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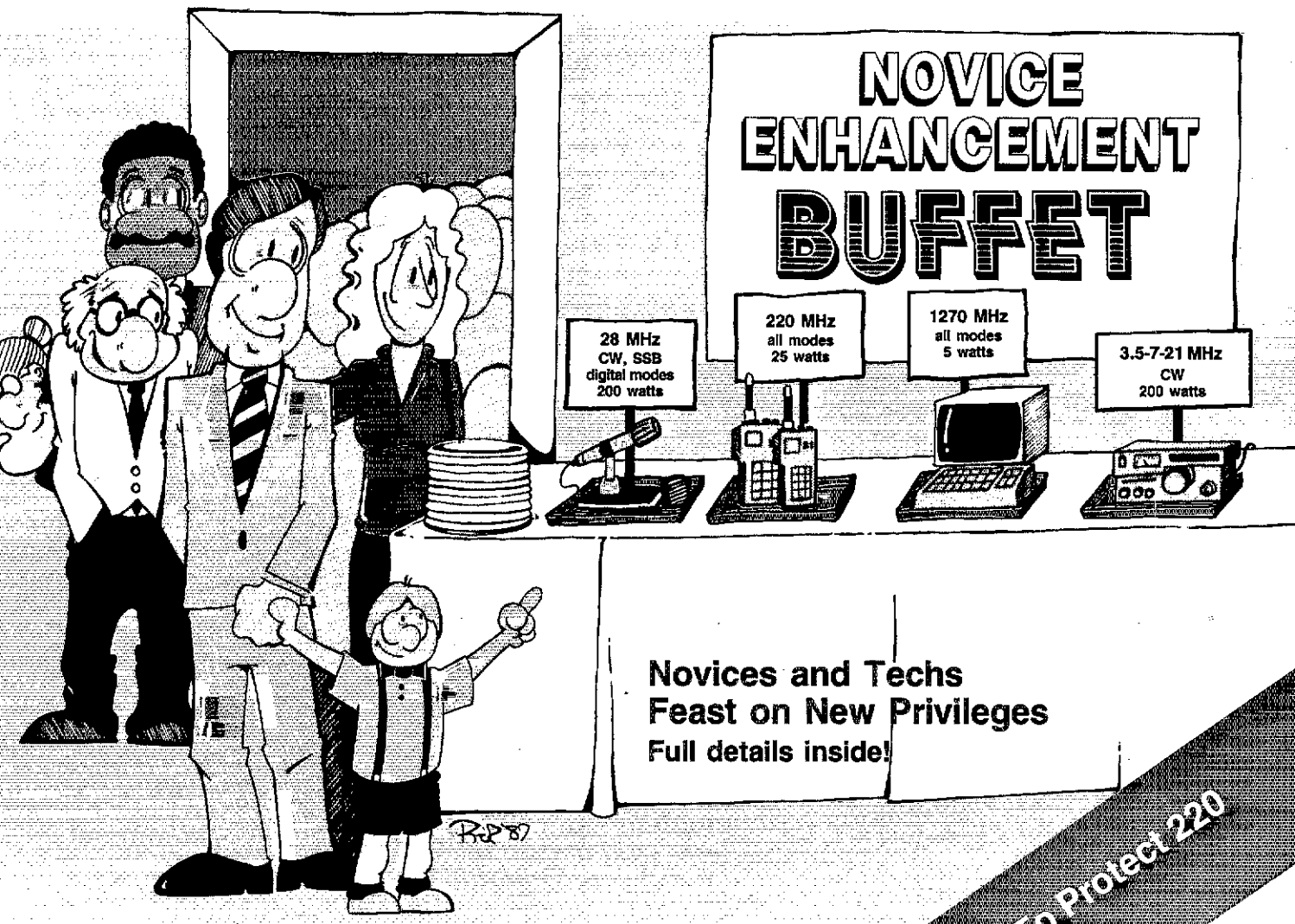

Novices and Techs Feast on New Privileges

Full details inside!

League Mobilizes To Protect 220

see page 9

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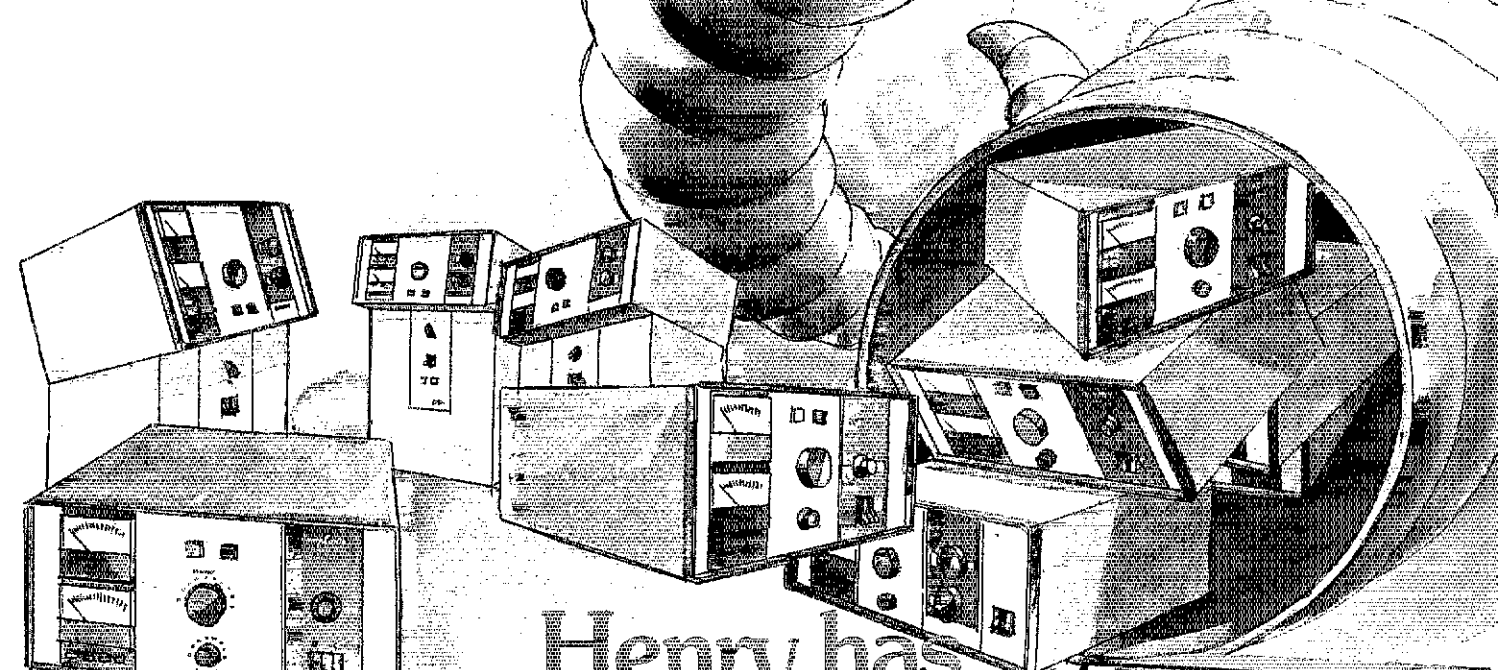

Henry has the amplifier you want!

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

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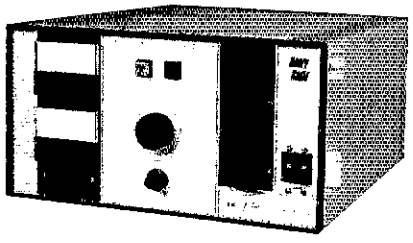
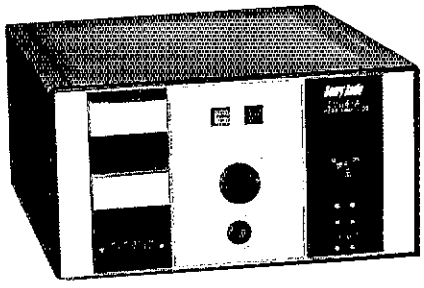
2K Classic...the culmination of more than fifteen years of developing the 2K series into the world famous line that sets the standards for top quality HF linears. A true "workhorse"; built to loaf along at full legal power, trouble free, for years of hard service. Operates on all amateur bands, 80 through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



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.

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.

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ALL NEW FM mobile!

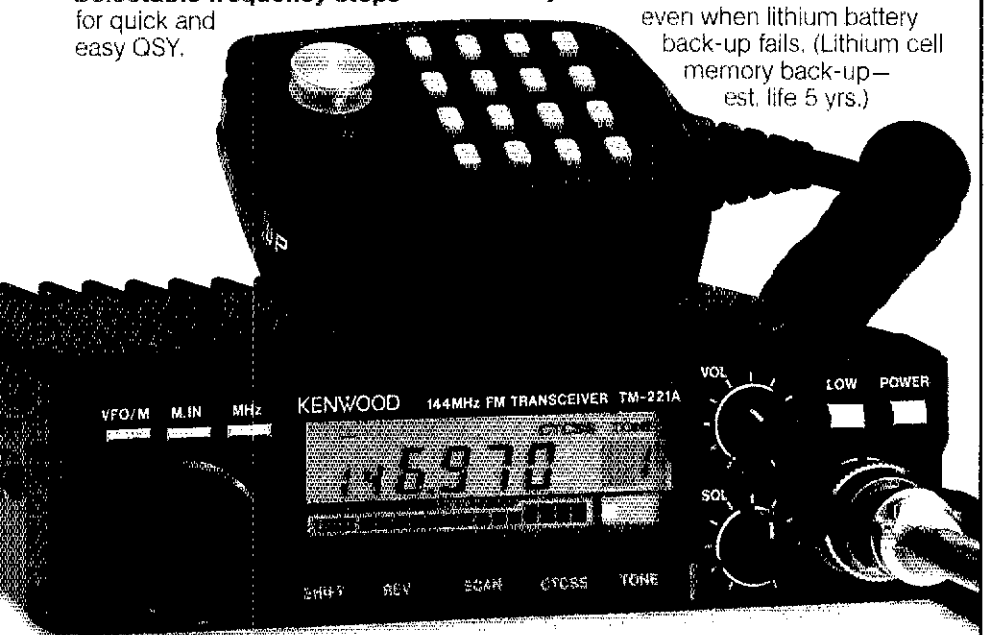
Here's One for You!

TM-221A/421A

2 m and 70 cm FM compact mobile transceivers

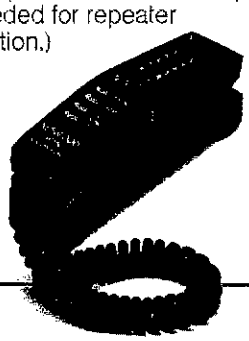
The all-new TM-221A and TM-421A FM transceivers represent the "New Generation" in Amateur radio equipment. The superior Kenwood GaAs FET front end receiver; reliable and clean RF amplifier circuits, and new features all add up to an outstanding value for mobile FM stations! The optional RC-10 handset/control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

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



RC-10 Remote Controller

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



Optional Accessories:

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

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

KENWOOD

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ICOM IC-761
A NEW ERA DAWNS

- **Built-in AC Power Supply**
- **Built-in Automatic Antenna Tuner**
- **SSB, CW, FM, AM, RTTY**
- **Direct Keyboard Entry**
- **160-10m/General Coverage Receiver**
- **Passband Tuning plus IF Shift**
- **QSK up to 60 WPM**

The IC-761 ushers in an exciting new era of amateur radio communications; an era filled with all the DX'ing, contesting, and multi-mode operating pleasures of a fresh new sunspot cycle. The innovative IC-761 includes all of today's most desired features in a single full-size cabinet. This is ham radio at its absolute best!

Work the World. The IC-761 gives you the competitive edge with standard features including a built-in AC power supply, automatic antenna tuner, 32 fully tunable memories, self-referencing SWR bridge, continuously variable RF output power to 100 watts in most modes, plus much, much more!

Superb Design, Uncompromised Quality. A 105dB dynamic range receiver features high RF sensitivity and steep skirted IF selectivity that cuts QRM like a knife. A 100% duty cycle transmitter includes a large heatsink and internal blower. The IC-761 transceiver is backed with a full one-year warranty and ICOM's dedicated customer service with four regional factory service centers. Your operating enjoyment is guaranteed!

All Bands, All Modes Included. Operates all HF bands, plus it includes general coverage reception from 100kHz to 30MHz. A top SSB, CW, FM, AM, and RTTY performer!

Passband Tuning and IF Shift plus tunable IF notch provide maximum operating flexibility on SSB, CW, and RTTY modes. Additional features include multiple front panel filter selection, RF speech processor, dual width and adjustable-level noise blanker, panel selectable low-noise RF preamp, programmable scanning, and all-mode squelch. The IC-761 is today's most advanced and elaborate transceiver!

Direct Frequency Entry Via Front Keyboard or enjoy the velvet-smooth tuning knob with its professional feel and rubberized grip.

Special CW Attractions include a built-in electronic keyer, semi or full break-in operation rated up to 60 WPM, CW narrow filters and adjustable sidetone.

Automatic Antenna Tuner covers 160-10 meters, matches 16-150 ohms and uses high speed circuits to follow rapid band shifts.

Complementing Accessories include the CI-V computer interface adapter, SM-10 graphic equalized mic, and an EX-310 voice synthesizer.

You're The Winner with the new era IC-761. See the biggest and best HF at your local ICOM dealer.

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ICOM CANADA, A Division of ICOM America, Inc., 3071 - #5 Road, Unit 9, Richmond, B.C. V6X 2T4 Canada

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OUR COVER

With the entry-level license now more appealing than ever, let's propagate the message to our friends and neighbors that there's no better time than now to earn that ham ticket! For a look at what Novice Enhancement really means, check out the article beginning on page 21, the complete FCC Report and Order (pages 64-67), the new ARRL VEC Novice Question Pool (pages 23-28), the newly separated Technician and General class questions (pages 29-31) and a revised frequency chart (page 70). Cover by Richard Pinchera and Paul Porazinski

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.

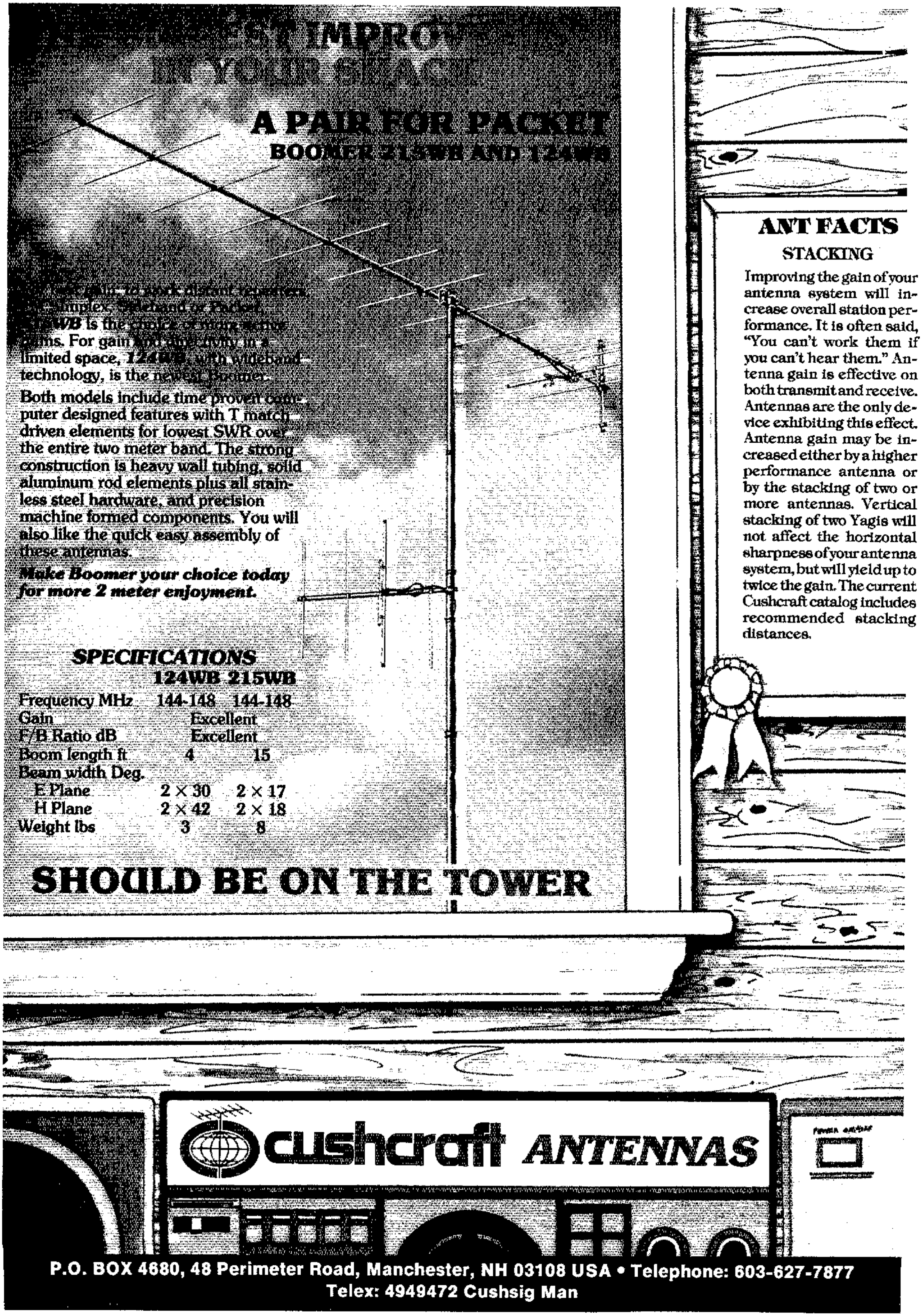
The PK-64 uses on screen indicators to show status, mode, and DCD (Data Carrier Detect) while the PK-232 uses front panel indicators. Both units use discriminator style tuning for HF operation. And that's just the tip of the iceberg. Features like multiple connects on packet, hardware HDLC, CW speed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

AEA Advanced Electronic Applications, Inc.
P.O. Box C-2160, Lynnwood, WA 98036-0918
206-775-7373 Telex 6972496 AEA INTL UW


A PAIR FOR PACKET
technology, is the newest Boomer.
Both models include time proven computer designed features with T match driven elements for lowest SWR over the entire two meter band. The strong construction is heavy wall tubing, solid aluminum rod elements plus all stainless steel hardware, and precision machine formed components. You will also like the quick easy assembly of these antennas.
Make Boomer your choice today for more 2 meter enjoyment.
SPECIFICATIONS
124WB 215WB
Frequency MHz 144-148 144-148
Gain Excellent
F/B Ratio dB Excellent
Boom length ft 4 15
Beam width Deg.
E Plane 2 × 30 2 × 17
H Plane 2 × 42 2 × 18
Weight lbs 3 8
SHOULD BE ON THE TOWER
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STACKING
Improving the gain of your antenna system will increase overall station performance. It is often said, "You can't work them if you can't hear them." Antenna gain is effective on both transmit and receive. Antennas are the only device exhibiting this effect. Antenna gain may be increased either by a higher performance antenna or by the stacking of two or more antennas. Vertical stacking of two Yagis will not affect the horizontal sharpness of your antenna system, but will yield up to twice the gain. The current Cushcraft catalog includes recommended stacking distances.
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Good for Satellite Digital QSOs

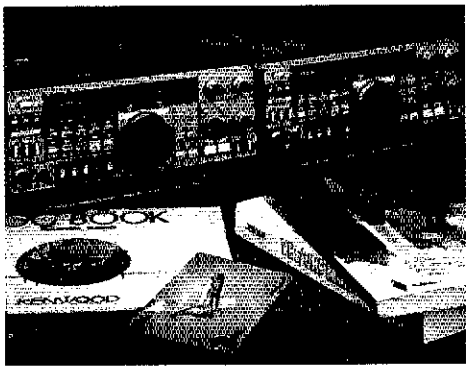
Matching Pair

Look for FUJI and PHASE III-C

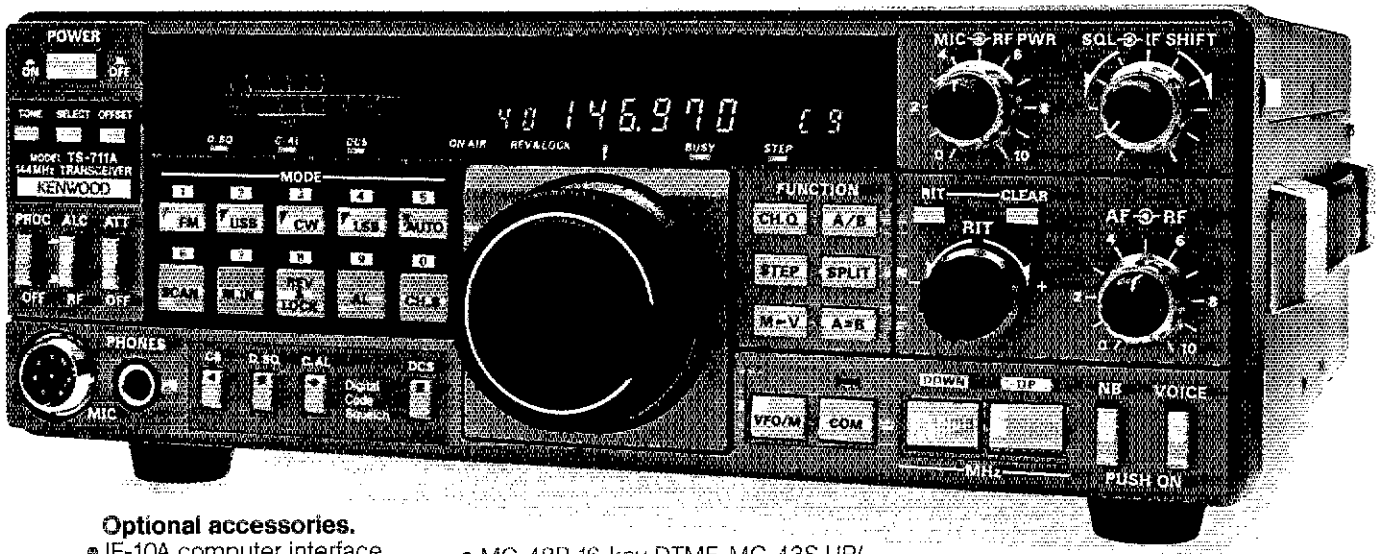
TS-711A/811A VHF/UHF all-mode base stations

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

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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YES! 220 MHz

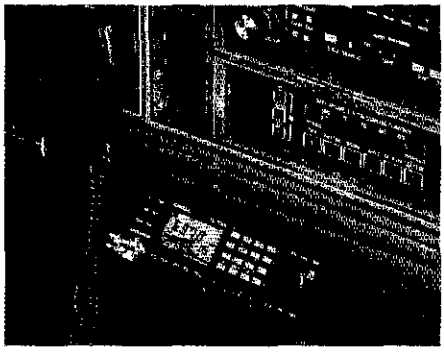
220: Kenwood Style!

TM-3530A

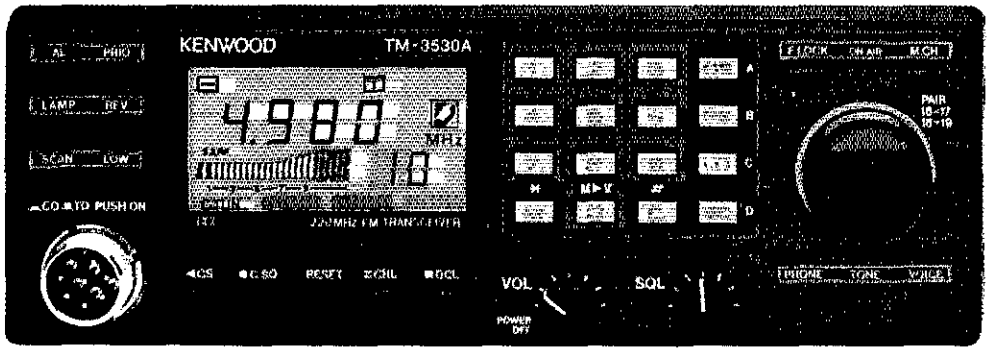
The first comprehensive 220 MHz FM transceiver

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/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/31A optional accessories:

- **HMC-1** headset with VOX
- **SMC-30** speaker microphone
- **PB-21** NiCd 180 mAH battery
- **PB-21H** NiCd 500 mAH battery
- **DC-21** DC-DC converter for mobile use
- **BT-2** manganese/alkaline battery case
- **EB-2** external C manganese/alkaline battery case
- **SC-8/8T** soft cases with belt hook
- **TU-6** programmable sub-tone unit
- **AJ-3** thread-loc to BNC female adapter
- **BC-6** 2-pack quick charger
- **BC-2** wall charger for PB-21H
- **RA-9A** StubbyDuk antenna
- **BH-3** belt hook

TH-31BT with DTMF pad shown
Optional RA-9A attached

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Vice Director: Wayne Overbeck, N6NB,
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11837 Judd Ct, #114, Dallas, TX 75243
(214-437-1363) business

Vice Director: Thomas W. Comstock, N5TC,
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(409-693-1181)

*Executive Committee Member

Section Managers of the ARRL

Reports Invited: The ARRL Board of Directors (see list at left) determines the policies of ARRL. The 16 divisions of the League are further arranged into 73 administrative "sections," each headed by an elected Section Manager. Your SM welcomes reports of club and individual activity. ARRL Field Organization appointments are available covering a wide range of Amateur Radio volunteer interests. Whatever your license class, your SM has an appointment available. Check with your SM (below) for further information.

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British Columbia — H. E. Savage, VE7FB, 4553 West 12th Ave, Vancouver V6R 2R4 (604-224-5226)
Manitoba — Jack Adams, VE4AJE, 227 Davidson Ave E, Dauphin R7N 2Z4 (204-638-9270)
Maritime-Nfld — Leigh Hawkes, VE1GA, Box 864, Armdale, NS B3L 4K5 (902-443-6360)
Ontario — L. P. Thivierge, VE3GT, 34 Bruce St W, Renfrew K7V 3W1 (613-432-5967)
Quebec — Harold Moreau, VE2BP, 80 Principale, St Simon Co, Bagot J0H 1Y0 (514-798-2173)
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Pacific — Army Curtis, AH6P, PO Box 4271, Hilo, HI 96720 (808-935-8893)
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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 . . ."

220: A Call to Arms

Once again, our 220-MHz band is under attack. And now, as in the past, each and every radio amateur must rise to its defense.

For more than a decade, commercial interests have cast covetous eyes on the 220 band. In the 1970s the threat was from "Class E CB," which was envisioned as a "high-quality" FM CB service. The FCC itself endorsed the idea of reallocating a part of the band for this use. ARRL led an eight-year fight against Class E CB, and won.

Unfortunately, that did not put an end to the threats. Despite rapid growth in our use of the band—a rate of growth that far outstrips what land mobile services have been experiencing—the impression that 220 is "underutilized" has lingered. Until now, none of the reallocation proposals has gained FCC support; but that has now changed, with the release by the Commission of a Notice of Proposed Rule Making (General Docket No. 87-14) proposing to reallocate 220-222 MHz for exclusive use by government and nongovernment land mobile operations.

Implicit in the Commission's proposal is that the amplitude compandored single-sideband (ACSSB) modulation technique would be used instead of conventional FM, in order to achieve 5-kHz channeling and consequent high efficiency in the use of the spectrum. For years the Commission has given a degree of support to ACSSB that has been sufficient only to keep the concept barely alive; it has stopped short of providing end users with any real incentive to abandon FM, with its 15 to 25 kHz channeling, in favor of the more efficient technology.

In the face of opposition from the entrenched FM interests to the use of the new mode in "their" bands, and on the basis of studies that show conventional FM and ACSSB do not mix well on the same or adjacent channels, ACSSB advocates have been searching for some "virgin spectrum" for their mode. Some ACSSB supporters see 216-220 MHz as a possibility, at least outside the areas where that band is used for barge communication along the Mississippi River system; others want to extend the reach up to 222. The FCC, wanting to minimize any possibility of television interference to channel 13, concluded that 216-220 MHz would be inappropriate—but cited only the *absence* of studies showing TVI as being no problem, *not* any evidence that it *would* be. Why stations communicating with barges will cause less interference than stations communicating with cars and trucks, and how land mobile operations in (for example) Los Angeles might "restrain the development of the inland waterways communications system" are questions left unanswered in the Commission's NPRM. Also left unaddressed is the problem of coordination with our neighboring countries of Canada and Mexico, since amateurs in those countries would continue to have every right to operate at 220-222 MHz.

What makes the proposal even more difficult to understand is that it comes on the heels of a Commission action to encourage innovative spectrum-management techniques in another two-megahertz chunk: 901-902 and 940-941 MHz. In setting aside this spectrum for a General Purpose Mobile Radio Service, the Commission said "this new service would be economically efficient because use of this 2 MHz of spectrum would be determined by market forces." As Commissioner Dennis Patrick—who will

(continued on page 14)

Decisions, decisions, decisions.

Should you choose one, two, or all three?

Choose one—Yaesu's FT-109RH, FT-209RH or FT-709R—and you gain the maximum performance available in any single-band HT.

Choose two—or even three, and you also get interchangeable accessories, options and operating procedures. Making it easy and affordable to work all your favorite VHF and UHF bands.

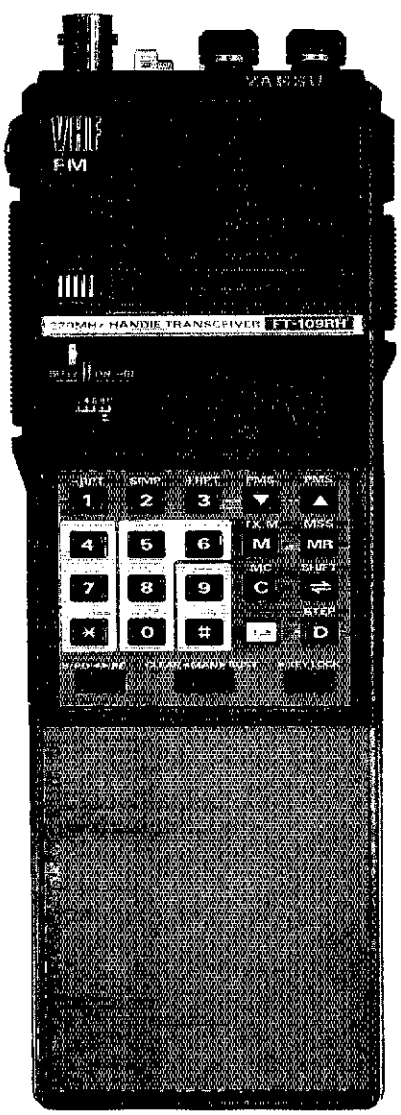
However you decide, you get all this operating flexibility: Powerful 5-watts output (4.5 watts on 440 MHz). Battery saver. Push-button recall of 10 memories, each that independently stores receive frequency, standard or non-standard offset, even optional tone encode and decode.

Push-button scanning routines for scanning all memory channels, selected ones, or all frequencies between adjacent memories. And a priority feature to return you to a special frequency.

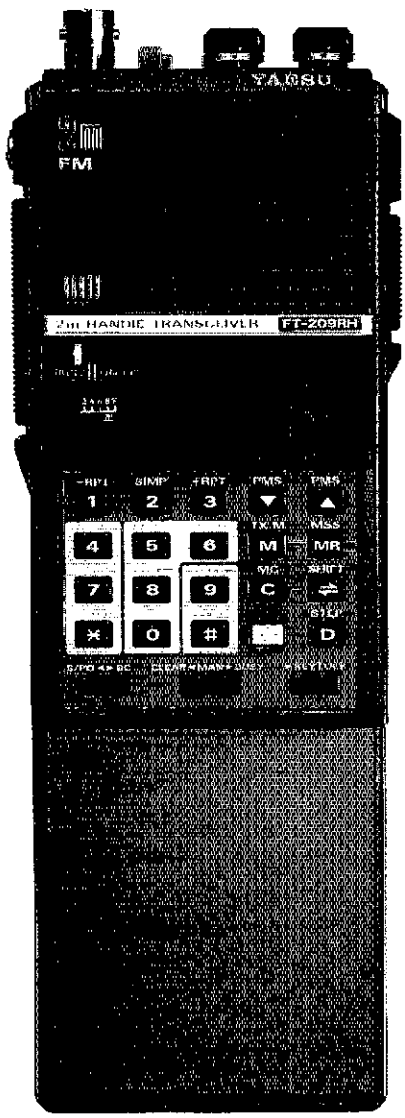
You also get a high/low power switch, power meter, backlit display, 500-mAh battery, wall charger, and soft case. Plus a choice of many interchangeable options, including a VOX headset, fast charger, hard leather case, and plug-in subaudible tone encoder/decoder for controlled-access repeaters.

Let Yaesu's 220-MHz FT-109RH, 2-Meter FT-209RH and 440-MHz FT-709R give you the decided advantage in HT performance and upgrade ability. It may be the most enjoyable HT buying decision you ever make.

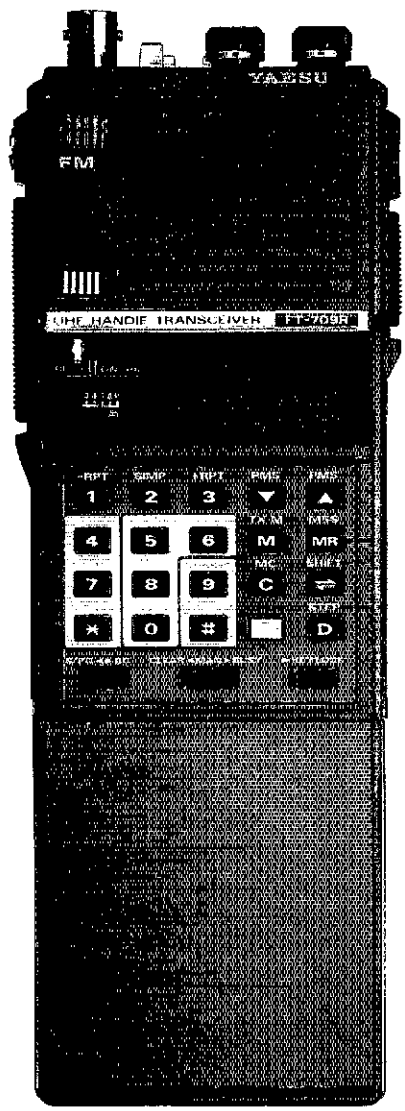
220 MHz



2 Meters



440 MHz



YAESU

Yaesu USA 17210 Edwards Road, Cerritos, CA 90701 (213) 404-2700. **Repair Service:** (213) 404-4884. **Parts:** (213) 404-4847.
Yaesu Cincinnati Service Center 9070 Gold Park Drive, Hamilton, OH 45011. (513) 874-3100.

Prices and specifications subject to change without notice.

UP FRONT in QST

NOVICE ENHANCEMENT: Not for Novices Only!

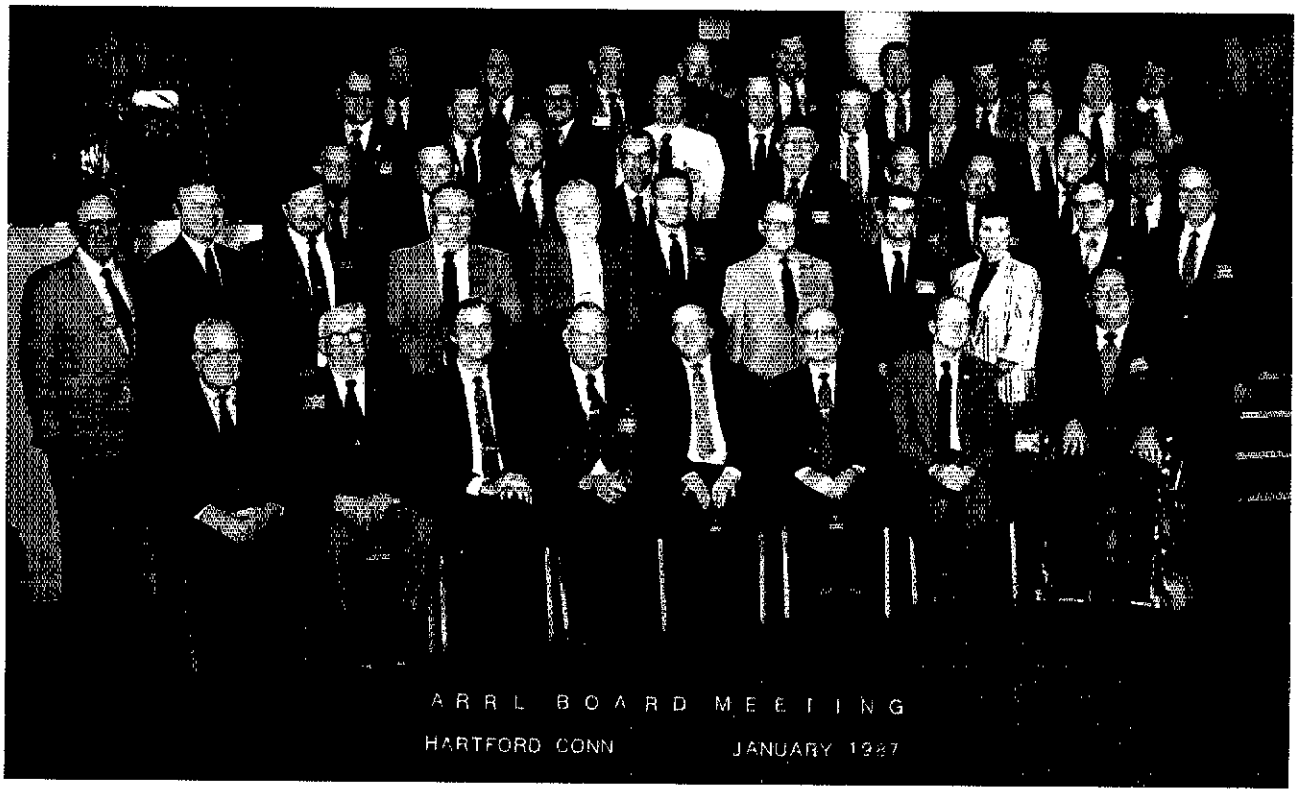
Beginning Friday, March 20 (0001 UTC March 21), it's a whole new ballgame. Those taking and administering exams for Novice, Technician and General class licenses will have some changes to deal with. To help you, in this issue of *QST* you'll find:

- A guide to the new Novice testing procedures (designed for those taking and giving exams, and for Elmers). See page 21.
- The complete text of the FCC's Novice Enhancement Report and Order. See page 64.
- The new questions and answers (along with the answer key) for the Novice exam. See page 23.
- A breakdown of which questions go with the Technician class exam and which go with the General exam (previously combined into one, Element 3). See page 29.
- A brand-new, easy-to-read frequency chart, showing where you can operate. Included is a summary of power limitations, which also were affected by Novice Enhancement. See page 70.

W5LFL to Head Center Committee

Former Astronaut Owen Garriott, W5LFL, has agreed to be chairman of the committee that will advise on exhibits for the ARRL Visitors' Center. W5LFL's distinguished career in space included the first manned Amateur Radio operation, from the Space Shuttle *Columbia* in 1983. In announcing Owen's willingness to serve, ARRL Executive Vice President David Sumner, K1ZZ, said: "The committee's charge is to ensure that the focus of the project is on the future. Owen's personal vision, and his continuing involvement on the cutting edge of space science, will bring an exciting dimension to the hands-on exhibits we have in mind."

Owen is shown here carrying the specially designed 2-meter equipment and the notepad log he used as the first Ham in Space.



Official Family Portrait. Officers, Directors and Staff in attendance at the League's Annual Board Meeting: 1st row (l-r)—W9PRN, W1QV, W6EJJ, WØFIR, W8RC, W6ZM, K1ZZ, K5DPG. 2nd row—W1UED, KØTO, KB6ZV, W4RA, W2HD, VE2VW, W4UG, KN1K, W4WYR, WA6WZO, W7RM. 3rd row—W1XX, AB8P, VE3CDM, W4RH, KBØZL, WØOZC, W7QMU, N5TC, W1GNC. 4th row—N4MM, W4OYI, N3AKD, K1PAD, WB5JBP, AGØX, N6NB, WB2VUK. 5th row—W2BCH, W3ABC, K6ITL, W5HD, WB1EYI, W5CH, W3UBQ, KØPGM, K1KI, WA2DHF.

Pedal Power: Making it to your high school 50th reunion is one thing—but getting there by traveling cross-country on bicycle is another matter entirely! Just ask Hartley Alley, NAØA. He's leaving his Boulder, Colorado home April 1 and heading for Lynn, Massachusetts to attend his 50th reunion on May 29. His solo trek will take him through nine states and many hundreds more miles, so to help get himself there safely, Hartley, 67, will be using 2 meters to keep track of road and weather information, and hopefully enjoy some ham companionship. Watch for the guy with his call letters on his vest and the half-wave antenna with the safety flag attached. Hartley's route: US 34 to Hastings, Nebraska and US 6 to Lincoln; Iowa 2 across the state; various roads and Illinois 10 from Havana to Champaign-Urbana; Indiana 46 to Bloomington, IN 37 to Indianapolis and US 40 to Richmond; various Ohio state routes; in Pennsylvania, US 20 through Erie to New York state line; US 20 past Buffalo to Auburn, NY 5 to Amsterdam and various routes to the Massachusetts line; Mass 2 to Concord, various roads to Lynn.

Scholarships Available for 1987-88 School Year

If you're an amateur looking for financial support in pursuing a higher education, help may not be far off. The Foundation for Amateur Radio (FAR), of Washington, DC, plans to award 26 scholarships for the 1987-88 academic year. Licensed radio amateurs may compete for these awards if they are enrolled or have been accepted for enrollment in an accredited university, college or technical school. Most of the scholarships range from $350 to $900, with preference given in some cases to residents of specific geographical areas or who are pursuing certain study programs.

Additional information and an application form can be requested, by a letter or QSL/postcard postmarked prior to May 31, 1987, from FAR Scholarships, 6903 Rhode Island Ave, College Park, MD 20740.

High on Ham Radio: Carter B. Smith, K6CWM, took a break from the broadcast booth on the ground to enjoy ham radio "in the air." In January, Carter, a morning man for a local radio station, and Phil Lerza, WB6RFU, made what they believe to be the first amateur operation from aboard the *Slice Airship*. In a brief flight over San Francisco Bay, prior to the blimp's heading to work the Superbowl, Carter and Phil managed to make over 20 contacts on 2-meter simplex. After that experience, we imagine Carter and Phil were slow in getting their feet back on the ground.

ARRL Seeks 1989 National Convention Site to Celebrate League Diamond Anniversary

The 1989 ARRL National Convention will be one of the main activities to mark the 75th, or Diamond, Anniversary of the American Radio Relay League. Accordingly, in addition to the usual criteria, the following will be used in selecting the site and the sponsoring organization for this convention:

1) The convention shall give attendees a historical perspective, and a look ahead to the last quarter of the League's first century. Applicants should address as specifically as possible their plans in this regard.

2) The convention shall provide attendees with a commemorative souvenir that will form a lasting part of their Amateur Radio memorabilia.

3) The convention shall provide attendees an opportunity to share in the experience through QSOs with a special convention station, through videotaped highlights for distribution by ARRL to its affiliated clubs, and through other means to be proposed by the convention committee at the time of application.

4) The convention application shall demonstrate financial and personnel resources sufficient to accomplish these aims, in addition to the usual high caliber of National Convention programs and exhibits.

5) The location will be selected so as to provide for a relatively large audience.

Applications received by the ARRL Secretary by June 1, 1987 will be circulated to Board members, and the selection made at the July 1987 Meeting of the Board from among the applications received. The application itself, and supporting documentation addressed specifically to the above-listed criteria, will be duplicated for Board members at League expense; for other supporting material, such as Convention and Visitor Bureau pamphlets and letters from local officials, the convention committee should supply 24 copies of each at the time of application.

League Lines

There were ***three major FCC actions*** in February: ***Novice Enhancement,*** a proposal to ***take away 220-222 MHz*** from amateurs, and an inquiry to determine if ***amateur call signs can be issued by the private sector!*** Let's take a look at these actions one by one:

• ***Novice Enhancement:*** Complete details, including the exact rule changes, can be found in the Happenings column. Special report on how Novice Enhancement affects candidates, instructors and Elmers appears on page 21.

• ***220-222 MHz:*** ARRL Executive Vice President Dave Sumner, K1ZZ, discusses the FCC Notice of Proposed Rule Making (NPRM) in It Seems To Us... beginning on page 9. A complete text of the FCC proposal follows. Comments on this proposal, the NPRM in General Docket 87-14, are due at FCC by April 6. ARRL has filed a request to extend the comment date. Needless to say, ARRL plans strenuous opposition to this reallocation proposal! W1AW and *The ARRL Letter* will carry more information as it becomes available.

• ***Call-sign inquiry:*** Acting in response to inquiries by ARRL and others, FCC has asked for comments on whether special call signs could be issued by the private sector. FCC said it favored the idea as long as there would be no additional cost or workload for the FCC. Written comments on this inquiry, numbered PRB-3, are due by April 23. Complete details on this inquiry appear in the Happenings column.

Enough FCC blockbusters for one month? There's even more FCC news in this month's expanded Happenings column.

The Second Session of the World Administrative Radio Conference for the Planning of the HF Bands Allocated to the Broadcasting Service met in Geneva, Switzerland, during February and March. While the conference had not concluded at the time of this writing, it appears that there will be a call for the convening of a future WARC having limited authority to ***reallocate spectrum to HF broadcasting.*** Such a WARC would pose a threat to the lower HF amateur allocations, particularly the top end of 75 meters and the top two-thirds of the 40-meter band. ***An IARU observer team*** headed by IARU Vice President Carl Smith, WØBWJ ***is at the conference and monitoring the situation.***

WM4T wins tower case! The Judge has awarded Thernes all attorney fees, dating from the effective date of PRB-1, as a result of winning his tower suit. However, this judgment still leaves Thernes some $7000 short of his total legal costs. This ruling will have vast consequences for amateurs nationwide. Give your thank you to WM4T by sending contributions to Northern Kentucky Tower Fund, PO Box 17721, Lakeside Park, KY 41017. Incidentally, John has just been elected ARRL Kentucky Section Manager. Further details appear in Happenings, elsewhere in this issue.

The Office of Management and Budget has approved the ***new FCC Form 610,*** which provides for two Administering Volunteer Examiners (VEs) for the Novice license, and for written examination credit. However, it is not known when the new form will be available. ***Meanwhile, the previous edition*** (dated July 1985 with the OMB expiration date of 3/31/88) ***will remain in use.***

Attention Novices: Because there's so much Novice Enhancement news to report this month, we've had to forgo the Novice Notes article. Be sure to tune in next month, though, when we explain what equipment you'll need for that first station, and where to put it. Future installments will cover the practical information you'll need to take advantage of those new operating privileges.

(continued from page 9)

become Chairman on Mark Fowler's departure this spring—said in a concurring statement at the time: "The best mechanism for determining the relative value to society of alternative uses of a scarce resource is competition in a free marketplace." While most developmental work has been done at lower frequencies, there is no technical reason why ACSSB cannot be used at 900 MHz. Surely it is consistent with the Commission's present philosophy for competing technologies, one offering the licensee more than twice as many channels as the other at perhaps a 25% premium in equipment costs, to square off against one another in this arena. Industry's response to this challenge would provide a marketplace answer to the question of whether there is a "scarcity" of land mobile allocations. Finally, if there is indeed such a scarcity, either now or in the future, it will be resolved only by more innovative uses of the large blocks of spectrum already available to land mobile—not by reallocating scraps of noncontiguous spectrum from other services. The best time to begin moving in this direction is now.

And what about the Amateur Service? Can we afford the loss of 40% of our 220-MHz band? Of course, our immediate reaction is that we cannot; even if we don't use 220-222 MHz ourselves, its loss would impact operating patterns in the rest of the band as well as other VHF and UHF bands. But the real test is the damage done to the public interest should the proposed reallocation take place, not whether it would make Amateur Radio less enjoyable to us as individuals. And that depends on what the public interest requires the Amateur Service to be, and to do.

