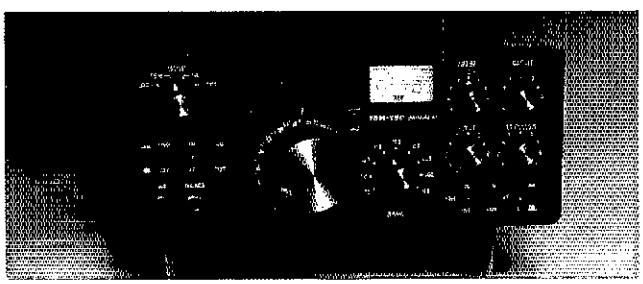
POWER REQUIRED: 13.8 VDC, Base or mobile at 20 A.
Size: HWD 5.25" x 15.25" x 15".

REMOTE VFO, Model 263 . . . $219
Uses the same PTO design as the CORSAIR. Adds complete TX/RX



ARGOSY II, SSB/CW HF TRANSCEIVER, MODEL 525D . . . $695
A unique combination of small size, simplicity and low cost. Great for mobile, portable and base station use. Operates 80, 40, 30, 20, 15 and 10 meters, in 500 kHz segments, plus 40 kHz overshoot at band edges. 100 watts input with solid state, no tune, final. 12 to 14 VDC at 500 mA, RX, 9A TX. Optional RX filters, 250 Hz, 500 Hz or 1.8 kHz. RX sensitivity .3uV for 10dB S + N/N typical. Offset tuning range, 6 kHz. Variable notch filter, greater than 50 dB rejection, 200 Hz to 3.5 kHz. Optional noise blanker. Famous Ten-Tec QSK CW, of course.

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Model 225 115/230 VAC 9A power supply $129.00
Model 222 Mobile Mount, w/quick release $27.50
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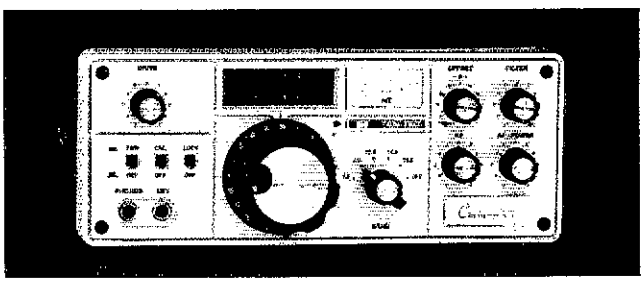

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Put the fun back into hamming. This is a top notch, 50 watt, CW transceiver. Features found in only the best rigs are included. Full break-in QSK, excellent RX selectivity on CW (also tunes LSB/USB) and 100% solid state circuitry. Broadband "no tune" RF amp. Operates 80, 40, 30, 20, 15 and the lower 500 KHz of 10 meters. Power required, 12 to 14 VDC at 6A. Size HWD 4" x 10" x 10.5". Weight 6 lbs. Great for portable, mobile or base station operation.
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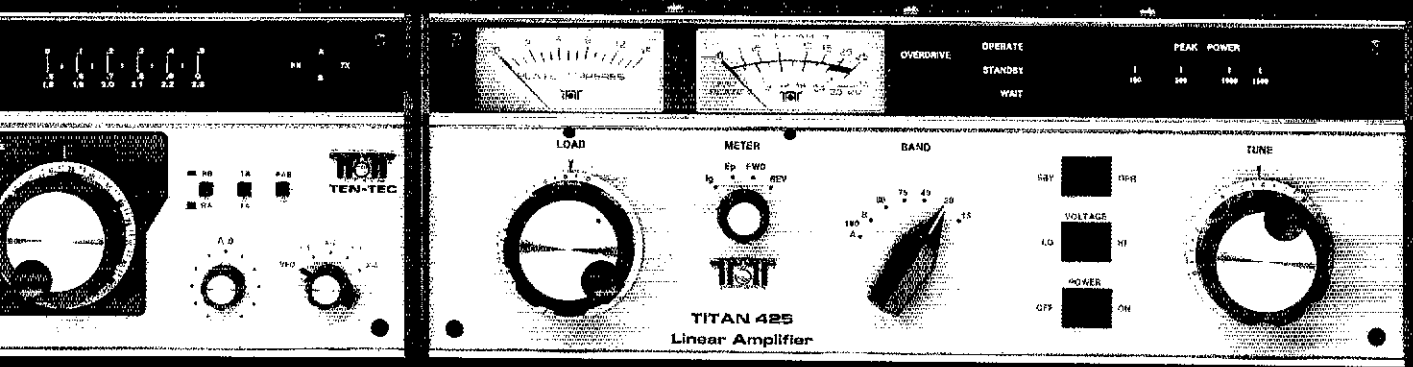
. . . From $28.00 - $40.00 per band.
HF mobile is a world of compromise! Give yourself a chance. Choose the finest, environmentally protected, antenna system. Loaded to the best height for radiation efficiency, and to clear most overhead obstacles. Upper SS whip is vertically adjustable for "no tears" tuning. Lowest wind resistance too, less whipping and de-tuning. Standard ⅜" x 24 base fitting screws into all standard mounts. Typical height 78" or less.

Our outstanding SSB performance equals our CW and DIGITAL reputation!



MODEL 263G REMOTE VFO — MODEL 425 TITAN

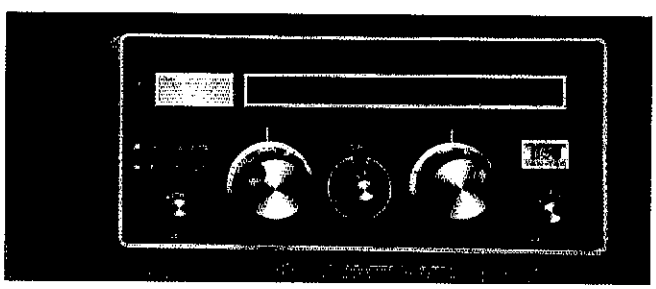
frequency control. Front panel switch selects, CORSAIR transceive, 263 transceive, CORSAIR TX/263 RX, 263 TX/CORSAIR RX. You can also listen to both frequencies simultaneously. A balance control is provided for priority adjustment. Also makes provision for Xtal control. Connects to CORSAIR with cables provided. Size is HWD 5.25" x 7.5" x 12".

MATCHING SPEAKER/POWER SUPPLY Model 260 . . . $199
A highly regulated and filtered, 20 amp. supply. Includes protective circuit breaker and primary power fuse. Can use either 115 or 230 VAC, 50/60 Hz. Size is HWD 5.25" x 7.5" x 12".

TITAN HF LINEAR AMPLIFIER . . . $2685
"BOOM BOX" EXTRAORDINAIRE! Remoted power supply makes possible, this compact, desk top linear amplifier. Puts out a solid 1500 watts SSB and CW, 1000 watts continuous power on RTTY, AMTOR or SSTV. Lightning fast QSK for "break-in" CW and super AMTOR performance.

RF DECK
Drive power: 80 watts typical.
Four LED status indicators, including "overdrive" warning.
Hi/Lo plate voltage switch.
Metering: Full time plate current meter. Multi-meter, selectable for plate voltage, grid current, power out or reflected power.
Vernier drive, tune and load controls.
Peak power indicator: Ultra quick 10 element LED bar-graph display.
Amplifier tubes: Two Eimac® 3CX800A7, ceramic, external anode, air cooled triodes in grounded grid circuit. Plate dissipation, 1600 watts.
Frequency coverage: 160, 80, 40, 20 and 15 meter bands plus 18 and 24 MHz standard, 10 meter kit supplied upon proof of authority to transmit.
Size and weight: HWD 5.25" x 15.25" x 15". 17 lbs.

POWER SUPPLY (Supplied with TITAN)
Primary power: 220-250 VAC @ 20 amps, maximum.
Conservatively designed for cool operation under full load using a Ten-Tec, tape wound, Hypersil® transformer.
Hi/Lo blower speed switch.
Size and weight: HWD 8.25" x 13.4" x 10.25". 45 lbs.
UPS shippable.



2KW ANTENNA TUNER, Model 229A . . . $299
Designed to match your 50 ohm, un-balanced coaxial, transmitter output to virtually any, balanced or un-balanced antenna. General coverage from 1.8 to 30 MHz. Handles all the power the law allows.

- Reversible "L" network circuit for best match and bandwidth, at either hi or lo, antenna impedance.
- Avoids false load indication.
- Ceramic insulators and coil forms throughout. Silver plated switch contacts and roller inductor coil.
- Built-in SWR bridge.
- Built-in balun.
- System by-pass switch.
- 4 Position antenna select switch.
- HWD 5.5"x13"x11", 9 lbs.
- Also available in kit-form. Model 4229 . . . $219.

The term of the TEN-TEC WARRANTY IS ONE YEAR...as always!

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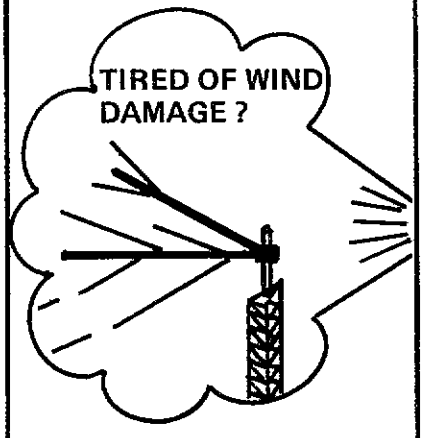
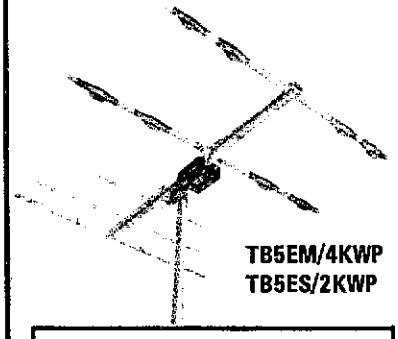
Why gamble with shoddy antenna construction when Telrex makes available a professionally designed quality product.



Antennas that last "Decades" (not months)



TB5EM/4KWP
TB5ES/2KWP

Some of the WORLD'S finest.

TB4EC 10, 15, 20 Mtr.	$320.00
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20M326 3 elem. 20 Mtr.	$410.00
20M536 5 elem. 20 Mtr.	$695.00
20M646 6 elem. 20 Mtr.	$1075.00
15M532 5 elem. 15 Mtr.	$510.00
15M845 8 elem. 15 Mtr.	$995.00
10M523 5 elem. 10 Mtr.	$375.00
10M636 6 elem. 10 Mtr.	$725.00
2MVS814, 2 Mtr. phased	$289.00

Prices subject to change.

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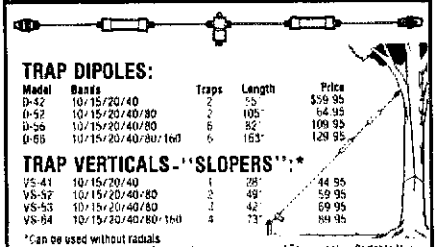
MULTI BAND TRAP ANTENNAS



TRAP DIPOLES:

Model	Bands	Traps	Length	Price
D-42	10/15/20/40	2	55'	$59.95
D-52	10/15/20/40/80	2	105'	64.95
D-56	10/15/20/40/80	6	82'	109.95
D-66	10/15/20/40/80/160	6	163'	129.95

TRAP VERTICALS-"SLOPERS";*

VS-41	10/15/20/40	1	28'	44.95
VS-52	10/15/20/40/80	2	49'	59.95
VS-53	10/15/20/40/80	3	42'	69.95
VS-64	10/15/20/40/80/160	4	73'	89.95

*Can be used without radials
*Feed line can be buried if desired

*Permanent or Portable Use

ALL TRAP ANTENNAS are Ready to use - Factory assembled -Commercial Quality -Handle full power - Comes complete with: Deluxe Traps, Deluxe center connector, 14 ga Stranded CopperWeld ant. wire and End Insulators. Automatic Band Switching - Tuner usually never required - For all Transmitters, Receivers & Transceivers - For all class amateurs - One feedline works all bands - Instructions included - 10 day money back guarantee!

SINGLE BAND DIPOLES (Kit form):

Model	Band	Length	Price
D-15	15	22'	18.95
D-20	20	33'	19.95
D-40	40	66'	22.95
D-80	80/75	130'	25.95
D-160	160	260'	34.95

Includes assembly instructions, Deluxe center connector, 14 ga Stranded CopperWeld Antenna wire and End insulators.

COAX CABLE: (includes PL-259 connector on each end)

Type	Length	With antenna purchase	Seperately
RG-58	50'	$8.00	$11.95
RG-58	90'	12.00	16.95

DELUXE CENTER CONNECTOR

- NO RUST Brass Terminals
- NO Jumper Wires Used
- NO Soldering
- Built in Lightning Arrestor
- With SO-239 Receptacle
- Handles Full Power
- Completely Sealed, Weatherproof
- Easy Element Adjustments
- Commercial Quality

CE-1
$8.95

DELUXE ANTENNA TRAPS: Completely sealed & weatherproof -Solid brass terminals - Handles Full Power - NO jumpers - NO Soldering. Instructions included. For 4-band Dipole Ant 40/20/15/10 $36.00/pr. For 5-band Dipole Ant. 80/40/20/15/10 $38.00/pr.

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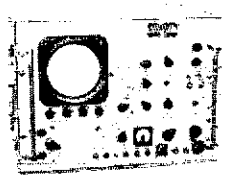
Dealer Inquiries Invited

SSB ANALYZER



TS-1379A solid-state SPECTRUM ANALYZER for single sideband equipment. Input 485-515 KHz and 2-30 MHz. Sweep: 150, 500Hz, 3.5, 7, 14, 30 KHz. Large 5" display; 16x19x18, 70 lbs sh. Used-reparable **$225**
Manual partial repro ..... **$15.**

CV-2353A CONVERTER, adds 100 Hz-2 MHz range to TS-1379A; 22 lbs sh. Reparable **$75**

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Reasonably frequent reports from Jettie Hill, W6RFF, Vern Wheeler, KA6GHI and Al Biegler, WA6WJZ. Do you know that Al makes the Section Traffic report, included below, directly to QST every month? If you have traffic to be reported see that it gets to Al. Other reports should bet to me BEFORE the 7th of each month. Traffic: N6CVF 277, N6LUY 158, WA6WJZ 136, K6SRG 103, WA6ZUD 78, WD6BZQ 54, KI6GW 20, WB6SRQ 6.

SAN FRANCISCO: SM, Bob Smith, NA6T— I hope every one will be active within their local clubs in 1987 by helping bring a new amateur into hobby, by helping in the local club activities, and by supporting the ARRL—this YOUR organization and YOUR hobby!! Rod, KB6ZV, the Div. Director and myself will be in Lakeport for the Feb. 1 Breakfast Meeting of LCARS and in Eureka for the Feb. 8 Breakfast Meeting of FWRA-HARC. Do you have any questions about the ARRL, now is the time to ask them. See you all there. Two different VE exam groups are now active in Humbolt County. RACES Drills in Sonoma County were well attended, 600+ in Santa Rosa alone. This is one place were Amateur Radio can SHINE, get out and support the SCRA and OES with YOUR participation. HP in Santa Rosa now has a club station on the air with all the equipment and space donated by Hewlett-Packard, I wonder where N1AL will be eating lunch? The "BEEP-BALL" van from the GS LADD RC was active this year, 272 hours of operation in PUBLIC SERVICE, the Telephone Pioneers really know how PR and Public Service work together. Where are all the traffic reports and PSHR reports this month, are you slipping?

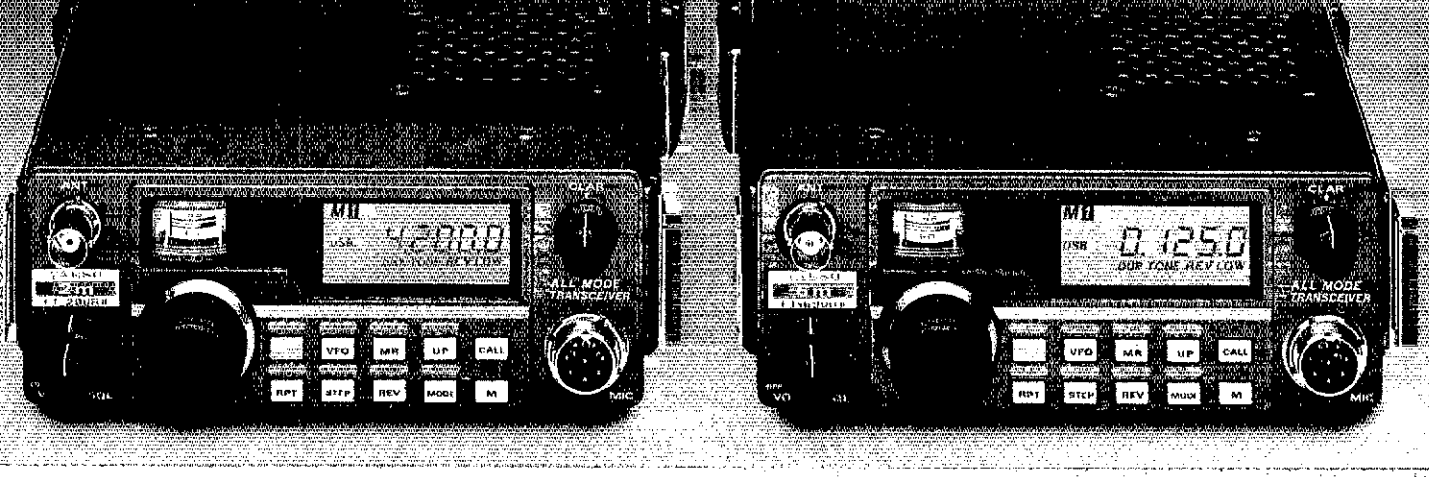
SAN JOAQUIN VALLEY: SM, Charles McConnell, W6DPD—SEC: WC6U. STM: N6AWH. TC: WA6EXV. ACC: W6DPD. Asst. SMs: W6TRP and K6YK. Happy New Year to all. The 1987 officers of the Turlock ARC are: Pres N6JUH, VP KD6QA, Sec WB6PJY, Treas W6SQR. The club meets the 2nd and 4th Tuesdays in Turlock. The 1987 officers of the Fresno ARC are: Pres N6HEW, VP WA6U, Sec KA6EME, Treas KA6LAC. The club meets the 2nd Friday in Fresno. The 1987 officers of the Kern County—Central Valley Radio club are: Pres KG6OB, 1st VP KA6LXM, 2nd VP N6UR, Sec N6NIB, Treas N6MWZ. the club meets in Bakersfield. WA6UMU and N6AHC are SILENT KEYS. WA6NQR is Extra. N6MZF is Advanced. KA6RITis General. KB6OGT, KB6GDE, KB6TXR, KB6HAO, KB6NEZ, KA6VFO, KB6CEG, and KB6CEH are techs. KB6GXX is N6OMM. N6AKJ is KI6MI. WS6X has a 40-meter beam. The 1987 Fresno Hamfest is May 103, 1987, at the airport Holiday Inn in Fresno. For information write Fresno Hamfest, P.O. Box 783, Fresno, CA 93712-0783. Traffic: N6AWH 55, N6MCY 54, W6DPD 11, WA6YAB 10. (Oct.) N6MXG 2.

SANTA CLARA VALLEY: SM, Glenn Thomas, WB6W—SEC: WA6OCV. TC: WA6PWW. STM: N6JLJ. PIO: WB6NLA. ASM: N6JQJ, NS6S. ACC: W6MKM. BM: (vacant). OOC: (vacant). The California Department of Forestry held its annual "thank you" BBQ in November. Special recognition was given to WA6PWW, N6JQJ, KA6YRK, and others, for their special assistance during fire season, and general recognition of the Amateur Radio contribution towards the CDF VIP program in the Santa Clara Ranger unit. Wally, KA6YMD, has been doing an excellent job teaching a Novice class for SCCARA. If your group is teaching any classes, let me know so that I can spread the word in the section! FARS held their thank-you pizza bash for the folks who helped make the last FARS Flea Market so successful. The Memorex ARC has a new vertical antenna for their station as well as a new corporate name! The SLAC ARC is in the process of renewing their club license, WA6NUP. A number of FARS members handled quite a bit of traffic concerning the earthquake in central America using the club call KY6A and equipment at the Palo Alto Red Cross. Some of you have said that you were having trouble mailing ORS and other traffic reports to our STM. Andy has moved. His new address is: Andy Cromarty, N6JLJ, 3153 South Court, Palo Alto, CA 94306. PSHR: K6YA, WB5VUL/T, W6NJR. OO reports: K6AYB. Traffic: W6YBV 221, W6KZJ 79, W6PRI 69, NR7E 59, KA6SXW 27, KB6IWG 14, N6JLJ 5, WB5VUL 5, W6NJR 4, WB6W 2. (Oct.) K6YA 596, W6KZJ 127, NR7E 103, KA6SXW 41, N6JLJ 6, KB6IWG 4. (Sept.) KA6SXW 18, N6JLJ 28, W6KZJ 24, KB6IWG 4.

ROANOKE DIVISION

NORTH CAROLINA: SM, Rae Everhart, K4SWN—SEC: AB4W. STM: K4NLK. BM: K4IWW. ACC: WC4T. PIO: WA4OBR. TC: K4ITL. SGL: KE4ML. This month begins a new hamfest season with Elkin Hamfest Feb. 15. Exams will be given at hamfest location. VE exams for FEB: Kernersville on 7th, Lexington on 21st. Want your exam schedule listed? Send to SM. 3 Months advance notice required for timely listing in column. Would like to RECOGNIZE and SALUTE the following Field Appointees this month: PUBLIC INFORMATION ASS'T. WB4ZSM. OFFICIAL EMERGENCY STATION—OES N4BJX, WD4CFZ, W4EHF, W4FMN, WB4HRR, WF4M, NO4T. NTS NET MANAGERS—NM: K4ABJ, W4EHF, WB4HRR, NE4J, NJ4L, WA4MNR, AA4MP, KF4MZ, WB4WII. Thanks to each for your hard work and dedication to the hobby. Congrats to KB4MUU on promotion with PD. To Cary ARC for First Place finish in 86 Field Day—6A catageory. New officers of Lenoir ARC Pres. N4NIN. VP N4FAX. Sect/Tres N4NJD. Newsletter Editor N4EUX. Thanks for FB newsletter. WA5DJJ, ATC was ready for VHF Sweepstakes operating on 2 new bands—220 and 432. Section had NO logs submitted for ARRL UHF Contest. Do we have any UHF activity in section? Let me hear from you. Make plans now to attend the Roanoke division Convention/Hamfest Mar 21/22. ATC, WD8DQL and K4SWN are looking for some 900 MHz gear for repeater. Can anyone help? Silent Keys: W4IFI, W4YPZ. YPZ was patriarch of the Pole Cat Net on 3915 kHz. He will be missed by all. Still need Liaison stations on the NTS nets. Contact your NET MANAGER for details. Got any ideas on packet radio? Traffic Handling? or packet radio in general? Let SM know what you're thinking. Traffic: K4NLK 362, NJ4L 292, KA4EYF 231, WB4HRR 176, AA4MP 176, AK1E 166, K4JHF 163, AB0Y 138, KA4TLC 137, WD4HTE 87, N4JRE 75, K4IWW 70, N4LST 57, WB4WII 46, WA4MNR 50, KI4YV 50, N4MMM 48, NE4J 46, KB4IVV 42, N4NTO 41, K4GI 37, K4SWN 37, W4EHF 32, WD4MRD 25, N4LUO 24, KA4YMY 23, WD4RMO 16, WD4EQK 13, WB4CYN 10, NT4K 9, N4CJJ 8, K4DDY 8, N4JEO 8, KB4NWX 8, K4QXA 6, K4YFH 4, N4UE 3, KB4QQJ 1, N4UE (Oct) 6.

