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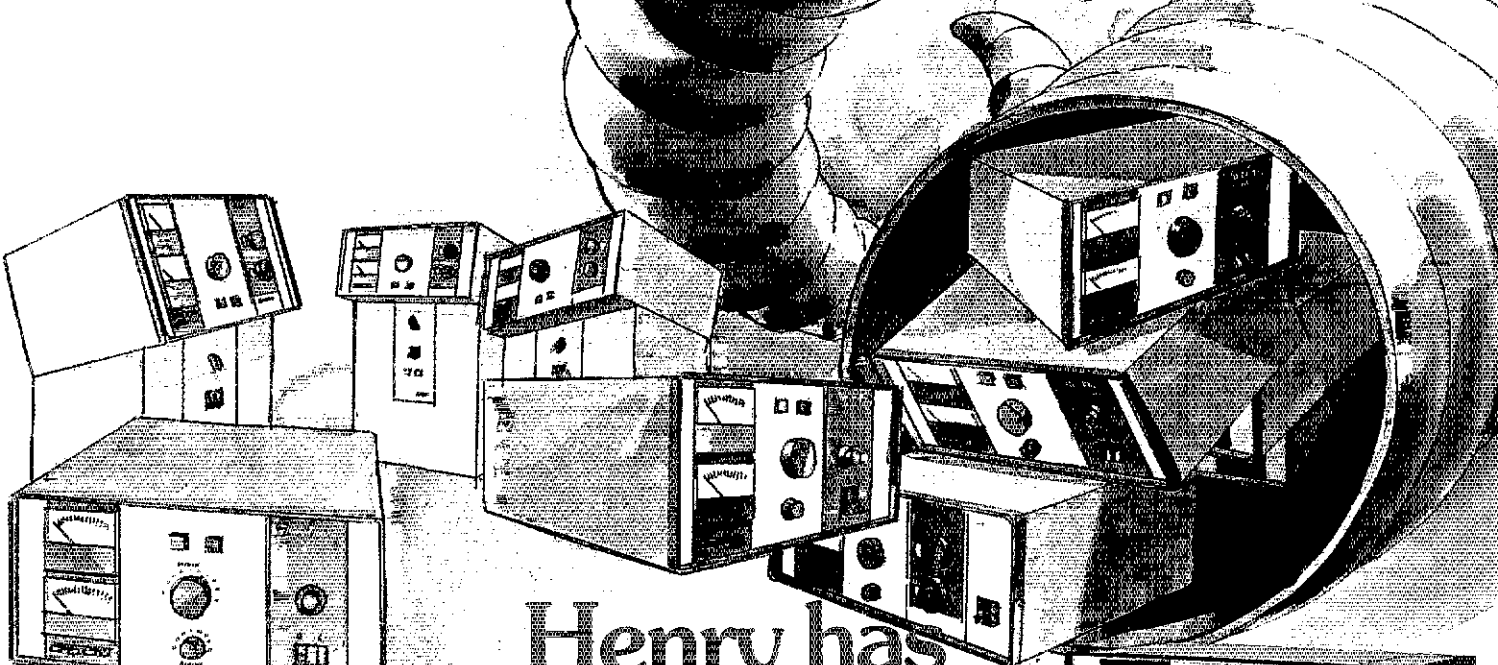

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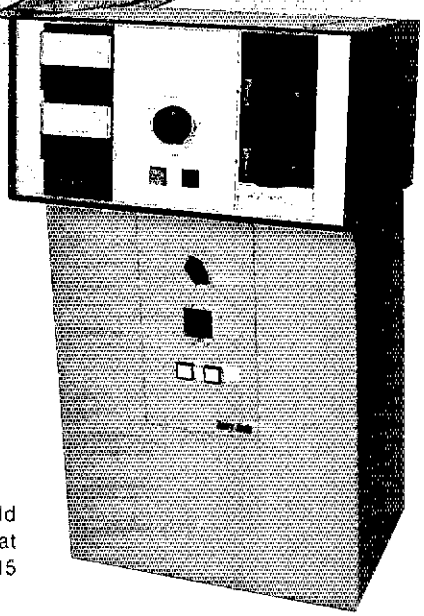

Take your choice. The world famous 2K Desk Classic, 2K Console Classic and 3K Console Classic HF amplifiers speak for themselves. Now to complete your range of choice, the superb new 3002-A and 2002-A for 146 MHz and the 3004-A and 2004-A for 440 MHz.

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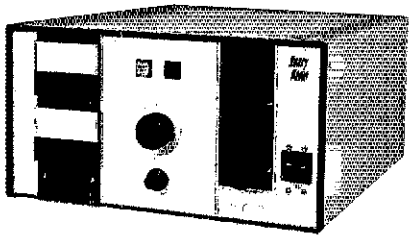
2K Classic...the culmination of more than fifteen years of developing the 2K series into the world famous line that sets the standards for top quality HF linears. A true "workhorse", built to loaf along at full legal power, trouble free, for years of hard service. Operates on all amateur bands, 80 through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

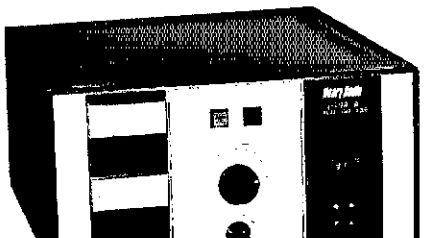
2K Classic "X"... We can't think of any way to make this magnificent 2000 watt amplifier better. Rugged...durable...the last amplifier you may ever need to buy.



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.

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Good for Satellite Digital QSOs

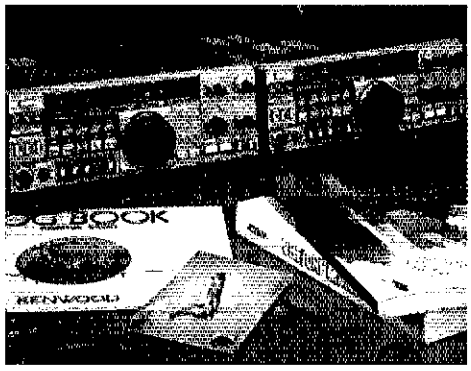
Matching Pair

Look for FUJI and PHASE III-C

TS-711A/811A VHF/UHF all-mode base stations

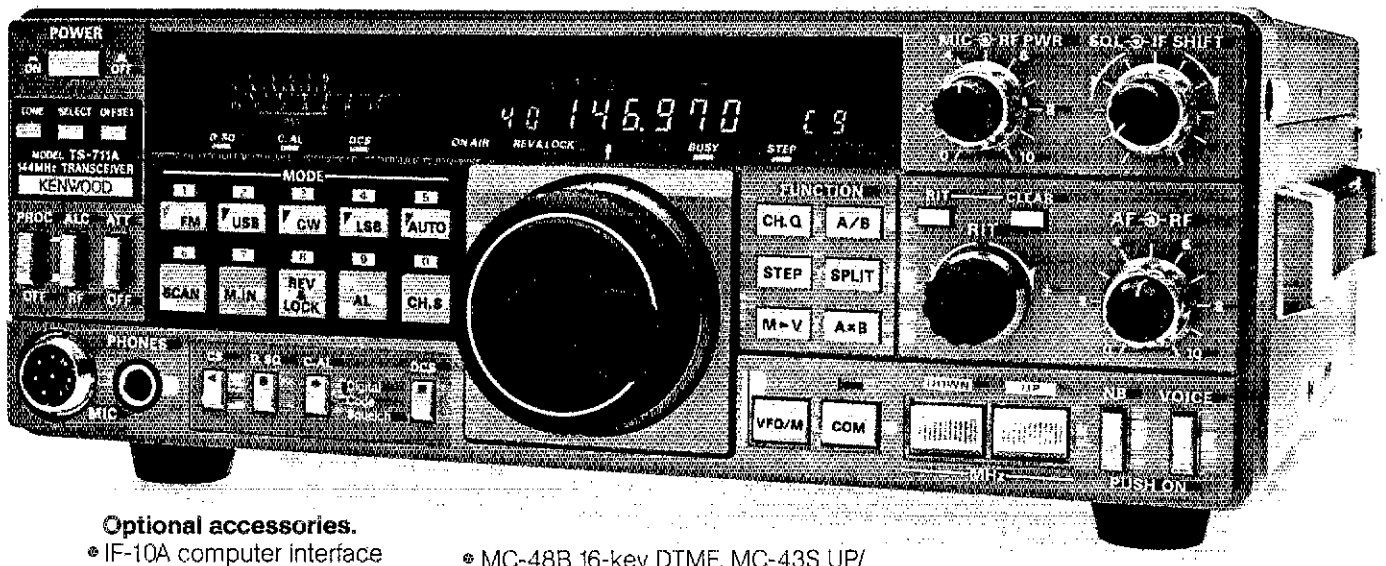
The TS-711A 2 meter and the TS-811A 70 centimeter all mode transceivers are the perfect rigs for your VHF and UHF operations. Both rigs feature Kenwood's new Digital Code Squelch (DCS) signaling system. Together, they form the perfect "matching pair" for satellite operation.

- **Highly stable dual digital VFOs.** The 10 Hz step, dual digital VFOs offer excellent stability through the use of a TCXO (Temperature Compensated Crystal Oscillator).
- **Large fluorescent multi-function display.** Shows frequency, RIT shift, VFO A/B, SPLIT, ALERT, repeater offset, digital code, and memory channel.
- **40 multi-function memories.** Stores frequency, mode, repeater offset, and CTCSS tone. Memories are backed up with a built-in lithium battery.



- **Versatile scanning functions.** Programmable band and memory scan (with channel lock-out). "Center-stop" tuning on FM. An "alert" function lets you listen for activity on your priority channel while listening on another frequency. **A Kenwood exclusive!**
- **RF power output control.** Continuously adjustable from 2 to 25 watts.
- **Automatic mode selection.** You may select the mode manually using the front panel mode keys. Manual mode selection is verified in International Morse Code.
- **All-mode squelch.**
- **High performance noise blanker.**
- **Speech processor.** For maximum efficiency on SSB and FM.
- **IF shift.**
- **"Quick-Step" tuning.** Vary the tuning characteristics from "conventional VFO feel" to a stepping action.
- **Built-in AC power supply.** Operation on 12 volts DC is also possible.
- **Semi break-in CW, with side tone.**
- **VS-1 voice synthesizer (optional)**

More TS-711A/811A information is available from authorized Kenwood dealers.



Optional accessories.

- IF-10A computer interface
- IF-232C level translator
- CD-10 call sign display
- SP-430 external speaker
- VS-1 voice synthesizer
- TU-5 CTCSS tone unit
- MB-430 mobile mount
- MC-60A, MC-80, MC-85 deluxe desk top microphones
- MC-48B 16-key DTMF, MC-43S UP/DOWN mobile hand microphones
- SW-200A/B SWR/power meters: SW-200A 1.8-150 MHz SW-200B 140-450 MHz
- SWT-1 2-m antenna tuner
- SWT-2 70-cm antenna tuner
- PG-2U DC power cable

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Compton, California 90220

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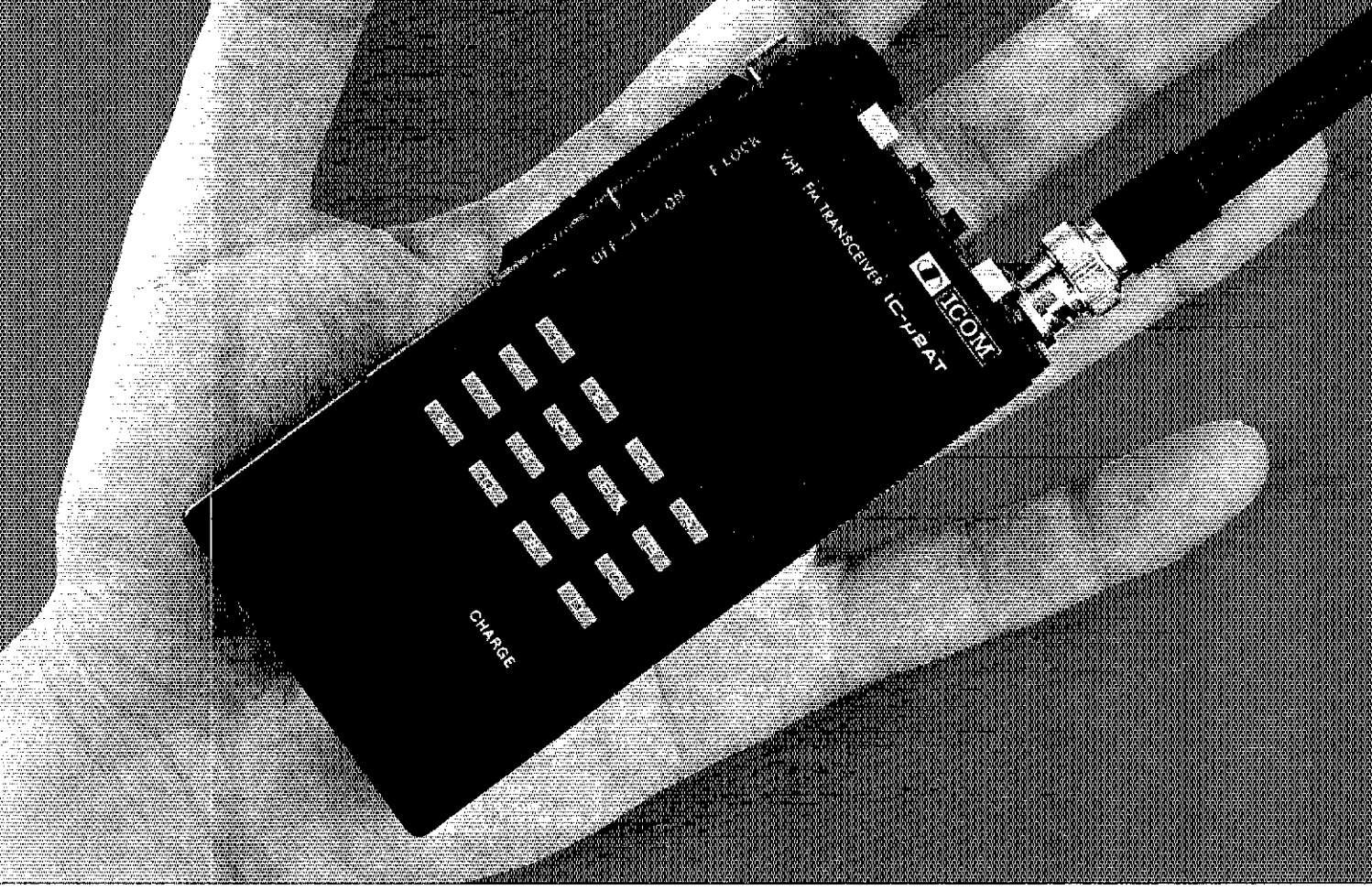


ICOM MICRO

ONLY ICOM COULD BUILD IT!

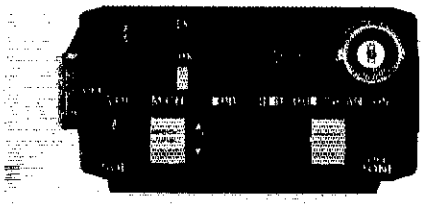
A new micro-sized 2-meter handheld with all the performance and reliability you've come to expect from an ICOM!

The ICOM Micro. A breakthrough that ends every amateur radio operator's quest for that one true, do-anything, go-anywhere 2-meter handheld.

Miniaturization. The Micro gives you all the advantages and performance of a larger handheld, in a package so small, so refined, so well built that only ICOM could build it like this.

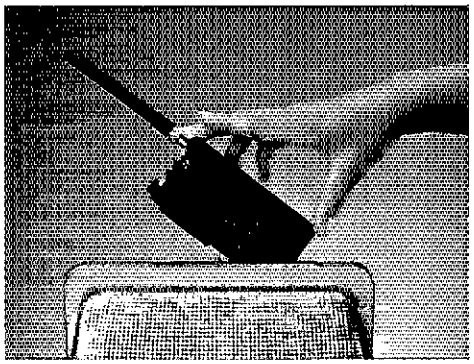
Measuring only 4.6" high by 2.3" wide, by 1.1" deep, the Micro fits in your pocket or purse as easily as a cassette tape. This miniaturization doesn't compromise ICOM quality. It's exactly what you'd expect from ICOM: high performance in a micro package.

Full Featured. And ICOM hasn't compromised features for size. The IC-μ2AT DTMF version includes ten programmable memories with odd offset capability, an LCD readout on the



top panel for easy readability, up to three watts of output (optional), 32 built-in subaudible tones AND wideband receive coverage from 138 to 166.995MHz 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.

Accessories. The Micro utilizes existing ICOM handheld accessories plus it hosts a new line of battery packs, long life to alkaline battery cases.



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OUR COVER

It's been a quarter of a century since Amateur Radio entered the space age via a tiny, odd-shaped box called OSCAR I. A two-part article beginning on page 15 of this issue explores the OSCAR program and the vital decisions that must be made soon about a new generation of amateur spacecraft. *(cover art by Jim Massara, N2EST//4)*

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.

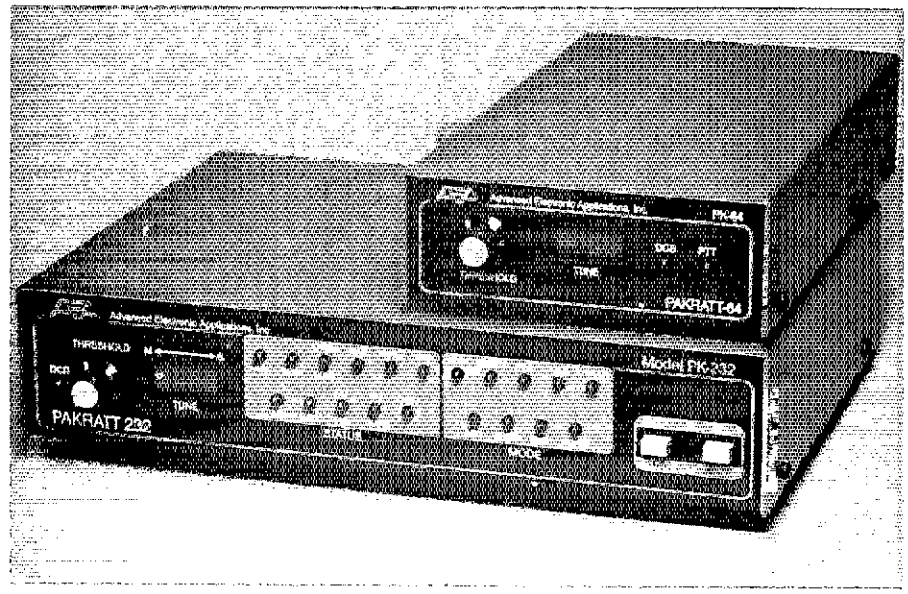
First, A Good Idea

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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NEW! Computer Interface!

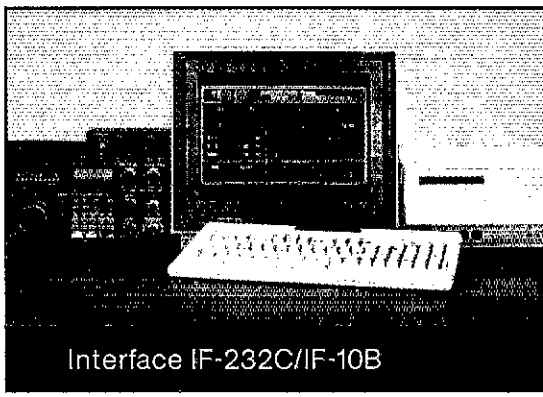
"DX-cellence!"

TS-940S

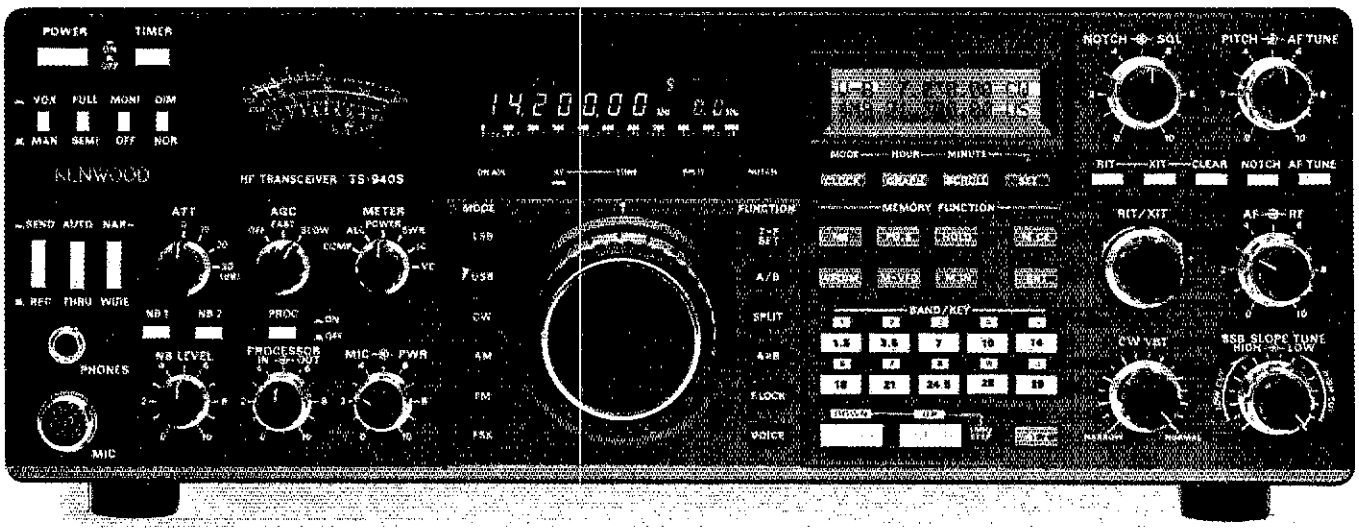
The new TS-940S is a serious radio for the serious operator. Superb interference reduction circuits and high dynamic range receiver combine with superior transmitter design to give you no-nonsense, no compromise performance that gets your signals through! The exclusive multi-function LCD sub display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



Interface IF-232C/IF-10B



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

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Connecticut — John T. Ronan, K3ZJJ, 114 Old Redding Rd, Weston 06883 (203-226-3388)
Eastern Massachusetts — Luck Hurder, KY1T, PO Box LL, North Eastham 02651 (617-255-2029)
Maine — Clevis O. Laverty, W1RWG, 17 Fair St, Norway 04268 (207-743-2353)
New Hampshire — William Burden, WB1BRE, 11 Briand, Nashua 03063 (603-882-0021)
Rhode Island — John Vota, WB1FDY, 41 Brookside Ave, Centerdale 02911 (401-231-1934)
Vermont — Frank I. Suitor, W1CTM, 727 North Ave, Burlington 05401 (802-863-5907)
Western Massachusetts — R. Donald Haney, KA1T, RD 1—Box 237, Myrick La, Harvard 01451 (617-772-4126)

Northwestern Division
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Idaho — Don Clower, KA7T, 5103 W. Cherry Ln, Meridian 83642 (208-888-7020)
Montana — L. C. "Les" Belyea, N7AIK, PO Box 327, Belgrade 59714 (406-388-4253)
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Nevada — Joseph D. Lambert, W8IXD, PO Box 1201, Boulder City 89005 (702-294-0505)
Pacific — Army Curtis, AH6P, PO Box 4271, Hilo, HI 96720 (808-935-8893)
Sacramento Valley — Robert H. Watson, W6IEW, 10994 Clinton Bar Rd, Pine Grove, CA 95665 (209-223-0101)
San Francisco — Robert Odell Smith, NA6T, 320 Park St—PO Box 1425, Fort Bragg, CA 95437 (707-964-4931)
San Joaquin Valley — Charles P. McConnell, W6DPD, 1658 W Mesa Ave, Fresno, CA 93711 (209-431-2038)
Santa Clara Valley — Glenn Thomas, WB6W, 554 Simas Dr, Milpitas, CA 95035 (408-263-9450)

Roanoke Division
North Carolina — Rae Everhart, K4SWN, PO Box 41, Lexington 27293-0041 (704-249-6734)
South Carolina — James G. Walker, WD4HLZ, Rte 1, Box 5395, Marion 29571 (803-423-3645)
Virginia — Claude E. Feigley, W3ATQ, 135 The Main—RR #1, Williamsburg 23185 (804-253-0658)
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Northern Florida — Royal V. Mackey, N4ADI, 161 Shell Point W, Maitland 32751 (305-644-5905)
Southern Florida — Richard D. Hill, WA4PFK, 3800 SW 11th St, Ft. Lauderdale 33312 (305-583-6932)
West Indies — Alberto L. Valldejuli, WP4CSG, V-11 19 St, Berwind Estates, Rio Piedras, PR 00924

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Los Angeles — Eugene R. "Bob" Poole, AJ6F, 2059 Reynosa Dr, Torrance, CA 90501 (213-326-2801)
Orange — Joe H. Brown, W6UBQ, 5444 La Sierra, Riverside, CA 92505 (714-687-8394)
San Diego — Arthur R. Smith, W6INI, 4515 Melisa Way, San Diego, CA 92117 (619-273-1120)
Santa Barbara — Byron W. Looney, K6FI, 6540 Buckley Dr, Cambria, CA 93428 (805-927-8733)

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Northern Texas — Phil Clements, K5PC, 1313 Applegate La, Lewisville 75067 (214-221-8873)
Oklahoma — William E. Goswick, K5WG, 12717 S. 124th E. Ave, Broken Arrow 74011 (918-369-2115)
Southern Texas — Arthur R. Ross, W5KR, 132 Sally La, Brownsville 78521 (512-831-4458)

THE AMERICAN RADIO RELAY LEAGUE, INC

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.

Membership inquiries and general correspondence should be addressed to the administrative headquarters at 225 Main Street, Newington, CT 06111 USA
Telephone: 203-666-1541 Telex: 650215-5052 MCI. MCI MAIL (electronic mail system) ID: 215-5052

Canadian membership inquiries and correspondence should be directed to CRRL Headquarters, Box 7009, Station E, London, ON N5Y 4J9, tel 519-225-2188.

"It Seems to Us . . ."

A Quarter-Century in Space

One of the many astounding facts about radiocommunication is that its entire history, from the transmission of the first message to the present day, spans but a single human lifetime. Measured against all of man's time on this planet, people have been using radio for barely the blink of an eye.

But, as new as radiocommunication is to the human experience, it is old and familiar compared to our use of space. Most League members had already graduated from school when the first manmade object achieved earth orbit, in 1957. Those of us who were in school at the time found our educations profoundly affected because the object was Russian, not American, in origin. Space launches hold a special magic for us because we can remember when space travel was the stuff of dreams and science fiction.

The story of the "space race" that closed out the decade of the Fifties is a story of high technology, concerns about national defense and big budgets. But it is also the story of a small group of California dreamers without a big budget—in fact, without any budget at all—who thought Amateur Radio deserved a place in space, and who set about to make it happen. Recognizing that a project is only as good as its acronym, they formed the Project OSCAR Association—for "Orbital Satellite Carrying Amateur Radio." The launch of OSCAR 1 on December 12, 1961, was the climax of more than two years of effort, not only to design and build the satellite, but to subject it to rigorous testing and navigate the uncharted waters of hitching a ride into space for the world's first nongovernmental communications satellite. On the 25th anniversary of this memorable day, we salute the pioneers whose vision and energy made it possible.

Would even the founders of Project OSCAR have dared to imagine that on the silver anniversary of their achievement, the score card would show launch of *twenty-two* amateur satellites from sites in four countries? Could they have envisioned the global cooperation that has so indelibly marked our amateur space effort? The leaders to whom the torch has been passed, particularly within AMSAT, deserve our thanks as well.

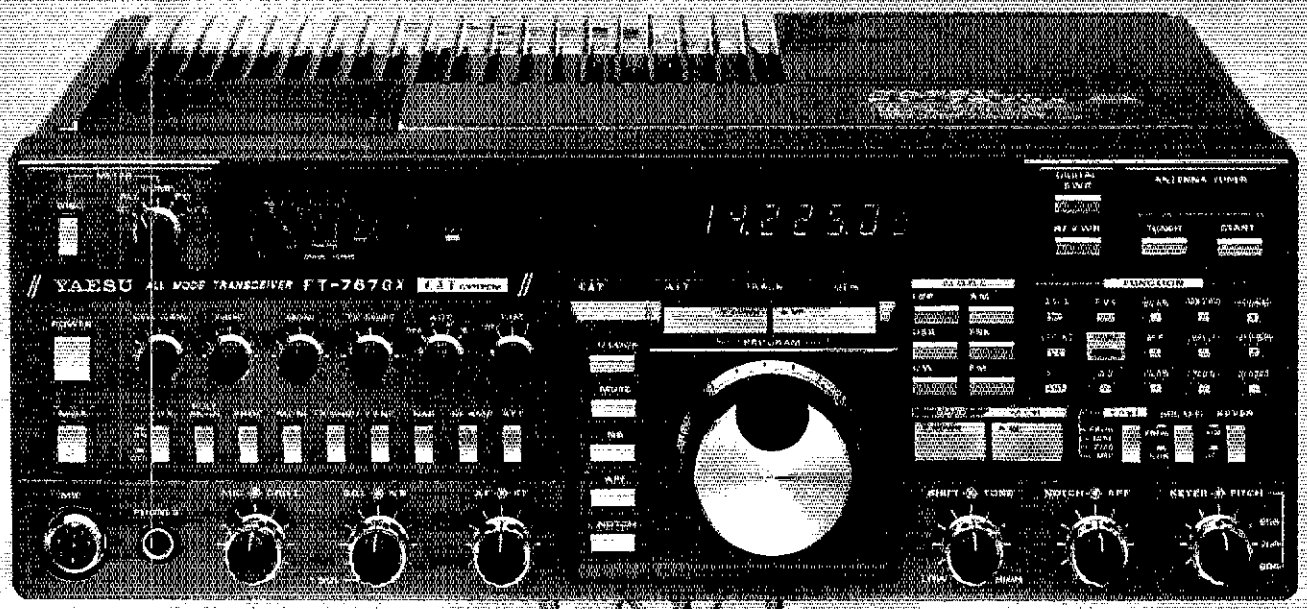
And what of the future? Even as we become familiar with Japan's new Fuji-OSCAR 12, mourn the passing of OSCAR 10, and get ready for next year's launch of Phase 3C, our thoughts leap ahead to the Nineties.

AMSAT, ARRL and others in the amateur community already are studying two possible space projects for the coming decade. Elsewhere in this issue you will read about the Phase 4 satellite, which is envisioned as a geosynchronous spacecraft carrying several transponders with a variety of missions. Phase 4 is the logical next step in amateur-satellite development, eliminating the problems of antenna tracking and everchanging coverage and providing a full-time communications tool. Phase 4 is an ambitious concept that will require more financial support and other resources than previous efforts, particularly in light of the launch uncertainties that plague the space program today.

The second project, equally ambitious in its own way, is to place a permanent Amateur Radio station on board the Space Station when it is commissioned in 1994-95. The Space Shuttle operations by Owen Garriott, W5LFL, and Tony England, WØORE, have demonstrated the feasibility of direct communication between small earth stations and manned stations in orbit. What better link with earth could there be for Space Station crews in their off-duty hours? When not being used for two-way communication by the crew members, the equipment could provide store-and-forward and other capabilities for earthbound hams.

The Amateur-Satellite Service exists today because a handful of people dared to dream—and more, because they worked to make the dream come true. The record of what we build on the foundations they laid has only begun to be written. Therein lies the challenge, and the opportunity, for the dreamers among us today.—*David Sumner, K1ZZ*

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



Listen for Yaesu's FT-767GX everywhere you might hear it: HF, 6 meters, 2 meters and 70 cm.

You'll hear operators calling it the ideal HF/VHF/UHF base station for small ham shacks and apartments.

And they'll rave about its full-featured performance and highly attractive price.

You see, the FT-767GX continues the price/performance tradition of our popular FT-757GX. But with even more features.

When you're ready to expand beyond HF coverage, just plug in optional modules for 6-meter, 2-meter, and 70-cm operation.

As standard equipment, you get a built-in HF automatic antenna tuner, AC power supply, digital SWR meter, digital power output meter, electronic keyer, and CW filter.

And operation is smooth and intuitive with keyboard frequency entry. Dual VFOs that tune in 10-Hz steps. A digital display in 10-Hz steps. And ten memories that store mode, frequency, and CTCSS tone information.

The FT-767GX is ready to operate full duty cycle at full rated power output for up to 30 minutes. And it listens from 100 kHz to 30 MHz.

Plus your station is really complete with full CW break-in, our patented Audio Peak Filter for CW operation, a CW TX offset variable 500/600/700 Hz, IF shift, an IF notch filter, a Woodpecker noise blanker, a VFO tracking system for slaved A/B VFO tuning, and optional CTCSS unit for repeater operation. And that's just a partial list!

But the best way to discover its full-featured performance is to visit your Yaesu dealer today.

Yaesu's FT-767GX. The affordable way to be heard on HF, VHF and UHF.

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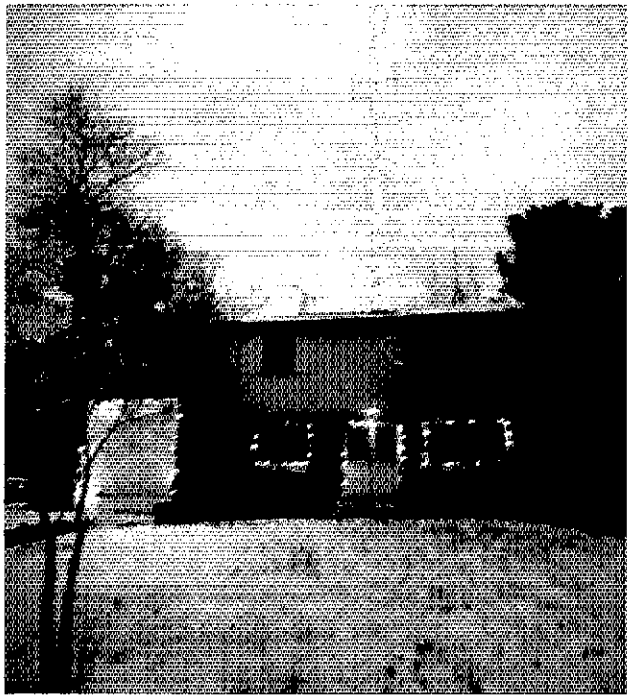
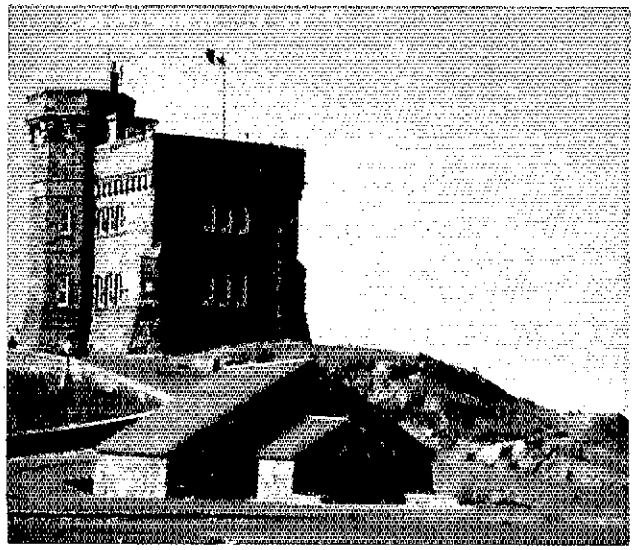
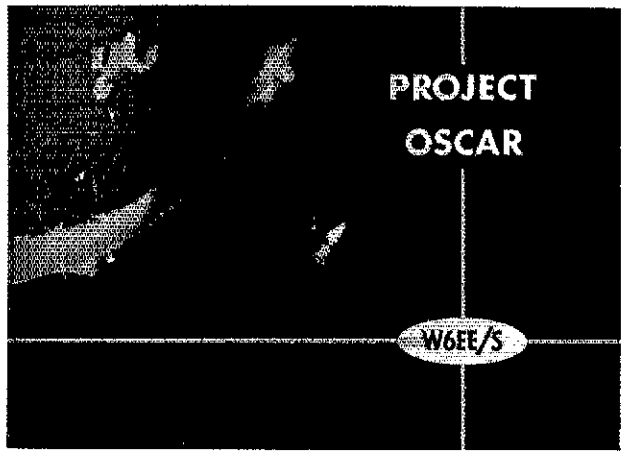
Prices and specifications subject to change without notice.

UP FRONT in QST



Shine On: When the Mions of Islip Terrace, Long Island, New York prepared for their Christmas party last year, they decorated not only their house, but the tower as well. Roger, WA2UMD, and Marie, KA2JKW, had good reason for their abundant good spirits: Their tower is one of but a few 100-foot towers in a highly regulated suburb that have won approval for a permit. It took them nearly 12 years of haggling with local zoning officials, but the Mions persevered. The colored lights at the top of the tower were the brainchild and handiwork of Marie's son, Bruce Noll (no call). You can bet the tower will be decorated again this Christmas season! *(tnx WB2HJD)*



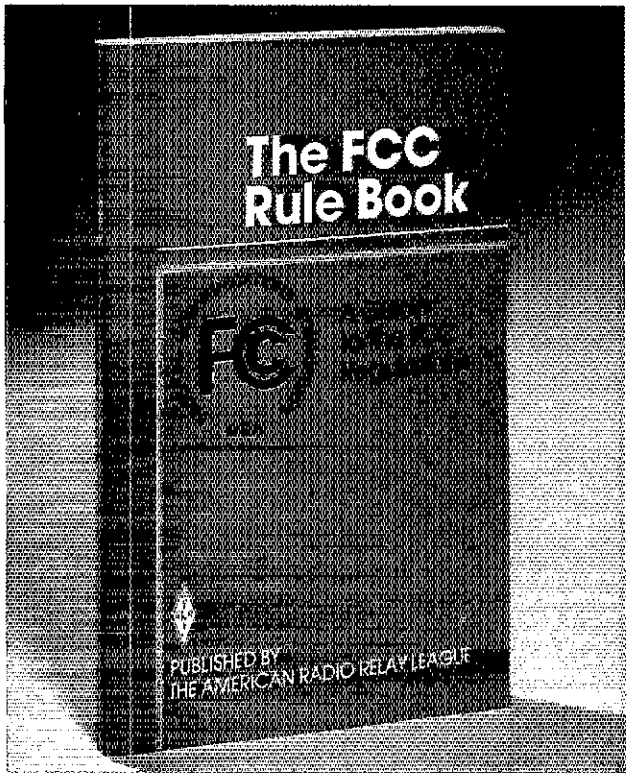


Happy 25th, OSCAR! It was on December 12, 1961 that the successful launch of this nation's first non-governmental satellite, OSCAR I, inspired amateurs worldwide to take their first steps into a vast, new frontier—space. QSLs like this one were issued to countless amateurs who copied OSCAR I's Morse code signal, "HI." Now, 25 years after that historic event, the Amateur Satellite Program is looking to take another big step in space communications, this time with the development of a new generation of satellites, Phase 4. This month and next, in celebration of OSCAR's Silver Anniversary, we'll be looking at the past and future of the Amateur Satellite Program with a two-part article. Won't you join us?

ARRL to FCC: Keep Question Pools

The only way to ensure standardization of volunteer exams is for the FCC to maintain the question pools. So argues the ARRL in its petition requesting that the Commission reverse its decision to turn over question-pool maintenance to Volunteer Examiner Coordinators. See this month's Happenings for details.

Marconi Remembered: The 12th of this month marks 85 years since Marconi received the first transatlantic signal, a major communications breakthrough. To commemorate the event, members of the Society of Newfoundland Radio Amateurs will return to the original site, Cabot Tower on Signal Hill in St John's, Newfoundland, to operate special-event station VO1AA/1. It was on December 12, 1901 that Marconi received the letter "S," transmitted from a station in Polhdu, England. In true amateur fashion, Marconi copied the signal using a primitive receiver fed by a long-wire antenna suspended from a kite. Watch for VO1AA/1 on 3.785, 7.085, 14.025, 14.140 and 21.250 MHz, beginning at 1200Z. *(photo courtesy VO1HO)*

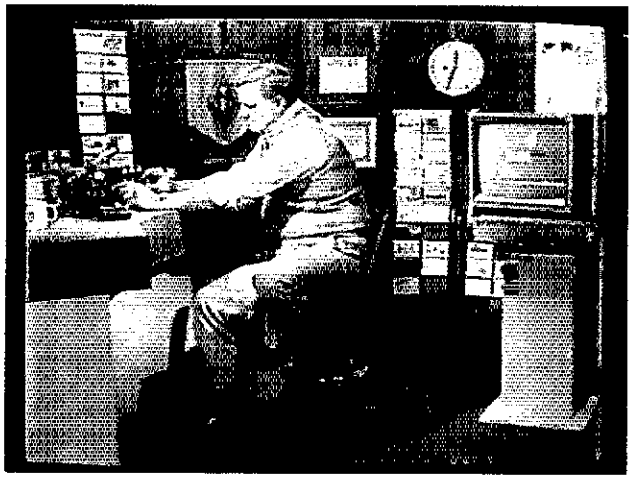


Ham's Best Friend: Having difficulty keeping track of the myriad changes in Part 97? Then, the latest edition of *The FCC Rule Book* is just what you need to keep your knowledge of the rules and regs state of the art. Not just a rehash of the FCC Rules, this book contains the latest answers to hundreds of commonly asked questions, in an easy-to-understand style. No ham shack should be without a copy. See page 166, this issue, for ordering information.

Author, Author: E. R. "Chip" Angle, N6CA (center), of Lomita, California, has the write stuff: He's the winner of the Technical Excellence Award for 1985. The coveted Pewter Cup is awarded annually by the Board of Directors to the author of the best *QST* article for that year. Chip's winning article, "A Quarter-Kilowatt 23-cm Amplifier," appears in March and April 1985. *QST* Editor Paul Rinaldo, W4RI (left), and Southwestern Division Director Fried Heyn, WA6WZO, are shown making the presentation at the ARRL National Convention in San Diego in September. *(N6EGY photo)*

What a View! Walt Stoll, KA8CLP (right), of Clinton, Ohio, got quite an eyeful as well as an earful during this amateur operation. Walt had been invited by Ralph Schoener, K8ZBY (partially shown, lower right), to tag along on a guest ride aboard the Goodyear blimp *America* when it made a stop in Akron. What would any amateur do in a similar situation? Bring along a hand-held, of course! The two hams got permission to operate, and drew an instant pileup when they signed "aeronautical mobile from the Goodyear blimp" after the first QSO, with Ralph's father, W8TPS. Although the half-hour flight "ended all too quickly," Ralph and Walt enjoyed about 25 two-ways on 2 meters. *(Nancy Baker photo)*

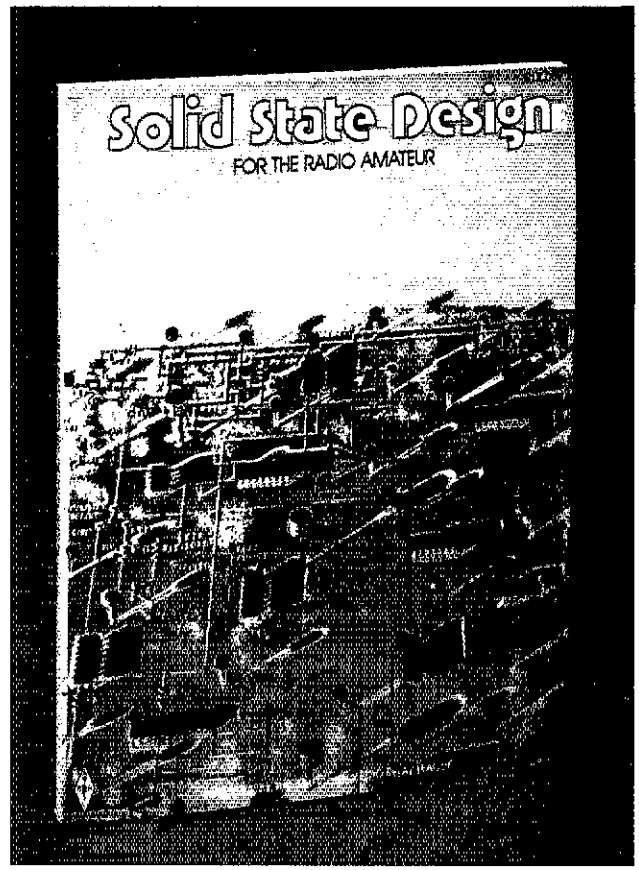
W4KFC Honored: The 1985 ARRL International Humanitarian Award has been awarded posthumously to Victor C. Clark, W4KFC. In making the choice, the ARRL Board cited Vic's lifelong commitment to the furtherance of international brotherhood and peace through Amateur Radio. Vic, who became a Silent Key in 1983 while in office as ARRL President, was a respected friend to thousands of radio amateurs throughout the world. From his youth, he was an active participant in the ARRL, serving in many capacities, including Section Communications Manager, Director and President. In 1936, already a renowned radio amateur as W6KFC at the age of 19, Vic was selected as the first recipient of the Hiram Percy Maxim Memorial Award.



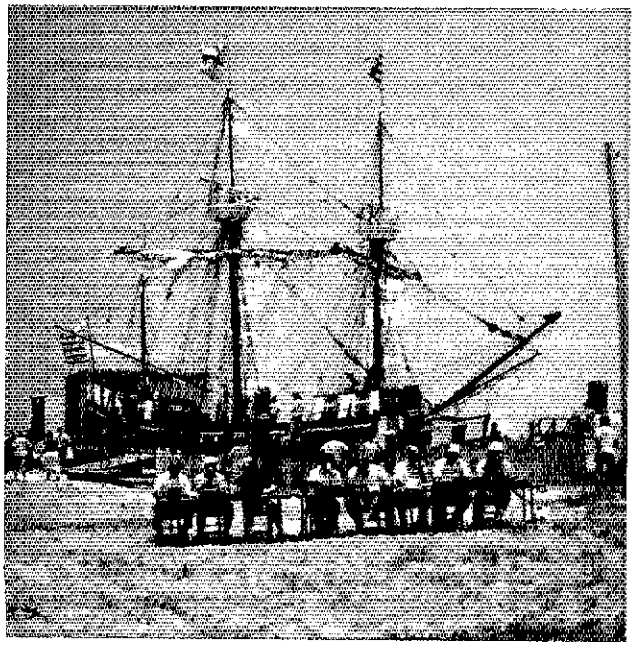
Ham Radio Takes to the Screen: The Fairfield Amateur Radio Association found a great way to get publicity for their club and for Amateur Radio in general. FARA teamed up with Connecticut Public Television to produce a program on what they do best—ham radio. Featured in the half-hour program are scenes of amateurs in action during the 1985 Mexico City earthquake, an emergency-preparedness drill, the Shuttle Amateur Radio Experiment (SAREX), the Mayor of Fairfield explaining how amateurs helped state officials during Hurricane Gloria, and information on how to get started in Amateur Radio. The scene above shows FARA member John Ronan, K3ZJJ (who is also an ARRL Section Manager), operating FARA club station WB1CQQ. The program can be seen by Connecticut viewers on December 7 at 1 PM on CPTV.

Trivia Quiz Answer

Last month, we asked you who were (1) the founding Secretary and (2) the first full-time paid manager of the ARRL. The answer to the first part is Clarence Tuska (1WD, 1ZT), co-founder of the ARRL with Hiram Percy Maxim. The second answer is Kenneth Bryant Warner, W1EH. K. B. Warner was hired as Editor and Managing Secretary in May 1919.



Solid Advice: Success in building solid-state devices need not be out of the reach of radio amateurs. Through the pages of ARRL's *Solid State Design for the Radio Amateur*, you can have at your fingertips the basics of circuit designs and their practical applications for a multitude of projects, including transmitter and receiver design, power amplifiers, transistor modeling and test equipment. See page 124, this issue, for ordering information.



A Royal Response: Some special events are more special than others. That's the conclusion members of the Raleigh Amateur Radio Society came to after their special-event operation to commemorate the 400th anniversary of English explorer Sir Francis Drake's arrival on the North Carolina coast June 10, 1585. Although W4DW operators netted many enjoyable QSOs and provided great exposure for Amateur Radio during the operation, the highlight was a "two-way" via Amateur Radio with Princess Anne, England's official representative to the 400th anniversary celebration. With help from many, including the State of North Carolina, the British Consulate and members of the Radio Society of Great Britain and the IBM Radio Club in London, third-party regulations were waived and a message was duly delivered and a reply from Princess Anne received. Here, RARS members operate the three stations used during the W4DW operation on Hatteras Island, North Carolina. In the background is the *Elizabeth II*, a composite of 16th Century English ships. *(tnx Bob Dean and N4IQA; N4IZE photo)*

League Lines

The Ninth General Assembly of IARU Region 2, the regional organization for IARU member-societies in North and South America, was held in Buenos Aires, Argentina, October 20-24. Such regional conferences are held every three years, and permit ***coordination and the development of closer ties between the national Amateur Radio organizations of the hemisphere.*** ARRL and CRRL were among 17 member-societies that sent delegations to Buenos Aires. Cuba was among the countries represented for the first time at a Region 2 conference. The next Region 2 conference will be held in the US during 1989, the 75th anniversary year of ARRL. A report on conference actions taken in Buenos Aires is in preparation for an early issue of *QST*.

Repeater owners/trustees: To make sure your information is correct in the 1987-88 *Repeater Directory*, you must be sure that your Frequency Coordinator has been kept up to date. All information for the next edition of the *Repeater Directory* will now be coming through your Coordinator. Registration forms and a list of Coordinators can be found in the 1986-87 *Repeater Directory*. Registration forms may also be obtained by sending an SASE to ARRL HQ to the attention of the *Repeater Directory* Editor.

Is your club ***holding a Novice or upgrade course this winter?*** Register the course with the ARRL Club Services Department now, and we'll be sure to put you in our computerized listing of classes. This will help us direct prospective hams to your club!

HQ is developing a list of clubs that have solid connections in college or graduate school video production facilities. If you can help us with some video production projects, contact Curt Holsopple, CSD Manager, at Headquarters.

The US Environmental Protection Agency has extended the time for filing comments in its proposal to limit public exposure to RF radiation. The new date is December 15, 1986. See the Happenings column in August *QST* for more details concerning the various guidelines proposed by the EPA. These guidelines would directly affect only government entities. Separate action by the FCC would still be necessary to impose the standard on FCC licensees after it is adopted.

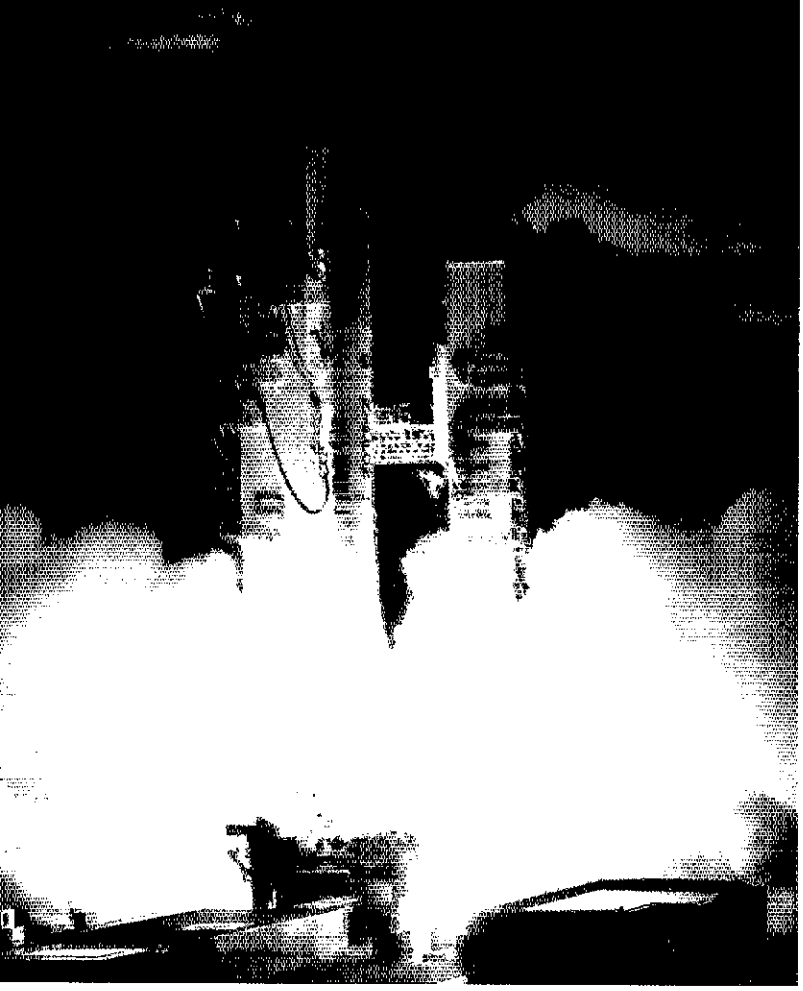
As the 1986 tax year draws to a close, consider the good works that your *tax deductible contribution* to the ARRL Foundation will support. You can even earmark your gift to any of the Foundation's scholarships (Goldwater, Hadlock, Grauer, "You Have a Friend in Pennsylvania"), the "Victor C. Clark Youth Incentive Program," the Amateur Radio Satellite Program or the ARRL Foundation General Fund, depending on your interests. Contributions made before December 31, 1986 can be deducted on your 1986 tax return. For further information, write or call the ARRL Foundation office at League Headquarters.

Attention educators! Here's your chance to view a live satellite closed-circuit conference about Amateur Radio. If your home or school is equipped with a satellite TV reception dish, you can ***tune in on Saturday, December 6, 1986, from 2 to 3:30 PM Eastern Standard Time.*** This ARRL production is one installment in a series entitled "The Shoulders of Giants," an in-service training course produced by the Talcott Mountain Science Center (Avon, Connecticut) under contract with the University of Hartford. Live phone-in audience participation is a part of the special satellite hookup. If you just want to watch, the program will be on Westar IV, transponder 10 direct, channel 19. Contact ARRL HQ, Club Services Department, for more information.

The Amateur Satellite Communications column will not appear this month or next, but will resume its usual schedule in February. In its place we're pleased to run an extensive article on "OSCAR at 25."

Attention Field appointees: Seven new Participating Badge Engravers have signed up to supply you with your official ARRL Field Organization Badge (see July 1986 *QST* for information on the ARRL Official Call Sign Badge Program). They are: House of Eades, 1989 Harrodsburg Rd, Lexington, KY 40503 $5.75; Florida Custom Plastics, 9900 Ulmerton Rd, Lot -56, Largo, FL 33541 $7; Omaha Rubber Stamp Co, 8104 Maple St, Omaha, NE 68134 $5.95; Accurate Engraving Service, 1816 SE 20th Ave, Portland, OR 97214 $5.50; Curley's Engraving, 1223 SE 32nd Pl, Portland, OR 97214 $5.50; The Sign Man III, 1146 Cross Creek Dr, Franklin, TN 37064 $5.80 (TN residents add 7%); and The Badgemakers, 613 W Yakima Ave, Yakima, WA 98902 $4.50. These join the three firms listed in October League Lines.

OSCAR at 25: The Amateur Space Program Comes of Age



Twenty-five years ago this month, OSCAR I successfully achieved orbit around earth—and amateurs took their first steps into an exciting, new frontier, space communications.

By Jan King, W3GEY, AMSAT VP, Engineering
Vern Riportella, WA2LQQ, AMSAT President
Ralph Wallio, WØRPK, AMSAT VP, Operations
AMSAT, PO Box 27, Washington, DC 20044

In many fields, there are watershed events that mark transitions from one era to another. In aviation, Lindbergh's 1927 solo flight from New York to Paris was such an event. Suddenly, the continents were days closer. Similarly, the 1957 launch of Sputnik partitions history to the pre-Space Age and the Space Age.

In Amateur Radio, the watershed date is December 12, 1961. On that day, OSCAR I was launched. (OSCAR is an acronym for Orbiting Satellite Carrying Amateur Radio.) We predict that in the last decade of this millennium, the significance of that date will come more clearly into focus. It was then, historians of Amateur Radio will note, that the hobby took a sharp turn toward its future: space communications. It was then that ham radio got on track for its major theme in the 21st Century: proliferated networks of hams communicating via multiple media with satellites carrying the bulk of the mostly digital traffic (digitized voice, data and video as a minimum over the amateur equivalent of the Integrated Services Digital Network, ISDN).

On the eve of a quarter century of OSCARs, then, we thought it an appropriate juncture to step back and take the long view. How did we get here? Where are we? Where are we going? And how fast are we getting there?

One way to see where we are going is to chart trends. Mark a few points along a path and soon enough a trend can be discerned. For example, we can classify OSCAR mission complexity and operating environment into three, soon to be four, phases:

Phase 1—Short-lived beacon and/or transponder-equipped spacecraft, from OSCAR I through OSCAR 5, and the recent Russian ISKRA series, which were manually deployed from the Salyut space station.

Phase 2—Longer-lived, multitransponder or scientific spacecraft in low earth orbits, including OSCARs 6, 7 and 8, UoSAT-OSCARs 9 and 11, Fuji-OSCAR 12 and RS-1 through RS-8. (Many new satellites will be added in this class in the future since the low altitude often means strong signals.)

Phase 3—Longer-lived, multitransponder spacecraft in elliptical orbits, including OSCAR 10, Phase 3C (to be launched in 1987) and perhaps Phase 3D in 1990. Benefits of long duration of visibility are offset by complex tracking task.

Phase 4—Very-long-lived multitransponder, multimission geosynchronous spacecraft serving large regions of the earth. Currently undergoing serious study aimed at commencing general use in less than five years.

However, these coarse classifications don't speak to advancements in many engineering and operational areas that have gradually built on the past to produce the capabilities we enjoy today and will enjoy tomorrow. Improvements in power systems, function control, attitude control, telemetry systems and transponder operating frequencies and bandwidth all point toward an astonishing capacity in tomorrow's Phase 4 program. (Refer to Table 1.)

OSCARs I-IV were built by Project OSCAR of California. Australis-OSCAR 5 was built by students in Australia and was launched by NASA on a "ride" arranged

Table 1
Capabilities Growth Comparison of OSCAR

OSCAR	Power	Function Control	Attitude Control	Telemetry	Beacon Transponder
I	Mercury battery	None	None	1-channel CW rate	2-m beacon
II	Mercury battery	None	None	1-channel CW rate	2-m beacon
III	Silver-zinc battery (transponder) solar cells 2.5 W & battery (beacon)	None	None	3-channel CW rate and pulse width	2-m/2-m transponder (50 kHz) 2-m beacon
IV	Solar cells 10 W & battery	None	Spin	None	2-m/70-cm transponder (10 kHz) 70-cm beacon
5	Manganese alkaline battery	1 ground command: beacon on-off	Spin & passive magnets	7-channels pulse width modulation	10-m, 2-m beacons
6	Solar cells 5.5-W NiCd battery	21 ground commands	Spin & passive magnets	24-channel CW	2-m/10-m transponder (100 kHz) 10-m beacon
7	Solar cells 15-W NiCd battery	70 ground commands	Spin & passive magnets	24-channel CW, 60-channel Baudot	2-m/10-m transponder 70-cm/2-m transponder (150 kHz) 10-m, 2-m, 70-cm, 13-cm beacons
8	Solar cells 15-W NiCd battery	5 ground commands	Spin & passive magnets	6-channel CW	2-m/10-m transponder 2-m/70-cm transponder (200 kHz) 10-m, 2-m beacons
9	Solar cells 17-W NiCd battery	Onboard computer & ground command	Gravity-gradient boom	105 channels ASCII Baudot synth-voice digital video CW	2-m, 70-cm, 13-cm, 10-GHz, 7, 14, 21, 28-MHz beacons
10	Solar cells 50-W dual NiCd batteries	Onboard computer & ground command	Spin & active magnets	64-channel ASCII Baudot	70-cm/2-m transponder 24 cm-70 cm (950 kHz) 2-m, 70-cm beacons
11	Solar cells 25-W NiCd battery	Onboard computer & ground command	Gravity-gradient boom & active magnets	156-channel ASCII Baudot synth-voice digital video CW	2-m, 70-cm, 13-cm beacons
12	Solar cells 8.5-W NiCd battery	Onboard computer & ground command	Spin & passive magnets	52-channel 66-channel CW PSK	2-m/70-cm transponders analog and digital (100 kHz) 70-m beacon
P3C	Solar cells 50-W dual NiCd batteries [Watts TBS]	Onboard computer & ground command	Spin & active magnets	64-channel ASCII Baudot	70-cm/2-m transponder 24-cm/70-cm transponder 2-m/70-cm transponder 70-cm/13-cm transponder digital transponder (500 kHz) 2-m, 70-cm, 13-cm beacons

by AMSAT. AMSAT built AMSAT-OSCARs 6, 7, 8 and 10 with its affiliated organizations and help from the ARRL (on OSCAR 8). UoSAT-OSCARs 9 and 11 are the products of the University of Surrey, England. Fuji-OSCAR 12 was a joint project of the Japan Amateur Radio Satellite Corporation (JAMSAT), the Japan Amateur Radio League (JARL), the Nippon Electric Company (NEC) and Japan's National Space Agency (NASDA). More on the history of the Amateur Satellite Program can be found in *The Satellite Experimenter's Handbook* (available from ARRL). Additional reading on FO-12 appears in the Oct and Nov 1986 installments of the Amateur Satellite Communications column and in the June, Aug and Oct 1986 issues of *QEX* (available from ARRL).

Power Systems

The application of solar-cell-driven battery recharging has been the single greatest improvement in OSCAR power-system design. Early projects predated usable solar-cell technology in terms of output, cost and reliability. While OSCAR III's solar cells and associated secondary battery powered the totally separate 2-m beacon for several months, the primary battery powering the transponder was depleted in 16 days. The first application of solar-cell technology that resulted in an extended working life was aboard OSCAR 6, whose Mode A transponder provided service to the Amateur Radio community for 4½ years, beginning October 1972.

The ultimate demise of every OSCAR project until AO-10 has been battery failure. Consequently, the baseline Phase 3 design includes an auxiliary battery, battery-charge regulator and a reliable means of switching between the two. This redundancy has not as yet been required aboard OSCAR 10, but continues as a vital insurance measure in Phase 3C, which is scheduled to fly in 1987.

Functional Control

The first application of ground-command capabilities for tuning the beacon transmitters on and off, flew aboard OSCAR 5. From this beginning, necessary to demonstrate remote-control capabilities to the FCC, hardwired functional control systems grew to accept as many as 70 different ground commands aboard OSCAR 7.

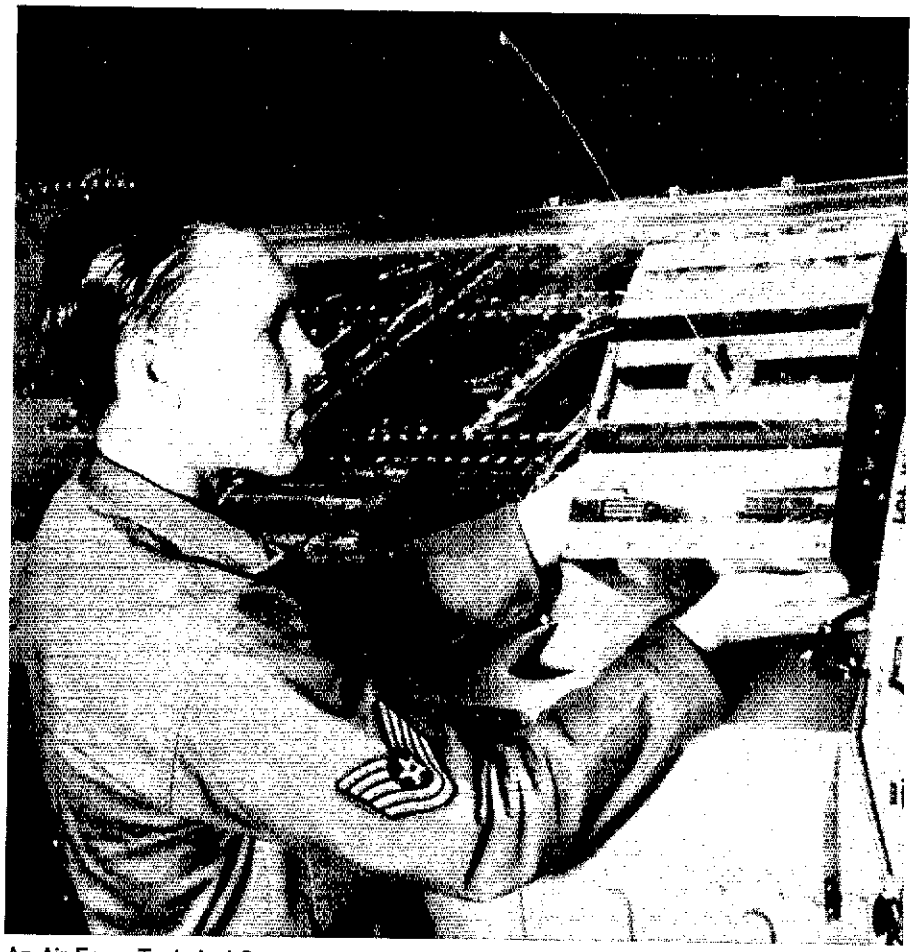
However, the big breakthrough was the successful application of software-driven onboard controllers, which have come to be known as Internal Housekeeping Units (IHU), beginning with OSCAR 9 and as flown on all OSCAR missions since. The IHU concept allows for at least two long-term benefits:

1) The ability to make decisions aboard the spacecraft, independent of ground control; and

2) The ability to upload new software representing better ideas designed after the bird is in orbit.

Attitude Control

The attitude of the spacecraft relative to the earth is important to ensure the best use of onboard antenna patterns and for thermal dynamics. Although spin stabilization was to be a feature of the ill-fated OSCAR IV mission, the OSCAR 5 project was the first to use both spin stabilization and passive magnets successfully. These attitude-control methods were entirely adequate for all transponder-equipped missions until the Phase 3 design. The scientific-studies payloads aboard OSCARs 9 and 11 require a completely different



An Air Force Technical Sergeant admires the handiwork that went into designing and building the world's first nongovernmental communications satellite, OSCAR I. While circling earth, the 10-pound satellite transmitted the word "HI" in Morse code.

OSCAR I was the brainchild of Project OSCAR, a group of California hams. The members shown here are (l-r) Gail Gangwisch, Nick Marshall, W6OLO, Don Stoner, W6TNS, Chuck Towns, K6LFH, and Fred Hicks, W6EJU. Project OSCAR also was involved in later amateur satellites.

stabilization technique. A gravity-gradient boom is used for UoSATs.

The tri-star Phase 3 design requires active attitude control to respond to changing sun angles. This control is provided in the form of IHU-controlled electromagnets that are pulsed by navigational software as necessary to maneuver spacecraft attitude. Attitude is determined by sun and earth sensors and is processed by the IHU.

Telemetry

The encoding and transmitting of vital spacecraft operating parameters and conditions has evolved from methods undecipherable by anyone but the primary engineering team (as with OSCARs I, II and III) to transmission of telemetry units in CW, Baudot and ASCII codes with conversion tables available to anyone. In the future, we can look forward to transmission of actual engineering values in plain language, which will be especially useful for elementary and secondary educational purposes.

The quantities of parameters has evolved from just one, the internal temperature of OSCARs I and II, to as many as 156, as transmitted by OSCAR 11.

Beacons and Transponders

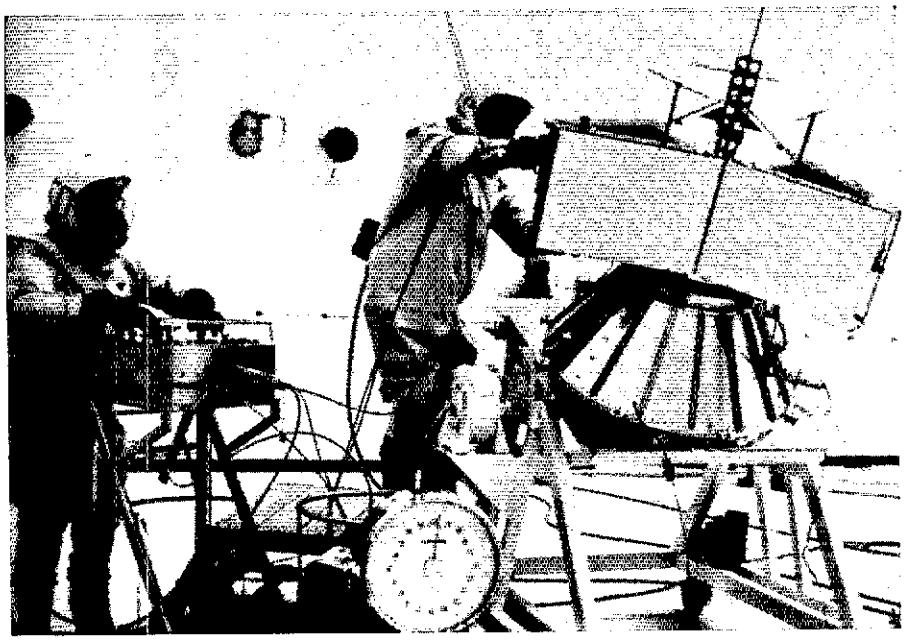
Amateur bands used for OSCAR missions have moved steadily higher in frequency as allowed by advances in technology and as the lower frequencies became more crowded with terrestrial operations. Through the years, both transponder efficiency and available bandwidth increased dramatically. OSCAR 10's 950 kHz of transponder bandwidth is more than equal to all preceding OSCAR missions combined.

Transition to the Next-Generation Satellites

Development and mastery of all of these areas has been necessary to bring us to the brink of the Phase 4 era. Without the successes achieved in power systems, functional control, attitude control, telemetry systems and transponders, we would not now be in the position to bring the advantages of satellite-borne transponder communications from the domain of the experimenter to the routine use by amateurs in many other facets of ham radio.

As is apparent, growth in OSCAR complexity and capability has been impressive since the humble beginnings in 1961. Despite the often-dramatic performance improvements between satellites within a generation, and even more so between satellite generations, working OSCAR has remained more or less an esoteric art; only about 3% of active US amateurs consider themselves "OSCAR-active."

A surprisingly high number of active US hams have tried OSCAR at least a couple of times. For one reason or another, they found it did not retain their interest; at least not in terms of the effort required to effect



Building today's amateur satellites requires an outstanding range of skills. Here, Dick Daniels, W4PUJ (right), and Wolfgang Mueller (from the German rocket manufacturer, MBB) wear special suits while loading potentially explosive, highly toxic propellant into AMSAT-OSCAR 10 prior to its launch in 1983.

a QSO. And *that* seems to be a major theme with persons we've interviewed regarding their experiences with OSCARs. We've found that about 15% of all current hams have had at least one OSCAR QSO in their ham career. Why this group should outnumber the "regulars" by about 5 to 1 has been the source of protracted soul searching among our future-system architects. "Why," they justifiably ask, "is something so inherently interesting (space communication) such a disappointment in terms of obtaining and maintaining the interest of a large proportion of the amateur population?"

The question is significant in light of plans for our next generation of satellites, Phase 4. For, although the trend lines of past evolutionary growth in satellite capacity and functionality point to several potential growth areas, the consensus among AMSAT long-range planners is that it may be time for *revolutionary* growth instead of evolutionary growth in satellite-system architecture. It may be time for a change in the way we look at satellite systems and how they interact with the general Amateur Radio community.

Moreover, there is a special sense of urgency associated with this introspection. While technology advances have made more OSCAR capacity available to amateurs, it has also sharpened the appetite of commercial interests for the very heart of our hobby: our precious spectrum. The same technology that is making it possible to enhance present and future OSCARs ironically is placing our hold on the VHF/UHF spectrum at risk. Spectrum that was thought useless for commercial purposes years ago is now deeply coveted and eagerly sought by entrepreneurial interests.

The popularity of all prior OSCARs has been throttled by two main factors: access and functionality.

"Access" really means "ease of access" or, alternatively, "convenience." In order to be convenient, an OSCAR needs to appear regularly (at a given time of day), and it needs to be enduring (stick around for long enough for a few QSOs, at least). While AMSAT-OSCAR 10, in its high, elliptical orbit, has improved access in meaningful ways, the major drawback has been that it is not sun-synchronous. That is, its appearance tracked neither with the sun nor human activities (such as work/play schedules), which *are* synchronized with the sun. Nevertheless, AO-10 did provide endurance. It could be in view often for eight- or nine-hour periods, during which thousands of QSOs could transpire.

"Functionality" means, essentially, "What can I do with it?" The conventional wisdom holds that satellites will be truly popular when they can do more than 20 meters can do most of the time. If satellites could do what 20 meters does for less money, that would probably accelerate the popularization process. Well, AO-10 has done some of the things 20 meters does and some of the things it does not. Like 20 meters, AO-10 has provided international coverage. Unlike 20 meters, it has not been choked with QRM. Neither has AO-10 been tied to the sun in terms of when it's on and when it's off. Neither has AO-10 been notably affected by geomagnetic storms or sunspot cycles. But, whereas when 20 meters is very good, signals can be 40 dB over the noise, signals on AO-10 have rarely exceeded 12 dB above the noise. And, spin modulation (QSB) is an effect associated with satellites, not 20 meters.

The point is this: Given the traditional equipment and experience base of the active amateur community, there has been insufficient motivation to become satellite regulars. "What can I do with satellites that I can't do on HF?"

Given this reasonable question, then, let's look at revolutionary ways to provide communications which *can't* be accomplished using available HF techniques. For example, let's provide a way for linking the minimum Amateur Radio station, say a 2-meter hand-held radio, with another hand-held 10,000 miles away through a gateway or teleport in the vicinity of the hand-helds. Let's look at ways of trunking terrestrial packet networks into a global network. Let's consider how we might address emergency voice bulletins to a large portion of the Amateur community through thousands of repeaters across the country using an alert broadcast code and selective addressing from the next-generation OSCARs. Let's see what we can achieve with the latest in digital TV and compression techniques in a new amateur context. Most important, however, let's look at ways of making the next generation of OSCARs truly justify not only themselves in terms of intrinsic merit, but rather in terms of service they can provide to the public. *That* spells revolution, not evolution!

Next month, we'll take a look at the transponders and communications possibilities of the next-generation satellite, Phase 4.

Strays

I would like to get in touch with ...

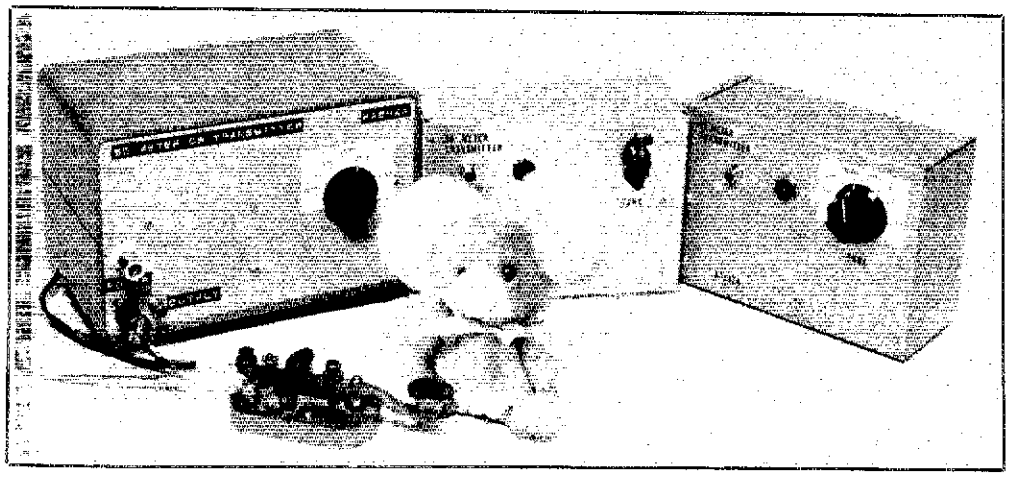
☐ anyone with information on converting a Cobra 148GTL SSB CB set for amateur use on 10 meters. Dave McGee, N3AFH, RD 1, Box 79A, Hopewell, NJ 08525.

☐ anyone with a manual/schematic for a Conar VTVM, Model-211. John Gercken, KA9EPO, RR 1, Box 27, Bellflower, IL 61724.

☐ any hams interested in railroads and locomotives, from HO to O27 to LGB. Ed Lamb, Jr, WB6JBJ, 2111 Orange St, Highland, CA 92346.

☐ anyone with information on the origin of the Farnsworth method of sending slow-speed CW. Bill Fisher, W2OC, 2 Barnard Rd, Armonk, NY 10504.

Three Fine Mice—MOuSeFET CW Transmitters



Got a hankerin' to build a simple CW transmitter that's a real performer? Take your pick—one or all—for 80, 40 and 30 meters. They're VFO controlled, too!

By Michael J. Masterson, KA2HZA
7 Hudson Rd
Budd Lake, NJ 07828

The availability of low-cost power MOSFETS (they're not really MOuSeFETs!) creates new possibilities for "homebrew" transmitter design. For several years, I have used various RF bipolar transistors, all priced in the $12 to $16 range, in homebrewed CW transmitters. They performed well, but when I found inexpensive switching MOSFETS priced at $1 to $2, I thought: "Why not give them a try?" The low-cost devices seemed to be a painless (to the pocketbook) way to determine the MOSFET's potential and how to tame it for use at RF. Since I'd lost a few RF bipolar transistors while learning how to use them, I knew certainly that a few MOSFETS would be "cooked" before I found the right circuit. I selected 80 meters as the test band, and eventually built transmitters for 30 and 40 meters.

Technical Approach

From articles I reviewed, it was apparent that the majority of MOSFET transmitter circuits use a 24-V, or greater, drain potential and most use RF-characterized device types. Because RF power MOSFETs are priced too high for this learning effort, my objective was to obtain at least 10 W output from a switching MOSFET operating from a 12-V supply.

Different circuits employing heavy gate swamping, RF feedback, drain loading and even the common-drain configuration were tried.

So, I did a lot of computer modeling, experimentation and article review. Different circuits employing heavy gate swamping, RF feedback, drain loading and even the common-drain configuration were tried. Some of these circuits looked promising—for a while. But, just as a circuit seemed to provide sufficient gain, the device would be destroyed by gate breakdown, not excessive dissipation or thermal runaway. I discovered that some form of gate protection is required, along with capacitive drain loading. Apart from the final amplifier, the remainder of the transmitter uses a proven transistor lineup from a previous design.

Circuit Description

Fig 1 is the schematic diagram of the transmitter. Frequency dependent parts information is given in Tables 1 and 2. The transmitter power chain is straightforward and is divided between two boards. (All transmitters use the same PC boards.) The VFO board contains Q1, an FET VFO, buffer Q2 and the balanced doubler composed of Q3 and Q4. D4 provides power-supply regulation for Q1. The 80-meter transmitter uses a Hartley VFO; it's a simple circuit and keeps the inductance of L1 at a reasonable value. A series-tuned Clapp oscillator with the inductor wound on an air-core ceramic form (for stability) is used in the 30- and 40-meter transmitters. Balanced doubler Q3-Q4 gets its drive from the bifilar winding on T1. The transistor collectors are tapped down on T2 for optimal output. T2 is tuned to the operating frequency, twice the VFO frequency.

The VFO runs continuously. When

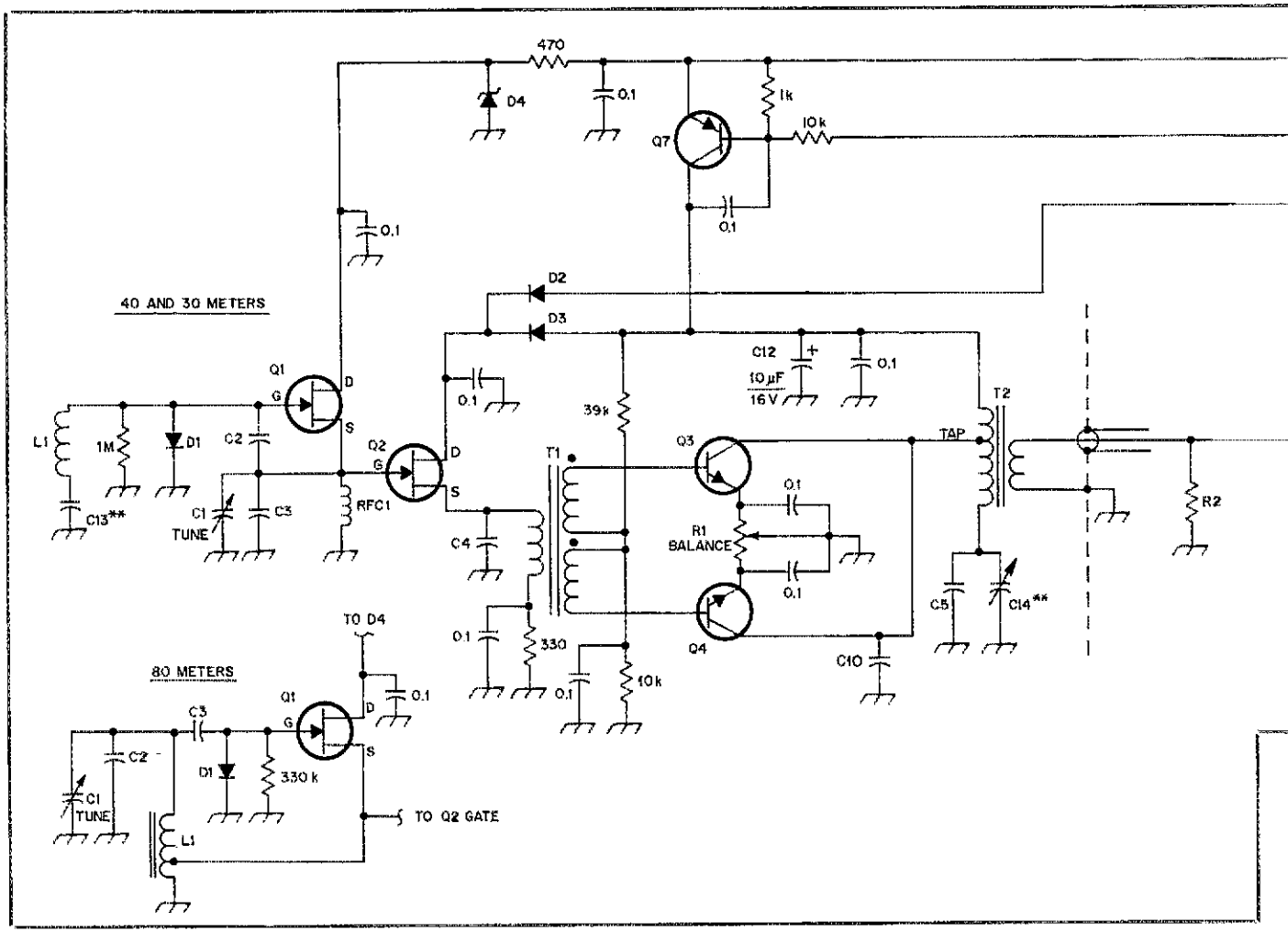


Fig 1—Schematic diagram of the MOuSeFET low-power transmitter. The 80-meter VFO is shown in the inset drawing. Refer to the parts list and Tables 1 and 2 for parts values not shown on the diagram. All 0.1-µF capacitors are 25-V X7R or Z5U ceramic types. All resistors are ¼- or ½-W, 10% tolerance acceptable.

C11— 47-µF, 16-V electrolytic or tantalum.
C12— 10-µF, 16-V electrolytic or tantalum.
D1-D3, incl— 1N4148.
D4—8.2-V, 400-mW Zener diode (1N959 or equiv).
D5—13-V, 400-mW Zener diode (1N964 or equiv).
FB—2t no. 28 enameled wire on FB-43-101 ferrite bead.
J1—Amphenol 126-011 jack (or equiv).
J2—Phono jack.
P1—Amphenol 126-010 plug (or equiv) for power cable.
Q1, Q2—MPF102 (see text).
Q3, Q4—2N3904 (see text).
Q5—2N3053 (see text).
Q6—80M, IRF 523; 40 m and 30 m, IRF510.
Q7—2N3906 or 2N2907A.
R1—500-Ω, 1-turn trimmer potentiometer.
RFC1—100-µH RF choke on phenolic form (Miller 4642 or equiv).

spotting, the buffer and doubler stages are keyed. The driver and final amplifier stages are on only during transmit when +12 V is applied at J1-E through an external TR switch. C12 provides some keyed wave-shaping, and R1 is an adjustment for doubler balance. C10 ensures stability at this stage, but it may not always be necessary. Measured VFO-board output is in the order of 60 mW. Improved keyed-wave shaping using a time-delay circuit was devised by Zachary Lau, KH6CP, of the ARRL Lab. That circuit employs a general-purpose PNP transistor, Q7, to moderate the otherwise fast rise time of the keyed wave. This addition also allows one side of the key to be grounded.

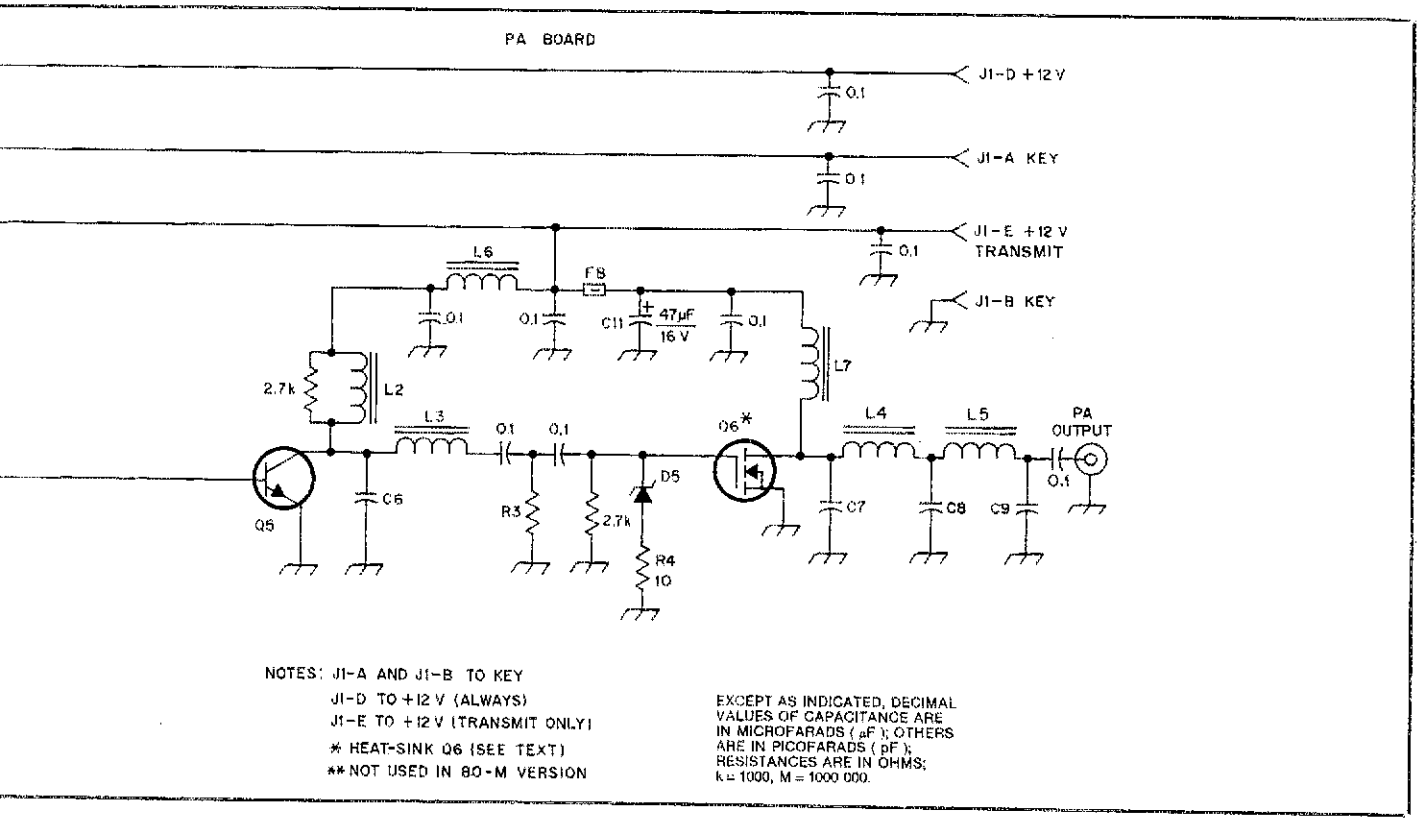
Q5, a 2N3053 operating class C, and Q6, an International Rectifier IRF type MOSFET also operating class C, comprise the power-amplifier chain. Q5 delivers about 1 W through an L network to Q6's gate circuit.

A power MOSFET's gate circuit is quite different from a bipolar power amplifier's base circuit. D5 provides two functions: It protects Q6 from excessive gate voltages and acts with C11 to provide a "grid-leak" action. During the negative half-cycle, D5 conducts and charges C15; during the positive half-cycle, C15's charge is added to the RF drive to supply a maximum of 15 V gate potential. Power MOSFETS have a high input resistance, but do require drive during switching. This is because of gate-source and gate-drain (Miller) capacitances. Gate-loading resistor R3, and drain-loading capacitor C7, augment stability as verified on a computer-aided design program. R4 limits the power dissipated in D5.

L4, C8, L5 and C9 form an L-pi output network (a pi-L in reverse). The L section matches the 5-ohm drain impedance of Q6 to a 100-ohm image impedance with a Q_L of 4.35. A pi network with a Q_L of approximately 2 then takes the 100-ohm image impedance down to 50 ohms. This type of network is less critical to tune than a T network for a given amount of harmonic suppression. At a nominal power output of 16 W, the second harmonic is 45 dB down; other harmonics are at least 60 dB down. (This performance was verified in the ARRL Lab.) The power level you obtain may be somewhat greater on 80 meters and less on 30 meters.

Component Notes

Most components used in this project are



widely available from radio component stores, hamfests or mail-order distributors. A & A Engineering is a one-stop source for boards and parts for this project.[1] The devices recommended for use at Q1 and Q2 are not difficult to find, and a 2N4416 or 2N3823 may also be used. Q3 and Q4 should be matched for current gain, or at least originate from the same production lot. A match of 50% or better (at I_c = 10 mA) will suffice. A 2N2222A can be used at Q3 and Q4, and candidates for Q5 include the 2N2102 or D42C4; good results were obtained with the D42C4 at 80 meters. I purchased the MOSFET (Q6) from Frank, K2AW, at a hamfest table.[2] Motorola, RCA, GE, GI and other manufacturers make IR equivalents.

The toroidal inductors are available from Amidon or Radiokit.[3,4] All coils are wound with no. 28 enameled wire. After the VFO is built and tested (see tune-up and operation), hold the L1 windings in place with a thin layer of glue. L4 and L5 are wound with two paralleled wires to effectively increase the wire size and reduce copper losses. (These are *not* bifilar windings! You may optionally use a larger wire size instead.) Except where noted, capacitors are X7R or Z5U ceramic types. These are used for bypassing and decoupling functions, but not in tuned circuits. C2 and C3 are specified as NP0 ceramic units for excellent temperature stability. C4 through C10, inclusive, can be polystyrene, silver-mica or NP0 ceramics. Do not use X7R or Z5U ceramic capacitors here—degraded performance can result. Polystyrene capacitors work well in this circuit, and are compact compared to mica or NP0 ceramic types. Use caution when soldering polystyrene capacitors because excessive heat will melt the plastic.

Construction

The transmitter may be housed in any

Table 1

Frequency Dependent Capacitor and Resistor Values

Capacitor Number	*80 M*	*40 M*	*30 M*
C1	25-pF air var	35-pF air var	35-pF air var
C2	450 pF (9 × 50 pF N)	1000 pF P	940 pF (2 × 470 pF P)
C3	50 pF N	470 pF P	600 pF (6 × 100 pF N/P)
C4	200 pF (2 × 100 pF N/P)	100 pF N/P	100 pF N/P
C5	200 pF (2 × 100 pF N/P)	100 pF N/P	50 pF N/P
C6	1000 pF P	470 pF P	330 pF P
C7	3300 pF P	1000 pF P	400 pF (4 × 100 pF N/P)
C8	2700 pF P	1410 pF (3 × 470 pF P)	1000 pF (10 × 100 pF N/P)
C9	1100 pF P	700 pF (7 × 100 pF N/P)	400 pF (4 × 100 pF N/P)
C10	50 pF N/P	50 pF N/P	
C13	Not used	250 pF (5 × 50 pF N)	250 pF (5 × 50 pF N)
C14	Not used	60-pF trimmer	60-pF trimmer

N = NP0 ceramic; P = polystyrene; N/P = NP0 ceramic or polystyrene. Silver-mica capacitors can be substituted for the polystyrene types.

Resistor Number	*80 M*	*40 M*	*30 M*
R2	47	68	68
R3	22	33	33
R4	10	10	10

[1]Notes appear on page 24.

sturdy, shielded enclosure. An 8 × 5 × 5-inch (LWD) cabinet provides more than enough room; even a 7 × 5 × 3-inch box, such as the LMB 782, is of ample size. The two circuit boards measure about 2 × 3 inches each, the VFO board being slightly larger than the PA board. A single-sided PC board (or perfboard and flea clips, if desired) is used for the VFO. This board can be installed in a box to shield it from the PA board, but no ill effects were found without the shield. If you elect to shield the VFO, C1 should be installed in the VFO box, and the larger transmitter cabinet used. Short, stiff leads from C1 to the VFO board are important for mechanical stability. Figs 2 through 5, inclusive, show the exterior and interior views of two of the three prototype transmitters. The 80-m transmitter (Figs 2 and 4) was the first unit built. Figs 3 and 5 are views of the 40-m unit.

The power amplifier PC board is double-sided, with one side left unetched. Copper foil or braid is used to provide low-inductance wraparounds to ground. Solder the foil to both sides of the board. Alternately, plated-through holes can be used in place of wraparounds. Solder all other components to this board prior to installing Q6. Cut the leads of Q6 to a length of 0.3 inch, and mount the transistor at the board edge. Insulating hardware for Q6 consists of a kapton or mica insulator, nylon washer and spaghetti sleeving for the metal bolt. Heat-sink grease is thinly applied to both sides of the insulator. (Too much grease impairs heat transfer.) The PA board and Q6 are bolted to the front panel, which acts as a heat sink. The leads of Q6 must not be stressed, so shim the PA board with metal washers if necessary. A small, clip-on heat sink will help Q5 dissipate heat.

Table 2
Frequency Dependent Inductance Values

Inductor Number	*80 M*	*40 M*	*30 M*
L1	14.5 μH 60t on T50-6, tap at 14t	14.1 μH 40t on 3/8-in-dia ceramic form	7 μH 35t on 3/8-in-dia ceramic form
L2	13t on FT-37-61	9t on FT-37-61	9t on FT-37-61
L3	19t on T50-2 (1.8 μH)	12t on T50-6 (0.5 μH)	9t on T50-6 (0.33 μH)
L4[1]	15t on T50-6 (0.9 μH)	10t on T50-6 (0.43 μH)	8t on T50-6 (0.3 μH)
L5[1]	22t on T50-2 (2.8 μH)	15t on T50-2 (1.2 μH)	13t on T50-6 (0.9 μH)
L6	11t on FT-37-61	10t on FT-37-61	9t on FT-37-61
L7	11t on FT-37-61	9t on FT-37-61	6t on FT-37-61
T1	pri: 18t on FT-50-61 sec: 9 bifilar turns	pri: 16t on FT-50-61 sec: 8 bifilar turns	pri: 12t on FT-50-4 sec: 10 bifilar turns
T2	pri: 40t, tap at 20t[2] sec: 7t on T50-2	pri: 26t, tap at 11t[2] sec: 5t on T50-2	pri: 22t, tap at 10t[2] sec: 4t on T50-2

All inductors wound with no. 28 enameled wire.
[1]L4 and L5 are wound with two parallel lengths of no. 28 enameled wire; this is done to increase the effective wire size. These are *not* bifilar windings.
[2]Tap measured from C12 side of primary.
Powdered-iron toroids (T50-6 and T50-2) and ferrite toroids (FT-37-61 and FT-50-61) are available from A & A Engineering, Amidon Associates or Radiokit (see notes 1,3,4). Ferroxcube 3/8-in 4C4 and 1/2-in 4C4 ferrite toroids may be substituted.

Tune-Up and Check-Out

With the exceptions of C1 and C14 (if used), there are no other variable capacitors in the transmitters. All tune-up is done by adding or removing turns on the toroidal inductors, and by compressing or expanding the windings. This may take some time and patience, but it results in compact construction without the need for large trimmer capacitors. Start with one or two extra turns on L1, the primary of T2, L3, L4 and L5, and remove turns as required during tune-up.

First, adjust the VFO tuning range by listening to its output with a calibrated receiver or coupling a frequency counter to the VFO output. (If your frequency counter is not sensitive enough, you'll have to use a receiver initially.) Set R1 at midrange and apply +12 V to J1-D, with a key across

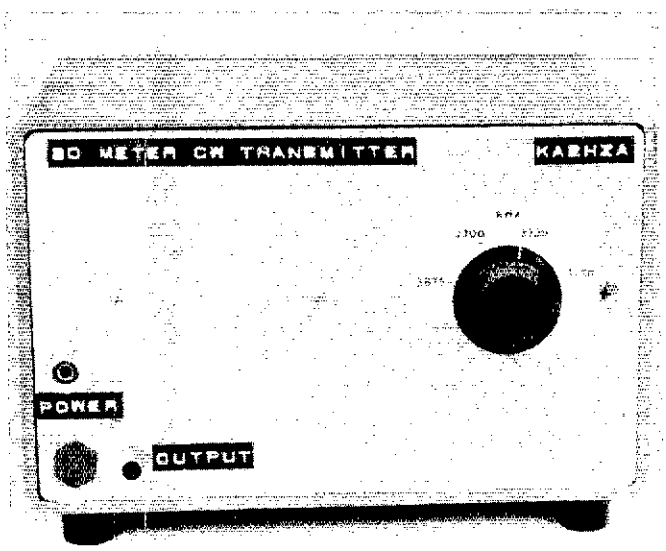


Fig 2—An 80-m transmitter was the first unit built. The enclosure was salvaged from a piece of defunct test equipment.

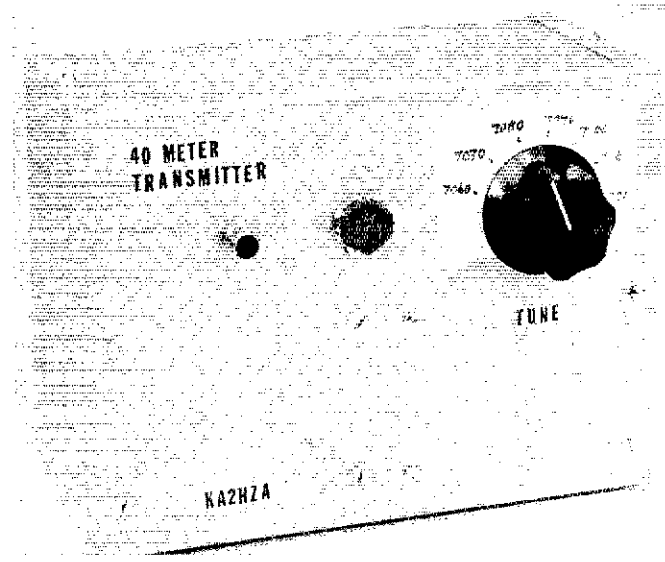


Fig 3—This 40-m unit is constructed in a readily available aluminum box. The 5-pin connector serves as a key and power-input jack.

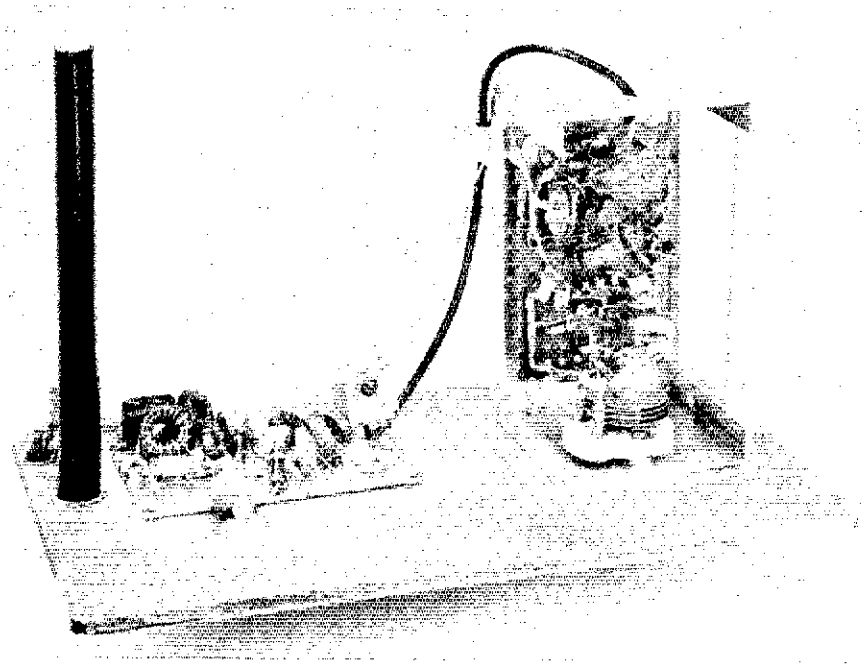


Fig 4—A close look at this inside view of the 80-m transmitter reveals the VFO is built on perf board. Note the shielded VFO enclosure (cover removed). To the left is the driver/output board. Q6 may be seen in the foreground attached to the heavy front panel.

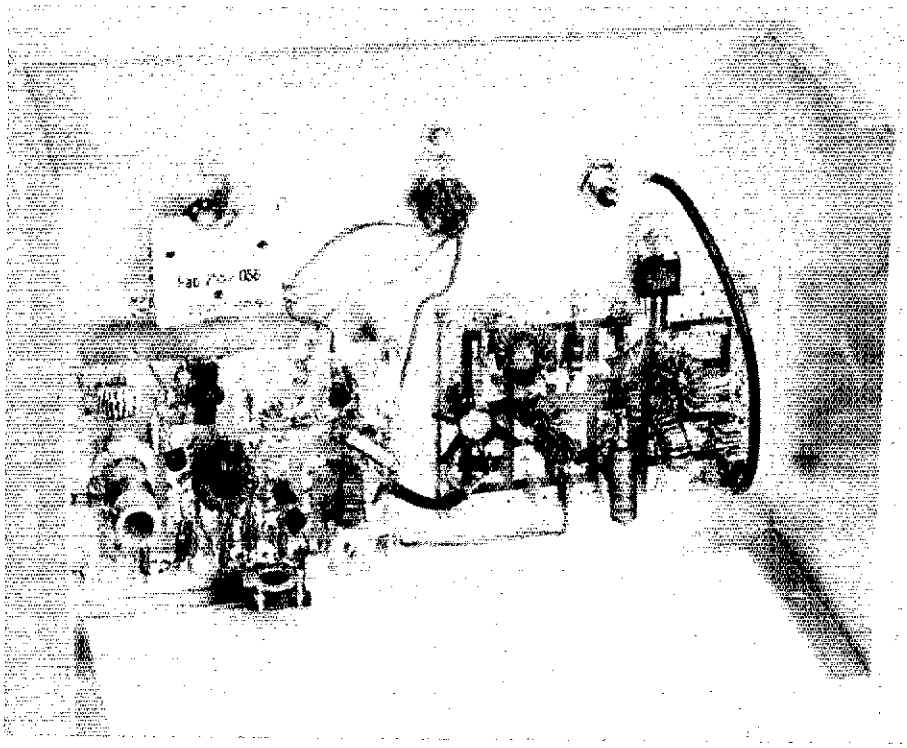


Fig 5—An inside view of the 40-m unit. PC boards from A & A Engineering were used in this model.

J1-A and J1-B. Adjust L1 for the desired band coverage, as you vary C1. Next, set C1 to mid-band and adjust the primary of T2 (80 meters) or C14 (30 and 40 meters) for maximum output as indicated on a sensitive power meter connected to VFO output. If C14 does not allow you to tune through a maximum output point within its range, adjust the primary of T2 until it does. Using a wave or dip meter, sense around T2, and set R1 for minimum fundamental feedthrough (that is, 1.8 MHz on 80 meters, 3.5 MHz on 40 meters and 5 MHz at 30 meters). You should notice a setting of R1 where the fundamental nulls out. Then, disconnect the power meter and connect the VFO output to the PA input using a short length of coaxial cable.

Next, connect an RF power meter to J2 and apply +12 V to J1-D and J1-E. Keying the transmitter briefly, adjust L3, L4 and L5 for maximum output. Go back and adjust the primary of T2 (80 m) or C14 (30 and 40 meters) to peak the output reading. Again, adjust L3, L4 and L5 if necessary to maximize output power. At this point, you should have 12 to 20 W of RF output. (With or without parts substitutions, your results may vary from mine because of construction or other differences. Prior RF-circuit building experience should help you correct any problems.) Finally, adjust R1 for minimum fundamental feedthrough as heard on a receiver. Again, a null should be found. Set the receiver to the transmitter's output frequency and reduce the receiver RF gain. Key the transmitter. The transmitted note should sound clean, with no chirp or clicks. Check the heat dissipation of Q6; if it is too hot to touch, it may not be heat-sinked properly. No stability problems were noted in my units; however, a check-up on a spectrum analyzer would help determine if any excessive spurious signals exist. I performed the tune-up as described here without the use of a spectrum analyzer, but if you have access to one, use it!

. . . you should have 12 to 20 W of RF output

On the Air

Operation is simple. Use a Transmatch and a resonant antenna. I recommend that you use a 12-V regulated power supply capable of delivering 2.5 A. In my receiver, provision is made for off-the-air monitoring. During receive, key the VFO to spot your operating frequency. External TR switching should remove the voltage from J1-E during receive. While transmitting, monitor your off-the-air signal instead of using a sidetone. No hint of thermal runaway has been noted, and the transmitter sustained no damage with high SWR loads. With the values of C1 given,

No hint of thermal runaway has been noted, and the transmitter sustained no damage with high SWR loads.

frequency coverage is about 100 kHz on 80 m, 60 kHz on 40 m, and all of 30 m.

Summary

The on-the-air performance of these little rigs is quite satisfactory. Using a folded dipole on 30 meters, TK5, IV3, G, F, FG and North America have been worked. Results on 80 m (using a random-length wire antenna) are good from Southeast to Midwest states and Canada. I have been too busy (and having fun) building these rigs to get on 40 m, so it is up to you to find out how one of these MOuSeFET transmitters will perform on that band! Though they're small, they pack quite a bite!

Acknowledgments

I offer my sincere thanks to Herb Englemann, W2VIE, and Mike Kucks, KA2ZAM, of KDI Electronics for use of lab facilities; the use of the KDI Electronics facilities was invaluable to the design effort. My thanks also to my wife, Dawn, for her encouragement during this project.

Notes

[1]A & A Engineering, 2521 W LaPalma Ave, Unit K, Anaheim, CA 92801, tel 714-952-2114.
[2]K2AW's "Silicon Alley," 175 Friends La, Westbury, NY 11590.
[3]Amidon Associates, 12033 Otsego St, North Hollywood, CA 91607, tel 213-760-4429.
[4]Radiokit, PO Box 411, Greenville, NH 03048, tel 603-878-1033.

Michael Masterson first obtained his Technician license in 1970 as WB2MQZ, upgrading to Advanced class in 1981. He is a Life member of the ARRL and secretary of the West Morris Wireless Society, where he also teaches theory classes. Mike holds a Bachelor of Engineering from Stevens Institute of Technology and an MS in Electrical Engineering from New Jersey Institute of Technology. Mike is employed by KDI Electronics as an RF/microwave engineer, developing ICs and other devices for use at microwave frequencies. He operates his homebrewed HF station on CW in the 80-15 meter bands, using folded-dipole antennas. Mike's other interests include hiking and sailing with his father. QST

Season's Greetings

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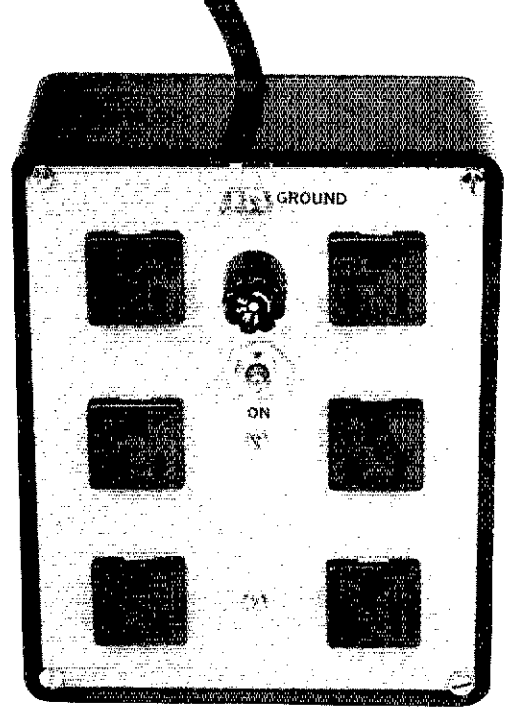
• *Under Construction*

A Ham-Shack AC-Outlet Strip with Filtering

Part 14: Combine ac outlets, transient suppressors and an ac-line filter in one package to provide a handy radio-room accessory. This project is great for computer users, also.



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

Have you priced quality ac-outlet strips recently? Ouch! The prices range from $15 to $40, depending on the brand and features. I have needed an additional outlet strip for several months, but owing to my reluctance for spending dollars needlessly, I held back on buying a commercial unit. While browsing through the pages of a surplus catalog recently, I found most of the components I needed to build a nice outlet box, so I ordered the parts.[1] This article discusses some added features I elected to include in the box, along with the practical details of my homemade assembly. Perhaps this is the type of weekend project you have been looking for. If so, read on!

Why Include RF Filtering?

A well-equipped shack includes an RF ac-line filter. This circuit is commonly called a "brute-force line filter." What will it do for us? Well, the filter will help prevent RF energy (originating in the transmitter) from flowing in the ac service, where it can be piped into digital clocks, hi-fi gear and TV receivers. In other words, if we keep the RF currents out of the ac line we will minimize RFI and TVI at home and in the immediate neighborhood. There is a reverse benefit we may enjoy: A line filter will aid in keeping unwanted RF energy from entering our receivers via the ac line. Some TV-receiver energy may, for example, be prevented from migrating into the station receiver along the ac line.

If you own a computer, an ac-line filter will help to keep disruptive RF energy from entering the computer, and it will help to keep computer hash from entering your receiver through the power circuit. Here we have the same two-way street mentioned earlier in connection with TVI and RFI.

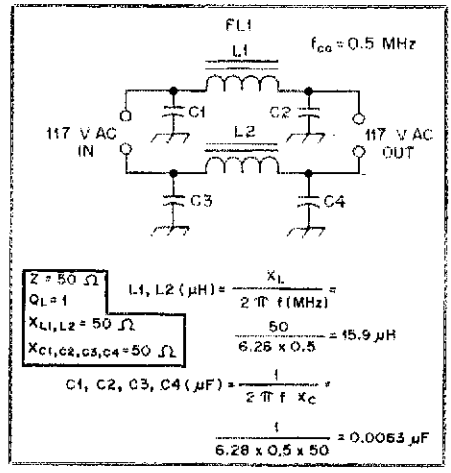


Fig 1—Circuit of a pi-network low-pass filter for use in 50-ohm lines.

Simple Line Filters

In basic design terms, an ac-line filter consists of two pi-section low-pass filters. This is illustrated in Fig 1. A pi network is inserted in each side of the ac line, as shown. In bygone years we amateurs wound our filter coils on pieces of broomstick, varnished toilet-tissue rolls, or whatever could be dredged up for the occasion. As a consequence, the coils were pretty large, and a substantial amount of wire was needed to provide sufficient inductance to ensure filtering well below the amateur bands. A typical approach was to use many turns of wire and randomly chosen capacitor values, such as 0.01 μF. The design was anything but scientific! The penalty was often a voltage drop through the large coils, coil heating (depending upon the current passing through the coils) and charred coils. Magnetic core material can be used to obtain high-inductance coils with only a few turns of wire. The filter in this month's project contains ferrite rods as cores for the inductors. Only 20 turns of no. 14 wire are required (½-inch ID) to satisfy the inductance requirements of 15.9 μH.

All filters should be terminated in their characteristic impedances, and these filters are designed for that terminal impedance. If this is not done the filters will not perform correctly. What is the ac-line impedance? In a sense this is a rather indefinite proposition. The impedance depends upon the gauge of the ac-line conductors and the center-to-center spacing between them, as is true of any two-wire transmission line. For the most part, house wiring ranges from 50 to 100 ohms if you calculate the impedance. I have chosen an arbitrary 50-ohm characteristic for the line when designing a filter. It seems to work fine for me.

The filter in Fig 1 is based on an impedance of 50 ohms. I chose a cutoff fre-

[1]Notes appear on page 27.

quency of 500 kHz and a loaded Q (Q_L) of 1. The equations for finding the inductance and capacitance of this filter are included in Fig 1. Our filter calls for 15.9 μH of inductance and 0.006 μF of end capacitance for 500-kHz roll-off. These values are not critical, provided we use component values within plus or minus 10% of the target value. Disc-ceramic capacitors are suitable for C1-C4, inclusive. They should have a voltage rating of at least 1 kV to ensure leeway for line surges. I used some 0.0056-μF, 1-kV capacitors that were on hand. You may obtain 1-kV disc-ceramic capacitors from Mouser Electronics.[2] Suitable values may be placed in parallel to obtain a value that approximates 0.006 μF.

Greater effective filtering would be possible by placing in series two of the filters of Fig 1. For most applications this elaboration is unnecessary. But for difficult interference problems, it will be helpful to use double-section filtering.

Spike Suppression

MOVs (metal-oxide varistors) are useful in the suppression of momentary spikes or voltage peaks on the ac line. Such unwanted voltage peaks may occur when an appliance motor is switched on and off. The collapse of the electric field in the motor winding can cause a high-level spike of short duration. Devices external to our homes may also cause high peak voltages that follow the ac line into our houses. Computers are especially affected by line transients, which can erase the data in a computer memory or cause permanent damage to the ICs. The placement of MOVs across the 117-V ac line will level these momentary surges and protect the otherwise affected equipment.