We are expected to be a noncommercial communication service, particularly with respect to providing emergency communications; to contribute to the advancement of the radio art; to advance individual skills in both communications and technical phases of radio; to be a reservoir of trained operators, technicians and electronics experts; and to enhance international goodwill. Providing these things is what earns our access to the radio spectrum.

The FCC has just taken a step that is sure to lead to an expanded reservoir of radio amateurs: the enhancement of Novice privileges. A good deal of this enhancement took place at 220, with 222.1-223.91 (and corresponding repeater outputs up to 225) MHz opened to all amateur licensees for the first time. Thus, 220 becomes a "common denominator," available to all hams for voice and digital communication. This is a great step, but one that greatly increases the importance of the rest of the band for other communications: high-speed intercity digital links necessary for the development of the packet radio network, for

How to Tell the FCC What You Think

To be treated as formal comments, your submission to FCC should follow these rules. Send an original and five copies to: Secretary, Federal Communications Commission, Washington, DC 20554. Use regular 8½ × 11 paper, printed on one side, preferably double-spaced. Leave an adequate left-hand margin so your submission can be read if put into a binder. Use the following heading:

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of

Amendment of Part 2 of the Commission's Rules Regarding the Allocation of the 216-225 MHz Band	General Docket No. 87-14 RM-4829 RM-4831 RM-4983

COMMENTS OF (your name)

Begin by stating that you are opposed to the proposed allocation of 220-222 MHz to land mobile, and that you favor its retention by the Amateur Service. State your qualifications, and what interest you have in the outcome (i.e., are you active on 220, are you planning to be, or do you use a repeater or packet radio system which is on 220?) Then, give factual, unemotional evidence why maintaining the amateur allocation is in the public interest. If you can offer alternatives which would accomplish the Commission's objectives for land mobile elsewhere in the spectrum (not another amateur band!), do so. Be persuasive, not threatening.

Sign your comments at the end, and include your address.

Send your comments to arrive by *APRIL 6*. If you can't meet that deadline, check W1AW or other sources for word on a possible extension of time to file.

What the FCC Proposes

In the Notice of Proposed Rule Making in General Docket No. 87-14, the FCC proposes the following allocation for 216-225 MHz:

(1) Maintain the existing 216-220 MHz allocation, which domestically is to the Maritime Mobile Service on a primary basis and for limited telemetering and telecommand operations in certain other services on a secondary basis;

(2) Allocate 220-222 MHz on an exclusive basis for government and nongovernment land mobile operations;

(3) Allocate 222-225 MHz on an exclusive basis to the Amateur Service.

The existing primary allocation to radiolocation (government radars) would be phased out by January 1, 1990.

example. Repeater control and auxiliary links, CW and SSB weak-signal experimenters, and propagation beacons also populate the lower two megahertz of the band—and cannot possibly be reaccommodated in the 100 kHz apparently set aside for the purpose in the Commission's planning.

The importance of these activities to the fulfillment of our mission cannot be overstated. Without a place for high-speed intercity links, the packet network will never live up to its potential—a potential that includes a dramatically improved emergency communications capability. Without such a network, our ability to attract to our ranks young people whose interests are in data communications will be diminished. Without a "window" between 144 and 432 MHz for weak-signal experimentation, the phenomena of sporadic-E, meteor scatter, transequatorial, and other exotic propagation media will be incompletely investigated.

What can we do to protect the 220-MHz band? Show the FCC that it is wrong. Show that its assumption of "light" loading of the band is outdated. Show that the public interest would not be served by such a reallocation. Show that there are better places, perhaps within existing land mobile allocations, for the introduction of ACSSB in that service.

FCC has given the public until April 6 to comment on its proposals. This gives us very little time to collect a mass of data, so ARRL has requested a 45-day extension of time, or until May 21. Others are known to be making similar requests. But don't count on the extension being granted; if you can file your comments now, do it now—don't wait! The accompanying box will show you how to make your voice heard.

Defense of 220 is nothing new. We've done it before, and we can do it again. If anything, we're in a stronger position now than ever. As ARRL President Larry Price, W4RA, said on learning of the Commission's proposals: "Let no one question the League's resolve to fight, with every means at our command, this unwarranted spectrum grab on behalf of commercial interests. Amateurs need this band—all of it—if we are to fulfill our public-service charter." Let's have all amateurs, irrespective of their operating interests, join together to turn back this latest threat.—*David Sumner, K1ZZ*

W1AW Schedule

April 5-October 25, 1987 **MTWThFSSn = Days of Week** **Dy = Daily**

W1AW code practice and bulletin transmissions are sent on the following schedule:

UTC	Slow Code Practice	MWF: 0200, 1300; 2300; TThSSn: 2000; Sn: 0200
	Fast Code Practice	MWF: 2000, TTh: 0200, 1300; TThSSn: 2300, S: 0200
	CW Bulletins	Dy: 0000, 0300, 2100; MTWThF: 1400
	Teleprinter Bulletins	Dy: 0100, 0400, 2200; MTWThF: 1500
	Voice Bulletins	Dy: 0130, 0430
EDT	Slow Code Practice	MWF: 9 AM, 7 PM; TThSSn: 4 PM; 10 PM
	Fast Code Practice	MWF: 4 PM, 10 PM; TTh: 9 AM; TThSSn: 7 PM
	CW Bulletins	Dy: 5 PM, 8 PM, 11 PM; MTWThF: 10 AM
	Teleprinter Bulletins	Dy: 6 PM, 9 PM, 12 PM; MTWThF: 11 AM
	Voice Bulletins	Dy: 9:30 PM, 12:30 AM
CDT	Slow Code Practice	MWF: 8 AM, 6 PM; TThSSn: 3 PM; 9 PM
	Fast Code Practice	MWF: 3 PM, 9 PM; TTh: 8 AM; TThSSn: 6 PM
	CW Bulletins	Dy: 4 PM, 7 PM, 10 PM; MTWThF: 9 AM
	Teleprinter Bulletins	Dy: 5 PM, 8 PM, 11 PM; MTWThF: 10 AM
	Voice Bulletins	Dy: 8:30 PM, 11:30 PM
MDT	Slow Code Practice	MWF: 7 AM, 5 PM; TThSSn: 2 PM, 8 PM
	Fast Code Practice	MWF: 2 PM, 8 PM; TTh: 7 AM; TThSSn: 5 PM
	CW Bulletins	Dy: 3 PM, 6 PM, 9 PM; MTWThF: 8 AM
	Teleprinter Bulletins	Dy: 4 PM, 7 PM, 10 PM; MTWThF: 9 AM
	Voice Bulletins	Dy: 7:30 PM, 10:30 PM
PDT	Slow Code Practice	MWF: 6 AM, 4 PM; TThSSn: 1 PM; 7 PM
	Fast Code Practice	MWF: 1 PM, 7 PM; TTh: 6 AM; TThSSn: 4 PM
	CW Bulletins	Dy: 2 PM, 5 PM, 8 PM; MTWThF: 7 AM
	Teleprinter Bulletins	Dy: 3 PM, 6 PM, 9 PM; MTWThF: 8 AM
	Voice Bulletins	Dy: 6:30 PM, 9:30 PM

Code practice, Qualifying Run and CW bulletin frequencies: 1.818, 3.58, 7.08, 14.07, 21.08, 28.08, 50.08, 147.555 MHz.

Teleprinter bulletin frequencies: 3.625, 7.095, 14.095, 21.095, 28.095, 147.555 MHz.
Voice bulletin frequencies: 1.89, 3.99, 7.29, 14.29, 21.39, 28.59, 50.19, 147.555 MHz.

Slow code practice is at 5, 7½, 10, 13 and 15 WPM.
Fast code practice is at 35, 30, 25, 20, 15, 13 and 10 WPM.

On Monday, Wednesday and Friday, 1300 through 2100 UTC, transmissions are beamed to Europe on 14, 21 and 28 MHz; on Wednesday at 2200 UTC they are beamed south.

Code practice texts are from *QST*, and the source of each practice is given at the beginning of each practice and at the beginning of alternate speeds. For example, "Text is from February 1987 *QST*, pages 9 and 85" indicates that the main text is from the article on page 9 and the mixed number/letter groups at the end of each speed are from the contest scores on page 85.

On Fridays, UTC, a DX bulletin replaces the regular bulletin transmissions.

On Tuesdays and Saturdays at 2230 UTC, Keplerian Elements for active amateur satellites will be sent on 45.45-baud Baudot on the regular teleprinter frequencies. The next date for transmission will be given in regular satellite bulletins

Teleprinter bulletins are 45.45-baud Baudot, 110-baud ASCII and 100-baud AMTOR, FEC mode. Baudot, ASCII and AMTOR (in that order) are sent during all 1500 UTC transmissions, and 2200 UTC on TWThF8Sn. During other transmission times, AMTOR is sent only as time permits.

CW bulletins are sent at 18 WPM.

W1AW is open for visitors Monday through Friday from 8 AM to 1 AM EDT and on Saturday and Sunday from 3:30 PM to 1 AM EDT. If you desire to operate W1AW, be sure to bring a copy of your license with you. W1AW is available for operation by visitors between 1 and 4 PM Monday through Friday.

In a communications emergency, monitor W1AW for special bulletins as follows: voice on the hour, teleprinter at 15 minutes past the hour, and CW on the half hour.

W1AW will be closed on April 17, May 25, July 3 and 4, and September 7.

FCC's NPRM Concerning the 220-MHz Band

The FCC's NPRM in General Docket No. 87-14 is reproduced here in its entirety, exactly as it was released by the FCC Feb 12, 1987. This month's It Seems to Us, beginning on page 9, discusses its ramifications and the League's response.

Before the
FEDERAL COMMUNICATIONS
COMMISSION
Washington, D.C. 20554

General Docket No. 87-14

In the Matter of

Amendment of Part 2	
of the Commission's Rules	RM-4829
Regarding the Allocation of	RM-4831
the 216-225 MHz Band	RM-4983

NOTICE OF PROPOSED RULE MAKING

Adopted: February 2, 1987 Released: February 12, 1987

By the Commission:

INTRODUCTION

1. By this action the Commission proposes to: 1) maintain the existing 216-220 MHz band allocation; 2) allocate the 220-222 MHz band on a exclusive basis to the land mobile service for both government and nongovernment operations; and, 3) allocate the 222-225 MHz band on a exclusive basis to the amateur service. This proceeding addresses only the allocation of this spectrum. A subsequent proceeding will address the necessary service rules for the new allocations that may result from this proceeding.

BACKGROUND

Planning Activities

2. Prior to the 1979 World Administrative Radio Conference (1979 WARC), the 216-225 MHz band was allocated on a primary basis to the government radiolocation service. There were secondary allocations in the 216-220 MHz portion of the band for the aeronautical mobile, fixed and land mobile services for telemetry operations; and, there was a secondary allocation in the 220-225 MHz portion for the amateur service. During the preparation for the 1979 WARC, it was determined that the 216-225 MHz band was not sufficient to meet future United States radiolocation requirements.[1] Therefore, this band was considered a candidate for reallocation for other purposes. At about the same time, a requirement for maritime mobile public correspondence was identified that could be accommodated in this band. Accordingly, the United States proposed at the 1979 WARC that the entire 216-225 MHz band be reallocated internationally to the maritime mobile service. That proposal was not adopted in its entirety. However, the 1979 WARC did allocate the 216-220 MHz portion to the maritime mobile service along with the fixed service on a primary basis and allocated the 220-225 MHz portion to the mobile service along with the fixed and amateur services on a primary basis. The 1979 WARC also provided for phasing-out the radiolocation service.[2]

3. Shortly after the 1979 WARC the Commission allocated the 216-220 MHz band to the maritime mobile service on a primary basis for the inland waterways communication system.[3] Secondary allocations in the 216-220 MHz band were retained for the aeronautical mobile, fixed and land mobile services for telemetry operations. Subsequently, the Commission reallocated the 220-225 MHz band to the amateur, fixed and mobile services on a coequal primary basis for nongovernment services.[4] The National Telecommunications and Information Administration (NTIA), in implementing the 1979 WARC results into the government table of frequency allocations, allocated the 220-225 MHz band on a coequal primary basis to the fixed and mobile services. However, NTIA and the FCC agreed that operations in the fixed and mobile services in the 220-225 MHz band would not be initiated until an allocations plan was developed for sharing the band by government and nongovernment users.[5] Later, an FCC/NTIA planning group recommended that a portion of the 216-225 MHz band be designated for narrowband land mobile operations on a shared basis between government and nongovernment users.[6]

Petitions for Rulemaking

4. The Commission also has received three petitions for rule making addressing allocations in the 216-225 MHz band. These were submitted by Land Mobile Communications Council (LMCC), Sideband Technology, Inc. (STI) and LAOAD Radio and Microwave Communications Consultants (LAOAD).[7,8] The petitioners requested that a portion of the 216-225 MHz band be allocated to the land mobile service for narrowband voice operations (5 kHz channels). The petitioners argued that an additional land mobile allocation is needed to help meet the private land mobile spectrum requirements through the year 2000. They stated that current narrowband equipment designed to operate in the 150 MHz land mobile band could be easily modified to operate in the 220 MHz band. Further, they asserted that since transmission characteristics at 220 MHz are similar to those in the 150 MHz band, the 220 MHz band would be attractive to users who otherwise would be seeking channels at 150 MHz. They argued that the 220 MHz band would be a good place to implement 5 kHz channel land mobile operations, due to the light loading of the band and because a channelization plan would not have to work around existing FM channels.[9] LAOAD further requested a primary allocation to the fixed service in the 216-220 MHz band for narrowband voice and telemetry operations (5 kHz and 2.5 kHz channels respectively). LAOAD argued that there is a growing need for telemetry channels, noting particularly oil, gas and utility companies that need to monitor and control many remote stations from a single location.

5. In response to the petitions, there was strong support from the land mobile community for an allocation for land mobile; however, there was only modest support for a fixed allocation. There was strong opposition from existing maritime mobile and telemetry users operating in the 216-220 MHz band and amateurs operating in the 220-225 MHz band. These existing users claimed that these bands are needed to meet their own respective spectrum requirements. Further, broadcast interests were concerned about potential interference to the reception of TV channel 13 operations in adjacent spectrum at 210-216 MHz.

DISCUSSION

6. Based on our analysis and the comments submitted in response to the petitions, we believe that the present allocations in the 216-220 MHz portion of the band are appropriate and should be maintained. Accordingly, we are not proposing any allocation changes to this portion of the spectrum. With regard to the 220-225 MHz portion of the band, we are persuaded that this band is presently underutilized and that the land mobile service has needs that can be met in this region of the spectrum.[10] The propagation characteristics of this band make it useful for land mobile operations. Further, a land mobile allocation in this region of the spectrum would provide an opportunity for further development of narrowband technologies. Therefore, we are proposing a 2 megahertz allocation to the land mobile service in the 220-222 MHz portion of the band.[11] The remaining 3 megahertz, 222-225 MHz, is proposed to be made an exclusive allocation for the amateur service. These matters are discussed below.

216-220 MHz Band

7. The 216-220 MHz band is currently assigned to the maritime mobile service on a primary basis. Telemetry operations in the aeronautical mobile, fixed and land mobile services are permitted on a secondary basis.[12] We are not proposing any changes to this allocation.

8. We believe it would be premature to permit additional services in the 216-220 MHz band before the inland waterways communication system in this band has had a chance to develop as planned. It is also our belief that the geographical limitations on land mobile operations at 216-220 MHz necessary to protect broadcast TV channel 13 operations would be so restrictive that an allocation in this portion of the spectrum would provide little relief for land mobile. This would be especially the case in the major cities where land mobile demand is greatest.[13] Further, there is no international land mobile allocation in this portion of the band, so domestic land mobile operations would be secondary to operations of other countries that are operating in accordance with the international Table of Frequency Allocations. This might greatly restrict domestic land mobile operations near the borders. For these reasons we do not believe it is in the public interest to propose a primary land mobile allocation below 220 MHz.

9. We believe that the needs of the fixed services can be satisfied within the present secondary allocation in the 216-220 MHz band. We reject LAOAD's request to upgrade the secondary fixed allocation to primary. At this time, we are reluctant to take any action that might restrain the development of the inland waterways communication system. LAOAD's request that narrowband voice operations be permitted in the fixed service may be more appropriately addressed in a separate proceeding dealing with service rules for this band.

220-225 MHz Band

10. The 220-225 MHz band, which is allocated to the amateur, fixed, mobile and radiolocation services, is currently utilized only by the amateur and radiolocation services as noted above. The amateur usage is mainly for base/mobile repeater operations, along with some special operations.[14] The Commission is cognizant of the services performed by the amateur community in this band and the other amateur bands. We are also aware of the investment by the amateur community in equipment in this band. However, the loading of this band is light in comparison with the 144-148 MHz amateur band, which supports similar operations. The 144-148 MHz band supports over six times as many repeater operations (repeaters/MHz) as the 220-225 MHz band.[15]

11. The majority of the amateur operations in the 220-225 MHz band are base/mobile repeater operations and are located in the 222-225 MHz portion of the band. Accordingly, we believe that reallocating 2 megahertz, 220-222 MHz, to the land mobile service, would have minimal impact on current amateur operations and would provide much-needed spectrum for land mobile operations. Further, in view of the current light loading of the 220-225 MHz band, and the availability of other amateur bands, it appears that the future needs of the amateur service will continue to be satisfied. We anticipate that this proposed action will have little economic impact on amateur operators since amateur equipment operating in the 220-222 MHz band could be modified at minimal expense to operate in the 222-225 MHz portion of the band.

12. With regard to a fixed service allocation in the 220-225 MHz band, we believe the needs of the land mobile and amateur services, as addressed above, outweigh those of the fixed service. Furthermore, fixed services can be accommodated in higher frequency bands, whereas land mobile use is best suited to frequencies below 1 GHz. Therefore, we are also proposing to delete the unimplemented fixed allocation in the 220-225 MHz band. In the 222-225 MHz band, we are also proposing to delete the unimplemented mobile allocation. This will provide the amateur service with an exclusive allocation in the 222-225 MHz band after January 1, 1990.[16]

PROPOSAL

13. In summary, we are proposing to reallocate the 216-225 MHz band as follows: (1) maintain the primary maritime mobile allocation in the 216-220 MHz band; (2) maintain the secondary aeronautical mobile, fixed and land mobile allocations in the 216-220 MHz band for telemetry operations only; (3) reallocate the 220-222 MHz band on a primary basis to the land mobile service for both government and nongovernment operations and delete the existing primary allocations to the amateur, fixed and mobile services; and (4) maintain the primary amateur allocation in the 222-225 MHz band and delete the existing primary allocations to the fixed and mobile services. The primary allocation to the radiolocation service for government operations in the 216-225 MHz band would be maintained until 1990, when radiolocation would become secondary except for one Navy radar system. Specific operating rules for the land mobile service at 220-222 MHz would be developed in a further proceeding.

REGULATORY FLEXIBILITY ANALYSIS

14. Pursuant to the Regulatory Flexibility Act of 1980, the Commission finds as follows:

I. Reason for Action

This proposal would reallocate the 216-225 MHz band. It responds to an unresolved issue of General Docket 80-739, Implementation of the 1979 World Administrative Radio Conference, which left the allocation of this band open until a separate proceeding could address all of the issues involved; it responds as well to three petitions for reallocation received by the Commission.

II. Objective:

The Commission is advancing this proposal to resolve the allocation issues of the 216-225 MHz band.

III. Legal Basis:

The proposed action is authorized under Sections 4(i) and 303(r) of the Communications Act of 1934, as amended, which authorizes the Commission to make such rules and regulations as may be necessary to improve the efficiency of spectrum use.

IV. Description, Potential Impact and Number of Small Entities Affected:

This proposal will help satisfy radio needs of private land mobile radio services as well as increase market opportunities for radio manufacturers, some of which may be small businesses. Beyond this, we are unable to quantify the potential effects on small entities. We, therefore, invite specific comments on this point by interested parties.

V. Reporting, Recordkeeping and other Compliance Requirements:

No new requirement will be imposed upon the Commission's licensees.

VI. Federal Rules which Overlap, Duplicate or Conflict with this Rule:

None.

VII. Significant Alternatives

There are no significant alternatives which would accomplish our stated objective of allocating the 216-225 MHz band.

15. IT IS ORDERED that the Secretary shall serve a copy of this *Notice* on the Small Business Administration.

16. The proposals contained herein have been analyzed with respect to the Paperwork Reduction Act of 1980 and found not to propose a new or modified information collection requirement on the public. Implementation of any new or modified requirement will be subject to approval by the Office of Management and Budget as prescribed by the Act.

17. For purposes of this non-restricted notice and comment rule making, members of the public are advised that *ex parte* contacts are permitted from the time the Commission adopts a notice of proposed rule making until the time a public notice is issued stating that a substantive disposition of the matter is to be considered at a forthcoming meeting or until a final order disposing of the matter is adopted by the Commission, whichever is earlier. In general, an *ex parte* presentation is any written or oral communication (other than formal written comments/pleadings and formal oral arguments) between a person outside the Commission and a Commissioner or a member of the Commission's staff which addresses the merits of the proceeding. Any person who submits a written *ex parte* presentation must serve a copy of the presentation on the Commission's Secretary for inclusion in the public file. Any person who makes an oral *ex parte* presentation addressing matters not fully covered in any previously filed written comments for the proceeding must prepare a written summary of that presentation; on the day of oral presentation, that written summary must be served on the Commission's Secretary for inclusion in the public file, with a copy to the Commission official receiving the oral presentation. Each *ex parte* presentation described above must also state by docket number the proceeding to which it relates. See generally, Section 1.1231 of the Commission's Rules, 47 C.F.R. 1.1231.

18. This action is taken pursuant to Sections 4(i), and 303(r), of the Communications Act of 1934, as amended. Interested persons may file comments on this proposal on or before April 6, 1987, and reply comments on or before April 21, 1987. All relevant and timely comments filed in accordance with Sections 1.415 and 1.419 of our rules and regulations (47 C.F.R. 1.415 and 1.419)

will be considered by the Commission before final action is taken in this proceeding. In reaching its decision, the Commission may take into consideration information and ideas not contained in the comments, provided that such information is placed in the public file, and provided that the Commission's reliance on such information is noted in its final decision.

19. In accordance with the provisions of Section 1.419 of the Rules and Regulations, 47 C.F.R. 1.419, formal participants shall file an original and five copies of their comments and other material. Participants wishing each Commissioner to have a personal copy of their comments should file an original and eleven copies. Members of the general public who wish may express their comments without regard to form (as long as the docket number is clearly stated in the heading). All documents will be available for public inspection during regular business hours in the Commission's Public Reference Room at its headquarters in Washington, D.C.

20. For further information concerning this rule making contact Mr. Fred Thomas at (202) 653-8112, Office of Engineering and Technology, Federal Communications Commission, Washington, D.C. 20554.

PROPOSED RULE CHANGES

Part 2 of Chapter 1 of Title 47 of the Code of Federal Regulations is proposed to be amended as follows:

The authority citations in Part 2 continues to read:

Authority: Secs. 4, 303, 48 Stat. 1066, 1082 as amended; 47 U.S.C. 154, 303. Part 2 - Frequency Allocations and Radio Treaty Matters; General Rules and Regulations.

Section 2.106 is amended by modifying the 216-225 MHz band as follows:

Sec. 2.106 Table of Frequency Allocations

UNITED STATES TABLE		FCC USE DESIGNATORS	
GOVERNMENT	NON-GOVERNMENT		
ALLOCATION MHz	ALLOCATION MHz	RULE PARTS(s)	SPECIAL-USE FREQUENCIES
(4)	(5)	(6)	(7)
***	***	***	***
216-220	216-220		
MARITIME MOBILE	MARITIME MOBILE	MARITIME (81 & 83)	
Aeronautical Mobile	Aeronautical Mobile	Private Land	
Fixed	Fixed	Mobile (90)	
Radiolocation 627	Land Mobile 627		
US210, US229 US274, G2	US210, US229 US274, NG121		
220-222	220-222		
LAND MOBILE	LAND MOBILE	PRIVATE LAND	
Radiolocation 627		MOBILE (90)	
US243, G2	627, US243		
222-225	222-225		
Radiolocation 627	AMATEUR	AMATEUR (97)	
US243, G2	627, US243		

FEDERAL COMMUNICATIONS COMMISSION

William J. Tricarico,
Secretary

FOOTNOTES

[1]An exception was made for the Navy SPASUR radar system operating in the southern United States in the 216.88-217.88 MHz band. This system tracks rocket and missile trajectories.

[2]The phase-out of radiolocation was handled by implementing the provisions of Footnotes 627 and US243 in the United States. Footnote 627 to the international Table of Frequency Allocations states that the band 216-225 MHz is allocated to the radiolocation service on a primary basis until 1 January 1990. On and after 1 January 1990 no new stations in that service may continue to operate on a secondary basis. Footnote US243 to the domestic Table of Frequency Allocations states that in the 220-225 MHz band stations in the radiolocation service have priority until 1 January 1990.

[3]*See Report and Order* in General Docket No. 80-1, 46 Fed. Reg. 15690 (March 9, 1981).

[4]*See Report and Order* in General Docket No. 80-379, 49 Fed. Reg. 2358 (January 19, 1984).

[5]*See id.*, at Paras. 30 and 31.

[6]Among the information considered by the FCC/NTIA planning group was the NTIA report, *Spectrum Resource Assessment in the 216-225 MHz Band* (NTIA Report 81-85, September 1981).

[7]*See:* (1) *Petition for Rule Making* filed by Land Mobile Communications Council, RM-4829 (June 1984), requesting amendment of Parts 2, 22 and 90 of the rules and regulations to make available additional frequency assignments in the land mobile radio services; (2) *Petition for Rule Making*, filed by Sideband Technology, Inc., RM-4831 (July 1984), requesting reallocation of 6 MHz at 216-222 MHz to the private land mobile radio services for narrowband systems using 5 kHz channelling; and (3) *Petition for Rule Making* filed by LAOAD Radio and Microwave Communications Consultants, RM-4983 (March 1985), requesting a reallocation of 4 MHz at 216-220 MHz to the private land mobile radio services for narrowband voice and low speed data communications systems.

[8]The Commission has also recently received two additional petitions pertaining to the 216-225 MHz band. The Association of Radio Reading Services (ARRS) submitted a petition, RM-5434, requesting the Commission to allocate 500 kHz on a nationwide basis from the 220-225 MHz band to provide spectrum for radio reading services for the print handicapped. This petition has been denied in a companion Memorandum Opinion and Order adopted by the Commission on January 30, 1987, FCC 87-41. Another petition, filed by Cubic Communications, Inc. (Cubic), requests the Commission to allocate the 216.0125-219.9875 MHz band to the fixed service for voice and telemetry operations on narrowband channels. Because the Cubic request is essentially the same as that by LAOAD in its petition, we did not put the Cubic petition on public notice; however, the substance of Cubic's request is covered herein.

[9]The Commission has provided for narrowband operation in the 150-174 MHz private land mobile band. *See Report and Order* in PR Docket No. 84-279, FCC 85-96, 50 Fed. Reg. 13596 (April 5, 1985). In a letter dated November 10, 1986, which has been inserted in the record, STI contended that it has proven difficult to obtain widespread usage of narrowband equipment in the 150-174 MHz band due to existing heavy use by licensees using conventional equipment (i.e., 30 kHz channels) and technical constraints in the rules. We note, however, that other factors may be involved. For instance, narrowband equipment carries a price premium of about 25% over conventional equipment.

[10]For further information on land mobile's needs for additional spectrum, *See: Future Private Land Mobile Telecommunications Requirements:* Final Report, Planning Staff, Private Radio Bureau, FCC, Washington, D.C., August 1983; *Report and Order* in General Docket Nos. 84-1231, 84-1233, and 84-1234, 51 Fed. Reg. 37398 (October 22, 1986); and the *Notice of Proposed Rule* Making in General Docket No. 85-172, 50 Fed. Reg. 25587 (June 20, 1985), proposing further sharing of the UHF television band by private land mobile radio services.

[11]An allocation of 2 megahertz to the land mobile service with channels of 5 kHz bandwidth would provide 200 channel pairs. Spectrum-efficient technologies that use alternative bandwidths may also be considered.

[12]Service rules for the secondary land mobile allocation have been developed but service rules have not been developed for secondary fixed and aeronautical telemetry operations.

[13]While a number of commenters discussed the issue of interference to TV channel 13 from land mobile service in the 216-220 MHz band, none provided any technical analysis showing how this band may be used by land mobile for base/mobile operations on a primary basis without causing interference to broadcast operations. LAOAD stated in its comments that it will be performing some field tests on this issue and will provide the data and its findings from the tests for the public record. Land mobile operation currently exists in a number of frequency bands that are adjacent to TV broadcast channels. In order to avoid interference to TV broadcasting, land mobile operations are subject to compliance with technical standards and operational constraints in the FCC Rules. These vary according to the bands involved. We make no finding here as to what standards may be appropriate if we were to permit land mobile operation in the 216-220 MHz band. However, because TV channel 13 is used

widely throughout the country, it appears that the necessary interference protection criteria and operational constraints would restrict the usefulness of the 216-220 MHz band for land mobile service.

[14]In addition to base/mobile repeater operations this band is used for remote control and experimental operations such as packet radio and moon bounce communications.

[15]*See: the Repeater Directory* 1985-86 edition published by the American Radio Relay League. Repeater stations are not licensed separately and the Commission has no independent listing of repeater operations. Therefore, the *Repeater Directory* is the Commission's best source of information regarding loading in the amateur repeater bands. Nevertheless, we believe this to be an accurate representation of repeater operations since repeaters not listed in the *Repeater Directory* have no status in the coordination of new operations. As additional evidence of light loading in the 220-225 MHz band, we note that ARRL filed a petition, RM-5038, which requested that the 220 MHz band, among others, be made available for Novice operator licensees. ARRL made the request in part because of the "relative absence of General, Advanced and Extra class operations on those frequencies..." *See* Petition for Rule Making, RM-5038, at 8. *See* also *Notice of Proposed Rule Making* in PR Docket No. 86-161. In the Matter of Amendment of the Amateur Rules to expand Privileges to Novice Operators, 51 Fed. Reg. 17074 (May 8, 1986).

[16]Supra, n. 2.

Amateurs Respond

In reference to the FCC proposal to take 220-222 MHz away from the amateur service—Docket 87-14—do you have any suggestions on how to oppose this issue? *(W1MEG).* I feel the best way to combat this thing is to BE INFORMED—and send SPECIFIC comments to the FCC *(K9PS).* POW!—220-222 MHz is lost—or is it? I've got lots invested there—8 big 220 earth-moon-earth antennas—kw transmitter & 44 states. I'm looking for the last six, for my 11th single-band WAS! The local packet guys are active there too, from 220.5 to 222 MHz *(W1JR).* I should like to bring before the Commission some points of information not contained in the NPRM of the subject General Docket. First, the "special operations" (as mentioned in Paragraph 10, "The 220- 225 MHz Band") of amateur licensees on the band include earth-moon-earth ("moonbounce"), tropospheric scatter, meteor scatter, auroral scatter, F.A.I. (field-aligned irregularity) and "Sporadic-E"; the majority of this fascinating work is performed using controlled-bandwidth telegraphy and single-sideband suppressed-carrier (A1 and A3J) transmissions. As such, we must encourage further experimentation to advance scientific research in propagation phenomena. I, for one, have thousands of dollars invested in amateur equipment built for the pursuit of weak-signal mode communications in the 220-225 MHz amateur band. While this equipment can be modified for operations in the 222-225 MHz band, I do not believe the opportunities for weak-signal mode communications will exist in this narrower allocation. Here in the densely populated New York City metropolitan area, amateur repeaters dominate the 222-225 MHz subband and these stations are in frequent use during those periods I am able to operate. I have already attempted to receive weak signals (−143 dBm and below) in between the local repeater stations, to no avail. It is imperative that their operations be spaced in frequency as far away from the wider bandwidth users as possible. If the weak-signal and lunar communications technologists are forced to operate in the 222-225 MHz subband, their high-powered (1.5 kW PEP output, often fed to +23 dB antenna systems, resulting in 300 kW e.r.p. or greater) operations will assuredly create havoc with the amateur fixed and mobile operators sharing the same narrow segment of the spectrum *(WB2WIK).* One cannot base activity level estimates for 220 MHz on reference only to repeater operations therein. Weak signal operations (moonbounce, tropospherics, meteor scatter, etc.) using CW and SSB on 220 paved the way for knowledge of this portion of the spectrum, and they still take place here. Packet radio operators have constructed long distance information transfer systems that operate in the frequency range that NPRM 87-14 would take away. Repeater, beacon, and other types of automatic station functions operate remote control links in this range. All these experimental modes of operation are a critical part of amateur radio. In the past five years, the number of active stations have increased fourfold, making CW and SSB operations on 220 the fastest growing amateur allocation of all. Does this sound like an underutilized band? *(WB2IEY).* The Southern California Repeater and Remote Base Association will be assembling data for ARRL's use. I think you pretty well understand our situation out here; both 220 MHz and the 420 MHz band are extremely occupied. If we lose the bottom 2 MHz of 220, which sub-band contains many control and auxiliary links for repeaters and remote base stations, it is a certainty that we do not have available spectrum on 420 MHz to accommodate these displaced operations. That would push these activities up to 902 MHz, at a minimum, and probably further to 1260 MHz. Here not only is the technology more difficult, but propagation conditions will greatly shorten operating ranges. In other words, this heavily utilized 2 MHz portion of our 1-1/4 meter band cannot easily be replaced, at least here in southern California *(WA6LBV).* 220-222 MHz has become more important to the Amateur Radio Service with the recent Novice Enhancement ruling by the Commission. The expected proliferation of repeaters and wideband FM communications above 222 MHz will leave insufficient spectrum space above 222 MHz for serious weak signal, narrowband communications. Placing the Land-Mobile Service in this portion of the spectrum will likely have severe negative impact in cities with Channel 13 Television (216 MHz). Also, the second harmonic of this proposed frequency would fall in the Amateur 70 cm band where there are many repeaters. The potential for TVI/RFI from signal mixing and intermodulation is great, opening the door for serious consumer complaints. 2 MHz is not sufficient space for the Land-Mobile Service to expand and total saturation would occur immediately *(KC4EG).* Amateurs here in the Texas Panhandle are very concerned about the FCC wanting to take away part of our 220 MHz band for the land mobile service, as heard in the ARRL bulletin today. I am Emergency Coordinator for Potter and Randall counties and was asked by amateurs here to express their concerns about this matter to ARRL HQ. With the wide range of new 220 MHz portable and mobile radios commercially available, radio amateurs here feel that the new Novice and Technician license enhancements will cause the 220 MHz amateur segment to become very active here and elsewhere *(KA5PTG).* In Los Angeles, and surely many other areas, the bottom of 220 is very busy but very little is on the record. There are numerous remote bases, repeaters, crosslinks, control channels and simplex phone patches. The owners of these systems have invested thousands of dollars in some of these systems. Some crosslinks provide interconnection between two or more repeaters, providing "HT" coverage for hundreds of miles and into remote areas. I, for one, control my 440 and 146 repeaters in this band on two channels. Many of us with these systems do not want the information published. The League should act as a clearing house, and gather information to prove that the band is being used. *(WB6AAM).* The 2 MHz space proposed for the Land Mobile Service will not be adequate as a 1 MHz split for repeaters is not practical for technical reasons. Also TV channel 13 will cause multiple problems on 220 to 222 MHz *(KB3KK).* There is the potential for economic loss on the part of Amateurs, and the manufacturers of their equipment. Allocation of the land mobile service in the 220-222 MHz portion may impose: a) modification of equipment to prevent illegal (out-of-band) operations, b) modification of existing site equipment to resolve near-band interference problems, c) inability to sell/buy/use existing equipment stocks, d) technical requirements above and beyond those already practiced in the Amateur Services, e) potential fault-finding against the Amateur Service for interference to land mobile operations, f) potential mis-use of existing Amateur equipment in the land mobile portion, or out-of-band operations of land mobile equipment impacting the Amateur Services *(WB9GVF).* Packet use is doubling every 5 months, and high speed intercity links are now in use, with many more being built on 220.55,.65,.75,.85, and 95. No other band is satisfactory for this purpose *(W3WCQ).*

Conducted By Paula McKnight, N1DNB
Editorial Assistant, ARRL

Roy Neal, K6DUE: All the News that Dits

"My favorite subject? Ham radio and the role it has played in my life," states Roy Neal, K6DUE, recently retired NBC News Correspondent and Deputy Bureau Chief, NBC News Operations, West.

Roy started hamming at age 13, as W3GIB in Wayne, Pennsylvania. He began his broadcasting career seven years later as Chief Announcer and News Editor at WIBG-AM. World War II brought a change of scenery, but not a change in career. Roy served in Europe as Program Manager for Armed Forces Radio.

Upon returning stateside, Roy continued in radio broadcasting, later striking off into the then-new world of television in 1946. In 1952, he started working for NBC News and moved to California, where he received his present call sign. After the birth of NASA in 1958, he became NBC's leading expert on space coverage and was present at each of the US major space launches.

It was only natural that Roy would blend ham radio with his media expertise. He acted as executive producer, writer, narrator and/or host for five (soon to be six) videos on Amateur Radio: Moving Up to Amateur Radio, The World of Amateur Radio, Amateur Radio's Newest Frontier—Preflight, Amateur Radio's Newest Frontier—Postflight, SAREX—The Shuttle Amateur Radio Experiment *and* The New World of Amateur Radio *(currently in production).*

In acknowledgment of his achievements in promoting ham radio via these films and of his key role in initiating the Manned Amateur in Space Program (Owen Garriott, W5LFL and Tony England, WØORE), Roy was named 1986 Radio Amateur of the Year by the Dayton Amateur Radio Association.

Also in 1986, Roy retired from his news correspondent position with NBC, remaining as a consultant. He hasn't strayed too far out of camera range, however. Roy is now owner and president of Talent Connections, producing tapes, mainly for television. We'll find out more about his current video project featuring Amateur Radio in this interview.

At work—Roy Neal, K6DUE (left), with cameraman Gary Eldridge, KC8UD, at Cape Canaveral, taping footage for *Amateur Radio's Newest Frontier. . .*

. . .or at home—ham radio is a "primetime activity" for K6DUE. Roy, an Advanced class ham, enjoys 220-MHz and 2-meter ragchews, and 10, 15 and 20-meter SSB contacts.

Roy, did Amateur Radio have any influence on your career?

My career has been on the production, not the engineering, side of the broadcasting house so Amateur Radio has not influenced career decisions. In practice, however, I have used my radio knowledge to advance the state-of-the-art of broadcasting by using ham transceivers to provide downrange coverage of early space flights and supervising the emergency-communications set-ups for NBC News in many applications.

What is the most memorable news story you've covered?

My most memorable story probably was Apollo 13. I was the pool correspondent at launch and mission control. It was the first time NASA permitted such coverage, and it also turned out to be one of the most dramatic rescue stories of all time, when the space ship blew out a service module while flying around the moon. I was on the air continuously for 36 hours, reporting from Houston, as the flight controllers and directors worked out the systems that brought the three-man crew safely back to earth. And it was a story with a happy ending for three of my friends—the crew.

You've always taken a great interest in the space program. What attracts you to space communications?

The attraction of space communications is that I believe our future, as hams, is in space. When AMSAT has a couple of geosynchronous satellites in orbit, so we can use hand-helds and repeaters through repeaters in space that don't require tracking, then ham radio will begin moving into new and exciting adventures similar to those we experienced while pioneering earlier techniques of communication.

What's your educated guess on the possibility of another Ham in Space operation?

It isn't just a guess, I *know* there will be future ham operations in space. It's only a question of timing. The space administration knows and trusts us and has come to realize that our operations bring big returns at no cost to the government. So the plan now is to present a formal request for proposal to put an amateur station aboard the manned space station. In preparation, we also propose putting gear on board space shuttles, once they're back in operation. With a first flight now scheduled in 1988, my guess would be that we can look forward to resumption of our activity in 1989 or 1990.

Is there anything more you'd like to accomplish?

I'm currently starting production on a major tape for ARRL, *The New World of Amateur Radio.* With luck, it will open a new avenue of travel for industry and operators as we move into the age of space and advanced communications. Specifically, I hope to still be around, taking an active role, when ham radio starts regular broadcasts with video and audio going to schools from a permanent station aboard the manned space station in the 1990s.

***Can you give us some details—general plot, cast of characters, expected date of release, etc—of* The New World of Amateur Radio?**

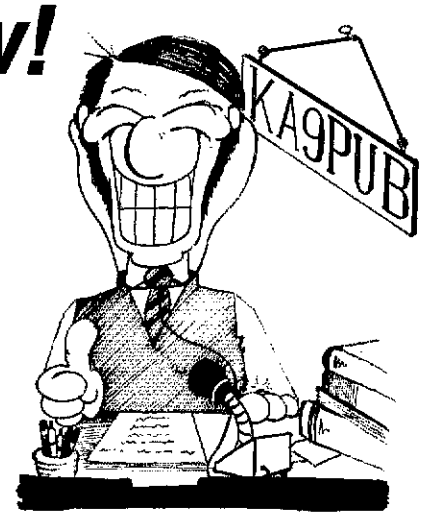
It is a videotape sponsored by the ARRL, with additional support from ICOM, Kenwood and Yaesu. I'll be Executive Producer and will anchor the production. "Frosty" Oden, N6ENV, will produce and edit. Bill Pasternak, WA6ITF, will be Technical Supervisor and will field-produce some segments. We hope to unveil it this fall.

We plan to use a magazine format, like TV's *60 Minutes* or *20/20,* with chapters that will deal with the many facets of ham radio. The chapters will cover such things as our history, our great variety of operators, the small world we live in, where DX is the guy or gal next door. We plan to devote time to state-of-the-art techniques, including packet and space-age adventure, and to how we handle emergencies for the public.

Different narrators will join in the telling. Jean Shepherd, K2ORS, will handle an essay on the shapes and sizes of our operators; Tony England, WØORE, the astronaut, will cover space communications; and Alan Kaul, JY9RL, will report DX from his station in Jordan. We look for sequences from the RSGB, JARL and other foreign ham organizations.

Above all, we hope to stress the excitement and adventure of Amateur Radio as we experience it. And in the telling, we hope to make it exciting enough to attract new hams to the Service. There will be an emphasis on younger members of the fraternity and on what's being done in schools to create new members.

Novice Enhancement: New Test Procedures Start *Now!*



Candidates for Novice, Technician and General class exams get new test procedures *starting Friday evening, March 20.* Here's a survival kit for candidates, instructors and Elmers.

By Curt Hoisopple, K9CH
Manager, ARRL Club Services Department

Ring-ring.... ring-ring....

"Good morning, ARRL. May I help you?"

"Yes! When does Novice Enhancement become effective? What do we use for study materials? What about new tests? Do existing licensees get grandfathered? How about a new Form 610...."

The ARRL HQ's telephones have been ringing off the hooks! Members of the ARRL Board and Field Organization have been barraged with inquiries from all directions. Questions about Novice Enhancement are falling into a pattern, much like the ones above. Okay, folks, take a deep breath and read carefully. We'll try to cover all the bases.

The Changeover Is Now

The "Novice Enhancement" issue affects more than Novices—it brings new operating privileges for Novices and Techs, *and* affects test procedures even up through the General class exams. Since this all became effective on Friday afternoon/evening, March 20, 1987 (0001 UTC March 21), the changeover is *now!* The ARRL has been spreading the details via W1AW Bulletins and direct mailings to our Volunteer Examiners, Field Organization volunteers, affiliated clubs and registered instructors, plus articles in *The ARRL Letter* and *QST*. Now is the time to beat the bushes in your area to make sure everyone knows of these changes, just in case they missed the word.

Although the Federal Communications Commission adopted the new Rules regarding Novice Enhancement on January 28, the Commission didn't release the full details until February 10. (Check the Happenings column elsewhere in this issue for a complete reprint of the FCC's Report and Order.)

Two Examiners Needed for Novices

With increased privileges goes increased responsibility and accountability. In the case of Novice licensees, the new and more-desirable privileges make the Novice ticket very attractive indeed. Based on the concerns voiced by hams all over the country, the ARRL Board of Directors requested that the new Novice exam be administered by *two* examiners, rather than one.[1] While the Novice exam may be administered as a free service by any ARRL/VEC Exam Team during a regular test session, a Novice candidate is still *not required* to use the more-formal VEC system to take the Novice exam.

The two examiners administering a Novice exam must *both* meet the traditional Novice-examiner criteria. Each examiner must:

- hold a current General, Advanced or Amateur Extra Class operator license issued by the Federal Communications Commission;
- be at least 18 years of age;
- not be a member of the candidate's immediate family; and
- not derive income from Amateur Radio-related commerce.

What Questions Will the New Tests Use?

The new Novice Element 2 question pool provides coverage of the expanded Novice operating privileges. A healthy portion of the new questions cover operating procedures and safety precautions with VHF/UHF radio energy. (Operator safety is the prime reason behind restricting Novice power output to 25 watts on 222 MHz and 5 watts on 1270 MHz.)

The ARRL/VEC staff has issued copies of a new Element 2 Novice pool to all Volunteer Examiner Coordinators and publishers of Amateur Radio study guides. The ARRL now has a supplement to its Novice study guide, *Tune in the World with Ham Radio*, that includes the revised Novice pool and other necessary information for instructors and examiners. If you need this supplement, see the "Update Information" sidebar elsewhere in this article.

A healthy portion of the new questions covers operating procedures and safety precautions....

Before March 21, 1987, both Techs and Generals shared the same 50-question Element 3 examination. Beginning March 21, however, the existing Tech/General question pool was divided into two pools. Questions for Technicians form the new Element 3A pool, while General class-related questions are now in Element 3B. Remember, though, that both sets of questions are the same ones that have been in use since mid-1986—they've just been sorted into two piles. A complete list of which questions now apply to the Technician exam and which apply to the General appears elsewhere in this issue.

The ARRL/VEC supplies all test materials for ARRL-affiliated Volunteer Examiner Teams. Our VE Teams who will administer tests on or after March 20 have been supplied with the appropriate new test materials. Because the new Rules were effective at 0001 UTC March 21, test sessions held March 20 (Friday evening) and after have had to be conducted in accordance with the new Rules. ARRL/VEC Teams are authorized to modify the existing Certificate of Successful Completion to grant written element credit as needed.

[1] "Novice Enhancement," *Happenings*, Sep 1986 *QST*, p 69.

SECTION II — EXAMINATION INFORMATION

SECTION II-A. To be completed only by the Volunteer Examiner administering the Novice Class Examination.

1. VOLUNTEER EXAMINER'S NAME: (First, MI, Last, Suffix) 1A	1B
2. VE'S MAILING ADDRESS: (Number, Street, City, State, ZIP Code) 2A	2B
3. VE'S OPERATOR CLASS: 3A ☐ GENERAL ☐ ADVANCED ☐ AMATEUR EXTRA 3B ☐ GENERAL ☐ ADVANCED ☐ AMATEUR EXTRA	4. VE'S STATION CALL SIGN 4A 4B
5. LICENSE EXPIRATION DATE: 5A 5B	6. IF YOU HAVE AN APPLICATION PENDING FOR YOUR LICENSE, GIVE FILING DATE: 6A 6B

CERTIFICATION

I CERTIFY THAT I have complied with the volunteer examiner requirements stated in Section 97.31 of the Commission's Rules; THAT I have administered to the applicant and graded an amateur radio operator examination in accordance with Sections 97.27(a), (c), 97.28(b), and 97.29 of the Commission's Rules; THAT the applicant has passed element 1(A) and element 2 or I have examined documents held by the applicant and the applicant is given telegraphy examination credit in accordance with Section 97.25 of the Commission's Rules.

7. SIGNATURE: (Must match Item 1) 7A 7B	DATE SIGNED 7A 7B

SECTION II-B. This section must be completed by all three Volunteer Examiner Team members administering an examination for the Technician, General, Advanced, or Amateur Extra Class operator license.