SOUTH CAROLINA: SM, Jimmy Walker, WD4HLZ—KA4GUT of Florence has been appointed an OBS to serve the GPD2M Net and repeater. In addition, Richard will upload bulletins via packet on WA4SZK BBS in Florence and KF4EF BBS in Charleston. He has been an amateur since 1978 and served as NCS on the SCSSB Net for a number of years. OBS appointees are still needed for Greenville, Spartanburg, Columbia Myrtle Beach, Beaufort and a number of other locations. If you are interested in joining the team, contact WØKT or me. Spring is around the corner and with it the concern of tornadoes. ECs-check your local preparedness and commence retraining for this season. We all should increase local net participation and review the WX Spotter training. Has your generator been serviced and checked?? Now is the time to complete 1987 planning for your club, net or group. Be sure



Introducing all-mode radios for your mode of travel.

Yaesu's 2-meter FT-290R and 6-meter FT-690R Mark II Series are the perfect all-mode traveling companions.

On the road, simply snap on the heat sink, apply 12 volts of power, and you've got a 25-watt mobile station. (FT-690R: 10 watts).

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You get around fast on SSB, CW and FM with ten memories; dual VFOs, LCD display, automatic storage of repeater shift into memory register, offset tuning during receive or transmit for satellite operation, relative power output/S-meter, and optional CTCSS unit.

And everything fits into a lightweight-yet-rugged case, measuring just 2¼ x 6½ x 8¼ inches.

The FT-290R and FT-690R Mark II are perfect for emergency use, camping trips, talking around town, and DX work.

Plus each is priced to maximize your ham budget's mileage.

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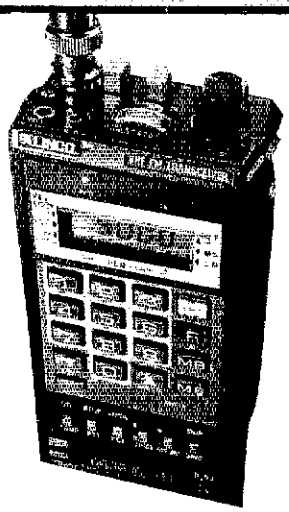
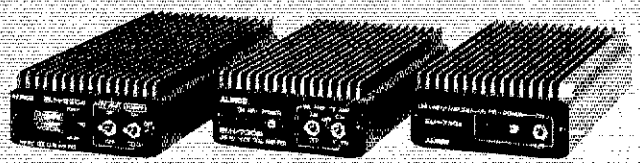
ALM-203T
List $345.00



2m FM Handheld Transceiver

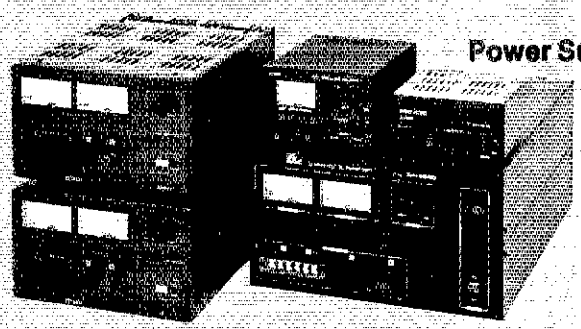
- 2 Band HT
  Band A 140-150 MHz
  Band B 150-160 MHz (Receive Only)
- 10 Channel Memory
- Built-In Sub Audible Tones
- Battery Save Function
- 3 Watts Output Standard; 5 Watts with 12 V adapter
- Don't decide on a handheld until you have seen Alinco's newest!



Linear Amps

List Prices From $82.00 to $177.00

- 2m and 70cm micro linear amplifiers
- 3 watts in provide 30 to 50 watts out to convert your HT to a high power mobile radio
- Each amp includes a heavy duty heat sink, protection circuit and a low pass filter for a clean signal
- Some models available with a 15 db gain GaAsFET receive preamp, others with a 10 db gain FET receive preamp and one with an RF meter.



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Affordable performance is the final output of these workhorses. These high efficiency, high output, regulated supplies each comes with automatic current limit and shut down protection. Choose from 6.5 to 30 amps of output.
List Prices From $74.00 to $193.00

ALR-206T List $358.00

- 140-149.995 MHz Covers MARS and CAP
- Programmable Band Scan
- Programmable Non-Standard Repeater Offset
- Unique Control Knob
- 25 Watt High · 5 Watt Low
- Built in Lithium Back Up Battery
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- 10 Channel Memory
- Built in Sub Audible Control
- Many Features, See Your Dealer

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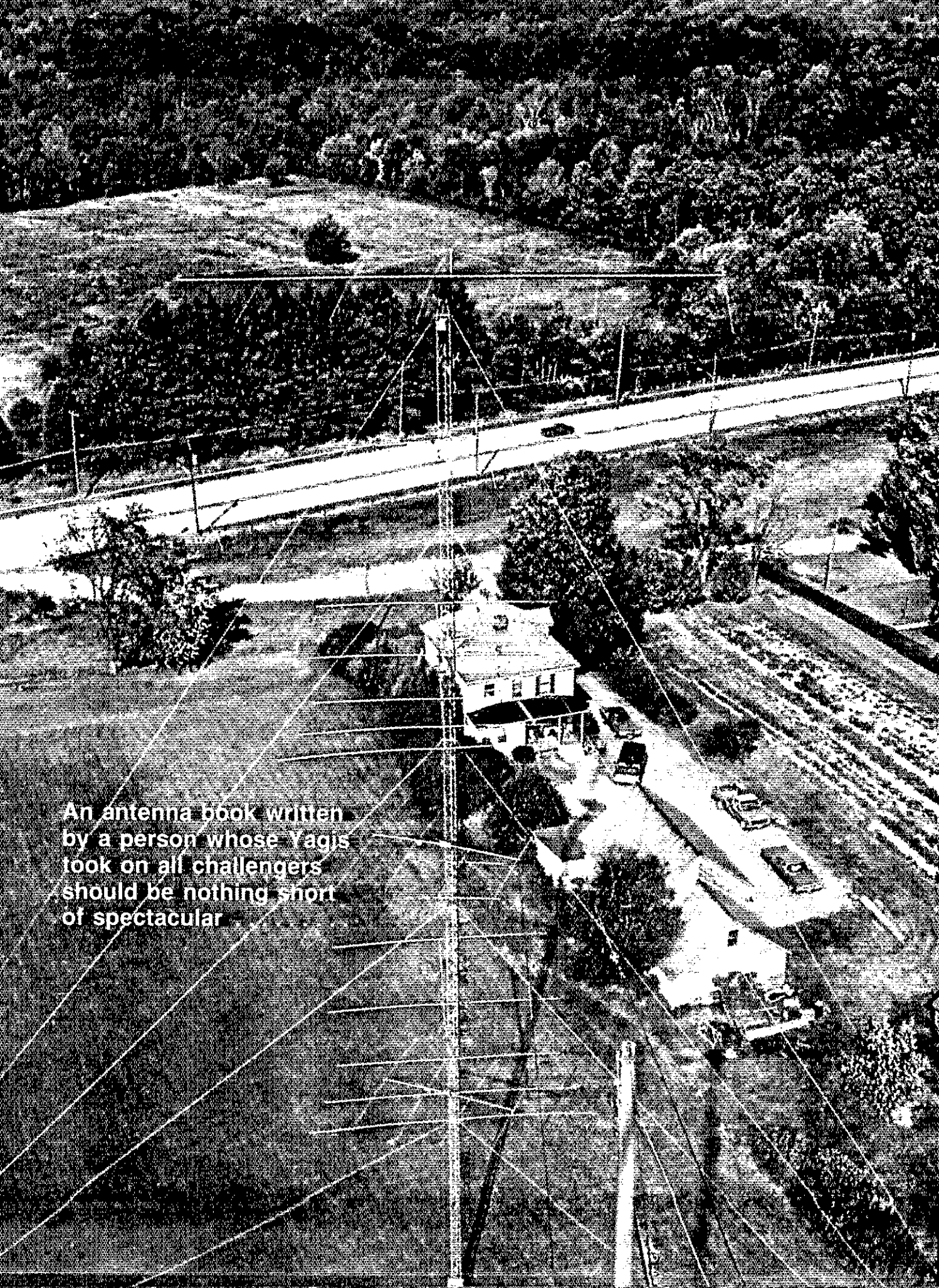
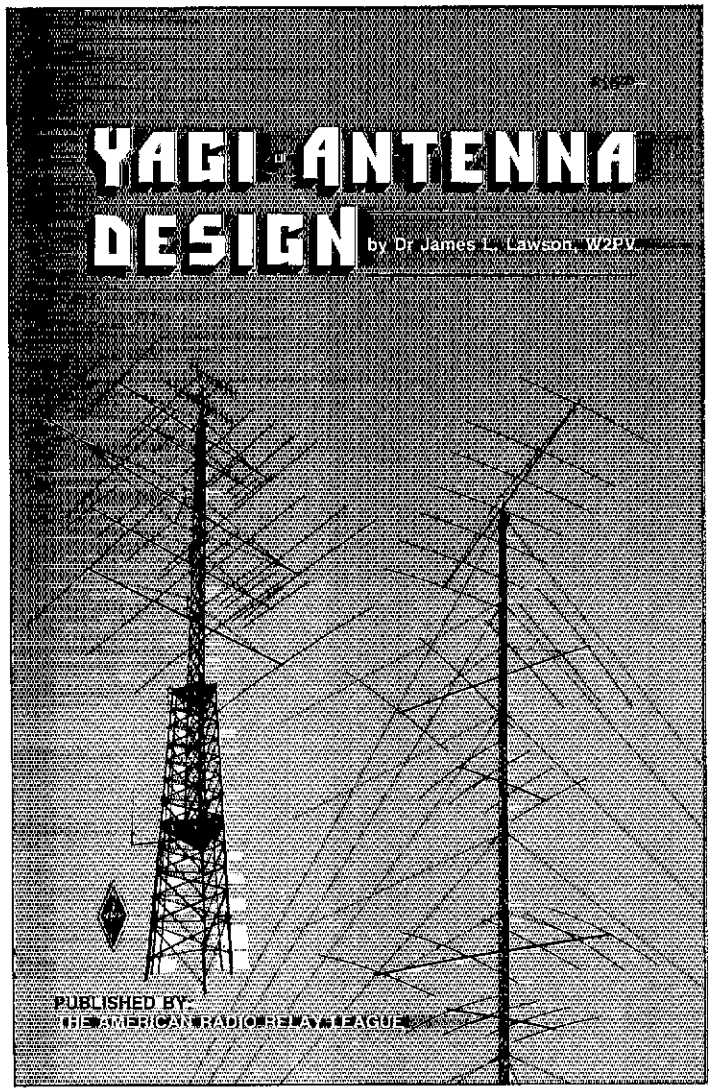


An antenna book written by a person whose Yagis took on all challengers should be nothing short of spectacular.



Yagi Antenna Design is based on the series in *Ham Radio Magazine* by the late Dr. James L. Lawson, W2PV. Jim was a highly competitive person and this carried through to his Amateur Radio hobby and work with antennas. Although this book is primarily the work of the author, credit should be given to its editors: Bill Myers, K1GQ; Clarke Greene, K1JX; and Mark Wilson, AA2Z. This ARRL publication stands to be a "classic" that should be added to every radio amateur's technical library. The book is available in hard cover, and contains over 210 pages of detailed information on Yagi design. For more detail, refer to the column at right. The photograph on the previous page is the 7 over 5 over 5 20-meter array on a 140 foot tower at W2PV. You can also see a 4 over 4 array for 10 meters. The photograph was taken by K1ZX. You can purchase this book at your ARRL dealer or direct from ARRL. Order #0410. Price is $15 plus $2.50 ($3.50 for UPS) shipping and handling.

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45 Affordable Watts!

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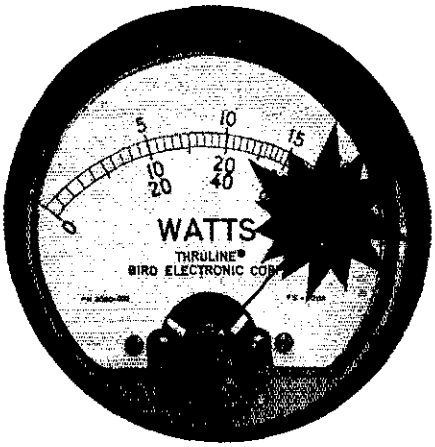
Super-compact mobile transceivers

The TM-201B boasts a powerful 45 watts output, easy-to-operate front panel controls, and ultra-compact size. The GaAsFET receiver front end provides high sensitivity and wide dynamic range. Receive and transmit characteristics are tailored for minimum distortion and excellent audio quality. Both the TM-201B and the TM-401B are supplied with a high-quality external speaker, 16-key DTMF microphone and mounting bracket.

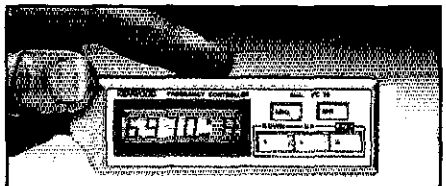
- 45 watt output, with HI/LO power switch (TM-401B has 25 watts output.) 5 W low.
- Dual digital VFOs
  TM-201B covers 142-149 MHz, includes certain MARS and CAP frequencies
  TM-401B covers 440-450 MHz
- 5 memories plus "COM" channel, with lithium battery back-up



- Programmable, multi-function scanning
- High quality external speaker supplied
- Audible beeper confirms operation

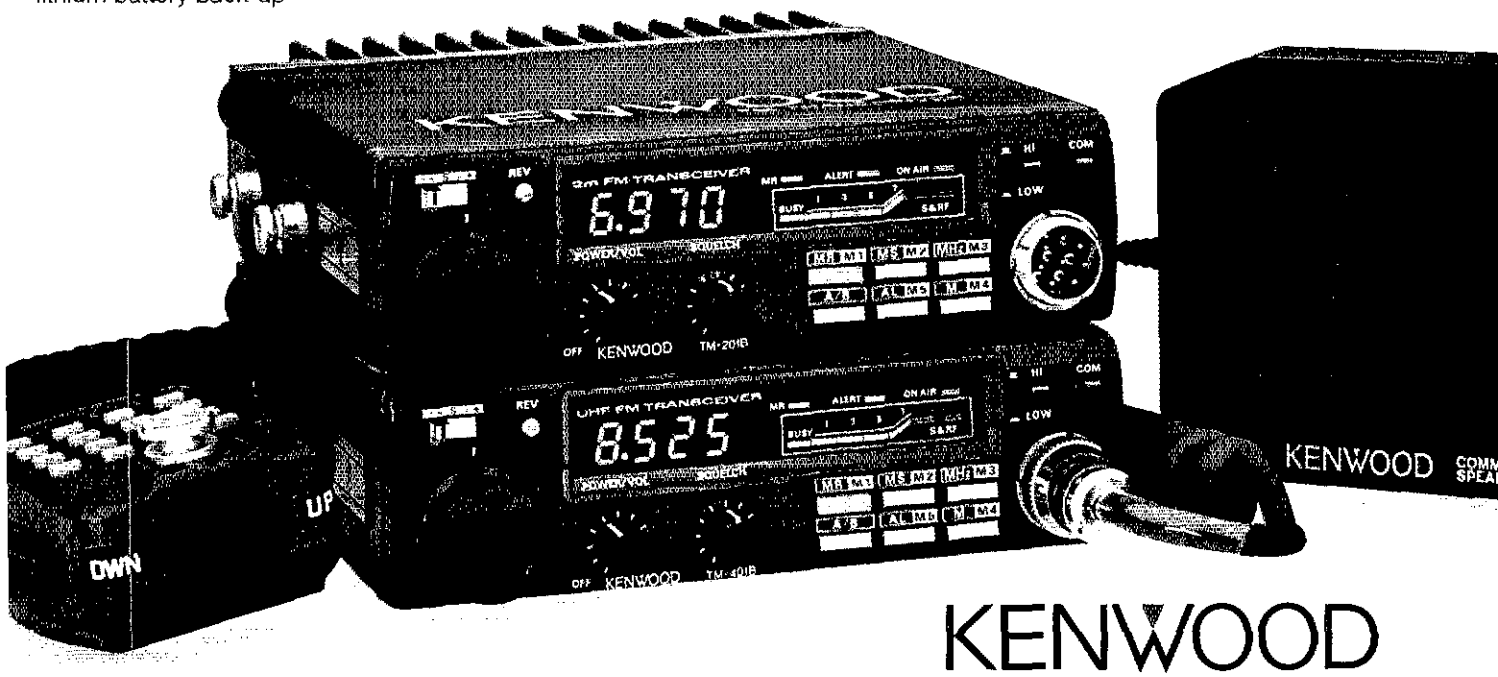
Optional accessories:

- PS-430 power supply
- TU-3 or TU-3A two frequency tone encoder
- FC-10 frequency controller
- MC-55 (8-pin) mobile microphone
- SP-40 compact mobile speaker
- SP-50B deluxe mobile speaker
- SW-100A/B SWR/power meters
- SW-200A/B SWR/power meters
- SWT-1 2 m antenna tuner
- SWT-2 70 cm antenna tuner
- PG-2N extra DC cable
- PG-3B DC line noise filter
- MB-201 extra mobile bracket



Optional FC-10 frequency controller
Convenient control keys for frequency UP/DOWN, MHz shift, VFO A/B, and MR (memory recall or change memory channel).

More information on the TM-201B/401B is available from authorized dealers.



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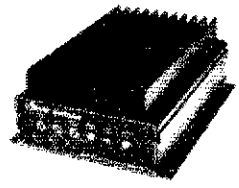

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to include usual events and set challenging goals with the idea to improve member involvement. Traffic: WØIKT 176, K4ZN 162, W4ANK 89, KA4BZA 89, W4FMZ 60, KA4LRM 48, WB4UDK 44, KA4YEA 8.

VIRGINIA: SM, Claude Feigley, W3ATO—STM: KB4WT. SEC: N4EXQ. ACC: NT4S. OOC: W4HU. BM: AB4U. TC: WB4MAE. Virginia Section NTS Nets:

VTN	1 PM	3907	AA4AT
VSBN	6 PM	3947	K4VWK
VSN	6:30 PM	3680	NN4I
VN (EARLY)	7 PM	3680	N4GHI
VN (LATE)	10 PM	3680	WB4KSG
VLN	10:15 PM	3947	KJ4MF
SVEN	7:15 PM	146/82	NT4S

The Woodbridge Wireless club has made application for Special Service Club recognition, when approved by ARRL they will become the Virgina Section's 5th Special Service Club. There many other clubs in the section who can qualify for this award. Contact our ACC, NT4S, for details. By this time many of the clubs have completed their training sessions. As a follow-up, have you designated an "ELMER" for your new Novices. The major cause of Novice drop-out is the their need for help in getting on the air and making their first contacts. Your club has not performed its full responsibility to these new Hams unless you provide them with an "ELMER." N4JSP is working hard to establish a "SKYWARN" organization for eastern Virginia, and he has been appointed Net Manager for the eastern Virgina Skywarn Net details will follow. The Virginia Packet Radio Assoc. (VPRA) is seeking members. Contact Don Bennett, K4NGC, Woodbridge details. N4EXQ reports ARES going strong and he appoints; KB4XF EC for Stafford County and WB4UHC DEC for First Colony District. The ARRL badge program is attracting a lot of interest, if you are a field appointee contact the SM for info. The Williamsburg ARES was alerted to provide communications for a missing hunter search, 20 local and nearby amateurs participated. Some VE exam schedules; Feb.7, Virginia Beach contact KA4UNC; Mar 7, Hampton Roads radio Assoc. contact AA4MB, Mar 7, Southwestern VA. Wireless Assoc. contact KC4DY in Roanoke. There was a slight dropoff of traffic, 41 stations reporting with a traffic count of 4985. Again N4GHI and N4EXQ led the pack. Hope all tfc handlers are rested from the Christmas tfc rush and are getting ready for the Valentine deluge. I hope all had a grand Christmas and Santa brought the goodies you wanted. Remember, if you have any suggestions on the operation of the Section please pass them to the Section Manager. I will be looking forward to seeing many of you at Vienna Wintertest, Feb 22. Traffic: N4GHI 714, N4EXQ 645, AA4AT 362, W3ATQ 324, KB4WT 269, K4MTX 249, WA4CCK 218, K4DOR 178, W4JLS 171, WB4PNY 159, K4JST 156, WB4KSG 122, WD4MIS 121, AA4GL 114, N4KSO 106, KB4NGO 103, WB4EDB 101, WD4OCW 96, N6ANQ 88, KI4BR 65, NN4I 61, W4TZC 60, WB4ZTR 59, NT4S 54, NW4O 51, WB4ZNB 50, K4JM 45, K4MLC 44, K4AXF 39, K4VWK 29, WB4UHC 27, WB4KIT 26, K3RZR 23, K4BGZ 13, KA4IUM 9, N4FNT 7, N3RC 6, WB3ANC 2, WA1VRL 2, W4YE 1.

WEST VIRGINIA: SM, Karl S. Thompson, K8KT—SEC: K8QEW. STM: KD8G. ACC: WA8CTO. TC: K8CG. SGL: K8BS. New dates for Jackson's Mill this year will be July 25 & 26. New name for affair: WV State Ham Feast and ARRL Conv. Make your plans new to attend. For more info., contact W8AH.