MOVs are rated for a maximum safe sinusoidal RMS voltage, transient-energy capacity in joules, peak pulse current in amperes and average power dissipation in watts. If the line-voltage peak amplitude and the duration of the spike exceeds the MOV ratings, the MOV will be destroyed. In this project, I used Radio Shack 276-570B (ERZC14DK201U) MOVs. Similar MOVs are available from other sources. They are rated for an applied voltage of 130, 35 joules, 4500 A peak and 0.6 W. There are heftier, more expensive MOVs, such as the GE V130PA10A, also rated for 130 V RMS and 10 joules, but at 4000 A peak and 8 W. Equivalent MOVs from other manufacturers are suitable, should your GE dealer not have the specified unit in stock. Fig 2 shows the MOVs across the ac line. The internal element of the MOV is a resistor that changes value in accordance with the current through it, hence the name varistor. The higher the current through it (from a voltage peak), the lower the internal resistance. This action suppresses the momentary voltage peak.

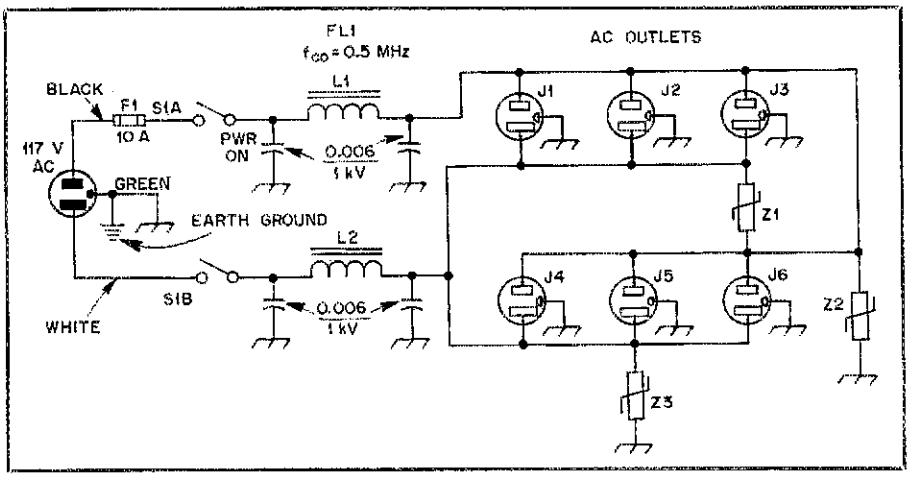


Fig 2—Schematic diagram of the filter/outlet box. J1-J6, inclusive, are three-terminal female ac sockets. Three standard, dual ac outlets for home use may be substituted. This will require a different layout than that of Fig 4. L1 and L2 are wound on Amidon Assoc ferrite rods, no. R61-050-200, 125 μ_i. See text for winding information. The 0.006-μF capacitors are 1-kV disc ceramic (see text). MOV (Z1-Z3) information is provided in the text. S1 is a DPST toggle switch.

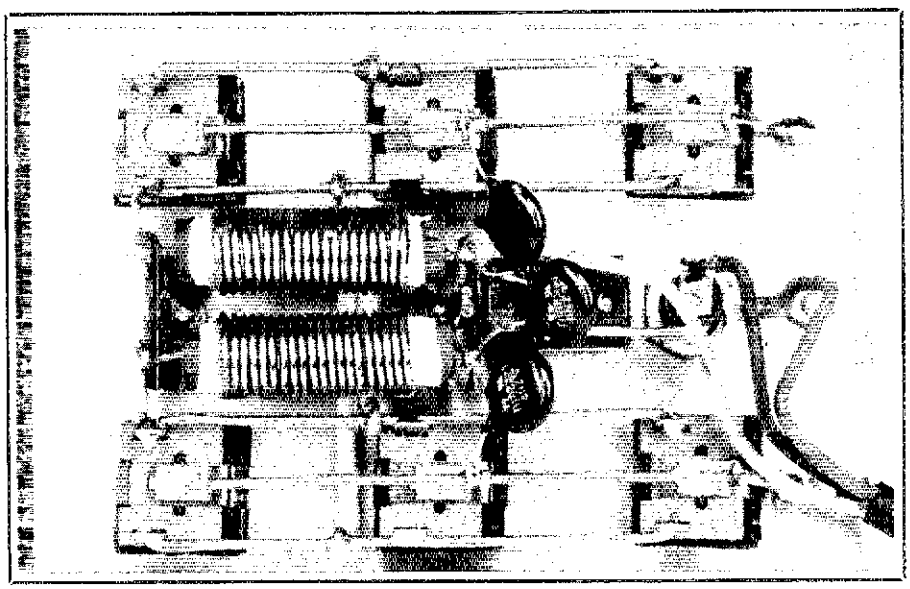


Fig 3—An inside view of the cover/chassis on which the circuit is built. No. 14 bus wire is used to join the like terminals of the ac sockets. The filter network is visible at the center of the assembly.

This Month's Project

Fig 2 contains a schematic diagram of the outlet strip or box. There are six female receptacles for the station equipment. A three-wire ac-line cord (no. 18 conductors) is used to connect the box to a wall outlet. Note that the color coding of the line cord is given in order to ensure that the polarized female sockets (J1 through J6) are wired correctly. Safety first! The green wire is the ground connection.

F1 is a 10-A standard fuse. I prefer to use a push-to-reset circuit breaker in lieu of a fuse, but at the time I built this project I was unable to locate such a device. You may wish to use a circuit breaker in place of the fuse and fuse holder seen in Fig 3. Note that the fuse is placed in series with the hot (black) lead of the line cord.

Each side of the ac line is filtered by means of L1, L2 and the four bypass capacitors (Fig 2). The six ac sockets follow the filter, FL1. You may use additional sockets if your station requirements dictate the use of more outlets.

Construction Details

An inner view of the outlet box is shown in Fig 3. With the layout shown, straight runs of no. 14 solid copper wire may be used to join the female receptacles. I used standard vinyl-covered house wire after removing the insulation. The bus that joins the ground terminals of the sockets is soldered at one end to the PC-board face plate. I used double-sided PC-board

material for the box cover/chassis. There is no reason why an aluminum plate may not be used instead of the PC-board chassis.

FL1 of Fig 2 is nestled between the rows of ac sockets. L1 and L2 are supported by a pair of three-lug terminal strips. The end capacitors are soldered between the outer lugs and the grounded center lug of each terminal strip.

Be sure to observe the ac-socket polarity when wiring the two rows of outlets in parallel. Specifically, ensure that the wide socket slots are joined and that the smaller slots are common to one another. I used short pieces of insulated no. 14 house wire for joining the two rows of sockets (insulation not removed). One MOV is wired from each side of the ac line (hot and neutral) to ground, and another across the hot and neutral leads.

The female sockets I used were purchased for 50 cents each from the supplier in note 1. They are snap-in receptacles that require a 1-inch-square hole. I made the holes with a hand nibbling tool, but you may use a hobby saw for making the holes. Fair warning—you may develop a blister between your thumb and forefinger while cutting the six holes with a nibbling tool. I did!

A drilling-and-cutting template is provided in Fig 4. The no. 8 hole at the left center of the sketch is for the earth-ground connection post. I used a ½-inch, no. 8-32 screw for this purpose. A solder lug is held in place by this screw on each side of the chassis. The top (outer) lug is for the ground connection, and the inner lug is for the green wire of the ac-line cord. Two ½-inch holes are drilled to the right of the no. 8 hole. These accommodate the fuse holder and the power switch, S1. Farther to the right are two no. 6 holes. These are used to mount the three-lug terminal strips on the inner surface of the box cover/chassis.

My cover measures 5 × 6½ inches to permit its use with a surplus Bakelite® meter case I obtained from the supplier in note 1. The box height is 2¼ inches. A variety of different enclosures are suitable. In fact, you may construct a box from sections of PC board. The corners of the box cover in Fig 4 have no. 8 holes. The meter case requires no. 6 screws at the corners. I made the holes slightly larger than no. 6 in order to allow for misalignment of the corner holes: I am not a craftsman when it comes to accurate pattern layout!

The ac-line cord enters the box at one end of the enclosure, near the box bottom. A cable clamp is mounted just inside the box where the line cord enters. This clamp holds the line cord firmly in place. A plastic line-cord retainer may be used if you can find one that has the proper inside diameter for the cord you use. If this is done, the metal cable clamp may be omitted.

I used gray automotive primer paint on the outer surface of the chassis/cover. After the two press-on decals were applied, I sprayed the cover with clear Krylon® lacquer. Be sure to do this before mounting the parts and wiring the circuit. Otherwise, you may get lacquer inside the ac outlets, and that would be bad news, indeed.

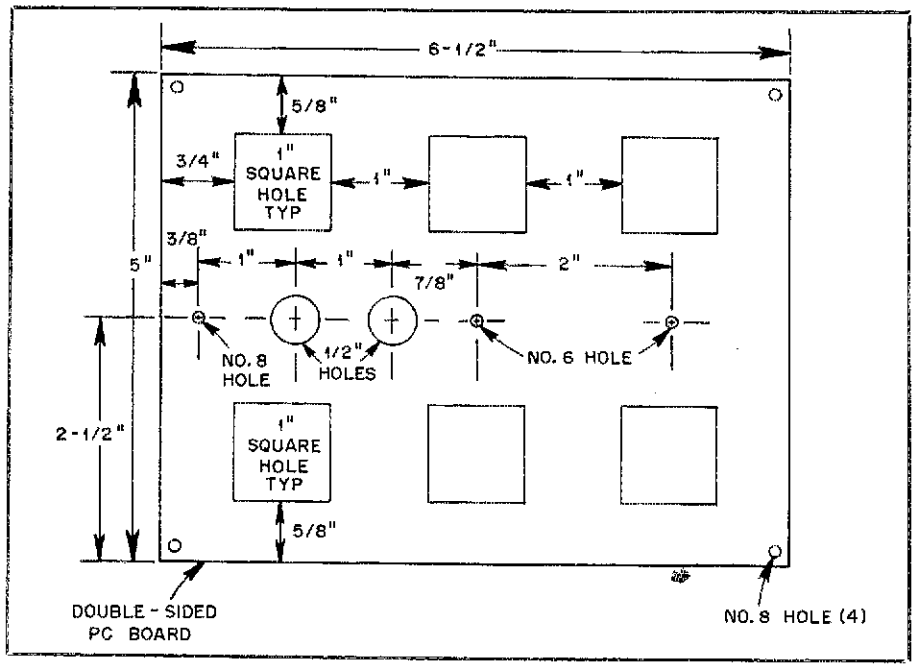


Fig 4—Hole template (not to scale) for the chassis of the outlet box. The square ac socket holes are for Hosfelt receptacles (see note 1).

Winding the Filter Coils

The inductors of Fig 2 (L1 and L2) are wound on Amidon Assoc ½- × 2-inch ferrite rods. The cores are first wrapped with two layers of Teflon® plumber's tape to insulate the windings from the cores. No. 14 formvar-insulated wire is used for the coils. Center the coils on the rods, then run a strip of epoxy cement along the coils and rod to affix the coils in position. If you use 20 turns of wire, close wound, on each core, the inductance will be the required 15.9 μH. The core permeability is 125.

Closing Comments

I neglected to include an on-off indicator light for the outlet box. Should you desire an indicator light, you may wire an LED between the normally open switch contacts where L1 and L2 connect. A 15-kΩ, 2-W resistor must be wired in series with one side of the LED. Typical LED voltage is 1.5, and the LED current should not exceed 8-10 mA. Alternatively, you may use an NE-2 neon lamp with a 47-kΩ resistor in series with one side of the lamp.

A project of this type has almost universal use among amateurs, computer enthusiasts and hi-fi buffs. Perhaps it will provide you with a few hours of workshop pleasure. At least the cost should be modest—especially if you're a skilled surplus/flea market scrounger.

Notes

[1]Hosfelt Electronics Inc, 2610 Sunset Blvd, Steubenville, OH, tel 800-524-6464; a catalog is available.

[2]Mouser Electronics, 11433 Woodside Ave, Santee, CA 92071, tel 619-449-2222; a catalog is available.

The Flasher

Add some pizzazz to your didahs! Amaze and amuse your shack visitors with this very sophisticated technical-display project.

By George Murphy, VE3ERP
ARRL Contributing Editor
Box 759, 275 Victoria St E
Alliston, ON L0M 1A0, Canada

If I have a visitor in the shack while I am bashing out CW and wearing my SuperSonic Lamb's-Wool-Lined headset (so only I can hear my rotten fist on the monitor), my visitor cannot hear or see anything happening, so he generally heads for the refrigerator. This constant drain on my supply of suds LED me to develop some visual aids for my visitors. These are flashing LEDs that keep up with my keying. Even if you never have any visitors, no ham shack should be without flashing lights that look like they're doing something important.

The Flasher Concept

As you will see from the accompanying highly technical and complicated schematics, the Flasher is a device that can be hooked up easily to any key or keyer, as long as the key or keyer is designed to ground something, which most of them are. From there on, because the rest of the circuit doesn't really do anything, you can go "hawg wild." Further on in this article, I'll suggest some interesting places to mount the LEDs.

Circuit Description

In the circuits shown, V_{in} is whatever dc voltage your keyer runs on, or in the case of Fig 1, whatever you happen to have handy. The LEDs (except for the tricolor job in Fig 5) are any typical 2-V, 20-mA type from Radio Shack or your local junk box. The values of the voltage-dropping resistors for the LEDs can be determined by the formula

$$R = \frac{V_{in} - 2}{0.02}$$

Using standard-value resistors, this works out to 470 or 560 ohms at V_{in} = 12, 330 or 390 ohms at 9 V, and 180 or 220 ohms at 6 V.

Fig 1 shows the Flasher wired to a hand key. This is for old-timers only. Who else uses a hand key? Figs 2 and 3 show how to hook up a Flasher to an electronic keyer.

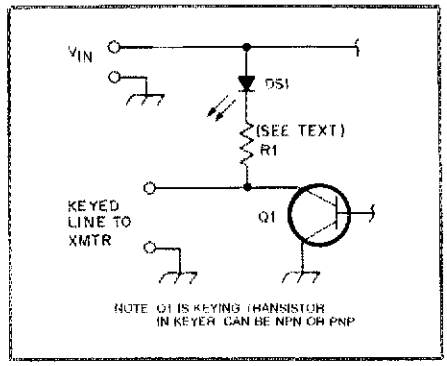


Fig 2—Single-color LED Flasher connected to an electronic keyer. Q1 is the keying transistor in the keyer.

Q1 is the keying transistor in the keyer, but you can ignore it. Connect your Flasher to the ungrounded terminal of the keyed line jack. By poking around a bit, you should also be able to locate the terminals of the keyer paddle—that's where you connect the other Flasher wires. Probably the best place to hook into V_{in} is at the ON/OFF switch in your keyer.

In Figs 1 and 2, the LED blinks along with your keying, giving off short and long flashes. In Fig 3 we get *flashier*, using two LEDs, with one flashing dots only and the other dashes only. In this case you add Q2, which is keyed along with the rig, turning on whichever LED is grounded by the keyer paddle at the time.

If you want to go hi-tech, try an XC-5491 tricolor LED (Radio Shack 276-035). While I have never been able to get inside one of these to find out for sure, I suspect it is nothing more than one red LED and one green LED in a single package as shown in Fig 4. It glows red on dc in one direction, and green on dc in the other direction. With ac, it glows both colors alternately and rapidly (60 Hz). As any artist or color photographer will tell you, this rapid mixture of red and green comes up a yellowish orange.

Fig 5 shows the Super Deluxe Version of the Flasher, with a single XC-5491 LED that flashes red on dots and green on dashes. If your fist is fast enough (oh, say about 500 WPM), you may even see the

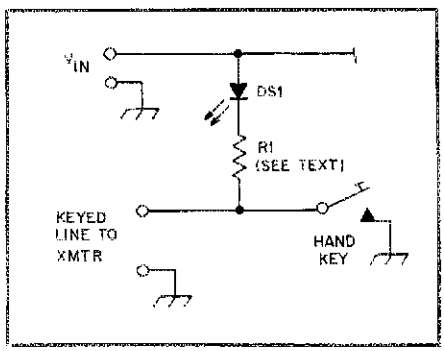


Fig 1—Simple LED Flasher connected to a hand key.

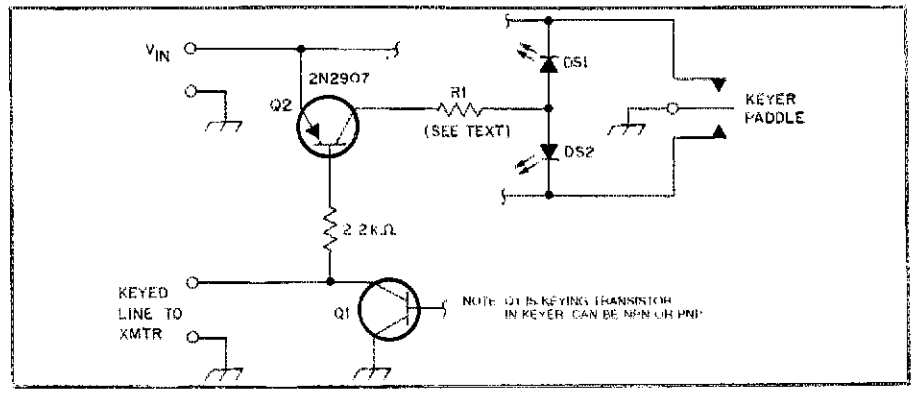


Fig 3—Flashier version of the Flasher using two (dot and dash) LEDs.

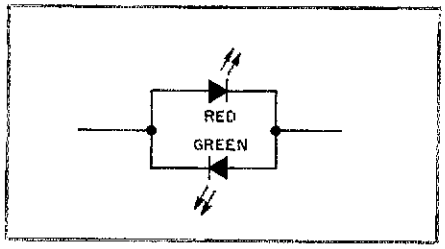


Fig 4—Suspected inner circuitry of the XC-5491 tricolor LED.

third color. DS3 is the tricolor LED. Q3-Q6 form a DPDT switch to reverse the polarity of the voltage to DS3. Either DS1 or DS2 lights up when you hold the paddle to one side or the other, and will remain lit as long as the paddle stays there. DS4 and DS5 light up when you turn your keyer on, and then don't do a thing except add to the confusion and profusion of color.

Mounting the LEDs

If your keyer is "homebrewed," and you are as careful a craftsman as I am, it probably already has a few holes drilled in the wrong places. These will provide ready-made mounting holes for your Flasher LEDs. Or, you can get a hollow plastic doll or figurine (such as a troll or gnome) that can sit on top of your keyer. Lop off its head and mount the LEDs in its eyes, then glue the head back on. If you use the circuit of Fig 3, mount one LED in each eye. If you use Fig 1 or 2, mount the Flasher in one eye, and another LED, wired in parallel to the ON LED in your keyer, in the other eye. If you opt for the circuit of Fig 5, you will need a figurine with a bellybutton for DS3, and you might stick DS4 and DS5 out the ears. Or, you can build a plastic model automobile, paint it to look like a police car, and mount all the LEDs across the top (Fig 6).

If all of these ideas are above your capability or beneath your dignity, then by all means drill holes in a neat little row on the front panel of your keyer. Mount the LEDs and label them "Baud Rate," or something equally dry and incomprehensible.

Construction Notes

There are so many possible physical configurations for the Flasher that I have not attempted to design any printed circuit boards for any of them. Unless you are a whiz at designing PC boards, I would suggest that you use a small perf board with solder-ringed holes (Radio Shack 276-148) and solder all the components, except the LEDs, onto it. Connect the projecting leads using point-to-point wiring or the wire-wrap method, or just a bunch of jumpers. You can then tuck the board into your keyer and run wires from it to the LEDs, wherever they are.

Conclusion

Dedicated, dyed-in-the-wool, dead-serious hams will not have read past the opening paragraph of this article! That leaves only us gals and guys who have a shack full of store-bought gear we don't really understand, and an urge to homebrew something simple without performing major surgery on anything still under warranty. If you are one of *us*, build a Flasher. It will add some class to your shack, save wear and tear on your refrigerator door, and give you confidence to tackle something bigger, such as the All-Band Computerized Automatic Orbiting Universal Remote-Controlled Digital Packet Radio Repeater that I will describe in a future issue of *QST*—as soon as I figure out how to build it for $9.95 or less. QST

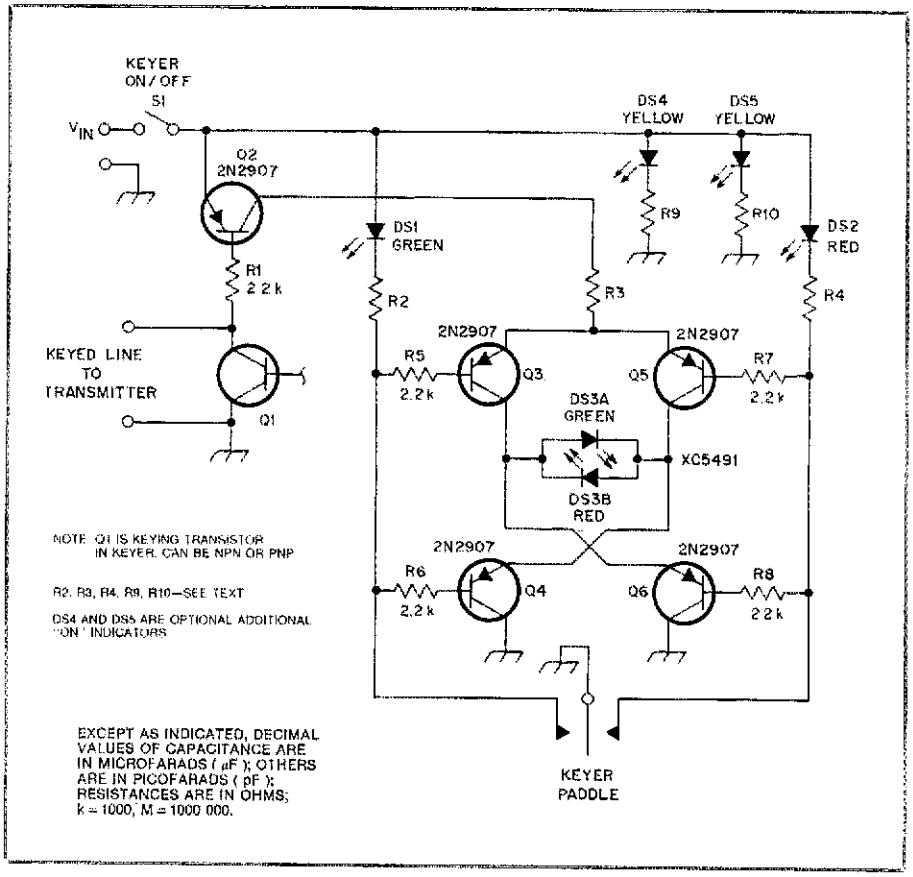


Fig 5—Super flashy Flasher containing five transistors and five LEDs (seven if you count DS3 as three colors).

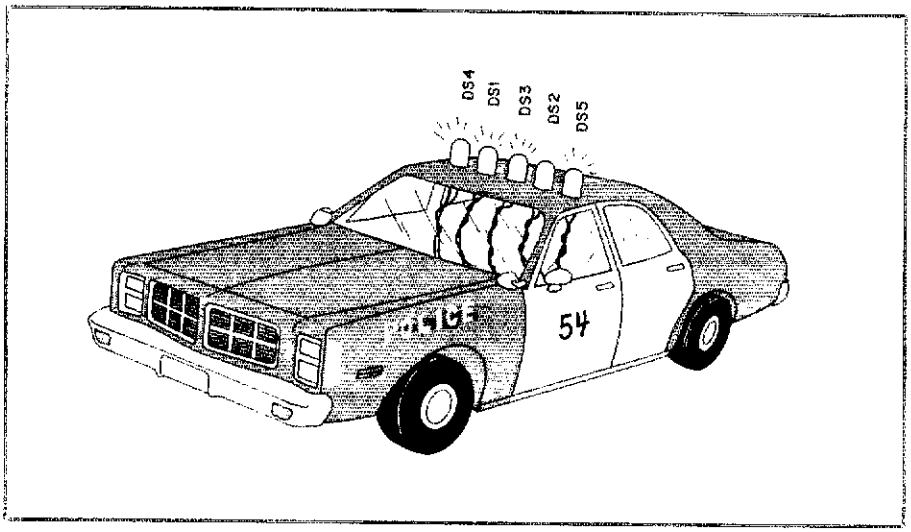
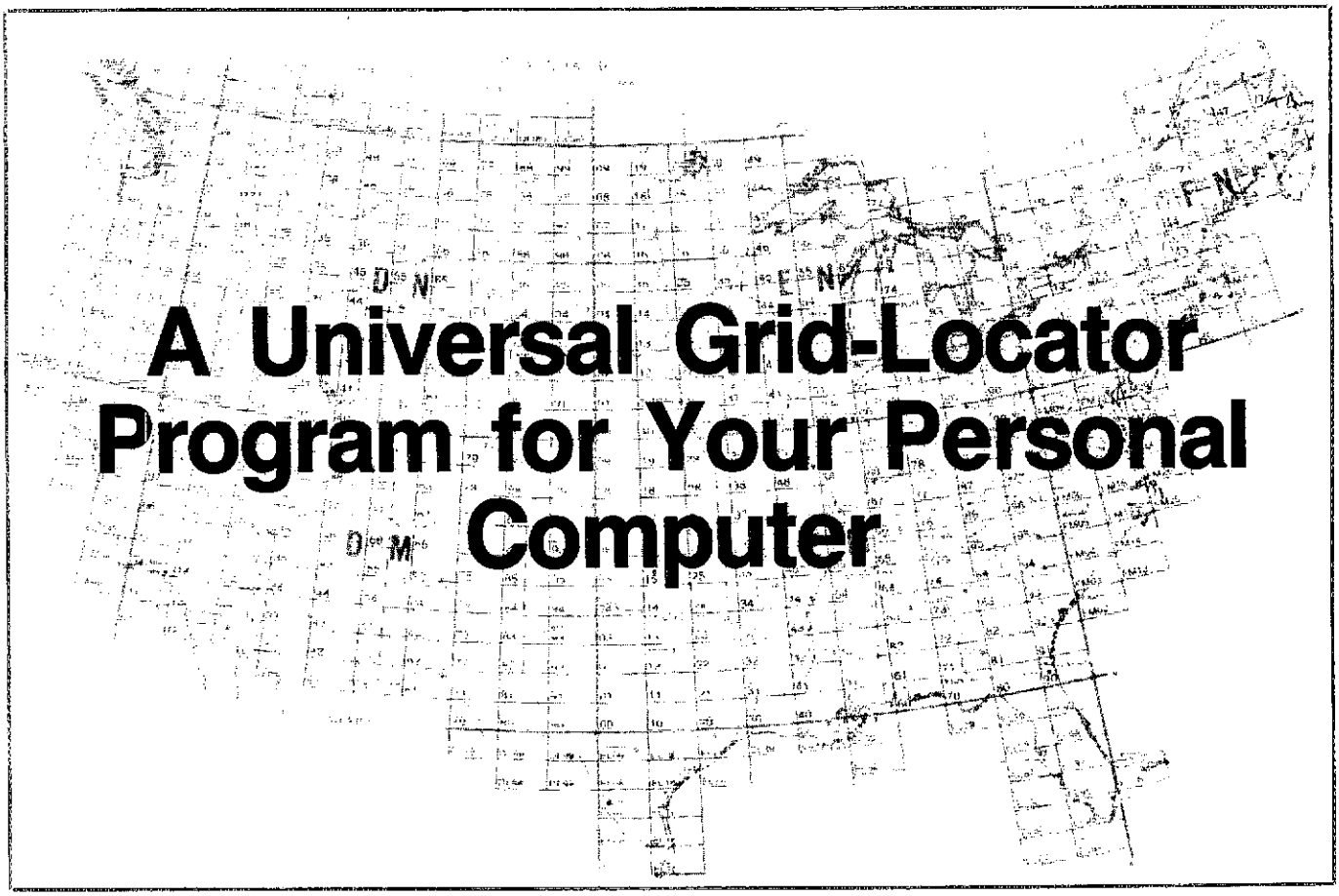


Fig 6—Possible police car configuration for the Flasher.



A Universal Grid-Locator Program for Your Personal Computer

With this user-friendly program, your home computer can perform a variety of functions involving grid locators.

By Wayne Overbeck, N6NB
ARRL Southwestern Division Vice Director
900 Avenida Salvador
San Clemente, CA 92672

The worldwide locator system, also known as the "Maidenhead Locator System," divides the earth's surface into grid fields, squares and subsquares, and is rapidly gaining in popularity. The "QTH Locator," not a worldwide system, has been familiar to European VHF operators for years, and forms the basis for the now universally accepted locator system. Grid squares are exchanged for the ARRL VHF/UHF Century Club (VUCC) award, as well as being used as multipliers in all ARRL VHF/UHF contests.

The entire six-character locator can be used for beam heading and distance calculations, and is used in the ARRL 10-GHz contest to calculate point values for each contact: The greater the distance, the more points the contact is worth. The locator system provides a quick and easy way to determine the distance between any two stations, even if they are half a world apart. If you know your own locator and the other station's locator, your computer can tell you in an instant the distance between the two stations, as well as the beam heading.

How do these locators (or "gridlocators," as they are sometimes called) work? The system was described in a *QST* article a few years ago.[1] Briefly, the world is divided into grid fields that are 20° of longitude wide and 10° of latitude high. Each field has a two-letter identifier. Each grid field is then divided into squares that are 2° wide by 1° high. Each square has a two-number identifier. Therefore, there is a total of 32,400 of these grid squares in the world, each having a unique two-letter plus two-number identifier. The first two letters identify the grid field, the two numbers identify a square within the field.

Each 2° × 1° grid square is then further divided into 576 smaller units, called subsquares, each 5 minutes of longitude wide and 2.5 minutes of latitude high. The last two letters of the six-character locator identify the subsquare within the square. There are more than 18 million of these smaller geographic units on the globe, but the six-character locator is sufficient to pinpoint any one of them. For example, I live at 117°16′ W longitude and 33°26′ N latitude, which is designated as DM13EK.

This sounds complicated, but when you use a personal computer and a suitable program, the complexity vanishes. This article describes a BASIC program named Universal Gridlocator—universal because it will run on almost any personal computer. It has been fully tested on a Commodore® 64, Apple® II, IBM® PC, TRS-80® Model III and several computers that use the CP/M® operating system and Microsoft® BASIC. A program listing is available from ARRL.[2] If your computer has at least 32 kbytes of RAM and you type the program as it appears, you should be up and running. If typing programs isn't your favorite pursuit, a ready-to-run program disk is available for the Apple II (DOS 3.3), IBM PC or Commodore 64.[3]

Program Features

The Universal Gridlocator program has several features not usually found in grid-

[1]Notes appear on page 31.

locator programs. For one thing, this is a *menu-driven* program—that is, a menu guides you through the various features and operating modes one step at a time. The program does the following:

- Converts geographic latitude-longitude coordinates to the appropriate six-character locator;
- Converts any four- or six-character locator to the appropriate coordinates;
- Determines the proper locator for any point on a map;
- Pinpoints a known locator on a map;
- Computes the beam heading and distance between any two locators;
- Keeps running totals of distance and contest points as you enter the locators of the stations that you work;
- Allows you to modify the built-in contest scoring system to accommodate the rules of either ARRL or European contests (including both the British "radial ring" scoring system and the continental raw-distance system);[4]
- Allows you to delete, revise or add to running contest scores to correct for duplicate contacts and erroneous locators that are discovered later.

Using the Program

To use the system, you select one of two operating modes, each of which has its own menu. When the program is first run, the "startup" menu is displayed. It allows you to use all of the program functions—or to move to the contest mode.

At startup, you might want to determine your own locator from coordinates or measurements on a map. Or, you might choose to modify the built-in contest scoring rules before moving into the contest mode. Once in the contest mode, you may enter a succession of station locators and see the distance and beam heading to those stations displayed. The program also tallies the total contest points and the cumulative distance in miles and kilometers.

While in the contest mode you may call up a second menu by entering "?" instead of a locator. This menu gives you additional options such as modifying the running scores and deleting previous entries. Or, you may call up the map and coordinate conversion features.

What happens if you contact someone who doesn't know his locator or his latitude and longitude? This is where the map features become most useful. If you have a good map of your area that has one latitude and one longitude line marked as a reference, you can determine locators quickly. To use the map feature, you first enter the latitude and longitude of your reference lines and specify a map scale. Then you measure the vertical and horizontal distances (in inches) from the references to the QTH of the station whose locator is not known. The program will compute both the coordinates and the six-character locator for that QTH. If you are careful with your measurements, the result will be quite accurate.

An aeronautical "sectional" map with a 1:1,000,000 scale (available at many airports) is good for use with the map features of the program. A sectional map covers a large enough area to include many of the stations you might work during a typical VHF contest, and yet sectional maps have reasonably good detail. Highway maps, however, often have latitude-longitude references too, so an ordinary highway map may also be used. A detailed topographic map will provide more accurate results, but many topographic maps may be needed to cover the area your signal covers during a contest.

The map program also pinpoints the location of a known locator on a map. When you enter the locator, the program displays the distance from the center of that grid square to the reference lines on your map. With four-character grid squares the center could easily be 30 or 40 miles from a station's actual location, because the $2^\circ \times 1^\circ$ grid squares are more than 100 miles wide at typical North American latitudes. Using six-character locators, on the other hand, will produce results that are accurate within two or three miles.

The Universal Gridlocator program yields correct coordinate/locator conversions and beam-heading/distance calculations for any point on the globe except the exact North and South Poles (where 18 different grid squares converge). Any worldwide geographic program must distinguish between north and south latitude and between east and west longitude. This program uses positive and negative numbers to do that. To specify north latitude or west longitude, you enter the coordinates directly in degrees and minutes. To enter a south latitude or east longitude, you put a minus sign (−) in front of the degrees (or in front of the minutes if the location is at zero degrees east longitude or south latitude).

The map feature also employs minus signs to indicate south and east. A measurement north or west of a reference line is entered as a positive number in inches; a minus sign is included if the measurement is for a point south or east of the line.

Notes for Programmers

Experienced computer programmers may be interested in some of the technical aspects of this program. There are numerous error-trapping features to prevent computer crashes as well as operator data-entry errors.

It takes only a few lines of computer code to compute beam headings and distances between two points, but several times that many are needed to test for the various combinations of data that may cause a computer to crash. And, the grid-locators, themselves, can sometimes cause problems. Entering two locators that are at exact antipodes (exactly halfway around the world from each other) can send a program into a frenzy of "division-by-zero" errors. Entering the same locator for both stations may also cause computational problems. And, of course, an operator may enter an invalid locator. To prevent these difficulties, nearly half of the 250 lines of this program are devoted to detecting and correcting possible operator or mathematical errors.

Hardware-specific syntax was avoided to keep the program compatible with the maximum number of different computers. Even as simple a function as clearing the screen requires different syntax on Apple, Commodore and IBM-compatible computers. In fact, because many computers are capable of only a 40-column display, this program is written in a 40-column format. Those using 80-column formats may wish to revise the on-screen displays.

Similarly, the program syntax required to print a hard copy—much less store information in a data file on disk—varies so much between computers that such features, though desirable, cannot be included in a universal program such as this one. If data files could be included in this program, they would permit the addition of a very desirable feature: full contest logging and dupe-checking routines. However, it was not possible to include all of the code required for logging, dupe-checking and data-file management on several different computers.

Conclusion

Considerable effort went into making this program as universal and as foolproof as possible. It works without modification on many different kinds of computers, performing numerous functions related to the worldwide locator system. As a public-domain program, it is available for anyone to use, modify or adapt.

I wish to thank several people for their contributions to this program. Michael J. Wilhelm, W4RUU, devised the original version of the map routines for a program he uses to process FCC applications in his Washington, DC law practice. James Steffen, KC6A, reviewed the entire program and made many helpful suggestions, and Folke Rosvall, SM5AGM, developed the formula used to convert coordinates to locators.

Notes

[1]For a more complete description of the worldwide locator system as it applies to North America, see J. Lindholm, "VHF/UHF Century Club Awards," *QST*, Jan 1983, p 49.

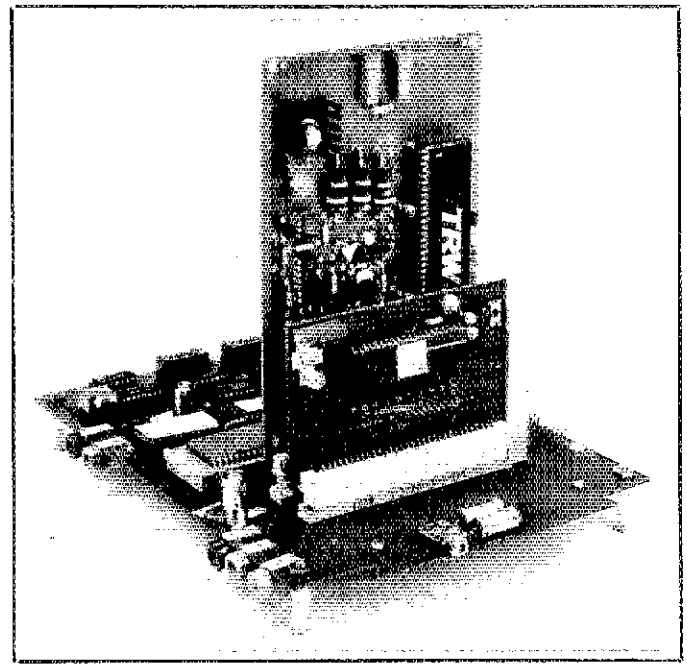
[2]A complete program listing is available from the ARRL at a cost of $3. Send your remittance and an SASE to: ARRL Technical Department, 225 Main St, Newington, CT 06111, and ask for "Overbeck Gridlocator."

[3]A ready-to-run copy of the program for Apple II (DOS 3.3), IBM PC or Commodore 64 is available from the author at no charge. Send a formatted disk with a self-addressed, stamped disk mailer to the author. Indicate on the disk the type of computer for which the disk is to be made.

[4]The Radio Society of Great Britain (RSGB) uses a "radial ring" system for VHF contest scoring. Typically, a contact spanning a distance of 0-50 km is worth one point, a 50-100 km contact is worth 3 points, 100-150 km is valued at 5 points, and so on. Most other European Amateur Radio societies use the actual distance for scoring: a 65-km contact is worth 65 points, while a 150-km contact is worth 150 points, and so on.

Digital Signal Processing— A Modern Audio Filter

Digital electronics is invading more and more of our analog world. Accuracy and reproducibility of circuit responses make the use of digital integrated circuits very desirable. This article will move you to the forefront of the exciting field of digital signal processing.



By Fred Williams
Staff Engineer
TRW LSI Products
La Jolla, CA 92038

Digital signal processing (DSP) is a powerful way to get high performance wherever intermediate- and audio-frequency stages are concerned. With extra care, DSP can even be used at higher frequencies. Previous *QST* articles introduced some of the basics, and gave a specific application (a direct digital frequency synthesizer).[1-3] This article digs deeper into how and why various operations are performed to accomplish another basic circuit function, filtering.

A Short Introduction to DSP

A digital signal processing system handles a signal by converting it from its traditional analog form into a sequence of numbers, (the digital form) storing those numbers, and performing arithmetic operations on them to get a different sequence. The new sequence that results from the calculations is then converted into an analog signal. The block diagram shown in Fig 1 illustrates the entire process.

This conversion/calculation/reconversion may sound like a very strange thing to do. Why is DSP better than just processing the analog signal? Probably the most important advantage is that you can get performance better than that available from filters made with coils, capacitors, op amps and the like.

The first area of improved performance is selectivity: With a digital filter it's easy to get roll-off rates of 2000 dB/octave, while having a passband that is flat to within a small fraction of a decibel. That's a really sharp filter! (An octave is the frequency range from one frequency to its second harmonic. The higher the value of attenuation [in dB] per octave, the sharper the filter.)

A digital filter is much more stable than an analog one. Two times two is four, and will always be four, regardless of the temperature, humidity, age of the equipment or phase of the moon. If the filter performance comes from that sort of unchanging result, it stands to reason that the filter response doesn't change either.

No adjustments are necessary to get a desired response from a digital filter. The filter will work as designed without any tweaking. (Anyone who has tried to tune up a 10-pole elliptic-function filter by hand will appreciate that feature!)

Finally, if you build more than one filter, they will all operate identically. Not just close: identically (at least if the analog-to-digital [A/D] and digital-to-analog [D/A] converters are the same). This kind of reproducibility is often necessary in such areas as radar and data transmission. You have to admit that it's a nice characteristic if you build some gear as a club project, too!

A Generic Digital Signal Processor

So what's inside that box in Fig 1 labeled "digital signal processor"? As a general rule, the filter will have to store some of the history of the incoming signal. Also, there are numbers that determine the response of the filter (some of those numbers determine where the cutoff frequencies are, for example). So, to store both kinds of numbers, there's a memory section. This may be nothing much more than two ICs: one for signal, one for coefficients.

Next, there have to be some circuits to perform the computer-like calculations on

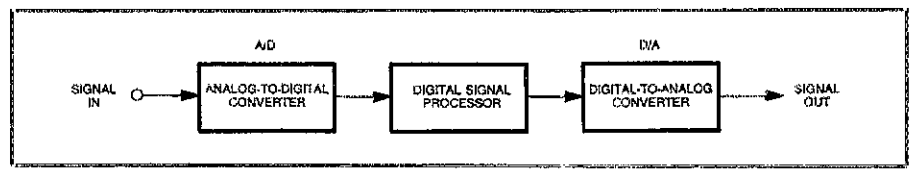


Fig 1—Three basic stages used in virtually all digital signal processing systems are the analog-to-digital converter, the digital signal processor and the digital-to-analog converter.

[1]Notes appear on page 40.

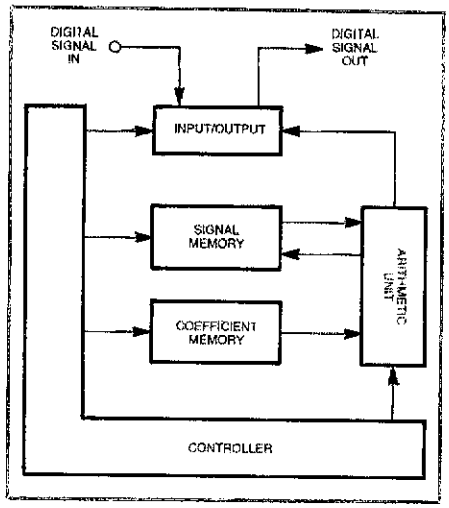


Fig 2—There are five separate functional blocks in a typical digital signal processor.

those numbers. The design of an "arithmetic unit" could be a real challenge, if it weren't for modern ICs. Today, the entire arithmetic unit may be nothing more than a multiplier-accumulator (MAC), such as the TRW TDC1009/TMC2009 used in the filter design presented in this article.

Finally, you need a controller to tie all the circuits together and make everything happen when it is supposed to. This controller tells the memory chips what numbers to send to the MAC, tells the MAC what to do with those numbers (and any previous results it may have), and tells the entire circuit what to do with the final result. These pieces are shown in Fig 2.

Digital filters are often embedded rather deeply in an entire digital signal processing system and that system itself is often dedicated to some special purpose. The result is that it seems like very little specific information about designing digital filters has been published. However, the decreasing cost of the components used in a digital signal processing system will bring about a trend toward stand-alone circuits, and away from embedded filters.

All filters, analog as well as digital, come in two "flavors." These are usually called finite impulse response (FIR) and infinite impulse response (IIR). Without going into a lot of detail, FIR filters are easier to understand and design, and can provide excellent performance. They also tend not to ring. IIR filters are similar to traditional LC filters and active filters that use op amps.

In this article, we'll talk about a hardware design for an FIR digital filter with particularly good qualities. It is an audio filter capable of eight different switch-selectable responses. Table 1 gives the target specifications for two of these filter responses.

Table 1
Filter Response Characteristics

	Filter 1	*Filter 2*
Passband	0-3400 Hz	900-1100 Hz
Passband ripple	0.1 dB	0.1 dB
Stop band(s)	3800-8000 Hz	0-800 Hz, 1200-4000 Hz
Stop-band attenuation	60 dB	50 dB
Sampling rate	16 kHz	8 kHz

A Quick Overview of FIR Filter Theory

Finite impulse response filters work on the simple principle of wave interference. Don't worry if you aren't familiar with this principle. We'll illustrate it with a simple example. Take a look at the block diagram for the simplest imaginable FIR filter (shown in Fig 3). A delayed version of an incoming signal is added to the undelayed signal. This filter will work whether it is built out of coaxial cable and hybrid couplers, or digital shift registers and adders.

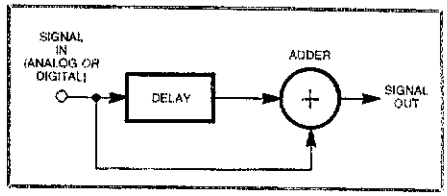


Fig 3—A block diagram of a simple finite impulse response filter. Depending on the type of delay used, the filter can be either an analog or a digital device.

Let's look at what happens when a sine-wave signal is applied to the filter. At low frequencies, there is very little phase shift introduced by the delay, and the signals effectively add. As the input frequency increases, it reaches a point at which the delay is 180°. At this point, the delayed signal is the exact opposite of the original signal, and they cancel each other. This action is shown in Fig 4. As the input frequency continues to increase, the phase shift approaches 360°, and the signals will add again. This kind of filter is referred to as a "comb" filter, after the appearance of its frequency response on a decibel scale, as shown in Fig 5.

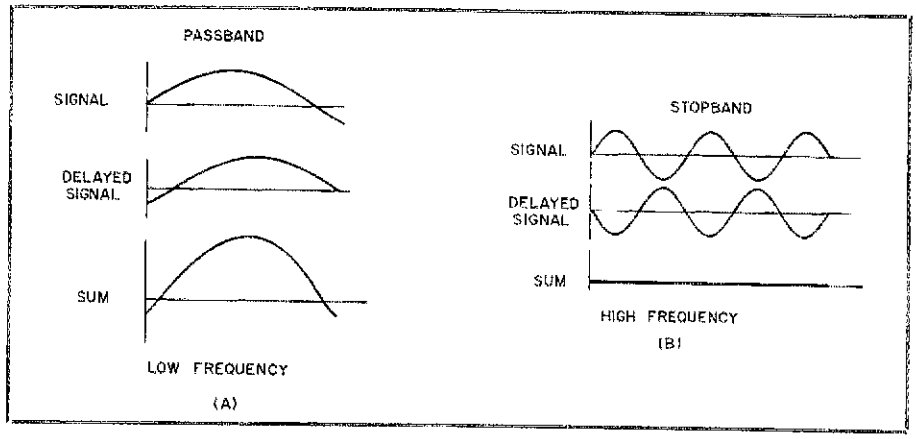


Fig 4—When the original signal and the delayed signal are combined in the adder section of the filter, the resulting signal can be very similar to the original, as shown at A (the filter passband), or there may be no output at all, as shown at B (the filter stopband).

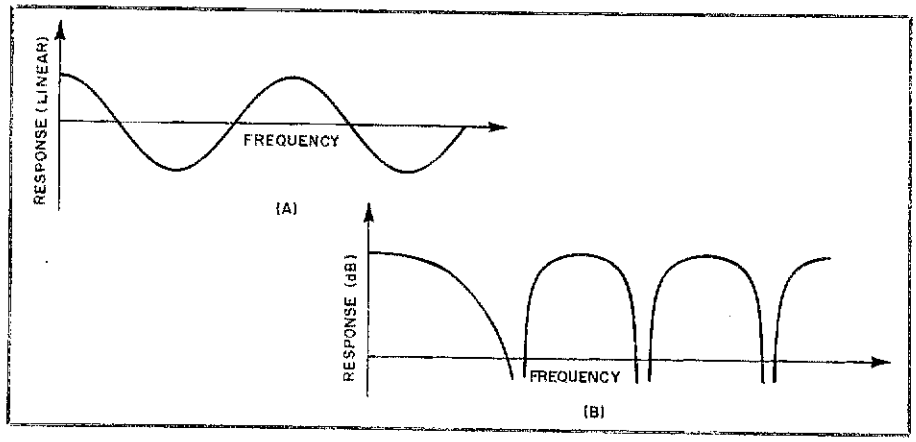


Fig 5—If the frequency response of a simple FIR filter is plotted on a linear scale, the curve resembles a cosine function, as shown at A. If the response is plotted on a decibel scale, it resembles the teeth on a comb, as shown at B. This explains why a filter of this type is often called a comb filter.

Analysis

In order to explain the design for this kind of filter, it will help to calculate its frequency response. That may sound like a lot of math, but only a little trigonometry is needed for this simple filter. All you need to do is to write down what the signals are, and then apply a simple formula (the "sum of cosines" identity, for those who are interested). If the signal delay is expressed by the Greek letter τ (tau), then we can write:

$$\text{undelayed signal} = \cos(2\pi f t) \quad \text{(Eq 1)}$$

$$\text{delayed signal} = \cos(2\pi f (t-\tau)) \quad \text{(Eq 2)}$$

The $(t-\tau)$ term just indicates that whatever the delayed signal is doing at a given instant, the undelayed signal already did a time τ earlier.

Adding these signal equations to obtain the output signal, we have:

$$\underbrace{X(t)}_{\text{output}} = \underbrace{\cos(2\pi f t)}_{\text{undelayed signal}} + \underbrace{\cos(2\pi f (t-\tau))}_{\text{delayed signal}} \quad \text{(Eq 3)}$$

Plugging the values for the undelayed and delayed signals into the sum of cosines formula gives:

$$X(t) = 2\cos(\tfrac{1}{2}(2\pi f t + 2\pi f (t-\tau)))\cos(\tfrac{1}{2}(2\pi f t - 2\pi f (t-\tau))) \quad \text{(Eq 4)}$$

After expanding the $2\pi f (t-\tau)$ terms, we have:

$$X(t) = 2\cos(\tfrac{1}{2}(2\pi f t + 2\pi f t - 2\pi f \tau))\cos(\tfrac{1}{2}(2\pi f t - 2\pi f t + 2\pi f \tau)) \quad \text{(Eq 5)}$$

This can be simplified by combining like terms within the parentheses:

$$X(t) = 2\cos(\tfrac{1}{2}(4\pi f t - 2\pi f \tau))\cos(\tfrac{1}{2}(2\pi f \tau)) \quad \text{(Eq 6)}$$

$$X(t) = 2\cos(2\pi f t - \pi f \tau)\cos(\pi f \tau) \quad \text{(Eq 7)}$$

$$\underbrace{X(t)}_{\text{output}} = \underbrace{2}_{\text{"gain" (number of signals that are added)}} \underbrace{\cos(2\pi f t - \pi f \tau)}_{\text{"carrier"}} \underbrace{\cos(\pi f \tau)}_{\text{"amplitude"}} \quad \text{(Eq 8)}$$

This equation represents the filter response in the time domain. When we transform the equation to represent the filter response in the frequency domain, the equation simplifies to:

$$H(f) = 2\cos(\pi f \tau) \quad \text{(Eq 9)}$$

How to Get Other Responses

There are not many filter applications that require this comb-filter frequency response. Let's look at the block diagram for the super-simple FIR filter in Fig 3 again to see what other types of response we may be able to obtain.

What are the obvious things that can be done to change the response? There is nothing that says we must have the same amplitude for each signal entering the adder. So the first option is to adjust the gain or weight independently for each signal coming from the delay to the adder. Secondly, there is nothing that restricts us to having only two signals. We could have three, four or any arbitrary number, N, of signals. Both of these changes are shown in Fig 6. The only drawback is that the system becomes more complex, and this can lead to construction difficulties. Filters used in industry usually have between 3 and 256 delay lines, with most having between 32 and 128.

Look at the frequency response shown in Fig 5 again—especially the linear scale. It has a very distinct form: It's the cosine of the *frequency*. Although it may not be obvious, adding more signals just adds more cosine terms. These cosine terms have different periods, and their amplitudes are just the gains or weights of the "taps" in the delay line. A sum of weighted cosines may suggest something to those who are familiar with some advanced mathematics: According to a century-old discovery by the French mathematician Fourier, any possible wave shape can be specified as a sum of weighted cosines with different periods and perhaps with different phases.

The task of designing the filter then reduces to answering two questions:

1) How many delayed signals (N) must be summed?

2) What weights or gains should be used for each delayed signal?

Computer programs are usually used to answer these questions. An application note containing a program written in Microsoft® BASIC is available from TRW LSI Products to answer the first question. If you want a copy of this program, write to TRW LSI Products, La Jolla, CA 92038, and request note TP-22. The IEEE has published a FORTRAN program to answer the second question. This program is found in the IEEE book, *Programs for Digital Signal Processing*.

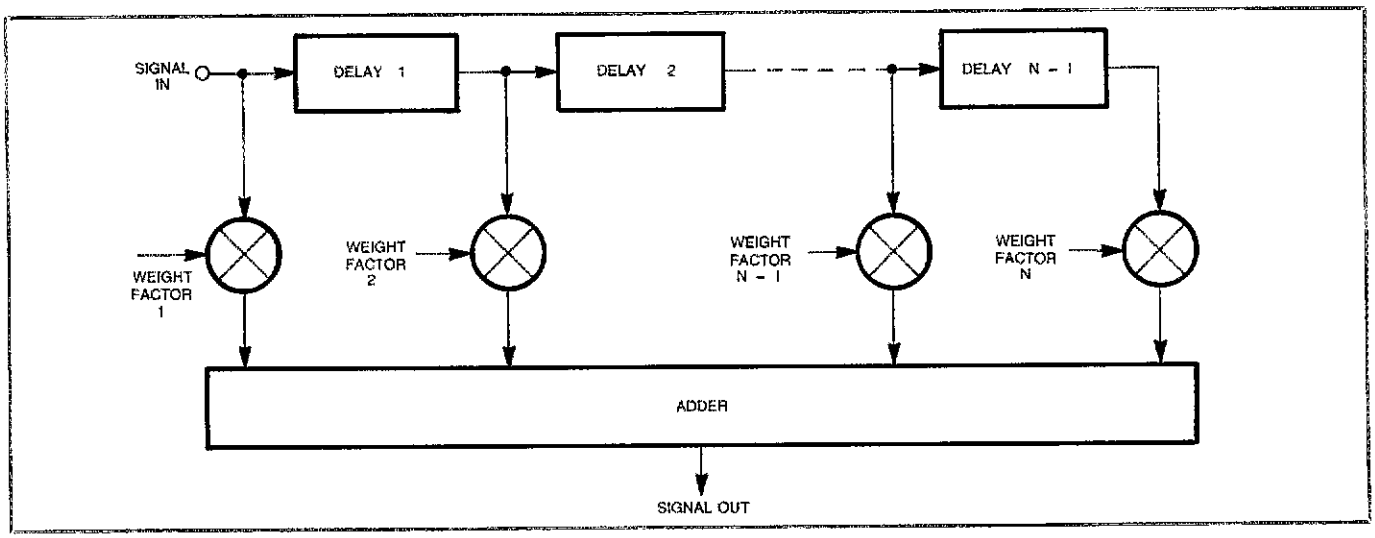


Fig 6—By adding more delay sections, and by multiplying each further delayed signal by an appropriate weighting factor, you can select a wide range of filter characteristics.

For the convenience of the DSP circuit designer, the delays are virtually always made to be multiples of the sampling interval. The weights are usually scaled to meet one of two goals: a given amplitude response (most commonly unity gain) at some frequency, or the best resolution for the coefficients.

FIR Filter Hardware

Instead of the simple filter shown in Fig 3, the filter block diagram will actually look more like Fig 6. When signals are processed digitally, however, the block diagram of the actual circuit may not look much like the signal-flow diagram, since it is sometimes possible to use some of the circuit elements in more than one section of the filter.

If you want to build one of these filters, one approach is simply to implement the block diagram in hardware. This means using a shift register that is a full word wide (usually a "word" is somewhere between 8 and 16 bits) and N stages long, with access to each stage. This might be done with a large quantity of 74LS374 register chips, for example. This will make up the chain of single-sample, time-delay stages in the block diagram above. Each stage of the shift register can then feed a separate multiplier, along with the weighting factor or coefficient required for that tap. For short filters, this approach may not be too bad. But if you want a very selective filter, you might need a value for N between 32 and 256 taps. That obviously takes a lot of hardware, so this approach can be very expensive! It will work at high sampling rates, though. (Remember that according to the Nyquist criterion, you have to sample at a rate that is at least twice the signal bandwidth.) This design is used mostly for processing TV signals.

Today, the cost per bit of read/write random-access memory (RAM) is significantly lower than the cost per bit of shift register memory. Since the specific filter responses that we want to design (given in Table 1) do not need the full speed of a multiplier or multiplier/accumulator (MAC), we can use the accumulation function of a single MAC by feeding it all N coefficients and all N data points per output sample that is desired. This means that the data can be processed only at around 1/N times the multiply/accumulate rate. That reduction in rate will allow us to simulate the action of a shift register by the proper use of reasonably high-speed RAM.

If the sampling is done by actually reading data from each location and writing it into the next location for each one of the data points, every time one new data point comes in, we will have to spend a lot of time just to shift data from one memory location to another. It's pretty obvious that if we keep track of what values are where in the memory, we might not have to shuffle the information all around in the RAM.

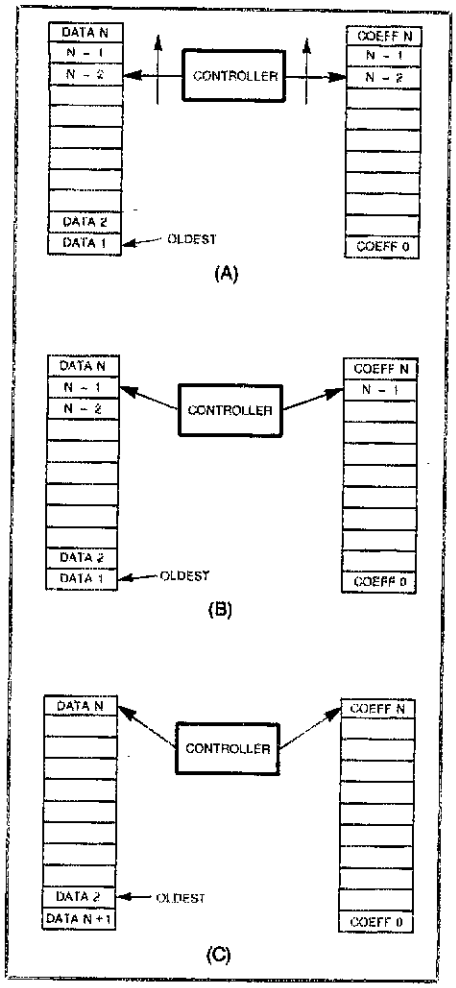


Fig 7—If the controller steps through the data memory and the coefficient memory in unison, it will be able to keep track of the order in which the data samples are written, and select the appropriate coefficient for each sample. All of the data information is replaced once for every complete sweep through the memory.

Fortunately, that's pretty easy to do. Fig 7 shows the basic idea. The obvious way to calculate the products is to start with either the oldest or the most recent input sample and work toward the other end. It doesn't matter which order you choose for calculation. Practically though, it makes life a lot easier if you start with the most recent signal data point and work toward the oldest. To do this, all you need is a counter. This counter's job is to count how many products have already been calculated. This number tells the read-only memory (ROM) which coefficient to send to the MAC for each calculation. When the product counter reaches the end of its range, we're ready for a new signal value. Now, what's needed is a way of identifying the oldest sample. For that, we need a second counter. This one is also incremented at each calculation, but is not reset or incremented at the last coefficient. This means that when the first counter is at its last count, the second counter will point to the oldest data location, which is the memory address that needs to store the new value, when it arrives.

The block diagram of Fig 8 is made up of two counters that perform the data and coefficient addressing, a RAM, an erasable programmable read-only memory (EPROM) for coefficient storage, and a MAC. Some "logic glue" is also needed: a clock pulse inhibitor, an output register, some RAM read/write timing circuitry, and a tri-state driver for allowing the digital input. The complete circuit diagram is shown in Fig 9.

To use this circuit, you have to determine how many coefficients will be needed, and set the two dual in-line package (DIP) switches accordingly. Next, a set of

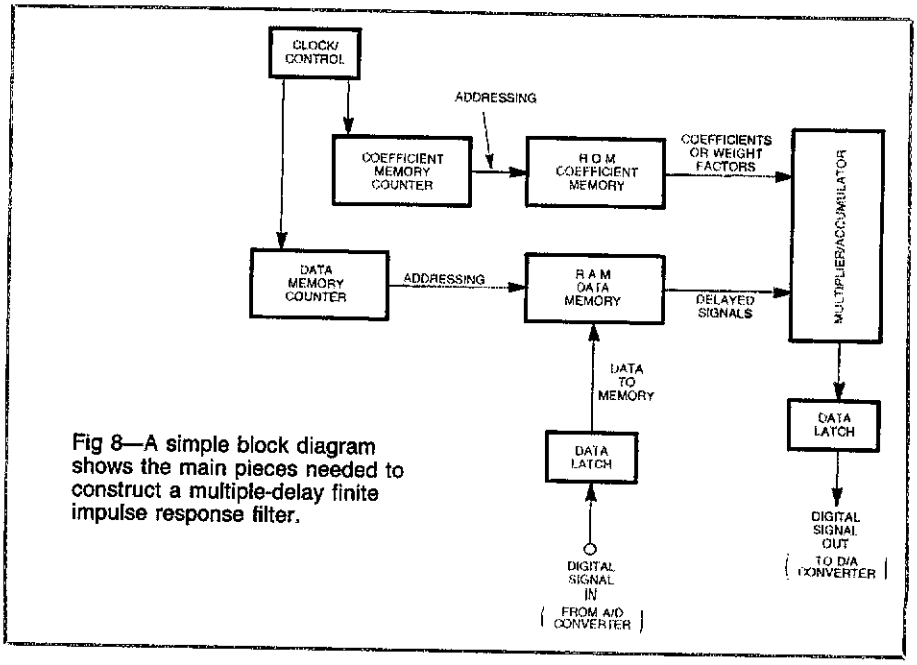


Fig 8—A simple block diagram shows the main pieces needed to construct a multiple-delay finite impulse response filter.

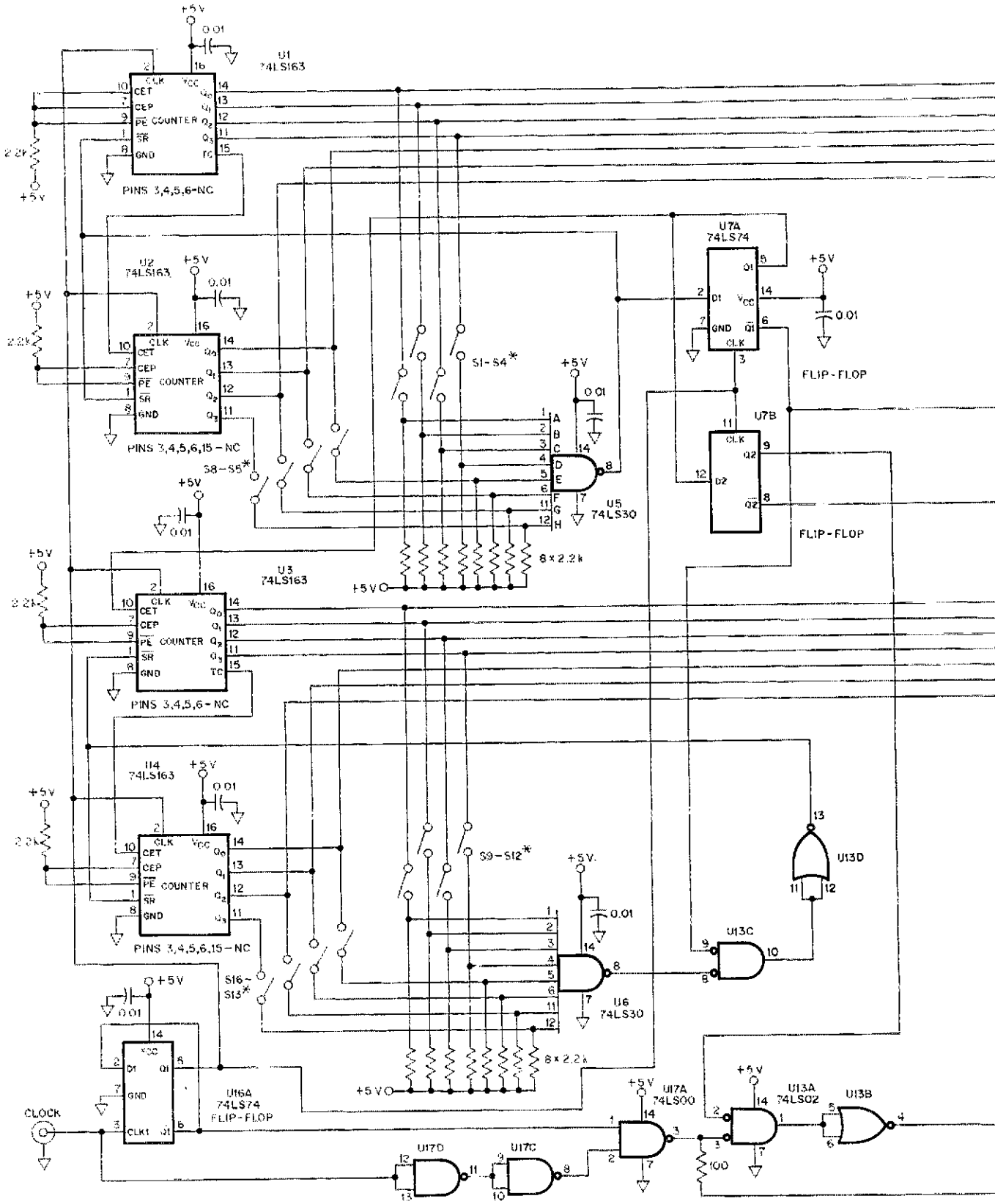
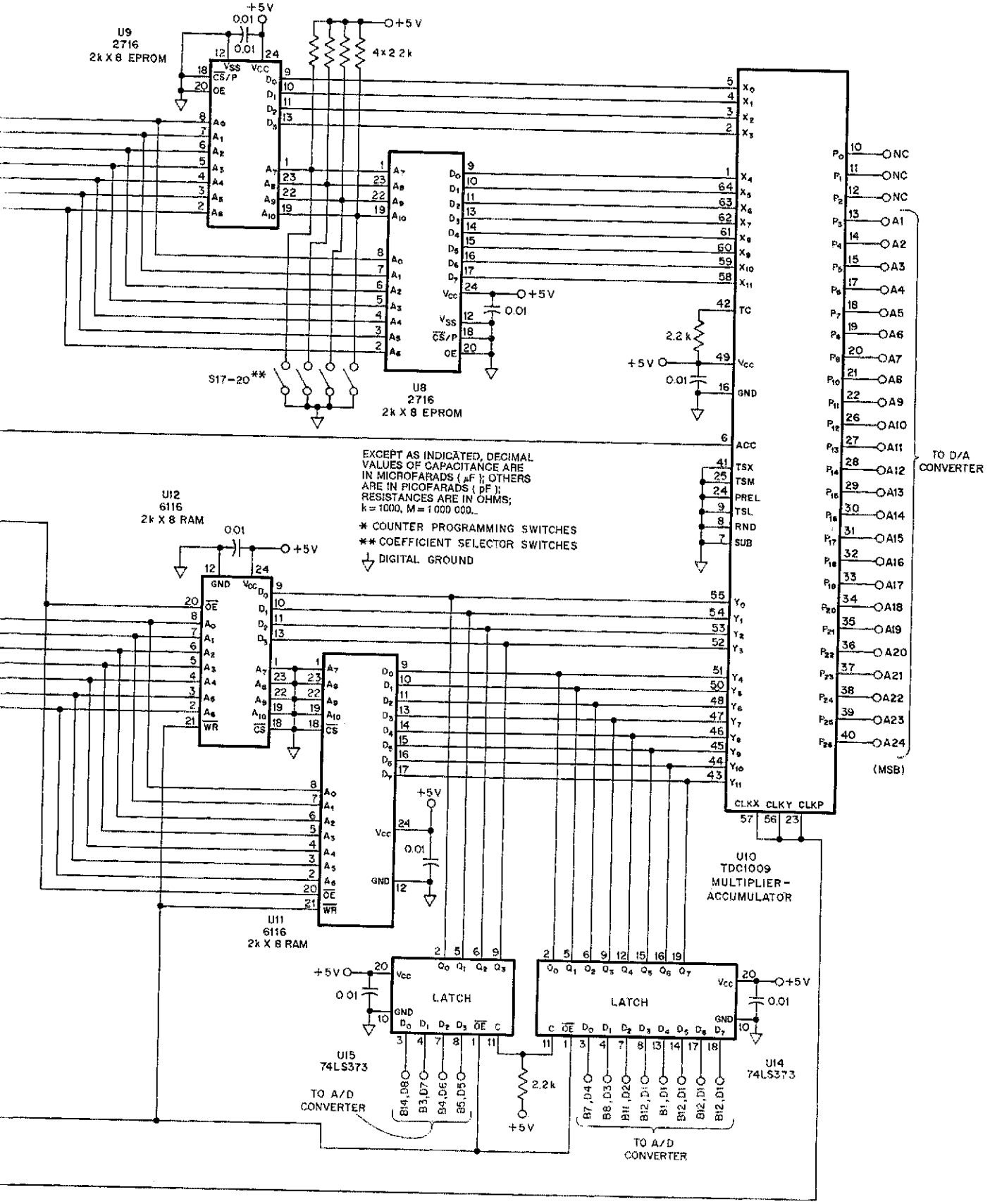


Fig 9—Complete schematic diagram of the low-pass/band-pass digital filter described in the article.


U9
2716
2k X 8 EPROM
+5V
0.01
4x2.2k
U8
2716
2k X 8 EPROM
S17-20**
2.2k
U12
6116
2k X 8 RAM
U11
6116
2k X 8 RAM
U10
TDC1009
MULTIPLIER-
ACCUMULATOR
CLKX CLKY CLKP
TO D/A
CONVERTER
(MSB)
NC
A1
A2
A3
A4
A5
A6
A7
A8
A9
A10
A11
A12
A13
A14
A15
A16
A17
A18
A19
A20
A21
A22
A23
A24
EXCEPT AS INDICATED, DECIMAL
VALUES OF CAPACITANCE ARE
IN MICROFARADS (μF); OTHERS
ARE IN PICOFARADS (pF);
RESISTANCES ARE IN OHMS;
k = 1000, M = 1 000 000.
* COUNTER PROGRAMMING SWITCHES
** COEFFICIENT SELECTOR SWITCHES
DIGITAL GROUND
U15
74LS373
U14
74LS373
LATCH
TO A/D
CONVERTER
TO A/D
CONVERTER

coefficients has to be calculated with the IEEE FORTRAN program mentioned earlier, using a personal or other computer. The calculated coefficients then have to be loaded into the EPROM with a programmer. If you don't have an EPROM programmer, many computer hobbyists do. If nobody you know has one, the major electronics distributors will program (usually for a nominal fee) the EPROMS that you buy from them. Please don't ask them to program devices that you have purchased elsewhere, though!

Real-World Interfacing

Most people don't just happen to have a source of signals that are already digitized, nor do they have a direct use for digital signals. As I mentioned in the introduction, most applications need an A/D converter before the input to the digital signal processor. They also need a D/A converter at the processor output.

Since I work for a manufacturer of these types of devices, I used parts that were available to me when I built the filter described in this article. The converters that I used are more widely applicable than many other available devices, because of their high speed and ease of use. This wide applicability is expensive in amateur terms, so if you want to try building a filter similar to the one I built, you might want to try some other A/D and D/A converters.

The filter circuit is designed to control the operation of the A/D and D/A converters. A timing pulse from the filter to the A/D converter tells the converter to send a new value to the filter. Likewise, the filter sends a pulse to the D/A converter to alert it that a new value is ready to be sent. Any converters that can be controlled in this way should work fine in this filter circuit.

There are two other problems inherent with using digital processing with analog signals. The first is a phenomenon referred to as *aliasing*. Aliasing occurs because the filter has no way to determine that a particular input signal is at a frequency higher than the Nyquist sampling rate allows. As a result, the filter will do something that you might not expect if the input signal is above the Nyquist rate, even though the input signal is out of the desired passband. The way around this problem is to include an anti-aliasing filter at the analog input, to prevent signals much above the intended range of the digital filter from being accepted for processing. This anti-aliasing filter prevents unpleasant surprises, if there are high-frequency signals present.

The second problem with a digital filter is that the filter output (after going through the D/A converter) contains the desired signal, plus sidebands around every harmonic of the sampling frequency! These harmonics are added to the desired signal, giving it a "stair step" appearance. (The output appears to be a series of discrete steps, if viewed on an oscilloscope.) Here again, the solution is a simple analog filter, this time placed at the output of the entire system. This filter also corrects another side effect of the conversion process.

At first it seems very strange that a digital filter, which is supposed to have far superior performance to what could be obtained with an analog filter, must depend on two analog filters for its proper operation! What you have to keep in mind, though, is that the digital filter will provide exact filter specifications, without having to tweak each component in a complicated adjustment procedure. The anti-aliasing input filter and the output filter need not have exact cutoff frequencies nor steep skirts. Analog filters with such inexact characteristics are rather easy to design and build.

The filter described in this article does not include these two analog filters. If this filter were actually being designed into a piece of equipment (or as an add-on filter), they would have to be included.

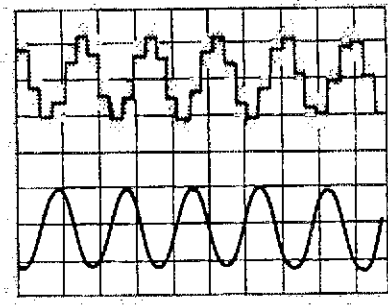
Circuit Description

The main circuit of our digital filter consists of timing and control circuits, digital-signal input circuitry, the RAM and ROM sections to store the data about the delayed signals, and the MAC. Let's look at each of these, to study how each one works, and how the pieces work together to form the complete filter system.

Timing and Control

The first part of the timing and control section consists of a memory-write-pulse-timing generator. This pulse generator uses half of U16 (a 74LS74 dual flip-flop) and three sections of U17 (a quad, 2-input NAND gate). The RAM chips used in this circuit require a specific timing sequence to work properly. First, the address must be correct, and then the read/write ($\overline{WR}$) control is brought LOW, and then HIGH again. The data must be correct for a period that straddles the rising edge of the $\overline{WR}$ control. This timing is achieved by dividing the input clock signal by two in U16, (to get the main clock signal that all the rest of the circuitry will use), and combining the input clock signal with the (divided-by-two) main clock signal in U17A to get a properly timed pulse. This pulse

Testing the Filter



I had the opportunity to participate in some of the lab testing that was done on the author's filter when we were considering this article for publication. A couple of things about the tests were quite a revelation to me, concerning the realm of digital signal processing.

The first test involved connecting a signal generator to the filter input so that we could automatically sweep through the audio range. This input signal was also connected to one channel of a dual-trace oscilloscope. The filter output was then connected to the other scope channel. In this way, we could view both the input and output signals. The most interesting aspect of this test was that while the input looked like a perfect sine wave, the output looked more like a stepped sine wave. The drawing in this sidebar shows what the scope display looked like. This stepped output is explained in the text, but actually seeing it on the oscilloscope sure helped me understand what was happening. This is why a simple analog filter on the output would be needed to make a complete filter package.

As the signal generator swept through the cutoff frequency of the low-pass filter, it was interesting to see the output signal disappear. Likewise, with the filter set up as a band-pass filter, we could watch the output signal appear and disappear as the input signal swept up in frequency. (The sweep rate of the signal generator had to be slowed way down to make these observations. With the generator sweeping at a high rate, the scope display did not seem to make as much sense.)

At this point, we connected a pair of stereo headphones to the filter. The main filter board conveniently included a headphone jack, with one side connected to the input and the other to the output. By using a sufficiently slow sweep rate on the input signal, I was able to hear the input signal start at a very low frequency, and then increase through the filter cutoff. The output signal would disappear quite suddenly, indicating a sharp roll-off. What was especially interesting about listening to the filter, however, was that as the signal generator was allowed to sweep up to a very high frequency (and even above my upper limit of hearing) it went through several frequencies that produced an aliasing response in the filter. So while hearing a very high tone (or no tone) in one ear, several short low-frequency bursts would come through in the other ear! Again, the aliasing process is discussed briefly in the text (and was described in much more detail in the article referenced in the first footnote). Actually hearing the filter output as it produced an aliasing response really helped me understand what the theory meant. It's too bad we can't include a tape recording of this output so that every reader could hear it.—*Larry Wolfgang, WA3VIL, ARRL HQ*

is then combined with a delayed terminal-count signal from the first counter (U7) to enable the memory write function.

The second part of the timing and control unit is an address counter section, made up of two counters that count up from zero to the number programmed into them with the DIP switch, then reset to zero and start counting up again. (This kind of counter is called a "modulo-N" counter.) Each of these counters consists of two 4-bit counters (U1/U2 and U3/U4), an 8-position DIP switch (S1-S8 for the U1/U2 counter and S9-S16 for the U3/U4 counter), and an eight-input NAND gate (U5 for the U1/U2 counter, and U6 for the U3/U4 counter).

The output from a NAND gate is normally HIGH, and goes LOW only if all of the inputs are HIGH. In this circuit, each NAND gate input is connected to the +5-V supply through a 2.2-kΩ pull-up resistor. An 8-position DIP switch is used to wire a switch between each resistor (on the NAND-gate side of the resistor) and the respective counter output. When a switch is open, a HIGH is presented to the NAND gate. If the switch is closed, a signal from the counter is applied. The first time that all inputs to the NAND gate are HIGH is when the counter reaches the number (N) that is set by the DIP switch.

If the counter were not reset to zero, all the inputs to the gate would also be HIGH at several other times; but since the counter is reset the first time, these states are never reached. (In this circuit both DIP switches must be programmed to the same value.) The second counter will not increment when the first counter is at its maximum value, because flip-flop U7A disables counter U3 when the first counter is at its final count. U13C disables the terminal count reset of the second counter when that reset happens at the same time that the first counter resets, because the reset function of the 74LS163 is not inhibited by the count-enable (CET) input.

Filter Input Circuit

The input circuit for the multiplier/accumulator consists simply of two 74LS373 latches, used as three-state buffers. The A/D converter I used has the input latch built in. With other converters, the latching function may be necessary. The outputs are enabled when a new input needs to be written into the RAM and the MAC. This happens once per clock cycle.

Memory Section

The memory systems (RAM and ROM) for this circuit are entirely contained on the 6116 and 2716 chips. Two of each chip are used to get a 12-bit-wide word. The 2716 ROMs, which store the coefficients used in the filter, have their outputs permanently enabled, because they are the only chips that are connected to the MAC X inputs. The RAM chips, however, use the same pins as input and output connections. For this to work correctly, the output has to be disabled before input data is placed on the input/output lines, and then the read/write line ($\overline{WR}$) has to be brought LOW while the data is held; finally, the $\overline{WR}$ line has to go HIGH. The data must be correct until about 15 nanoseconds after the $\overline{WR}$ line goes HIGH. The proper waveforms are generated in the timing generator.

Multiplier/Accumulator

The part that does all of the computations is a TRW 12-bit MAC, the TDC1009 (or its CMOS version, the TMC2009). These chips are quite expensive at this time (over $100 each), and tend to

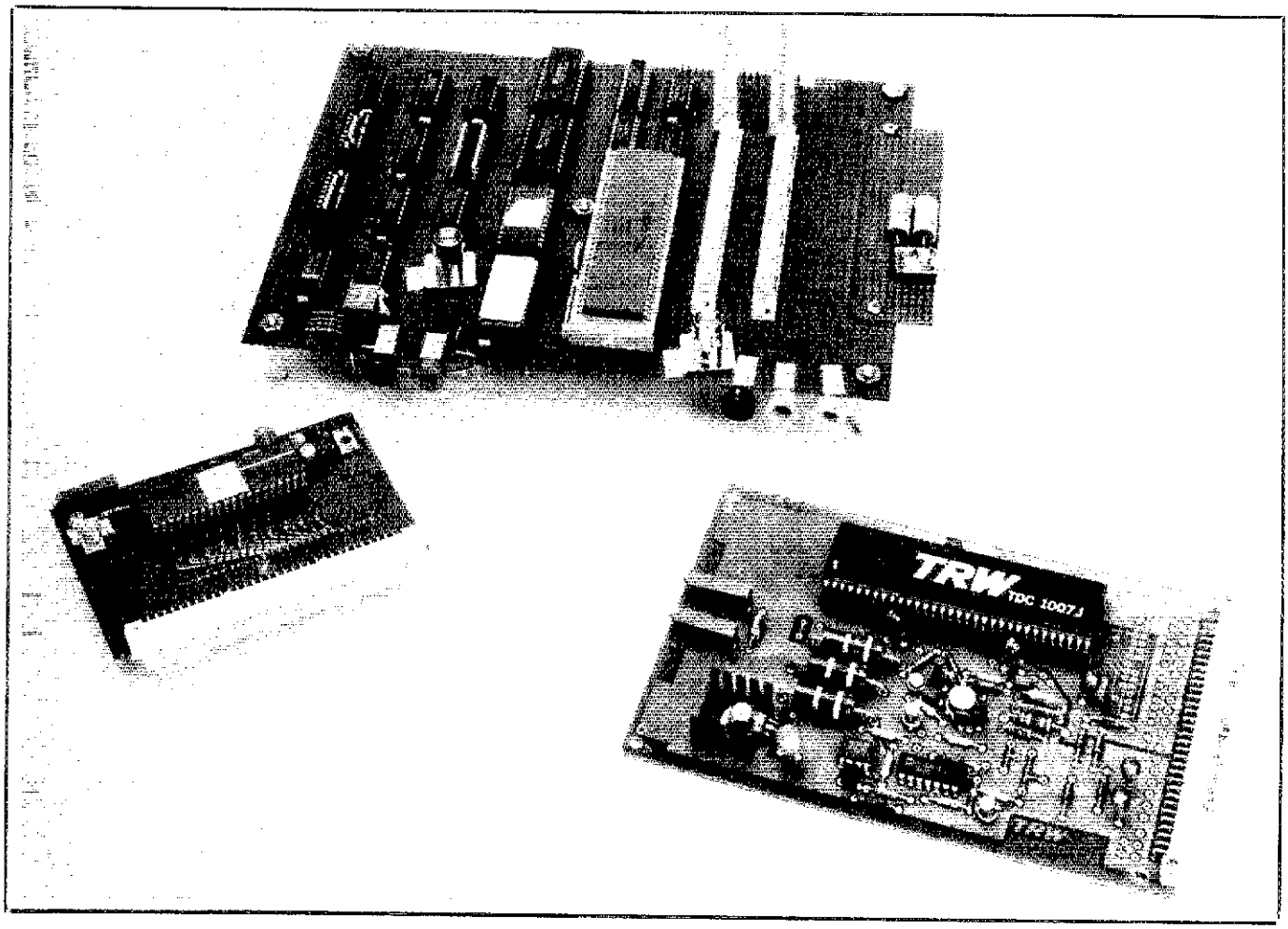


Fig 10—The three circuit boards used for the digital filter. The A/D board, on the right, is a PC board that TRW designed for commercial applications. The D/A board and the main filter board were wire-wrapped for this project.

make this type of filter less attractive for amateurs.

[Since this project was completed, TRW has produced an even faster 16-bit MAC, the TMC2210N3C, which sells for under $40! With a few changes to the pin connections for the MAC, the author believes his filter could be made to work with the new chip.—Ed.]

In this filter, a good deal of the flexibility of the MAC is not used. For example, all the clock leads are connected together, and many of the control leads are permanently set. The only control that is actively used is the ACCumulate control. This is pulsed LOW once per cycle, which has the same effect as clearing out the accumulator section.

Construction

This article is not intended to be a construction project, and complete construction details are not included here. There are a few thoughts about building a digital filter like this that I would like to share with the readers, however.

The way a digital system is built is often a shock for people more used to analog design. Prototypes and one-time-only projects are often built with wire-wrapping tools, IC sockets and connectors. This provides rapid design and construction, and ease of modification if changes are desired. Only minimal care is needed to prevent coupling between signal leads, and shielded wire is only used for external connections, if it is used at all. If there are any analog signals involved with the circuit, there will generally be two separate grounds, connected only at the power supplies.

The lead photo shows the completed filter project, with the A/D and D/A converters plugged into the main board. Fig 10 is another picture of the project, showing the A/D, D/A and main processor boards separately. The D/A board is an evaluation board that I had available. Other, less expensive, converters are available, and their performance would be fine for this application.

Troubleshooting a Digital Circuit

After building the filter, debugging may be necessary. This is mostly to detect errors in wire-wrapping. In debugging digital circuits, you need a way to feed signals in, and a way of looking at the resulting signals. For this, a logic probe and pulser are good tools. While a triggered oscilloscope can speed up the process dramatically, it isn't really necessary. When you build a new circuit, I recommend building one functional section and testing it before continuing construction. That way, you know that almost everything is correctly wired and working by the time you are done. A good sequence to follow for building this filter is to first build the timing and control circuits, then the input circuitry, the RAM and ROM sections and finally the MAC.

Should anyone choose to build a similar filter, a good final test (before applying digitized audio signals) is to provide an input sequence that has a value of 1 for a single cycle, then a long series of zeros. The filter output should then just be the numbers stored in the PROM for the coefficients, followed by all zeros until another 1 is input.

Conclusion

Digital signal processing is still a moderately expensive technology, but one that gives very high performance. As production volumes increase, the prices will decrease to the point that this kind of filter will be attractive in amateur equipment. This article has given an introduction to one kind of digital filter, as well as a circuit that can be used directly as it stands, to perform digital filtering in the audio-frequency range. This might be used as a high-selectivity CW filter, or perhaps as the filters in an RTTY demodulator, for example. Good luck in your experimentation!

I would like to thank Barbara Jung for building the prototype for me, and also Bonnie Hayman and Rick Olsen, N6NR, for constructive criticism of my writing. (The responsibility for any mistakes is mine, however!)

Please note that some or all of the circuits described in this article may be protected by patents. No representation, express or implied, is made as to the existence or nonexistence of patent rights covering these circuits.

Notes

[1]R. Olsen, "Digital Signal Processing for the Experimenter," *QST*, Nov 1984, pp 22-27.
[2]F. Williams, "A Digital Frequency Synthesizer," *QST*, Apr 1984, pp 24-30.
[3]F. Williams, "A Microprocessor Controller for the Digital Frequency Counter," *QST*, Feb 1985, pp 14-20.

First licensed as a Novice (KN3FNH) in 1964, Fred Williams quickly moved up to Technician in 1965, and was active for about eight years as K3FNH and WA0ZXP. During college, though, he let his license lapse (he thought he had no time for ham radio!) while he was earning a BA in Physics (1973). After graduation, he joined the Satellite Ground Systems Laboratory of the Hughes Aircraft Company, where he worked for six years, developing analog and digital circuitry for satellite communications. While at Hughes, he obtained an MSEE degree from the University of Southern California in 1978. In 1980, he joined the LSI Products Division of TRW as an applications engineer. Presently, he is a Staff Engineer in the Advanced Marketing and Technology group, concentrating on the specification of new products. Fred is also presently studying for an amateur license again. We hope to hear him on the air soon!

Strays

STRAY HINTS

☐ "Strays" are those interesting fillers used when space allows in *QST*. Think you have an item with Stray potential? Here are some hints to help your submission become one. (1) Be sure the information will be of interest to most *QST* readers. (2) Any photographs you send should be good-quality black-and-white glossy prints.

Items submitted are normally acknowledged, but that doesn't necessarily mean that your item will be appearing in *QST*. Strays are used on a space-available basis, and usually we receive far more material than we can find room for in each issue. Photos become the property of ARRL and can't be returned.

Follow the above hints and maybe your Stray will find a home in *QST*.—*Paula McKnight, N1DNB*

Next Month in *QST*

- The Mid-Michigan Skyhook—what is it? Nope, not a Magic Johnson basketball shot. The answer is in January *QST*.
- Some Power-Supply Design Basics prescribes a cure for the common-mode hum.
- A new year, a new look for *QST*'s club column with the debut of Club Spectrum. This month, a Washington State high-school radio club goes mountaineering with ham radio.
- Novices and Technicians—it's your turn to rule the air waves in the Novice Roundup. Brush up on the contest rules in January *QST* and prepare to sizzle that straight key.
- Attention contesters and hamfesters: Don't miss the list of major ARRL operating events and conventions for 1987

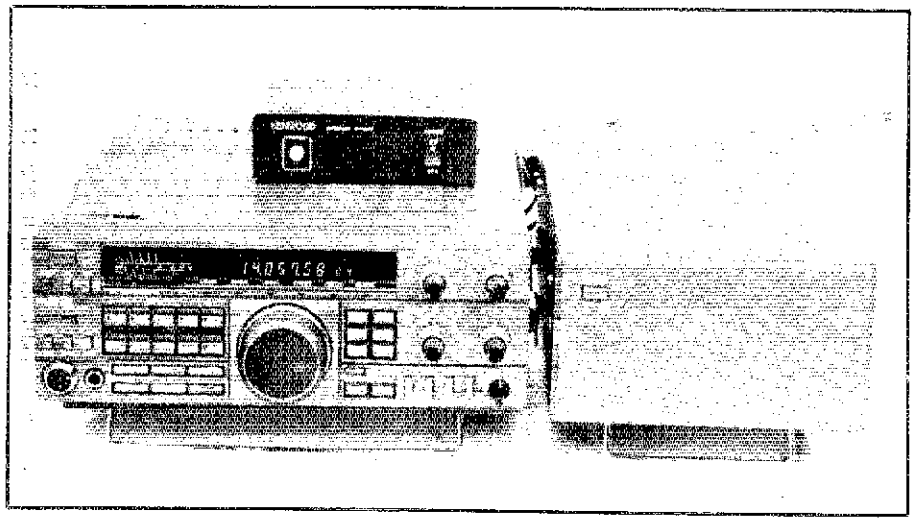
Please note: Part 1 of the article on Amplitude-Compandored Single Sideband, scheduled to appear in December, has been postponed. The publication date is unknown at this time.

Product Review

Conducted By Bruce O. Williams, WA6IVC
Assistant Technical Editor

Trio-Kenwood TS-440S HF Transceiver

Trio-Kenwood's latest entry into the full-featured, compact HF transceiver market is here—the TS-440S. Comparable with ICOM's IC-735 (see Product Review, *QST*, Jan 1986), the '440 is the next step in the development of the TS-430S transceiver. Feature for feature, the '440 falls somewhere in between the '430 and the '940 (Product Review, *QST*, Dec 1985), incorporating traits of both rigs.



Receiver Features

The TS-440S receiver uses a state-of-the-art triple-conversion scheme with IFs of 45.05 MHz, 8.83 MHz and 455 kHz. Its wide dynamic range can be attributed to the use of 3SK73 dual-gate MOSFETs, 2SK125 JFETs and a number of multipole band-pass filters (selected by the microprocessor) for maximum rejection of unwanted signals without sacrificing performance. There are two VFOs using a common shaft encoder and a PLL containing five loops. Either VFO covers the frequency range of 100 kHz through 30 MHz.

Transmitter Features

Because I've used rigs with vacuum tube finals most of the time I've been a ham, I found the user friendliness of solid-state finals a pleasant change. The only transmitter adjustments are the MIC (microphone gain) and CAR (carrier level) controls.

The transmitter also uses the triple-conversion scheme. The double-sideband first IF is generated at 455 kHz, then mixed with a local oscillator (8.375 MHz) to produce the second IF at 8.83 MHz. This signal is filtered and then fed to the RF unit where it is mixed with a heterodyne oscillator output to result in a 45.05-MHz third IF that is mixed again with the VFO output to develop the desired output frequency. This output is fed to the power amplifier, the low-pass filter, and then to the antenna connector on the rear panel, or to the (optional) internal automatic antenna tuner.

In the TUNE mode, the transmitter output is limited to approximately 10 W to protect the final transistors from any high SWR conditions. In the event that the antenna tuner cannot match the antenna impedance, a current foldback circuit protects the finals. Kenwood specifies that a range of 20 to 150 ohms can be matched. I used it to match both a tribander antenna and an 80/40-meter dipole to work all bands, 10 through 80 meters. I then tried matching a 40-meter antenna on 80 meters and was successful except at the very low end of the 80-meter band. The antenna tuner's threshold is an SWR of about 1.5:1, and it is satisfied if it sees that, or less. I am rather impressed with the antenna tuner, as it apparently will match about anything you present it with. The one drawback is that it does not function on 160 meters.

Front-Panel Controls

I was intimidated when I first saw the transceiver's front panel, but after spending a few minutes with the operating manual, it all came together. In the extreme-upper-left corner of the panel is the push-button ON/OFF switch (see Fig 1). Immediately beneath the ON/OFF switch are three additional push buttons. The VOICE push button causes the optional voice synthesizer to announce the operating frequency (in English or Japanese). The noise blanker, NB, can reduce a pulsating noise signal by as much as 40 dB. The ATTenuator introduces 20 dB of attenuation to incoming signals. The ATTenuator is useful if operating under extremely strong signal conditions, as it reduces front-end overload.

The front-panel meter functions as an S meter in all receive modes. A three-position slide switch allows selection of three different meter functions in transmit mode; PWR (power output), ALC level, or SWR. In the PWR position, the meter indicates the output power. It is a peak-reading meter, not an average-reading meter. In the ALC position, the meter monitors the drive level in USB, LSB and AFSK modes. The SWR meter shows the condition of the antenna only when the AUTO/THRU switch is in THRU position. Immediately below the meter switch are the SEND/RECeive push button, and the AUTO/THRU and AT TUNE/OFF switches to control the antenna tuner.

Using the automatic antenna tuner is easy—first push the AUTO button to enable the system. Then (if the frequency is clear) press the AT TUNE to put the rig in the transmit mode and cause the tuner to look for

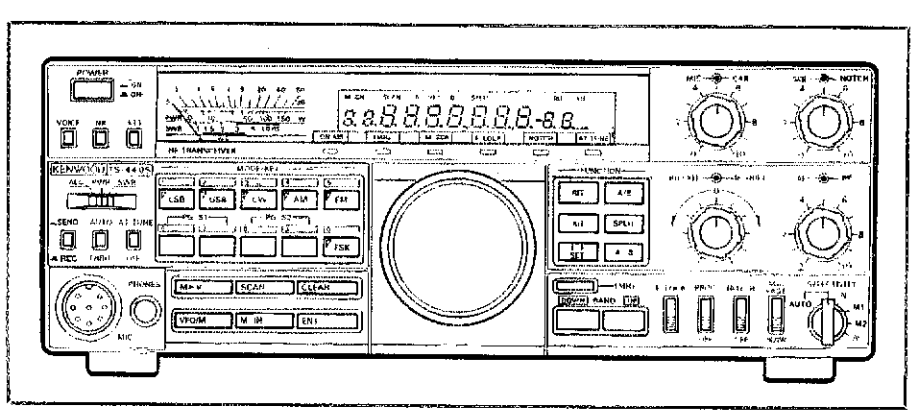


Fig 1—Front panel layout of the Trio-Kenwood TS-440S HF transceiver.

the best match. When you press AT TUNE, an LED indicator to the right of the status display at the top of the panel illuminates to indicate that the tuner is operating. When the tuner has found an acceptable match, which it accomplishes through microprocessor control, the LED goes off. This is the *only* indication that the tuner has found the optimum match. If the tuner is unable to obtain a satisfactory match (about 1.5:1 SWR), it continues to run until the AT TUNE is pressed to OFF. The operating manual notes that the tuner should not be allowed to operate more than 30 seconds. If it does, then press AT TUNE to OFF, and then back to on again. If the tuner fails to stop after several tries, the antenna impedance is unmatchable. It is also necessary, after completion of the tuning process, to again press (release) the AT TUNE push button before operating the transmitter. The MIC connector, an 8-pin male type, is located in the lower left of the front panel, next to the ¼-in, single-circuit PHONES jack.

The operating mode is selected by six buttons on a membrane MODE/KEY numeric keypad located in the middle left of the front panel. When one of the mode switches (LSB, USB, CW, AM, FM or FSK) is pressed, a green LED lights in the key pressed, and an audible Morse code indication of the selected mode is heard from the speaker (L for LSB, U for USB, C for CW, A for AM, F for FM and R for FSK). The mode-selection switches also double as part of the 10-key numeric keypad used for direct entry of VFO frequency. This feature allows rapid frequency changes without the delays encountered in other tuning methods. Below this keypad are six push buttons used for selection of the memory mode and direct frequency entry.

The '440 contains 100 (numbered 00 through 99) memories that contain frequency, VFO mode (VFO A, VFO B, Split VFO and so on) and XIT/RIT information. Memory entry and recall can be accomplished in several different ways. Selection of the memory to be used can be made through the VFO dial, the numeric keypad, or the UP/DOWN switches on the panel or microphone. Memory information can be transferred from one memory channel to another or from memory channel to VFO. Split-frequency information can be stored in memory channels 90 through 99.

The VFO tuning knob incorporates adjustable drag control, and frequency rate of change is faster if the knob is turned faster. VFO mode is controlled through a FUNCTION pad with six push buttons, just to the right of the knob. This pad allows VFO A/B selection, VFO A=B, SPLIT VFO operation, T-F SET (allows you to check or set the transmitter frequency during SPLIT operation) and RIT/XIT. BAND selection is accomplished through three switches; DOWN, UP and 1 MHz. The 1 MHz switch toggles on and off. When on, it lights up an LED on the top front panel display, and allows frequency changes in 1-MHz steps with the DOWN/UP buttons (for general coverage). If it is off, DOWN and UP select the next higher or lower amateur band.

There are four dual-function potentiometer controls on the upper right panel: MIC gain/CARrier level; SQUELch gain/NOTCH frequency; RIT/XIT offset/IF SHIFT and AF/RF gain. Below these controls, at the bottom right of the panel are: FREQUENCY LOCK (locks all VFO functions); PROC/OFF (enables or disables the speech processor); NOTCH/OFF (controls the notch filter); AGC FAST/SLOW (the AGC cannot be turned off) and SELECTIVITY. The '440 will select the appropriate filter AUTOmatically, if desired, or the operator can choose NARROW, M1, M2 or WIDE. The radio comes equipped with an SSB filter installed (2.2 kHz at −6 dB), and optional SSB, FSK and CW filters are available (250 Hz and 500 Hz for CW, and 1.8 kHz for SSB).

Rear and Top Panel Controls and Connectors

Three DIN connectors on the rear panel provide most of the necessary interfacing to the '440. ACC 1 provides an RS-232-C interface (more on this later). ACC 2 provides user access to TR relay control and RX/TX lines. REMOTE accesses the TR relay contacts, ALC input, PTT control, speaker output and 12 V dc at 10 mA during transmit. Other connections include a ¼-in phone jack for the key (short to ground for transmit, open voltage approximately 5.5 V dc), a 1/8-in external speaker jack, a 6-pin Molex-type connector for the external 12 V dc power supply, an SO-239 antenna connector, a stud with a wing nut for grounding, and three phono jacks for FSK audio in, FSK audio out, and a spare. Three recessed potentiometers provide VOX GAIN, VOX DELAY and ANTI VOX gain.

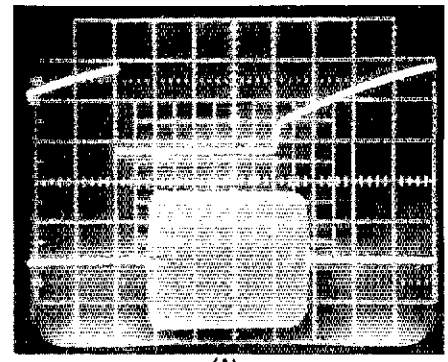
The TS-440S is capable of full or semi break-in, or manual PTT control. The control switch is recessed in the front left top cover. This switch also functions as the VOX enable.

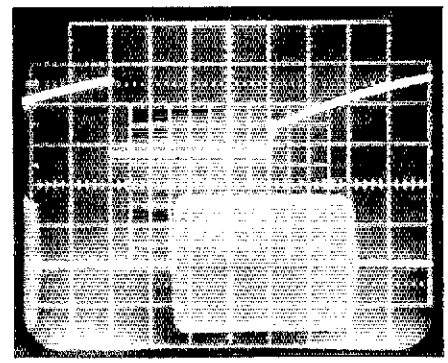
Operation

As mentioned previously, the '440's 100 memory channels provide tremendous flexibility. Memory entry and recall are two-step processes. This enables you to save the present frequency, hop to another frequency for a quick QSO, and come back to the original frequency without having to write anything down or even remember anything except the channel number. To enter a frequency and VFO mode into memory, first select the frequency on the VFO and the mode. Press the M.IN switch to enter the memory scroll mode (the M.SCR LED lights on the top display panel) and current memory channel number (M.CH)—frequency and mode will be displayed. Then find a memory channel that is free (no information) or that can be reprogrammed, by turning the VFO dial, with the numeric keypad or with the UP/DOWN buttons. When M.IN is pressed again, the frequency and mode is saved into the selected memory channel. You can check the frequencies in memory by pressing the VFO/M key and tuning across the memory channels. Recalling a frequency from memory is even easier—press VFO/M, find the memory location with the VFO dial and press M>V. Presto! All the information is recalled to the VFO. However, all information in that memory channel is erased—it must be reentered.

The scan function allows you to scan between two frequencies entered into memory. Memory scan operates from channel 00 to channel 99, with stops at each channel where data is stored at approximately 3-4 second intervals. Program scan is provided in two programmable scan ranges. PG.S-1 utilizes memory channels 06 and 07 to specify the upper and lower scan limits. PG.S-2 uses memory channels 08 and 09 to define upper and lower scan limits. Once programmed (similar to memory channel entry), scanning is initiated by pressing the SCAN button. This function can also be used in any segment of the general coverage receiver.

Remote computer control capability is another impressive feature of the '440. (There were rumors floating around after Field Day that one entrant was a CW robot consisting of a computer with exchange and duping capabilities and automatic control of a TS-440S. He, she or it supposedly did very well!) Installation of the IC-10 and IF-232


(A)


(B)

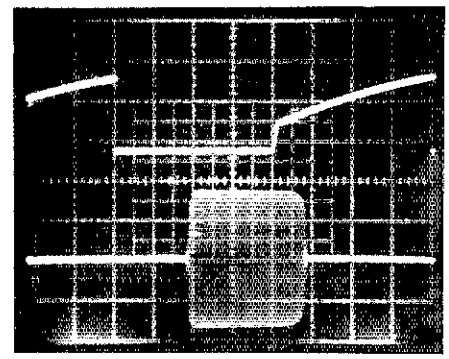
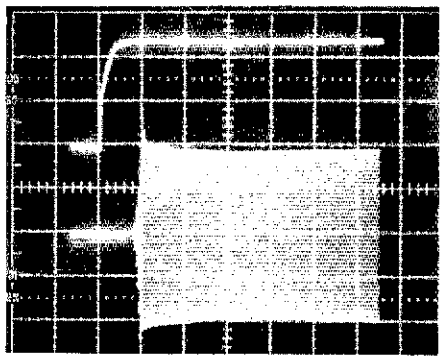
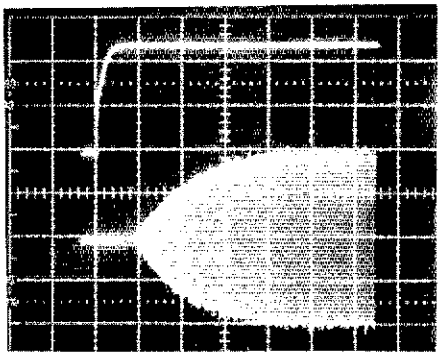

(C)

Fig 2—Keying waveforms for the '440. The transmitter was operating at a power output of 123 W on 14.100 MHz. Each horizontal division is 5 ms. The top trace is the input key closure; the bottom trace is the RF output. At A, a normal manually keyed signal is shown. B shows a semi-QSK signal—some delay is evident in the keying waveform. Additional delay as well as shortening of the signal is evident in the full-QSK signal at C. At speeds above about 30 WPM, this signal could sound choppy.



(A)



(B)

Fig 3—Receiver turnaround-time waveforms for the TS-440S transceiver. Each horizontal division is 20 ms. The top trace shows the key closure. The lower trace shows audio output. Upon key opening, the delay from opening to 90% audio output is measured. Receiver turnaround time with an S9 signal input is shown at A. The turnaround time is 20 ms, suitable for AMTOR. At B, receiver turnaround time with an S1 signal is shown. The turnaround time is approximately 45 ms, which may be marginal for weak-signal AMTOR operation.

interface units requires about half an hour. With these options and a suitable computer, the following functions can be remotely controlled: frequency, RIT/XIT mode, VFO selection, memory usage and scanning. This requires a computer with a communications program capable of sending and receiving 4800-baud ASCII with eight data bits, one stop bit and no parity. I used a Radio Shack® TRS-80 microcomputer, Model 4P, with a terminal program to test this capability. I then wrote a BASIC program to control the '440 through the RS-232-C port. It is possible to control the transceiver completely from the computer during normal QSOs.

The TS-440S QSK feature has two speed options, fast and slow. Slow QSK works something like VOX keying (the delay is internally fixed), and the fast mode allows break-in between each dot and dash. There are some problems, however, with how this is accomplished. Fig 2 shows the '440's keying waveshape in manual, semi-QSK and full-QSK modes. In all three cases, the input keying waveform is the same—about 20 ms. The upper trace shows the key closure; the lower trace is the RF output. Fig 2A shows a normal manually keyed output waveform. In Fig 2B, the semi-QSK keying causes some additional delay in the transmitted signal, while in full-QSK, Fig 2C, it is evident that considerable shortening of the waveform occurs. At speeds above about 30 WPM, this signal may sound choppy, but additional keying weight may improve the signal.

Although Kenwood states that FSK data transmission is possible with the '440, the rig requires an external source of audio with the desired tones. The '440 has no built-in tone generator. The rig can be driven to full output with less than 100 mV of audio. With the SELECTIVITY switch in AUTO position, and the optional YK-88C filter installed, the receiver exhibits a 500-Hz bandwidth.

We measured the receiver turnaround time, (the time it takes for the receiver to reach 90% audio output after the TR relay opens) to determine if the '440 is suitable for AMTOR. For an S9 signal, the delay was 20 ms (Fig 3), and for an S1 signal it was approximately 45 ms. Although the transceiver is capable of good performance on medium-to-strong signals, it may be marginal for weak-signal AMTOR, depending on the type of modem used. AMTOR normally requires receiver turnaround in about 30 ms, or less.

(continued on page 47)

Trio-Kenwood TS-440S Transceiver, Serial No. 7050095

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Transmitter frequency range: 160 m 1.8- 2.0 MHz 80 m 3.5- 4.0 MHz 40 m 7.0- 7.3 MHz 30 m 10.1-10.15 MHz 17 m 18.068-18.168 MHz 15 m 21.0-21.45 MHz 12 m 24.89-24.99 MHz 10 m 28.0-29.7 MHz	As specified.
Receiver frequency range: 100 kHz-30.0 MHz.	As specified.
Modes of operation: A3J (USB, LSB), A1 (CW), F1 (FSK), A3 (AM), F3 (FM).	As specified.
Frequency display: Large fluorescent-tube digital main display.	As specified.
Frequency resolution: $\pm 1 \times 10^{-5}$.	As specified.
Frequency stability: $\pm 1 \times 10^{-5}$.	As specified.
Transmitter	*Transmitter Dynamic Testing*
Power input: 200 W PEP (160-10 m bands, SSB, CW, FSK, FM) 110 W (AM).	Power output (CW): 160 m, 118 W; 80 m, 123 W; 40 m, 123 W; 30 m, 125 W; 20 m; 127 W; 17 m, 126 W; 15 m, 126 W; 12 m, 124 W; 10 m, 123 W.
Spurious signal and harmonic suppression: Less than −40 dB (in CW).	−43 dB. See Fig 4.
Third-order intermodulation distortion: More than 26 dB below one of two tones.	−28 dB. See Fig 5.
CW keying waveform: Not specified.	See Fig 2.
Receiver	*Receiver Dynamic Testing*
Receiver sensitivity: LSB, USB, CW, FSK (at 10 dB S/N) 100-150 kHz: less than 2.5 μV. 150-500 kHz: less than 1.0 μV. 500-1600 kHz: less than 4.0 μV. 1.6-30 MHz: less than 0.25 μV. AM (at 10 dB S/N) 100-150 kHz: less than 25 μV. 150-500 kHz: less than 13 μV. 500-1600 kHz: less 40 μV. 1.6-30 MHz: less than 2.5 μV. FM (at 12-dB SINAD) 1.6-30 MHz: less than 0.7 μV.	Minimum discernible signal (Noise floor) (dBm) *80 m* *20 m* −140 −139
Receiver dynamic range: Not specified.	Blocking dynamic range (dB): *80 m* *20 m* 112 111 Two-tone, 3rd-order intermodulation distortion dynamic range (dB): *80 m* *20 m* 89 89 Third-order input intercept (dBm): *80 m* *20 m* −6.5 −5.5
Receiver quieting (μV for 12 dB signal + noise + distortion/signal + distortion): 0.65 μV at 29.0 MHz.	
Receiver recovery time: Not specified.	See Fig 3.
Squelch sensitivity: FM, 1.6-30 MHz.	Min 0.12 μV, max 0.33 μV.
Receiver audio output at 10% total harmonic distortion: 1.5 W.	2.0 W
RIT/XIT variable range: more than ± 1 kHz.	± 1.3 kHz.
Color: Gray.	
Size (height × width × depth): 4.5 × 12.0 × 13.0 in.	
Weight: 13.9 lb (16.1 lb with AT-440).	

Hints and Kinks

Conducted By Bob Schetgen, KU7G
Assistant Technical Editor

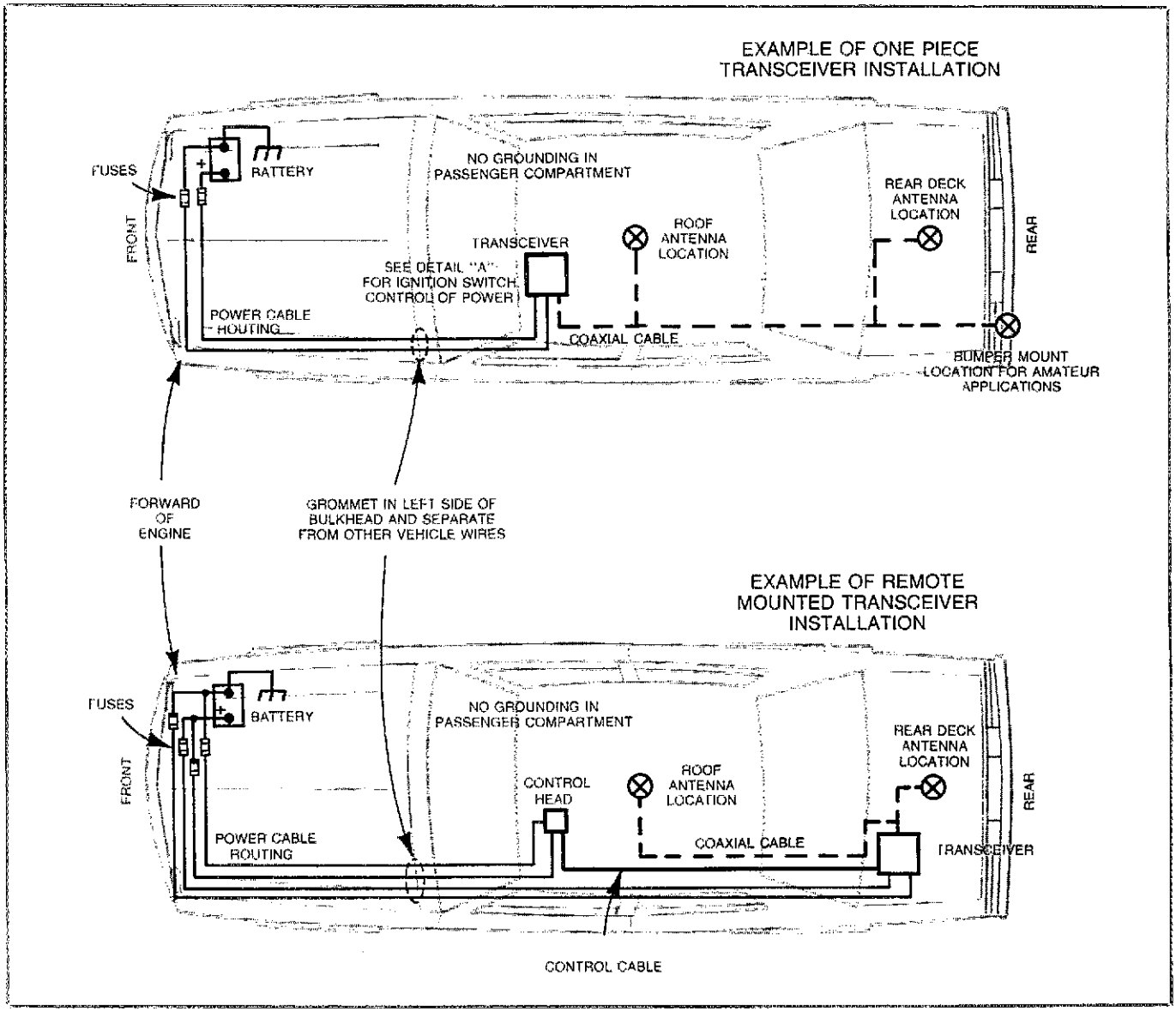


Fig 1—Details of typical mobile radio installations showing both remote-control and one-piece transceivers.

GENERAL MOTORS CORPORATION RADIO TELEPHONE/MOBILE RADIO INSTALLATION GUIDELINES

[Editor's Note: The following is a reprint of "Radio Telephone/Mobile Radio installation Guidelines" from the General Motors (GM) Electrical Engineering Center. GM makes these recommendations for their products only. The address shown at the end of the guidelines is for current GM products only. Contact that address only after consultation with your local GM representative, and do not write with questions about other manufacturers' products.[1] My thanks to Doug Constance, Don Hibbard, WD8NFX, and Bill Sperber at GM for their help.]