1A. VOLUNTEER EXAMINER'S NAME: (First, MI, Last, Suffix)	1B. VE'S STATION CALL SIGN:

Fig 1—Add the information to Section II-A on the back of the Form 610, as shown, to make room for two examiners when the candidate is seeking a Novice license. *Do not* use Section II-B for Novice exams. See text for details.

The Element 3A Technician class written exam is 25 questions long. Candidates for the General class ticket must pass the full 50 questions by taking 25 questions in Element 3A plus an additional 25 questions in General class written Element 3B. Novices and Techs both must still demonstrate code proficiency at 5 words-per-minute, and General class candidates must still be able to handle the 13-WPM code speed.

How to Give a Novice Exam

Examiners giving Novice code tests use a variety of methods to test their candidates. The most reliable way is to load a five- to six-minute message into a memory keyer or computer and play it back for the candidate. Another method is to tape record the test message. A third method is to tune in a W1AW 5-WPM code practice session and use the real on-air signal to generate the test message. Least reliable is to hand-send the code using a keyer or straight key.

Grading the code test is also up to the examiner to some extent, since FCC Rules are not completely specific. Traditionally, a passing mark is earned if the candidate can copy one minute (25 characters) solid with no errors. In the past 10 years, the FCC and most VECs have used a 10-question comprehension quiz, with a requirement that at least seven out of the 10 questions be answered correctly, letter-for-letter as sent in the message. No changes were made to the code test requirements with Novice Enhancement, although the Commission stresses that the candidate must be accountable for all 26 letters, all 10 numerals, the period, comma, question mark, and the characters $\overline{AR}$, $\overline{SK}$, $\overline{BT}$ and $\overline{DN}$.

Now, the written portion of the Novice examination must be at least 30 questions long and provide coverage of the new Novice operating privileges and related material. To assist examiners with the startup of this new procedure, we have mailed an "Instructor/Examiner Kit" to all of our ARRL-affiliated clubs and registered instructors. The package for instructors includes several ready-made Novice exams using the new 30-question test format.

If you need to give a Novice exam, and qualify as an examiner, you may contact the ARRL's Club Services Department to become a registered instructor and receive the "Instructor/Examiner Kit" free until July 1 of this year. The kit includes full instructions for administering both code and written exams, the FCC Form 610 with instructions for fitting the required information on it, and several Novice examinations valid for use on or after March 21, 1987.

What Study Guides Are Valid?

Novice candidates should use the current (sixth—1987) edition of the *Tune in the World* Novice study guide. They should also consult the ARRL's *Technician/General Class License Manual* (second edition—1986-87) for additional material about VHF/UHF propagation, and operating techniques relating to single-sideband, FM/repeater and teleprinter modes.

Update Information

With all of the late-breaking news on Novice Enhancement, we have several different information packets for you, depending on your situation.

- If you need a new Novice question pool to update your sixth edition of *Tune in the World*, ask for the *Supplement to Tune In The World.*
- If you need to know which questions are in the two new Tech/General question pools, look elsewhere in this issue of *QST* for the list.
- If you are an instructor and need some help in giving the new Novice exams, ask for the Instructor/Examiner Kit.

Contact: The American Radio Relay League, 225 Main St, Newington, CT 06111, Tel 203 666-1541

The content of the Technician- and General-class question pools remains virtually unchanged, so the ARRL's *Technician/General License Manual* will also remain stable for the rest of 1987. We will insert a table that tells the reader which questions are relevant to aspiring Technicians and which are relevant to aspiring Generals. If you already have a second edition copy of the ARRL's *Technician/General License Manual*, see the Element 3A and Element 3B Tables elsewhere in this issue.

At this point, all Volunteer Examiner Coordinators are observing a "freeze" on changes to the various test question pools

until early 1988, except where updates are necessary in the Novice pool, and the splitting of the Technician/General pool into two separate pools. Advanced and Extra Class candidates can also expect the correct answers and distractors about Novice test procedures to change accordingly. In general, though, candidates for Technician and General exams will be able to use the ARRL's *Technician/General Class License Manual* for exams during 1987.

Grandfathering—Hang on to Your Documents!

Novice Enhancement comes with a "grandfather clause." Anyone who took the "old" 20-question Novice exam prior to March 21, 1987 will automatically receive the expanded Novice operating privileges without taking additional tests. Likewise, existing Technicians will be "grandfathered" into the new 10-meter Novice privileges.

Candidates who took an Element 3 written exam for the Technician license in the few weeks prior to March 21 are in a special situation. If you took the old 50-question Element 3 written exam, but because of processing time your new Technician ticket was or will be issued *after* March 21, it will convey credit for the 25-question Element 3A exam only. Similarly, currently licensed Technicians who renew after March 21 will not be able to get full credit based on their latest license alone. Don't panic—there is a solution.

Whenever you take a test, keep a copy of your Form 610 and the *original Certificate of Successful Completion* issued by your Volunteer Examiners. Also keep all of your *original* licenses. An original Technician license or Element 3-credited *Certificate* valid before March 21, 1987 indicates credit for the full 50-question Element 3 exam, even if the certificate's one-year lifespan has expired.

Filling Out the Form 610 for Novice Candidates

The new test procedures for Novice candidates require that two examiners administer the test. Both examiners must sign the Novice candidate's FCC Form 610 application for an Amateur Radio license. Two Novice examiners must complete "Section II—Examiner Information" on the reverse side of the Form 610. Examiners for Novice candidates *must* use Section II-A, which is the upper half of the page.

If you are using an FCC Form 610 dated July 1985, divide boxes one through seven of Section II-A into two parts, relabeling Box 1 as 1A and 1B, Box 2 as 2A and 2B, and so on. One examiner should fill out all of the "A" boxes, and another examiner complete all of the "B" boxes. Don't get them crossed up, or you could cause processing delays in the FCC's Licensing Division offices at Gettysburg, Pennsylvania. Also, don't second-guess the folks at Gettysburg and try to use the space available for three accredited Volunteer Examiners down below in Section II-B. Section II-B is reserved for the examiners administering exams for Technician and above. Also, the FCC will not accept Form 610s if there is only one examiner's name for exams given after the magic date of March 21, 1987. Please do your Novice candidate a favor and be *positive* that the Form 610 is filled out completely and correctly.

Any time you send a completed Form 610 to Gettysburg, make at least two photocopies of both the front and back, and keep one copy in your records. You may later need to show that copy as evidence that the candidate passed your test. Give the candidate the other set; the FCC will accept it as element credit for the Novice candidate should he/she wish to go for higher-level testing before receiving the Novice license.

Some Notes about 220 MHz and Repeaters

We want to head off any unnecessary confusion by telling you about another FCC action that affects the 220-MHz band. [Further details appear in It Seems to Us and FM/RPT, elsewhere in this issue.—Ed.] On February 12, 1987, the FCC released a Notice of Proposed Rule Making (General Docket 87-14) that proposes to allocate 220 to 222 MHz exclusively to the Land Mobile Service and 222 to 225 MHz exclusively to the Amateur Radio Service. While we will not discuss here the merits or problems associated with this proposed rulemaking, we must note that the proposed loss of 220-222 MHz from the ham bands does *not* affect the new Novice allocation! The complete text of the 220-MHz NPRM appears elsewhere in this issue.

Many callers have expressed concern that the Novice allocation includes only the input frequencies, but not the repeater outputs. Novices are authorized to *transmit* only in the 222.1-223.91 MHz subband, but they can listen anywhere they want. Therefore, they can legally operate a hand-held or base/mobile radio that follows the established repeater band plan. Novices are *not authorized* under the FCC Rules to serve as repeater control operators.

Many callers have also wondered if Novices could legally use a 220-MHz-band repeater that is crossband-linked to 2 meters. The answer is "yes" so long as the Novice's transmitter is operating within Novice-authorized frequency bands. The FCC established this precedent with satellite operations—Technician class operators using the Mode A configuration transmit up to a satellite on 2 meters, and their signals are retransmitted by the satellite down into a portion of 10 meters where Techs are not authorized.

While crossband repeater linking will help bring Novices into the 2-meter mainstream of VHF operating, we suggest a word of caution: If the link could be turned on and off by the repeater *user*, this would put the Novice in control of a 2-meter transmitter, which is not authorized. If, however, the link is activated by a Technician or higher-class control operator, we see no problem. If the link is full-time, we also see no problem.

Here We Go

Now that Novice Enhancement is here, complete with implications for Technicians and Generals, we have a whole new ballgame for folks coming into Amateur Radio. Do you know of some prospective hams? Tell them about the latest developments, and then brace yourself. You may find that you're teaching a Novice or Tech class yet this year, and the classroom will be filled with some very enthusiastic people! QST

Existing Questions in Element 2 With Revised Answers

2A-9.4 What are the Novice control operator frequency privileges in the 10 meter band?
A. 10.100 to 10.109 MHz
B. 10.115 to 10.150 MHz
C. 28.000 to 29.700 MHz
D. 28.100 to 28.500 MHz

2A-9.5 What, if any, frequency privileges are authorized to Novice control operators beside those in the 80, 40, 15 and 10 meter bands?
A. All authorized Amateur Radio frequencies above 50.0 MHz
B. None
C. 145 to 147 MHz
D. 222.1 to 223.91 MHz and 1270 to 1295 MHz

2A-9.6 In what frequency bands is a Novice authorized to be the control operator of an amateur station?
A. 1800 to 2000 kHz, 3750 to 3775 kHz, 7100 to 7150 kHz, 21,100 to 21,200 kHz, 28,100 to 28,500 kHz
B. 3700 to 3750 kHz, 7100 to 7150 kHz, 21,100 to 21,200 kHz, 28.1 to 28.5 MHz, 222.1 to 223.91 MHz, 1270 to 1295 MHz
C. 3.5 to 4.0 MHz, 7.0 to 7.3 MHz, 21.0 to 21.4 MHz, 28.0 to 29.7 MHz, 1240 to 1296 MHz
D. 3.5 to 4.0 MHz, 7.0 to 7.3 MHz, 14.0 to 14.35 MHz, 21.0 to 21.45 MHz, 28.050 to 29.7 MHz, 222.1 to 223.91 MHz

2A-10.1 What emission type is authorized to Novice control operators?
A. Any emission authorized to the Amateur Radio Service in the 80, 40, 15 and 10 meter CW subbands
B. Any authorized emission used below 29.7 MHz on the Amateur Radio bands
C. All emissions authorized to the Amateur Radio Service on frequencies between 222.1 and 223.91 MHz
D. A3J between 145 and 147 MHz

2A-10.5 What, if any, emission privileges are authorized to Novice control operators beside A1A?
A. Any emission authorized to the Amateur Radio Service in the 80, 40, 15 and 10 meter CW subbands
B. Any authorized emission used below 29.7 MHz on the Amateur Radio bands
C. All emissions authorized to the Amateur Radio Service on frequencies between 222.1 and 223.91 MHz
D. A3J between 145 and 147 MHz

2A-10.6 What telegraphy code may a Novice control operator use?
A. Any telegraph code authorized for use in the Amateur bands
B. Only the International Telegraph Alphabet Number Three
C. ASCII, Packet and RTTY
D. Baudot, AMTOR and CW

2A-10.7 Which, if any, telegraphy codes may a Novice control operator use beside the international Morse code?
A. Any telegraph code authorized for use in the Amateur bands
B. Audio-frequency-shifted CW and AMTOR
C. ASCII, Packet and RTTY
D. Baudot, AMTOR and CW

2A-19.2 What is the maximum transmitting power ever permitted to be used at an amateur station transmitting on frequencies available to Novice control operators?
A. 75 watts PEP output on the 80, 40 and 15-meter bands
B. 100 watts PEP output on the 80, 40 and 15-meter bands
C. 200 watts PEP output on the 80, 40 and 15-meter bands
D. 1500 watts PEP output on the 80, 40 and 15-meter bands

Please note that the existing answer key remains unchanged for these questions, except for Question 2A-9.5. The correct answer for 2A-9.5 changes from answer B to answer D.

New Questions for Element 2

Subelement 2A—Rules and Regulations

2A-9.11 What frequencies may a Novice control operator use in the amateur 10-meter band?
A. 28.1 to 28.5 MHz
B. 30.1 to 30.5 MHz
C. 27.1 to 27.5 MHz
D. 28.0 to 29.7 MHz

2A-9.12 What frequencies may a Novice control operator use in the amateur 220-MHz band?
A. 225.0 to 230.5 MHz
B. 222.1 to 223.91 MHz
C. 224.1 to 225.1 MHz
D. 221.2 to 223.0 MHz

2A-9.13 What frequencies may a Novice control operator use in the amateur 1270-MHz band?
A. 1260 to 1270 MHz
B. 1240 to 1300 MHz
C. 1270 to 1295 MHz
D. 1240 to 1246 MHz

2A-9.14 What frequencies may a Novice control operator use in the amateur 23-centimeter band?
A. 1260 to 1270 MHz
B. 1240 to 1300 MHz
C. 1270 to 1295 MHz
D. 1240 to 1246 MHz

2A-10.11 What emission types are Novice control operators permitted to use on frequencies from 28.3 to 28.5 MHz?
A. All authorized amateur emission privileges
B. A1A and J3E
C. A1A and F1B
D. A1A and F3E

2A-10.12 What emission types are Novice control operators permitted to use on frequencies from 28.1 to 28.3 MHz?
A. All authorized amateur emission privileges
B. F1B and J3E
C. A1A and F1B
D. A1A and J3E

2A-10.13 What emission types are Novice control operators permitted to use on the amateur 220-MHz band?
A. All amateur emission privileges authorized for use on 220 MHz
B. F1B and J3E
C. A1A and F1B
D. A1A and J3E

2A-10.14 What emission types are Novice control operators permitted to use on frequencies from 1270 to 1295 MHz?
A. All amateur emission privileges authorized for use on 1270 MHz
B. F1B and J3E
C. A1A and F1B
D. A1A and J3E

2A-10.15 On what frequencies in the 10-meter band are Novice control operators permitted to transmit emission F1B (RTTY)?
A. 28.1 to 28.5 MHz
B. 28.0 to 29.7 MHz
C. 28.1 to 28.2 MHz
D. 28.1 to 28.3 MHz

2A-10.16 On what frequencies in the 10-meter band are Novice control operators permitted to transmit emission J3E (single sideband voice)?
A. 28.3 to 28.5 MHz
B. 28.0 to 29.7 MHz
C. 28.1 to 28.2 MHz
D. 28.1 to 28.5 MHz

2A-10.17 On what frequencies in the 220-MHz band are Novice control operators permitted to transmit emission F3E (FM voice)?
A. 220 to 225 MHz
B. 222.1 to 223.91 MHz
C. 223 to 225 MHz
D. 223.1 to 224.91 MHz

2A-10.18 On what frequencies in the 220-MHz band are Novice control operators permitted to transmit emission A1A (CW)?
A. 220 to 225 MHz
B. 222.1 to 223.91 MHz
C. 223 to 225 MHz
D. 223.1 to 224.91 MHz

2A-10.19 On what frequencies in the 220-MHz band are Novice control operators permitted to operate packet radio?
A. 220 to 225 MHz
B. 222.1 to 223.91 MHz
C. 223 to 225 MHz
D. 223.1 to 224.91 MHz

2A-10.20 On what frequencies in the 1270-MHz band are Novice control operators permitted to transmit emission F3E (FM voice)?
A. 1240 to 1270 MHz
B. 1250 to 1285 MHz
C. 1270 to 1295 MHz
D. 1295 to 1300 MHz

2A-10.21 On what frequencies in the 1270-MHz band are Novice control operators permitted to transmit emission A1A (CW)?
A. 1295 to 1300 MHz
B. 1270 to 1295 MHz
C. 1250 to 1285 MHz
D. 1240 to 1270 MHz

2A-10.22 On what frequencies in the 1270-MHz band are Novice control operators permitted to operate packet radio?
A. 1295 to 1300 MHz
B. 1270 to 1295 MHz
C. 1250 to 1285 MHz
D. 1240 to 1270 MHz

2A-19.5 What is the maximum transmitting power permitted an amateur station with a Novice control operator transmitting on the amateur 10-meter band?
A. 25 watts PEP output
B. 200 watts PEP output
C. 1000 watts PEP output
D. 1500 watts PEP output

2A-19.6 What is the maximum transmitting power permitted an amateur station with a Novice control operator transmitting on the amateur 220-MHz band?
A. 5 watts PEP output
B. 10 watts PEP output
C. 25 watts PEP output
D. 200 watts PEP output

2A-19.7 What is the maximum transmitting power permitted an amateur station with a Novice control operator transmitting on the amateur 1270-MHz band?
A. 5 milliwatts PEP output
B. 500 milliwatts PEP output
C. 1 watt PEP output
D. 5 watts PEP output

2A-19.8 What amount of transmitting power may an amateur station with a Novice control operator use on the amateur 220-MHz band?
A. Not less than 5 watts PEP output
B. The minimum legal power necessary to maintain reliable communications
C. Not more than 50 watts PEP output
D. Not more than 200 watts PEP output

2A-22.1 What does the term "digital communications" refer to?
A. Amateur communications that are designed to be received and printed automatically
B. Amateur communications sent in binary-coded decimal format
C. A "hands-on" communications system requiring manual control
D. A computer-controlled communications system, requiring no operator control

2A-22.2 What term is used to describe amateur communications intended to be received and printed automatically?
A. Teleport communications
B. Direct communications
C. Digital communications
D. Third-party communications

2A-22.3 What term is used to describe amateur communications for the direct transfer of information between computers?
A. Teleport communications
B. Direct communications
C. Digital communications
D. Third-party communications

2A-23.1 When must the licensee of an Amateur Radio station in portable or mobile operation notify the FCC of such operation?
A. 1 week in advance, if the operation will last for more than 24 hours
B. FCC notification is not required for portable or mobile operation
C. 1 week in advance, if the operation will last for more than a week
D. 1 month in advance of any portable or mobile operation

2A-23.2 When may you operate your Amateur Radio station at a location other than the one listed on your station license?
A. Only during times of emergency
B. Only after giving proper notice to the FCC
C. During an emergency or an FCC approved emergency preparedness drill
D. Whenever you want to

Subelement 2B—Operating Procedures

2B-6.1 What is the format of a standard radiotelephone CQ call?
A. Transmit the phrase "CQ" three times, followed by "this is", followed by your call sign three times
B. Transmit the phrase "CQ" at least ten times, followed by "this is", followed by your call sign two times
C. Transmit the phrase "CQ" at least five times, followed by "this is", followed by your call sign once
D. Transmit the phrase "CQ" at least ten times, followed by "this is", followed by your call sign once

2B-7.1 How is the call sign "KA3BGQ" stated in Standard International Phonetics?
A. King America Three Baker Golf Queen
B. Kilo Alfa Three Bravo Golf Quebec
C. Kilowatt Alfa Three Bravo George Queen
D. Kilo America Three Baker Golf Quebec

2B-7.2 How is the call sign "WB2OSQ" stated in Standard International Phonetics?
A. Whiskey Baker Two Oscar Sierra Queen
B. Whiskey Bravo Two Oscar Sierra Quebec
C. Willie Baker Two Ontario Sugar Quebec
D. Washington Bravo Two Oscar Sugar Queen

2B-7.3 How is the call sign "ON4UN" stated in Standard International Phonetics?
A. Ontario Nancy Four Uncle Nancy
B. Ocean Norway Four Uniform Norway
C. Oscar November Four Uniform November
D. Oscar Nancy Four Unicorn Nancy

2B-7.4 How is the call sign "WB1EYI" stated in Standard International Phonetics?
A. Whiskey Bravo One Echo Yankee India
B. Whiskey Baker One Echo Yankee Ida
C. Willie Baker One Echo Yankee India
D. Washington Baltimore One Easy Yellow Ida

2B-8.1 What is the format of a standard RTTY CQ call?
A. Transmit the phrase "CQ" at least ten times, followed by "this is", followed by your call sign two times
B. Transmit the phrase "CQ" at least five times, followed by "this is", followed by your call sign once
C. Transmit the phrase "CQ" three to six times, followed by "DE", followed by your call sign three times
D. Transmit the phrase "CQ" at least ten times, followed by "this is", followed by your call sign once

2B-8.2 What are three common sending speeds for RTTY signals on the 10-meter band?
A. "45 speed" (45 bauds), "100 speed" (100 bauds) and "1200 speed" (1200 bauds)
B. "75 speed" (45 bauds), "110 speed" (80 bauds) and "1200 speed" (1170 bauds)
C. "60 speed" (45 bauds), "105 speed" (80 bauds) and "1500 speed" (1475 bauds)
D. "60 speed" (45 bauds), "75 speed" (56 bauds) and "100 speed" (75 bauds)

2B-8.3 What is the commonly used RTTY sending speed above 50 MHz?
A. 1200 bauds
B. 60 bauds
C. 100 bauds
D. 9600 bauds

2B-8.4 What is one common use for a RTTY mailbox?
A. To leave a message with an amateur equipment dealer, ordering a new radio
B. Storing messages from one amateur for later retrieval by another amateur
C. To establish a QSO with another amateur RTTY station, and then to move off frequency
D. To leave messages that will be mailed to another person the next day

2B-8.5 What is the term used to describe an automatic RTTY system used to store messages from amateurs for later retrieval by other amateurs?
A. A message delivery system
B. An automatic teleprinting system
C. A digipeater
D. A RTTY mailbox

2B-9.1 What do the letters "TNC" stand for?
A. Terminal-Node Controller
B. Tucson Network Controller
C. Terminal Network Contact
D. Tactical-Number Controller

2B-9.2 What does the term "connected" mean in a packet-radio link?
A. A telephone link has been established between two amateur stations
B. An Amateur Radio message has reached a station for local delivery
C. The transmitting station is sending data specifically addressed to the receiving station, and the receiving station is acknowledging that the data has been received correctly
D. A transmitting and a receiving station are using a certain digipeater, so no other contacts can take place until they are finished

2B-9.3 What does the term "monitoring" mean on a frequency used for packet radio?
A. The FCC is copying all messages, to determine their content
B. A member of the Amateur Auxiliary to the FCC's Field Operations Bureau is copying all messages to determine their content
C. The receiving station's video monitor is displaying all messages intended for that station
D. The receiving station is displaying information that may not be addressed to that station, and is not acknowledging correct receipt of the data

2B-9.4 What is a digipeater?
A. A packet-radio station used to retransmit data specifically addressed to be retransmitted by that station
B. An Amateur Radio repeater designed to retransmit all audio signals in a digital form
C. An Amateur Radio repeater designed using only digital electronics components
D. A packet-radio station that retransmits any signals it receives

2B-9.5 What is the meaning of the term *network* in packet radio?
A. A system of telephone lines interconnecting packet-radio stations to transfer data
B. A method of interconnecting packet-radio stations so that data can be transferred over long distances
C. The interlaced wiring on a terminal-node controller board
D. The terminal-node controller function that automatically rejects another caller when the station is connected

2B-9.6 What is the term used to describe a packet-radio station used to retransmit data specifically addressed to be retransmitted by that station?
A. A RTTY mailbox
B. A network-node controller
C. An autopatch
D. A digipeater

2B-9.7 What is the term used to describe a method of interconnecting packet-radio stations so that data can be transferred over long distances?
A. Networking
B. Crosslinking
C. Autopatching
D. Duplexing

2B-9.8 What sending speed is commonly used for packet-radio transmissions on the 220-MHz band?
A. 45 bauds
B. 110 bauds
C. 1200 bauds
D. 12,000 bauds

2B-10.1 What is a good way to establish a contact on a repeater?
A. Give the call sign of the station you want to contact 3 times
B. Call the other operator by name, then give your call sign 3 times
C. Say, "Breaker breaker," and then give your call sign
D. Call the desired station and then identify your own station

2B-10.2 What is the main purpose of a repeater?
A. Repeaters extend the operating range of portable and mobile stations
B. To provide a station that makes local information available 24 hours a day
C. To provide a means of linking Amateur Radio stations with the telephone system
D. To retransmit NOAA weather information during severe storm warnings

2B-10.3 Why is there an *input* and an *output* frequency to describe the operating frequency of any repeater?
A. All repeaters offer a choice of two operating frequencies, in case one is busy
B. The repeater receives on one frequency and transmits on another
C. One frequency is used to control repeater functions and the other frequency is the one used to retransmit received signals
D. Repeaters require an access code to be transmitted on one frequency while your voice is transmitted on the other

2B-10.4 When should simplex operation be used instead of a repeater?
A. Whenever greater communications reliability is needed
B. Whenever you need someone to make an emergency telephone call
C. Whenever a contact is possible without using a repeater
D. Whenever you are traveling and need some local information

2B-10.5 What is an *autopatch*?
A. A repeater feature that automatically selects the strongest received signal to be repeated
B. An automatic system of connecting a mobile station to the next repeater as it moves out of range of the first
C. A system that automatically locks other stations out of the repeater when there is a QSO in progress
D. A device that allows repeater users to make telephone calls from their portable or mobile stations

2B-10.6 What is the term used to describe a device that allows repeater users to make telephone calls from their portable or mobile stations?
A. A amateur phone controller
B. An autopatch
C. A terminal node controller
D. A phone patch

Subelement 2C—Radio Wave Propagation

2C-3.1 Why can a VHF or UHF radio signal that is transmitted toward a mountain often be received at some distant point in a different direction?
A. You can never tell what direction a radio wave is traveling in
B. These radio signals are easily reflected by objects in their path
C. These radio signals are easily bent by the ionosphere
D. These radio signals are sometimes scattered in the ectosphere

2C-3.2 Why can the direction that a VHF or UHF radio signal is traveling be changed if there is a tall building in the way?
A. You can never tell what direction a radio wave is traveling in
B. These radio signals are easily reflected by objects in their path
C. These radio signals are easily bent by the ionosphere
D. These radio signals are sometimes scattered in the ectosphere

2C-4.1 What type of antenna polarization is normally used for communications on the 40-meter band?
A. Electrical polarization
B. Left-hand circular polarization
C. Horizontal polarization
D. Vertical polarization

2C-4.2 What type of antenna polarization is normally used for communications on the 80-meter band?
A. Right-hand circular polarization
B. Magnetic polarization
C. Horizontal polarization
D. Vertical polarization

2C-4.3 What type of antenna polarization is normally used for communications on the 15-meter band?
A. Electrical polarization
B. Horizontal polarization
C. Right-hand circular polarization
D. Left-hand circular polarization

2C-4.4 What type of antenna polarization is normally used for repeater communications on the 220-MHz band?
A. Vertical polarization
B. Horizontal polarization
C. Magnetic polarization
D. Left-hand circular polarization

2C-4.5 What type of antenna polarization is normally used for repeater communications on the 1270-MHz band?
A. Enhanced polarization
B. Vertical polarization
C. Right-hand circular polarization
D. Left-hand circular polarization

Subelement 2D—Amateur Radio Practice

2D-9.1 What precautions should you take when working with 1270-MHz waveguide?
A. Make sure that the RF leakage filters are installed at both ends of the waveguide
B. Never look into the open end of a waveguide when RF is applied
C. Minimize the standing-wave ratio before you test the waveguide
D. Never have both ends of the waveguide open at once when RF is applied

2D-9.2 What precautions should you take when you mount a VHF or UHF antenna in a permanent location?
A. Make sure that no one can be near the antenna when you are transmitting
B. Make sure that the RF shield screens are in place
C. Make sure that the antenna is near the ground to maximize directional effect
D. Make sure you connect an RF leakage filter at the antenna feed point

2D-9.3 What precautions should you take before removing the shielding on a VHF or UHF power amplifier?
A. Make sure all RF screens are in place at the antenna
B. Make sure the feed line is properly grounded
C. Make sure the amplifier cannot be accidentally energized
D. Make sure that the RF leakage filters are connected

2D-9.4 Why should you use only good-quality, well-constructed coaxial cable and connectors for a VHF or UHF antenna system?
A. To minimize RF leakage
B. To reduce parasitic oscillations
C. To maximize the directional characteristics of your antenna
D. To maximize the standing-wave ratio of the antenna system

2D-9.5 Why should you be careful to position the antenna of your 220-MHz hand-held transceiver away from your head when you are transmitting?
A. To take advantage of the directional effect
B. To minimize RF exposure
C. To use your body to reflect the signal, improving the directional characteristics of the antenna
D. To minimize static discharges

2D-9.6 How can you minimize RF exposure when you are operating your 220-MHz hand-held transceiver?
A. Position the antenna near the ground
B. Use a shielded RF screen around your antenna
C. Use a special short "stubby duck" antenna
D. Position the antenna away from your head

2D-9.7 Why should you be careful to position the antenna of your 1270-MHz hand-held transceiver away from your head when you are transmitting?
A. To take advantage of the directional effect
B. To use your body to reflect the signal, improving the directional characteristics of the antenna
C. To minimize static discharges
D. To minimize RF exposure

2D-9.8 How can you minimize RF exposure when you are operating your 1270-MHz hand-held transceiver?
A. Position the antenna near the ground
B. Use a shielded RF screen around your antenna
C. Use a special short "stubby duck" antenna
D. Position the antenna away from your head

2D-9.9 How can you minimize RF leakage from your VHF or UHF antenna system?
A. Use open-wire line for antenna feed line
B. Use only good-quality, well-constructed coaxial cable and connectors
C. Use special shielded AC line cords with all your equipment
D. Use an RF leakage filter on the antenna feed line

2D-9.10 Why should you make sure your VHF or UHF amplifier cannot be energized before you open the amplifier enclosure?
A. To minimize static discharge when you open the enclosure
B. To minimize RF exposure and prevent electric shock
C. To minimize the effects of hand capacitance
D. To prevent exposure to Cerenkov radiation from the amplifier

2D-9.11 Why should you never look into a VHF or UHF waveguide when RF is applied?
A. Because the fluorescent coating inside the waveguide gets very bright
B. Because exposure to VHF or UHF RF energy can be harmful to your eyes
C. Because the waveguide might not be properly grounded
D. Because the Cerenkov Effect may scatter RF energy

2D-9.12 Why should you be sure that your transmitter cannot be energized before you work on your VHF or UHF antennas?
A. Because operating the transmitter when the antennas are disconnected might harm the transmitter
B. Because exposure to VHF or UHF RF energy can be harmful
C. Because if the transmitter is operated while you are touching the antenna, the radiated energy might be out of an amateur band
D. Because accidental operation might blow a fuse

Subelement 2E—Electrical Principles

2E-13.6 Your receiver dial is calibrated in megahertz and shows a signal at 1200 MHz. At what frequency would a dial calibrated in gigahertz show the signal?
A. 1.2 GHz
B. 12 GHz
C. 120 GHz
D. 1200 GHz

2E-13.7 Your receiver dial is calibrated in gigahertz and shows a signal at 1.27 GHz. At what frequency would a dial calibrated in megahertz show the signal?
A. 1.27 MHz
B. 12.7 MHz
C. 127 MHz
D. 1270 MHz

2E-13.8 Your receiver dial is calibrated in megahertz and shows a signal at 223.9 MHz. At what frequency would a dial calibrated in kilohertz show the signal?
A. 0.223 kHz
B. 2239 kHz
C. 22,390 kHz
D. 223,900 kHz

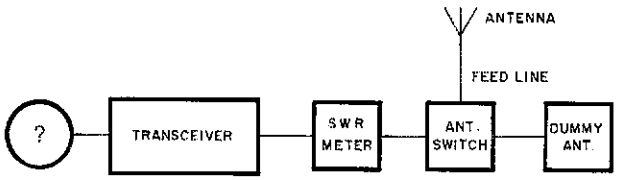
Subelement 2F—Circuit Components

No new questions

Subelement 2G—Practical Circuits

2G-4.1 In an Amateur Radio station designed for radiotelephone operation, what station accessory will you need to go with your transmitter?
A. A splatter filter
B. A terminal voice controller
C. A microphone
D. A receiver audio filter

2G-4.2 What is the unlabeled block (?) in this block diagram of a radiotelephone station?



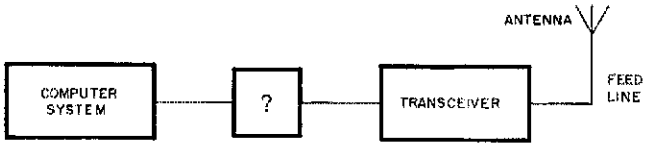
A. A splatter filter
B. A terminal voice controller
C. A microphone
D. A receiver audio filter

2G-5.1 In an Amateur Radio station designed for radioteletype operation, what station accessories will you need to go with your transmitter?
A. A computer, a printer and a RTTY refresh unit
B. A modem and a teleprinter or computer system
C. A terminal-node controller
D. A modem, a monitor and a DTMF key pad

2G-5.2 Draw a block diagram showing how the parts of a radioteletype station connect. Include at least a modem, transceiver, computer system or teleprinter, feed line and antenna.

2G-6.1 In a packet-radio station, what device connects between the radio transceiver and the computer terminal?
A. An RS-232 interface
B. A terminal-node controller
C. A terminal refresh unit
D. A tactical network control system

2G-6.2 What is the unlabeled block (?) in this diagram of a packet-radio station?



A. An RS-232 interface
B. A terminal-node controller
C. A terminal refresh unit
D. A tactical network control system

2G-6.3 Where does a terminal-node controller connect in an amateur packet-radio station?
A. Between the antenna and the radio
B. Between the computer and the monitor
C. Between the computer or terminal and the radio
D. Between the keyboard and the computer

Subelement 2H—Signals and Emissions

2H-8.1 What emission designator describes the use of frequency shift keying to transmit radioteletype messages?
A. F2D
B. F1B
C. J1F
D. A1B

2H-8.2 What keying method is used to transmit F1B radioteletype messages?
A. Frequency shift keying
B. On-off keying of the radio wave
C. Split-baud keying
D. Tuned-output keying

2H-9.1 What emission designator describes single-sideband suppressed-carrier (SSB) voice transmissions?
A. J2D
B. A3J
C. J3E
D. F3E

2H-9.2 What type of signal is emission J3E?
A. Frequency-modulated voice
B. Single-sideband suppressed-carrier voice
C. Frequency-shift keyed RTTY
D. Packet radio

2H-10.1 What emission designator describes frequency-modulated voice transmissions?
A. F1B
B. F2D
C. F3E
D. A3F

2H-10.2 What type of signal is emission F3E?
A. Frequency-modulated voice
B. Single-sideband suppressed-carrier voice
C. Frequency-shift keyed RTTY
D. Packet radio

2H-11.1 What may happen to body tissues that are exposed to large amounts of RF energy?
A. The tissue may be damaged because of the heat produced
B. The tissue may suddenly be frozen
C. The tissue may be immediately destroyed because of the Maxwell effect
D. The tissue may become less resistant to cosmic radiation

2H-11.2 What precaution should you take before working near a high-gain UHF or microwave antenna (such as a parabolic, or dish antenna)?
A. Be certain the antenna is FCC type approved
B. Be certain the antenna and transmitter are properly grounded
C. Be certain the transmitter cannot be operated
D. Be certain the antenna safety interlocks are in place

2H-11.3 How should the antenna on a hand-held transceiver be positioned while you are transmitting?
A. As close to your body as possible, to take advantage of the directional effect
B. Away from your head and away from others standing nearby, to minimize RF exposure
C. Close to the ground, since a hand-held transceiver has no ground connection
D. As close to a vertical position as possible, to minimize corona effect

2H-11.4 Why should you always locate your antennas so that no one can come in contact with them while you are transmitting?
A. To prevent damage to the antennas
B. To prevent RF burns and excessive exposure to RF energy
C. To comply with FCC regulations concerning antenna height
D. To prevent unexpected changes in your standing-wave ratio

2H-11.5 What is a good way to prevent RF burns and excessive exposure to RF from your antennas?
A. Shield your antenna with a grounded RF screen
B. Make sure you use plenty of radial wires in your antenna installation
C. Use burn-proof wire for your antenna feed line
D. Always locate your antennas so that no one can come in contact with them while you are transmitting

2H-12.1 What type of interference will you cause if you operate your SSB transmitter with the microphone gain adjusted too high?
A. You may cause digital interference to computer equipment in your neighborhood
B. You may cause atmospheric interference in the air around your antenna
C. You may cause splatter interference to other stations on nearby frequencies
D. You may cause processor interference to the microprocessor in your rig

2H-12.2 What may happen if you adjust the microphone gain or deviation control on your FM transmitter too high?
A. You may cause digital interference to computer equipment in your neighborhood
B. You may cause interference to other stations on nearby frequencies
C. You may cause atmospheric interference in the air around your antenna
D. You may cause processor interference to the microprocessor in your rig

2H-12.3 If you are using an excessive amount of speech processing with your SSB transmitter, what type of interference are you likely to cause?
A. You may cause digital interference to computer equipment in your neighborhood
B. You may cause splatter interference to other stations on nearby frequencies
C. You may cause atmospheric interference in the air around your antenna
D. You may cause processor interference to the microprocessor in your rig

2H-12.4 If you are operating SSB voice and another operator tells you that you are causing "splatter," what might be the cause of the interference?
A. Your rig may be switching from transmit to receive too quickly
B. You may have your transmitter microphone gain control set too high
C. Your rig may have a defective modulator transistor
D. You may have your transmitter splatter control set incorrectly

2H-12.5 If you are operating FM voice and another operator tells you that your signal is "too wide" and that you are causing interference to other stations on nearby frequencies, what might be the cause of the interference?
A. You may have your transmitter deviation control or microphone gain control set too high
B. The spectral width control on your transmitter may be set incorrectly
C. Your microphone may be defective
D. You may need to use an amplified "power microphone"

Subelement 2I—Antennas and Feed Lines

2I-2.6 What is the approximate length (in inches) of a 5/8-wavelength vertical antenna for the 220-MHz band?
A. 19-1/2 inches
B. 22 inches
C. 28-1/2 inches
D. 32 inches

2I-2.7 Why do many amateurs use a 5/8-wavelength vertical antenna rather than a 1/4-wavelength vertical antenna for their VHF or UHF mobile stations?
A. A 5/8-wavelength antenna can handle more power than a 1/4-wavelength antenna
B. A 5/8 wavelength antenna has more gain than a 1/4-wavelength antenna
C. A 5/8-wavelength antenna exhibits less corona loss than an 1/4-wavelength antenna
D. A 5/8-wavelength antenna looks more like a CB antenna, so it does not attract as much attention as a 1/4-wavelength antenna

2I-5.1 What type of radiation pattern is produced by a 5/8-wavelength vertical antenna?
A. A pattern with the transmitted signal spread out equally in all directions
B. A pattern with more of the transmitted signal concentrated in one direction than in other directions.
C. A pattern with most of the transmitted signal concentrated in two opposite directions
D. A pattern with most of the transmitted signal concentrated at high radiation angles

2I-6.1 What type of radiation pattern is produced by a Yagi antenna?
A. A pattern with the transmitted signal spread out equally in all directions
B. A pattern with more of the transmitted signal concentrated in one direction than in other directions.
C. A pattern with most of the transmitted signal concentrated in two opposite directions
D. A pattern with most of the transmitted signal concentrated at high radiation angles

2I-6.2 On the Yagi antenna shown in Figure 2I-6, what is the name of section B?
A. Director
B. Reflector
C. Boom
D. Driven element

2I-6.3 On the Yagi antenna shown in Figure 2I-6, what is the name of section C?
A. Director
B. Reflector
C. Boom
D. Driven element

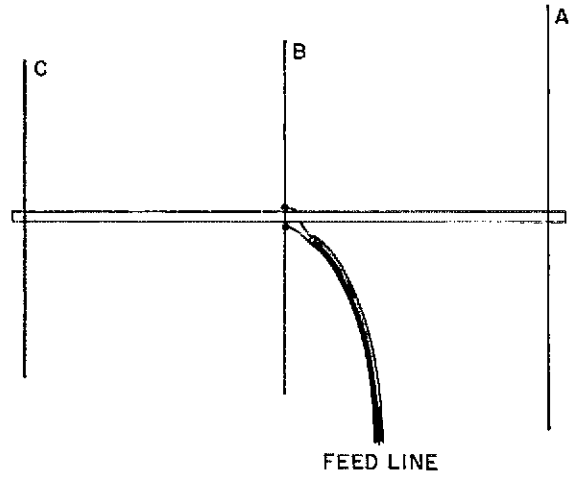


Figure 2I-6

2I-6.4 On the Yagi antenna shown in Figure 2I-6, what is the name of section A?
A. Director
B. Reflector
C. Boom
D. Driven element

2I-6.5 Approximately how long (in wavelengths) is the driven element of a Yagi antenna?
A. 1/4 wavelength
B. 1/3 wavelength
C. 1/2 wavelength
D. 1 wavelength

Answer Key

Subelement 2A

2A-9.4	D
2A-9.5	D
2A-9.6	B
2A-9.11	A
2A-9.12	B
2A-9.13	C
2A-9.14	C
2A-10.1	C
2A-10.5	C
2A-10.6	A
2A-10.7	A
2A-10.11	B
2A-10.12	C
2A-10.13	A
2A-10.14	A
2A-10.15	D
2A-10.16	A
2A-10.17	B
2A-10.18	B
2A-10.19	B
2A-10.20	C
2A-10.21	B
2A-10.22	B
2A-19.2	C
2A-19.5	B
2A-19.6	C
2A-19.7	D
2A-19.8	B
2A-22.1	A
2A-22.2	C
2A-22.3	C
2A-23.1	B
2A-23.2	D

Subelement 2B

2B-6.1	A
2B-7.1	B
2B-7.2	B
2B-7.3	C
2B-7.4	A
2B-8.1	C
2B-8.2	D
2B-8.3	A
2B-8.4	B
2B-8.5	D
2B-9.1	A
2B-9.2	C
2B-9.3	D
2B-9.4	A
2B-9.5	B
2B-9.6	D
2B-9.7	A
2B-9.8	C
2B-10.1	D
2B-10.2	A
2B-10.3	B
2B-10.4	C
2B-10.5	D
2B-10.6	B

Subelement 2C

2C-3.1	B
2C-3.2	B
2C-4.1	C
2C-4.2	C
2C-4.3	B
2C-4.4	A
2C-4.5	B

Subelement 2D

2D-9.1	B
2D-9.2	A
2D-9.3	C
2D-9.4	A
2D-9.5	B
2D-9.6	D
2D-9.7	D
2D-9.8	D
2D-9.9	B
2D-9.10	B
2D-9.11	B
2D-9.12	B

Subelement 2E

2E-13.6	A
2E-13.7	D
2E-13.8	D

Subelement 2F

No new questions

Subelement 2G

2G-4.1	C
2G-4.2	C
2G-5.1	B
2G-5.2	See Drawing
2G-6.1	B
2G-6.2	B
2G-6.3	C

Subelement 2H

2H-8.1	B
2H-8.2	A
2H-9.1	C
2H-9.2	B
2H-10.1	C
2H-10.2	A
2H-11.1	A
2H-11.2	C
2H-11.3	B
2H-11.4	B
2H-11.5	D
2H-12.1	C
2H-12.2	B
2H-12.3	B
2H-12.4	B
2H-12.5	A

Subelement 2I

2I-2.6	C
2I-2.7	B
2I-5.1	A
2I-6.1	B
2I-6.2	D
2I-6.3	A
2I-6.4	B
2I-6.5	C

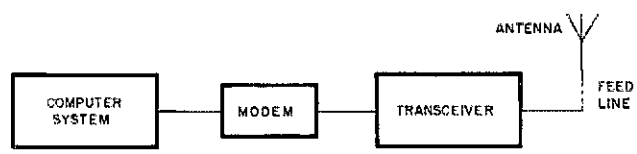


Figure 2G 5.2

New Written Exams for Technician and General Class Licenses

On January 28, 1987, acting on a request made by the ARRL, the FCC adopted a *Report and Order* that grants Novice class Amateur Radio operators new operating privileges. Technician licensees also benefit from these new privileges on 10 meters, where they have been granted digital and voice communications modes.

In addition to the Novice changes, the FCC split the Element 3 exam, previously required for both Technician and General class licenses, into Elements 3A and 3B. The 3A exam is now required for the Technician license and the 3B exam is required for the General license. The Technician and General class exams each contain 25 questions under the new rules. All of these rule changes take effect at 0001 UTC on March 21, 1987, and all exams given on or after that time will follow these new procedures.

We prepared this article for *QST* as a supplement to the second edition of *The ARRL Technician/General Class License Manual* to provide you with information about the new Element 3A and 3B Question Pools in the shortest possible time. The tables given in this article show how the ARRL/VEC has divided the existing Element 3 Question Pool into the two new pools.

Used with the second edition of *The ARRL Technician/General Class License Manual,* this article tells you which questions to study for a Technician class exam and which ones to study for a General class exam. The Tables indicate which questions the ARRL/VEC will use on each exam. We believe most other VECs will use the same Tables to determine the questions used on their exams. If you are taking an exam coordinated by a VEC other than the ARRL/VEC, however, check with that VEC for a list of the questions they will be using.

If you try for the General class license without having already earned a Technician class license you will have to take both exams, for a total of 50 questions exactly like the old Element 3 exam. (Incidentally, if you earned a Technican class license prior to March 21, 1987, you automatically receive credit for passing both Element 3A and 3B. You will only have to pass the 13 WPM code test to earn your General class license.)

All of the study material you need can still be found in *The ARRL Technician/General Class License Manual.* In the Element 3A and Element 3B Tables given in this article, we have listed page numbers along with the question numbers from the old Element 3 Question Pool. These page numbers indicate where you will find the text discussion related to each question in *The ARRL Technician/General Class License Manual.* These page references are intended to help you identify the text material you should study for each exam. You may have to study beyond the listed page numbers. There are no page references for the questions in the Rules and Regulations subelement (old questions numbered 3A). Reference material for the rules and regulations is provided in *The FCC Rule Book,* published by the ARRL. The current sixth edition is now being supplied with a single-page supplement which shows the changes to part 97 of the rules pertaining to Novice Enhancement.

Table 1

Number of Questions From Each Subelement on the Technician and General Class Exams

Subelement	*Number of questions on 3A (Technician) Exam*	*Number of questions on 3B (General) Exam*
A	5	4
B	3	3
C	3	3
D	4	5
E	2	2
F	2	1
G	1	1
H	2	2
I	3	4
Total	25	25

Table 2

Element 3A (Technician) Question Pool

Two of the questions on the Element 3A (Technician) Question Pool require revised answers because of the the new 10-meter privileges granted to Novices and Technicians.

3A-8.1 What are the HF privileges authorized to a Technician control operator?

A. 3700 to 3750 kHz, 7100 to 7150 kHz (7050 to 7075 kHz when terrestrial station location is in Alaska or Hawaii or outside Region 2), 14,100 to 14,150 kHz, 21,100 to 21,150 kHz, and 28,100 to 28,150 kHz only

B. 3700 to 3750 kHz, 7100 to 7150 kHz (7050 to 7075 kHz when terrestrial station location is in Alaska or Hawaii or outside Region 2), 21,100 to 21,200 kHz, and 28,100 to 28,500 kHz only

C. 28,000 to 29,700 kHz only

D. 3700 to 3750 kHz, 7100 to 7150 kHz (7050 to 7075 kHz when terrestrial station location is in Alaska or Hawaii or outside Region 2), and 21,100 to 21,200 kHz only

The correct answer is B, as listed in *The ARRL Technician/General Class License Manual* answer key.