NET	TIME	FREQ	QNI	QTC	SESS	NM
WVFN	6:00	3865	994	162	30	W86P
WVMD	11:45	7235	800	43	30	W8FZP
WVN	7:00	3567	270	71	30	KZ8Q
WVRN	6:30	3640	215	44	30	K8LG
WVNN	5:15	3730	144	47	28	WD8LDY

Hillbilly Noon su 14290 157 16.5 W8YP Traffic: WD8LDY 443, W8FZP 178, K8TPF 162, KE8FI 136, W8YP 95, KD8G 72, WD8DHC 68, K8QEW 67, KA8TIK 57, KA8WNO 39, W8JWX 35, K8KT 32, K8UQY 31, N8FXH 28, KA8OGF 23, WB8BMX 19, NC8G 15.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Bill Sheffield, KQ0J—ASM: KA0MQA. SEC: WB0FOB. STM: N0DZA. ACC: WB0DUV. PIO: N0FOE. SGL: WD0GQL. TC: NC0F. BM: KA0CZW. We have just completed our second year of VE testing in the Section. I would like to take this opportunity to thank all of the VEs for their time, effort & dedication to this program, and to the many clubs and groups who sponsor the test. Along the front range there are tests which are held on a monthly and semi-monthly basis. Novice classes have recently been held by Pikes Peak ARC, ARA Ham Radio School and WA0KHN in Granby, WA0YAU in Littleton, congratulations to your new upgrades, and thanks for your efforts in Novice instruction. Congratulations to WN0RWG for coordinating the hams for the "Parade of Lights" event in Denver. Congrats to KJ0GUZ on the article "Over the Wall" which appeared in RMPRA Newsletter, and has been reprinted in Gateway and Ski Country ARC Newsletter. If your club or group has a newletter don't forget to put me on your mailing list. 73, KQ0J. NETS: COL QNI 949, QTC 39-int 53, QNF 871, 30 SESS. CWN QNI 85, QTC 83, QNF 431, 29 SESS. CWXN QNI 2494, QTC 2018, QNF 2700, 30 SESS. HNN QNI 1839, QTC 88-INF 472, QNF 1351, 30 SESS. NCTN QNI 294 QTC 133, QNF 371, 30 SESS. SCTN QNI 93, QTC 34, QNF 178. Traffic: N0BQP 2084, KA0TXX 952, K0JAN 899, WA0HJZ 882, WD0BSZ 193, KB0Z 116, WB0FFV 94, N0ØZA 87, KA0NLI 85, N0HMX 55, N0FCP 20, AI0W 18.

NEW MEXICO: SM, Joe T. Knight, W5PDY—ASM: K5BIS. DEC: WD5HCB. STM: ND5T. NMs: WA5UNO K6LL W5QNR. TC: W8GY. ACC: W5HD. Southwest Net (SWN) meets daily on 3583/7083 at 0230 UTC and handled 140 msgs with 210 stations in. New Mexico Roadrunner Net meets daily on 3939 at 0100 UTC and handled 55 msgs with 1077 stations in. New Mexico Breakfast Club meets daily on 3939 at 1330 UTC and handled 126 msgs with 1005 stations in. Yucca 2-mtr Net 01/61 handled 28 msgs with 459 checkins. Caravan Club 2-mtr Net 66/06 handled 43 msgs with 176 checkins. SCAT 2-mtr Net 66/06 handled 5 msgs with 566 checkins. Info Net, 102 checkins. FB newsletter from Pecos Valley ARC. Congrats to WS5A on his Extra Class. New officers for Mesilla Valley RC are KE5VJ, WE5Z, W0SWK and N5HRI. Traffic: W5DAD 158.

UTAH: SM, Jim Brown, NA7G—SEC: Rich Fisher, NS7K. STM: John Sampson, W7OCX. Packet radio continues to grow, with more stations on each week. We are now seeing some activity on 03 - 09, as well as 145.010 (which is the primary packet frequency). It's now possible to digipeat on 2M from the Salt Lake area to Colorado, Wyoming, Idaho, Montana, Arizona, Nevada, and the west coast. KN7U and I have connected successfully (Phoenix- Kaysville); he reports heavy activity there with packet repeaters now in use. 73 de NA7G. Traffic: WA7KHE 108, WA7MEL 73, K7MG 38, N7ASY 24, NA7G 14, W7OCX 6, N7BQE 3.

WYOMING: SM, Dick Wunder, WA7WFC—The Treat Plains Rptr. Assn. held its annual meeting on Nov. 2 at Vimbo's restaurant in Wheatland with a nice turnout. Lightning protection on the AC line as well as the coax is recommended by the Laramie Peak Rptr group as both the AC & coax protectors operated during a lighting hit and no damage was sus-

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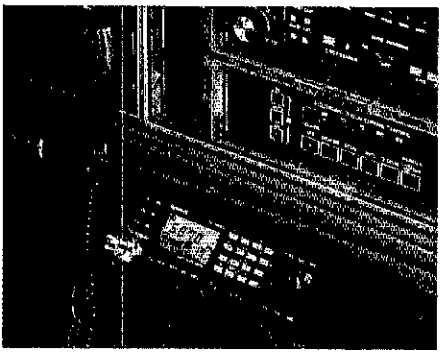

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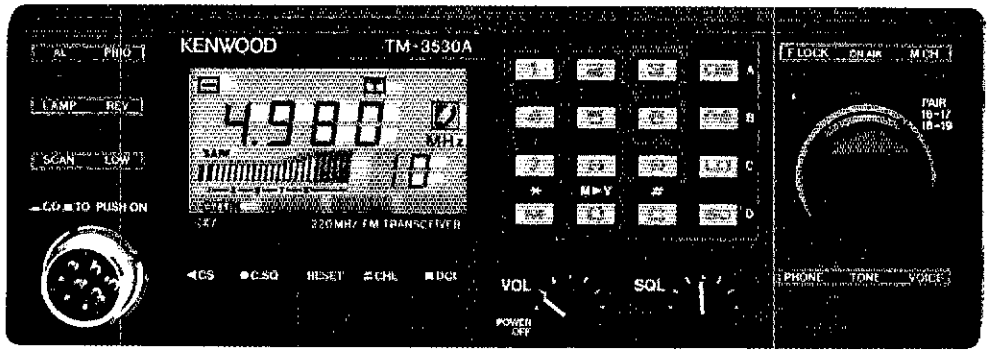

TM-3530A optional accessories:

- **TU-7** 38-tone CTCSS encoder
- **MU-1** DCL modem unit
- **VS-1** voice synthesizer
- **PG-2N** extra DC cable
- **PG-3B** DC line noise filter
- **MB-10** extra mobile bracket
- **CD-10** call sign display
- **PS-430** DC power supply
- **MC-60A/MC-80/MC-85** desk mics.
- **MC-48B** extra DTMF mic. with UP/DOWN switch
- **MC-43S** UP/DOWN mic.
- **MC-55** (8 pin) mobile mic. with time-out timer
- **SP-40** compact mobile speaker
- **SP-50B** mobile speaker
- **SW-200B** SWR/power meter
- **SW-100B** compact SWR/power meter

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- Quick change, locking battery case

TH-31BT/31A optional accessories:

- **HMC-1** headset with VOX
- **SMC-30** speaker microphone
- **PB-21** NiCd 180 mAH battery
- **PB-21H** NiCd 500 mAH battery
- **DC-21** DC-DC converter for mobile use
- **BT-2** manganese/alkaline battery case
- **EB-2** external C manganese/alkaline battery case
- **SC-8/8T** soft cases with belt hook
- **TU-6** programmable sub-tone unit
- **AJ-3** thread-loc to BNC female adapter
- **BC-6** 2-pack quick charger
- **BC-2** wall charger for PB-21H
- **RA-9A** StubbyDuk antenna
- **BH-3** belt hook

TH-31BT with DTMF pad shown
Optional RA-9A attached

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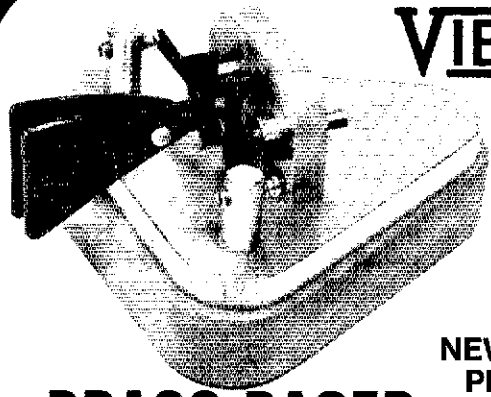

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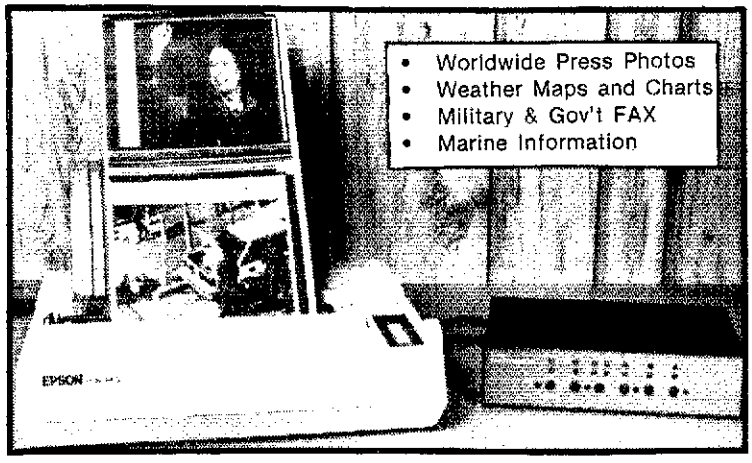

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RT-868A/APX-76	AN/TPX-46
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RT-547/ASQ-19	MK-994/AR
RT-857/ARC-134	MK-1004/ARC
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tained on machine. Both of the protectors were destroyed by the strike. Packet Radio is growing at a very rapid pace in the state. Cheyenne now has three Bulliten Boards on the air. The 145.01 frequency is getting quite congested at times with all the WY & CO stations now on the air. Wyo. Cowboy Net held 22 sessions with 771 QNI & 4 QTC. Albany Co. RACES Net had 34 QNI. Traffic: NN7H 401.

SOUTHEASTERN DIVISION

ALABAMA: SM, Joseph Smith Jr. WA4RNP—STM: N4JAW. SGL: KA4WVU. BM: KF4VV. OO/A AUX: AA4BL. TC: N4AU. ATC: WB4BYQ. AAC: WA4RNP. "act" SEC: WA4RNP. Here are the new officers of the Telephone Pioneers Amateur Radio Club: President AC4V, Paul Rogers; Sec/Treas N4JCM, Ken Browning; Chapter Presidents WA4IPI, Steve and KB4XN, Dennis; Chapter Vice Presidents W4AXO, Jim and KA4VCA, Mike. I have a Silent Key to report this month: K4HAK, Donald C. Williams of Birmingham. He will be missed. I am glad to note that the Shelby Co. ARC has been officially renewed as a Special Service Club. If you hold a current section appointment (STM, OES, DEC, EC, ETC), you are eligible to purchase an official ARRL call-sign badge. I have the order forms and will send yours when I get your SASE. Traffic: CAND reports 619 messages in 30 sessions with DRN 5 REP 100% by WA4JDH, W4CKS, NW4X, and, W4WJF. AEND reports 37 messages passed in 30 sessions with other nets represented by WA4JDH, WD4NYL, KJ4MG, and N4DCS. AENB reports 53 messages passed in 30 sessions with RN 5 represented by WA4JDH, W4CKS, W4QAT, NW4X, and, KJ4MG. AENM reports 59 messages passed in 35 sessions. Brass Pounders League: WA4JDH. PSHR: WA4JDH, W4CKS, and WA4RNP. Totals: WA4JDH 1066, W4CKS 101, WA4RNP 45, K4AOZ 44, W4WJF 40, K4HJX 12, W4DGH 8, WB4TVY 2.

GEORGIA: SM, Eddy Kosobucki, K4JNL—ASM & BM: K4VHC. SEC: NC4E. STM: WB4WQL. ACC: WA4ABY. OOC: NA4I. PIO: WB4DEB. SGL: W4BTZ. TC: WD4PAH. Tnx to all in the section who handled Christmas tfc. Lots of hams don't realize it, but it's a big plus for our hobby. We exist because of the PUBLIC SERVICE we render. W4PIM, WB4WQL, K4EV, WA4LLE, KF4FG, W4HON, KB4JPN & K4BAI made PSHR for Dec. TNX... Our sympathy to the family of Bill Copeland, NT4E of Albany who passed away on Nov 19th. If your club or group is planning a hamfest in '87 & want an announcement made in QST, u must get into HQ at least two months prior to the month of the affair. Get with your group & do it now. We still don't know what mother nature will do this spring so get that Emergency equipment out & see that it is working. If u hold an ARRL appointment & desire to purchase a badge let me know & I'll send u an application. The section ACC, WA4ABY informs me that he knows that there are many clubs in GA who can qualify to be a SPECIAL SERVICE CLUB. If u need any info contact Sandy & he'll help u. STM informs me that net check-ins are picking up. We have some FB section nets. Won't u take a little time & check in to one of them. My on-the-air activity was pretty well shut down during Nov & Dec due to the added activities the boss put on me. In two more years I hope to retire & join the many of u who can be heard all day long HI... God bless... Traffic: W4PIM 189, WB4DVZ 122, W4WXA 91, WB4WQL 83, WD4NGI 56, WA4LLE 46, K4BAI 37, KF4FG 34, K4EV 32, W4HON 30, KA4HHE 21, N4MWR 18, W9NXC 17, K4NM 11, W4OHH 5

NORTHERN FLORIDA: SM, Roy Mackey, N4ADI—ACC: WD4RIQ. BM: KB4LB: OO/RFI: K4JJE. PIO: WA4PUO. SEC: WA4PUP. SGL: KC4N. STM: WB4GHU. TC: N4KF. Jim, K4JJE, advises we need more OOs to cover the Section. There are only a few who are active and submit monthly reports and we can use several new stations. Contact Jim for more info and training. It has been discouraging news to hear of the cancelling of some sessions of Traffic Nets because we couldn't get enough stations to cover the NCS and/or Liaison duties. With the optimistic view of improved propagation coming over the horizon, our ability to maintain good contacts should get more Traffic Handlers to check in to our Nets to help provide the extra hands we need. All net managers are looking for help, so please let them know of your willingness to try and help! This is election time for a number of our clubs, and I want to congratulate some of the officers for the year 1987. LMARS has WD4NVJ, Pres. WA2ARS for VP KL7IV as Secy. KJ4HS is Treas. HAMM- RAMM has W4UJL, Pres. K4RLH VP., WA4DFA Secy., WD4AKL, Tres. As I am advised of others, I will be publishing their names also. A continuing problem that is occuring is the expiration of ARRL memberships of the appointed leadership officials. When HQ knows this, the appointments are cancelled. You must keep your ARRL membership current to continue to keep the appointments you now have. I am trying to advise you before the fact, so there will be no discontinuity in the current appointments. So far the lead time is too short. Check your dates! Traffic: N4PL 714, WA4OXT 528, WD4IIO 524, WX4H 522, KC4VK 392, KB9LT 406, KI4PB 162, AA4HT 138, KB4LB 130, W4MGO 127, WD4IUI 124, N4GMU 119, WA4EYU 117, WC4D 100, N4ADI 74, WA4SXW 73, KB4FIY 70, N4JAQ 69, W4KIX 49, K4AJV 67, N2AOX 45, NF40 41, NS4C 41, W7YWF 38, W8IM 37, WD4RIQ 32, WA4PUP 27, KI4CQ 25, W4GUJ 24, W4LDY 24, W4DTV 20, N4JHI 18, NQ4P 18, KA4KAH 17, WD4FJY 16, N4ENL 14, WD4HBP 14, WA4STZ 12, KJ4HS 11, WB4AWG 9, KF4GY 7, WD4HUZ 7, NA4F 5. (Oct.) WC4D 50.

SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFK—SEC: W4SS. STM: K4ZK. TC: KI4T. BM: WD4KBW. PIO: W4WYR. SGL: KC4N. OOC: W4TAH. ACC: WA4NBE. Congrats to W4SME, who has been appointed manager of the FAST Net. The net meets at 6 PM and 10:30 PM on 3940 kHz every evening and your QNI will certainly be appreciated. 1987 officers elected by the Manasota Repeater Association are WA3TOX, President; N1CVG, Treasurer. The Palmetto ARC announces the election of W4VMN, President; WA9JNB, Vice President; KE4DC, Secretary and KE4HQ as Treasurer. Received notice from W4SME that the late session of the FAST net has been discontinued due to insufficient participation. It's too bad as the late session was a good way to relay appropriate traffic from late QFN to FPTN. I am sure that Gator net reps will continue to volunteer to relay any traffic which can't be handled on QFN. I also heard WA4EIC volunteer to QSP a piece of Rockledge traffic which can easily be handled on FPTN. WA4EIC is a very active member of both QFN and FPTN. Gator net meets on 3651 at 8:30 AM and FPTN on 3940 at 8:55 AM. N4KB reported that his first TCC sked for this winter was 18 for PAN. W1NJM is back and has already checked into QFN. WB4YDD, Manager of RN5D, reported 687 QTC during November and that Florida had 100% representation. WD4KBW reports 66 bulletins received and 101 sent by AA4BN 18, W4DL 37, WA4EIC 44, WT4F 6, KA4GUS 14, K4IEK 15, WD4KBW 19 and AA4MI 14. REMEMBER THE ARRL INFORMATION NET—SATURDAYS AT 8:00 AM ON 3940 kHz. 73 de WA4PFK. Traffic: W3CUL 2915, W3VR 1067, WA4PFK 403, K4SCL 286, W4NFK 275, K4EUK 264, K4ZK 263, WA4EIC 263, AA4BN 225, WA4RUE 187, KA4GUS 180, KI4ZW 175, WB4WYG 163, W4DL 141, KA4NXF 140, KF4JA 133, WD4KBW 132, KA4FZI 129, K4IA 125, N4KB 105, W4SME 86, KA4YHS 83, KF4RL 80, KB4MON 66, WD4CHO

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- **Standard accessories:** Rubber flex antenna, earphone, wall charger, 180 mAH NiCd battery pack, wrist strap.
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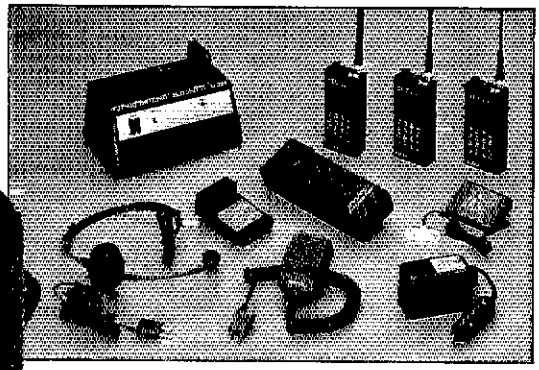

Optional accessories:
- **HMC-1** headset with VOX
- **SMC-30** speaker microphone
- **PB-21** NiCd 180 mAH battery
- **PB-21H** NiCd 500 mAH battery
- **BC-2** wall charger for PB-21H
- **BC-6** 2-pack quick charger
- **DC-21** DC-DC converter for mobile use
- **BT-2** manganese/alkaline battery case
- **EB-2** external C manganese/alkaline battery case
- **SC-8/8T** soft cases with belt hook
- **BH-3** belt hook
- **AJ-3** thread-loc to BNC female adapter
- **RA-8A/9A/10A** StubbyDuk antenna
- **TU-6** sub-tone unit (TH-21AT/A only)

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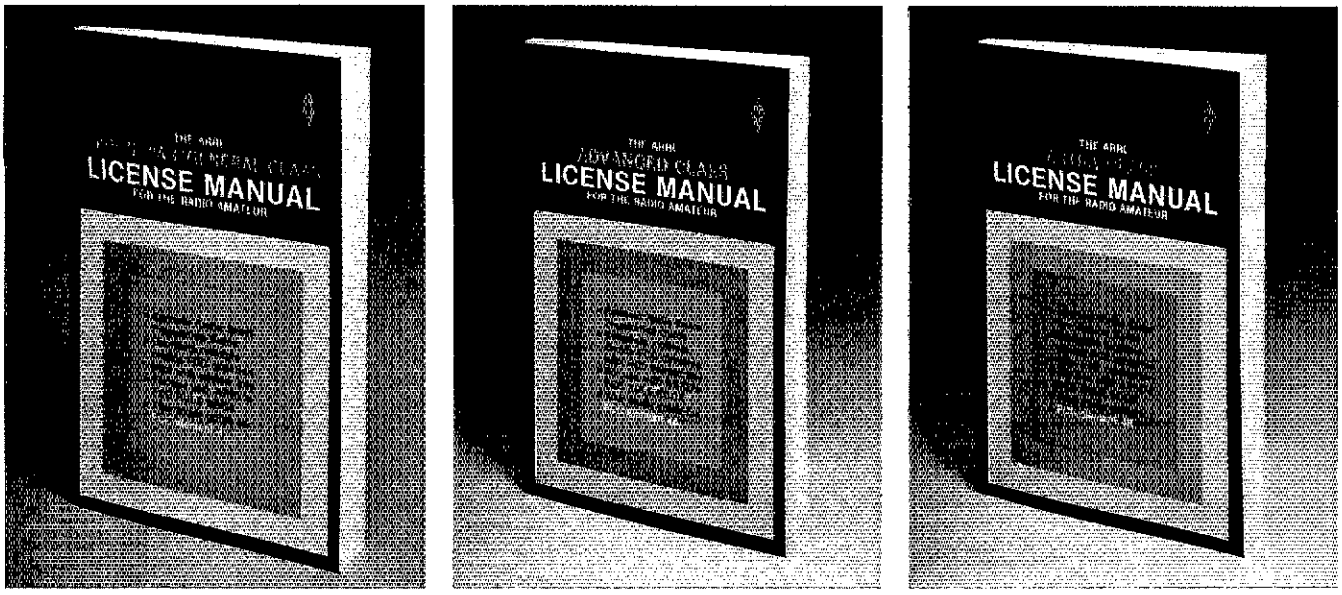

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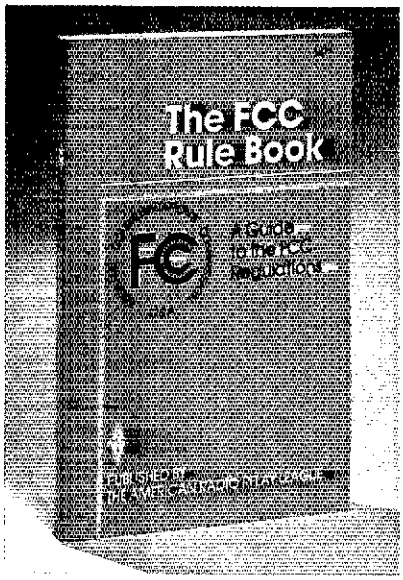

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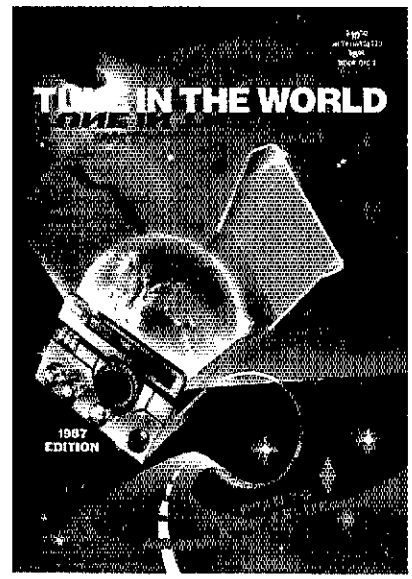

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The TS-930S (with or without automatic antenna tuner) is a high performance DX and contest transceiver delivering superior features and field-proven performance. Compare the TS-930S with other HF rigs in its price class and see why no other rig comes close!