Certain radio telephones, land-mobile radios or the way they are installed may adversely affect engine performance or operation of driver-information, entertainment and electrical-charging systems. Expenses incurred to protect vehicle systems from adverse effects of any such installations are not the responsibility of General Motors Corporation. The following are general guidelines for radio-telephone or land-mobile-radio installations in GM vehicles. These guidelines are intended to supplement, but not to be used in place of, detailed instructions for such installations, which are the sole reponsibility of the involved radio-telephone or land-mobile-radio manufacturer.

Transmitter Location

A) Place the transceiver portion of two-piece radios in the driver's side of the trunk

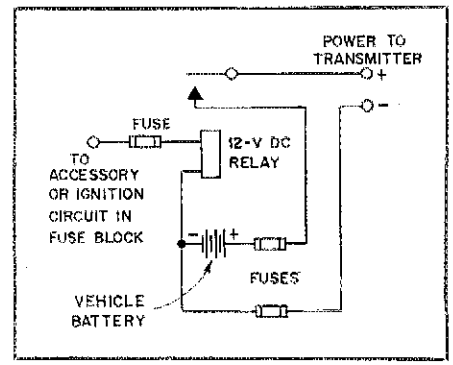


Fig 2—A schematic of contactor wiring for ignition-switch control of a transceiver.

as near to the vehicle-body side as possible.

B) Mount one-piece transceivers under the dash or on the transmission hump, where they do not interfere with vehicle controls or passenger movement.

Antenna Installation

A) Use a permanently mounted antenna located in the center of the roof or rear-deck lid. Keep glass-mounted antennas as high as possible in the center of the rear window or windshield. If a magnetic-mount antenna must be used, carefully place it in a location recommended for a permanently mounted antenna. If a disguise-mount antenna is used, shield the matching network from vehicle electronics and wiring or mount the matching network in an area completely clear of vehicle electronics and wiring.

B) Radio-frequency energy affects each vehicle model and body style differently. When dealing with an unfamiliar vehicle, use a magnetic-mount antenna to check proposed antenna locations for unwanted effects. (Antenna location is a major factor in these effects.)

Antenna-Cable Routing

A) Always use high-quality coaxial cable (at least 95% shield coverage), and route it away from the Engine Control Module and other electronics modules.

B) Do not route feed line next to any vehicle wiring.

Antenna Tuning

A) It is important to properly match the antenna so that reflected power is kept to a minimum (keep SWR less than 2:1).

Radio Wiring and Connection Locations

A) Transceiver power leads:
Power connections, including the ground, should be made directly to the battery (or to the jump-start block on vehicles so equipped). Transceiver power leads should be no. 10 AWG or larger, installed as a twisted pair if possible. The ground lead should not be attached to the body at any point. Place appropriate fuses, as near the battery as possible, in both positive and ground leads. (A fuse in the transceiver ground lead prevents possible transceiver damage should the battery-to-engine-block ground be disconnected.)

Where ignition-switch control of dc power is desired for one-piece transceivers, install a 12-V power contactor in the transceiver positive lead. Install the contactor near the vehicle battery, and drive the contactor coil through an appropriate fuse from an available accessory or ignition circuit that is not powered during cranking. The contactor-coil ground should return directly to the negative battery terminal.

B) Handset or Control-Unit Battery and Ground:

Any ground lead from a handset or control unit should return directly to the negative battery terminal. The positive lead of a handset or control unit should be connected directly to the positive battery terminal. Fuse the handset or control unit power leads separately from the transceiver power leads. If the radio dc power must be controlled with the ignition switch, the handset or control-unit positive lead may be connected, through an appropriate fuse, to an available accessory or ignition circuit not powered during cranking.

C) Connections for multiple transceivers and receivers:

If multiple transceivers or receivers are installed in the vehicle, install heavy power conductors to the trunk or dash and terminate them in covered, insulated bus bars. Connect all radio power leads to the bus bars. (This makes a neater installation and reduces the number of wires running under the hood.)

Wire Routing

A) Bring radio power leads into the passenger compartment through a grommet in the driver's side of the firewall. For trunk-mounted transceivers, continue the cables along the driver's-side door sill(s), under the rear seat, and into the trunk through the rear bulkhead. If the battery is located on the passenger side, power leads should cross the vehicle in front of the engine. Maintain as much distance as possible between radio power leads and vehicle electronic modules and wiring.

B) For police vehicles, route radio power leads in the conduit provided with the option package.

Troubleshooting

A) Should vehicle problems develop following installation, the source of the problem should be determined prior to further vehicle operation.

B) Possible causes of vehicle problems include:

1) Power connections to points other than the battery.

2) Antenna location.

3) Transceiver wiring located too close to vehicle electronic modules or wiring.

4) Poor shielding or poor connections in the antenna feed line.

Contact and Feedback

A) GM vehicles have been designed and extensively tested for immunity to known sources of RF energy. It is impossible, however, to test every combination of RF source and installation. If you encounter a persistent condition in a GM vehicle, contact your local GM representative. If no solution is found locally, write to: EMC Dept—Mr, Bldg 40, General Motors Proving Ground, Milford, Michigan 48042-2001.

[1]Surprisingly little information is available about proper installation of two-way radios in vehicles containing microprocessors. The GM recommendations are all that I have seen to aid those who wish to make competent, interference-free installations of amateur gear in today's electronically sophisticated automobiles.

Conversations with technicians who install police radios in Chrysler products have yielded some unofficial information. The microprocessor is usually in the passenger-side kick panel. Police cruisers come equipped with a steel cable housing welded to the frame on the driver's side from the firewall to the rear bumper. RF cables are routed inside the housing to the antenna at the rear of the vehicle. Power cables are kept as far as possible from the computer.

I would appreciate copies of any additional official information. Send them to Bob Schetgen, KU7G, Hints and Kinks Editor, 225 Main St, Newington, CT 06111.

FLASH! VCR CURES TVI!

☐ Here is a tip on the use of a VHS videotape recorder. I live in the weak-reception area of several Los Angeles television stations. When the signals from those stations are very weak, my 7-MHz amateur transmissions produce a light cross-hatch pattern on Channel 5. I have found that the interference is eliminated when the received TV signal is passed through my operating VCR. I do not know the gain of the VCR front end, but it seems significant. —*K. C. Jones, W6OB, Hemet, California*

LIVING WITH TVI

☐ I live in a small apartment building at a summer resort area. During the colder half of the year, I am the only occupant and have no TVI worries. As warm weather approaches, however, the other apartments start filling up. Three tenants have hand-me-down TV sets with poor antennas that are particularly susceptible to TVI. (My own set is free of TVI even when I use my amplifier. Thus, my station emissions are clean. That doesn't cut any ice with the neighbors, however, who want to see their programs.) For my part, it is good practice to keep my neighbors happy. So, do I go QRT during all TV-viewing hours? Not on your life! I have set up a TV detector to determine when the neighbors are watching TV.

If you live in an apartment building, perhaps you have noticed that your AM broadcast receiver is little better than useless when your (or your neighbor's) TV is on. This is the result of interference from the TV horizontal-sweep oscillator, and it is especially prevalent near the low end of the AM-broadcast dial. Such interference is much worse on longwave frequencies (150-300 kHz). All I do is tune my receiver near 150 kHz (the 10th harmonic of the sweep frequency) and a loud roaring noise can be heard when a neighboring TV is on.

My discovery does not cure TVI, but it does allow me to operate many hours when I would otherwise have to stay off the air.—*Robert J. Panknen, K4SYP/EA5CHT, Murcia, Spain*

MORE ON THE BALANCED GRID CIRCUIT FOR THE SB-200

[In Mark Tyler, K5GQ's hint (Aug 1986 *QST*) about the SB-200, he replaced C29, a fixed capacitor, with an 8- to 50-pF variable capacitor. Here is Mark's adjustment procedure for the new capacitor.—Ed.]

☐ The variable capacitor determines the amount of ALC sent to the exciter. To determine the variable capacitor setting:

1) Set the new component for maximum capacitance.

2) Momentarily increase the exciter to maximum RF output. (ALC through the new capacitor should limit the exciter output.)

3) Decrease the capacitance until maximum amplifier output is reached. (Decreasing the capacitance should increase amplifier drive and output by reducing the ALC signal.)

I installed a 20-pF fixed capacitor in NM5I's SB-200 because he does not use the ALC line.—*Mark Tyler, K5GQ, Katy, Texas*

Technical Correspondence

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

HF WEFAX ON THE IBM PC

☐ Keith Sueker's (W3VF) article on HF WEFAX for the Apple II computers is a popular one.[1] Those of you who own an IBM® PC can join the fun with WXFAX.BAS. This program copies HF WEFAX and is written for use with the IBM graphics printer. WXFAX.BAS is run from within BASIC.COM, *not* BASICA.COM.

The interface used with WXFAX.BAS is basically the same one described in Sueker's article except for one resistor value: Change R12 to 2.2 kΩ. Connect the output of demodulator to pin 14 of the PC's game port, and ground to pin 12.

Fig 1 contains the WXFAX.BAS program listing. I use DOS 2.1. If you use a larger DOS than mine, move the subroutine higher in memory by changing line 21Ø to: DEF SEG &h1FØØ, and the last term in line 34Ø to &h1F. Provisions are made to allow for the adjustment of three timing constants used in the program: TD3, TD6 and TD9. Experience obtained from running the program on a few PCs has shown that program timing adjustments are sometimes required to accommodate variations in the PC's clock frequency. Hopefully, you won't have to make the adjustment because it takes some patience, but if you need to correct some picture distortion, it is well worth doing. The correction is made by simply changing the constant values in three program lines (180, 190 and 200). Record the original values, though, in case you have to start over. [Placing the original values in a REM statement within the program (see lines 150 and 160) is one approach.—Ed.]

Always get TD3 right before you adjust TD6, and get TD6 right before you adjust TD9. TD3 varies the timing between a pair of adjacent lines. Adjust TD3 so that the picture information in the line pair matches up. That is, the picture content from one of the pair to the other of the pair is not moved to the right or left. At first, there is some ambiguity here because it is not obvious whether a given line is paired with the one above it, or the one below it, until you have begun to make small changes in TD3.

TD6, when properly adjusted, will bring four adjacent pairs of lines together so that the picture made by 8 lines will match. Proper TD9 adjustment brings groups of four pairs (8 lines per group) together.

The best place on the picture to check the adjustment of these timing constants is at the beginning of the transmission when only sync pulses are being sent. The sync pulses form a vertical bar when all the timing has been properly set. A magnifying glass will help because each line of the picture is only 1/72 inch from the next. Make changes of only 50 to 100 in the values so you don't get lost in the process.

A program disk is available from me for $15. The disk contains somewhat more detailed instructions on the timing adjustment.—*Elmer W. Schwittek, K2LAF, 429 N Country Club Dr, Atlantis, FL 33462*

[1]K. Sueker, "Real-Time HF WEFAX Maps on a Dot-Matrix Printer," *QST*, Mar 1986, pp 15-20; Feedback, *QST*, Jul 1986, p 43.

ALC FOR TRIODE AMPLIFIERS

☐ After I wrote "ALC for Class AB_1 Amplifiers," I realized that it should be easy to adapt the circuit to grounded-grid triodes.[2] Unfortunately, I haven't been able to try such a circuit. Although I think little of untested ideas, someone else may want to give the circuit in Fig 2 a try.

The referenced article contains the hints for this adaptation. For a zero-bias tube, Q1 has no voltage at its emitter, and thus Q2 requires only about −20 V; anything more than the ALC control voltage required by the exciter will suffice. A small auxiliary supply may have to be built into the amplifier to provide

[2]M. Mandelkern, "ALC for Class AB_1 Amplifiers," *QST*, Jul 1986, pp 38-39 and 47.

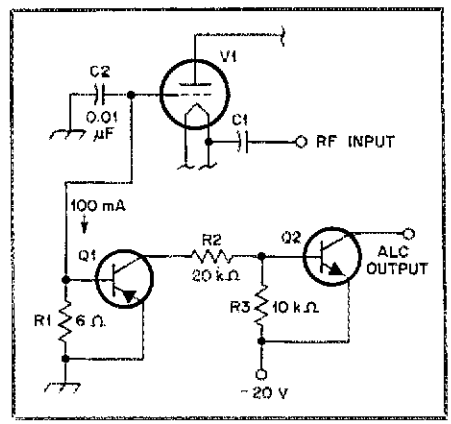


Fig 2—This shows how the ALC circuit presented in the July article (see note 2) might be adapted for use with grounded-grid triodes; it is an untested circuit. For automatic grid current control at a different level, the value of R1 may be changed (see text).

```
1Ø '              **********************************
2Ø '              *            WXFAX.BAS           *
3Ø '              * By Elmer W. Schwittek, K2LAF  *
4Ø '              *    429 N. Country Club Dr.    *
5Ø '              *      Atlantis, FL 33462       *
6Ø '              *       August 31, 1986         *
7Ø '              **********************************
8Ø '
9Ø CLEAR,&hFØØØ
1ØØ KEY OFF:CLS
11Ø LOCATE 1Ø,33:PRINT "Turn printer ON"
12Ø LOCATE 14,28:PRINT "Press any key to continue . . . "
13Ø IF INKEY$="" THEN GOTO 13Ø
14Ø '
15Ø ' Timing constants follow.  Original values in lines 18Ø,
16Ø ' 19Ø and 2ØØ are:  TD3% = 119ØØ  TD6% = 4972  TD9% = 365Ø
17Ø '
18Ø TD3%=119ØØ
19Ø TD6%=4972
2ØØ TD9%=365Ø
21Ø DEF SEG=&hFØØ
22Ø FOR F=Ø TO 362
23Ø READ G:POKE F,G
24Ø NEXT F
25Ø CLS
26Ø LOCATE 8,22:PRINT "To Start FAX copy, press 'g' or 'G'"
27Ø LOCATE 9,22:PRINT "(FAX audio signal must be present)
28Ø LOCATE 13,24:PRINT "To Stop FAX copy, press any key"
29Ø LOCATE 18,26:PRINT "To Begin Again, press 'RUN' [ F2 ]"
3ØØ K=Ø
31Ø CALL K (TD3%,TD6%,TD9%):END
32Ø DATA &h55,&h8B,&hEC,&h8B,&h76,&hØA,&h8B,&hØ4
33Ø DATA &h5Ø,&h8B,&h76,&hØ8,&h8B,&hØ4,&h5Ø,&h8B
34Ø DATA &h76,&hØ6,&h8B,&hØ4,&h5Ø,&hB8,&h16,&hØF
35Ø DATA &h8E,&hD8,&h8F,&hØ6,&hØ9,&hØØ,&h8F,&hØ6
36Ø DATA &hØ7,&hØØ,&h8F,&hØ6,&hØ5,&hØØ,&hBA,&hØØ
37Ø DATA &hØØ,&hB4,&hØØ,&hBØ,&h1B,&hCD,&h17,&hB4
38Ø DATA &hØØ,&hBØ,&h41,&hCD,&h17,&hB4,&hØØ,&hBØ
39Ø DATA &hØ8,&hCD,&h17,&hB4,&hØØ,&hBØ,&h1B,&hCD
4ØØ DATA &h17,&hB4,&hØØ,&hBØ,&h32,&hCD,&h17,&hB4
```

Fig 1—WXFAX.BAS program listing.

this voltage source; only a few milliamperes of current are required.

The value of Q1's base resistor, R1, is chosen to produce a nominal 100-mA grid-current limit, and can be selected as required for any particular amplifier. This selection need be made only once during the design of the amplifier; it is not an adjustment (this is still a "no adjustment" circuit). The advantage of this approach to that of RF voltage-detector ALC circuits is that the latter needs adjustment to compensate for the different RF drive voltages required on different bands, caused by differing tube and circuit losses. If the low value base resistor is inconvenient, a somewhat larger value may be used, followed by a voltage divider —perhaps a "set and forget" trimmer potentiometer. Any method that produces 0.6 V at the base of Q1 will do. The usual RF filtering, as shown in the July article, should be applied to all circuit leads.—*Mark Mandelkern, KN5S, Department of Mathematics, New Mexico State University, Las Cruces, NM 88003*

Feedback

☐ Author Stephen Stuntz reports a good response to his article, "A CW Program Cartridge for the Atari Computer," *QST*, Aug 1986, p 34. Some who have modified the cartridge PC board, however, couldn't remember how to orient the board when reinstalling it in the cartridge. Author Stuntz advises that the circuit board should be oriented so the top of the EPROM faces the back of the cartridge.