3A-8.4 The answer to this question should be changed to answer A in the Element 3 Answer Key printed in your *ARRL Technician/ General Class License Manual.*

Table 2 (continued)
Element 3A (Technician) Question Pool

SUBELEMENT 3AA

3A-1.1
3A-1.2
3A-2.1
3A-2.2
3A-2.3
3A-2.4
3A-2.5
3A-2.6
3A-2.7
3A-2.8
3A-3.1
3A-3.6
3A-3.8
3A-4.2
3A-4.4
3A-4.5
3A-4.6
3A-5.1
3A-5.2
3A-5.3
3A-5.4
3A-6.3
3A-6.4
3A-6.5
3A-7.1
3A-7.2
3A-7.3
3A-7.4
3A-8.1
3A-8.2
3A-8.3
3A-8.4
3A-8.5
3A-10.9
3A-10.10
3A-11.1
3A-11.2
3A-12.1
3A-12.2
3A-12.3
3A-12.4
3A-13.3
3A-13.4
3A-13.5
3A-13.6
3A-13.7
3A-13.8
3A-13.9
3A-13.10
3A-14.1
3A-14.2
3A-14.3(First One)
3A-14.5
3A-14.7
3A-15.2
3A-17.1
3A-17.2
3A-17.3

SUBELEMENT 3AB

3B-1.1 p 2-3
3B-1.2 p 2-3
3B-1.3 p 2-3
3B-1.6 p 2-2
3B-1.7 p 2-2
3B-1.8 p 2-2
3B-1.9 p 2-2
3B-1.10 p 2-2
3B-1.11 p 2-2
3B-1.12 p 2-2
3B-1.13 p 2-2
3B-1.14 p 2-2
3B-1.15 p 2-2
3B-1.16 p 2-2
3B-2.5 p 2-8
3B-2.7 p 2-7
3B-2.8 p 2-8
3B-2.9 p 2-7
3B-3.1 p 2-4
3B-3.2 p 2-4
3B-3.3 p 2-4
3B-3.4 p 2-4
3B-3.5 p 2-4
3B-3.6 p 2-4
3B-3.7 p 2-5
3B-3.9 p 2-6
3B-3.10 p 2-6
3B-3.11 p 2-6
3B-3.13 p 2-6
3B-6.4 p 2-12
3B-6.5 p 2-12
3B-6.6 p 2-12
3B-6.7 p 2-12
3B-6.8 p 2-9
3B-6.9 p 2-12
3B-6.10 p 2-12
3B-9.1 p 2-16
3B-9.2 p 2-16

SUBELEMENT 3AC

3C-1.1 p 3-1
3C-1.2 p 3-2
3C-1.3 p 3-2
3C-1.4 p 3-2
3C-1.5 p 3-2
3C-1.8 p 3-3
3C-1.11 p 3-2
3C-1.12 p 3-2
3C-1.14 p 3-3
3C-2.1 p 3-3
3C-2.2 p 3-3
3C-2.5 p 3-3
3C-2.6 p 3-3
3C-3.1 p 3-5
3C-3.2 p 3-5
3C-3.5 p 3-5
3C-4.1 p 3-3
3C-4.2 p 3-3
3C-4.3 p 3-2
3C-4.4 p 3-3
3C-6.1 p 3-9
3C-6.3 p 3-3
3C-8.1 p 3-11
3C-8.2 p 3-11
3C-9.1 p 3-11
3C-9.2 p 3-11
3C-9.3 p 3-11
3C-9.4 p 3-11
3C-9.5 p 3-11
3C-9.6 p 3-11

SUBELEMENT 3AD

3D-1.1 p 4-1
3D-1.2 p 4-1
3D-1.3 p 4-1
3D-1.4 p 4-1
3D-2.1 p 4-5
3D-2.2 p 4-5
3D-2.3 p 4-5
3D-2.5 p 4-5
3D-5.2 p 8-7
3D-5.3 p 9-18
3D-5.4 p 9-18
3D-7.1 p 4-8
3D-7.2 p 4-8
3D-7.3 p 4-8
3D-7.4 p 4-8
3D-8.1 p 4-10
3D-8.2 p 4-10
3D-8.3 p 4-10
3D-8.4 p 4-10
3D-8.5 p 4-10
3D-11.1 p 4-19
3D-11.2 p 4-18
3D-11.3 p 4-19
3D-11.4 p 4-19
3D-11.5 p 4-19
3D-12.1 p 4-16
3D-14.1 p 4-18
3D-14.2 p 4-18
3D-14.3 p 4-18
3D-14.4 p 4-18
3D-14.5 p 4-18
3D-14.8 p 4-18
3D-16.1 p 4-15
3D-16.2 p 4-15
3D-16.3 p 4-15
3D-16.4 p 4-15
3D-16.5 p 4-15
3D-17.1 p 4-15
3D-18.1 p 4-19
3D-18.2 p 4-19
3D-18.3 p 4-19

SUBELEMENT 3AE

3E-2.1 p 5-4
3E-2.2 p 5-4
3E-2.3 p 5-5
3E-2.4 p 5-5
3E-4.1 p 5-15
3E-4.2 p 5-17
3E-4.3 p 5-15
3E-4.4 p 5-15
3E-4.5 p 5-15
3E-5.1 p 5-13
3E-5.2 p 5-14
3E-5.3 p 5-13
3E-5.4 p 5-14
3E-5.5 p 5-14
3E-7.1 p 5-14
3E-7.3 p 5-14
3E-8.1 p 5-14
3E-8.2 p 5-14
3E-8.3 p 5-14
3E-8.4 p 5-14
3E-9.1 p 5-17
3E-9.2 p 5-17
3E-9.3 p 5-17
3E-9.4 p 5-17
3E-11.1 p 5-6
3E-11.2 p 5-6
3E-11.3 p 5-9
3E-11.4 p 5-6
3E-11.5 p 5-6
3E-12.2 p 5-5
3E-13.4 p 5-9
3E-14.8 p 5-6
3E-14.9 p 5-6
3E-14.10 p 5-6
3E-14.11 p 5-6

SUBELEMENT 3AF

3F-1.1 p 6-1
3F-1.2 p 6-1
3F-1.3 p 6-3
3F-1.4 p 6-3
3F-1.6 p 6-3
3F-2.1 p 6-4
3F-2.2 p 6-4
3F-2.3 p 6-7
3F-2.4 p 6-7
3F-2.5 p 6-4
3F-2.8 p 6-4
3F-3.1 p 6-9
3F-3.2 p 6-9
3F-3.3 p 6-9
3F-3.4 p 6-9
3F-3.5 (First One) p 6-9
3F-3.8 p 6-9
3F-5.3 p 6-15

SUBELEMENT 3AG

3G-2.1 p 7-8
3G-2.2 p 7-8
3G-2.3 p 7-8
3G-2.4 p 7-7
3G-2.5 p 7-8
3G-2.6 p 7-7
3G-2.7 p 7-8
3G-2.9 p 7-8
3G-3.1 p 7-9
3G-3.2 p 7-14
3G-3.3 p 7-10

SUBELEMENT 3AH

3H-1.1 p 8-1
3H-1.2 p 8-1
3H-1.3 p 8-1
3H-1.4 p 8-1
3H-1.5 p 8-1
3H-1.6 p 8-1
3H-1.7 p 8-1
3H-1.8 p 8-1
3H-1.9 p 8-1
3H-1.10 p 8-1
3H-2.2 p 8-2
3H-6.1 p 8-8
3H-6.2 p 8-10
3H-7.1 p 8-10
3H-9.2 p 8-4
3H-12.1 p 8-11
3H-14.1 p 8-13
3H-14.2 p 8-13
3H-16.1 p 8-14
3H-16.2 p 8-14
3H-16.3 p 8-14

SUBELEMENT 3AI

3I-1.1 p 9-3
3I-1.2 p 9-5
3I-1.4 p 9-6
3I-1.5 p 9-6
3I-1.6 p 9-6
3I-1.8 p 9-5
3I-2.2 p 9-9
3I-2.3 p 9-9
3I-2.4 p 9-9
3I-2.5 p 9-9
3I-2.6 p 9-9
3I-4.1 p 9-1
3I-4.2 p 9-1
3I-4.3 p 9-1
3I-4.4 p 9-1
3I-4.5 p 9-9
3I-4.6 p 9-9
3I-4.7 p 9-9
3I-4.8 p 9-9
3I-6.7 p 9-5
3I-8.1 p 9-16
3I-8.2 p 9-16
3I-8.3 p 9-16
3I-9.1 p 9-16
3I-9.2 p 9-16
3I-10.1 p 9-18
3I-10.2 p 9-18
3I-10.3 p 9-18
3I-10.4 p 9-18
3I-11.3 p 9-13
3I-11.5 p 9-13
3I-11.6 p 9-14
3I-11.9 p 9-13
3I-11.11 p 9-13
3I-12.3 p 9-18
3I-12.4 p 9-18

Table 3
Element 3B (General) Question Pool

SUBELEMENT 3BA

3A-3.2
3A-3.3
3A-3.4
3A-3.5
3A-3.7
3A-4.1
3A-4.3
3A-6.1
3A-6.2
3A-6.6
3A-8.6
3A-9.1
3A-9.2
3A-9.3
3A-9.4
3A-9.5
3A-9.6
3A-9.7
3A-9.8
3A-9.9
3A-9.10
3A-9.11
3A-9.12
3A-9.13
3A-9.14
3A-9.15
3A-9.16
3A-10.1
3A-10.2
3A-10.3
3A-10.4
3A-10.5
3A-10.6
3A-10.7
3A-10.8
3A-13.1
3A-13.2
3A-14.3(Second one)
3A-14.6
3A-15.1
3A-15.3
3A-15.4
3A-16.1
3A-16.2
3A-16.3
3A-16.4

SUBELEMENT 3BB

3B-1.4	p 2-1
3B-1.5	p 2-1
3B-2.1	p 2-7
3B-2.2	p 2-7
3B-2.3	p 2-7
3B-2.4	p 2-8
3B-2.6	p 2-7
3B-2.10	p 2-8
3B-2.11	p 2-8
3B-2.12	p 2-8
3B-3.8	p 2-6
3B-3.12	p 2-6
3B-4.1	p 2-2
3B-4.2	p 2-2
3B-5.1	p 2-11
3B-5.2	p 2-11
3B-6.1	p 2-12
3B-6.2	p 2-12
3B-6.3	p 2-12
3B-7.1	p 2-15
3B-7.2	p 2-15
3B-7.3	p 2-15
3B-7.4	p 2-13
3B-7.5	p 2-13
3B-8.1	p 2-13
3B-8.2	p 2-13
3B-8.3	p 2-13
3B-8.4	p 2-13
3B-8.5	p 2-15
3B-8.6	p 2-13
3B-8.7	p 2-13
3B-8.8	p 2-13
3B-8.9	p 2-13
3B-10.1	p 2-17
3B-10.2	p 2-17

SUBELEMENT 3BC

3C-1.6	p 3-3
3C-1.7	p 3-3
3C-1.9	p 3-3
3C-1.10	p 3-3
3C-1.13	p 3-4
3C-2.3	p 3-3
3C-2.4	p 3-3
3C-3.3	p 3-5
3C-3.4	p 3-5
3C-5.1	p 3-6
3C-5.2	p 3-6
3C-5.3	p 3-6
3C-5.4	p 3-6
3C-5.5	p 3-6
3C-6.2	p 3-10
3C-6.4	p 3-10
3C-6.5	p 3-9
3C-6.6	p 3-9
3C-7.1	p 3-5
3C-7.2	p 3-6
3C-7.3	p 3-6
3C-7.4	p 3-6
3C-7.5	p 3-6
3C-7.6	p 3-6
3C-7.7	p 3-6
3C-7.8	p 3-6
3C-10.1	p 3-7
3C-10.2	p 3-7
3C-10.3	p 3-7
3C-10.4	p 3-7

SUBELEMENT 3BD

3D-1.5	p 4-1
3D-1.6	p 4-4
3D-1.7	p 4-4
3D-1.8	p 4-2
3D-1.9	p 4-4
3D-2.4	p 4-6
3D-3.1	p 4-11
3D-3.2	p 4-11
3D-3.3	p 4-11
3D-3.4	p 4-11
3D-3.5	p 4-11
3D-4.1	p 4-13
3D-4.2	p 4-13
3D-4.3	p 4-13
3D-4.4	p 4-13
3D-4.5	p 4-13
3D-5.1	p 8-7
3D-5.5	p 8-7
3D-5.6	p 8-7
3D-5.7	p 8-7
3D-6.1	p 4-6
3D-6.2	p 4-6
3D-6.3	p 4-6
3D-6.4	p 4-6
3D-9.1	p 4-11
3D-9.2	p 4-11
3D-9.3	p 4-11
3D-10.1	p 4-19
3D-10.2	p 4-19
3D-10.3	p 4-19
3D-10.4	p 4-19
3D-10.5	p 4-19
3D-12.2	p 4-16
3D-12.3	p 4-16
3D-12.4	p 4-16
3D-12.5	p 4-16
3D-13.1	p 4-15
3D-13.2	p 4-15
3D-13.3	p 4-15
3D-14.6	p 4-18
3D-14.7	p 4-18
3D-15.1	p 4-12
3D-15.2	p 4-12
3D-15.3	p 4-8
3D-15.4	p 4-8
3D-17.2	p 4-15
3D-17.3	p 4-15
3D-17.4	p 4-15
3D-17.5	p 4-15
3D-17.6	p 4-15

SUBELEMENT 3BE

3E-1.1	p 5-23
3E-1.2	p 5-23
3E-3.1	p 5-21
3E-3.2	p 5-21
3E-3.3	p 5-21
3E-3.4	p 5-22
3E-3.5	p 5-21
3E-6.1	p 5-24
3E-6.2	p 5-24
3E-6.3	p 5-24
3E-6.4	p 5-24
3E-7.2	p 5-21
3E-7.4	p 5-23
3E-10.1	p 5-11
3E-10.2	p 5-11
3E-10.3	p 5-11
3E-10.4	p 5-11
3E-10.5	p 5-11
3E-10.6	p 5-11
3E-10.7	p 5-11
3E-10.8	p 5-11
3E-10.9	p 5-11
3E-12.1	p 5-5
3E-12.3	p 5-5
3E-13.1	p 5-9
3E-13.2	p 5-9
3E-13.3	p 5-9
3E-14.1	p 5-5
3E-14.2	p 5-5
3E-14.3	p 5-18
3E-14.4	p 5-14
3E-14.5	p 5-5
3E-14.6	p 5-18
3E-14.7	p 5-14
3E-15.1	p 5-19
3E-15.2	p 5-19
3E-15.3	p 5-19
3E-15.4	p 5-19
3E-16.1	p 5-2
3E-16.2	p 5-2
3E-16.3	p 5-2

SUBELEMENT 3BF

3F-1.5	p 6-4
3F-2.6	p 6-7
3F-2.7	p 6-7
3F-3.5(Second One)	p 6-11
3F-4.1	p 6-12
3F-4.2	p 6-12
3F-4.3	p 6-12
3F-4.4	p 6-12
3F-5.1	p 6-13
3F-5.2	p 6-13
3F-5.4	p 6-15

SUBELEMENT 3BG

3G-1.1	p 7-4
3G-1.2	p 7-4
3G-1.3	p 7-1
3G-1.4	p 7-2
3G-1.5	p 7-2
3G-1.6	p 7-6
3G-1.7	p 7-5
3G-1.8	p 7-2
3G-1.9	p 7-2
3G-2.8	p 7-7

SUBELEMENT 3BH

3H-2.1	p 8-2
3H-2.3	p 8-8
3H-2.4	p 8-8
3H-3.1	p 8-2
3H-3.2	p 8-3
3H-4.1	p 8-6
3H-4.2	p 8-6
3H-5.1	p 8-6
3H-5.2	p 8-6
3H-7.2	p 8-10
3H-8.1	p 8-3
3H-8.2	p 8-3
3H-9.1	p 8-3
3H-10.1	p 8-11
3H-10.2	p 8-11
3H-11.1	p 8-5
3H-13.1	p 8-4
3H-13.2	p 8-4
3H-15.1	p 8-12
3H-15.2	p 7-14
3H-16.4	p 8-14
3H-16.5	p 8-14

SUBELEMENT 3BI

3I-1.3	p 9-7
3I-1.7	p 9-7
3I-1.9	p 9-11
3I-2.1	p 9-9
3I-3.1	p 9-9
3I-3.2	p 9-9
3I-3.3	p 9-9
3I-3.4	p 9-9
3I-3.5	p 9-9
3I-3.6	p 9-9
3I-3.7	p 9-9
3I-3.8	p 9-9
3I-3.9	p 9-9
3I-5.1	p 9-3
3I-5.2	p 9-11
3I-5.3	p 9-12
3I-5.4	p 9-12
3I-6.1	p 9-9
3I-6.2	p 9-3
3I-6.3	p 9-3
3I-6.4	p 9-10
3I-6.5	p 9-5
3I-6.6	p 9-5
3I-7.1	p 9-13
3I-7.2	p 9-14
3I-7.3	p 9-14
3I-7.4	p 9-14
3I-8.4	p 9-16
3I-9.3	p 9-17
3I-9.4	p 9-17
3I-9.5	p 9-17
3I-11.1	p 9-14
3I-11.2	p 9-14
3I-11.4	p 9-14
3I-11.7	p 9-14
3I-11.8	p 9-13
3I-11.10	p 9-13
3I-11.12	p 9-13
3I-12.1	p 9-16
3I-12.2	p 9-18
3I-12.5	p 9-18

Hardline Coaxial Connectors You Can Make

Would you like to use low-loss Hardline, but dread the cost of buying the proper connectors? Then try these methods of making your own high-performance connectors—inexpensively!

By George Chaney, W5JTL
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On frequencies above 50 MHz, we are more concerned with transmission-line attenuation than we are at HF, and rightfully so. At VHF and above, the attenuation of RG-8 types of coaxial cable (except Belden 9913) becomes intolerable, even for short runs. Fortunately, most of us are able to acquire surplus, low-loss CATV Hardline (75 ohms), or the more-desirable 50-ohm type used in the two-way-radio business. These cables are frequently available at hamfests and in the trade sheets at reasonable cost. But what can we do about connectors for this coax? Spending $20 (or more) for ½-inch connectors or $50 (or more) for 7/8-inch connectors is more than most of us can afford!

What's Needed?

Amateur ingenuity has tried, in varying degrees of quality, to provide inexpensive Hardline connectors. Many of the suggested methods do not give sufficient attention to maintaining constant impedance, and sometimes weatherproofing is questionable. Since retiring, I have been able to combine my ham radio and home workshop hobbies, and have come up with what I believe to be excellent alternatives to the expensive connectors. My connector criteria are: (1) They should be used only where absolutely necessary; (2) they must maintain (as near as possible) a constant impedance; (3) the connectors must be inexpensive; and (4) they must be weatherproof.

A Modified PL-259

My first effort in fabricating a connector for 50-ohm Hardline was for RG-331, which has an aluminum outer conductor, a ½-inch OD and a center conductor of 0.159-inch-OD copper wire. This is about 0.005 inch oversize, but will fit into an SO-239 female UHF connector. The outer sleeve of a PL-259 will readily slide over the outer conductor, with the jacket material removed.

Fig 1 shows the steps necessary to make this connector. Start by putting a 9/16-inch-long sleeve with an OD of 9/16 inch and ID of ½ inch over the outer cable conductor; about 1/16 inch of the coaxial cable outer conductor should protrude through the sleeve. Using a sharp pocketknife, make a ½-inch-long slit lengthwise in the aluminum outer conductor. Now, slide the sleeve (part C) forward to the bottom of the slit and hold it there. Lift the tab of the outer conductor as shown at the upper part of the photo and peel it around. This leaves a flared end that is flattened easily against the sleeve to retain it. A little deburring and presto!—we now have a PL-259 connector. A small amount of diameter-reduction on the center conductor can be done using a file.

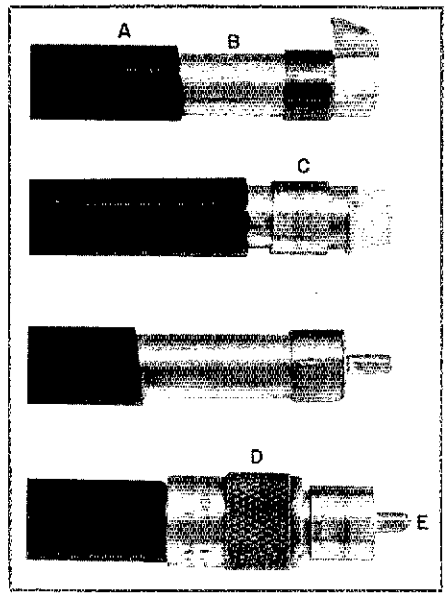


Fig 1—Shown here is the construction of a homemade, 50-ohm, constant-impedance connector for ½-in-diam aluminum-jacketed Hardline. In the sequenced steps presented here, the first three stages do not show the presence of part D, the threaded sleeve, or shell, as it appears on the finished product. The threaded sleeve must be put on first, before the 9/16-inch sleeve (part C). Parts A and B are the coaxial cable outer jacket and outer conductor, respectively. Part C is the spacer sleeve (see text). The coaxial cable center conductor (part E) is 0.159-inch OD and will enter an SO-239 receptacle, but should be filed down to 0.154 inch.

The foregoing procedure will work okay with ½-inch, 75-ohm Hardline. Solder a short piece of 5/32-inch-OD hobby-shop brass tubing over the center conductor to bring it up to the proper diameter for the SO-239 connector.

The SO-239

I haven't seen one of these with a brass body since WW II. They all seem to be made of the cheapest kind of pot metal that can be found. Insulating material may be Bakelite, acrylic, polyethylene or perhaps some magic mixture from the witch's cauldron. In any event, it smells bad when you get it too hot with a soldering iron. Now you can get them with a Teflon® dielectric, but the connector still creates a bad impedance bump.

The center conductor of an SO-239 connector, when expanded with a 5/32-inch (0.156) rod, is about 0.220-inch diameter. Most of the center conductors appear to be silver plated. Maybe the plating is tin, but it serves its purpose well, so we can retain that part as a useful item. Without the insulating material, the impedance through this connector would be slightly less than 50 ohms. Other than support for the center pin, I cannot see that the insulation serves any useful purpose, particularly as a dielectric material. Just to see if it could be done, I carefully removed the crimp that retains the insulator and cut off the part of the insulator that extends into the body of the SO-239. This left only about 1/8 inch of insulation. The insulator was replaced in the connector shell and re-crimped. The center remained concentric and did not need more support. Thereafter, the connector impedance was close enough to 50 ohms that it could be considered a constant-impedance connector. This little

experiment, done solely out of curiosity, was later put to good use.

Threads for both UHF and N type connectors are 5/8 inch, 24 tpi (NEF). Recently, in QSO with N5BHO, Woody expressed a desire to obtain some connectors for Heliax LDF-4-50. He wanted a female UHF connector. I made some measurements and determined that the OD of the ridge of the corrugated outer conductor of this coaxial cable was 0.545 inch; the center conductor OD is 0.189 inch. With about $1 worth of materials and a couple of days labor, cutting, trying and discarding, a high-quality, constant-impedance UHF female connector came into being; see Fig 2.

Half-inch copper water tube is actually 5/8-inch OD. In K grade, the greatest wall thickness available, it is 0.535-inch ID. The hard-drawn type machines well and leaves good clean threads. While not as good as brass for this purpose, it is acceptable and—more important—available. This copper tube will be the outer conductor. Without going into details, let me say that several different versions were developed. To maintain a 50-ohm impedance, the center conductor of the connector needs to be 0.232-inch OD, with the ID of the copper pipe being 0.535 inch. Because I didn't have a standard SO-239 center conductor available at the time, one of them was made on the lathe from ¼-inch brazing rod. On the end that mates with the coaxial cable center conductor, a hole was drilled with a no. 12 (0.189-inch) drill about 0.150 inch deep. This is a perfect fit for the center conductor.

The outer connector shell (part B of Fig 2) is made from ½-inch, type K, hard-drawn copper water tube. The thread is cut with a 5/8 × 24 die for a length of about 5/8 inch. Then, the pipe is cut to an overall length of 2 inches for the body of the connector and, finally, deburred. Four 1-inch-long, equally spaced slits are made lengthwise on the unthreaded end. We are now ready to assemble the connector on the coax.

The coaxial cable (part A of Fig 2) must have no bends on the end. Bends prevent alignment and concentricity of the center and outer conductors. Remove 1¼ inch of jacket material. Expose ¼ inch of the center conductor. Cut the outer conductor at the low part of the annular corrugation, and then very carefully remove, with a sharp knife, additional copper outer conductor until it is just short of the ridge of the corrugation. If the exposed center conductor is more than ¼ inch long, remove the excess with a file, but be very careful not to leave any marks or scratches on the center conductor; otherwise, the 0.189-inch hole will be too small.

To protect the foam insulation from heat and solder flux contamination, wrap two turns of aluminum foil around the coaxial cable and fold the foil end down until it contacts the center conductor. Put the connector center piece on the coaxial cable center conductor. There will be slightly less than 1/8 inch of exposed center conductor to which the solder must be applied. Use a 200-W soldering gun, if available, and permit it to attain full heat before applying it to the solder joint. Hold it against the brass pin and hold the solder against the copper of the center conductor, at the joint, but not touching the brass. In about 1 minute, the solder will commence to melt. Quickly run it around the joint and remove heat. Permit it to cool for about five minutes, and then remove any excess solder with a knife. Remove the aluminum foil and you will observe that the foam insulation remains clean and white.

To install the outer connector shell, open the fingers formed by the slits enough so that the end of the coaxial cable can be pushed into it. It will be a 0.010-inch interference fit, requiring compression of the coaxial cable outer conductor, and application of considerable force. If necessary, spread the fingers more until the shell is in place. The end of the center connector (part C of Fig 2) should be about 1/16 inch inside the threaded end of the shell. A wormscrew type hose clamp is used to compress the fingers firmly against the coaxial cable outer conductor. The clamp is left in place. Coax Seal, or something similar, is applied to seal the cracks and joints, with heat-shrink tape on top of the sealer.

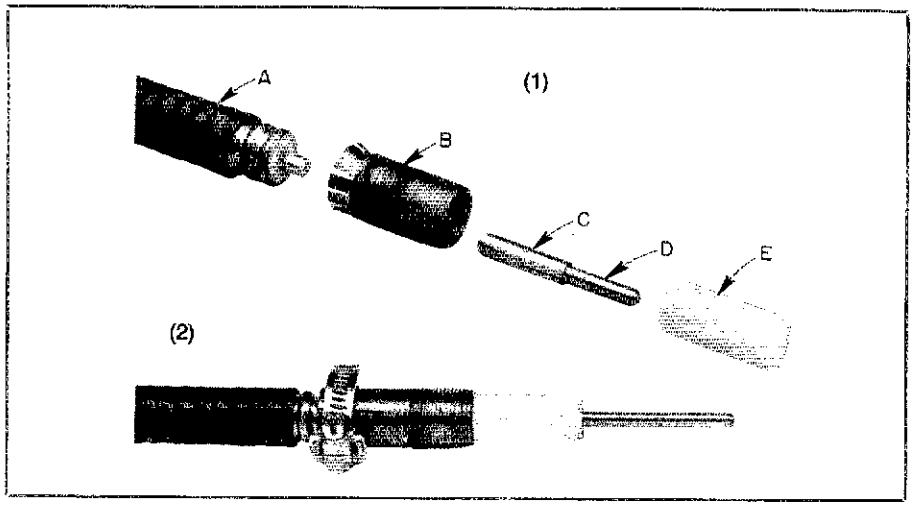


Fig 2—A constant-impedance female UHF connector for Heliax LDF 4-50 cable is shown in disassembled (1) and assembled (2) form. Part A is the coaxial cable. Part B is the outer shell made of type K copper water pipe. The female center conductor (C) is composed of two parts: a 7/32 OD × 5/16-inch-long piece of hobby brass tubing and the center portion of an SO-239 connector soldered together. The small diameter rear portion of the salvaged SO-239 pin is removed. In the photo, a center pin, part D (as from a PL-259 connector), is seen inserted into the female portion of the connector; the Teflon section (part E) is used to maintain concentricity of the female pin. (The only purpose of the male pin is to expand the female pin so that it is held in alignment by the plug.) One way of attaching the connector to the coaxial cable is shown at (2), where a compression clamp is used. Again, the Teflon section and large male pin are used only as an alignment plug and are not part of the finished connector. In lieu of the compression clamp, the fingers on the outer shell of the connector may be soldered to the metal outer conductor of the cable.

If the end result of the preceding operation is repugnant to your aesthetic values, you may want to consider some other type of retainer. I haven't tried it, but there is no reason that it could not be wrapped with close-wound no. 18 bare copper or brass wire. If you choose this method, do it in three steps: First, on each side of the clamp, wrap the wire tightly and secure the ends with solder. Then, remove the clamp and wrap that part. It is very important that the pressure of the fingers against the outer conductor of the coaxial cable not be released.

Most of you will probably prefer an alternate method of making the connector, which does not require the "high tech" machinery. For this one, we will use the center connector of an SO-239 connector. Liberate it from its present surroundings with a hacksaw, chisel or any way you can without damaging the center connector. Some alteration of the back end of it will be necessary. A convenient way to hold it for this work is to insert a short piece of 5/32-inch-diameter rod or tubing into the opening and put that end in a drill chuck. Remove the small diameter part with wire cutters and file flush with the next larger diameter. You will observe that it has been enlarged at the bottom to retain it in the insulator. File off the enlargement. The diameter will be approximately 0.183 inch, except for the flat place on it.

To connect it to the coaxial cable center conductor, we will need a 5/16-inch length

of 7/32-inch diameter hobby-shop brass tubing. This tubing has a wall thickness of 0.014 inch, and is a tight fit on the center conductor. Solder it to the center conductor, in the manner previously described, leaving sufficient depth to accommodate the center connector. Put the 0.183-inch end of the center connector in the open end of the tubing. It will be a loose fit and will require some type of support to keep it straight during the soldering. Again, get the soldering iron hot before applying it to the work. Quickly solder the joint, but be sure you don't get a cold joint. Heat-sinking provided by the coaxial cable center conductor will prevent the previously applied solder from melting, provided you don't get things too hot.

For this connector, the copper pipe is only 1 inch long. A 1¼-inch length of 17/32-inch-diameter hobby-shop-type brass tubing is soldered inside the threaded copper tube. Extreme care is required to prevent inadvertent creeping of the solder into the threads. Cleaning the stray solder without thread damage is quite difficult. Some silicone grease on the threads should prevent solder adhesion, but silicone residue on the back part will not permit good bonding of the Coax Seal which will later be required. The excess portion of the brass tube is left protruding out the unthreaded end of the shell. With a Dremel® or other hobby motor tool and silicon carbide disc, slits are made in the protruding brass tube to form fingers about 1/8 inch wide. Bend these fingers out at about a 45° angle and lightly tin the inside of them. These fingers will be soldered to the outer conductor of the coaxial cable.

I have found that the outer conductor of the coaxial cable, while bright and shiny, has some sort of residue on it that inhibits soldering. Because we want to get this job done without excess heat, clean up the outer conductor with 600-grit silicon-carbide abrasive. Tin the conductor lightly with minimum heat.

It's necessary to provide a means of keeping the shell in alignment and concentric with the center conductor before and during assembly. A 1-inch length of ½-inch-diameter Teflon rod, drilled through the center with a no. 1 (0.228-inch) drill, will work fine. Press the shell against the outer conductor, over the center connector, with centering device in place. Determine that everything is going to fit up properly and that the center pin doesn't protrude or recede too far. If any dimension adjustments are to be made, now is the time to do so. You may need to remove a slight additional amount of outer conductor, or pull the shell out so that there is at least a 1/16-inch recess from the outer end of the shell to the tip of the center connector.

Bend one of the fingers into contact with the tinned outer conductor, and conform it as nearly as possible to the shape of the outer conductor. Keep pressure on it while soldering. Turn over the assembly and solder a finger on the opposite side to the outer conductor, proceeding in like manner until all fingers are soldered. Hold the work in a vertical position while soldering to prevent any solder droplets from being trapped in the connector. File a couple of notches for the locating tabs on the PL-259, or file them off the PL-259. Weatherproof the connector with sealer and heat-shrink tubing, and you are in business with a high quality connector.

Female N Connectors

N type female connectors can be made on the same principle, except that we use the shell and center conductor of a UG-58A chassis receptacle. See Fig 3. First, the flange is completely removed using a lathe. The rear portion is turned down to a diameter of 0.503 inch for about ¼ inch, to accept a 17/32-inch brass tube. The crimped extension which holds the Teflon insulator is likewise turned off flush with the bottom, and the insulator (holding the center pin) is removed. Center-pin diameter is exactly 0.120 inch as is a no. 31 drill bit, which is used to drill a hole in a 0.218-inch-diameter brass rod ½ inch long. The hole is enlarged to 0.189 inch on one end with a no. 12 drill bit. Both ends will be perfect mating fits—for the center pin and center conductor—so that there is no problem holding it straight for alignment purposes when soldering.

I soldered the center pin first, from the inside. In order to protect it from undesired solder spread, I used small-diameter solder and cut it into very small chips, dropping them in the hole before applying heat. Fingers are cut in the brass tube, where it mates with the coaxial cable outer conductor, and soldered to it. Be sure that the Teflon insulator extends completely to the bottom of the hole provided for it in the UG-58 body. A centering jig should also be placed in the open end of the UG-58, fitted closely, with the male center pin in place so that the female center pin will be expanded and have uniform diameter. The impedance through this connector will be as near 50 ohms as any other part of your feed-line system.

Connectors for 7/8-inch Heliax are made easily (Fig 4 is typical), but I have not found any way to do so satisfactorily without the use of a lathe. I have searched in vain for some type of copper or brass fitting that can be mated with it. Fittings

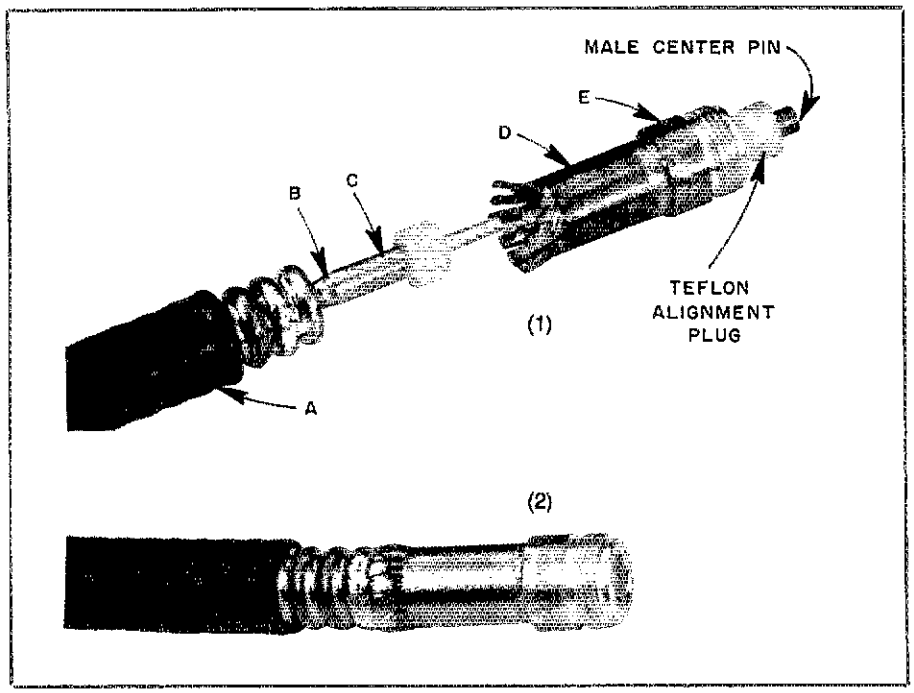


Fig 3—An N female connector to fit Heliax LDF 4-50 cable. At (1), a breakdown of a 50-ohm, constant-impedance female connector for 4-50 Heliax. An alignment plug consisting of a piece of Teflon and a pin is shown at the right of the connector. In the breakdown, part A is the LDF 4-50 coaxial cable. Part B is a small coupling sleeve used between the coaxial cable center conductor and the center pin (part C) removed from a UG-58 receptacle (complete with center insulator). The connector's outer conductor (part D) is made of hobby brass tubing. Fingers at one end mate with the coaxial cable, while the other end of the tube is soldered to a modified UG-58 receptacle body, part E. The completed connector is shown at (2). Note the fingers soldered to the coaxial cable outer conductor.

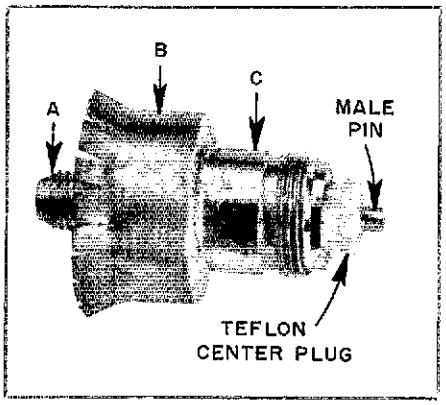


Fig 4—A homemade connector for use with Andrew LDF 5-50 Heliax. Refer to text for construction details. Part A is the homemade center conductor. A copper sleeve coupling is used for part B and soldered to part C, a modified UG-58 receptacle.

(couplings, caps, and so forth) for ¾-inch copper pipe are close, but require some enlargement to go over the outer conductor of the coax.[1] These fittings are much closer to the annealed state than hard-drawn tubing, requiring special attention when machining. Cutting tools tend to "dig in" and pull the work out of the lathe chuck. I have made some split sleeves for the different diameters of fittings I work with. The work is put in the sleeve, and the sleeve is held in the chuck. This applies equal pressure around the circumference of the fitting, holding it securely in place for machining.

To mate the fitting to the coaxial cable, the fitting is enlarged internally with a boring bar until the wall thickness has been reduced to about 0.015 inch to a depth of ¼ inch or more. This thinned portion is cut into fingers with a hobby motor tool and slitting saw. The fingers are folded out and over the corrugations of the Heliax and soldered to it.

Center-conductor adapters are screw-in type for LDF 5-50 Heliax. The center conductor of this cable is thin-wall copper tubing. Threads cut with a 5/16-inch NF die will self-tap very neatly inside the copper tube. The adapter is made from 5/16-inch hex stock brass, drilled through the center with a no. 31 (0.120-inch) drill to accommodate the UG-58 center pin. Thread the adapter with a 5/16-inch NF die (7-mm die for the older type Heliax with helical corrugation) for about ½ inch. Cut the adapter off, leaving enough hex material to accept a 5/16-inch open-end wrench. After soldering the center pin, it is screwed into the copper-tube center conductor until the hex part is flush with the center conductor. Because the hex corners come closer than I think they should to the base of the UG-58, I prefer to slightly round off that end of the adapter.

The body or shell of the connector can be made from either a sleeve coupling, cap or ¾- to ½-inch reducer. Regardless of which one you choose, keep it as short as possible. There is nothing to gain by creating a large cavity and filling it up with Teflon. If sleeve couplings are used (my preference), the flange of the UG-58 is lathe-turned to fit the inside of the coupling. This will be just past the "clean up" of the screw holes in the flange. The center pin and insulator are also removed from the UG-58. To assure alignment, I use a Teflon plug, which is a tight fit in the coupling and supports the bottom of the UG-58 during the soldering process. If you don't have a high-wattage soldering iron, preheating with a torch will help.

There may be a worthwhile advantage in using reducers, if you can find them. Some have right-angle internal reduction, others are tapered. The right-angle type facilitates making the Teflon filler to be described later. On the small end of the reducers, the hole is 5/8-inch diameter, which is a perfect fit for the UG-58 body, with the flange removed. Cut it off, leaving about 1/8 inch for centering purposes, and solder in the UG-58.

Where it is possible to do so without disturbing impedance, I prefer to fill cavities with Teflon. In this case, it can be done with a 0.875-inch-diameter plug drilled with a size X drill bit. This will be a snug fit over that part of the center pin insulator that protrudes outside the body of the UG-58. In order to lower the dielectric constant of the part that goes over the hex part of the center-pin adapter, an additional amount of Teflon is bored out, over that part only, to a diameter of ½ inch. Impedance calculations at points of abrupt diameter change in coaxial cable become quite complex and are beyond my capability. I am sure there is room for refinement of dimensions here, but following the axiomatic rule, "If it ain't broke, don't fix it," I am reluctant to change them. Attenuation tests for the connectors described here were made by Kent Britain, WA5VJB, using laboratory grade equipment. His measurements indicate that these connectors are almost identical in insertion loss to commercially made connectors from 0 to 2 GHz, and within 0.2 dB of the commercial units up to 4 GHz.

Internal length dimensions have not been given; that depends on the length of the center-pin adapter extending from the coaxial cable center conductor. Keep the adapter as short as possible to allow use of an open-end wrench. These lengths are also affected by the make of the adapter. UG-58 adapters made by Amphenol do not have locking rings on them. They use a knurled center pin to keep them in place. Kings uses lock rings, which do not permit the center pin to penetrate the adapter to the point of contact with the insulator. Adjustments must be made for this sort of thing. I recommend that the Teflon plug be made about 0.005-inch shorter than the separation between the bottom of the UG-58 flange and the coaxial cable insulation, to assure bottoming of the UG-58 insulator in its recess.

Summary

There is much more that could be written on this subject. I hope that the material presented here will be helpful to you. Perhaps it will provide you with other ideas on how to obtain inexpensive Hardline connectors. I'd like to express my gratitude to Kent Britain for providing attenuation measurements.

George Chaney, W5JTL, holds an Advanced class license. He was first licensed in 1940. George is an attorney, admitted to the bar in 1938. He is a former Municipal Court Judge, United States Commissioner, County Prosecuting Attorney, City Prosecuting Attorney, Youth Court Counsellor and District Attorney of the 9th Judicial District of Mississippi. He retired from legal activities in 1980.

Though he professes no formal education in electronics, George's primary interests lie in VHF, UHF and microwave activities. He is currently active on 144, 432 and 1296 MHz. He holds 144-MHz WAS no. 45. George used all known modes of propagation for 144 MHz WAS: tropo bending, ducting, meteor scatter, E-skip, aurora, FAI, aircraft reflection and EME. He's also done some design work in the areas of antennas, transmission lines, power dividers and support structures for large antennas. George has had several other articles published in Ham Radio *magazine. His plans for the future include being active on 432, 902 and 1296 EME, and lots of shop work.*

[1]The words "copper-sleeve coupler" or "coupling" describe what you would get if you asked for one of a given size at a plumbing supply store. These couplers are used to connect together (by soldering) two pieces of copper water tube. A reducer connects dissimilar sizes. The OD of copper water pipe is 1/8 inch larger than the nominal size. The ID of the coupling sleeve is about 0.002 inch larger than the OD of piping that size. Copper water pipe comes in three different grades of wall thickness for each nominal size: K, L and M, in descending order of thickness and ascending order of ID. By proper selection of size and grade, and use of hobby-shop brass tubing (in 0.031-inch increments), we are able to fabricate short sections of coaxial cable of any desired impedance, within close tolerances.

Strays

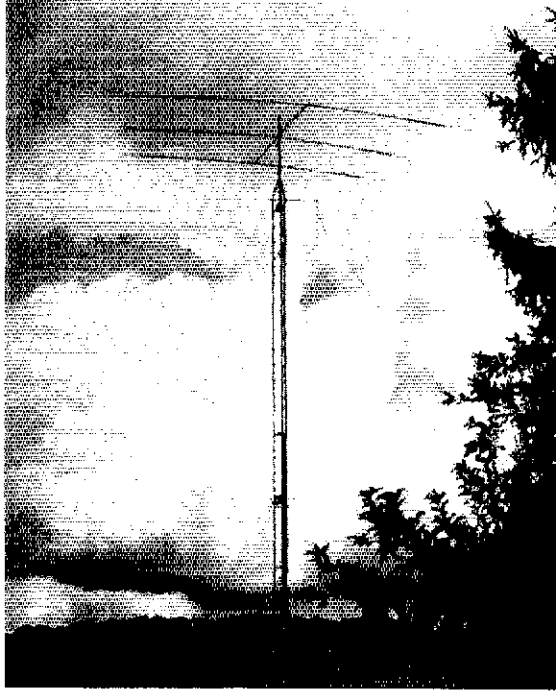
I would like to get in touch with...

☐ anyone with a manual for a Knight linear, Model T-175. Sam Cone, N4DNJ, 2198 Dunn Ave, Memphis, TN 38114.

☐ anyone with a schematic/manual for a Lysco Transmaster transmitter. Ed Baznik, WD8CFO, 6499 Crossview Rd, Seven Hills, OH 44131.

☐ anyone who has converted a Kenwood TS-700A to operate on the 145-MHz repeater subband. George Sauerwein, WA2RQQ, PO Box 753, Mount Jackson, VA 22842.

Antenna Hardware You Can Build



There are some generic items that most of us need for home-station antenna projects. These tips may help you to save money by building your own hardware.

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

Are you weary of tower climbing, or perhaps too old to risk climbing that steel pinnacle in your back yard? If so, I share your outlook! Wouldn't a yardarm and halyard be a nice addition to your tower—especially if you like to experiment with wire antennas, as I do? There's also the matter of combining numerous radial wires at a common point near the base of a shunt-fed tower or metal mast. Looking for a convenient way to do this? If you are, you'll find these specialty hardware items and others that pertain to routine antenna projects treated in this article. I doubt that I have "invented a better mouse trap" with the gadgets I want to describe, but they work satisfactorily for me. I'm convinced that some of you will have better solutions to the common hardware problems we will consider here. If you do, send them to the Hints and Kinks editor, thereby sharing your innovative ideas with the other *QST* readers.

A Tower Yardarm

Although I own a 50-foot tilt-over tower, I find it time-consuming to disconnect my wire antennas and winch the top section up and down each time I want to hoist a new wire antenna. I decided to eliminate that tedious routine by installing a yardarm with a pulley and halyard near the top of my tower. Fig 1 shows a photograph of the yardarm after I installed it. Presently it supports one corner of a full-wave rectangular loop antenna for 80 meters. The far end of the loop is held aloft by a 50-foot telescoping mast.

Nothing could be more ordinary than a homemade yardarm, but there are some pointers I want to offer with regard to making them strong and lasting. A yardarm made solely from a mere piece of steel pipe will bend and sag from stress during high winds and periods of icing. Fig 2 shows details for the yardarm of Fig 1. Note that two methods are used to increase the load limit of the unit: (1) A wooden dowel is contained within the pipe. The dowel is the same length as the pipe section. (2) A small eye bolt is added at the outer end of the yardarm. The eye bolt allows the addition of a nylon guy line that attaches to a tower leg. This helps prevent the yardarm from sagging or bending because of undue stress. Apart from those two features, the yardarm follows typical lines. The wooden dowel insert serves another purpose: It prevents the pipe from compressing at the points where the U bolts and eye bolts are located, thereby keeping the related hardware tight over a period of time. I painted my dowel rod with two coats of spar varnish before inserting it into the pipe. This extends the life of the wood by sealing it against moisture.

A yardarm made solely from a mere piece of steel pipe will bend and sag.

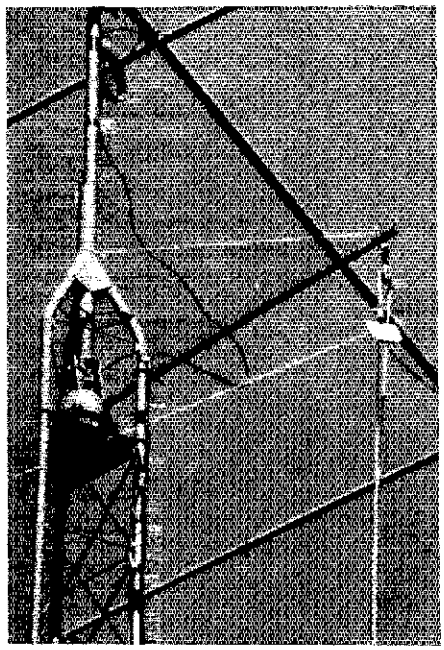


Fig 1—Photograph of a tower that is equipped with the yardarm of Fig 2.

You may want to eliminate the pulley for the halyard and use the large screw eye as a guide for your halyard. But when the eye bolt becomes rusty, it will cause undue wear and tear on the halyard. For a slight additional expense you can add a pulley.

I prefer to use ¼-inch-diameter nylon rope as halyard material. This type of cord is widely available at marinas that stock boat accessories. I also have had good luck with heavy-duty fabric clothesline. A yearly coating of silicone waterproofing liquid (such as that used for boots and shoes) extends the life span of fabric rope. I do not recommend the use of stranded polypropylene clothesline; it deteriorates rapidly from ultraviolet rays and airborne pollutants.