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  An innovative, quadruple "UP" conversion digital PLL synthesized circuit provides superior frequency accuracy, stability, plus greatly enhanced selectivity.
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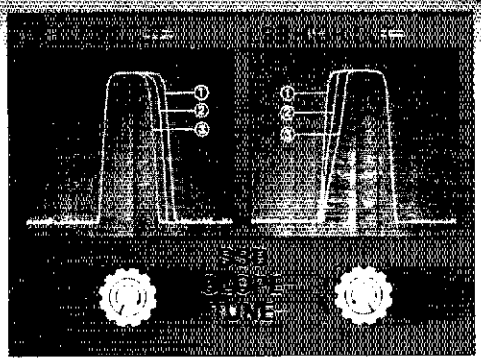
  CW Variable Bandwidth Tuning control tunes out interfering signals. The CW pitch control shifts the IF passband and simultaneously changes the beat frequency pitch.



- **SSB slope tuning—Another Kenwood First!**
  Allows independent adjustment of the low and/or high frequency slope of the IF passband, for best interference rejection.
- **IF notch filter.**
- **Tunable audio filter built-in.**
- **RF speech processor.**
- **Dual mode noise blanker.**
- **Dual digital VFOs.**
- **Eight memory channels.**
- **AC power supply built-in.**
- **Built-in automatic antenna tuner (optional).**
  Covers 80-10 m. *Another industry first by Kenwood!*
- **Fluorescent tube digital display.**
- **Excellent receiver dynamic range.**
- **One year limited warranty.**

Optional accessories:

- AT-930 automatic antenna tuner
- SP-930 external speaker, with selectable audio filters
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- YG-455CN-1 (250 Hz) CW filter
- YK-88C-1 (500 Hz) CW filter
- YK-88A-1 (6 kHz) AM filter (all plug-in type)
- SO-1 commercial stability TCXO
- MC-60A, MC-80, MC-85 desk microphones
- TL-922A linear amplifier (not for CW QSK)
- SM-220 station monitor
- PC-1A phone patch
- SW-2000, SW-200, SW-100 SWR meters
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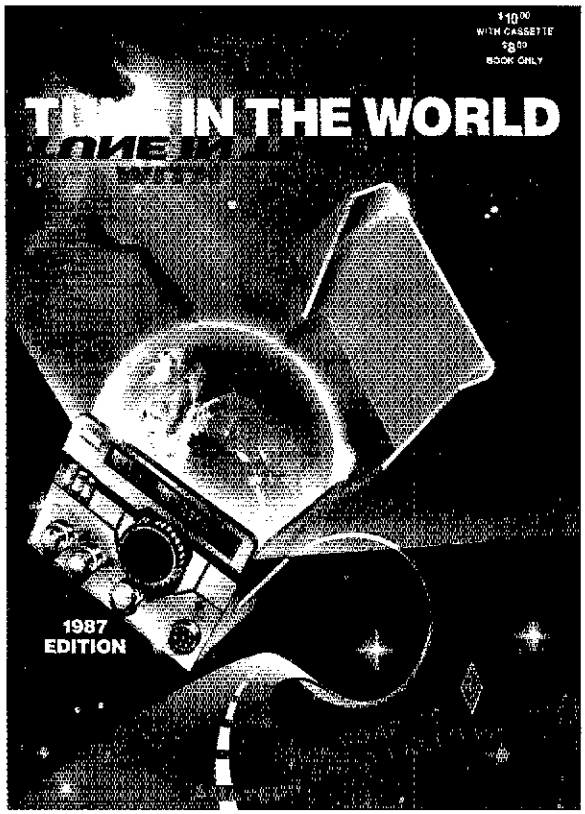

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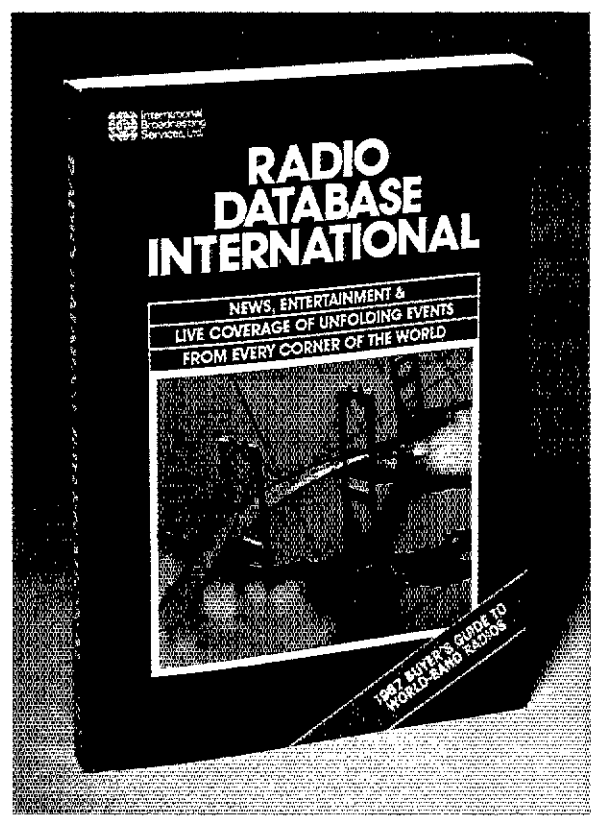

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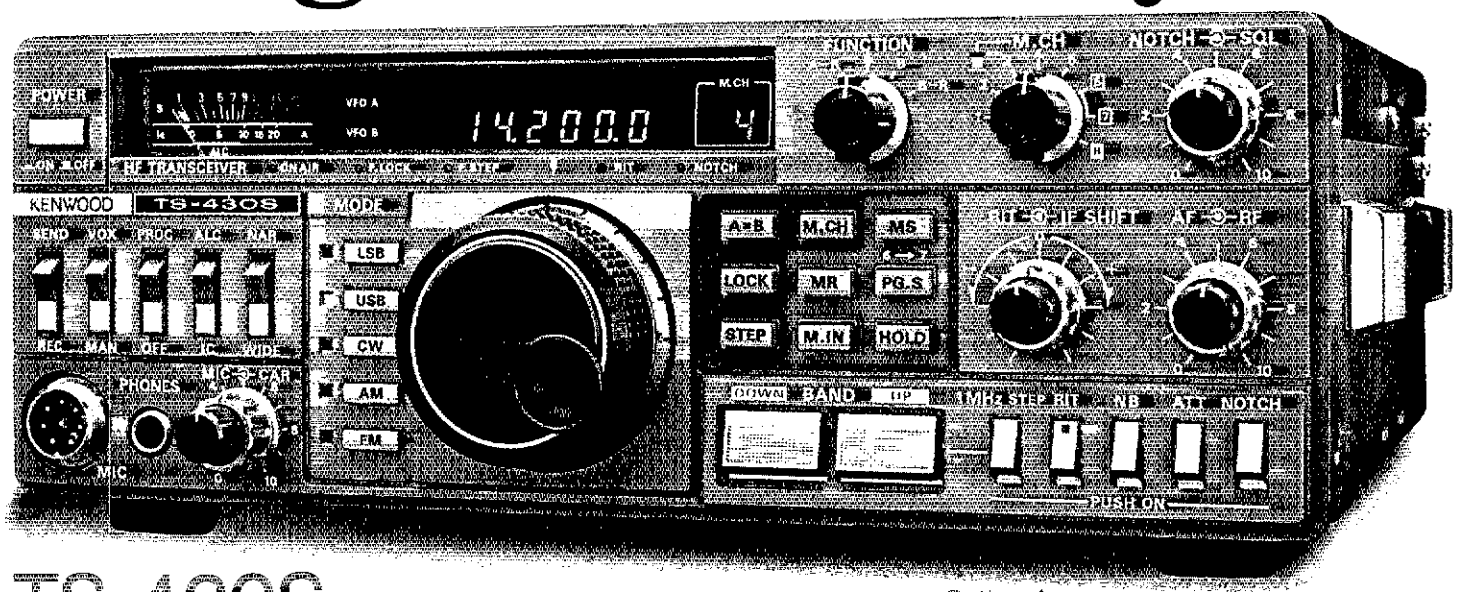

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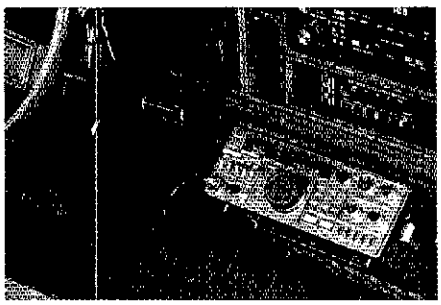
Digital DX-terity—that outstanding attribute built into every Kenwood TS-430S lets you QSY from band to band, frequency to frequency and mode to mode with the speed and ease that will help you earn that dominant DX position from the shack or from the mobile!



- **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.
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- **Dual digital VFOs.**
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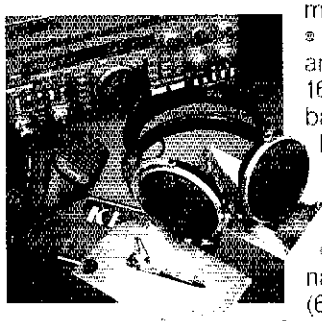

Optional accessories: • PS-430 compact AC power supply • SP-430 external speaker • MB-430 mobile mounting bracket • AT-130 compact antenna tuner covers 80-10 meters, incl. WARC bands • AT-250 automatic antenna tuner covers 160-10 meters, incl. WARC bands • TL-922A 2 kW PEP linear amplifier • FM-430 FM 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

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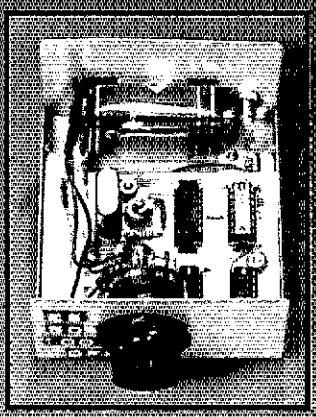
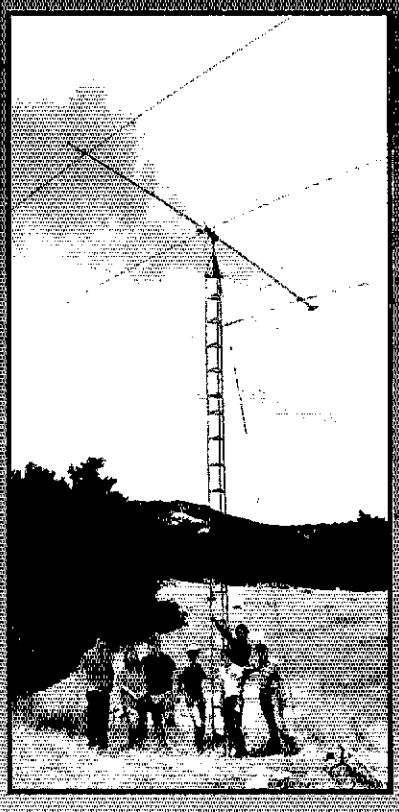
THE 1987 ARRL HANDBOOK

FOR THE RADIO AMATEUR





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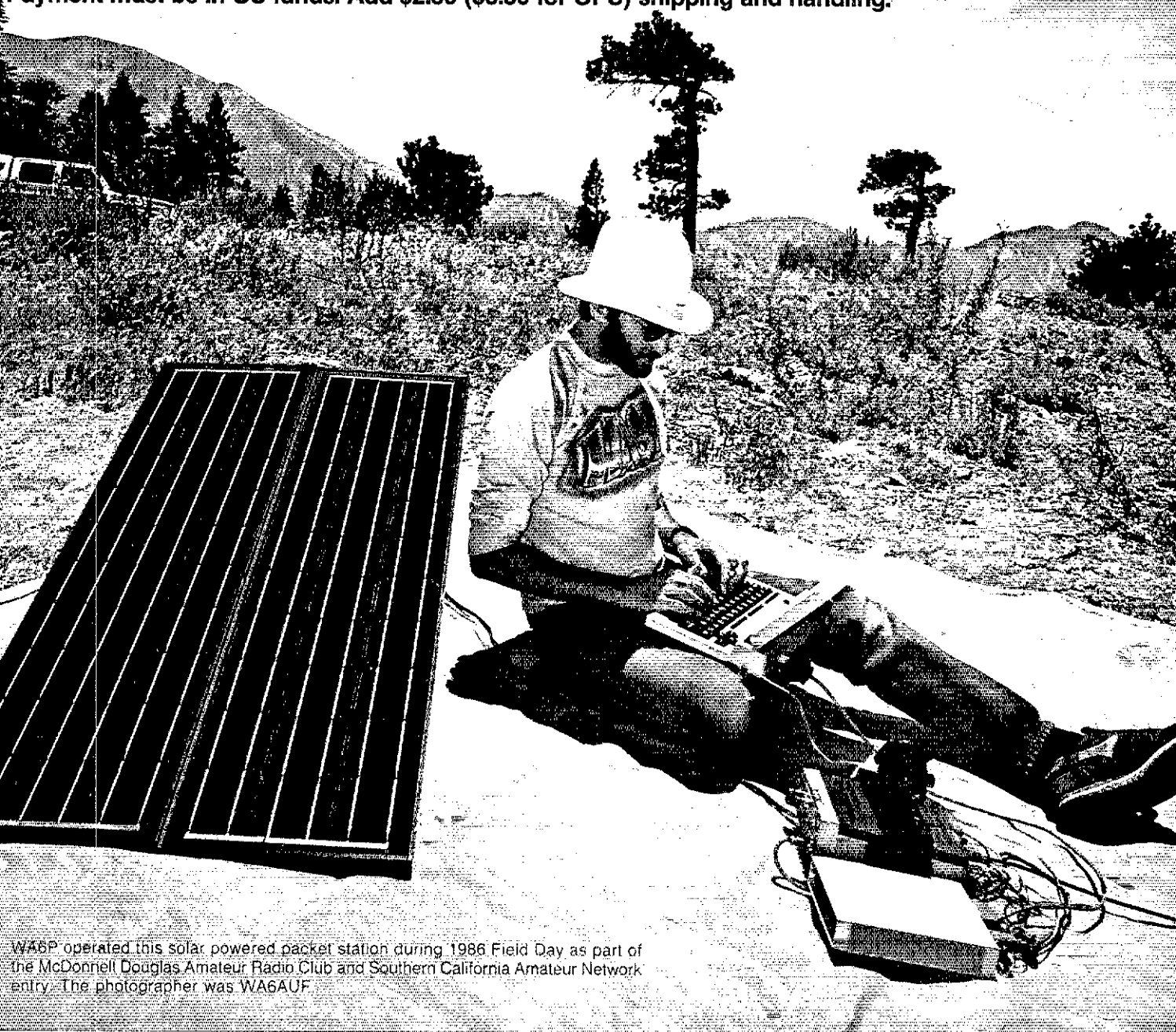

WA6P operated this solar powered packet station during 1986 Field Day as part of the McDonnell Douglas Amateur Radio Club and Southern California Amateur Network entry. The photographer was WA6AUF.

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IC-03AT
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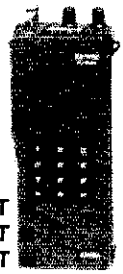

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BP-3 250mA 8.4V NICAD Battery
BP-4 Alkaline Battery Case
BP-5 425mA 10.8V Battery
BP-7 425mA 13.2V NICAD Battery
BP-8 800mA 8.4V NICAD Battery
HM-9 Speaker Mic
CP-1 Cigarette Lighter Cord
DC-1 DC OP Pack
Leather Case for IC-2AT
HS10 Headset for HTs
HS10SA VOX Unit for IC-02AT
HS10SB PTT Switch Box

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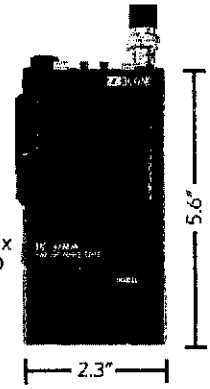
- Wide Frequency Coverage
- Size: 2.3"W x 5.6"H x 1.1"D



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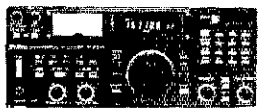

IC-R71A
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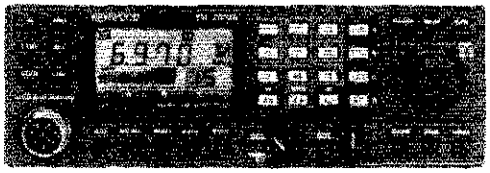

TM-2530 TM-2550 TM2570

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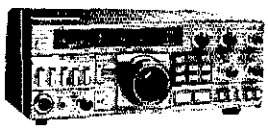

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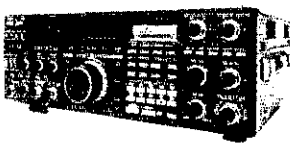

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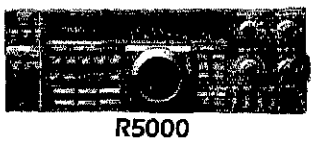

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UP TO 11 NONSTANDARD SPLITS: ***COMPARE*** this with other units!

20 CHANNELS OF MEMORY IN TWO SEPARATE BANKS: Retains frequency, offset information, PL tone frequency.

DUAL MEMORY SCAN: Scan memory banks separately or together. ***ALL*** *memory channels are tunable independently.* ***COMPARE!***

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TWO RANGES OF PROGRAMMABLE BAND SCANNING: Limits are quickly reset. Scan ranges separately or together with independently selective steps in each range. ***COMPARE!***

BUSY SCAN AND DELAY SCAN: Busy scan stops on an occupied channel. Delay scan provides automatic auto-resume.

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WEST INDIES: SM, Alberto L. Valldejuli, WP4CSG—I hope all of you had a wonderful Christmas season; and that this new year brings all of you health, wonderful times with your families, and excellent new experiences in hamming. There are new fields to be explored such as packet radio, Fax, RTTY, etc., and many of these hold great rewards for those who practice them. ATV is also one of those things which might interest some of you, and seems after all that it might just fit almost any budget. Experimenting is one of the main characteristics of us Hams, and all these new fields provide good sources for expanding our interest in radio and all things related. Try one new thing this year and rekindle the interest in your hobby. For one thing, if you have not yet tried it, there are other new areas you might want to explore, which are as interesting as those new things previously mentioned, and which do not require any investment other than your time and interest. How about joining ARES and participating in emergency drills, exercises, and when the time comes (hopefully never), in the real emergency situation. Or how about traffic handling? These areas are not only interesting, they are also most rewarding. Try them. Contact KP4IG, KV4JC or VP2VI, they'll be glad to hear from you. NETS: WINS (KP4DJ-NM) Sessions 31, QND 175, QTC 9 QNI 130; WINE (VP2VI-NM) Sessions 26, QTC 1, QNI 88; WINC (KP4JW-NM) Sessions 30, QTC 35, QNI 816. Traffic: KP4DJ 53.

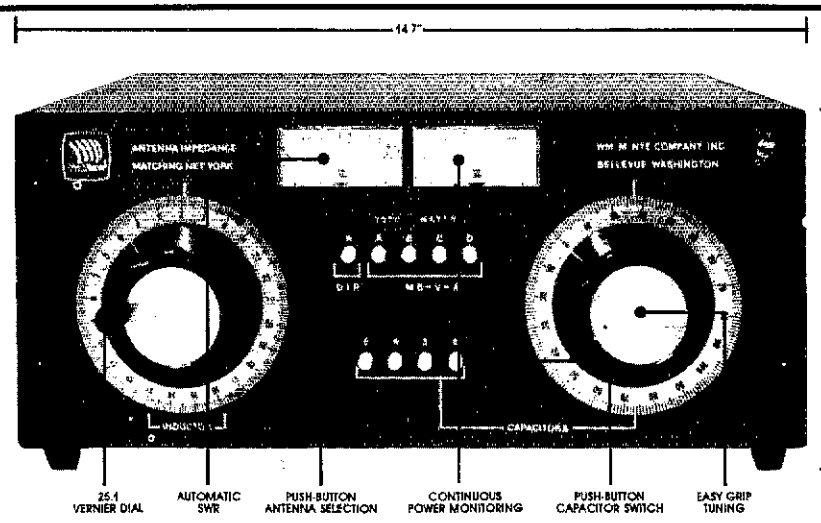
SOUTHWESTERN DIVISION

ARIZONA: SM, Jim Swafford, W7FF—STM: W7EP. NM's: K6LL, HA7HEV, WB7CAG. Congratulations to Ken, WB7TWM, on his recent appointment and certification as O.O. Also, congrats to KA7MUL and W7AMM both of which made BPL in November. The ATEN net has moved their starting time to 1900 local time on 3992 as winter condx move in. Your SM enjoyed visiting with the Cococino ARC at their meeting in Flagstaff in November. Also visited the IBM Tucson club and the T.R.A. recently. Good groups. Many Phoenix and Sun City area hams participated in the Palo Verde Siren Test. FB job. A long and lasting "well done" to our retiring Senator Barry Goldwater, K7UGA, after a long and distinguished career in Congress. Maybe now we'll hear you more on the air, Barry. We wish you many pleasant years of enjoyment in your retirement. Bernie, W7KGY, reports that the Las Vegas "Hamwest" convention was a big deal. Sorry we missed it due to other committments. Maybe next time! The "El Tour De Tucson" cycle event for diabetes charity was a very well run public service event, primarily sparked by the Tucson IBM club, but supported by all Tucson hams. Nice press coverage for radio amateurs. Chuck, NØADI, was the sparkplug. K2DNR is working on his VUCC using 10 Gigahertz and doing a lot of mountain-topping. Gene, KH6PP, decided to relocate back to Hawaii from Tucson. We will miss him on two meter packet radio. Your SM along with SW Div'n Director, WA6WZO will be attending the Superstition ARC Swapmeet in Apache Junction Dec. 6-7 where it is anticipated that about three thousand AZ hams will show up with their wares. This has to be the biggest swap-fest of the year! ARCA all ready planning for another big hamfest next July in Flagstaff with KB7NE, Chairman. Big gun DX'er, K6FM has retired from California and moved to Flagstaff. W7YS was awarded first place as portable station in recent County Hunters CW contest. That's about it guys and gals. Hope Santa is good to all of you, and "keep those cards and letters coming in!" 73, Jim.