☐ From author Clay Abrams, we've received corrections to Figs 1 and 3 of "In Search of the Perfect Picture," *QST*, Jan 1986, pp 18-24. In Fig 1, p 20, there should be a connection between U5 pin 1 (not shown) and the common point of U8B, pin 4 and U9B, pin 3. In Fig 3, p 22, insert a 0.01-μF capacitor in the line between the arm of S1 and U3, pin 6. At U8, change the Q10 output pin number (labeled 14 on the diagram) to 12.

```
41Ø DATA &hØØ,&hCD,&h16,&h3C,&h67,&h74,&hØ6,&h3C
42Ø DATA &h47,&h74,&hØ2,&h75,&hF2,&hB9,&hFF,&hØØ
43Ø DATA &hBA,&hØ1,&hØ2,&hEC,&h3C,&h8Ø,&h73,&hF8
44Ø DATA &hE2,&hF6,&hBØ,&hØØ,&hA2,&hØØ,&hØØ,&hB9
45Ø DATA &hCØ,&hØ3,&h8B,&h3E,&hØ1,&hØØ,&hBA,&hØ1
46Ø DATA &hØ2,&hEC,&hDØ,&hDØ,&hDØ,&h95,&hØB,&hØØ
47Ø DATA &h47,&h51,&hB9,&h63,&hØØ,&h9Ø,&hE2,&hFD
48Ø '
49Ø DATA &h59,&hE2,&hEB,&hB9,&hBC,&hØ1,&h51,&hB9
5ØØ DATA &hAØ,&hØ1,&h9Ø,&hE2,&hFD,&h59,&h9Ø,&hE2
51Ø DATA &hF5,&h8B,&hØE,&hØ5,&hØØ,&h9Ø,&hE2,&hFD
52Ø DATA &hB9,&hCØ,&hØ3,&h8B,&h3E,&hØ1,&hØØ,&hBA
53Ø DATA &hØ1,&hØ2,&hEC,&hDØ,&hDØ,&hDØ,&h95,&hØB
54Ø DATA &hØØ,&h47,&h51,&hB9,&h63,&hØØ,&h9Ø,&hE2
55Ø DATA &hFD,&h59,&hE2,&hEB,&hB8,&hØØ,&hØØ,&h8B
56Ø DATA &h3E,&hØ3,&hØØ,&hAØ,&hØØ,&hØØ,&hB2,&hFØ
57Ø DATA &hF6,&hE2,&hØ3,&hF8,&hBA,&hØØ,&hØØ,&hB9
58Ø DATA &hFØ,&hØØ,&hB4,&hØØ,&hBØ,&h1B,&hCD,&h17
59Ø DATA &hB4,&hØØ,&hBØ,&h4C,&hCD,&h17,&hB4,&hØØ
6ØØ DATA &hBØ,&hFØ,&hCD,&h17,&hB4,&hØØ,&hBØ,&hØ8
61Ø DATA &hCD,&h17,&hB4,&hØØ,&h8A,&h85,&hØB,&hØØ
62Ø DATA &hCD,&h17,&h47,&hE2,&hF5,&hFE,&hØ6,&hØØ
63Ø DATA &hØØ,&h8Ø,&h3E,&hØØ,&hØØ,&hØ4,&h74,&h18
64Ø DATA &hB9,&hB2,&hØ1,&h51,&hB9,&hA6,&hØ1,&h9Ø
65Ø '
66Ø DATA &hE2,&hFD,&h59,&h9Ø,&hE2,&hF5,&h8B,&hØE
67Ø DATA &hØ7,&hØØ,&h9Ø,&hE2,&hFD,&hE9,&h57,&hFF
68Ø DATA &hB4,&hØØ,&hBØ,&hØD,&hCD,&h17,&hB4,&hØØ
69Ø DATA &hBØ,&hØA,&hCD,&h17,&hA1,&hØ1,&hØØ,&h8B
7ØØ DATA &hØE,&hØ3,&hØØ,&hA3,&hØ3,&hØØ,&h89,&hØE
71Ø DATA &hØ1,&hØØ,&hB4,&hØ1,&hCD,&h16,&h74,&hØF
72Ø DATA &hB4,&hØØ,&hBØ,&hØD,&hCD,&h17,&hB4,&hØØ
73Ø DATA &hBØ,&hØA,&hCD,&h17,&hEB,&h19,&h9Ø,&hB9
74Ø DATA &h7A,&hØ1,&h51,&hB9,&h7Ø,&hØ1,&h9Ø,&hE2
75Ø DATA &hFD,&h59,&h9Ø,&hE2,&hF5,&h8B,&hØE,&h09
76Ø DATA &hØØ,&h9Ø,&hE2,&hFD,&hE9,&hØB,&hFF,&h8C
77Ø DATA &hDØ,&h8E,&hD8,&h5D,&hCA,&hØ6,&hØØ,&hØØ
78Ø DATA &hØØ,&hØØ,&hØØ,&hE8,&hØ3,&hØØ,&hØØ,&hØØ
79Ø DATA &hØØ,&hØØ,&hØØ
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Product Review

(continued from page 43)

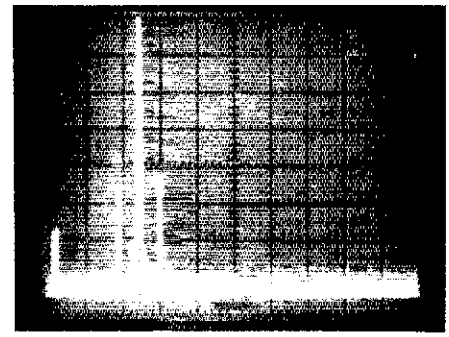


Fig 4—Worst-case spectral display of the TS-440S operating on the 20-m band. Vertical divisions are each 10 dB; horizontal divisions are each 10 MHz. Output power is approximately 123 W at a frequency of 14.1 MHz. All spurious emissions are at least 43 dB below peak fundamental output. The two taller pips on each side of the fundamental are mixing products, but are below the maximum level allowable under FCC regulations. The TS-440S complies with current FCC specifications for spectral purity.

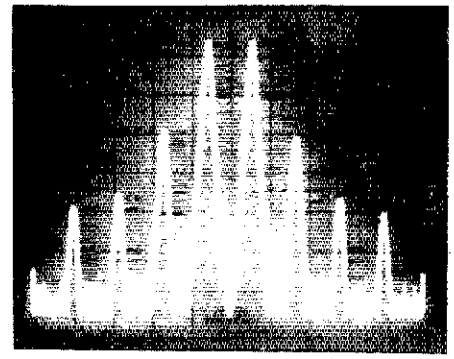


Fig 5—Spectral display of the TS-440S output during transmitter two-tone intermodulation distortion (IMD) testing. The transmitter was being operated at rated input power on the 20-m band. Third-order products are 28 dB below PEP, and fifth-order products are 46 dB down. Vertical divisions are each 10 dB; horizontal divisions are each 1 kHz.

Conclusion

The TS-440S is truly a pleasure to use, and I must say that I am impressed with its many features. It performed flawlessly through the review period. Because I tend not to operate from one location all of the time, its light weight and compact design enhanced my operations. Even though the controls are compactly arranged, I did not find them difficult to use. The only complaint I have is that the RIT and XIT controls are not separate—this caused some problems during contests because I use these two controls a lot in contesting. All things considered, however, I give Trio-Kenwood's TS-440S a "10."

Manufacturer: Trio-Kenwood Communications, 1111 West Walnut St, Compton, CA 90220. Price class: TS-440S with AT-440 antenna tuner, $1200; YK-88C 500-Hz CW filter, $65; YK-88CN 270-Hz CW filter, $65; VS-1 voice synthesizer, $45; PS-50 heavy-duty power supply, $210 ; IF-232C level translator, $55; IC-10 modem IC kit, $23.—*Thomas Miller, KA1JQW*

ARRL Museum and Visitors' Center

A tribute to 75 years of Amateur Radio, a gateway to the future

By Andrew Tripp, KA1JGG
Editorial Supervisor, *QST*

At its July 1986 meeting, the ARRL Board of Directors approved, in principle, the idea of creating a Museum and Visitors' Center on the League's property in Newington. This is but the first of several steps that would have to be taken before the decision to proceed is made, and the Center can become a reality.

The Board, in effect, gave the okay for the ARRL staff to proceed to the next phase: determining if adequate funding is available from voluntary sources. The ARRL staff is gathering that information now for a report to the Board. Based on the project's feasibility and members' input, the Board will then vote on the project. For details on the Board action in July, see Minute 45 of the Meeting (Moved and Seconded, September 1986 *QST*).

In September *QST*, Executive Vice President Dave Sumner, K1ZZ, introduced the idea behing the Museum and Visitors' Center to the ARRL membership (It Seems to Us, page 9). Let's take a closer look now at some of the various aspects being considered.

Why build it? Certainly one good reason is to make sure that our roots—the people, the events, the traditions that have shaped Amateur Radio—are not lost forever, so future generations will have the opportunity to appreciate all that is Amateur Radio. Clearly, there is much to recognize and honor in our history, and the list of achievements and significant events is sure to continue to grow in the years to come (see accompanying sidebar).

A well-designed and -promoted museum display is much more than a well-deserved monument to past pioneers; it also will increase public awareness of Amateur Radio in general. This can only help to enhance the public's perception of the importance of Amateur Radio as a national resource. Initial building plans also include a multipurpose room for use as a command center to coordinate amateur communications during natural disasters. Headquarters space in the lobby that is used now as a museum could be converted to office space to help serve the members' growing needs.

Proposed Features of the Museum and Visitors' Center

- a renovated W1AW with four guest operating positions
- permanent exhibits, including operating positions from each period of Amateur Radio history, antique equipment, historical events, distinguished amateurs
- space for artifacts on loan from other collections
- a members' library
- a multipurpose room for meetings, receptions and video presentations, and to serve as an emergency-communications command center
- ample space for storage and restoration of artifacts

Recruitment is another important consideration. Studies of similar facilities show that a permanent museum exhibit will have a significant impact on the ability of Amateur Radio to attract newcomers. Presently about 2000 visitors, 62% from outside New England and the bulk of them amateurs, come to League Headquarters annually. We believe that with the Museum and Visitors' Center as a drawing card, that figure will jump to about 8000-10,000 visitors annually—a significant number of whom will be prospective amateurs.

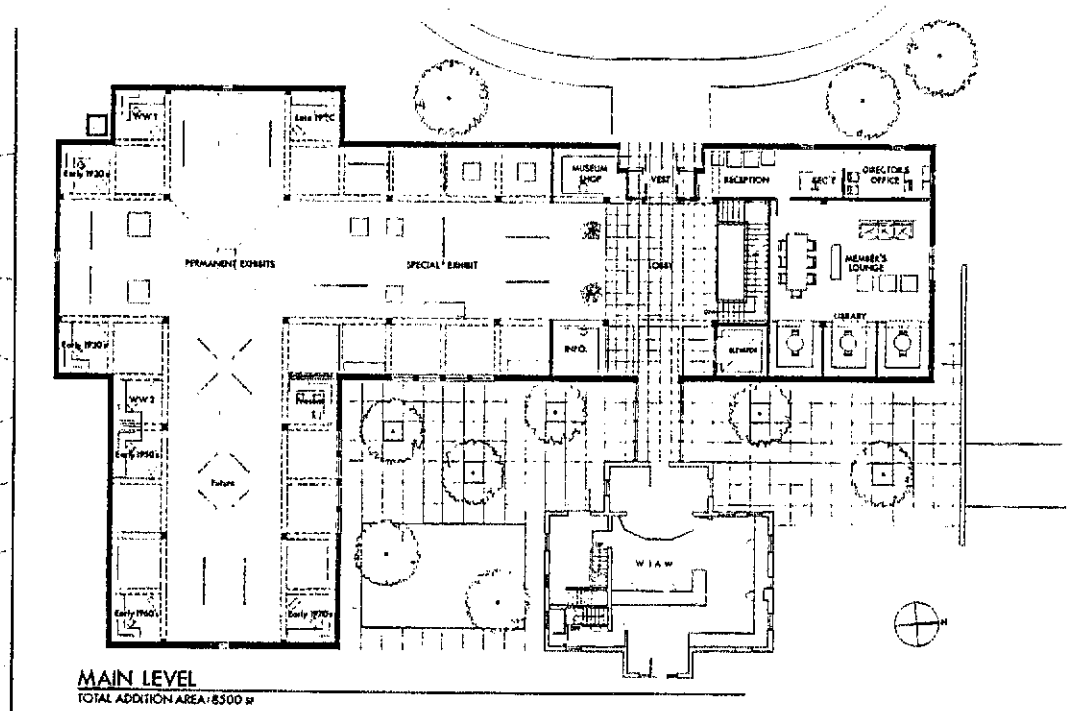
Already, the project has the support of the Connecticut State Department of Economic Development. Preliminary discussions with state officials indicate the possibility of a grant for restoring historic radios, components and other artifacts. Similarly, the Olde Towne Tourism Bureau, which promotes historic districts in neighboring towns, has expressed an interest in working with the ARRL should the Museum and Visitors' Center be approved. Through these promotional efforts alone, we would reach many prospective amateurs. State and other support earmarked for the Center could not be used directly for recruitment of new hams, of course.

The projected cost of the Center is about $2.7 million. This includes the construction of the building and exhibit space, the renovation of W1AW and additional parking space. So, where will the money come from?

It is the Headquarters' view that the Center should be able to stand alone financially. Neither construction nor operating costs should be derived from League membership-subscriptions or existing resources. To that end, these and other sources of funding are being explored:

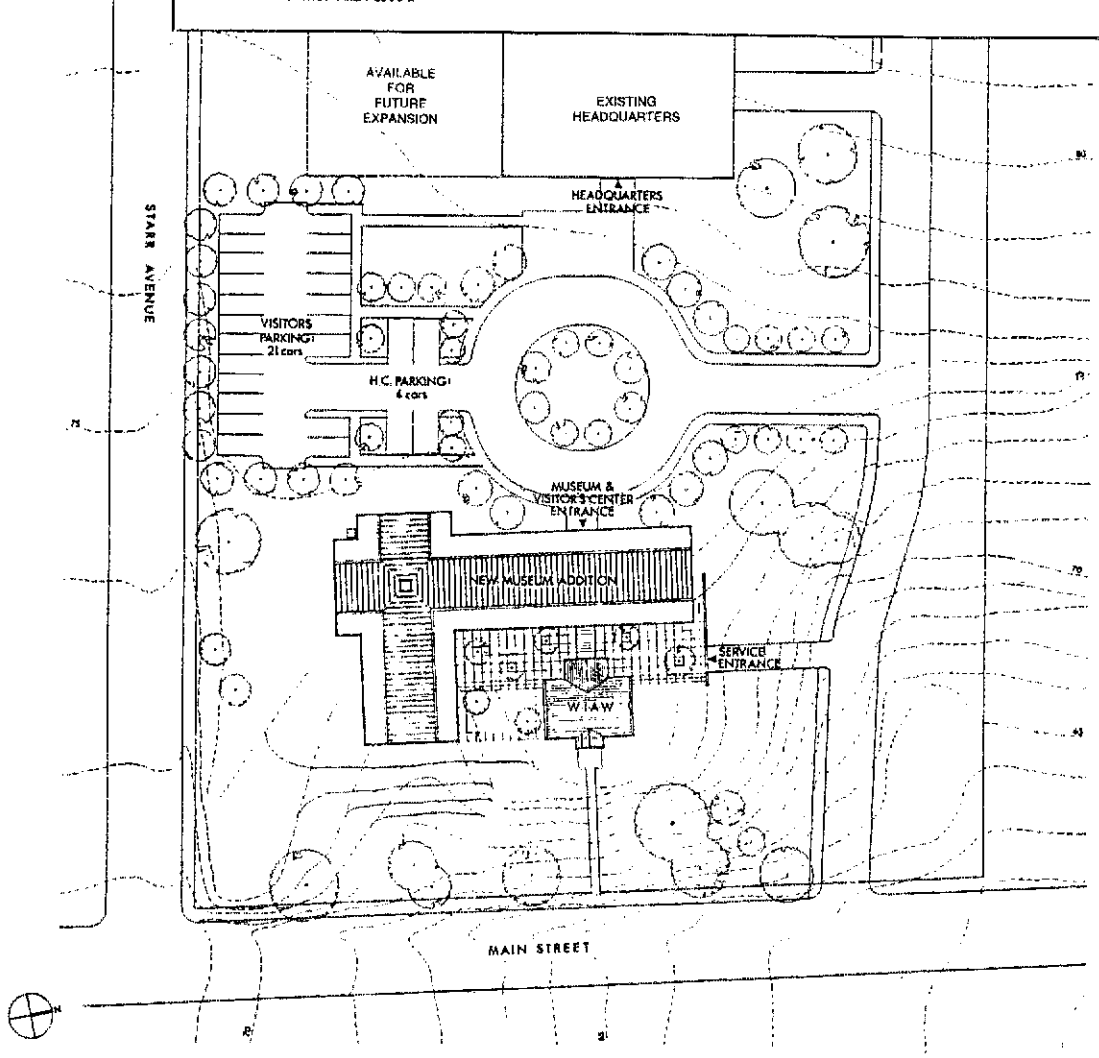
- grassroots contributions from League members and longtime amateurs and supporters
- 38 Connecticut Foundations whose stated purpose for giving grants fits ARRL and the museum part of the Center
- gifts from the electronics industry
- a possible grant from the State Department of Economic Development
- large personal gifts
- a blue-ribbon committee to promote fund-raising.

The decision whether to build the center is an important one, indeed, but not without precedent. The project is, in many respects, similar to the construction of the present Headquarters building in the 1960s. You, the members, made that a reality with your input and ultimate support. We're looking for that same effort again. Before the Board votes on the Center next month, voice your opinion to your Director or to HQ. With your support, the ARRL Museum and Visitors' Center can become a reality—a project worthy of a great organization to be dedicated in its Diamond Jubilee year.



MAIN LEVEL

TOTAL ADDITION AREA: 8500 sf



SITE PLAN

The "Slipup"

By Bruce Vaughan, NR5Q
PO Box 203
Springdale, AR 72765

Looking out of his window at the large parking lot, the old-timer watched people arriving for the evening visiting hours. A light snow had begun falling about mid-afternoon, and now at dusk the ground was almost covered. The large Christmas tree, with its hundreds of colored lights and the large star on top, stood out in bright contrast to the falling snow.

Carefully, the cars crossed the parking lot, pausing at the entrance only long enough to allow the passengers to step out onto the snow-free walk, then on to find a parking space. Many of those arriving were carrying flowers or gaily wrapped Christmas gifts.

What a wonderful time of year, but what a lousy place to spend Christmas, thought the OT. This hospital brought back a lot of memories—some good, some bad—but the past few days were not ones he would care to remember.

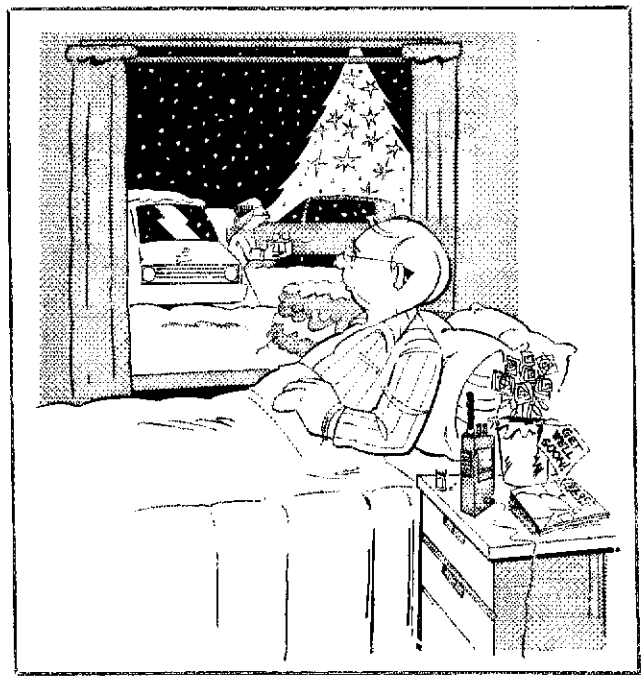
His three children had been born in this hospital, and even one grandchild had arrived here. There had been the usual annual check-ups, some surgery and broken bones, which, while unpleasant, were at least temporary. He could even look back with a certain amount of amusement at the time just before the DX contest when he had, after repairing his antenna, managed to lose his grip near the bottom of his tower, fracturing a leg. Not only did he miss the contest, but spent three weeks here right at the peak of the sunspot cycle.

With all these visits to the hospital, every day brought improvement and you could look forward to resuming your normal activities. This was different. The OT wondered if he would ever be able to enjoy the pleasures of everyday things we all take for granted. Or perhaps, and he preferred not to think about it, just maybe this was his last trip here.

The little 2-meter hand-held sitting on his bedside table broke his chain of thought. It was one of his fellow club members on the local repeater calling to wish him well and offer a few words of encouragement. With his right arm practically useless and partial paralysis of the left side, he clumsily operated the 2-meter rig with his left hand.

A cynical smile was on his face as he thought about an old CW man like himself now having difficulty operating 2-meter FM. He wondered, would he again know the pleasure of putting up his own antennas? Were his days of building equipment over at last? Most of all, he would miss the pure joy of a good, snappy CW QSO.

When he had retired last year, he was looking forward to many more years of hamming, of being able to chase DX or ragchew any time he wished, of not having to leave a wide-open band with the DX rolling in to go to work.



His thoughts returned to 1938, when he was first licensed as W5HTX. He was in high school at the time, and money was scarce. Tape machines cost real money, so he learned code and theory by sitting in front of an old broadcast radio that would tune the 160-meter band, listening to W9BSP in Olathe, Kansas conduct his one-hour lessons. After three months of study, he was ready for the exam. Working after school and on Saturdays he was able to save enough for a used Sky Buddy, and to build a 15-watt transmitter.

From the first QSO, CW was his love. Oh, he tried 10-meter phone and worked some 75-meter phone, but always returned to CW. His code speed increased quickly, and at the end of his first year on the CW bands, 25 WPM was his usual QSO speed.

He smiled as he remembered the day his "Mac" bug arrived. It had cost him $5.50, but it was worth every cent. Boy, what a thrill to work CW with that "Mac."

Now, at age 65, these CW days might be gone forever. The doctor had told him that his stroke had been a "light one," that he was sure he would soon regain most, if not all, of the use of his arms and legs.

However, he could not help but wonder . . . was the doctor really telling him the truth. After all, it was Christmas. Perhaps the XYL and the doctor had decided not to give him the bad news. Maybe, they were waiting until later, thinking he would slowly realize the extent of his disability.

One thing he did know: Marge would get the truth from the doctor and even if she decided not to tell him, sooner or later she would "slip up." After all, he had lived with her for 41 years and knew her better than anyone. When she, by action or word, made the "slipup" he would know it. Bad news is one thing, but this waiting, worrying and not knowing was worse.

"Hi," said Marge, as she came through the door carrying a small package. "I know it's only Christmas Eve," she said, "but I want you to open your present tonight."

Does that mean that I may not be here tomorrow, thought the OT, or perhaps she is feeling sorrow or pity for me.

With his shaking left hand he unwrapped the box. Slowly lifting the flaps, he peeked inside, knowing the gift she had picked for him might very well be the "slipup" he had been waiting for. "Marge, please lift it out of the box for me. I'm afraid I might drop it."

Gently she lifted the "Presentation" Vibroplex from the box, placing it on the light-blue folded blanket at his side. The Vibroplex glistened like the Crown Jewels, its gold base, polished chrome parts contrasting beautifully with the red knob and paddle.

There was a smile of relief on his face and a tear in his eye as he read and reread the inscription engraved on the gold base. It said, "The best DX is yet to come."

His Christmas was truly a merry one when he noted the "bug" was a *right handed* model. Marge had indeed made the "slipup."

Happenings

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

ARRL to FCC: Reconsider Question Pools

The ARRL has filed a Petition for Reconsideration with FCC, requesting the Commission reverse its decision in PR Docket 85-196 to delegate to Volunteer Examiner Coordinators (VECs) the responsibility for maintaining the question pools for written-examination elements. The ARRL comments state that it was the intent of Congress that the FCC supervise the examination process through the maintenance of question pools, and that the FCC's maintenance of them is the only way to ensure standardization among the 25 VECs. A number of other petitions for reconsideration have also been filed.

In this Docket, the Commission has replaced the question pools with what the ARRL Petition calls a "vague, generalized algorithm" which specifies a list of nine topics and the percentage of questions on each topic the VEC should include in its question pools for each examination element. The list of topics in the algorithm is so general and vague that it permits radically different question pools to be maintained by the various VECs. For example, it asks VECs to design questions for the Extra Class written examination on the topic of antennas and feedlines that relate to the extra privileges granted over those of an Advanced class licensee. There is just no practical way to comply with this. Said ARRL: "There is no guidance in the algorithm. The League is completely at a loss as to how to apply it."

The petition states that the FCC expectation that the 25 different VEC organizations will somehow band together and establish one question pool is unrealistic: "The volunteer nature of the VEC program generally suggests the relative independence of VECs and a multitude of different question pools."

Should different question pools arise, candidates for the same class of license may be required to take examinations of widely different levels of difficulty and quality. For example, applicants with equal levels of understanding of the material may pass exams by one VEC, and fail exams by another VEC solely because of different question pools. The League concludes that "there must be only one question pool per written element, approved by the Commission, so that candidates are uniformly qualified and that examinations are fair to each candidate."

Should the ARRL's Petition be denied, the ARRL may appeal to the US courts.

ECPA PASSES CONGRESS, SENT TO PRESIDENT

Congress has finished its work on the Electronic Communications Privacy Act of 1986 and sent it on to the White House. It was signed by the President Oct 21, and is now known as Public Law 99-508. The Senate report number 541, which explains the bill, may be requested from the offices of your local Congressman or Senator.

In most cases, radio communications defined as *not* "readily accessible" will be illegal to monitor, unless one of the below exemptions applies. "Readily accessible to the general public" is defined to mean that the communication is *not:*

- scrambled or encrypted;
- carried on a subcarrier or other signal subsidiary to a radio transmission;
- transmitted over a communication system provided by a common carrier (except for tone-only paging signals);
- transmitted on frequencies allocated under FCC rules Part 25 [communication-relay satellites]; Part 74(D) [remote pickup broadcast stations]; Part 74(E) [aural broadcast auxiliaries, including studio-to-transmitter links]; Part 74(F) [television broadcast auxiliaries & studio-to transmitter links]; or Part 94 [private fixed microwave].

As mentioned above, some exceptions override the general ban on reception of allegedly "inaccessible" signals. For example, the radio emissions of a cordless phone may be monitored, even though it relays common carrier communications.

What May Legally Be Monitored:

- any Amateur, CB or General Mobile Radio Service transmission.
- any marine or aeronautical radio communication.
- any communication transmitted "for the use of the general public, or that relates to ships, aircraft, vehicles, or persons in distress."
- the radio portion of cordless telephone communications linking the handset and base unit.
- tone-only paging signals.
- certain types of audio subcarriers (to be specified in Senate report).
- signals causing harmful interference to "any lawfully operating station or consumer electronic equipment, to the extent necessary to identify the source of such interference."
- satellite transmissions of "network feeds," some audio subcarriers, and cable programming covered by Section 705(b) of the Communications Act.
- any governmental, law enforcement, civil defense, private land mobile, or public safety (including police and fire) radio communications system that is "readily accessible to the general public."
- any other electronic communication made through a system "configured so that such electronic communication is readily accessible to the general public."

Penalties

For most unencrypted radio communications protected under the ECPA, intentional unauthorized interception carries a criminal penalty of up to one year in jail and/or a fine of up to $100,000—for a first offense that is not for a "bad purpose"—ie, "not for a tortious or illegal purpose or for purposes of direct or indirect commercial advantage or private gain."

If it is a "public land mobile radio service" communication (ie, a cellular or a traditional IMTS radiotelephone call) or any type of paging except for tone-only, and the signal is not scrambled or encrypted, and if the interception is intentional, but not for a "bad purpose," the penalty for a first offense is a fine of up to $500.

If the communication is scrambled or encrypted, or the interception is for a "bad purpose" or is a second or subsequent offense, the penalty is up to five years in jail and/or a fine of up to $100,000.

Sections of the bill about which amateurs were most concerned at the outset have been modified, and it does not appear to inhibit any amateur operation as such.

FCC AUTHORIZES AUTOMATIC CONTROL FOR PACKET STATIONS WHEN RETRANSMITTING THIRD-PARTY TRAFFIC

The Commission has acted in PR Docket 85-105 to make permanent the provisions of the tempory waiver issued earlier in the year permitting network amateur stations, transmitting digital communications on VHF and above, using the AX.25 packet protocol, to be operated under automatic control while retransmitting third-party traffic.

Although the FCC acknowledged assurances of safeguards by the ARRL for the AX.25 packet protocol, the FCC noted that control operators capable of monitoring such transmissions must alert the control operator of any intermediate retransmitting station, under automatic control, of any station misuse so that corrective action can be taken.

The Commission deferred action on requests for automatic control for digital communications on HF until its feasibility can be determined. HQ received the order just at press time; further details, including the exact rule changes, will appear next month.

FCC TO ALLOW WRITTEN-EXAMINATION CREDIT

Beginning December 1, the Commission will allow reexamination credit for written elements passed during an otherwise unsuccessful amateur examination, according to an October 9 FCC news release. Currently, the Commission allows credit only for code-examination elements. The FCC also clarified that examiners who administer a Novice examination are not required to issue a Certificate of Successful Completion of

Examination (CSCE). Instead, applicants may produce a photocopy of a pending application that indicates the applicant has qualified for a Novice license. These rule changes are contingent upon Office of Management and Budget approval of revisions to FCC Form 610.

FCC DENIES ARRL PETITION TO REQUIRE LABELING OF HOME ELECTRONIC DEVICES

The Commission has affirmed a May 20, 1986 order of the Chief Engineer dismissing the petition for rule making filed by the ARRL requesting that the FCC require that a label be attached to home electronic devices. The label would indicate whether the device incorporates shielding, filtering or circuitry designed to reduce the susceptibility of the device to radio-frequency interference (RFI).

The Chief Engineer said the petition failed to take into account the need to establish criteria or standards to permit a qualitative assessment of the RFI susceptibility of a home electronic device. He also said the petition was premature since the susceptibility of home electronic devices to RFI is being addressed by an Ad Hoc Committee instituted by the American National Standards Institute.

In upholding the Chief Engineer's action, the Commission noted that while ARRL said its aim was public education on the subject of RFI responsibility, the implications of labeling home electronic devices or systems as to their immunity feature went far beyond public education. Such a program could imply that a standard had been developed that would assure the proper functioning of a home electronic device in the proximity of a properly operating licensed transmitter. This implied assurance could complicate the resolution of RFI problems involving home electronic devices.

The Commission said it would continue to monitor the effectiveness of the efforts of the Ad Hoc Committee and, if it finds that voluntary efforts are not yielding an adequate degree of RFI susceptibility control within a reasonable time, it may then consider mandatory standards and a means of enforcing them.

"VOLUNTEER EXAMINERS" IN THE COMMERCIAL SECTOR?

In General Docket 86-367, the FCC has asked for comments on legislation it may propose seeking authority to delegate responsibility for preparing and administering commercial radio operator examinations. According to the press release (we haven't seen the text of the actual proposal yet), examination authority might be delegated "to a private organization with the resources to better prepare and administer the tests" to be "selected through a competitive bidding process." The Commission requested comments on how a private examiner should be selected and funded.

HAM ISSUED $1450 FORFEITURE

The San Juan FCC office issued a Notice of Apparent Liability to Monetary Forfeiture for $1450 to David G. Ackley, W4UWH, of St Thomas, Virgin Islands. The forfeiture was assessed for violation of several sections under Part 97 of the Commission's Rules.

Ackley was allegedly found to be causing willful and malicious interference to ongoing amateur communications on 7258 kHz, constituting a violation of Section 97.125. He also allegedly violated Sections 97.7(a), for transmitting on a frequency not authorized by his Technician class license, and Section 97.84, for failing to identify his transmissions.

ANOTHER NEW COSMOS ON 2304 MHz

WB5LUA and W4HHK report reception of a new Cosmos satellite on 2304 MHz beginning October 2. This second satellite almost identically follows by 13 hours an earlier new Russian bird that was reported in the *ARRL Letter* of September 15 and last month's Happenings. The first satellite is being received for five hours beginning at sunrise. The second is heard in the evening with a maximum elevation of 16 degrees at the end of a pass. For more information, contact Paul Wilson, W4HHK, P.O. Box 73, Collierville, TN 38017.

FCC CHAIRMAN TESTIFIES FOR SPECTRUM AUCTIONS

On October 1, FCC Chairman Fowler testified before the House Subcommittee on Telecommunications, Consumer Protection and Finance on the subject of "Spectrum Auctions: Proposals for FCC Management of the Airwaves." Chairman Fowler sought legislation giving FCC limited authority to use auctions to award spectrum to various commercial FCC licensees, arguing that this approach would generate revenue for the government and reduce administrative expenses and delays without altering the obligations or rights of licensees. This will not affect the Amateur Service. "Auction authority would not be granted for use in the amateur service or in any mass media or public safety service." The FCC estimates it could raise over $2 billion by "auctioning off" some remaining portions of the UHF spectrum to potential licensees.

CQ NOVICE

CQ Novice is a magazine in development by *CQ* Publishing that will be made available free of charge for six months to all newly licensed amateurs. According to Publisher Richard Ross, K2MGA, the six issues of the magazine will be designed to aid newly ticketed hams in getting their feet wet in the real, day-to-day world of Amateur Radio. Writers such as Gordon West, WB6NOA, Robert Locher, W9KNI, and Peter R. O'Dell, KB1N, will present the various aspects of Amateur Radio to the new ham.

GWEN

Have you heard of an Air Force communications system named GWEN? GWEN stands for Ground Wave Emergency Network. Its purpose is to provide an EMP-immune communications network to carry "attack warning data" between the nation's military command authority and strategic military forces. Right now, a "Thin Line Connectivity Capability" is under construction which includes 56 unmanned VLF (150-175 kHz) relay nodes. The primary feature of one of these nodes is a 300-foot tower hooked to a 2-3 kW VLF transmitter; when GWEN reaches "Final Operation Capability" there will be approximately 70 such nodes scattered across the nation. If one is planned for your area, you're likely to hear a wide variety of concerns expressed by the general public, such as aesthetic impact, RF radiation hazards, environmental impact, creation of a nuclear-strike target in your backyard, and so on. It's worth noting that the Air Force is not required to comply with local land use regulations.

FCC ENFORCEMENT ACTIONS OF ILLEGAL CB RADIOS

Two Long Island, New York men were sentenced for importation and marketing of illegal CB radios by the US District Court in New York last week. Lawrence Wallach, President of L. W. Sales, Inc, of Lynbrook, pleaded guilty to two felony counts and received a $10,000 fine and five year's probation. Gerard Purnhagen, of East Rockaway, pleaded guilty to one felony count and was sentenced to four year's probation and a $2000 fine.

Both men were indicted in February 1986 for importing and marketing CB radios that were not authorized by the FCC for sale in the US. The radios operated on frequencies outside the CB band with excessive transmitter power. In a related case, the US Marshal's Service, with the assistance of the FCC's New York office, confiscated an estimated $35,000 worth of illegal radio equipment from Suburban Electronics of Fairfield, New Jersey, on October 7. This action is part of a continuing enforcement program to make certain the FCC ban on manufacturing and selling CB linear amplifiers and other non-type-accepted transmitters is observed. Federal law prohibits the marketing and manufacture of such non-compliant equipment.

FCC LICENSING FIGURES

The FCC amateur licensing figures for fiscal year 1986 (October 1985 through September 1986) are out. They show an increase in licensees of 8495 over one year ago. This is a 2.1% rate of annual increase.

By license class, the figures (with comparison to a year ago) are:

	Sep 30, 1986	*Sep 30, 1985*	*Change*
Novice	79,107	76,337	up 2770
Technician	86,148	83,117	up 3031
General	116,864	117,340	down 476
Advanced	98,195	97,825	up 370
Extra	40,768	37,968	up 2800
Total operators	421,082	412,587	up 8495

There were 20,979 new licensees entering the Amateur Radio Service during the fiscal year, compared to 17,373 during the previous year. During fiscal year 1985, 1460 of the newcomers went directly to a Technician or higher license, bypassing the Novice stage; during the fiscal year just ended, the figure was 1832. Thus, there is a slight trend toward entry at the Technician or higher level, but it still constitutes less than 9% of the newcomers.

FCC PROPOSES 7075-7100 kHz TO NOVICE AND TECHNICIANS OUTSIDE REGION

The FCC, in response to a petition filed by Dean Manley, KH6B, has issued a Notice of Proposed Rule Making that would authorize

7050-7075 kHz for Novice and Technician class operators in Alaska, Hawaii, the Region 2 Pacific insular areas and the Caribbean insular areas.

In his petition, Manley stated that international broadcasting in the 7100-7300 kHz band rendered the Novice and Technician band at 7100-7150 kHz virtually useless. Manley noted that approximately 4500 Novice and Technician class operators would be affected by the change, not enough to pose a significant problem to amateur operators in the 48 contiguous states in Region 2. Presently, 7050-7075 kHz is authorized for Novice and Technician control operators in Regions 1 and 3. The Commission has assigned the number RM-5361 to Manley's petition, and will accept comments on the proposal until December 22, 1986. In accordance with Commission rules, persons submitting comments should provide an original and five copies.

MICHAEL R. ZEIGLER, ARRL CONTROLLER

ARRL Controller Michael R. Zeigler, 66, passed away October 16, three weeks after suffering a heart attack and undergoing emergency surgery for replacement of a heart valve. As ARRL Controller, Mike was responsible for all financial reporting and analysis. He was also responsible for the administrative-services functions at Headquarters. Mike, who was not a licensed amateur, had worked at HQ for over nine years. He leaves his wife, Grace, two sons, two daughters and seven grandchildren. Mike was an easygoing, friendly individual, and the ARRL Headquarters staff mourns his passing.

CAP RULE CHANGES

At the request of the Civil Air Patrol (CAP), the FCC has issued an order providing for SSB operation on 26.620 MHz, a frequency assigned to CAP, with 150 watts output. The present rules only allow for AM operation with 5 watts output.

The CAP requested the changes because of its need to improve intermediate range communications support for their search-and-rescue operations. The Commission said it approved the change since only the CAP was assigned this frequency, and that any resulting interference caused by the increased power and the new SSB emission would impact only upon CAP stations and would be within their capability to control.

COMMENT PERIOD EXTENDED FOR ATIS

The FCC has extended the comment deadline for both the Notice of Inquiry (NOI) and the Notice of Proposed Rule Making (NPRM) sections of their Automatic Transmitter Identification System Docket No. 86-337. The comment period for the Notice of Inquiry, the section in which Amateur Radio is specifically mentioned, has been extended to January 19, 1987.

ATIS is a unique, unchangeable identifying number assigned to each transmitter at the time of manufacture. This signature is added automatically during transmissions providing positive identification of the signal.

Obviously, ATIS is not practical in the Amateur Service where equipment is frequently bought and sold, making it difficult and expensive to keep track of who is using each transmitter. The ARRL will shortly file comments strongly opposing ATIS.

International Amateur Radio Arrangements

Countries with which the United States shares reciprocal-licensing/operating agreements:

LU	Argentina	J3	Grenada	LA	Norway
VK	Australia	TG	Guatemala	HP	Panama
OE	Austria	8R	Guyana	ZP	Paraguay
C6	Bahamas	HH	Haiti	OA	Peru
8P	Barbados	HR	Honduras	DU	Philippines
ON	Belgium	TF	Iceland	CT	Portugal
V3	Belize	VU	India	J6	St Lucia
CP	Bolivia	YB	Indonesia	S7	Seychelles***
A2	Botswana	EI	Ireland	9L	Sierra Leone
PY	Brazil	4X	Israel	H4	Solomon Islands
VE	Canada	I	Italy	ZS	South Africa
CE	Chile	6Y	Jamaica	EA	Spain
HK	Colombia	JA	Japan	PZ	Suriname
TI	Costa Rica	JY	Jordan	SM	Sweden
OZ	Denmark	T3	Kiribati	HB	Switzerland
HI	Dominican Rep	9K	Kuwait	9Y	Trinidad
HC	Ecuador	EL	Liberia	T2	Tuvalu
YS	El Salvador	LX	Luxembourg	G	United Kingdom**
3D2	Fiji	3A	Monaco	CX	Uruguay
OH	Finland	PA	Netherlands	YV	Venezuela
F	France*	PJ	Neth Antilles	YU	Yugoslavia
DL	Fed Rep of Germany	ZL	New Zealand		
SV	Greece	YN	Nicaragua		

*Includes all its overseas departments/territories.
**Includes the following territories: VP2A (V2 now), VP2D (J7 now), VP2M, VP2V, VP5, VP8, VP9, VS6, ZB2, ZD7 and ZF.
***Cancellation claimed by Seychelles.

Countries with which the United States shares third-party-traffic agreements:

V2	Antigua	C5	Gambia	ZP	Paraguay
LU	Argentina	9G	Ghana	OA	Peru
VK	Australia	J3	Grenada	V4	St Christopher
V3	Belize	TG	Guatemala	J6	St Lucia
CP	Bolivia	8R	Guyana	J8	St Vincent
PY	Brazil	HH	Haiti	9L	Sierra Leone
VE	Canada	HR	Honduras	3D6	Swaziland
CE	Chile	4X	Israel	9Y	Trinidad
HK	Colombia	6Y	Jamaica	GB	United Kingdom**
TI	Costa Rica	JY	Jordan	CX	Uruguay
CO	Cuba	HL9	Korea*	YV	Venezuela
HI	Dominican Rep	EL	Liberia	4U1ITU	ITU Geneva
J7	Comm Dominica	XE	Mexico	4U1VIC	VIC Vienna
HC	Ecuador	YN	Nicaragua		
YS	El Salvador	HP	Panama		

*Temporarily around Christmas in past years.
**Limited to special-event stations with call-sign prefix GB (GB3 excluded) and to stations on Pitcairn Island (VR6).

NARTE TO ISSUE COMMERCIAL TICKETS TO AMATEURS

The National Association of Radio and Telecommunications Engineers (NARTE) is one of the groups that stepped in to fill the void when the FCC decided to stop issuing broadcast radiotelephone licenses. NARTE offers examinations at over 100 colleges and universities to certify broadcast engineers. The Board of Directors of NARTE has determined that the technical complexity of the Amateur Advanced and Amateur Extra Class licenses is equivalent to the NARTE Technician 4th Class entry-level examination. Effective immediately, NARTE will grant its entry-level, 4th Class certificate without endorsement, to persons holding the Amateur Advanced class license, and to Amateur Extra Class licensees, the 4th Class certificate with one endorsement.

Before running to NARTE for your 4th Class Certification, you should note that NARTE charges a $15 *annual* fee for Advanced class certification, and a $20 annual fee for the Extra Class certification.

NARTE hopes that this certification program will provide for an easier transition for radio amateurs who are interested in a broadcasting/commercial profession.

NEW THIRD-PARTY AGREEMENT WITH SIERRA LEONE

The United States has entered into a third-party-traffic agreement with Sierra Leone (9L). As with other third-party agreements, FCC licensed amateur stations may exchange messages with third parties in Sierra Leone, effective July 18, 1986. Remember, messages must be in plain language, and the text must consist only of communications of a technical or personal nature. As always, business communications are prohibited.

Correspondence

Conducted By John Hennessee, KJ4KB
Regulatory Information Assistant, ARRL

HAM RADIO FOREVER!

I do a great deal of traveling and have had the opportunity to associate with hams from many parts of the country. Although there are differences, it seems the sense of trust and helpfulness between hams is universal and one of the stronger positive traits of our hobby. I will relate an incident worthy of recognition.

While temporarily assigned to Fulton, Missouri, I was involved in a training class at the Callaway Nuclear Plant when the need to demonstrate a certain method of teaching arose. As it happens, Morse code lends itself readily to this style of teaching, and I immediately volunteered. Shortly thereafter, it dawned on me that while living out of my suitcase I had no code oscillator or available means of producing quality code. I also knew no hams in the area. That evening I stopped at a house with a large ham antenna in back. I introduced myself, and I was invited into the home of Jerry Liley, KØGUG. After about an hour eyeball ragchew, I left his house with a keyer and an iambic paddle. I was all set for my lesson.

His trust of a fellow ham and dedication to our hobby is admirable. Through our "instant" friendship created by a common affection for Morse code I was able to introduce our hobby to several new individuals, many of whom may continue on to get their tickets. Qualities such as these make ham radio not just a fun hobby but a great one.—*Robert L. Vandevender II, KR2K, Muncie, Indiana*

EXPO EXPOSED

I am writing in commendation of the effort of the Canadian hams involved in VE7EXPO.

Never in my travels have I seen a more whole-hearted effort to portray Amateur Radio to both the government sponsors and the public who attended the EXPO. All of the exhibitors involved were eager to talk to both visiting hams and fully explain Amateur Radio to the thousands of passersby.

On the air, the hams "talked in" many incoming and on site operators, and I found myself giving reports as to the current crowd and pavillion status. To Ted, VE7CHE, I give a special thanks, as he was often on the air talking to anyone who had any questions. Ted talked me in on my first day at EXPO and was a great help through out my stay in Vancouver.—*Scott P. Selby, KH2BU, Dandan, Guam*

HAM RADIO CARTOONS RETURN!

The recent series of letters on ham radio featured in cartoons indicates to me that many amateurs have excellent memories and ever-active minds. For me, it was always easy to remember the activities of Disney characters, such as Donald Duck and Mickey Mouse, because so much of each story was accurate with regard to geography, electronics, chemistry and other areas of interest.

Each recent letter was enjoyable because of explanations on the subtle ways in which radio and code appeared in Disney movies. However, I have had a question in my mind since 1953.

Did you know that the April-May 1953 Mickey Mouse comic book shows Mickey on the air using the call W6OPU? In addition, the story has Mickey installing a four-element beam, telling a neighbor (symbolized by the character Goofy) about ham radio, handling emergency communications and leaving on a "DX-pedition" to "the island." I am not reading comic books any more, but much would be lost if those behind-the-scenes technical experts no longer had influence on the content of comic books.—*Paul B. Williams, K1SSO, Glastonbury, Connecticut*

[The use of Amateur Radio in cartoons is not a thing of the past. The ARRL, in conjunction with the Amateur Radio industry, has produced an Archie comic book featuring ham radio. This is a way of reaching young people. Teachers of school-aged children may request these comic books free of charge from HQ.—Ed.]

AHH THE MEMORIES...

I recently served as one of three Volunteer Examiners for the Michigan City (Indiana) ARC. As we administered the exams, I remembered the gray FCC examination rooms and the examiners back then. I'm sure some of you have those fond memories, too!

I wondered if our new applicants are getting off "easy" by not having to face the old federal "tyrants." Is it really worse facing three of your peers?—*R. Perry Awe, AJ9H, Griffith, Indiana*

MANY YEARS AGO

As a matter of interest, with the arrival of the September 1986 issue of *QST*, I have been a member of the ARRL for 60 years. I commenced my membership in October 1926.

I was licensed in 1921 with the call sign 2BMS and have maintained an amateur license ever since. The actual date of the original license is January 29, 1921.

I well remember going to the corner newsstand to obtain *QST* monthly at a cost of 25 cents per copy. A real bargain. I owe all my years of ham radio pleasure and knowledge to *QST* and the League. Now, at the age of 83, I am still active in ham radio on the 40, 20 and 2 meter bands. Keep up the good work and may the ARRL continue to grow and grow.—*John J. Glauber, W4OB, Zellwood, Florida*

FLY CASTING THE NOVICE BANDS

Remember those contacts you made when you first got on the air? Who can forget the pressure of trying to keep your cool, and of receiving your first QSL cards? Those truly were great times for all of us.

A lot of new Novices are sitting back because they lack the nerve to make their first contact, so why not crank it down to 5 WPM and send out a few CQs? Once you entice a new Novice out of his shell and help him break the ice, this will leave a good feeling in the pit of your stomach, not to mention the fact that you may have rescued a possible dropout.—*Earl G. Jones, KA4VMU, Zephyr Hills, Florida*

DX WITHOUT A kW

I noted with much interest the article in the July *QST* about W2DDN's mobile. He is to be commended for his DX achievements. However, I wonder why he went to this much trouble and expense to work DX on 20 meters?

Over the past 16 years, I have operated HF mobile with many different transceivers. All of them ran less than 100 watts fed to a Hustler antenna system. My 20-meter contacts have included Europe, South Africa and even VKs and ZLs.

My point is that you don't need a kW to work from your mobile. You do, however, need a good radio and good antenna system.

As for growing population of "kW alligators" that are all mouth and no ears, the HF bands could certainly do without them. If you want to have fun and be amazed, try 20 meters with a QRP (5 watt) transmitter. You'll be amazed by the long distance QSOs you will easily make.—*Mack Avery, WA5ZKL, Canyon, Texas*

QSL 100%

Some time ago *QST* had a letter addressing how poorly amateurs in the United States respond to QSL cards.

Patience is part of the rewards in receiving any QSL card and indeed one of the requirements for DX contacts. This does not even begin to mention that cards can be lost after they have been mailed.

Amateurs in the United States are not alone for a poor response rate. I have been waiting since 1983 for 32 cards from DX stations and have spent over $25 postage and IRCs alone in the last few months, once again attempting to obtain the QSL. This amount cannot even come close to the total amount of money expended in the past three years. I've even been told on the telephone, "What's the emergency over one card?"

I'll admit that at least three attempts have been made to get the 32 cards, and some from stateside managers, who in like manner, have failed to respond even when an SASE was enclosed. Overall, the response rate has been about 60% for both stateside and DX QSL cards for my station.

Even registered letters with return receipts have been ignored, and now a matter has been turned over to the postal authorities. This really makes one think twice about mankind and the empty promises of a QSL card.I believe if you can't afford to send a QSL, don't request one.—*Ronald J. Johnson, WA2PJC, Endwell, New York*

[Correction: The call of Jim Kennedy, who wrote "Please QSL, Porky Pig" (September *QST*, p 86), was listed incorrectly. It should have been W7MID.]

How's DX?

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

YO6VZ.

Popular VU2GI (left) and VU2UGI with WA4ETN's XYL, Betty, and Bob, WA4ETN, at Bob and Betty's Georgia shack.

ZS6BWD/ZS6CAF at their operating position in Johannesburg. *(tnx DK7PE)*

AZ1A, RTTY from the South Orkneys (Laurie Island), by LU8DTQ, Box 5, 1636 Olivos, Buenos Aires, Argentina.

WA5OYH, T30AT and KL7VZ.

ZP5JAL (XYL ZP5MJY), the only RTTY station in Paraguay. *(ZP5XDW photo)*

OZ5PF (ex-OX3PW) operating 4U1ITU. Ib is currently spending a year in Saudi Arabia, working on a Loran-C system.

Tim Chen, BV2A/BV2B (left), met with W1UF over Peking duck in Taiwan. (Tim was a communications officer in Rangoon during WW II, helping Allied aircraft fly the "hump" into China.)

9K2AH *(tnx DK7PE)*.

YO6VZ

Sandu Chelement, YO6VZ (see photo), is secretary of the Brasov County Radio Club and an International Master of Sport in Romania. Sandu holds 5BDXCC no. 1902 and has 215 countries toward his DXCC, using a home-brew YO3NP-designed 5-band transceiver, Delta loop for 80 and 40, and 2-element quad for 20, 15, 10. Sandu wishes the USA hams special luck from his Brasov QTH, Bronzului Nr 7, 2200 Brasov 5, Romania.

ALASKA, THE CROSSROADS

The photo of WA5OYH, T30AT and KL7VZ shows them at a meeting in Anchorage earlier this year. George, KL7VZ, flew down from Fairbanks for the rendezvous, and Jim, WA5OYH (who is now QRV in Texas), provided ground transportation for Alan, who has given T30 and T31 to thousands. *(tnx KL7VZ)*

CAYMANS

ZF2 calls may be used only when an operator is in the Cayman Islands. An operator who signs /ZF2, portable ZF2 or ZF2 maritime mobile is operating illegally. During Nov 1985, a station using ZF1RC (operator "Ron") was operating illegally. Unfortunately, this was the call assigned to the now ZF1RC on Dec 21, 1985, so the resultant confusion can be imagined. The Caymans do have a reciprocal-licensing agreement with a number of countries, including the US. The Cayman Amateur Radio Society now operates an open repeater on 146.76/146.16. The simplex frequency most regularly used locally is 146.52. *—Roger A. Corbin, ZF1RC, Secretary, CARS, Box 1549, Grand Cayman*

PARIS

AB4Y, N4GPB, K5MG and others have organized an international Amateur Radio club in Paris to support, promote and encourage Amateur Radio (with particular emphasis on the needs and special requirements of the foreign residents). Chuck, AB4Y, notes that Paris has one repeater, FT1THF, on 145.10/145.60 (requiring a single tone burst of 1750 Hz to activate) and that packet stations are active in France. Visiting Paris the next two years? Stop by and visit Chuck, 24 Quai du 4 Sept, Boulogne, tel 46 05 69 33.

THE CIRCUIT

☐ **3G9:** The Chilean DXpedition to Antarctica should take place during the first 10 days of this month from the sub base Yelcho, located on Doumer Island. QSL via Box 2000, Punta Arenas, Chile, South America, or via the bureau (special tnx CE8PD).

☐ **K6AN:** Northern California DX Club member Ed Peck (ex-W6LDD) became a Silent Key August 11. Active in contests and DXing, highly respected K6AN will be deeply missed by his many friends.

☐ **P40:** Bob, K4UEE, and Paul, N4PN, will be QRV from Aruba Nov 24-Dec 1 in a multi-single CQWW CW effort, concentrating on the low bands prior to the contest. (This is a SEDXC expedition.)

☐ **P43GD:** W2GD will be operating from Aruba Nov 24-Dec 1, with special contest attention to 160/10 meters, 160 on the hour during darkness, and 28,025 on the hour daylight hours. QSL Mgr N2MM, SASE appreciated. A successful effort in CQWW would fulfill John's all-time contest goals.

☐ **9M2PV:** About a year ago, this call was pirated, giving VK2ZF as the QSL manager. All cards related to 80-meter contacts, but more recently the phony operation moved to 20. Noel has returned the cards, plus IRCs, to the various stations. He is retired and finds the financial drain a real problem. Take heed!

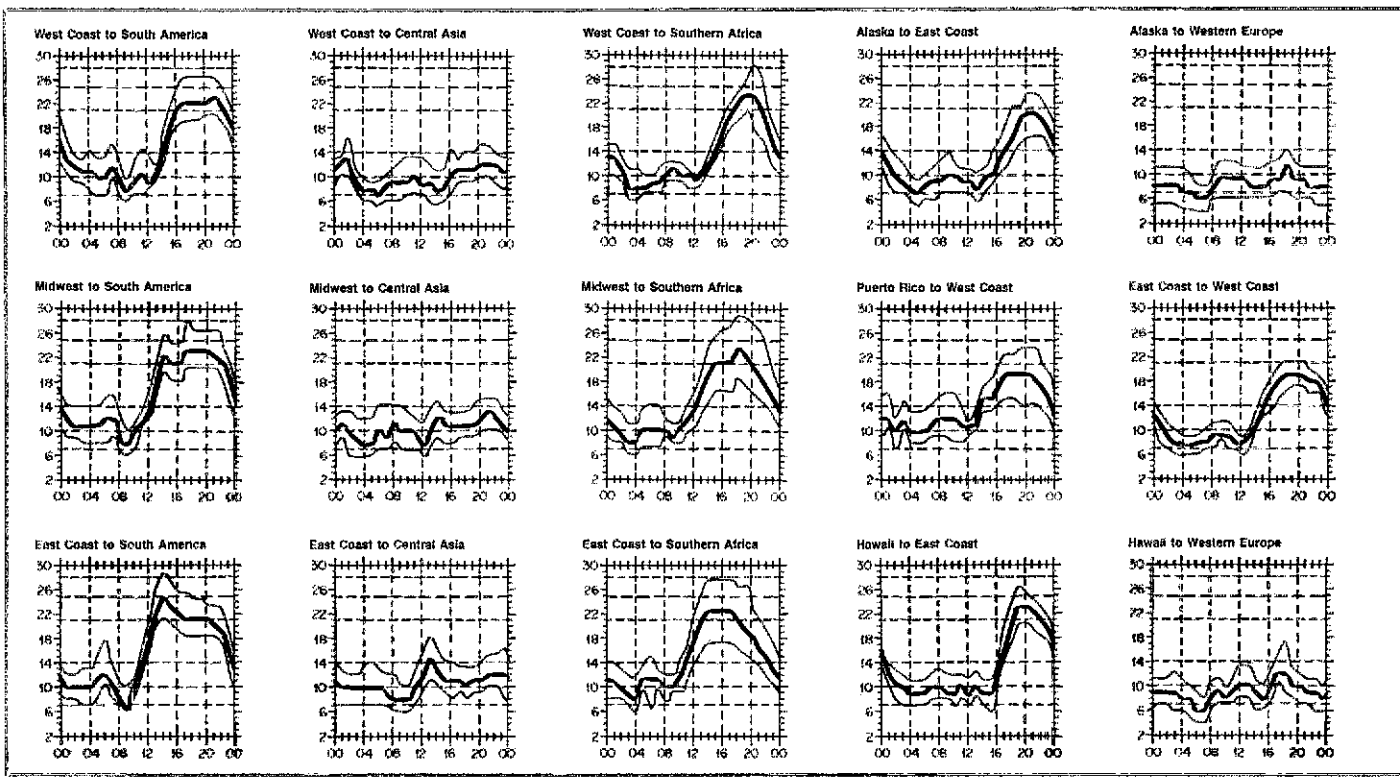
☐ **Yasme:** The Colvins took to the road October 1, dedicating this latest DXpedition to the memory of W6AM. Lloyd and Iris expect to operate principally in the Indian Ocean area. Cards go via the Yasme Foundation, Box 2025, Castro Valley, CA 94546. [A new Yasme Supreme Award is available. It is a beautiful Yasme boat trophy, requiring that QSLs for 60 different Yasme calls, operated by Yasme officials, be submitted to WØMLY; no fee.—Ed.]

☐ **Mellish:** K4ADN is interested in participating in an August 1987 DXpedition to Mellish Reef and is currently exploring the logistics. If interested, contact Ken Keenan, 8609 66th St N, Pinellas Park, FL 33565, tel 813-391-6547.

☐ **KX6DS:** Dave expected to operate from the Eastern Carolines (the shack of KC6JC) the last week in November. Calls might be either KC6TO, K4TO/KC6 or KX6DS/KC6. For this operation only, QSL via the Northern Alabama DX Club, PO Box 4563, Huntsville, AL 35815-4563. (SASE or SAE/2 IRCs appreciated. Others returned by the bureau.) Kwajalein is beginning to feel like home to Dave after 3 years and 51,000 QSOs in 240 countries. He has now worked over 1500 contacts in 62 countries on 160.

☐ **HL9:** If you're going to Korea and think you qualify for an HL9 call, drop a line to KD5YG for the proper forms: TSGT Jeff K. Steinkamp, HL9YG/KD5YF, PSC 456, APO San Francisco, CA 96461-0006. (In order to become licensed in the ROK, you must be assigned to Korea under the Status of Air Forces Agreement or the Ministry of Foreign Affairs.) There are no repeaters in the ROK and hand-held mobile operation is not permitted unless expressly permitted for special events (such as the Asian Games).

☐ **Golden Jubilee DXCC:** Don't forget January



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

1 to start working and logging your claim for this commemorative award!

☐ **RSB** *Splatter:* John, VP9CP, is now sporting a new single-letter call, VP9J. VP9CP is very well known on HF, and it will take some getting used for the faithful to recognize John's new "name."

☐ **Greater Milwaukee DX Association:** New officers include Pres W9RN, VP KJ9I, Secy-Treas N4TZ. Their most recent "needs list" shows the following as being most desired by their membership: 3Y XZ ZA 4W 7O XV VU7 XW YA 5A.

QSL Corner

Administered By Joanna Hushin, KA1IFO

The ARRL DX QSL Bureau System (Incoming)

Within the US and Canada, the ARRL DX QSL Bureau System is made up of call area bureaus that act as central clearinghouses for QSLs arriving from foreign countries. These "incoming" bureaus are staffed by volunteer workers. The service is free, and ARRL membership is not required.

How It Works

Most countries have "outgoing" QSL bureaus that operate in much the same manner as the ARRL-Membership Overseas QSL Service. Members send cards to their outgoing bureau, where they are packaged and shipped to the appropriate countries.

A majority of the DX QSLs are shipped directly to the individual incoming bureaus, where volunteer workers sort the incoming QSLs by the first letter of the call-sign suffix. One individual may be assigned the responsibility of handling from one to three letters of the alphabet.

For detailed information on the operation of the bureau serving your district, please send an SASE for a prompt reply.

Claiming Your QSLs

1) Send a 5- × 7½-in SASE to the bureau serving your district.

2) Neatly print your call sign in the upper left-hand corner of the envelope.

3) A preferred way to send envelopes is to affix a First Class stamp. If you expect to receive more than 1 oz of cards, please affix postage accordingly.

4) When requesting *any information* from the bureau serving your district, always include an SASE for a prompt reply.

Some incoming bureaus sell envelopes or postage credits in addition to the normal handling of SASEs. They provide the proper envelope and postage upon prepayment of a certain fee. The different stages of presorting and sorting cards take time. It may be six to eight months, or longer, before you receive your cards.

Helpful Hints

Good cooperation between the DXer and the bureau is important to ensure a smooth flow of cards. Remember that the people who work in the area bureaus are volunteers. They are providing you a valuable service. With that thought in mind, please pay close attention to the following DOs and DON'Ts.

DOs

Do keep self-addressed 5- × 7½-in envelopes on file at your bureau, with your call in the upper-left corner, and affix at least one unit of First Class postage.

Do send the bureau enough postage to cover envelopes on file and enough to take care of possible postage-rate increases.

Do respond quickly to any bureau request for envelopes, stamps or money. Unclaimed card backlogs is the bureau's biggest problem.

Do notify the bureau of your new call as you upgrade. Please send envelopes with old call. Please put only one call on an envelope.

Do include an SASE with any information request to the bureau.

Do notify the bureau *in writing* if you *don't* want your cards.

Do be appreciative of the fine efforts of these volunteers.

DON'Ts

Don't expect DX cards to arrive for several months after the QSO. Overseas delivery is very slow. Many cards coming from overseas bureaus are over a year old.

Don't send your outgoing DX cards to this bureau (see "ARRL Membership Overseas QSL Service" in this column in September 1986 *QST*).

Don't send envelopes to your "portable" bureau. For example, K9CH/1 sends envelopes to the W9 bureau, *not* the W1 bureau.

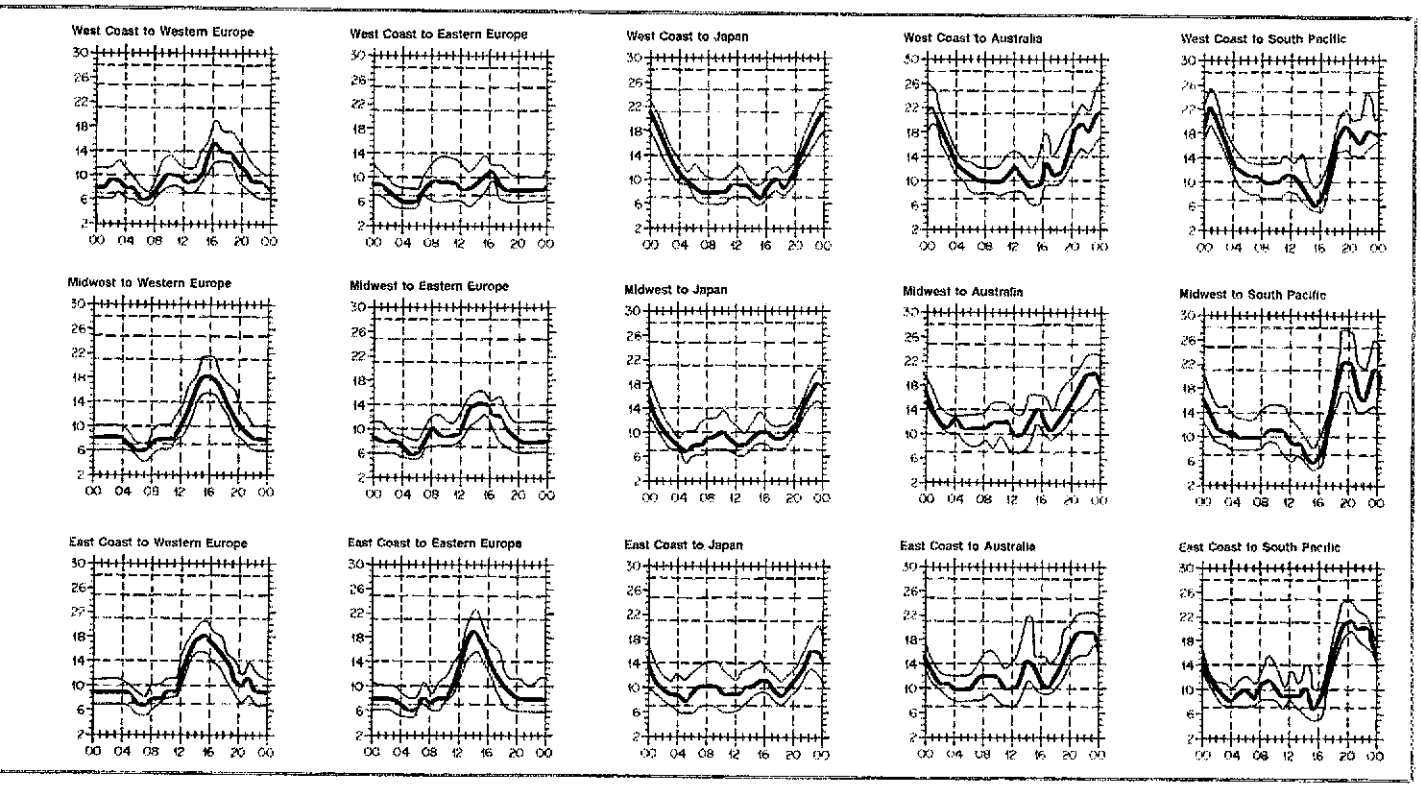
ARRL DX QSL BUREAU SYSTEM

First Call Area: all calls*—W1 QSL Bureau, Mt Tom Repeater Assn, Box 216, Forest Park Station, Springfield, MA 01108.

Second Call Area: all calls*—NJDXA, PO Box 599, Morris Plains, NJ 07950.

Third Call Area: all calls—C-CARS, PO Box 448, New Kingstown, PA 17072-0448.

(Continued on page 71)



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 *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 December 16, 1986 to January 15, 1987, assume a sunspot number of 9, which corresponds to a 2800-MHz solar flux of 71.

DX Century Club Awards

Administered By Don Search, W3AZD

The DX Century Club certificate is awarded to amateurs who submit written confirmations for contacts with 100 or more countries on the official ARRL Countries List. There are now 316 current countries on the list. The DXCC Honor Roll includes those who are within 9 countries of that figure. The following annual Listing of the DXCC membership contains the call signs and exact country totals by endorsement during the two-year period from October 1, 1984, through September 30, 1986. Honor Roll members are indicated in bold face print.

MIXED

368
W1GKK

366
K6ZO LU6DJX W2AGW W2BXA W4EX W7MB W8JIN

365
W1BIH W4AIT W7KH W8GT W8GZ W9ZM WØELA ZL1HY

364
K8OJ OE1ER VE7GI VK4QM W3MP W4BQY W9NDA

363
N4SU W1AX W2JVU W6ZO W8BF W8DMD WØBW WØDU WØMLY

362
DL7AA DL1KB G4CP N4SU OH2NB ON4NC W1HX W2AG W2QHH W3EVW W4OM W4YJ W6EE WØAX

361
DL1KB G3AAE GW3AHN KH6CD W2LV W3VT W4GD W5MMK W6BZE W6TZD W7IR W6LKH

360
I8AMU K3GL K4KQ K5UC W1FZ W1HZ W2AYJ W2GT W2OKM W5IO W6KUT W7PHO W8JBI W8MPW W8RT W9FKC W9JUV 4X4DK

359
DJ2BW DL3RK G3FKM G3FXB G5VT HB9MQ K4PDV K4SM K6DC KD8VM SM3BIZ VE3SR W8RT W1DK W2AO W2GW W2LPE W5AL W5PQA W6BA W8CHV W6HX W6PT W6YK W7OF W8DAW W8EWS W8GIL WØSYK

358
DL1BO HM9TLT K2BZT K2FL K4YR ON4DM W1AXA W1JR W2BOK W2SSC W3CWG W4DR W4EEE W6BS W6KZL W7CG W7GN W7LDC W8AH W8KPL WØPGI WØQGI

357
DL6EH DL7EN IT9TAI K5DX W1JNV W2CR W2HTI W2QM W2UE W3GH W5KGX W5MMD W6BSY W6FSJ W6ID W6SQP W7ADS W8NGO W6PHZ W9SFR 4X4JU

356
GI3IVJ IT9ZGY K2BK K2LWR K3II K4LNM K6CH KH6IJ LU4DMG LU5DO OK3MM OZ3Y W1NU W4BAA W4ML W5NW W6RKP W9RKP W6AIH

355
JA1DM K3MO K9AB PAØFX PY1HQ PY1HX ZS6LW W1AA W2AX W2BHM W2FZY W2TQC W2XN W5NUT W7QK W8QY W8ZCQ W9DWQ W9TKV

354
DJ1JW DL3BK DL7AP I8KDB K5FJ K8EC K8KII K8LGF KA1QY OH2QQ PAØLOU SMØAJU W2FXA W2GC W2SAW W3AFM W4AXR W4EO W4GXB W4VPD W5UN W6BVM W6ET W6GPB W7AQB W7AO W8BKP W9HB W9DY W9RCJ ZL3IS

353
DL9OH F3AT I1ZL K6RQ W8DR N7EB UB5WF VE3HD VE5RU W1HH W2BMK W2IRV W3CGS W3GRS W4IF W5AQ W5FFW W5GO W5QK W6HYG W6KG W6KH W6ONZ WØTJ YS1O ZS6RM

352
AE4X DL1DC G3HCT HB9MX N6EA PT7YS SM7ANB SMØKV W1CKA W1PM W1WY W2GLF W4HR W4WV W4ZD W5GEL W6FF W6ZM W8OK W9YSX WØLWG

351
DL1HH DL7HU F9RM G3BOZ G3FSP HB9KB HB9PL K9ECE OE1FT PY4OD SM7QY VE7AAQ W4BYU W4FX W4OO W5LCI W5OB W6MUR W6QNM W6UQQ W7CMO W9BM W9GU WØDEI W8GKL WA2DIG

350
GM3ITN JA2JW K2SHZ K4AIM K4RPK K6GA K6RF K6RN K8ONV NY5F SM8CCE VE3AAZ VE3BWY W2MJ W2TP W2YY W4BFR W4LMX W4MGN W7DX W9FD W9TKD XE1AE

349
G2FYT HB9DX HB9MO I5UA JA1BK JA3DY K2FB K2TQC K8CD KP4RK LA5HE N6FX VK3YL W4AVY W4QM W4SSU W6GMF W6ISQ W8CUT W9CH W9HJ W9NA WØTD WØZV

348
DL3ZI DL7BK JA7AD K4EZ K6EV NA8Y ON4PA W1AFF W1IAS W1RLQ W1SP W1UU W3DJZ W5HDS W6REH W7BGH W7JYZ W8DA WF5E YV5AIP 4X4FQ

347
DL8CM EA1BC F9GL JA1BN K4JC K6WR KI6T OH2QV OK1ADM OK1MP ON4IZ OZ8SS PY1DH UR2AR VE2WA W1DGJ W1MIJ W4BBP W4CV W4NNH W5RDA W6EL W6YA W9HLY W9IU W9KNI W9LT ZL1AJU ZS6YQ

346
DJ2AA DL7HZ K2PXX K6ZM K8OHG N9ZN OE1LO W1ELR W1SD W2CP W4DRK W4VQ W5DL W5UR W6QNA W7CSM W7LLC W8ZD YV5BX YV5BZ ZL4BO

345
G3IOR G3KMA I7ZPB JA1BRK K2OEA K3AV K4BVQ K4MQG K6FF N6AR N6GM UA1CK W1AB W1GME W2VJN W4DHZ W5EJT W5GJ W5NO W6FW W6HFL W6RJ W6TWZ W6YGR W6ZET W9BW W9HK YV5ANF ZS6IW

344
DL1CF JA1ADN JA1AG K4ID LA1K N5AR OH2BH ON4QJ SM5CZY SM6AOU UA9VB W1QJR W2GKZ W3EYF W4UQ W5GC W6KTE W6YMV W8PR W9AZP W9WM

343
DJ7ZG DL7FT I1RB JA4ZA K2BS K2JMY K2UVU N4JF N6AV OH2BZ PY2PA PY2PE W1FTX W2AZX W2GK W2LL W3TV W6CF W6ERS W8ARH W8RSW W9FID W9PN

342
DJ5DA DJ6KQ HB9IK I2KMG I2SM I5ARS K4FJ K4KG K4YYL K6JG K6LEB K6MA K6PU K6YRA K8FL LA8LF OH2BC VE3LGQ W2NC W2PN W4EEU W4KN W4QQN W5HE W6TXL W7KR W9JQ W9GRF W9HZ WØBN WØPT YU1HA YU7BCD ZL1AV

341
AI9J DJ7CX DL1PM DL6MK G5RP JA1BWA JA2XW JA9AA K2LE K2YLM K4CIA K5AAD K6DT K8DYZ OH4NS OH5UQ PY2BKO SM1CXE VE4OX W1NHJ W1OO W3AC W4OWJ W5JC W5QOU W6EUF W6PN W6RGG W8HN W9AQ W9EB W9GB WØHZ WA6OET ZL1AH

340
DJ2YA DJ5LA DJ9VQ F2BS K1DRN K2MUB K2UR K3KP K5YY K6QH K8EJ K9CJK K9SM N1XX N4XO N6DX OZ3PO OZ4RT SM6AEK VE3MJ VE3WT VE7SV W1FJ W1MM W2LNB W2MZV W4JVU W4XJ W4YN W6SC W6YB W7DY WØWW WA4WIP WA6GFE WØWW

339
DJ7CY GI3OQR I8AA JA1IBX JA8ADQ K1YZH K4DJ K4IKR K4MPE K4XL K6LU K7ABV K9RJ LA1KI OK1MG PAØTAU SM5AZU SP7HT W1OHA W4NKI W5TO W6KZS W6PHF W6MI W6QL W7JYX W8CT W9DH W9KQD ZL1ARY

338
DJ1XP DL8NU G3GIQ G3UML JA4BJO K1NA K4MZU K6XW K6BLT N6CW K9AB N4TO N7NG OZ1LO PY2CQ PY2SO SM5BHW VE3BX VE3WW W2FG W2HI W2HZ W3OP W3XM W5CKT W6YO W8DCH W8ZCK W9DC WA9NUQ ZS4MG

337
G3JEC HB9AHA I8YRK JA1MCU JA1MIN JA1MJ JA3BG K4DY K4ISV K5CR K6EXO K9AWK KY2Q LA9CE N4EA N4WW N4ZC N5NW OH6RA ON4UN PY1APS SM6CKS SM6CWK VE3NE VK5WO W4BRE W4GTS W4NL W4OEL W6BYH W6GR W6KNH W6KPC W6TPJ W7NCO W7RV W8KR W9OA W9CJZ Z24JS

336
AA4MM DJ4AX DJ6RX F2IU F5II F8RU F9IE G3JEC JA8JL JA8ZO K1RM K2CL K4CEB K4II K4KC K7KG K8MFO K8BUR N4MM N5DX N9AF PP5UG SM3CXS SM5API SM5AQB SM5BBC SM6AFH SM6CAK SM6VR SM7ASN VE7IG W1GG W2GZZ W2VUF W5SJ W6BFW W6FET W6KYJ W6MUM W7CB W8RCM W8PAH W8UD WB2HXD WB7ABK

335
AJØX DJ5JH DJ8CR DL3OH DL7CS G3HTA G3JAG GM3BQA HB9AAA I1RBJ JA1CRR JA1CRR JA1GV JA1ZZ K1DFC K2LGJ K4AUL K4XO K5LIL K9MM K9OTB N4KG N4UH OE2EGL OE8RT OH3SR ON8XA SM6DHU SP6RT W1GX W2PPG W3EKN W3PVZ W5LZZ W5MUG W6ABA W7JFO W8ILC W8QFR W8QWI W9LNQ WA2CBB WA3HUP WA5IEV YU2DX

334
CT2AK DJ4PI I3EVK I8JX JA1AAT JA1JRK JA2AN K2AGZ K2BT K3KV K4XG K5UR K6KA K8IFF K8IP K9KA K9RA KV4FZ N1GL N2LM N5RR OH2VB OZ6MI PY2DFR SM5RK SM6CVX VE3GMT VE3XN W1JBW W1KGH W1YRC W2SUA W2VYX W4ORT W4XR W5IR W5JW W7EDA W7OM W8GKM W6OQK W8SD WA8OAH YO3JU YV5AHP YV5BBU ZL1AMO

333
AD5N DL1LD DL3ZA EA3NC I2LAG I7WL JA1IFP JA1UQP JA2AAQ JA2AIR K2KER JA3AAW JA3APL K2CM K4BBF K4HJE K5AQ K8VUR N4WF N8UC N7TT N9AB OE1UZ SM5FC W1JZ W1OT W1WLW W2FP W2ZZ W3LPL W4UKA W7LFA W8BE W8CNL W9ZR W9ZRX W6CD WA3ATP WB4OSS YO3AC YU3EY 4X4NJ

332
DK3PO DL6KG DL8QW DL7CW G2DMR I4MKN JA1DFQ JA1EOD JA1OCA JA2BHG JA4AFT K3HPG K3NL K5OS K6OZL K6XP K8CH K9GM K9PPY N8ET N8AA OH2VZ OK2RZ VE3GS VK6HD W1LQQ W1NQ W1OR W3GG W4FPW W4WD W4YV W5EDX W5MQ W5RO W5YV W6EJJ W7NCO W8TA W8SEY W9AG W9RF W9WY W8BL W8RI WA6DUG

331
AA4S AB4D DJ6TK EI8H G3DOG G3LQP I5FLN JA1JAN JA2ADH JA3AQ JA7MA JA8MS K1BV K4CEF K4LTA K6JR K6LAE K7AA K9IUF K8BS K8GVB KJ6V KN8Z N2SS N6AW N8DX OK1TA OK3EA ON5KL OZ7JZ PY2ELV SM4EAC SM6EOC SM7EXE VE1KG W3AP W3LB W4AUH W4FDA W4JD W5LVD W6XI W8DX W8YA W9TKR WA2JBV WA3IKK WB2YQH WB8EUN

330
DK3GI DL8FL F5LQ F9YZ I1APQ I2DEZ I7HH JH1EIG JA2HNP JA2JKV JA8AQ K3TUP K3ZR K4EWG K4IR K5JW K7NN K8TL K9JF KD5RP N4NO N6AN N7RO OH2BAD OH2BR OZ5DX OZ8BZ PT2BW SM5DQC W1DQH W1HGA W3SO W4OMO W4PZV W4WG W5DJ W5ZWX W6AE W6EYR W6LQC W8OB W6OMR W7ETZ W7ORH W8AD W8CFG WA4QBX WA7BEV YU1EXY

329
AB4H DJ5AI G3ALI G3KDB HB9AIJ JA2AH JA9BJ K1BW K1JO K2KBG K3SGE K4RA K6LQA K6OJO K8PYD K8RWL K8IFL KE4I KM2P KR2Q N2MU N3ED N4XX N6HR N8OA OE3WWB ON5KD PY2BW SM7BIP SP9PT W1BR W1EOA W2SY W3ZN W4OTX W4XQ W4YA W5UCQ W6BJH W8QC W6ZYC W7KSG W9GW WØMYN WA4DRU XE1KS

328
G3RUX JA1CJF JA1GTF JA3BQE JA6BSM K2OF K2VV K4EEK K4TO K5GO K6IR K6PZ K8EA K9YRX N4CC N4RA N4SA N5TP OH2BCV OH2LU OK1ACT OZ7OP PY5ATL SM2EKM SM3RL SM6CST UB5WE VE4SK W4CPZ W4FLA W5RA W6DN W6JZU W6XP W6YHT W9RN WØIZ WA4FFW WB2NYM YU1AM

327
DJ6KH DJ8NKA DJ8UJ DK9FB F5VU I2ZZZ JA1HGY JA1HYF JA2KLT JA8KB K1NJE K1ZSI K2SB K4BAI K4SMX K5KX K6SVL K7ZR K8CW K9RF KM2V OH2BGD VE7BD W1DA W1ER W2GA W4VZB W5LFK W5VT W7EKM W8ELE W9AMM W9VNE WAØKDI YV5DFI ZS1OU

326
AA4CJ DJ1CG DJ4XA DK5PR DL1BS DL7NB F2VX G3MCS HB9RX I3VRV IT9AUA JA5EN JA6VA JA7EHU JA7HZ K1KI K2AGJ K4LSP K4UTE K4ZYU K5GH K5LM K6XJ K6XT K8LJG K8ST K9FN K8WWX KG8V KK8J N2AP N4KE N4PN N4WB N5AU NØRR NF4A OE1HGW OH8SR OZ7BG RT5UN W2GQF W2YD W4RIM W4TK W5SP W6TC W6UY W7CNL W7TE W7MI WØLYI WA9WJE WB6APX WB9EBO WR4K 4X4FU

325
AF3E DJ2TI HB9AMO HB9AQW JA1ELY JH1CJQ JH1IFB JA3EMU JA3GM JA3MNP JA8AYN JA8EAT K2UU K4YT K5BZU K5OA K5RJ K6JB K7BR K7OXB K8RA K9XJ N4OL N6RJ OK1VK OZ7YY PY7ZZ SM7DMN SP6BZ SP9AI W1AM W1BFA W1GDQ W1KG W1ODY W2BAI W2JB W2PSU W2REH W3CDG W5XJ W6US W6VBI W7KS W7XA W9RY W9SS WB6DXU YS1RRD YV5CWO

324
AC8K DJ3GG HB9LL K2DSV K2XA K4UEE K4XH K5VT K6UFT N5EA LA3XI ON5NT SM4DHF SM7DMN VE3CVZ VE7HP W1UN W2RS W2SM W3BTX W3VQ W4YKH W5QKR W7OEV W7UZA W9FU W9NGA W9RXJ W8GKE W8SMV W8SR WA8PYL WB4QNP

323
AE3T DL1KS DL4FF EA3NA G3ZAY I2LLD I2VGU JA1FNA JA1GO JF1PJK JH1GZE JH1QOJ JK1OPL JA3BXF JA4RF JA7FS JA8BIO K1CC K1TN K2UFM K3KG K3WS K5YCP K6AAW K8ZR K9CT K9KU K9PQG K8ALL KD6PY N3II N7NR N8TN NØEL OY7ML W1GL W1YY W2IYX W2MP W3HNK W5CPI W6JRY W7IYW W7KSA W8KCJ

322
DJ8FW DJ9RO DK1FW DK3SF DL8UI G3SJH HKØBKX I2PJA JA2JSF JA4CQS JA4FHE JA7ZF JA8BMK JA9CXA K3NN K4RD K4XI K5KLA K6AXC K9BB K6JAD K7UR K9AJ K9BWQ K8GSV KB9EZ KZ2I N6MG N6MM N6QR NA4M SM6CTQ TF3SV UD6JD W2BXC W2MIG W3FM W3XX W3YX W5IJW W6BJI W6HT WA4CXZ WA9TVM YU7BB 4Z4DX

321
AA4V DK1YK F6BFH HB9AHL JA1PNA JA2MGE JA3CMD JA3HZT JA6CNL JA8CDT K1MEM K2TV K3ND K4AEB K4FCT K4RZ K6RK K8UD K7RLS K8KAE K8NN KW8A LA7JO N4DW N4JJ N4WJ N6VR OE6MKG OH2KI OZ5EV OZ9PP PAØINA PP5YC SM6CMU SM7BBV VE3FRA W1RED W1RR W1VV W2CC W2PD W3VRT W4PTH W5ZF W9FR W9LW WØCAW WA4JTI YU2CBM YU1DZ 9H4G

320
AE4Q DJ5IO EA4MY G3TOE I7TGT JA1WSK JA7QLB K2HVN K3UA K4GJD K4PI K5JM K9IL K9UWA K8CL K9VQK KR4M N4AH N4SR N5OK N6JV N5UD N9MM NS6C ON4FQ SM5BRW SMØBFJ VE3XK W2HAZ W5IRG W7DQ W8NPF W9EQP W9ZA WA1AER YO3JW YU1DD ZL4AW

319
DK3FD DL1DA DL1YD F2GL F6CKH I2VDX JA1OYY JA1PCY JA1WTI JH1VRQ JA3KWJ JA4LXY JA5IU JA6BVU JA6EYD JA7BJS JA7PL JA8DNZ JA8IXM JA8XJF K1HZ K1VR K2LQ K4PVZ K4XP K6CBL K7UT K8NA KØLUZ KB9OC KM6B LA6CJ N4GG N4IA N4VZ N5UR N7US OH2BDP SM3EVR VE1YX W1IKB W3ACE W3LMZ W4ZMC W5DOZ W5DV W6GO W6RFX W8GS WB2BNJ WB2QMU YU2TW

318
AD3Z AE5B DL1RB DL2AW DJ3NW DL2AW G3VIE I2ZGC JA1NRH JA1VN JH1HLO JA2APA JA2DJH JA6GXP JA7ARD JA7IL JA8GZZ K2MFY K3GYD K3NZ K5KR K5NW K5OR K6AG K8CMO K9BG K9HMB KA4S KF2O KJ6G PY2TM N5FG OH2FS PY5WD VE3II VE6VM W2LW W2LZX W2TA W4DXI W4LVM W5VJP W6OMM W7FP W8JMZ W6OBI WA4TLI WA6FIT WA6WZO WA7FIG YU2YM ZL2UW 9YVU

317
DK8NG DL8XL F6BKI G3RCA JA1RLV JH1EDB JR1AIB JA3FYC JA3JOR JH3TKM K1EFI K1JA K1MM K1ST K4GFI K4TEA K6SMF K7LAY K7SP K8IA KD9E KH6CF KN4B N3UN N4NX N8ZA N5FW N6ND VE5YA W1GKJ W2HN W2KE W3NB W4CZU W7FR W8UVZ WA1EOT WA6OGW WA6TLA WA9VOL WB4NDX WB6ZUC YU2OB ZP5CE

316
AA6G AB6K DJ5MC DK3KD FY7AN I1SBU JA1MDK JR1FYS JA5PUL JR7TEQ JA8FKO K1TK K1UO K2UO K3EH K3FN K5VNJ K6AC K6ANP N2OO N3US N4HH N4OM N6OC N6OJ NE4R SM4CTT SP5EWY UP1BZZ UW6MF VE3IR VE7DP W1ENE W1QV W1RQ W2FR W2QL W6OKX W8LU W8QBG W9MCR W9KZV WØWP WW4E YU4TU YU7BPQ

315
DK4BW F2NB F6BWJ IT9JLA JA1QXY JE1MGE JR1TNE JA8CWZ K7RDG K8RD K9NB KØKTP N4CQ N6CR N8BM NF4U SM5BFC SM6DYK VE6WQ W1BL W1JJ W2FCR W2IOB W3NF W4MWT W6KFV W7GXD W8NJC WØFF WA6GFY WA8HFN WB4RUA WB4TDH ZL2ACP

314
ABØX AEØK DL7SY G4DYO HZ1AB I2JR I2PNB I8DUD JA1JWP JA1SVP JH1APK JH1OJU JA2KVD JA6HUG JAØAB K4WMB K5BLV K6JG K6LM K6WD K8NW K9QVB K9ZO K8JN KY8A ON5FU SM7BYP SMDJZ SMØMC T77C W5JLU W6AN W6NPY W7IUV W7ZR W9NNE W9PIO WØNB WØVX WB4ZNH

313
AA3K AA4M AB9E AL7EL DL3IE F8BEE F6DCQ F6DHB HB9HT JA1VDJ JA5AQC JA9YBA JAØCAK K1SA K3KA K4LR K7NO K8LD KP4AM N2KW N4CQT N9RS NE4A UB5UAT VE3HO W1ESN W2QXA W3NV W3TVB W3YY W4OHZ W5ZPA W6TXL W7LR W8HO W8WOJ W9ZWH W9IT W8JMZ WA8AZL WAØDK WB4EDD WB8HAD

312
AA6AA AA4AR AA7A DF1DB DK5AD DK5QK DL8UP HB9BGN I4USC IT9JLA JA8AUC K1VJH K2YGM K3LWM K5GWN K6TWU K7SFN K9GX K9MK K9QXY K8CS KB2ZP KF6H KM1D N2DT N4PB N8DE OH3TQ OK1ZL ON6HE VE7AHA W4DZZ W5RJC W6RDL W6TFO W8GIO W9TY W9XX WØNS WA4VDE WB4HOK WB4OSN WB8JEY WB9YXY YU3AW

311
CT4SD F6EXV G2FFO HI8LC I3OBO I4AND IT9AF JA1OND K7ZA K8GG K8WW K9RN KØVAL KG4W KW2P KX4R LA9GV N2MF N3RL N4LX N4XR N6ST NØAT OE2VEL PAØLEG SM7CRW TG9NX VE3DR VE3GJH VO1AW W7GUR W8CY WA2JUN WA8HAT WA6IUM WB6RIU WB8IGU XE1GBM YU2AKL ZL4LZ

310
AA4KT AI5B AJ9D DJ2MN DK6NP DL7MQ I2MQP JA1CB JH1EBF JE3LWB JA4FWM K1SF K1VKO K1WJ K2NJ K4OCE K7EG K9FD K9IW K9MFI KA5V KA7AUH KH6GS KV4F KW8T KW9K N2JV N4TX N7KA N7MC NIØF OE1CP OK1DH OK2QR PT7WA UQ2MU VE7DX W1ACB W1TSP W3SOH W3UJ W4HY W4RNP W8KKF W9SC W9YT WA3DVO WA9VGY WD4RCO YU3QI ZS2EM

309
AA4KA AC9M AI8S F8DZU HB9NU I2XIP I4EAT JA1SYY JA4DND JA8AWH K1FI K2ON K4CXY K4IBP K4KUZ K4SE K8MNG K9BJ KB2RV KB5FU KV2S KZ8Y N4AVB N4AXR N6JR OZ1CTK TG9AL VE3BHZ VE3DGX W1HSB W1TPK W2JGR W2MPI W5EFA W7AHX W7BCT W7LQG W9YK WA2VEE WA3WIP WB1DQC WB9HIP WB9NHD WD9IIX

308
DJ6BN DK2XX DK5WS EA2HW HB9AQA I8RFD JI1OPU JA3THL JH3CXL JA5FDJ K1AP K2EYJ K2JLA K3RT K5JUC K6RE K8PCZ K8QQ KA8T KB6KW KB8U KE3A

KP4EQF LA9HC N5TC N6AHU N8MC NA9O NN4Q P29JS PY1LW PY5EG SM4EMO SM6CCM UA3FT W1VH W3UM W6MFC W6MUS W7HR WA2MNM WA3LJP WA4OBO WB2CEI WB6RSE WD4NKP WD9AHJ WX4A XE1OX ZL1BIL W3EV W8LKG WA4VCC WB9MSV WB9OQU WD9IIC WT4T YU3DJK N9RF SM7FDO W8MFW W9RW W0JO WA3CGE WA9MAG WB4FTU WB7CLU XE1OW YU7KV K5OTI K6KU KB5AB KB8ZW KC9X KG9N KA3R N2JD SM5AKT VE3NI VE7RG W1EP W5HEZ W5JG WB1EAZ WB4PRU WD4FWE YU3TE W3DO W4ZWZ WA1KUL WA4YOM YU7OX K5BDX K6SD K6TMB KA0E KB2HK KC9TA NB7R W1GVZ W5BOS WB5ZKR WB8VKL WD8NBD NM4L PY4ALC PY4DD SP2FAP VE7AIW W3LDD W3YO W6GYM W9UO W6RYW WA5SUE WB8KFG

307
AB2N F6CUK HB9AFI JA6GIJ JH7BRG JA8SC K2IJ F4NYV K5PP K5RSG KA1DE KB4FQ KB5GL KB8BS KB8IZ KC9JP KR9O N4OI N7MM N7UT OH2BLD ON7EJ ON7EM SM6BZH VE3DMC W2MT W4VN W6JD W6MND W6VW WB8IP WA5IGD WA9EKA WB2KPE WB4GNT

306
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305
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304
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303
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302
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301
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300
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299
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298
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297
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296
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295
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294
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293
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292
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291
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290
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289
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288
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287
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286
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285
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284
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283
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282
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281
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280
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279
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278
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277
G4BWP JA8QR JH8MFS K3SEW K3TRM KA1HQ N8N PA0RLF W1GY W2KN W2TS WA2PPV WI4K

276
G3JFF JA1CZI JE1HKW K3ZO KC7ET KD8IW KF9D N4BQD N7BES NU4D OE2DYL ON6YH W2BTG W7BG W9NYW WA8JOC WB2CZB WB5PLD YU2BOP

275
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274
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273
EA3CTI HK6EHM IV3BLQ I0MMI JA2OZI JF2HPA JH7NRE K4TIA KC9EW KL7AF N4GFI N9CPW W6UZ W6KBZ

272
CX2CS DK0ZR DL7AFV HA4XX I3ZKD JH1WJR K9GPN K9WG N4CRI N8BUS OH3RF SL0ZG W1GNE W2TO W7MCU W8GWC WA5TDS WA9RCO

271
DF7VO EA6ET F6DYY JR1SSH K9JJI K0SR KA4PKB KB3OM KG8GF N2AIF OH3SG SM7CMY W1CYB W8PCS WA9LEY YU2CQ

270
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269
AI6V DL1VJ F6HJR JH6SOR JA7XBG K4JAF KB2RA KN4F N6HK W3TEF

268
CT2CE DL2HD K8JFN N9AIB NS5M SV1PL WD5HRX

267
AK1N K4ICH KB2XL KJ0H KC4OH KC8QT KK9Q LA4YW N2AMS N4FKZ/HR NX4Y W9KRI

266
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265
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264
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263
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262
AB9O DJ5IH JJ3AFV KB0G KC4ZH OH5OZ OZ1FAO SP3CB VE4ADG W6AUG W9HAH WB5KTD WS4E YU4BM

261
CT4YN DK3QJ JE1TTI K1OXD K6ASI K8ICE KA1UT KB9VF KD2GB KD6WW KF3C KX1A N9DOK NO6H PY1DFF SM5BMB SM5CSS W5HNS W8DWP WA1SN WA1FCN

260
DJ4XC G3JJG G3YBH I4UFH JA8CM JA7MF K9ALP KB2VP KC7G KK0M N3ACU NX4N LA8PF PT2VE VE1BWP VE3KOY W1ZT W2DW W2QJT W6CSI WA4CCP WA5IPS WK6E

259
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258
AB1P JA8CAQ K8ES NF9S

257
AK1L HC1HV JA0AQO K4LW KB1HJ ND0F W4FL WB9RNF YU3HAM

256
AA5C DJ4BE DJ6OV G4IJW GM3WIL K7RS KT1J KU5L N9ADN N9BMS SP2BRZ W2GVX

255
F6ACV KA1ML N4XM NE6I PY2ZM W1SG WB4QFH YU3BQ

254
JE4ESR JF1CKL K3WGR K8AC K8MW KM1E NG8S W5KNE WA8ADK

253
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252
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251
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250
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249
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248
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247
DJ2XP KB6WI NI2C W8CD W0JN ZS5MY

246
AK6A FM5WD N8BLZ PA0OI

245
I1SOP JL1IEO NK6N VE7AVC W8PFG

244
KA1X KC9JH KD7J N9CHN N9YC OE5KE OK2PO

243
JE1VPC K1RB K1ITS K5KT WB2FTK

242
F6FNU I0ZUT K4CM K4ELV LZ1HA WA4SNI YU7BJ

241
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240
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239
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238
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237
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236
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235
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234
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233
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232
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231
DL2QB HA5AW KA2HMJ KA4EQW N3CYI N9BAF W8FN YU1AST YV4AU

230
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229
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228
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227
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226
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225
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224
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223
HA9RE KC0D W6YFW

222
OZ1CAH W2KF

221
IK5CQV JK1PTF JE2LPC KD7P/KH2 OH2EE W2KKZ WA1COA

220
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219
HB9CMZ IK6BOB K8UNP N7DDK VE3CEY YU3DX

218
JR6LDE

217
SM7AIO

216
I8LPR I0TIC LA7SI W7RO

215
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214
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213
DK1EI JR2CFD JA9CWJ KK7Y W5SL WB5DBT

212
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211
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210
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209
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208
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207
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206
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205
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204
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203
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202
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201
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200
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199
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198
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197
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195
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194
JJ3FOZ KB4FO

193
AA4BK DL3YAW 4X6KA AA4BK

192
IK0CAJ JA1BIN KN1M KO1R

191
DL2SAD JA4CZM W0WJ

190
KA4LRM K4TP

189
DL3DK K4AOH ON8DG W4PKA WD0DDU WL7K 5Z4YV

188
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187
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186
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185
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184
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183
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182
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181
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180
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179
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178
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177
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176
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175
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174
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173
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171
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170
F5DE JH1OVY KG1F V3FB

169
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168
DK8ZB DK9CR K4KB SM5BZQ VE2FT

167
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166
HA5HR KA2VYW KA8CMR YU1EFG ZL1PF

165
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164
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163
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162
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160
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159
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158
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157
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156
JF1ERP JF1IRW JA4YQO KT6S N4FKZ/EA4 OH3BU WB3EVL 3D2ER

155
AA4DO DK2JX HL4XM JN1VNW JN1XWO JE3EOJ KB3J JA4AQA KC0PR KZ8I NF9V OE1ZOS OH7EU W1YK WA1SMH

154
DJ0AJ DL1NP F6GBH G3NOB JF1EYH JM1GYQ JO1BMV JH4BUO KA1YP KD8WX N3CSL OE2YGM VE3FIU W1UA W5WF W6ZQR 5R8AL

153
AA4ER DL3GG HK3BFU JA3FKK JR3WXA K9EC KY2D NR6E OZ1GRS OZ5EOR W4UCF WA2HZT WD4LOK YU2QW

152
F6HKD G3UKH HB9BQT

IK1ADH
K6UXO
KA1CFA
KA1MX
KA1Q
KA3KZF
KD2BW
LA6XM
N8BEF
N9CAS
N0DJJ
PP7JR
SM3CBR
VE6CB
W4YVZ
W6FL
151
AA4FL
DL5RAL
K4YKZ
KA1PF
KA5MIJ
KB9L
KE7CR
KF4QD
KT5Y
N1BVZ
N4EED
N4EM
PA3AWW
PA0BEA
VE2HN
W1KDD
W8DN
W9JZ
WA2TMP
WA2YMX
WA3LFU
WA4GOX
WA4SAC
WG4I
150
CN8EL
DL7NS/HB0
EA8HJ
G3CWW
HB9BIN
JA1BLC
K1JYM
K2QPM
K4LNA
K6LY
KA2DYB
KA7KMP
KC4OZ
KD9WK
KF4ZR
KZ9F
N0BZP
NA1N
NA2Q
NJ9O
NN8R
PY2ZJ
VE6BBI
VE7EIK
W2NUS
W3HMR
W7KJJ
W8FEM
WA2LWA
WA0JRB
WA0QVC
WT4Z
YV5ENJ
149
OL1EK
FO8IFF
JG2CLS
KB0CN
N1CPC
N8AID
NA2N
SM6NJK
W6EW
W8URM
WB1AJG
XE3ABC
WD5ETI
148
F6HGB
JR7BTI
147
DL4GBA
KD5UO
KF4IX
VK2EXW
146
JA8WOV
KB9PB
KC4OZ
KC8MK
WA1IWH
WA4SFF
WA4SSM
ZS6P
145
F8HLB
KA7FL
SL0ZZI
144
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KA9JOL
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WD5BIN
143
I5KXK
JR1TXR
KS3F
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142
JA7AZY
KA8HTE
N4HHZ
SP5AA
W8AUO
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141
DL7YBU
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GW3SB
JA4IYL
JA7DQS
JH0XSW
W7OIH
WA4EMF
139
AL7FG
CX2AQ
KO3E
W4PG
WZ4Z
YV6ABM
138
DL8WD
DL8SP
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KA4UPI
KM7L
KX2A
KZ4Z
SM4DDS
W2VP
W8NDO
WA3IMY
137
DL0OK
JA7AER
KA1GQW
KJ1F
NA8G
NG4W
136
DK9HN
DL9GAU
EL2AY
HA3HZ
JA8GTO
KA6CUU
KT1I
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OE6WK
OK1FIW
135
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KO3B
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WA1HUM
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134
EA3DBO
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KB7WD
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SM5AHX
VE7BCU
133
FD6IGX
JJ1YLS
JL1EBL
KC1A
KZ3H
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SM6MNH
TI0RC
WN4G
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132
DL6ON
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JH3BXO
JA6CBG
PA3BUD
SM6NFK
W6MYJ
WA4BKD
WB5TFM
131
DL7ABK
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NT7Y
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VE3OIT
W6YHM
WA7GVB
WB8TFJ
WI4E
YU4WRS
130
DK3LM
DL3FAP
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JE2MDE
JG3NKP
JA6YOV
K2BEV
K2HPV
K4NST
K4TTO
K8BXD
KA2ESQ
KA6SWI
KA9MCQ
KD9OT
KL7LF
N3TA
N4FKZ/I8
SM6GDB
WA4JWS
129
AI2S
DF6QI
F5DK
HB9CWA
JA1FKY
JR1RBE
JE2RDO
K2PEQ
K3LVO
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KA5RNH
KD2JC
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N8OGE
PA3AGI
YB2BGZ
YU1NHG
ZP5XDW
128
AA4EH
EA1CIM
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G4HYO
JF2UOP
JH2KCE
JH4GNE
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OZ1JEN
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WA5OXK
WB2SZY
YC4FRX
127
GM3WFJ
GU4XEA
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WA3WBU
WB8CCL
WD5CCM
126
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DJ5AV
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HB9CMM
HB9O
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JA2VB
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K4IPO
KA8FFW
KB4EQR
KB4JRS
KB8CLL
KD9FY
KV7Q
LU1CLA
NM7V
OK3TKA
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WE4U
ZS5NK
125
DF4IE
DL4BO
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J2DOU
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KF4BA
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KU0A
KV5F
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N5BQO
N5GAP
N6DDL
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NK8Q
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VE1RH
VE4AGT
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W3DBA
W3ENL
W4NM
W8ZN
WA2VUM
WA4HVL
WA5KBH
WB1CRI
WB6WIV
WB5YFE
WD5BRR
WD9DZV
124
HB9CRV
JA1VIO
K6CFV
KA1CRP
KA2UFA
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N6BAD
NO4K
OK1AXB
ON5BI
OY6FRA
VE7DRI
WB4JEM
YU3RW
123
IX2AI
JH4ELD
OH2BQG
W4WYX
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122
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JE6NPA
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120
F6HSI
JK1SQJ
JH7XTS
KA5MQH
PY3AJZ
WA2ABN
WS4G
119
CX4GL
FG7CB/FS
HA5JP
VQ9DG
WA1PTZ
WB2BXO
5T5RY
118
AE2L
EA5CHT
JP1EVN
JA3UCO
KF4CI
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JA8EC
PY7OO
117
DL2HAZ
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HK1HHX
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JA3VOT
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DF8DA
HL2SF
IK8DOI
JA2IIT
JA8GZJ
K2VM
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PA3CCE
W6KGJ/A7
WA2VJD
WB4J
115
DL7AKC
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G4VOE
JE3TAE
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TG9EO
VE6TC
WA1GUD
WA2WSO
WA2RKO
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114
DJ6ZF
JN1GIV
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OH2UBF
VQ9GD
WD9INF
7X2ED
113
OK8EE
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KY0T
PY2MIK
SK0HS
W7UN
Y25IJ
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LA7QW
OK3KGW
OZ4XX
SK0CT
SM5NWX
111
DJ2LH
IK5CXL
JH0ACW
JY6KG
K4YT/DU
K5EIJ
KA0GRO
KD7XR
KF4ZP
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N0CIB
NE2W
OZ8WD
VE3NBI
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G4VZQ
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JE3ENP
JJ3JJL
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JE7LHT
JR7RHR
JR7XBN
JH8NQV
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KA1LZR
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KF5EA
KI0A
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NB2P
NE7L
OH7AI
SM5AAW
SP9EPF
TF5EP
VE3AXU
VE3FOI
W1IP
W2TJO
W6QL/HK3
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WA5QHX
WB2LNR
WF4E
ZC4MR
YU2ZZ
ZS6ALH
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JH1BJB
JI1VVB
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JM1S2S
JA2FQS
JR2QUZ
JE3NWO
JA4FMS
JA8HXV
JH8EVL
K3VWF
KD9LG
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N8IBP
N0COP
NI2N
OH3JG
ON4AJZ
VE3NUP
VK2COP
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WB2KQC
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WD5FUR
YU2SWV
YU3KD
9K2GL
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K5PG
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KF6Z
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VP2VDQ
WB8FNI
WV4I
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107
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GM3RFQ
GU4WTN
HB1FC
JA1KRW
JR1IFC
K1OVF
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KA1CSL
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KW6Q
OH9SC
OK3TTL
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WE5Y
YO3TU
YV5DEK
106
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DJ3MZ
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JA1FVB
JA1UTN
JH1MFN
JI2UDK
JA3DM
JA3HF
JW0P
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KA1LEV
KA4JNB
KA7DNJ
KC7EG
KD9ZV
KD7XO
KD0OH
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KM2L
KR1D
KX8A
LA4CW
N3CZJ
N6ITY
N0CLV
N0FYM
NI2P
OE5THL
OH5MQ
OH9TJ
OK1XPX
OK3CKW
PA3CJS
SM7MPM
VE3LSK
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WB2TPS
WB5STU
3D6AL
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105
AA4LL
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DL4MCF
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HA8KVB
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IT9GXE
JE1RXJ
JH1OCC
JE2PMC
JJ3UJC
K4BQJ
K7BJ
KA1PE
KA2ARB
KA2OOG
KA9OTD
KF4BU
KI4BW
KI4WA
KS4X
N5GGO
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NB0H
NE0P
NM7H
NN4S
OK1DIL
OK1KBI
OK3KTY
SM4NLL
SP7EWL
VE7FJE
VE7EDA
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W2RK
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W9OTE
WA4TBH
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XE2NNZ
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YU5CEF
YO4CST
YU3NF
ZS6AE
7P8CI
104
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DF4IA
DL0BO
G4SDJ
GM4BWT
HA6IB
HC1SK
HK3HFQ
HU1DX
IK4DCT
IT9EKI
JP1AOK
K4CGY
K0HA
KA6JTR
KA8CUP
KA8AND
KA8TNS
KC3SA
KC4IL
KC9DY
KD8LH
KD9WB
KI4UZ
KJ4MR
KZ9A
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LA6LX
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N2JW
N3BDW
N4HXK
N5DIP
N6HYK
N6IFD
N7GWF
OA8CP
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W3TI
W6YB/3D6
W7HRR
W9NIP
WA4EVB
WA6NFC
WB9SAU
YC8VCE
103
AA4LI
DF9KV
DK7WCY
EI4FC
GI4PMP
JJ1EGE
JR2MKQ
K1VSC
K2OMQ
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KF5DA
KD2CR
KD2ES
KD4YT
KF4CM
KG6IP
KI4DC
KI4HL
KT1S
KT3H
KU9T
KW7Z
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NE4H
NG7K
NI2Z
OK1ANS
PA3CTO
PA0BN
TF5BW
VE7FKZ
VQ9JC
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W4ZCT
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W8PVD
WB3GRA
WB5OSD
WD4KQD
WN6J
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ZS1QJ
102
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DA2EBF
DK3GD
EA4CQS
G3ZOH
G4DIB
GD3AAE
HA8CW
JA1KEV
JA1CG
JR0ICI
K9CQV
KA9UGA
KB4DFK
KC4XA
KB4MD
KD9NT
KF5AL
KI6BN
KI0G
KJ4CG
KS4N
KW1V
KY9P
LA1NRK
N3COB
N3ELN
N6BCN
N8DD
NF7E
NF9E
OK1MJL
OZ8JYL
T30AC
TG9RB
UA9YAT
VE3MQV
W3GIS
W4TZC
W6FRM
W6QL/HC1
W7KSK
W0AWP
WA3JOJ
WB2ONZ
WB5TGL
WB6PRK
WD6HHM
WI6L
WM4V
YU4JLM
ZS5AZ
101
AD1S/KH5
DF2LZ
DF8EM
DK0AK
EA5ADI
EL7W
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GI4FZC
GM5EMM
JA1KWC
JH4RNF
K1MZB
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K6VW
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KA9ACS
KB1NS
KB2OR
KB5NO
KD2HE
KD9HK
KE5RM
KK9W
KL7GPG
KS7R
KY2L
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WA2SSV
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YU1AGP
YU2REP
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A92NH
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DL6MAW
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GW4LFO
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KA1JKM
KA3IUT
KA4KJI
KA8PPQ
KA7FEF
KA9OYA
KA0OMX
KC8ZQ
KG7G
KD7RX
KE5OD
KE6US
KI2B
KI4Y
KK1A
KU4A
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N4ILG
N4RK
N6ESV
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N9CIQ
NA5Z
NI8W
NJ2L
OE5BYL
OK1JLC
OK1OFA
OK1JDJ
ON4ABT
VE7HMS
VK6AHI
VK6AVL
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W1TQS
W5HL
W6KG/CP
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W8IZV
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WA3BNH
WA3GSN
WA4PEE
WA5NTI
WA6TMY
WA7VYJ
WA9VYB
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WB2GAI
WB2STV
WB5HSB
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WD8L
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WL7AME
WP4O
YB4FNN
YU2LDD
YU4EU

PHONE

365
W8GZ
364
TI2HP
W2BXA
W4EX
ZL1HY
363
VK6RU
W6GVM
W8BF
360
I8AMU
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G5VT
K4HEF
VK5MS
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W5IO
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PY4TK
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VE3QA
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343
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K4JRB
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NY3F
OE1LO
PY2PA
PY2PE
VE2WY
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342
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341
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340
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KI6T
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VE3SR
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339
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W8SFU
338
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G3UML
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PY2PC
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337
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336
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JA1MIN
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335
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DJ5LA
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EA4JL
GM3BQA
HB9AAA
I1RBJ
I4ZSQ
IT9GAI
JA1BN
JA1IBX
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K6EPE
ON8XA
PY2CYK
PP5UG
SM5BHW
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W2GBC
W5LZZ
W7JFO
W7UPF
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W9DCE
334
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K8ONV
KP4CK
OA4OS
OE2EGL
OH3SR
PY3BXW
SM5RK
VE3GMT
VE3NE
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W4BRE
W4DPS
W5QOU
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333
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332
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JA1DM
JA1JRK
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331
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KM1JG
KM2P
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323
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322
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318
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316
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JE1MGE
JA3JOR
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KV2S
KZ8Y
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306
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305
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KT4G
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ZL2AFT

302
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KZ2P
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301
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300
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299
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YS1GMV

298
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XE1L

297
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YV3AZC

296
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295
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294
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293
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292
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291
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VE3XO
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YV1EAH

290
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WD8CZA

289
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288
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287
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286
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285
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284
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WB6RSE

283
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WD8OTZ
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282
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WB6FCR

281
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280
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WD9FOE

279
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278
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AJ1L
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I1SBU
I4CSP
JA6VA
K0VZR
KG9N
W1GD
W1TN
W2HN
W4PKM
W9GBC
WB8LFO
YU1FW
YU2OB

277
AA6BB
HB9BLQ
HK4DHR
I2QMU
I4KDJ
K2TK
K5TGE
K6CID
KA1HQ
KB0SY
KR9G
N4BSN
N7GMN
NL7P
PY4LJ
PT7WZ
VE3LRU
W1CRL
W1GG
W5HEZ
W6CF
W6TGI
W6US
W9TT
WA4QQV

276
DJ5MC
JA8IAB
K5MLG
K6VMN
KC6H
LZ2DF
NS7R
NJ8N
PA0TO
W6HT
WA4HNL
WI4K
XE1XF

275
JA4GXS
K3RT
K7EG
K0TCM
KA2BZS
KA6V
KD9M
LU3MCJ
N8DE
W7BG
W8SEY
WA7OIJ
WA8CZS
WA8UWS
WI4R
ZP5JCY

274
HB9BRC
HC1HC
JA4VAD
K6CBL
KB7VD
N4DW
N7BES
OE2DYL
ON7FK
W4MOM
W5GVP
W7OAX
W8QHG
WB4MAI
WB9MSV

273
EA7LM
HK6EHM
K1ER
K1YHM
K4KQ
K9MGF
KA6KKN
KC7JO
KV5E
LU2CC
W4JZ
W7FJE

272
AE5E
JR2BZA
KB8WC
N5JR
N7AKO
NW5K
W4CYJ
W5YH
W0VX
WA1ZAM
WA4YOM
WB4YZC

271
DJ7QB
GM3CSM
JH1AGU
JR1SSH
JH7NRE
K1HDO
K8EX
K8IQB
KB2MY
KC2FC
KC7ET
PT7KW
W1CYB
W2CKR
W3DR
W9CA
WA5BBR
WA6CTX
WB2CJL
WD6EKR
WD8IXE

270
DL1BS
EA4BVE
I2PQW
JH8MXH
K4JDJ
K4PR
KA1ACC
KA4PKB
KA0NNF
KB7HB
KD4NZ
N2CIC
N3AZU
NP4CC
NT4W
PY5OC
W1AB
W4ZMC
W8GS
W8ILH
W8NNE
W0GDQ
WA2MTR
ZP5RS

269
KB6OK
KC5CR
KE2S
N2BAT
WD9IIC

268
CT2CE
G4GIR
KB2RA
KB0JF
KR9U
KV2Y
N2RR
W2GZA
W8QWI
WA2BDP
WB6VIN

267
EA5BCX
I4AND
VK9NL
W2RS
WA4QHN
WB4ZIM

266
JG1TSF
JL1BLW
K4HTY
KE4YD
N4ETA
N6NF
N9CPW
G4BWP

265
CX2CS
EA1BDB
I1TLJ
JA0WRF
K2NJ
K0LUZ
KA2AJT
KB5EK
NK2H
WA1LOU
WA2YNH
WB6SRK

264
AA4H
AI9F
AL7BL
I2WZX
K5CTG
KF2X
SM6AVM
VE7ML
W7FJE
W7JBS
W8VPN
ZP5JAL
WA2WDJ
ZL1SZ

263
CX3BH
CX4AAU
DJ6KH
DF2AL
I2TZK
K0HSC
KB2XL
N6VO
NA2M
NJ5X
ON4AAC
W2OB
W7DAA
4X8AG

262
AB9O
AK1N
DK8JS
EA5KF
EA7CEO
EA8AKN
G4GED
JA1KYE
K1KOB
KC4ZH
LA4HH
LU1SE
LU8DPM
N4AJZ
NY4H
WA0GUD

261
AF4Y
G3COJ
GW4KGR
KF3C
KN0L
KQ8O
KR9R
N4CRI
N4TL
VE5ADA
W1HJF

260
AE6T
EA1ABT
I4UFH
JA1SVP
JA1VDJ
JA3RRN
K6PO
KA4FQZ
KB6BW
KC2CO
KC7G
KC8OT
KD4HO
KQ2O
NG8W
VE4ADG
W2BIE
W4DMV
W6MKB
WA1IRN
ZP5MJY

259
G3YBH
HI8JO
K0AZG
JM1MGP
JA6SC
K6ASI
K8WOW
KQ8J
W4APQ
WD8NMV
ZP5CBL

258
AB1U
F6HJR
JA4NHG
JA5BEN
JA8AOO
K3SEW
K8RJI
W7HPI
W0PXM
WB5ZKR
WD8AQJ
4Z4UX
7X2LS

257
EA8VV
K2LS
KF4NO
KN3P
KQ7U
PA0MA
W8KBZ

256
DJ5IH
EA5BW
KB7DA
KG2T
N6DJY
NF9S
W4PC
W9LW

255
G4JJW
JA1SJV
K3RPY
K0MPR
KE1K
KL7AF
N9ADN
OK3EA
VO1AW
W8TA
WB4VQO

254
JF1CKL
KO2GB
KD6WW
KM1E
OZ8EA
W8DOG
WA4UNZ
WB5RQM

253
F6GPG
I2EOW
JF1SEK
JH1WJR
JA7OP
K3QMX
K7RDH
KA2CDE
KC8KE
KT1J
OZ1BOD
W3IOA
W5VVD
WA6IVO
WA6LOD
WB6RMN

252
CO2HQ
I2KAJ
JA1HEE
JO1ABS
JF2HPA
K1NLQ
K7DVK
KA3HXO
KA0DMB
KC4LQ
KD4RH
SV8RX
VE3CWE
W3IGU
W6AEO
W6MND
W6OB
W6GAX
WA6Z
WA6YTM

251
AK1L
CT4RH
CX4HS
G3UAS
EA6ET
JA2JRG
KK9Q
KR8X
KS8R
KX7J
N9BUS
N0ACH
W5KWK
W8ANM
W9KGW
W0ZRA
WA1NSJ
WA2OEP
WL7E
WA1SMI

250
DJ8UR
F6GXB
G3RUR
HL1SX
I1XXM
IK1AOD
I6IXJ
JH6SOR
JR6EXN
K6WZ
K8MID
K0RDJ
KB2PX
KB4CWO
KC2JA
KC4TJ
KC4ST
KC5FR
KT4M
N6BLN
N9AIB
NF8W
LA9TCA
OX3KM
OZ1BNZ
PP2ZDD
SM8LIF
W4BLB
W8JRW
W0KXZ
WA4PPS
WB2IJD
WB3BAP
WB8UBR
WB8TRW
WJ4T
ZP5MJO

249
AA4AM
DF7QD
DJ8UR
DL7AFV
I3AAV
J88AQ
K7CU
K9LCR
KD7CL
NF9Q
PY2JSF
PY3JC
VE3RO
W2VP
W7FF
WD4IKI
WD6MRC
XE1VIC

248
WB7WQE

247
K0M
ON4SW

246
JA6KSD
KL7KJ

245
I2IAU
JA3FYC
NK0N
NN2G
VE1JL

244
HK6BDX
K1NOK
KE4VU
KM1R

243
JE1VPC
N9CHN

242
K1RB
WB1BVQ
WB9UKK

241
F6FNU
KD7P
LZ1HA
WB4FQX

240
K3JRG
KA3BTH
N2AC
SM5CSS
VE3JU

239
EA7EU
JA3ANW
KW4V
WB4LND

238
K3RV
NQ5W
OK2QR
N9BMS

237
G4ULC
JA7XBG
SL0ZG
WD9JKZ

236
K5KT
KA1PM
NE8Q

235
HK8BUT
K2IBW
KC7V
PY3CM
W6DUB
W9WM

234
JA4UQY
K7PM

233
JA1BFF
K7JXR
KA1X
KA2CYN
KB1HJ
KS8M
KT9P
NE9I
SM8HEP
W5ZKK

232
KB0YM
SM5IMO

231
AA4NA
DL9JI
I8SNY
K1YR
K7INM
K9ALP
KB7TQ
KE4FW
KZ2W
VE7BXG
W2KVA
WA6GTU
WB2MNO
WD4FHD
WD5JFM
YU1NR
YU2BOP

230
K7EHI
K8REG
KC2WQ
KD7J
N4WJ
N9BAF
5B4MF

229
AA4NC
AC2F
HB9AST
KC5NO
KD4XN
N4FKZ/HR
N8DBI
SM4IKL
SM0JOQ
VE3ZN
W2GVX
W2IIX
W5HNS
WA8TLA
WD6GFF
WD9AEU

228
KD9EB
KE4WY
KK0L
V2AO
W4PNY

227
AG2K
EL2AM
KC5P
KN4F
NE8I
VE2PD
W6FAH
WB2TKU
WF4I
XE2FL
YB3CEV

226
AK1E
CE3TZ
DJ4ZD
I1WZT
I8IXO
I8JLX
K4BFJ
K5GKC
K8WWA
KB5RA
KC5WJ
KC7XB
KF4YH
KO3J
NJ5V
W5VUZ
W6MEL
W7MCG
WB5SAK

225
EA5BYP
I1NRF
I2ADN
I8TOH
IS0NZA
K9LJN
KB7F
KC6ZA
KC7GO
KJ4MD
KU0Y
N3CWP
N5WH
NA5S
W1WB
W8ELE
W8MAK
W8NPF
W0WFB
WB6FZN
YB2BOT
YV4ACY
4Z4MJ

224
DK0ZR
G4HVR
K1HBM
KJ9N
KR9S
VY1CC
W8NGZ

223
K2PWG
SM5CCH
W4LHY

222
JT1BG
NI2C
TG9HH
WB7CEH

221
DJ1DX
JL1IEO
KD9GJ
W6YFW
WB7VNY
4Z4KX

220
W8GG

219
DL2DN
J73PD
N2AIF
VE3CEY
W4UYC
WB4CSK

218
EA4CDZ
K7SPL
N9DPL
8R1RBF

217
CT1TZ
CT4UW
W1JNN
W8QNF
W9DS

216
CP8HD
FD6ITO
HA5XW
N1DCM
RT5UN
WA5NQJ
WA8IMO

215
JA8CWZ
JH1OXV
OE2KGM
W3NB
WB0OLC
6W1CK

214
EA5FCP
IK6BOB
JA4ESR
JR6LDE

213
K2EK
K7KH
NM8O
W1JCI

212
IK1AAW
K5PC
N8AW
W7LZA
VE5UK
VE6VW
WA3GXI
WB5DBT

211
I8WYD
JH0HWP
K4VAI
KC7WO
KC8PX
NN4K
ZL2UW

210
F8BO
JI1WLL
JK1PTF
JA9GPG
K2OVS
KA5DGX
KM3N
N2EGR
W1DOH
W1MGP

209
I8XJU
JA1SFL
JK1SAI
KD0HN
KM9W
N2DHZ

208
A92F
EA1AWW
EA3CCN
JR7COO
NZ6N
W5ODD
WD4CHR

207
F6IFE
I2KUW
KA5GRP
KD7P/KH2
KS2O
N8BLD
VE5AEC
WD6AFC
YB3CDL
YV5HNI

206
DJ7AX
I8TIC
JE2LOX
JH4IFF
KD6VU

205
CT2CJ
EA4GT
K6BKU
KA5DNP
KA6JDH
KB0V
PY6ACP
VE1OC
VY1CW
W2KKZ
W9VSL
W0LYM
W8MD
XE1JIW
XE1MMD
XE1OD
XE1OZ
3D2DM
4X4AT
4Z4VG

204
CT1TM
DL9EY
EI8AR
IK1ARA
IV3JNH
KA2UTV
KA9PJZ
KD4OH
KY7M
NO4N
W3ARK
WA9BZW
WB0DHS
WD6EAW

203
AC2J
CX2CB
DJ3VM
IK8AUC
JA2MNB
JR6PGB
JA7REE
JA8FKO
KA4GYU
KC3KE
OZ4ZT
PZ5JR
W3JZP
W0LEC

202
DL4FV
IK0EPS
JR2QKH
K4II
KB5KA
KD8KX
KK6X
KS0C/KH2
N2US
NA2G
N8BSB
OZ1ACB
W8NOF
W8ZGP
WA1WWH
WA6BIE
WD4AIE
WD8SDL

201
AD4E
I2BCU
JA8UUA
K6NM
K7DXD
KB1FE
KB3PD
KB9PY
LU9DBK
N6ABE
SM7LPY
VE7DFW
WA6O
WA7ECU
WD5DHF
WG8P
YU1AST
YU6ZA

200
CP5AI
G4UCB
HC1OT
HI3AMF
IK8CNT
IK8EPC
JA2GSQ
K4HGG
K4SWF
K6JCK
K6SIK
K9BQL
KA0ZM
KC9YX
KJ2O
NK7Y
KR5D
SM5LI
TI2KD
VE3FWQ
W3WFM
W4KHL
W4UFH
W5PD
W7BNH
W8RHZ
WA2EIJ
WA4WHJ
WA4YED
WB3AIT
WK6V

199
AE3Y
AG4M
CP6IM
I2YKV
JH4KMA
KB6HW
N4AQA
N4DDZ
W4HNK
W8PKB
WA1WMS

198
JA1ETO
KD7FD
W1FG
W7LZG

197
W2IJM
W4KHZ

196
JL1XMN
KA1FXI
ON4ACB
OZ1BQA
W0DFT

195
DL2FAG
KB8G
KC5MO

194
JJ3FOZ
JA4DBV
KS3L
W7CSW
4X4IL

193
IK2EGL
WD8DXN
4X4KA

192
WB4VHE

191
JA7CUK
KB9CH
WA1COA

190
DL7ZR
EA1FP
JF2AXT
KZ6Z
OK3WW
VE2FS
W2HTW
WD5ELJ

189
K0QC
N0EKK
PJ3DO
W7LHO

188
JA1SYY
JK1ALI
TR8SA

187
K8UNP
W1SIX
W1ZT

186
EA7ABV
JJ3WUG
KA1SR
WA2NBV
WB6WZT

185
CT2DR
DF2CD
F8FGJ
JK1GDD
KF6AW
WA9YZN
WB1CTO

184
KA0M
DJ1TV
N6HVZ
SV1MO
WB0YMQ
WD9GIG
XE2AQ

183
DL4NN
F6BDG
I8ZUT
JE7BEX
KD6WD
KP8P
SM7NJJ
W3MOF
W5TTK
WA4AYC

182
DL2SAD
I3ZSX
JH1NPX
JF2ECJ
KD9CN
KI2P
JH4UVU
N8EHW
WA8AEA
WC5E

181
DL1MAJ
KC4HN
N2DXJ
W1ICH
WB9IWN
WL7K
WP4D

180
AA4MA
IK1BQB
IK8BQS
JR2UBS
KA4EMR
KF1J
5Z4YV

179
IK2AGN
JA4ZD
JE1CCD
KA1ERN
KB8FJ
PY4IL
PY4ZU
W7QN
KB8XT

178
AA4DU
EA5AYD
KC4MJ
N1AIS
OE8JNK
OK1VAM
PT7NK
W2EEO
YB5QZ

177
AJ3K
HB9BMZ
HB9CJX
JK1RJQ
JA3YOT
JE6WVU
K3IXD
K5TEX
K0PCK
KI7X
KU7F
KX8Q
LU1VK
N1BPJ
N8FZI
NO6B
W4HVU
W4PKA
W7KEU
YC8OPO

176
A22ME
G3CCX
HB9AQS
KA1HBV
K8BQQ
N1CBM
OE1PPC
KB3H
N0DWU
W8NTU
W0YZL

175
DK6UR
HB9AGI
I2OMI
I2ODZ
K1JRE
K4HN
K1ZLA
K6OCY
KA3CRC
KB2BC
KC8PG
KD4OM
KD7UZ
KE4SN
KF8EN
KL7VZ
KT1H
N9BOK
OK3MB
W6TZN
W7TSQ
W8JM
WA4IAX
WA5PIE
WB6FDQ
WB0MWJ
WD4AFY
YV5EF

174
I2WTU