My yardarm is made from 1-inch-OD electrical conduit. The wooden dowel rod is ¾-inch OD. The metal pipe was cleaned, then sprayed with two coatings of automotive undercoating paint. The eye bolts and U bolts were obtained at a hardware store.

Ground Radial Connection Plate

I've seen some very fancy metal plates used to join numerous ground-radial wires. I have also observed some dreadful rat's nests where radial wires were connected.

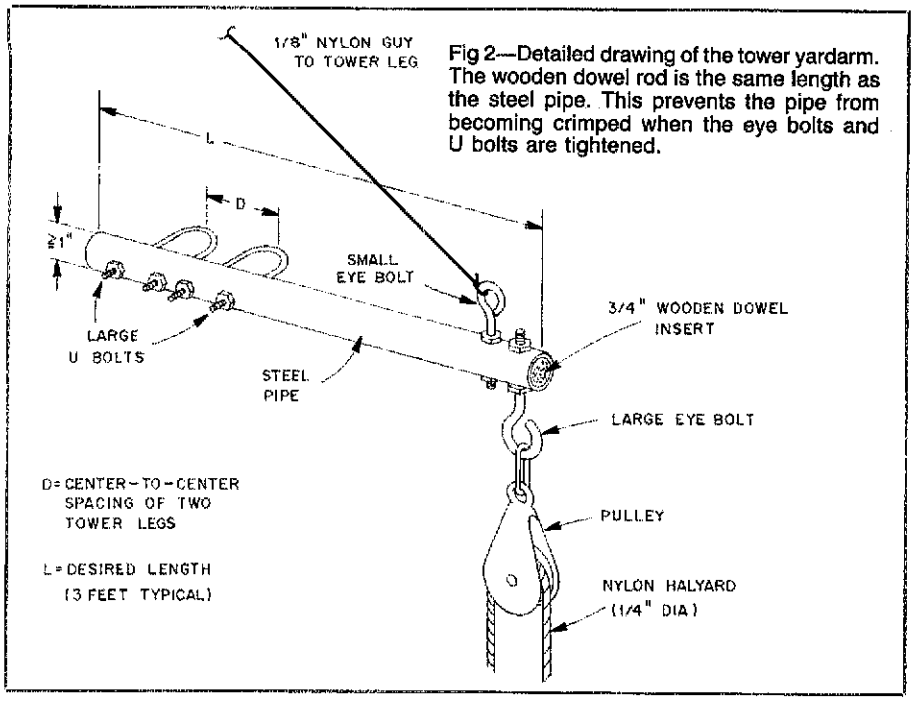


Fig 2—Detailed drawing of the tower yardarm. The wooden dowel rod is the same length as the steel pipe. This prevents the pipe from becoming crimped when the eye bolts and U bolts are tightened.

No doubt either method is suitable if all of the wires are well bonded electrically. But, it is nice to have an orderly arrangement that ensures positive electrical contact between the base of the vertical antenna and its radial system. To that end, I gravitated toward a technique that calls for each radial wire being soldered to a common junction block near the antenna feed point. A sketch of this unit is presented in Fig 3.

... each radial wire is soldered to a common junction block near the antenna feed point.

Form a U-shaped aluminum channel from 14- or 16-gauge stock. Use two U bolts to affix the channel on a tower leg or metal mast. Three no. 14 copper bus bars provide conductors to which the radial wires may be soldered. Drill six ¼-inch-diameter bolts at their ends to accommodate the no. 14 bus wire. A propane torch or 500-W soldering iron is suitable for soldering the wires to the bolts. On completion of the assembly, coat the bolts and nuts with nonacidic sealant such as that sold in tubes by Dow Chemical or GE. This coating retards oxidation to ensure good electrical contact between the bolts and the junction-block plate. I find that a thin coating of silicone grease between the U bolts and the tower leg (renewed yearly) helps to minimize oxidation at the points where the U bolts contact the tower.

The occasion for unwanted oxidation may be reduced considerably if you can locate some iron sheet metal from which to form the U-shaped channel. If iron is used, you will eliminate the mating of dissimilar metals. However, the formation of rust will still be a consideration, and this suggests frequent maintenance. If the iron sheeting can be galvanized at a nearby plating shop, it is worth considering.

Half-Sloper Fixture

Good electrical connections are as important to the quarter-wave or half-sloper antenna, as is the case with the ground radials discussed previously. We need to be aware that the tower is a working part of the quarter-wave sloper antenna. This means that the shield braid of the coaxial feed line must have a positive connection to the tower at the point of antenna attachment (usually near the top of the tower). I have seen some inferior arrangements for half slopers, wherein the amateur simply wrapped the coaxial-cable braid around a tower leg, then taped it in place. This may seem acceptable at first, but in no time the copper-to-steel mating surfaces (dissimilar metals again!) will begin to oxidize. The result is a resistive connection and possible TVI from rectification. This can also cause reception of spurious responses in the station receiver.

... the tower is a working part of the quarter-wave sloper antenna.

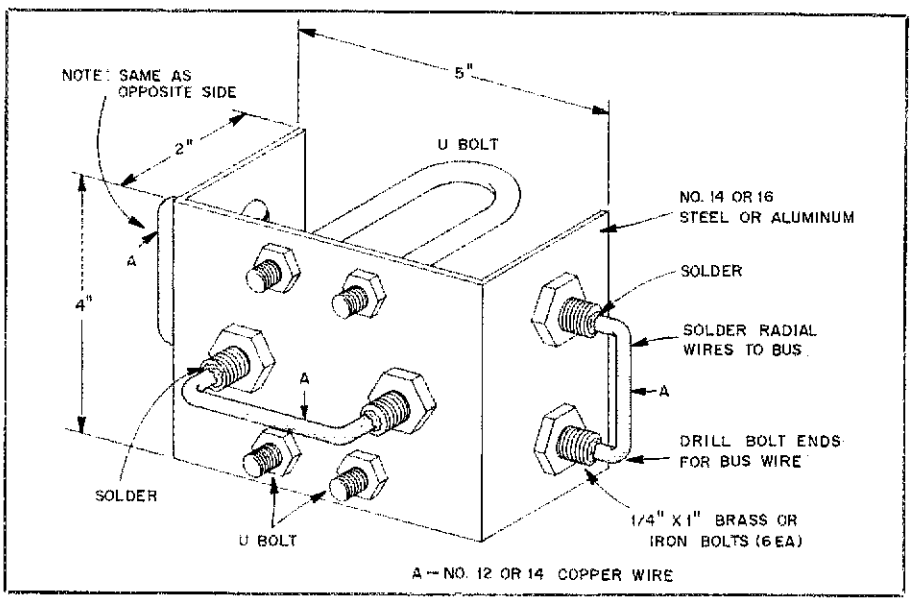


Fig 3—Details for the ground-radial block. The radial wires are soldered to the U-shaped bus-wire loops on the front and sides of the bracket. The ends of the ¼-inch-diameter bolts are drilled to accommodate the bus wires, which are soldered to the bolts.

My solution to the problem is shown in Fig 4. An L-shaped steel or aluminum bracket is attached to a tower leg by means of U bolts. The metal stock should be fairly thick in order to prevent bending from the weight of the antenna wire. No. 14 gauge sheet metal is recommended. You may use no. 16 gauge sheet metal if diagonal braces (two) of the same stock (about ½ inch wide) are used across the inside part of the L at the top and bottom of the fixture.

A ¼-inch hole is drilled in the lower, outer corner of the L bracket. This is used to attach the top insulator for the wire portion of the half sloper. A small loop of wire (to relieve strain on the upper end of the antenna) is soldered between the antenna

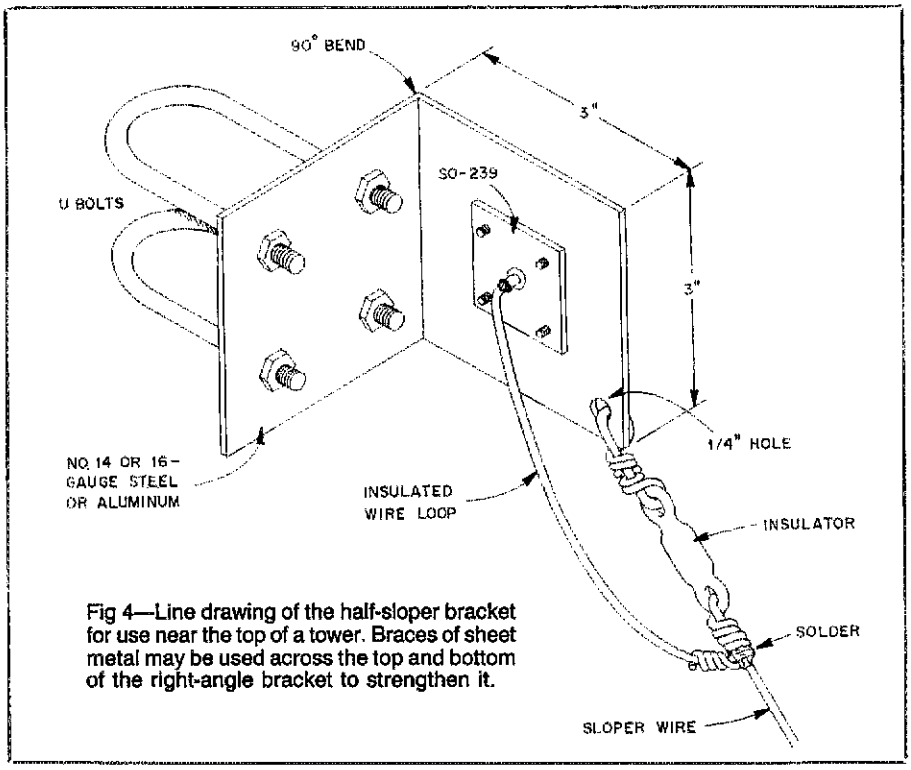


Fig 4—Line drawing of the half-sloper bracket for use near the top of a tower. Braces of sheet metal may be used across the top and bottom of the right-angle bracket to strengthen it.

and the coaxial connector center lug on the fixture. The wire loop should be insulated to prevent it from shorting to the metal L bracket. A short length of easy-to-get automotive high-tension wire (don't use resistance wire that has a carbon core) or Teflon-insulated no. 16 or 18 hookup wire will work nicely. Once more, a thin coating of silicone grease is helpful in minimizing corrosion where the U bolts mate with the tower leg. If you have an elbow adaptor for your coaxial jack, it will reduce the strain on the cable where it attaches to the L-shaped fixture. Vinyl electrical tape may be used around the coaxial connector and the elbow to keep moisture out, after the cable has been attached. Coax Seal® may be used instead of the tape, and can be applied also to the base end of the SO-239 connector to protect it from the effects of weather.

Although I do not recall seeing it mentioned in articles about half slopers, it is wise to ground the coaxial cable shield braid also at the bottom of the tower. This is helpful when the integrity of the tower-section joints is in doubt. The base of the tower or mast should be well grounded in order for the half sloper to work properly.

Homemade Ladder Line

Although manufactured 300-ohm 1-kW twin-lead and 450-ohm molded ladder lines are available for use as tuned, balanced feeders, it is often faster and less costly to make your own balanced, open-wire line. Not only is the monetary consideration worthwhile, but we can design the feed line for a specific impedance. Fig 5A shows a section of balanced line. The characteristic impedance of the feeder (Z_0) may be obtained from the accompanying equation. You will experience difficulty when trying to design very low-impedance lines, such as 150 or 300 ohms. This is because the spacing (S), if it is close, may be hard to realize from a practical point of view. The smaller the conductor diameter, the less difficult becomes the task of building low-impedance lines. Unfortunately, the wire size may be so small that the line will not accommodate the power of your transmitter.

We will have no difficulty when working with no. 14 wire (0.064-inch-diameter) provided we build line that has a 450-ohm or greater impedance. Fig 5B shows the correct spacing (S) for no. 14 wire when designing the line for 450 or 600 ohms.

Open-wire feed line of the type in Fig 5 is superior to the commercial 300- and

... it is wise to ground the coaxial cable shield braid also at the bottom of the tower.

450-ohm feeders that have polyethylene insulation. The 450-ohm ladder line is better than the 300-ohm TV line, at least when it comes to losses and temporary impedance changes from rain and ice. This is because rectangular sections of the polyethylene insulation are removed from the 450-ohm ladder line at approximately 1-inch intervals. This reduces losses and weather-related impedance changes. On the other hand, the solid-insulation, 300-ohm line is highly subject to impedance changes and increased loss when it is wet.

If we build open-wire line, we can greatly reduce losses in general and should experience very little impedance change when there is water, snow or ice on the line. I use

If we build open-wire line, we can greatly reduce losses ...

70 feet of homemade 600-ohm open-wire line to feed an 80-meter full-wave loop. Despite the line having been encrusted with snow and ice last winter, the system im-

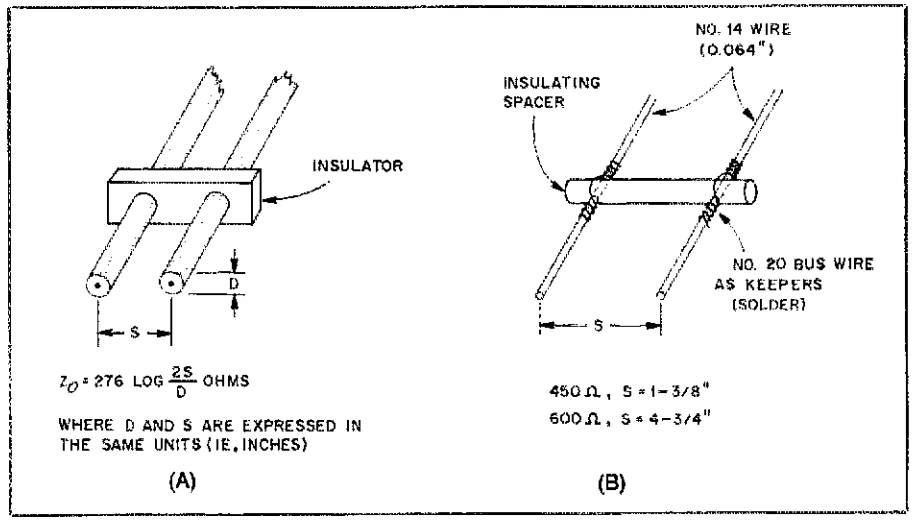


Fig 5—Illustration A shows a section of balanced feeder with the equation for determining the impedance. At B is an example of open-wire line with dimensions for 450- and 600-ohms impedance.

pedance, as checked at the transmitter end of the line, remained relatively close to that during dry conditions. The SWR only changed from 1.3:1 to 1.7:1 when there was ice on the feeders. Another antenna that has 450-ohm polyethylene ladder line changed from 1.12:1 to 3.5:1 when the line was covered with ice.

Feed-Line Insulators

We may use a variety of materials for the spacers in our open-wire line. Perhaps the least expensive stock is that of variety store plastic coat hangers. The material is 3/8-inch-diameter, and several insulators may be cut from one hanger. I use a spacing of approximately 8 inches between insulators. Fewer spacers may be used if you are able to affix the open-wire line to posts with insulators at 15- to 20-foot intervals. I use polyethylene electric-fence insulators for this purpose.

Various kinds of plastic tubing and rod may be used for feed-line spreaders. I have seen some homemade feed line that contained small, plastic hair curlers. The handles from throw-away razors or the bodies of plastic pens can be used. If there is an industrial plastics dealer in your area, check the odd-lot materials that most of them sell. It is possible to buy odd lengths of plastic rod or tubing at attractive prices. Tubing is best in terms of reduced overall weight for the feed line.

Various kinds of plastic tubing and rod may be used for feed-line spreaders.

Insulator Anchoring

Fig 5B illustrates one method for affixing the insulators to the wire conductors of open-wire line. A short jumper of no. 20 or 22 bare bus wire (strip the insulation from some bell or hookup wire) is soldered to the feed line on each side of each insulator as shown. This prevents the insulating spacers from slipping on the two feed-line wires. Another scheme I find quick and easy is to use thin-wall spacers (no. 4 hole) over the wires at each side of the spacer. A crimping tool allows me to lock the spacers in place on the wire. If you can't find some thin-wall spacers, try cutting 3/8-inch sections from small-diameter copper tubing. They may be crimped on the wires by means of diagonal cutters or a crimping tool.

Closing Comments

There is nothing spectacular about any of the ideas presented here. Perhaps some kinks found in these pages will aid you in shortening the job when you are in need of antenna hardware. Innovation on your part will no doubt yield better hardware than I have described. The items seen here have worked nicely for me over a couple of decades, and none of them require special tooling to produce.

New Products

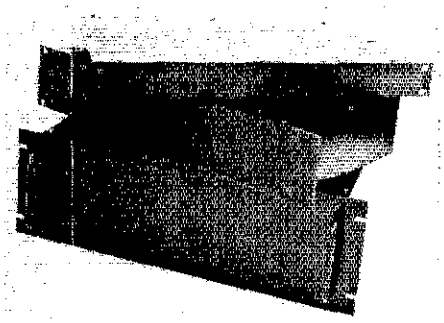
DICK SMITH ELECTRONICS PROJECT BOXES

☐ Dick Smith Electronics has several series of low-cost project boxes in a variety of styles and sizes. The die-cast aluminum series (A) are built in England and Australia, and feature interior channelled walls for PC-board mounting. They come complete with die-cast cover and screws.

(A)

Cat No.	Size (inches)	Price
H-2221	3.9 × 1.0 × 2.0	$3.95
H-2211	4.7 × 1.6 × 2.4	4.95
H-2206	6.0 × 2.0 × 3.2	5.95
H-2201	7.5 × 2.4 × 4.3	8.95

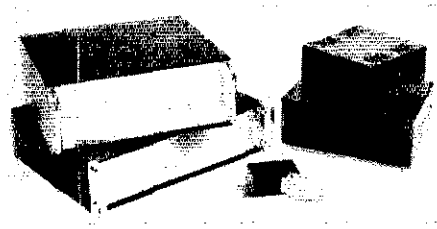
The standard 19-inch rack-mount black instrument cases (B) feature a heavy gauge (1/8-in) front panel and ventilated top and bottom panels. They are supplied flat and assemble in just minutes.



(B)

Cat No.	Size (inches)	Price
H-2483 Slim	16.75 × 9.8 × 1.5	$24.95
H-2482 Medium	16.75 × 9.8 × 3.25	27.50
H-2481 Large	16.75 × 9.8 × 5.5	29.95

The "Pro" look instrument cases, at (C) left, feature front and rear aluminum panels and handles. The plastic power supply case and air vent case, at right, include front and rear plastic panels and slots for cooling. The mini-project case, center, comes complete with mini-circuit board and a lid with flange mounts.



(C)

	Cat No.	Size (inches)	Price
Inst Case	H-2455	8 × 4 × 10	$17.95
Inst Case	H-2465	9 × 3 × 12	19.95
P S Case	H-2516	5.1 × 5.1 × 2.9	5.50
Vent Case	H-2504	7.9 × 5.7 × 2.9	6.95
Mini Case	H-2765	2.6 × 1.8 × 1.2	2.25

Available from Dick Smith Electronics, Inc, PO Box 8021, Redwood City, CA 94063, tel 415-368-8844. Send $1 postage and handling for the DSE catalog. The DSE catalog has 15 pages filled with hard-to-get information on pin connections for ICs, Zener diode data, circuit ideas, transistor interchangeability data and much more. —*Bruce O. Williams, WA6IVC*

Strays

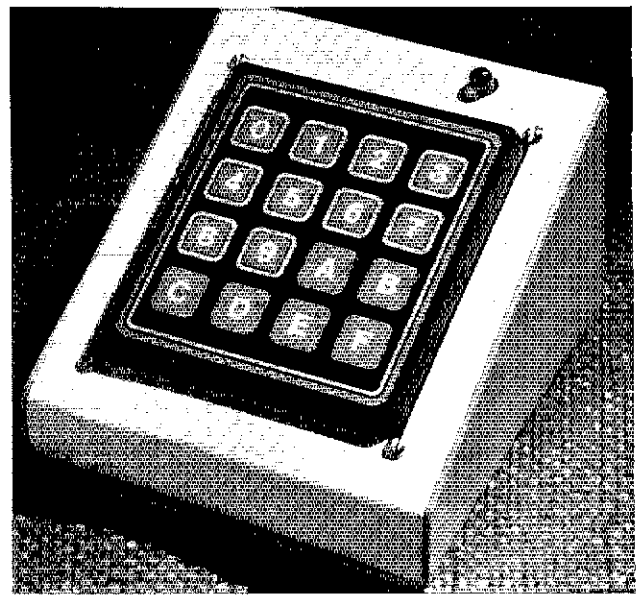
I would like to get in touch with...

☐ anyone for exchanging information and circuits of gadgets (microelectrode preamplifiers, transducers, thermostats, impedance pneumographs and osmometers) for improving teaching of biological sciences. Carlos Peres da Costa, PY7CPC, Rua dos Navegantes 541, Apt 602, Boa Viagem PE 51021, Brazil.

The DIGI-CAT

Direct-frequency entry for your Yaesu FT-757GX transceiver is just a handful of parts away!

By Steven E. Reyer, PhD, WA9VNJ
8664 N Pelham Pkwy
Bayside, WI 53217



Two years ago, I finally decided it was time to retire my old tube-type ham gear and buy a new solid-state rig. When I did, I settled on the Yaesu FT-757GX with its general-coverage receiver and other nice features. One of its features, the "CAT" computer interface, really attracted me. Since then, I have seen several articles on connecting the '757 to a personal computer.[1,2] Not wanting to tie up a PC for this purpose, however, I decided to design a simple keypad frequency control unit for the Yaesu.

The small size of the '757 was probably the reason its designers left out a frequency-entry keypad. This size-vs-features tradeoff means that tuning across the bands, or moving many megahertz, requires a lot of dial spinning. After a while, I longed for a simple method to bounce between frequencies of my choice. The result of my efforts is the design described in this article: the DIGI-CAT. The DIGI-CAT may also find good use in a handicapped ham's shack.

The DIGI-CAT consists of a single-chip Intel 8748 microcomputer, a 16-key keypad and several other common parts. The unit is powered by the FT-757, and requires only one other wire connection to the '757's rear-panel EX CNTL or REMOTE jack. The DIGI-CAT provides the following new features:

- Direct keypad frequency entry (500 to 29999 kHz).
- Instant recall of WWV and CHU frequencies.
- Scanning up and down.
- Toggling between the last two frequencies used (without using both the '757's VFOs).
- Remote toggling of the '757's A/B VFOs.
- Remote locking of the dial.

[1]Notes appear on page 43.

These features result from combining the power of the 8748 microcomputer and the CAT system in the rig. Since I have preprogrammed the 8748 chip, a bit of soldering is all that's necessary on your part. It's one of the simplest circuits around.

The Yaesu FT-757GX CAT Computer Interface

The FT-757GX contains a "computer aided transceiver (CAT)" interface for external control of operating frequency and other transceiver functions. The article referenced in note 1 describes the complete system: I will mention only the portions used by the DIGI-CAT design.

On the '757's rear panel is a three-pin connector identified as the EX CNTL or REMOTE (see Fig 1). The center pin accepts 4800-baud serial data at TTL voltage levels. The idle state is +5 V, corresponding to a logic 1. Normal serial-data bytes are used—each with one start bit, eight data bits, and two stop bits. Each bit is nominally 208 μs long (1/4800 s). To control the rig, a command word consisting of five such bytes is sent. For instance, to control the frequency, the first four bytes contain frequency data, and the fifth byte, a hexadecimal ØA, indicates a "frequency change" command. For other functions, the first four bytes are dummy data and are ignored, while the fifth byte is a hexadecimal command—Ø5 for "toggle VFOs," or Ø4 for "dial lock." Fortunately, the DIGI-CAT does all this for you.

To set a new frequency, the DIGI-CAT formats the data signifying your desired frequency as follows. If, for example, you wish to command the '757 to 12345.67 kHz, the hexadecimal numbers 67, 45, 23, Ø1 and ØA are sent to the rig as a five-byte command word. The first four bytes are the frequency data; the fifth is the frequency change command. The bytes in a command word must be sent in close succession, with not more than 100 ms delay between them. Other keypad entries send the appropriate data for the various DIGI-CAT functions.

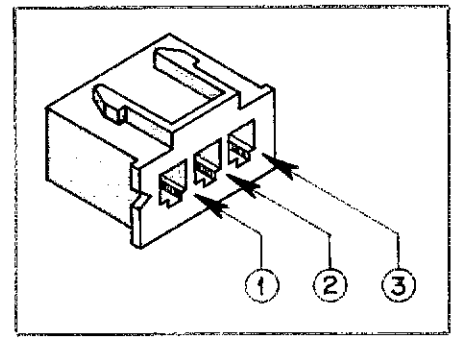


Fig 1—EX CNTL or REMOTE jack on rear panel of FT-757GX transceiver.

The Intel 8748 Single-chip Microcomputer

The heart (brain?) of the DIGI-CAT is the Intel 8748 single-chip microcomputer. This chip has been used in other *QST* projects.[3,4] The amazing feature of this chip is that it combines all the usual components of a small computer system into a single 40-pin package. The 8748 has 1 kbyte of erasable, programmable read-only memory (EPROM), 64 bytes of random-access memory (RAM), and 27 input/output (I/O) lines. A 4-MHz crystal, two 22-pF capacitors and a 1-μF power-on reset capacitor are all that's required to get the 8748 up and running. Programs for the 8748 are written in assembly language—a bit of a chore, but ideal for precise timing and control applications. "Burning" (programming) the EPROM in the 8748 usually requires more than just a normal EPROM programmer. For these reasons, preprogrammed 8748s and complete parts kits are available for your use.[5] If you feel that you are capable of burning your own EPROM, an ob-

ject code listing is available.[6]

DIGI-CAT Commands

Here's how to command your FT-757 using the DIGI-CAT.

Direct keypad frequency entry. Key in the frequency desired and then press F. The rig instantly jumps to that frequency. (I chose F as the "enter" key because it's conveniently located in the lower right-hand corner of the keypad.) For example, to enter 3985 kHz, key in 3 9 8 5 F. If the frequency is entered as a five-digit value (14250), the F key is not needed. Megahertz values can be entered in a "shorthand" fashion. For example, to jump to 5 MHz, key in 5 F, or for 21 MHz, key in 2 1 F.

Toggle last two frequencies. If you press F without entering any digits before it, the previous frequency is recalled. Repeated entries of F merely toggle between the present and previous frequency. This is accomplished with just one of the rig's VFOs.

WWV and CHU list. Want to check WWV or CHU? Press E to move through the internal list of WWV frequencies (2.5, 5, 10, 15 and 20 MHz), followed by the CHU frequencies of 3.33, 7.335 and 14.67 MHz. It's easy to find a good frequency for time checks or to get an idea of how propagation is doing.

Toggle VFO. The C key toggles between VFOs A and B.

Dial lock. The D key locks the dial so that inadvertent movements of this control won't alter a tuned frequency. For instance, if the DIGI-CAT is located in another part of the shack or house for remote control, this ensures that no one can shift your operating frequency by fiddling with the tuning knob.

Scanning. The A and B keys allow you to scan up and down the frequency. Holding the A key down causes the rig to scan down the band, B causes the scan to move up in frequency.

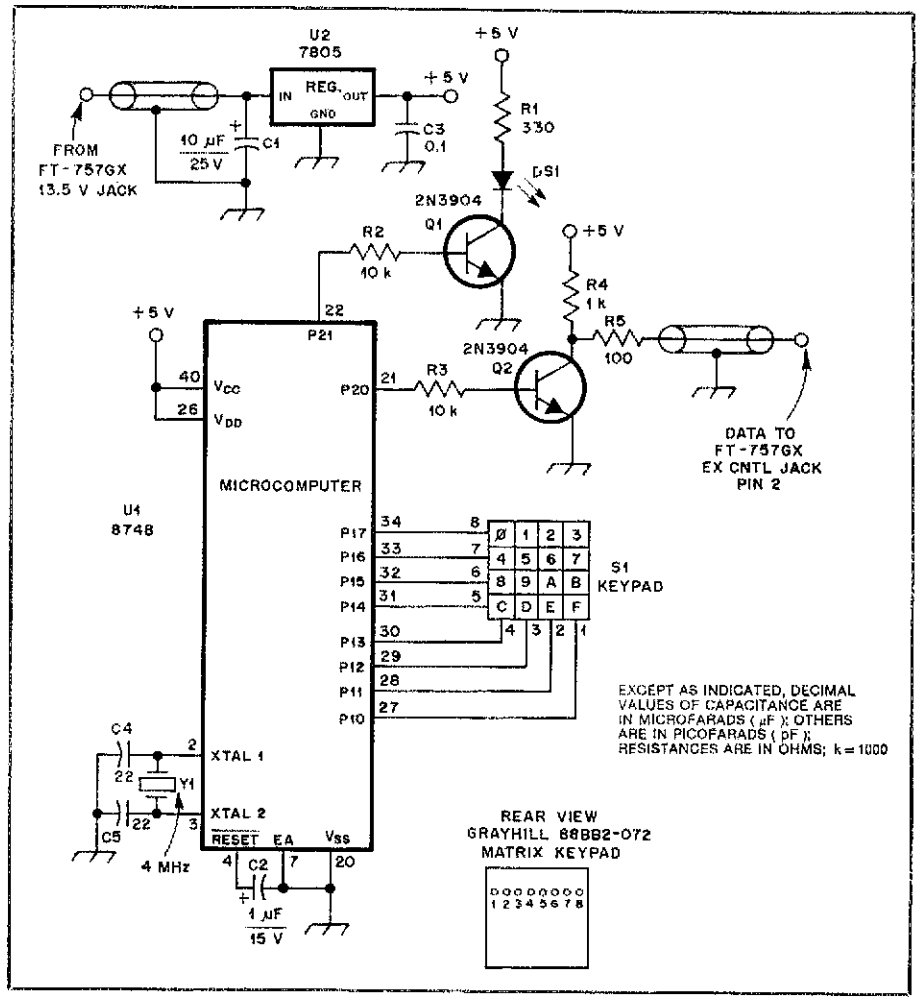


Fig 2—Schematic diagram of the DIGI-CAT.
C1—10 µF, 25-V tantalum.
C2—1 µF, 15-V tantalum
C3—0.1 µF, disk or monolithic.
C4,C5—22-pF disk or silver-mica.
DS1—Green LED.
Q1,Q2—2N3904.
R1—330 Ω, ¼ W.
R2,R3—10 kΩ, ¼ W.
R4—1 kΩ, ¼ W.
R5—100 Ω,¼ W.
S1—Grayhill 88BB2-072 16-key matrix keypad.
U1—Intel 8748 single chip microcomputer.
U2—7805 (LM340T-5) 5-V positive voltage regulator.
Y1—4-MHz crystal.

Construction

Fig 2, the schematic diagram, shows the simplicity of the DIGI-CAT, but don't be fooled! The 8748 chip is truly a computer and contains an enormous amount of computing power. Printed-circuit-board construction is simplest, but point-to-point wiring could be used (see Figs 3 and 4). Dc power (13.5 V) for the unit is available through a phono jack on the rear panel of the '757. Because the DIGI-CAT needs only 5 V at 60-90 mA, a simple 7805 regulator is provided in Fig 2 to provide this. (I have even plugged the DIGI-CAT into the 8-V accessory jack on the '757, and it worked fine. This jack is rated at 100 mA, maximum, so there is current to spare.)

The keypad is a matrix type. This means that each row and each column has a connection associated with it. The DIGI-CAT program continually scans the rows and columns, looking for a key being pressed. A current path along a single row and down a single column uniquely defines the key being pressed. The keypad specified in the parts list is ideal for this application, but you can construct your own using 16 SPST switches. Arrange them in a 4 × 4 pattern (see Fig 5). Run four separate column wires, one wire down each of the columns and connected to one side of each switch in the column. Similarly, run four wires, one wire across each row and connected to the other side of each switch. That's all there is to it! Label the keys as shown in the diagrams.

The DIGI-CAT data output goes to the center pin of the EX CNTL jack on the rear panel of the '757 (Fig 1). The ground return is through the ground in the dc power connector. Q2 buffers the data, providing protection for the 8748 in case of a mistaken connection. Q1 drives an optional DATA PENDING LED indicator, DS1, that glows when numbers have been keyed in, but before F has been pressed. DS1 helps remind you where you are in the keying sequence. C2 is part of a power-on reset circuit that starts the 8748's program running properly when power is first turned on.

While the hardware is simple, the software is not. It consists of about 600 lines of assembly language. The program must scan the keyboard to look for a key closure, interpret and store the results, check for user errors, and format and send the data—all with split-second timing! This is where assembly language really shines. And, this is also where purchasing the preprogrammed 8748 can save you a lot of time and trouble.

Connecting the DIGI-CAT

Turn off the '757 and the power supply.

Connect the shielded power-supply cable from the DIGI-CAT to 13.5 V via the phono jack on the rear panel of the '757. If this jack is already used, try the 8-V accessory jack. Using this power source has worked fine for me, except for one time when I violated my own rule and plugged the DIGI-CAT in with the power on. The '757's microprocessor seemed to glitch. Resetting the rig's memories according to the manual cleared up the problem. So, *turn off the power first.*

With the power connection made, but with the data connection still open, turn on the power supply and the '757. Check for +5 V at the open data connection from the DIGI-CAT with a dc voltmeter or oscilloscope. If the +5 V is not there, recheck your wiring for errors. If the +5 V is there, press the 1 key and check that the DATA PENDING LED, DS1, lights. If so, everything is working fine so far. With the voltmeter or scope still connected to the open data line of the DIGI-CAT, press the F key. Check to see that the LED goes out, and the meter needle jiggles just a slight bit. (This may be hard to see on a voltmeter.) If the LED goes out, things are probably okay. Do not proceed, however, if the voltage on the data line exceeds +5 V because damage to the '757 could result.

Turn off the rig and the power supply. Attach the data line from the DIGI-CAT to the center pin of the EX CNTL connector on the '757 rear panel. Don't let it short to the adjacent pins. Turn on the power supply and rig. Now you're ready to have some fun!

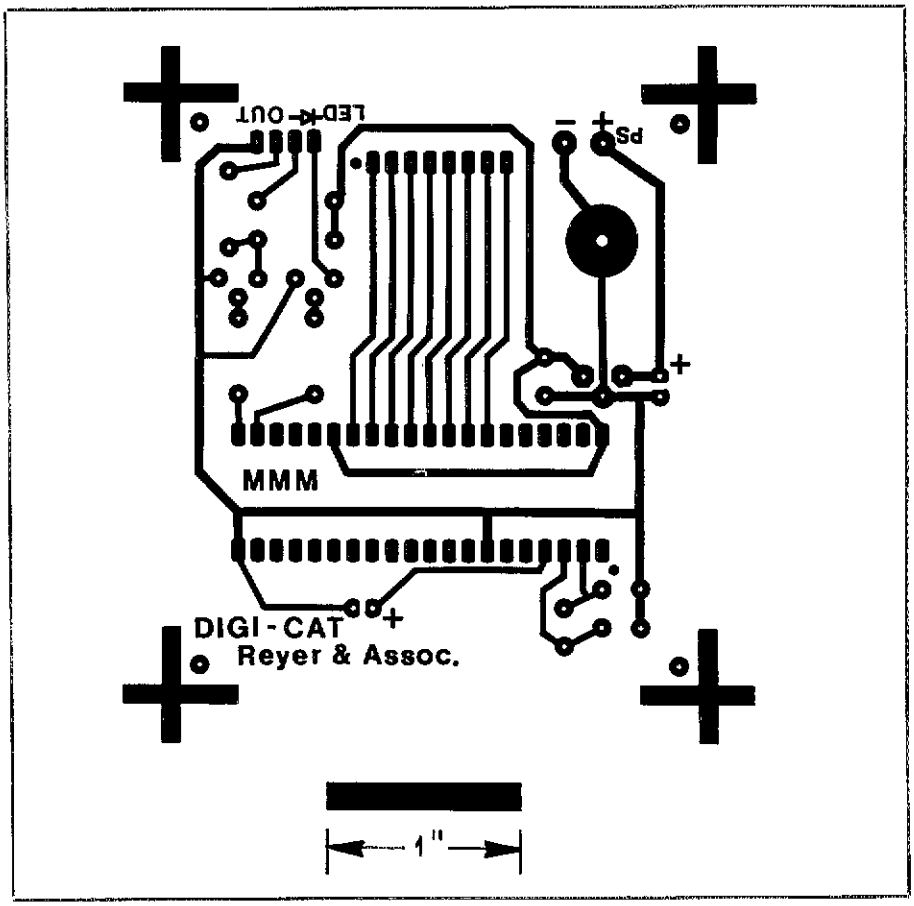


Fig 3—Circuit-board etching pattern for the DIGI-CAT. The pattern is shown full-size from the foil side of the board. Black areas represent unetched copper foil.

Operation

On the DIGI-CAT keypad, key in the frequency of your favorite AM broadcast station. For example, if it is on 1250 kHz, key in 1 2 5 0 F. The '757 should pop right to that frequency. Enter another frequency, and note that the rig jumps right to it. Now, press F a few times. The DIGI-CAT will bounce you between the two frequencies. Press 1 F. The rig goes right to 1 MHz. Try 1 2 F—you're on 12 MHz now, right? Hold the A key down to scan down the band. Use B to scan up the same way. C toggles the VFOs and D locks and unlocks the dial on the '757. Press E. Do you see the first WWV frequency? Press E again, and again. You will cycle through WWV and then to the CHU frequencies. At the end of the list, it will start over and cycle through WWV and CHU again. If you use another DIGI-CAT function and then return to E, the WWV/CHU scroll list always starts at the beginning (2.5 MHz).

Conclusion

The DIGI-CAT enhances an already great rig. It provides the "missing" keypad, offering direct frequency entry and other functions. Although its functions are very sophisticated, its construction is simple because of the powerful 8748 microcomputer hardware and software. The DIGI-

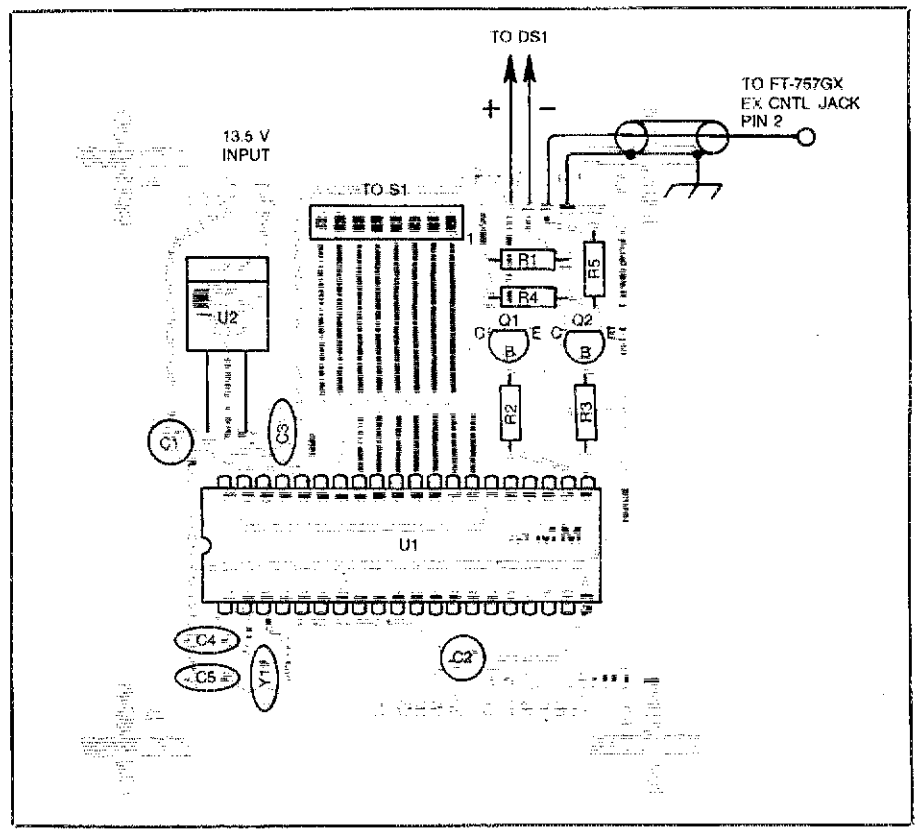


Fig 4—Parts-placement guide for the DIGI-CAT. Parts are placed on the nonfoil side of the board; the shaded area represents an X-ray view of the copper pattern.

CAT truly adds a new dimension to a state-of-the-art transceiver.

Notes

[1]K. Strom, "A CAT Control System," QST, Oct 1985, pp 38-40.
[2]K. Strom, "The CAT and the Commodore," QST, Oct 1986, pp 50-51
[3]S. Freeberg, "The Microcomputer Repeater Controller," QST, Dec 1983, pp 26-31.
[4]G. S. Beal, "The VE3MWM All-Mode PTT Switch," QST, Mar 1985, pp 21-25.
[5]Preprogrammed 8748 microcomputer ICs and complete parts kits are available from Reyer and Associates, PO Box 17821, Milwaukee, WI 53217. Prices: preprogrammed 8748 microcomputer, $25; complete kit of all parts, including preprogrammed 8748, etched and drilled PC board, matrix keypad and other parts (not including cabinet or cables), $59. Please include $2.50 shipping and handling for US orders. Wisconsin residents please add 5% sales tax. Foreign orders, please write for prices. The ARRL and QST in no way warrant this offer.
[6]An object code listing is available for $3 from ARRL, Technical Dept, 225 Main St, Newington, CT 06111. Send a large SASE, and ask for the "DIGI-CAT listing."

Dr Steven E. Reyer was licensed in 1967 at the age of 17. He holds a PhD in electrical engineering from Marquette University and currently is Professor and Program Director of Electrical Engineering at the Milwaukee School of Engineering. He also consults with industry in the areas of digital signal processing, communications and microprocessor systems.

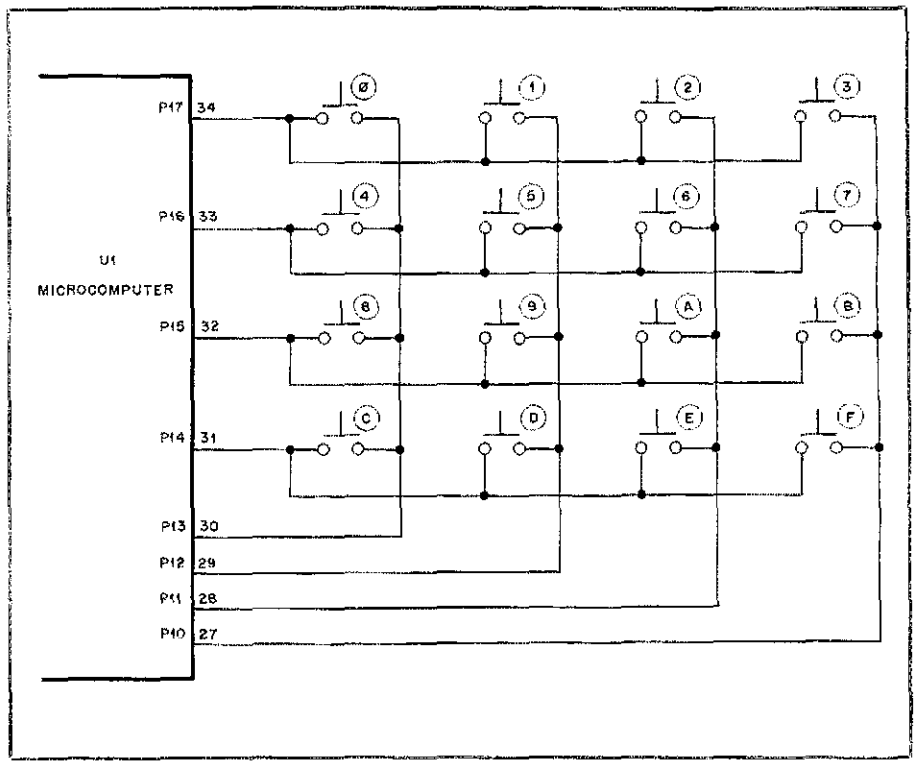


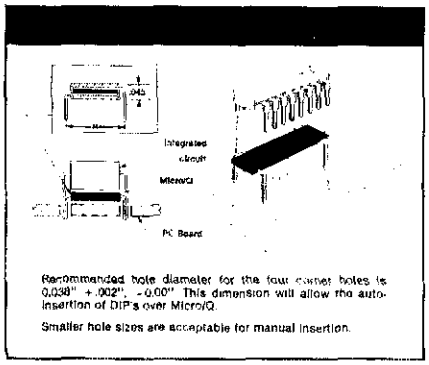
Fig 5—Wiring diagram for a 16-key matrix keyboard

New Products

ROGERS MICRO/Q® DECOUPLING CAPACITORS

☐ Rogers Micro/Q decoupling capacitors are designed for use under integrated-circuit packages. They provide an extremely low-impedance, low-inductance decoupling loop that results in significantly reduced voltage noise spikes. Compared to conventional decoupling capacitors, Micro/Q types can cut noise by up to a factor of 10.

Since they share mounting holes with the IC pins, board design is simplified by eliminating the need to plan additional holes for standard capacitors. This feature also provides increased IC package density. Micro/Q allows the designer to use smaller boards with fewer holes.



Typical installation for a Micro/Q decoupling capacitor.

The capacitors are available in a variety of configurations, to suit most packaging needs. As in the typical installation shown in the figure, the standard configuration package would have dummy pins at pin 1 and the diagonally opposite pin; the other two pins are the active capacitor pins. For more information, contact Rogers Corporation, Printed Circuit Components Division, 2400 South Roosevelt St, Tempe, AZ 85282, tel 602-967-0624.—*Paul K. Pagel, N1FB*

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Available from MJR Co, PO Box 30355, Phoenix, AZ 85046, tel 602-482-0323. Price class: $18.—*Bruce O. Williams, WA6IVC*

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Interested in working AMTOR? The March issue guides you through a procedure for testing a transceiver for AMTOR capability. Once you learn that your transceiver will operate on AMTOR, use the offered program to transfer files, error-free, using that mode.

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- "Smith Chart Fundamentals," by R. Sherman Banks, N4CXF
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QEX is edited by Paul Rinaldo, W4RI, and Maureen Thompson, KA1DYZ, and is published monthly. The special subscription rate for ARRL/AMSAT members is $8 for 12 issues; for nonmembers, $16. There are additional postage surcharges for mailing outside the US; write to Headquarters for details.

A Low-Cost Bridge for Large Inductances

Unmarked large chokes and transformers in your junk box need no longer remain unused. You can evaluate these weighty enigmas with this simple Hay/Maxwell inductance bridge.

By Robert C. Dennison, W2HBE
82 Virginia Ave
Westmont, NJ 08108

Small values of inductance (0.1 to 100 μH) are usually best measured on a Q-meter or an instrument like the one described by Doug DeMaw, W1FB, in April 1986 *QST*.[1] Larger values, such as some RF chokes, filter chokes, and audio and power transformers, can be measured on an inductance bridge of the Hay or Maxwell type.[2] Both bridges allow measurement of an unknown inductance by comparing it with a known capacitor. Here is a switchable Hay/Maxwell inductance bridge you can construct to measure inductances from 1 mH to 1000 H—see Fig 1. It is simple, low cost, and easy to build and use.

[1]Notes appear on page 50.

How the Bridge Measures Inductance

The bridge circuit is shown in Fig 2. It is similar to the familiar Wheatstone bridge [see the sidebar, "How Bridges

How Bridges Work: Zero News is Good News

If you connect a voltmeter to two points between which there is no potential difference, you'll read 0 V. This isn't exactly news, but when you use a bridge to measure component values, a reading of zero may be just what you're looking for. Here's why.

Bridge for Beginners

The basic resistance bridge (named the Wheatstone bridge after its inventor, Sir Charles Wheatstone) consists of two voltage dividers fed from a common dc source (see Fig A). R1 and R3 form one voltage divider, and the other consists of R2 and R4. Each resistor is said to be one *ratio arm* ("arm" for short) of the bridge. A sensitive dc voltmeter, M1, is connected between the two voltage-divider taps.