NET	QNI	TFC
SUPERSTITION TFC NET	46	7
CACTUS VHF	385	94
CACTUS HF	562	101
ATEN	922	114
SWN	213	161

Traffic: KA7MUL 764, W7AMM 514, KN7U 147, K6LL 144, W7EP 112, W7KCM 110, W7GAQ 110, WB7CAG 104, W7LVB 60, KA7HEV 42, N7ETP 34, K7JKM 30, K7POF 25, K7RDH 16, (Oct.) KB7FE 73.

LOS ANGELES: SM, Bob Poole, AJ6F— ASM:K6IYK. SEC:AK6Y. STM:W6INH. PIO:NJ6K. SGL:K6KSY. OOC:K6BMG. TC:WBØQPO. From WA6LOD comes the following report: A simulated 7.6 Richter Earthquake was the scenario for a 6 hour exercise conducted in the City of El Segundo with the cooperation of several of the larger industries in the City. The ham participation in the drill was highly acclaimed by the officials at City Hall and by the companies. The ESARC station, WB6VMV, provided a communications center operating on emergency power from 80 thru 1.25 meters. ESARC hams participating were: N6NLA, WA6ROW, W5LFF, N6AKF, K6OQO, NI6U, N6NVS, K6IJP and WB6JJM. Companies and ham coordinators were: Aerospace, WW6A and K6GJN; Internat'l Rectifier, W7JXQ; Xerox, N6DGK, N6DBS, K3LKF, KD6CQ and W6KKU; and GM/Hughes, N6HUQ—a fine showing for hams and industrial communications. The San Pedro Christmas parade was another setting for the continuing role of ham public service; WA6MZV (SW DEC), WA6TIU, WA6YSX, N6CHE, N6HEX, KA6ZRG, KB6DCV, WA6EKR, N6NW, and KB6FLF were URAC members helping out. My thanks to the HamWest crew, Jan and John, the folks from this section and W8IXD for making this writer's weekend exciting and fun in Las Vegas! Also, congratulations to N6ENV and the video crew on a spectacular performance in the video production of the event. The W6AM museum is several steps closer to reality in Rancho Palos Verdes; We're all hoping to see this come to fruition. My reservations are in for the International DX Convention in Visalia in April—are yours? Contact the SCDXC for details. I am pleased that Mel Hughes, K6KSY, has decided to accept the position of State Government Liason for the LAX section. Mel has the highest possible qualifications for the post since he recently was elected as mayor of Rancho Palos Verdes and has been active politically for many years. Welcome aboard, Mel. Thanks to the Buena Park ARC for keeping me informed of Orange County activities through their "Communicator" bulletin. The LAACARC plans to bring ham radio to the Girl Scouts this coming Field Day; the GSA will be setting up for their diamond anniversary and a full-fleged Field Day effort on the site is anticipated. My thanks to Royce Bell, KX7Q, who served admirably as the ACC in this section. Royce has relocated and we all wish him well. The LA Marathon will be held March 1. Communicators and others are being recruited actively; contact your ARES rep for details. My warmest congratulations to the PVARC Ham-of-the-year, Peter Von Hagen, WA6HXM—a very deserving fellow. Another PV ham, Clint Mason, WA6TMJ was awarded the City of Rancho Palos Verdes' highest award, the City Commendation for Civic Contributions. Clint was cited for numerous activities including organizing and teaching amateur radio classes, public



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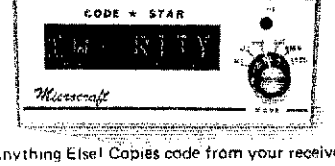

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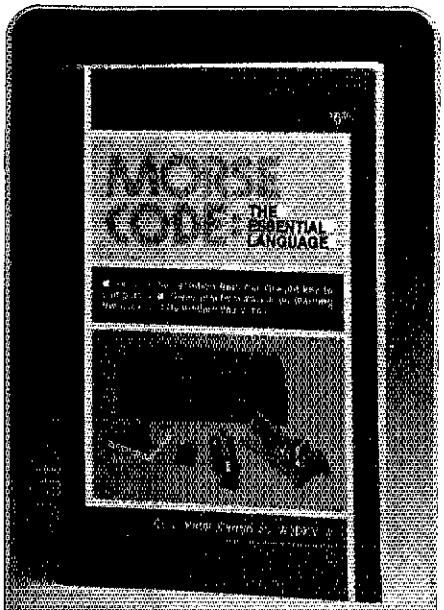

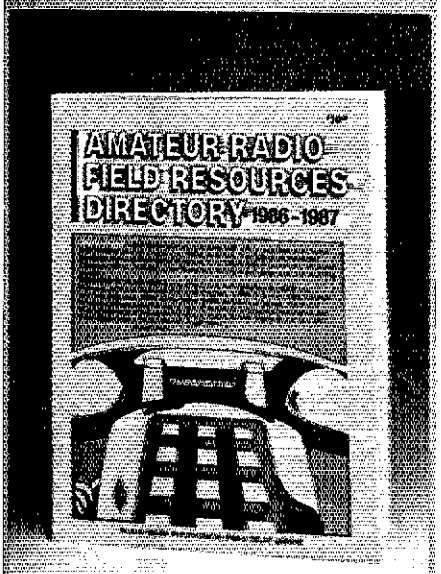

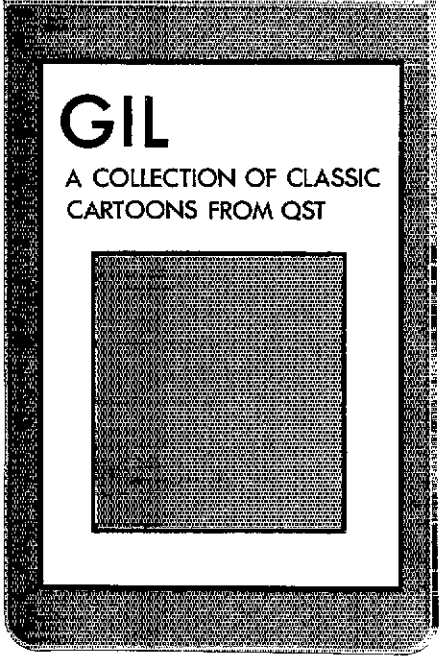

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The Amateur Radio Field Resources Directory for 1986-87 is now available. Its 514 pages are divided into three sections. The WHITE pages list those individuals who can help with almost any Amateur Radio-related question or problem. The BLUE pages include a 10-year **QST** cumulative index, ARRL organization and much more. The YELLOW pages contain advertisers. Copyright 1986 #0321 $10 plus postage and handling*.

GIL - A Collection of Classic Cartoons from QST Phillip "Gil" Gildersleeve, W1CJD contributed over 1500 cartoons and drawings to ARRL from the late twenties until he became a silent key in 1966. This book presents only a small portion of the "best of Gil." Most hams would love to have a "Jeeves" character to do the tough chores around the ham shack, and what radio club doesn't have characters similar to those portrayed on the famous field day covers? Gil was an avid radio amateur, and a member of *Who's who in American ART*. This book is a tribute to W1CJD, and we are sure that you will have as much fun reading and viewing Gil's work as we did in assembling the material. Approximately 110 pages, copyright 1986 #0364 $5 plus postage and handling.*

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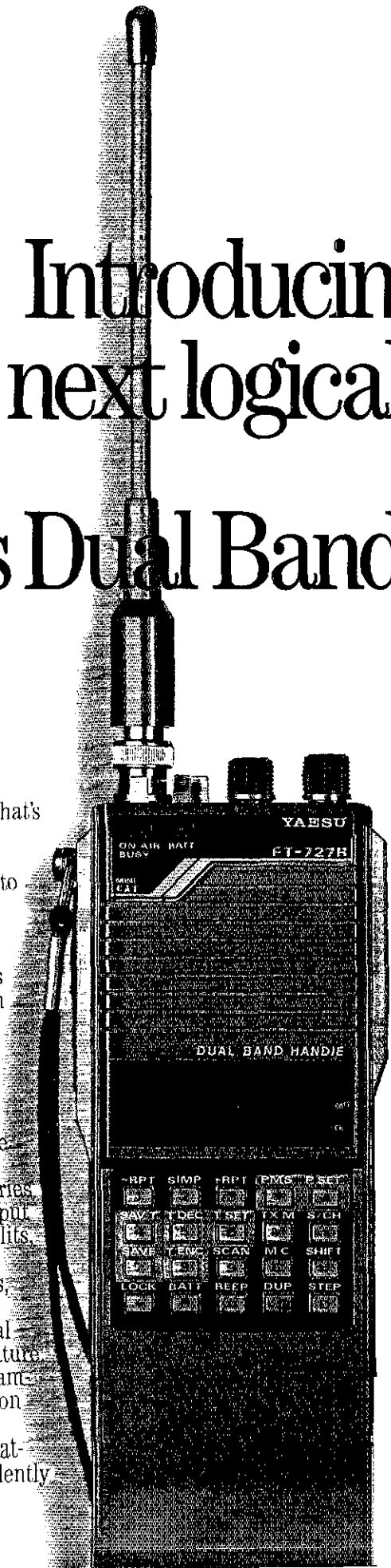

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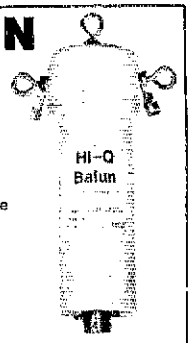

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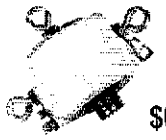

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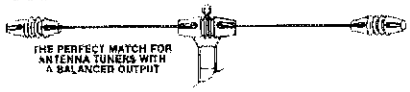

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S-80	80/75		$13.95/pr.
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All antennas are complete with a HI-Q Balun, No. 14 antenna wire, insulators, 100' nylon antenna support rope (SD models only 50'), rated for full legal power. Antennas may be used as an inverted V, and may also be used by MARS or SWLs.

Antenna accessories — available with antenna orders

Nylon guy rope, 450 lb. test, 100 feet	$4.49
Molded Dogbone Type antenna insulators	1.00/pr.
SO-239 coax connectors	.55
No. 14 7/22 Stranded hard drawn copper antenna wire	08/ft.

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telecasting of civic proceedings, emergency communications organization and participation, providing two VHF repeat ers and an active RACES participant. I wish I had this young man's energy! The QCWA and OOTC groups had a good dinner meeting during November and December. Sorry some of you missed these affairs. The SOWP group had a brown-bag meeting in Long Beach. They are trying to get together again and locate somewhere near by. The two meter gang was a big help during the Holidays as the regular bands went flat on us. Thanks a lot, guys. Traffic: K6UYK 617, W6INH 346, N7CZF 110, N6LHE 101, WB6VPY 76, W6NKE 22.

ORANGE: SM, Joe K. Brown, W6UBQ—ASM: San Bernardino Co., Tony WB6QHB, (714) 981-1836. ASM: Orange Co. Ralph WB6JBI, (714) 776- 9272. ASM: Riverside Co. W6IKN, Bob (714) 686-3823. Mary KA6IGG from the Public Schools Support Group rpt a meeting with Dr. Petterson Superintendent of Schools Orange Co Board of Education was productive. He is for the Amateur Program. Archie Comic books a useful tool. Club Activities, OCCARO encourages all amateur radio organizations to support ARES in coordinating public service events using amateur radio for communications. Riverside Co. Amateur Radio Association for 1987. Pres. John WA6QMW. VP George W6RPD. Sec Paul WD6HEE. South Orange County Amateur Radio Association, Pres Muriel KA6EJP. VP Lois WD6CEO. Sec Vern KI6GP. Yucaipa Valley Amateur Radio Club, Pres Fred Schmidt VP Don Ames, Sec Paul Starr. Inland Empire ARC Pres Ken WA6ZEF, VP Chris KB6JRB, Sec Inez KA7FMV. Ken Walston WA6ZEF has been appointed to take over the Section Emergency Coordinator Slot vacated by Jim, AE6N. With the ARES reorganization in Orange County and Riverside/San Bernardino bringing their RACES Organizations up to State OES Guide lines, Ken has lots of work ahead of him. He will need all our support. Need ARES involvement info? Call Ken (714- 983-1272).

NET	FREQ	SEC	QNI	TFC	NM	TIME
SCN/1	3598	31	249	223	WF60	1830
SCN/2	3598	25	131	41	WF60	2015
SCN/V	146.645	31	422	263	WA6QCA	2100

STM Report, PSHR WF60, WB6QBZ, WA6QCA, KA6HJK and WF60 also made BPL. Very little traffic handled during the Simulated Emergency test. NTS Stations and operators were monitoring Freqs from 0900 to 1200 during the S.E.T. period, 18 Oct 1986. Local Emergency coordinators must appoint district NTS liason Stations and the must check in with TFC into Region or section Nets. Only in this way can they become familiar with the NTS System and it's procedures. Traffic: WF60 522, WB6QBZ 129, WA6QCA 114, KA6HJK 105, N6GOT 84, AD0A 78, K6ZCE 70, W6CPB 47, K6DD 41, W6SX 26, KA6TND 19.

SAN DIEGO: SM, Arthur R. Smith, W6INI—TC: N6NR. STM: N6GW. SEC: W6INI. PIO: KG6LF. We almost got thru the fire season without a call-out, however, a last gasp Santa Ana resulted in a call-out on November 11 and 12. Responding for the Red Flag Patrol were KF6BB WA6BCC W6BFC WD6CSS K6DBJ KB6DJV WA6EDG WD6FUN W6FWF KA6GPR N6HWK W6INI W6JWU W6JYV N6KUR N4KRA N6LKL WB6LLO W6NFG KA6OMK KB6QML K6PD K6PZE KD6QJ W6QLJ K6QM W6TET W6TZV K6UV W6UZL WB6YHC W6YVY KE6YY. A 2-meter antenna for ARES use has been installed on El Cajon's new fire station with help of K6DS, N6MRR, KE6MU, N7NKJ, KF6XY. Microwave enthusiasts have net each Monday at 2100 on Palomar Club rptr, 146.73 (-). K6QM is happy recipient of 5-band DXCC. Supporting the Red Cross at the Mother Goose Parade were WA6BCC N6CQW N6JOJ N6JZE KB6KBI N6KUR WA6KWM N6LKL W6NFG N6NKJ N6NZO KA6QYE KH6VO KG6VP WA5VSL KE6VX KF6XY. Traffic: (Oct) KU6D 101.

SANTA BARBARA: SM, Byron Looney, K6FI—SCN/SB now five years old. Watch for QST article by N6FOU, net manager, in the near future. W7CB, W6MSG and W6OUL operated CQWW CW from Virgin Islands. KF6OY attended CSTI Earthquake School in November, W6AFF scheduled for January and Susan, WA6OCV will attend in February. Susan is SEC for Santa Clara Valley Section. If you are active in ARES and have the time, contact the SM about a CSTI Scholarship. Paso Robles ARC radio school scheduled for 13 weeks beginning Feb 25. W7CB is headmaster. N6AJA, DEC for SBAR County, reports excellent EC meeting for North County. Our Section Meeting should be history when you read this. Hope you were there. Traffic: W6NOR 102, K6YD 29, N6FOU 14, N6HYM 14, (Oct.) W6NOR 78.

WEST GULF DIVISION

NORTHERN TEXAS: SM, Phil Clements, K5PC—Asst. SM: K5MXQ. STM: AE5I. SEC: W5GPO. BM: W5QXK. OOC: WB5JBP. TC: W5LNL. PIO: K5HGL. SGL: W5UXP. The new West Texas Section became effective on Jan. 1, 1987. Very little info has been passed on to me about the logistics of organization of the new Section; I can only surmise that an acting Section Mgr. will be appointed by our Director until an election can be held. We are losing many fine leadership officials that I have been pleased and honored to work with for many years; none the least is Gene Smith, AE5I, who has held many appointments as far back as I can remember. He has served as Section Traffic Mgr. since the office was created. Before that he's held the post of PAM (phone activities mgr) for many years. We will miss your leadership, Gene, but I am sure you will continue your good work in the position of your choice in the new Section. To all of you DECs and ECs; I hope you will re- volunteer your services with the new SM as soon as possible to keep our fine record and tradition of emergency services going here in Texas. I am standing by here to transfer any applicable records to the new SM that may be helpful in expediting a smooth transision. Your SEC, W5GPO, and I will be hard at work revamping our DEC Districts and recruiting ECs where vacancies exist, striving for our goal of 100% ARES coverage in each county in our Section. Congrats and welcome aboard to our new West Gulf Division Director, Jim Haynie, WB5JBP, and the return of our incumbent Vice Director, Tom Comstock, N5TC. With these most capable gentlemen at the helm, we can expect excellent representation of our Division in Newington. It is time again to attend a SKYWARN refresher course and prepare for the upcoming tornado season. All ARES units should be ready to mobilize on short notice should a major communications emergency occur anywhere in or near our Section. Remember, ARES is national in scope, and any agency in need can be provided services regardless of location. Our Section Emergency freqs. are 7290/day 3873 night, and 3697/CW. Packet freqs. will be announced soon. All stations should monitor the appropriate freq. for possible emergency tfc. and calls for assistance. The 7290 Tfc. Net for Nov.: QNI 2806 QTC 690 in 43 sessions. PSHR for Nov. KB5UL KA5QYV KA5SPT W5VMP WG5S KB5ADE K5MXQ. Traffic: N5BT 359, W5TNT 331, KD5RC 240, KA5SPT 227, W9OYL 202, K5MXQ 181, KA5AZK 121, AE5I 114, K5UPN 101, W5VMP 97, WB4HML 77, KB5UL 62, WG5S 55, KB5ADE 55, N5IUI 47, N5JHI 22, KA5QYV 20.

OKLAHOMA: SM, Bill Goswick, K5WG—ASM/ACC: NB5N. BM: W5AS. OOC: K5WG. PIO: WB5SYT. SEC: W5ZTN. SGL: W5NZS. STM: KV5X. TC: W5QMJ. Congratulations to Jim Haynie, WB5JBP, on winning the West Gulf Director's election. We should all get behind Jim and help to make the West Gulf Division tops in the country. The hard work and dedication of the outgoing Director, Ray Wangler, W5EDZ, is certainly appreciated. Congrats to Dave Cox, NB5N, on being appointed the ACC. Dave has done considerable work in this area; the ACC branch is in most capable hands. Congrats to Jim Crew, WA5ICW, and Tony Bickel, K5PJR, on setting a new North American record (288 miles) on 5,760 MHz. All affiliated clubs should be receiving their 1987 annual report form in the next few weeks; please complete and return it ASAP. During Oct OBSs reported transmitting a total of 220 bulletins and participated in 53 net sessions. Their efforts are sincerely appreciated. All OBS appointees are reminded to submit monthly reports on their activity to W5AS. Traffic: W5AS 322, WB5SRX 286, KV5X 234, NX5E 153, N5IKN 99, WA5OUV 88, W5RB 86, NQ5W 61, K5GBN 60, WA5OGC 34, WD5IFB 34, W5SUG 29, W5ULW 26, W5VOR 25, WA5ZOO 24, KA5WGS 24, K5WG 23, K5CAY 16, WD5S 6, KF5LG 4, NQ5Y 4, W5JJ 3. (Oct.) WD5IFB 46.

SOUTHERN TEXAS: SM, Arthur R. Ross, W5KR—ASM: N5TC. STM: K5OEW. SEC: K5DG. PIO: WA5UZB. TC: NZ5U. ACC: WB5YDD. OOC: WA2VJL. Note two appointments: K5DG appointed SEC to replace KA5KRI; Steve did a grand job for Amateur Radio and ARRL, but had to yield to pressure of his career; Steve remains active in the VE program; many thanks for a job well done, Steve. WB5YDD is new ACC to replace K8SV who had resigned for similar reasons. Sun City ARC, El Paso, enjoying newly refurbished club house; new officers are WA5VEE, pres; WB5LJO, vp; N5GHQ, secy; N5RG, treas; W5PMC and WA5HLO, trustees; Jacks Peak digipeater now operational complete link to U.S. west coast. Bryan ARC active with VE program, license classes and Comy munity Christmas parade communications; also active with H&W traffic following Salvadoran quake. Hot Hog News, Heart of Texas Ham Operator's Group, in Brady, reports well-attended VE session, Kendall ARS, Boerne, busy looking for new meeting place. Hill Country ARC, Kerrville, provided communication for a community biathlon. San Antonio RC provided communication for Las Colonias Marathon and for Canyon Lake Triathlon; many were actively involved with Salvadoran H&W traffic; NK5Q logged 100 hours on-the-air in the Salvadoran effort. El Paso Sun Parade communication provided by El Paso ARC and many volunteers. OOC WA2VJL enjoyed three Friday afternoons talking to gifted and talented fifth graders and showing ARRL tapes on VCR; he also asks for OOs in Corpus Christi and Del Rio areas. CAND Mgr W5KLV reports 619 messages in 30 sessions; DRN5 represented 100%; STX stations NZ5U, K5WOB, KE5ZV, NX5V, KD5KO, WB5EPA, WB5FQU, N5DFO, WB5YDD, W5KLV. C.H.A.R.R.O., Brownsville, enjoyed success with their swapfest: KA5RTV upgraded to General at November VE test session—Congratulations! DRN5 Mgr WB5YDD reports 687 messages in 60 sessions; STX represented 100% by W5CTZ, NX5V, KD5KO, N5DFO, AJ5K, W5KLV, WB5EPA, WB5FQU, WA5ZJY, N5BHQ, K5OEW, WB5YDD. San Benito ARC set to provide communication for annual Santa claus Parade; will also provide shut-in children with a chance to talk direct to Santa at the North Pole. OBS W5KLV reports 8 ARRL bulletins, 30 satellite bulletins, 3 propagation forecasts, 4 DX bulletins, 3 CRRL bulletins given 156 readings on 9 nets. Beaumont ARC received a plaque from the Beaumont Adult Soccer Assn in recongition of communications help during the Beaumont Blast Soccer Tournament. Traffic: WB5YDD 419, W5KLV 342, W5TFB 311, AJ5K 212, W5CTZ 187, WD5GKH 180, WB5FQU 112, ND5C 106, WB5EPA 102, WB5J 54, AC5Z 39, WA2VJL 35, WB5BGE 29, NZ5J 11.

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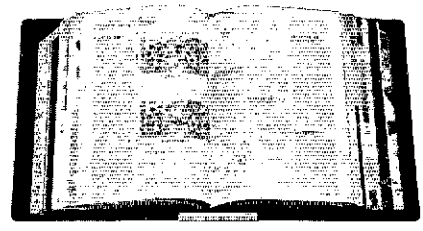

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THE NEW LK-500ZC

This self-contained, full QSK high frequency linear power amplifier is capable of amateur continuous operation at output power levels of 1500 watts. It is manually tunable from 1.8-2.4 and 3.5-22 MHz continuous. The HF tank coil and Centralab bandswitch are silver-plated.

INTERNAL POWER SUPPLY

All 500 Series amplifiers have a Peter Dahl Hipersil plate transformer and a separate filament transformer. The fullwave bridge rectifier system—unlike other systems that utilize weak voltage doublers—uses computer grade electrolytic capacitors.