IK2AWT
I8IGZ
K3FNW
NI5T
W5OPZ
YC5NOF

173
WB9EVH
ZS6BCR

172
JE1ZSK
JN1KEJ
OH2BMC

171
I4UJI
JI1FJV
K7ORK
KM7U
SP6DVP
WA1YFF
YV6CAX

170
KC5UC
V3FB
W5DLQ
W0WJ

169
KG1F
ND0F
PT2PT
W6FQ

168
EA1JO
HB9CXZ
K1IYD
K2BDY/DU
KA2PHQ
NK5Z

167
JA3VZD
K4ZCQ
N4IQN
W7PLK

166
HA9XX
NI8B
WB9ZHS

165
CT2DG
HB9BVV
JI1HNJ
KC2PX
N6GBM
PA3AAN
YC8DLG

164
HK6DOS
JH1QYT
WB8X

163
G4YAQ
JM1KYK
KD2LM
KD9EC
KS1G
N6BXM
PZ5ES
WN6R

162
F6FYD
JG2MWA
K3VY
KE5PA
LA8SN
NB9C
OE2YMO
ON7CU
W6SUP
WB5KTD

161
IV3UT
I4GKX
JA1NQI
KA2HMJ
KE4XY
KE6OT
N9ACD
VE2FT
W1WRN
WD4KWI
XE1JCL

160
G4MBT
JA1JYZ
JM1SMY
K5KNA
K7JNB
KA1SK
PY2FFW
VE2GHZ
WA4BQH
WB3AMO

159
C30AAN
KA3DLT
N8EJL
W8KDL

158
CS3EK
EA7CWC
JR1CVV
KC9LB
KD7PS
W6ROK
4X6II

157
F3DE
EA5DHE
EA5JC
TI2BAM
TR8DR
VE3EHG
VE7YL
WA7GQA
WB2PCF
ZP5LOB
5Z4DU
6Y5AG

156
I6IQU
JR4QZH
K3ZPG
KA2VYW
N3CWD
N4ERN
N4XM
W4DDP
WB4PZM
WB6TJW
ZS3MS

155
AI7M
CT1AVR
I2KVI
JA4AQA
KB3TC
KB4QR
KB6CLL
KB9PQ
KO1R
KY1O
NI0S
W4WKB
W6RCL
WB6ALC

154
CT2FH
DJ4QC
G4LMO
GM3LYY
JA1AUJ
JE2KSM
JA3UCO
K2DUX
N5AFV
ND5H
OE1ZOS
W4LSI
WA4PMF
WB6FSR
YV5IVI

153
DL3YAW
EA5CGU
JE6WVT
K8NLD
KP4CZ
VE3FIU
W5EHY
WB3EVL
WB5INB
WB9YZE
WB9ZGY
WD0GBU

152
CT4CP
DU1GJM
EA7SJ
I3FOM
JE6EGC
JH4BUD
KA1ION
KB2TN
N7GMT
VK5QW
W4WVB
W8NE
WA2ZGO
WA6DGK

151
EA8YK
G2HKW
G3UZM
JA4CZM
K3WGR
K9EC
K9JSK
KA1PF
KA5MIJ
KD8KX
KC0PR
KY4JC
KV9V
N2DNY
N8BEF
NI5D
PA0FVH
YC0BLO

150
AA9F
CN8EL
CT1LF
CP8IH
DK1WN
DK2JX
EA7ARK
K1MZN
KA1JLK
KB0BH
KB0VQ
KC8SV
KD7TO
KD9WK
KE4SQ
KO9Q
KZ9F
N2BFH
PY2ZJ
W1QJI
W3FME
W5MUA
W6IBU
W8MLK
WA2POW
WA8SXM
WB8CHS
WC4B
YC3BRY
9M2MM

149
KA2OYL
NT5V
VE1JS

148
KB0CN
KD6KY
KL7XO
N9NB
PY3WW
W6UE
WB1AJG

147
AK6T
FD6IFF
I8UZF
K9VTO
KA2FAJ
W6ZCK
W7LJI
WA4TJW
YV5ENJ
4X6GS

146
KC9MK
VP2AZE
W2DW
W5UXR

145
K3NA

144
EA7DKG
IK2FCZ
K9FD
KJ8Y
W6ABC
WA4GOX
WA4SFF
WD4LJY

143
PY4BA
WB2QJY

142
JR1TXR
KY3V
LU1HG
K0IYF

141
JP1TRJ
W4SPK

140
K7TIC
KX8N
OZ2RM
W5BAV
W8AKS
WD8YJF
YV5BHW

139
JA1ASO
N4FKZ/
EA4
W9JZ

138
A35SA
AL7FG
OE2YGM
WB5NVZ
ZD9BX

137
EA1ATQ
JA1KNS
JA7AER
W8IGK
WB2EOB
WB3HTT
WQ4I

136
CT1AHU
EL2AY
W1VBX
XE3ABC

135
CT1CNI
GM3WIL
JA4YQO
KJ1F
KS3F
NE9O
W1CED

134
DF4TI
G4HLS
JA7GYR
N4KMY
WD8NNB

133
EA8BCJ
I5UKA
JN1XWO
LA5LT
OD5SM
W6UVW
WA2ICE
XE1XM

132
EA7DTY
JA5CKD
KF4IL
KL7IEN
KM7L
NM6L
W5SL
WA3GLA
WB7BWZ
WD5BYZ

131
JA7WKG
KA5CXJ
KT5Y
NM8C
W6KFV
WA7GVB
WB9TFJ

130
DL3ZQ
EA8ANT
FD1HWB
I2OGC
KD9OT
KK3W
LA1SEA
N3EHD
OE3IPW
W5GFM

129
AK5Q
DL1BBP
JA4IPU
JA6CBG
JA7YAF
JH8XSW
KC3NO
KC9SF
W7TLK

128
EA7GW
G3NOB
G4MTC
HB9BIN
JH2KCE
JH4GNE
KB0ZZ
KC8AF
KC9ZZ
N5BCL
PA8BEA
SM5LZ
W7YAQ
WO4O

127
DJ3YP
I1KGF
JO1HSX
JA2ITK
KF4VS
N2DXQ
W7UFM
WA1OEZ
WA5OXK
WD5CQG
YV5CMI

126
CX1AW
DL3UY
HI3AAI
HL4XM
I8JKN
KB4JRS
KC5UB
KD0FW
KF6TE
SV1VS
W1WAI
W7BMM
W8TLC
WB3IHQ
XE1NJ
ZS5NK

125
AC3T
DU1KT
EA1TE
F5FBE
G3CWW
I5RUR
KA1YK
KA9MOM
KD7LK
KL0A
N1CWB
WA4BRM
WB6LHW
YB6NF
YU2CZA
YS9HH
ZF2GE

124
DL1EK
GW4UZL
JR6GFS
JA9IFF
SM5BZQ
VE4AGT
VK7UA
W2FV
WA7EJU
WA8OLM

123
IK2BTI
JA1EPL
K7KNG
KA4CIZ
VE5ZN
WA9HFS

122
KB2HN
N5FYJ
NB9C
W4ODE
W7OP
YV7QP

121
CX2CX
G4OWN
I2YPY

120
HA5SO
IK0FEW
KD7PC
PP8WV
SV1UG
YV5JEA
WD9FEN

119
CX9CG
DL1KAU
K9UTO
SM7NDX
YC8BYW

118
CE4BJ
EA3AAY
HB9O
JO1BMV
JF7DZA
PY4OY
SV0DC
WA0UHQ
5T5RY

117
I0VVQ
JM1GYQ
JP1EVN
K6DMN
VK2EXW
WA5OYU

116
EA3BTO
FG7CB/FS
N5CCX
N6AVX
W3EE
YV6BTF

115
DL3FAH
I8UAV
JE6NPA
JA9RFN
K8JEY
KA2VAA
KA5GHR
N4FKZ/I8
TG9EO
W5DZF
W8JS
4X6AS

114
DK8JB
HC2KW
KA7BOE
KY6R

OH2EE
OZ7BPX

113
DJ2BA
DJ7MD
EA5CHT
HL2AMO
JA2ODS
JE2VDG
JR4TET
KA1LR
KC3DJ
N8ADA
WB2ODH
WD9DZV
YB3BJT

112
C53CR
DL6YAU
EA2QC
EA4CPK
EA5DIT
EI9FE
F8HB/EA8
JL1EBL
KD6LV
3K8HS
WD4ALW

111
IK2DZN
K4YT/DU
KA4EQW
VR6TC
W6SIY
YC2BGZ

110
EA3BMT
EA5BRE
EA5CED
F6EUG
G4VZQ
HK4AHX
I6KYL
IK8DOI
JA1NGM
JA5SLM
JH1CAO
JN1WOZ
JR7RHR
JR7XBN
K2QXS/HH
K9LA
KA3GMP
KA8QHI
KD0MD
KF4ZP
N9CWQ
OZ1AUW
PA3DEY
VE3NUP
VK2DEJ
W6WPK
WA2RKO
WA4OBR
WB4MHR
WB7VON
WB9LAI
YV5VN
5N8HEM
5N8KBM

109
DL2BAR
EA5DWQ
EA8AFS
G4KDV
IK4DSM
JA1VYQ
JM1KNT
JH2AZP
JR2QUZ
K2RYI
KC0NY
KD0MC
N9BRV
NK2J
NN2C
NX5C
SM0KRN
VU2DVP
W2TJO
W3EMV
W4IAA
YC0DPZ
YC0EMJ
YO4PX
ZP5FGS

108
AA7A
AA4FL
CX2AAL
DL5SBA
EA7EMR
G4SZD
G4WIA
HB9AQA
HK7BEI
J73LC
JM1LPN
JK3DGX
JR0AMO
K7OZ
K9HEK
K0YXU
KA9TNZ
LU8DWN
N7ACK
N8EKS
NE5I
NI8Y
PJ8DFS
SM3ETC
SV2UA
VU2CVP
W7GYX
W0LBR
YC6XE
ZD9CC

107
AD8S
DA2TH
EA2SN
EA5AEN
G4VZU
GM4TOQ
HB9BEB

JA1KRW
JF2MVI
JG2CLS
JI2KAR
JA3BBG
KA1HME
KG6FG
KI4LP
LA3KBA
LA5BX
LZ2AB
ON4JT
OZ1HAS
PT7ZO
PY8KW
W6MEF
W0OOO
WW4Q
YU4WRS

106
CT2CM
CX5CC
DL5HBL
DL9YH
EA5BMK
G4GIZ
G4VOE
I6GKI
I8VJB
JA1UTN
JL1IHE
KA6CUU
KB1JZ
KC3TG
KE0Y
LU4DM
N7FTL
W4DGH
WA7FJR
3D6AL
5V7NG
9J2JI

105
A92EB
CP1PR
CT1TH
EA4CTU
HK6BER
HK8AQN
IK2AEO
JA1SDH
JE1RXJ
JA2QCX
JH8WGR
K1OVF
K2ZFW
KB0LB
KG6OU
KN5A
N5FNW
N5GGO
N5HBQ
N8BRQ
N8CQA
NB2Q
PA3BVU
PR7SM
TF5BW
V44KQ
VE3FOI
W6VMN
W9HHS
WA4ETN
WD9CIR
Y81ZN
ZS6TB
7P8CI

104
AK1V
DJ7AE
DL2AAE
DL8LT
EI6EW
F3VX
HK3HFQ
HL1AQB
IV3AAC
K3NEE
KC7LP
KC7QE
KE5ZW
KF6Z
KZ2X
LA2IZ
LU8DWR
N4ENX
N4FZH
N8LTN
N7AXW
N8COY
NI4M
PY6LE
TF5EP
W8YLJ
W9IH
WB9SAU
WD9INF
WE4F
WW4Z
YC2AFP

103
AA4NK
DJ0AF
DK0UU
F6INJ
F5ZO
G2DRT
G4LEA
G4OUT
GW4LPA
HB9AVI
HB9AWS
HG5AAP
JP1AOK
K4ADN
K0EW
KB8OM
KD2GC
KD5YQ
KD7UN
KF4UB
KF5MP
KG6IP
LU1DKH
N2CTJ
N3ARK
N4CXK
N5CTK

N6IBM
N8BGE
NE0V
NG7K
LA2EG
OE5RLM
PA2HJH
TI2ANL
W1EII
W4JZA
WA2KDC
WA4GRZ
WA6EED
WD8BKT
WN6J
XE1HTT
XE1JRV
YV5IMF

102
A22TE
CE4ETZ
DL4OK
DL5FD
EA5EBT
G4HLC
G4VBT
HB9CFV
HB9DAX
HK3HMA
K4KST
K5RSI
K9AYK
KA2ESQ
KA7KZS
KA0EOE
KB1AY
KB8RM
KB0KY
KC9YE
KD5ZD
KO7JI
KE6KT
KJ4CQ
N4DDW
N5AWE
N5GAP
N5HRX
NF9E
OK1AFZ
OK1ORA
ON5FV
W1GMX
W6IYV
W1WYP
WA2AUO
WA4APM
WA7PMS
WB1FQW
WB6ZRD
YC8LD
YB8QD
ZS6AXC
6WILL
8WINQ
9K2SA

101
A4XYQ
C53BI
DF5CT
EI0EM
EL7W
JH7GFO
K2HMY
K2KAB
K0TDO
KA2IVS
KB4MD
KC4SR
KC0DJ
KD5LP
KF4CR
KJ4UJ
KW3X
N2BOW
N3CZJ
N6FNT
N6ITY
N7BJT
N8BDX
N9CNF
N0ERC
NJ5L
OK1ABP
OK1HP
PY2CRN
VP8AQA
VU7WCY
W3GEZ
W4TLA
W8JRK
WA1GPI
WA7MGF
WB2SRL
WB5TGL
WB0HOX
YU2GG

100
A92NH
DL7ABZ
G4TLZ
G4VKV
G4XHA
GI4NKF
HA4ZZ
K1NIT
K2KJJ/PJ7
KA1GIP
KA5QXH
KA5TQF
KB1GN
KB4IZB
KC3AW
KC5HY
KD7HH
KD7YO
KE4PE
KF4CM
KG6AQ
KI4DV
KJ6V
KU9T
LA1XDA
LU1CLA
N2DNO
N3BCZ
N0DJS
N0EXW
OE7XMH
OK1KPX

W2DFZ
W2RK
W3RLR
W8EHX
W8VJW
WA2OYK
WB3HNK
WD8RBW
WN4R
WT4Z
WY4P
XE2NNZ
YB4FW
YC8TG
YV3XR
6Y5KG
8P6QI
9H1GO

CW

320
W9KNI

318
K6GA
N4WW

316
K9MM
N4RJ

315
DL6EN
K2TQC
W8AH

314
K3FN
K4PI
W6PT

313
DJ2BW
JA1JRK
K2FL
K5VT
SM5BHW
W1DA

312
K5UR
W1NG

311
DL8AN
JA1ELY
JA3FYC
K0MFO
ON5NY
OZ1L0
PY2TM
SM3EVR
SM8AJU
W8DWQ

310
JA8JL
K4XO
N0RR
OZ7BW
W9ZM
W0WP
WA6TLA

309
AA6AA
JA1MCU
JA6EAT
JF1PJK
K2UO
K9QVB
W9BW

308
F8AT
JA1BWA
K5KLA
K8CW
K9AJ
TG9NX
W2FP
W4VQ
W9SFR
W9ZR

307
DL1PM
JA1GTF
JA8BSM
K1MM
K8WW

306
JA3GM
N2KW
K6JG
K8NW
N4MM
N4NX
N5JR
W8UVZ
WB6RSE

305
AB9E
JA3BQE
K4CEB
ON7EJ
OZ1VY
VE5CKF
W2MIG
W0SR

304
AA7A
DK8NG
I3OBO
W2NC
W2SM
W5TC
W6RT
W0BW

303
AA1K
AA4KT
JE1JKL
JH1IFS
JI1QPU
JH3CXL
K6CBL

LA8CJ
OZ1CTK
OZ7JZ
W1FZ
WB6ZUC
WD9AHJ

302
JA1BK
JA1IFP
K9AB
N4VZ
W4WJ
W9XX
WA1AER

301
JH7BRG
K4HTY
N4JF
W1GL
W3EVW
N4KG
W8ZCQ

300
JR1EBE
K5AQ
K9IW
N4NO
N4OI
N6JV
OK1MP
OZ3Y
PY5WD
PY7ZZ
W3AP
W9TY

299
I5XIM
K3KA
K4KUZ
K4SE
K8PYD
ON7WW
W1JR
W5ZPA
W7LR

298
EA4MY
JA1FNA
JA1JWP
W6BJH
W9KQD
YU2TW

297
JA1BN
JA8ZO
K1JA
K5KR
SM6CST
VE3BX
W7IVU

296
JA1MDK
K1RH
K3UA
K4JC
KB9KB
LA3XI
OH2BN
OK1MG
W6GO
W6TFO

295
AA4AR
AA4CM
DJ1XP
JA3MNP
K2IJ
K7ZR
K8LJG
W1WLW
W2YY
W3EKN
W4DJJ
W5UR
W6QWI
WA9EKA

294
DL1HH
HB9ALO
K8DT
N4BPP
N5FW
SM6DQC
W9RY
W0IZ
WB4OSN

293
DL9YX
JH1EDB
JA2MGE
K9MFI
N7MW
N8MC
OZ1FRR
W1YY
W6JI
W9GW
WB8JEY

292
HB9HT
JH7LMZ
SM5AKT
YS9RVE

291
JA3CSZ
K2AGJ
K4XG
NS8C
W2LZX
WA4JTI
WD9IIC

290
OJ5JH
DK5AD
JA1MRM
JA3AQ
K1JO
K4FJ
NN4Q

W8OQK

289
AB4H
JA1UQP
JA3PXH
K6LM
NS7J
SM0DJZ
W0YK

288
AJ8J
K9BG
KC0O
SM7FDO
SP5EWY

287
JA3DY
JA6VA
JR7TEQ
K0CVD
N2MF
OZ7OP

286
AA4M
DF3SV
DJ4XA
JH1VRQ
JH2CJW
JA8DNV
K1VHS
PA0LVB
VE7AAQ
WA8SXQ

285
JA1HGY
JA4LXY
JE3LWB
K4CXY
K4NV
K9ZO
N6MU
W1AB
W3TVB
W4BFR

284
DJ5VO
DL7WL
JF1KKV
JH1EIG
K5YY
N4IR
ON5KD
OZ7GI

283
JA1GV
JA1OXY
K9GX
KD6MD
N4DW

282
DF3FI
K8EJ
KA3R
KA6W
KT5A
W9LNQ

281
JA5PUL
JH7BDS
K9IL
N7UT
SL0AS
SM6DYK
WA2HZR

280
DL3BK
JA3BG
K1EFI
K7ZA
K8JCF
K0KES
PA0LOU
SM7BYP
W1KSZ
W2HAZ
W2SR
W2TQC
W4JD

279
G3KDB
K6RK
K9TI

278
DK6NP
DJ7CX
DL1KS
DL7MAE
F2IU
ON4SH
SM6CTQ
W8LU
4Z4DX

277
AG4S
K6EE
KD9E
N4JJ
SM6CMU
SM8CCE
W3EYF
W3ODJ
W9WAQ
4X4FU

276
AI8S
JG1NBD
K2UFM
KE9U
N3RL

275
AI0O
DL7SY
I6WY
JA1GO
JA2TK
K5TSQ
K9BWQ

KO9W
N9KW
PY2FR
W3DA
W0PT

274
JA1VN
KJ0U
KV4F
W5OG
W5SJ

273
JH1OJU
JR1TNE
K1SA
OK1IQ

272
AD1C
G3WPF
HB9WZ
JA3CMD
W4JTL
W6JD
W7TE

271
DL3RK
JA1DUH
JA7HMZ
K9JU
W1RR
W4LVM

270
DL6QW
I2XIP
JA1SVP
K2OWE
K8NA
KD8V
KR4F
W1LQQ
W4CZU
W4MPY
W6TMD
W9DH

269
DL1VJ
JA1NQI
K4II
K0GUG
N5CID
VE3II
W3GG
W5HEZ

268
JA1PNA
K1ST
K4CEF
N4FKZ
VE6WQ
WB3JRU
YU1ZO

267
DF8ZH
KA0E
KE4E
SM5BRW
VE3CVZ
W2QL
W6YQ
W8GKM

266
DL5FF
JA7FS
K1IK
K2PK
K5KV
KL7H
KZ8Y

265
DL7CW
KR5D
N5TC
OK1VK
SM6CVX
SM0CCM
W0NB

264
AA4KA
DL4FF
K4UEE
K9BIL
KE9A
KF9D
KI3L
N3ED
W5AL

263
N6AN
N6VR
SM0BZH
W8CY

262
AE5H
KB8KW
KE2S
9Y4VU

261
DL1BS
DL7NB
G3XTT
K7ZBV
W9NUF
WA7HMZ

260
DK5PR
I4AND
JA3JOR
K2BK
K2SX
KM9L
N7CM
ON5WQ
VE7AHA
W1BFT
W6ZID
W7EKM
W9KB

WB4MAI

259
W8HO
W9RW

258
DL1KB
K2PZ
K6WD
K9VAL
W1GNR
W3BBL
W0VX

257
GM3YOR
HK3YH
JF1SEK
JH4UVU
K3LWM
K8CX
NO6H
W2RS
W8SN
WD5DBV

256
DL1ES
JR3GWZ
K5FNQ
W1TSP
W8DCH

255
KA1CB
KB4JS
KK6X
N7US
ON4SW
SM7HCW
W9AG

254
DJ5DA
JH1OXV
KA8DJZ
N5DEE
WA4QBX
WB8RJX

253
AI3Q
JA8CAQ
K4JLD
K5BDX
N0ZA
SM6CVX
W5SVZ
W6DN
W7QMU

252
DF3FJ
JA1CZI
K2MFY
K7DOR
K8SW
KC8PG
KN8Z
N8DE
WB8TRW
WB8ZRL

251
AC8W
DF2PW
DJ2AA
DJ0GO
I1YRL
JR2BZA
JA5AUC
K2ENT
K7UR
NF4A
W3ARK
W0CAW

250
AB0M
K8QXB
KJ8G
N2AC
N4RI
N7RO
NR7F
OK3EA
OZ1FAO
VE3ST
W2FXA
W4BAA
W7TS
W6NPF
W8SEY
W9PR
YO3AC

249
IT9VDO
JA1BGS
JA8AAJ

247
WP4D

246
OK2RU
OK3MB

245
K2TWI
OZ1EUO

244
DL2HD
JA1RWI
JA2JYP
K5OTI
OZ8AE
N2AIF

243
JA2VK
W1TN

242
JA2BP
JA2JRG
JA8CAK
VE7AVC

241
G4GIR
K1VKO
K7NO

240
I3BLF
K4AEB
KF9E
W5ASP

239
AK5B
KD6VM
KG9J
OH2VD
VO1AW
SL0ZG

238
JA5IU

237
JG1TSF
K2LS
KB7HH
N5FG
OY7ML
OZ2E
VK9NS

236
HB9CND
KC9T
ON6YH
W3UM

235
DF3EK
I4EAT
K1ITS

234
DL2AW
F6BEE
W0GAX
YU1NZW

233
LA5LT
PY4OD

232
DJ2GW
F6GXB
HK3DDD
I1BWI
JA1OND
JA4GXS
K8MW
KC3X
KN4B
W2DW
W2YC
W8CD
W9TX
WF4G

231
G2GM
GM3LYY
JA1SFL
K2NJ

230
HB9CDZ
HB9QM
JA8KSD
K7SP
SM3LGO
W7XN
WB4CSK
4Z4OL

229
DK0ZR
JA2DC
KN2N
SM5CAK
SV1IW

228
DL1EV
DL9TJ
HB9BFQ
I3ZRL
K5XE
KB8BS
KI6O
N8OZ
NG6W
SM6EOC

227
AA4V
DF2PI
DK6NC
G4BWP
JH2TPI
K2TK
K9LV
KK2I
N3KR
OH2FS
VE7DX

226
AI3E
JA1BFF
JH1BZJ
JP1BJR
K1IU
K4XI
K9LJN
KF2O
KF8N
KR9O
LA4YW
OH3RF
SV1JG
W2ZZ
W7MCG
W0MCY
WB6ZKR
YU2OB
YU3VQ
ZS6BSZ

225
AB6R
HA7RB
K1XA
K2JF

K3ZUF
K6TS
K8UD
K8PXG
KL7AF
KS0M
NA2M
NN6W
OH5OZ
PY2FK
PY2FNB
VE3CWE
W1ENE
W1WAI
W2HN
W8BTTL
WT4T

224
JA0DBQ
K4BWU

223
W6AUG

222
K9PQG
W5OB

221
DK1RV
DK9MB
EA3CTI
NY4H
OK3WW

220
DJ3XD
DJ6TK
W6AN

219
JR1IOS
W1AX

218
N4CC
W9DE
YU2NW

217
JA4FHE
K6VL

216
WD8IXE

215
I2IWM
JA7IL
OZ1ABA
VE3HO
WB3GPR

214
JJ1DWT
JE1HKW
W0ANZ

213
AE3Y
K5WG
VK9NL
W3PLI
W8YGR
WA2CDD

212
KO5D
PT7WA
SM5AQB

211
DK2UA
IT9TQH
K1AP
K6EID
KC5M
W6ENZ

210
DF6ZK
HB9CMZ
I0ZUT
KC8O
KR0G
ON7CS
UA6JD

209
DF9HE
I8RFD
K3WGR
N3FT
N9DJ

208
AF9R
KA2HMJ

207
DJ1ND
JA4TF
KG9N
WA4LOF
WL7E

206
DF9FM
DF3EP
F6HBI
KR8Y
NE6I

205
DL3HAH
IK5DEY
K8DD
KZ4V
N2US
PT2ACZ

204
AA4NA
HB9CGO
I1JQJ
JJ3AFV
JH1NPX
JA9JFO
K5WK
K6ZTT
K0QC

KA0M
KU7Y
LA7SI
ON7FK
WA4RRB
WM4Z

203
CT1YH
F6CZL
IT9GLJ
IT9ZGY
JA1WTI
K8ZUR
KB9RM
W6OB

202
AK2H
JA8DJY
K8MNG
N6VO
PY2RO
SM5DAC
W4OYI
W8FN
W9CA

201
AK2O
HB9AJY
HB9CSA
I5UNA
JA1AAT
K8NN
KC7V
KF2F
KJ0H
KY7M
LA9XG
W8NE
WA8YTM
4X6AG

200
I2QMU
I8JOV
JA4ESR
K2QIL
K4MF
K7WF
K0SI
KA6IYE
OE2VEL
N6ADI
VO1CA
W1GKJ
W4WG
W8TVP
W7YS
WA6PES
XE1VV

199
G3FXA
JA3KWJ
JA7PL
K4MG
KJ2O
SM4EMO
W4NUS

198
AA2A
K8FU
SM6DEC
W5AS

197
AI9J

195
IK1CJT
P29JS
PY2RRG
VE1AXT

194
DF6LK
JA1PS
JA2FXV
JA9CWJ
KM9G
WB2IVO

193
Z24JS

191
JA1KNS
JH1PEZ
JH9AUB
K6HLR
KA4EQW
N3AKD
W3KV
WB4VKW
4X4KX

190
JH6SOR
K7CU
KB5EK
NA5C
SM6IMO
W1ZT

189
AK9Y
K7GM
W7YCK

188
IS0NZA
W1KEE

187
SM4IKL
VE3MWX
W7KZK

186
KF8K
LA8CE
N4GG
SM5CSS
W2AO
WB9NOV
WD8PKF

185
N7TT

W5LW

184
K5MC
W1ZW

183
DJ2XP
JA1JKG
JA1LKJ
JA3VZD
WB0OQV

182
AK1L
K6TMB
N9ER
VE6CHW
WB2ABD

181
DK6UR
JA8KSF
LA7JO
W9FU
YU1AST

180
AK1A
HB9BMW
I5JRR
I8YRK
JL1IEO
K2DI
K0VZR
N0DH
W1LY
W9LT
WB4STU

179
DL7AFV
I4YNO
IK6CGO
JJ1UJK
K8HRF
K0LUZ
W8LNO
W0NQ
WB9EEE
ZS2U

178
AB1U
K1VJH
K9KA
KA3CRU
KA6DXY
N4AJZ
W1OGZ

177
K0QQ
KW7N
KY2W
W6SWM
W6PKB
WA7NXL
WA0GUD
XE2AQ

176
DL1HBT
EA4AXW
JM1MGP
JA8RII
K1TG
K2LFL
K4PR
KB2FS
KB6WI
KE1K
OZ2JI
W8SL
VE4AEX
ZL1AMO

175
AA6EE
JA8GRR
K1HDO
KR0S
LA7SP
NN4B
NF5Z
WA2CNF
WC4B

174
AK5Q
G3GHY
ZS6BCR

173
JA1SJV
KA9LTR

172
EA1JO
I1QGZ
KD7J

171
N3AQQ
N4XM
LA5DW
OK2PO
N4LS

170
JH1OVY

169
AF2C
JA7YAF
K1NTR
N9AW
SM6AHS

168
AG9S
K5WGO
KJ4KB
OH2BVI
KE1OX

167
W6CTL
WC5N

166
EI9CZ

KD7P

165
DJ2YA
DJ3BE
JA7AZJ
KB2CB
W4MGX
WB4FOT

164
PY4ZU

163
JA3ANW
SM0KRN
TI4BGA

162
KB1HJ
SM4FZC
SM0LJF
W6SIY

161
AA4H
JA1JYZ
KZ3B
PA3DKX
WB9UKK

160
K6MR
SM7NJJ
W1RED
W2FV
W5VGX

159
KA6A
KO1R
NF5Y

158
DL2HBX
N1QY
SM6CNX
SM8BSB
W1AIO
WA0UHQ

157
DL8MBS
F5DE
F6HWM
PA3DBG

156
I2MOV
JA1SJC
K2JLA
KD9M
N6DAZ
NG8S
SM4JCE
W9PEL
WB5ZDP
XE1X
YV5GRV

155
CE6EAT
JA1EMQ
JF1ERP
JA3BAG
JH7ONG
KA5FXX
KI2P
NZ4Y
PY2KP
WD5T

154
AK8T
JA0KHD
K9FO
K0YF
KA1X
LA3IBA
LA3UL
N1AFC
ON5CW
PA3BFH
W8KJP

153
JA1JAT
JA3RRN
K5CON
KE0Y
N4AVB
NO6E
PA3CKO
W9KE

152
AF3E
G4IJW
JH1IZR
JK1SAI
JA5JGV
KE3A
KY0A
N1CYA
NI0G
N0OA
W0LYI

151
DK1GF
DL2GBB
I1HLJ
JA3ARM
JI1MNT
KC4HN
LA9PCA
NA2G
SM5CCT
W5HFN
W6NLG
W0HBH

150
CT1AJW
DL8ZAJ
F6HKD
JG1RYQ
K3NA
K6UXO
KA0O
KD8WX
KG4O

LU4FDM
NA1G
NF9V
PA0TO
W4NZR
W9NO
WP4F
XE1XF

149
AK1E
DL3MQ
KI6J
KK5K
W2KVA

148
AK2L
G3LPS
OE1TKW

147
W3EE
WB9PAV

146
KK0M

145
DF1OF
DL5YBU
JA1CHN
KB3J
N4ERM

144
JN1GQK
K1YR
LZ2DF
SL0ZZI
WE6V

143
F6HLB
KO2Q
N9NB
W8ZN

142
AG1C
KO9Q
KR1B

141
HB0NL

139
K8CH
SM0HEP
WZ4Z

138
JH1NRV
JA2QCX
JA7AZY
OH3BU
W8URM
YU2QW
ZS2WV

137
F9BB
HB9NL
JA0DAI
N6OJ
OE2SNL
VB2BNJ

136
DL1MAJ
JA4VAD
KQ3E

135
W4FRU
WA3VPL

134
DL8RE
W3KYN

133
ND0F
NO4N
NS6B
PA3CBU
SM6NJK
W1AEL

132
DL9DY
EA8IR
G4ISK
NE4R

131
EA8BEH
KV8Q
WA1WTP
WD5ELJ

130
DL9EY
F6HMJ
I5OQV
WA1ZIC
WA8DXU
WD9JKZ
8Y5NH

129
JA1DSI
KA2DYB
K6PZ
K7BLU
N3BNA
WA7HCE

128
F6IJV
HB9CEY
JO1BMV
JA2KPV
JA7DQS
KN5A
N7EPD
SM3CBR
SM6LWH
SM6NFK
W3ZQN
W4PBC
W8CHJ

127
AA4DO
DL9HC
K1YHM
K0OST
KA2BZS
LA1VL
N4IHT
N8CQA
OK1FIW
PA3BWQ
W6MND
WK6E

126
JJ1EEA
LA4IAA
N4GVT
OE2KGM
VE4ADG
W4ABI

125
AG2C
G3YBH
I1WNB
JH4IFF
K2HPV
K8ATV
K8KBB
K9HQW
KA4QZJ
KD8WW
N9EJL
VE1VX
W7QN
W9NNK
W0ULU
WB4WRM
ZP5XDW

124
HA1YG
JR7BTI
KA7AUH
NU4B

123
G3SGQ
JA4CZM
N4KMY
SM6MNH

122
AI8M
K2OVS
OK1KAQ

121
K4YT
SM4ODS

120
FE6ACV
K2SD
VE1BLG
W2XS
W7KT

119
CT4CP
GM4LHA
JA1SDV
W8DN

118
DL2SAD
DJ5NT
JA9FPI
KA1KPH

117
DL3TX
JG2CLS
K7DV
N7NR
OH2LQ
PA3BUD
PY3CJI

116
JA2HMF
LA2EG
W7OAX

115
DL4SBD
K9LA
K50X
OK3TKA
OZ5PA

114
FO8FW
IK2EGL
I7TYK
KS3F
SM0GDB

113
DK7HP
FD6IDZ
KA2AOT
KC4DY
KD7P/KH2
KE6OT
KM9W
N6EK
LA9CM

112
DJ3SU
DL3KAG
I1SOP
JA1SYY
JA0CWZ
K3SEW
YV7PF

111
AA4LI
G3DJJ
IK8BOB
JN1GIV
OH2BFV
NE0V
VE3KYL

110
CX2AQ
DF1UQ
F6HSI

JA2KVB
JE2KSM
JH8HSW
JA7EDZ
KA5DYB
KD8WP
KG8S
KN3P
I4YCE
JE7ODM
JA9FT
LZ2AB
N9BMS
NF9V
OZ4RS
SP5AA
VE3JFH
VP2MM
W3TI
W7LHO

109
G4LKM
I1OOK
JE3TAE
KB4CTX
KQ2I
KS5M
LZ1XX
N4DDK
NB9C
NN5G
WA0JRB
WD5DEQ

108
DF4XG
DJ9IW
G3CRF
G3SWO
IK2CIH
IK0FWI
JA1HKP
JR3WXA
JA5LFB
KA0EBG
N9CVO
PA3AXU
PY1QN
PY2GCW
W1YB
W8IRT
W8RLG

107
AJ3N
AJ6F
AL7BL
DL9IE
FE2VV
I2YWR
JA1UPO
JA2CXK
JH8NQV
KA4BIJ
KA9OKH
KC3Q
N4HHZ
N0FIO
NF9S
OH2EE
PY4WS
SM7NDX
W8UFO
YV5IWT

106
DL5EBE
DL7KBU
JA7BE
JR7CCO
K4GSK
K7OZ
KA8HOK
KT1O
KZ3H
LA1SV
N7DHA
NN2G
OK1AXB
WA3IMY
YC2BDJ

105
DK2DE
DL1NR
DL5OAI
DL7AET
EA8ZS
G3NOB
HA8DX
HA8ZC
JE2MDE
JR2KHX
JG3NKP
K8KZW
KA7NNJ
NC1B
NG2U
NR5Q
OK1DIL
OK2BVX
OK2BYL
OK3CEI
OK1DJM
OK3YDM
OZ1JLX
SM6OLL
W6ALQ
W9FF
WA2ABN
WJ4S
YO4CBT

104
OK7PS
DL4NN
DL6NU
G3VQO
G4GBG
IK0UZF
K7RIE
KB2MX
KB2OR
N6LHN
NE5I
NN4K
PY1DEA
SM4OTI
SM8MLL
W3GXK
WA2UKA

WC5M
WF4I
XE1MDX
YU2LCF
6W1CK

103
F5ZI
G3RDU
HL4XM
I2HJO
KA4CHG
KA5GHR
KF4AV
N4CRI
N4IBF
N7DVN
N9BN
OH2BMC
OK1DAU
W8UE
W0JM
WA2VJD
WB6AFJ
WD5DRR
WS4G
WU4E
YU7FN

102
AJ3K
DF1PN
DK7JI
DL1KH
G2FFO
HA5JP
JR2MKQ
K9ACD
K9BQL
KC8PX
KD8KY
KV1A
N5GNE
N6BLN
N6IBP
N9DPL
OH2BQG
OK1QH
W2DJH
W0QQN
WA5VGI
WB5TKO

101
A22ME
AA3O
DF5KU
DK3GO
DL9XM
EI3DP
F6ENU
F6IJA
GW3SB
HB9BOK
I2EAY
I5EFO
JA7WJU
K2HVM
K2KPC
K7KH
KA2GGB
KA1T
KC8UR
KO7S
KW6D
LA2GV
N1CPC
N2EAW
N4IHT
NI2N
NO7B
OK2PFN
OK3TAY
PA3CXC
W4NM
W6MFC
W7MME
W8PCS
W8UAB
W9XD
WB4YZC
WQ4I

100
DL6MAW
G4AFU
G4LQN
G4SSH
IT9GXE
K4GFH
K4ZIN
K6MBV
K7BUY
KA3LUE
KA0OMX
KJ2Y
KL7UR
KN7L
KP4GJ
KS2C
KU8C
KY9P
LA6LX
N4FVE
N9OXZ
NA7R
NC8U
OK3TTL
PA3CNI
VE7DRI
W1HJF
W3CEI
W4OHZ
W4WNB
WA9CYG
W0LYM
WA2AOG
WA2ASQ
WA2AXK
WA9VYB
WB6IYS
WI4E
WT4G
YU2RZF
YU3DV

RTTY

228
W3KV

217
I5FLN

204
JA1DSI
192
JA8ADQ
188
W3DJZ
182
W5HEZ
176
I5KGK
167
W1GKJ

165
KA6CQJ
158
F6HUJ
OK1MP
154
WB2CJL
153
W6MI
151
W1DA
W2FXA
150

W6HAH
W6LHS
W6LYM
WA2JBV
146
W2JGR
135
JA3AUQ
W5DOZ
131
F5JA
129
AE5H

128
WD5ELJ
127
GE2SNL
WA4WIP
WA6PJR
125
K4AGC
W5ZPA
123
I2JIR
106
CE3BBW
EA2RE

W0IZ
105
CE3GN
DL7WL
HJQJ
JA3GM
TG9VT
104
PT2BW
NE4R
W7KS
YO4PX
103
JA1EOD
LA7AJ

OH2TI
102
CE3CEW
K5KR
NJ0M
PA0LUS
VK5RY
W8AH
W8WYK
YU2OH
101
N5DSK
W4UG
W6GC
W8WP
WB4UBD

100
AK2N
KT1N
W8RWC
160
METERS
201
W8LRL
185
W4DR
182
N4WW
177

AA1K
182
W8ZV
158
N4JJ
152
DL9KR
K1MEM
150
K1MM
W2OKM
W2SM
W2TQC

145
W1OO
140
W2JB
138
4X4NJ
130
DJ8FW
JA1GTF
W2FZY
W8AH
129
W1JR

128
K2UU
127
G3XTT
OZ1LO
PA3BFM
W2BHM
W4MGN
W8CD
126
HB9AMO
K9UWA
OK1ATP
125
AA4V

K2RIH
K3UA
W1JZ
W2BXA
124
KG4W
111
N4WJ
110
VE1ZZ
109
TG9NX
UB5ZAL
107

G4AKY
106
F6BKI
I2BBJ
K1IU
N4KG
WA8TXT
YU3EF
105
G3YUV
KA1PE
OK3CQD
104
F6VJ
I2ZGC

K1IK
LZ2DF
UA2FF
UA3PFN
103
G4OBK
HB9CIP
JA2GQO
K2TQC
N4JF
OH1XX
OZ7JZ
W3CV
4Z4DX
102
AA4MM

CT4BD
DL7AA
F6BWO
JA3ONB
OE5KE
OZ7YY
UT5AB
K1LPS
K4AQQ
K5NA
N1ACH
OK1DTN
T77V
VE2FYR
W2LW
W2XN
W4FX
WD9AHJ

ZL3GQ
101
G3ZFC
K1ZZ
K2EK
K4PI
K5GO
K9GX
KM1H
LA2GV
N4NX
N4RJ
N8XA
OK2BGB
OK3EY
UG6GAW
W1AX

W3GG
W3UM
W5TO
W9ILC
WBJIN
WBUVZ
W9CM
YU2TW
100
DL1RK
GM3ZSP
JA6DQH
K1NA
K2VV
K3FN
K4CNW
K7VIC

K8CCV
K9RJ
VK6HD
W1WAI
W2FCR
W2LPE
W2LZX
W2QHH
W2VO
W3GH
W5AQ
W9CG
W9GYH
WB2CZB

Coming Conventions

1987

February 7-8
Florida State, Miami

March 13-15
Southeastern Division, Orlando, Florida

March 20-21
Michigan State, Muskegon

March 28-29
Nebraska State, Kearney

ARRL NATIONAL CONVENTIONS

July 10-12, 1987—Atlanta, Georgia
July 21-24, 1988—Portland, Oregon
1989—Las Vegas, Nevada

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.]

Indiana (South Bend)—Jan 4: The Repeater Valley Hamfest is sponsoring their Swap & Shop at the Century Center downtown, on US 33, one-way north between St Joseph Bank Building and the river. Four-lane highways to door from all directions. Round tables $5/5 ft; rectangular tables $10/8 × 2½ ft; wall locations $2/ft. Talk-in on 52 and area repeaters. For more info, contact Wayne Werts, K9IXU, 1889 Riverside Dr, South Bend, IN 46616, tel 219-233-5307.

†ARRL Hamfest

Note: Sponsors of large gatherings should check with League HQ for an advisory on possible date conflicts before contracting for meeting space. Dates may be recorded at ARRL HQ for up to two years in advance.

Strays

WHO IS THE "PROFESSIONAL" AMATEUR?

Have you ever wondered why people like Doug DeMaw spend so much time building ham gear and reporting on the results? One reason is that it *is* the basis of Amateur Radio over the past several decades. Most hams approach their hobby as they do their profession. Professionals always return something to the profession. To feel like a well-rounded ham, return something to our hobby. Construction projects are ideal avenues for this. You might save some other tinkerer all the heartbreak and frustration you experienced on a project by reporting the results of your efforts. Don't feel that nobody's interested! Even if it's only a one-evening fun project, be a pro. Report it! Send your information to Paul K. Pagel, N1FB, Senior Assistant Technical Editor, *QST*, ARRL, 225 Main St, Newington, CT 06111.

WOUFF HONG INITIATION

☐ What is the Royal Order of the Wouff Hong? When does it meet? How can I join?

The ROWH is a secret society of radio amateurs who are members of the ARRL. The Order of the Wouff Hong can be conferred only at a National, Division, State or Section ARRL Convention. Each inductee receives a certificate of membership to be displayed prominently in his or her shack.

The ceremony is not conducted at every League convention, so you'll have to watch the convention writeups in *QST* or publicity mailings to determine whether it is one of the scheduled events at a convention in your area. Then, with proof of League membership in hand, register to be one of the inductees into the great, secret fraternity of Amateur Radio, the Royal Order of the Wouff Hong.

ATTENTION HAMFEST AND CONVENTION SPONSORS

☐ ARRL HQ maintains a register of scheduled events that may assist you in picking a suitable date for your event. You are encouraged to register your event with HQ as far in advance as your planning permits. Note that the Hamfest and Convention approval procedures for ARRL sanction are separate and distinct from the date register: Registering dates with ARRL HQ does not constitute League sanction, nor does it guarantee there will not be a conflict with another established event in the same area.

We at ARRL HQ are not able to approve dates for sanctioned Hamfests and Conventions. This must be done by your Division Director for Sanctioned Hamfests and, additionally, by the Executive Committee for Conventions. Application forms can be obtained by writing to or calling the ARRL Convention Program Manager, tel 203-666-1541.

QST congratulates ...

☐ Roger Hedgpeth, N7EUQ, on being appointed as Manager for Sales and Services at Jackson County Airport in Medford, Oregon, by Pacific Southwest Airlines.

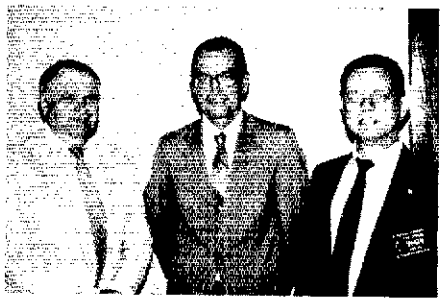
☐ Colonel (Dr) William Hess, W6CK, on being chosen Alumnus of the Year for the North Dakota State School of Science.

☐ West Gulf Division Director Ray Wangler, W5EDZ, on being awarded the Charles V. Culbertson Outstanding Service Award from the American Society of Safety Engineers.

I would like to get in touch with ...

☐ anyone with a manual/schematic for a Hy-Gain RB-550A rotator control unit. Louis Kocurek, Jr, W5VIV, 108 Thelma Dr, San Antonio, TX 78212.

☐ anyone with a schematic for an EMC VOM, Model 102. Harold Becker, KA1KRD, PO Box 515, Gales Ferry, CT 06335.



Not only are the calls similar (and in alphabetical order here), but the three gents shown here represent the three types of management in the League— Officer, Director and Staff member. From left, President Larry Price, W4RA, Southeastern Division Director Frank Butler, W4RH, and Editor Paul Rinaldo, W4RI.

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.

Get Out and Have Some Fun

Hamstrung by a poor VHF location or antenna restrictions? Why not take a leaf from the Europeans' book? Saddled with crowded living conditions for hundreds of years, many Old World hams, be they VHF aficionados, microwave enthusiasts or inhabitants of the lower bands, have learned to contend with their cramped environment by getting out into the countryside to do their hamming. Perhaps because of our less congested surroundings, we have not been as prone to leave our comfortable shacks. True, Field Day represents a major exception. Also, the major VHF contests induce some of us into making treks to those super locations. However, these are usually group efforts. Less frequently do one or two individuals take to the road.

There have been some rather notable exceptions in recent years, and the trend does seem to be on the rise. As far back as the '30s, the favorite pastime of this column's originator, Ed Tilton W1HDQ, was to backpack portable UHF equipment to various New England hilltops. In those days, they called UHF anything over 30 MHz. Later, in the '70s, Wayne Overbeck (ex-K6YNB), N6NB, became famous for his "cabover kilowatt EME DXpedition," including his most ambitious one to Alaska, which enabled KØMQS to complete the first 2-meter WAS. Since that time, the exploits of many VHFers who have taken to the road have been chronicled in these pages. There were the trips taken by WØSD and WBØTEM to various western state lines to bring a 1¼-meter WAS within closer reach for many operators of that band. Later, this time in the dead of winter, it was WØSD again, teamed up with WBØPJB (now NSØN), providing 1¼-meter moonbounce contacts for still more people chasing WAS on that underpopulated band. On 70 cm, many owe several of their states to K2UYH, who hauled a complete moonbounce station to several locations. Al was recently in Delaware at the QTH of KB3QM. Last spring, WA4MVI continued the tradition, journeying to a number of state lines in the West to help many in their quest for 70-cm WAS. These pages have chronicled the numerous foreign trips by W6JKV, who provided rare countries for many 6-meter logs and even a few 2-meter contacts. The several 2-meter EME operations to the Bahamas by WA1JXN and visits to such places as CEØ and KH6 by K6MYC are other examples of ambitious DXpeditioning. This list is by no means complete. To compile one would require more space than that allocated to The World Above 50 MHz each month. It does illustrate, however, how valuable to others some of these DXpeditions can be.

Less heralded are the many shorter trips staged by individuals or small groups to activate an unpopulated grid or a neighboring state with little or no activity on the band in question. This kind of mini-DXpedition is especially valuable on the microwave bands, but are worthwhile and fun on the lower VHF frequencies as well. A fine example of microwave mini-DXpeditioning are the many trips around Texas, Arkansas and Louisiana by WA5DBY, providing new states and many grid squares to a number of 13-cm stations. And there was the climb to the top of Pike's Peak last July by KXØO and WØMXY to work WB5LUA and others on 23 cm.

More and more people have been making short journeys to give the gang back home a shot at a new grid square. The *Midwest VHF Report*, put out by WBØDGF, often publishes examples of these. It also regularly lists active grid squares as well as those that could stand a visit, especially in the central part of the country.

This column often carries accounts of the West Coast to Hawaii tropo duct that sometimes lasts for days at a time. Except for last August's opening, contacts with Hawaii have required that someone, either KH6HME or KH6IAA, make the torturous journey up the side of Mauna Loa to a point where the duct can be accessed.

Whether your motives are to help others work something they need, free yourself from a poor location and/or antenna restrictions, or just get out and have some fun, taking to the countryside may be the answer. An example of what can be accomplished by this type of operation is furnished by W3EP, who, limited by apartment living while attending school in Bloomington, Indiana, regularly journeyed to a nearby hilltop and set up his 2-meter station. From that location, Emil ran up a total of 41 states and over 100 grid squares.

Although this may not be the best time of year in many parts of the country to even think about leaving the comfort of a warm shack and venturing forth, it isn't too soon to start planning for the more pleasant temperatures that are sure to follow. Next month, I will mention some of the preparations that you may wish to make and a few ideas to help make your coming year's DXpeditioning easier and more enjoyable.

ON THE BANDS

6 Meters—Will wonders never cease? Either the summer E_s season continued into October, or the winter season started early. Whichever it is, as this is being written about the 10th of October, we are still experiencing E_s openings. The ARRL September VHF QSO Party has never been noted for Sporadic E. Tropo is usually king during this event. But this year, tropospheric conditions, with a few exceptions, were only so-so throughout much of the country, but the E clouds helped fill the void, at least in a few areas. For stations across the southern tier of states, 6-meter totals were helped considerable by late season E_s. Even 2 meters was affected for a short period between Texas and Florida. See the 2-meter section for specifics. But that was not the swan song for the E Clouds. September 24 brought a very strong opening between the Mid Atlantic states and the Southeast. Even W3XO managed to catch this one, working WA3BSZ/4 Charleston, SC and NA4I in Georgia on 6 meters and hearing two Florida stations on 2 meters. E_s in mid-September is one thing, but in the last week of the month and into October is something else entirely. The next surprise came as the first full week of October got underway. W5UWB Kingsville, TX says that 6 meters was open October 6 to the south and that, in a QSO with YS1ECB, Edgardo told him of a contact he had made earlier in the day with Argentine station LU7DZ. It's encouraging to learn of continuing activity by these Central and South Americans that we haven't heard much from of late. John further reports that the band was open to the Mid Atlantic states from his south Texas location the evenings of October 8 and 9. WA5IYX San Antonio adds that, from TV and FM broadcast listening, he determined that the opening began early in the day to Cuba and persisted late into the evening.

2 Meters—As promised last month, I am including some of the reports received on the Perseids meteor shower in mid-August. Opinions were mixed on how good this shower was. Those with schedules seemed to do quite well, but adherents to the 144.2 random club were not as well rewarded as in some previous years. W9IP/2 has a theory to explain this phenomenon. Mike notes that the shower peaked on the 12th and 13th, which were work days for most. He surmises that those with skeds played hooky from their jobs, while the rest went dutifully to the salt mine and thus weren't around when conditions were at their best. One who reports doing very well is KB3PD Newark, DE. Rick made 18 skeds via the phone and 3818 and was successful on 13 of them for 9 new states and 11 grid squares. His total is now 34 states and 88 grid squares. In other 2-meter activity, he reports his first taste of EME by joining the "Worked W5UN Club." Rick describes Dave's signal as "incredible." W5UN is on 144.008 MHz most weekends when the moon is on the horizon for the earth's major populated areas. For those who may need Delaware, KB3PD's phone number is 302-737-7966. The station consists of 300 W to stacked CushCraft 215WBs, and a GaAs preamp ahead of a FT-726R.

Making up for the lack of tropo, this has been a most unusual year for E skip. Who ever heard of a 2-meter E_s opening in September? As noted above, we had at least two of them, not to mention one in October. W9AGH/5 Houston, TX reports that between 2345 September 14 and 0030Z on the 15th, he worked seven stations in Florida plus WB8EQJ/C6A in the Bahamas. Larry says that signals were very strong and that 6 meters was open to the same general area at the time. Coming as it did, during the Sunday evening of the September VHF QSO Party, this opening added considerable excitement to that event.

1¼ Meters—It is always nice to report successes with this band, especially when it involves some kind of ionospheric propagation—in this case, meteor scatter. W9IP/2 in northern New York was summoned home from work by a telephone call from WS4F telling him that the meteors were very good. The result was a 1¼-meter QSO in

about 15 minutes. Mike thinks that the belief that the Perseids peaks later than expected is accounted for by the larger meteors being a day or so later than the peak in the number of meteors. It is the meteor count that is the measure the astronomers use for defining the peak of a shower. He notes that it is the larger meteors that do the most good for 2 meters and above, hence the apparent disparity. N3AHI/4 near Atlanta says that he tried 1¼ meters during a meteor shower for the first time and completed two of four skeds. The result was two new states to Jim's roster: KFØM Kansas and W3HQT/1 Maine.

50-MHz DX Standings

DXCC countries based on information received as of Sep 2, 1986. Space limitations dictate that continental US and lower-tier Canadian stations with fewer than 15 countries (except those who claim WAC) not be listed. Crossband totals are those not duplicated by 6-meter two-ways. Countries are those listed in the latest ARRL Countries List, but credit has not been granted for contacts with stations known not to have been authorized 6-meter operation at the time of the contact. Unless noted, totals are those worked by individual or club stations operating from a single location or multiple locations within a radius of 150 miles. The next update will be published in the Nov 1987 column. In order to be included in that update, reports must arrive at the address listed at the head of each World Above 50 MHz column by Sep 1, 1987. Reports need not be on the special forms, available by an SASE to the column address, but their use is encouraged. They must, however, state the country, one station worked in that country, an indication as to whether the contact was two-way on 6 meters or crossband, the date of the contact and whether the contact has been confirmed by receipt of a QSL.

1—6-meter two-way claimed. 3—Crossband claimed.
2—6-meter two-way confirmed. 4—Crossband confirmed.

	1/2	3/4
JA4MBM*	81/79	0/0
VE1YX*	79/77	18/15
W5VY*	75/72	10/9
KH6IAA	74/72	0/0
K8WKZ*	73/71	15/15
K5FF*	72/71	3/3
VE1BNN	70/68	6/6
W5FF*	70/68	2/2
W4CKD*	70/67	15/14
JA1RJU*	69/69	0/0
WB4OSN*	69/67	8/6
LU3X*	69/67	0/0
K1TOL*	69/66	0/0
W3XO*	69/59	12/5
W2IDZ*	68/67	11/10
W4OO*	68/67	4/-
W2CAP/1*	68/66	15/15
N3AHI/4*†	67/65	0/0
W8CMS	67/64	12/9
JA1VOK*	66/66	0/0
WD4IYS*	65/65	15/14
WB2MAI	65/65	9/7
WA7JTM*	65/61	1/1
WA5IYX*	65/55	10/8
W3JO	64/63	8/3
N4EJW†	64/60	0/0
W4WHK	64/58	13/8
K4KUZ*	63/63	0/0
WB2CZB*	63/62	12/11
W5HUQ/4*†	63/59	16/8
ZD8TC*	62/62	10/-
JA2DDN*	62/61	0/0
WA4OWC*	62/54	0/0
JA3EGE*	61/60	0/0
WA4UAS*	61/59	0/0
WA8LXJ*	60/55	18/18
JA5HTP*	59/58	0/0
W6XJ	59/-	3/-
WB7OHF*	58/58	1/0
WA1OUB	58/57	13/12
K5SW*	58/55	10/10
KA1PE*	58/54	0/0
WA2BPE*	57/57	14/6
K4CKS*	57/56	18/13
W6BJI*	57/56	2/2
LU9AEA	57/56	0/0
W3IWU*†	56/56	15/15
W5DZF/4*	56/54	2/2
K1ZFE*	55/55	5/5
LU3DCA	55/55	0/0
KA1BRD*	55/55	0/0
W1QXX	54/54	12/11
JE1TGN*	54/54	0/0
WA6BYA	54/54	0/0
NØLL*	54/53	8/8
W1JR*	54/53	7/7
N6AJ*	54/51	1/0
LU7DZ*	54/48	0/0
WA6JRA*	54/18	3/1
K5CM*	54/-	-/-
W7KMA*	53/52	2/1
K8EFS*	53/51	18/15
WA5HNK*	53/51	15/15
JA2ODM*	53/48	0/0
W5UWB*	53/42	0/0
WB8BKC*	52/52	16/15
K3QMX*	52/52	12/12
N5DDB*	52/52	1/1
JAØAGA*	52/52	0/0
WØSF*	51/51	0/0
N5KW*	51/48	-/-
K5ZMS*	50/50	2/0
WA7EPU*†	50/50	1/1
WB2PMP/4*	50/49	10/9
WBØPKN*	50/49	7/7
W6SMS*	50/48	1/-
PY2XB*	50/47	2/1
WB7TOV*	50/47	0/0
N6CT*	50/44	1/1
W2RTW*	49/46	9/9
WA3AHZ*	48/48	14/14
K2QWD*	48/46	13/13
K2YOF	48/46	12/12
KØGJX	48/46	3/2
K8UNV*	48/46	2/2
WB4RUA	48/46	0/0
W2MPK*	48/44	13/7
JA6YBR*	48/-	0/0
JF3KQA	47/47	0/0
WA1UQC*	47/45	16/3
WA3DMF	47/45	14/14
W3BWU	47/45	10/10
WAPEV*	47/44	3/3
W1EJ*	46/56	14/12
WB2GEX*	46/44	14/12
K2QIE*	46/43	7/2
LU8BF	46/42	0/0
K1ICM*	45/45	15/8
JA9DUR*	45/45	0/0
WD4FAB	45/44	7/5
WB8GEW*	45/44	5/5
W4NVW/3	45/44	2/0
N4TL	45/42	3/3
WB2WSV*	45/42	2/2
XE1GE	45/42	1/1
WA8ONQ*	45/41	7/7
K4QXX	44/43	1/1
K1MNS*	44/42	0/0
JA2GHT	44/42	0/0
AE3T*	43/43	14/14
N9CEX*	43/42	6/6
WB8KAY*	43/42	0/0
K8ZT	43/41	0/0
WB4NMA	43/-	0/0
K6QXY	42/42	0/0
VK8GB	42/42	0/0
WB8YFE*	42/41	5/5
KAØAYN*	42/41	0/0
KA1DHO	42/40	10/8
KG6DX	42/40	0/0
W3WFM	42/40	0/0
KG6JDX*	42/38	0/0
KH6FLD	42/35	0/0
CX8BE*	42/29	0/0
N5BBO*	41/41	5/5
ZL1MQ	41/41	0/0
K1FWF*	41/40	18/10
WA1AYS	41/40	15/14
KA1A	41/40	0/0
KØTLM*	41/39	5/5
W5KRH*	41/39	5/5
WB5CHW*	41/37	7/4
JG3AOD*	41/37	0/0
W5HN*	41/35	0/0
K7ICW	41/34	1/1
W3OTC	41/34	0/0
WAØCSL*	41/15	6/4
VP2VGR*	41/-	11/-
K4VPK*	40/39	7/7
N5WM*	40/39	6/5
K6KLY	40/39	0/0
WB6BMB*	40/38	0/0
W1AIM*	40/36	3/0
VP2MO	40/34	0/0
WB6KBZ*	40/29	1/0
K1FJM/4	39/39	7/6
K1GPJ*	39/37	0/0
K1SF	39/35	8/3
JA1NVG	38/38	0/0
WA7UJH*	38/37	0/0
KB4CRT	38/36	1/1
WA5VJB	38/35	1/1
WB5JAR*	38/34	7/6
N7AKB*	38/34	1/1
VE3ASO*	38/31	0/0
WA1CRE	37/36	5/4
JA7QVI	37/35	0/0
W1GXT	37/34	12/4
K3ICH/4	37/32	0/0
WA6HXM	37/29	0/0
K7GGJ	37/28	0/0
KØUS*	37/23	1/1
WBØZKG*	37/20	4/3
WD2AKA	36/34	9/6
CH2FG	36/34	2/2
WA6SBZ*	36/33	3/2
KØAYN*	36/33	0/0
W6ABN*	36/32	3/3
JH3WXB	36/32	0/0
K3HCE	36/31	6/4
VE3DSS*	35/34	14/11
WA9ETW*	35/34	2/2
WA5UFH*	35/33	0/0
KØUDZ*	35/32	3/1
KC2TX/5	35/32	1/1
N6AMG	35/26	0/0
W2VO*	35/26	0/0
K4GOK	34/34	13/12
N7DB	34/33	0/0
K1DAT	34/33	8/5
N4VC	34/33	1/0
WØJR*	34/33	0/0
W5NZS*	34/33	0/0
WA6CRA/4	34/31	8/8
KAØETE*	34/31	0/0
WA1ZUB	34/30	11/7
WD2AFH	34/28	4/0
K1SC/7	34/28	2/2
VP2MJ	34/26	1/1
K6JYO*	34/22	0/0
W2LT	34/20	9/0
W2CNS*	33/32	10/4
WA7GCS	33/32	0/0
K8TGC	33/31	4/4
W2RLV	33/31	3/2
KA4AOK	33/30	11/6
N6RZ	33/24	1/1
AE9M*	33/23	11/1
WB8PAT*	32/32	11/9
K6GSS	32/32	0/0
K2OVS	32/31	13/12
K5VVV*	32/31	3/0
AD1C	32/31	0/0
KS4J*	32/31	0/0
N6VI	32/31	0/0
N7ARC*	32/31	-/-
WB8IGY	32/30	9/7
WB4F	32/30	-/-
K6QAX	32/29	0/0
K1ZKR	32/29	0/0
WB2QLP/4	32/26	5/4
W5NKG	32/25	2/1
K4LFF*	32/22	0/0
K6PHE	31/31	0/0
WA2EQK	31/30	6/6
VE4AS*	31/30	2/0
WB6NMT	31/26	2/1
VE1RC	31/26	0/0
W2BN	31/24	4/1
LU8DLB	31/16	0/0
N4CD	30/27	12/8
K6JZK	30/27	0/0
JG3RGG*	30/22	0/0
KC3EP	30/22	0/0
VK2BA	29/29	0/0
VK2DDG	29/28	2/-
K4ROM	29/27	5/5
WAØNOK	29/27	2/1
K8RZB*	29/26	8/3
KA7IXS	29/26	0/0
VE3FDP	29/25	10/8
WB2TMD	29/25	6/4
WA8OGS*	29/25	0/0
8P6KX	29/24	8/2
WB7SLY	29/20	1/1
C5AEH*	29/-	13/-
VK4ZJB	28/28	-/-
KCØJ*	28/27	0/0
N5JM	28/25	0/0
N5DDS*	28/25	2/2
W9TC	28/25	-/-
N7AQM*	28/22	1/1
VE3EVW*	28/17	13/7
WA5QCP	27/27	0/0
W7FIV	27/26	2/1
KQ8J*	27/25	0/0
N6AMD	27/25	0/0
KA5CAW	27/23	0/0
K9SM*	27/21	6/4
YV4UY	27/20	0/0
N2ASC	26/26	3/3
WA9DYV*	26/26	1/1
VE5LY	26/25	1/1
K9XY*	26/22	0/0
WA9DYT	26/22	0/0
KØSE*	26/21	2/2
NP2AE	26/21	0/0
KA1CDZ	26/13	15/3
WA2YWP	26/13	4/2
K1LPS	25/25	4/4
VK3OT	25/25	0/0
N9AND*	25/25	0/0
N7EIJ	25/25	0/0
KAØCDN	25/25	0/0
VK2QF	25/25	0/0
WA5DLT	25/22	5/5
JF3TDC	25/22	0/0
WØRGU*	25/21	3/3
VE5JQ	25/20	2/2
NBAXA*	25/19	5/4
XE1FE*	25/17	1/1
9Y4LL	25/13	0/0
WB4SLM	25/13	0/0
W8NE/4*	24/24	1/1
WA4TJW	24/24	0/0
VK2VC	24/24	0/0
KØSFH*	24/23	1/1
W7HAH	24/23	0/0
KD4HP	24/21	4/2
W8QOI	24/21	2/2
W9NAW	24/20	2/2
JM1LCW	24/17	0/0
KJ3F	23/23	0/0
W7ABX	23/22	0/0
W7JXU	23/20	0/0
HC8VHF*	23/-	4/-
OA8V	22/-	0/0
N4MM	22/22	0/0
W7KNT	22/22	0/0
WB6AAG	22/22	0/0
KA6ING	22/22	0/0
VK3AWY	22/22	0/0
WBØRJR	22/19	4/2
WB2QLP	22/18	5/4
KA1YQ	22/17	7/1
K7NV	22/16	1/1
KB7N	22/16	0/0
PY2TTV*	22/15	0/0
KA5FLE*	22/14	0/0
KA1GIY	22/12	2/1
JE3YIA	22/12	0/0
HC1MD/HC5	22/-	2/-
KAØCDN	21/21	0/0
WDØFOY	21/21	0/0
KD6PY	21/21	0/0
VK2BNN	21/20	0/0
KA4CRT	21/20	0/0
WB4WXE	21/20	-/-
WB6CTQ	21/19	0/0
K6ZMW	21/18	0/0
NI6E	21/16	0/0
K1HTV/3	21/15	17/3
9Y4JW	21/12	1/1
VK5LP	20/20	0/0
WD8OXK	20/19	2/2
JG3JLC	20/19	0/0
VK3XO	20/19	0/0
K2JF	20/17	5/5
VE1BUF	20/15	4/3
KB6QK	20/-	0/0
WA8LLY/6	19/19	0/0
VK4ALM	19/19	0/0
ZB2BL	19/18	8/4
VE5XU	19/18	0/0
WØJRP*	19/18	0/0
W9OEH	19/-	0/0
VE6CX	18/18	1/0
WØLSD	18/18	0/0
NØAJU	18/16	0/0
WA4TNV/ KL7	18/15	0/0
WAØOFO	18/14	1/1
KC4KK	18/14	0/0
K9LCR	17/17	3/3
VK3AMK	17/17	0/0
VK4TL	17/17	0/0
WB9OPD	17/16	1/0
KB7Q	17/16	0/0
VK3NM	17/16	0/0
VK7JG	17/16	0/0
VK3AUI	17/16	0/0
N2AVR	17/15	0/0
VK4AYX	17/14	0/0
KA4CRT/5	17/14	0/0
HK4EB†	17/13	0/0
WØPVL	16/16	0/0
KØCJ	16/15	5/2
VK4ZSH	16/15	0/0
GW3MHW	16/15	-/-
KL7GLL/4	16/14	0/0
WØPKN	16/12	1/1
W8SMD	16/11	5/5
OA8CW	16/-1	0/0
KØWM	15/15	1/1
W7IDZ	15/15	0/0
VK3AQR	15/14	0/0
N5BOG	15/13	0/0
8P6CX	15/11	2/1
NA4I	15/11	0/0
VK4ZAL	14/14	0/0
GW3LDH	14/10	11/5
V2ADX†	14/4	0/0
KL7JAI	13/13	0/0
EI2W	13**/-	-/-
WAØLHK	12/12	2/1
VP9WB	12/11	4/1
W1QXX/KP4	12/10	0/0
G4BPY	11/11**	34/30
AL7FH	11/11	0/0
AL7C	11/11	0/0
J6LOV	11/9	2/2
G3COJ	11/7	9/7
G3IMW	11/6	12/4
JN1DQO	11/5	0/0
GJ3YHU	11/3	4/1
VK6OX	10/10	1/1
KL7WE	10/10	0/0
KL7JJH	10/10	0/0
KL7IKV	10/10	0/0
ZD7BW	10/10	0/0
FK8EB	10/10	0/0
VK3ZZX	10/10	0/0
VK4KHZ	10/8	0/0
SZ2DH	10/-	0/0
XE2BC	10/-	0/0
VK6RD	9/9	3/3
WB4WXE/ KL7	9/8	0/0
G5KW*†	9/4	35/-
K6KLY/8P6	9/3	0/0
VP2VDL	8/6	0/0
GI3ZSC	8/-	-/-
8P6MH	6/6	4/1
G4JCC	6**/4**	37/35
G4GLT	6/-	13/-
G3PWK	6/-	12/-
GW3LDH	6/-	-/-
WB4YLR	5/5	0/0
G4HUP	5/-	-/-
G4JLH	5/-	-/-
G2AOK	4/-	-/-
G4BAD	4/-	-/-
GM4FZH	3/-	-/-
VK2ZDI	2/2	0/0
SM7BAE	1/1	6/3
SM6PU	0/0	23/10
DJ2RE	0/0	14/9
DK6JL	0/0	11/4
SV1DH	0/0	10/-
CT2EE	0/0	5/2
OZ9QV	0/0	5/1
G3VZJ	0/0	4/4
G3PLP	0/0	4/2
I5CTE	0/0	4/0
G4ANT	0/0	3/2
G3TAA	0/0	3/2
F6EMT	0/0	3/2
HA6NP	0/0	3/-
HB9QQ	0/0	2/2
G3RDQ	0/0	2/2
OE1HGW	0/0	2/1
OZ7IS	0/0	2/-
G4IDE	-/-	18/-
GM4WOJ	-/-	9/-

*6-meter two-ways claimed with all continents.
†some contacts made from locations more than 150 miles apart.
**includes 4- to 6-meter crossbands and 4-meter two-ways.

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 as indicated in *italics* for each band listing. Numbers listed after calls refer to endorsements. The totals shown are current as of October 20, 1986. An SASE will bring you the rules and application forms.

6 m (50 MHz)
100

1	K8WKZ	350
2	KB4CRT	250
3	W1QXX	275
4	N4MM	300
5	WB8WXZ	200
6	WB7OHF	275
7	WB1FVB	
8	WD4FAB	225
9	WA3DMF	250
10	WA6BYA	275
11	W4OO	200
12	KA1DHO	200
13	W3WFM	275
14	N3COG	225
15	N2DXP	175
16	K1TOL	350
17	WA1OUB	325
18	W3EP/9	175
19	N5DDB	250
20	W1WHL	175
21	WB4SLM	150
22	N2CEI	175
23	W8MVE	125
24	NØLL	300
25	KI3L	
26	WB4NMA	125
27	KØTLM	275
28	K8TGC	250
29	W1JR	225
30	KC8PS	
31	WB4OOJ	
32	KC7QY	
33	KA2BTD	
34	WA4UAS	
35	N8EDL	
36	W5JME	200
37	WA6CRA/4	175
38	N9CEX	
39	KØUS	
40	WB8BKC	125
41	NZ5W	150
42	KAØJGH	250
43	N9ANO	
44	WBØZKG	250
45	K8YAH	150
46	KA9MGR	225
47	KY9P	175
48	AK4T	
49	N2BMN	
50	KD9QU	150
51	AA2Z/3	
52	WD5ICC	250
53	WA1AYS	
54	KB2XJ	
55	N2WK	200
56	WB2EBS	
57	K2YOF	
58	WBØPKN	275
59	WB2NPE	
60	K5WE	
61	KX9N	
62	N9DCA	
63	WA8LLY	
64	WB8KAY	
65	K9HEK	150
66	W5FF	300
67	WB4NJG	175
68	KE5EP	175
69	KD5RO	
70	W3ZZ	
71	W2SZ/1	125
72	KE4PE	
73	WØJRP	
74	N2BJ	
75	WBØYZN	
76	W3OTC	150
77	WDØCKF	
78	K5IS	125
79	W9VNE	
80	WAØDYU	
81	K6EID	
82	KA5LVP	
83	K8GQB	
84	K8IXU	
85	KD6PY	
86	KS5M	
87	KAØNVT	
88	W2CUK	125
89	WB8KRY	125
90	WB6KLL	
91	KA3B	150
92	KCØOG	
93	KA9JYZ	
94	W2HRW	175
95	N9FDS	150
96	W9NO	
97	KA2LIM	
98	KCØQR	
99	K2OS	
100	N5DDT	
101	KF5DB	
102	K4LHB	
103	K5UR	225
104	WD8CTX	
105	K2OVS	
106	KD7IY	
107	W5NZS	
108	NB9L	
109	WA1WIF	
110	WD6BCN	125
111	NC9F	150
112	VE3FGU	
113	W9UD	
114	NN9K	150
115	KI3L/5	125
116	N3BBI	225
117	K4RWP	125
118	N7BUP	
119	K9LCR	
120	WD9FFC	175
121	K4CKS	150
122	N4VA	
123	WA9FYB	125
124	AC3T	125
125	K2GK	
126	KB3QM	
127	WB2MKN	
128	W6RXQ	
129	KA9DZM	175
130	KA9LDS	
131	KU8Y	
132	W7US	
133	WB8TGY	
134	W7HAH	
135	AA4FL	125
136	K5AS	125
137	W4HJW	
138	WA4JNE	
139	WDØBQM	
140	NA4I	
141	WBØTEM	
142	AI6O	125
143	KA2GOJ	
144	WB9MSV	
145	KD9IV	
146	KA5EBL	
147	WA3CKA	
148	W5OZI	150
149	N2AHN	150
150	KF5AL	
151	W8QXO	
152	WB9VQE	
153	W8QOI	
154	KI6O	
155	AB9W	
156	W9UB	
157	KB4DZX	
158	W1GXT	
159	W5DXN	
160	N5HVJ	175
161	K9RRS	
162	W9XT	
163	KA9SPD	
164	K1ISW	
165	KA4CRT	
166	K6EJO	125
167	W5RCI	
168	N4MW	125
169	WA6IJZ	
170	W3BWU	150
171	WA2PDI	
172	AA4FQ	
173	W7ABX	
174	K1RSA	
175	WØKEA	175
176	NW5E	150
177	AA5C	
178	KF6ZB	
179	K1TMM/9	
180	WB8YFE	
181	N2AVR	
182	K3YTL	
183	K6CH	
184	WB5ROR	125

2 m (144 MHz)
100

1	K9MRI	250
2	WB9MSV	175
3	KD8SI	250
4	N9KC	125
5	NØLL	175
6	WB4NMA	125
7	WA4NJP	175
8	K2LWR	175
9	KFØM	125
10	W4GJO	175
11	N9AQ	150
12	SM4GVF	
13	WA6MGZ	
14	KB5MR	125
15	DELETED	
16	K5WE	
17	KCØQR	125
18	WA3HMK	
19	K7CW	
20	W5SUS	125
21	W3EP/9	
22	K8WKZ	
23	N4AR	150
24	NR5O	
24A	K5YY	200
25	WD4DGF	150
26	K4CAW	125
27	WB8BKC	
28	K3MD	
29	WB8KAY	150
30	KA9LDS	150
31	W1JR	125
32	WA1OUB	125
33	NN9K	150
34	N9BD	
35	K2TXB	
36	WBØYWW	
37	K3RX	125
38	WB8ART	175
39	WDØFOY	
40	WBØTEM	225
41	NØAJU	
42	K2OS	
43	WAØTKJ	150
44	W5RCI	150
45	WBØDGF	125
46	WA2FXB	
47	N8BJN	125
48	KØTLM	150
49	KØUS	
50	SM3AKW	
51	WAØVJF	
52	WB4NXY	125
53	NI8O	150
54	W3ZZ	
55	KAØABA	125
56	KXØO	
57	W9HAD	
58	AA5V	
59	WBØZKG	
60	N8CKH	
61	W8LSC	
62	W5FYZ	125
63	KCØOG	
64	K5UR	225
65	W5FF	125
66	WØRT	
67	NØEKT	
68	WBØYZN	
69	KD9QU	125
70	WB9OJR	
71	N5BHO	
72	WB2NPE	
73	WB9CAS	
74	K8TL	
75	WB4NJG	
76	AA4FS	150
77	VE1UT	
78	KU8Y	125
79	WB4GFO	
80	K4CKS	
81	KB7Q	
82	K2GK	
83	KB9QC	
84	WB9UQE	
85	W2SZ/1	
86	WB3LJK	
87	G6JNS	
88	G4UXC	
89	K8RZB	
90	AF9Y	150
91	G6DZH	
92	G4WAD	125
93	G6HKM	
94	W9UD	
95	N4AVV	
96	DL6LAU	175
97	W9YCV	
98	W7HAH	125
99	K9VGE	
100	G4XEK	
101	W2RS	
102	KE2N	
103	W8NJR	
104	N8DEJ	
105	WBØSWD	
106	WA3FYJ	
107	KD4LT	
108	W3CWG	125
109	KB4FQ	
110	N2WK	
111	W5NZS	
112	LA9FY	
113	WA4VCC	125
114	GØCHE	125
115	KR9U	
116	G6XVV	
117	N2AHN	
118	YO2IS	
119	WA5DBY	
120	KMØA	125
121	W9JGV	
122	WA9JFM	
123	W7ID	
124	WØIZ	
125	WØJRP	
126	KB4CSE	
127	K3JFL	
128	KU9L	
129	W8QXO	
130	WB4TWX	
131	W4CPZ	
132	W4ZD	
133	WØEMS	
134	K4JQU	
135	WA8MIL	
136	WA8NPX	

1¼ m (220 MHz)
50

1	W1JR	70
2	WØSD	
3	WBØTEM	60
4	WB8BKC	
5	VE3EMS	
6	WD4DGF	
7	N9HH	
8	W2SZ/1	
9	W9UD	
10	KC4EG	
11	WB3LJK	
12	W5RCI	

70 cm (432 MHz)
50

1	W1JR	140
2	K8WW	110
3	WB3ESS	
4	WB8BKC	70
5	W4GJO	120
6	W2VC	60
7	WA9JFM	70
8	KB5MR	70
9	WB4NXY	80
10	K4CAW	70
11	W2SZ/1	70
12	KD8SI	70
13	WBØTEM	120
14	VE3CRU	75
15	W9UD	
16	WB9MSV	70
17	WB5AFY	130
18	W5RCI	90
19	KØTLM	75
20	SM3AKW	
21	K5YY	90
22	WB8ART	80
23	K1FO	150
24	W3ZZ	
25	WØRAP	140
26	KFØM	
27	K8TL	60
28	WBØDRL	
29	NI8O	100
30	KC4EG	
31	KCØQR	
32	VE3BFM	
33	W8LSC	60
34	KR9G	
35	AF9R	
36	WB8KAY	
37	NZ5W	
38	NC9F	
39	WB2NPE	
40	W1XX/2	
41	W5NZS	
42	K2GK	
43	K5UR	70
44	WØRT	
45	G6JNS	
46	N9KC	
47	G6DZH	70
48	G6HKM	
49	KE5EP	60
50	K3YTL	
51	WA5DBY	
52	KB3QM	
53	WB3LJK	
54	WB9SNR	
55	N5BHO	
56	N8DJB	
57	WØRRY	90
58	N4AVV	
59	KØUS	
60	KØJJA	
61	AA4FS	
62	VE3LNX	
63	N4MW	

33 cm (902 MHz)
25

1	AA2Z	

23 cm (1296 MHz)
25

1	WB8BKC	30
2	K8WW	35
3	N6CA	35
4	WB5LUA	60
5	W8YIO	35
6	W1JR	30
7	W2VC	
8	W2SZ/1	
9	W5HN	30
10	WBØDRL	
11	WA5TKU	
12	WØRAP	35
13	VE3BFM	
14	WA8TXT	
15	VE3LNX	
16	WB2NPE	
17	KD5RO	30
18	K3YTL	
19	G4PRJ	
20	WB5AFY	35
21	WAØTKJ	
22	KE5EP	30
23	WA5DBY	
24	KØNG	
25	WB9SNR	
26	WB4NXY	
27	NOØY	
28	W7CNK	
29	W5RCI	

2.3 GHz
10

1	WB5LUA	20
2	WA5DBY	
3	WA3AXV	
4	WA3JUF	
5	WA5VJB	
6	W5HN	
7	W2SZ/1	
8	WB5AFY	
9	KD5RO	
10	W7CNK	
11	W5UC	
12	W8YIO	

3.4 GHz
5

1	W2SZ/1	
2	WA5DBY	
3	WB5LUA	10
4	W5UC	
5	KD5RO	
6	WA5VJB	
7	WB7UNU	
8	WA3RMX	
9	KØRZ	
10	W7CNK	

5.7 GHz
5

1	W2SZ/1	
2	K5PJR	10
3	WA5ICW	
4	WD5AGO	
5	W5UGO	
6	WB7UNU	
7	WA3RMX	

10 GHz
5

1	W2SZ/1	
2	K2DNR/7	
3	KCØW	
4	K2DNR/7	
5	WA7BBM	
6	WB7UNU	
7	WA3RMX	
8	N6CA	
9	WA6EXV	
10	KB7CI/7	

The New Frontier

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

New 3456-MHz Record

The following information was sent along by Kent Britain, WA5VJB.

On August 3, 1986, a new North American 3456-MHz record was established when WA5TNY, KA5JPD and N5MP traveled to a location south of Ft Worth, Texas and worked W7CNK at his home station in Oklahoma City. First contact was made at 7:15 AM, with WA5TNY and W7CNK exchanging 529 reports on CW. At 7:35 AM, both stations went to SSB, exchanging reports of 51 and 59. The distance was 228 miles, and represents the seventh attempt by members of the North Texas Microwave Society to break the 16-year-old 3456-MHz record. WA5TNY used a home-brewed transverter, upconverting 144 MHz to 1296 MHz and then to 3456 MHz, with a final (solid-state) power output of 1.5 W. A 6-ft-diameter TVRO dish was used along with a TVRO LNA (low-noise amplifier)—which goes to show there is a good use for satellite TV equipment! W7CNK also used a home-brewed transverter, mixing 1296 MHz with a 2160-MHz LO to produce output on 3456 MHz, which was amplified with a traveling wave tube to produce 1 W out. The antenna used was a 7-ft mesh dish, and again a TVRO LNA was used as the receive preamp.

KA5JPD's van set up for 3456 MHz.

WA5TNY at the rig during the setting of the 3456-MHz record.

Kent also comments that the 3456-MHz exploits are not over yet, as 5- and 10-W solid-state amplifiers are now operational. In addition, in the October 1986 New Frontier column, I gave an old address for Kent in connection with the North Texas Microwave Society. His current address is Kent Britain, WA5VJB, 1626 Vineyard, Grand Prairie, TX 75052.

MODULATING GUNN OSCILLATORS

Jim Veatch, WA2EUJ, recently wrote with a question concerning the modulation of a surplus Gunn oscillator assembly he picked up at a flea market. In contrast to commercially available Gunnplexers, which use a varactor diode mounted close to the Gunn diode to produce frequency modulation, surplus Gunn oscillators often contain no frequency modulating component since they are usually intended for fixed frequency use in motion sensors (burglar alarms). They can quite easily be frequency modulated, however, by modulating the voltage fed to the Gunn diode. The amount of frequency shift depends on the diode, its operating conditions and the "Q" of the oscillator cavity, but is of the order of several megahertz per volt at 10 GHz. For best modulation, the diode should not be operated at the voltage producing maximum RF out (since this point on the operational curve produces the lowest and most nonlinear frequency change with voltage), but at a lower voltage producing about 75% of maximum output. The RSGB *VHF/UHF Manual*, 4th edition (available from ARRL), p 9-57, contains a description of a power supply/modulator unit suitable for use with a Gunn oscillator of this type.

10-GHz CUMULATIVE CONTEST —PHASE 1

September 26-27 saw the first leg of the 10-GHz cumulative contest. At the time of writing (October 2), I have not received many reports of activity and conditions, but I know that a lot of stations made the effort to get on the band. One report has come in from the San Bernardino Microwave Society, sent in by Chuck Swenblom, WA6EXV:

> The first half of the 10-GHz contest is now history. To say the least, conditions were not great, but there was lots of activity in the So California area. At this writing (Sunday, 8th) I do not have a tally of the contacts made by all of the members that participated, but all six of us were out there. I managed to make 13 contacts from the beacon site at Heaps Peak. The fog was so thick most of the time that I was unable to see 50 feet away and it was very cold. Ed, W6OYJ, had planned to operate from Pt Loma, but at the last minute found that there was a test being run on 29.9 MHz with a high-power transmitter in the vicinity that was getting into the IF amplifiers of his receiver, so he had to move locations to Mt Soledad. Ed did a superb job of coordinating the activities of the San Diego group with the rest of us.
>
> Conditions on Friday evening were good for the first two hours, then turned bad with very few long haul contacts being made by anyone. On Saturday, an inversion set in and did not break up until almost noon. Bill, WA6QYR, and I were unable to make our first schedule early in the morning but did make the rest of them. Bill was interrupted during one contact by the visit of the Kern County Sheriff wanting a lot of information about what was going on. I had a visit by the San Bernardino County Sheriff, but he didn't stay very long after he saw what I was doing. All in all it was a lot of fun and I am looking forward to the second half. *(San Bernardino Microwave Society Newsletter, Sep 28, 1986)*

Ed O'Connor, W2TTM, was active in New Jersey using both wideband Gunnplexers and a 10-GHz solid-state transverter system from SSB Electronic. Ed comments that his system puts out 200 mW+ and has a noise figure spec of about 2.5 dB. Not bad at 10 GHz! I have no reports of his success on narrowband, other than an unsuccessful attempt with KA1GT due to antenna feed problems!

I would be interested to hear the experiences of those who participated in the contest first or (upcoming) second sessions.

MICROWAVE SOCIETIES

Keith Ericson, KØKE, has sent in information about a microwave society meeting in Denver. The Colorado Front Range Microwave Society held its first meeting on June 26 in the studios of KOSI in Denver, with 30 attendees. For more information, contact Keith Ericson, KØKE, 5195 E Missouri, Denver, CO 80222.

FM/RPT

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

United, We Stand: The Need for Strong Frequency-Coordination Organizations

The September installment of FM/RPT, "When the Frequency Coordinator Doesn't...," dealt with the problem of an appointed or elected frequency coordinator who doesn't do his job, thus leaving those who seek coordination in the lurch. In response to that column, I received letters that cited other problems.

Divided, We Fall

A reader from the Central US complained, "Several of us in the area have requested coordination of frequencies on 440-450 MHz. We have written letters and made phone calls to no avail. I have written and asked for frequencies on 2 meters and have been told there are none, when, in fact, there are several."

An uncoordinated repeater operator in the Northeast explained, "I was unable to obtain coordination for a 2-meter repeater because the repeater did not meet the frequency coordinator's 70-mile co-channel separation rule. I operated the repeater uncoordinated and because of the local topography, had absolutely no interference. In fact, the other group operating on the same frequency was not even aware that I was operating on the channel. Despite the fact that there was no interference, the frequency coordinator would not grant coordination because of their 70-mile rule."

A Midwestern ham, who tried to coordinate his 220-MHz repeater, exclaimed, "The frequency coordinator does not issue frequencies to individuals, only to groups or clubs (minimum of five people)."

A ham from the Southwest explained, "I now operate an uncoordinated repeater because I was unable to obtain coordination from the local coordination group. The state has recently adopted the 20-kHz channel plan and I operate on 146.96, which conforms to the new plan. The reason that I am denied coordination is that there are older repeaters in the state that are still on the old band plan and are operating on 146.97. These repeaters are in distant parts of the state and there is absolutely no interference; however, the frequency coordinator will not coordinate with 10-kHz spacing no matter what the geographical separation."

From the Midwest again, "The frequency coordinator does not honor frequency requests ... He assigns frequency pairs from the low end of the repeater subband upwards as they are available"... without regard to real or potential interference or intermod with other radio stations, Amateur or commercial.

One last complaint from the Central US, "I am a member of the frequency coordinator organization and attended their last meeting. Election of new officers was to take place. About 18 people showed up and the floor was never opened for nominations. One of the officers said that the same people that served last term would serve again. At this time, I had a friend interrupt and nominate me for office. There were about 16 shocked looks on people's faces and a lot of confusion. They didn't even know how to hold an election! I later asked for a copy of their by-laws and still do not have a copy..."

Besides these examples, James Mills, NJ9F, cited the following example of potential abuse. "Suppose John Smith has a repeater on a VHF frequency that is uncoordinated, but it has been in existence for some time with no interference problems. In addition, John's repeater has lots of users and good, wide-area coverage. Now, suppose the Frequency Coordinator decides to coordinate someone on or near John's frequency, who complains about the interference, and, as a result, the frequency coordinator tells John Smith to get off the air. It may be partially deserved in that John didn't register his system with the coordinator. But what if the coordinator has a burning hatred for John Smith and refuses to allow him a pair?"

Finally, Mark Kolber, WB2WHC, opined, "The purpose of coordination, as defined by the FCC, is to reduce interference... Coordinators should be allowed to refuse coordination only on the basis of interference."

Strength in the Number of Active Participants

Each of these problems is different, but they are all the result of the same problem—the lack of a strong frequency-coordination organization. By strong, I mean strength in the number of active participants in the organization. When only one person provides frequency coordination, the potential for abuse is higher than if frequency coordination is a group effort, a truly representative group that allows many voices to be heard when the organization's rules are made and frequencies are coordinated.

Ideally, everyone who is affected should have a voice in the frequency-coordination process. When one man rules, it's his ball and everyone must play by his rules. However, when everyone has the ability to participate in the rule-making process, the system is fairer to everyone because each person is, in effect, ruling himself.

If one person is "volunteered" as frequency coordinator because nobody else wants to be involved ("Let George do it"), should there be any complaints when George does something that is disagreeable? A number of coordinators are in this situation. For example, some poor sap has had the job of coordinating 220 MHz in Podunk for 20 years. Until now, there have been no complaints because there are only three 220-MHz repeaters in all of Podunk. Suddenly, all of the 2-meter and 450-MHz repeater channels in Podunk are full and there is a big push for 220-MHz assignments. Our coordinator is overwhelmed with frequency requests. He tries to do the best job he can, but when he makes one mistake, there is a horde of disgruntled hams ready to tar and feather him. Such a situation could have been avoided if there was a strong frequency coordination organization that did not leave one poor sap out in the cold to fend for himself while performing the 220-MHz coordination job.

Look at the successful frequency coordinators in the US and you will find that most of them are representative organizations, not one-man rule.

MICHIGAN AREA REPEATER COUNCIL NEWS

The following is courtesy John L. Hackman, WB4VVA.

At a meeting of the Michigan Area Repeater Council September 14, the membership present overwhelmingly reaffirmed its commitment to the 20-kHz band plan for 2 meters by a vote of 26 to 6. The membership authorized immediate implementation of the plan, with those repeaters anticipating no problems to make the switch as soon as they can get their new crystals. A small number of repeaters still have coordinating problems to be worked out with the Council, and those are expected to be worked out soon enough to permit them to make the change during the Thanksgiving-December 7 period. No existing repeater has been left without a frequency as a result of the change, and it is expected that a number of long-standing interference problems will be improved or eliminated.

Also, the Council adopted on first consideration an allocation of the 20-kHz channels 144.91 to 145.09 MHz and 147.54, 147.56 and 147.58 MHz for packet.

REPEATER LOG

According to August 1986 reports received, repeaters were involved in the following public-service events: 223 vehicle emergencies, 25 fire emergencies, 18 weather emergencies, 21 drills/alerts, 16 medical emergencies, 3 public-safety events, and 2 power failures.

The following repeaters were involved (followed by the number of events): WA1DGW 19, KG1O 5, W2VL 33, WA2ZWP 11, WD4JWO 7, WA4KDB 1, WB4LAI 2, W4YJG 1, WV4Z 4, WD5KBZ 1, WA6BJY 8, W6CDR 2, W6FNO 182, N8ACV 2, WB8ART 2, W8BI 2, K8DDG 4, W8DYY 2, KD8GL 6, WA8KZR 2, W8OG 2, WB8SMC 2, K8TDN 2, WA8ULB 5, KC9PL 1.

Strays

I would like to get in touch with ...

☐ anyone with a circuit diagram for a Ham Master HM-2020 2-m transceiver. Werner Stier, Kirchstrasse 43, 5249 Hoevels, Fed Rep of Germany.

Washington Mailbox

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

What's in a Name? Call Signs—Part 2

To an amateur, a call sign is like his or her name. Calls are of great interest to all hams for this reason. In the last Washington Mailbox, we began our discussion of call signs with a look at the present FCC system of issuing calls. This installment, we'll examine particular situations involving call signs we amateurs face. You may find it helpful to refer to the table of prefixes the FCC has allocated to amateur use (this table appears in October *QST*, page 66). And now, the continuing saga of call signs....

Special Call Signs

Q. What is the difference between a primary call and a secondary call?

A. A primary call is issued to you as an individual. Since there is only one of you, you may possess only one primary call! A secondary call was issued to a station, not to an individual. Until 1978, if an individual owned a vacation home, he could obtain a secondary call sign for this location. The FCC no longer issues or renews secondary call signs, although those issued previously will be valid until they expire.

Q. Fifteen years ago I held the call W4AAA, but I let my license lapse. Recently, I passed my Technician examination, and I received the call N4XXX. Is there any hope that I may get back my old call of W4AAA?

A. At the present time it is impossible to regain lost calls, but there is hope! There is a possibility—and it is only a possibility—that the ARRL might become involved in the issuance of call signs. A special call-sign system is being studied jointly by the ARRL and by the FCC. If this possibility does become a reality, an amateur would apply to the ARRL where he could obtain a special call sign of his choice—if it is available. He would continue to keep his FCC-issued call sign. There would very likely be a special call sign fee. It is expected that the amateur could use either call sign interchangeably. No consideration is being given to the ARRL's issuing primary calls. If this special call sign program does evolve, it would likely be in the latter half of 1987. It must be stressed that this special call sign proposal is only a possibility, and it may never occur. (See November Happenings for more information.)

Call-Sign Modification and Renewal

Q. How do I apply for a change of call sign?

A. You must file FCC Form 610 with Item 2E marked. Use a 610 Form dated June 1984, or later, because the FCC will not accept forms with an earlier date. Important note: If you are completing an FCC Form 610 and you do not want a new call, do not check Item 2E. The FCC will give you a new call only if you specifically request it.

Q. What does it mean to be eligible for a new call?

A. To be eligible, you must have either upgraded or moved to a new station location. You are also eligible for a call-sign change when your current license class is not equivalent to the call group from which your call is issued. An example of this is if KB4HPD (an Advanced class operator with a Group D call) wants to obtain an Advanced class call. He does not need to upgrade or to move. This operator is simply obtaining a call that is equivalent to his license class.

On the other hand, an Extra Class operator who does not like his present call may not change it unless he moves to a new call-sign area. He would be eligible for a call-sign change in this case.

Q. I recently passed my Amateur Extra examination, and I received a call I find offensive. I am very unhappy with this call. May I obtain another call from the same group?

A. Under certain circumstances, a call sign you find verbally offensive might be changed upon request to the FCC. The request may not be granted. In most cases, you must keep your call unless you change your station location, or upgrade your license class.

Q. I failed to renew my amateur license, which expired in 1983. I have since regained interest in Amateur Radio. Can I renew my license without retaking the examinations?

A. Yes, your license may be renewed under a grace period. Licenses issued before January 1, 1984 carry a five-year grace period after the expiration date. You will receive a new call sign after two years, and you will not need to retake any examinations. Licenses with a 10-year term carry a two-year grace period.

Q. I am moving to a new call-sign area and I want a new call. From which group will it be issued?

A. You will receive a call that corresponds to your current operator class. Extra Class operators receive Group A calls, Advanced operators receive Group B calls, General/Technician operators receive Group C calls and Novices are issued calls from Group D. You may not want to change calls, especially if you hold one of the "preferred calls" under the old system. If old-timer W3AAA, who holds a General class license, moves to Cheraw, South Carolina, and applies for a new call, he will receive a call issued from Group C, such as N4XXX. He cannot request a 1 × 3 call beginning with the prefix W or K at the present time.

Call-Sign Situations

Q. I was listening to the Extra Class subband and I was surprised to hear a Group D 2 × 3 call sign. Is this possible?

A. Yes, it is quite possible. Many licensees kept their orginal call signs even though they have upgraded. For example, KA4ABW is an Advanced class licensee, and he has elected to keep his Group D call.

Q. A local ham recently became a Silent Key. Will his call automatically be deleted from FCC records?

A. The FCC no longer deletes calls of Silent Keys unless cancellation is specifically requested. Since the term of an amateur license is now 10 years, the family of the deceased amateur could continue to receive correspondence for quite some time. To avoid this unwanted correspondence, families of deceased amateurs should return the license to the FCC, or send a letter to the FCC stating that the amateur is deceased in the event that the license cannot be found. The family of the deceased should write to the FCC at the following address: FCC, Consumer Assistance Office, Gettysburg, PA 17325, requesting cancellation of the license. The FCC is not reassigning the calls of Silent Keys at this time.

Station Calls

In 1978, the Commission decided that our special station calls were luxuries that the government could not afford to provide. Provisions for issuance of secondary repeater, RACES, auxiliary, military-recreation, special-event and club-station licenses were felled under the budget axe. These various types of special operations are still permitted, of course, but under the auspices of your primary call. The FCC will continue to renew and modify existing club, RACES and military-recreation licenses. There are currently 2226 club, 154 military recreation and 347 RACES station licenses. All others have expired.

Q. Our new club, the Thumb Twitlers Amateur Radio Club, wants to set up a club station at our clubhouse. Since no club licenses are being issued, what are we supposed to do for authorization?

A. You should designate an amateur licensee member of your group as the trustee of the station. Since no club-station license is involved, there is no need to submit an application to the FCC. The club station uses the trustee's primary station license for authorization and identification purposes. Technically, the trustee's station is in portable operation, which is perfectly permissible. The FCC no longer requires an amateur to specify when he or she is in portable operation. The trustee whose call is being used is responsible for proper station operation at all times. The control operator is also responsible for the proper station operation while on duty.

Note: Questions appearing in this column are typical of those frequently asked of the FCC and other agencies. Answers, prepared at ARRL HQ, have been reviwed by the FCC's Personal Radio Branch for agreement with current FCC interpretations and policy. Numbers in parentheses refer to specific sections of the FCC rules.

Canadian NewsFronts

Conducted By Harry MacLean, VE3GRO
500 Riverside Dr
London, ON N6H 2R7
Tel 519-473-1668

"We Couldn't Have Done It without the Hams"

Supplying emergency communications can be an education. That's what New Brunswick amateurs discovered in the Gagetown forest fire last May. Several days of warm weather had left the forests tinder-dry. Fires did break out, but they were usually small and easily put out. The Gagetown fire was different.

Soldiers from the nearby Canadian Forces base started it. The fire was an accident and confined to the base and Canadian Forces personnel were sure they could handle it. Then, the wind shifted. The fire gained strength. It moved along Highway 102, threatening homes there and even in Gagetown itself.

On May 15, the evacuations began. EMO, the Emergency Measures Organization, established a command post in the safety of a gravel pit and asked if the amateurs could assist.

The amateurs came from the immediate area, from Fredericton and even from Saint John. Many took time off work. They would probably lose their pay. Some took operating positions at EMO Headquarters in Fredericton, others at the command post or at the edges of the fire. Many went with the emergency vehicles, the RCMP patrol cars, the ambulances and the fire trucks. The vehicles had radios, but they had been brought in from all over and the radios were on different frequencies. The amateurs, using their 2-metre equipment would be providing the *essential* communications that would result in a coordinated effort.

Where was the fire moving? Where should fire fighters concentrate their efforts? Was a particular building in danger? Would that nursing home have to be evacuated? Amateurs relayed the information. There were a few tense moments. More than once, an amateur would find himself cut off by flames that had jumped a road and set a field on fire. But, three days had passed, and you could see results. Then, the wind shifted again, and the fire came under control. The amateurs were able to sit back and reflect.

What had been learned? Another time, have mobile rigs mounted in such a way that they might be removed and used on another vehicle. Have a way of overriding the timeout feature on the local repeater. Have a portable repeater ready. Use two frequencies, one for essential communications, the other for ordering the inevitable sandwiches and coffee. Wear armbands for easy identification. Keep emergency kits in each car: A flashlight, road map, first-aid kit, foul-weather gear, water, snack foods and extra batteries for the hand-held transceiver can be lifesavers in an emergency.

Not that the amateurs hadn't done an outstanding job without all this. As one EMO official put it, "We couldn't have done it without the hams." *(special tnx to Brent Taylor, VE1APG)*

SECTION MANAGER APPOINTMENT

Leigh Hawkes, VE1GA, of Armdale, Nova Scotia, has been appointed Section Manager, Maritimes-Newfoundland Section, to complete the term of office temporarily filled by Don Welling, VE1WF. Welcome aboard, Leigh!

DOC NEWS

☐ No word yet from DOC, but according to Japanese authorities, on September 17, Canada signed a reciprocal-operating agreement with Japan. The agreement went into effect on November 16. Canada follows the United States and the Federal Republic of Germany as the third country to sign such an agreement. While in Japan, Canadian amateurs will use 7J calls.

☐ DOC has authorized a new radio-navigation system operating from the west end of Lake Ontario on or about 432 MHz. The frequency assignment appears to be legal. Amateurs use 430-450 MHz on a secondary basis. However, the frequency assignment also appears to have been made without due regard for potential interference. The wideband nature of the system's signal threatens weak-signal terrestrial and EME communications near 432 MHz and even satellite communications near 435 MHz. There is also a possibility that amateur signals could interfere with the system, creating a danger for ships that rely on it. CRRL is watching the matter closely.

RABC NEWS

☐ As a result of the Jack Ravenscroft case, CRRL, CARF and commercial users of the radio spectrum have expressed some serious concerns to the Electromagnetic Compatibility Committee of RABC, the Radio Advisory Board of Canada. As a result, that committee formed a subcommittee, chaired by a DOC engineer, to study the problem of RF susceptibility of nonradio electronic equipment. At its September meeting, the subcommittee unanimously supported an approach suggested by CRRL Director Ray Perrin, VE3FN: Have DOC make a regulation that would require manufacturers of nonradio electronic equipment to modify their equipment without charge whenever it malfunctions in an RF field. The subcommittee also supported changing the Radio Act to allow the Minister of Communications to make such a regulation. If the Radio Advisory Board adopts the recommendations, they will be forwarded to the Minister. Early indications are that the Minister will be receptive.

The emphasis was on the Field Organization when Jean-Serge Labelle, VE2ED (left), and Quebec Section Manager Harold Moreau, VE2BP, set up this fine CRRL booth at the 1986 Quebec Hamfest. Jean made the signs and Harold made the banner that did CRRL proud. *(VE2GMP photo)*

NOTES FROM ALL OVER

☐ At an October meeting of Fredericton Amateur Radio Club, CRRL Director Andy McLellan, VE1ASJ, presented Certificates of Merit to amateurs who had provided communications in the Gagetown forest fire. Earlier, similar certificates were sent to amateurs who helped conduct an eight-day search for a child lost near Waverly, Nova Scotia in July.

☐ Jim DeZorzi, VE3ZK, is organizing a cross-Canada packet-radio network to distribute the CRRL bulletins. If you can help, please contact Jim by packet radio, VE3ZK via VE3GYQ, or write to him at 1047 Prince George Rd, London, ON N6H 4E2.

☐ Alberta Section Manager and CRRL Director Bill Gillespie, VE6ABC, has a new address and telephone number. Contact Bill at 10932 68 Ave, Edmonton, AB T6H 2C1, tel 403-438-2510.

☐ From everyone in and around the CRRL Headquarters office in London, Ontario, from all your CRRL reps and workers across Canada, best wishes for a happy holiday season. May 1987 be your best year ever.

IARU News

Conducted By Richard L. Baldwin, W1RU
HC 60, Box 60, Waldoboro, ME 04572

ARDF

A facet of Amateur Radio that is very popular in Europe, quite popular in the Far East and practically unheard of in the Americas—that's ARDF, Amateur Radio Direction Finding. The Third ARDF World Championships were held in Sarajevo, Yugoslavia, during the first week of September 1986, organized under the very capable leadership of SRJ (Savez Radio-Amatera Jugoslavije), our IARU society there. Over 150 contestants were present, representing 17 countries.

What is ARDF? In a nutshell, it's a contest in which the participants attempt to locate hidden transmitters, using hand-held receivers and traveling on foot over an area that is large enough to accommodate a total distance traveled of about three to four miles. Any championship involves two separate events, for 3.5 and 144 MHz, scheduled on separate days. Some of the equipment used is home-made, some commercially available. In addition to the hand-held DF unit, a contestant needs a map (provided by the organizing body), a compass, a sturdy pair of legs and stamina.

There are five hidden transmitters, and they operate for one minute each in sequence, repeating this sequence throughout the contest. Each transmitter uses a distinctive call sign (MOE, MOI, MOS, MOH, MO5) so that there is positive identification. Built-in timing circuits, synchronized at the beginning, are arranged so that only one transmitter is on the air at a time. These transmitters are located no less than 400 meters (that's roughly a quarter of a mile) apart, and the first one must be at least 750 meters (roughly a half mile) from the start. As mentioned earlier, the total distance covered by the course should be 4-7 kilometers, or between 2.5 and 4 miles. There is a time limit of two hours to complete the course, but the real hotshots generally cover the distance in about one hour. Those are the ones who are not only radio amateurs but also well-conditioned athletes.

In Yugoslavia, the course was set up in the vicinity of the site of the 1984 Winter Olympics. It was a heavily wooded and hilly area (although the ARDF rules limit the up-and-down excursions to 200 meters), through which there ran a number of trails and paths. It was a tough course, and most of the contestants arrived at the finish lines pretty well winded. In fact, the course was so tough that on the first day, for the 144-MHz competition, quite a number of contestants failed to finish within the required two hours. Two days later, the 3.5-MHz competition did not, that I recall, have any contestants coming in over the time limit. It appears that the 144-MHz competition may have been more difficult because of the hilly terrain causing confusing reflections of the 2-meter signals.

The countries represented in the Third ARDF World Championships included the Soviet Union, Bulgaria, Hungary, Norway, China, Yugoslavia, Romania, Austria, North Korea, South Korea, Japan, Belgium, Switzerland, Sweden, Poland, Czechoslovakia and West Germany. As you can see, quite a representation from Regions 1 and 3, but nobody from Region 2. This has caused quite a bit of comment from our overseas friends, and they'd like nothing better than to see a team from somewhere in the Americas taking part in this activity. ARDF seems to be gaining in popularity, as this was an all-time high in the number of contestants. It seems to be a great way to encourage young people to become interested in Amateur Radio. It fosters a great spirit of camaraderie during the events, both while the young men and women are charging around the puckerbrush, but also during the after-hours festivities. Did I say while the *young* people are DFing? There are several classes of competition, making it possible not only for the younger crowd but also for more senior citizens to compete on an equal basis. In fact, at Sarajevo there was one special group of competitors who had first competed with each other some 25 years ago.

We'd like to see a greater interest in ARDF, and to that end we hope to have some more articles that give a far more complete description of the sport and its equipment than has been possible this month. ARDF is growing in Regions 1 and 3—when will Region 2 take up the challenge?

QSL Corner

(continued from page 57)

Fourth Call Area: single-letter prefixes—Mecklenburg ARS, PO Box DX, Charlotte, NC 28220.

Fourth Call Area: two-letter prefixes—Sterling Park Amateur Radio Club, Call Box 599, Sterling Park, VA 22170.

Fifth Call Area: all calls*—ARRL W5 QSL Bureau, PO Box 44246, Oklahoma City, OK 73144.

Sixth Call Area: all calls*—ARRL Sixth (6th) District DX QSL Bureau, PO Box 1460, Sun Valley, CA 91352.

Seventh Call Area: all calls—Willamette Valley DX Club, Inc, PO Box 555, Portland, OR 97207.

Eighth Call Area: all calls—Columbus Amateur Radio Assn, Radio Room, 280 E Broad St, Columbus, OH 43215.

Ninth Call Area: all calls*—Northern Illinois DX Assn, Box 519, Elmhurst, IL 60126.

Zero Call Area: all calls*—WØ QSL Bureau, Ak-Sar-Ben Radio Club, PO Box 291, Omaha, NE 68101.

Puerto Rico: all calls*—Radio Club de Puerto Rico, PO Box 1061, San Juan, PR 00902.

US Virgin Islands: all calls—Virgin Islands ARC, GPO Box 11360, Charlotte Amalie, St Thomas, VI 00801.

Hawaiian Islands: all calls*—John H. Oka, KH6DQ, PO Box 101, Aiea, Oahu, HI 96701.

Alaska: all calls*—Alaska QSL Bureau, 4304 Garfield St, Anchorage, AK 99503.

Guam: AH2, KH2, WH2 and KG6 calls—MARC, Box 445, Agana, GU 96910.

SWL—Mike Witkowski, WDX9JFT, 4206 Nebel St, Stevens Point, WI 54481.

CRRL DX QSL BUREAU SYSTEM

QSL Cards for Canada (VE, VO and VY) may be sent to CRRL Central Incoming QSL Bureau, Box 51, St John, NB E2L 3X1. Or, QSL cards may be sent to the individual CRRL Incoming QSL bureaus.

VE1*—L. J. Fader, VE1FQ, PO Box 663, Halifax, NS B3J 2T3.

VE2—A. G. Daemen, VE2IJ, 2960 Douglas Ave, Montreal, PQ H3R 2E3.

VE3—The Ontario Trilliums, PO Box 157, Downsview, ON M3M 3A3.

VE4*—Larry R. Lazar, VE4SL, 30 Bathgate Bay, Winnipeg, MB R3T 0L2.

VE5—B. J. Madsen, VE5FX, 739 Washington Dr, Weyburn, SK S4H 3C7.

VE6*—N. F. Waltho, VE6VW, General Delivery, 9714-94th St, Morinville, AB T0G 1P0.

VE7*—Alex Ivsic, VE7CNE, 1107-7434 Kingsway, Burnaby, BC V3N 3B7.

VE8*—Rolf Ziemann, VE8RZ, 2888 Lanky Ct, Yellowknife, NT X1A 2G4.

VO1, VO2—Roland Peddle, VO1BD, PO Box 6, St. John's, NF A1C 5H5.

VY1—QSL Bureau, W. L. Champagne, VY1AU, PO Box 4597, Whitehorse, YT Y1A 2R8.

*These bureaus sell envelopes or postage credits. Send an SASE to the bureau for further information.

YL News and Views

Conducted By Joan Gibson, KG1F
RR 1, Box 1465, Waterbury, VT 05676

1986 DX-YL to NA-YL Contest Results

KM8E—June Branz's contesting expertise pays off (at long last!). Her 1st place SSB finish and 2nd place in CW brought her the coveted DX-NA YL plaque. A longtime contester, this was her first win.

WD4NKP—Martha King is a contest winner of many years as well as a hard-working YL in support of YLRL.

IT9JLA—Nina LaVecchia showed her skills as both an SSB and CW operator by taking top prize in both contests.

WA3HUP—Mary Ann Crider is known to the amateur community as a YL of DX accomplishments as well as a QSL manager for many DX stations.

I2KYM—Manuela R. Petrucci is an avid contester and a DX chaser with 250 countries to her credit.

EI7CW—Clare Dixon from County Cork was "pleased to come in 3rd in the CW portion, but it was hard work." Clare also finds time to sail.

WD8MEV—Shirley Hooper is a pediatric RN who is proof that the "little gun" (as she calls herself) can fare well in contests.

Scores

	SSB Winners			*CW Winners*	
NA		*DX*	*NA*		*DX*
KM8E	Gold Cup	IT9JLA	WD8MEV	Gold Cup	IT9JLA
WA3HUP	Second Place	I2KYM	KM8E	Second Place	VK3KS
WD8MEV	Third Place	EI7CW	WD4NKP	Third Place	I5UNA

Combined-Score Plaque Winners

NA—KM8E DX—IT9JLA

NA SSB	
KM8E	1018*
WA3HUP	940
WD8MEV	761*
WD4NKP	659*
VE7YL	330*
N2EVZ	325*
WA2NFY	250*
KA2ESQ	138*
WA8EBS	113*
K1IIF	104
NA3H	56
KU7F	53*
KAØOMX	36
W2EEO	24

NA CW	
WD8MEV	158*
KM8E	140*
WD4NKP	130*
VE7YL	83*
KAØOMX	77
N2EVZ	68*
KA8TYM	53*
WA2NFY	44*

DX SSB	
IT9JLA	1018*
I2KYM	945*
EI7CW	925*
DJ1TE	493
DL2SAP	390*
CT1YH	368*
J87CD	316*
HB9ACO	300*
ZL1ALF	275*
DF6UI	158*
GM4YMM	140*
VK3KS	120*
CP5LE	77
OK2BBI	38*
SMØHNV	15*

DX CW	
IT9JLA	278*
VK3KS	220*
I5UNA	124*
DF6UI	110*
I2KYM	100*
CT1YH	96*
OK2BBI	70*
DL2SAP	68*
JA1AEQ	25*

*denotes low-power multiplier
Check logs: F5RC, JA1AEQ (SSB), NY4H, VK2SU, WD8IKC

I5UNA—Lina Ramella is a first-rate CW operator with a well-equipped station.

VK3KS—Mavis Stafford collects another contest accolade to add to her other accomplishments: a 1st CW in the DX-YL Contest in 1980 and 1981, and a 3rd CW in 1983, 1984 and 1985.

In Training

Conducted By John Foss, W7KQW
Training Manager, ARRL

Motivated Instructors Motivate Students—Part 2

In October, we began our discussion on motivation as the key ingredient in conducting a successful Amateur Radio course. This month, we wrap up that subject.

Why Does a Student Enroll?

Consider the reasons why people sign up for ham courses, basic or upgrade. Granted that no two students have exactly the same reasons for enrolling. Nevertheless, certain reasons seem to appear more often than others. These are:

1) To learn ham radio (but for many students, this is far from the primary reason for enrolling).
2) To get a license or to upgrade (entirely apart from what one might learn).
3) To begin or enhance a career in electronics.
4) To get a raise on their present job.
5) They like the instructor (applies more to juniors than to adults).
6) They want the challenge.
7) They want to meet other people.
8) They're simply bored with life in general, and ham radio is, for them, at least, something new.

Seldom does only one of these motivating influences apply. Usually, the student enrolls for some combination of two or more of these reasons. Furthermore, the student does not always know precisely what motivates him/her to enroll. And often one is afraid to reveal the real reasons if they are known. Those motivated by reasons 5-8 probably won't complete the course, unless you reinforce the motivation heavily. Usually, you can do so by giving the student other, considerably more specific, reasons for completing the course.

Providing Additional Motivation

For instance, a student who enrolls primarily because he/she is bored and wants to meet other people often will drop out when the going gets rough. But that student will complete the course if he/she learns that the knowledge being acquired will help earn a promotion on the job. Or a retired person will learn that the knowledge will enliven his/her spare time by making possible an on-the-air discussion of a favorite subject with other hams worldwide who are knowledgeable in that subject.

In courses where learning the code or upgrading one's code speed is a prerequisite for completion, a different motivation might be involved. Many students will be dissuaded from dropping out by discovering that a knowledge of the code might save a life in an emergency situation (in which, for instance, code might be sent with a flashlight to alert the pilot of a passing airplane).

The Importance of Instructor Awareness

For this reason, you as the instructor must be aware of the student's real motivation for enrolling—not necessarily the stated motivation. If the real motivation is unsubstantial, you must act from the outset to reinforce the motivation with something more substantial. The first class session, during which each student states why he is taking the course, provides a starting place—but only that—for reinforcement. As mentioned, personal conversation with the individual student through the first month or so of the course usually provides good clues to the real motivation. More often than not, you will find the real motivation to be considerably other than the stated motivation, whether or not the student has tried to state honestly his reasons for enrolling. Remember, though, that your guess as to the true motivation might be wrong.

Emotion as a Motivating Force

Most students have given little or no thought to the question of basic motivation. They have chosen to enroll primarily on emotional grounds: because ham radio appears to be fun, because a friend recommended the course, because they're lonely. Nothing is *wrong* with such motivation. It must be reinforced, however, if it is to be strong enough to keep the student in the course through difficult and sometimes tedious study.

Many of today's most successful hams entered ham radio primarily or entirely for emotional reasons. They never had analyzed just what was involved in becoming a ham, or how much commitment the effort might require. Nevertheless, they found new reasons for continuing the course, and they did stick it out to the end. Now, with 10 years or more of hamming behind them, they're more than glad that they did so.

***Growth* Is the Goal**

Your course should be a learning experience for all involved—your students and yourself. That, after all, is what instructing is all about. The entire project fails unless you and your students grow. All of you *will* grow if you adopt the proper attitude and spend the required amount of time in preparation. Seldom will time spent on anything produce such beneficial results lasting for so long a time to so many people as will time spent on this project!

REGISTER YOUR COURSES: IT'S IMPORTANT!

During the past 11 months we've sent out several hundred blue course-registration sheets. Unfortunately, only slightly more than a hundred have been returned, duly filled out. Every week we receive a dozen or so inquiries from would-be hams who want to enroll in a ham course and get a license. Our referral system is being computerized and automated; still, we cannot refer potential students to courses we don't know exist!

Please be sure to register your courses with ARRL HQ as soon as you know the dates, time and location of the instruction. If you do so, we can match each applicant with the appropriate course nearest his location. No fee is charged for course registration. Also, we have operating aids and diploma forms for your graduates, but to send you these items we must know how many students will graduate and when the course will end. Course-registration sheets are available free from ARRL HQ.

NOVICE ROUNDUP'S COMING!

Don't forget the Novice Roundup, Jan 24-Feb 1. All licensed hams can participate, but only Novices and Technicians can win points. Instructors, this is the time for having fun on the bands with your former students—and cementing life-long friendships, to boot!

WE'RE CHANGING THE NAME OF OUR COLUMN!

Beginning in 1987, our column will be entitled Exploring Ham Radio. It will continue to address instructors' problems, but will also open to beginners new horizons in Amateur Radio. It will show them how new modes can enhance their fun with radio and how they can begin having fun with these new modes. And it will show instructors how to introduce students to these new modes of operation. More training material will appear in the *Field Forum* newsletter during 1987, too. Be sure to write us and tell us what *you* would like our columns to discuss.

Merry Christmas, Happy Hanukkah, to all the instructors and other loyal readers of this column—from W7KQW and all the ARRL Headquarters staff. Have a great 1987!

Strays

TRAVELING ABROAD?

☐ ARRL HQ is equipped to assist members in obtaining operating permits for most places in the world. In addition, we can provide you with information on Amateur Radio societies and repeaters in foreign countries. Instructions and information are available from the Regulatory Information Branch. Please enclose a business-size SASE, and don't forget to indicate which country you plan on visiting.—*N1CIX/JH1VRQ*

COAX INVENTOR DIES

☐ Lloyd Espenschied, AT&T Bell Labs staffer credited with coinventing coaxial cable with Herman Affel in 1929, passed away on June 21. He was 97. He held more than 100 patents in wire and radio communications systems, and was awarded the Medal of Honor by the Institute of Radio Engineers in 1940.

QST congratulates ...

☐ the following radio amateurs on 60 years as ARRL members:

- Donald Alexander, W8LK, of Dayton, Ohio
- Taylor Shreve, WØCXW, of Denver, Colorado
- Maynard Black, WØEDQ, of Neodesha, Kansas

Silent Keys

Administered By Nancy A. Slipski

It is with deep regret that we record the passing of these amateurs:

W1AOS, G. Roger Gladding, Chester, CT
W1ELT, Sidney G. Gray, Northboro, MA
WA1HNN, Bernard E. Reade, Putney, VT
W1HUC, Wallace F. Howlett, Groton, CT
W1KYP, Royal M. Proulx, Providence, RI
W1NVA, Richard T. Laffin, Ellsworth, ME
W1VHF, John H. Pattee, Marblehead, MA
W2AQJ, W. Manning Grim, Medford, NJ
W2DFF, Edward J. Moser, Hillside, NJ
W2FA, William E. Devereux, Ossining, NY
KA2GTT, Denis W. Blonde, Staten Island, NY
KA2JEC, Robert A. Harris, Ho-Ho-Kus, NJ
WA2LSB, Wallace L. Colross, West Caldwell, NJ
W2MIK, Irving A. Krause, Nutley, NJ
W2PSD, George A. Emery, Rotonda West, FL
W2RD, Eric H. Palmer, Jr, Middletown, NY
WB2SOZ, Irwin A. Wolman, Oceanside, NY
W2YQQ, E. De Forest Burdick, Terre Haute, IN
W3CFD, Wilven J. Hagerty, Honesdale, PA
W3DKX, Roger E. Cole, New Castle, DE
KA3HXG, Albert Resneck, Baltimore, MD
K3KNJ, Stanley J. Ugolick, Tamaqua, PA
W3LVI, John K. Young, Butler, PA
W3MCL, Wade H. Kesselring, New Freeport, PA
W3OML, Herwood N. Miller, Orwigsburg, PA
W3ZO, Henry B. Cowan, Parkesburg, PA
WB4AIL, S. Leo Mc Granaghan, Greensboro, NC
N4AND, Hoyle U. Scott, Loris, SC
WA4BEY, Roy C. Jones, Etowah, NC
N4BIS, Malcolm Nelson, Sebring, FL
W4BMX, Reynolds W. Collins, Fort Myers Beach, FL
KA4BNA, Daryl Hughes, Kingsport, TN
W4CFH, Robert E. Pendleton, Fort Lauderdale, FL
W4DB, Winston J. Jackson, Sr, Ashville, NC
W4DX, Benjamin L. Team, Camden, SC
KB4FHQ, Stephanie S. Toller, Oakland, FL
W4FMG, Theodore R. Jones, Christiansburg, VA
WA4HLJ, Chestley L. Yelton, Pell City, AL
W4IM, William O. Long, Jr, Miami Lakes, FL
W4IZC, Edward M. Thornbury, Richmond, VA
W4JUJ, Charles C. Justice, Richmond, VA
NO4K, Madison C. Greene, Buffalo, SC
KC4LK, Larry L. Schuster, Sr, Prestonsburg, KY
W4LL, A. A. "Augie" Brieske, Peachtree City, GA
W4MAQ, Seymour "Cy" Harris, Sunrise, FL
*W4OR, Russell C. N. Beck, Huntsville, AL
WD4PGG, Eldon F. Stanford, St Cloud, FL
WA4RMP, Will I. Hardy, Halls, TN
W4TOW, Adolph S. Sanchez, Eatonton, GA
WB4TRJ, Arnold Ustal, Orlando, FL
WA4TXS, James T. Heenan, Clarksville, TN
W4VL, William D. Pease, Windermere, FL
KA5EWG, Gordon M. Lambrecht, Jordan, AR
W5GHE, Leith E. Bodley, Claremore, OK
W5GRP, Augustus W. Peale, Jr, Natchez, MS
N5HVP, Fred H. Podrasky, Lake Charles, LA
W5IKW, Scott E. Mollenauer, Elsa, TX
N5ISW, John S. Amorin, Houston, TX
W5MAV, Jack Hover, Monroe, LA
KC5MV, Henry E. Zachmye, Alexandria, LA
W5SBJ, Clementin Wottle, Albuquerque, NM
W5SJF, John H. Waller, Sr, Baton Rouge, LA
WB5TFF, Homer R. Wise, Washington, MS
W5TKV, Nathan C. Lafleur, Opelousas, LA
W5UHV, E. F. Aymond, Jr, Dallas, TX
WB5UQI, Edwin Gjerstad, Ferriday, LA
WA5WKI, William R. Mc Gahan, Vernon, TX
W5WMQ, Anthony Velez, Natchez, MS
W6AC, J. West Little, Sr, San Francisco, CA
K6AN, Edward F. Peck, Walnut Creek, CA
W6ELW, William Temp Campbell, Felton, CA
KA6FTO, Allie W. Johnson, Escondido, CA
K6KQE, Robert L. Le Clert, Tracy, CA
K6QOK, Cyril D. Robinson, Fresno, CA
WA6WJS, William T. Acord, Long Beach, CA
W7AIB, Herman F. Helgesen, Port Angeles, WA
W7LXF, Everett B. Cobb, Reno, NV
W7QYV, Evert L. Pipkin, Everett, WA
W7SQM, Todd D. Long, Kingman, AZ
W8BL, Earl M. Osborne, Grayling, MI
W8CIL, Roy E. Lockwood, Charlevoix, MI
N8DBL, Thomas Chaney, Brecksville, OH
W8DP, Wally A. Seaman, Findlay, OH
WB8HMI, Richard L. Smith, Vermilion, OH
WA8IQB, Zoltan Gaal, Lorain, OH
*K8OQB, Alfred F. Nelson, Jr, Portage, MI
KA8RDR, Alfred J. Filmer, Canfield, OH
W8RKB, Marcel F. Cloutier, Dayton, OH
W9CYP, Marvin E. Wyatt, Mesa, AZ
N9ECB, Gerald F. Smith, Harker Heights, TX
W9HHB, Robert J. Mink, Dundee, IL
K9IIG, Bern W. Ferrill, Dallas City, IL
W9JBI, Chester F. Tucholski, Brookfield, WI
WB9KAR, Orlin Mikelson, Nelson, WI
W9RSZ, Fred K. Wilhelm, Belleville, IL
K9TBA, Eugene Palermo, Clintonville, WI
W9ZDG, Stanley J. Fic, Bensenville, IL
NØBN, Alan Lee Fleming, Blair, NE
NØFXP, Henry J. Luhrman, Jr, Bloomington, MN
WØGSW, James C. Evans, Joplin, MO
KØIEU, Harold O. Brent, Portis, KS
KXØJ, James L. Elms, Wichita, KS
WAØPCC, Harold F. Layher, Omaha, NE
WBØPEL, Robert A. Clark, Minneapolis, MN
WØRPR, Andrew C. Bohn, Fergus Falls, MN
WØZUH, Frank Stefonek, Jamestown, ND
VO1CM, Roy Moyles, Tor Bay, NF
VE3DK, Morley C. Patterson, Toronto, ON
VE3DO, Alfred J. Fletcher, Burlington, ON
VE3MOD, Robert C. Corbett, Sault Ste Marie, ON
VE3NS, Edgar Stephens, Hagersville, ON
VE3SS, Andrew Peter Kufluk, Agincourt, ON
VE4VJ, James Watt, Winnipeg, MB
VE7FX, Herbert A. Fowler, Langley, BC
VE7WD, Walt Daniel, Vancouver, BC
*DL1VQ, Kurt Ladwig, Tegernsee, Fed Rep of Germany

*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

December 1936

☐ Proud that *QST* has "come of age" (21 years), the Editor reminisces on our journal's earlier days, with unpaid League officers wrapping copies on the kitchen table and then carting 'em to the post office in Hiram Percy Maxim's car.

☐ Mailed vertically folded for many years, causing a near-permanent crease in the cover picture and numerous complaints from members who like to keep immaculate files, *QST* is now wrapped and mailed flat using some newer machinery.

☐ The Columbia Broadcasting System has announced the offer of a permanent award to that person who, through amateur radio, has contributed most usefully to the American people—whether in research, technical development or operating achievement. The annual award is named for CBS President William S. Paley.

☐ For a 20-watt basic low-power transmitter design, George Grammer chose receiving tubes (41s, 42s) as the most practical, considering performance and expense. Fourteen coils, some being modifications of commercial units, are needed to cover the five bands.

☐ VODAS? That's an acronym for "voice operated delayed amplification system" which W2ATQ has adapted from commercial practice for his 100-watt crystal controlled rig. The circuit protects the receiver by disabling it an instant before the transmitter comes on.

☐ W3BES had some difficulties with the much-touted 6L6 beam tube, but they disappeared when he switched to the glass version (6L6G) for his final amp. He added two more for the modulator.

☐ Some broadcast stations are updating their microphone equipment and disposing of earlier condenser mikes with preamps at rock-bottom prices. W1CBG describes how the units can be revamped easily for excellent service in ham gear.

☐ The new RCA 913 cathode ray tube has a one-inch screen and is low enough in price that most any ham can afford to build his own scope.

☐ The Spanish civil war has disrupted amateur radio in that portion of the world. Some EAs have mysteriously disappeared, and all sorts of rumors are rife. Portugal has shut down amateurs, simply to ensure complete neutrality. Better news from Colombia, where the congress adopted legislation recognizing amateur radio, after years of open hostility by bureaucrats in the government communications agency which refused to issue licenses.

☐ "DX Notes" in the operating news section is coming into its rightful place with a new title, "How's DX?" bylined by W1JPE.

25 Years Ago

December 1961

☐ The Editor notes the 60th anniversary of Marconi's successful transmission of the letter "S" across the Atlantic, and how that news event sparked a lot of interest in radio experimentation and eventually amateur radio. The Society of Newfoundland Radio Amateurs and the Radio Society of Great Britain have installed stations at both original locations and will commemorate the event—but not on quite as long a wavelength.

☐ While we bite our fingernails waiting for the first OSCAR launch, K2QBW continues his treatise on principles of space communications, with such subjects as tracking, Faraday rotation, atmospheric absorption and Doppler shift.

☐ W6 amateurs who have been providing liaison for the 319-mile annual motorboat race on the Sacramento River switched this year to 2 meters and repeaters, finding it much superior to previous 75-meter circuits.

☐ Using a transistor in the cathode keying circuit of your rig is not without problems, George Grammer points out; the open-key voltage becomes a major consideration which can be remedied by his solutions.

☐ The little "IMP" exciter in May 1960 *QST* helped quite a few hams get on sideband with minimum expense. Now W4IMP has come up with a transistorized version which, admittedly experimental, has some interesting ideas for those who prefer semiconductors to tubes.

☐ WA2RMA gets two voltages from the same basic power supply by switching from a full-wave center-tap circuit to a full-wave bridge hookup.

☐ The 1959 Geneva world radio conference found allocations in 4 to 27.5 Mc. too difficult for agreement, and so appointed a Panel of Experts to study the problem. The first meeting has now been held, and we breathe a sigh of relief in that no amateur bands were discussed; we are left to solve our own QRM!

☐ There's no theory—just practical facts in W4GEB's collection of basic transistor circuits in multiple applications around the ham shack.

☐ A combination band checker, field-strength meter and "monimatch" feature W1ICP's contribution this month to the progress of Novice amateurs.

☐ Be sure to write your Senator seeking his favorable vote on the bill to provide reciprocal-licensing privileges. —*W1RW*