The magic of the Wheatstone bridge is that there is only one condition under which M1 will indicate zero (assuming that a dc source has been connected to the bridge): when *the ratio of the resistance of R1 to R3 equals the ratio of R2 to R4*. Even a slight inequality in these ratios results in enough potential difference between points A and B to shift the voltmeter indication away from zero. This shift may be positive or negative, and for this reason a voltmeter with zero at center scale is especially useful as the indicator in a Wheatstone bridge. A reading of zero (null) on the bridge voltmeter means that the bridge is *balanced*, and when this happens we know that the ratio of the resistances in one bridge voltage divider equals that of the other. This balanced condition may be expressed by the equation

$$\frac{R1}{R3} = \frac{R2}{R4} \qquad \text{(Eq A)}$$

Since voltage and current don't enter into this equation at all, balance is independent of the voltage applied to the bridge.

What about using the bridge to *measure* resistance? Well, since measurement of just about anything boils down to the comparison of an unknown quantity to a known quantity, we can use what we know about a balanced Wheatstone bridge to measure unknown resistance values. For instance, we know that the bridge is balanced if the ratios of the resistances in its two voltage dividers are equal—so if our bridge is balanced, and if we know the ratio of the resistances in one of its voltage dividers, we also know the ratio in the *other* voltage divider. This tells us that if we know the resistances in any three of the bridge arms, we can calculate the resistance of the fourth.

Let's redraw the bridge as it would be set up for resistance measurement (Fig B). Now, we've installed fixed resistors of

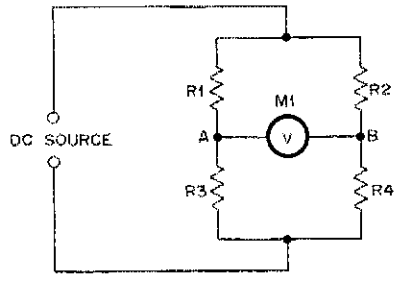


FIG A

Fig A—Introducing Sir Charles Wheatstone's bridge, a circuit older than human use of radio. Dc voltmeter M1 indicates any difference in potential between points A and B. If M1 reads zero when the bridge is connected to a dc source, we know a very useful fact about the relationship between resistors R1, R2, R3 and R4. The text tells the tale. This bridge works at ac, too, with an ac instrument at M1.

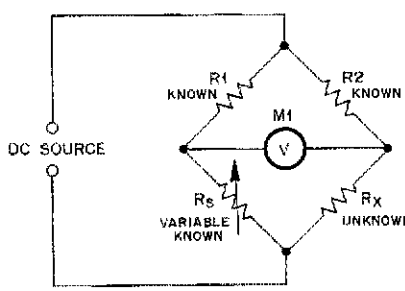


FIG B

Fig B—The bridge as a resistance measurer, drawn here in classical textbook style. If we know the resistances of three arms in a Wheatstone bridge (R1, R2 and R_S), we can calculate the resistance of the fourth (R_X) as explained in the text.

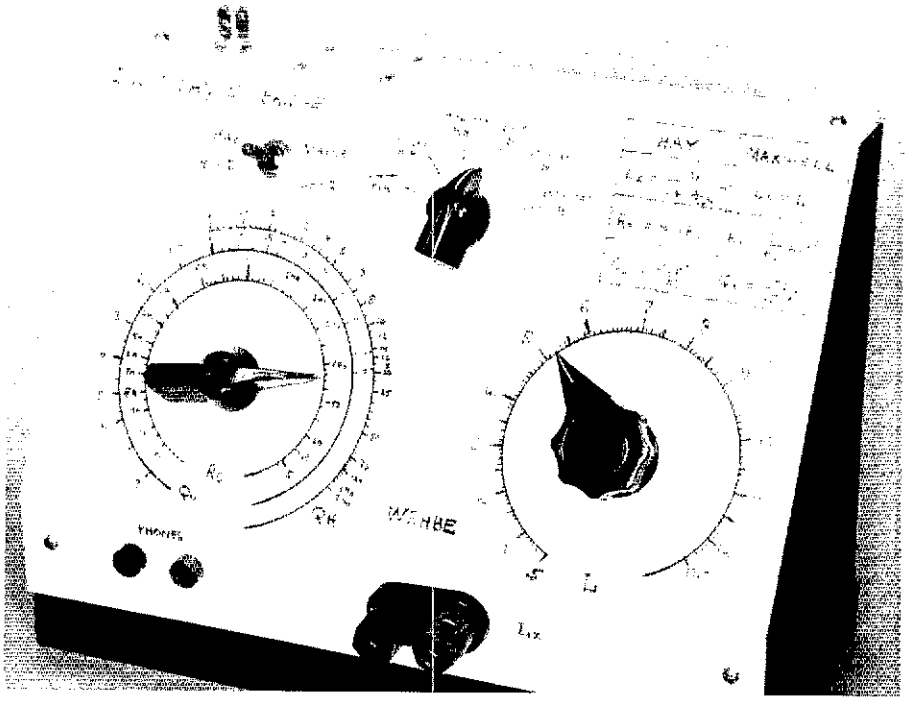


Fig 1—This simple Hay/Maxwell inductance bridge measures inductances from 1 mH to 1000 H with the addition of a 1-kHz audio source, a pair of high-impedance headphones and your ears. An oscilloscope may be used as a visual indicator during particularly difficult measurements.

Work"—Ed.]. Switch S1 (RANGE) selects R_b from one of six multiplier resistors to set the inductance measurement range of the instrument. A variable resistance, R_a (L), is used to balance the bridge for inductance. The unknown inductance, L_X, and its effective series resistance, R_X, form the third arm of the bridge. The final arm is composed of R_s (control R_s/Q) and C_s. BRIDGE switch S2 allows these to be connected in series (Hay) or parallel (Maxwell).

The unknown impedance represented by the inductor to be measured, Z_X, has both magnitude and phase angle:

$$Z_X \angle\theta = R_X + j2\pi f L_X \qquad \text{(Eq 1)}$$

known value at R1 and R2. In place of R3, we install a variable resistor, R_s, the subscript S meaning "standard"—calibrated so that we know its resistance at each setting of its control knob. In place of R4, we connect our unknown resistance, R_X. Now, we're ready to compare the unknown ratio R2 to R_X with the known ratio of R1 to R_s.

With dc applied to the bridge, we adjust R_s until the voltmeter reads zero. That's all there is to nulling the bridge! Next, we ponder a revised equation for bridge balance:

$$\frac{R1}{R_s} = \frac{R2}{R_X} \qquad \text{(Eq B)}$$

This can be rewritten to solve for R_X as

$$R_X = R_s \frac{R2}{R1} \qquad \text{(Eq C)}$$

The value for R_s may be read directly from its calibrated control, and we already know the values for R1 and R2. If a calculator is handy, the value of our unknown resistance, R_X, is just a few keystrokes away.

A practical wide-range Wheatstone bridge would require that we be able to switch in different values of R1, R2 and R_s according to the magnitude of R_X—similar to the range switching on an ohmmeter. These values, and that of the bridge test voltage, must be chosen for optimum bridge sensitivity—ability to indicate small shifts in bridge balance—and energy consumption. As it is, most of us reach for an ohmmeter for routine resistance measurements anyway, because the direct resistance readout of an ohmmeter doesn't entail math calculations.

Some of us may have already made good use of a resistance bridge without knowing it, however. The Wheatstone bridge has been used in some receivers to provide signal-strength indication. In such applications, the dc resistance of the active devices in one or more AGC-controlled stages represents R_X, and the S meter serves as the bridge balance indicator. As AGC voltage varies with signal strength, the dc resistance of the controlled stages varies. This upsets bridge balance, and the S-meter needle moves away from zero. The meter indicates degree of bridge imbalance in S-units and "dB over S9."

Bridges for ac, Too

With suitable modifications, bridges may be constructed for use with ac signal sources, and these may be used to measure capacitance, inductance, impedance and characteristics of the test signal. The basic equation for balance in an ac bridge is the same as that for the Wheatstone bridge above—just replace all the Rs with Zs. In the simplest ac bridge—Fig A with ac applied instead of dc, and an ac voltmeter at M1—the impedance ratio in one bridge voltage divider is compared with that of the other divider across the bridge balance indicator. When the impedance ratios are equal, the indicator reads zero, and balance is achieved. Simple?

Not usually. Any impedance not composed entirely of resistance—a *complex* impedance—contains reactance. Balance is trickier to achieve in ac bridges because an ac bridge null depends not only on the magnitude of the signal in the ratio arms, but also on the *phase* of the test signal as it passes through the various reactances—inductances and capacitances—in the arms. (There's no way to escape these effects if we want to measure an inductance or capacitance with a bridge: Measurement of an unknown complex impedance necessitates the presence of a known complex impedance elsewhere in the bridge.) Also, depending on the particular bridge circuit in use, the adjustments necessary for bridge balance may vary with the frequency of the test signal. As the test frequency is raised, the physical layout of the bridge may affect balance. At radio frequencies, shielding to avoid interaction between components in the ratio arms, and between the ratio arms and objects external to the bridge, is usually necessary.

Aural balance indicators may be used with ac bridges under certain conditions. At radio frequencies, a receiver may be used to listen for the null. At audio, high-impedance headphones may be used. (If the audio signal source is harmonic-ridden, however, it may be hard to hear a null on the fundamental, since in many cases the bridge won't quite be balanced for harmonics when it's balanced at the fundamental. In such cases, bridge balance is better observed with the help of an oscilloscope.)

Are ac bridges so complex that they're better left in the laboratory? Not at all! If W2HBE's treatment of an elegantly simple Hay/Maxwell inductance bridge hasn't persuaded you of the value of bridges in your ham radio endeavors, cast a glance in the direction of your SWR or RF power meter. Yes, you're looking at another very useful ac bridge.—*David Newkirk, AK7M, Assistant Technical Editor,* QST

where
Z_x = unknown impedance in ohms
R_x = unknown resistance in ohms
f = frequency in hertz
L_x = unknown inductance in henrys
π = 3.14
θ = phase angle in degrees

Because of this, two resistances (R_a and R_s) must be adjusted to obtain perfect bridge balance. The balanced condition is indicated by a null (zero output) at the DETECTOR terminals in Fig 2. The null may be detected with high-impedance headphones or observed on an oscilloscope.

It can be shown that when the Maxwell bridge is balanced,

$$L_x = R_a R_b C_s = L \qquad \text{(Eq 2)}$$

$$R_x = \frac{R_a R_b}{R_s} = \frac{L}{R_s C_s} \qquad \text{(Eq 3)}$$

$$Q_x = 2\pi f C_s R_s = Q_M \qquad \text{(Eq 4)}$$

where
R_a = resistance of R_a in ohms
R_b = resistance of R_b in ohms
R_s = resistance of R_s in ohms
C_s = capacitance of C_s in farads
L = dial reading of R_a (control L) multiplied by the RANGE factor
Q_x = Q of L_x
Q_M = Q as measured with the Maxwell bridge

For the Hay bridge,

$$L_x = \frac{R_a R_b C_s}{1 + (2\pi f C_s R_s)^2} = \frac{R_a R_b C_s}{1 + \frac{1}{Q_x^2}} \qquad \text{(Eq 5)}$$

$$R_x = \frac{R_a R_b R_s (2\pi f C_s)^2}{1 + (2\pi f C_s R_s)^2} \qquad \text{(Eq 6)}$$

$$Q_x = \frac{1}{2\pi f C_s R_s} = Q_H \qquad \text{(Eq 7)}$$

where
Q_H = Q as measured with the Hay bridge

To simplify everyday use of the bridge, it is customary to make measurements at a test frequency of 1 kHz. Then, to a fair approximation (with C_s equal to 0.1μF), the values of L_x, R_x and Q_x for unknown inductances may be determined from the formulas shown in Table 1. For convenience, these simplified formulas are inscribed upon the front panel of the bridge (see Fig 1).

Hay or Maxwell?

The presence of Q in the balance equation for inductance with the Hay bridge means that balance in this bridge depends on Q_x. The frequency of the test signal will also affect balance if Q_x depends on frequency. Practically speaking, the effect of Q on bridge balance and measured inductance values is not serious if Q_x is >5, at which value the Q-dependent measurement error is less than 4%. Q-dependent measurement error is 1% or less if Q_x = 10.[3]

The equations for balance in the Maxwell bridge are independent of Q and frequency, but values for R_b become impractically large if Q_x is high. Hence, the switchable Hay/Maxwell bridge: Use the Hay configuration for high-Q inductors and switch to Maxwell for low-Q units. Tips on when to use which configuration will be presented later on.

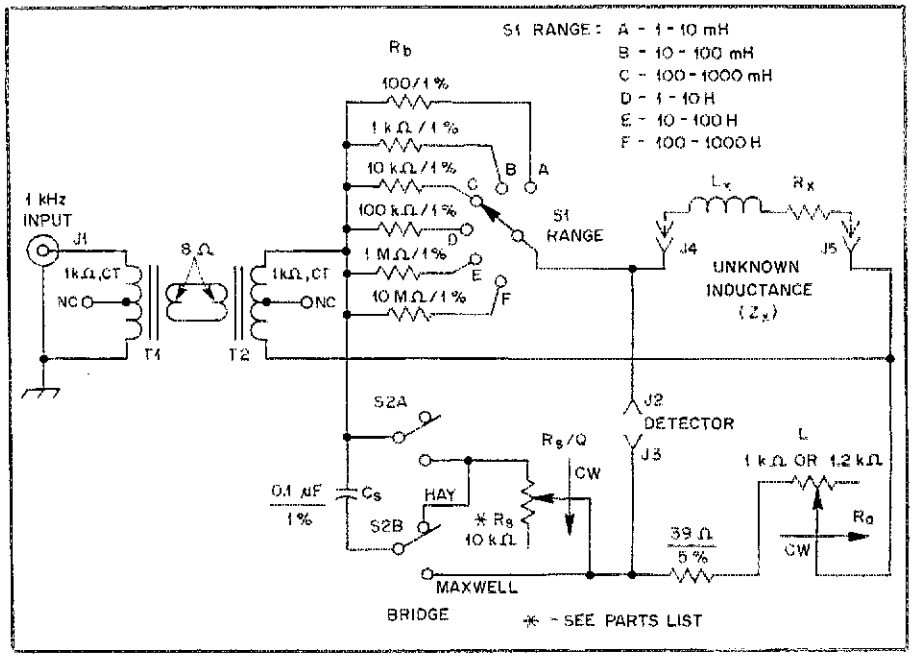


Fig 2—Schematic of the Hay/Maxwell bridge. The 1% tolerance R_b resistors are metal film units; 2% tolerance components are also suitable. If desired, R_b resistors may be selected from 5% and 10% units if an accurate ohmmeter is available to check them. The 39-ohm resistor may be carbon film or composition.

C_s—0.1μF, 100 V, 1% tolerance polyester film (available from Mouser Electronics); see text.[5]
J1—BNC connector.
J2, J3—Tip jacks.
J4, J5—Binding posts.
R_a—1 kΩ or 1.2 kΩ linear control.
R_s—10 kΩ control, logarithmic taper preferred (see text and Fig 4).
S1—Single-pole, 6-position rotary switch.
S2—DPDT toggle switch.
T1, T2—Audio transformer, 1 kΩ CT to 8 ohms (Radio Shack 273-1380 or equiv).

Construction and Calibration

Since this bridge operates at audio frequencies, it may be built into a wide variety of enclosures without affecting its measurement accuracy. I chose to build my own cabinet of wood, bristol board and aluminum (see Figs 1 and 3). The flat top, sloping panel and short vertical front panel are formed from a single piece of thin aluminum. Dial scales and other legends are drawn on a piece of white bristol board glued to the panel.

I chose a capacitor for C_s from my junk box; luckily, it turned out to be exactly 0.1 μF as confirmed with a laboratory standard inductance at Z_x. You may also be fortunate with a random choice for C_s, but if you don't want to guess, a source for new close-tolerance capacitors is given in note 5.

R_s must cover a wide range of values (from zero up to at least 10 kΩ) and yet have good resolution at low values. There are at least two solutions to this problem. One is to use a control with a logarithmic taper, such as an Allen-Bradley CA-1031 or CB-1031. I had one of the latter in my junk box so I used it. Another solution is to use two separate controls, as shown in Fig 4. The front panel will have to be larger to accommodate the extra control if this is done, or the controls may be ganged to save space.

The dial scales for controls R_s/Q and L should be drawn after they are mounted and before they are wired. As shown in Fig 2, the R_s/Q control has three scales: R_s (its resistance in ohms), Q_M (direct readout of Q_x with the Maxwell bridge at 1 kHz) and Q_H (direct readout of Q_x with the Hay bridge at 1 kHz). First, using an accurate ohmmeter, calibrate the R_s scale from about 5 ohms to 10 kΩ. Next, calculate the Q_M and Q_H scales from the "C" equations in Table 1. For example, for Q_M = 1.0, $R_s = Q_M \times 1590$, or 1590 ohms. Similarly, for Q_H = 10, R_s = 1590 ÷ Q_H, or 159 ohms.

The L control, R_a, is calibrated with a "normalized" scale that runs from 0.5 to 1.0 or 1.2, depending on whether a 1 kΩ

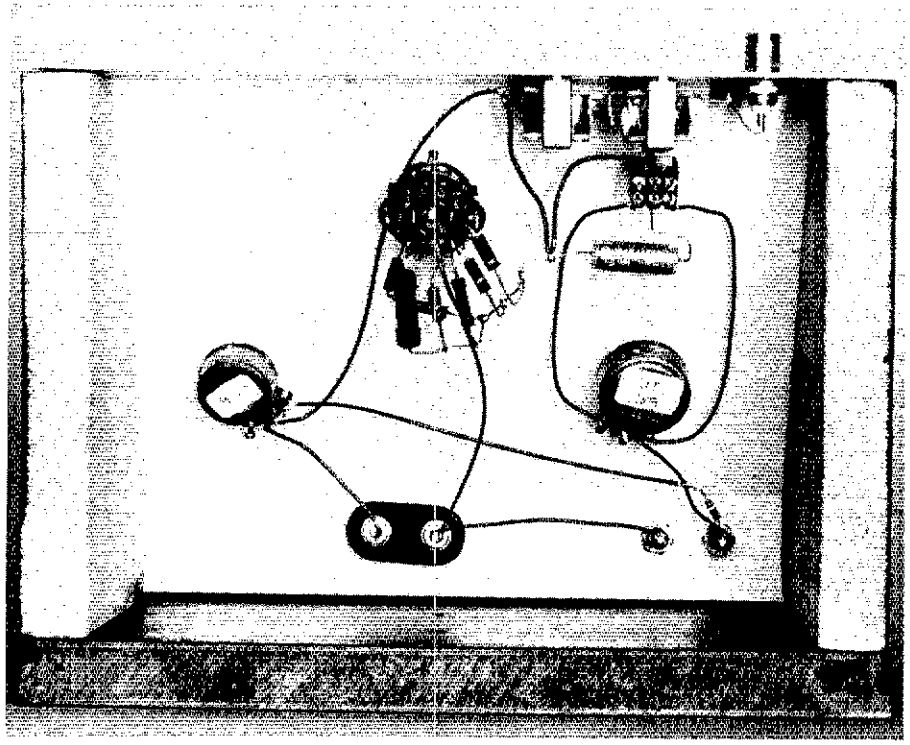


Fig 3—This is all there is to it! Simplicity is the word for the Hay/Maxwell inductance bridge. Screws, wood, bristol board and aluminum go into making the cabinet. At upper right, next to J1, T1 and T2 are mounted to the aluminum panel by bending their mounting tabs through holes drilled in the panel. At top center is S1 (RANGE) and the associated R_b resistors. To its right are C_s and RANGE toggle switch S2. The bridge balance controls R_a, (L, left) and R_s (R_s/Q, right) are potentiometers wired as variable resistors. Bottommost are binding posts for the unknown inductance (J4 and J5, left) and tip jacks (J2 and J3, right) for connecting the bridge detector.

Table 1

Simplified Equations for L_x, R_x and Q_x at Bridge Balance, f = 1 kHz and C_s = 0.1 μF

	Hay	*Maxwell*
(A)	$L_x = \dfrac{L}{1 + \dfrac{1}{Q_H^2}}$	$L_x = L$
(B)	$R_x = 4L_xR_s$	$R_x = \dfrac{L}{R_s} \times 10^7$
(C)	$Q_H = \dfrac{1590}{R_s}$	$Q_M = \dfrac{R_s}{1590}$

Note: On the Hay bridge, if Q_H is greater than 5, L_x = L with less than 4% error.

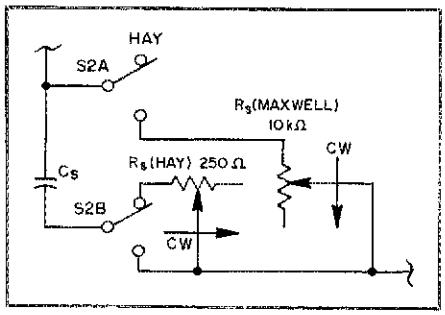


Fig 4—Alternate method of wiring the BRIDGE switch when separate R_s controls are employed for the Hay and Maxwell configurations. Since only low resistance settings of R_s are used in the Hay bridge, a 10-kΩ linear control at R_s would make for touchy adjustment in the Hay configuration. Switching in a linear 250-ohm control at R_s solves this problem. See text.

or 1.2 kΩ control is used at R_a. The scale is calibrated in terms of $R_a \div 1000$. Thus, when R_a is 500 ohms, the scale reads "0.5," and so on.

Operation

Use of the bridge requires a sinusoidal audio oscillator (see the sidebar, "A Simple Audio Sine-Wave Generator," for a suitable circuit), a pair of high-impedance (2 kΩ or so) headphones and an oscilloscope (optional). (Low-impedance headphones may be connected to the bridge through an audio transformer similar to T1 and T2.) Set the audio oscillator to 1 kHz and connect it to the bridge at J1. Connect the unknown inductance to the bridge binding posts. (A pair of 6-inch test leads with alligator clips at one end will facilitate connecting various chokes and coils to the bridge.)

Connect the detector to the bridge. In perhaps 85% of measurement situations, a pair of headphones is sufficient as a detector, but for the most accurate results, especially with low-Q inductors, an oscilloscope is recommended. (This is especially true when measuring iron-core inductors. Since such core material has nonlinear magnetic properties, the waveform presented to the detector will be a distorted sine wave. In such cases, it is usually easier to find the null while observing the waveform visually than while listening to it.)

Make a guess as to the approximate value of the unknown inductance and set the RANGE switch accordingly. Assuming that RANGE has been set correctly, both L and R_s/Q must be adjusted until a complete null is obtained. With low-Q inductors, there will be some interaction between adjustments. If the null doesn't seem deep enough, try a slight increase in R_s/Q and then readjust L. If this improves the null, continue this procedure. If not, try a slight decrease in R_s/Q and then readjust L. If you can't find a null on the first range you

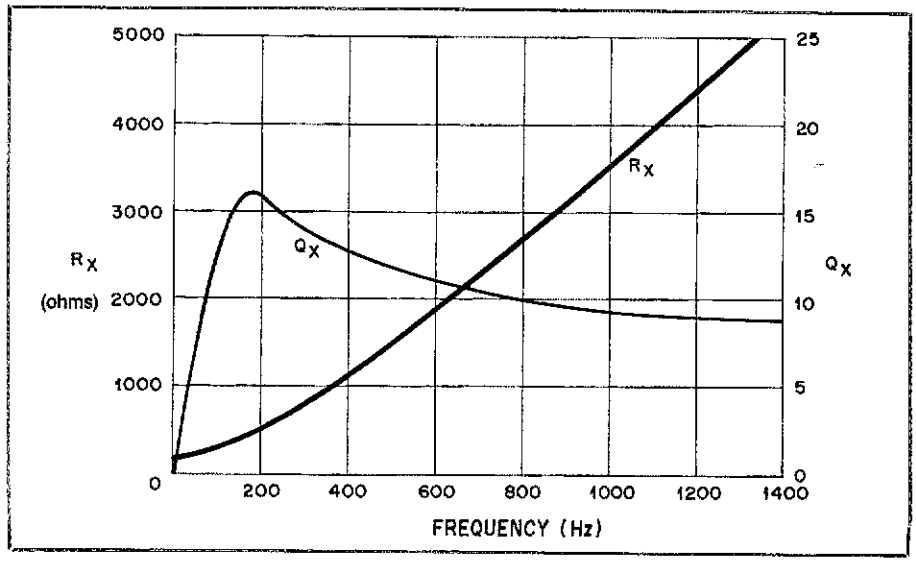
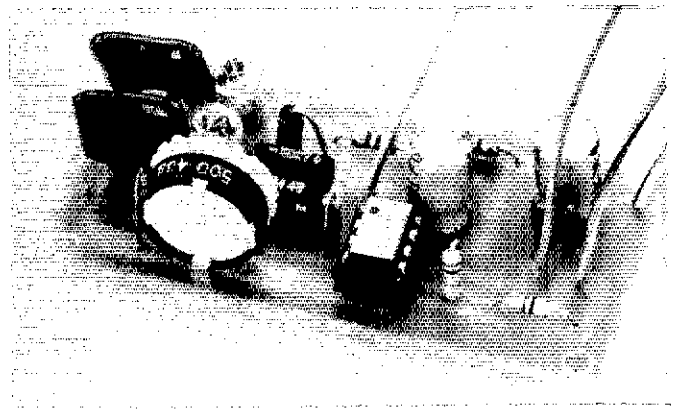


Fig 5—Measurements made on a 6-H filter choke showing how Q_x and R_x vary with frequency. See text.

A Simple Audio Sine-Wave Generator

Here's a simple Wien-bridge oscillator well-suited to driving your Hay/Maxwell inductance bridge. It provides output frequencies of 50, 100, 500, 1000, 5000 and 10,000 Hz. If any of these frequencies aren't what you need, you can change component values to provide output at the frequencies required.



The Circuit

You've already been introduced to the Hay and Maxwell bridge configurations; this audio "genny" is based on another bridge circuit: the *Wien bridge,* pronounced WEEN as in "Halloween" (see Fig A). U1A, an op amp, oscillates at the frequency at which the phase shift in the Wien bridge network is exactly zero degrees. Changing bridge component values changes the oscillator frequency. In this circuit, we need change only two resistors to do this. S1A chooses a value among R1 through R6, and S1B similarly selects a value from R7 through R12. For output frequencies other than those listed, a simple calculation provides the resistance values you need.†

†Use this formula to calculate the resistor values necessary for operation on other frequencies:

$$R = \frac{1}{2\pi fC}$$

where
f is the frequency in hertz
C is in farads; in this case, the capacitance of C1 or C3 (1.5×10^{-9} F)
R is in ohms

This formula holds only if the two resistors switched by S1 are *equal* in value and C1 equals C3. If you can't find 1% resistors in the values you need, use an accurate ohmmeter to select resistors from 5% stock. With your calculated resistances in place, adjust FREQ TRIM capacitors C2 and C4 to spot the oscillator exactly where you want it.

U1A must provide enough gain to overcome losses in the bridge, but not so much gain that oscillation builds up to the point of overload and distortion. U2 and D1 automatically regulate circuit gain to maintain oscillation. U2 places D1 across R13 with the proper polarity on both positive and negative alternations of the signal at pin 1 of U1. As the voltage at pin 1 of U1 approaches its peak value, D1 enters its Zener breakdown region, effectively shunting R13 with a resistive load. This increases the amount of negative feedback around U1, reducing its gain. R15, WAVEFORM ADJ, allows you to optimize circuit operation for lowest distortion.

U1B provides isolation between oscillator and load. With the values shown for R17 and R18 in Fig A, U1B operates at unity gain.

Construction

All components used in the audio generator are readily

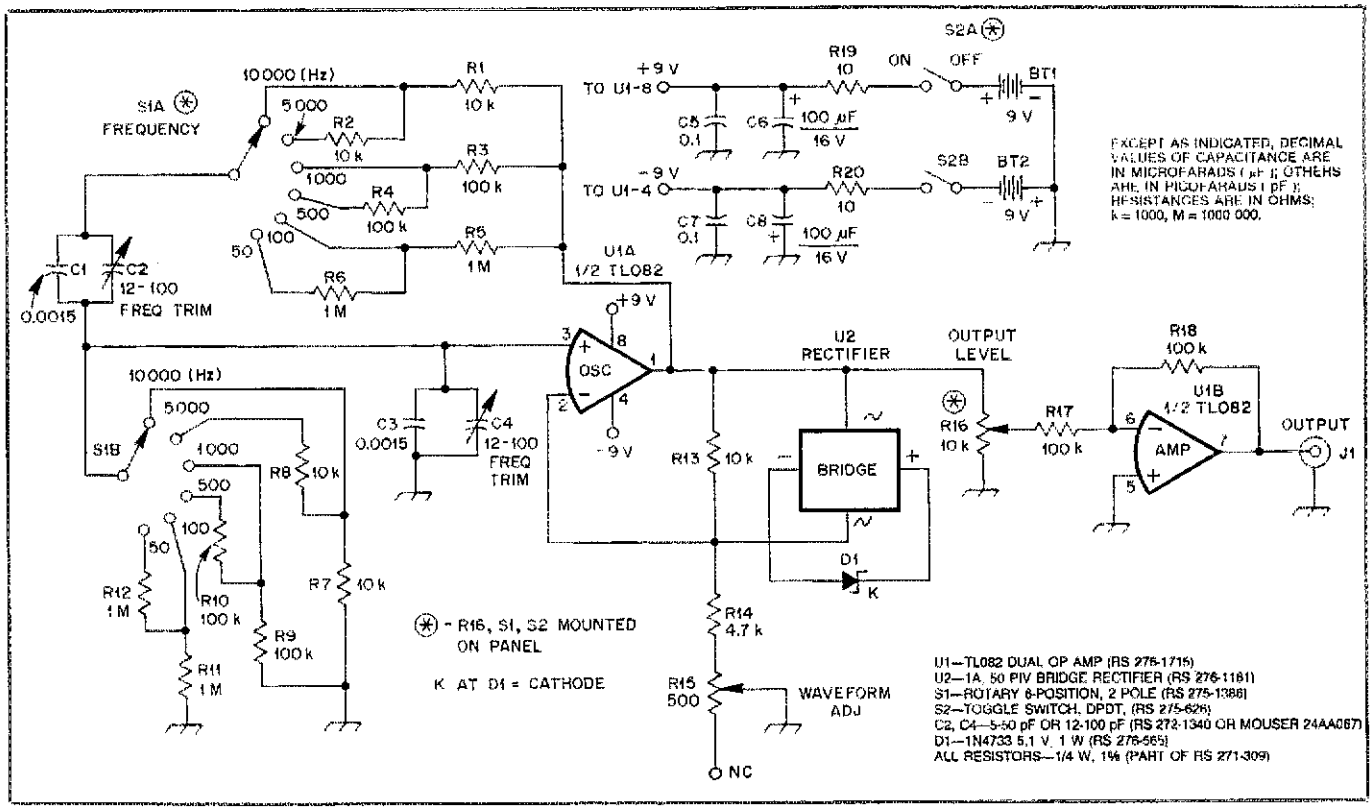


Fig A—Schematic of the audio sine-wave generator.

available. The exception could be the 0.0015-μF silver-mica capacitors, but polystyrene capacitors would be a suitable substitute for these. The resistors used throughout the circuit are 1%-tolerance metal-film units available in an assortment of 50 from Radio Shack.

The components can be tacked in place on perf board with a drop or two of epoxy cement, then point-to-point wired with fine wire. I used no. 26 tinned bus wire covered with sleeving. No. 30 wire-wrap wire could also be used. If you prefer PC-board construction, a full-size etching template is provided in Fig B, with parts placement shown in Fig C.

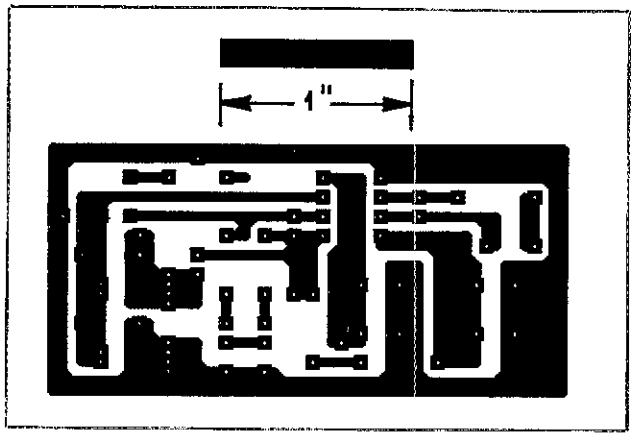


Fig B—Circuit-board etching pattern for the audio sine-wave generator. The pattern is shown full-size from the foil side of the board. Black areas represent unetched copper foil.

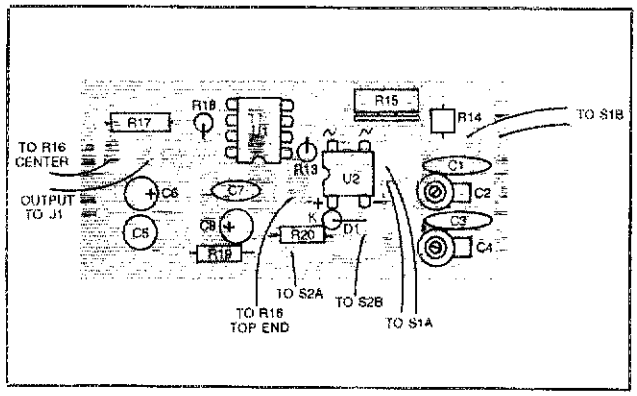


Fig C—Parts-placement guide for the audio sine-wave generator. Parts are placed on the nonfoil side of the board; the shaded area represents an X-ray view of the copper pattern. K at D1 = cathode.

Use a low-wattage soldering iron and do not overheat the ICs and other precision components. I recommend using a socket for U1, but it may be carefully soldered directly into the board.

Mount resistors R1 through R12 on the back of S1 (see Fig D). Solder together the end leads of R1, R3 and R5 and connect this common point to the circuit board with one wire. R7, R9 and R11 require the same treatment.

Mount the circuit board with metal standoffs and no. 4-40 screws. Position the board so that the leads from the two S1 resistor triads R1/R3/R5 and R7/R9/R11 can be directly soldered to the board.

Test and Adjustment

Adjust C2 and C4 (FREQ TRIM) to their midpoint settings. Turn S2 to OFF. Install batteries BT1 and BT2. Set S1 (FREQUENCY) to 1000 Hz. Connect the generator output to an oscilloscope with the vertical gain set for 2V/div. Turn R16 (OUTPUT LEVEL) fully clockwise (max output), and R15 (WAVEFORM ADJ) to fully counterclockwise (max). Turn S2 to ON and adjust the scope to display the audio output. The amplitude should be about 6-10 V P-P, and may show clipping on positive and negative peaks. Gradually adjust R15 until the signal is a nearly perfect sine wave. The amplitude will be about 5-6 V P-P. (The exact amplitude depends on the actual breakdown voltage of D1.) Check the other output frequencies to verify proper oscillation.

Each output frequency should be within 5% of its nominal value without adjustment. Better accuracy on one frequency is obtained by adjusting FREQ TRIM capacitors C2 and C4. For example, for use with the Hay/Maxwell inductance bridge, set the 1000-Hz output as close to 1000 Hz as you can. Connect the audio generator output to the frequency counter and set S1 to 1000 Hz. If the frequency is not 1000 Hz, vary C2 and C4 slightly, adjusting each capacitor by the same amount until the frequency is exactly 1000 Hz. Once this is done, the other five frequencies should still be accurate to within a few percent.

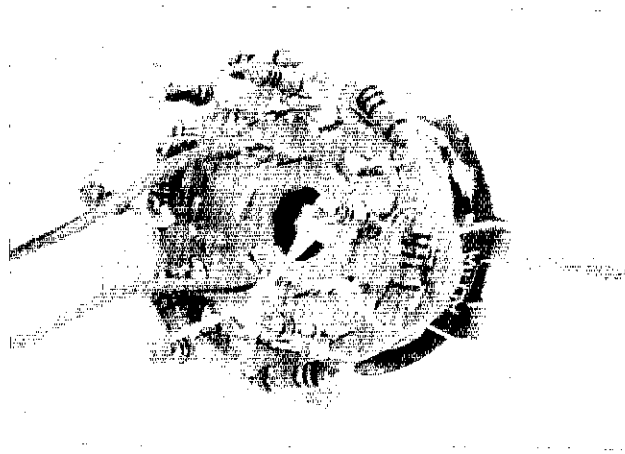


Fig D—Rear view of S1, showing resistor mounting.

Conclusion

The generator can drive a 300-Ω load at full output level (6-10 V P-P). Heavier loads can be driven at lower output levels. Thus, a 250-Ω load can be driven at 6-8 V P-P, and a 125-Ω load at 5 V P-P. (You can increase generator output somewhat by lowering the value of R17; halving R17 doubles the output voltage.) Connecting the generator directly to an 8-Ω speaker creates an output mismatch, and results in a distorted, nonsinusoidal output. Use a small 1-kΩ to 8-Ω output transformer (RS 273-1380) between audio generator and speaker for sound output.

The audio generator operates best with 9-V batteries, but continues to work at reduced output until its supply voltages drop to about 3. Normal current drain at 9 V is about 4 mA; this rises when the generator is used to drive a low-impedance load, reaching about 11 mA with a 250-Ω load.

choose, try another range and search for a null there. With practice, you will soon become adept at balancing the bridge. Once you achieve a null, solve the simplified equations in Table 1—on the panel of your bridge if you recorded them there—using the R_S/Q, RANGE and L values you find at bridge balance. The unknown is known!

Applications and Notes

The bridge is useful for measuring the inductance of RF coils, IF transformer coils, toroidal coils used in audio filters, filter chokes and various transformers. Most RF chokes have low Q when measured at 1 kHz, so the Maxwell bridge works best here. Coils with cores of powdered iron, silicon steel, Permalloy, etc, have much higher Q, so here the Hay bridge should be employed.

Don't be surprised if the R_x you obtain during your measurements is much larger than the dc coil resistance of the inductor under test. Hysteresis and eddy-current losses in the cores of iron-core coils show up as a substantial ac resistive component that increases with frequency. As an example of this, Fig 5 shows measurements made on a power supply filter choke at different test frequencies. Note that Q_x peaks at 175 Hz and then begins to fall as frequency increases. Above 175 Hz, the core losses rise more rapidly than the inductive reactance.[4]

Conclusion

Bridges already serve as useful test instruments and indicators in many of our ham shacks, but here's one that may help keep your shelves from sagging under the weight of unused chokes and transformers! If an instrument for the measurement of large inductances is what you've been looking for, I hope this switchable Hay/Maxwell bridge will allow you to put more good parts to good use.

Notes

[1]D. DeMaw, "A Tester for Coil Inductance," *QST*, Apr 1986, pp 20-22.
[2]F. E. Terman, *Radio Engineers' Handbook*, 2nd ed. (New York: McGraw-Hill, 1943), p 905.
[3]F. E. Terman and Joseph M. Pettit, *Electronic Measurements*, 2nd ed. (New York: McGraw-Hill, 1952), p 73.
[4]Measurements made on a filter choke with an ac test signal may not fully characterize its inductance. Dc flow through the windings of an iron-core inductor results in a decrease in its effective inductance at ac. This effective ac inductance is known as *incremental inductance*, and it is the L_x to be determined where the inductor under test is to be used in a situation involving the simultaneous flow of ac and dc. Power supply filter chokes and many interstage and output transformers are such components; the *swinging* choke, so named because its inductance swings (varies inversely) with dc flow, thus contributing to better filtering and voltage regulation, is designed to exploit this phenomenon. The Hay bridge may be modified to allow measurement of incremental inductance with the addition of means to provide an adjustable metered flow of dc through the unknown inductance. See the reference cited in Note 3, pp 107-108.—Ed.]
[5]Mouser Electronics [Western US], 11433 Woodside Ave, Santee, CA 92071, tel 619-449-2222; [Eastern US] 2401 Hwy 287 N, Mansfield, TX 76063.

Robert C. Dennison, a ham for over 50 years, was first licensed as W9YRQ in Salina, Kansas in 1936. He qualified for the First Class Radiotelephone operator's license in 1940, and was Radar Officer on DD775 during World War II. After the war, he hit the books and received his BSEE (1947) and MSEE (1948). Bob worked as a TV design engineer at RCA from 1950 to 1981. Now retired, he enjoys collecting and using old-time radio gear.

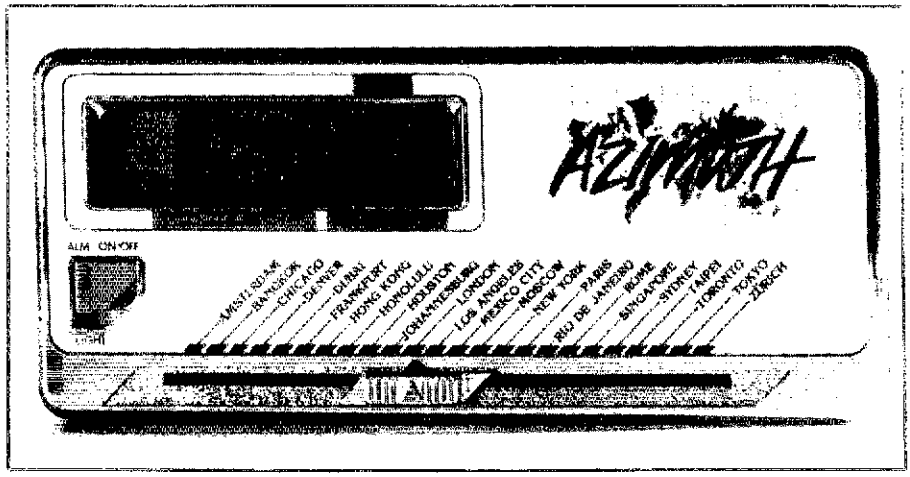
New Products

AZIMUTH COMMUNICATIONS WORLD TIME CLOCK

The Model WT-80 World Time Clock features digital readouts with both local time and times for 24 cities world wide. Designed around a special microprocessor, the quartz clock operates from a single oscillator and features a 24-position slide switch to show the time in any of 24 cities. UTC/GMT is shown with the slider on London. Date changes from time differences around the world and the International Date Line are shown as + or − from the local date.

The clock is easy to set. Daylight Saving Time is memorized on a city or zone basis with the push of a button. The unit operates with 2 AAA penlight batteries. The Azimuth World Time Clock is equipped with press-on light and snooze alarm, and comes with a carrying case.

The clock is priced at $19.95 plus $1.95 postage and handling (CA residents add sales tax). Order from Azimuth Clock, 11030 Santa Monica Blvd, Suite 100, Los Angeles, CA 90025, tel 1-800-821-6842 (1-800-421-1061 in CA).—*Bruce O. Williams, WA6IVC*



Strays

I would like to get in touch with...

☐ anyone with a schematic/manual for a VHF Engineering 2-meter synthesizer, Model-Synthesizer II. Greg Lose, N6MSN, PO Box 7000-459, Redondo Beach, CA 90277.

☐ anyone with a manual for an AN/USM-89B US Govt surplus oscilloscope. N. Marsala, AB5M, 5339 E 97th St, Tulsa, OK 74137.

☐ anyone with manuals for Hewlett Packard 3469B multimeter, 5260A frequency divider and 5245L electronic counter. John Anderson, N7GGO, PO Box 1145, Shelton, WA 98584.

☐ anyone with a schematic/manual for an Eico electronic voltmeter-ohmmeter, Model-21. Jacques Castille, F6GZT, 100 avenue de Fontresquieres, 30200 Bagnols sur Ceze, France.

☐ anyone with information on an ASR teleprinter, Model-32. Jeff Howell, WB9PFZ, RR 16, Box 423, Bedford, IN 47421-9426.

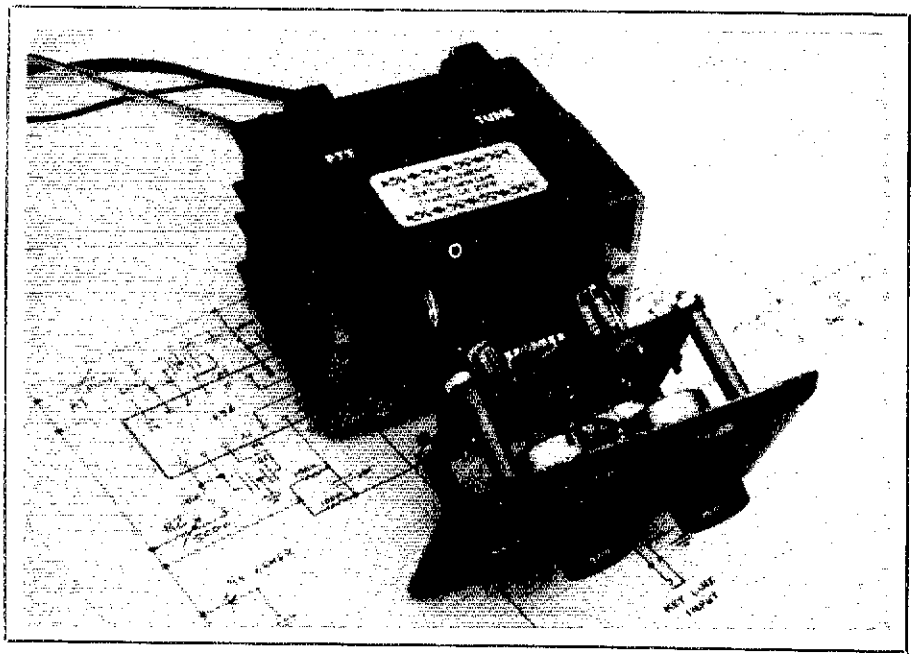
UNIVERSAL GRID-LOCATOR UPDATE

☐ Author Wayne Overbeck reports a strong response to his December 1986 *QST* article, "A Universal Grid-Locator Program for Your Personal Computer." Wayne has recently changed his address. Please direct all correspondence to Wayne Overbeck, N6NB, 11552 Gail La, Garden Grove, CA 92640.

A CW Keying Interface

Eliminate start-up distortion in semi-QSK, and add a little weight as well!

By F. A. Bartlett, W6OWP
6306 Tabernacle La
Paradise, CA 95969



Start-up distortion—the distortion of the first dot or dash at the beginning of a semi-QSK transmission—has long been an accepted trade-off for the convenience and utility of transceiver operation. Because of the distortion, many operators use the semi-QSK feature as a send-receive switch, cranking in so much delay that little QSK advantage exists. The distortion occurs because there is no RF output during the interval required to switch from receive to transmit after initial key closure. Clipping of the first code element is the usual aberration, but switching discontinuities in the several circuits involved can also produce an amplitude "chirp" or a distinct click at the start of semi-QSK transmission.

Use of reed relays or solid-state switching has solved the problem in many of today's more sophisticated rigs. Retrofit modification of existing equipment, however, is not a practical approach to the problem.

Changes in keying weight result from envelope shaping for click-free transmissions, as well as from the built-in delay to accommodate send-receive switching. Lengthening of the code elements, most noticeable at higher code speeds, is commonly seen. A reverse effect occurs with some "full-QSK" transceivers. The built-in delay circuitry severely clips *each* dot and dash. Keying becomes extremely light, and the full-QSK option is limited to relatively slow speeds. Weight compensation applied to input keying is helpful. Many keyers, keyboards and computer-keying programs make no provision for such weight adjustment, and none is provided in the transceivers themselves. Apart from the compensation feature, the ability to tailor keying weight has an operational advantage.[1] The smoother rhythm of slightly heavy keying at medium speeds, in contrast to the precise cadence of an unbiased signal, is preferred by most operators. On the other hand, light keying affords increased readability at high speeds.

To address these problems, an interface to interconnect the keyer and the transceiver was devised. It takes up little space, draws power from the host transceiver and is built from off-the-shelf parts.

Design Philosophy

If manual control (MOX) of the transmit-receive function is used, keying shows no start-up distortion. This points to a solution. Put simply, a "black box" is needed that will sense activity on the key line and switch the transceiver to transmit mode *before* the arrival of the first dot or dash.