COMPATIBILITY GUARANTEED

Customer feedback in 1986 insisted on system compatibility. Responding to this challenge, a special Plug and Play Harness to hook your favorite radio to the LK500 is offered as an accessory. Of course, all Amp Supply amplifiers have our famous ATI-6 tuned input systems, assuring a perfect 50 ohm load to your transceiver.

AUTOMATIC LOCK OUT "NEW"

All the new LK-500ZC Series amplifiers are equipped with the ALO which stops amplifier operation when it senses an unacceptable SWR, improper tuning, or overcurrent on the tubes.

2-SPEED FANS

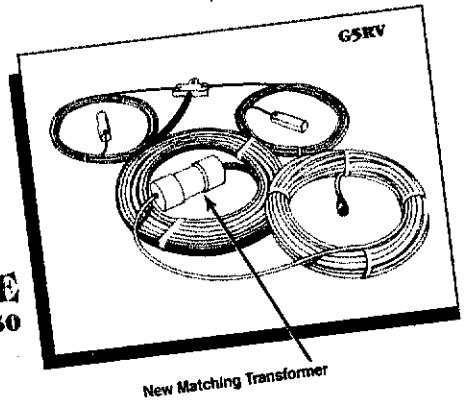
Most manufacturers have had to compromise on fan speed, one of the noisiest and objectionable aspects of amateur radio operation. But, our 500 Series amplifiers are different; they are the result of our perfected system of customer communication and engineer response.

THE LK-500ZC WITHOUT QSK

A version of the 500ZC is available without the Jennings vacuum antenna changeover relay and a companion sealed relay QSK system. A super buy at $1199.00!

THE LK-500NTC NO-TUNE

Our no-tune amplifier is the same dependable amplifier as the LK-500ZC with the new ALO system and full QSK, and completes our popular 500 Series. This desirable version allows you to merely switch to your favorite amateur band and transmit at full power. We have preset internal capacitors and coils for each of the traditional six amateur bands. The LK-500NTC is also available for special MARS and commercial channelized frequencies.



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THE G5RV ANTENNA **Reg. $60.00 SALE $49.50**

The G5RV Signal Injector™ antenna is an excellent all band (3.5-30 MHz) 102 ft. dipole. On 1.8 MHz the center and shield of the coax at the transmitter end may be joined together and the antenna may be used as a Marconi with a tuner and a good earth ground. The proper combination of a 102 ft. flat-top and 31 ft. of 300 ohm tranmission line achieves resonance on all the amateur bands from 80 to 10 meters with only one antenna. There is no loss in traps and coils. The impedance present at the end of the 300 ohm line is about 50-60 ohms, a good match to the new RG8X mini foam coax.

- 2 KW PEP
- Completely assembled
- Use as horizontal or "V" configuration
- Consists of: 102 ft. copper antenna wire, 31 ft. 300 ohm transmisison line, 70 ft. RG-8X coax, 2 end insulators, 1 center insulator, 1 PL-259 and sleeve, connector and the **new transformer coupler.**

SPECIFICATIONS LK-500ZC

Frequency Range: 160 Meters 1.8-2.2 MHz, 80 meters 3.5-4.5 MHz, 40 meters 7.0-7.5 MHz, 30 meters 10.1 to 10.15 MHz, 20 meters 14.0-14.9 MHz, 17 meters 18.0-19.2 MHz, 15 meters 21.0-21.5 MHz, Export models: 12 meters 24.8-24.9 MHz, 10 meters 28.0-29.7 MHz.
Drive Power: 100W Nominal for 1500 Watt SSB PEP output, 125W Nominal for 1500 Watt CW output.
RF Output SSB 1.5 KW PEP continuous, CW 1.2 KW Average continuous, RTTY, SSTV 1 KW Average 1.5 KW PEP
Plate Voltage: RTTY/AM/SSTV/CW/SSB 3.2 KV DC
Harmonic Suppression: -50 dB minimum.
Intermodulation Distortion Products: -33 dB down minimum.
Circuit Type: Class AB_2 grounded grid. Type of Emission: SSB, CW, RTTY, AM, SSTV
Duty Cycle: Amateur continuous duty in all modes at specified output.
Output Circuit: Pi-network (silver plated tubing HF coil).
Power Requirements: 115/230 VAC, 30/15 amps (230 VAC factory wired and recommended).
Dimensions: 8" H x 14" W x 16" D (including knobs).
UPS Shippable: 59 lbs.
Warranty: Two years on amplifier.

LK-500ZC Full QSK	**$1395.00**
LK-500ZC Without QSK	**$1199.00**
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Meet "Versa Tuner V". It has all the features you asked for, including the new smaller size to match new smaller rigs-only 10¾"Wx4½"Hx14 7/8"D.

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

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

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

MFJ989B **$329.95**

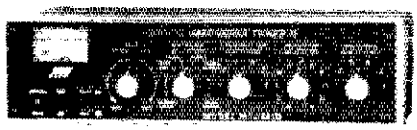
Lighted Cross-needle Meter reads SWR, forward and reflected power all in one glance. Has 300 and 3,000 watt ranges. Meter light requires 12 VDC.

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

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

MFJ's Fastest Selling TUNER

MFJ-941D **$99.95**



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

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

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

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

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

MFJ's 1.5 KW VERSA TUNER III

MFJ-962B **$229.95**

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

Lighted Cross-needle Meter reads SWR, forward and reflected power in one glance. Has 300 and 3,000 watt ranges. 6 position antenna switch handles 2 coax lines, wire and balanced lines. 4:1 balun. 250 pf, 6 kv variable capacitors. 12 position ceramic inductor switch. New smaller size matches new rigs: 10¾ × 4½ × 14⅞ inches. Flip stand for easy viewing. Requires 12V for light.

MFJ's Best VERSA TUNER

MFJ-949C **$149.95**

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

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

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

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

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

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

Order your convenience package now and enjoy.

2 KW COAX SWITCHES

MFJ-1702 **$19.95**

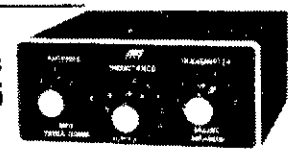
MFJ-1702. $19.95. 2 positions. 60 dB isolation at 450 MHz. Less than .2 dB loss. SWR below 1:1.2.

$29.95 MFJ-1701

MFJ- 1701, $29.95. 6 positions. White markable surface for antenna positions.

MFJ's Smallest VERSA TUNER

MFJ-901B **$59.95**



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

MFJ's Random Wire TUNER

MFJ-16010 **$39.95**

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

MFJ's Mobile TUNER

MFJ-945C **$79.95**

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

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

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

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. . . you get MFJ's latest clone of TAPR's TNC-2, TAPR's VHF/HF modem and built-in tuning indicator that features 20 LEDs for easy precise tuning

MFJ-1274
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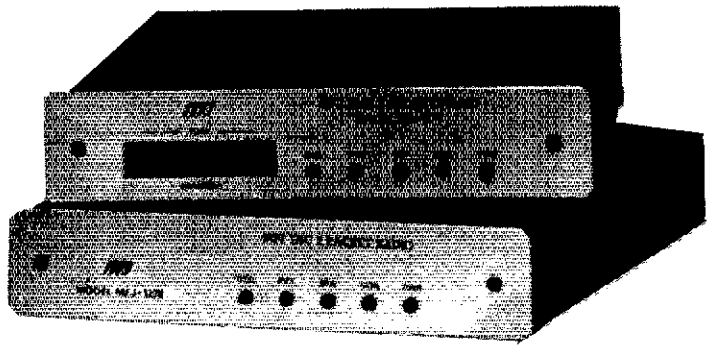

Now you can join the exciting world of packet radio on both VHF and HF bands with a precision tuning indicator . . . for an incredible $169.95!

You get MFJ's top quality clone of the highly acclaimed industry standard TAPR TNC-2. We've made TAPR's modem selectable for both VHF and HF operation, added their precision 20 segment LED tuning indicator, a TTL serial port, an easily replaceable lithium battery for memory back-up and put it all in a new cabinet.

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If you have a Commodore 64, 128, or VIC 20 you can use MFJ's optional Starter Pack to get on the air immediately. The Starter Pack includes interfacing cable, terminal software on disk or tape and complete instructions . . .everything you need to get on packet radio. Order MFJ-1282 (disk) or MFJ-1283 (tape), $19.95.

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Also speeds in excess of 56K bauds are possible with a suitable external modem! Try that with a machine specific TNC or one without hardware HDLC as higher speeds come into widespread use.

You can also use the MFJ-1274 or MFJ-1270 as an excellent but inexpensive digipeater to link other packet stations.

Both feature AX.25 Level 2 Version 2 software, hardware HDLC for full duplex, true Data Carrier Detect for HF, multiple connects, 256K EPROM, 16K RAM (expandable to 32K with optional EPROM), simple operation, socketed ICs plus much more.

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Help make history! Join the packet radio revolution now and help spread this exciting network throughout the world. Order the top quality and affordable MFJ-1274 or MFJ-1270 today.

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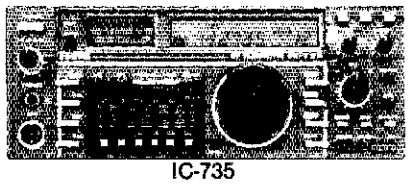

IC-735

HF Equipment	List	Juns
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IC-745 Gen. Cvg Xcvr	1049.00	Call $
IC-751A Gen. Cvg. Xcvr	1649.00	Call $
Receivers		
IC-R7000 25-1300 + MHz Rcvr	1099.00	Call $
IC-R71A 100 kHz-30 MHz Rcvr	949.00	Call $
VHF		
IC-271A All Mode Base 25w	859.00	Call $
IC-271H All Mode Base 100w	1099.00	Call $
IC-27A FM Mobile 25w	429.00	Call $
IC-27H FM Mobile 45w	459.00	Call $
IC-28A FM Mobile 25w	429.00	Call $
IC-28H FM Mobile 45w	459.00	Call $
IC-38A FM Mobile 25W	459.00	Call $
IC-2AT FM HT	299.00	Call $
IC-02AT FM HT	399.00	Call $
IC-μ2AT Micro HT	329.00	Call $
UHF		
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IC-471H All Mode Base 75w	1339.00	Call $
IC-47A FM Mobile 25w	549.00	Call $
IC-48A FM Mobile 25W	459.00	Call $
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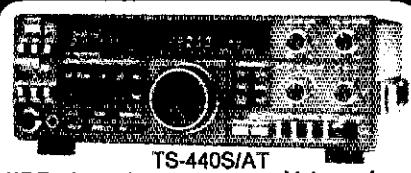
IC-04AT FM HT	449.00	Call $
IC-3200A FM 2m/70cm 25w	599.00	Call $
220 MHZ		
IC-37A FM Mobile 25w	499.00	Call $
IC-3AT FM HT	339.00	Call $
Repeaters		
IC-RP3010 440 MHz	1229.00	Call $
IC-RP1210 1.2 GHz	1479.00	Call $



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TS-940S Gen. Cvg Xcvr	2049.95	Call $
TS-930S/AT Gen. Cvg Xcvr	1849.95	Call $
TS-830S Xcvr	1099.95	Call $
TS-530SP Xcvr	899.95	Call $
TS-430S Gen. Cvg Xcvr	819.95	Call $
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TS-440S Gen. Cvg Xcvr	1049.95	Call $
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R-2000 150kHz-30 MHz	649.95	Call $
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VHF		
TS-711A All Mode Base 25w	899.95	Call $
TR-751A All Mode Mobile 25w	599.95	Call $
TM-201B FM Mobile 45w	369.95	Call $
TM-211A FM Mobile 25w	399.95	Call $
TM-2530A FM Mobile 25w	429.95	Call $
TM-2550A FM Mobile 45w	469.95	Call $
TM-2570A FM Mobile 70w	559.95	Call $
TH21-BT FM, HT	259.95	Call $
TH-205 AT, NEW 2m HT	TBA	Call $
TR-2600A FM, HT	359.95	Call $
UHF		
TS-811A All Mode Base 25w	1049.95	Call $
TM-401B FM Mobile 25w	399.95	Call $
TM-411A FM Mobile 25w	449.95	Call $
TH-41BT FM, HT	269.95	Call $
TR-3600 FM HT	369.95	Call $
220 MHZ		
TM-3530A FM 220 MHz 25w	449.95	Call $
TH-31BT FM, 220 MHz HT	269.95	Call $
TL-922A HF Amp	1499.95	Call $

FT 757GX

HF Equipment	List	Juns
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FT-757 GX Gen. Cvg Xcvr	995.00	Call $
FT-767 4 Band New	1895.00	Call $
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FRG-8800 150kHz-30 MHz	599.95	Call $
FRG-9600 60-905 MHz	679.95	Call $
VHF		
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FT-290R All Mode Portable	579.95	Call $
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FT-209RH FM Handheld 5w	359.95	Call $
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FT-770RH FM Mobile 25w	479.95	Call $
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FT-709RH FM HT 4w	359.95	Call $
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IMRA-International Mission Radio Association Helps missionaries by supplying equipment and running a net for them daily except Sunday, 14.280 MHz, 1900-2000 GMT. Br. Bernard Frey, 1 Pryer Manor Rd., Larchmont, NY 10538.

THE Veteran Wireless Operators Association, a non-profit organization of communications people founded in 1925, invites your inquiries and application for membership. Write VWOA, Ed F. Pleuler, Jr., Secretary, 46 Murdock Street, Fords, NJ 08863.

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THANK YOU for attending Warren, Ohio Hamfest. See you August 16, 1987. W.A.R.A.

MASSACHUSETTS, MARLBORO, Electronic Flea Market Feb. 15 10AM-2PM at the Marlboro Middle School, Union Street off Route 85. Tables $8 prepaid registration $10 at door. Doors open 8AM for sellers 10AM for buyers. $1 admission call-in 01-61 and '52'. Sponsored by Algonquin Amateur Radio Club. Info write AARC P.O. Box 258 Marlboro MA 01752 or call Dan KB1WW at 1-617- 481-1587

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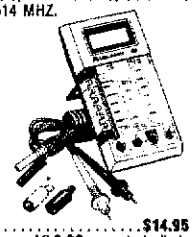

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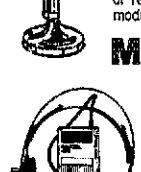

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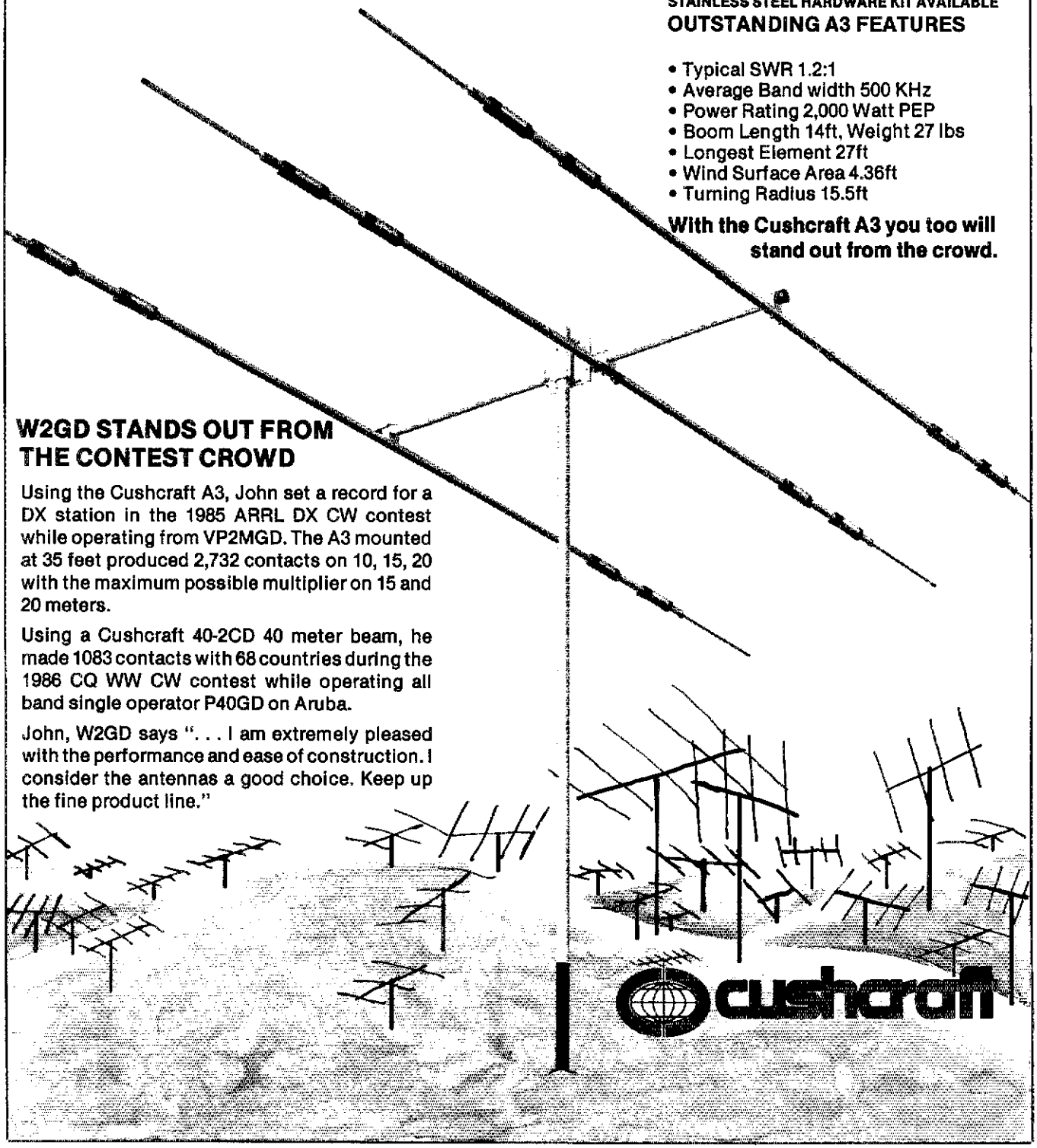

W2GD STANDS OUT FROM THE CONTEST CROWD

Using the Cushcraft A3, John set a record for a DX station in the 1985 ARRL DX CW contest while operating from VP2MGD. The A3 mounted at 35 feet produced 2,732 contacts on 10, 15, 20 with the maximum possible multiplier on 15 and 20 meters.

Using a Cushcraft 40-2CD 40 meter beam, he made 1083 contacts with 68 countries during the 1986 CQ WW CW contest while operating all band single operator P40GD on Aruba.

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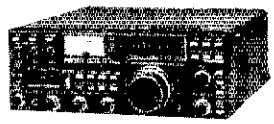

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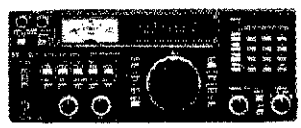

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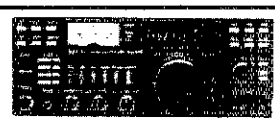

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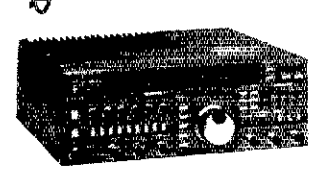

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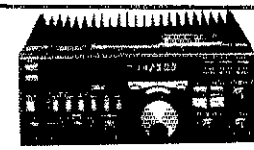

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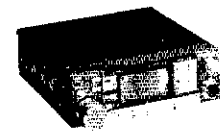

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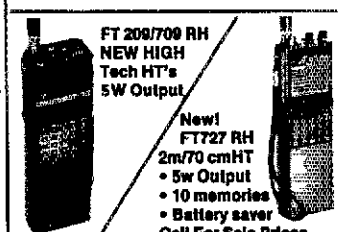

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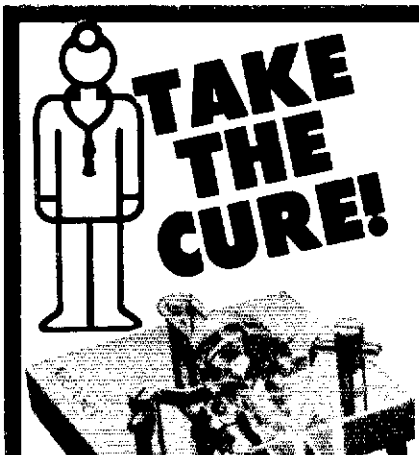

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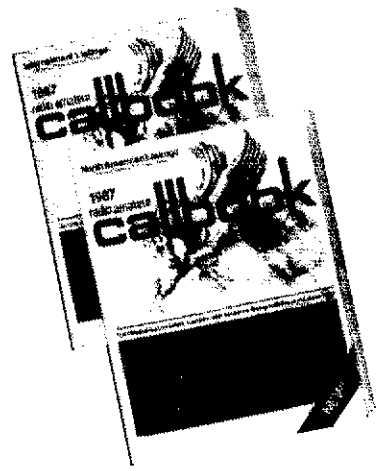

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The 1987 Callbook Supplement is a new idea in Callbook updates; it lists the activity in both the North American and International Callbooks. Published June 1, 1987, this Supplement will include all the new licenses, address changes, and call sign changes for the preceding 6 months.