Affiliated Clubs in Action

Conducted By Lee G. Hayford, AH2W
Club Program Manager, ARRL

Be an Audience

Nothing seems harder than to *really* listen. While driving to work one morning I tuned in to WGAB, a local AM broadcast station with a talk-show format. The announcer was doing everything possible to get someone to call the station and express an opinion. "Look," she said, "I've called teenagers lazy, irresponsible, stuck-up little brats; what will it take to get someone to call?"

We like to be listened to, but have trouble listening to others. Some hams suffer the same fate. Take the hams you always hear calling CQ on the band—or worse, calling CQ DX. Their voice gets edgy; you feel the frustration. What keeps you from answering the CQ? The signal is S9 plus. After a few minutes you leave the frequency, embarrassed that no one answers the CQ and wondering why you didn't either.

Where's the Audience?

Like the frustrated ham who always calls CQ and never takes the time to figure out why no one answers, Amateur Radio clubs sometime become bogged down in business meetings that lead to inactivity and, thus, apathy: the first step of decline. And yet many club members don't want their club to die. They frantically begin trying to recruit new members into the club hoping that "new blood" will halt the club's skid. Yet the club still falters. What's wrong?

Too Much QRM

When a person becomes ill, it's easy to focus on the problem and not the solution. The same thing happens to an organization—whether a club or business. Seems like clubs reel from a QSB in purpose and a rising QRM of criticism. I found a club pulling together because they focused on a community need instead of a disinterested membership. True, many community needs deserve attention, but the first reaction is paralysis—to do nothing. A club, however, should act like a high-performance receiver: filter community needs with selectivity and sensitivity.

A Club That Cares

The New River Valley ARC, cloaked beneath the long shadows of the Blue Ridge Mountains in Southwestern Virginia, is an example of one club that listens and therefore perceives community needs. Club members recently donated $1300 to the Chance For Life Committee in response to the large medical bills accrued by one club member's daughter. Michelle "Petie" Lineberry underwent a heart transplant operation in June because of cardiomyopathy, a condition where the heart muscle deteriorates. Although the Commonwealth of Virginia paid for the heart transplant operation, Michelle will have monthly medical bills between $750 and $1200 perhaps for the rest of her life.

"The money just keeps coming in; I've received another $40 from club members during tonight's meeting," said Bob Cecil, WA4LNT, New River Valley ARC club member. Bob also said that the Chance For Life Committee set a goal of $75,000 for this year and has already raised $25,000. "I think we'll make our goal," added Bob.

Bob has started a campaign through Amateur Radio to help with Michelle's huge medical expenses. "It's a long-term effort, not just a one-time donation," cautioned Bob. "Michelle will have large medical bills for a long time." For more information about the Chance For Life Committee, write to New River Valley ARC, Drawer 1127, Dublin, VA 24084.

Bob Cecil, WA4LNT (right) and Bill Lineberry, WB4TGT (center) present the New River Valley ARC's $1300 donation to a Chance For Life Committee representative. *(photo courtesy WA4LNT)*

TELL US WHAT YOUR CLUB IS DOING

I know many other clubs are also involved with community service, but don't publicize their efforts. Starting with January 1987 *QST*, the club column will be renamed Club Spectrum. League HQ looks for different kinds of clubs and what they are doing in the community. If your club is involved with public service, please send us your story and photographs. Are you listening?

Volunteer Examiner Information

from the ARRL/VEC, 225 Main St, Newington, CT 06111

Locating A Test Session: Sessions are advertised publicly via local Amateur Radio club newsletters and repeaters. A printout of sessions in any state and some overseas locations is available from ARRL HQ for an SASE. We list ARRL/VEC sessions plus those of other VECs who inform us of their testing schedules.

Registering to Take an ARRL-Coordinated Test: A completed FCC Form 610 application and a check or money order for the test fee, payable to the "ARRL/VEC," should be sent to the local
VE Team where you intend to be tested. "Walk-in" candidates may be allowed at some sessions, but registering in advance helps. If you write to a VE Team, send an SASE to cover postage and handling.

Test Fee: For ARRL-coordinated sessions held during calendar 1986, the test fee is $4.25, payable to "ARRL/VEC." This fee is to cover expenses incurred by administering examinations. A check or money order is preferred.

What to Bring to the Session: Bring the *original* plus a photocopy of your current FCC-issued Amateur Radio license, and the *original* plus a copy of any temporary upgrade certificate issued by a VE Team less than 1 year prior to the test date. (Duplicates of lost licenses are available through the FCC's Gettysburg office.) Also bring two forms of positive identification (including a photo ID, if possible) and at least two pencils and a pen. Scratch paper and answer sheets are provided.

Calculators: Nonprogrammable and "scientific" calculators are welcome. Pocket computers that store words are not allowed. Programmable calculators will be allowed only at the discretion of the VE Teams; be prepared to demonstrate that the memories have been cleared.

Exam Format: Written-element exams are four-choice multiple-answer tests. A score of 74% or more is required to pass a written element exam. Most VECs assemble tests based on the ARRL-issued multiple-choice question pool. Code test transmissions are played from an audio tape prepared by the ARRL/VEC with message contents similar in format to an Amateur Radio QSO. The code test is "fill-in-the-blank" style and may be passed by answering at least 7 out of 10 comprehension questions correctly *or* by copying on paper at least one continuous minute of perfect copy from the code test transmission. The ARRL/VEC does not require a code sending test, based on the FCC's recommendation. Code tests may be copied on typewriters, but prior arrangement with the VE Team is required so that other candidates are not disturbed.

ARRL/VEC Retest Policy: A candidate who fails a written element and who has exhausted all code test possibilities at a session may not be retested during that same session. If a convention or hamfest test session schedules multiple sittings, a failed candidate may request that the VE Team retest him or her at a subsequent sitting. Retesting is allowed *if* the VE Team has a *different* test version available and the VE Team determines that it has the time and resources available to accommodate the retest. A candidate for retest is required to pay another test fee, and may be required to complete a fresh application Form 610 at the Team's request.

Special Tests: Candidates who require special assistance, materials or equipment because of physical disability must attach to the application a signed and dated physician's statement certifying the nature of the disability, plus a letter explaining what special assistance, materials and/or equipment must be used to conduct the examination. (See Section 97.26[g] of the FCC Rules.) Be sure to notify the VE Team well in advance so that special arrangements can be made. If Braille or tape-recorded written tests or special-pitch code tapes are needed, contact the ARRL/VEC at least one month in advance to ensure materials will be available. Further questions about testing persons with disabilities should be addressed to the ARRL Program for the Disabled at HQ.

Public Service

Conducted By Michael R. Riley, KX1B
Public Service Manager, ARRL

The UNICEF "Round the World" Torch Relay

"Fantastic! Absolutely fantastic! We could not have done it without ham radio!" Those were the words of Martin Bentz, the UNICEF organizer for the Round the World Torch Run for Peace. For 22 hours on September 16-17, 38 Amateur Radio operators from Connecticut had guided an enthusiastic but disorganized torch relay operation from the United Nations in New York City through Connecticut and on into Rhode Island. Amateur Radio might have been the glue that kept the event going through initial difficulties. Skeptical at first, the Torch Run organizers had grown to rely upon our highly flexible communications. More importantly, however, they also relied upon our organizational skills, without which the first leg of the "Around the World" torch run would have run aground.

The Amateur Radio communications network set up for the event was impressive, especially considering that UNICEF organizers had given us only six days' warning! The Torch Run network was organized in three phases and involved eight Connecticut Amateur Radio clubs, nine 2-meter repeaters and more than $100,000 worth of volunteered Amateur Radio equipment.

The Torch Run operation involved three caravans, each with a motor home, two vans and a lead car. Each caravan had its cadre of runners drawn from 24 different countries. Most were United Nations employees who belonged to the UN Running Club. Several had been assigned to run by their country's embassies, and a handful were recognized world-class runners.

Bob Schetgen, KU7G, operates from his 1963 Corvette while watching for the Torch Run in Hartford's Bushnell Park. *(Rita Armour photos)*

Sharon Ramsharram (left) of the UNICEF Torch Run Relay discusses Torch Run operations in Hartford with Len Bourquin, KA1NVS, of the Newington Amateur Radio League.

Phase 1

Phase 1 encompassed the first day of the run from 10 AM to 6 PM. Torch runners started at the United Nations Building and progressed northeast through Connecticut's coastal towns and cities. Radio amateurs representing clubs in Stamford, Norwalk and Fairfield were with runners all the way on this first part of the trek. Amateur Radio clubs provided communications for celebrations in their respective communities as the Torch Run passed through.

Because the day's scheduled activities were physically spread out and depended upon the movement of the torch, communication between these points was essential. To cover all areas of action, net control WA1PDK would, at times, handle traffic on four repeaters at once during this initial phase of the run.

Problems quickly cropped up along the route. Although the motor homes were equipped with kitchen and sanitary facilities, no one had thought to fill the water tanks. Food was promised for the runners (and radio operators), but none was supplied. Commercial radios were provided to the caravan drivers, but they were inoperable. The frequencies were mismatched, antennas were not supplied and those radios that did work had insufficient range to be of use. Drivers were not provided, and the relay runners were expected to double as drivers between their runs. No provision was made to dispose of trash, which quickly filled the vehicles. Fortunately, the amateur operators had anticipated that the motor home roofs would be fiberglass and had brought metallic bases for mag-mount antennas.

Nevertheless there was a contagious enthusiasm shared by this international group of young men and women. In their 20s and 30s, these young runners seemed to be even younger than their ages. They applauded each other as each ran their relay and shouted encouragement as teenagers to seniors from each community joined in the run. Each torch runner saw to it that everyone who joined in shared in carrying the Peace Torch.

One caravan of Torch Run officials branched off and proceeded to Hartford. Enroute, the officials realized no torch had been provided for the Hartford celebration and no one would be ready to run the relay around Bushnell Park.

W1LUH, with the Hartford-bound group, made contact with WA1VUU in the main caravan near Stamford. Organizer Martin Bentz, however, was in the lead car behind the torch runner and out of reach by radio. K3ZJJ, with a mobile radio in his car, picked up Bentz from the lead vehicle and made contact with W1LUH and the Torch Run officials waiting at Bushnell Park. After much conversation, a program was decided upon, a facility for the officials to change into running clothes was located and instructions were passed along for fabricating a torch from hardware supplies. All of this was accomplished literally "on the run" as Bentz dashed back and forth between K3ZJJ and the lead car to confer with his associates. The celebration in Hartford was ultimately delayed thirty minutes while an official searched for fuel to burn in a torch fashioned from a large funnel and a towel. Had State officials not been advised by the radio operators, they would have left the park.

The torch run continued steadily on through Stamford and Norwalk amid high-spirited celebrations that included a band playing a new "Peace Anthem," a children's choir singing "We Are The World" and the release of hundreds of helium-filled balloons. Confusion turned to chaos as the torch relay approached the 50-mile exchange point in Fairfield. Caravan B had been twice notified via radio of the location of the exchange point and was kept continually informed of the estimated time of arrival. Nevertheless, when the torch arrived at the exchange point—the Fairfield Town Green—Caravan B and its runners were two blocks away! As the torch runner approached, a Fairfield town official stepped proudly forward with a proclamation. The runner, not seeing his relief, paused not a step, but strode briskly past the astonished crowd that had gathered and disappeared down the wrong route with half of Caravan A trailing. Meanwhile a portion of Caravan B with its own torch runner was prompted to start down an entirely different route! Luck was with us. N1DTI was aboard the lead car following the second runner, and K3ZJJ took chase after the other splinter group. After 30 minutes of confusion, amid much waving of the arms in the air by run officials, N1DTI and K3ZJJ were able to

rejoin the splinter groups—after a wild chase through the streets of Bridgeport with the aid of a State Police escort. At that point, matters finally settled down.

Phase 2

As night fell, Phase 2 began with calm efficiency in contrast with the confused shake down of the day. Phase 2 spanned the 50-mile route from Fairfield to Wesleyan University gymnasium, the transfer point, and ran from 6 PM to midnight.

Amateur Radio operators from the West Haven Amateur Repeater Association worked through this phase with excellent net operation and discipline. Net control N1DCS carefully plotted the progress of both caravans on a detailed map. The estimated time of arrival of either caravan could be accurately determined for key points on the route.

Impromptu celebrations started along the route. Kids at a ball field playing "under the lights" broke up their game to greet the torch runner. And everywhere people of all ages joined in the run. Phase 2 continued smoothly until the very last runner began her relay. The runner, a tall blond from Norway, had just dismounted from the motor home to begin her run when the driver ran over her foot. Although in considerable pain, she ran the remaining five miles to the Phase 3 transfer point, averaging 7½-minute miles! After she had passed her torch onward to the Phase 3 relief runner, K3ZJJ recognized that she was shivering with pain, and medical assistance from the EIM van was summoned.

Phase 3

Phase 3 began at 12:20 AM Wednesday and would take the Torch Run from Wesleyan University in Middletown to a check point near East Putnam where Rhode Island Section Manager WB1FDY and his group were scheduled to take over the communication reins.

By now, the caravan was deep into early morning on a clear moonlit night with the dancing flame from the torch lighting the way of a solitary runner down deserted country roads. But then, as one might expect, the motor home broke down. If KA1HTX had not been located at the end of the caravan in his car, the procession would have continued blithely onward, leaving the stricken vehicle stranded. As it was, KA1HTX arranged for a tow truck, repairs and the timely return of the motor home to the caravan.

Suddenly, at about 3 AM, a high school track team appeared out of the night followed by The Silk City Striders, an adult running group from Manchester, Connecticut. The enthusiasm of these groups in the dead of night was hard to believe, and each runner was rewarded with a turn to carry the torch.

As the Torch Run pulled into Putnam at 7:30 AM, it was greeted by an early morning celebration. It then moved onward to the transfer point where the tired Connecticut operators passed control of radio communication to the Rhode Islanders.

Almost everyone involved had positive comments on the Torch Run operation. Bob Namara, KR1J, president of the Pioneer Valley Radio Association, said, "We were privileged to be a part of it. We had the same feeling for our role in the Olympic torch run." Caesar Rondina, N1DCS, added, "This is an example of what can be accomplished through multiple club cooperation. Much can be accomplished by working together."

Dick Pechie, KB1H, president of the Eastern Connecticut Amateur Radio Association, summed it up this way: "I had the opportunity to ride in the runner's motor van throughout the night. What an exciting ride! Being involved in an international effort was interesting to say the least. The ride, though eight hours long, was quick to pass. I was able to chat with runners from countries such as Kenya, USSR, Austria and Canada. There was as much interest by the runners in ham radio as there was interest by me in why each one had chosen to run or what their jobs were at the United Nations. Through 21 years of being associated in this hobby, the evening spent doing this public service ranks high in the all time thrills to me. I am not ashamed to say that I got goosebumps when I saw Connecticut residents meet the torch runner at 3 AM just to be able to run alongside the light of hope for world peace."

The enthusiasm of these young men and women Torch Run participants from different countries and cultures was appealing. They all seemed to share the confirmed belief that there are simple, happy solutions to the problems of a difficult, troubled and often brutal world, and simply by running a lighted torch around the world, somehow the world would be made better. As the torch left Connecticut in the hands of a small, young girl from Nigeria and slowly disappeared in the distance, it struck us that such simple faith could not be all that bad.—*John T. Ronan, K3ZJJ, ARRL Section Manager, Connecticut*

SPOTLIGHT ON SERVICE

Operation Sail 1986

Operation Sail orchestrated the Parade of Tall Ships and the International Naval Review July 3-4, 1986 in New York Harbor. This event was held in honor of the 100th anniversary of the Statue of Liberty dedication.

A communications challenge was met by the Operation Sail 1986 organization. A complex network set up under the guidance of the Technical Service/Communications Committee provided all organizations involved in Operation Sail intergroup communication, press and public information and a message-delivery facility.

Several companies provided equipment and services for the communications network. Several layers of the network were developed to handle a variety of situations, and the Radio Communication Subcommittee was instrumental in pulling all the pieces together. Amateur Radio was an integral part.

The Amateur Radio Subcommittee, in addition to invaluable participation in overall Technical Service activities, engineered an Amateur Radio network on the 2-meter band to provide supplementary means of radio communication. Amateurs operated the base stations and controlled the entire network of eight UHF radio base stations, two VHF marine base stations, 40 UHF hand-held radios, 12 VHF marine hand-held radios and the ham radio stations.

Throughout the weekend, the team of nearly 60 Amateur Radio operators worked with other communications services. The skilled operating techniques of the amateurs proved to be a useful example to all participants in communications for Operation Sail 1986.—*Michael F. Shapiro, Chairman, Technical Services/Communications Committee, with assistance from Richard Brooks, N2KO, Chairman, Amateur Radio Operations*

IN SERVICE...

☐ Cape Cod, MA—Sep 19-21. "Autumn Escape Bike Trek" saw 200 cyclists pedaling from Plymouth to Provincetown over a three-day period. Cape Cod radio amateurs were set up at checkpoints along the route and handled safety-related messages.—*Harry D. Azadian, W1ODO, President and Director, Cape Cod and Islands Amateur Radio Association*

☐ Rochester, MN—Sep 21. Heavy rain, starting late on Sep 20, caused a flood threat early Sunday morning. Radio amateurs were called to monitor flood gauges on the Zumbro River, which runs through Rochester. A few hours later, the threat was upgraded to a warning, and nearly 200 people were relocated to emergency shelters. Nineteen radio amateurs continued to help the Red Cross and county-wide emergency services through the weekend.—*J. D. Fishburn, KØTS, EC, Olmsted County*

☐ Bartlesville, OK—Sep 20-21. The Bartlesville Amateur Radio Club supported the Bicycle Classic that included time trials, lap races and a road race. About 100 riders from a five-state area participated. Radio amateurs, set up along the course, reported accidents and minor incidents to the Red Cross and helped race officials keep track of riders' progress.—*Michael S. Brannan, KA5OXA*

☐ Wheeling, WV—Sep 24. N8GHQ witnessed a car accident as he was driving down a hill near Oblebay Park. The car just in front lost control and flipped on its roof, blocking the road. N8GHQ called for help on the KD8GL repeater and was answered by N8HRB who gave him the repeater autopatch emergency number for the police department. The police responded immediately. In the next few minutes, N8GHQ assisted the slightly injured and dazed driver of the flipped car.—*Ralph A. McDonough, K8AN, DEC, District 10, Ohio*

☐ Lake and Porter Counties, IN—Sep 26. Large storms, bringing damaging winds and heavy rain, prompted the ARES Severe Weather Net to activate at 1:30 PM. Stations checking in from around the area reported flooding streets, dangerous lightning and pea-sized hail. A large tree fell, blocking a main street into Griffith, and radio amateurs notified the state police promptly. Severe weather conditions cleared around 3 PM, and the weather net was secured.—*Lucille Schendera, N9DTG, DEC, District 1, Indiana*

☐ Indianapolis, IN—Sep 26. Human-powered vehicles raced on the 2½-mile Indianapolis Motor Speedway. Members of the Indianapolis Red Cross Amateur Radio Club assisted throughout the event by tracking vehicle progress and reporting any trouble along the race track.—*Bruce Woodward, W9UMH, Assistant Section Manager, Indiana*

☐ Los Angeles, CA—Sep 27-28. The first Angeles Crest 100-Mile Endurance Run sent runners on a day-and-night trek that covered 15 miles of road and 85 miles of mountain trails in the Angeles National Forest. The route gained 19,100 feet and lost 24,230 feet before ending at the Rose Bowl in Pasadena.

Nearly 60 radio amateurs followed all runner positions throughout the race. Nineteen checkpoints had Amateur Radio stations, and liaison was maintained with the Sierra Madre Search and Rescue headquarters.—*Ell Fullmer, WB6MKA, DEC NE District, Los Angeles*

☐ Gainesville, FL—Oct 10. The annual University of Florida Homecoming parade was held on a rainy day, but that didn't stop the parade goers or the hams. Members of the Gainesville Amateur Radio Society and the Gator Amateur Radio Club provided parade officials with tactical communications.—*Kenneth T. Merrill, KJ4PH, EC Alachua County*

Field Organization Reports September 1986

ARRL Section Emergency Coordinator Reports

Twenty-eight SEC reports were received, denoting a total ARES membership of 14,148. Sections reporting were: AB, GA, IA, LAX, MDC, MI, MN, MO, NNJ, NH, NLI, NFL, NV, OH, ONT, PAC, SCV, SD, SDG, SFL, SK, UT, VA, WA, WMA, WPA, WNY, WV.

Transcontinental Corps

Area	Successful Functions	% Successful	TCC Function Traffic	Total Traffic
Cycle Two				
TCC Eastern	101	84.0	452	946
TCC Central	74	82.0	197	418
TCC Pacific	108	90.0	452	835
Summary	283	85.3	1101	2199
Cycle Four				
TCC Eastern*	220	90.9	963	1935
TCC Central	48	80.0	195	435
TCC Pacific	106	95.0	124	831
Summary	374	88.6	1282	3001

*TCC Eastern operates both cycles 3 and 4.
TCC Certificates Issued: VE3GSQ

TCC Roster

N1BHH W1CE N1DMU W1EFW K1EIC K1EIR WA1FCD K1GRP W1ISO KN1K W1NJM KT1Q W1QYY KA1T KW1U W2CS WB2EAG WA2FJJ W2FR NN2H N2IC W2GKZ NN2H KB2HM W2LWB W2RQ N2XJ W3ATQ N3COY N3DPF KK3F WB3GZU W3PQ KQ3T KB3UD AA4AT WA4CCK N4EXQ WA2FJJ WD4FTK N4GHI WB4HML WA4JDH W4JL WA4JTE WN4KKN KA4MZY WB4PNY WB4UHC W4UQ N5AMK N5BB N5BT W5CTZ N5DFO K5GM AE5I W5JOV AJ5K W5KLV KD5KQ KD5RC K5OAF KA5SPT ND5T N5TC W5TFB K5TL W5TNT W5VMP KB5W NQ5W WB5YDD KV5X K4ZK KA8APP KU6D N8EOT W8INH K8LL WF8O K8UYK W8VZT KA7CPT N7DRP W7EP KB7FE W7GHT NN7H W7JMH KR7L W7LG W7LYA KF7R W7TGU W7VSE WD8LDY W8PMJ W8QHB N8XX WB8YDZ W8YP W9EHS W9FC W9JUJ KA9RII WB9UYU K0DJ KA0EPY K0EZ KJ0G AD0A W0HI N0IA WA0OYI KS0U VE3AWE VE3DCX VE3FAS VE3GSQ VE6CHK

National Traffic System

Net	Sess	Tfc	Avg	Rate	% Rep	% Rep to Area
Cycle Two						
Area Nets						
EAN	30	800	26.10	.570	91.7	
CAN	30	634	21.10	.493	100.0	
PAN*	60	557	9.94	.441	92.7	
Region Nets						
1RN	60	750	12.50	.480	95.0	
2RN	56	261	4.70	.327	72.3	
3RN	30	195	6.50	.500	97.0	
4RN	60	417	6.95	.276	76.9	
RN5	60	641	10.68	.512	86.0	100.0
RN6	47	198	4.21	.266	100.0	91.6
RN7	60	558	9.30	.456	90.7	93.3
8RN	59	223	3.78	.230	88.0	
9RN	60	231	4.00	.256	84.0	100.0
ECN						
TEN	60	337	5.60	.309	79.4	100.0
TWN	58	283	4.88	.380	71.4	93.3
TCC						
TCC Eastern	101	946				
TCC Central	74	418				
TCC Pacific	108	835				
Cycle Three						
Area Net						
EAN	30	420	14.0	.761	89.4	
Region Net						
1RN	30	116	3.87	.370	78.0	93.3
2RN	29	222	7.70	.453	92.4	80.0
3RN	20	12	0.60	.009	56.7	100.0
4RN						98.6
8RN						76.6
ECN						90.0
Cycle Four						
Area Nets						
EAN	30	1557	51.90	1.520	98.3	
CAN	30	807	26.90	.842	99.4	
PAN	29	774	25.80	.628	95.4	
Region Nets						
1RN						100.0
2RN	60	314	5.20	.459	87.0	96.6
3RN	59	182	3.08	.288	91.4	96.6
4RN	60	574	9.57	.380	100.0	96.6
RN5	60	647	10.78	.538	100.0	100.0
RN6	60	434	6.20	.600	94.0	91.6
RN7	58	343	6.00	.628	84.8	95.0
8RN	54	299	5.54	.325	87.0	100.0
9RN	60	479	7.90	.500	93.3	100.0
TEN	60	274	4.60	.369	70.6	98.3
ECN						100.0
TWN	60	318	5.30	.415	95.4	90.0
TCC						
TCC Eastern	220	1935				
TCC Central	48	435				
TCC Pacific	106	631				

*PAN operates both cycles one and two.
TCC functions not counted as net sessions.

ARRL Section Traffic Managers reporting: AL, AR, AZ, DE, GA, IA, IL, IN, KY, MDC, ME, MI, MN, MO, NC, NE, NH, NLI, NNJ, NTX, OH, OK, ONT, OR, ORG, SB, SC, SDG, SJV, SF, SFL, STX, SV, TN, UT, VA, VT, WA, WV, WI, WMA, WNY, WPA.

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.

156
N4GHI

152
KB4WT

147
WB2OWO

146
N3EMD

140
KK3F

136
KD7ME
W7LRB

135
KA1GWE
WB2IDS

133
K4NLK

132
KK1A

129
N4EXQ

128
WB1GXZ
W8FPA

123
KA9FFO

122
WX4H

121
NG1A

119
WA4QXT

117
NQ2H

115
W0IKT
AA4AT

113
WF8O

112
K4ZK
WB2VUK
VE4LB

111
W3FA
N9BDL

110
N3EGF
WB6DOB
WA4PFK
WB1HIH

109
N2XJ
KT1Q
N7BHL

107
WB2EAG
W9YCV
N3DPF

106
KA2MYJ
W9JUJ
K0SI
AG9G
NC9T
K4JST
WA2FJJ
W2MTA
KW1U

105
W0OYH
KD2UV

104
WD4KBW
WA4JDH
AA4MP
KA2UBD
KN1K

103
K5MXQ
K4JHF

N1DMU

102
N4JRE
NN2H
WB8JGW

101
WD8RHU

100
WA1FCD
N8EFB

99
KA1MDM
W9CBE

98
K0ERM
WD5GKH
W7VSE

97
W4ANK
K0ZBJ
KC4VK
WA2SPL
WB8KWC

96
KA0EPY
W4CKS

95
WB4HRR

94
KA2DQA
NJ8R

93
K2ZVI
KA4TLC

92
K6UYK
KD0CL
WB8RFB

91
AC5Z
KV5X

KJ9L
ND2S
AA4UO

90
WA6ZUD
W9DM

89
K3RXK
K0GP
WA2JBO
VE3DPO
VE3WV
N1AKS
KB7FE
KA4MTX
WB1CBP
WB4WII
NE2W

88
N1CPX
VE4AJE
KB1AF

87
W5CTZ
KI4YV
WA4CCK
WB2RBA
WB8SIW
KA8KHS
KA1MKJ

86
W3YVQ
W5VMP
N8EVC
NR8C

85
W4PIM
NK8B
N8AEH

84
W6INH
KT9I
KA9RII

W9EHS
W7GHT
N8HBI

83
WA4EIC
K5OAF
KA4HHE
WD8KQC

82
W2RRX
WB5EPA
N6CVF
KC2TF
W2RRX
N0BKE
KA4BCM
N1BGW
KF8J
KQ3T

81
WA0TFC
W9FZW
N4KRA/T
W4JLS

80
AA4HT
KN7U
WB2IKL

79
WB6QBZ
KA1LMR
AE1T
K3JL
KA5SPT
VE4RO
WD8OUO
KD8WI

78
WA1JVV
N4KSO
NT4S
K2YAI

77
W2PKY
KA1KTH
K9CNP
W1KK

76
WA9VLC

N7GGJ
KU2N

75
WA4RUE
N0CLS
WD0GUF
KA8TNT

74
WB6BZQ
NN4I
N7BGW
VE2FMQ
N1CVE
K8JDI
KF4FG

73
VE3GT
N1EDD
KB4LB
AI0O
W9NXG
NF8B
W7LNE

72
KC3Y
AJ5K
VE3CYR
W0FRC
KJ9J
NJ4L
KA7AID
K4MOG
N2ABA

71
WA6QCA
N8FWA

70
W5KLV
WA6WJZ
AA4JV
WB2NLU
WA1TBY
NW7K
KA1JXH

69
WB2QMP
KE8BE

68
N8HYM

N4PL
NG2T
WA4RNP
KP4DJ
K4BAI

67
WB5YDD
VE4IX
WD4ALY

66
WA3GYW
KA4GUS
KA4YHS
KA0KPY
W1TN
N0GCC
WB9PFZ
K0PCK
WG5S

65
KB4BZA
WD4PPG
WB2MCO
W0MYM
N2FKA
ND0N
NT0C
KB4JPN
W7JMH
WB8SYA
KA8CPS
WD8KBW
KC8UZ

64
KA4FZI
K2VX
WB5FQU
VE3POJ
VE3GSQ
KA0SBY
K5EVI
KA1LHI
KD8KU
NM8N

63
K2KBT
K9ZBM
W4HON
W2ZOJ

62
N2DXP
KA0SLD
N2EQM
N2DXP
K4VWK
NT8G
K8ND

61
WA2VJL
N8AWH
KB9LT
W0OUD
AB0Y
AA4GL
W2FR

60
WB5J
N1DDC
WA8DHB
WD8QXT

58
VE2EDO
KA5QYV/T
N4MMM/T
N2EVG/T

52
KA7RFD/T

45
KA9CTW/T

44
KB2ATJ/T
W1YOL/T

42
KB5ADE/T
KA2SJG/N
WA8DYS/T

40
WB4HXS/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	637	877	1202	73	2789
W1WP	940	44	877	4	1865
WB9YPY	0	728	80	462	1268
N4EXQ	399	204	506	65	1174
N4GHI	62	457	429	50	998
W3VR	301	271	320	22	914
KN1K	0	372	298	45	720
W9JUJ	0	352	350	0	702
WA4JDH	1	329	359	3	692
WX4H	0	320	260	13	593
WF8O	1	306	274	12	593
KW1U	0	309	253	5	567
N1CPX	—	—	—	—	533
KA1MDM	1	271	216	40	528
WB1GXZ	13	212	271	22	518
KK3F	0	255	215	40	510
KA7MUL	0	242	264	3	509

BPL for 100 or more originations plus deliveries:
WB2IDS 150

Independent Nets

Net Name	Sess	Tfc	Check-Ins
Amateur Radio Telegraph Society	36	243	160
Central Gulf Coast Hurricane Net	30	168	3220
Early Bird Net	30	719	301
Empire Slow Speed Net	29	83	376
Golden Bear Amateur Radio Net	30	124	1687
Hit and Bounce Net	30	218	517
IMRA	26	809	1545
Mission Trail Net	30	87	932
NYSPTEN	30	65	579
Southwest Traffic Net	30	182	1388
20ISSBN	26	270	702
75 Meter Interstate SB Net	30	238	1080
7290 Traffic Net	48	679	2383

Rules, 40th January VHF Sweepstakes

January 10-12, 1987 will mark the 40th running of the ARRL VHF Sweepstakes. The VHF/UHF bands will come out of their winter doldrums and spring to life. Note that the QSO point values are the same as last year, and that single-band entrants may count their all-band score for their ARRL-affiliated club.

Official entry forms are available from ARRL HQ for a business-size SASE with one unit of First Class postage. These forms will simplify the task of calculating your score and make our job of compiling the results much easier.

Also, don't forget the Affiliated Club Competition available to members of ARRL-affiliated clubs in the VHF SS. Check with your club secretary to see if your club is going to make an aggregate entry. If your club is not ARRL affiliated, contact the ARRL Club Services Department to find out how to join the ranks. **Club secretaries note:** See January *QST* for rules governing affiliated-club competition. *Each affiliated club wishing to enter the club competition must submit a current club roster showing the calls of all club members eligible to submit their scores for the club.* Now is the time to start planning for successful participation in the VHF SS.

Good luck!

Scoring Example

Band (MHz)	QSOs	QSO Points	Grid Squares
50	25 (×1)	25	10
144	40 (×1)	40	20
220	10 (×2)	20	7
432	15 (×2)	30	10
902	36 (×4)	144	9
1296	5 (×4)	20	3
2300+	1 (×8)	8	1
Totals:	132	287	60

Final Score = (QSO Points) × (Total no. Grid Squares) 17,220 = 287 × 60

Rules

1) **Object:** To work as many amateur stations in as many 2° × 1° grid squares as possible using authorized amateur frequencies above 50 MHz. Foreign stations work W/VE amateurs only.

2) **Contest Period:** Begins 1900 UTC Saturday, January 10, and ends 0400 UTC Monday, January 12.

3) **Categories:**

(A) *Single Operator, Single Band*—one person performs all transmitting, receiving, spotting and logging functions. All QSOs for score listing in *QST* must be made on one band. Single-band entries may, however, submit QSOs made on other bands for credit in ARRL-affiliated club competition.

(B) *Single Operator, All Band*—one person performs all transmitting, receiving, spotting and logging functions.

(C) *Multioperator*—those obtaining any form of assistance, such as the use of relief operators, loggers or spotting nets. All equipment (including antennas) must be located within a 300-meter-diameter circle.

4) **Exchange:** Grid square locator (see January 1983 *QST*, page 49). Example: W1AW in Newington, CT would send FN31. Exchange of signal reports is optional.

5) **Scoring:**

(A) *QSO Points*—count one point for complete two-way QSOs on 50/144 MHz; two points on 220/432 MHz; four points on 902/1296 MHz; and 8 points on 2.3 GHz or higher.

(B) *Multiplier*—total number of different grid squares worked per band during the contest. Each different 2° × 1° grid square counts as one multiplier on each band it is worked.

(C) *Final Score*—multiply the total number of QSO points by the total number of multipliers. See scoring example.

6) **Use of FM:**

(A) *Retransmitting either or both stations, or use of repeater frequencies, is not permitted.* This prohibits use of all repeater frequencies for contest QSOs. Contest entrants may not transmit on repeaters or repeater frequencies on 2 meters for the purpose of soliciting contacts.

(B) *Use of the national simplex frequency, 146.52 MHz, or immediate adjacent guard frequencies, is prohibited.* Contest entrants may not transmit on 146.52 for the purpose of making or soliciting QSOs. The intent of this rule is to protect the national simplex frequency from contest monopolization. There are no restrictions on the use of 223.50 MHz.

(C) *Only recognized simplex frequencies may be used,* such as 144.90 to 145.00; 146.49, .55, .58; and 147.42, .45, .48, .51, .54 and .57 MHz on the 2-meter band. Local-option simplex channels and frequencies adjacent to the above that do not violate the intent of (A) or (B) above or the spirit and intent of the band plans as recommended in the *ARRL Repeater Directory* may be used for contest purposes.

7) **Miscellaneous:**

(A) *Stations may be worked for credit only once per band from any given grid square, regardless of mode.* This does not prohibit working a station from more than one grid square with the same call sign. Such a roving station, however, must submit a separate entry for each grid square from which operation takes place. In this situation, the entrant may opt to waive rule 7 (C) and use a single different call sign from each different grid square. Crossband QSOs do not count. Aeronautical mobile contacts do not count.

(B) *Partial QSOs do not count.* Both calls, the full exchange and acknowledgment must be sent and received.

(C) A transmitter used to contact one or more stations may not be used subsequently under any other call during the contest period (with the exception of family stations where more than one call is assigned to one location by FCC/DOC). The intent of this rule is to accommodate family members who must share a rig, not to manufacture artificial contacts.

(D) *Only one signal per band* (6, 2, 1¼, etc) at any given time is permitted, regardless of mode.

(E) While no minimum distance is specified for contacts, equipment should be capable of real communications (ie, able to communicate over at least 1 km).

(F) *Multioperator stations* may not include QSOs with their own operators except on frequencies higher than 2.3 GHz. Even then, a complete, different station (transmitter, receiver and antenna) must exist for each QSO made under these conditions.

(G) A station located *precisely* on a dividing line between grid squares must select only one as the location for exchange purposes. A different grid-square multiplier cannot be given out without moving the complete station (including antennas) at least 100 meters.

(H) *Above 300 GHz,* contacts are permitted for contest credit only between licensed amateurs of Technician class or higher using coherent radiation on transmission (eg, laser) and employing at least one stage of electronic detection on receive.

8) **Reporting:**

(A) *Entries must be postmarked no later than 30 days after the end of the contest.* Use ARRL VHF SS forms or a reasonable facsimile.

(B) *Logs* must indicate time in UTC, bands, calls and complete exchanges. Multipliers should be numbered clearly in the log the first time they are worked. Entries with more than 200 QSOs total must include cross-check sheets (dupe sheets).

9) **Awards:**

(A) *Single Operator*

1) Top single-operator score in each ARRL Section.

2) Top single-operator on each band (50, 144, 220, 432, 902 and 1296-and-up categories) in each ARRL Section where significant effort or competition is evidenced. (Note: Since the highest score per band will be the award winner for that band, an entrant may win a certificate with additional single-band achievement stickers. For example, if WBØTEM has the highest single-operator all-band score in the Iowa Section and his 50- and 220-MHz scores are higher than any other IA single op's, he will earn a certificate for being the highest single-operator Section leader and endorsement stickers for 50 and 220 MHz.

(B) *Top multioperator score in each ARRL Section where significant effort or competition is evidenced.* Multioperator entries are not eligible for single-band awards.

10) **Club Competition:** *ARRL-affiliated clubs* compete for gavels on three levels: unlimited, medium and local. Details are in January *QST*.

11) **Conditions of entry:**

(A) Each entrant agrees to be bound by the provisions, as well as the intent, of this announcement, the regulations of his or her licensing authority and the decisions of the ARRL Awards Committee.

(B) Disqualifications: For excess duplicates and call sign/exchange errors. See January *QST* for complete details.

1987 ARRL International DX Contest

To the serious DX contester and the casual country hunter alike, the third full weekend in February (21-22, for CW) and the first full weekend in March (7-8 for phone) bring the challenge and excitement of the ARRL International DX Contest. For these two weekends each year, the bands spring to life with DX aplenty. An operator can choose to go all out in the competition for a top score, or leisurely chase those last few countries needed to finish the requirements for the 5-Band DXCC award.

If you participated in the 1986 ARRL International DX Contest, you are that much ahead of the pack. The rules for the '87 contest are exactly the same as in '86.

Use of official entry forms makes the post-contest paperwork a snap for you, and makes the job of compiling the results a lot easier at our end. To receive your set of entry forms, send a self-addressed, stamped, business-size envelope (for W/VE amateurs) or a self-addressed envelope and 2 IRCs (for DX amateurs) to ARRL HQ. Mail early and avoid the last-minute delay.

Complete contest rules are listed below. If you have any questions on any aspect of this contest, get in touch with us at HQ, and we'll do our best to help you out. Good DX!

Rules

1) **Eligibility:** Amateurs worldwide.

2) **Object:** W/VE amateurs work as many amateur stations in as many DXCC countries of the world as possible on 1.8 to 30 MHz, *excluding* the 10, 18 and 24-MHz bands. Foreign amateurs work as many W/VE stations in as many states and provinces as possible.

3) **Dates:**

(A) **CW**—Third full weekend in February (February 21-22, 1987).

(B) **Phone**—First full weekend in March (March 7-8, 1987).

4) **Contest Period:** 48 hours each mode (separate contests). Starts 0000 UTC Saturday; ends 2400 UTC Sunday.

5) **Categories:**

(A) **Single Operator** — One person performs all operating and logging functions. Use of spotting nets (operator arrangements involving assistance through DX-alerting nets, etc) is not permitted. Single-operator stations are allowed only one transmitted signal at any given time. (Note: This does not permit multiple single-band entries from the same station.)

(1) *All band.*

(2) *Single band* (one only). Single-band entrants who make contacts on other bands should submit logs for checking purposes.

(B) **Multioperator**—More than one person operates, checks for duplicates, keeps the log, etc.

(1) *Single transmitter.* One transmitted signal at any given time. Once the station has begun operation on a given band, it must remain on that band for at least 10 minutes, listening time counts as operating time. Multioperator, single-transmitter stations must keep a single, chronological log for the entire contest period. Violation of the 10-minute rule or improper logging will result in an entrant's reclassification to the unlimited multi-multi class (see below).

(2) *Two transmitter.* A maximum of two transmitted signals at any given time, on different bands. Once either station has begun operation on a given band, it must remain on that band for at least 10 minutes, listening time counts as operating time. Both transmitters may work any and all stations; the second transmitter is *not* limited to working new multipliers only. Each of the two transmitters must keep a separate, chronological log for the entire contest period. Violation of the 10-minute rule by either or both transmitters or improper logging will result in an entrant's reclassification to the unlimited multi-multi class (see below).

(3) *Unlimited.* A maximum of one transmitted signal per band at any given time. Unlimited multi-multi stations must keep a separate, chronological log for each band for the entire contest period.

(C) **QRP**—Single operator, all band only. QRP is defined as 5-W output or less.

6) **Contest Exchange:**

(A) W/VE stations (includes 48 contiguous United States and does not include Canadian islands of St Paul and Sable) send signal report and state or province.

(B) DX stations send signal report and power (three-digit number indicating approximate transmitter input power).

7) **Scoring:**

(A) **QSO Points**—W/VE stations count three points per DX QSO. Foreign stations count three points per W/VE QSO.

(B) **Multiplier**—W/VE stations: sum of DXCC countries (except US and Canada) worked per band. Foreign stations: Sum of US states (except KH6/KL7) and District of Columbia (DC), VE1-7, VO, VE8/VY1, worked per band. Maximum of 58 per band.

(C) **Final Score**—QSO points × multiplier = final score.

8) **Miscellaneous:**

(A) Call signs and exchange information must be received and logged by each station for a complete QSO.

(B) All operators must observe the limitations of their operator licenses at all times.

(C) Your call sign must indicate your DXCC country station location (KH6XYZ/W1 in Maine, FG0AAA/FS on St Martin, etc).

(D) One operator may not use more than one call sign from any given location during the contest period.

(E) The same station may be worked only once per band—no crossmode, crossband or repeater contacts.

(F) Aeronautical and maritime mobile stations outside the US and Canada may *not* be worked for QSO or multiplier credits by W/VE stations.

(G) All transmitters and receivers must be located within a 500-meter-diameter circle, excluding directly connected antennas. This prohibits the use of remote receiving installations. Exception: Multioperator stations may use spotting nets for multiplier hunting only.

9) **Reporting:**

(A) All entrants are encouraged to use official forms available from ARRL (SASE or 2 IRCs) to report contest results.

(B) Logs must indicate times in UTC, bands, calls and complete exchanges. Multipliers should be clearly marked in the log the first time worked. Entries with more than 500 QSOs total must include cross-check sheets (dupe sheets).

(C) All operators of multioperator stations must be listed.

(D) Entries must be postmarked within 30 days of the last contest weekend (April 7, 1987). Logs not postmarked by the deadline will be classified as checklogs; no extensions, no exceptions. All stations are requested to send their entries in as early as possible. Entries received after mid-July will not make *QST* listings.

10) **Awards:** Plaques will be awarded in the following categories for both the CW and phone contests.

(A) Top W/VE scorer in each entry category — single operator-all band, single operator-single band (1.8-28 MHz), QRP, multioperator-single transmitter, multioperator two-transmitter and multioperator-multitransmitter.

(B) Top scorer in the single operator-all band category worldwide and on each continent. In addition, worldwide leaders in the single operator-single band, QRP, multioperator-single transmitter, multioperator-two transmitter and multioperator unlimited categories will receive plaques.

(C) Additional special plaques will be awarded as sponsored. See January 1986 *QST* for the current list.

(D) Certificates will be awarded to top single-operator, all-band entries from each country and ARRL Section; top single-band entries in each US call area and each country; top multioperator entries (both single and multi-transmitter) in each country, US call area and in Canada. Additional single-band and multioperator certificates will be awarded if significant effort or competition is displayed. DX entrants making more than 500 QSOs on either mode will receive certificates.

11) **Club Competition:** ARRL-affiliated clubs compete for gavels on three levels: unlimited, medium and local clubs. Details are listed in January *QST*.

12) **Conditions of Entry:**

(A) Each entrant agrees to be bound by the provisions, as well as the intent, of this announcement, by regulations of his or her licensing authority and the decisions of the ARRL Awards Committee.

(B) Disqualification: An entry may be disqualified if the overall score is reduced by more than two percent. Score reduction does not include correction of arithmetic errors. Reductions may be made of unconfirmed QSOs or multipliers, duplicate QSOs or other scoring discrepancies. An entry *will* be disqualified if more than two-percent duplicate QSOs are claimed for credit. For each duplicate or miscopied call sign removed from the log by ARRL, a penalty of three additional QSOs will be deleted. The penalty will not be considered as part of the two-percent disqualification criterion. If a participant is disqualified, that operator will be barred from entering the contest on that mode the following year. The calls of all disqualified participants will be listed in the *QST* contest results.

Results, 1986 ARRL UHF Contest

Number nine was really fine!

By Michael B. Kaczynski, W1OD
Contest Manager, ARRL HQ

One hundred and seventy-three grid swappers took to the hills on the weekend of August 2-3, 1986 to celebrate the ninth birthday of the ARRL UHF Contest.

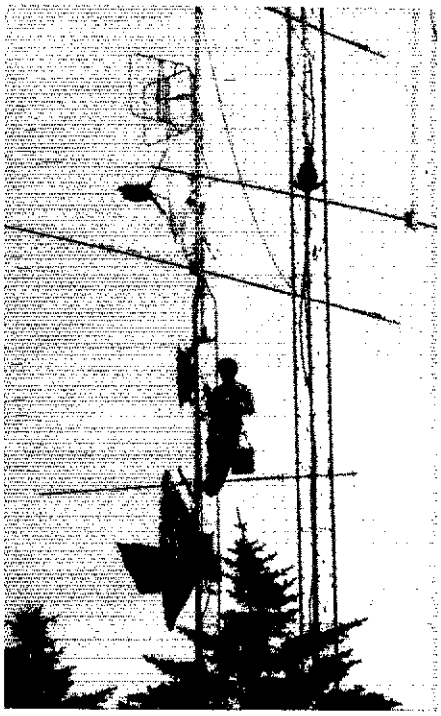
Since the contest's earliest beginnings, the August event has been a "fun" time. For most, activity isn't quite as "go get 'em" as the June and September QSO parties, giving station owners a little time to "tweak" things a little here and there in anticipation of the September VHF QSO Party. For others, the UHF Contest is a time to check the effectiveness of equipment and antennas for 220 MHz and above, without the distractions afforded by 6 and 2 meters.

And what a celebration it was! The northeastern portion of the country was plagued with persistent thunderstorms on Saturday, which wreaked havoc with the top single-op scores. Some who braved the storms were treated with some unexpected "off time," while others were a little luckier.

The Atlantic Division took top single-op honors this year, with K2SMN reeling in 31 QSOs and 18 multipliers on 220, 93/29 on 432, and 47 contacts in 23 grid squares on 1296. Wow! New Englander K1PXE finished second with 32k, followed very closely by N2BJ (29k) and AA2Z (28.8k).

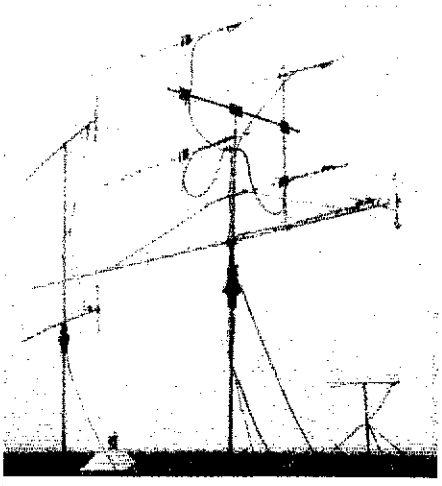
The multioperator top-five box represents as many call areas this year. An outstanding effort by the crew from the Tektronix Employees' RC in Oregon treated K7AUO to a number-five finish. Numbers two, three and four were separated by *less than 600 points*, with AB4L's 20.7k just squeezing by K6TZ (20.5k) and WB5LUA (20.16k). The Rensselaer Polytechnic Institute gang, W2SZ/1, took top slot again this year, while setting an all-time multioperator record in the process. Their 137k effort, set just last year, has already fallen by the wayside. Not too shabby considering the "flat" conditions. Way to go, guys!

Some folks have suggested some rules and time changes for this operating activity. What do you think? Send your ideas and comments to the ARRL Contest Branch at HQ. While you're at it, mark your calendar to celebrate this contest's 10th anniversary, August 1 and 2, 1987. CU then! Thanks to Billy Lunt, KR1R, who helped in the preparation of this report.



WA2AAU putting the finishing touches on W2SZ's 35-foot rotating tower, which allows their microwave antennas to be pointed to within a half-degree.

W1UUQ adjusts the 432-MHz quagis used at K6TZ.



The antenna system used at K1DS played—to the tune of 13k.

Single Operator Top Five

K2SMN	45,780
K1PXE	31,659
N2BJ	29,322
AA2Z	28,836
WB8BKC	24,924

Multioperator Top Five

W2SZ/1	205,884
AB4L	20,709
K6TZ	20,544
WB5LUA	20,163
K7AUO	8,844

SOAPBOX

No band openings. Nuts! Weather was a real, literal washout on Saturday ... rain, rain, rain ... I'm sure looking forward to September! (K2SMN). Propagation was poor on all bands. Activity? Many stations were heard (K2GK). Activity on 220 was very slow, but I guess everyone was enjoying the sun. Hope for more activity in September

(VE3LNX). Best activity of any UHF test so far, but better conditions would really help! (WB9MSV). A contest period of 0000Z to 0000Z would be better for me (W9YCV). This was my first contest ever, and 432 was stone dead. Also, everybody should try homebrew on this mess, and experience the joys of a rather flaky transmit converter that worked flawlessly before the contest, and a reliable linear that shot fire on the first QSO (KA9LNV). How about Friday and Saturday nights local time, say 0000Z to 1200Z each day? (K5YY). "Yawn" (KC4EG). Lightning, four inches of rain, a flash flood and two downed power lines forced this 432 MHz backpacker out of the Black Mountains in Harriman State Park, NY. The lightning produced some fine loud signals, for a few seconds, but was extremely dangerous to operate in. What a weekend! I'll try this again in the VHF QSO Party in September (WA2PIV). Doesn't anybody work 220 MHz except for the June contest? (WAØNOK). I had a fun time despite the electrical storm Saturday evening (W1RIL). I don't recommend operating during a lightning storm. The flashover in my shack scared me half to death, and it took 12 hours to replace all the blown semiconductors and components! Needless to say, it kind of killed my overall score and operating time (W1JR). I was amazed at the great activity on 902 and 1296 MHz! (AF1T). I worked two stations on 220 MHz with 10 watts and a shorted connector. One was 35 miles away! I only managed 15 more contacts without the short (VE3BFM/W1). If it wasn't for equipment failing, loss of ac power and lightning on Saturday, operating from Mt Equinox might have been fun! (WA1ZMS). Halfway through the contest, lightning took out my 432 transverter. Murphy's law at its finest! Oh well, next time (WA4PFN/1). Activity was disappointing—I only worked my own grid square once (W7PUA). I had difficulty making contacts from my new "under a hill" QTH (NR6E). Conditions were very good into New England. Missed a few new 23-cm QSOs because of QRM! Sure enjoy the reduced TVI problems on the UHF bands! (W3IY/4). Three gridpeditions were out covering all of eastern Colorado. There wasn't much activity, but I tried (WD4AHZ). I made two more X-band contacts after the contest ended! (W6OYJ). A thunderstorm came up and blew down my 432 antennas (WB7OHF). Activity was better than last year (WB5AFY). Where was everybody? (K5IS).

Scores

Score lines indicate call sign, total score, QSOs, multipliers and bands operated (C = 220 MHz, D = 432 MHz, 9 = 902 MHz, E = 1296 MHz, F = 2.3 GHz, G = 3.4 GHz, H = 5.7 GHz, I = 10 GHz, J = 24 GHz, K = 48 GHz) and ARRL Section. Example: K2SMN had a total score of 45,780, with 31 QSOs and 18 multipliers on 220 MHz, 93 QSOs and 29 multipliers on 432 MHz and 47 QSOs and 23 multipliers on 1296 MHz. He is located in the Southern New Jersey Section. Call signs of Division leaders and band indicators of band winners are printed in bold type.

Atlantic Division

K2SMN 45,780- 31-18-C-SNJ
93-29-**D**
47-23-**E**
KB3QM 21,840- 35-20-C-DE
55-24-D
20-12-E
N2WK 11,885- 41-20-**C**-WNY
50-19-D
2- 2-E
W2EIF 10,989- 36-16-C-SNJ
33-12-D
15- 9-E
K2GK 8,658- 26-13-C-WNY
36-18-D
8- 6-E
N2AHN 4,392- 61-24-D-SNJ
W3CL 4,140- 28-13-C-EPA
32-10-D
WA3JUF 2,808- 6- 6-D-EPA
19-10-E
2- 2-F
AC3T
(KA3B, opr) 2,142- 18- 9-C-DE
24- 8-D
K3AKR 1,632- 12- 8-C-MDC
20- 9-D
KB3PD 1,585- 31-17-D-DE
WA1KOO/2 1,344- 32-14-D-SNJ
W3GN 60- 5- 4-D-MDC
W3KWH (N3EQP,W3s ANX, HH, WA3TTS, WB3EML, oprs)
20,496- 4- 3-C-WPA
66-32-D
26-21-E
W3LP (W3s GFN, JUZ, WA3CUQ, oprs
7,395- 19- 9-C-EPA
46-16-D
10- 4-E

Canada

VE3LNX 18,218- 25-18-**C**-ON
49-24-**D**
1- 1-**9**
13-10-E
VE3EYR 1,782- 10- 8-C-ON
23-10-D
VE3ASO 1,440- 7- 6-C-ON
17- 8-D
1- 1-E
1- 1-F
VE3DDW 1,344- 28-16-D-ON

Central Division

WB9SNR 8,295- 41-23-D-IL
15-10-**E**
3- 2-**F**
WB9MSV 5,670- 70-27-**D**-IL
WB9WMM 2,415- 35-23-D-IL
KR9G 1,071- 21-17-D-IL
K9RRS 432- 16- 9-D-WI
W9YCV 218- 9- 8-D-WI
KA9LNV 36- 4- 3-D-IN
WØOHU 420- 8- 7-D-MN
3- 3-E-MN

Delta Division

K5UR 7,560- 18-15-C-AR
42-27-D
W5RCI 2,673- 6- 6-C-MS
17-16-D
5- 5-**E**
K5YY 1,482- 26-19-D-AR
N4VC/5 1,026- 6- 5-C-MS
13-13-D
WB5LUA (+K5ASZ, KD5RO, WA5TKU) 20,163- 13- 9-C-AR
40-18-D
23-11-E
8- 6-F
2- 2-G
1- 1-I

Great Lakes Division

WB8BKC 24,824- 26-17-C-MI
58-29-**D**
25-16-E
NI8O 10,200- 43-25-D-OH
21-15-E
KB8ZW 6,042- 20-14-C-OH
33-24-D
K8TL 1,782- 21-14-D-OH
6- 4-E
KC4EG 1,716- 11- 9-C-KY
15-13-D
WD8IFC 3- 1- 1-D-OH

Hudson Division

N2BJ 29,322- 50-19-C-ENY
83-23-**D**
24-12-E
W1XX/2 24,768 39-15-C-ENY
73-20-D
2- 2-9
26-11-E
W2VC 15,006- 64-25-D-NNJ
29-16-**E**
K2BJG 2,079- 14-10-C-NNJ
19-11-D
WA2PIV 570- 19-10-D-NLI
WA2EUS 462- 11- 7-E-NLI
WA2RUW 360- 12-10-C-ENY

Midwest Division

WØRHP 7,035 41-27-D-IA
13- 8-E
WAØNOK 2,250- 6- 5-C-MO
24-20-D
WD8FLJ 1,326- 22-15-D-MO
2- 2-E
KFØM 780- 7- 7-C-KS
10- 8-D
NØLL 450- 15-10-D-KS
WØJRP 324- 12- 9-D-MO
WDØBQM 72- 1- 1-C-NE
5- 3-D
NJ6X (+N9BD, KØTLM)
8,844- 12-10-C-MO
40-26-D
8- 8-E

New England Division

K1PXE 31,659- 40-19-C-CT
69-27-D
32-15-**E**
AA2Z 28,836- 44-17-C-CT
62-20-D
12- 6-9
24-11-E
K1PO 24,150- 46-18-C-CT
115-32-**D**
W1RIL 15,228- 17- 6-C-WMA
42-14-D
6- 2-9
33-13-E
1- 1-F
AB1U 14,040- 31-14-C-CT
42-15-D
22-11-E
K1DS 13,500- 31-10-C-RI
46-17-D
24- 9-E
W1JR 12,810- 25- 9-C-EMA
39-14-D
6- 5-9
23- 7-E
AF1T 11,040- 27-10-C-NH
38-13-D
8- 3-9
15- 5-E
1- 1-I
WA1JOF 10,620- 16- 8-C-EMA
38-11-D
7- 2-9
25- 9-E
W1QXX 8,850 19- 6-C-EMA
43-11-D
11- 4-9
11- 2-E
3- 2-F
WB1FKF 8,175- 20- 6-C-EMA
33- 9-D
10- 4-9
12- 4-E
3- 2-F
K1KG 6,048- 23-10-C-EMA
39-10-D
11- 4-E
W3HQT/1 4,950- 18- 8-C-ME
33-10-D
4- 2-9
9- 4-E
W1GXT 3,780- 27-10-C-EMA
22- 7-D
7- 3-E
VE3BFM/W1 3,672 17- 5-C-NH
25- 7-D
6- 2-9
7- 4-E
WA1ZMS 3,402- 4- 3-C-VT
30-13-D
10- 5-E
AC1J 3,264- 16- 6-C-NH
48-11-D
AJ1E 2,835- 37-11-D-EMA
13- 4-E
WA4PFN/1 2,640- 22-11-C-EMA
22- 9-D
WB1GQR 2,592- 20- 2-C-VT
34-14-D
K1VYU 2,208- 46-18-D-CT
K1VZI 1,053- 12- 3-C-EMA
11- 4-D
8- 2-E
KB9NM/1 570- 13- 7-D-WMA
3- 3-9
K1TR 333- 22- 5-D-NH
W2SZ/1 (AK4L, K2UF, KA2s DEW, MXO, WRG, N2BNY, NC1J, NF2B, W2ARQ, WA2s AAU, SCA, SPL, WA8USA, WB2s KMY, QCJ, oprs) 205,884- 84-30-C-WMA
183-37-D
65-26-E
18-10-F
6- 7-G
6- 7-H
7- 7-I
4- 5-J

Northwestern Division

W7PUA 528- 5- 2-C-OR
7- 3-**D**
3- 2-**E**
1- 1-F
K7RUN
(DN82) 270- 1- 1-C-OR
1- 1-D
1- 1-F
1- 1-G
2- 1-I
K7RUN
(DN83) 54- 1- 1-C-OR
1- 1-D
1- 1-F
K7HSJ 252- 4- 2-C-OR
6- 2-D
2- 2-E
N7DB 30- 5- 2-D-OR
K7AUO (NA7T, W7UDM, WA3RMX oprs) 9,333- 4- 3-C-OR
5- 3-D
2- 4-E
4-10-F
3- 7-G
1- 5-H
3- 5-I
1- 2-J

Pacific Division

W6RXQ 6,984- 8- 7-C-SCV
51-11-**D**
13- 3-E
2- 2-F
1- 1-I
K6HCP 4,416- 8- 5-C-SCV
32-12-D
12- 6-E
KE6ZE 1,110- 37-10-D-SCV
K7ICW 432- 16- 8-D-NV
NR6E 252- 3- 2-C-EB
5- 2-D
3- 2-E
WA8LLY 90- 10- 3-D-SF
N6NRQ 72- 8- 3-D-SCV
KU6U (+KG6MW, W6YLL)
3,825- 18- 5-C-SCV
35- 9-D
12- 3-E

Roanoke Division

W3IY/4 22,308- 31-16-C-VA
50-21-D
31-15-**E**
K4QIF 10,179- 55-29-D-VA
16-10-E
WA4SBC 3,456- 16-10-C-VA
32-14-D
N4HB 1,125- 25-15-D-VA
N4IWI 168- 8- 7-D-VA
AB4L
(+WA4IVF) 20,709- 27-17-C-VA
78-38-D
7- 4-E

Rocky Mountain Division

NKØP
(+KXØO) 5,346- 11- 8-C-CO
40-15-D
13-10-E

Southeastern Division

WS4F 2,886- 9- 9-C-GA
20-14-**D**
4- 3-**E**
WB4HXE 180- 1- 1-C-GA
9- 4-D
K4DZP 120- 8- 3-D-SFL
1- 1-E
WD4AHZ 42- 7- 2-D-SFL

Southwestern Division

W6CPL 10,584- 48- 8-C-LAX
57-10-D
22- 8-E
K6LMN 6,552- 33- 7-C-LAX
31- 8-D
20- 6-E
WA5BNH 3,360- 10- 2-C-SDG
22- 8-D
12- 5-E
1- 1-I
K6IBY 1,395 12- 7-C-ORG
19- 8-D
WA6OYS 1,008 21- 8-E-SB
W6OYJ 918- 8- 3-C-SDG
14- 5-D
3- 1-I
WB6FCS 744- 31- 8-D-LAX
W6YLZ/m 484- 18- 3-C-SB
11- 5-D
WA6SNN 180- 12- 5-D-ORG
WB7OHF 45- 5- 3-D-AZ
K8PFW 27- 3- 3-D-ORG
K6TZ (K6s DDO, SPK, W1UUQ, WA6s MBZ, VNN, WB6s HOZ, OBB, WB9KMO, oprs)
20,544-101- 9-C-SB
63-13-D
19- 8-E
3- 2-I

West Gulf Division

K5SW 5,610- 12-10-C-OK
23-16-D
10- 8-E
WA5VJB 5,250- 12- 5-C-NTX
24-11-D
11- 6-E
1- 1-G
1- 1-I
1- 1-J
WB5AFY 5,208- 8- 6-C-NTX
24-15-D
11- 5-E
2- 2-F
WØRRY 4,836- 52-31-D-OK
W5NZS 1,296- 5- 5-C-OK
10- 7-D
8- 4-E
WD5AGO 459- 13- 8-D-OK
1- 1-H
K5IS 96- 4- 3-D-NTX
1- 1-I

CHECKLOG

N2EA/m

Contest Corral

Conducted By Billy Lunt, KR1R
Assistant Contest Manager, ARRL

DECEMBER

2

West Coast Qualifying Run, 10-35 WPM, at 0500Z Dec 3 (9 PM PST, Dec 2). W6OWP prime, W6ZRJ alternate. Frequencies are approximately 3590/7090 kHz. 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.

5-7

ARRL 160 Meter Contest, Nov *QST*, p 81.

TOPS Activity Contest, Nov *QST*, p 82.

8

W1AW Qualifying Run, 10-35 WPM, at 0300Z Dec 9 (10 PM EST, Dec 8). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 147.555 MHz. See Dec 2 listing for more details.

13-14

ARRL 10 Meter Contest, Nov *QST*, p 81.

Garden City Contest, Part 1, sponsored by the Vivesvaraya Industrial and Technological Museum and the Bangalore ARC in 2 parts. CW from 1200Z Dec 13 until 1200Z Dec 14; phone from 1200Z Dec 20 until 1200Z Dec 21. Single operator only. Work VU2 stations only (VU2 station work the world). Work stations once per band. 10-80 meters. Exchange RS(T) and serial number. North and South American stations count 3 points per QSO with VU2 stations. No multipliers. Certificates. Mail logs before Jan 15 to The Convenor, Garden City Contest 1986, Banglore ARC, PO Box 5053, Banglore 560001, India.

20-21

EA DX CW Contest, sponsored by the Union de Radioaficionados Espanoles from 1600Z Dec 20 until 1600Z Dec 21. CW only. 10-160 meters. Classes are single operator and multioperator, single transmitter. Work EA stations only. Work stations once per band. Exchange RST and serial number starting with 001 (EA stations add province). Count 3 points per QSO (Europeans count 1 point per QSO). Multiply total QSO points by the sum of different EA provinces worked per band for final score. Separate logs per band. Awards. Send logs before Jan 30 to URE, PO Box 220, 28080 Madrid, Spain.

Garden City Contest, Part 2. See Dec 13-14 listing.

28

Canada Contest, sponsored by the Canadian Amateur Radio Federation, from 0000Z to 2400Z Dec 28. Everyone works everyone. 160-2 meters, phone and CW. Entry classes: single op, all bands, mixed mode; single op, all bands, CW; single op, all bands, phone; single op, single band, mixed mode; multiop, single transmitter, all bands; multiop, multitransmitter, all bands. Single ops must use their own stations. Work stations once per mode on each band. No crossmode QSOs allowed. Exchange name, RS(T), serial number starting with 001 and province/state/country. VE1 stations must also send their province. Multi-multi stations use separate serial numbers for each band. Count 10 points per VE QSO, 4 points for other countries. 20 point bonus for any CARF station using TCA or VCA suffix. Multiply by total VE provinces worked per band on each mode (VO1/VO2 VE1-PEI VE1-NB VE1-NS VE2-8 VEØ VY1). Suggested frequencies: 1.810/1.840 3.525/3.775 7.025/7.070/7.155 14.025/14.150 21.025/21.250 28.025/28.500 50.040/50.110. Mail logs within 30 days (include SASE or SAE/IRC for results) to CARF Contest c/o Norm Waltho, VE6VW, Box 1890, Morinville, AB T0G 1P0, Canada.

30

W1AW Qualifying Run, 10-35 WPM, at 1400Z (9 AM EST) Dec 30. See Dec 2 and 8 listings for more details.

31

West Coast Qualifying Run, 10-35 WPM, at 0500Z Jan 1 (9 PM PST Dec 31). See Dec 2 listing for more details.

31-Jan 1

ARRL Straight Key Night, 24-hour period UTC (from 7 PM EST Dec 31 until 7 PM EST Jan 1). This is a friendly meeting on the air using straight keys. Suggested areas of operation of 80, 40 and 20 meters are 60 to 80 kHz from the lower band edges and 10 kHz from the lower Novice band edges. When participating in SKN, use SKN instead of RST preceding the three-digit report to clue in passersby. Following SKN, send a list of stations worked plus your vote for best fist heard (not necessarily one you've worked) during that period. This is not a contest; quick contest-like exchanges are discouraged. Vote also for the most interesting QSO. Mail your report by Jan 10 to ARRL HQ.

YL-ISSB QSO Party, CW, coordinated by Bill Early, WA9AEA, from 0001Z Jan 31 until 2359Z Feb 1. (Phone is from 0001Z Mar 21 to 2359Z Mar 22.) Frequencies are the General portion of all bands. Single operator, DX-W/K partners, YL-OM teams. Exchange call, signal report, state/province/country, name, ISSB number (if member) and DX-W/K partner. Score 3 points per member QSO within same continent, 6 points per member QSO in different continent, 1 point per nonmember QSO. Member stations only count as multipliers. Multiply by 1 for each DX-W/K partners; YL-OM team; US, VK, ZL, VE state or province; DXCC country. Bonus multipliers: 1 for working 15 or more members on a second band; 2 additional for 15 or more members on a 3rd band. Multiply by 5 for maintaining a dc input under 250 watts throughout contest. Mail logs before Apr 30 to Bill Early, WA9AEA, PO Box 401, McHenry, IL 60050-0401.

JANUARY

3-4

World SSB Championships, sponsored by *73*. 10-meter contest 0000Z Jan 3 to 2400Z Jan 4; 15-meter contest 0000Z-2400Z Jan 10; 20-meter contest 0000Z-2400Z Jan 11; 160-meter contest 0000Z Jan 17 to 2400Z Jan 18; 40-meter contest 0000Z-2400Z Jan 24; 75-meter contest 0000Z-2400Z Jan 25. There are six separate contests. Work stations once in each contest. SSB only. No crossmode QSOs. Single op, single transmitter and multiop, single transmitter classes. Exchange signal report and QTH (state, province or territory for W/VE stations; DX country name for others, including KH6 and KL7). Count 5 points per QSO with own continent, 10 points per QSO other than own continent. Multiply by number of states (48 max), VE provinces/territories (13 max) and DX countries worked (excluding US and Canada). A 100 QSO point penalty for each duplicate contact found in log. DX window frequencies are reserved for split-band operation only. DX windows include 1.907-1.913 1.850-1.855 1.825-1.830 3.790-3.805 7.080-7.090. Official entry forms are available from the sponsor. Mail entries by Feb 18. 10-meter entries go to Linda Ingram, KG6MO, 44720 N 11th St E, Lancaster, CA 93535. 15-meter contest entries go to Gary Vest, NW5E, Star Route, Box 34, Holliday, TX 76366. 20-meter contest entries go to Chuck Ingram, WA6R, 44720 N 11th St E, Lancaster, CA 93535. 40-meter contest entries go to Dennis Younker, NE6I, 43261 6th St E, Lancaster, CA 93535. 75-meter entries go to Ron Johnson, KC7PA, 68 S 300 W, Brigham City, UT 84302. 160-meter contest entries go to Bill Gosney, KE7C, 2665 N Busby Rd, Oak Harbor, WA 98277.

10

15-Meter World SSB Championship, see Jan 3-4 listing for more details.

10-12

ARRL January VHF Sweepstakes, this issue, p 78.

Michigan QRP Club CW Contest, sponsored by the Michigan QRP Club, from 1500Z Jan 10 until 1500Z Jan 11. Three entry categories: 1 W or less output power; 5 W or less output power; more than 5 W. Exchange signal report, QTH (state, province or country) and MI QRP no. (power output if nonmember). CW only. Work stations once per band. Suggested frequencies: 1.810 3.560 3.710 7.040 7.110 14.060 21.060 21.110 28.060 28.110. Count five points per member QSO and one point per nonmember QSO. Multiply by the number of states/provinces/countries worked per band. Multiply total by 1.5 if using battery or natural power. Mail logs (include SASE for results) to be received no later than six weeks after the contest to Chris Hethorn, KM8X, 6818 Meese Dr, Lansing, MI 48910.

Hunting Lions in the Air Contest, sponsored by Lions Clubs International, from 0000Z Jan 10 until 1200Z Jan 11. Open to all radio amateurs worldwide, 80-10 meters (excluding WARC bands), phone and CW. Phone and CW count separately. Categories are single op and multiop, single transmitter. Multiop must be club or association of ham radio operators. Exchange signal report and serial number. Lion, Lioness and Leo club members will also send their club name and Lion District. Work stations once per band and mode. QSOs with stations on the same continent count 1 point; QSOs with stations on other continents count 3 points. Bonus points: 10 points for QSOs with Lion, Lioness or Leo Club from different countries; 20 points (5 points for Brazilian stations) for QSOs with Rio de Janeiro Arpoador Lions Club members. 20 points (5 points for US stations) for QSO with the Melvin Jones Memorial Radio Club of US. 25 points for QSO with Arpoador Official Station, PY1LCA (does not apply for the Rio de Janeiro Arpoador Lions Club or Melvin Jones Memorial Radio Club). No multiplier. Mail logs by Feb 15 to Rio de Janeiro Arpoador Lions Club Contest Committee, Rua Oto de Alencar 32, Apt 301, 20271 Rio de Janeiro, RJ, Brazil, South America.

11

20-Meter World SSB Championship, see Jan 3-4 listing for more details.

13

W1AW Qualifying Run, 35-10 WPM, at 0300Z Jan 14 (10 PM EST Jan 13). See Dec 2 and 8 listings for more details.

17-18

160 Meter World SSB Championship, see Jan 3-4 listing for more details.

AGCW-DL QRP Winter Contest, sponsored by the DL Activity Group CW, from 1500Z Jan 17 until 1500Z Jan 18. CW only, 160 through 10 meters. Classes are: A—less than 3.5 W input (2 W out), single operator; B—less than 10 W input (5 W out), single operator; C—less than 10 W input (5 W out), multioperator; D— QRO stations, more than 10 W input (5 W out), to contact QRP stations; E—SWL. Class C stations may operate full time; classes A, B, D and E must break for 9 hours, which can be taken in 2 segments. Exchange RST, QSO number and input, adding × if crystal controlled. QRO stations add /QRO. Operation is limited to one class per band, VFO or crystal controlled. No more than 3 crystals may be used on one band. Contact each

station once per band. Count 1 point for QSO with own country, 2 points for QSO with own continent, 3 points for QSO with DX (outside own continent) per DXCC list. JA, PY, VE, W and ZS call areas count as separate countries. Count 1 multiplier for each country and 1 for each DX QSO. Multiply points by multipliers on each band, then add band results. Crystal-controlled stations double total result. Submit a separate log for each band. Logs must be received within 6 weeks of the contest. Send logs (include 1 IRC for results) to Siegfried Hari, DK9FN, Spessartstrasse 80, D-6453 Seligenstadt, Fed Rep of Germany.

Crazy 8s HF, VHF and UHF Contest, sponsored by the Cuyahoga Falls ARC, from 1400Z Jan 17 until 2300Z Jan 18. Work only stations in the 8th Call Area (8th Call-area stations work everyone). Exchange state/province/country and grid locator (Maidenhead). Score 1 point per QSOs. All bands 1.8 though 1296 (except 10 MHz) and all modes (including repeaters, satellites, etc). There are two groups of multipliers. Group one (times 1 per total): number of bands operated (min 3 QSO per band), number of grid squares worked, number of states worked. Group two (each multiplier times 8; must have min of 3 QSO per multiplier): SSB contacts, CW contacts, FM contacts, RTTY or AMTOR contacts, SSTV or ATV contacts, packet contacts, satellite contacts, AM contacts, QRP contacts (<5 W), 12-meter contacts, 6-meter contacts, 220-MHz contacts, Novice contacts, ragchew contacts (min of 10 minutes each), repeater contacts, mobile contacts. Final score equals QSO points times the sum of group one and group two multipliers. Awards. Send logs to Anthony Luscre, KA8NRC, 5441 Park Vista, Stow, OH 44224.

22
W1AW Qualifying Run

23-25
CQ World Wide 160 Meter CW Contest
REF French Contest, CW

24
40-Meter World SSB Championship, see Jan 3-4 listing for more details.

25
75-Meter World SSB Championship, see Jan 3-4 listing for more details.

24-Feb 1
Novice Roundup

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 **Jan 1** to make the **March** issue. Please include name of contest, dates, times (Z) and complete rules. Send to Contest Corral, 225 Main St, Newington, CT 06111.

Standard Contest Guidelines

1) Make sure your log details the date, time, band, call sign and complete exchange sent and received, for each QSO claimed for contest credit.

2) Your summary sheet should indicate your score, including how you figured it, and a declaration that you followed FCC/DOC regulations and the contest rules. Your name, call sign and complete address should be typed or printed in block letters.

3) Crossband, crossmode and repeater contacts are usually not permitted. Contacts with the same station on different bands are usually permitted.

4) Your log should be checked carefully for duplicate QSOs and if more than 200 QSOs are made, dupe sheets should be included with your entry.

5) Your log may be considered a checklog or disqualified if it is incomplete or if too many errors are detected by the contest committee.

6) Avoid standard net frequencies.

7) International contests generally offer awards to top scorers from each US call area and each country; state QSO parties to each state/province.

8) Your summary sheet should include the following statement: "I have observed all competition rules as well as all regulations established for Amateur Radio in my country." The declaration should be signed and dated.

Special Events

Conducted By Billy Lunt, KR1R
Assistant Contest Manager, ARRL

Bethlehem, Connecticut: The Hen House Gang ARC will operate the Santa Special, W1FHP, throughout the month of **December.** Operation will be 10, 20 and 40 General bands and 40 Novice band. Work any four Bethlehems around the world, any time, band or mode for extra special award. QSL to Robert O'Neil, W1FHP, Hard Hill Rd, Bethlehem, CT 06751.

Moscow, Idaho: The University of Idaho ARC will hold its 2nd Annual Alumni Reunion on the Air from 2000Z **Dec 6** until 0400Z **Dec 7.** Suggested frequencies and times: phone—14.230 (2000Z-0100Z), 7.230 (0000Z-0400Z), 3.930 (0000Z-0400Z); CW—14.030 (2000Z-0100Z), 7.130 (0000Z-0400Z). For QSL, send SASE via *Callbook* address. For more information, contact W7UQ.

Lynchburg, Virginia: The Piedmont ARA will operate AA4UM **Dec 13,** 1200Z-2400Z, to celebrate the 200th birthday of Lynchburg. Suggested frequencies and times: SSB—3.855 (1200Z-1600Z), 14.302 (1600Z-2400). For commemorative certificate, send an 9- × 12-in SASE to Piedmont ARA, PO Box 11362, Lynchburg, VA 24506.

Bethlehem, Indiana: The Clark Co ARC will operate W9WWI from 1700Z **Dec 13** until 0300Z **Dec 14** and from 1300Z-2000Z **Dec 14.** Suggested frequencies: 3.905 7.240 14.290 21.365 146.25/.85. For certificate, send a large SASE to CCARC, Box 532, Jeffersonville, IN 47131.

Christmas, Florida: Special-event station W1TRB will operate **Dec 19-26,** 1200Z-2400Z each day, from Christmas, FL to celebrate the Christmas season. Suggested frequencies: 3.900 7.200 14.300 21.300. For certificate and QSL, send SASE via Lou Hoekstra, W1TRB, Box 430, Christmas, FL 32709.

Nazareth, Pennsylvania: The Delaware-Lehigh ARC will operate Christmas City station, W3OK, **Dec 20-21,** 1600Z-2200Z each day. Suggested frequencies: 3.900 7.200 14.250. For special certificate, send QSL and no. 10 SASE via The Delaware-Lehigh ARC, W3OK, Greystone Building, Nazareth, PA 18064.

Thomaston, Connecticut: The Northfield Emergency Amateur Team (NEAT) will operate the 6th Annual Number One Christmas Carol (N1CC) **Dec 24-25.** Operation will be 1.850 3.900 7.225 14.285 21.350 28.600. For a special QSL, send SASE to N1CC, 454 High St Ext, Thomaston, CT 06787.

Plano, Texas: The Plano ARK will operate WQ5S from 1600Z **Dec 27** until 1600Z **Dec 28** to give "New Christmas Toy" owners a chance to try out their new equipment. Operation will be in the center of the Novice bands, lower 25 kHz of the General phone bands, 146.52, 52.525, 29.600 FM and 144.200 SSB. For QSL, send to Brad Fuller, WQ5S, Rte 11, Box 24, McKinney, TX 75069.

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 **Jan 1** to make the **March** 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-Events 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.

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	Conventions—1986	Jan 1986, p 61
Club Challenge for the '80s Rules	Sep 1986, p 58	MARS Information	Jul 1985, p 46
Club Contest Rules	Jan 1986, p 94	Novice-Enhancement NPRM	Jun 1986, p 49
DX Contest Awards Program	Feb 1986, p 83	QSL Bureaus Incoming	This issue, page 57
Frequency/Mode Allocations	Jan 1986, p 62	Outgoing	Sep 1986, p 73
Golden Jubilee of DXCC Award	Sep 1986, p 60	Reciprocal-Operating Agreements	This issue, p 53
Hamfest Calendar Rules	Sep 1986, p 84	Spread-Spectrum Rules	Apr 1986, p 45
Ham Radio-Related Landline BBSs	Nov 1986, p 58	Third-Party-Traffic Agreements	This issue, p 53
License-Renewal Information	Jan 1986, p 62	902-MHz Interim Band Plan	Jan 1986, p 74
Major ARRL Operating Events and		10-Meter Contest Rules	Nov 1986, p 81
		160-Meter Contest Rules	Nov 1986, p 81

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. Alberta amateurs provide communications for Zenith Jaycees race from Calgary to Edmonton (about 180 miles) to support Ronald McDonald House in Edmonton. Race started at 8 AM Aug. 23 and ended at 11 AM Aug. 24 in Edmonton. Amateur and advanced classes gearing up for Fall start. Band conditions improving slightly. Traffic: APSN QNI 986, QTC 22, Informal 63. ATN QNI 167, QTC 59. Personal totals: VE6CPE 34, VE6CHK 23, VE6ABC 14, VE6EJ 6, VE6EO 4.

BRITISH COLUMBIA: SM, H. Ernie Savage, VE7FB—British Columbia Emergency Net has had a good month even with unfavorable band conditions. QNI's high 38 Low 22 Total 910, NM Ferdi VE7EJU. British Columbia Public Service Net, QNI's High 200 Low 106 Total 4720, NM Ford VE7DDF has a new QTH still in Victoria. Bill, VE7CGJ, allowed a tree limb he was cutting to put him in Hospital for a couple of days. Doc's, VE7AKG, eye surgery was successful. Herb, VE7VN, retired Doc is now in real estate. Harry, VE7BXD, is in California training with his Seeing Eye Dog, Ernie, VE7FB, at Dogwood Breakfast was presented with two certificates from QCWA, fifty years award and Fifty years with same call signs. Thanks to all the Newsletters. Surrey ARC's President Mike, VE7AVM. Also code and theory classes again this year. The Girls, 16 hour shift at VE7EXPO did beat the days shift record, and also Elizabeth, VE7YL, found the missing State for WAS. Traffic: VE7BNI 420, VE7CDF 151, VE7EJU 76, VE7EJW 65, VE7XA 47, VE7CCJ 45, VE7FME 42, VE7ANG 32, VE7FB 33, VE7BZI 16, VE7FSP 13, VE7DJ 13, VE7AVC 9. (Aug.): VE7BNI 229, VE7CDF 194, VE7EJU 145, VE7ANG 42, VE7EJW 38, VE7XA 33, VE7FME 29, VE7FB 13, VE7BZI 12, VE7DJ 10, VE7AVC 7, VE7FSP 5, VE7EIR 4.

MANITOBA: SM, Jack Adams, VE4AJE—Leaves turning all pretty colors, flea markets taking place—change of equipment; namely take five things to flea market to sell—bring back ten things you didn't need—"man that's fun". Thank you Dick, VE4HK, and crew for your communication work. Sure great to have someone with a little ambition. Traffic down, hardly any wonder no one wants to get involved with the exception of the ole reliables. It's worse than pulling hens teeth to get people involved in amateur projects one way or the other. For the few who are willing to work, all they get is criticism. Let's get together and be a service which Amateur Radio has been in the past. Net reports: MEPN QNI 927, QTC 15. MWN QNI 853, QTC 30. WRIN QNI 448, QTC 2. MTN (CW) net Sessions 17, QNI 122 QTC 19. Traffic: VE4RO 65, VE4TE 32.

MARITIME-NEWFOUNDLAND: ASM, Aaron D. Solomon, VE1OC—Annual *Moncton, N.B. Flea Market* held on 20th Sept. 200 Hams attended very successful event. *Charter members of HARC* and XYLs attended enjoyable social. New *Atlantic Director* of CRRL is VE1SH. He hopes to increase membership. Good luck, Ron. VE1LZ and XYL have returned from pleasant trip to OZ-land. VE1PQ, Pres. of HARC receiving any *changes of QTH, tel. number,* etc. for VE-1 Call Book. *New Calls*—VE1NG now VO1SA; VE2DD now VE1DD. *Visitors*—VE3HC; VE3WW; VE4AOE; VE6ADX; K1EIU. *Hospital*—VE1QX, Speedy recovery, Bob. *Silent Key*—VE1AKW.

ONTARIO: SM, Larry Thivierge, VE3GT—BM: VE3LST. PGL: VE3AR. SEC: VE3GV. STM: VE3CYR. TC: VE3EGO. The DOC has a new, on-line system for handling the issuing of call signs. You can now pick the call that you want, provided it is available, rather than that one which happens to be next on the list. Belated congratulations to VE3CNE, VE3GSQ, VE3FAS for earning BPLs last month. Welcome to the following new amateurs: VE3TTC, VE3NUZ, VE3LFW, VE3PTZ, VE3PSB, VE3NET, VE3WSN. Bruce Co. has a weekly ARES net on VE3PER to keep group members up-to-date. VE3IHB is now VE3ACY. VE3GTF is now EC for Prince Edward Co. When it becomes operational on 448.575 MHz in and 443.575 MHz out, VE3RFL will be another UHF repeater in Oshawa. VE3LFV and VE3ACY are forming a Windsor chapter of the 10-10 International organization. South Pickering ARC has installed a phone patch into the Oshawa exchange on their repeater, VE3SPA. The new manager of Ottawa ARC's Capital City Net is VE3MJV. In between traffic assignments VE3GSQ found time to assist in providing communications for the Orangeville Terry Fox run. VE3CGV was voted amateur of the year by the members of Chatham-Kent ARC. With the confirmation of Clipperton, VE3GFN's DX total stands at 270 countries. VE3JFE is the new editor of the London ARC's bulletin. Ottawa ARC's new executive consists of Prez VE3NVF, V Prez VE3JLP, Treasurer VE3NJN, new directors are VE3GG and VE3OWL. I'm not intentionally neglecting the northern portion of our Section—it is just that I hear very little from up there with the exception of VE3IFP, VE3FPI and VE3EYW. I'm sure there must be some activities going on up there that they might like to share with all of us. On behalf of all your Section officials and appointees, may I extend a Merry Christmas and a Happy New Year to you. Traffic: VE3FAS 328, VE3GSQ 283, VE3GNW 222, VE3CYR 107, VE3GT 99, VE3DCX 82, VE3DPO 74, VE3WV 73, VE3AJN 72, VE3ORN 55, VE3BUO 53, VE3KCZ 32, VE3BAJ 31, VE3GFN 31, VE3EAM 27, VE3POJ 23, VE3JSM 12, VE3GOL 11, VE3KXD 6, VE3JHA 4, VE3IFP 3. (Aug) VE3KXB 43, VE3EFX 4. (Jul) VE3KXB 29.

QUEBEC: SM, Harold Moreau, VE2BP—STM: VE2EDO. BM: VE2ALE. TC: VE2ED. NM: VE2EDO. Congratulations to Claude, VE2ZZ, who has been elected Director for Quebec, his two year term of office starts on January 1, 1987. Le nouveau president du CRA de St-Hyacinthe est Jean, VE2DOK. Felicitations a VE2CBS (Sorel Tracy) pour leur classement lors du Field Day 1986. Traffic VE2EDO 153, VE2BP 50, VE2JN 31, VE2WH 29, VE2EC 27.

SASKATCHEWAN: SM, W. C. Munday, VE5WM—SEC: VE5CU. EC: VE5AQ, VE5FF, VE5HG, VE5ACI, VE5WM: STM: VE5HG. NM: VE5EE, VE5EX, VE5HG, VE5MML. TC: VE5GF. ATC: VE5XZ. BM: VE5WM. OBS: VE5CU, VE5JA. Congratulations to VE5GF who has been elected Section Manager for a two year term commencing January 1987. New three-letter call signs have made their appearance on the bands of late. Has the SK QSL Bureau Manager been notified? Ham classes are now well under way and a sincere thanks is extended to all instructors. Net reports: ARG-2 30 sessions 676 QNI; PWXN 30 sessions 789 QNI. Traffic: VE5KZ 25, VE5WM 3. Merry Christmas to all with good health and happiness in 1987.

ATLANTIC DIVISION

DELAWARE: SM, Harold K. Low, WA3WIY—STM: KA3IXV. SEC: K3PFW. EC: KC3TI KC3JM KA3LNK. PIO: WB3DPJ. SGL: AF3R. PSHR: K3JL. Persons wishing to upgrade in the Wilmington area should contact AWARE and or First State ARC. Downstate contact Nanticoke ARC. Communications for Rehoboth Beach Senior Day with 37 bus loads of about 1225 Senior citizens was handled by SARA. Attended meeting at AWARE and was happy to meet David Sumner, K1ZZ. Received word that AB3D has been the first person in Del. to work all states on 2 meters. AWARE information net Mondays 8 PM on 147.225. DTN stations 329 traffic 33 in 22 sessions. DEPN stations 49 traffic 7 in 4 sessions. SEN station 43 traffic 1 in 5 sessions. Traffic: W3QO 63, WA3WIY 29, KA3IXV 25, KC3TI 21, WB3DUG 17, W3FEG 12, K3JL 10, W3PVO 10, KC3JM 9, N3AXH 2.

EASTERN PENNSYLVANIA: SM, Kay Craigie, KC3LM—ASM: WA3PZO, K3ZFD. ACC: KA3A. SEC: WA3PZO. STM: KB3UD. PIO: W3AMQ. TC: W3FAF. Happy holidays, everybody. This month it's hats off to our county Emergency Coordinators. Too numerous to list here, they're the people who make our ARES work by training local volunteers and keeping in touch with Emergency Management officials. We still have a few open positions; contact WA3PZO for information. W3ZXV has been appointed Atlantic Division rep on the Public Relations Advisory Committee. New address for T-PARC frequency coordinators: PO Box 36, Croydon PA 19020-0903. Welcome aboard new Official Bulletin Station KC3BP of Mid-Atlantic ARC. Schuylkill Area Rptr Assn's new officers are W3VA, KC3HH, W3PYS, KC3NB, K3SLJ and W3EEK. Warminster ARC sought volunteers to answer phones at a public TV pledge drive; good PR for WARC, Amateur Radio, and an interesting thought for other ham groups, too. Mobile Sixers did a special station at the Middletown Tri-Centennial this fall. Suburban ARC's newsletter published a handy list of emergency phone numbers. N2SS writes an outstanding DX column in the Frankford RC paper. Harrisburg RAC's fall special events station made over 100 contacts. New Public Info Asst WB3AIG and ORS W3BUR appeared in a good local newspaper story about R.F. Hill ARC. PIO W3AMQ worked on York hamfest publicity. Congrats to ARES Dist. 6 NM WA3CKA for VUCC on 6m. Many of our dedicated public service ops also enjoy other sides of radio. Thanks and 73 to KB3LR, retiring as DEC 7, and AA3C, retiring as DEC 2. AA3C and Lancaster EC WB2OOB aided efforts to stop a restrictive antenna ordinance in Manheim Twp. Red Rose Repeater Assn's N3CC and attorney WA3HMK, among others, worked hard on this problem. PRB-1 is not magic! We must make our value better known to planners and township supervisors. Emergency management officials may know we're an asset to the community, but they don't write the antenna ordinances. Ever consider running for local office or getting on the zoning board? Hmmm? Because response to emergencies isn't just an ARES affair, KC3LM has written a general plan for Section leaders (stations in the alphabet soup atop this column) in major emergencies. Thanks to WA3PZO and KA3DVY for advice on the plan. In the traffic list, note that WA3DFU is the Warminster ARC callsign, originating traffic out of the Grange Fair again. Section Nets, August (QNI/QTC): EPA 150/62; EPAEPTN 538/208. Local Nets, August (QNI/QTC/Sessions): DBESN 66/13/8; MARC/ARES 89/3/5; MARCTN 174/59/13; STARNET 199/52/31. Traffic, August: N3AZW 736 (BPL), WA3DFU 554 (BPL), N3COY 280, W3IPX 151, N3CD 131, KA3DLY 89, W3JKX 64, AA3B 59, KA3IME 57, N3ESI 54, W3KAG 53, KB3UD 51, N3DRM 41, K3TX 34, KB3FW 28, KU3R 26, W3AQN 24, W3ADE 24, N3EFW 18, WA3CKA 16, W3FAF 16, W3VA 13, W3DP 6, N3ERE 4.

MARYLAND-DC: SM, John A. Barolet, KJ3E— Best wishes to MDC ARRL members for a wonderful holiday season. Did you ever wonder how many ARRL members there were in MDC. There were 3152 members as of August 31, 1986. K3RXK, MDC SEC, chaired a second meeting this year of the sections emergency coordinators at Ellicott City, preparation for the SET being the principal topic. Also, K3RXK and KJ3E attended the Eastern Area Staff meeting in Williamsburg, Virginia; two days of traffic, emergency, packet, and organizations subjects! By the time you read this Novice Enhancement may be a fact; get ready for 220-MHz activity! Are you aware of the two hospital communication emergencies MDC experienced this year, Sinai Hospital in Baltimore and Washington Adventist Hospital in Takoma Park. In both cases telephone circuits were severely disrupted; amateur radio provided needed critical communication links. WB3EFG and KN3U wrote detailed reports of these events. Significantly, 440-MHz FM was needed for links within the hospitals in both cases because 144 MHz was not workable or was unreliable. ARES groups should have 440 MHz operation capability. Chesapeake Bay RA repeater site may soon be the connecting link for Washington, DC, and Philadelphia UHF operators; talks are in progress. In St. Mary's County the ARES is working with the county fire department to provide 2-meter autopatch and packet circuits supplementing the regular radio communications, expecially in preparation for a major disaster such as an aircraft crash into a populated area. New subject: We know by now that we radio amateurs have to prepare print media publicity ourselves, including photographs. Perhaps each ARES group should have some Public Information Assistants (PIA) in the organization. PIO KC3EK and ARRL, and SM KJ3E, will provide direction. All those yearning to practice photography and writing short news articles, here's your chance! Congratulations to NC3Z, ex-KC3AV, now an extra. Anne Arundel RC suffered another lightning strike on their repeater but held a scheduled net using simplex, relaying messages as required. KA3KIW, Andrews AFB packet BBS, has moved his operations to Iceland . . .to support the SUMMITT? N3AGM reports that Frederick County amateurs provided communications for the annual crop walk in that county. N3AUG in Laurel ARC is on 1.2 GHz; who else works that band? NB3P opened his shack to the Boy Scouts for two days during the Jamboree on the Air (JOTA). With the nets: Net/Manager QND/QTC/QNI: MDD/W3FA 60/186/564, MEPN/N3EGF 31/128/837, MSN/KC3Y 30/87/441, WRPON/WB3FK 22/18/260, FREDCARES/K3RXK 5/11/83, WC2MN/KC3DW 5/8/94, MDCPON/W3OYY 4/4/63, TS2MN/W3DFW 5/0/135, BCN/KA3OFS 5/0/103. PSHR: KK3F 130, W3FA 111, N3EGF 110, K3RXK 89 W3YVO 86, KC3Y 72, WA3GYW 66. Traffic: KK3F 510, W3FA 148, NC3Z 87, KC3Y 82, KJ3E 76, W3LDD 76, K3NNI 76, N3EGF 75, N3DE 66, KC3DW 65, K3RXK 51, KT3T 45, KX3U 36, N3RO 33, W3YVO 31, WA2WDT 18, WB3BFK 15, NB3P 14, WA3GYW 10, W3ZNW 10, W3DQI 9, W3FZV 8, KC3TA 6, KA3T 5, KA3JJN 4, KB3QV 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 and KA2RJA. Last month I spoke about handling traffic via our local VHF nets in the section. To stay with that thought, I'd like to speak to all you "packeteers" in our section. Handling traffic via packet is a natural. Early last fall I put about 15 messages on the WB2MNF PBBS in Medford. These were messages congratulating new novices on getting their licenses and asking them to check into the New Jersey Slow CW Net. These messages had no real time value, so I could afford to see how long they sat there before they were taken. Some sat there four about 2 weeks before I finally took them to our voice nets. Please. When you log onto a board using the W0RLI command set (and most in our section do), please do an "LT" (List Traffic). This will list any NTS traffic on the board at that time. If you CAN take some of the listed traffic, leave a message after receiving the traffic, to the originator of the message saying you took the message for . . . This will allow the person putting the message on the board to delete it. 73. Traffic: W2IML 61, N2FKA 44, NG2T 42.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA—Special Service Clubs: Fulton ARC now joins the seven other SSCs in WNY. (They are Champlain Valley ARA, Chautauqua County FMA, Liverpool ARC, Radio Amateurs of Greater Syracuse (RAGS), Rochester ARA, Salt City DX Assoc., Squaw Island ARC, and Fulton ARC.) Note: Technical Coordinator K2QR says "every SSC should have an Assistant Technical Coordinator appointee to assist in the club's program of activities". Present count shows some 3200 League members in WNY out of a total of 10,000 licensees. Some forty-nine affiliated clubs have filed annual reports this year . . . another 10 are well overdue and 4 others are becoming marginal. Has your affiliated club been filed? If your club is not affiliated, why not inquire and find out how you can gain through League affiliation . . . write to Lee Hayford, AH2W, at ARRL Headquarters. September BPL to WB2IDS and W2MTA. PSHR: N2ABA, N3DPF, KA2DQA, N2EVG, WA2FJJ, VE2FMQ, W2FR, NN2H, WB2IDS, WB2IKL, W2MTA, KU2N, WB2NLU, WB2OWO, WB2RBA, ND2S, KA2SJG, KA2UBD, KD2UV, NE2W, K2YAI, W2ZOJ. Appointments: (EC) N2CUK Orleans, WB2GZE Steuben; Club Officers: Orleans KZ2R, KA2SYY, N2CWG, KA2BCF; Rome K2GVI, KA2OQB, KA2JXA, W4BNY, N2GFN, KA2TSC, KA2UBD; Boonville NC2O, W2VYI, KA2SJG, KA2FOR; Rochester DXA W2TZ, KB2SE, W2HG; Rochester Packet Group WB2NBU, K2YNW, N2FQR; Rochester Repeater (RRRA) KD2OU, KS2Z, WA2MYG. Lots of Novice classes underway . . .some are sponsored by Liverpool ARC, Binghamton ARA, Tompkins County ARC, Rochester ARA, more later. K2QR reports "ATTABOYs" to ATCs W2AWB and KA2VEG.

NYSEMO	3993	085-004-04	NYSR	3530	026-004-04
NYS/M*	3677	335-180-30	Bluetn	93/33	
WDN/M*	04/84	303-080-30	JCARCN	10/70	443-007-29
MFN	3925	099-059-30	OARCN	25/85	057-002-04
NYPON*	3913	705-411-30	NYTN	3720	129-035-29
NYSPTEN	3925	579-065-30	BRVSN	055/655	382-008-30
ESS	3590	376-083-29	CNYTN*	90/30	233-046-30
Q Net	31/81	328-006-30	MVTN	21500	020-045-09
OGTEN/E*	/94	- -30	OCTEN/L*	/88	- -30
STAR*	13/73	232-077-30	VHFTHIN	/64	056-000-05
WDN/E*	57/17	508-235-30	WDN/L*	/64	504-125-30
NYS/E*	3677	424-325-30	NYS/L*	3677	367-278-30

*NTS Net. Other Nets: CVARCSEN 076-001-04, Lewis County ARES 042- 000-04. CNYTN August 245-044-31. COMMS: OCARA active at both Richfield Springs Lions Day and at Glimmerglass Triathalon— KA2QBQ. Enjoyed meeting many at HAM-O-RAMA in Niagara Falls, including K. B. Warner's nephew KA2IXV who has some great insights into "KB". Packet Radio is BOOMING in New York State, find out about your Local Area Network (LAN) and join in; it ain't all just Bulletin Boards! Traffic: W2MTA 566, KA2UBD 453, WB2IDS 434, WA2HSB 430, WB2OWO 382, N3DPF 334, WA2FJJ 284, KD2UV 203, KU2N 172, NE2W 164, VE2FMQ 161, WB2QIX 157, NN2H 151, ND2S 142, N2ABA 138, W2FR 123, W2ZOJ 106, KA2DQA 102, WB2IKL 99, WA2JPB 97, K2YAI 89, KA2DBD 76, WB2IJH 75, WB2RBA 70, WB2NLU 59, N2EVG 46, AP2K 41, KA2SJG 33, WB2KCT 27, K2QR 27, W2PPS 26, N3DPE 20, WB3CUF 19, K2IUT 8, WA2OEP 8, W2PHQ 7, K2VR 6. Season's Greetings to All!

WESTERN PENNSYLVANIA: SM, Otto L. Schuler, K3SMB—SEC: WA3UFN. STM: WN3VAW. PIO: KC3TO. OO COOR: KJ3Q. SGL: ? TC: K3LR. BM: KR3P. ACC: AK3J.

Net	QNT	QTC	SESS	kHz	T/D	Man.
WPACW	246	142	30	3985	7:00P	WA3UNX
SPAPTN	397	121	30	3983	6:00P	WA3HLN
KFN	171	49	30	3958	1:00	N3EMD
PFN	207	100	30	3958	5:00	WA3THT
WPA2MTN	351	123	30	146.28/88	8:00P	KA3BGC
NWPA2MTN	461	34	29	144.53/145.73	10:00P	KC3NY
KSSN	40	15	12	3730	6:30	

We have a Silent Key this month. He is WA3GET. Our sympathy is extended to his family. Congratulations to the Allegheny County ARES for the fine article and cover on OST's front and the article in the October issue. I think any events in your county would be appreciated by the staff in Newington (pictures articles in the news). In Allegheny County, we have several big public events and the ARES members do the communications for them. I know that other counties have many events, so why not let the public know what you are doing and can do. Do you have an active EC get him moving and check with your local Officials in most cases the planners of these events are glad to enlist your aid. When you read this, I will be starting a new term as SM. I would appreciate any suggestions to better our capabilities for traffic handling, ARES activities and any other ways to better our image. All will be kept in strictest confidence, and the best will be considered and used if warranted. All must be signed and not critize any individual. Please be direct and try to give good thoughts. Traffic: KQ3T 302, W3EGK 186, N3EMD 146, N3AES 114, W3OKN 112, WA3UNX 88, W3NGO 75, N3CZW 71, K3SMB 58, KA3ETC 55, WA3DBW 47, WA3QNT 39, W3KMZ 33, KA3COX 32, N3FM 32, N3EKJ 28, W3RUL 26, WB3CIS 25, KA3COX 20, W3TTN 9, KA3EGE 7, KB3NV 6, K3LTV 5.

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. Welcome aboard to new ORS appointee W5DTR of Belleville. Curtis comes to us with a good deal of ARRL Field Organization experience and formerly served the North New Jersey Section as SM! Travel requirements of my job during the week and those of the SM job on weekends keep me away from home so much lately that at times I feel like a stranger in Southern Illinois. It has been quite a long time since I have been able to attend any local club meetings on a regular bases, so it was an unqualified pleasure to man the ARRL table at the Shawnee Amateur Radio Assn Hamfest on September 14th. I had the opportunity to renew a number of friendships which at times have gotten lost in the travel. The hamfest was a success even though I didn't get away from the table long enough to have some 'goat herder beans" for lunch. Thanks to SARA and W9CJW for the invitation and the work on the table and materials. Kane Co. EC AA9D reports that members of WCRA, FRRL, and Kane Co. ARES provided communications for Central DuPage Hospital's 'Mill Race Ride" Bike-a-thon on September 26th. I have received some complaints regarding the failure of traffic and PSHR reports to appear in *QST*. While I am not incapable of loosing reports, most often the reason is that the reports are received after the date on which I must mail my report to HQ. There is no provision for the inclusion of late reports in the next months issue. I colate and mail all end of month reports on the 7th of each month, so all reports must be received in the mail or on the nets on the 6th. Reports received after the 6th are recorded in the section records, but are not sent to Newington. PACKET radio is getting more and more use as a traffic backbone into the Chicago area by ILN/ISN/ITN stations who use it to get traffic for Chicago distribution to stations who are regulars on CTN. This is an outstanding use of our latest new technology melded with our oldest tradition. If you would be interested in the formation of a statewide PACKET backbone for NTS use please drop me a note or message. I have been recently contacted by the Chicago Convention Bureau regarding the possibility of holding a future ARRL National convention in Chicago. A check with HQ indicates that the next open convention is 1990. If your club would be interested in hosting or co- hosting an ARRL National Convention in the future please give me a call at 1-800/IL1-ARRL. Traffic: W9HLX 232, W9LWH 208, NC9T 133, W9EHS 115, W9NXG 113, W9HOT 110, KJ9L 100, KA9FEZ 92, WB8RFB 87, WA9VLC 72, WD9DZU 60, K9CNP 54, NN9M 51, WA7MAD 49, W9KR 44, KA9BBV 26, KF9W 26, W9LNQ 22, KD9K 20, KZ9I 17, WB9TVD 14, K9EHP 12, K9QEW 9, W9VEY/M 7, KA9CTW/T 6, WD9HQW 6.

INDIANA: SM, Ron Koczor, K9TUS. ASM: W9UMH. SEC: WB9ZQE. STM: W9JUJ. ACC: K9TUS. TC: K9PS. SGL: WA9VQO. BM: KC9TA. PIO: K9DIY. OOC: KJ9G. SRC: N9WB. Net Managers: ITN KD9DU, QIN KJ9J, ICN KW9D, VHF W9PMT, IWN KA9ERC.

Net	Freq	Time	Daily	UTC	QNI	QTC	QTR	Ses
ITN	3910	1330/2130/2300		3241	377	2294	89	
QIN	3656	1430/0000/0300		639	342	1643	90	
ICN	3705	2315		80	28	575	21	
IWN	3910			1680		352	30	
IWN	VHF	Bloom./Kokomo		2159		373	60	
Hoosier VHF Nets:				3299	169	2640	117	

APPT: K9KTB, EC Kosciosko Cty; K9KTB, DEC District 2; WD9ART, ORS. Silent Key: WA9HLW. BPL: W9JUJ. OO Reports from N9CJT, KA9BYN. IN rep. 100% to D-9RN tnx to W9JUJ. IN 100% to 9-RN tnx to W9SCJ, W9FC, N9HZ, KJ9J, W9JUJ, W9KT, NJ9S, WA9QCF, WB9UYU, K9WWJ. Welcome aboard to new SSCs Michiana ARC in South Bend and Tippecanoe ARC in Lafayette. That makes 17 SSCs in Indiana! Special Service Club of the month is Allen County Amateur Radio Society, AC-ARTS. Newsletter is STATE OF THE ARTS, contact is N9BAC. AC-ARTS has about 180 members, operates NE Indiana's Skywarn repeater (28/88) and operates several public service events each year, including a public exhibit during the Three Rivers Festival. AC-ARTS operates one of Indiana's largest indoor hamfests each November in Fort Wayne. AC-ARTS is one of two clubs which make Fort Wayne a hotbed of ham radio activity! If you're interested in digital communications, check into the Indiana Digital Experimenters Assn. IDEA publishes a periodic newsletter that is full of news and ideas pertaining to packet and other digital techniques. Their latest map of Indiana shows the digital network expanding to full state coverage. ECs and others interested in emergency preparedness should stay on top of this emerging technology . . a revolution may be at hand! For information about IDEA, contact Bob, WB7QWG, in Indy. Greenfield Hamfest is December 7. Holiday greetings to all Hoosier hams . . . enjoy yourselves but be careful! Don't forget to let me know what your hamfest dates are for 1987 so that I can spread the word for you. If your repeater is experiencing interference from other repeaters due to coordination problems, let N9WB know in writing as soon as it starts. In some cases, something can be done. Traffic: W9JUJ 702, W9JZV 195, KJ9J 145, K9WWJ 130, KA9FFO 127, NJ9S 103, W9UMH 78, KD9ER 45, KB9HH 41, KW9D 36, WB9IHR 32, WB9PFZ 30, K9KTB 28, W9UEM 27, W9ZGC 21, W9PMT 21, W9BTZ 14, WB9AWI 14, K9ZBM 12, W9EI 12, WB9OZZ 12.