To implement this concept, basic logic elements are arranged to accomplish the "black box" function, and also provide control over keying weight as needed. Incoming keying is split into two paths: (1) a direct path to the PTT line, and (2) a delayed path to the transceiver key input. The delay must be sufficient to assure keying only *after* the PTT line has fully transferred the transceiver to the transmit function.

The delay is achieved by removing a segment from the leading edge of each code element. This is the interval during which the PTT circuitry places the transceiver in transmit mode. Then, to preserve the original keying symmetry, each code element is lengthened by the amount removed from the leading edge. Both actions are adjustable, and provide a means for weight compensation.

With the addition of the added connection from the interface to the transceiver PTT line, the transceiver can be operated in the semi-QSK mode. If control over keying weight only is desired, no PTT connection is required. The transceiver may be operated in any CW mode.

Circuit Description

The interface schematic is shown in Fig 1. A 556 timer IC is connected as a dual one-shot. Three of the NAND gates in the quad 4011 are used as inverters. Path isolation is performed by the 1N914 diodes. Zener regulation holds V_{cc} at 9 V. The two transistors and the optoisolator form an isolating switch that can be connected as either a positive- or negative-polarity transceiver key line.

Construction technique is shown in Fig 2. The circuit board is a standard Radio Shack item. Its size, 2.83 × 1.85 inches, lends itself to a compact assembly that uses a plastic electrical outlet box as the enclosure. A blank cover plate serves as the panel and mount for the two control potentiometers and the input key jack. The circuit board is mounted to the panel with 1¼-inch spacers. Point-to-point wiring is used, with sockets for the ICs and transistors. The two SPST switches are installed on the top of the enclosure. S1 is a push-on/off switch in the PTT line. S2 is a momentary push-button switch across the outgoing key line and is used for tune-up. R1 and R2 determine the pulse lengths developed by the one-shots; R1 controls the marking bias (makes keying heavier), and R2 sets the spacing bias (lightens keying). R2 also sets the width of the segment cut from the leading edge of each keying element, while R1 determines the length added to the trailing edge. Both controls are wired

[1]Albert Kahn, "Keyer Weighting," Hints and Kinks, *QST*, Mar 1976, p 41.

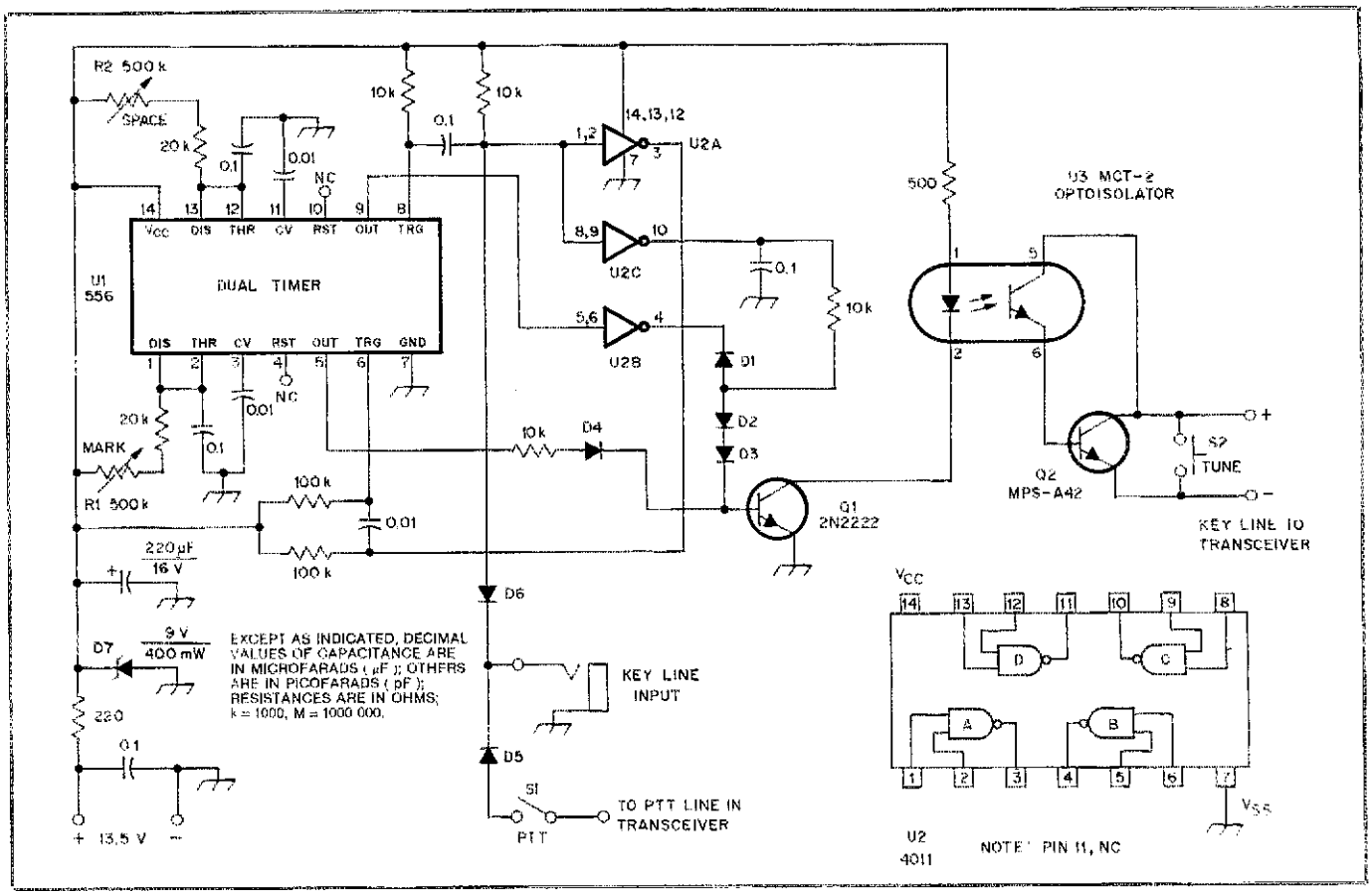
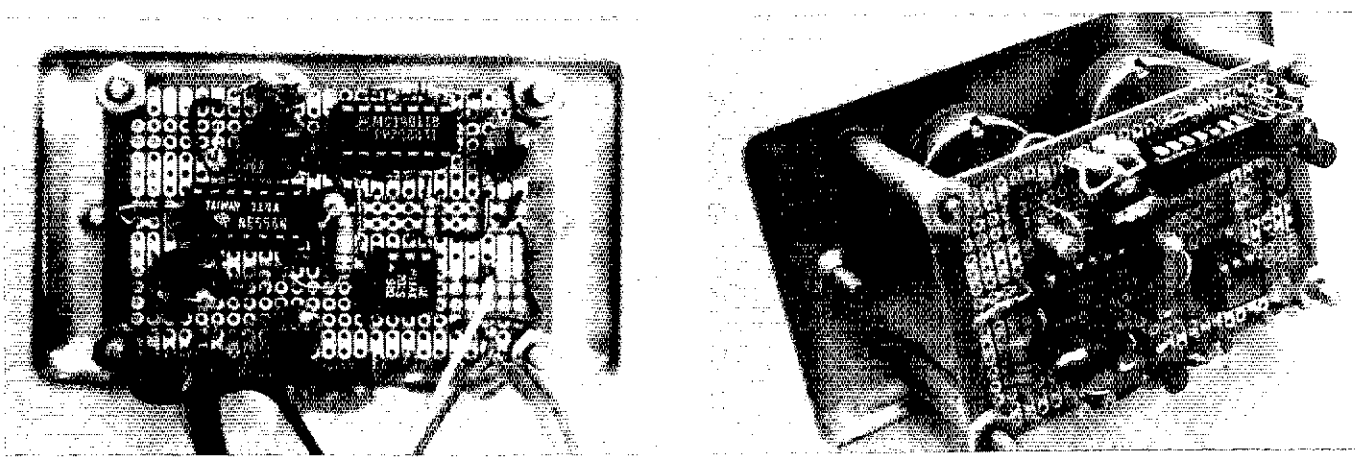


Fig 1—Schematic of the Keying Interface. Part numbers in parentheses are Radio Shack.

D1, D6, incl—1N914 (276-1122).
D7—9-V, 400-mW Zener (276-562).
Q1—2N2222 (276-2009).
Q2—MPS-A42.
R1, R2—500-kΩ potentiometer.
S1—SPST push on/off switch (275-1565).
S2—Momentary push-button switch (275-1566).
U1—556 dual timer (276-1728).
U2—4011 quad 2-input NAND gate (276-2411).
U3—Optoisolator, MCT-2 or ECG 3042.

Miscellaneous
PC board—(276-150).



(A) (B)

Fig 2—Two views of the Keying Interface. At A, mounting of parts on the perforated circuit board. At B, assembly of the circuit board to the front panel.

for maximum resistance when rotated fully clockwise. The input voltage, PTT and keying leads are brought out of the unit for connection to the transceiver. Operating voltage may be picked up from the accessory socket. The PTT line may be accessed at the microphone socket or the accessory connector if the transceiver provides one. The output key line terminates in a plug to match the transceiver key jack.

Important Note: If the interface is used to eliminate start-up distortion, it *must* operate in conjunction with an active PTT line when the transceiver is in VOX (semi-QSK) mode. Most transceivers are wired this way. However, there are exceptions. The Yaesu FT-101 series, for example, has PTT on a separate switch position. A jumper must be added so that the PTT line remains active when the switch is moved to the VOX position.

System Logic

Referring to Fig 3, with S1 closed, an incoming key-line closure immediately energizes the transceiver PTT circuit. In the secondary path to the transceiver key input,

outputs of inverters U2A and U2C go high, but turn-on of the 2N2222 switch driver is inhibited until completion of a pulse generated by one-shot A (U1, pin 9) and inverted by inverter U2B. The pulse length is controlled by R2. Upon key opening, outputs of inverters U2A and U2C go low, one-shot B is triggered and a timed positive pulse, controlled by R1 (U1, pin 5), continues to drive the 2N2222 to restore original keying integrity. While it would appear that the PTT line is continuously keyed, only the initial key closure is significant because the VOX circuit holds the line closed for whatever delay has been selected.

Fig 4 shows oscilloscope photos of the Keying Interface under test in the ARRL Lab. The interface was used with a Trio-Kenwood TS-820 transceiver, and keying was accomplished with a programmable keyer that produces a series of dots at adjustable speeds. The transceiver VOX circuit was used to switch from receive to transmit mode. In all three photos, the keyer output is shown on the top trace and the transmitter output on the lower trace. At A, the keyer is directly keying the transceiver. The shortening of the initial dot is caused by the delay in the transceiver's TR switching circuit. At B, the keying interface is keying the PTT line at the initial closure and delaying the key closure to the VOX circuit. R1 was adjusted for a 40-ms delay, long enough for the TS-820 to finish switching to transmit mode. R2 was adjusted to provide sufficient weighting to reproduce the original keyed waveform. At C, R2 has been adjusted to provide heavier weighting—a capability that was otherwise impossible to achieve with the keyer used in this test.

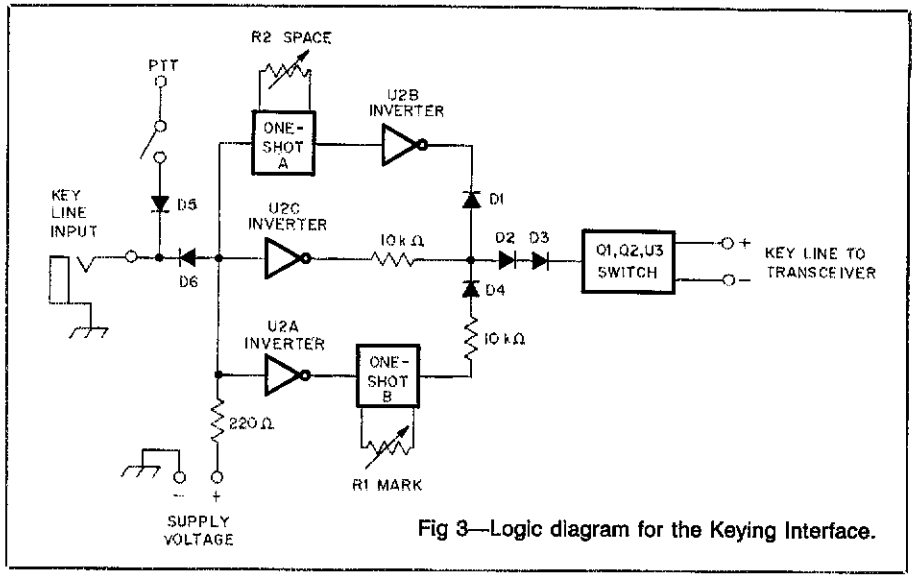
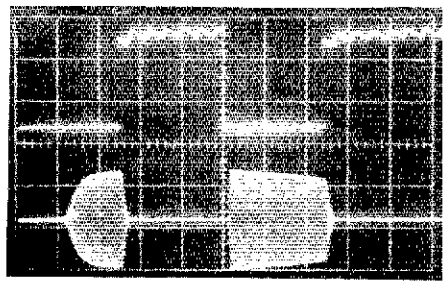
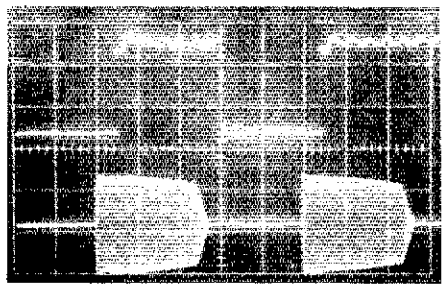


Fig 3—Logic diagram for the Keying Interface.



(A)



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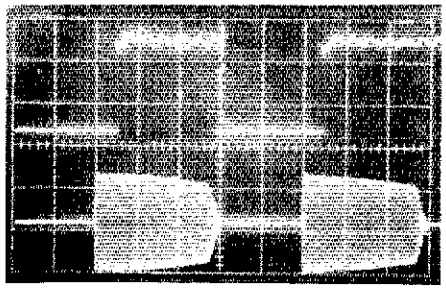


(C)

Fig 4—Oscilloscope photos showing performance of the Keying Interface. The top trace shows the key closure, the bottom trace shows the RF output. At A, the keyer is directly keying the transmitter, without the interface. At B, the interface is adjusted to delay the keying to the VOX circuit until the PTT line has switched from receive to transmit. R1 has been adjusted for a 40-ms delay. At C, R2 has been adjusted to provide a heavier weighting than possible with the keyer alone.

Interface Adjustment

Correcting Start-up Distortion

It is necessary to observe the transceiver keyed output because the sidetone signal monitors only the input keying. A second receiver or RF-keyed oscillator will suffice. An oscilloscope may be used if it will accurately display the first dot of a transmission.

Initially, S1 and the two potentiometers are turned to their OFF positions (controls CCW). Key the transceiver in semi-QSK sequences of dots at a speed where start-up distortion is evident. Now close S1 and advance R2 (spacing bias control) until the distortion is eliminated. Advance the control a few degrees beyond this point. You'll notice that each dot and dash has been slightly shortened. Advance R1, the marking bias control, until the original keying envelope is restored. Satisfactory adjustment can be made readily by ear.

Weighting Adjustment

After start-up distortion is corrected, keying weight can be increased or decreased by adjusting R1. The only exception is if an extremely heavy keying characteristic is encountered. In this case, advance the spacing control, R2, until weighting is satisfactory, with the marking bias control, R1, in the off position (CCW).

If only weight control is desired (no start-up distortion), the PTT switch, S1, should be off, or no PTT connection made. The set may be operated in any CW mode. With R1 and R2 initially in the OFF (CCW) position, adjust only the one required for the desired weight change.

If undamped metering of the transceiver final stage or power output is available, weight adjustment may be facilitated by observing the meter readings. Unbiased keyed dots will result in an average 50% of the steady carrier reading. A handy way to make a test series of dots from a computer or buffered keyboard is to type a series of the letter "T" into the buffer (TTTT...), and then read them out at high speed. The result simulates a perfect series of dots.

Final Notes

No difficulties have surfaced in the several units built. RF poses no problems despite the use of a plastic enclosure. However, a word of caution is in order. If the interface is used to eliminate start-up distortion, and the PTT switch is closed but the transceiver VOX switch is OFF, the PTT line will follow the input keying. Inadvertent "tests" were made on both Kenwood and Yaesu transceivers, but no harm was done. Nevertheless, such fast PTT switching is contrary to the design intent of non-full-QSK rigs. Take care in using the interface to assure that the VOX circuitry is activated.

F. A. "Bart" Bartlett was first licensed as W9FYK in 1930 and received his present call, W6OWP, in 1937. He also held KA1ABH while stationed in Manila, Philippines after WW II. He currently holds the Amateur Extra as well as commercial radiotelegraph and telephone licenses.

He became interested in CW early, and studied at the University of Colorado and at RCA Institutes in Chicago prior to being licensed to work in broadcasting. He was frequently assigned to copying press, and in 1942 entered the world of radio communications. His employers included Transradio Press Service, Press Wireless, ITT and Aeronautical Radio. He is currently retired and spends much of his time traveling.

He is no stranger to QST readers—he has several articles to his credit, going back as far as 1941—and, of course, any QST from early 1948 on carries the W6OWP listing for the monthly Code Proficiency run.

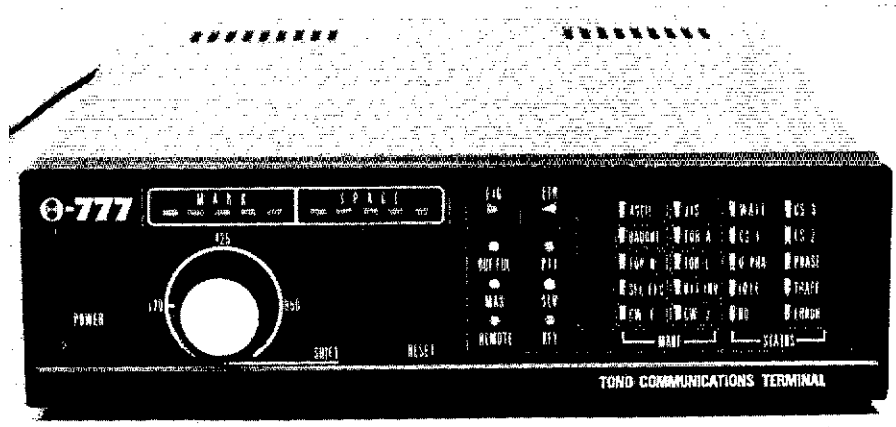
Product Review

Conducted By Bruce O. Williams, WA6IVC
Assistant Technical Editor

Tono Θ-777 Communications Terminal

The heart of a modern computerized Amateur Radio station is the modem. Connected between the transmitting and receiving equipment and the computer, the modem modulates and demodulates RTTY and CW signals for display by the computer. Modern communication terminals have come a long way from the first simple one- or two-chip modems connected to the computer. Today's terminals handle most of the decoding chores "on board," and most use their own microprocessor and memory. The Tono θ-777 is an excellent example of a state-of-the-art communications terminal.

The '777 receives and transmits RTTY (Baudot and ASCII), AMTOR and CW. All coding and decoding is handled by the terminal; a computer is used for display and keyboarding. The Tono '777 incorporates an RS-232-C interface, and may even be used with an ASCII or Baudot teleprinter machine.



First Impressions

The first thing you notice about the θ-777 is the lack of front-panel controls. The POWER switch, RESET button and variable SHIFT potentiometer are the only breaks in an otherwise smooth front panel. These are the only operating controls on the unit—all functions of the '777 are controlled from the computer.

A 28-LED display tells you everything you need to know about operating MODE and STATUS, PTT, KEY line and BUFfer status, AMTOR MAStER or SLAVe station, phase, traffic and idle indications, and FIGures and LETTERS case in RTTY. A 10-LED bar-graph tuning indicator is used for tuning both RTTY and CW signals.

All connections to the terminal are made from the rear panel; RS-232-C connector, DC12V input cable, INPUT TTL and AF jacks, a PHONE jack for headphones or an external monitor speaker, PTT jack, POSitive and NEGative keying jacks, a REMOTE jack for keying accessory equipment, and an AFSK output with a GAIN control. The INPUT jacks provide for both audio and TTL signals. The TTL input is provided so that a high-speed modem can be connected to the '777.

Connections

The '777 comes equipped with a standard cable with a DIN plug on one end to mate with the RS-232-C jack on the rear panel, and a DB25P plug on the other end. The manual includes detailed instructions for connecting the Tono to different types of terminals, including ASCII and Baudot teleprinter machines. An internal DIP switch selects the code and speed used to communicate with the '777. I used a Radio Shack TRS-80® Model 4P with the '777—my Western Union Model 100 teleprinter machine has been in the attic since I moved to Connecticut three years ago. It is interesting, however, to note that a Baudot terminal *can* be used with the '777, if you are so inclined.

The '777 requires 12 V dc at approximately 1 A. A 12-V power supply is not provided with the unit. All keying and input/output lines are terminated with phono jacks on the rear panel. For the simplest RTTY and CW installation, the AFSK and PTT lines are connected to a microphone connector, the keying line is connected to the radio's key jack, and the AF input on the Tono is connected to the external speaker output of the radio. This is how I connected the '777 to a Kenwood TS-820 for testing at W1INF, the ARRL HQ club station.

On the Air

When you first turn on the '777, it responds with what the manual calls the "status line." This is a display on the terminal screen informing you of the current operating mode, which set of tones and shift is in use, the sense (normal or reverse), speed and PTT status (manual or automatic). The '777 starts up in Baudot mode at 45.5 bauds, normal sense and manual PTT.

All functions of the '777 are controlled from the terminal keyboard. While this is a bit confusing at first, it becomes quite natural very quickly, and is really convenient. ESCAPE sequences (typing the ESCAPE key, followed by another key or keys) are used to control the various modes and operating parameters. For example, after power on, you change to CW mode by typing ESCAPE M 7 to select mode 7 (CW). To change the speed to 20 WPM, you type ESCAPE S 20.0. If you need to see the status line, you type ESCAPE ?

The dual bar-graph display is used as a tuning indicator. Five LEDs on each side of center show the relative strengths of the MARK and SPACE tones. The MARK side of the indicator is also used as a CW tuning indicator.

CW Operation

The '777 sends beautiful CW. The weighting (dot:dash ratio) is adjustable from 1:3 to 1:7. The '777 automatically tracks the receive speed; no operator adjustment is required. The unit receives strong signals well, and even copies poor "fists" if the signal is strong enough. Like most computerized CW-receive devices, however, weak-signal receive performance leaves something to be desired. A "random code generator" function is also included, so that you can use the unit to improve your code speed.

The "Green Keys"

The '777 really shines on RTTY. With the PTT set to "automatic," the unit keys the transmitter as soon as you start typing; ESCAPE D unkeys the transmitter. With manual PTT selected, you must also type ESCAPE D to key the transmitter. Transmitted text may be formatted automatically into 64, 72 or 80-character lines. The '777 inserts a carriage return/line feed sequence when the end of the line is reached. Unshift-on-space and a "diddle" feature are also available; with diddle on, the '777 sends continuous LETTERS characters when there is no text to be sent. The AFSK tones are crystal controlled for accuracy.

The unit has a 768-character input buffer; to activate the buffer, you type ESCAPE P and start typing. When you type ESCAPE P again, the buffered text is transmitted. There are also four 64-character message memories, seven 32-character memories, and four 16-character memories for SELCAL data. Memory data is not retained if the unit is switched off.

The terminal software I use does not support split-screen operation. Most terminal programs written for use with a modem do not—you may be able to find some written specifically for your computer. This is not really a problem, but a split-screen display makes RTTY operation a bit easier and more pleasant.

An interesting feature is "mode 0" RTTY. While tuning around the RTTY subband, you can set MODE 0 (ESCAPE M 0) and the '777 will automatically select Baudot or ASCII and set the speed by tracking the incoming signal. This feature works reasonably well, but if you have a good "ear" for RTTY, you can often recognize the type of signal being received and manually set the parameters before the Tono can figure out the signal.

The LED tuning indicator is adequate for use in the amateur bands, but trying to tune in a commercial RTTY signal with an oddball shift is difficult without an oscilloscope display. The '777 incorporates outputs for a tuning oscilloscope, but the phono jacks for vertical and horizontal outputs are inside the

case on the PC board, and *under* the monitor speaker! The speaker must be removed (unplugged from the PC board and lifted out of its mounting bracket) to *use* the scope outputs.

With the internal modem, operating speeds between 12 and 200 bauds can be selected. The internal software will handle speeds up to 600 bauds if an external TTL-output modem is connected to the TTL input of the '777.

The input-filter shift is continuously variable from a little less than 170 Hz to a little more than 850 Hz. Markings for 170, 425 and 850 Hz shifts are provided around the SHIFT control for easy reference. The SHIFT control selects the receive shift only; transmit AFSK tones are selected from the terminal keyboard, with the MARK tone either 1275 Hz or 2125 Hz, and the shift 170, 425 or 850 Hz.

Monitoring Commercial RTTY

Commercial RTTY signals are a real challenge for any modem. An addendum sheet packed with the '777 states, "Due to the proliferation of 'communications terminals,' *most* if not *all* of the major Commercial Press Services are now 'playing games' with shift, tone, phasing, and speed in order to discourage unauthorized use of their services." I tried the unit with the Kenwood TS-440S in W1INF and found only a few readable transmissions. The US Information Agency transmits "in the clear," as do some foreign press services. If you plan to use the Tono to monitor commercial traffic, it will help if you speak Spanish or French, and a book such as the Klingenfuss *Guide to Utility Stations* will be extremely helpful.

AMTOR

Even AMTOR operation is simple; here, again, the software adds some "automation." In mode 5 (what Tono calls Mode L AMTOR), you can monitor ARQ, FEC AMTOR and SITOR (commercial ship traffic) signals. To switch to the "wait state" common to both Mode A and Mode B AMTOR, you type ESCAPE M 4. To transmit in Mode B, you type ESCAPE B, and the '777 begins transmitting. In the "wait" mode, if the '777 hears your station being called in Mode A, it will automatically switch over and synchronize with the transmitting station. In operation, you can call CQ in Mode B, and when you get an ARQ call, the '777 automatically switches over and the radio starts to chirp away.

If you hear a Mode B CQ call and want to call the station in Mode A, you type ESCAPE A followed by the selcal of the station you want to call. The Tono switches to Mode A and calls the station. This all may sound complicated, but in actual operation it is quite simple. I had never operated AMTOR before I reviewed the '777, and it only took me 5 minutes or so to get the hang of operating with the terminal.

Problems

Very few problems appeared during my Product Review operation. The main complaint I have is that the manual is a bit lacking for such a complex piece of hardware. The table of contents is quite detailed, but there is no index. A few of the features are not fully documented, such as the adjustable CW weight feature. The manual states that to change the weight you type ESCAPE followed by a number from 0 to 9, corresponding to CW weights between 1:3 and 1:7. There is no indication of which weights correspond to which numbers, which weight is the default value or how to return to the default after you set a different weight.

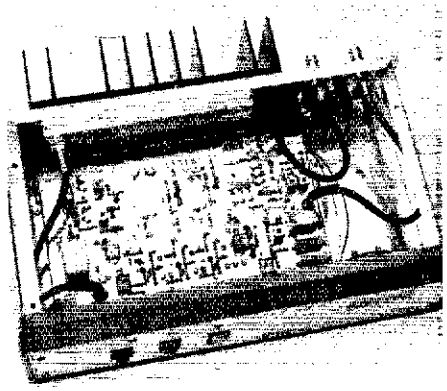
Finally

I am impressed by the Tono θ-777. It does everything I'd want a communications terminal to do, and does it all very well and with a minimum of knob tweaking and software fiddling. The control functions seem quite logical, once I got used to them, and I found it very easy to switch from mode to mode as I tuned around the band. If there were no AMTOR stations to work, I could quickly tune up the band and work Baudot, or tune down to the low end of 20 and work CW. If the ham bands were lifeless, I went hunting for commercial RTTY stations. In short, I was sorry to see the end of my Product Review testing.

Exclusive distributor: Amateur-Wholesale Electronics, 8817 SW 129th Terr, Miami, FL 33176, tel 305-233-3631. Suggested price: $249.—*Bruce S. Hale, KB1MW*

SSB ELECTRONICS LT 33S 902-MHz TRANSVERTER

Times sure have changed for the UHF/microwave enthusiast. In the old days, there was no commercial equipment available for these frequencies, and everything had to be built piece-by-piece at home (or at work during "free" time). Now, there is a wealth of compact commercial equipment available if you know where to look. SSB Electronics is



an established West German manufacturer of high-quality VHF and UHF equipment, including transverters and preamplifiers. The subject of this review, a new transverter for the new 902-MHz (33-cm) amateur band, is based on the popular LT 23S 1296-MHz transverter. Anxious to get on 33 cm for the summer, I purchased the LT 33S in May 1986, about 9 months after 902 MHz became available for use in the US. The review unit was from the first production run.

Circuit Highlights

The LT 33S is a linear transverter that converts signals in the 902-904 MHz range to 144-146 MHz. It is meant to be used with a 2-meter transceiver as a tunable IF, and works on all modes. Weak-signal activity (on the East Coast, at least) centers around 903.1 MHz, so the 2-meter rig must be able to tune to 145.1 MHz. Don't despair if your 2-meter rig won't cover that frequency. The LT 33S is equipped with two crystal-controlled oscillators, selectable from the front panel. Order an additional crystal and you're all set.

The receiver section of the LT 33S is equipped with a modern Mitsubishi MGF1202 GaAsFET front end. Another MGF1202 acts as a low-loss active mixer. Conversion gain is about 20 dB, and the converter noise figure is 1.6 dB (measured with an HP8970A Automatic Noise Figure Meter and an HP346A Noise Source).

On the transmit side, the 2-meter signal enters the mixer through an adjustable 30- to 50-dB attenuator. Although the correct mixer drive level is about −10 dBm (100 μW), the attenuator allows the transverter to be used with 2-meter drive levels ranging from 100 mW to 10 W. Following the mixer, a 3-pole filter eliminates the image and other spurious signals. The signal is then amplified to the final output level through six stages. The review LT 33S transverter was rated at 6-W output. Higher powered units are planned for the future.

The LT 33S is built in two modules. The receiver, local oscillator, low-level transmitter stages and control circuitry are contained on one large circuit board that takes up most of the cabinet interior. The final amplifier is enclosed as a separate unit that is attached to a heat sink on the rear panel.

Connections

The front panel contains the POWER OUTPUT meter, three control switches and some LED indicators. The L.O.1/ L.O.2 switch allows selection of local oscillator frequencies. L.O.2 is the standard position, while L.O.1 is for an optional crystal. Manual PTT operation is afforded by the TX switch. The third switch is for power ON/off.

The rear panel is equally simple. BNC connectors are used for the 902-MHz transmitter output, 902-MHz receiver input and for the RF connection to the 2-meter transceiver. There are binding posts for power and ground, as well as for control of an external TR relay. Finally, a phono jack is provided for PTT control.

The LT 33S contains internal switching to connect the 2-meter IF rig to the transmitter attenuator in transmit, and to the output of the receiver in receive. There is, however, no internal antenna relay. SSB Electronics did this to make it easier to connect additional power amplifiers or an external preamplifier. You'll have to supply your own relay rated for use at 900 MHz. Suitable relays are often available at flea markets or through ham ads. If you wish to purchase a new relay, the SSB Electronics distributor listed at the end of this review can help. I used a CX-600N relay purchased from RadioKit, Box 973H, Pelham, NH 03076.

Connections between the LT 33S and the rest of the station are easy to make. First, you'll need a power supply capable of providing 14 V at about 2.5 A. You can use the LT 33S at 12 V, but the power output will be down by a watt or two. If your antenna relay has a 12- to 14-V coil, you can power it from the rear panel. The control circuit is set up to supply 12-14 V to the +REALAIS terminal during receive periods and remove this voltage when the LT 33S switches to transmit. If you use RG-58 cable to connect the antenna relay to the 902-MHz input and output jacks, make the runs as short as possible—RG-58 is very lossy at 900 MHz. A single cable runs between the 144-MHz

IN/OUT jack on the transverter and the antenna jack on the 2-meter rig. To control the LT 33S TR switching from the 2-meter rig, you must connect the PTT jack on the transverter to a line from the transceiver that is grounded in transmit and open in receive. Note that the LT 33S does not contain any RF switching. You must ground the PTT jack or manually operate the front-panel TX switch to transmit.

I used the LT 33S with a Yaesu FT-726R as the IF transceiver. Following the suggestion in the operator's manual that the 2-meter transmitter be operated at the lowest possible power output, I adjusted the internal attenuator in the LT 33S for full 33-cm power output at 1 W of 2-meter drive power.

Operation

The antenna I used with the LT 33S was a Down East Microwave 33-element loop Yagi on a 100-foot tower. I installed the antenna with a 130-foot feed line of Belden 9913 as a "temporary" measure a few days before the June 1986 VHF QSO Party. This feed line has a measured loss of 6 dB at 902 MHz, so I would not recommend using it on a permanent basis. Unfortunately, I still haven't gotten around to replacing it... With this feed line, only 1.5 W from the LT 33S reaches the antenna and the receiver noise figure is increased by 6 dB.

Despite the poor feed line, I worked 10 stations in 6 grid squares during the June VHF QSO Party. During June, July and August, I worked a number of other stations, to bring my grid total to 15. In September, I added a 20-W amplifier to boost my power at the antenna to 5 W. In October, I added an 80-W amplifier. By mid-October, I had worked 25 different grid squares and 12 states. My best DX was W3HQT/4 in FM27, about 300 miles.

I am very pleased with the LT 33S. Since it is a linear transverter that works in all modes, I was able to make CW, SSB and FM QSOs. The transmitter has a clean-sounding signal, and you can work a lot of good DX with 6 W. The receiver hears very well, even with a lousy feed line ahead of it. Of minor concern is the stability of the local oscillator—it tends to drift slowly until the transverter has warmed up for a half hour or so.

The LT 33S proved to be a reliable piece of equipment. The only problem I had was when I accidently connected the 2-meter transmitter to the 902-MHz receiver input. This resulted in a blown MGF1202 in the front end. I replaced that device with a Mitsubishi MGF1402 I had available. The replacement device worked fine! Without making any adjustments, the conversion gain rose to 21.25 dB and the noise figure decreased to 1.25 dB.

This transverter is a fine way to gear up for our newest UHF band. Distributed by Transverters Unlimited, Box 6286 Station A, Toronto, ON M5W 1P3, Canada, tel 416-759-5562. Price class: $500.—*Mark Wilson, AA2Z*

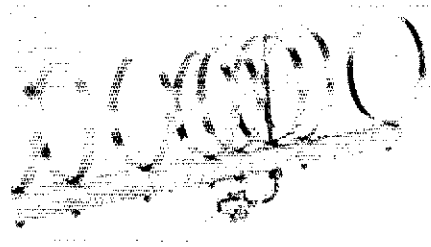
DOWN EAST MICROWAVE 3333LY 33-CM LOOP YAGI

Loop Yagis have been popular for many years among amateurs operating at 1296 and 2304 MHz. These antennas have proved to be good performers in wet weather as well as dry. Many amateurs have had good luck building loop Yagis from various construc-

Table 1

SSB Electronics LT 33S 902-MHz Transverter

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
Transmitting Converter	
Input frequency: 144-146 MHz.	As specified.
Output frequency: 902-904 MHz.	As specified.
2-m drive power: 0.1 to 10 W.	As specified.
Output power: 6 W.	Maximum saturated output 7.3 W.
Receiving Converter	
Input frequency: 902-904 MHz.	As specified.
Output frequency: 144-146 MHz.	As specified.
Overall noise figure: 1.4 dB, typical.	1.6 dB.
Overall gain: 20 dB, typical.	20.7 dB.
Power supply requirements: 14.5 V dc at 2.5 A transmit, 0.2 A receive.	13.8 V at 2.3 A during transmit (6 W output) and 0.2 A during receive.
Dimensions: 3 × 11.8 × 8.7 in (HWD).	
Weight: 5.5 lb.	
Color: Green.	



tion articles in the amateur literature.

Down East Microwave supplies commercially constructed loop Yagis for popular frequencies in the 900- to 2500-MHz range. The 3333LY reviewed here is designed for use on the 33-cm (902-MHz) amateur band. It has 33 elements, including 30 directors, two reflectors and a driven element. The boom is 12 feet long.

For ease in shipping, the 1-inch-OD boom is fabricated in two sections that are spliced together with a 7-inch length of smaller tubing. Boom material is high-quality 6061-T6 for high strength and long life. The loop elements are 5/16 inches wide and made from 0.032-inch-thick 5052-H32 alloy aluminum. The loop element material was chosen for strength and corrosion resistance. The largest loop is about 4½ inches in diameter. All hardware is stainless steel. A Type-N connector is supplied, but other types are available upon request. The machine work on the review antenna was excellent, and everything lined up well.

Down East Microwave loop Yagis are available assembled, and also in kit form at a lower price. The review antenna was assembled. To get it ready for installation, I just had to unpack the antenna, remove one director, slide the boom sections together and fasten them, and replace the director. Kit assembly is only slightly more involved, and takes about an hour. All kit parts are well marked, and the elements come preformed into loops, so putting one of these antennas together is not too much different from assembling a conventional Yagi. The only tools required are a screwdriver and small wrench, as well as a soldering iron for making two easy connections to the driven element.

I installed the 3333LY on a 100-foot tower as described in the SSB Electronics 33-cm transverter review in this column. It's worth noting that the loop Yagi must be mounted at the top of the mast so that the mast does not pass through the plane of the elements. I wanted to place the antenna at the bottom of the mast to minimize feed-line loss, so I bolted the review antenna to a cross boom along with a similar Yagi for 1296 MHz.

A common criticism of loop-Yagi antennas is that the elements are fragile and easily deformed. That is not the case with the Down East products because of the size and quality of the loop materials. I mounted my antenna with the loops pointing down and have not experienced damage from birds or ice.

The home-station antenna worked so well that I purchased another for friends to take to rare grid squares on expeditions. The portable antenna survived some 3000 miles of travel during the summer and fall. It was carried on (and in) vehicles as diverse as Ed Hare's (KA1CV) Subaru Brat, Bart Jahnke's (KB9NM) Ford Bronco and Clarke Greene's (K1JX) Audi Quattro with no damage, save a missing nut on one element. That's one sturdy antenna!

If you're planning to get on 33 cm, this antenna is worth serious consideration. If you need more gain, stacking kits are available. Manufacturer: Down East Microwave, Box 1655A, RFD 1, Burnham, ME 04922, tel 207-948-3741. Price class: $93 assembled, $77 for the kit.—*Mark Wilson, AA2Z*

Table 2

Down East Microwave 3333LY 33-Element, 33-cm Loop Yagi

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
Frequency range: 880-910 MHz.	Tested only at 902-904 MHz.
Boom length: 144 in.	As specified.
Boom diameter: 1 in.	As specified.
Mast diameter: Up to 1 in.	As specified.
Weight: 5 lb.	As specified.
Maximum power handling: 550 W, average.	Tested only up to 80 W.
Connector: Type N female.	As specified.
Typical SWR: Less than 1.2:1.	1.3:1 at 903 MHz.

Hints and Kinks

Conducted By Bob Schetgen, KU7G
Assistant Technical Editor

A PORTABLE 2-METER BEAM ANTENNA

☐ As a RACES member, I need a quickly assembled 2-meter beam antenna. This could be accomplished easily by adding parasitic elements to an existing mobile antenna. Fig 1 shows a novel, portable, 2-meter antenna based on that premise.

I begin with a homebuilt J-pole antenna that has several features to recommend it: (1) It performs as well as a commercial roof-mounted 5/8-λ whip; (2) it is small enough to clear highway obstructions; and (3) it requires no ground plane for proper operation. It is made of a 58-inch piece of ½-inch aluminum tubing. A 19¼-inch piece of similar tubing makes up the matching section (stub). The J pole is constructed by mounting a strap of aluminum to the bottom of each piece of tubing and an insulator made from a scrap of plastic at the top of the stub. Keep 1½ inches between element and stub. I forced a mounting stub from a broken mobile mast section into the bottom of my J pole to make for easy attachment to an existing ball mount. The antenna is not fed from the ball, however, but with a separate feed line attached to the stub with straps made of scrap aluminum. Vary the tap point on the stub until the best SWR is achieved (about 2 inches up from the bottom on my antenna).

The reflector and director elements are fastened to a 36-inch boom. Also connected to the boom is a small plywood yoke that fits snugly into a spool mounted on the driven element. The parasitic elements easily clear the body of my compact, hatchback car as the beam is rotated.

For emergency or portable operation, it is easy to pull into a rest stop and attach the boom to give your signal a significant boost. It is a big help to work that distant repeater or get back to the RACES control station when far out in the field. The antenna can be used on Civil Air Patrol frequencies as well. It seems to operate well from 146 to 148 MHz.—*Jim Brenner, NT4B, Ocala, Florida*

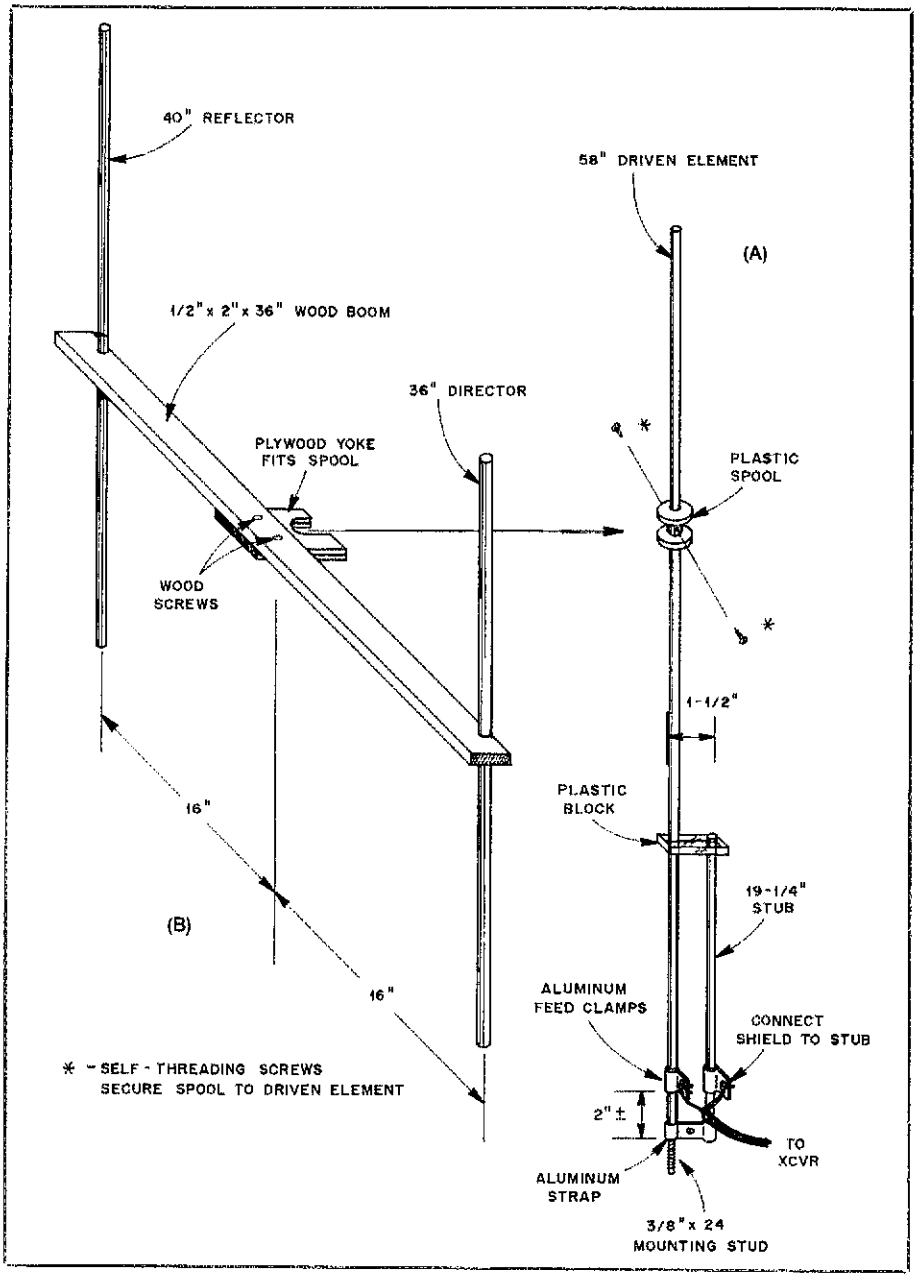


Fig 1—NT4B's beam antenna. The J pole is used without the parasitic elements for normal mobile operations (A). A plastic spool is attached to the J pole with screws. A wooden boom (B) with parasitic elements slips onto, and rotates about, the spool. The base of the J pole has a 3/8-24 stud to fit common ball antenna mounts, an aluminum tie strap and sliding clamps at the J-pole feed point. Adjust the clamps for the best SWR without the boom attached. All tubing is ½-inch-diameter aluminum. Varnish all wood parts to protect them from weather. Secure the parasitic elements to the boom and the plastic block to the J with silicone caulk.

EASY BEAM-ANTENNA CALIBRATION

☐ Now that the winter storms have passed us by, and the spring thundershowers are on the move, do you ever wonder if your beam antennas are still pointing in the right direction? Many articles have been written on this subject, but there is a very easy way to check antenna heading.

Aim the beam north or south and check your daily newspaper or weather bureau for the exact time of local sunrise and sunset. Using simple arithmetic, figure the time that is exactly halfway between sunrise and sunset. This will be "high" noon, local time (the time when the sun is directly overhead). Any shadow cast at this time will point to either the North or South Pole, depending on your latitude and the position of the sun.

While the indication can be off slightly, most of us are using 3- or 4-element Yagi antennas with a 30° to 40° beamwidth. This method provides ample accuracy for such situations.—*Ed Karl, KØKL, Manchester, Missouri*

AMATEUR RADIO PLUMBING

☐ Most operators try to locate their antennas outdoors and their transceivers indoors for rather conspicuous reasons. One common obstacle to that goal is transmission-line routing. The old standby, an open window, permits the intrusion of insects in summer and cold air in winter. Hams have dreamed up some ingenious methods of getting the signal out of the house: A fitted sash plug can be

used to seal open windows; that idea is especially attractive if you rent your home. My club newsletter even explained how to drill holes through window panes (yes, glass)! [Lad's idea first appeared in the Chicago Suburban Radio Association newsletter, *TXT*, for Apr 1983.—Ed.] Major publications have also shown soffit connectors and wall conduits.

One of my favorite feed-throughs is a roof conduit. I have installed two at my station, each with excellent results. Fig 2 shows the details. Many ½-inch cables fit through the conduit without binding. Also, plastic pipe edges are much less likely to damage the cable jacket than are metal pipe edges. Since the pipe is not under hydraulic pressure the special fitting solvent should not be used. The two elbows can be glued to each other with silicone rubber. Since access is desirable, use no glue on the elbow-to-pipe joint. The weight of the cable will prevent the elbow assembly from separating.—*Lad Kucera, N9AEG, Clarendon Hills, Illinois*

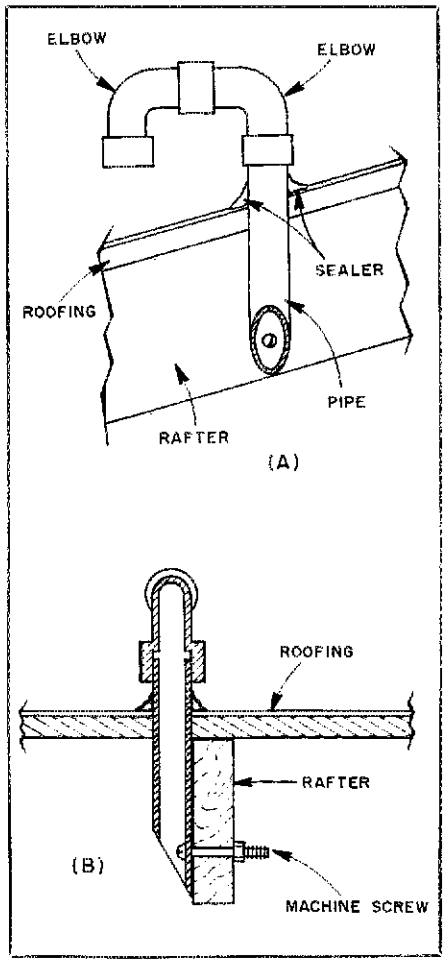


Fig 2—A side view (A) and cross section (B) of N9AEG's roof conduit for flexible coaxial feed lines.