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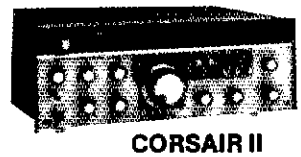

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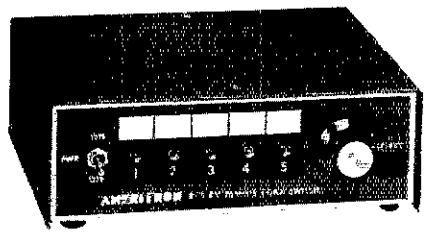

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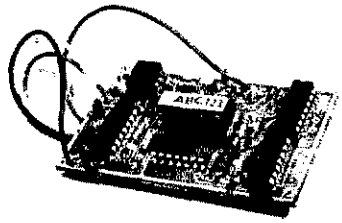

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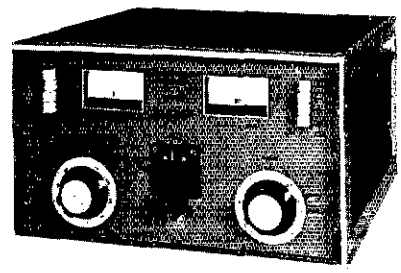

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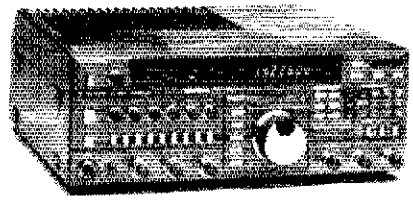

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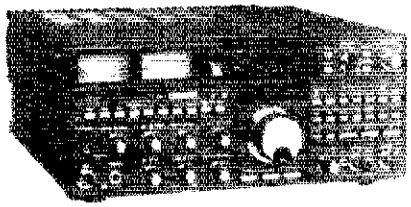

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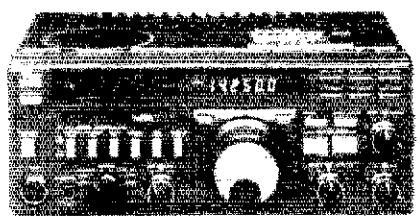

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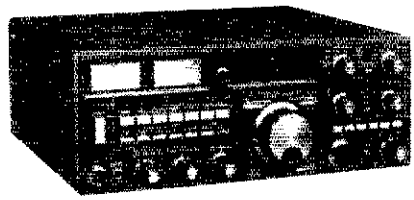

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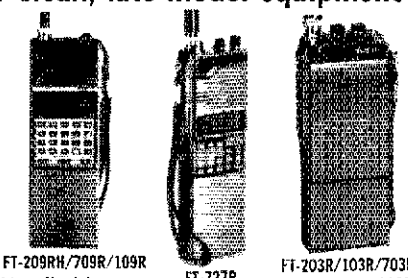

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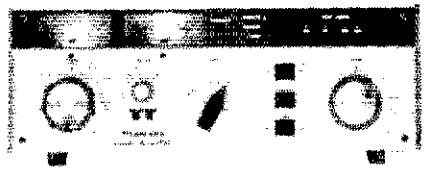

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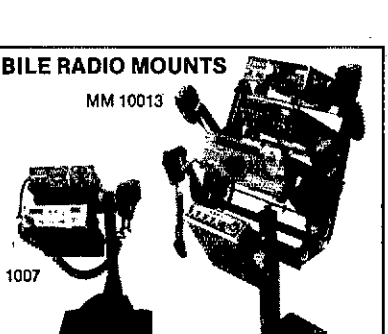

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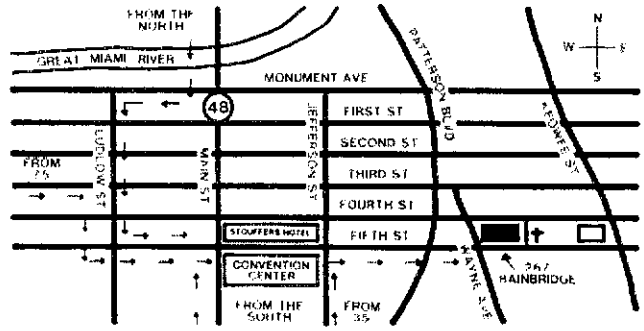

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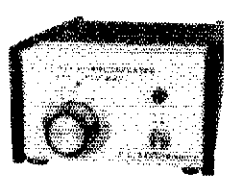

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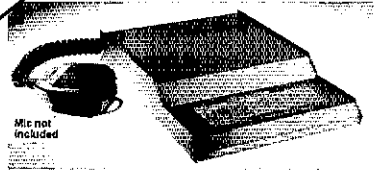

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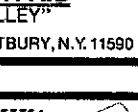

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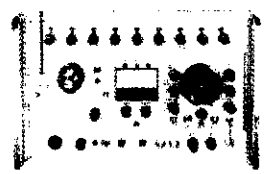
(1) This list was prepared from an inventory taken on the date shown. The letters after the prices indicate in which store the equipment was located at that time. The quantities vary. In some cases there are several of an item; others, only one. Due to the lead and distribution time of this publication, some of the items may have already been sold by the time you see this ad. However, due to the number of trades we are involved in each day, some items are in stock that are not listed. **(2)** We reserve the right to sell certain power supplies and accessories only with matching transmitters or transceivers, depending on our stock situation. **(3)** Sometimes used gear is serviced after we receive your order. Please allow for a few days delay in shipping your order. **(4)** No trades on used gear. **(5)** Used gear policies do not apply to any New Equipment specials, Closeouts, etc.



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w = Wickliffe, OH 44092; 28940 Euclid Ave.....	(216) 585-7388	1-800-321-3594	1-800-362-0290
f = Orlando, FL 32803; 621 Commonwealth Ave	(305) 894-3238	1-800-327-1917	1-800-432-9424
c = Clearwater, FL 33575; 1898 Drew St.....	(813) 461-4267		
v = Las Vegas, NV 89106; 1072 N. Rancho Dr	(702) 647-3114	1-800-634-6227	
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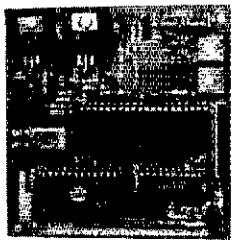

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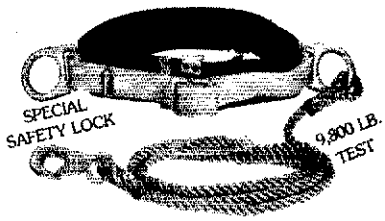

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P/N		Rating	Each	Match Pr.
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MRF421	Q	100W	22.50	51.00
MRF422*		150W	38.00	82.00
MRF426,/A*		25W	18.00	42.00
MRF433		12.5W	12.00	30.00
MRF449,/A	Q	30W	12.50	30.00
MRF450,/A	Q	50W	14.00	31.00
MRF453,/A	Q	60W	15.00	35.00
MRF454,/A	Q	80W	15.00	34.00
MRF455,/A	Q	60W	12.00	28.00
MRF458		80W	20.00	46.00
MRF475		12W	3.00	9.00
MRF476		3W	2.75	8.00
MRF477		40W	11.00	25.00
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MRF492	Q	90W	16.75	37.50
SRF2072	Q	65W	13.00	30.00
SRF3662	Q	110W	25.00	54.00
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MRF237	4W	136-174	3.00	—
MRF238	30W	136-174	13.00	30.00
MRF239	30W	136-174	15.00	35.00
MRF240	40W	136-174	18.00	41.00
MRF245	80W	136-174	28.00	65.00
MRF247	75W	136-174	27.00	63.00
MRF607	1.75W	136-174	3.00	—
MRF641	15W	407-512	22.00	49.00
MRF644	25W	407-512	24.00	54.00
MRF646	40W	407-512	26.50	59.00
MRF648	60W	407-512	33.00	69.00
SD1441	150W	136-174	74.50	170.00
SD1447	100W	136-174	32.50	78.00
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2N6080	4W	136-174	7.75	—
2N6081	15W	136-174	9.00	—
2N6082	25W	136-174	10.50	—
2N6083	30W	136-174	11.50	24.00
2N6084	40W	136-174	13.00	31.00

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MRF174	80.00	2N5590	10.00
MRF208	11.50	2N5642	13.75
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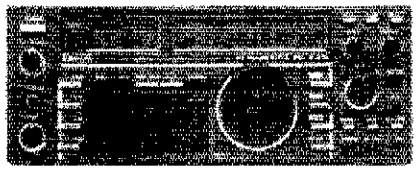
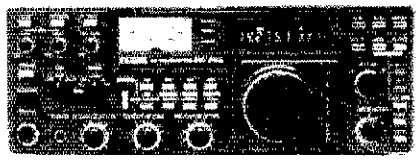


HF Equipment	Regular	SALE
IC-735 HF transceiver/SW rcvr/mic	999.00	**849.95**
PS-55 External power supply	199.00	**179.95**
AT-150 Automatic antenna tuner	445.00	**349.95**
FL-32 500 Hz CW filter	66.50	
EX-243 Electronic keyer unit	56.00	
UT-30 Tone encoder	17.50	
IC-745 9-band xcvr w/.1-30 MHz rcvr	1049.00	**899.95**
PS-35 Internal power supply	199.00	**179.95**
EX-241 Marker unit	22.50	
EX-242 FM unit	44.00	
EX-243 Electronic keyer unit	56.00	
FL-45 500 Hz CW filter (1st IF)	66.50	
FL-54 270 Hz CW filter (1st IF)	53.00	
FL-52A 500 Hz CW filter (2nd IF)	108.00	**99.95**
FL-53A 250 Hz CW filter (2nd IF)	108.00	**99.95**
FL-44A SSB filter (2nd IF)	178.00	**159.95**



IC-751 9-band xcvr/.1-30 MHz rcvr	1399.00	**999.00**
IC-751A 9-band xcvr/.1-30 MHz rcvr	1649.00	**1399**
PS-35 Internal power supply	199.00	**179.95**
FL-32 500 Hz CW filter (1st IF)	66.50	
FL-63 250 Hz CW filter (1st IF)	54.50	
FL-52A 500 Hz CW filter (2nd IF)	108.00	**99.95**
FL-53A 250 Hz CW filter (2nd IF)	108.00	**99.95**
FL-33 AM filter	35.25	
FL-70 2.8 kHz wide SSB filter	52.00	
RC-10 External frequency controller	39.25	

Other Accessories:	Regular	SALE
IC-2KL 160-15m solid state amp w/ps	1999.00	**1699**
PS-15 20A external power supply	169.00	**154.95**
PS-30 Systems p/s w/cord, 6-pin plug	299.00	**269.95**
OPC Opt. cord, specify 2, 4 or 6-pin	10.00	
MB Mobile mount, 735/745/751A	24.50	
SP-3 External speaker	61.00	
SP-7 Small external speaker	49.00	
CR-64 High stab. ref. xtal (745/751)	63.00	
PP-1 Speaker/patch	159.25	**149.95**
SM-6 Desk microphone	44.95	
SM-8 Desk mic - two cables, Scan	78.50	
SM-10 Compressor/graph EQ, 8 pin mic	136.25	**124.95**
AT-100 100W 8-band auto. antenna tuner	445.00	**389.95**
AT-500 500W 9-band auto. antenna tuner	559.00	**489.95**
AH-2 8-band tuner w/mount & whip	625.00	**549.95**
AH-2A Antenna tuner system, only	495.00	**429.95**

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EX-248 FM unit	55.50	
LC-10 Leather case	39.50	
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AG-20 Internal preamplifier	64.00	
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IC-275A 25W 2m FM/SSB/CW w/ps	1199.00	**1049**
IC-471A 25W 430-450 SSB/CW/FM xcvr	979.00	**869.95**
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IC-471H 75W 430-450 SSB/CW/FM	1399.00	**1169**
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PS-35 Internal power supply for (H)	199.00	**179.95**
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EX-310 Voice synthesizer	46.00	
TS-32 CommiSpec encode/decoder	59.95	
UT-15 Encoder/decoder interface	14.00	
UT-15S UT-15S w/TS-32 installed	92.00	
VHF/UHF mobile multi-modes	**Regular**	**SALE**
IC-290H 25W 2m SSB/FM, TTP mic	639.00	**569.95**
IC-490A 10W 430-440 SSB/FM/CW	699.00	**599.95**
VHF/UHF/1.2 GHz FM	**Regular**	**SALE**
IC-27A Compact 25W 2m FM w/TTP mic	429.00	**369.95**
IC-27H Compact 45W 2m FM w/TTP mic	459.00	**399.95**
IC-37A Compact 25W 220 FM, TTP mic	499.00	**439.95**
IC-47A Compact 25W 440 FM, TTP mic	549.00	**479.95**
PS-45 Compact 8A power supply	139.00	**129.95**
UT-16/EX-388 Voice synthesizer	34.99	
SP-10 Slim-line external speaker	35.99	
IC-28A 25W 2m FM, UP/DN mic	429.00	**369.95**
IC-28H 45W 2m FM, UP/DN mic	459.00	**399.95**
IC-38A 25W 220 FM	459.00	**399.95**
IC-48A 25W 440-450 FM	459.00	**399.95**
HM-14 TTP microphone	55.50	
UT-28 Digital code squelch	37.50	
UT-29 Tone squelch decoder	43.00	
HM-16 Speaker/microphone	34.00	
IC-3200A 25W 2m/440 FM w/TTP	599.00	**499.95**
UT-23 Voice synthesizer	34.99	
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Larsen PO-K Roof mount	20.00	
Larsen PO-TLM Trunk-lip mount	20.18	
Larsen PO-MM Magnetic mount	19.63	
RP-3010 440 MHz, 10W FM, xtal cont.	1229.00	**1089**
IC-120 1W 1.2 GHz FM Mobile	579.00	**499.95**
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IC-1271A 10W 1.2 GHz SSB/CW Base	1229.00	**1069**
AG-1200 Mast mounted preamplifier	105.00	
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EX-310 Voice synthesizer	46.00	
TV-1200 ATV interface unit	129.00	**119.95**
UT-15S CTCSS encoder/decoder	92.00	
RP-1210 1.2 GHz, 10W FM, 99 ch. synth	1479.00	**1289**

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IC-2AT with TTP	299.00	**259.95**
IC-3AT 220 MHz, TTP	339.00	**299.95**
IC-4AT 440 MHz, TTP	339.00	**299.95**
IC-02AT 2-meters	399.00	**329.95**
IC-03AT for 220 MHz	449.00	**399.95**
IC-04AT for 440 MHz	449.00	**389.95**
IC-u2A 2-meters	299.00	**269.95**
IC-u2AT with TTP	329.00	**289.95**
Accessories for u2A/T	**Call**	
IC-12AT 1W 1.2GHz FM HT/batt/cgr/TTP	459.00	**399.95**
A-2 5W PEP synth. aircraft HT	599.00	**499.95**

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BP-7 425mah/13.2V Nicad Pak - use BC-35	74.25
BP-8 800mah/8.4V Nicad Pak - use BC-35	74.25
BC-35 Drop in desk charger for all batteries	74.50
BC-16U Wall charger for BP7/BP8	20.25
LC-11 Vinyl case for DIx using BP-3	20.50
LC-14 Vinyl case for DIx using BP-7/8	20.50
LC-02AT Leather case for DIx models w/BP-7/8	54.50
Accessories for IC and IC-O series	**Regular**
BP-2 425mah/7.2V Nicad Pak - use BC35	47.00
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	37.50
BP-4 Alkaline battery case	15.25
BP-5 425mah/10.8V Nicad Pak - use BC35	58.50
CA-5 5/8-wave telescoping 2m antenna	18.95
FA-2 Extra 2m flexible antenna	11.50
CP-1 Cig. lighter plug/cord for BP3 or DIx	13.00
CP-10 Battery separation cable w/clip	22.50
DC-1 DC operation pak for standard models	23.25
EX-390 Bottom slide cap	5.50
MB-16D Mobile mtg. bkt for all HTs	24.50
LC-2AT Leather case for standard models	54.50
RB-1 Vinyl waterproof radio bag	34.95
HH-SS Handheld shoulder strap	16.95
HM-9 Speaker microphone	47.00
HS-10 Boom microphone/headset	23.25
HS-10SA Vox unit for HS-10 & Deluxe only	23.25
HS-10SB PTT unit for HS-10	23.25
ML-1 2m 2.3w in/10w out amplifier	**SALE 99.95**
SS-32M Commspec 32-tone encoder	29.95

Receivers	Regular	SALE
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RC-11 Infrared remote controller	67.25	
FL-32 500 Hz CW filter	66.50	
FL-63 250 Hz CW filter (1st IF)	54.50	
FL-44A SSB filter (2nd IF)	178.00	**159.95**
EX-257 FM unit	42.50	
EX-310 Voice synthesizer	46.00	
CR-64 High stability oscillator xtal	63.00	
SP-3 External speaker	61.00	
CK-70 (EX-299) 12V DC option	12.25	
MB-12 Mobile mount	24.50	
R-7000 25 MHz-2 GHz scanning rcvr	1099.00	**969.95**
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2- " " " - 80, 40M	40 ft. "	$ 35	"
3- " NO-TRAP DIPOLE - 160, 80, 40M	113 ft. long	$ 71	"
2- " " " - 80, 40M	85 ft. "	$ 55	"
9-BAND SPACE-SAVER DIPOLE - 160 thru 10M*	468 ft. long	$ 85	ppd

* Requires wide-range tuner (80, 40, 20, 15M without tuner)

SEND SASE for complete details of these and other unique antennas

W9INN ANTENNAS 312-394-3414
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WRIGHTAPES: (Since 1976) Unconditionally guaranteed Morse Code Practice on 60 min. cassette tapes. Beginners 2-tape set 5 WPM $7.90. Also 3, 4, 5, 6-8, 10, 9-11, 12-14, 14, 16-20, 22, 24-28 WPM. Specify Plain Language or Code Groups. Also plain lang. only 30-35, 35-40, 45-60. FCC type tests: 5-6, 11-12, 11-17, 13-14, 20-24. Call signs: 12-15, 20-24. Nos.: 5-22, 13-18, 18-24. Check, M/C, Visa $3.95 ea. PPD 1st class USA, Can. Printed texts add $.50 per tape. **Call anytime.**

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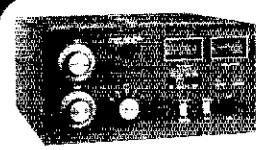
B & W PRESENTS A WINNING COMBINATION



MODEL PT2500A LINEAR AMPLIFIER

The Barker & Williamson PT2500A Linear Amplifier is a completely self-contained table-top unit designed for continuous SSB, CW, RTTY, AM or ATV operation. Intended for coverage of all amateur bands between 1.8 MHz and 21 MHz, it can be readily modified for frequencies outside the amateur bands for commercial or military application. Two type 3-500z glass envelope triodes provide reliability and rapid turn-on time.

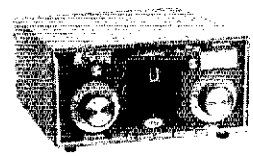
FEATURES INCLUDE:
- Full 1500 watt output
- Pi-network input for maximum drive
- Pressurized plenum cooling system
- DC antenna relay for hum-free operation
- Illuminated SWR and power meters
- Vernier tuning for accurate settings
- Pi-L output for greater harmonic attenuation

Ruggedly constructed of proven design, this amplifier reflects the manufacturer's critical attention to details—such as the silver-plated tank coil for maximum efficiency. Cathode zener fuse and internal/external cooling are among the protective and safety devices employed. Input and output impedances are 50 ohms.

Dimensions: 17" wide x 19" deep x 8"½ high
Weight: 80 lbs. (shipped in 3 cartons to meet UPS requirements)

Price: $2175.00 FOB factory. Price includes one year limited warranty.

Call or write factory for complete specifications.



MODEL VS1500A ANTENNA COUPLER

The Barker & Williamson VS1500A antenna coupler is designed to match virtually any receiver, transmitter or transceiver in the 160 to 10 meter range (1.8 to 30 MHz) with up to 1500 watts RF power to almost any antenna, including dipoles, inverted vees, verticals, mobile whips, beams, random wires and others, fed by coax cable, balanced lines or a single wire. A 1:4 balun is built in for connection to balanced lines.

FEATURES INCLUDE:
- Series parallel capacitor connection for greater harmonic attenuation.
- In-circuit wattmeter for continuous monitoring.
- Vernier tuning for easy adjustment.

Front panel switching allows rapid selection of antennas, or to an external dummy load, or permits bypassing the tuner.

Dimension (Approx.): 11" wide x 13" deep x 6" high

Weight: 6½ lbs.

Price: $499.00 FOB Factory. Fully warranted for one year.

ALL OUR PRODUCTS MADE IN USA
B&W **BARKER & WILLIAMSON**
Quality Communication Products Since 1932
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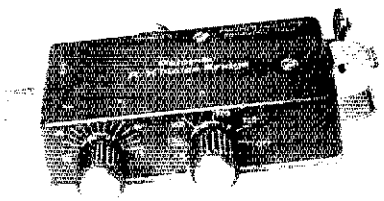
R-X NOISE BRIDGE

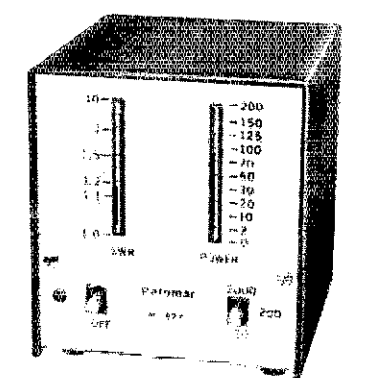


•Learn the truth about your antenna.

The Palomar R-X Noise Bridge tells you if your antenna is resonant or not and, if it is not, whether it is too long or too short. It gives resistance and reactance readings on dipoles, inverted Vees, quads, beams, multiband trap dipoles and verticals from 1 to 100 MHz.

Why work in the dark? Get the instrument that really works, the Palomar R-X Noise Bridge. Model RX-100 $59.95 + $4 shipping/handling in U.S. and Canada. California residents add sales tax.

SWR & POWER METER



•The only meter that shows PEP output directly, accurately, instantly.

Shows power and SWR on bright red light bars. See PEP and SWR while you talk! Automatic "hands-off" SWR reading. Power ranges 20-200-2000 watts. Works from 1-30 MHz. For 115-v AC, 220-v AC and 12-v DC models also available.

Model M-827 $129.95 + $4 shipping/handling in U.S. and Canada. California residents add sales tax.

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Send for FREE catalog that shows our complete line of noise bridges, SWR meters, preamplifiers, loop antennas, VLF converters, audio filters, baluns, RTTY equipment, toroids and more.

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Phone: (619) 747-3343

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ANTENNA/TOWER SALE!

hy-gain

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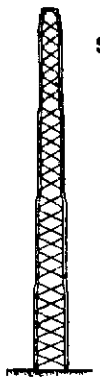
All Models Shipped Factory Direct—Freight Paid*!

Check these features:
- All steel construction
- Hot dip galvanized after fabrication
- Complete with base and rotor plate
- Totally self-supporting—no guys needed

Model	Height	Load	Sale Price
HG37SS	37 ft	9 sq ft	$CALL
HG52SS	52 ft	9 sq ft	$CALL
HG54HD	54 ft	16 sq ft	$CALL
HG70HD	70 ft	16 sq ft	$CALL

Masts—Thrust Bearings—Other Accessories Available —Call! Prices Shown Are Your Total Delivered Price In Continental U.S.A.!



ROHN

Self Supporting Towers On SALE!

FREIGHT PREPAID

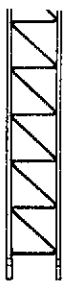
- All Steel Construction—Rugged
- Galvanized Finish—Long Life
- Totally Free Standing—No Guy Wires
- America's Best Tower Buy—Compare Save $
- Complete With Base and Rotor Plate
- In Stock Now—Fast Delivery

Model	Height	Ant Load*	Weight	Delivered Price*
HBX40	40 ft	10 sq ft	228	$329
HBX48	48 ft	10 sq ft	303	$429
HBX56	56 ft	10 sq ft	385	$499
HDBX40	40 ft	16 sq ft	281	$399
HDBX48	48 ft	16 sq ft	363	$489

*Your Total Delivered Price Anywhere in Continental 48 States. Antenna Load Based on 70 MPH Wind.

ROHN

Guyed Tower Packages



- World Famous Rohn Quality and Dependability
- Rugged high wind survival-provides safe installation
- Multi purpose towers satisfy a wide range of needs
- Complete packages include: guy hardware, turnbuckles, guy assemblies, w/torq bars, concrete base, rotor plate and top section per manufacturers specs.