WISCONSIN: SM, Richard R. Regent, K9GDF—SEC: W9OAK. STM: K9UTQ. ACC: KA9FOZ. BM: WB9JSW. OOC: NC9G. PIO: K9ZZ. SGL: AG9V. TC: K9GDF. Seasons greetings. WB9YPY was awarded plaque for WNA for being choses as the traffic handler of the year. New officers WNA: Chairman WB9ICH; N9DGL Secretary; NC9G Treasurer; and K9UTQ Training Officer. Contact them with your questions and suggestions for traffic handling or net procedures. KA9RZL and W9NGP are new Official Relay Stations. KB9IE, who lives in the Hilbert area, is now an Assistant Technical Coordinator. Interested in DX? The Greater Milwaukee DX Association has DX tips, rumors, news, and great programs at members homes around SE Wisconsin; ask KJ9I for information. New Wisconsin net, Fearless Brass Pounders Net meets on trial basis Monday and Friday at 8 PM on 21.150 MHz for code practice and rag chewing, ask KA9RZL for details. December 10th, exams at Wauwatosa East High School by Milwaukee Metro Area Team, mail card to W9SNK. December 11th, Milwaukee Radio Amateur Club's annual Christmas Dinner Party 7 PM, at Elm Grove Legion Post Hall with plenty of fun and door prizes; s.a.s.e. to W9SNK for invitation and registration. December 20th exams at Waukesha County Technical Institute, send card to WD9JKZ. Milwaukee ARES could use more operators for Operation Santa Claus. December 24th to help kids at the hospitals talk to Santa. Tip of the month: The happiest miser on earth is the one who saves friends. Traffic: WB9YPY 1268, KA9RII 293, KB9UE 230, W9CXY 229, K9GDF 221, W9YCV 215, WB9ESM 209, N9BDL 148, W9CBE 138, W9DND 123, WB9RGO 119, N9BGE 105, WA9WYS 97, KA9BHL 93, W9UCL 75, WB9ICH 63, K9UTQ 53, AG9G 51, KA9KLZ 49, WD9DNQ 40, N9AUG 38, N9FTN 33, K9FHI 21, W9IEM 20, W9ODV 12, KA9BHK 10, WB9NRK 5.

DAKOTA DIVISION

MINNESOTA: SM, George Frederickson, Jr., KCØT—SEC: KAØARP. STM: KDØCI. Hello again! The ARRL Dakota Division Convention was held in Fargo ND on Sept 19, 20 and 21. I was pleased to be able to attend this annual affair for the first time. The Red River ARC is commended for a well planned convention. While I was not at the Saturday Evening Banquet, I understand it was very worthwhile. Tony England, WØORE, was guest speaker at the banquet. Earlier in the day, an ARRL Forum was held featuring Howard Mark, WØOZC, Dakota Division Dir, and ARRL President Larry Price, W4RA. There were MARS, SKYWARN, and other seminars as well as the Flea Market and Commercial displays. Our thanks to the Red River Radio Amateur Club of Fargo-Moorhead for a job well done. Stay tuned for info on next years convention. Speaking of forums, I believe another ARRL On-the-air session is being planned. Listen to MSPN and other nets for further updates. NET NEWS: KØGI is acting as interim Mgr for the MNAMWXNT for KAØZA. MSSN continues to grow. The training program is an outstanding success and MSSN is supplying people to our CW traffic nets. Did I hear someone say that CW was dying? Not here in Minnesota! Since success is catching, our phone nets are catching the training bug. MSPN/E will be initiating its own program and I encourage anyone to get in on it. Even if you think you know all you need to know about traffic handling and net procedures, take a moment to participate in the MSPN Training Program. Maybe you've been out of the traffic game for a while and you're a bit rusty, or maybe you're new to Amateur Radio and want to learn. There seem to be many ways to handle traffic these days, but there is only one correct way! Let's learn to do it right, folks! The Minnesota Section Amateur of the Month for September is Mel Cook, NØFOO, of Brainerd. Recent upgrades to Tech: KAØVDC, KAØYQX, to General: NØGDG, NØGWT. KAØUSD and KAØWVE, to Advanced: W7HCB, KAØUWO and WBØWCO, to Extra: WØIPY. Congrats to all of you! By the time you read this column, a decision will have been made as to who will inherit the job of editor of the Minnesota Section News. Yes, folks I'm stepping down from this responsibility after nearly four years. I will continue as Section Traffic Manager for KCØT. More on this later, for now 73 de KDØCI . . .

NET	FREQ	TIME	QNI/QTC/SESS	MGR
MSN/1	3685	6:30P	412/74/30	KAØEPY
MSN/2	3685	10:00P	265/46/30	NCØE
MSSN	3710	6:00P	265/61/30	KAØODQ
MSPN/N	3929	12:00P	419/95/30	WBØWNJ
MSPN/E	3929	5:30P	871/100/29	WDØBGS
MNAMWXNT	3929	6:15P	221/128/22	KAØIZA
PICONET	3925	9:00A	3387/294/151	WDØBAC
MSN/RTTY	3620	6:30P	NO REPORT	WAØLUT

MN EMERGENCY FREQ: 3929 BULLETINS: 3685 & 3929. MN/MSO: 3620. Traffic: WAØTFC 320, KT9I 219, KAØEPY 178, WDØBAC 177, WBØWNJ 156, KDØCI 124, KAØSBY 116, NØFOO 86, KDØCI 61, KØOGI 58, W9DM 45, WØKYG 37, NØCLS 36, WDØGUF 35, WØUCE 32, KAØJUX 29, WDØBGS 25, WØHZU 24, KAØARP 21, KAØAJF 15, KCØT 14, KCØFT 13, NØJP 12, KTØR 10, NØEWA 9, KAØPDM 8, KAØCDC 7, KAØBFP 6. (Aug) NØJP 20.

SOUTH DAKOTA: SM, R. L. Cory, WØYMD—STC: NØABE. SEC: KAØKPY. W6ARJ/ex WØUSI and K1AXF ex WØUSH. Visit at Bookings in a get together that consisted of WØUDI K7IDA/ex WØORE and WØKQO totaling 250 years of amateur radio. They also visited WØZRA WØIT WØPRZ and WØGQH as they passed thru their cities. WØIT had a get together for WØURD when he visited Watertown. Call letter license plates will increase from $2.50 per year to $10.00 per year due to Senate bill 77 sponsored by Christensen of Pierre, Pederson of Wall, Shannard of Mitchell and Peterson of Yankton. Cost of a set of plates to the state is $2.50 and must last 3 years. SEARC 2 meter net meets on Sioux Falls Repeater every Tuesday night 16/76 at 6:45 PM. Congrats to KAØRBN upgrade to Gen. Traffic: KØERM 61, KØZBJ 56, WAØVRE 44, WBØOMF 35, WØYMB 20, KAØKPY 18, WØMZI 14, NØABE 9, KAØSLD 4, NØCTK 4, WØHOJ 4, NØCTG 4.

DELTA DIVISION

ARKANSAS: SM, Joel M. Harrison, WB5IGF—ASM: K5UR. SEC: N5BPU. STM: W9OK. ACC: NI5D. SGL: W5LCI. TC: W5FD. BM: W5HYW. Repeater Coordinator: WB5FDP. The Arkansas DX Assn. will hold its annual meeting and banquet the second weekend in December. For more information contact Earl Smith, KD5ZM, or Rick Roderick, K5UR. We are ending the year with a 100% current status of affiliated clubs. Thanks to all for your support and the work of NI5D. Our earthquake scenerio for the SET yielded excellent results. N5BPU reports that packet was used for some of the communications and results were pleasing. Stations are still needed to handle traffic into the state from Region 5 nets. Please help if possible at 10 AM on 7280 and 3:30 PM on 7290. CW nets are at 7:45 PM and 9:30 PM on 3650. On behalf of the Ark. ARRL field staff, I would like to take this opportunity to wish each of you a very merry Christmas and the best of holiday blessings.

LOUISIANA: SM, J.M. "Wondy" Wondergem, K5KR—The La. Council of Amateur Radio Clubs Repeater Linking Committee recently met at Baton Rouge to develop a plan to provide fast and reliable statewide communications by linking VHF/UHF repeaters throughout the state. A secondary purpose would be for a regular use linking system for wide-area nets, drills and public-service events. The committee recommendations will be presented at the next LCARC Council meeting at the Monroe Hamfest on 15 November. Basically the proposals recommend the establishment of regional centers that will be known as "hubs" and a "backbone" or linking system between the regional centers. The first linking system will be established between Baton Rouge, Lake Charles, Lafayette and Shreveport. The Ascension ARC has just been accepted as an ARRL Affiliated Club. Congrats. The Campti ARC has a repeater on 147.27 with the call KD5FZ. Club newsletters received in October: Vicksburg ARC, Lafayette ARC, Baton Rouge ARC, Central La. ARC, Southeast La. ARC, QCWA Chapter 109 and Louisiana Council of Amateur Radio Clubs. Thank you for the newsletters. They help.

MISSISSIPPI: SM, Paul Kemp, KW5T—ASM: K5QNE. SEC: K4HKD. SGL: AL7GQ. ACC: KC5VD. PIO: KA5VBE. OOC: W5VMC. VHF Coord: N5DWU. BM: AJ0X. TC: WB5SXK. Now hear this! JACKSON HAMFEST RESCHEDULED! 1987 Jackson Hamfest/ARRL Mississippi State Convention now scheduled for February 14-15 (not May 2-3 as announced); watch QST for details. Late summer was a busy time for the Section's clubs: Hattiesburg and Laurel ARCs provided disaster communications following derailment of chlorine tank cars near Collins and Hattiesburg's simultaneous telephone system failure; Jackson ARC members assisted authorities in wake of chemical tank car derailment near Flora; Vicksburg and Greenville ARCs provided communications for Jesse Brent memorial boat race down the Mississippi River; and Hattiesburg ARC provided communications for city's

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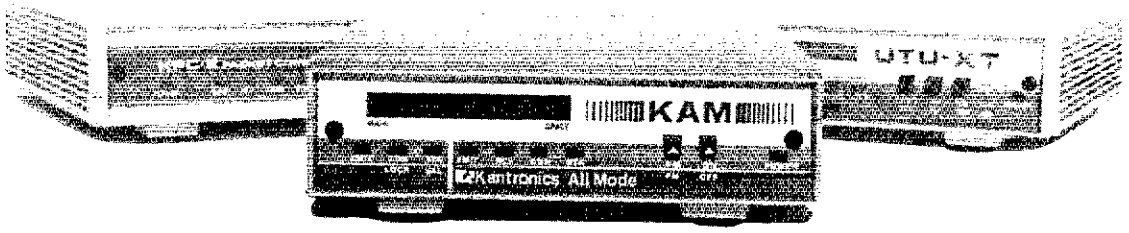

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- Quartz synthesized AFSK or direct FSK operation.
- RS-232 or TTL level operation by jumper selection.
- 16K RAM (expandable to 32K), 256K EPROM, EEPROM for parameter storage.
- Compatible with any computer having an asynchronous serial I/O port.
- FCC Part 15 compliant.

NEW PROGRAM

2400 BPS Packet Video or Basic Packet Video
VHS or BETA – $25 (includes shipping)

UTU-TERM/PACTERM for IBM and compatibles.
Works with UTU, UTU-XT, Packet units, & KAM.
Disk – $29.95 retail.

Kantronics
RF Data Communications Specialists
1202 E. 23 Street Lawrence, Kansas 66046 (913) 842-7745

"Hubfest" festival. Appointment: WA5SUE as Official Observer. Congratulations to KA4CRT on becoming member of VHF Century Club with VUCC 165. Attention ARRL leadership officials: Have you acquired one of the new League call-sign badges yet? They're neat. See Field Forum or QST for details, or ask your SM or ASM. Congratulations to N5ILY and KA5ZQJ on birth of their new "harmonic". Hattiesburg ARC members are undergoing training in damage assessment at request of American Red Cross. By the way, if your club is not already aligned with your local Red Cross, explore it; you'll likely find they can offer you as much as you can offer them. CAND (W5KLV) sessions 30, QTC 634 (Mississippi represented 100/by N5AMK. DRN5 (WB5YDD) Sessions 60, QTC 641 (Mississippi represented 100/by N5AMK, KT5Z, W5HKW, KE5EC and KB5W). MSBN (WJ5P) Sessions 30, QNI 1929, QTC 88. MTN (K5OAF) Sessions 30, QNI 140, QTC 71. MMN (WJ5L) Sessions 30, QNI 493, QTC 6. GCSBN (W5JHS) Sessions 30, QNI 1058, QTC 24. MLEN (WD5O) Sessions 4, QNI 97, QTC 1. HAEN (N5GRW) Sessions 4, QNI 89, QTC 0. Traffic: K5OAF 317, KT5Z 116, W5WZ 77.

TENNESSEE: SM, John C. Brown, NO4Q—ASM/ACC: WA4GLS. OOC: W9FZW. SEC: WA4GZQ. SGL: WA4GZZ. STM: NG4J. TC: W4HHK. The Section Manager has been reminded that he omitted something for an activity that was well worthy of mention. WB4TDB was the commercial radio guest on a Nashville station. The subject matter discussed was, you guessed it, amateur radio. I must say that he did a very good job on relating the matter to non-amateur public. Many TNX. If any other amateurs in the section are involved in radio or TV along these lines, it would be appreciated if you would send along an account of the event to the section manager so that it can be recorded in this column. As an activity matter, the "OLD CODGER" certificate and membership card program has generated some kind of interest on the TN match frequency of 3980. It is a good activity creating program initiated by persons unknows. The interest and comradery the program has caused or created is very commendable. The unknown person or persons are to be congratulated. TNX unknows. The 3980 "Bunch" is alive and well I would say. Don't know if all the WX forecaster have been right but many indicated that we are to have some "rough" times this go around and if you did not prepare for that condition, it is a bit late now I would say. HI. The band conditions have been everything but good for some time and DX as well as other kind of operations have got to improve. We are at the bottom of the cycle or just coming off the bottom according to what report you consulted. Spotted conditions have been heard on all modes from packet up or down according to your desires. The section traffic is beginning to show some rise. CW net Honor Roll for this period shows KB4NSB (upgrade to GN) with new call N4OSZ, WA4CNW & NG4J. Section traffic for this period is: LF Sessions 82, QNI 2869, QTC 105; VHF Sessions 62, QNI 709, QTC 510; CW Sessions 41, QNI 133, QTC 64. No applications for packet net manager yet. Individual station activity for the period: W9FZW 150, NG4J 148, WA4FMR 117, W4WXH 108, KJ4JE 85, W4DDK 47, NN4S 40, W4PFP 26, W4TYV 14, K4WOP 10, KA5KDB 10, W4TYU 9, N4OSZ (ex KB4NSB) 8, W4PSN 7, KB4UQ 7, N4KQX 7. (Aug) K4WOP 3. 88's and 73 till next time.

GREAT LAKES DIVISION

KENTUCKY: SM, Dale Bennett, WA4JTE—It seems that fall is upon us. From some of the newsletters, it seems this is the time of year to select new officers. So let me know of any new officers. If your club has a newsletter, be sure send me one so I can keep up with the activities of your group. Still need improvement on 9RN and D9RN. D9RN's precent was only 68% during Sept. 9RN was a lot better—88%. 9RN reps were KA4BCM, K5HOE, W4OGP, KZ8Q, K4OCQ, KI4QH & KC4WN. D9RN reps last month were KA4MTX, KA4BCM, KB4AMA, K4YZU & KA4SSA. Thanks for the help. Ray, WB4ZDU, and Bruce, WA4JZT, have resigned as STM and SEC. Thansk for all your efforts and help, guys.

NET	QNI	QTC	ESS	NM
3ARES	36	1	4	KA4BCM
TSTMN	522	42	30	KZ8Q
KYN2	119	66	28	KZ8Q
MKPN	1170	117	30	KA4SAA
KNTN	210	60	37	KB4OZ
KTN	915	60	30	KA4GBZ
NKARC	46	5	4	WA4AVV
KYPON	66	7	4	WA4AVV
KYN1	71	11	17	WB4ZDU

Traffic: K4VHF 121, KA4BCM 82, KI4QH 59, KA4MTX 30, K4HOE 19, KA4GBZ 14, WA4AVV 13, WD4CQF 13.

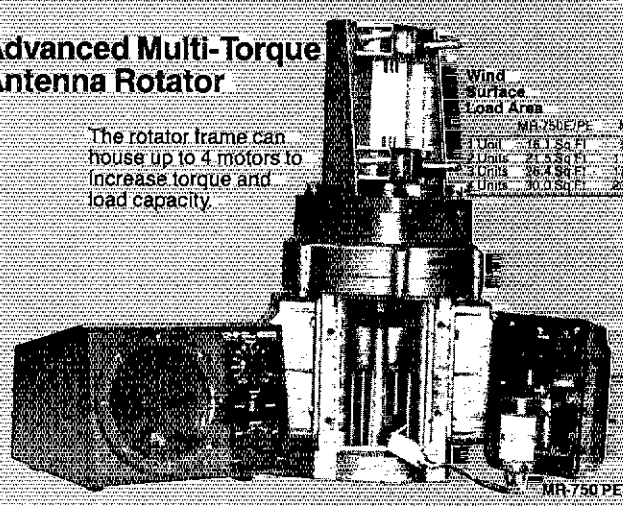
MICHIGAN: SM, James R. Seeley, WB8MTD—The Southeastern MI Traffic Net—SEMTN—is born again! If memory serves, this is the third try at an effective NTS net at the local level in MI, and it looks like this one just might fly. (Check the reported totals below for the first month of the new operation.) STM WB8SIW sees the need for it, as indeed we all have in times past. With lots of encouragement from him, and with the aficionados of the latest technology so eager to put their skills and equipment to work, the new net is getting lots of participation and quite a bit of business that it can handle. N8AHA is the manager. Best of luck to you, Jeff! Correction on the announcement in last month's column: if you haven't picked up on it elsewhere, NK8Q is the recipient of the 1985 Maxim Award, not 1986. Correction also re. the UPN extra noontime session: it's on Sunday, not Saturday. We have had VHF repeaters in the amateur service now for longer than a goodly number of us have been hams. You can drive from coast to coast or from Mexico to the Canadian wilds and hardly ever be out of range of good, solid VHF amateur communication. The operator who these days doesn't use a repeater at least occasionally is a very rare bird indeed, and there are many among us who work these ubiquitous black boxes almost exclusively. Conventions and procedures, almost universally understood, have been accepted by the community—or have they? Why, I ask, does hardly a month go by in which I don't see in one club or repeater bulletin or another the exhortation to "Wait for the beep" or its local equivalent. It's always for the same reason—someone needed help and was unreasonably delayed in getting it because the machine was tied up and the users weren't "waiting for the beep." Are we ever going to grow up? I am very pleased to see quite a few "first time" callsigns in the traffic reports this month. Welcome to the club, y'all! Net summary for Sept. (Net QNI Tfc Sessions): MITN 650 232 30; QMN 636 165 59; SEMTN 192 87 28; MACS 517 70 30; UPN 1091 63 34; MNN 240 51 55; GLETN 836 40 29; VHF 945 23 46. Traffic: KA8CPS 237, W8QHB 221, WB8SYA 96, NJ8R 94, WB8SIW 89, WD8KQC 78, K8GXV 72, K8KMQ 69, K8OCP 51, W8SCW 50, WA8DHB 49, KA8PWM 43, WD8RHU 40, WB8MTD 37, K8UPE 34, K8HAP 28, KI8Q 27, NJ8X 26, NT8G 25, W8YIQ 23, WD8MCN 21, KA8WVE 20, WB8WJV 19, WD8MJB WD8OUO 18, W8RNQ 15, WD8EIB 12, N8EXS W8VIZ 10, K8ZJU 9 WA8MVH W8URM 6.

OHIO: SM, Jeffrey A. Maass, K8ND—ASM: N8AUH. SEC:

Superior Ham Accessories

Advanced Multi-Torque Antenna Rotator

The rotator frame can house up to 4 motors to increase torque and load capacity.



Wind Surface Load Area	MR-750E/PE	MR-300E
1 Unit	16.1 Sq Ft	9.46 Sq Ft
2 Units	21.53 Sq Ft	11.84 Sq Ft
3 Units	26.4 Sq Ft	14.23 Sq Ft
4 Units	30.0 Sq Ft	24.67 Sq Ft

MR-750 PE

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

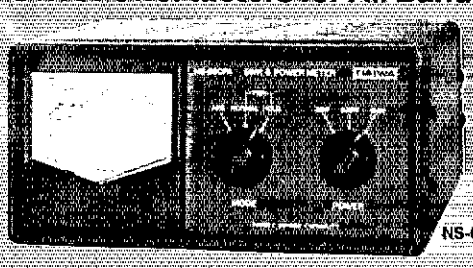
■ Rotator Unit

		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 – 2½ 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

New Cross Needle SWR/Power Meters for All Bands



15° angle face for easy reading and operation

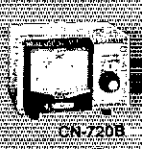
NS-660PA

Model*	Freq. Range Int. Sensor	Forward Power	Tolerance Full Scale	Connectors
NS-660A	1.8-150 MHz	30/300 W/3 kW	±10%	SO-239
NS-660PA	1.8-150 MHz	30/300 W/3 kW	±10% Av Pwr ±15% PEP	SO-239
NS-663A/N	140-525 MHz	30/300 W/3 kW	±10%	SO-239/N Type
NS-668	900 MHz-1.3 GHz	1.5/15/60 W	±10%	N Type

*Optional sensors adapt each meter for use on other bands.

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 50 ft. Cable with connectors for use with remote sensors

SWR & POWER CROSS NEEDLE METERS



CN-720B

CN-720B
Frequency Range: 1.8-150 MHz
Power: 3 Ranges (Forward, 20/200/2000 W) (Reflected, 4/40/400 W)

CN-410M

NS-448
300 MHz-1.3GHz
(Forward 5/20 W)
(Reflected 1.6/6.6 W)
Separate Sensor Type

NS-448

	CN-520	CN-550
Frequency Range:	1.8-60 MHz	144-250 MHz
Power Range:	200/2000 W	20/200 W

	CN-410M	CN-460M	CN-465M
Frequency Range:	3.5-150MHz	140-450 MHz	140-450 MHz
Power Range: Forward	15 W/150 W	15 W/150 W	15 W/75 W
Reflected	5 W/50 W	5 W/50 W	5 W/25 W

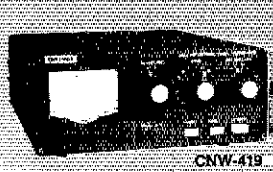
Back Lit, with mobile bracket.

LA-2035R

POWER AMPLIFIERS

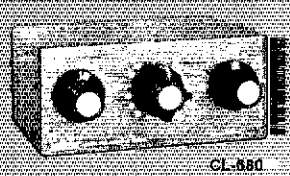
LA-2155W

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			



CNW-419

ANTENNA TUNERS



CL-680

Frequency Range:	CNW-518 3.5-30 MHz (8 bands)	CNW-419 1.8-30 MHz (17 bands)	CL-680 (no metering) 1.8-30 MHz (17 bands)	CNW-919 140-150 MHz
Power Rating:	1 kW CW (50% duty)	200 W CW (3.5-30 MHz) 100W CW (1.8-3.4 MHz)	200W CW (3.5-30 MHz) 100W CW (1.8-3.4 MHz)	200W CW 10-250ohm
Output Impedance:	10-250/25-100 ohm (On 3.5 MHz)	10-250 ohm	10-250 ohm	

AF-606K

AUDIO FILTERS

AF-606K
Four stages of filtering...variable bandwidth over broad range...razor sharp CW reception...built-in speaker...PLL Tone Decoder circuitry

CS-201 CS-401

COAXIAL SWITCHES

PAT. No. 59-000803

	CS-201 2position	CS-201G 2position	CS-401 4position	CS-401G 4position	CS-4 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				

ELECTRONIC KEYER DK-210

Sharpen your "fist" with Daiwa precision!

Model	IMAX. (CONT.)	Variable Output VDC
PS-51XM	5.6A/5A	5-15
PS-120M	12A/10A	9-15
PS-30XM	31A/24A	1-15
PS-660MD*	56A/44A	13.8**

*Sub-DC Outlets, 10.6A/1-15 VDC
**Fixed Output Voltage

POWER SUPPLIES

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MADE BY DAIWA INDUSTRY CO., LTD., TOKYO, JAPAN

WD8MPV. STM: KF8J. BM: W8ZM. ACC: KJ3O. TC: KB8MU. OOC: AD8I. PIO & SGL: N8CVK.

NET	QNI	QTC	Sess	Time(Local)	Freq.	MGR
BN(E)				1845	3.577	N8EVC
BN(L)	232	111	30	2200	3.577	K8TVG
BNR	168	107	30	1800	3.605	W8EK
BSSN	530	320	59	0945, 1900	3.873	K8OZ
ONN	198	38	29	1825	3.708	WD8KBW
OSN	321	117	30	1810	3.577	N8AEH
OSSBN	2128	684	90	1030, 1615 & 1845	3.9725	WB8JGW
OSSN	145	60	30	0645 M-F	3.577	KA8GJV
				0800 S-Sn	3.577	KA8GJV
OSMN	98	10	13	2100	50.16	WD8CTX
Ohio Section ARES Net				1500 Sun.	3.875	WD8MPV

VE sessions in December: Mentor 12/6; Ravenna 12/27; Barberton 12/27; Elyria 12/28. Contact me for more information at the address or telephone number given on page 8 of this QST. The Canton ARC and the Massillon ARC are helping to introduce Amateur Radio to young people in their communities by donating copies of the K8ATX novels to 18 high schools and 23 junior high schools in Stark County. In addition, a complete set of ARRL publications have been donated to the Stark County Library. Amateur Radio is not a "secret society": to grow we must let others know that we exist, and that our operating privileges open the world to young and old alike. The new Archie comic book is one tool that you can use to "spread the word": contact me for details. Clubs should take the initiative to recruit new amateurs from their community: it benefits the Amateur Service, and it benefits the club! The Lake County ARA has been designated an ARRL Special Service Club, attesting to it's continuing contributions to amateur radio and to it's community: congratulations! Also in Northeast Ohio, the North Coast Traffic Watch (NCTW) has begun to operate with a combination of RTTY and packet. Contact Net Manager Joan Spencer, WB8RSM, for information. Assistant Technical Coordinator KC8JN in Wintersville has been active in the past several months promoting packet radio and helping to answer a variety of technical questions for Amateurs in his area. The ATC program is available for your use: if you have a technical question, a problem with RFI/TVI, or would like to volunteer to help, contact the Ohio Section's Technical Coordinator KB8MU. The Jackson County Traffic Net (JCTN) has changed it's operating time, and now meets on the 146.79 MHz repeater at 9 PM nightly. This net helps to move traffic into and out of the Southeastern part of Ohio. Especially in this high-volume traffic month, check in regularly if you are within range! Contact Net Manager KD8XL for additional information. September was a big month for new ARRL Field Organization appointments, with 17 new appointments issued—ORS: KC8D, N8HBF, N8HIL, and W8SKP; OES: KE8AB, WB8ACP, N8DRR, K4FCK, WB8JGW, KA8KHS, and KA8SYO; OHS and OES: N8CWU, KA8ESL, and WD8OXT; OES and ATC: WB8IUH; OO: WA8CFX and WA8DYS. Congratulations to all for making the committment to serve the public and our hobby! If you'd like to join them, contact me for information. In this holiday season, may you and yours experience Peace and the best that the world has to offer! Traffic: WD8KFN 306, W8PMJ 273, WB8JGW 261, K8OZ 226, WB8MEK 201, K8TVG 199, K8ND 187, KD8KU 184, KA8GJV 170, KA8KHS 161, W8OZK 144, W8FPA 138, K8JDI 137, KV8Q 135, KF8J 126, N8EVC 122, WA8EYQ 120, K8CMR 118, WD8MIO 109, N8AKS 108, N8GEC 108, N8EFB 96, N8FWA 95, W8EK 92, W8BO 81, WA8SSI 76, KA8UYM 73, KD8FW 72, WB8KWC 70, N8AEH 62, N8HBI 62, WB8KWD 62, W8SKP 62, KE8BE 61, NC8Q 59, WD8IKC 54, WD8RIB 54, KA8CGF 53, WD8KBW 51, KD8WI 50, NR8C 48, WB8DMF 48, N8FBE 47, KC8UZ 47, K8DHD 43, KD8XL 41, K8EF 40, WA8FQW 39, WD8QXT 36, W8WEG 34, WA8DYS 33, WA8HGH 32, NM8N 30, KC8YV 30, KA8YXW 30, NF8B 29, WD8DCB 29, W8JMD 29, KA8TNT 29, KA5ILZ 28, NE8X 28, WA8HED 27, WD8MPV 27, WD8JYE 24, K3RC 24, W8ZOL 24, NK8B 22, WB8RSM 22, K8VOY 21, N8FPH 20, KJ3O 20, WB8BWY 19, KC8D 17, N8GOB 17, W8UQY 17, WD8CSP 15, N8HBF 15, N8AJU 14, W9SWM 14, KA8THO 14, N8CW 13, KD8WH 13, WB8HHZ 12, KA8RIX 12, N8CJS 10, K8CKY 10, WD8CTX 10, W8MVE 10, KA8OQF 10, NR8L 9, NK8C 8, KD8IC 8, KA8SON 8, WD8ATN 7, KA8DRR 7, N8HEA 7, WD8JMM 7, NQ8K 7, KA8RQF 7, KC8WH 7, WB8YFD 7, WD8CKK 6, WD8DKO 6, KA8SOM 6, KA8YIT 6, W8ZM 6, KD8CV 5, KA8VET 5, WB8AWM 4, N8GIO 4, KZ8P 4, WD8PWG 4, KA8QIX 4, KA8SZH 4, WB8YIJ 4, W8BHL 3, N8FFC 3, WB8GDM 3, N8GIY 3, N8HSU 2, K8IOW 2, KA8VYT 2, KB8AHP 1, K8EEN 1, N8HIL 1, K1LT 1, KA8MFG 1, KA8MFH 1, WD8NED 1, W8KN 0. (Aug.) WB8YYS 39. (Jul.) WB8YYS 47.

HUDSON DIVISION

EASTERN NEW YORK: SM, Paul S. Vydareny, WB2VUK—ASM: K2ZM. STM: WB2MCO. BM: WB2EAG. SGL: KB2HQ. TC: KC2ZO. ATC: WA2VGM. NET LISTINGS: (QNI/QTC) AESN 51/3 ESS 376/83 HVN 187/58 NYPON 705/411 NYSE 424/325 NYSL 367/278 NYSM 335/180 SDN 306/116. CLUB NEWS: Albany ARA had demonstration on ATV at October meeting. They welcome new members KA2OPG WB2SBO. Member K2VV was US 1st place in DX contest as single op. CCNR had demo of packet radio. Overlook Mtn ARC has been holding Novice classes. Rip Van Winkle ARS members participated in Columbia Cty Air show. Saratoga RACES has set date for next year's Hamfest, 12 Sept. 87. Schenectady ARA is running Novice and Tech courses. WECA heard WA2MOE talk about DX-peditions. WARA learned "What a Ham should know about solid state" from KN2X. A special Thanks to N2BFG, former ACC and Speaker Coordinator for a job well done. He has moved to New Jersey and is now an ASM in NNJ. Thanks to AK2E for his years as SEC. If anyone is interested in the job of ACC, a PIO or SEC, please let me know ASAP! With the holidays almost upon us, the traffic nets could really use some help. It only takes a few minutes to check into VHF nets, CDN, SCRN, HVN, SDN. Please lend a hand. They will appreciate it. Special Thanks to Saratoga RACES for their hospitality to WA2DHR and me in September. The very best of the upcoming holidays to all. Aug PSHR KA2AQV. SEP PSHR NQ2H WB2VUK WB2EAG KA2MYJ K2ZVI WA2JBO KC2TF W2PKY WB2MCO N2EQM KB2ATJ. Traffic: WB2EAG 351, KC2TF 218, NQ2H 151, W2PKY 147 WB2VUK 139 KA2MYJ 131, K2ZVI 119, WA2JBO 68, WB2MCO 64, K2ZM 62, N2EQM 32, WB2OHR 22, KA2TQW 15, KB2ATJ 10. (Aug) KA2AQV 144.

NEW YORK CITY-LONG ISLAND: SM, John H. Smale, K2IZ—ASM/ACC: WB2IAP. ASM/VE: W2NL. SEC: KA2RGI. OOC: NB2T. TCC/RFI: WA2YMH. STM: WA2ARC. PIO: W2IYA. The following are traffic nets in and around the section:

NLI*	3630 kHz	1900/2200	WB2EUF mgr
NCVHF	6.745 rpt	1930 m-f	K2MT mgr
BAVHF	6.87 rpt	2000 m-f	K2YOK mgr
SCVHF	5.37 rpt	2030 m-f	W2GZD mgr
ESS	3590 kHz	1800	W2WSS mgr
NYS/M	3677	1000	WB2EAG mgr
NYS	3677 kHz	1900/2200	WB2EAG mgr

*Denotes section net, all times are local, please try and check in whenever possible. On behalf of the XYL, the four jr. ops and myself I want to wish everyone a Merry Christmas and a Happy New Year. I also wish to thank everyone who has helped me over the years during my terms as Section Manager. When 1987 starts Woody, WB2IAP, will be the new SM. I will stay on to continue to write the column. I guess that will make me the Section Column Manager (SCM). I will miss the job, but the needs and responsibilities of helping to raise the 4 children has to come first, 3 of them are already asking when can they get their licenses, and in this day and age, we could use all the hams we can get. 12 years didn't really seem like a long time, not with all the people I have come to know and the friends my wife and I have made, I'm thankful I was able to do it. If anyone is interested in setting up amateur radio demonstrations for schools, satellite, packet, computer, what ever, please contact either K2IZ or WB2IAP. We aren't getting any younger, and perhaps we can get the youth of today interested in our hobby by showing them all of the "modern" things our hobby is able to do. LIMARC will continue to conduct examination sessions on the second Saturday of the month at the N.Y. Inst. of Technology, Rt 25A, Old Westbury, in Salten Hall, room 2, applicants are reminded to bring 2 forms of ID, original and a copy of their FCC license, check for $4.50, made payable to ARRL/VEC, 2 pens/pencils and a calculator for the math questions, for further info contact Woody Gerstner WB2IAP, 42 Mohawk Ave., East Atlantic Beach NY 11561. LIMARC held their fall flea market, nice weather for a change and an excellent turn out, nice to see a lot of old friends once again. Traffic: K2YOK 205, W2GKZ 90.

NORTHERN NEW JERSEY: SM, Robert R. Anderson, K2BJG—ASM (VE liaison): N2XJ. ASM (FO Info): N2BFG. SEC: N2FOZ. STM: KA2HNQ. OO/AAC: KA2BZS. ACC: KY2S. PIO: WB2NQV. SGL: W2KB. TC: K2BLA. BM: N2CXX. I am pleased to announce the section leadership appointment of Ronald A. Loneker, Sr, KA2BZS as Official Observer Coordinator. Contact Ron at 2092 Nicholl Ave., Scotch Plains, NJ 07076, Phone 322-6993. Other new appointments are: Sussex county ECs K2BOG (Vernon Twp.), KZ2X (Newton), N2ERH (Frankford Twp.), WA2GZB (Andover), WA2SPX (Sparta), WB2PXJ (Sussex/Wantage area); OESs K2YHY, N2BNB, N2CFD, NQ2G, WA3WUD, and WB2WNX. Bergen county ECs K2KRF (Carlstadt), N2DNO (Rochelle Park), and NB2F (Lodi). SEC, N2FOZ attended the state RACES symposium held on Sept 28th. He reports excellent prospects for joint ARES/RACES ventures in the future. It is desirable that Amateurs who are active in emergency communications be members of both ARES and RACES. Your local EC or your county DEC can initiate a request for your appointment in ARES, or can provide information on where to sign up for RACES. Do it now! Gordon Beattie, N2DSY, has been appointed chairman of the Tri-State Amateur Repeater Council (TSARC) packet committee. This committee will function as the "Network Coordinating Agent" for the Tri-State area. Affiliate and other NNJ clubs please note: The annual meeting of the Hudson Amateur Radio Council (HARC) will be held Saturday January 17, 1987. Plan now on sending your representative. Congratulations to the following who were newly licensed or upgraded during September sessions conducted by: Bayonne EM, NNJ VE Board, Ramapo Mountain ARC, and Raritan Bay ARC; Novice: M. Macioce. Technician: KA2ABD, KA2MAH, KB2BLA, KA2UHT, KA2WLX, and KA2YQO. General: KA2YDA, KA2IXS, N2FQW, and N2GJX. Advanced: KB2ASU, KA2UWB, KA2ZZO, K2DRO, and WB2ANM. Extra: N2FVP, N2FZG, WB2HNE, KA2UVI, WB2ZLI, N2GHJ, and WA2OTX. Traffic handlers please note: The Contab is scheduled to be held December 6th. All traffic handlers are invited. Time and place will be available on the various nets. NJN/L has returned to 3695 from 3707. NJ Voice net has added an early session, please see listing below. By agreement with the SM of the SNJ section the NJ slow net will from this time forward be reported in this column. September Data:

Net	Mgr.	Freq.	Time	Sess	QNS	QNI	QSP
NJM	W2RRX	3695	1000	Dy	30	170	76
NJPN	W2CC	3950	1800	Dy	30	377	91
NJN/E	AG2R	3695	1900	Dy	30	212	156
NJN/L	AG2R	3695	2200	Dy	30	119	58
OBTTN	WB2QMP	147.12	2000	Dy	30	290	151
TCETN	KA2SPH	146.685	1930	DyNot Rec.			
NJVN/E	WB2FTX	146.895	1900	DyStart 10/86			
NJVN/L	WB2ANK	146.49	2230	dY	29	235	100
NJSN	WB2PKG	2795	1830	dY	30	225	22
NJPTN (PBBS)		145.01	WA2SNA-1 and WB2GWD-0				

NNJ Amateur Radio Public Info Line: 201-735-8550. SAR/PSHR: N2XJ 291/109, N2DXP 104/62, W2CC 22/, WB2QMP 82/69, W2RRX 81/82, W2XD 23/.

MIDWEST DIVISION

IOWA: SM, Rollin Sievers, WBØAVW—SEC: KDØBG. STM: KCØXL. OOC: WØVX. ACC: WBØQAM. BM: KBØIIR. PIO: NQØW. TC: KØDAS. SGL: AKØQ. The Des Moines R.A.A. will host the 1987 Midwest ARRL Convention Sept. 26-27. The Burlington area hams are doing it again, they are starting a ham radio class again this year at James Madison Middle School for novices and upgrades. The last count I had was 73 novices from 140 of last years class. The Des Moines R.A.R. club has been approved as a Special Service Club. Scotland A.R.A. are considering modifications and a new site for their repeater. Mt. Pleasant ARC reports a record breaking number of hams visiting the WØMME shack and QTC of 118 at the Midwest Old Threshers Reunion. By the time you read this we will have an idea of what the winter may be like. I wish each and everyone a very Merry Christmas and a Happy New Year.

NET	QNI	QTC	FREQ	TIME	DAY	MGR.
75 meter noon	1253	61	3970	1730	Dy	WBØJFF
75 meter eve	909	82	3970	2300	Dy	NØAEF
ITEN 4 sess.	76	3	3970	2300	Sun	KDØBG
TLCN 60 sess.	212	137	3580		Dy	WØYLS
W. Cen. ARES	247	3	147.69	8:30	M-Th-F	KØCNM

DTEN: 337 messages in 60 sess. at rate of .309. Iowa represented 68% by stations KCØXL/41, KØIPT/15, WØHTP/8, KAØGRO/4, WAØAUX/4, NØCKD/1, WDØAQS/A. DTEN QTC 274 in 60 sess. 100% by KAØADF, NØCWW, KØGP. Traffic: KØGP 178, WØYLS 100, WØSS 95, KAØADF 94, W4JL 43, KAØGSA 40, KCØXL 38, WBØJFF 23, KØBRE 17, NØAEF 12, WØBW 12.

KANSAS: SM, Robert M. Summers, KØBXF—SEC: NØBLD. STM: WØOYH. Net Manager KSBN/KPN, WØFRC. Net Mgr QKS, ——. Ks RTTY Mgr, KAØCUF. District Emergency Coordinators are WØOAG, WBØYJT and WØEB. STATE Govt Liaision is NØBLD. Tech. Coord is WBØNQM. Bulletin Mgr, KØJDD. ACC, KØBXF and Manager of QKS-SS is WØMYM. Packet Radio is coordinated for KS by WDØBRZ and the WX NET by WBØHOZ. Ever wonder who else holds an ARRL station appt.? ECs: WBØSZS, WBØWHB, WØPBV, KAØJPM, NØCBI, NØAOL, WØNYG, WBØIZY, WAØTAH, KCØGR, WAØRXS, KØEQH, WBØSRP, KBØEY, WAØGBN, NNØM. ORS appts are held by WØAM, NØAOL, WBØBCL, NØBDG, KØBXF, WØCHJ, KAØCUF, NKØZ, ACØE, KAØE, WØFDJ, WØFIR, WØFRC, WØFT, NØGCC, WØHI, WAØHOZ, KØJID, WØKL,

WA8LBB, K8MXJ, W8MYM, W8NYG, WA8OWH, W8OYH, W8PB, W8RBO, K8WA and WB8ZEN. OES: WB8BBC. ATC: KA8FMZ, KA8HEP, NN8M, KA8RZO and K8SF. OBS: W8AM, K8BXF, WA8YMI, W8CHJ, W8FIR, K8JDD, W8NYG and N8GCC. OO: W8KL and K8BXF. Thats not a bad bunch to follow!!! WHY NOT look into what it takes to hold the appointment of your choosing? I am sure we have room for a few more real active amateurs on the league staff for KS. So much for the WHO's WHO this month. We'll catch up on the net reports next month. Traffic: N8GCC 302, W8QBK 248, W8FIR 178, W8FRC 147, KS8U 110, W8OYH 84, NB8Z 66, W8FDJ 63, W8QMT 52, K8BXF 51, WA8HOZ 44, W8HI 37, W8MYM 27, W8PB 7, W8CHJ 6, K8KD 5.

MISSOURI: SM, Ben Smith, K8PCK—Newly elected officers for the Zero Beaters ARC are: Pres. WA8NUT, VP & Tres. WB8QBS, Sec. WD8ELL and PIO NR8K. The Southwest Missouri ARC has announced their Hamfest for 1987 will be August 15 at Lake Springfield in Springfield at 8:00 AM. The PHD ARC provided communications for the "Half Iron Man Triathlon" at Smithville Lake on Sept. 20. Twenty-eight club members assisted in the operation. Silent Keys reported to me this month were: KB8FM and KD8GP. Anyone that holds a Section appointment is eligible to have an ARRL call badge. Send me an SASE and I will send you an order form. Thirty-two amateurs from the kansas City area provided communications for the 4th Annual Baptist Medical Center Triathlon. They did everything from operating on the lake during the swimming part to providing liaison with the police. KM8B was the organizer of the Amateur participation. On behalf of the other ARRL Section Officials and myself we want to wish all the amateurs of Missouri a very happy Holiday Season. Nets reporting:

NET	Ses	QNI	QTC	Day	Time PM	Freq MHz	Mgr
MON	60	353	126	Dly	7:00/9:45	3.585	K8SI
MOSSB	30	705	84	Dly	6:00	3.963	K8ORB
MEOW	30	503	71	Dly	5:30	3.963	K8DSQ
HBN	22	237	14	Mon-Fri	12:05	3.880	K8DSQ
MTTN	18	44	14	Mon-Sat	6:30	3.370	N8BKE
MOFON	4	33	13	Wed	8:15	222.42/4.02	AI8O
PHD	5	136	11	Mon	9:00	146.43	WA8KUH
RRABN	29	376	5	Dly	8:00	146.39/.79	KA8LLN
SLAN	5	303	4	Mon	8:00	146.31/.91	K8WEX
ZAEN	5	94	2	Tue	8:00	147.84/.24	N8OE
ARESN	5	74	2	Thu	9:00	147.855/255	N8FQW
SWARC	5	70	2	Tue	7:00	146.31/.91	KD8UD
LOZFM	4	94	1	Fri	9:00	146.13/.73	W8RTL
CMEN	5	78	1	Wed	9:00	146.16/.76	K8PCK
LOZBC	26	341	0	Mon-Sat	6:00AM	146.13/.73	W8RTL
HARCM	4	110	0	Thu	9:30	146.34/.94	K8RWL
JCCCN	4	24	0	Wed	8:00	146.40/7.00	WB8DZX
TCN	5	58	0	Thu	9:00	147.09/.69	KA8LO
LOZCW	2	3	0	Wat	9:00	3.707	W8RTL

Traffic: K8SI 142, K8PCK 127, KC8AS 116, WB8MA 114, NQ8G 108, AI8O 85, K8ORB 73, W8OUD 58, ND8N 55, K8DSQ 44, KT5Y 39, WA8YJX 38, N8BKE 36, NT8C 33, N8SS 32, NI8R 26, K9OCU 24, WD8ELL 17.

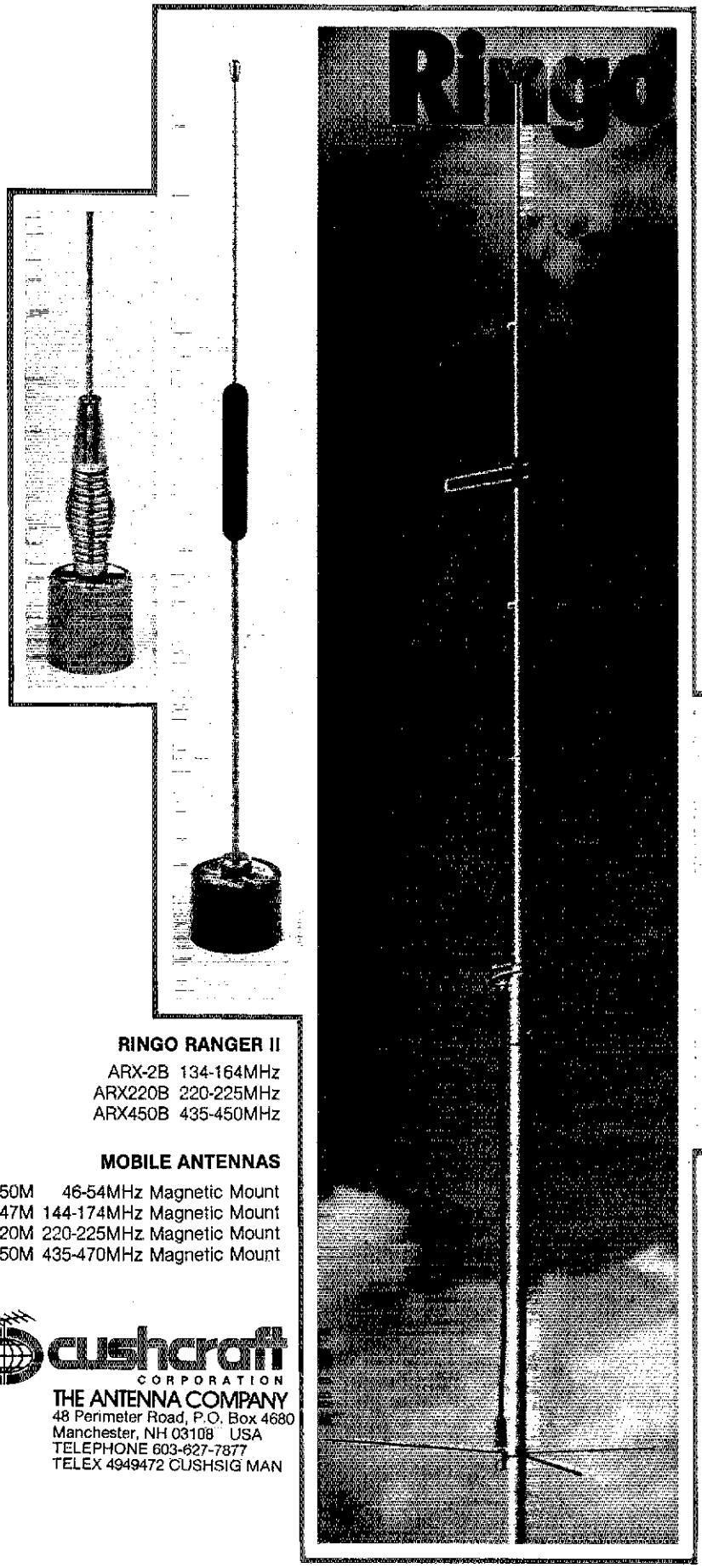
NEBRASKA: SM, Vern Wirka, WB8GQM—STM: Jerry Kohn, WD8EGK. Holiday greetings to everyone!! The Midway Amateur Radio Club, of Kearney, reports that radios have been purchased for the purpose of linking several central Nebraska area repeaters. The Blue Valley Amateur Radio Club reports that a new receiver board has been installed in the 147.87-27 MHz repeater. Stations within the coverage area of the 147.87-27 MHz repeater are invited to check into the Blue Valley ARES nets on Wednesday evenings at 8:30, local time and on Sunday evenings at 9:00, local time. Tim Andersen, NO8C, of Kearney, is the first one in the Nebraska section to order an ARRL call-sign badge for his field organization appointment as an Official Relay Station. Your Section Manager has the required forms for ordering the ARRL call-sign badges for currently active field organization volunteers. The amateur television repeater in Omaha is being used by more and more stations. Videotapes made at various amateur radio activities are being shown on the ATV repeater following the Sunday evening Midlands ARES Net. Further information on the ATV system in Omaha can be obtained from John Gebuhr, WB8CMC. Traffic: K8DKM 121, WB8TED 62, WD8EGK 49, KA8KPT 36, WA8BOK 25, W8KK 14, W8KBS 10, WB8GMQ 8, WB8QGM 7, NO8A 7, WA8DXY 5, KA8BCB 4, K8TUH 3, W8NIK 2, WD8CRD 2, W8KFN 1.

NEW ENGLAND DIVISION

CONNECTICUT: SM, John T. Ronan, K3ZJJ—Our sincere congratulations to Bob Koczur, K1WGO, for an excellent job as Section Manager. Bob has been very dedicated to the advancement of the Connecticut Section and Amateur Radio. The first Fairfield County Hamfest on September 7 was a great success and will be held again next year. The sponsors are FARA, GNARC, SARA and WHARA. The UNICEF Round the World Torch Run Operation was a great success and proved once again the value of Amateur Radio as a National Resource. The UNICEF director agreed that "We could not have done it without Ham Radio." Nine repeaters and 38 operators were involved. Participating clubs were SARA, GNARC, FARA, WHARA, MARS, NARL, ECARA and the PVRA whose 147.18, 146.64 and 146.79 repeaters were crucial. ECARA has placed an RBBS in operation on 147.48. To access send "K1MUJ" at 110ASCII. FARA has produced a television show on amateur radio which will be broadcast in December on Connecticut PBS. Holt, W1WP, sent an incredible 940 messages from the Oyster Festival for a traffic count of 1865 thereby earning BPL. The incomparable Mary Baxter, WB1GXZ, earned BPL for the eleventh time with 518 points. Carol, KA1FVY, is teaching a Novice Course at the Fairfield Library for FARA. Congratulations to Caesar, N1DCS, for his appointment as DEC for New Haven County. Caesar, N1DCS, and Art, W2HQQ, are the Connecticut representatives on the new TSARC Packet Radio Committee. Mary, WB1GXZ, had to resign as First Region Net, Cycle Two manager due to other commitments. KT1Q will act as interim net manager. Betsy, K1EIC, our STM demonstrated incredible traffic handling skills when as WCN NCS she successfully routed 83 Oyster Festival messages in 1 ½ hours. Congratulations to Bill, KA1MDM, who achieved BPL for the first time. Karen, KA1MKJ, and Debbie, N1EDD, operated a public service station at the Lions Club County Fair in Wolcott. Sky, KA1EAJ, operated a public service station at the International Boy Scout Campree near Winsted in July. Tri-City ARC operating projects included the Ledyard Fair with Mark KA4NME in charge. Upgrades: Extra—NF1Q, NF1R, KA1YP, WB8SIV; Advance—KB1YO, KB1YQ, KB1YS, KB1ZC, WA1ZZP; General—KA1DEC, K1SFC, KA2PZD, WD4LEL.

NET	SESS	QNI	QTC	MGR
CN	30	310	450	K1EIR
WESCON	30	408	304	
CPN	30	335	160	
NVHFTN	21	68		

Traffic: W1WP 1865, KA1MDM 528, WB1GXZ 518, N1EDD



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426, K1EIR 386, W1EFW 345, KA1MKJ 307, KA1GWE 260, W1YOL 129, KA1KTH 104, KY1F 66, KA1BHT 56, KB1ZC, WB4FDT 48, K1AQE 22, WA1NLD 18, WB1EFJ 12, W1CUH 12, W1BDN 7.

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.

NET	MGR	FREQ	TIME(LOC)/DY	QTC	QNI	
EMRI	N1AJJ	3658	1900/2200	DY	299	325
EMRIPN	N1BGW	3880	1730	DY	203	163
EM2MN	KA1AMR	145.23	2000	DY	200	288
NEEPN	K1BZD	3945	0830	SN	12	49
HHTN	NG1A	04/64	2230	DY	140	437
EMRISS	N1CVE	3715	1600/2030	DY	79	173
CITN	KB1AF	745/045	1930	DY	181	307

Bulletin Manager KB1AF reports that we have not just one, but a total of FOUR new OBS appointees this month K1BOG of Attleboro, KA1KEZ of Salem, KA1AMR in Scituate, and N1DH in Easton. This represents a large increase in our ability to "get the word out" to EMASS Amateurs, especially when considering that 96 bulletins were transmitted by packet stns K1BC/PBBS and K1BOG PBBS during a one month period! Attention all clubs in a bind for speakers for your meetings? Affiliated Club Coordinator KA1KCU keeps a vy interesting list of people who are willing to speak about their areas of interest and expertise. Contact Ron or myself for details or to get YOURSELF on that list! Emergency Coordinator N1CLC is heading up Falmouth ARA's fall Novice class, while N1CKN is steering Billerica area potential Novices towards BARS' classes. Anyone who hasn't seen the new Archie comic book yet is in for a surprise! I've had super success showing it to young students a great way to expose them to the Amateur Radio Service! N1BLH, Emergency Coordinator in Framingham, sez that his ARES team meets once a month now, and welcomes all Amateurs with HF or VHF equipment. Congrats to Public Service Honor Rollers NG1A, KW1U and KN1KI Traffic: KN1K 720, KW1U 567, N1BGW 471, WA1FCD 349, KB1AF 277, WA1TBY 211, W1CE 192, NG1A 171, KA1AMR 161, W1ZHC 143, N1CVE 140 K1GRP 128, KY1T 112, N1BHH 110, K1SEC 94, N1AJJ 78, K1BA 72, KA1EID 60, N1DDC 60, KA1QN 57, K1ABO 45, KA1LIH 41, KA1KCU 29, WA1RAJ 24, WA1SNH 13, KA1LIK 12, WA1FNM 9, KA1EDY 7, K1BID 7, K1LCQ 6, N1EGN 2. Have you expressed your opinions to your Division Director and your Section Manager lately?

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's bulletin report includes ARRL 7 Maine 7 Propagation 4 with 47 transmissions, 9 on packet. Pen Bay ARC elected the following for 1987: Ken Orne, K1BEA, pres; 1st VP K1VEB; Tech VP WA1ZDA; Secy N1DOY; treas N1DEI; directors K1EHO, W1BDL, KA1HEH, KX1I. This new club now has 52 voting members, 25 non-voting members. PAWA reports 1148 points on CW, 569 SSB, and 100 bonus for FD. Merrymeeting ARA very active sponsoring VE tests. PSHR: WB1CBP 89.

Net	Sess	QNI	QTC	Manager
SGN Aug	26	936	141	K1GUP
Sept	27	1017	190	
PTN	30	284	126	ND1A
N1AH-1PBBS	*	815	330	N1AHH
AEN	6	98	65	WA1YNZ
RACES	4	45	4	W1RWG

*N1AHH-1 packet bulletin board reports 66 hours connection time, 543 connections. Traffic: WB1CBP 186, KA1AVU 158, W1ISO 115, AK1W 105, W1KX 96, ND1A 64, N1BJW 58, W1RWG 42, WA1YNZ 23, KA1ODT 8, N1BIR 8, W1OTQ 8, W1BMX 7, KA1ENM 6, N1BME 5.

NEW HAMPSHIRE: SM, Bill Burden, WB1BRE—SEC: W1NH. BM: K1OSM. Someone asked me recently if I really got enough material for the section report each month. My answer follows: Both clubs and individuals were prominent in activities during Sept—INDIVIDUAL ACHIEVEMENT—Twin State RC president WB1GRR talked about Ham radio on local radio station. Congrats to K1GQ on his Yagi ant article published in QST, and to WA2MBQ whose CD article has been accepted for pub in QST. KB1MK running for NH state legislator. I attended the Governor's annual Volunteer Recognition Ceremony honoring outstanding volunteers in NH. Nominated for recognition were WA1PEL, K1ACL, WA1YZN, and KA1GOZ for their excellent efforts. AF1T has been contesting on 902 and 1296 and hilltopping in the 10 ghz contest. AK4L of the CNHARC running high speed cw classes this winter. JA1OMV was the newest member of the Twin State RC. STATE ORG/CLUBS—State meeting in Concord was well attended with planning for NH QSO party started. Field org reports were given by WB1GXM, K1ACL, W1TN and WB1BRE. GSARA provided comm and safety support for Manchester RIVERFEST event. Club members WB1AAZ and XYL, KB1QV, KA1NXT, AB1Q, KX1L, KA1KGB (and friend) and N1DNV provided the communications network. A good, visible public service activity! Twin State club working with Montshire Museum to plan and setup Ham radio exhibit. A highlight of the Gilford Old Home Days celebration was the special event station setup and operated by the CNHARC with CW demos, N1LT, N1EEA, and W1WNJ provided the public with info on Ham radio and station demos. It must have worked because 13 people signed up for a Novice class and the club received a letter of appreciation from the town committee for their effort! FIELD ORG—welcome to new appointees: W1GUA as EC of Sullivan Cty, KB1GI as EC in Henniker, and WA1YKL as ATC. The section again had 100% participation in FRN—TNX to all the tfc handlers who make it happen! The new ARES net on 25/85 on Thursday evenings doing very well in stirring up ARES members.—And thats what Sept was like for us!! Traffic: GSPN 210, GSFM 187, WB1DSW/P 160, MSOVTP 3; N1CPX 533, W1PEX 377, W1QYY 250, W1FYR 230, KK1E 177, W1TN 145, KA1LMR 125, KA1LBW 122, K1PQV 99, WA1YZN 86, NE1J 80, N1AKS 71, W1ALE 56, K8UXO 52, K1TQY 43, K1IM 41, KA1GOZ 41, WB1GXM 38, KB1XI 34, N1DCT 21, N1ALM 19, K1ACL 14, K1OIQ 9, W1LQG 8, N1DQA 4.

RHODE ISLAND: SM, John (Bob) Vota, WB1FDY—Tnx to N1RI George and his team of operators for working with the Narragansett Bay Wheelmen on the Largest bicycle ride on the East Coast. 1700 bikers were on the road and only 8 operators to handle it all. Give N1RI a call for next year. Tnx to BVARC for their work with the Autumnfest and Parade and the Amateur Radio Booth they set up. I would like to wish you all the best of the Holiday Seasons Greetings and hope the New Year brings you all that you are looking for. Tnx to the NPARC for the work with the United Nations Earth Run. Congrats to KA1AVG on his "90th" birthday. Traffic: KA1JXH 213, PSHR 109. W1EOF 224, WA1CRY 59, KA1KML 193, PSHR 70.

VERMONT: SM, Frank I. Suitor, W1CTM—ASM: KD1R. STM: AE1T. SEC: W1KRV. State emergency communications capability is being upgraded by ur Section Emergency Coordinator (SEC) (Joe, W1KRV). In order to make it effective, he needs our collective support. You can help by becoming a member of the Amateur Radio Emergency Service (ARES). The sole purpose of this group is simply to provide emergency communications when needed. To join us in this public service activity is very easy—fill out an application which lists ur equipment capabilities and volunteers ur help during a disaster. (Applications are available from W1KRV, ur club, or me. You may participate thru ur club emergency coordinator (EC) or on an individual basis. Whichever way u choose to participate, ur station data will be coordinated into a state wide geographical network which can be activated by the SEC thru his organization of district ECs, ECs and individual ARES members. The object always is to use those volunteers closest to the disaster site to provide the communications help needed. Because we are a rural state with fewer hams than most, we need to have a high participation rate or we can't do the job. Pse help Joe by volunteering ur support—Tnx! Joe (W1KRV) has appointed KA1LDJ (Richard) and N1CDD (Mac) as DECs in Washington and Lamoille Counties respectively. NB1A (Kevin) is BARC's new EC. Many tnx to CVARC members who made me feel right at home at ur 10/1 meeting. I look forward to attending at least one meeting of each VT ARC over the next year. ARC presidents are requested to provide me with ur newsletters/reports, etc. so I can put ur club info in this column. Don't forget ARRL 160 M contest (12/5-7) and 10 M contest (12/13-14). Congratulations are in order to Keith (KA1HUA) on getting ur Novice ticket and to Peter (N1EBT) on upgrading to Advanced. K1MOQ repeaters are being upgraded with a new 100'tower in Tunbridge. Bob (W1RNA) is looking for any volunteers to help on Navy/Marine Corps MARS—call him for details. Twin State ARC got some good PR on local radio station WNHV on 9/30. AE1T has copies of VT Net Directory. If u would like a copy, send him a SASE. Next month, N.E. ARRL Hamfest report. September Traffic report: KT1Q 739, WA2SPL 354, WA1JVV 97, W1KRV 67, AE1T 145, K2KBT 67, WA2MIC 21. September Net report: HHN 13/119/2, SEN (BARC) 4/84/4, VTN 30/173/161, CVFMN 4/73/5, GMN 26/404/36, VTBHN 4/70/4, TSN 5/68/15. GMN 26/404/36. VTPN 4/70/4. Merry Christmas and Happy 1987 to all.

WESTERN MASSACHUSETTS: SM, Don Haney, KA1T—OO/RFI: N1CM. PIO/ACC: K1BE. SEC/SGL: WB1HIH. STM: W1UD. TC: KA1JJM. The severe weather net on K1FFK and data collection on other repeaters had 5 sessions in July and were especially busy in early August as several storms generated tornado activity. Fortunately, most of the section saw no damage but information provided to National Weather Service was valuable in tracking storms. KA1JJM-2 packet BBS provides NWS forecast and alert information for western Mass and eastern NY. It is accessible on 145.05 via the KA1NEQ and KA1JJM-1 digipeaters. Pleased to appoint N1DMU as Net Manager of West Mass Phone Net. Hope to see many of you at New England Convention at Boxboro on October 18-19. This is the chance to get with hams from all over the Division for technical programs, flea market, and two days of eye-ball QSOs. And NOBARC club auction is the next week on October 26 at 7:00. PSHR: WB1HIH 103, N1DMU 100. Traffic: W1UD 152, KA1T 115, N1DMU 99, W1KK 40, WB1HIH 25, WA1OPN 7, W1ZPB 3.

NORTHWESTERN DIVISION

ALASKA: SM, Jim Moody, Jr., NL7C—SEC: KL7JIM. STM: KL7T. TC: AL7L. NM: KL7GID, KL7AF, KL7JKW. DEC: AL7AC, KL7WM, KL7JFT. Had a very enjoyable and educational visit with KL7GNG and KL7EDK at the Anchorage Fleamarket. Packet communications was demonstrated in a state sponsored exercise and proved to the Division of Emergency Services that the traffic can be passed quicker and more accurately than on the 75 meter phone net. In the next emergency Packet will play a big part in the communications structure in Alaska. KL7GNG and KL7ILA (in Palmer) have linked their BBSs to pass traffic hourly between Fairbanks and Anchorage. A new link is in that links Glenallen via Paxson. I also want to wish everyone a Merry Christmas and the best for the coming New Year!

IDAHO: SM, Don Clower, KA7T—SEC: N7BI. STM: W7GHT. OOC: WB7CYO. PIO: WB7PFQ. Special tnxs to Lee, WB7CYO, for taking on the job as OOC. Ron, KU7Y, moved to Nevada. Tnxs to Ron for a job well done, and good luck to him. I still need to fill several appointments, if you are interested in helping please let me know. W7JMH, W7IWU, KD7HZ, KA7T, WA7VPW, and K7CXG attended a luncheon with various state volunteer groups to discuss an emergency network for the state. Future meetings are planned. Twin Falls ARC is providing communications for the annual "Rim to Rim" Run. W7ZRC, K7TM, and KA7T conducted VE exams on 9/6/86. Cong. to KA7ZFX, KA7ZEB, KA7UUH, and KA7YIH on upgrades. We are considering starting a slow CW net, if you have an interest let me know.

Net Reports	Fq-Time	Sess	QNI	QTC
Farm	3937 lsb 8P Da	30	1882	27
Id Cd	3990 lsb 8:30 A M-F	22	736	20
Imn	3635 CW 9P Da	30	357	86
Nw Tfc	146.38/98 7:30 P Da	30	824	26

Traffic: N7BHL 184, W7GHT 92, NW7K 44, W7JMH 34. General: If you have any info for this report please let me know by the 1st of the month. 73s.

MONTANA: SM, Les Belyea, N7AIK. Please check page 54 of October QST, the Section Manager position for Montana is available. The current SM has the nominating petition form CD-129, will be glad to send one to anyone qualified. New officers for the Anaconda ARC are—Pres: KA7NCY, VP: KD7KD, Secy: N7HKW. W7IDK reports the Havre group had a successful Hamfest last August. The Hellgate ARC has obtained and placed in the Missoula County Library the new Foreign and North American Callbooks. Upgrades reported—to Adv: N7HXF, KA7ODS; To Gen: KA7OBM, N7IHF; To Tech: KA7WPA. DX note: W7LR, KE7X and K0PP worked Europe on 160M, very rare. PBL-W7TGU, PSHR-W7TGU, KF7R.

NET	SESS	QNI	QTC	MGR
IMN	30	357	86	WA7GQO
MTN	30	1935	163	KF7R
MSN	4	83	2	K0PP

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: N7HMY, KE7LW, N7HMV, K7YQM, K7QMY, N7FFF, W7KOX (EXTRA); WA7ADW, KA7HZX, N7GVG, (ADVANCED); KA7IYT, KA7ZAG, N7HAB, N7HGL, N7HPA, N7HWE, N7IGE, N7IJD (GEN); KA7UEK, KA7WXY, KA7VZB, N7IGS, N7IHU, N7IIB (TECH); KA7ZLN, KA7ZIJ (NOVICE). Both families N7ENU/KA7RKZ and AL7W/XYL are proud parents of new male junior operators. KA7MOJ has been promoted to PFC by the U.S. Army. N7EUQ has been promoted by PSA to be the new manager for Sales/Services at the Medford Airport. The Rogue Valley ARC is celebrating its 50th year anniversary in 1986. Oregon winners in the 1986 ARRL DX contest are W7TC (CW) and W7YAQ (SSB). Congratulations to one and all. The Traffic Handler's Net which was originated by W7VSE Ore STM about two and half years ago is continuing to grow. It is an ideal meeting place for SSB and CW traffic.

handlers. If you are interested check on 3944 kHz at 0520Z (1020 PM Local) daily. The NW amateur Radio Council is in the process of reorganization with KX7Y at the helm. Your club will be contacted with full info about the aims of the Council in the future. Traffic: W7VSE 486, W7ZB 95, N7BGW 57, W7ODG 53, W7HLF 51, WB7VSN 41, N7DRP 34, W7LNE 25, KA7AID 24, KA7EEE 6.

WASHINGTON: SM, Brad Wells, KR7L—ASM/ACC: KC7PH. STM: KD7ME. SEC: N7DRT. SGL: KD7AC. OOC: N7IL. TC: W7BUN. ASM: KD7G, Frank Price, KD7AC, has taken on the job of State Government Liaison. He will keep tabs on local and state legislation that may affect ham radio. Please keep him informed of legislative activities in your area. Gene Sprague, KD7G, has accepted a position as ASM to handle much of the Staff paperwork. Congrats to WB7V8Z, WA7BPJ, WA7ZEV, and N7BRB for accepting/continuing as DEC/EC. Sorry to report W7GHI has resigned as Island County EC after many years of fine work. Have you registered as an Official Emergency Station? Most of you active in emergency communications qualify. Minimum requirements: Technician License, participation in ARES, mobile or portable capability on one or more bands, familiarity with ARRL message format, and monthly activity report. Contact your EC or N7DRT to apply for this position. The 40th annual Walla Walla hamfest was the biggest and best ever. Lots of good company and flea-market bargains. Plan for it next year. Both the Radio Club of Tacoma and the Yakima ARC operated very effective message booths at the Western Washington and Central Washington State Fairs. Congrats to the Issaquah ARC on becoming a Special Service Club. Other clubs interested in this program should contact KC7PH. Clubs: Clark County ARC meets 1st Friday at 7:30 PM at Washington State School for the Blind, Vancouver (contact K7DYG). The Yakima ARC meets 2nd and 4th Tuesdays, 7:30 PM at the J.M. Perry Institute, Yakima (contact WB7WAM). Both the Lower Columbia ARC and Cubs ARS renewed as Special Service Clubs. Keep up the good work! Contest season is upon us. Lots of Section activity in both the cw and ssb Sweepstakes. Don't forget the 10 Meter and 160 Meter contests later this month. Contest Tip of the Month: The best antennas are put up in a driving rainstorm one hour before the start of a contest. The very best wishes to each of you during the Christmas Holiday season from all of the Section Staff. It has been our very real pleasure to serve you this past year. Share the spirit of the holidays by handling and delivering some message traffic. A special thanks to those who reported traffic during September: K7AJT, N7AM, W7APS, WA7CBN, W7DK (BPL), KE7EO, N6EQZ, W7GB, N7GDW, N7GGJ, K7GXZ, W7IEU, W7IGC, KR7L, W7LBK, W7LG, KD7ME, KD7MW, K7OXL, KC7PH, K7SUX. In handling traffic, quality is the more important virtue than quantity. Please report your monthly traffic.

PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W6RGG—ASM: W6ZF & N6DHN. SEC: W6LKE. OOC: NY6Z. STM K6APW spoke recently at EBARC. Jim reminds me that the following nets are looking for checkins: NCN, 3630 at 1900 and 2030; RN6, 3655 at 1945 and 2130; PAN, 3675 at 2030 (all times are PST). Speaking of nets, EBARC has a slow speed CW net on 21.115 at 2000 and an SSB net at 21.395 at 2100. Both on Wednesdays. KA6DFY is a new member and N6NML upgraded to General and KB6MWP to Tech. NBARA's nominating committee members are KD6T, K6UJS and WA6EFP. They have a new net starting up on 28.600 at 2000 each Thursday. BARC welcomes new member KA6NQT. LARK repeater WA6ODP/R 147.12 may soon sprout a new HC-85 controller. ARC has their general net each Thursday on W6CX/R 147.06 at 2000 and the "Perky" Net on 3895 every night at 2200. Traffic: WB6DOB 117, K6APW 114, WB6UZX 32. (Aug) WB6UZX 40.

NEVADA: SM, Joe Lambert, W8IXD—SNARS still working on their new repeater site. Curly, K7HRW is looking for volunteer instructors for Novice classes & also VE's. N7GWT reports VHF link completed from Ely to Goldfield. Expect to tie in Reno soon. Both Northern & Southern Nevada well-represented at Nat'l. Conv. in San Diego. TARA's 10th yr. Anniversary Banquet was enjoyed by many. Novice classes are being held in So. Lake Tahoe. Contact NX6W for details. N7KR arranged an informative presentation at the LVRAC on the new Metro Police Communications Center. All hams in the community were invited to attend. CARCON, formed in June, 1976 has been re-activated as of Nov. 1985 with 15 member organizations dedicated to working together in coordinating repeater, remote base & packet radio in No. Nev. W8IXD brought back much info from Nat'l. Conv. and was a panelist at the ARRL Forum on Field Organization at Pac. Div. Conv. in S.J.

PACIFIC: SM, Amny Curtis, AH6P. Aloha and hafa adai to all of the Pacific. Had a great time at the National Convention in San Diego. Sorry that I didn't see more KH6's there. KH6B was there and even managed to win one of the hourly door prizes! WH6BFT and WH6C now on packet from Maui. KH6H/R now on 147.62/.02 and linked to KH6JCA/R 147.66/.06 on Diamond Head. A nice alternative for interisland work! N6HPQ has moved to Kula and will have a machine up shortly on 1291.6 MHz. Is this the first in Hawaii? AH6EE has moved back to Maui, hard to take all that cold white stuff in W8-land. Next Maui VE session is December 13. Hilo VE sessions set for Jan 17, April 18, July 18, and Oct 17 in 1987. Got a very nice phone call from KH6JKY. Ray is in W6- land for awhile and sends his best to all. Traffic: KH6S 44, KH6H 36.

SACRAMENTO VALLEY: SM, Bob Watson, W6IEW—STM: WA6WJZ. SGL: N6IG, ACC & TC: W6RFF. 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. I have just returned from the Pacific Division Convention in San Jose where the participation of the SV Section was disappointingly low. You missed many good sessions, good exhibits and a fine banquet. Next time think about going yourself. This is written in October, one year after I became your SM so it is my anniversary report to you. There has been a remarkable change in that time, for which I take no credit, I merely report it. Complaints about the League have vanished. Earlier at club meetings and the Section meeting there were many complaints but lately, even when I follow "any questions? comments? complaints?" with "what, no complaints?" there aren't any. Maybe you are all just being nice but in any case, it is a pleasant change, for which I thank you. However, if you do have complaints, or questions, I want to hear them. By the time you read this it will be December so I want to wish you all Happy Holidays and a Happy and prosperous New Year! Traffic: N6CVF 322, N6LUY 245, WA6WJZ 193, K6SRF 169, KI6GW 55, WD6BZQ 47, W6RFF 28, KB6COH 13, WB6SRQ 10, WD6EEZ 8, WA6ZUD 4.

SAN FRANCISCO: SM, Bob Smith, NA6T—The "Pacificon 86" was an interesting convention this year with three forums on PACKET RADIO. Two new packet "DIGI's" should be in operation in the next few months in northern Ca. from Mendocino County using WA6FBL-1 and NA6T-1. Also look for a new DIGI in the Cresent City Area soon to link into Southern Oregon. NAPA and SONOMA counties will be ad-

ding ATV to their CDF-VIP programs, Mini-cams from airplanes, etc. for fire control. Do you know a young artist who would like to participate in the ARRL's search for a NATIONAL theme for "Youth in Amateur Radio", contact NA6T for further information. SF County is looking for an ARES-REACT liaison any offers? SKYWARN-PACKET is running on 145.01 in SF AREA, just in time for winter. Newest OBS STATION in section is KE6IT in Marin County. Novice classes are starting in all clubs this month, if you know a propective amateur—invite him out to a class and help preserve YOUR hobby! FDT Pioneers have been active with the BEEP BALL Van this month, they are always looking for volunteers to man the comm-van during PS Events, give them a call on 146.79 if you want to help. Interested in a Section Field Appointment, give me a call and express your desires. 73, NA6T.

SAN JOAQUIN VALLEY: SM, Charles McConnell, W6DPD—SEC: WC6U. STM: N6AWH. TC: WA6EXV. ACC: N6ECH. ASST. SMs: W6TRP, K6YK. Emergency Coordinators (ECs) are needed in Madera and in Mono Counties. Contact WC6U or W6DPD if you can serve in one of these positions. Amateurs interested in the technical end of Amateur Radio and who might consider becoming Assistant Technical Coordinators (ATCs) should contact WA6EXV for information. The SJV was well represented at Pacificon 86 October 3-5, 1986 in San Jose. WA6EXV won a prize. KB6PB, WB6LOA, and KA6ONN are Extra. N6NTU, KA6YSW, KA6ZRV and KB6JDT are Advanced. KB6NXG is a Novice. KA6WDU is KI6JQ. KB6JHU is N6OCV. KA8RTA is KI6HN. KB4JIT is N6NUL. KB6JZR is N6NVY. KI6DI is WU6V. KB6MKB is N6NXH. WA6YDI has an IC 12AT and a TNC. Merry Christmas and a Happy New Year to all. Traffic: N6AWH 121, N6MCY 42, W6DPD 24, WA6YAB 9, N6MXG 3. (Aug) N6MXG 6.

SANTA CLARA VALLEY: SM, Glenn Thomas, WB6W—SEC:WA6OCV. TC: WA6PWW. STM: N6JLJ. PIO: WB6NLA. ASM: N6JQJ & NS6S. ACC: W6MKM. BM: (vacant) OOCORD:(vacant) The FORM (Found On Remote Mountains) group spent the September VHF QSO party at 9300 feet near Mammoth Lakes. Sparse turnout for the contest was compensated for by the spectacular sunset Saturday evening... the SLAC ARC held elections at their monthly meeting, congrats to the winners (?) ...the OSCAR Users Group has changed its weekley net to the 147.15 (+600) machine. Also, it will now be on Tuesday (a new day). This is an excellent place to meet others who are interested in the Amateur space program...Larry N7EQN, of the NWS has been very busy estabilishing the SKYWARN system in our area. Contact him if you are interested in participating...the Foothills ARS had their yearly outing on Mt. Tam for the Cal QSO party. Excellent weather was enjoyed by all who were there...I met many of you at PACIFICON' 86. Thanks to SCCARA for sponsoring it, and special thanks to the convention committie for their long hours and hard work to bring it all together...I'd like to take this opportunity to thank all of you who have assisted me in my first year as SM. It has been quite an experience and I have learned quite a bit. Happy Holidays to all and best wishes for the new year! OO reports: K6AYB. Traffic: W6YBV 199, N6JLJ 28, KA6SXW 18, KB6IWG 4. (Aug) W6KZJ 24.

ROANOKE DIVISION

NORTH CAROLINA: SM, Rae Everhart, K4SWN—SEC: AB4W. STM: K4NLK. BM: K4IWW. ACC: WC4T. PIO: WA4OBR. TC: K4ITL. SGL: KE4ML. MERRY CHRISTMAS and HAPPY NEW YEAR from SECTION STAFF. Thanks to everyone who helped in 86 in setting new records of unparalled proportion. High interest in traffic handling with new amateurs coming into ranks. Have you ever been an NCS on a net? NO? Get excellent training on the section NTS nets. Want to be a liaison on other nets? Contact STM, K4NLK and ask for an NCS or ANCS slot. You will be glad you did and thankful for the training. League now has an ARES Local Memorandum of Understanding—LMOU for ECs. Contact SEC, AB4W for more info. NC DOT has advised KE4ML that they are flooded with amateur radio plate applications. Keep'em coming. This month is the Christmas Season so be on alert and help pass the Christmas Spirit in the form of RadioGram traffic. It will be heavy so all assistance will be appreciated. New year is around the corner. Set yourself a goal— upgrading, DXCC, WAS, WAC, Oscar, Packet Radio, EME—and reach for the atmosphere in 1987. Effective 1-1-87 special golden anniversary DXCC award starts. Get yours early. Contact HQ DXCC desk for more info. Attention all VECs. Send this SM your 87 exam schedules. Mark your calendar NOW for Division League Planning Meeting—LPM May 16/17 in Roanoke, VA. Get well wishes to our division director, W4UG. Wanted: 75 Public Information Assistants—PIAs. Section PIO, WA4OBR needs help in distributing info about the League and Ham Radio. Every club needs a PIA. Applicants MUST be League Members. Contact SM for application. Want to tell your community about amateur radio? WA4OBR has the new RADIO/TV spot announcements. Don't forget Straight Key Night—SKN contest at end of month. This will be good month to make BPL. Silent Keys: W4EQ, K4SWR. Traffic: K4NLK 309, NJ4L 237, WB4HRR 170, K4JHF 143, AB0Y 125, AA4MP 122, WB4N 109, KA4TLC 95, WD4HTE 85, AK1E 79, N4JRE 60, KA4EYF 58, KI4YV 58, WB4WII 50, WA4MNR 48, K4SWN 44, AA4UO 41, W4EHF 40, N4LST 38, K4IWW 36, N4MMM 34, NE4J 32, N4LUO 31, KA4YMY 28, N4MQU 24, WB4CYN 22, N4NTO 22, K4RWV 21, K4GI 19, K3HXC 19, KU4W 18, WD4EQK 15, WD4MRD 11, N4JEO 10, N4CJJ 8, NT4K 8, N4LUB 8, WD4RMQ 7. (Aug.) AA4UO 41. New officers of Carolina Amateur Radio League (CARL) formerly Lumberton FM Rptr. Assn: President WB4DVN. VP WB4WOR. Tres. KS4S. Sect. KA4TLC. Rptr Trustee WV4Z.

SOUTH CAROLINA: SM, Jimmy Walker, WD4HLZ— On October 11, the South Carolina Voluntary Organizations Active in Disaster (SoCarVOAD) held a seminar in Columbia. The Red Cross, Salvation Army, Emergency Preparedness Division (EPD) and Amateur Radio (ARES) provided displays showing the capability of each organization. I am proud to say, the ARES display generated the most interest and questions. N4FVU (EC Richland Co.) and WA2GYM (AEC) provided an excellent demo of Packet Radio. After a 15 minute discussion, WA2GYM demonstrated capabilities of his Packet station in providing communications during an emergency. As a direct result of this demo, EPD will provide a second amateur position in the Forward EOC (FEOC - 18 wheel tractor trailer) and a second amateur position in the State EOC (SEOC - Rutledge Bldg., Columbia) for Packet Radio. THANKS - to N4FVU and WA2GYM for their time and effort. If it had not been for the time, effort, dedication and money that YOU, the Packet Radio Nut, have given this mode in SC, this demo would not have been possible. Traffic: K4ZN 140, W0IKT 109, KB4BZA 65, KA4LRM 60, W4ANK 58, WB4UDK 24, K4ZB 18, WA4JWS 4.

VIRGINIA: SM, Claude Feigley, W3ATQ—STM: KB4WT. SEC: N4EXQ. ACC: NT4S. OOC: W4HU. BM: AB4U. TC: WB4MAE. The following are the Section's official "NTS" nets. If you desire to have your net become an NTS net contact the STM, KB4WT.

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

SEC, N4EXQ announces the following new appointees, as EC, N4OKH, Mecklenburg Cty, WB4ZTR, Frederick Cty, KJ4AG, Accomack Cty, AA4QG, Lunenburg Cty, WA8MWI, Bedford Cty, WA4QQI, Cumberland Cty. Also, NC4B has been named DEC for Frederick Cty. A final reminder to all Affiliated Clubs. If your 1986 Annual report has not been submitted to ARRL Hdqs, your club is subject to being placed on inactive status. As of October, 36 of the Section's 49 Affiliated clubs have submitted reports. Report forms can be obtained from the ACC, NT4S or the SM, W3ATQ. The Richmond group had a bang-up traffic operation with their station at the Va. State Fair. They originated 462 messages, obtained 11 prospective Novices for their upcoming class with 11 operators at the station. This was a very fruitful operation more Special event stations should make an effort to recruit new amateurs. K4JST gave a Packet demonstration before a body of James City County officials with a lot of interest shown by these people on the capabilities of Packet's error free transmissions. Our BM, AB4U, is striving to revitalize the Section's Official Bulletin Station (OBS) activity. He needs your help especially from stations who can put W1AW bulletins and other local news items on their repeaters. If the copying of W1AW broadcasts is a problem the SM will gladly furnish copies of the broadcasts to interested parties. Packet BBS are ideal spots for these news items. Late info, just received additional EC appointees, KB4BOZ, Patrick Cty, AB4L, Henry Cty, WD4RFS, city of Alexandria, N4EFJ, Arlington Cty, N4AKZ, Washington Cty, WB4WZZ, Fairfax Cty. OOC, W4HU and OOs W8IRT, K4JDJ and KB4WT were active monitoring the HF bands. Reminder, if you hold a field appointment and would like one of the identification badges announced in the Field Forum contact the SM for details. This month indicates the beginning of the Fall/Winter tfc season. Total msg count was 6135 with 44 stns reporting. N4EXQ and N4GHI continue to lead the pack. K4DOR had a fine total with most of his traffic count derived as a liaison from the VFN. Again, if you have any suggestions for the betterment of the Section's operation let the SM know. Hope everyone had a pleasant Thanksgiving. Traffic: N4EXQ 1174, N4GHI 998, W4JLS 383, WB4PNY 324, KB4WT 294, AA4AT 280, K4MTX 279, K4DOR 248, WD4FTK 222, WA4CCK 220, K4JST 199, W3ATQ 174, WB4KSG 146, WD4ALY 132, AA4GL 116, NN4I 101, WD4MIS 80, WD4OCW 74, N4KSO 68, KJ4MF 68, K4JM 63, WB4EDB 59, KB4NGO 51, KA4ERP 49, NT4S 39, K4GR 37, N6ANQ 34, K4JUM 30, W4TZC 28, WB4ZTR 24, KA4IUM 18, KB4PW 18, K4MLC 17, K4VWK 17, WB4UHC 16, WB4ZNB 16, K4AXF 8, W4YE 8, WB4KIT 7, WA4TVS 7, N4FNT 3, WA1VRL 3, N3RC 2, KC4HN 1.

WEST VIRGINIA: SM, Karl S. Thompson, K8KT—SEC: K8QEW. STM: KD8G. ACC: WA8CTD. SGL: K8BS. TC: K8CG. CVRA Director: WB8GDY. N8CG is new chairman of Chas. area H. F. and Computer Show. New date for Jax. mill was discussed at Oct 4 mtg., details later. NS8U is new EC for Minge Co., Tnx John.

Net	Freq	Time	QNI	QTC	Sess	NM
WVFN	3865	6:00	1102	137	30	W8YP
WVMD	7235	11:45	562	18	29	W8FZP
WVRN	3640	6:30	218	26	30	K8LG
WVNN	3730	5:30	126	32	28	WD8LDY
Hillbilly	14290	Noon su	126	12	4	W8YP

Traffic: W8YP 314, KZ8Q 148, KA8WNO 138, WD8LDY 131, N8GJO 124, W8FZP 89, KE8FI 84, K8TPF 55, KA8TIK 48, K8KT 41, KD8G 34, WA8KCJ 31, K8QEW 27, K8UQY 24, KD8VT 18, WD8DHC 11, KA8OGF 10, NC8G 7.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Bill Sheffield, KQ0J—ASM: W0RSG, KA0MOA. SEC: WB0FQB. STM: N0DZA. OO: W0ACH. ACC: WB0DUV. PIO: N0FOE. SGL: WD0GQL. TC: NC0F. BM: KA0CZW. On January 1st, the Rocky Mountain Div. will welcome a new Division Director, AG0X, who has been serving as Vice Director. Our best wishes and many thanks to K0PGM who is going to enjoy his retirement after many years of service to the Division and the Section. I would like to take this opportunity to thank all of the field organization appointee's for a job well done. Public Service work takes little time and is a very rewarding experience. The section can use hams who can pass some traffic, become involved with emergency communications, or as a Public Information Ass't... Official Bulletin Station...Official Observer...let me know if you are interested, and I will send you further info. From the Section Team...we wish you all a very happy holiday season and best wishes for the New Year. 73, KQ0J. NETS: Col; QNI 903, QTC 44-112 Inf. 839 min, 26 sess. CWN; QNI 101, QTC 87, 465 min, 26 sess. CWXN: QNI 2889, QTC 2336, 2700 min, 30 sess. NCTN; QNI 273, QTC 65, 391 min, 32 sess. SCTN; QNI 28 QTC 25, 129 min, 14 sess. Traffic: N0BQP 2196, WA0HJZ 1542, W0ACH 540, K0RXK 604, K0JAN 323, WA0OYI 305, KB0Z 182, WD0BSZ 116, WB0FFV 64, N0DZA 55, W0HRS 30, W0NFW 24, KE0BI 9.

NEW MEXICO: SM, Joe T. Knight, W4PDY—ASM: W5HD. DEC: KB5XD. STM: ND5T. NMs: WA5UNO K6LL W5VFQ. 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 43 msgs with 1268 stations in. New Mexico Breakfast Club meets daily on 3939 at 1330 UTC and handled 98 msgs with 867 stations in. Yucca 2-mtr Net 01/81 handled 18 msgs with 444 checkins. Caraven Club 2-mtr Net 66/06 handled 43 msgs with 176 checkins. SCAT 2-mtr Net 66/06 handled 4 msgs with 619 checkins. N5CLM was injured in an motorcycle accident near Amarillo, TX. We all wish him a speedy recovery. Congrats to new officers in Pecos Valley ARC; Pres. W5BWV, VP KC5MU & Sec/Treas N5JFZ. Also new officers for ABQ DX Club; W5ZHI Pres, W5OLN Sect/Treas, & N7KA Act. Chair. Traffic: W5DAD 38.

UTAH: SM, Jim Brown, NA7G—SEC: Rich Fisher, NS7K. STM: John Sampson, W7OCX. Had a nice visit in Vernal and Roosevelt, and met with many area hams at a club meeting there. We talked about the Emergency Broadcast System, how to protect rigs from the effects of lightning and EMP, and about emergency communications. After the meeting, we took a tour of the state's emergency communications van. Thanks to Gary, NB7B, for your help in setting the meeting up. 73 de NA7G. Traffic: WA7KHE 109, WA7MEL 100, NS7K 40, K7MG 30, N7ASY 19, NA7G 16, W7OCX 14.

WYOMING: SM, Dick Wunder, WA7WFC—Asst. Section Mgr.—Steve Cochrane, KA7AWS. Section Emergency Coord.—Jim Anderson, W7TVK. Amateur radio was there when emergency assistance was needed 16 miles west of Sundance. W7TZK was traveling towards Sundance and came upon an accident at 10:45 PM. A call for assistance on the 146.79 rptr was answered by KE7NT in Gillette and NI0N in Spearfish. KE7NT notified the authorities and help arrived 1 1/2 hours later. KC7AR reports the Wyo Cowboy Net held 22

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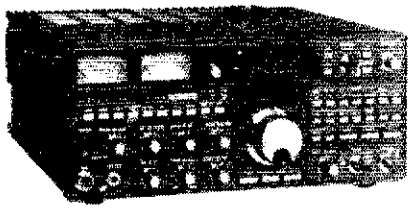
2M/767 2m module	179.95
430/767 430-440 module	219.95
440/767 440-450 module	219.95
FT-ONE Xcvr/Rcvr/4 filters/RAM/FM	2859.00
KY-ONE Keyer unit	50.00
DC-ONE DC cable	15.00



FT-980 9-band CAT Xcvr/SW Rcvr	$1795.00
SP-980 Speaker with audio filter	99.95
SP-980P Speaker/patch	99.95
FC-757AT Automatic ant. tuner w/memory	359.00
FAS-1-4R Remote antenna selector	79.95
E-980 Interface cable; FT-980/757AT	46.50
XF-8.9HC 600 Hz CW filter (1st IF)	50.00
XF455.8MCN 300 Hz CW filter (2nd IF)	59.95
KY-ONE Keyer unit	50.00
FIF-65 Computer interface; Apple IIe	69.95
FIF-80 Interface; NEC PC-8001	119.00
FIF-232C for VIC-20/TI/most RS-232	79.95
FRB-1 External relay box	20.00
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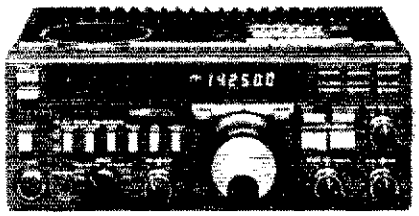

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FP-700 Power supply	209.95
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MH-1B8 Mobile microphone	24.95
YS-60 1.8-60 MHz 2kw PEP wattmeter	$ 84.95
YS-500 140-520 MHz 200w wattmeter	69.95
YH-55 Lo-Z headphones	21.95
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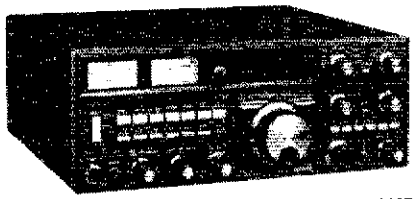

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6M/726 6m unit	269.95
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440/726 440-450 MHz unit (FM band)	329.95
SU-726 Satellite duplex module	129.95
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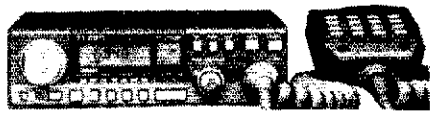
DC-726 DC cable for FT-726R	10.05
FTE-36 Tone board for FT-726R	58.00
AD-2 50w 2m/440 duplexer	34.95
FT-290R MKII 25w 2m FM/SSB xcvr	579.95
FT-690R MKII 10w 6m FM/SSB xcvr	569.95



FT-270RH 45w 2m FM Xcvr w/TTP mic	439.95
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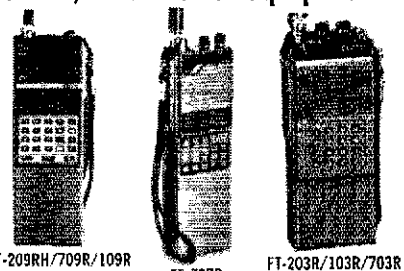

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FNB-4 500ma 12v batt (comes w/09-series)	59.95
FTS-6 Encoder/decoder; 09-series	49.95
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LCC-6 Leather case w/top cover; 09-series	39.95
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NC-9B Wall charger for FNB-3	9.95
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MMB-21 Mobile bracket	14.95
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sessions with 854 QNI & 22 QTC. Albany Co ARES Net had 21 QNI. Sweetwater Co. 2M Net had 44 QNI. Traffic: NN7H 205, W7HLA 87, K7HBB 8. W7COK recovering very well from recent surgery.

SOUTHEASTERN DIVISION

ALABAMA: SM, Joseph E. Smith, WA4RNP—STM: N4JAW. SGL: KA4WVU. BM: KF4VV. OO/A AUX: AA4BL. TC: N4AU. ATC: WB4BYQ. ACC: WA4RNP. "act" SEC: WA4RNP. I have appointed W4QAT, Pat Patterson, of Tuscaloosa as the new AENB net manager. Pse give him your support. Huntsville and B'ham have really turned out the public service work last month with three apiece. These efforts, on the part of any club, promote public awareness and are the best way for your club to establish a "working" relationship in your community; also it's a lot of fun. I am still thinking about a packet radio net for the section (possibly on the HF bands) so if you are interested, pse drop me a line and give me your views. I hope that Santa drops into your shack just what you have been wanting. Traffic: CAND reports 634 messages in 30 sessions with DRN5 rep 100% by WA4JDH, W4CKS, and NW4X. DRN5 reports 641 messages in 60 sessions with Alabama rep 85% by WA4JDH, W4CKS, NW4X and W4WJF. AEND reports 53 messages passed in 30 sessions with other nets represented by WA4JDH, WD4NYL, KJ4MG, W4DEU and N4DCS. AENB reports 33 messages passed in 31 sessions with RN5 represented by WA4JDH, W4CKS, W4QAT, NW4X and WA4PIZ. Brass Pounders League: WA4JDH. PSHR: WA4JDH, W4CKS and WA4RNP. Totals: WA4JDH 692, W4CKS 123, WD4NYL 50, WA4RNP 49, K4AOZ 48, W4WJF 16, W4DGH 10, WB4TVY 4. Seven Three, Joe.

GEORGIA: SM, Eddy Kosobucki, K4JNL—ASM & BM: K4VHC. SEC: NC4E. STM: WB4WQL. ACC: WA4ABY. OOC: NA4I. PIO: WB4DEB. SGL: W4BTZ. TC: WD4PAH. GN NM: WB4DVZ. GCN NM: W4HON. GSSBN NM: KA4HHE. GSN NM: W4WXA. GA ARES NM: NC4E. QCWA NM: K4VN. Well 1986 is almost history & I do want once agn thank all u FB GA hams for the support given during the past year. We have made many strides & I hope that '87 will be even more fruitful. One more time I want all of u to remember that if ur club or group is planning a Hamfest in 1987 to please contact Frank Butler, W4RH, the SE Division Director or me for the necessary forms. By us having the dates etc., we can avoid conflict in our section & neighboring states. Colquitt County HRS once agn getting deeply involved with SUNBELT EXPO '86. Tnx to Gwinnett County ARS & area hams who furnished communications for the Gwinnett Touring Club bicycle rides. Atlanta ARC new officers are: Pres: N4IBW. VP: WD4AGW. Sec: N4MAQ. Treas: WA4ABY. Act: N4LPU. Georgia SSB Asso. elected KA4HHE Pres., KF4FG VP, W4HON Sec/Treas., Dir: N4DOM & WA4EPK. W4TOW was the Georgia Amateur of the year. The award was given posthumously as "DOC" became a Silent Key. Albany RC once agn assisted with the annual Pecan Festival. Tnx to the Atlanta ARC for the FB welcome given me on my club visit. If ur an ARRL member & think that u can qualify for an OO appointment contact NA4I the GA section OO Coordinator or me for the form CD-187. This is the month of the HOLIDAY SEASON, I hope that all of u and ur families enjoy them together. Traffic: WD4COL 238, WB4DVZ 116, WB4WQL 115, W4PIM 85, K4MOG 70, KF4FG 47, K4BAI 39, KA4HHE 28, AA4JV 28, KA4ATM 27, W9NXC 27, W4HON 26, K4NM 23, N4MWR 8, 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. NOFL now has complete staff and we are geared to assist you or your club in reaching for new goals. Several of our Affiliated Clubs have had problems with keeping enough ARRL members on their rolls to maintain the Affiliation that requires 51% of the club as ARRL members. A suggestion to help get your Affiliated Club an extra $2.00 and also to maintain your ARRL membership is to add the date of expiration of each ARRL member's dues to the clubs roster sheet, so the Treasurer can also remind them to pay their dues thru the club. If the membership chairman also watches the list it will give you more chances to keep up the ARRL memberships. Another way is to participate in the Club Challenge and get $5.00 for every new member, but your club has to be an affiliated club to participate. Contact WD4RIQ for his help. If your club has any other ideas along this line we'd like to hear from you. The Volunteer Examiners in Central Florida have been conducting FCC Exams every two months, usually on the First Saturday, next sessions will be Nov 1, 1986 and Jan 3, 1987. Call N4ADI in Maitland for details. There are between 15 and 25 examiners who help each session. The pass rate is near the National average of 60% and we feel this is a good way to keep our Amateur Radio operator ranks growing and improving. If you want to help give us a call. 73 de N4ADI. Traffic: WX4H 593, N4PL 392, WF4Y 292, KB9LT 229, KC4VK 219, WA4QXT 194, WD4IIO 178, AA4HT 142, KB4LB 131, N4GMU 129, WD4IUI 94, W4MGO 91, N4JAQ 88, KD4KK 68, WC4D 59, N4EDH 49, NS4C 46, W4KIX 46, NF4O 40, WA4SXW 39, N4AOX 39, WB4FJY 30, W7YWF 30, KB4FIY 28, KI4CQ 27, W4LDY 26, WA4EYU 25, W4DTV 23, WA4PUP 22, NQ4P 19, KF4GY 18, WD4RIQ 15, WD4HBP 14, N4ENL 14, WB4AWG 13, WD4HJZ 12, KJ4HS 11, KA4KAH 11, WD4RJI 10, N4BQE 4. (Aug) WD4RJI 10, WB4TZR 10, KJ4PA 6.

SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFK—SEC: W4SS. STM: K4ZK. TC: KI4T. BM: WD4KBW. PIO: W4WYR. SGL: KC4N. OOC: W4TAH. ACC: WA4NBE. KB4T has requested that he be relieved as manager of the ARRL Information Net due to work and other conflicts. Many thanks Frank, for a great job! You have a booming signal all over Floridal WA4PFK has assumed responsibility for the ARRL Information Net which meets Saturday mornings at 8 AM on 3940 kHz. NCSs for the first, second, third, fourth and fifth Saturday of each month are respectively, W4WYR, WD4KBW, W4TAH, WD4RIQ and WA4NBE. WA4NBE will also act as sub if anyone should have to miss. Checkins have held up well over the summer and conditions have not been too bad. In fact they have been great compared to the problems some other nets have experienced. Hope many will QNI and that all will listen. W4TAH has started a monthly (more or less) newsletter to the Official Observer Stations in an effort to increase coordination among them. The Martin County ARA's newsleter, the Common Emitter, provides the information that K4ZK is having his carport remodeled into a hamshack. The bad part of this is, according to Bill, that he has to be out of the sack by 0800 when the workmen arrive! That is really a bloody shame—HI. A letter from W4SME indicates he expects to be back in Southern Florida about the first of November. Had a nice message from KY8T and N4DIN—they are now sailing to South Africa. KY8T also sent his best 73 to all his friends on the CW traffic nets. WD4KBW reports 205 bulletins sent in September by AA4BN 14, W4DL 45, WA4EIC 71, W4ESH 7, WT4F 6, KA4GUS 21, K4IEK 16, WD4KBW 12, AA4MI14. 73 de WA4PFK. Traffic: W3CUL 2789, W3VR 914, WA4PFK 346, W4NFK 196, K4EUK 167, WA4EIC 150, K4ZK 132, K4IA 125, WB4WYG 124, AA4BN 113, KA4GUS 108,

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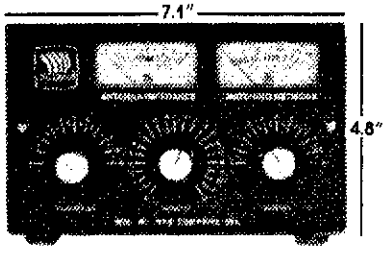

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Daiwa NS660A 30/300/3000 watts	135.00
Alinco ELH 230D- Excellent buy	88 00
Nye MB5-A (for the big boys!)	529.00
Shure 444D	54 95
Ameco PT-2	84 95
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Miller C5141 Low pass filter	43 50
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Tripp 25A/12VDC Supply (16A continuous)	99 00

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8237 RG8	39¢/ft
8267 RG213	55¢/ft
8000 14 Ga stranded copper ant. wire	13¢/ft
8448 8 conductor rotor cable	33¢/ft
9405 Heavy duty 2-16 Ga 6-18 Ga	56¢/ft.
9258 RG8x	20¢/ft
9269 RG-62A/U	16¢/ft
8403 Mic Cable, 3 condctr & shield	45¢/ft
100 feet 8214 w/ends installed	54 00
8669 7/16" tinned copper braid	1 00/ft

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UG176 reducer RG8X	30
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AEA PM-1	149 00
New AEA UDC-232 Firmware, No modem. List 279 00	249.00
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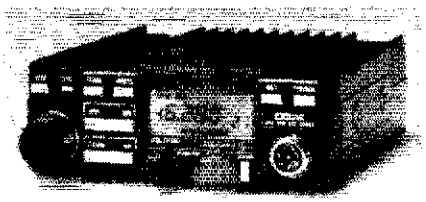

IC28A	List 429	Your Cost 369 00

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Anteco 2M 5/8, Mag. Mount, Comp	25 00
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Stoner DA100 D Active Rx Antenna	190 00
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25 watts	—	25A	25B	25C	25D	25E
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					
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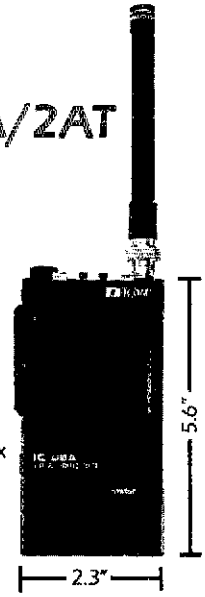

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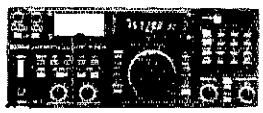

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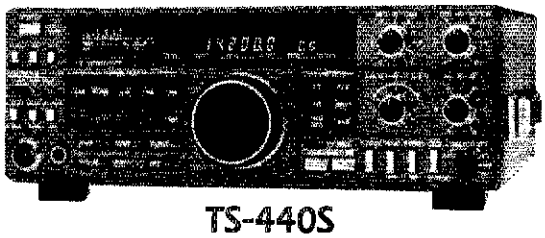

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TM-2530 TM-2550 TM2570
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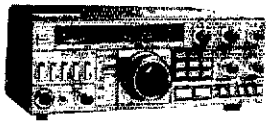

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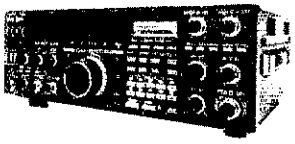

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PB-26 NiCd Battery for TR2600
LH-3 Leather Case for TR2600
SC-9 Soft Case for TR2600
BT-3 Battery Case for TR2600
PB-21 NiCd Pack for TH-21/41
PB-21H 500 MAH NiCd Pack for TH-21/41
BT-2 Battery Case for TH-21/41
SC-8T Soft Case for TH-21AT/41AT
BC-6 Two-Pack Quick Charger
BC-2 Wall Charger for BP-21H
AJ-3 BNC Adapter for TH-21/41

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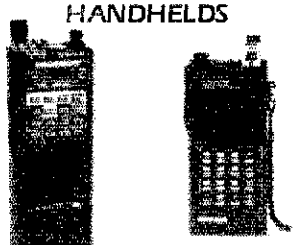
HANDHELDS



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WEST INDIES: SM, Alberto L. Valldejuli, WP4CSG—The PRARC hamfest was a complete success. The demonstration put up by the Humacao group of SSTV, ATV, etc. was most interesting. This group has been experimenting on different modes of amateur radio transmissions, and currently have an ATV repeater in operation. In P.R. the recruiting continues for ARES volunteers. The STM, KP4IG is actively recruiting through 2M repeaters, and by personal visits. All persons interested in helping us form an active ARES group on the Island, please contact WP4CSG or KP4IG. In the VI's there is similar activity. KV4JC is most active organizing the St. Croix ARES group; and in St. Thomas WØDX is in charge. Please get in touch with these and offer them your assistance, they need it and will be most grateful to all those who volunteer. Keep in mind that we, as licensed amateur radio operators have a fiduciary duty to serve the public. The best way we can do it is by offering our services during emergencies. Traffic: WINS (KP4DJ-NM) Sessions 30, QND 220 mins., ATC 13, QNI 124. WINE (WØDX-NM) Sessions 27, QTC 1, QNI 78. WINC (KP4JW-NM) Sessions 25, QTC 10, QNI 734. KP4DJ 46.

SOUTHWESTERN DIVISION

ARIZONA: SM, Jim Swafford, W7FF—STM: W7EP. NMs: K6LL, KA7HEV, WB7CAG. The ARRL National Convention in San Diego was a big success. Saw many AZ hams there. Hope you all enjoyed it as much as I did. Attention, all ECs and DEC.s: Please send your monthly activity report cards for ARES to Ed, KX7P, SEC so he can send combined monthly report to Public Service Branch at HQ and QST by the 7th of each month. Congratulations to Page AZ High School Amateur Radio Club on their recent affiliation with ARRL. W7DRR is the faculty advisor of this new group. Latest figures show 2335 ARRL members in this Section. If new members will join through the affiliated clubs in their areas, the club gets five dollars; two dollars for renewals—an easy way to increase club membership and help your club treasury. KA7MUL reports the Mogollon Monsters will have an overnight awards ceremony and review of their 1986 Field Day experiences in Phoenix the first weekend in November. License exams will be given in Yuma on Dec. 6. Contact K6LL for availability of walk-ins.

NET	QNI	QTC
ATEN	811	90
Cactus HF	468	97
Cactus VHF	305	77
Southwest	210	140

Traffic: KA7MUL 509, W7AMM 324, KB7FE 174, KN7U 125, W7EP 109, K6LL 100, WB7CAG 91, KA7HEV 34, N7ETP 20, K7JKM 16, W7GAQ 13, K7POF 11. (Aug) KB7FE 109.

LOS ANGELES: SM, Bob Poole, AJ6F. ASM: K6IYK. SEC: AK6Y. STM: W6INH. ACC: KX7Q. PIO: NJ6K. QOC: K6BMG. TC: WB6QPO. Unfortunately, the LAACARC/USCG AUX booth did not materialize at the LA County Fair as reported last month; a last minute withdrawal of the booth space wasted the efforts of the crew— BUT...undaunted, the Council has decided that in 1987, even at the cost of a booth investment, they are resolved to pull this off! The Angeles Crest 100 mile endurance run coordinated by EC W6ORG was an absolute success! DEC WB6MKA furnished a list (too lengthy to print here) of the over 50 radio volunteers in this event; rugged terrain and cool weather added to the already difficult circumstances. Congratulations to our new PSHR recipients, KA6ZDL and N6AHT. W6FNO/R September traffic: 283 vehicular, 10 fire and 5 medical for a total of 298 emergency messages. The Downey Amateur Radio Club has been officially renewed as a Special Service Club. Coast-to-coast packet radio messages are now possible; we have been able to send test messages from here to Newington with feedback from K1ZZ and K1CE. The San Diego National Convention was one of the best ever; the spirit of public service prevailed and everyone in attendance enjoyed renewed enthusiasm. Contact the SUB CLUB A.R.A. for information on camping and outings centered around ham radio; call Mary Ann at (213) 726-0721. J.A.A.R.S. and S.C.A.T.S. are recent ARRL affiliated clubs in the section. Many Southlanders were present at the HamWest convention in Las Vegas, the site of the 1989 ARRL Diamond Anniversary; this growing convention stands a chance of getting as large as Dayton! Congratulations to Tom, WX6N; new call and privileges go along with a new field appointment: ATC for Repeater Technology. Call Tom for expert advice on this subject. Contact the Lockheed ARC to obtain an Amateur Radio Wall Calendar; suitable for public places, these can be obtained through W6LS: (818) 842-1863. Valley hams are reminded that the SFVARC meets the 3rd Friday at 7:30 at the Van Nuys Red Cross. Crosstalk, the TRW newsletter, reported that the newly-formed Manhattan Beach Club provided the city with the necessary communications for the 10K run there; public service is so important in overcoming adverse reactions by municipalities. Congratulations to MBARC in instituting the support. Regrettfully, I was unable to attend the Hughes El Segundo ARC Banquet this month due to my Angeles 100 participation; the guys had a great time! W6FRZ is the new So. Cal. DX Club Repeater Coordinator; he needs your input regarding a new repeater and a new location for this valuable DX service. Write Steve at 2234 Conquista Ave., Long Beach, CA 90815. By the time that you read this, holiday traffic will be upon us, so get everything piled up. WB6VPY is getting considerable traffic moved this month. Hope we get more operators soon, we need them, as we have many vacant spots on SCN and RN6. Traffic: K6UYK 479, W6INH 235, WB6VPY 164, N6LHE 158.

ORANGE: SM, Joe H. Brown, W6UBO—There is gold in them there hills, Corona, CA hills that is. Mark Costa, KB6GNZ, has been enticed to accept the vacant Affiliated Club Coordinator slot. Mark has been an effective EC in the Norco/Corona Area with an impressive increase in membership and Club Public Service activities. His work as Program Coordinator for EMD of the Orange County Fire Department and the plan to coordinate the Public Service Activities of the many Amateur Groups in Orange Co. should go hand in hand. A strong united Amateur Community should prevail. The VICTOR VALLEY ARC reports that with about three weeks of classes completed, we feel sure that those in the course who have individual help from an "Elmer", are the ones sticking with it. If you are an "Elmer", your help is needed. "COMING EVENTS" Very important from The Tri-County ARA. We will have nominations of officers for the coming year. Think about it! I mean really look around for the workers, the doers, the enthusiastic hams that attend most all of the meetings and club functions, who

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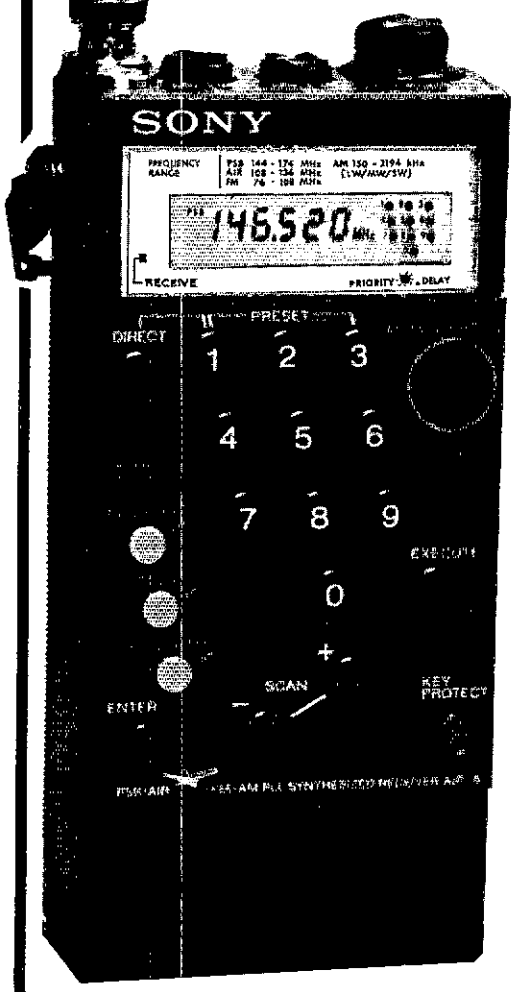

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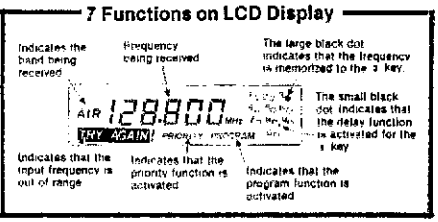
Band		Frequency range	Tuning interval
PSB		144 - 174 MHz	5kHz
AIR		108 - 136 MHz	25kHz
FM		76 - 108 MHz	50kHz
AM	SW	1601 - 2194 kHz (1603 - 2194 kHz)	1kHz
	MW	530 - 1600 kHz (531 - 1602 kHz)	10kHz (9kHz)
	LW	150 - 529 kHz (150 - 530 kHz)	1kHz

7 Functions on LCD Display



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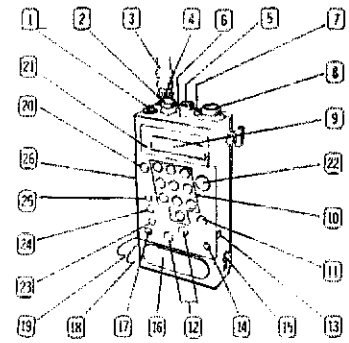

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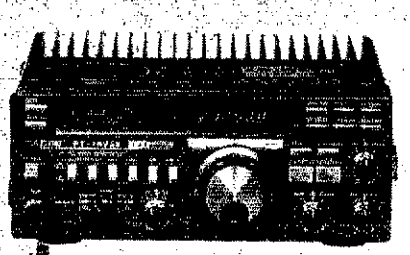

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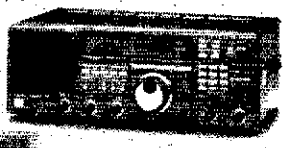

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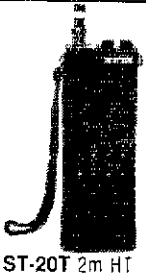
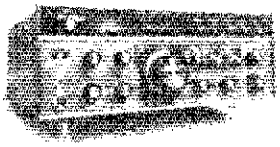


ST-20T 2m HT
ST-400ET 440 MHz HT
ST-200ET 220 MHz HT

KDK
FM240 2m, 25-watt

TEN-TEC



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15-4CD 4-element 15m	125.95
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KT34XA 6-element 10-15-20m	Call
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2m-16LBX 16-element 2m	Call
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393S TH5DX 5-ele 10-15-20m	CALL
395S Explorer 14 10-15-20m	CALL
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208S 8-element 2-meter Beam	CALL
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V2S 2-meter vertical	CALL
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Cushcraft A144-10T 10-ele	53.30
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contribute to our present and future, not personality kids, but really true blooded Hams interested in the future of Ham radio, willing to give a little of themselves for just one year in return for the many pleasures Ham radio has given them. Nominate them for whatever office you feel they deserve. That's what we need! The "BIG" and very important meeting of the year. The final selection of the Club officers; the BIG vote. Come to this meeting or don't complain later. It's your club! Make this meeting above all! CONVENTION. OCCARC—HAMCOM-88 planning is well on the way with Chairman Len Gerardi, NC6H at the helm. John KD7XG, Orange Section TC has made four club presentations this month, with the ARRL NTI Convention at San Diego thrown in. I came to the conclusion that putting modes/bands aside there are basically three kinds of hams; those that invent new modes/methods, those that develop practical uses for the new modes/methods, and those that put these various modes/methods to use sooner or later in their everyday operating. Each of these groups is essential to the health of Amateur Radio. How very dull it would be if something new and exciting wasn't always looming on the horizon. Practical uses for new developments always make operating more exciting/enjoyable for many hams. Last, but never the least, if it weren't for the day- to-day users, there probably wouldn't be Amateur Radio. The radio spectrum is a very precious commodity, and it is usually a use or lose proposition for all services. The teamwork of these three kinds of hams is what makes Amateur Radio tick. It is the reason Amateur Radio has evolved from the 1923 spark gap to the computer automated satellite stations. Whatever part of Amateur Radio you choose to fit into, above all else enjoy it! Rest assured that all facets of Amateur Radio contribuet to its advancement. On that note, The AMSET Tech Achievement award has been awarded to our own TC John KD7XG for capturing telemetry from morse on the space shuttle thru OSCAR 10. Good show OM. Ernie WA6QCA, STM; PSHR WF6O, WB6QCA, WB6QBZ. BPL WF6O.

NET	FREQ	SEC	QNI	TFC	NM	TIME
SCN/1	3598	30	238	261	WF6O	1830
SCN/2	3598	26	128	31	WF6O	2015
SCN/V	146.645	30	404	297	WA6QCA	2100

Traffic: WF6O 593, WB6QBZ 180, KA6HJK 156, N6GOT 126 K6DD 120, WA6QCA 93, K6ZCE 72, AD6A 48, W6CPB 30 KA6TND 7.

SAN DIEGO: SM, Arthur R. Smith, W6INI—STM: N6GW. SEC: W6INI. PIO: KG6LF. TC: N6NR. New EC for Eastern Dist of S D County is N6NKJ. Can you imagine the chaos on the repeater bands if frequency selection were a "free for all"? Our tradition of self-regulation is manifested by the repeater coordinating organizations which maintain order on repeater bands. Recent changes in FCC regs (PR85-22) give official recognition to these groups. Your support is vital to their existence. Join those coordinating your local area. The 220 Club of SD hosted the Oct meeting of the 220 SMA (the 220 coordinator for Southern Calif). Join your local club. The ARC of El Cajon meets on second Thursday at Parkway Junior High School, near Fletcher Pky & Dallas, La Mesa, at 1930. Visitors welcome. The club's repeater, WA6BGS, in Santee, is on 146.19(+). To encourage activity among club members a WAMO (Worked All Members Only) award is given for on-the-air contacts. Club leaders with over 300 contacts are KD6PZ, K6DS. Have you checked the expiration date of your license recently? NCTN met 29 times, handled 56 msgs. Traffic: N4KRA 103, N6GW 40.

SANTA BARBARA: SM, Byron Looney, K6FI—Santa Barbara County OES and Public Health sponsored a disaster drill using ARES in Sept. Many lessons learned but, most important, 2M antennas now installed on hospitals in Lompoc and Vandenberg AFB. Our next Section Meeting being scheduled for December...Contact your EC for date and time. Latest appointment is Tony Tonkin, N6AJA, who has agreed to take on Dec for Santa Barbara County. I frequently get calls asking for info re VE schedules. If your club or group is conducting tests, please send a card as I only receive info where ARRL is the VEC, and this is often delayed. SBARC van was a hit at the San Diego Convention...Take a bow, fellows. Traffic: W6NOR 126, N6HYM 24, N6FOU 20.

WEST GULF DIVISION

NORTHERN TEXAS: SM, Phil Clements, K5PC—Asst. SM: K5MXQ. ACC: NI5V. SEC: W5GPO. TC: W5LNL. STM: AE5I. BM: W5QXK. PIO: K5HGL. OOC: WB5JBP. SGL: W5UXP. George Lyons, K5MXQ, has been appointed Asst. SM. He will be meeting the NTS nets and soliciting your stn. activity and PSHR monthly reports, and serving as my "on the air" rep. Reports must reach him by the 5th of each month, the printing deadling for QST. Charles Byars, W5GPO, has been reappointed Section Emergency Coordinator. He is already hard at work on a recruiting drive to make our section 100%, with an active ARES unit in each county. The ARES districts will be redrawn in January when the new West Texas Section is formed. I am sure Charles would like inputs from all DECs on how the new district lines should be drawn to match repeater coverages etc. so that DECs can more easily reach their ECs by radio. Our TC, W5LNL, is on "TDY" in the Wash. D.C. area, and has attended several club meetings and seminars in "3" land. DEC/NM K5UPN reports that the Northeast Texas Tfc. and Emer. Net had QNI of 65, QTC 8 in 8 sessions in Sept. Attn: "Packeteers", we need someone to form a Northern Texas Section Packet Emergency Net to test our capabilities and coverage and be "in place" before a disaster strikes. Any takers!?! An open note to the 900 ARRL members and all the Leadership Officials who will be in the new West Texas Sec. Jan. 1; it has been my pleasure working with you these last 10 years. Thanks for your dedicated work for the betterment of our hobby and your public service. Good luck on the establishment of our 74th Section! I am sure I can speak for W5KR and myself that we are committed to doing all we can to insure a smooth transision. Just let us know if we can help. PSHR for Sept.: KA5QYV, K5MXQ, W5VMP, KA5SPT, WG5S, K5EVI and KB5ADE. Traffic: N5BT 297, W5TNT 263, W5VMP 206, KA5SPT 165, KD5RC 142, W9OYL 139, WG5S 90, K5MXQ 97, KA5AZK 95, WB4HML 83, K5EVI 58, KB5ADE 51, N5HJI 40, KB5UL 31, WA5EZT 19, KA5QYV 13, N5IUI 7.

OKLAHOMA: SM, Bill Goswick, K5WG—The OK Section owes a debt of gratitude to Dave Cox, NB5N, the previous SM. Dave worked long and hard for the section during his term, going well beyond the call of duty. He expanded the role of SM into many new areas and did much to promote amateur radio and the League within the section. He has been a valuable source of information and guidance for me, and his help is greatly appreciated. Well done, Dave. Congrats to Sam Sitton, KV5X on being appointed an Asst. Dir. Feel free to contact Sam regarding ARRL policy matters. Congrats also to John Thomason, WB5SYT, on being appointed the PIO for the section. John is looking for PIAs to assist him across the state; if you are interested, please contact him. Does your club have a committee to investigate and resolve RFI complaints? If so, please let me know. Many thanks to those who helped provide emergency communications during the Sept-Oct

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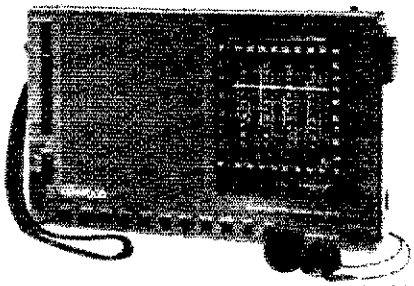

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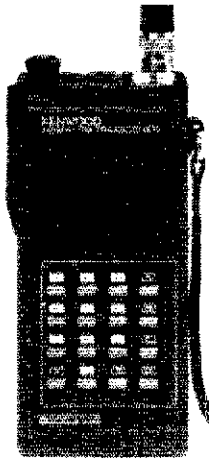

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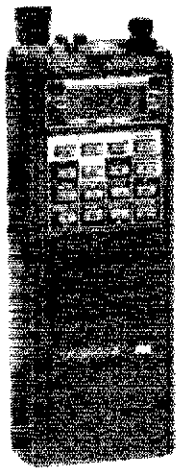

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floods. A happy Thanksgiving to all. Traffic: W5AS 364, KV5X 190, W5RB 157, NG50 148, NQ5W 120, N5IKN 105, NX5E 91, WA5OUV 71, K5GBN 59, WD5IFB 48, NB5N 46, N5IXV 32, K5CAY 30, W5VLW 27, W5VOR 25, WA5ZOO 23, W5SUG 17. (Aug) KV5X 101, WA5OGC 31.

SOUTHERN TEXAS: SM, Art Ross, W5KR—ASM: N5TC. STM: K5QEW. SEC: KA5KRI. OOC: WA2VJL. PIO: WA5UZB. BM: W5OVH. TC: NZ5U. The PIO— Public Information Officer—is a relatively new appointive office in the ARRL field service. We once "hid our heads under a bushel." Our aim now is to tell the world about the good things done by Amateur Radio. The PIO has a group of helpers known as PIAs—Public Information Assistants— who gather information and help spread the good words. Each club should have a PIA to help in that spreading, to tell everyone of its good activities. South Texas Section has WA5UZB as PIO. His assistants (PIAs) are WA5BTO, KA5EEQ, N5FIX, K5HMB, N5HPB, N5IDD, KE5OG, KA5OGA, K5PFE and WA5WCY. Get in touch with WA5UZB if one of the listed PIAs is not a member of your club. You'll be glad you did. The word is out on the ARRL's "Youth in Amateur Radio" program. Do all you can to spread the word and to help prospective young artists. (Another reason for becoming a PIA.) Kendall ARS reports K5MOF finally won the "worked all counties" award!! Williamson County ARC's VE team held a special exam session for a visually handicapped applicant; KB5ADG successfully upgraded from Novice to General. Nice work, gang! VEs from three of the Rio Grande Valley Clubs held a similar session; word not received at report time on outcome. Hill County ARC, Kerrville, VE test session produced four upgrades: KA5IPA to Technician; KA5VSX to General; N5FJD and KB5EQ to Extra. Congratulations all around. PIA N5FIX reports NARS (Houston) has full participation in Houston HAM-COM, including the transmitter hunt; NARS is coordinating visits to actual Ham Shacks by Boy Scouts during the BSA Jamboree-on-the-air; they have been listed in a BSA district news letter and in a local flyer; is providing communications for Lions Club International Eye Bank Bike Ride. CAND Mgr W5KLV reports 634 messages in 30 sessions; DRN5 represented 100%; South Texas stations KD5KQ, W5KLV, WB5FQU, WB5EPA, N5DFO, WD5UOP, NX5V and N5CRU. DRN5 Mgr WB5YDD reports 681 messages in 60 sessions; South Texas represented 100% by W5CTZ, NX5V, KD5KQ, N5DFO, AJ5K, W5KLV, WB5EPA, WB5FQU, WA5ZJY, N5BHQ and WB5YDD. ORS K5CVD elected to Net Mgr of Central Gulf Coast Hurricane Net, to be Asst Net Mgr until installed as NM January 1, 1987. OBS W5KLV reports 13 ARRL bulletins, 28 satellite bulletins, 3 propagation forecasts, 3 DX bulletins, 4 CRRL bulletins, given 180 readings on 8 nets. NZ5J reports KA5DYB is now WQ5C. PIA/ORS/ATC WA5WCY is now radio technician for Houston PD; is restoring Viking Ranger II, Hammarland HQ-170 revr and HX-500 xmtr. Traffic: W5CTZ 298, W5KLV 288, WB5YDD 279, W5TFB 231, AJ5K 217, WD5GKH 85, WB5J 74, WB5EPA 73, AC5Z 52, WB5FQU 41, WA2VJL 38. (Aug) WD4PPG 21, WA5UZB 2.

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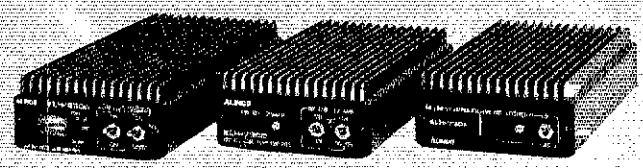

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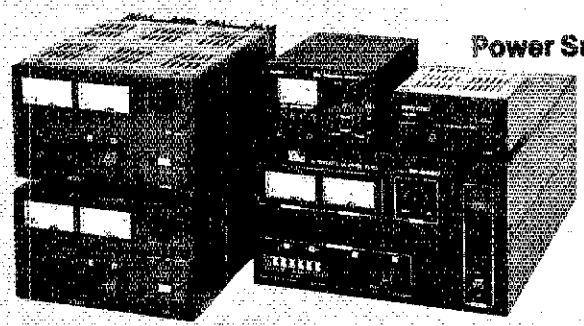

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Matching Vacuum Tube Amplifiers with Solid State Transceivers

ICOM's Tech Talks and discussions at various conventions around the country often uncover some interesting inquiries which are beneficial to the amateur community at large. Since information retained is information lost, we would like to share knowledge of an occasionally misunderstood area with our friends. Specifically, let's consider the question "How can I interface my older style vacuum tube linear amplifier with a modern solid state **ICOM** transceiver?" This isn't a difficult operation, but it does require some forethought and understanding. Let's take a closer look at that situation.

Older style vacuum tube transceivers and high power linear amplifiers use large relays with wide spaced contacts for their essential transmit/receive switching. Those large relays are necessary because tubes require high voltage and low current for operation, and that high voltage can arc across close spaced contacts. Transmit/receive switching times of those units are not fast, but they were sufficient for their era's technology.

Most modern solid state transceivers utilize high speed diodes and small reed type relays to support their extremely fast transmit/receive switching capabilities. While this arrangement is ideal for full break-in CW, AMTOR, Packet and other popular activities, large relays with long "arm travel distances" can't maintain compatible T/R switching speeds. Likewise, their mated transceiver's reed relay will arc or "stick" from application of excess amplifier T/R switching voltages.

A popular alternative, however, involves using the "barefoot" transceiver for full break-in type activities and using a simple relay interface circuit for including amplifier operation during semi break-in CW and SSB activities. A convenient interfacing circuit is shown in Figure 1, and parts are available at most Radio Shacks. Merely remember to observe polarities, check the circuit's operation before connection to transceiver and amplifier, and enjoy the results.

A second question concerning ALC interconnections also arises when vacuum tube linear amplifiers are mated with solid state transceivers. Generally speaking, ALC may be visualized as an "original" or "basic" form of RF speech processing. A linear amplifier's ALC control is also a convenient means of decreasing a transceiver's RF output to prevent overdriving that amplifier's input circuit. Since many high power linear amplifiers include vacuum tube compatible ALC voltage (quite high compared to solid state equipment), and since linearity curves of various units are different, ALC lines must usually be left unconnected.

Fortunately, both high performance RF speech processing and front panel adjustment of RF output (not merely mic input level) are included in all **ICOM** HF transceivers. Many competitive transceivers lack one or both of these capabilities, resulting in less than optimum overall performance and flexibility.

Naturally, **ICOM'S** overall and logical suggestion for station assembly involves using its fully broadbanded and solid state IC-2KL linear amplifier. This deluxe unit features instant on and no tune-up operation, plus it can be interconnected with the station's transceiver for automatically tracking band changes. The IC-2KL's RF and power supply sections are housed in separate cabinets for easy handling and installation. Its 1,000 watt input power also liberates it from the 240 AC power requirement. A healthy 120 AC outlet is sufficient.

Whether your HF interests include high power SSB, break-in CW, RTTY, AMTOR or Packet activities, **ICOM** has you covered in top style. Its HF transceivers boast a full one year warranty, and its service centers give the most rapid "turn around" time in the industry. That's possible because **ICOM'S** new generation amateur gear is exceptionally reliable. It stays in your station rather than waiting its turn in the shop. Performance is the name of the game, and **ICOM** is...simply the best!

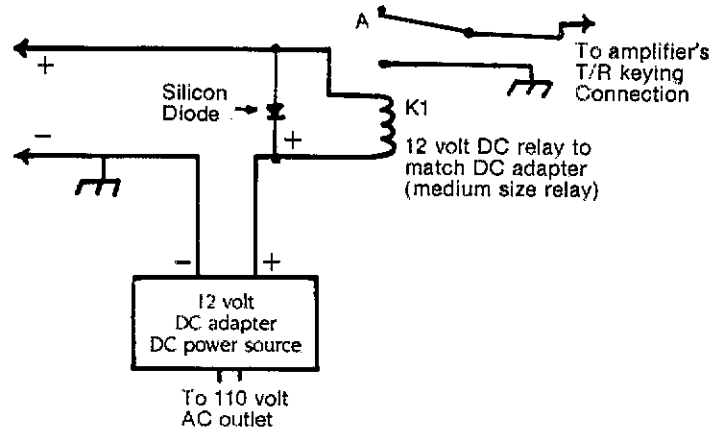

FIGURE 1: AMPLIFIER INTERFACE CIRCUIT

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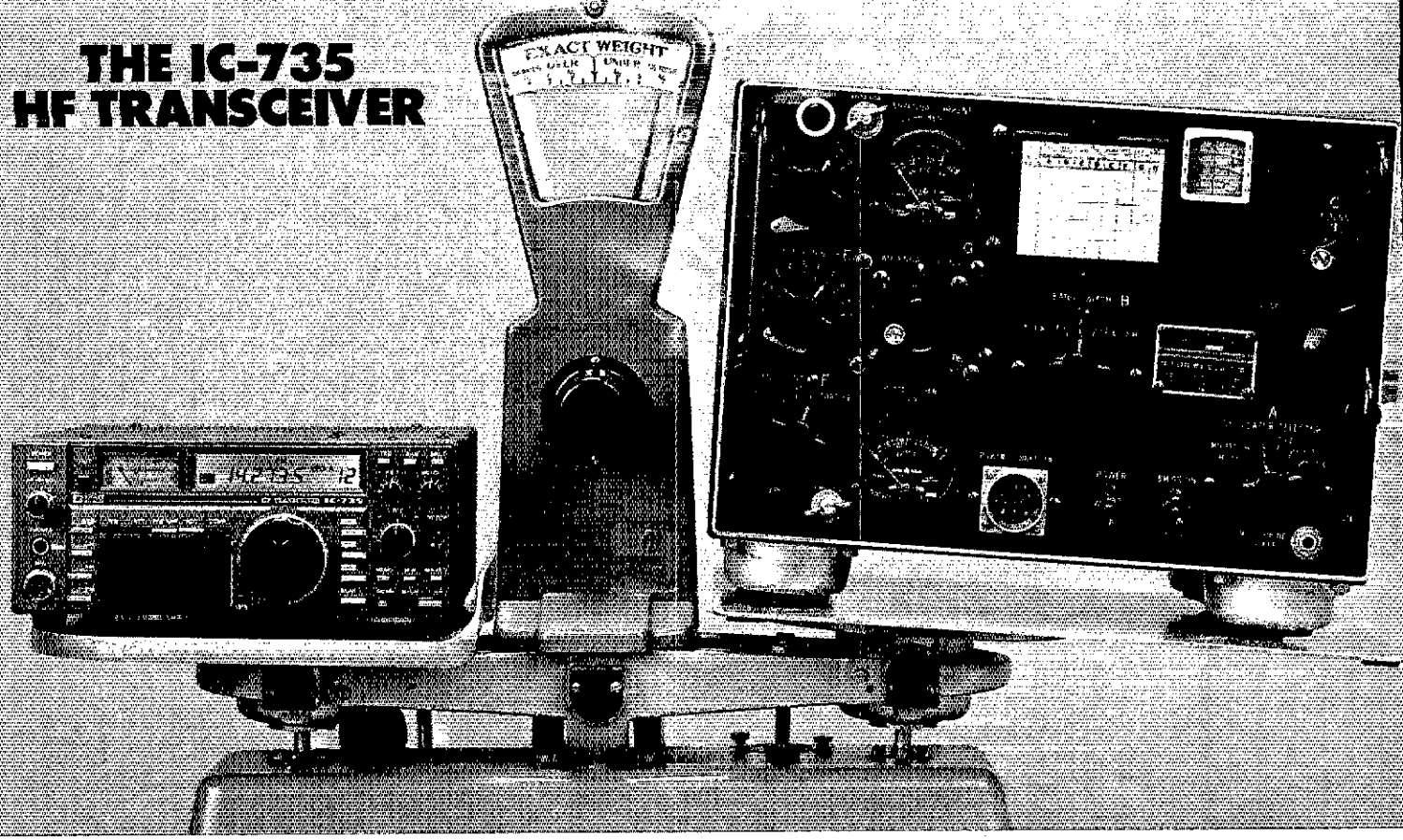
THE IC-735 HF TRANSCEIVER



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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.

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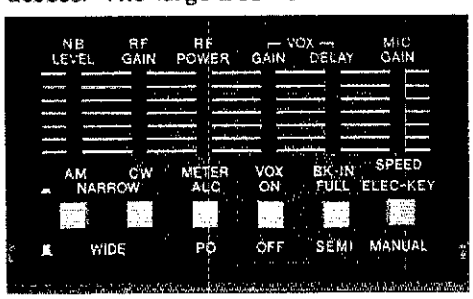
12 Memories. Frequency and MODE may be easily stored and retrieved in the 12 tunable memories.

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..



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See the IC-735 performance heavyweight at your local authorized ICOM dealer.

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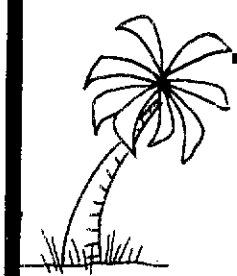

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220MHz. To get away from the crowd, ICOM has the IC-3AT 220.000–224.990MHz handheld with 1.5 watts output, thumbwheel selection and a DTMF pad.

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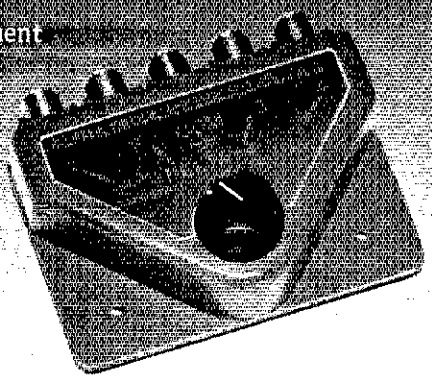

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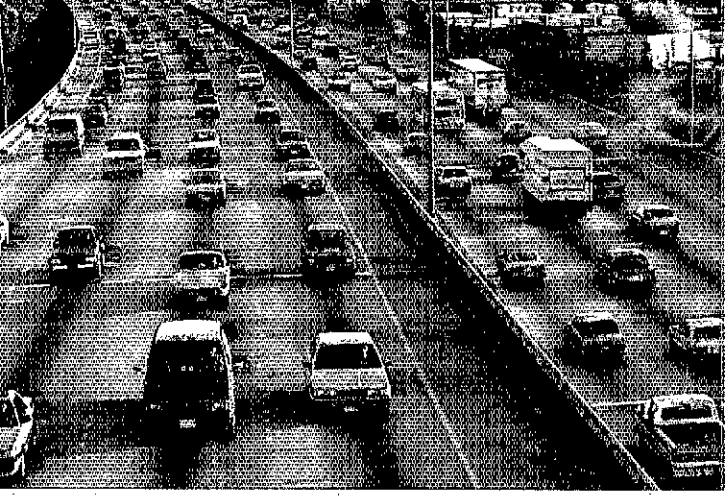

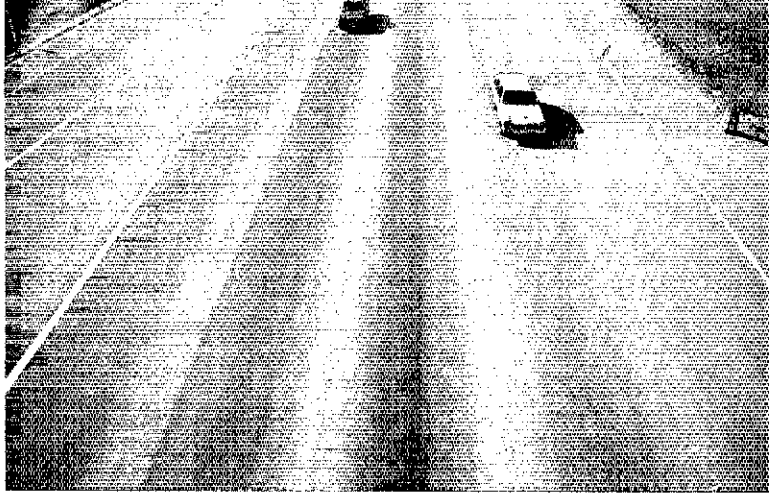

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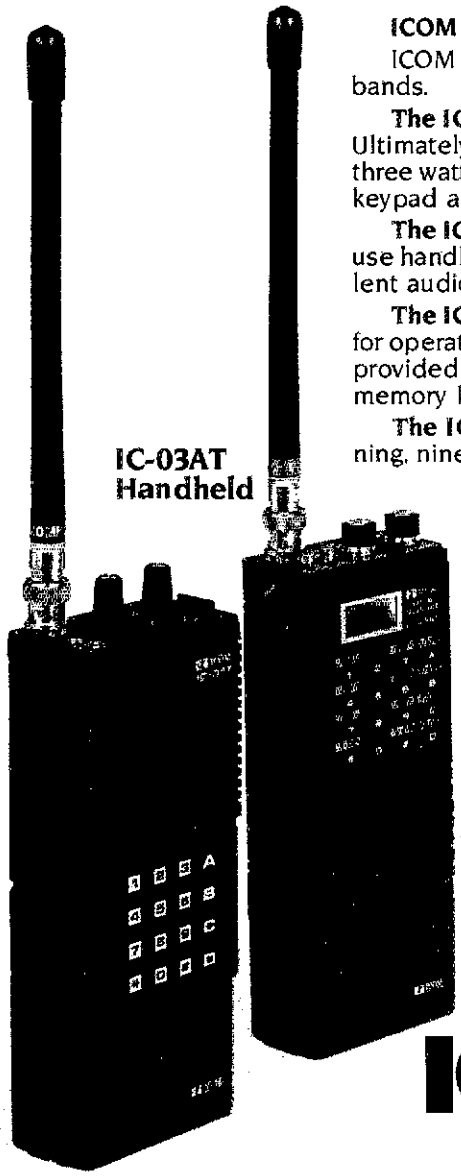

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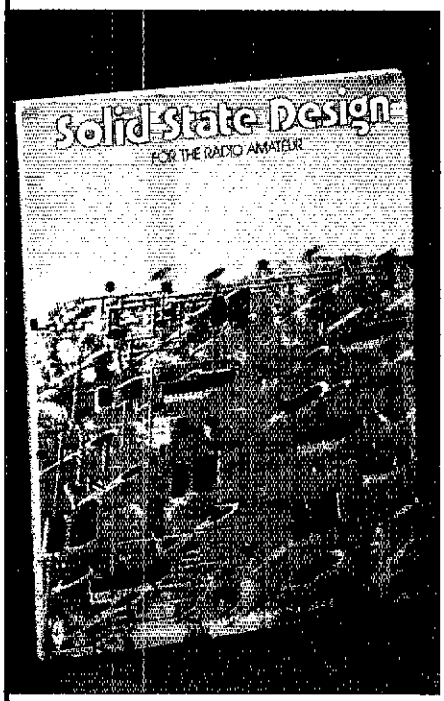

Solid State Design for the Radio Amateur was first released in 1977 as a theoretical and practical guide for the radio amateur interested in using solid-state devices in RF design work. In the just released second printing, the occasional errors and omissions which inevitably creep into a work of this magnitude have been corrected, making this publication even more valuable not only to amateurs, but professional RF designers as well.

Solid State Design is among the select few technical books that have sold more than 50,000 copies. Why has it achieved this enviable sales milestone? For one thing, its 9 chapters and 256 pages are chock full of good basic information on circuit designs and their applications. Much of the data such as transistor modeling, cannot be found in other publications. Some of the topics covered are: basics of transmitter design, power amplifiers, matching networks, receiver design basics, advanced receiver concepts, modulation methods and test equipment. 1st edition, 2nd printing. $12.00 in US funds. Add $2.50 for shipping and handling ($3.50 for UPS).

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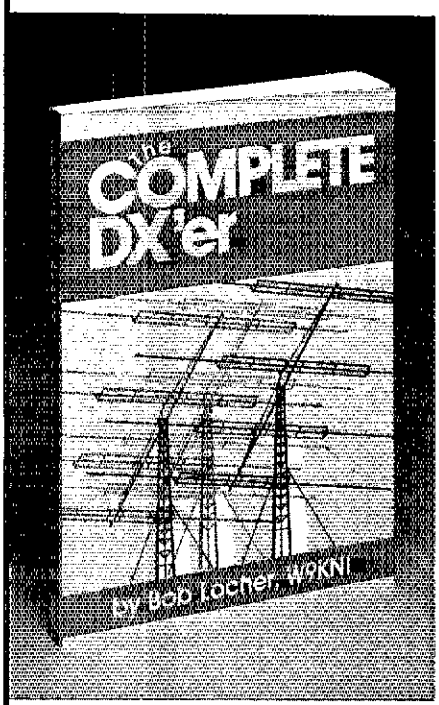

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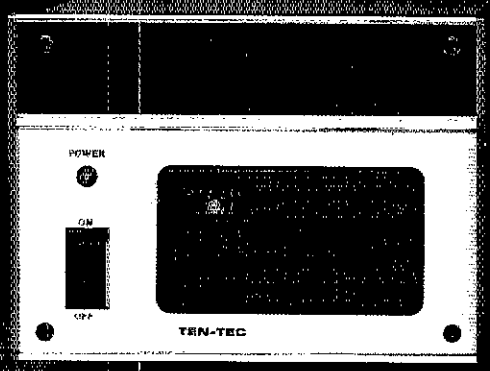

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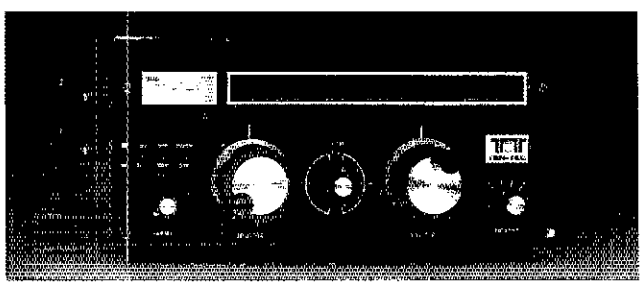
Selectivity: 16 pole crystal ladder filter, 2.4 kHz bandwidth. 1.6:1 shape factor at 6/60 dB. Three position, mode independent, switch selects standard 2.4 kHz, optional 1.8 kHz, 500 Hz or 200 Hz filters.
Notch filter: Greater than 50 dB notch, adjustable from 200 Hz to 3.5 kHz.
Audio Bandpass filter: 8 pole, active filter centered at 750 Hz variable from filtered to flat response.
Passband tuning (PBT): Tunes 2nd IF frequency 3 kHz.
Noise Blanker: Switchable on/off with adjustable threshold and blanking
Offset tuning: Dual range, tune RX, TX or TRX.
PLUS: Built-in antenna pre-amp, spot button, selectable AGC fast, slow and off and much more.

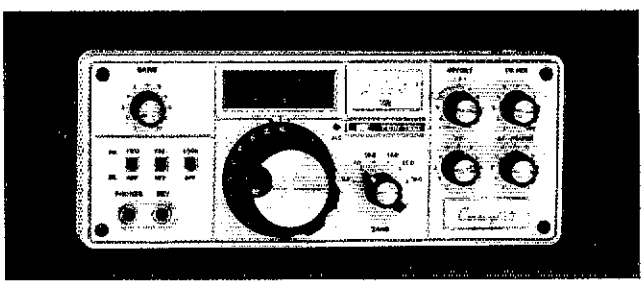
TRANSMITTER
RF Output: Broadband, solid state, self tuning with 85-100 watts, all bands.
Built-in iambic keyer. Speed adjustable 8-50 WPM with 40 character programmable memory.
Multi-meter: Reads Ic, Power out, SWR, speech processing level.
Built-in speech processor, with level control, standard.
Variable ALC, adjust power output continuously from 100% to 25% and retain full ALC action.
PLUS: Rear panel connectors for station control, AFSK, QSK, phone patch, auxiliary antenna, PTT, standard CW key, and more.
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



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.

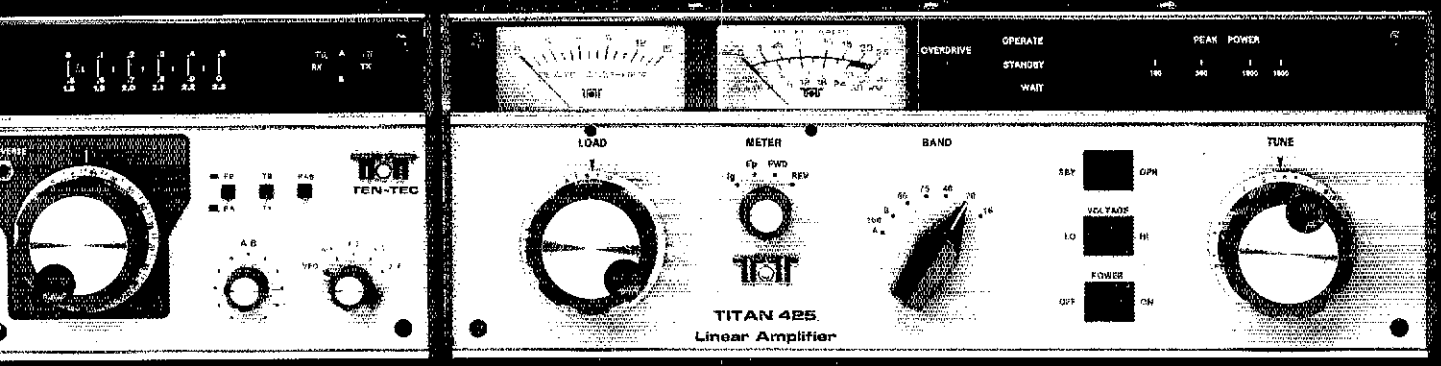
- Reversible "L" network circuit for best match and bandwidth, at either hi or lo, antenna impedance.
- Avoids false load indication.
- Ceramic insulators and coil forms throughout. Silver plated switch contacts and roller inductor coil.
- Built-in SWR bridge.
- Built-in balun.
- System by-pass switch.
- 4 Position antenna select switch.
- Attractive Ten-Tec Corsair styling.
- Also available in kit-form. Model 4229 . . . $219.



CENTURY/22, CW Transceiver, Model 579 . . . $389
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.
POWER SUPPLY for Century/22. Model 979 115VAC . . . $98.
979E 230VAC . . . $110

THE ULTIMATE HF MOBILE ANTENNA SYSTEM
. . . 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

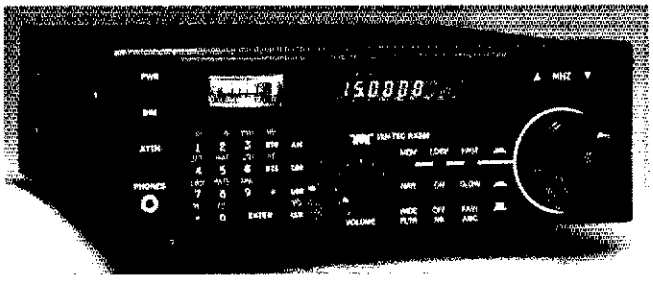
"BOOM BOX" EXTRAORDINAIRE! Remoted power supply makes possible, this compact, desk top linear amplifier. Puts out a solid 1500 watts SSB and CW, 1000 watts continuous power on RTTY, AMTOR or SSTV. Lightning fast QSK for "break-in" CW and super AMTOR performance.

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.



NEW! Model RX-325 General Coverage RCVR...$699

Fully synthesized, the RX-325 is the latest from Ten-Tec. General coverage from 300 KHz to 30 MHz. Operates on 12 to 14 VDC or with 120 VAC adapter, supplied. You will hear it all, mobile or base. Look at these features:

- Keyboard entry or tuning knob frequency control.
- 25 Memories.
- AM, LSB (cs), or USB (CW).
- S-Meter with SINPO scale.
- Built-in quartz digital clock with timer feature.
- Noise Blanker.
- RF Preamp built-in.
- Programmable band or memory scan.
- Dual ceramic I-F filters.
- Hi and Lo impedance antenna terminals.

PLUS . . . switchable AGC, built-in speaker, 2 Watts audio power, epoxy-glass circuit boards throughout. Striking, high-tech appearance, finished in black. Size (HWD) 3.75" x 9.5" x 7". Weight 5 lbs. 5 oz.

The term of the TEN-TEC WARRANTY IS ONE YEAR...as always!

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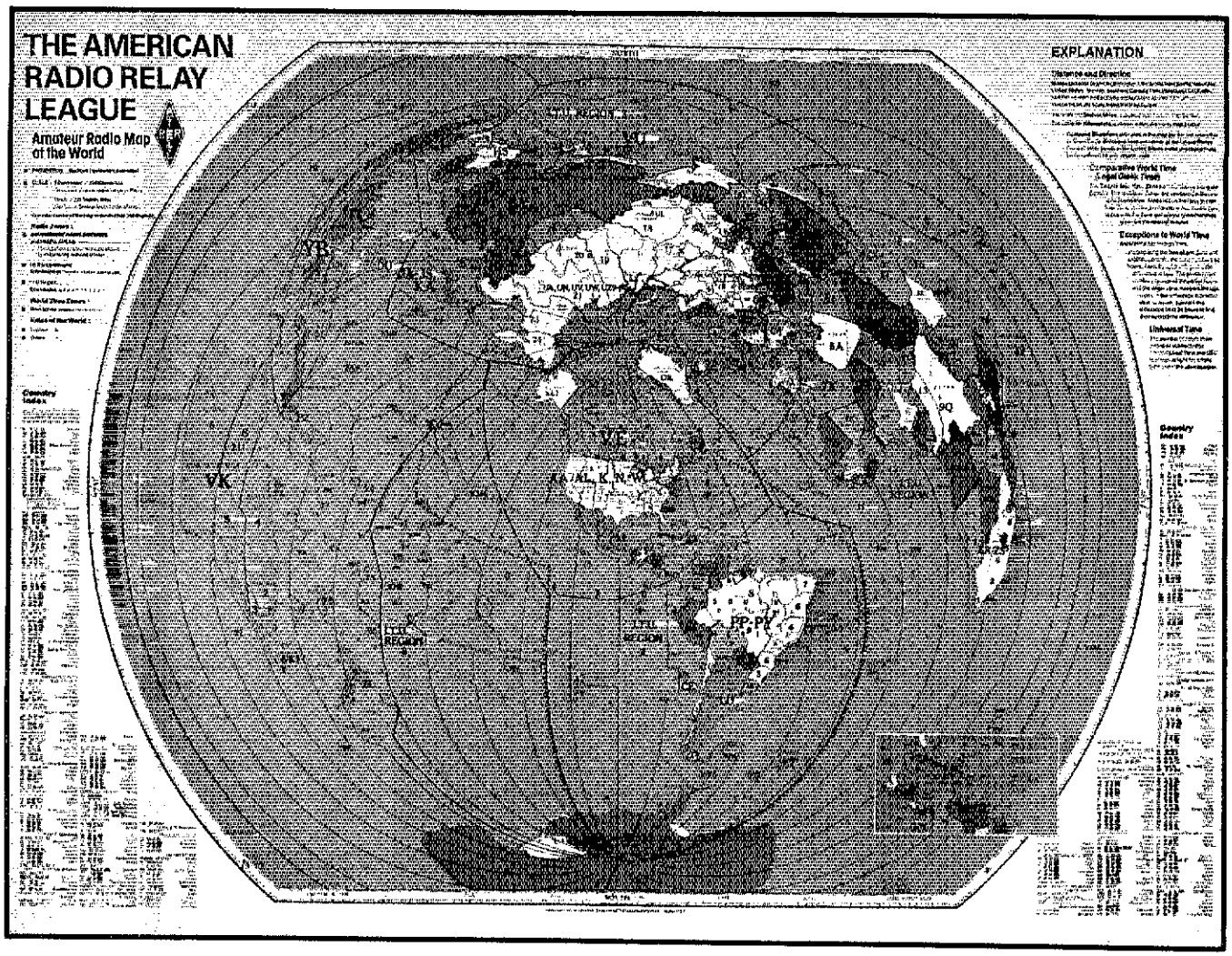

LATEST EDITION

DETAILED CARIBBEAN INSERT

The ARRL Amateur Radio Map of the World has been updated from the 1980 version by the League and Rand McNally. The colors are brighter and bolder, and we have added an enlarged and detailed insert of the Caribbean. The country index lists countries alphabetically by prefix and shows ITU and CQ Zones as well as continent. On the map itself you will find ITU Regions, time zones and great circle bearings centered on the United States as well as prefixes and call districts. The latest edition of ths popular Amateur Radio map will brighten any ham shack wall! Price is $8.00.

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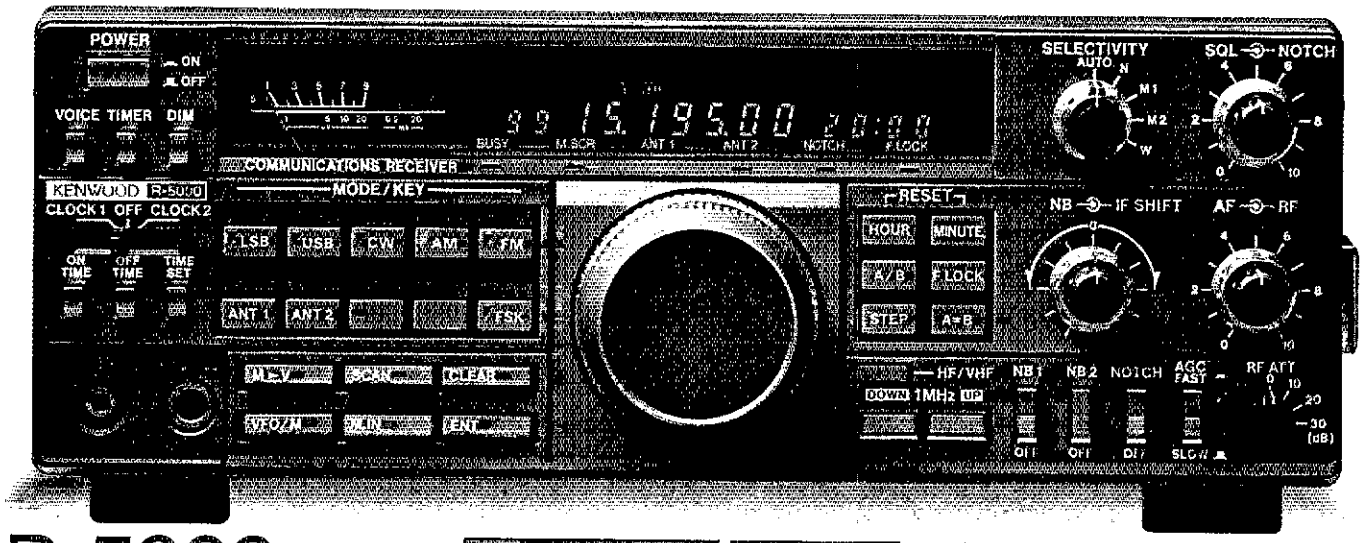
Hear it All!

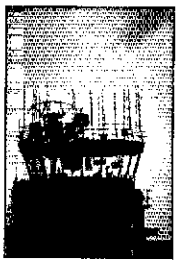


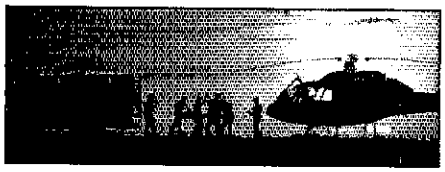
R-5000

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.)





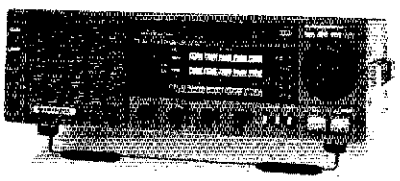
- **100 memory channels.** Store mode, frequency, antenna selection.
- **Voice synthesizer option.**
- **Computer control option.**
- **Extremely stable, dual digital VFOs.** Accurate to ±10 ppm over a wide temperature range.
- **Kenwood's superb interference reduction.** Optional filters further enhance 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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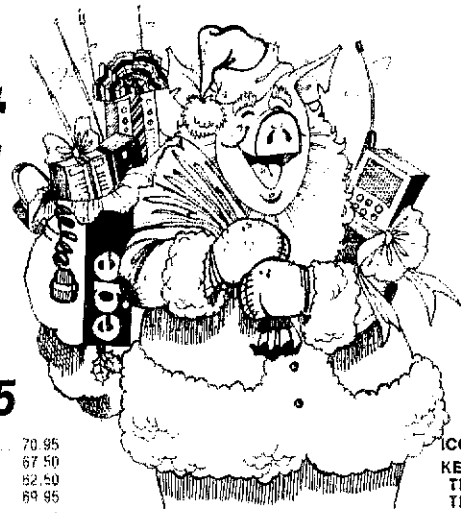

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Headphones and headsets in low close-out prices. Procom 400 Mike wired for your Icom, Yaesu, or Kenwood radio is just $49.95. Call to ask about other models in stock.

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Packet Unit
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IC271H 100W 2m Base Station ... Call
IC27A/27H 2m Mobile 25/45 Watt ... Call
IC28A/28H 2m Mobile 25/45 Watt ... Call
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Here Now! 220 MHz

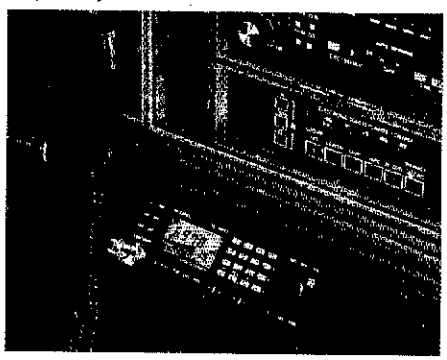
220: Kenwood Style!

TM-3530A

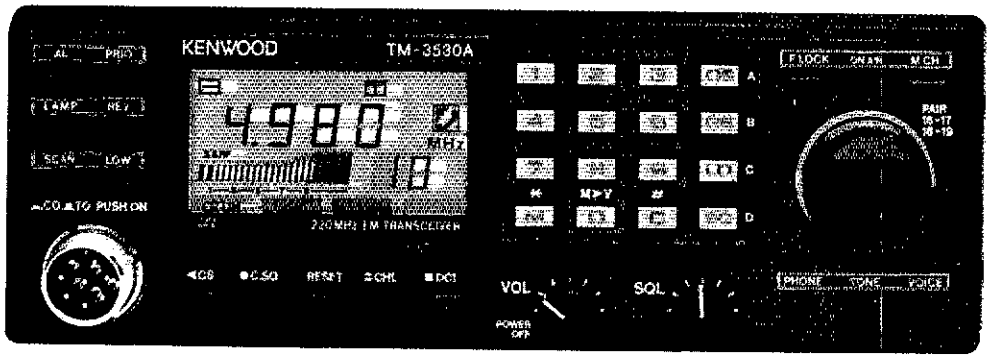
The first comprehensive 220 MHz FM transceiver

TM-3530A—25 watts of 220 MHz FM—Kenwood style! Features include built-in 7-digit telephone number memory, auto dialer, direct frequency entry and big LCD. All this makes the TM-3530A the most sophisticated rig on 220 MHz!

- **First** mobile transceiver with telephone number memory and auto-dialer (up to 15 seven-digit telephone numbers)
- Frequency range 220-225 MHz
- Automatic repeater offset selection—**a Kenwood exclusive!**
- Direct keyboard entry of frequency
- 23-channel memory for offset, frequency and sub-tone
- Big multi-color LCD and back-lit controls for excellent visibility
- Optional front panel programmable 38-tone CTCSS encoder **includes 97.4 Hz**
- Frequency lock switch
- Digital Channel Link (DCL) option
- High performance GaAs FET front end receiver



- 16-key DTMF pad, with audible monitor
- Center-stop tuning—**another Kenwood exclusive!**
- **New** 5-way adjustable mounting system
- **Unique** offset microphone connector—relieves stress on microphone cord
- HI/LOW power switch (adjustable LOW power)



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

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

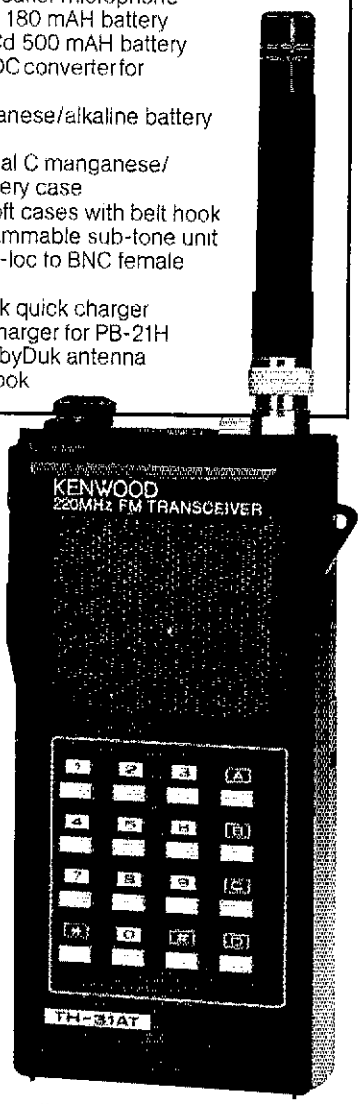
TH-31BT/31AT/31A

Kenwood's advanced technology brings you a new standard in pocket/handheld transceivers!

- 1 watt high, 150 mW low
- Super compact and lightweight (about 8 oz. with PB-21!)
- Frequency range 220-224.995 MHz in 5-kHz steps
- BT Series has built-in tone
- Repeater offset:—1.6 MHz, reverse, simplex
- **Supplied accessories:** rubber flex antenna, earphone, wall charger, 180 mAH NiCd battery and wrist strap
- Quick change, locking battery case

TH-31BT/31AT/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

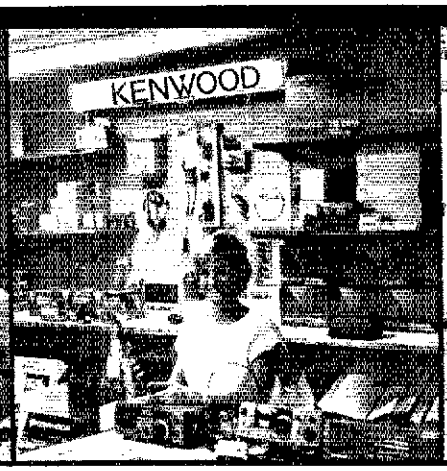


TH-31AT with DTMF pad shown. Optional RA-9A attached.

KENWOOD

TRIO-KENWOOD COMMUNICATIONS
1111 West Walnut Street
Compton, California 90220

Rob, WA3QLS



Katherine, KA3IYO

Paul, WA3QPX

Delaware Amateur Supply

71 Meadow Road, New Castle, Del. 19720 302-328-7728

***Factory Authorized Dealer!* 9-5 Daily, 9-8 Friday, 9-3 Saturday**

KENWOOD YAESU ICOM TENTEC MICROLOG KDK SANTEC KANTRONICS AEA AMERITRON and much more!

800-441-7008

Orders, Pricing & Availability of New Equipment

Large Inventory

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No Sales Tax in Delaware!

One mile off I-95

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KENWOOD

...pacesetter in Amateur radio

"Dual-Band" Leader!

TW-4000A

2-m/70-cm FM transceiver.

The first is still the best! The original FM "Dual Bander." TW-4000A delivers 25 watts output on both VHF and UHF in a single compact package.

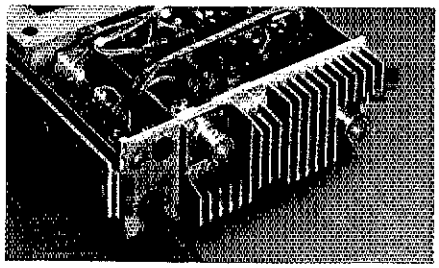
2 m and 70 cm FM in a compact package.
Covers the 2 m band (142.000-148.995 MHz), including certain MARS and CAP frequencies, plus the 70 cm FM band (440.000-449.995 MHz), all in a single compact package. Only 6-3/8 (161)W x 2-3/8 (60)H x 8-9/16 (217)D inches (mm), and 4.4 lbs. (2.0 kg.).

Single-function keys allow easy operation.

Large, easy-to-read LCD display.
A green, multi-function back-lighted LCD display for better visibility. Indicates frequency, memory channel, repeater offset, "S" or "RF" level, VFO A/B, scan, busy, and "ON AIR." Dimmer switch.

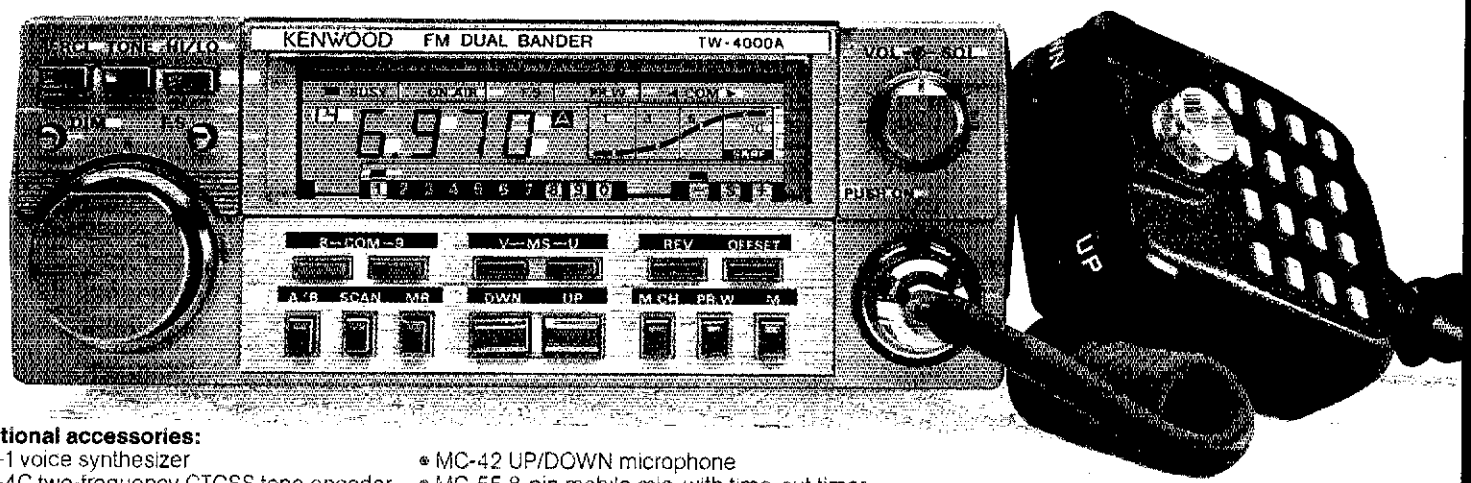
Front panel illumination.

10 memories with offset recall and lithium battery backup.
Stores frequency, band, and repeater offset. Memory 0 stores receive and transmit frequencies independently for odd repeater offsets, or cross-band (2 m/70 cm) operation.



- **Rugged die-cast chassis.**
- **Two separate antenna ports.**
  Use of separate antennas is recommended. This simplifies antenna matching and minimizes loss. However, mobile installations may require a single antenna. The optional MA-4000 dual band mobile antenna comes with an external duplexer.
- **Programmable memory scan with channel lock-out.**
  Programmable to scan all memories, or only 2 m or 70 cm memories. Also may be programmed to skip channels.
- **Band scan in selected 1-MHz segments.**
  Scans within the chosen 1-MHz segment (i.e., 144.000-144.995 or 440.000-440.995, etc.). The scanning direction may be reversed by pressing either the "UP" or "DOWN" buttons on the microphone.
- **Priority watch function.**
  Unit switches to memory 1 for 1 second every 10 seconds, to monitor the activity on the priority channel.
- **Common channel scan.**
  Memories 8 and 9 are alternately scanned every 5 seconds. Either channel may be recalled instantly.
- **High performance receiver/transmitter.**
  GaAs FET RF amplifiers on both 2 m and 70 cm, high performance monolithic crystal filters in the 1st IF section, provide high receive sensitivity and excellent dynamic range. The high reliability RF power modules assure clean and dependable transmissions on either band.
- **Optional "voice synthesizer unit."**
  Installs inside the TW-4000A. Voice announces frequency, band, VFO A or B, repeater offset, and memory channel number.
- **Repeater reverse switch.**

More TW-4000A information is available from authorized Kenwood dealers.



Optional accessories:

VS-1 voice synthesizer
TU-4C two-frequency CTCSS tone encoder
PS-430 DC power supply
KPS-7A fixed station power supply
MA-4000 dual band mobile antenna with duplexer
SP-40 compact mobile speaker
SP-50 mobile speaker
- MC-42 UP/DOWN microphone
- MC-55 8-pin mobile mic. with time-out timer
- SW-100B SWR/power meter
- SW-200B SWR/power meter
- SWT-1/SWT-2 2 m/70 cm antenna tuners
- PG-3A noise filter
- MB-4000 extra mounting bracket

Complete service manuals are available for all Trio-Kenwood transceivers and most accessories
Specifications and prices are subject to change without notice or obligation
Antenna mag mount is not Kenwood supplied

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Compton, California 90220

AMATEUR ELECTRONIC SUPPLY® • USED GEAR

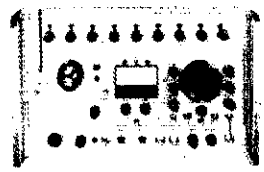
★ *10-Day Trial (pay only Shipping Charges)*
★ *30-Day Warranty*
★ *Full Trade-in within 90-days on New Gear*

AMERITRON
AL-1200 Linear 1099 f
ATR-8 Ant tuner 69 f
AMP SUPPLY
LA-1000NT Linear $369 f
LK-500NT-B Linear 1089 m
AI-1200 Ant tuner 129 m
ASTRON
RS-10A 7.5A ps $ 45 f
CES
510-SA Splx autopatch $249 m
COLLINS
75S-3 Ham Rcvr $269 c
75S-3B Ham Rcvr 299 m
32S-3 Transmitter 299 m
62S-1 VHF converter 499 m
312B-3 Speaker 29 c
312B-4 Station control 189 f
KWM-2 Xcvr 429 mc
KWM-2 (round) 499 mf
312B-5 P10 console 289 c
516F-2* AC supply 149 mv
PM-2* AC supply 119 mf
*Not sold separately
MM—1 Mobile mic 29 m
DAIWA
CNW-518 Ant tuner $189 c
DENTRON
160-10AT Ant tuner $ 89 w
RT-3000 Ant tuner 169 m
BL-1 Balun 29 m
GLA-1000B Linear 249 v
MLA-2500 Linear 589 m
WP-2A Wattmeter 49 c
AFA-1 Rcv audio proc DEMO 39 m
DRAKE
R-4A Ham Rcvr $149 m
R-4C Ham Rcvr 249 mv
MS-4* Speaker 19 mfv
*Not sold separately
SC-6 6m rcv conv 49 f
CPS-1 Conv ps 19 mwf
SCC-1 VHF calib 19 t
CC-1 Conv console 29 w
R-7 Receiver 699 m
R-7A Receiver 899 m
T-4X Transmitter 149 v
TR-4 Xcvr 189 m
TR-4C Xcvr 229 m
TR-6 6m Xcvr 319 f
RV-6 Remote VFO 69 f
AC-3* AC supply 49 m
AC-4* AC supply 69 mwfv
*Not sold separately
TR-5/1.8 filter 349 v
TR-7 Xcvr 469 m
TR-7/1.8/6/aux/nb/tan 599 v
PS-7* Power supply 149 cve
*Not sold separately
PS-75 Power supply 89 m
MS-7 Speaker 29 cv
AUX-7 Range board 29 v
TR-7 service manual 25 v
MN-7 Ant tuner 119 m
MN-75 Ant tuner 99 m
Theta 9000E Terminal 299 mf
729SRD Microphone 19 m
7075 Desk mic 29 m
7077 Desk mic 29 v
UV-3 (2m/440) FM Xcvr 369 m
HAL
CT-2100 Terminal $219 m
KB-2100 Keyboard 99 m
DS-2000KSR V2 Terminal 329 m
ARQ-1000 Error terminal 489 m
HENRY
2KD Classic Linear (air) $795 w
ICOM
IC-720/cw/am filters $529 f
IC-720A Xcvr 529 m
IC-730 Xcvr 429 f
IC-740 Xcvr 499 mf
IC-745 Xcvr 649 m
IC-751 Xcvr 799 mc
IC-751 w/PS-35 int ps 899 f
PS-15 Power supply 99 v
PS-30 Systems ps 179 m
PS-55 Power supply 139 w
AT-100 100w auto tuner 229 mc
7072 Interface 49 f
R-71A SW receiver 629 w
R-71A/FL-44A SW Rcvr 689 m
IC-505 6m Xcvr 329 me
IC-551D 6m Xcvr 469 m
IC-25A 2m FM Xcvr 179 m
IC-25H 2m FM Xcvr 239 f
IC-27H 2m FM Xcvr 319 f
IC-260A 2m Xcvr 249 v
IC-271A 2m Xcvr 599 e
IC-271H 2m Xcvr 769 m
IC-37A 220 FM Xcvr 349 m
IC-47A 440 FM Xcvr 349 f
AG-25 2m preamp 49 m
GC-4 World clock 45 e
SM-5 Desk mic 25 f
SM-6 Desk mic 25 m
SM-10 Desk mic 69 m
KENWOOD
TS-130V Xcvr $399 c
PS-30 Power supply 99 f
KPS-21 Power supply 89 f
AT-120 Ant tuner 69 c
AT-130 Ant tuner 99 m
VFO-120 Remote VFO 99 w
TS-180S/DFC Xcvr 399 w
TS-180S/DFC/cw/ssb filts 459 m
AT-180 Ant tuner 129 f
SP-180 Speaker 49 f
VFO-180 Remote VFO 59 mf
TS-430S/cw/ssb/am filts 649 v
TS-520S Xcvr 369 mc
DG-5 Dig display 129 m
TS-530S Xcvr 469 c
TS-530SP Xcvr 639 c
TS-820 Xcvr 399 c
TS-820/DG-1/cw filter 479 f
VFO-820 Remote VFO 99 f
TS-830S Xcvr 689 w
DFC-230 Dig freq control 119 m
SM-220/BS-8 Scope/pan 299 f
TL-922A Linear (air) 999 f
R-600 SW receiver 229 m
R-1000 SW receiver 269 m
R-2000/VC-10 VHF conv 449 f
VC-10 VHF converter 79 m
TM-211A 2m FM Xcvr 279 m
TR-9130/TTP 2m Xcvr 389 e
TH-21A 2m FM HT 149 m
TM-3530A 220 FM Xcvr 299 m
TR-3500 440 FM HT 179 m
MC-30S Mobile mic 19 m
MC-42S Mobile mic 19 v
MC-60A Desk mic 55 w
SP-40 Mobile speaker 19 m
MFJ
494 Super keyboard $169 m
624 Phone patch 39 m
941C Ant tuner 49 m
989 Ant tuner 199 c
NEC
JB-1201M 12" green mon $ 69 m
OKI-DATA
82A Printer/C64 interface $149 v
REGENCY
HX-2000 Pocket scanner $199 m
ROBOT
400 SSTV converter $229 m
SEI
SM-101 2m 10/80w amp $ 69 w
SPECTRONICS
DD-1C Dig disp; Collins $ 69 c
TEN-TEC
505 Argonaut Xcvr $199 e
405 50w linear 149 m
251 9A power supply 49 e
251M 9A power supply 59 m
225 Power supply 89 m
570 Century/21 Xcvr 189 v
979 Power supply 69 mf
240 160m conv 69 f
546 Omni-D Xcvr 349 c
546C Omni-D series C 499 m
546C/cw/ssb filters 549 m
243 Remote VFO 99 m
560 Corsair Xcvr 679 me
560/cw filter 699 v
560/cw/ssb filter 729 m
560/2 cw/2 ssb filts 769 m
580 Delta Xcvr 369 v
283 Remote VFO 129 m
263 Remote VFO 139 e
252M/O Power supply 79 mc
260 Power supply 129 fve
262G Power supply 89 v
280 Power supply 99 m
234 Speech processor 69 mv
214 Desk mic 29 m
USI
1400C 14" color monitor $129 m
YAESU
FR-101 Dig/2/6/lm/am $269 m
FL-101 Transmitter 229 m
FT-101 Xcvr 379 c
FT-101B Xcvr 389 c
FT-101E Xcvr 449 fc
FT-101EX Xcvr 389 f
FT-101Z Xcvr 399 mc
FT-101ZD Xcvr 469 fv
FV-101Z Remote VFO 59 m
SP-101PB Spkr/patch 49 m
YO-100 Mon scope 149 m
LL-301 Phone patch 35 f
FT-901DM Xcvr 499 f
FT-902DM Xcvr 699 w
YK-901 Keyboard 89 f
FC-902 Ant tuner 149 v
FT-107M/DMS Xcvr 399 m
FTV-107/2m/430 Xvtr 349 m
6m/FTV 6m module 99 m
2m/FTV 2m module 109 m
70 cm/FTV 430 module 169 f
FT-707 Xcvr 369 c
FTV-707 Xvtr w/no module 89 m
FP-757GX Power supply 99 m
FP-757HD DEMO ps 199 v
FC-757AT Auto tuner 259 c
FT-980 Xcvr 969 m
FT-ONE Xcvr 1229 c
FT-ONE/tm/ram/4 filters 1269 m
FT-ONE/fm/ram/4 filts/keyer 1299 t
FT-726R/cw/sat/430 1099 v
FT-625RD 6m Xcvr 449 m
FT-720RVH 2m FM Xcvr 139 v
FT-720RU 440 FM Xcvr 169 m
FP-80 4.5A ps 24 w
NC-24 Multi-charger 249 m
YD-148 Desk mic 19 m
YM-34 Desk mic 19 m
SATELLITE TV
AMPLICA
100° LNA $ 29 m
85° LNA 59 m
DRAKE
85° LNA $ 59 m
FAN-SAT
3500 Satellite Rcvr $129 m
85° LNA 49 m
REGENCY
95° LNA $ 29 m
WILSON
YM-450A Satellite Rcvr $ 99 m

10-15-86

USED GEAR INFORMATION

(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.



SINGER-GERTSCH
FM-10CS signal generator with RFM-10A, FIM-3 and ODM-1 options..... **$3495**
OAM-1 AM module FM-10C .. 195
Purchased new, and used exclusively in our service department. Good condx, operational, manual.

New Equipment Closeouts

(Most are available at the Milwaukee Store only)

AEA
MM-2 Morsematic keyer $149.95
KT-2 Keyer/Trainer 79.95
BT-1 Basic Trainer 49.95
Isopole 220Jr base antenna 29.95
AMP SUPPLY
LK-500ZA Linear amplifier 969.95
COLLINS
AC-2808 Blower kit for 380 269.95
CUBIC (SWAN)
WM-1500 Wattmeter 54.95
DRAKE
TV-300-HP High pass filter 9.95
HAL
CT-2100 CW/RTTY Terminal 349.95
HYGAIN
330S 3el 15/10m beam 99.95
ICOM
IC-751 HF Transceiver 999.00
GC-4 World clock 59.95
KENWOOD
TH-21AT 2m HT/TTP 199.95*
TH-31AT 220 MHz HT/TTP 199.95*
TH-41AT 440 MHz HT/TTP 199.95*
*Includes FREE Extra Battery Pack
VFO-180 Remote VFO 69.95
R-11 Portable SWL rcvr 69.95
RM-76 Control unit 39.95
MICROLOG
ACT-1 Terminal/keyboard 249.95
NEC
JB-1201M 12" grn scrn mon. 89.95
REGENCY
ACT-R-92AP Aircraft scanner 49.95
ROBOT
800 Term/kybd, low tone 199.95
TAXAN
415 12" Hi-res color mon. 269.95
TOSHIBA
V-9035 Portable Beta VCR 369.95
TRAM
Dual meter SWR/wattmeter 69.95
USI
PI-2 12" green scrn monitor 89.95
YAESU
FT-203R/TTP 2m HT 199.95
FT-103R/TTP 220 MHz HT 199.95
FT-703R/TTP 440 MHz HT 199.95
FV-101Z Remote VFO 69.95
FV-107 Remote VFO 69.95
FV-707DM Remote VFO 69.95
SC-1 Station console 49.95

AES® Store Locations	Local Phone	Nationwide	In-State
m = Milwaukee, WI 53216; 4828 W. Fond du Lac Ave.	(414) 442-4200	1-800-558-0411	1-800-242-5195
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	
e = Chicago, IL Erickson Communications (assocate)	(312) 631-5181		

MasterCard VISA

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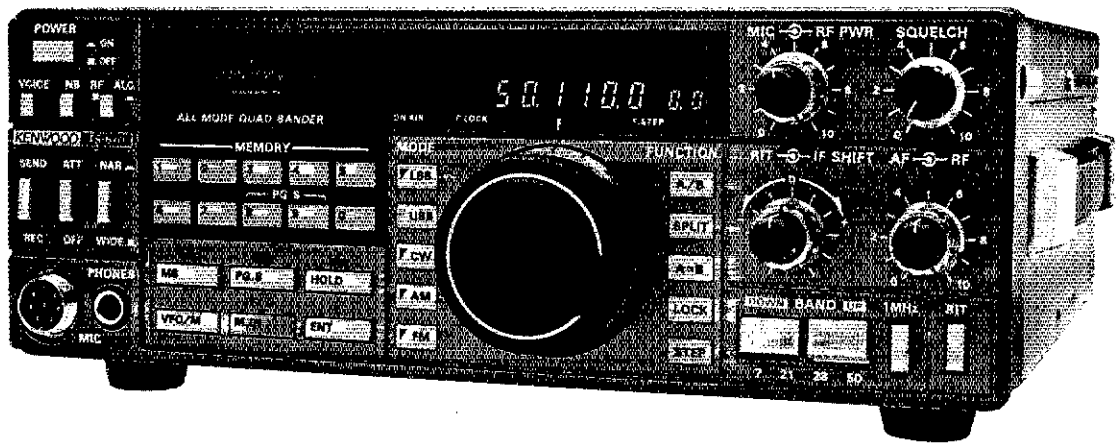
HF to Microwaves!

TS-670 40, 15, 10, and 6-meter all mode "Quad Bander"

- Keyboard selection of frequency, as well as "traditional" VFO
- 80 memory channels store frequency, band, mode data
- All-mode squelch, noise blanker, RF attenuator
- Optional general coverage unit, voice synthesizer, FM unit, IF filters

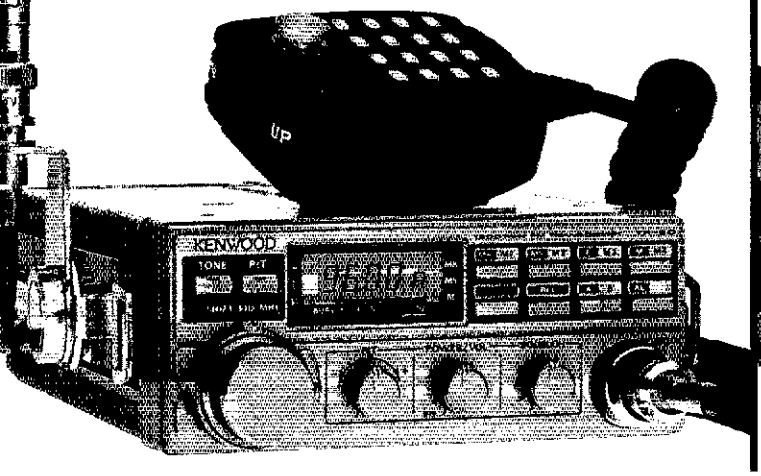


TR-50

1.2 GHz FM transceiver

The perfect portable for microwave mountain-topping!

- 1 watt output
- LCD frequency readout with S & RF power meter
- 5 memory channels
- Odd split on memory channel 5
- Includes: Battery set, charger, external power cable, 16-key DTMF hand microphone, sleeve antenna with adjustable mount, shoulder strap.



TM-211A/411A

The compact mobiles with "flexibility"

- 5 channel memory
- 25 watts high, 5 watts low (adjustable)
- 7-position, tilting control panel
- DCS—Digital Coded Squelch selective calling system
- GaAs FET front end for superior reception

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complete line of accessories is available for these transceivers.
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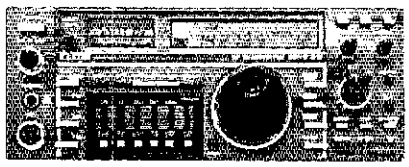
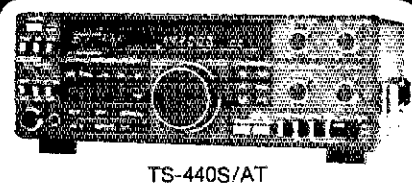
ICOM KENWOOD YAESU



IC-735

HF Equipment	List	Juns
IC-735 Gen. Cvg Xcvr	999.00	Call $
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 100kHz-30 MHz Rcvr	949.00	Call $
VHF		
IC-271A All Mode Base 25w	859.00	Call $
IC-271H All Mode Base100W	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-2AT FM HT	299.00	Call $
IC-02AT FM HT	399.00	Call $
IC-U2AT	NEW!	Call $
UHF		
IC-471A All Mode Base 25W	979.00	Call $
IC-471H All Mode Base 75w	1339.00	Call $
IC-47A FM Mobile 25w	549.00	Call $
IC-4AT FM HT	339.00	Call $
IC-04AT FM HT	449.00	Call $
IC-3200A FM 2m/70cm 25W	599.00	Call $
220MHZ		
IC-37A FM Mobile 25w	499.00	Call $
IC-3ATFM HT	339.00	Call $
Repeaters		
IC-RP3010 440 MHz	1229.00	Call $
IC-RP1210 1.2 GHz	1479.00	Call $



TS-440S/AT

HF Equipment	List	Juns
TS-940SAT Gen. Cvg Xcvr	2249.95	Call $
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 $
TS-440S/AT Gen. Cvg Xcvr	1199.95	Call $
TS-440S Gen. Cvg Xcvr	1049.95	Call $
Receivers		
R-5000 NEW!	899.95	Call $
R-2000 150kHz-30 MHz	649.95	Call $
TS-670 All Mode Quad 6M	799.95	Call $
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 $
TH-21AT FM, HT	249.95	Call $
TR-2600A FM, HT	359.95	Call $
UHF		
TS-811A All Mode Base25w	1049.95	Call $
TM-401B FM Mobile 25w	399.95	Call $
TM-411A FM Mobile 25w	449.95	Call $
TH-41AT FM, HT	259.95	Call $
TR-3600 FM HT	369.95	Call $
220MHZ		
TM-3530A FM 220MHz 25w	449.95	Call $
TH-31AT FM 220 MHz HT	259.95	Call $
TL-922A HF Amp	1499.95	Call $

FT 757GX

HF Equipment	List	Juns
FT-ONE Gen. Cvg Xcvr	2859.00	Call $
FT-757GX Gen. Cvg Xcvr	995.00	Call $
FT-767 4 Band New	1895.00	Call $
Receivers		
FRG-8800 150kHz-30 MHz	599.95	Call $
FRG-9600 60 - 905 MHz	679.95	Call $
VHF		
FT-270RH FM Mobile 45w	439.95	Call $
FT-23R/TT Handheld NEW!	299.95	Call $
FT-209RH FM Handheld 5w	359.95	Call $
UHF		
FT-770RH FM Mobile 25w	479.95	Call $
FT-73R/TT NEW!	314.95	Call $
FT-709RH FM HT 4w	359.95	Call $
VHF/UHF Full Duplex		
FT-726R All Mode Xcvr	1095.95	Call $
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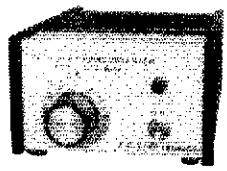

70 CM ATV DOWNCONVERTER
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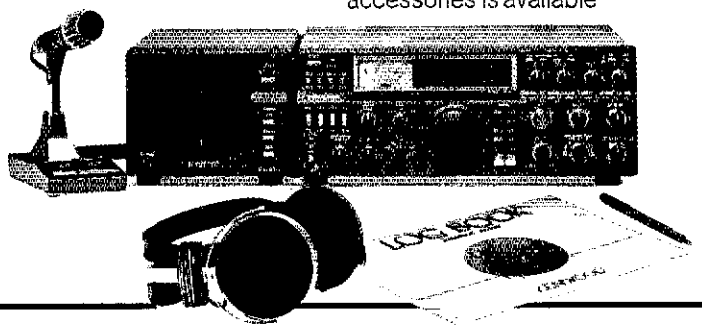

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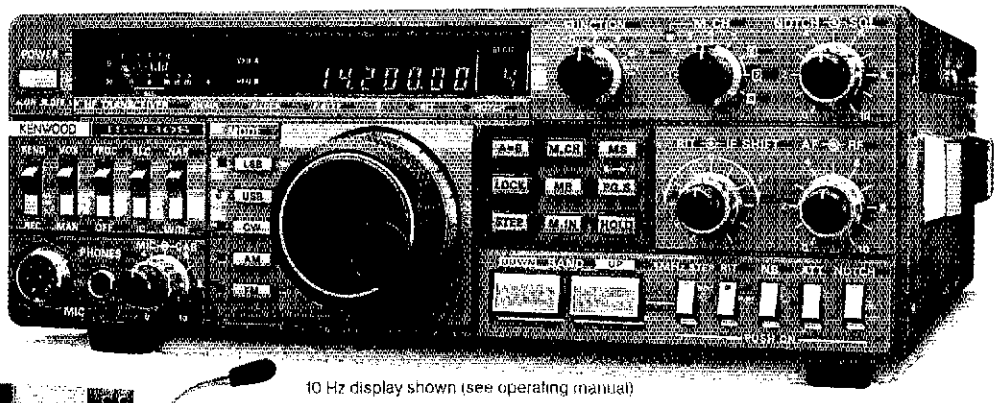
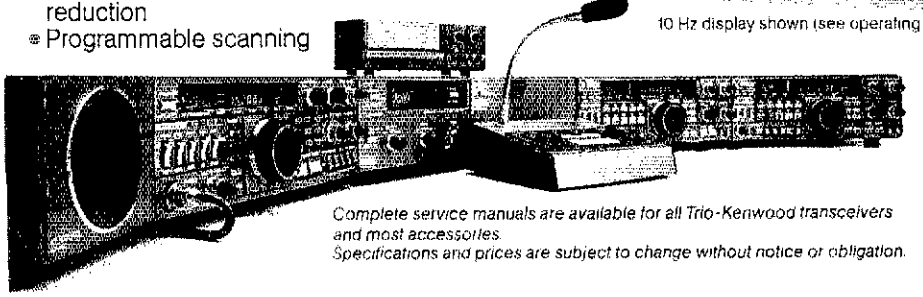


10 Hz display shown (see operating manual)



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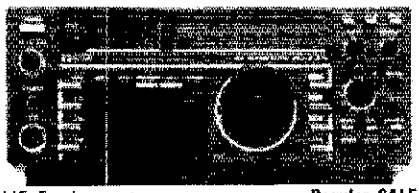

HF Equipment	Regular	SALE
IC-735 HF transceiver/SW rcvr/mic	999.00	849.95
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AT-150 Automatic antenna tuner	445.00	359.95
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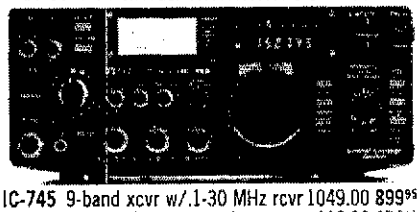
EX-243 Electronic keyer unit	56.00	
UT-30 Tone encoder	17.50	



IC-745 9-band xcvr w/.1-30 MHz rcvr	1049.00	899.95
PS-35 Internal power supply	199.00	179.95
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EX-242 FM unit	44.00	
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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
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FL-32 500 Hz CW filter (1st IF)	66.50	
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SM-8 Desk mic - two cables, Scan	78.50	
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AG-20 Internal preamplifier	64.00	
IC-271H 100W 2m FM/SSB/CW	1099.00	969.95
AG-25 Mast mounted preamplifier	95.00	
IC-471A 25W 430-450 SSB/CW/FM xcvr	979.00	869.95
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A-2 5W PEP synth. aircraft HT	599.00	499.95

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LC-14 Vinyl case for Dlx using BP-7/8	20.50
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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
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DC-1 DC operation pak for standard models	23.25
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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	
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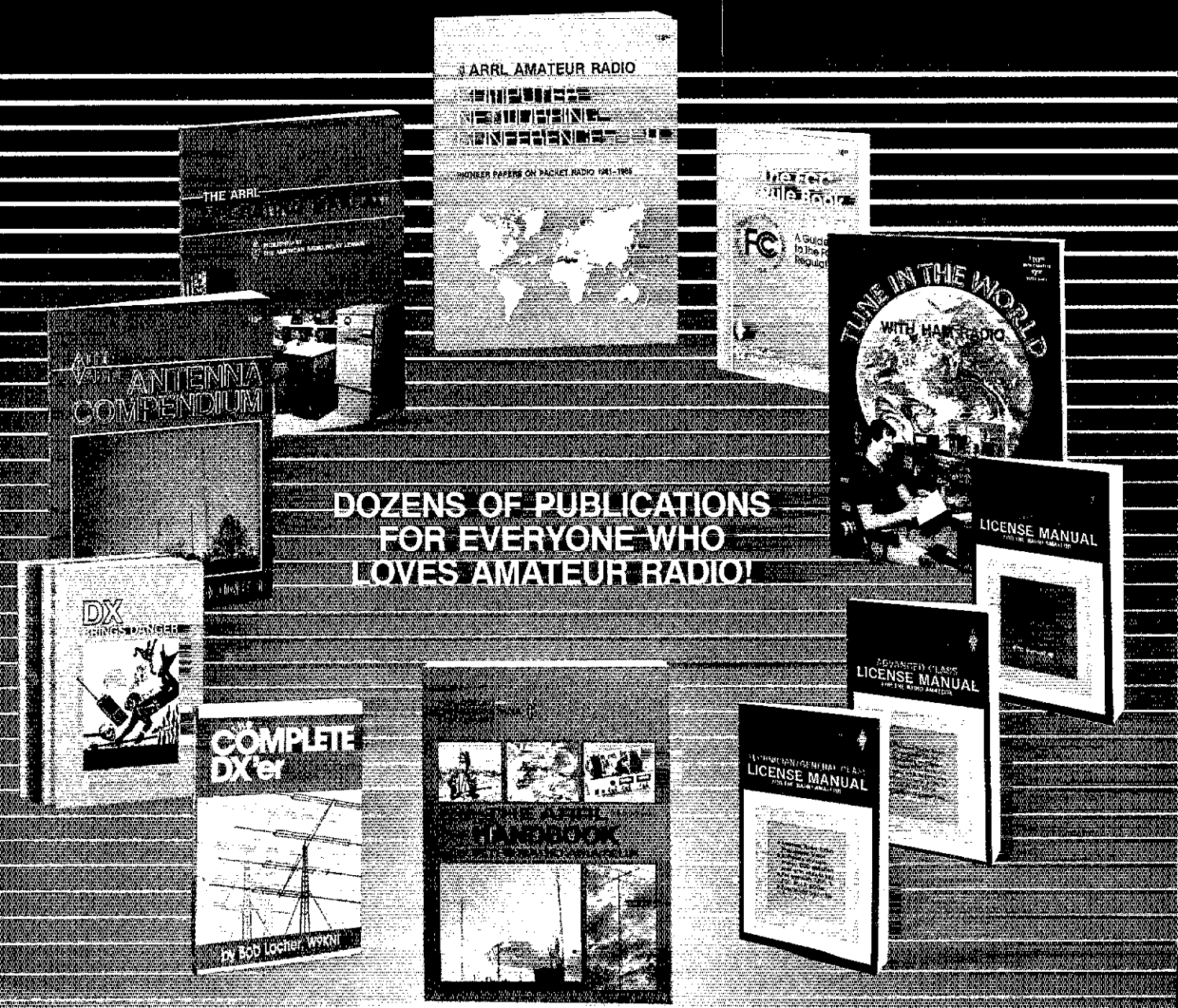

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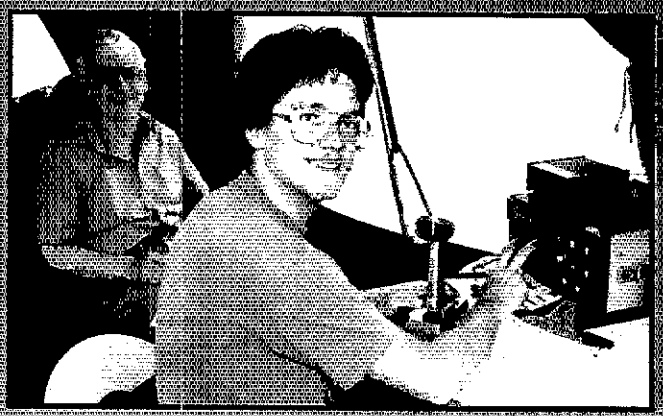

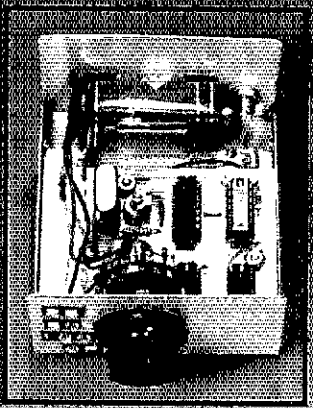

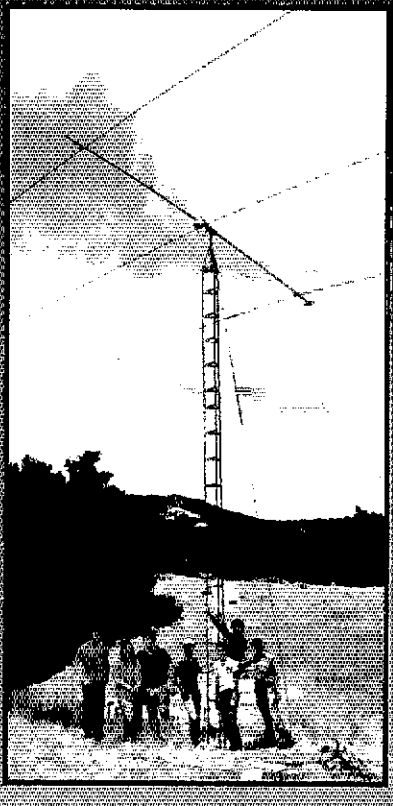

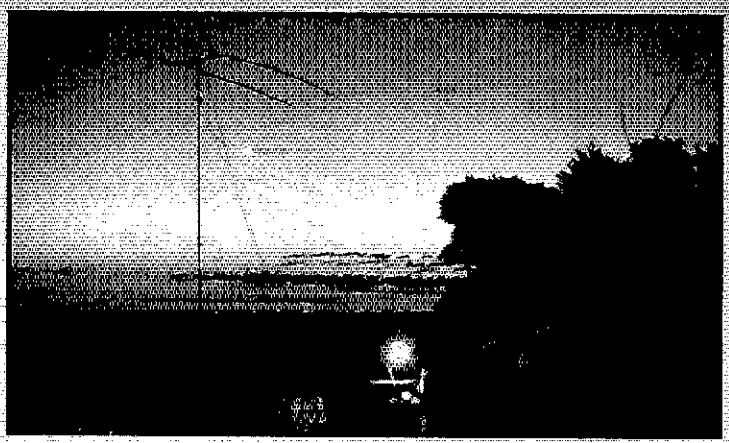

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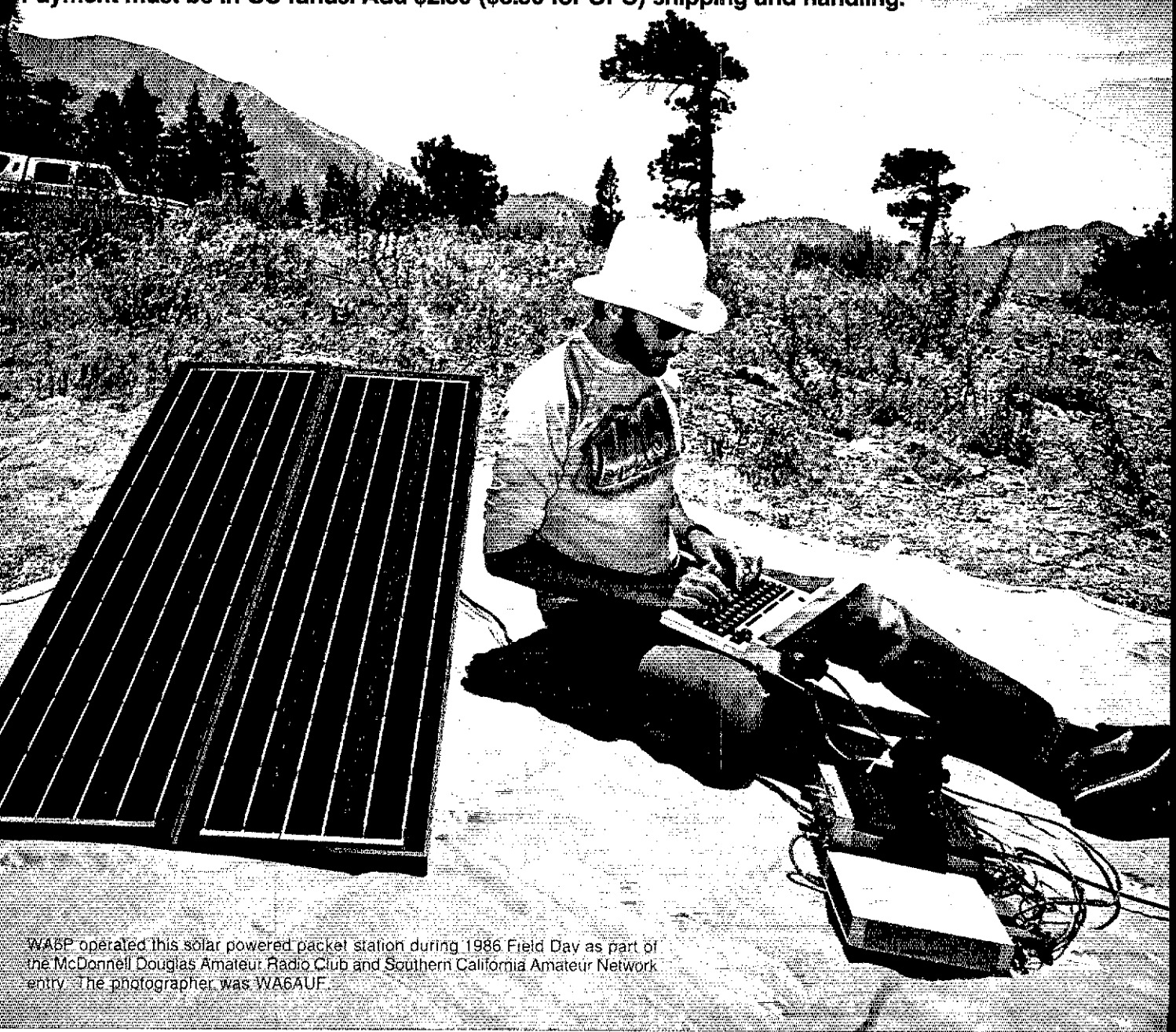
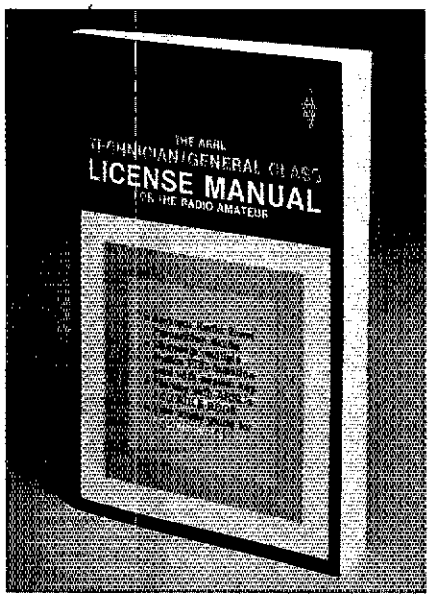
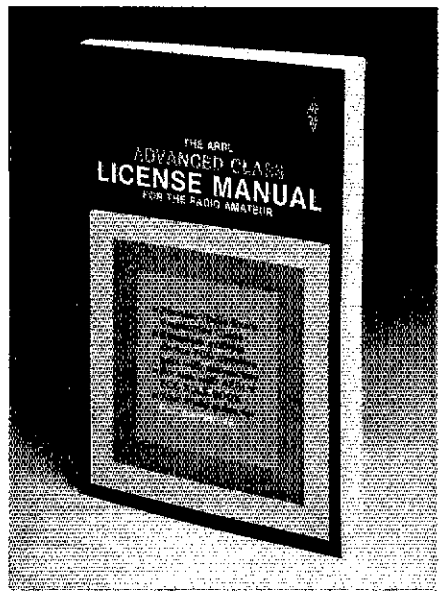
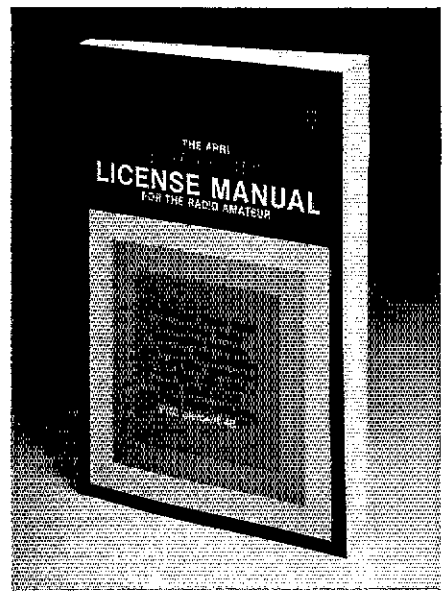


WA6P operated this solar powered packet station during 1986 Field Day as part of the McDonnell Douglas Amateur Radio Club and Southern California Amateur Network entry. The photographer was WA6AUF.







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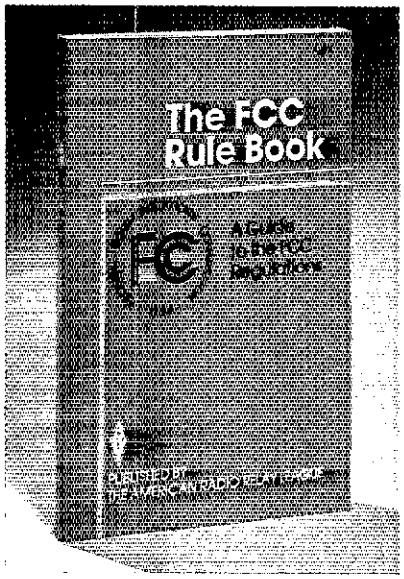

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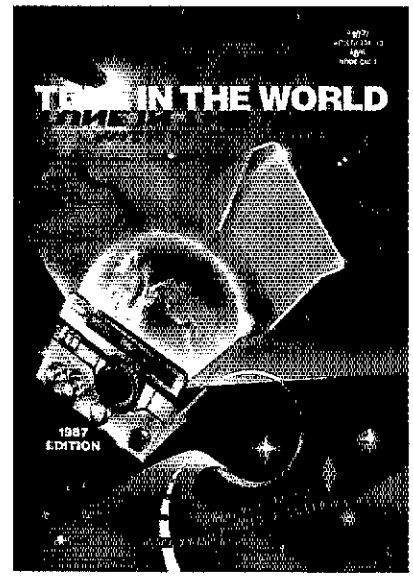

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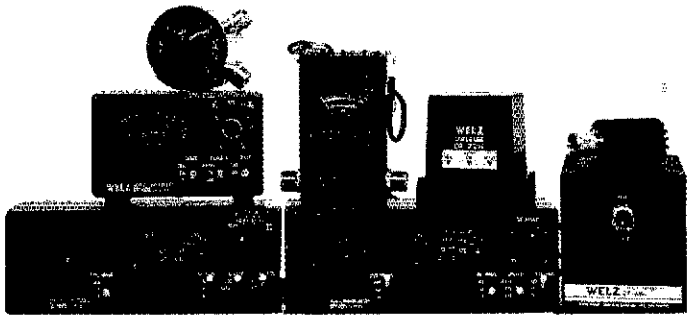

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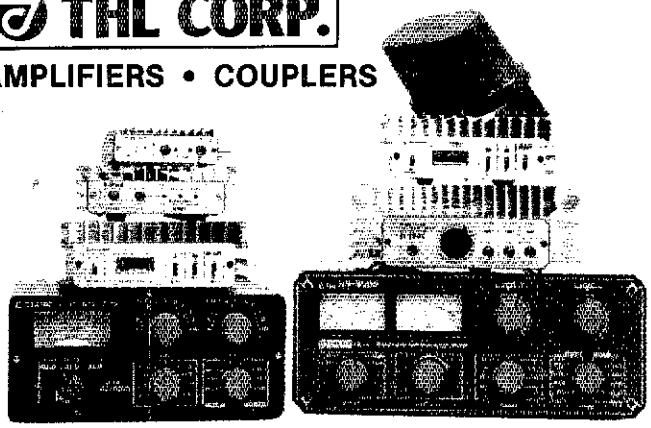
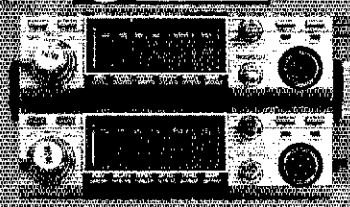


THL THE INDUSTRY LEADER IN DESIGN AND PERFORMANCE add-on accessory VHF/UHF amplifiers, antenna couplers and now HF LINEARS too. When power out is your problem, stop in for the THL brand solution.

KDK



COMPACT MOBILES MAKE FULL DUPLEX POSSIBLE! KDK mobile radios are so small, TWO of them will fit in the space normally accomodating one full size mobile radio. This allows for full duplex cross band operation with 32 memory capacity, plus many other advantages. Check out the FM-240 (VHF) and the FM-740 (UHF) today.

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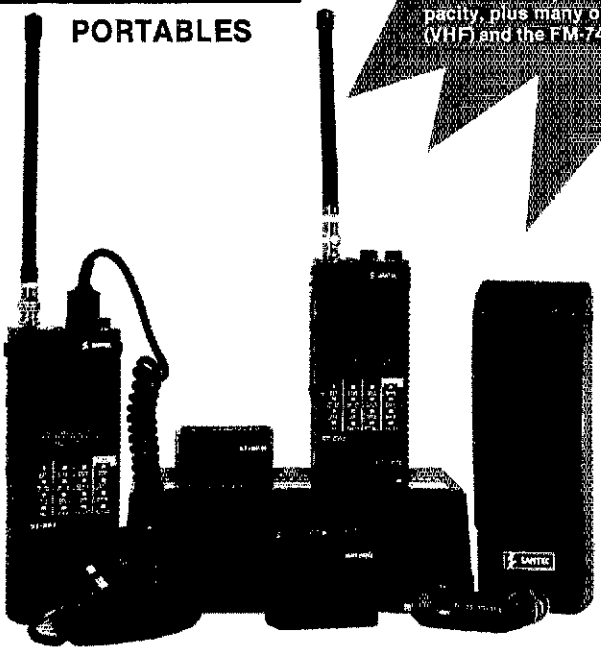

LOOK CLOSELY AND YOU WILL CHOOSE SANTEC. Santec hand-helds are truly the BEST value + quality + performance combination available today. A Full 5 Watts output, Multi-mode Scan, 10 Memories and AUTO-DIALER make the SANTEC a fantastic hand-held radio. Try one yourself at your next trip to your favorite Ham Radio Shop.

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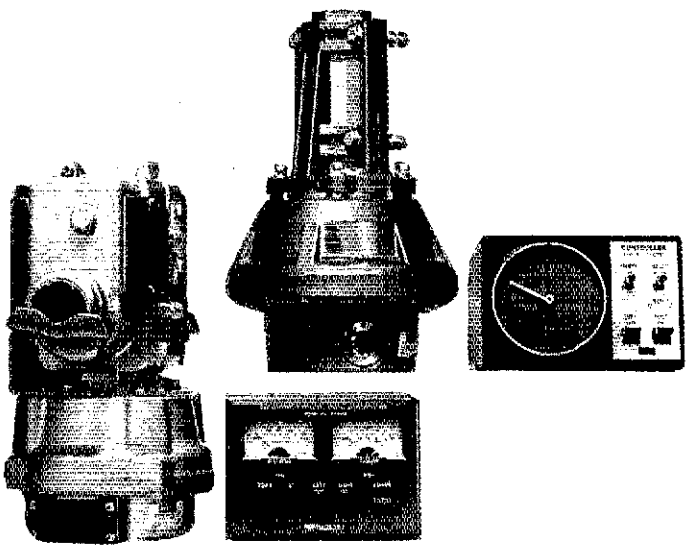
WHEN YOU TURN YOUR ANTENNA, DO IT WITH KENPRO antenna aiming devices and accessories. From light to heavy-duty there's a KENPRO for you. NEW Satellite tracking AZ-EL units with external computer controller interface.



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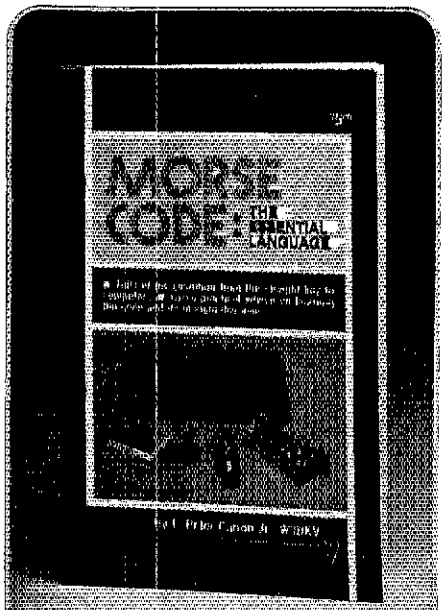

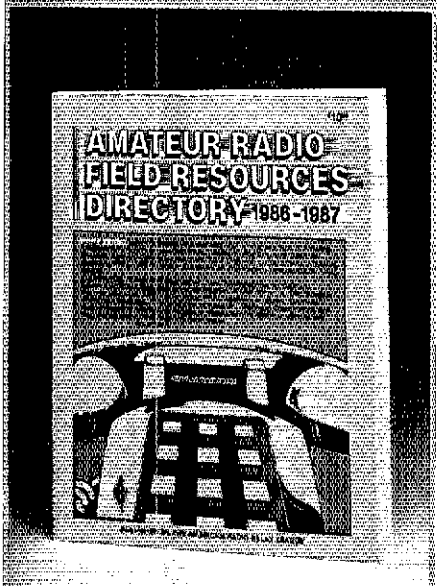

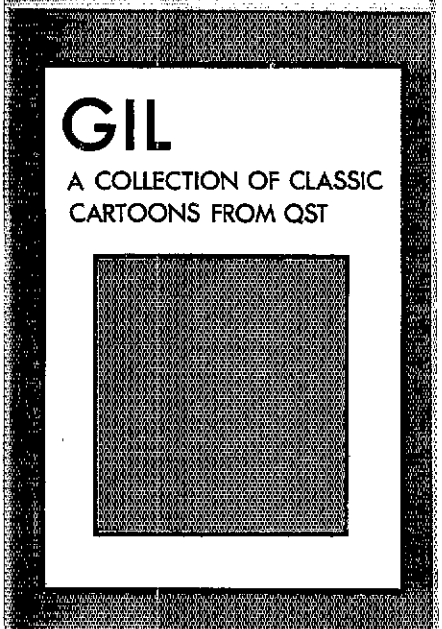

NEW! FROM ARRL

MORSE CODE: The Essential Language tells of the evolution from the straight key to computers. Using the code is a fun and exciting way to communicate, and author Pete Carron, W3DKV has incorporated his own enthusiasm into this book. The beginner will find practical advice on learning to receive and send. There are chapters on high speed operation, distress calls and what the future has in store for CW operation. An extensive history of the code is presented and the appendix lists abbreviations, the RST system, associations and organizations of CW operators and manufacturers of equipment. If the sight of a radio operator sending a message in code generates a certain intrigue that makes the mind wander to thoughts of mysterious signals in the night, ships in distress and faint transmissions from distant lands; then *MORSE CODE: The Essential Language* is must reading for you! 111 pages, copyright 1986 #0356 $5 plus postage and handling.*

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.*

*Shipping and handling charges are $2.50 per order for book rate or parcel post, $3.50 for UPS.

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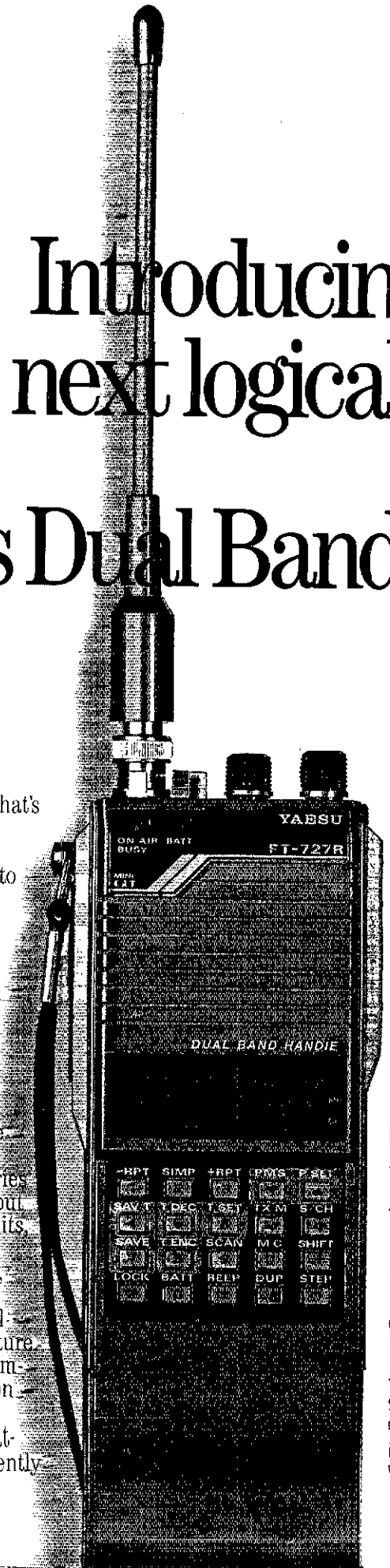

Two affordable radios in one—that's exciting.

Yaesu's dual-band FT-727R packs our best HT know-how into one compact design. At a price that's in step with your ham budget.

Hit hard-to-reach repeaters with a powerful 5 watts on both 2 meters and 440 MHz.

Work the bands quickly and easily with a wealth of microprocessor-controlled commands:

Jump between the separate VHF and UHF VFO registers. Program each of the ten memories for instant recall of repeater input and output frequencies, odd splits, and tone encode/decode.

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Finally, your operation is rounded out with features like VOX capability. A one-touch repeater reverse switch. An LCD readout with illumination lamp. A high/low power switch. Remote computer control capability. An optional CTCSS module. And Yaesu's full line of optional accessories.

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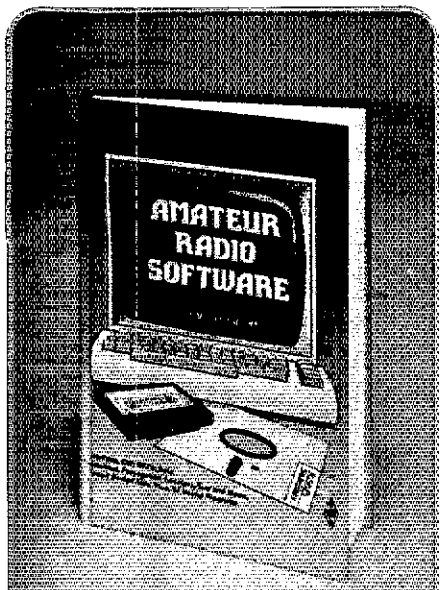

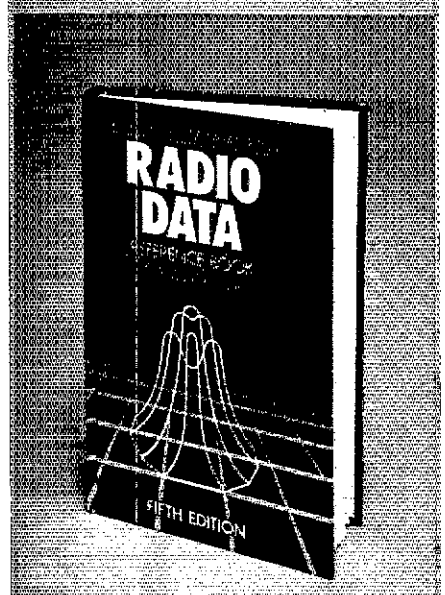

THE LATEST FROM RSGB

AMATEUR RADIO SOFTWARE by John Morris, GM4ANB. Designed to be a sourcebook for the radio amateur program. Contains 86 programs written in BASIC and 6 in assembly language. The introductory chapter describes the differences between various versions of BASIC so that the programs presented can be modified slightly in order to be used on as many types of computers as possible. The remaining 8 chapters cover: CW, sending and receiving; RTTY and Data including Amtor and packet; Antennas and Propagation, predicting path loss, propagation predictions; Distances, Bearings and Locators; Satellites, predicting elliptical and geostationary orbits; Sun and Moon; Circuit Design Aids, filters and matching networks; Miscellany, a simple data base system and network analysis package. Copyright 1985, 328 pages, $15.00 hardbound. First Edition.

RADIO DATA REFERENCE BOOK by G.R. Jessop, G6JP. This handy publication is divided into 9 chapters: Units and symbols, Basic calculations, Resonant circuits and filters, Circuit design, Antennas and transmission lines, Radio and TV services, Geographical and meteorological data, Materials and engineering data, and Mathematical tables. You'll find hundreds of useful tables, charts, and formulas. Fifth Edition, Copyright 1985, 244 pages, $15.00 hardbound.

AMATEUR RADIO OPERATING MANUAL by R. J. Eckersley, G4FTJ. The latest edition just off the press. Get the British side of operating. Besides such chapters as Setting up a station, and Mobile, Portable and Repeater Operation, the reader will find information in the Appendices most useful. There are continental and regional maps which show the prefixes assigned to each area and listing of countries showing ITU callsign allocations, callsign systems for each country, notes on foreign amateur operation, addresses of licensing administrations and the names and addresses of National Amateur Radio Societies. Third Edition, Copyright 1985, 204 pages. Softbound $10.00

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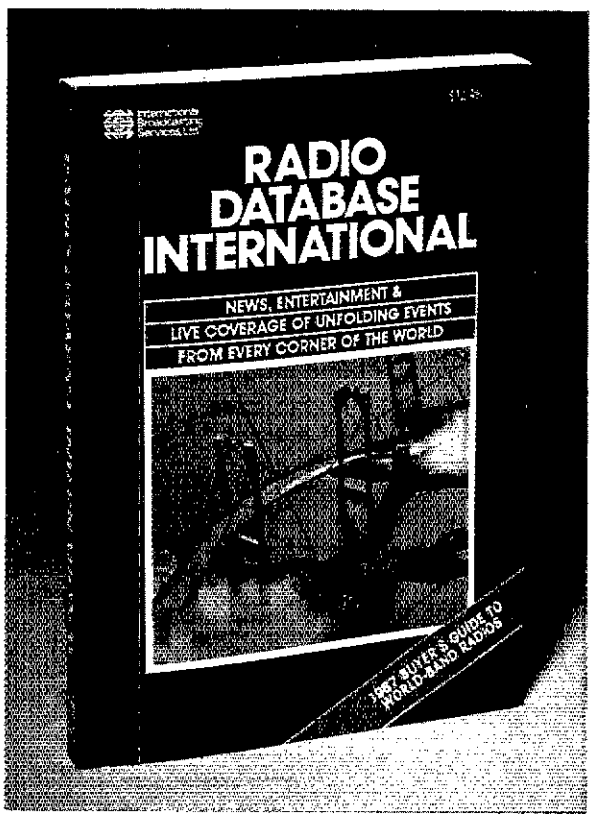
Tune In The World With Ham Radio has been used by thousands as their road to Amateur Radio adventure. The 6th Edition explains in simple bite-sized chunks what you need to know in order to pass your beginner's (Novice) exam. It also tells you how to select equipment for your first station and guides you step-by-step through your first on-the-air contact! In no time you will be communicating with new-found friends, *and* there's excitement too. During recent earthquakes and forest fires these active communicators were in the thick of the action, passing messages to loved ones and providing communications for rescue workers. Amateur communications satellites, ham-astronauts, and communication between home computers via digital ham networks are all part of the fun. A code learning cassette is included in the package. #0380 $10.00, Book only, #0399 $8.00

Please include $2.50 ($3.50 for UPS) for shipping and handling on all orders.

DISCOVER!

Here's your chance to discover (or rediscover) what is going on between our ham bands in the way of international broadcasting. Many modern Amateur Radio transceivers can receive these frequencies. Now it is easier than ever to hear world events as they happen — *providing* you know where and when to look for a particular station. **Radio Database International** lists medium and shortwave broadcast stations by country and frequency. It also gives the language, power and antenna directivity at specific times. For example, when might you expect to hear an English language broadcast from Malta? The country listing shows such a transmission on 9515 kHz. For more detail you turn to the frequency listings and see that the broadcast takes place at 2030z with an erp of 250 kW beaming Europe. The frequency listing makes identifying particular stations a snap! International radio is a great way of increasing your knowledge of the world. Something is happening *right now!* You can be a part of it by listening in on the medium and shortwave broadcast bands. 352 pages, 1987 edition $13.00 #RDBI.



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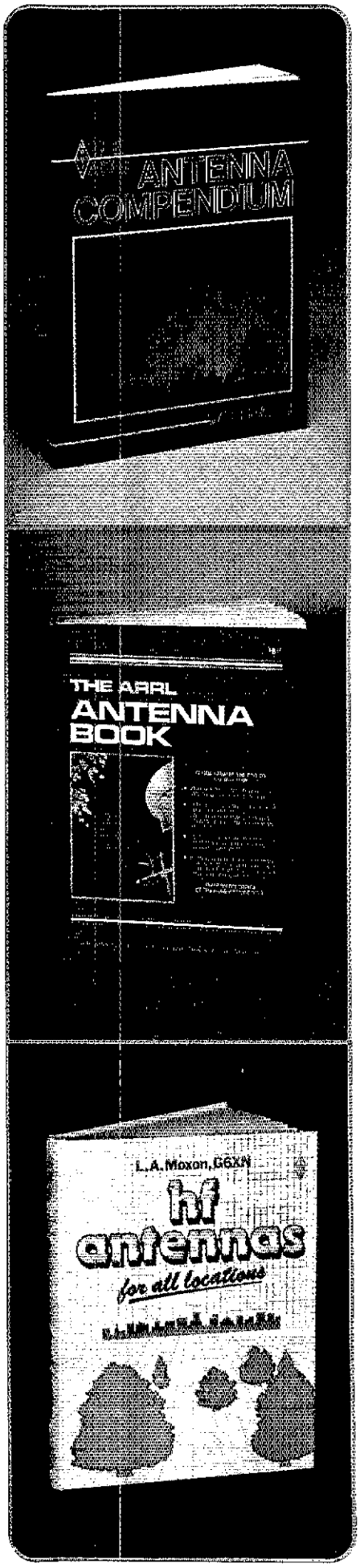

ANTENNA BOOKS !

Because of space limitations in ***QST,*** we don't have room to run all of the good antenna articles that are submitted. The solution to this problem? ***THE ARRL ANTENNA COMPENDIUM!*** You'll find 178 pages packed with new material on quads, loops, log periodic arrays, other beam antennas, multiband antennas, verticals, reduced size antennas, plus such interesting topics as: Mr. Smith's "Other" Chart and Broadband Rigs; Available Power, SWR and Loading; Baluns: What They Do and How They Do It; The Horizontal Dipole Over Lossy Ground; and Antenna Polarization. Copyright 1985. Paperbound: **$10.00** in the U.S., **$11.00** elsewhere.

THE ARRL ANTENNA BOOK The best and most highly regarded antenna information available. The 14th Edition contains 328 pages of propagation, transmission line and antenna fundamentals. You can update your present antenna system with practical construction details of antennas for all amateur bands - 160 meters through microwaves. There are also antennas described for mobile and restricted space use. Tells how to use the Smith chart for making antenna calculations and covers test equipment for antenna and transmission line measurements. Over 600,000 copies of previous editions sold. Copyright 1982. Paperbound: **$8.00** in the US., **$8.50** elsewhere. Clothbound: **$12.50** in the U.S., **$13.50** elsewhere.

HF ANTENNAS FOR ALL LOCATIONS by L.A. Moxon, G6XN. An RSGB publication. Contains 264 pages of practical antenna information. This book is concerned primarily with small wire arrays, although construction information is also given on a small number of aluminum antennas. Chapters include: Taking a New Look at hf Antennas; Waves and Fields; Gains and Losses; Feeding the Antenna; Close-spaced beams; Arrays, Long Wires, and Ground Reflections; Multiband Antennas, Bandwidth; Antenna Design for Reception; the Antenna and its Environment; Single-element Antennas; Horizontal Beams; Vertical Beams; Large Arrays; Invisible Antennas; Mobile and Portable Antennas; What Kind of Antenna: Making the Antenna Work; Antenna Construction and Erection. Copyright 1982, 1st Edition, Paperbound **$12.00**

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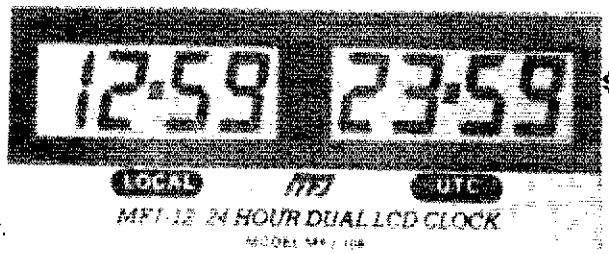
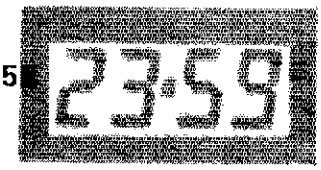
MFJ ACCESSORIES

MFJ 24 HOUR LCD CLOCKS



MFJ-108 **$19.95**



MFJ-107 **$9.95**

These MFJ 24 hour clocks make your DXing, contesting, logging and SKEDing easier, more precise.

Read both UTC and local time at a glance with the MFJ-108, $19.95, dual clock that displays 24 and 12 hour time simultaneously. Or choose the **MFJ-107, $9.95** single clock for 24 hour UTC time.

Both are mounted in a brushed aluminum frame, feature **huge easy-to-see 5/8 inch LCD numerals** and a sloped face that makes reading across-the-shack easy and pleasant.

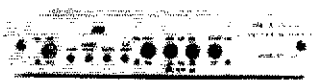
You can read hour, minute, second, month and day and operate them in an alternating time-date display mode. You can also **synchronize them to WWV** for split-second timing. Both are **quartz controlled** for excellent accuracy.

They are **battery operated** so you don't have to reset them after a power failure, and battery operation makes them suitable for mobile and portable use. Long life battery included.

MFJ-108 is 4½x1x2 in. MFJ-107 is 2¼x1x2 in.

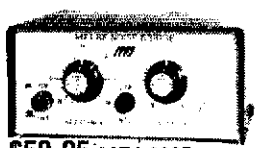
RTTY/ASCII/CW COMPUTER INTERFACE

MFJ-1224 **$99.95**



Free MFJ RTTY/ASCII/CW software on tape and cable for VIC-20 or C-64. Send and receive computerized RTTY/ASCII/CW with nearly any personal computer (VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64, etc.). Use Kantronics or most other RTTY/CW software. Copies both mark and space, any shift (including 170, 425, 850 Hz) and any speed (5-100 WPM RTTY/CW, 300 baud ASCII). Sharp 8 pole active filter for CW and 170 Hz shift. Sends 170, 850 Hz shift. Normal/reverse switch eliminates retuning. Automatic noise limiter. Kantronics compatible socket plus exclusive general purpose socket. 8x1¼x6 in. 12-15 VDC or 110 VAC with adapter, MFJ-1312, $9.95.

RX NOISE BRIDGE



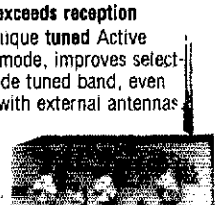
Maximize your antenna performance! **$59.95** MFJ-202B

Tells whether to shorten or lengthen antenna for minimum SWR. Measure resonant frequency, radiation resistance and reactance.

New Features: individually calibrated resistance scale, expanded capacitance range (±150 pf). Built-in range extender for measurements beyond scale readings. 1-100 MHz. Comprehensive manual. Use 9 V battery. 2x4x4 in.

INDOOR TUNED ACTIVE ANTENNA

NEW! IMPROVED! with higher gain **"World Grabber" rivals or exceeds reception of outside long wires!** Unique **tuned** Active Antenna minimizes intermode, improves selectivity, reduces noise outside tuned band, even functions as preselector with external antennas. Covers 0.3-30 MHz. Telescoping antenna. Tune, Band, Gain, On-off bypass controls. 6x2x6 in. Uses 9V battery, 9-18 VDC or 110 VAC with adapter, MFJ-1312, $9.95. **MFJ-1020A $79.95**



POLICE/FIRE/WEATHER 2 M HANDHELD CONVERTER

Turn your synthesized scanning 2 meter handheld into a hot Police/Fire/Weather band scanner! **$39.95** MFJ-313

144-148 MHz handhelds receive Police/Fire on 154-158 MHz with direct frequency readout. Hear NOAA maritime coastal plus more on 160-164 MHz. Converter mounts between handheld and rubber ducky. Feedthru allows simultaneous scanning of both 2 meters and Police/Fire bands. No missed calls. Crystal controlled. Bypass/Off switch allows transmitting (up to 5 watts). Use AAA battery. 2¼x1½x1½ in. BNC connectors.

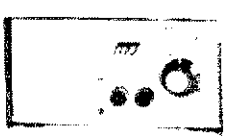
MFJ/BENCHER KEYER COMBO

MFJ-422 **$119.95**

The best of all CW worlds- a deluxe MFJ Keyer in a compact configuration that fits right on the Bencher iambic paddle! MFJ Keyer - small in size, big in features. Curtis 8044-B IC, adjustable weight and tone, front panel volume and speed controls (8-50 WPM). Built-in dot-dash memories. Speaker, sidetone, and push button selection of semi-automatic/tune or automatic modes. Solid state keying. Bencher paddle is fully adjustable; heavy steel base with non-skid feet. Uses 9 V battery or 110 VAC with optional adapter, MFJ-1305, $9.95.

VHF SWR/WATTMETER

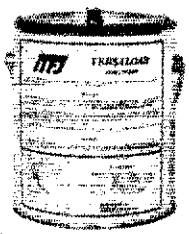
MFJ-812 **$29.95**



Low cost VHF SWR/Wattmeter! Read SWR (14 to 170 MHz) and forward/reflected power at 2 meters. Has 30 and 300 watts scales. Also read relative field strength. 4x2x3 in.

1 KW DUMMY LOAD

MFJ-250 **$39.95**



Tune up fast, extend life of finals, reduce QRM! Rated 1KW CW or 2KW PEP for 10 minutes. Half rating for 20 minutes, continuous at 200 W CW, 400 W PEP. VSWR under 1.2 to 30 MHz, 1.5 to 300 MHz. Oil contains no PCB. 50 ohm non-inductive resistor. Safety vent. Carrying handle. 7½x6¾ in.

MFJ "DRY" DUMMY LOADS

MFJ-262 **$64.95**

MFJ-260 **$26.95**

MFJ's "Dry" dummy loads are air cooled—no messy oil. Just right for tests and fast tune up. Non-inductive 50 ohm resistor in aluminum housing with SO-239. Full load to 30 seconds, de-rating curve to 5 minutes. **MFJ-260 (300 watt),** SWR 1.1:1 to 30 MHz, 1.5:1, 30-160 MHz, 2½x2½x7 in. **MFJ-262 (1 KW),** SWR 1.5:1 to 30 MHz, 3x3x13 inches.

MFJ ANTENNA BRIDGE

MFJ-204B **$79.95**

Now you can quickly optimize your antenna for peak performance with this portable, totally self-contained antenna bridge that you can take to your antenna site—no other equipment is needed.

You can determine if your antenna is too long or too short, measure its resonant frequency and antenna resistance to 500 ohms. It's the easiest and most convenient way to determine antenna performance available today to anyone. There's nothing else like it and only MFJ has it. Built-in resistance bridge, null meter and tunable oscillator-driver (1.8-30 MHz). Uses 9 V battery. 4 x 2 x 2 inches.

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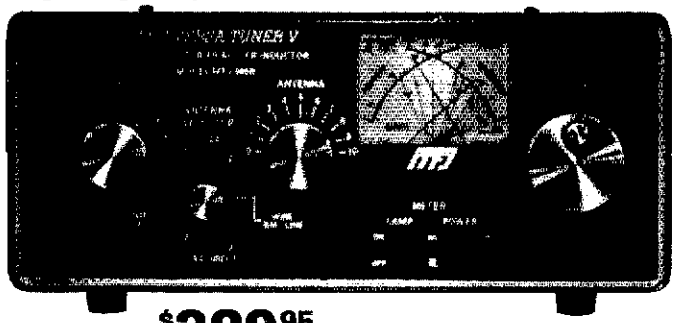
MFJ TUNERS

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



Meet "Versa Tuner V". It has all the features you asked for, including the new smaller size to match new smaller rigs-only 10¾"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.

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.

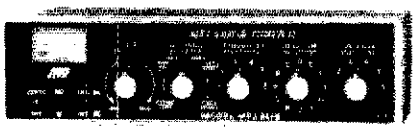
6 position antenna switch (2 coax lines, through tuner or direct, random/balanced line or dummy load). SO-239 connectors, ceramic feed-throughs, binding post grounds.

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

MFJ989B **$329.95**

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**

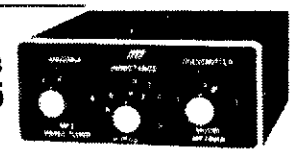
MFJ-1702. $19.95. 2 positions. 60 dB isolation at 450 MHz. Less than .2 dB loss. SWR below 1:1.2.

$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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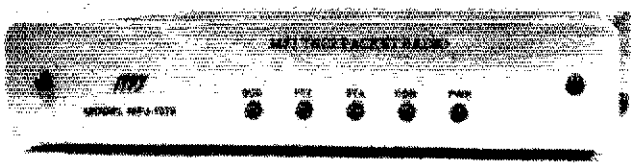
AFFORDABLE PACKET RADIO FROM MFJ

MFJ's TAPR TNC 2 clone in a new cabinet with added features...for an incredible $139.95!



MFJ-1270
$139.95

Join the exciting packet radio revolution and enjoy error-free communication...for an incredible $139.95! MFJ brings together efficient manufacturing and TAPR's (Tucson Amateur Packet Radio) leading edge technology to bring you top quality and affordable packet radio.

You get MFJ's highly acclaimed clone of the industry standard TAPR TNC 2. Its in a new cabinet and includes a TTL serial port and an easily replaceable lithium battery for memory back-up.

All you need is your rig, home computer with a RS-232 serial port and a terminal program. If you have a Commodore 64, 128, or VIC-20 you can use MFJ's optional Starter Pack to get on the air immediately.

You get interfacing cable, terminal software on tape or disk and complete instructions...everything you need to get on packet radio. Order MFJ-1282 (disk) or MFJ-1283 (tape), $19.95 each.

Unlike machine specific TNC's you never have to worry about your MFJ-1270 becoming obsolete because you change computers or because packet radio standards change. You can use **any** computer with an RS-232 serial port and an appropriate terminal program. If packet radio standards change, software updates will be made available as TAPR releases them.

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 widespred use.

You can also use the MFJ-1270 as an excellent but inexpensive digipeater. You can use 12 VDC for portable operation or 110 VAC for fixed station operation.

It features AX.25 Level 2 Version 2 software, hardware HDLC for full duplex, true Data Carrier Detect for HF, 16K RAM, simple operation plus more.

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-1270 today.

Here are MFJ's latest and hottest products for improving your station's performance.

MEMORY KEYER

MFJ-484B
$139.95

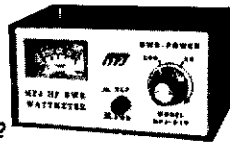
The MFJ-484B "GRANDMASTER" Memory Keyer is **THE** choice of CW contesters. Why? Because it's so easy to use it's second nature...you don't have to remember how to use complex commands...**and** it has all the features you'll ever need for easy CW.

Features like these... you can store up to twelve 25 character messages that you can combine and send at whatever speed you want, you can repeat any message continuously or pause between repeats, you can change or insert into a playing message by simply sending and much more.

The MFJ-484B is RF proof, sends 8-50 WPM and measures just 8x2x6 inches. It uses 12 to 15 VDC or 110 VAC with MFJ-1312, $9.95.

HF SWR/WATTMETER

MFJ-816
$29.95



Want minimum SWR to maximize your antenna performance?

The MFJ-816 is our smallest -4½x2¼x3 inches-(and most affordable) SWR/Wattmeter that lets you read SWR, forward and reflected power (30/300 watt scales) from 1.8 to 30 MHz. Uses toroidal current pickup for uniform sensitivity.

CROSS-NEEDLE SWR/WATT METER

MFJ-815 $59.95

MFJ's cross-needle SWR/Wattmeter gives you SWR, forward and reflected power —all at a single glance! SWR is automatically computed —no controls to adjust. Easy-to-use push buttons select three power ranges that give you QRP to full legal limit power readings. Reads 20/200/2000 W forward, 5/50/500 W reflected and 1:1 to 1:5 SWR on easy-to-read two color scale. Lighted meter. Needs 12 V. ±10% full scale accuracy. 6½ x 3¼ x 4½ inches.

2 KW COAX SWITCHES

MFJ-1702
$19.95

$29.95 MFJ-1701

Instantly select any antenna or rig by turning a knob. Organizes coax cables and eliminates plugging and unplugging. Unused terminals are grounded to protect your equipment for stray RF, static and lightning. 2 KW PEP, 1 KW CW. For 50 to 75 ohm. Negligible loss, SWR, and crosstalk gives high performance. SO-239s. Convenient desk or wall mounting.

MFJ-1702, $19.95. 2 positions. Cast aluminum cavity construction gives excellent performance up to 500 MHz with better than 60 dB isolation at 450 MHz. Heavy duty, low loss switch has less than 20 milliohm contact resistance, less than 0.2 dB loss and SWR below 1:1.2. 2 x 2½ x 1 inches.

MFJ-1701, $29.95. 6 positions. White markable surface for recording ant. positions. 8½ x 1½ x 3 in.

ANTENNA CURRENT PROBE

MFJ-206 $79.95

This new breakthru MFJ Antenna Current Probe lets you monitor RF antenna currents—no connections needed! Determine current distribution, RF radiation pattern and polarization of antennas, transmission lines, ground leads, building wiring, guy wires and enclosures.

- **Indicate transmission line radiation** due to high SWR, poor shielding or antenna unbalance.
- **Detect re-radiation** from rain gutters and guy wires that can distort antenna field patterns.
- **Detect RF radiation** from ground leads, power cords or building wiring that can cause RFI.
- **Determine if ground** system is effective.
- **Pinpoint RF leakage** in shielded enclosures.
- **Locate the best place** for your mobile antenna.
- **Use** as tuned field strenght meter.

Monitors RF current by sensing magnetic field. Uses an electrostatically shielded ferrite core, FET RF amplifier, op-amp meter circuit for excellent sensitivity, selectivity. 1.8-30 MHz. Has sensitivity, bandswitch, tune controls, telescoping antenna for field strenght meter. 4 x 2 x 2 inches.

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.

Run up to 300 watts RF output—and match coax, balanced lines or random wires from 1.8 thru 30 MHz. Tune out SWR on dipoles, vees, long wires, verticals, whips, beams/quads. 10x3x7 in.

RF PRESELECTOR

MFJ-1040
$99.95

Is your transceiver or receiver "hearing" all it could? Adding a MFJ-1040 RF preselector can make "lost" signals readable while reducing troublesome images and out-of-band signals. It adds 20 dB of low noise gain with a strong, sharp tuning front end and covers all HF amateur and shortwave bands through lower VHF from 1.8 to 54 MHz.

A built-in 20 dB attenuator prevents receiver overload. It has automatic bypass for transmitting, works with 2 antennas and 2 receivers, is 8x2x6 inches and uses 9-18 VDC or 110 VAC with optional MFJ-1312, $9.95

MOBILE ANTENNA MATCHER

MFJ-910 $19.95

Lower your SWR and Get more power into your mobile whip for solid signals and more QSOs. Your solid state rig puts out more power and generates less heat. For 10-80 meter whips. Easy plug-in installation. Complete instructions. Fits anywhere, 2½x2½in.

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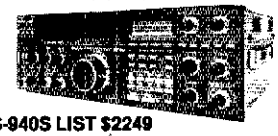

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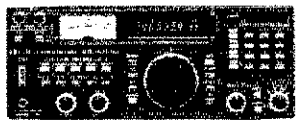

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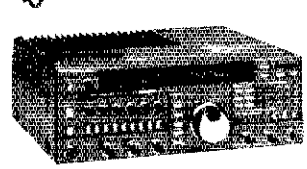

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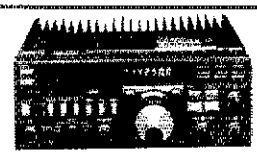

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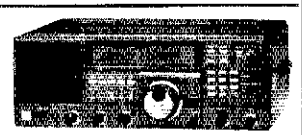

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• compact size
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- Fully Electrically Regulated 5mV Maximum Ripple
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Model	Cont. Amps	ICS Amps	Price
RS4A	3	4	$ 39
RS7A	5	7	49
RS12A	9	12	69
RS20A	16	20	89
RS20M	16	20	109
RS35A	25	35	135
RS35M	25	35	149
RS50A	37	50	199
RS50M	37	50	229

MIRAGE AMPLIFIER SALE!

B3016
ONLY $229!

Model	Band	Pre-amp	Input	Output	Sale Price
A1015	6M	Yes	10W	150W	$289
B23S	2M	No	2W	30W	$ 99
B23A	2M	Yes	2W	30W	$129
B215	2M	Yes	2W	150W	$259
B108	2M	Yes	10W	80W	$159
B1016	2M	Yes	10W	160W	$259
B3016	2M	Yes	30W	160W	$229
D24	440	No	2W	40W	$219
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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

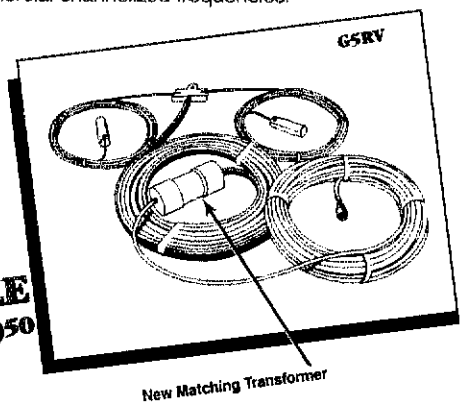
Most manufacturers have had to compromise on fan speed, one of the noisiest and objectionable aspects of amateur radio operation. But, our 500 Series amplifiers are different; they are the result of our perfected system of customer communication and engineer response.

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 $1099.00 during this special sale.

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.



THE G5RV ANTENNA **Reg. $50.00 SALE $39.50**

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.**

SAVE $100!

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 Reg. $1295.00 SALE
LK-500ZC Without QSK ..... $1199.00 Reg. $1099. SALE
LK-500NTC No-Tune Version ... $1695.00 Reg. $1595 SALE
Plug & Play Harness (Specify your radio) ..... **$ 9.95**
AT3000 Matching 3K Tuner ..... $ 499.00

Add an automatic SWR lock-out brain to your present amplifier (any brand). Self contained plug and play.
ALO-1 Accessory ..... $ 94.50

Trade in amps accepted. Reconditioned and guaranteed trade-in amps available. We now have a full line of wire antenna and accessories.

Order Today.
For fastest delivery, send cashiers check, money order, or order by credit card. Personal checks, allow 18 days to clear. North Carolina residents, add 4½% sales tax. Hours: Monday-Friday 9:00 a.m. - 5:00 p.m. E.S.T.

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Ham-Ads

1) Advertising must pertain to products and services which are related to Amateur Radio.

2) The Ham-Ad rate is 85 cents per word. This includes firms or individuals offering products or services for sale. A special rate of 25 cents per word applies to individuals seeking to dispose of or acquire personal station equipment, and to hamfest and convention announcements.

3) Remittance in full must accompany copy since Ham-Ads are not carried on our books. Each word, abbreviation, model number, and group of numbers counts as one word. Entire telephone numbers count as one word. No charge for postal Zip code. No cash or contract discounts or agency commission will be allowed. Tear sheets or proofs of Ham Ads cannot be supplied. Submitted ads should be typed or clearly printed on an 8 1/2" × 11" sheet of paper.

4) Closing date for Ham-Ads is the 13th of the second month preceding publication date. No cancellations or changes will be accepted after this closing date. Example: Ads received September 14 through October 13 will appear in December *QST*. If the 13th falls on a weekend or holiday, the Ham-Ad deadline is the previous working day.

5) No Ham-Ad may use more than 100 words. No advertiser may use more than two ads in one issue. A last name or call must appear in each ad. Mention of lotteries, prize drawings, games of chance, etc. is not permitted in *QST* advertising.

6) New firms or individuals offering products or services for sale must submit a production sample (which will be returned) for our examination. Dealers are exempted, unless the product is unknown to us. Check with us if you are in doubt. You must furnish a statement in writing that you will stand by and support all claims and specifications mentioned in your advertising before your ad can appear. The publisher of *QST* will vouch for the integrity of advertisers who are obviously commercial in character, and for the grade or characters of their products and services. Individual advertisers are not subject to scrutiny.

The League reserves the right to decline or discontinue advertising for any reason

CLUBS/HAMFESTS

QCWA Quarter Century Wireless Association is an international nonprofit organization founded in 1947. You are eligible for membership if licensed 25 or more years ago, and presently licensed. It is not necessary to have been licensed the entire 25 years. Members receive QCWA publications and participate in QCWA activities. Come grow with us! Write QCWA, Inc., 1409 Cooper Drive, Irving, TX 75061.

PROFESSIONAL CW operators, retired or active, commercial, military, gov't., police etc. invited to join Society of Wireless Pioneers—W7GAO/6 Box 530, Santa Rosa, CA 95402.

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.

JOIN the Old Old Timers Club, an international non-profit organization. If you operated a radio station, commercial, amateur or Armed Forces 40 or more years ago, and have an Amateur license at present you are eligible. Join the real pioneers of ham radio. Write O.O.T.C. 1417 Stoneybrook, Mamaroneck, NY 10543.

HAVE A-M capability? Join S.P.A.M. (Society for Promotion A-M) Membership is free. Write: F.A. Dunlap (S.P.A.M.), 14113 Stoneshire, Houston, TX 77060 (S.A.S.E. please).

FCC EXAMS. Novice-Extra. Sunnyvale VEC ARC. 408-255-9000, 24/hr. Gordon, W6NLG, Pres. Flea Market, Los Altos, CA March-September.

FIND OUT what else you can hear on your General Coverage Transceiver or Receiver. Join a shortwave radio listening club. Complete information on major North American clubs and sample newsletter $1. Association of North American Radio Clubs, P.O. Box 462, Northfield, MN 55057.

INDIANA: SOUTH BEND Swap & Shop, Jan. 4 at the Century Center downtown, on U.S. 33, ONEWAY north between St. Joseph Bank Building and the river. Four lane highways to door from all directions. Tables: $5/5 ft. Round; $10/8x2.5 Rectangular; $2/ft. Wall locations. Talk-in 52-52 & area Repeaters. Sponsored by Repeater Valley Hamfest Committee. Contact: Wayne Werts K9IXU, 1889 Riverside Dr., South Bend, IN 46616, Telephone 219-233-5307.

MIDWINTER MADNESS-Nothing can be fina than to be in Medina (Ballroom)-more parking, space, K0LTC

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POST CARD QSL Kit-Converts Post Cards, Photos, to QSLs! Stamp brings circular. Labelcraft, P.O.Box 412, West Sand Lake, NY 12196.

National Tower Company

P.O.Box 12286 Shawnee Mission, KS. 66212

Hours 8:30-5:00 M-F **913-888-8864**

ROHN TOWER

25G	10' section	$49.00
25AG2 & 3	model 2 or 3 top section	$60.00
25AG4	model 4 top section	$65.00
45G	10' section	$109.00
45AG3 & 4	model 3 or 4 top section	$123.90
55G	10' section	$133.50
TB3	thrust bearing	$56.25
M200	10' mast, 2"o.d.	$22.00
BX-40	40'self supporting [6 sq.ft.]	$170.00
BX-48	48'self supporting [6 sq.ft.]	$216.00
BX-56	56'self supporting [6 sq.ft.]	$290.00
BX-64	64'self supporting [6 sq.ft.]	$375.00
HBX-40	40'self supporting [10 sq.ft.]	$187.00
HBX-48	48'self supporting [10 sq.ft.]	$255.00
HBX-56	56'self supporting [10 sq.ft.]	$339.00
HDBX-40	40'self supporting [18 sq.ft.]	$249.00
HDBX-48	48'self supporting [18 sq.ft.]	$319.00

WE STOCK A COMPLETE LINE OF 'ROHN' ACCESSORIES
ALL OF OUR ACCESSORIES ARE MANUFACTURED BY 'ROHN'

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HF ANTENNAS	**Tribands**	
TH3JRS	3 element 'Junior Thunderbird'	$229.00
TH5MK2S	5 element 'Thunderbird'	$489.00
TH2MKS	2 element 'Thunderbird'	$215.00
TH7DXS	7 element 'Thunderbird'	$565.00
TH6DXX	conversion kit to TH7DXS	$189.00
EXP 14	Explorer 14 triband beam	$385.00
QK710	30/40 M conv. Exp 14	$95.00
	Monoband	
105BAS	'Long John' 5 element 10 mtr.	$165.00
155BAS	'long John' 5 element 15 mtr.	$255.00
205BAS	'Long John' 5 element 20 mtr.	$429.00
204BAS	4 element 20 meter	$315.00
7-1S	'Discoverer' rotary dipole 30/40mtr.	$179.00
7-2S	'Discoverer' 2 elem. 40 meter beam	$399.00
7-3S	converts 7-2S to 3 elem. beam	$249.00
	Multiband Verticals	
18HTS	Hy-Tower' 10 thru 80 meters	$530.00
14RMQ	roof mt kit for 12 AVQ,14AVQ and 18ATV/WB	$44.00
18VS	base loaded, 10 thru 80 meters	$37.00
12AVQS	trap vertical 10 thru 20 meters	$59.00
14AVQ/WBS	trap vertical 10 thru 40 meters	$80.00
18AVT/WBS	trap vertical 10 thru 80 meters	$129.00
	Multiband Doublets	
18TD	portable tape dipole 10-80 meters	$149.00
2BDQS	trap doublet 40 and 80 meters	$75.00
5BDQS	trap doublet 10 thru 80 meters	$157.00
VHF ANTENNAS	**Beams & Verticals**	
23BS	2 meter 3 element beam	$26.00
25BS	2 meter 5 element beam	$31.00
28BS	2 meter 8 element beam	$44.00
214BS	2 meter 14 element beam	$53.00
64BS	4 element 6 meter beam	$80.00
V-2S	colinear gain vertical 138-174 MHz.	$54.00
V-3S	colinear gain vertical 220 MHz.	$54.00
V-4S	colinear gain vertical 430-470 MHz.	$64.00
GPG2A	base, 2 mtr. ground plane	$29.00
	VHF & UHF Mobiles	
HR144GRI	tigerglass 2 mtr. 3/8-24 mt	$76.00
HB144GRI	HyBander 2mtr 3/8-24 mt.	$69.00
HB144MAG	HyBander 2 meter	$24.00
BN86	ferrite balum for 10-80 meters	$25.00
	OSCAR LINK ANTENNA	
218S	Complete Oscar link system	$244.00

CUSHCRAFT ANTENNAS

A3	3 element triband beam	$216.00
A743	7 & 10 MHz add on kit for A3	$74.50
A744	7 & 10 MHz add on kit for A4	$74.50
4218XL	18 element 2 mtr, 28.8' boomer	$101.50
A4	4 element triband beam	$290.50
AV4	40-10 mtr. vertical	$94.50
AV5	80-10 mtr. vertical	$101.00
ARX2B	2 mtr. 'Ringo Ranger'	$35.00
ARX450B	450 MHz. 'Ringo Ranger'	$35.00
A144-11	144 MHz. 11 ele. VHF/UHF	$47.50
A147-11	11 element 146-148 MHz. beam	$47.50
A147-22	22 element 'Power Packer'	$128.50
A144-10T	10 element 2 mtr. 'Oscar'	$50.50
A144-20T	20 element 2 mtr. 'Oscar'	$74.50
215WB	15 element 2 mtr. 'Boomer'	$81.00
220B	17 element FM 'Boomer'	$94.00
32-19	19 element 2 mtr. 'Boomer'	$94.00
424B	24 element 'Boomer'	$81.00
R3	20-15-10 mtr. vertical	$267.00
10-4CD	4 element 10 mtr. 'Skywalker'	$108.00
15-4CD	4 element 15 mtr. 'Skywalker'	$121.50
20-4CD	4 element 14 mhz 'Skywalker'	$270.00

HUSTLER ANTENNAS

4BTV	40-10 mtr. vertical	$79.00
5BTV	80-10 mtr. vertical	$105.00
6BTV	6 band trap vertical	$124.00

ROTORS

Alliance	HD73 [10.7 sq.ft.]	$104.00
Alliance	U110	$47.00
CDE	CD45-II [8.5 sq.ft.]	$197.00
CDE	HAM IV [15 sq. ft.]	$279.00
CDE	T2X [20 sq. ft.]	$335.00

ROTOR CABLE

[2-18 & 6-22]	4080 - per foot	$0.18
[2-16 & 6-20]	4090 - per foot	$0.35
RG8U	Mini 8 low loss foam per foot	$0.17
	500' roll	$79.00
RG8U	Columbia superflex $29/100' or 500' for	$125.00

uniden Bearcat

BC210XL...$159.00
18 channel 8 band, dual scan speed, auto squelch, direct chan. access, limit, search, programmable, auto lockout, AC/DC.

BC145XL.....$99.00
16 channel 10 band, 2 digit LED display, priority, memory backup, Channel lockout, weather search, AC/DC (DC cord optional), external speaker & antenna jacks.

BC50XL	10 chan. 10 band hand held	$114.90
BC100XL	16 chan. 9 band, aircraft, hand held	$179.00
BC175XL	16 ch. 11 band aircraft	$159.00
BC210XW	20 chan. 8 band(2 ham), programmable	$179.00
BC800XLT	40 chan. 12 band, aircraft & 800 MHz	$279.00

Regency®

XL156.....$109.90
10 channel, 6 band, search or scan, priority control, memory backup system requires no batteries. Dual level display channel lockout, scan delay, external speaker & antenna jack, AC/DC.

C403	4 chan. 3 band, crystal, AC only	$59.90
R806	6 chan. 8 band, mobile, AC/DC	$69.90
R1070	10 chan. 6 band, programmable AC/only	$99.90
Z45	45 chan. 7 band aircraft AC/DC	$149.90
Z60	60 chan. 8 band, aircraft, AC/DC, clock	$169.90
HX1500	55 ch. 10 band hand held. aircraft	$219.00
MX3000	30 Ch. 6 band, prog. AC/DC	$199.90

J.I.L.
SCANNER/RADIO

SX200.....$159.00
Covers aircraft, military, FBI, satellites, police, fire, defense, aero navigation, paramedics, amateur radio, AM/FM radio, on 16 Ch. 26-57.999, 58-88, 108-380-514 MHZ.

SUPER HET RADAR DETECTORS

Uniden RD9	dash/visor or hidden superhet	$179.90
Uniden RD35	dash/visor superhet	$69.90
Uniden RD55	dash visor, audio alert	$99.95
Uniden RD95	remote mounting superhet	$129.95
Fox IMPULSE	Compact superhet, X & K band	$79.90
FOX VIXEN III	NEW - superhet, dash/visor	$159.90
Fox Vixen II	Superhet, dash/visor	$139.90
Fox Super Remote	Superhet detector	$169.90
BEL 861	dash/visor, audio & LED's	$89.90
BEL 860	small dash/visor,	$119.00
BEL 844	sensitive dash/visor, LED & audio	$149.00
BEL 847	smallest remote, audio for X & K band	$159.00
BEL 870	super small with GaAs diodes	$134.90
BEL 880	New Quantum superhet, dash/visor	$229.00

ASTATIC

D104 SILVER EAGLE.....$59.90
Chrome plated base station amateur microphone. Factory wired to be easily converted to electronic or relay operation. Adjustable gain for optimum modulation.

MAXON $26.95

model 49S
49 MHz, FM 2-WAY RADIO
hands free operation, voice activated transmit up to ½ mile. Batteries optional

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Same as 49S except uses "AA" nicad batteries and comes with battery charger

TENNA PHASE III POWER SUPPLIES

PS3.....$13.90
Output:13.8V DC - 3 amp regulated low ripple, electronic overload protection w/instant auto reset, fuse protected.

PS7.....$19.95
Fully regulated, 7 amp constant,10 amp surge capacity.

PS12.....$29.95
Fully regulated, output 13.8V DC-12. electronic overload protection w/instant auto reset

PS20.....$59.95
Fully regulated, 20 amp surge capacity, 13.8 VDC, 17 amp constant, with meter.

PS25.....$69.90
Regulated 4 5-15VDC-25 Amp output, instant auto reset, dual meter for current & voltage.

TELEGRAPH BUGS, paddles, old keys wanted. Collector needs most models and variations Martin, McElroy, Melehan, Ward, Hills, Clark-Rotoplex, Dow-key, Brown Bros., pre-1960 Vibroplex, etc. Historical data and donations of parts or damaged keys appreciated. Write: John Hensley, WJ5J: 5054 Holloway Avenue; Baton Route, LA 70808.

WANTED: SPEEDX BUG. CONLY, 819 Henrietta, Sunnyvale, CA 94086

WANTED: McINTOSH Tube-type Audio Equipment, Accessories, and literature for personal collection. All inquiries answered; information and appraisals gladly given. Marcus Frisch, WA9IXP, Box 385, Elm Grove, WI 53122-0385. 414-545-5237

$100 for 6ACB or W6ACB QSL card prior to 1940. WØKU 303-371- 6159.

WE MAY HAVE the tubes you need. (Thousands in stock). Send S.A.S.E for our list. Fata Electronics, PO Box 1378-1, Milwaukee, WI 53201.

WANTED-WESTERN Electric tubes, amps, consoles, drivers, horns, speakers, microphones, parts. Radio tubes (2A3, 45's, 50's, 199, 280, 210, 211, 845) old speakers, drivers, horns, from Jensen, Altec, Trusonic, JBL, University, Tannoy, David Yo, PO Box 832, Monterey Park, CA 91754. Tel: 818-576-2642.

R-390A RECEIVER: $195 checked; $115 reparable. Parts, tubes, sections. Info SASE. Baytronics, Box 591, Sandusky, OH 44870. 419-627-0460 evenings.

WANTED-BANDSPANNER Broomstick Antenna. Write or call K8LJM 313- 792-2787.

WANTED: CRYSTAL SET parts: Variometers, Variocouplers, Condensers, Detectors, Catwhiskers, Dial Knobs, Tap Switches, Tap Points, Binding Posts, Headphones. MIDCO, 660 N Dixie Highway, Hollywood FL 33020

WANTED NEW in crates WWII Signal Corps and Navy airborne radio equipment. A.J. Link 619-722-6162.

WANTED WW2 JAPANESE military radios like Chi-Ichi in original condition also BC1000 Antenna AN130, RC291, AN131. Tajima, JA1DNQ/KD2HB, C/O Toshiba, 914-273-1750.

QST 1959 to date, complete. Ham Radio all to 1985, complete. Best offer. Robert Meyer, 2710 Main, Lafayette IN 47904. 417-448-6616.

WANTED: C.E. 100 V, working or not. State condition and price. Jim, K1LLU 55 Woodcrest, Boxford, MA 01921. 617-887-8126.

WANTED WW2 JAPANESE Military Radios like Chiichi Receiver also BC312 or any US WW2 Items in original conditions also manuals for HR05TA1 S20 also UY807W also control cable between TCS Power Supply and Speaker also Collins S Lines KWM2 send Details to Tajima JA1DNQ/KD2HB care Toshiba 111 Business Park Drive Armonk NY 10504 914-273-1750

WANTED: Low priced Collins KWS-1 with or without 75A-4, and mechanical filters. Need not be working. Will pick up within 500 miles. Also want Collins 310B exciter and 32V3 transmitter. Need vernier reduction knob assembly for 75A4. R. Myers, Box 175, Litchfield CT 06759, 203-283-0769.

HALLICRAFTER SX28A Receiver/Speaker/Manual $125 FOB. George Prather, 22860 Tumbleweed Court, Bend, OR 97701 503-389-9933.

SPARK GEAR for sale ½ kW Thordarson Spark Transformer, and Rotary Spark Gap. Write: Edward Payne, P.O. Box 822 Clifton, NJ 07015

QST's 28 1930's 120 1940's 1950's to date. CQ, others 1948-1958. Offers. W4FNR 872 Orchid Dr. Plantation, FL 33317 305-791-4736

FOR SALE SE1420C Receiver 250-7500 meters, Amplifier BC-44A dated 8/20/13. National Receiver RCF-2. W2IDG 609-667-7097.

WANTED: HRO Coils RAS Coil 14-30 HRO-60 Scales. Brown, P.O. Box 3187, Lancaster, CA 93536

FOR SALE: Rider's Manuals Vols. 3, 4, 7, II, I2, I3, 14. Make offer, Jack McCann, KDØSV, 3108 Jefferson, Joplin, MO 64801.

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*QST*S-1933 to present - few missing issues, Best offer, SASE for list. Ernest Orr, R.D. -3, Box 259, New Holland, PA 17557 717-354-7121.

WANTED: DRAKE IA KU7S, 801-272-5522

SELLING: $60, Heath DX-35, VF-1. Working recently calibrated. Instruction books, spare 6146, 0A2 included. Bob Powell, 4644 South 2030 West, Salt Lake City, UT 84119. 801-969-9250.

WANTED: HAMMARLUND HX-50 Transmitter, HXL-1 Amplifier. Mint only for operating vintage station. Ken, N2GHX; 4 Great Neck Court, Huntington, NY 11743, 516-299-5567 collect 9-5.

TELEGRAPH and WIRELESS COLLECTOR looking for each make and model of bug made before 1935. Vibroplex, Martin, Boulter, Mecograph, etc. Also need spark keys, pre-1900 landline keys, detectors, couplers and spark gaps. Visitors welcome; 300+ items. K5RW 1128 Midway, Richardson, TX 75081, tele. 214-234-1653.

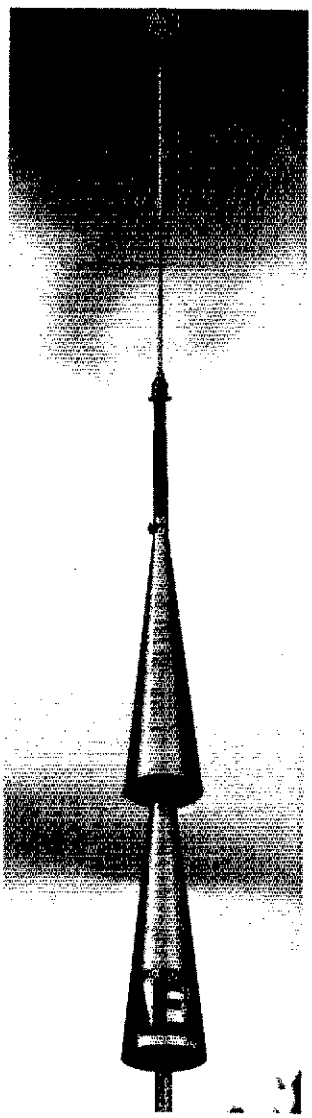
COLLINS STATION: 75A4 & KWS-1, Both with vernier tuning knobs; SC-101 Station Console w/312A Control/Speaker Unit, w/302C-2 Directional Watt Meter, Clock, Phone patch, Antenna Heading Synchro Circuit & Meter; 68Y-1 Antenna Selector Unit Coax Relays; 534A-1 Cable Harness & Wiring Duct; Manuals & Sales Literature, $950. Hammarlund Station: Mint, HQ-170, HX-50, HXL-One w/Spare Finals, Manuals, $475, National Receiver, NC-185, $95, Tektronix and HP Laboratory equipment, call or write, AF7T, 206-842-4182.

FOR SALE: Knight R-100 Rcvr, Heathkit HM-102 SWR Meter, Heathkit VF-1 VFO, Heathkit QF-1 Q-Mult; WB9ZAJ 618-277-5735.

Put More Punch in Your Packet

Outstanding mechanical design makes the IsoPole the only logical choice for a VHF base station, especially for Packet operation. All Isopole antennas yield the **maximum gain attainable** for their respective lengths and a maximum signal on the horizon. Exceptional decoupling from the feed line results in simple tuning and a significant reduction in TVI potential. The IsoPole antennas are all impedance matched in the factory so that no field tuning is required. The IsoPoles have the broadest frequency coverage of any comparable VHF base station antenna. This means no loss of power output from one end of the band to the other, when used with SWR protected solid state tranceivers. **Typical SWR is 1.4 to 1 or better across the entire band.**

A standard 50 Ohm SO-239 connector is recessed within the base sleeve (fully weather protected). With the IsoPole you will not experience aggravating deviation in SWR with changes in weather. The impedance matching network is weather sealed and designed for maximum legal power. The aerodynamic cones are the only appreciable wind load and are attached directly to the support (a standard TV mast which is not supplied).



High Performance Hand-Held Antenna — The Hot Rod

The Hot Rod antenna can be expected to make the same improvement to hand-held communications that the IsoPole antennas have made to base station operation. **Achieve gain** over ANY 5/8 wave two meter telescopic antenna. The factory tuned HR-1 is 20% shorter, lighter and places far less stress on your hand-held connector and case. It will easily handle over 25 watts of power, making it an excellent emergency base or mobile antenna. In the collapsed position, the Hot Rod antenna will perform like a helical quarter wave. Three Hot Rods are available; HR-1 1/2 wave 2M Ant., HR-2 for 220 Mhz, and HR-4 for 440 Mhz. Amateur Net Price on all Hot Rods is $19.95.

For either base station or hand-held operation AEA has the perfect VHF/UHF antenna. Put more punch in your Packet station with an AEA IsoPole or Hot Rod antenna. To order your new antenna contact your favorite Amateur Radio Distributor. For more information contact Advanced Electronic Applications, P.O. Box C-2160, Lynnwood, WA 98036, or call 206-775-7373.

IsoPole Specifications

Model	144	220	440
Freq. Coverage (Mhz)	135-160	210-230	415-465
2.1 VSWR bandwidth	›12Mhz @ 146Mhz	›15Mhz @ 220Mhz	›22Mhz @ 435Mhz
Power Rating	1 kw	1 kw	1 kw
Radiating Element Length	125.5" (3.2m)	79.25" (2m)	46" (1.2m)
Amateur Net Price	$49.95	$49.95	$69.95

Prices and Specifications subject to change without notice or obligation.

AEA Brings you the Breakthrough!

QST 1930-1985, many dupes, $350; Ham Radio Vol.I, No.2-1985, $95; 25 ARRL Handbooks 1934-1982 $150; *General Radio Experimenter* 1955-1968, $45; plus shipping, Call or write, AF7T 206-842-4182.

GENERAL

SSB ELECTRONIC Transverter Systems, Preamps, Power Amplifiers for 902, 1296, 2304 and 10384 MHz. Hans Peters (VE3CRU) 416-759-5562 evenings.

TELETYPEWRITER parts, supplies, gears. Toroids, S.A.S.E. list. Typetronics, Box 8873, Ft. Lauderdale, FL 33310. Buy unused parts, cash or trade.

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TEFLON, s.a.s.e. W9TFY, Alpha IL 61413.

COLLINS Repair and Alignment, former Collins engineer. Research and Consulting, Glenn A. Baxter, P.E., Registered Professional Engineer. K1MAN 207-495-2215.

HOSS-TRADER ED says "Shop around for the best price then telephone the Hoss last for the best deal." Christmas specials: New Azden PCS-5000, $289; new display ICOM 735 transceiver regular $999, cash $769; new display ICOM 28H $369; new display ICOM 745 transceiver regular $1049, cash $779; new display ICOM 02AT $299; new Nye MB-5A 3kW Antenna Tuner regular $625, cash $499; new 2500 Watt Amp Supply linear/tubes/Hypersil transformer regular $1149, cash $979; new display Kenwood 440-S $829; new display Kenwood 940-S/tuner $1819. VISA/Master Card Accepted!!!!! Moory Electronics Co., P.O. Box 506, DeWitt, Ark. 72042. Tel.: 501-946-2820.

WE BUY Electron tubes, diodes, transistors, integrated circuits, semiconductors. Astral Electronics, P.O. Box 707, Linden, NJ 07036. Call toll-free 800-526-4052.

FAST, ACCURATE, readable, nonsensational—The ARRL Letter! Every two weeks, we fill you in on what's happening in Amateur Radio. But, you have to be an ARRL member to get it. For a one year subscription, send $19.50 (U.S. funds) and we'll send you the Letter first class mail anywhere in the U.S. and Canada. The ARRL Letter, 225 Main St., Newington, CT 06111.

KEYER KITS, $15. SASE for information MSC, 1304 Toney Drive, Huntsville, AL 35802.

TUBES WANTED . . . I pay cash or trade for all types of transmitting or special purpose tubes-Mike Forman, 1472 McArthur Blvd.,Oakland, CA 94602 415-530-8840.

SOLAR ELECTRIC components to run your station from sunlight. Why pay for electricity? $3 technical information, prices. SPECS, Inc., P.O. Box 155, Montrose, CA 91020.

RIGID PLEXIGLAS Key Cover Bencher $9.95; MFJ-422 $9.95 Desk Top License Holder $9.95; George Chambers, KØBEJ, 302 S. Glendale Ave., Coffeyville, KS 67337.

CHASSIS & CABINET Kits. 5120 Harmony Grove Rd., Dover, PA 17315 SASE K3IWK.

SUPER QUIET-All American TenTec Corsair II, 200W $1117, Argosy II 100W $560. Mosley Yagi's lifetime design 5kW Wind Survival 150mph 5 band 7el. 10-20M Pro-57-$499. 6-band 10-40M Pro-67 $679. Organs & Electronics, POB117, Lockport, IL 60441.

HAM RADIO REPAIR, tube through solid state. Robert Hall Electronics, P.O. Box 8363, San Francisco, CA 94128; 408-729- 8200.

FREE RECORDINGS OF Mexico City and Columbia emergency nets. Send two C-90 cassettes and return postage to: Internaitonal Amateur Radio Network, Belgrade Lakes, ME 04918. I A R N emergency frequencies: 14.275-SSB, 14.090-RTTY. 14.313 monitored daily as emergency calling frequency and for routine one and two way traffic. Plan to attend World Emergency Conference during second weekend of July. Glenn Baxter, K1MAN, Network Manager.

CLIMBING BELTS & Accessories. Illustrated brochure. W9JVF, 1147 N. Emerson, Indianapolis, IN 46219.

COMPREHENSIVE APPLE SOFTWARE Transmit/receive CW/RTTY with/without TU. Variable speed code practice. Calculate/display/beam headings on world map. More. $49.95 and callsign brings disk and good manual for II/II+/e. Send now for free brochure. W1EO 39 Longridge Road, Carlisle, MA 01741.

NICAD BATTERY PACKS - Exact replacement FNB-2 NiCad packs for Yaesu FT-207/FT-208 with case, $24 + $2 shipping. Kenwood, ICOM and other inserts and cells also available, send SASE for list. Periphex, 149 Palmer Road, Southbury, CT 06488, 203-264-3985.

TENNATEST * * * ANTENNA Noise Bridge. Out-performs others. Accurate. Costs less. Compare 1-40 MHz. $44 1-150 MHz. $68. Satisfaction Guaranteed. Send stamp for details. W8URR, 1025 Wildwood Road, Quincy, MI 49082.

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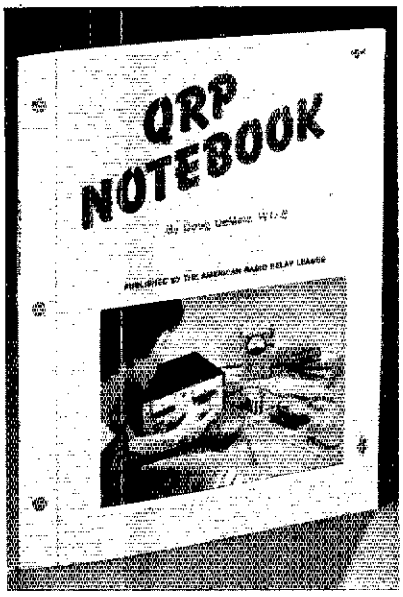

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The QRP Notebook contains 112 pages. #0348, copyright 1986, $5.00, plus $2.50 postage and handling ($3.50 for UPS).

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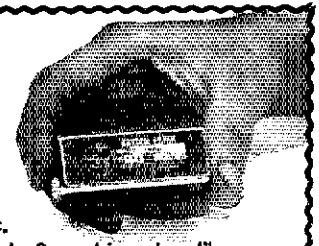

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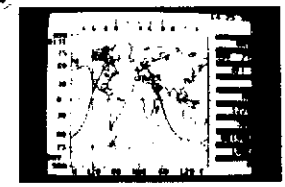

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SELL HEATH SB-104A and Heath Power Supply and SB-604 Speaker with Heath Noise Blanker and 400 Hz Filter. Including SB-644 Remote VFO. All For $360. SB-104A has been to Benton Harbor for check-out and final alignment. McNamara, 2226 Comistas Drive, Walnut Creek, CA 94598. 415-932-8992.

CORSAIR II with all CW Filters. K4CRF 871 Five Chop Rd. Orangeburg, SC.

LINEMAN'S BELTS $30, extra safety straps $10, pole climbers $15, $2.50 postage/handling each item. Heathkit DX60B $35, Knight T150 $50, HW12 with mobile/base power supplies $125. N2RU 201-747-7334.

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SELL: KENWOOD TS-130S, excellent, all filters, manuals, one-owner. 213-541-2200, WA6MSO, $450.00

MOSLEY TA-40KR 40 meter kit for TA-33 new in original carton $50, W9QL phone: 815-654-9847

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MADISON-QST. TenTec 2510 Satellite $399; Tokyo HC200A $115. Orion CD78/80M rotatable dipole $299; AEA UDC232 firmware, no modem $249; KLM KT34A $399; Daiwa NS660A $135; GE 6146B $11.95; 12BY7A $7; 3500Z $99; Used, 90 day guarantee: TS830S/clean $629; TS430S/Acc $629. Madison Electronics,3621 Fannin, Houston, TX 77004. 713-520-7300. Mastercard/Visa/COD

WANTED: KENWOOD: HC-10 Clock DM-81 Grid Dip Meter. DRAKE: MN-2700, B-1000, RV-75 VFO, R7A pkg, Extender Boards for TR-7. YAESU: SP-901PB, 102 accessories, 902 accessories. Tony Musero, K3UKW, 215-271-8898.

PC/MS-DOS Ham Software. $6.50 for Sample Disk and new catalog. Rockford Systems, 7474 Hessler, Rockford, MI 49341

KWM-2 W/WATERS Speech Processor, Noise Blanker 516F2 AC Power Supply/Spkr, Collins Mobile Mike, 12VDC Power Supply $600; TenTec Triton IV Digital, Model 262G AC Power Supply/VOX/Spkr. $400; Swan SW-175 $50; Hallicrafters SX-100 $200; Viking Ranger $150; ICOM IC30A (UHF) $50; IC22A (2M) crystals in 22 channels $70; Waterman S-14 Pocketscope $50; Jones Micromatch VSWR meter $50; Santec HT-1200 (2M) w/Drop in charger $50; All with manuals! E.C. Reich, W5FQA, Route 4, Box 4621, Lakehills, TX 78063.

YAESU FT101EX-has DC Power Supply, two power cords, 500Hz CW Filter, 150 hours on Fox Tango tubes, speech processor, and some other mods. All documentation and shipping included. Asking $425 (or best offer). Tom Miller, KA1JQW 203-666-1541 ext 214 Days.

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DRAKE TR6 XCVR, AC4, MS4 $350. Microwave Modules 432 Transverter $100 WA6JYU, 415-897-3987

KENWOOD R-600 Receiver like new $265 W6XM 619-459-5527

VFO WANTED for Hallicrafters HT-40 transmitter. KA7UNW Route 3 - Box 1120, Beaverton, OR 97007; 503-642-4573

BUD 4ft cabinet with 2ea 4-125's 500W AM/CW amp, 1.2KV/2.5KV, 200mA power supply, 2ea 811A's AM modulator, B&W plug in coils, 4 meters, grid and screen supplies, etc.; Bud 18" cabinet with exciter, VFO, and speech processor. Great foundation for a linear or good CW rig as is. Built with NEW parts 1950's. No reasonable offer refused. Call after 6 p.m. CST for info and/or pictures. E.C. Reich, W5FQA, Route 4, Box 4621, Lakehills, TX 78063, 512-751-3054.

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ROSS'$$$$ NEW SPECIALS (December only): Kenwood TS-440S $879.90 TR-3500 $227.90 ICOM IC-735 $849.90 IC-490A $545.90 YAESU FT-767GX $1549.90, FT-209RH $274.90, AEA MP-20 $89.90, MP-64 $114.90 All L.T.O. Over 7500 ham-related items, all major lines. Phone or send SASE for more specials and personal price quote, mention ad. Prices cash, FOB Preston. We close at 2:00 Saturdays & Mondays. Ross Distributing Company, 78 South State, Preston, ID 83263

HDR-300 (rotor only) $250; IC-2A, $165; Johnson #229-203 rollers (Ultimate Transmatch) $35; Drake 4NB, $60; new 500pF/15KV vacuum variables, $63; postpaid. Large ceramic standoffs, feedthrus. Wanted dead or alive: IC-271/471. Paul Husby, 1462 Midway Pkwy., St. Paul, MN 55108. 612-642-1559.

FOR SALE: HEATH HW-5400 xcvr with Keypad entry, SSB Filter, P.S. and Shure 444D Mike $1600. Heath AD-1308 real-time Spectrum Analyzer with Rack-mount P.S. and noise gen. $300. IO-4205 Dual Trace Scope with IG-4505 scope cal. $250 IP-2717A High Voltage P.S. $150. HQ-140X Rcvr Pick-up only $85. WA2HAL 212-877-0980

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ROBOT 70A, 80B monitor/camera, $300. TRS-80 model II, with Macrotronics RTTY/CW interface $150. Genave GTX-200 2M, $75. Heath HA-201 2M amp, $40. Other items. Will ship. WA7WOC 602- 488-9215.

TENTEC ARGOSY 525 CW Fltr, NB, P/S, Keyer, $350. Bearcat DX-1000 SWL RX $270. Wilson WE-800 2 Mtr FM $125, Tom Howey -WB1FPA 603-497-3539. 6 pm EST.

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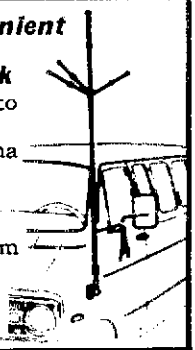

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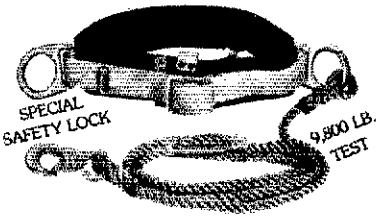

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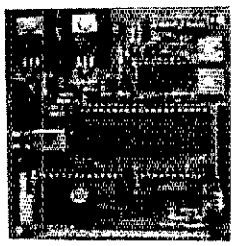

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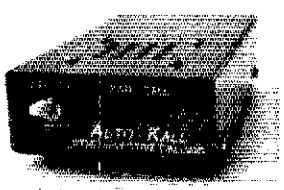

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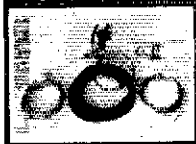

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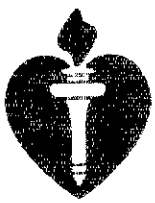
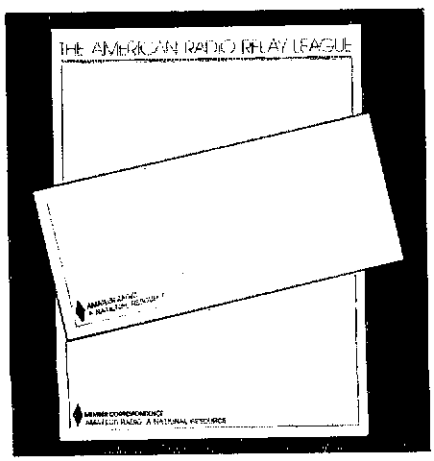
American Heart Association





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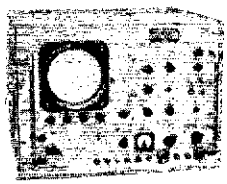

TS-1379A solid-state SPECTRUM ANALYZER for single sideband equipment. Input 485-515 KHz and 2-30 MHz. Sweep: 150, 500Hz, 3.5, 7, 14, 30 KHz. Large 5" display; 16x19x18, 70 lbs sh. Used-reparable **$225**
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Prices F.O.B. Lima, O. • VISA, MASTERCARD Accepted.
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Easy-to-learn lessons on two 60-minute audio cassettes.

Send $14.95 + $2.00 shipping and handling (IN residents add $0.85) to:

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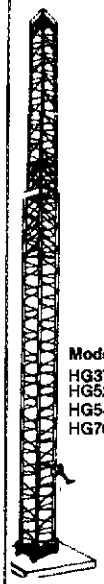
Index of Advertisers

ANTENNA/TOWER SALE!



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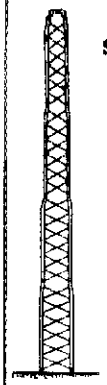
CRANKUP SALE!

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

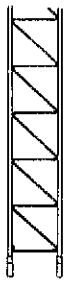
- All Steel Construction—Rugged
- Galvanized Finish—Long Life
- Totally Free Standing—No Guy Wires
- America's Best Tower Buy—Compare Save $
- Complete With Base and Rotor Plate
- In Stock Now—Fast Delivery

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	18 sq ft	281	$399
HDBX48	48 ft	18 sq ft	363	$489

***Your Total Delivered Price Anywhere in Continental 48 States. Antenna Load Based on 70 MPH Wind.**

ROHN

Guyed Tower Packages

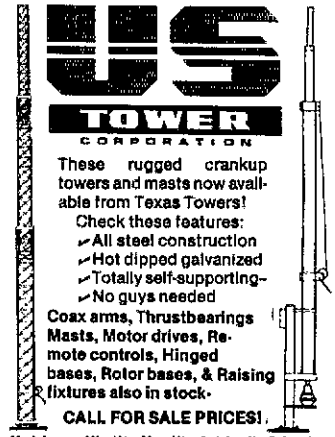


- **World Famous Rohn Quality and Dependability**
- **Rugged high wind survival-provides safe installation**
- **Multi purpose towers satisfy a wide range of needs**
- **Complete packages include: guy hardware, turnbuckles, guy assemblies, w/torq bars, concrete base, rotor plate and top section per manufacturers 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'	1189	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	999
TX436	22'	36'	18 sq ft	529
TX455	22'	55'	18 sq ft	1249
TX472	23'	72'	18 sq ft	2069
HDX556	22'	55'	30 sq ft	1879
HDX572	23'	72'	30 sq ft	3229

Note - US Towers Shipped Freight Collect From Visalia, CA Factory

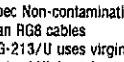
***Note-towers rated at 50 mph to EIA specifications**

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

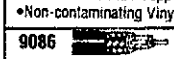
- RG8X—95% Bare Copper Shield • Low Loss
- Non-contaminating Vinyl Jacket Foam Dielectric

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!

½" Alum. w/poly Jacket	.$.79/ft
⅞" LDF4-50 Andrew Heliax™	$1.79/ft
⅞" LDF5-50 Andrew Heliax™	$3.99/ft

select connectors below.

Coaxial Cable Loss Characteristics (DB/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
½" 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

ANTENNA WIRE & ACCESSORIES

Stranded Copper 14ga.	$.10/ft
16ga.	$.09/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
D40 40mtr Dipole	$159
40-2CD 2-el 40 mtr Beam	$299
A50-5 5-el 6 mtr Beam	$85
215 WB NEW 15-el 2 mtr Beam	$85
230 WB NEW 30-el 2 mtr Beam	$229
4218 XL 18-el 2 mtr Beam	$105
3219 19-el 2 mtr Beam	$99
220B 17-el 220MHz Beam	$99
424B 24-el 432MHz Beam	$85
ARX2B 2 mtr Vertical	$39

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Limited Quantities purchased at old prices. Call for current prices

CALL FOR SPECIAL PRICES!

Discoverer 2-el 40-mtr Beam	
Discoverer 3-el Conversion Kit	
EXPLORER-14 SUPER-SPECIAL	
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	
14 AVQ 40-10 mtr vertical	
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

6BTV 80-10 mtr Vert $129 5BTV 80-10 mtr Vert $109
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

Bumper Mounts - Springs - Folding Masts in Stock!

BUTTERNUT ELECTRONICS CO

HF6V 80-10m Vertical $129 Delivered
- Full Legal Power
- Q Tuning Circuits

HF2V 80-40m Vertical $129 Delivered
- Full Legal Power
- Automatic Band Switching

Accessories:

RMK II Roof Mtg. Kit	$49
STR II Stub-Tuned Radials	$29
TBR160 160m Coil Kit	$49
30m Add-on Kit	$29
20m Add-on Kit	$29
17/12m Add-on Kit	$27

FREE UPS on ACCESSORIES when purchased w/antenna

HF4B "Butterfly" 20-10m Compact Beam $189. Delivered
- Unique Design Reduces Size
- No Lossy Traps
- Turns w/TV Rotor

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KT34A 4-el Broad Band Triband Beam	$399.95
KT34XA 6-el Broad Band Triband Beam	$589.95
2m-14C 14-el 2-mtr Satellite Antenna	$139.95
2m-16LBX NEW 16-el 2-mtr Beam	$169.95
2m-22C NEW 22-el 2-mtr Satellite Antenna	$179.95
432-30LBX NEW 30-el 432 MHz Antenna	$139.95
435-18C 435 MHz Satellite Antenna W/CS-2	$179.95
435-40CX 435 MHz Satellite Antenna W/CS-2	$209.95

ROTORS

Alliance HD73 (10.7 sq ft rating)	$119.95
Alliance U110 (3 sq ft rating)	$49
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
Kenpro KR500 Heavy Duty Elevator Rotator	$189
Kenpro KR5400 AZ/EL Rotor Package	$319

ROTOR CABLE

Standard 8 cond cables $.19/ft (vinyl jacket 2-#18 & 6-#22 ga)
Heavy Duty 8 Cond cable $.36/ft (vinyl jacket 2-#16 & 6-#18 ga)

ROHN GUYED TOWER SECTIONS

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/ft
1/4 EHS Guywire (6650 lb rating)	$ 18/ft
5/16 EHS Guywire (11,200 lb rating)	$.29/ft
5/32 7 × 7 Aircraft Cable (2700 lb rating)	$.15/ft
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
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1/2 × 12EJ (1/2" × 12" Eye & Jaw Turnbuckle)	$13.95
5/8 × 12EJ (5/8" × 12" Eye & Jaw Turnbuckle)	$16.95
3/16" Preformed Guy Grip	$2.49
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6" Diam - 4 ft Long Earth Screw Anchor	$14.95
500 D Guy Insulator (5/32" or 3/16" Cable)	$1.69
502 Guy Insulator (1/4" Cable)	$2.99
5/8" Diam - 8 ft Copper Clad Ground Rod	$12.95

PHILLYSTRAN GUY CABLE

HPTG2100 Guy Cable (2100 lb rating)	$ 29/ft
HPTG4000 Guy Cable (4000 lb rating)	$ 49/ft
HPTG6700 Guy Cable (6700 lb rating)	$ 69/ft
9901LD Cable End (for 2100/4000 cable)	$8.95
9902LD Cable End (for 6700 cable)	$9.95
Sockettast 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
18 in Wall	$39	$69	$99	$129
25 in Wall	$69	$129	$189	$249

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• Add Optional 6m, 2m & 70cm Modules
• Dual VFO's
• Full CW Break-in
• Lots More Features
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FT23/73R
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• 10 Memories
• 140-164 MHz, 440-450 MHz
• 600 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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Can you put a price tag on reliability? Now ICOM offers a ONE YEAR WARRANTY on its HF Transceivers & Receivers purchased after August 1, 1986.
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• 32 Memories
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• Full 25W, 5W low
• 21 memories
• Subtones built in
RX 215-230 MHz
CALL FOR BEST PRICE
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• 140-163 MHz
• 10 Memories
• 1W, 1.5W optional
• 32 tones built-in
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KPC-2400
"ALL THE FEATURES OF KPC-2 PLUS 2400 BAUD"
• Easy Direct Interface to PC Compatibles or the VIC/C-64 Series
• AX.25 Version 2 Software • Supports multiple connects
• Has both the KPC-2 modem for 300 Baud HF and 1200 Baud VHF work, and a new phase shift keying (PSK) modem for 2400 baud operation.
MFJ 1270
• TTI 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 $229
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Most orders shipped the same day.
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• Morse, Baudot, ASCII, AMTOR, Packet
• Loaded with features.
HUSTLER
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• MOST ORDERS SHIPPED SAME DAY •

Index to Volume LXX—1986

How to Use This Index

Items are listed according to the monthly column in which they appeared and/or under any category(s) that generally describes them. Examples: "A CW Program Cartridge for the Atari Computer" is listed under Technical Feature Articles and Computers. "Major ARRL Operating Events and Conventions—1986" is listed under Organizational and in the Mini Directory at the end of this index.

Technical

FEEDBACK

These items are not listed elsewhere in this index.

FM/RPT

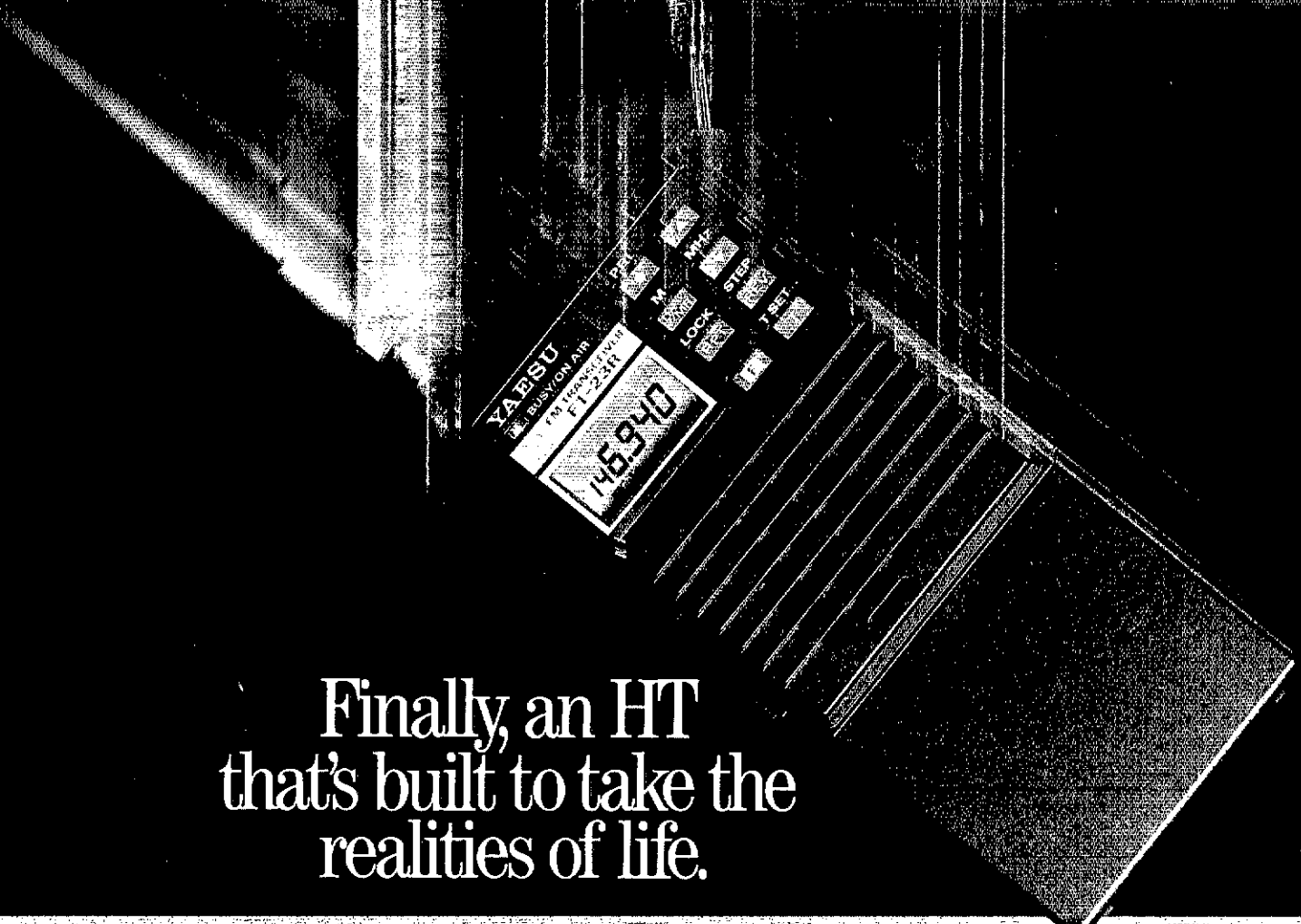
HAPPENINGS

HINTS AND KINKS

HOW'S DX?

IARU NEWS

IN TRAINING

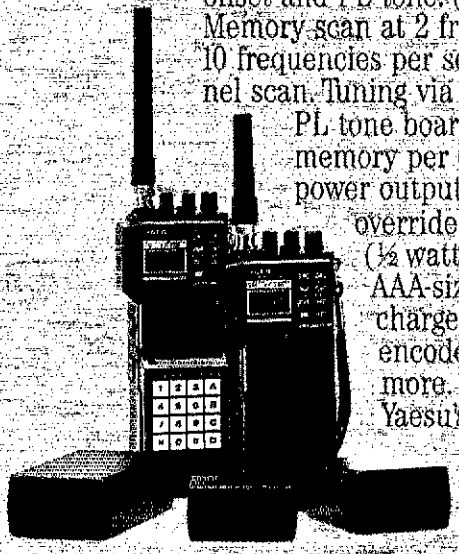


Finally, an HT that's built to take the realities of life.

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 10-volt, 2-watt battery pack. (Optionally, a 12-volt, 5-watt pack, or a 10-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

Our 30th Anniversary.

Yaesu USA 17210 Edwards Road, Cerritos, CA 90701 (213) 404-2700. Customer Service: (213) 404-4884. Parts: (213) 404-4847.
Yaesu Cincinnati Service Center 9070 Gold Park Drive, Hamilton, OH 45011 (513) 874-3100.

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KENWOOD

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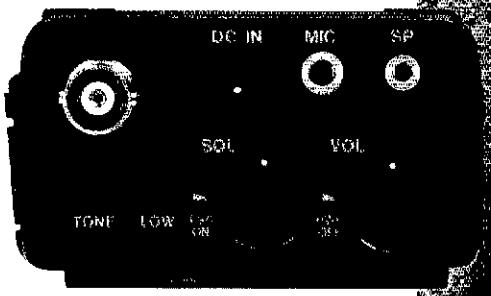
NEW!

This HT has it all!

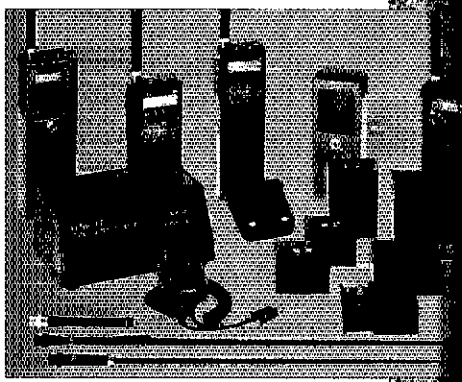
TH-215A

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).
- **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, 800 mAH NiCd pack for 5 W output • PB-2: 8.4 V, 500 mAH NiCd pack (2.5 W output) • PB-3: 7.2 V, 800 mAH NiCd pack (1.5 W output) • PB-4: 7.2 V, 1600 mAH NiCd pack (1.5 W output) • BT-5 AA cell manganese/alkaline battery case • BC-7 rapid charger for PB-1, 2, 3, or 4 • BC-8 charger for PB-1, 3, or 4 • SMC-30 speaker microphone • SC-12, 13 soft cases • RA-3, 5 telescoping antennas • RA-88 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.

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TRIO-KENWOOD COMMUNICATIONS, INC.
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