Packages shown below are rated for wind zone "B" (86 mph wind). Zone "C" (100 mph wind) design prices slightly higher. All tower packages shipped freight collect from our Plano, TX warehouse, in stock for prompt delivery.

	Model 25G	Model 45G	Model 55G
50'	$ 579	1079	1439
60'	639	1209	1609
70'	689	1329	1759
80'	849	1479	1929
90'	919	1749	2089
100'	989	1899	2259
110'	1169	2019	2639
120'	1259	2179	2819

US TOWER CORPORATION

These rugged crankup towers and masts now available from Texas Towers!

Check these features:
- All steel construction
- Hot dipped galvanized
- Totally self-supporting-
- No guys needed

Coax arms, Thrustbearings Masts, Motor drives, Remote controls, Hinged bases, Rotor bases, & Raising fixtures also in stock.

CALL FOR SALE PRICES!

Model	Min. Ht.	Max. Ht.	Ant. load*	Sale price
MA40 mast	21'	40'	10 sq ft	$ 549
MA50 mast	22'	50'	10 sq ft	699
TX438	22'	38'	18 sq ft	829
TX455	22'	55'	18 sq ft	1249
TX472	23'	72'	18 sq ft	2059
HDX556	22'	55'	30 sq ft	1879
HDX572	23'	72'	30 sq ft	3229

Note - US Towers Shipped Freight Collect From Visalia, CA Factory

*Note-towers rated at 50 mph to EIA specifications

RG-213U

$.29/ft $279/1000 ft
Up to 600 ft via UPS

- RG-213/U—95% Bare Copper Shield
- Mil-Spec Non-contaminating Jacket for longer life than RG8 cables
- Our RG-213/U uses virgin materials.
- Guaranteed Highest Quality!

RG-8X

$.19/ft $179/1000 ft

- RG8X—95% Bare Copper Shield •Low Loss
- Non-contaminating Vinyl Jacket Foam Dielectric

9086

$.39/ft $379/1000 ft

- Same specs as Belden 9913
- Lower loss than RG8U
- 100% shielded-braid & foil

HARDLINE/HELIAX®

Lowest Loss for VHF/UHF!

⅞" LDF4-50 Andrew Heliax®	$1.79/ft
⅞" LDF5-50 Andrew Heliax®	$3.99/ft

select connectors below

Coaxial Cable Loss Characteristics (50/100 ft)

Cable Type	Imped.	10MHz	30MHz	150MHz	450MHz
RG-213/U	50	.6	.9	2.3	5.2
RG8X	52	.8	1.2	3.5	5.8
9086	50	.4	.64	1.7	3.1
½" Alum	50	.3	.5	1.2	2.2
½ "Heliax	50	.2	.4	.9	1.6
⅞" Heliax	50	.1	.2	.5	.9

HARDLINE & HELIAX® CONNECTORS

Cable Type	UHF FML	UHF MALE	N FML	N MALE
½" Alum	$19	$19	$19	$25
⅞" Heliax®	$25	$25	$25	$25
⅞" Heliax®	$49	$49	$49	$49

COAX CONNECTORS

Amphenol Silver PL259	$1.25
UG21B N Male	$2.95
9086/9913 N Male Connector	$4.95

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Stranded Copper 14ga. $.10/ft
¼ mile 18ga copper-clad steel wire $30
Dog bone end insulator $.79 ea.

Van Gorden

1:1 Balun $11 Center Insulator $6
Dipole Kits D80 $31.95/D40 $28.95
Short Dipole Kits SD80 $35.95/SD40 $33.95
All-band Dipole w/ladder line $29.95
G5RV all band antenna $49.95

ALPHA DELTA

DX-A 160-80-40 Sloper	$49

CUSHCRAFT

A3 3-el Tribander	$229
A4 4-el Tribander Beam	$299
A743 & A744, 30/40 mtr KIT for the A3 & A4 ea	$79
R3 20, 15, 10mtr Vertical	$275
AV5 80-10mtr Vertical	$109
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A50-5 5-el 6 mtr Beam	$85
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230 WB NEW 30-el 2 mtr Beam	$229
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ARX2B 2 mtr Vertical	$39

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- QK710 30/40 mtr. Add-On-Kit
- V2S 2-mtr Base Vertical
- V4S 440MHz Base Vertical
- TH5MK2S Broad Band 5-el Triband Beam
- TH7DXS 7-el Triband Beam
- TH3JRS 3-el Triband Beam
- 205BAS 5-el 20-mtr Beam
- 155BAS 5-el 15-mtr Beam
- 105BAS 5-el 10-mtr Beam
- 204BAS 4-el 20-mtr Beam
- 64BS 4-el 6-mtr Beam
- 12 AVQ 20-10 mtr vertical
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- 18 AVT/WB 80-10mtr Vertical
- 18HTS 80-10 mtr Hy-Tower Vertical
- 23BS 3-el 2 mtr Beam
- 25BS 5-el 2 mtr Beam
- 28BS 8-el 2 mtr Beam
- 214BS 14-el 2-mtr Beam
- 2BDQ 80/40 mtr Trap Dipole
- 5BDQ 80-10 mtr Trap Dipole
- BN86 80-10 mtr KW Balun W/Coax Seal

HUSTLER

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4BTV 40-10 mtr Vert. $89 G7-144 2-mtr Base. $119
G6-144B 2-mtr Base. $89

Mobile Resonators	10m	15m	20m	40m	75m
400W Standard	$16	$17	$19	$22	$26
2KW Super	$20	$22	$25	$29	$39

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TBR160 160m Coil Kit	$49
30m Add-on Kit	$29
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HF6V HF2V

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- Unique Design Reduces Size
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CALL FOR DISCOUNT PRICING!

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Daiwa MR 750 PE (16.1 sq ft rating)	$289
Additional Motor Units	$89
Alliance HD73 (10.7 sq ft rating)	$119.95
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Telex CD 45II (8.5 sq ft rating)	$Call
Telex HAM 4 (15 sq ft rating)	$Call
Telex Tailtwister (20 sq ft rating)	$Call
Telex HDR300 Heavy Duty (25 sq ft rating)	$Call
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Standard 8 cord cables $.19/ft
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10 FT. STACKED SECTIONS

20G ..... $39.50 45G $112.50
25G ..... $49.50 55G $149.50

ALL ACCESSORIES IN STOCK—CALL

ROHN FOLDOVER TOWERS

Model	Height	Ant. Load*	Price
FK2548	48 ft.	15.4 sq. ft.	$ 899.
FK2558	58 ft.	13.3 sq. ft.	$ 949.
FK2568	68 ft.	11.7 sq. ft.	$ 999.
FK4544	44 ft.	34.8 sq. ft.	$1199.
FK4554	54 ft.	29.1 sq. ft.	$1299.
FK4564	64 ft.	28.4 sq. ft.	$1399.

25G Double Guy Kit	$249.
45G Double Guy Kit	$269.

*Above antenna loads for 70 mph winds w/guys at hinge and apex. All foldover towers shipped freight prepaid in 48 states. Prices 10% higher west of Rockies.

TOWER/GUY HARDWARE

3/16 EHS Guywire (3990 lb rating)	$ 15/1
1/4 EHS Guywire (6650 lb rating)	$ 18/1
5/16 EHS Guywire (11,200 lb rating)	$ 29/1
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3/16 CCM Cable Clamp (3/16 " or 5/32 "	$.45
1/4 CCM Cable Clamp (1/4 " Cable)	$.55
1/4 TH Thimble (fits all sizes)	$.45
3/8EE (3/8 " Eye & Eye Turnbuckle)	$6.95
3/8 EJ (3/8 " Eye & Jaw Turnbuckle)	$7.95
1/2 × 9EE (1/2 " × 9 " Eye to Eye Turnbuckle)	$9.95
1/2 × 9EJ (1/2 × 9 " Eye & Jaw Turnbuckle)	$10.95
1/2 × 12EE (1/2 " 12 " Eye & Eye Turnbuckle)	$12.95
1/2 × 12EJ (1/2 " × 12 " Eye & Jaw Turnbuckle)	$13.95
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HPTG2100 Guy Cable (2100 lb rating)	$ 29/1
HPTG4000 Guy Cable (4000 lb rating)	$ 49/1
HPTG6700 Guy Cable (6700 lb rating)	$ 69/1
9901LD Cable End (for 2100/4000 cable)	$8.95
9902LD Cable End (for 6700 cable)	$9.95
Socketfast Potting Compound (does 6-8 ends)	$14.95

GALVANIZED STEEL MASTS

Heavy Duty Steel Masts 2 in OD - Galvanized Finish

Length	5 FT	10 FT	15 FT	20 FT
12 in Wall	$29	$49	$69	$89
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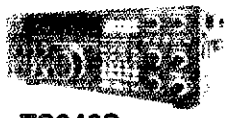

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- General Coverage Receiver

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- 100% Duty Cycle
- 100 memories
- Direct Keyboard Entry
- Optional Built-in AT

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TM2570 "ALL NEW"

- First 70 Watt FM Mobile
- First With Memory & Auto Dialer
- 23 Channel Memory
- Front Panel Programmable CTCSS

KENWOOD

TR2600 "SPECIAL"

- 2.5 W/300 MW 2 Meter HT
- LCD Readout
- 10 Memories
- Band And Memory Scan

TH-21AT "THE Smallest HT"

- Compact Pocket Size
- 1 Watt
- Optional 500mA Battery

YAESU

FT-757GX "CAT SYSTEM"

- All Mode Transceiver
- Dual VFO's
- Full Break-in CW
- 100% Duty Cycle

CALL FOR BEST PRICE!

YAESU

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- Add Optional 6m, 2m & 70cm Modules
- Dual VFO's
- Full CW Break-in
- Lots More Features

YAESU

FT23/73R

- Zinc-Aluminum Alloy Case
- 10 Memories
- 140-164 MHz, 440-450 MHz
- 800 MAh Standard Opt. 5w New "super handie"

YAESU

FT-727R "DUAL BAND HT"

- 5 Watts on Both 2m & 440 MHz
- 10 Memories
- Battery Saver
- Remote Computer Control Capability

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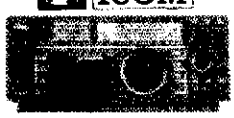

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- FM Standard
- 32 Memories
- QSK (Nominal Speed 40 WPM)

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- Full 25W, 5W low
- 21 memories
- Subtones built in RX 216-230 MHz

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- Built in subtone
- 10 Memories

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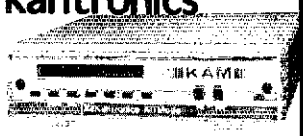

KAM

Kantronics All Mode

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- RS-232/TTL, Universal Compatability
- Transmit and Receive CW 6-99 wpm, RTTY/ASCII 45-300 Baud, ARQ, FEC, SELFEC, Listen ARQ, VHF and HF Packet

MFJ 1270

MFJ

- TTl serial port
- Latest AX.25 version 2.0 software
- True Data Carrier detect for HF
- 16K Ram

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Power Supply

• RS7A	$48
• RS12A	$68
• RS20A	$88
• RS20M	$105
• VS20M	$125
• RS35A	$133
• RS35M	$149
• VS35M	$165
• RS50A	$189
• RS50M	$215
• RM50A	$219
• VS50M	$279

ANTENNA SALE

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HUSTLER	25% off mobile
CUSHCRAFT	
KLM	
BUTTERNUT	
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HF2V	$110.00
AEA	144SR $42.00
AVANTI	151.3G $32.00
QUATRON	

KENPRO	KR400 $149.00
	KR500 $189.00
	KR5400A $299.00
	KR600 $229.00
COLUMBIA CABLE	
	RG-8X.15/ft.
RG-8	Superflex.28/ft.
	9913 Type.39/ft.
	Rotor Cable.18/ft
	H.D. Rotor Cable.31/ft

CALL FOR BEST PRICES

PK 232

- Make any RS-232 compatible computer or terminal a complete digital operating position.
- Morse, Baudot, ASCII, AMTOR, Packet
- Loaded with features.

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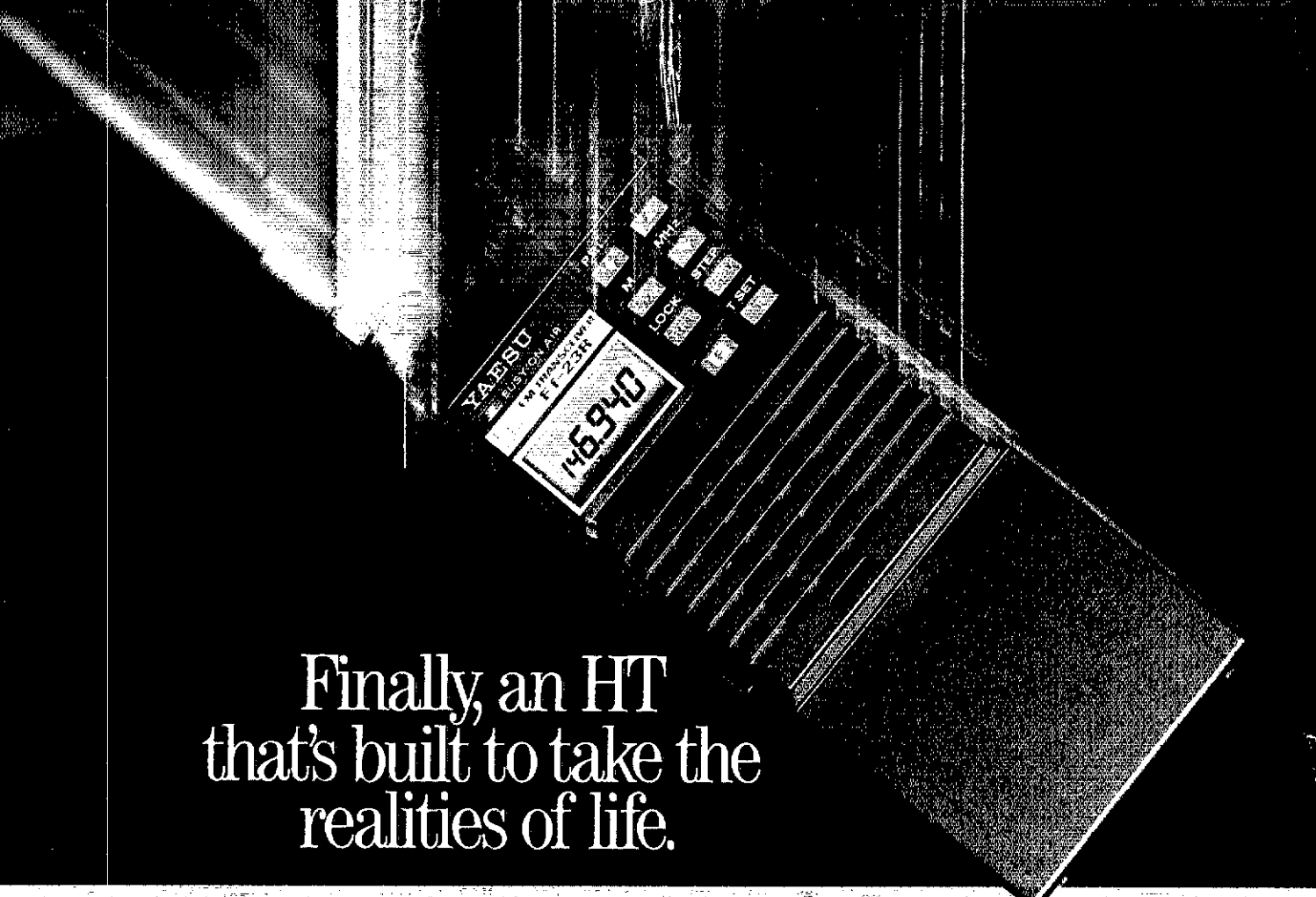
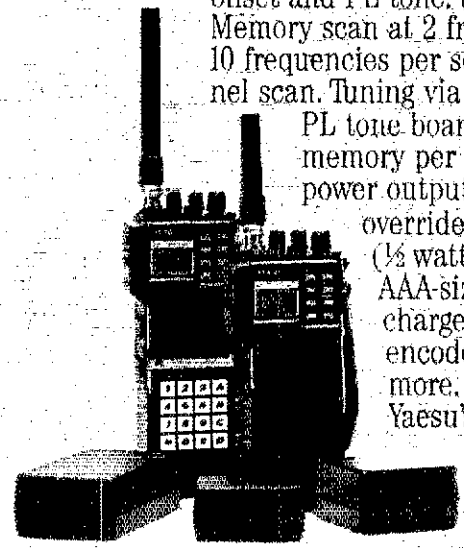


Finally, an HT that's built to take the realities of life.

Let's face it. It's easy to bump, drop, or get rain on an HT. ■ But if your HT is Yaesu's mini 2-meter FT-23R or 440-MHz FT-73R, such mishaps are a lot less worrisome. ■ They're built to last, with rugged aluminum-alloy cases that prove themselves reliable in a one-meter drop test onto solid concrete. Plus, their moisture-resistant seals really help keep the rain out.

Built for the realities of operating. Despite their miniature size, both radios have all the operating capabilities of larger microprocessor-controlled HTs. Yet operating them couldn't be easier. Consider: ■ You get a 7.2-volt, 2-watt battery pack. (Optionally, a 12-volt, 5-watt pack, or 7.2-volt miniature 2-watt pack.) 10 memories that store frequency, offset and PL tone. (7 memories can store odd splits.) Memory scan at 2 frequencies per second. Band scan at 10 frequencies per second. Tx offset storage. Priority channel scan. Tuning via tuning knob, or up/down buttons.

Radios above shown actual size.



PL tone board (optional). PL display. External PL selection. Independent PL memory per channel. PL encode *and* decode. Expanded Rx coverage.* LCD power output and "S"-meter display. Battery saver circuit. Push-button squelch override. Eight-key control pad. Keypad lock. High/low power switch (½ watt on low power.) ■ Options available: Dry cell battery case for 6 AAA-size cells. Dry cell battery case for 6 AA-size cells. DC car adapter/charger. Programmable CTCSS (PL tone) encoder/decoder. DTMF keypad encoder. Mobile hanger bracket. External speaker/microphone. And much more. ■ So get the intelligent mini HT that's built for life's realities. Yaesu's 2-meter FT-23R, or 440-MHz FT-73R.

YAESU

Yaesu USA 17210 Edwards Road, Cerritos, CA 90701 (213) 404-2700. **Repair Service:** (213) 404-1884. **Parts:** (213) 404-4847.
Yaesu Cincinnati Service Center 9070 Gold Park Drive, Hamilton, OH 45011. (513) 874-3100.

*Modification required. Prices and specifications subject to change without notice. PL is a registered trademark of Motorola, Inc.

KENWOOD

...pacesetter in Amateur radio

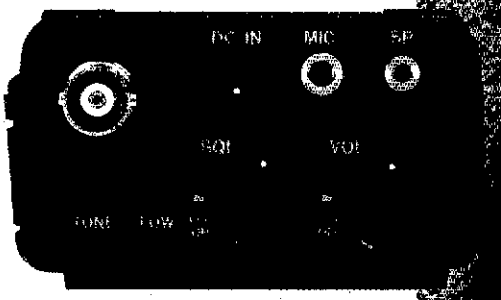
NEW!

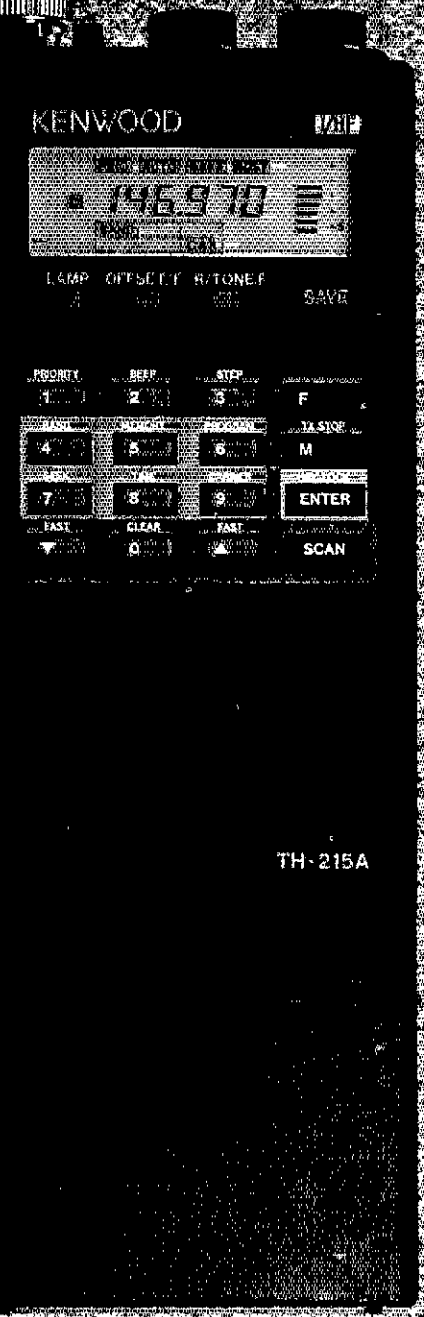
This HT has it all!

TH-215A

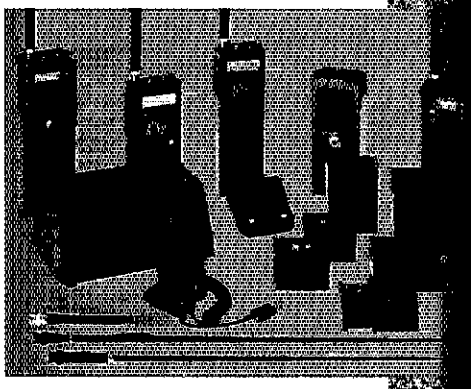
Full-featured 2m Hand-held Transceiver

Kenwood brings you the greatest hand-held transceiver ever! More than just "big rig performance," the new TH-215A packs the most features and the best performance in a handy size. You will want to keep this HT "close at hand" all of the time. And our full line of accessories will let you go from hamshack to portable to mobile with the greatest of ease!





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



Optional Accessories:

• PB-1: 12 V, 600 mAH NiCd pack for 5 W output • PB-2: 8.4 V, 500 mAH NiCd pack (2.5 W output) • PB-3: 7.2 V, 800 mAH NiCd pack (1.5 W output) • PB-4: 7.2 V, 1600 mAH NiCd pack (1.5 W output) • BT-5 AA cell manganese/alkaline battery case • BC-7 rapid charger for PB-1, 2, 3, or 4 • BC-8 Compact battery charger • SMC-30 speaker microphone • SC-12, 13 soft cases • RA-3, 5 telescoping antennas • RA-6B StubbyDuk antenna • TSU-4 CTCSS decode unit • VB-2530: 2m, 25 W amplifier • LH-4, 5 leather cases • MB-4 mobile bracket • BH-5 swivel mount • PG-2V DC cable • PG-3C cigarette lighter cord with filter

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

KENWOOD

TRIO-KENWOOD COMMUNICATIONS, INC.
1111 West Walnut Street
Compton, California 90220