☐ Experimenters often attempt to use the 1- to 2-inch vent pipes on buildings as antenna supports. Fortunately, plastic plumbing parts are a prolific source of adapters and masting. The inner and outer dimensions of most pipes and fittings are similar regardless of the material, so slip-joint fittings are usually sufficient for short, light-duty supports.

Most existing metallic vents are fairly well grounded and can provide a reasonable ground for a vertical antenna when the cable shield is connected to the vent. [In this arrangement, the pipe may serve either as a ground conductor or a counterpoise depending on the length of the vent pipe. Any electrical discontinuities in the pipe may cause problems.—Ed.]

Inexpensive "trap adapters" are exceptionally useful. They hold tubing of any material without threading (and at any length).

Most vents are pressure-relief devices—as long as the installed mast is left open, no plumbing problems should result. —*C. Buttschardt, W6HDO, Los Osos, California*

STRAIN RELIEF FOR COAXIAL CABLES

☐ For some time now, I've been using long-wire antennas in the inverted-vee configuration. I feed the antennas λ/4 from one of the leg ends so that I can use coax transmission lines. (Each leg is an odd multiple of λ/4 in length.) Thus, the feed point is not at the apex, but along one of the sloping legs. This arrangement frequently creates a sharp bend at the coaxial connector (see Fig 3).

To remedy this problem, I slip a short length of ¾-inch garden hose or automotive heater hose over the outside of the PL-259 connector. (A little petroleum jelly on the connector makes the job easier.) The hose is relatively stiff in comparison to the coaxial cable and it nicely evens out the sharp bend. In addition it serves as a weather shield for the connector. I secure the hose with vinyl electrical tape, but a hose clamp (or both) would probably make a more durable assembly. Photos of my installation appear in Fig 4.—*J. A. Ciciarelli, WB3DDM, Beaver Falls, Pennsylvania*

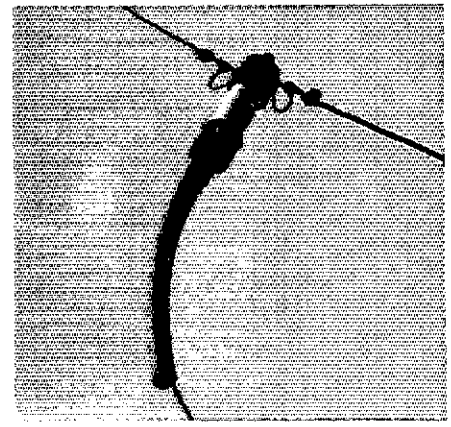


Fig 4—Photos of WB3DDM's strain relief in place on his antenna.

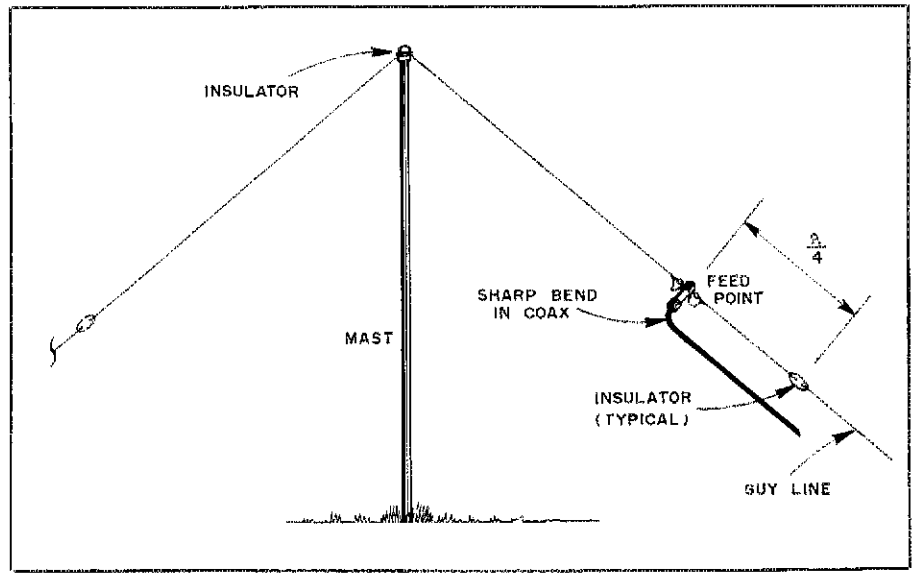


Fig 3—WB3DDM's long-wire antenna with a low-impedance feed at one end.

Technical Correspondence

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

NOT AN EMP EXPERIENCE

☐ Your choice of a title (An EMP Experience) for Dr Chalfin's correspondence is unfortunate, as are the conclusions drawn by Dr Chalfin.[1] Whatever it was he experienced on the 6- and 2-meter bands, it certainly was not a nuclear EMP. EMP, by its very definition, is a transitory effect lasting on the order of a fraction of a second. Additionally, EMP ground coverage of exoatmospheric nuclear explosions can be determined by equations that involve the elevation angle between the position of the observer and the burst. The nuclear test which Chalfin claims caused his "EMP Experience" was not high enough to produce EMP effects at a distance.

It is well-known that nuclear detonations at ionospheric heights can disrupt communications by disturbing the ionosphere, and this should not be confused with EMP. But, the aforementioned test was not at an altitude sufficient to cause such effects. Further, these effects at VHF would not extend beyond several hundred miles or last for more than a few tens of minutes.

Dr Chalfin is right that there is a considerable amount of study and data on EMP, but his conclusions indicate that he may not have read any of this material. He and interested readers should read *Electromagnetic Pulse Protection Guidance* (CPG 2-17, Jan 1986, available from the Federal Emergency Management Agency or your State Civil Defense Office), Chapters 10 and 11 of *The Effects of Nuclear Weapons* (Gladstone and Dolan, third edition), and the *complete* NCS TIB 85-10 document. All of these, plus other published data, clearly show that protection against EMP (and lightning for that matter) is relatively simple, using existing technical capability and commonsense engineering methods.—*Chip Taylor, W1AIM, State Radiological Officer, State of Vermont Emergency Management, Waterbury State Complex, 103 South Main St, Waterbury, VT 05676*

☐ Mr Taylor is correct. The phenomenon described by Dr Chalfin is not EMP. Gladstone's book correctly describes the situation experienced by Dr Chalfin.—*Dennis Bodson, W4PWF, Assistant Manager, Technology and Standards, National Communications System, Washington, DC 20305-2010*

[Dennis Bodson is the author of the four-part article, "Electromagnetic Pulse and the Radio Amateur." See *QST*, Aug-Nov 1986.—Ed.]

CEREBRAL PACKET RADIO

☐ *QST*'s coverage of the coordination of the 1986 Pittsburgh Marathon via packet radio was great![2] Since packet is growing and changing so rapidly, I wanted to pass on to other *QST* readers some interesting and late-breaking packet-radio information.

A bunch of local amateurs recently erected a new digipeater, W4JNB-1. Now, this may sound *almost* unbelievable, but within days, several of us discovered we could copy 1200-baud packet in our heads, error-free! I have an old silver filling in my right second mandibular molar. RF rectification occurs across a crack in this filling, and when I am within two miles of the digipeater, I can copy it error-free without even turning on a radio!

I was having a hard time understanding multiconnect operation using my new TNC, but found I could copy channel 1 with my left cerebral hemisphere and channel 2 with my right hemisphere. I contain my short-term RAM files in the left temporal lobe, and the lesser-used operating parameter menu in my right temporal lobe. Those of us over 40 (and that's most) have noticed a few glitches in our short-term RAM capabilities. Despite this, we at W4JNB-1 are requesting that the League add 1200-baud packet to the East Coast Qualifying Run.—*Bill Reid, MD, WA4KBD, 337 Martin Dr, Muscle Shoals, AL 35661*

[It would be an interesting experiment to see what results from exposure to FAX, SSTV and ATV transmissions. Perhaps visual images could be formed directly within the brain!—Ed.]

[1]Technical Correspondence, *QST*, Nov 1986, p 45.

[2]Public Service: "The 1986 Pittsburgh Marathon," *QST*, Oct 1986, p 75.

Feedback

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

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

☐ See Fig 2, p 37 of "Meteor Scatter—European Style," *QST*, Nov 1986. An 8-ohm speaker is shown connected to C4. Author Willis notes that a piezoelectric microphone should be used instead of the 8-ohm speaker.

☐ There is a typographical error on p 34 of "A CW-Program Cartridge for the Atari Computer," *QST*, Aug 1986. In the right-hand column where the program line changes are called out, the second change should read: • Change 5185 to: * = 1000. Thanks to Rob Frohne, KL7NA/W9, for catching that one.

☐ In "Some Power-Supply Design Basics," *QST*, Jan 1987, p 29, Fig 2, Q1 is incorrectly identified as a 2N3055, which is not a PNP transistor. An MJ2955, 2N3789 or equivalent should be used at Q1.

☐ Mike Huddleston, KJ4LN, designer of the Morsemaster II, discovered two errors in the schematic diagram shown on pp 34-35, Feb 1987 *QST*. C7 (U4, pin 5) should be a 0.01-μF unit. R24 (U5, pin 6) should have a value of 2.7 Ω.

☐ Please refer to "Understanding and Constructing RF Chokes," Feb 1987 *QST*, p 19, Table 1. The seventh line of text at the bottom of the table should read: "and the Q_U (unloaded Q)...", not Q_L.

New Products

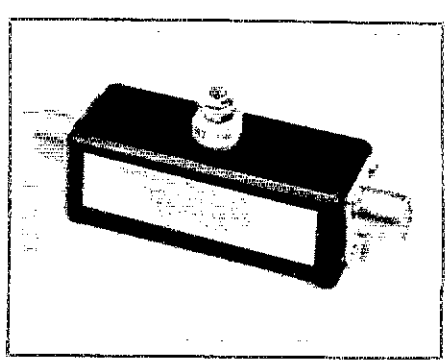
ALPHA DELTA COMMUNICATIONS EMP SERIES TRANSI-TRAP® SURGE PROTECTORS

☐ Alpha Delta's EMP series Arc-Plug® cartridges are designed to protect against nuclear electromagnetic pulse (EMP) as well as lightning surge voltages. The EMP series design is based on the National Communications System Technical Information Bulletin 85-10. All Transi-Trap protectors feature "isolated ground" to keep damaging arc energy from the chassis.

The Model LT, rated at 200 W, has UHF "T-Type" connectors for use through 30 MHz. Models R-T (200 W) and HV (2 kW) are super ruggedized, low loss (0.1 dB at 500 MHz) versions designed for use through VHF and UHF.

The 200-W units are the most sensitive, and best for receivers and transceivers. The Model HV is designed for amplifiers. For maximum protection, use both with the 200-W model between the transceiver and the amplifier. All models include replaceable Arc-Plug cartridges and are designed for 50-ohm impedance.

Transi-Trap surge protectors are available through dealers or direct from Alpha Delta Communications, Inc, PO Box 571, Centerville, OH 45459, tel 513-435-4772. Price class: Model LT, $19.95; Model R-T, $29.95; Model HV, $32.95.—*Bruce O. Williams, WA6IVC*

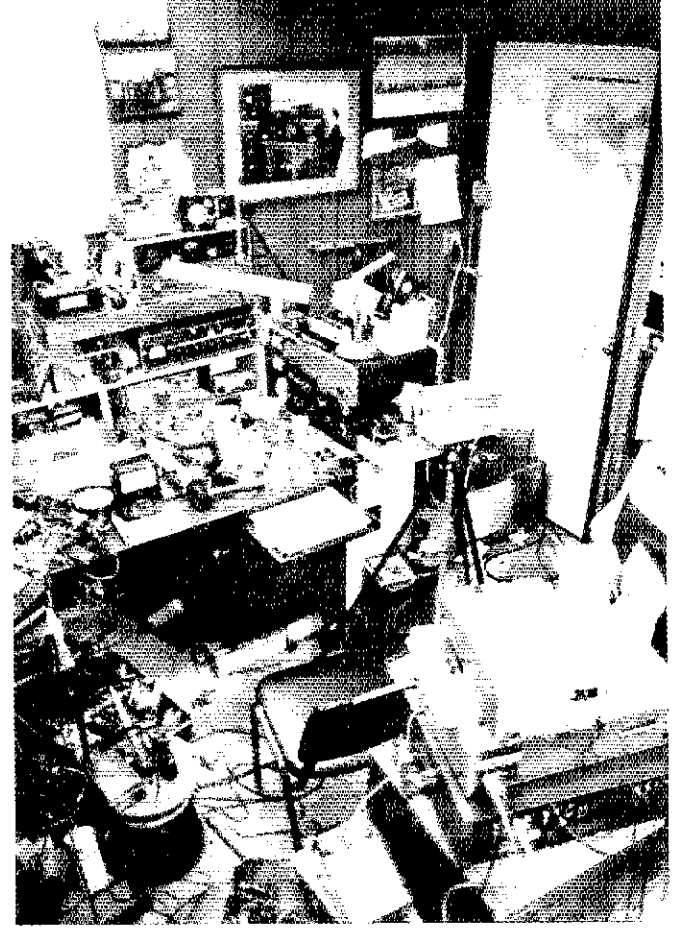


Results, 1987 Messy Shack Photo Contest

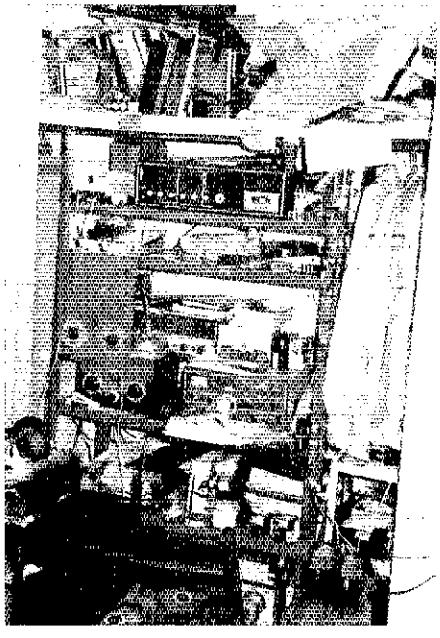
By Andrew Tripp, KA1JGG
Editorial Supervisor, ARRL

What a mess! It took some digging, but the judges finally reached bottom and have come up with their picks for the First Annual Messiest Shack Photo Contest. Shortly after its announcement in October 1986 *QST*, photos of disheveled ham shacks began pouring in to ARRL HQ from around the world, creating quite a massive pileup. From that logjam, the judges have extracted winners in 10 categories, giving readers a good overall look at just how today's ham shacks stack up. To the winners goes coveted *QST* Page Space. Every US call area was bravely represented, with the 2s coming through with the most entries, and the 1s trailing very closely behind. But it was the 7s who racked up the highest scoring percentage—overall and by call area—winning three categories with only five entrants. The 5s came close, though, going two for four. The 1s, 2s, 4s and 9s each captured a category, but, alas, the 3s, 6s, 8s and Øs were just too neat. Even some of our counterparts around the world got into the spirit of the Contest, with entries coming from Norway, Scotland, England and Mexico. However, only one of them—Norway—proved to be in enough disarray to capture a place amongst the heap.

Congratulations to all the category winners, and thanks to everyone else who dared enter the Contest. The judges had a helluva good time picking the best of the litter.

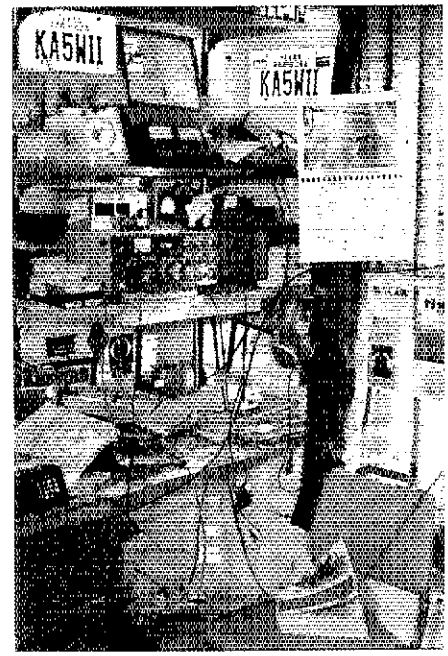


Most Functional Messy Shack: Henry Felton, WA4HXZ, of West Palm Beach, Florida. This shack not only is obviously radio-active, it's loaded with amenities, such as a basic fix-it tool—a rubber mallet (shown on the bench). Henry's shack is "famous and the source of much humor on the local repeater," says Clay Jones, WV4H, who with several others submitted this photo. Hey, Henry, what are friends for?

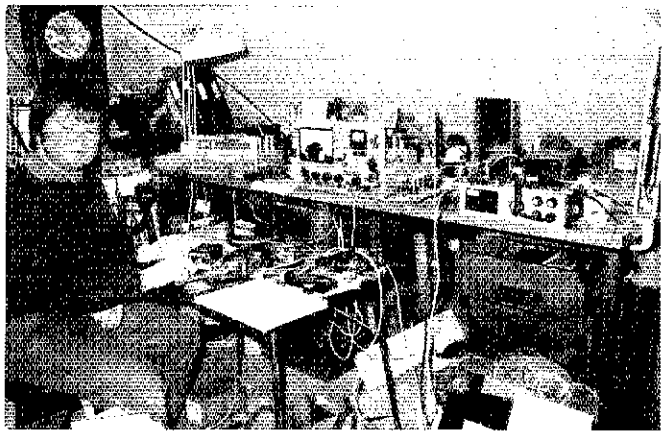


Most Creative Use of Space: John Curran, W1AN, of Palmetto, Florida. Lack of space was a real problem for John when he was looking for a place to start a shack with some growth potential; his QTH is a mobile home. So, John combined his shack with his shirts and slacks. Looks like he succeeded, though John would be hard-pressed to find *anything* in that closet that isn't wrinkled.

Moderately Messy Shack: Leo Bingham, KE7NT (ex-KA7SQK), of Gillette, Wyoming. Leo's heart (and mess) is pretty much in the right place, and he shows great promise in aspiring to reach the top of the messiest shack heap. Leo could have improved his chances, though, by using the floor space under and around the table more effectively. And is that a hint of tabletop we see peeking through?

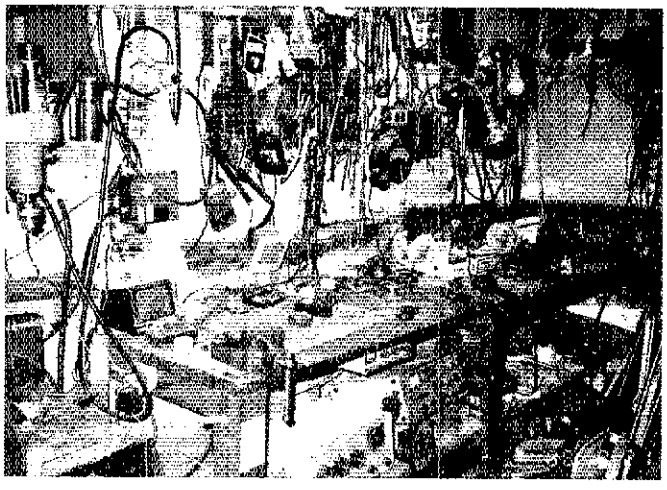


Best Vertical Mess: Art McGinty, KA5WII, of Wichita Falls, Texas. In this photo, Art shows creative and effective use of vertical space—he didn't just spread out his mess—and his knack for pushing available shelf space to the limit lends an element of adventure. Besides, Art obviously is well-read, and we liked his use of earth tones throughout.



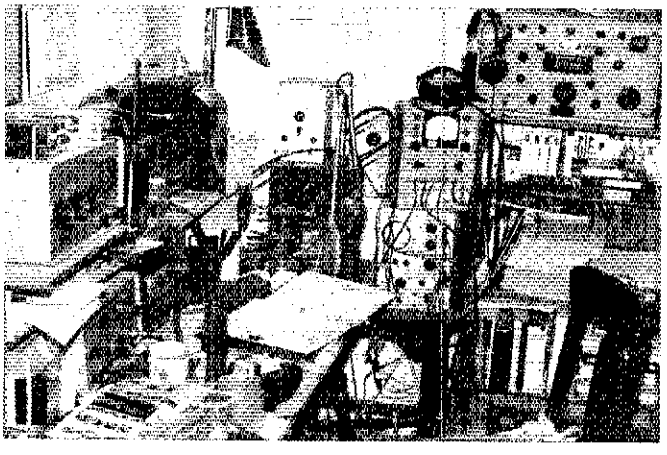
Messy Shack with the Most Potential: Torfinn Horn, LA4OFA, of Trondheim, Norway. Sure, Tor hasn't quite reached the pinnacle of ham shack messiness, but considering his age and that he's been accumulating things for only about three years, we'd say he's well on the way to achieving the ultimate pileup. Tor's father, LA4KG, sent in this photo. What? A parent who *praises* his teenage son for having a messy room!

Marathon Mess: Jonathan Klein, K7JK, of Cave Junction, Oregon. We knew there was something special about a guy who introduced his entry by saying, "Finally a contest I can win!" We think we spot the operating position, but wonder how long it takes Jon to get there from across the room to answer a rare station's CQ! Jon's philosophy on the origins of a messy shack: Nature abhors a flat surface worse than a vacuum, and endeavors to obliterate it as soon as possible.

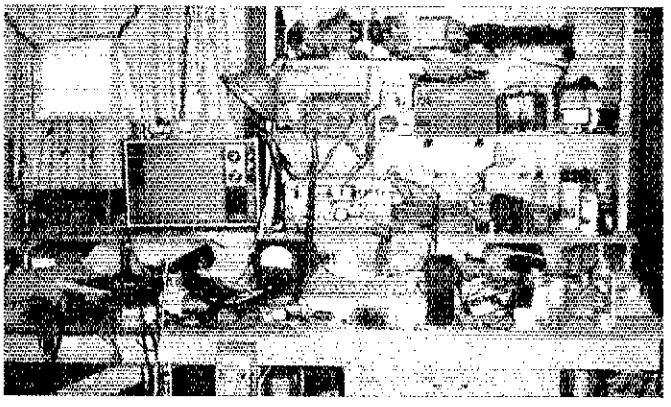


Messiest Workbench: George Lindner, W2JMU, of Whitestone, New York. The clincher is that this bench looks more like the Hanging Gardens of Babylon than a work area. George says he's been hamming over 50 years and it's too late for him to clean up his act. Besides, he says, if he did clean the area, he'd never be able to find anything.

Best Horseshoe-Shaped Mess: Maurice Wells, Sr, WB9UTC, of Indianapolis, Indiana. Maurice says he ventures to his shack several times a day, and uses the same straight key he used in the 1920s, when his call was 9CJA. Looks like Maurice has kept a lot of things since the '20s! When it comes to enjoying a good messy shack, age is no barrier: Maurice is 90 years young and still messing up!



Best Arm's Length Operating Position: Joseph Noecker, N7HMV, of Portland, Oregon. You name it, and Joe probably has it buried—within reach, of course—somewhere in this maze of equipment. According to Joe, you ain't seen nothin' yet: Since this photo was taken, he's added more equipment, which has made the operation so cramped that Joe has had to do some rearranging. Who's your interior decorator, Joe?



Messiest Shack Through a YL's Eyes: Clint Burnette, WA5DTC, of Mabank, Texas. This photo was taken and sent in by Clint's YL, Betty, KA5CBP, who calls this "the worst Messiest Shack I have ever seen." She complains that even though this disaster called a ham shack was straightened up about six months before this photo was taken... well, we can see what has happened since. Honestly, Betty, after seeing the other messy shacks on these pages, don't you think you might be overreacting just a little?

Noon of a New Era

A report on the impact of the packet-radio revolution on the amateur community: where we were, where we are and where we're headed.

By Richard Palm, K1CE
Manager, Field Services
Department, ARRL

It's not the "dawn of a new era" anymore. It's noon, and no one's breaking for lunch. At its recent meeting, the League's Board of Directors stated, "Packet radio and similar digital techniques are the fastest growing part of Amateur Radio; it is possible now to handle a national emergency using these modes, and messages are routinely being exchanged by elements of the National Traffic System (NTS). A test of an HF packet network will be proposed to the FCC soon, with a group of stations requesting special temporary authorization for up to 1200-baud service under automatic control."

The Board's Digital Committee, an internationally recognized panel of experts, will develop a proposal for facilitating NTS message handling (both regular and emergency), plus ancillary amateur-to-amateur message and data traffic via packet radio. The investigation will consider changes in message formats, system software or any other area which may be necessary to achieve the objectives. Watch for its report next January.

In the meantime, let's examine how packet radio is currently pumping new blood into one of the traditional public services, the National Traffic System (our organized network for relaying messages for the public) and, consequently, emergency, health and welfare communications capabilities.

National Traffic System Connects

Message relaying—the basic founding premise of organized Amateur Radio 73 years ago—is the same one that brings us to the doorstep of the 21st century. In 1949, the National Traffic System was created to enhance the original principles. Comprising a nightly cycle of nets, NTS moved formatted greeting messages, originated by third parties, throughout the continent for delivery to other third parties just about anywhere in North America. NTS offered this fine "greeting card" service to the public while training operators for emergency, health and welfare communications when disaster struck. SSB and a daytime cycle further enhanced the System in the mid-70s. And now, packet radio represents the next major enhancement, offering speed, accuracy and alternative routing of NTS third-party messages.

In many regions, viable packet radio/NTS networks are already firmly entrenched. Major packet bulletin board system (PBBS) software supports NTS formatted message handling and automatic forwarding to recognized NTS packet nodes (bulletin boards). For example, in New England, a solid network of traffic nodes exists to forward NTS mail automatically throughout the region. A birthday greeting addressed to a grandmother in Burlington, Vermont, is originated in Connecticut, designated "NTSVT" (NTS message for VT) and uploaded to the local packet bulletin board system W1AW-4 in Hartford for "autoforwarding" to Vermont. Usually within an hour, W1AW-4 BBS automatically shuts itself off to local users, checks its outgoing mail pouch and finds the NTSVT message. It checks NTSVT against its forwarding file for the programmed packet bulletin board station next in the line of forwarding stations to Vermont. It finds it's K1UGM in Wakefield, Massachusetts, then initiates a connection and forwards the message to that BBS for relay up the road to Vermont.

The message ultimately lands at the Milton, Vermont KD1R-1 BBS, the programmed destination BBS for all NTSVT messages. A local traffic handler in Vermont who periodically checks the KD1R-1 incoming mail index finds the Burlington message listed, and takes it off the BBS. He or she either phones it to grandma personally, or puts it up for grabs on an NTS Local or Section phone or CW Net for relay to a station within local calling distance of grandma's house. Her reply can be put back on KD1R-1 for autoforwarding back to W1AW-4, where the same relay/delivery process occurs. Voilà!

The system works much the same way for other parts of New England (NTSEMA, NTSWMA, NTSRI, NTSME and NTSNH) and several other areas around the country. And, soon, with a national HF Ionospheric Autoforwarding Network in place (see below), "SKIPNET" will offer more reliability in transcontinental NTS message autoforwarding. And, of course, the system can and should be easily adapted for organized emergency, health-and-welfare message (in the most efficient format) routing in emergency situations.

WANTED: Homo Sapiens

The machinery is developing nicely, thank you, but we could use more NTS-ready packet operators to check traffic nodes daily for NTS messages. Fortunately, this issue has not been ignored by several groups in position to do something about it. The NTS Pacific and Eastern Area Staffs, experts who manage regional, area and transcontinental message relaying networks above the section level, are two such groups. At both of their meetings this past year, there was serious discussion concerning assigning responsibility to NTS people to ensure NTS traffic is taken off packet mailboxes (BBS) promptly for relay and delivery. Pacific Area Staff recommended that League Section Traffic Managers assign formal packet mailbox liaison stations for daily clearing functions, although several have already taken this initiative. The Eastern Area Staff went a step further by recognizing "Region Packet Managers" to see that NTS traffic flows smoothly from section to section within regions. As reliable long-haul packet channels evolve, we may soon have managers to monitor region-to-region functions as well.

Both groups have also recognized the need for a grassroots NTS recruitment effort aimed at existing and future packet operators, as well as the general amateur community. It should be easy! There are 30,000 hams out there with new packet radio gear who would love to find a use of service to their fellow hams and to the public.

Transcontinental Networking: Coming Soon to a Packet Theater Near You

With solid local, section and regional networks in place, it's time to look at the national picture in terms of tying everything together. Enter an HF network whose sole purpose is to forward messages among

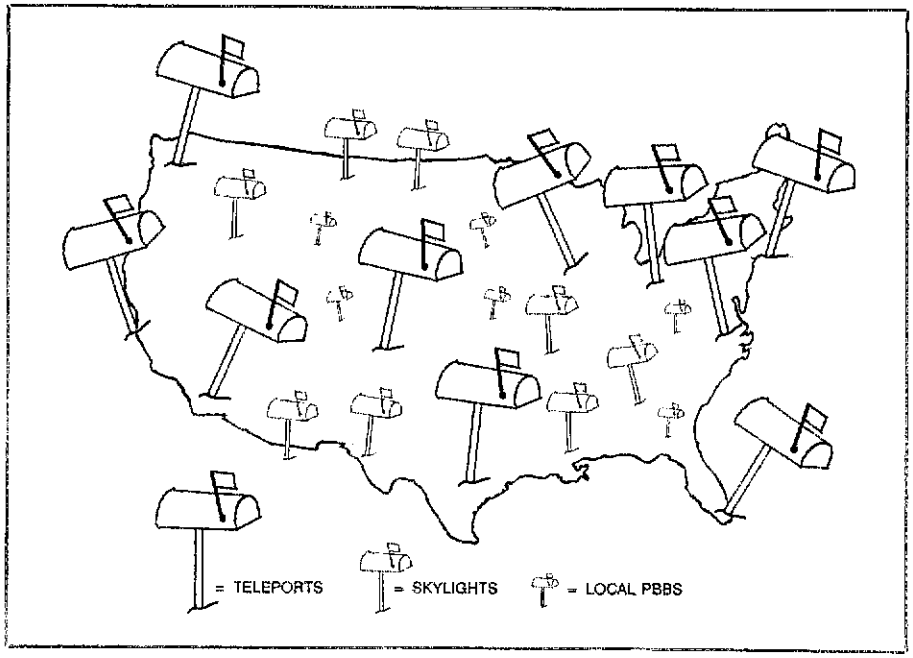
regions, closing the circle opened by local area networks a few years ago. More specifically, its mission is threefold: (1) to provide main-route relay of packets or packet messages between HF packet relay stations throughout the United States at distances greater than 300 miles (shorter distances being served by VHF/UHF); (2) to provide entry points for gateway stations serving the function of bridges between HF and VHF/UHF packet local-area networks wherever they are needed in the country; and (3) to provide entry points for international packet traffic.

Of course, present FCC rules permit operation of packet-radio stations under automatic control only above 50 MHz, an impediment to a fully effective HF packet radio network. ARRL will shortly seek Special Temporary Authorizations as mentioned above for a number of experimental stations participating as teleports for demonstration to FCC and the amateur community the feasibility of such an HF network employing automatic control and forwarding of packet traffic.

There are several guiding principles that will be considered during the experiment. General population, served agency and Amateur Radio demographics need to be considered in distribution of network resources and development of traffic routes. The network must be suitable for both normal and emergency situations. As emergencies occur with little or no notice, the network must be in place and operating automatically at all times. There must be sufficient flexibility for system reconfiguration during normal communications outages. The network must interface with other Amateur Radio resources as well as those external to Amateur Radio, both domestic and foreign. Network resources must have an adequate local support structure base, addressed above, not just initially but for a permanent, stable structure.

A key principle is the *cluster concept:* As most amateur stations are able to operate only on one MF/HF at a time because of co-site interference, larger cooperative communications facilities will be formed by clustering of nearby stations. Other principles include network organization in accordance with MF/HF ionospheric-propagational realities—stations must be capable of changing operating frequencies with propagational needs. The number of stations on any frequency must be limited to well below the critical load at which throughput is reduced to provide reserve capacity for emergencies. Routing decisions must make use of the path with the shortest transit time, minimum number of relays and minimum number of retries.

As the NTS, emergency communications and packet communities continue work on the development and experimental phases of the HF trans- and inter-continental network we will keep you advised.



The future of HF Networking. Packet-bulletin board systems (PBBS) serving local area networks in any given region will be tied together by a skylight station. Skylights will also serve as gateways to teleports, 10 clusters of stations spread out around the country forming a closed network for long-haul HF autoforwarding of messages. ARRL will soon seek Special Temporary Authorizations for teleports to operate at HF under automatic control for experiments.

It's noon, but it's not too late to wake up and smell the coffee brewing in the packet-radio pot.

Richard Palm is also system operator (SYSOP) for the K1CE BBS, the Connecticut Section Traffic Node for inbound and outbound NTS third-party messages.

Exam Info

ARRL/VEC
225 Main St, Newington, CT 06111

FCC CHANGES EXAM STANDARDS

The big news this month, of course, is Novice Enhancement, which took effect on March 21. For the full write-up on the docket, please refer to "Novice Enhancement: New Test Procedures Start *Now!*" elsewhere in this issue. However, be sure to check with the VEC that will coordinate the session where you intend to upgrade so you won't be in for any surprises.

Written-Element Credit

This new regulation took effect on February 13. It now allows candidates to take one or more written elements (in the proper sequence only, of course) and, upon passing each element, be credited with those elements without having to take any additional code test necessary to achieve a complete upgrade. (Previously, the FCC authorized credit for code elements passed, but would not do likewise for written elements.)

VE Teams will issue to candidates Certificates of Successful Completion of Examination (CSCEs) that will carry credit for elements specified on the certificates and will denote appropriate upgraded operating privileges.

However, candidates who have passed their Novice tests should retain photocopies of both sides of their properly completed *and signed* application Form 610s. The FCC now accepts these as evidence of a candidate's having passed the necessary elements to qualify for the Novice license.

The new written-element provision also allows for applicants to "upgrade an upgrade." Under the new rules, a card-carrying General class licensee who has a CSCE for Advanced and then passes the Extra will be issued a CSCE at that session for the new license class. Now, no one must wait for each successive license to be issued before upgrading.

Additional information on VE Testing is available from the ARRL/VEC (see address above) for an SASE with 2 units of first-class postage.

Happenings

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

Novice Enhancement Is A Reality!

In October 1984, the ARRL Board of Directors set an ambitious goal of growth in the Amateur Service. From that grew the realization that a more attractive entry-level license was necessary to meet that goal—a license that would allow a sampling of the smorgasbord of present radio technology. Thus, the concept of Novice Enhancement came into being. And it has gained almost universal support. It was simply a matter of ironing out the details. That process was more than a year in the making, including comments in response to the FCC's proposed rule making released last April. The wait is over!

On February 10, FCC released the text of the Report and Order in PR Docket 86-161, Novice Enhancement. *The rules become effective 0001 UTC March 21, 1987.* Here is the exact order:

Federal Communications Commission FCC 87-36

Before the
Federal Communications Commission
Washington, D.C. 20554

PR Docket No. 86-161

In the Matter of

Amendment of the Amateur	RM-5022 RM-5038
Radio Service Rules to	RM-5023 RM-5251
Expand the Privileges	RM-5024 RM-5281
Available to Novice Operators	RM-5025 RM-5282

REPORT AND ORDER
(Proceeding Terminated)

Adopted: January 28, 1987 **Released: February 10, 1987**

By the Commission:

INTRODUCTION

1. On April 18, 1986, in response to several petitions for rule making, we adopted a *Notice of Proposed Rule Making* (51 FR 17074; May 8, 1986) *(Notice)* proposing to enhance the privileges authorized by the Novice amateur operator license. The enhanced privileges would be in the HF 10 meter,[1] VHF 1.25 meter, and UHF 0.23 meter bands with transmitter peak envelope power maximums of 200 watts, 25 watts, and 5 watts respectively. We proposed all authorized emission modes[2] for the VHF and UHF bands and emissions A1A, F1B and J3E for the HF subband. We also requested information on related issues including the number of questions appropriate for the Novice operator written examination, the number of volunteer examiners (VE's) required to properly administer a Novice operator examination, and whether a better balance between the requirements and privileges of the Technician operator license would be helpful. More than 350 comments were filed, including four reply comments.

2. The proposed enhanced Novice class privileges were intended to create a greater desire in new entrants into amateur radio to stay with the hobby and advance through its five-tier licensing structure. In this way, the licensing structure would become more responsive to the needs and desires of the amateur community. The other proposals and questions were generally related to the increase in Novice privileges or to the basic licensing procedures.

COMMENTS

3. More than 80% of the commenters supported the proposal. They believed that enhanced Novice operator privileges would attract and retain more persons in the service. In addition, manufacturers and distributors of amateur radio equipment said they hoped it would curb the loss of operators and consequent declining sales of equipment.[3] The major concern in the comments was that excessive privileges could diminish the incentive for Novice operators to upgrade to a higher operator license. Also objected to was authorizing present Novice and Technician operator licensees[4] any additional privileges without requiring them to qualify by further examination.

4. The comments favored expanding Novice operator HF 10 meter privileges to 28.1-28.5 MHz. The International Beacon Project, the International Amateur Radio Union and other commenters were concerned that such an expansion could jeopardize the usefulness of the amateur beacon system. They believed that amateur stations in other countries would be driven to transmit on beacon system frequencies in order to avoid congestion caused by an influx of stations with Novice and Technician control operators. The American Radio Relay League, Inc. (ARRL) stated, however, that amateur operators traditionally observe voluntary operating restrictions when necessary for the protection of universally beneficial operations like the beacon system.

5. The Notice of Proposed Rule Making in this proceeding proposed that Novice control operators be authorized privileges in the entire VHF 1.25 meter band. The comments generally supported this proposal because it would provide a common meeting ground for new amateur operators to meet experienced operators. In commenting on our statement[5] that we will not finalize this aspect until certain related allocation matters for the 216-225 MHz band are resolved, ARRL said that this proceeding has no connection with frequency allocation decisions. It stated that the inclusion of Novice operator privileges on a band already available to the Amateur service would not affect future allocation revisions.

6. Richard S. Moseson and other commenters pointed out that the proposed UHF 0.23 meter Novice operator privileges were not in keeping with the ARRL voluntary band plan. In its reply comments, ARRL acknowledged the discrepancy and requested the subband be at 1270-1295 MHz where repeater operation is conducted. Also mentioned in the comments was a potential biological hazard to the operator of a station transmitting in this frequency range.[6]

7. The comments favored all emission modes in the VHF and UHF bands so Novice operators could communicate using modern technology. Dissatisfaction with the telegraphy-only privileges was blamed as a major cause of Novice operators dropping out of the Amateur service. Although most commenters favored limiting Novice operators to emissions A1A, F1B and J3E in the 10 meter subband, a few commenters urged authorization of emission A3E. Still other commenters considered any HF emission privileges for Novice operators beyond A1A as a disincentive to upgrading. In its reply comments, ARRL said that enhanced privileges in the limited frequency bands proposed would operate as an incentive for Novice operators to upgrade. About 5% of the commenters were apprehensive that Novice operator telephony privileges in the 10 meter band could attract unlawful operators from the nearby 11 meter band.

8. Novice operators were asked to comment on the proposal to limit their stations to low transmitter power while higher class operators could transmit on the same frequencies with high power. The comments stated that this would place Novice operated low power stations at a distinct disadvantage. It was also suggested that all stations transmitting on the Novice subbands be restricted to low power. It was noted that higher class operators would lose existing privileges if this approach were taken.

9. The comments generally concurred that the topics on the Novice operator written examination should correspond to the privileges authorized. They favored increasing examination Element 2 to 30 questions or even to 50 questions. The repeated concern was that Element 2 should not be so difficult as to discourage newcomers.

10. Twenty-one percent of the comments discussed ARRL's request for two administering volunteer examiners (VEs).[7] Some 9% of the comments stated that the one-VE requirement should be continued because it is more convenient and less stressful for beginners. About 5% of the comments, including the ARRL's, disagreed and said that enhanced privileges for Novice operators necessitated a second administering VE to minimize the likelihood of examination fraud. Another 7% of the comments recommended that the examina-

tions be prepared and administered under the volunteer-examiner coordinator (VEC) System. ARRL opposed this approach because it would increase the burden on the VEC System and reduce the availability of examinations.

11. Comments were requested on confining the written examination for the Technician operator license to the privileges authorized by that license.[8] Gordon West, an amateur operator instructor, stated that such a change would allow instructors to train students preparing for the Technician operator license more thoroughly in relevant VHF and UHF topics. Another viewpoint expressed in the comments was that another examination element would complicate the examination process.

DISCUSSION

12. The prospect of enhanced privileges for Novice operators has already stimulated growth in the service. In FY 1986, nearly 21,000 new persons entered the Amateur service, an increase of 20.75% over FY 1985. More than 19,000 became Novice operators. Furthermore, the number of licensees dropping out of the Amateur service decreased by 15.13% during the same period. We believe these are clear indicators that changes in the entry level license are appropriate.

13. In its proposal regarding the 1.25 meter band (VHF), the ARRL requested that Novices be permitted use of the band 220-225 MHz with all voice and data modes, including radiotelegraphy, with a power limit of 25 watts output. However, it asked that repeater operation by stations licensed or controlled by Novices not be permitted, i.e., a Novice signal could be retransmitted by a repeater, but a Novice operator could not sponsor or be the trustee of one. The comments reflected an interest in VHF privileges for Novice operators. In our view, VHF privileges for Novices would create the kind of interest that is needed for amateurs to continue in the hobby and at the same time motivate them to advance to the higher license classes. To this end, we will authorize frequencies 222.10-223.91 MHz for use by Novice operators. This action in conjunction with voluntary band plans will allow operation on repeater input and simplex channels. Novices may not be licensees, control operators or trustees of the repeaters.[9] This would permit Novice operators to operate with those modes most appropriate to their level of license and to communicate with more experienced amateurs. For example, frequencies below 222 MHz are typically used for moonbounce, propagation beacons and control signals, activities generally engaged in by amateurs with more experience.

14. We agree with the commenters that the UHF 0.23 meter subband should be on 1270-1295 MHz to allow Novice operators to gain experience with repeater operation. Low transmitter power and incorporation of suitable safety precaution information in the amateur radio practices examination topics[10] should assure that Novice operators will not endanger themselves. Thus, we will authorize the subband at 1270-1295 MHz, as requested.

15. The prospect of interference to the 10 meter beacon system expressed in the comments is speculative and may never become a concern, given the record of amateur operators in adhering to voluntary arrangements. Moreover, the low power limit proposed for stations with Novice control operators should satisfy this concern. Thus, it does not afford a reason not to go forward.

16. It is evident from the comments that more emission modes will attract more Novice operators to the Amateur service. However, the frequency ranges in which to use them should provide the proper degree of enhancement so that Novice operators would still have an incentive to upgrade to higher operator licenses. Thus, digital and limited telephony privileges in the 10 meter band appear appropriate and will be authorized.

17. We continue to believe in power restrictions for Novice sections in the new bands. The restrictions will add a further incentive to upgrade the class of license. Also, because of the lesser experience level, Novice operators are more likely unintentionally to cause interference. Reduced power levels will help limit the extent of any interference.

18. When the privileges of any operator license class are modified, the qualification requirements should be revised accordingly.[11] The Novice operator license written examination, Element 2, is based upon telegraphy station operation. We believe the examination should be broadened in scope, commensurate with enhanced Novice operator privileges. We shall therefore require an additional 10 questions, for a total of 30, to make the scope of Element 2 appropriate to the new privileges, without creating a significant deterrent to potential Novice operator examinees.

19. We will adopt rules so that two VEs will prepare and administer Novice operator examinations. Although there may be isolated areas where locating two VEs may be difficult, the added safeguard would be justified. There are legal and practical problems which prevent placing Novice operator examinations under the VEC System.[12] Additionally, to incorporate this work into the VEC system would nearly double the workload and expense for the volunteers operating that system. We will accordingly adopt the two VE procedure and reflect that requirement in a revised Form 610, Application for Amateur Radio Station and/or Operator License.

20. In a related issue, Novice operators may not be upgrading to Technician operator because the content of Element 3 requires them to also be knowledgeable about General class operator privileges. This is the only instance in the operator license progression where the applicant must not only know the material for the operator privileges that will be authorized at the next step (Technician), but also must know the material for the next higher step (General). To require any applicant to be knowledgeable about privileges which the license does not authorize is inconsistent and a burden upon applicants, administering VEs, and instructors. To resolve this problem, we will separate Element 3 into two parts. Technician operator questions will be placed into an Element 3(A) VEC question pool and General class questions will be placed into an Element 3(B) VEC question pool. It would be timely to take this action at this juncture for two reasons. First, the VEC's will have to revise Element 3 as a result of this action in order to move certain of its questions to Element 2 in conjunction with enhanced Novice operator privileges. Therefore, they could concurrently divide the remaining Element 3 questions into an Element 3(A) and an Element 3(B) as appropriate. Second, the application form is being revised in order to incorporate provisions for Novice operator examination certification by two administering VEs. It could be concurrently revised to include marking boxes for Element 3(A) and for Element 3(B).

OTHER ISSUES

21. All present Novice and Technician operators will be authorized the new privileges without additional qualification. However, we strongly recommend that present Novice operator licensees become knowledgeable in the new requirements before using their new privileges. For example, they should study the material in new Element 2 that relates to the enhanced Novice operator privileges even though we will not require that they be examined on it. As to present Technician operators, any examinee holding such a license issued before the effective date of these rule amendments will be given examination credit for Elements 1A, 2, 3(A), and 3(B).

22. FCC Form 610 is currently being revised in connection with rule amendments pertaining to allowing credit to examinees for certain previously-passed written examinations.[13] Those revisions and the revisions required by the action taken in this proceeding are being simultaneously incorporated into the form. Upon receipt of Office of Management and Budget (OMB) approval of FCC Form 610, we will issue a Public Notice with a draft sample of the form attached. The modified FCC Form 610 will provide for certification by two administering VEs for the Novice VE System and for a revised Administering VE's Report.

23. The new rules adopted herein have been analyzed with respect to the Paperwork Reduction Act of 1980 and found to impose a modified information collection requirement on the public. Burden hours imposed on the public will not increase or decrease.

24. Pursuant to 5 U.S.C. §604, we submit this final regulatory flexibility analysis. We are enhancing the Novice operator license by authorizing privileges in the 10 meter, 1.25 and 0.23 meter bands. We expect that at least 21,000 persons each year will become Novice operators. This should have a positive effect on the sale of amateur radio equipment. The only changes made from our proposal were that the UHF frequencies are being revised, the number of VEs required to prepare and administer examinations in the Novice VE System is being increased to two and examination Element 3 is being restructured. No other alternatives to the proposal were considered except to maintain the *status quo*.

25. A copy of this Report and Order will be served on the Chief Counsel for Advocacy of the Small Business Administration.

26. IT IS ORDERED, That Part 97 is amended as set forth in the Appendix hereto. This action is taken pursuant to the authority contained in Sections 4(i) and 303(c) and (r) of the Communications Act of 1934, as amended.

27. IT IS FURTHER ORDERED, That these rule amendments shall become effective 0001 UTC March 21, 1987.

28. IT IS FURTHER ORDERED, That this proceeding is terminated.

29. For information concerning this proceeding, contact Maurice

J. DePont, Federal Communications Commission, Private Radio Bureau, Washington, D.C. 20554. (202) 632-4964.

FEDERAL COMMUNICATIONS COMMISSION

William J. Tricarico
Secretary

APPENDIX

Part 97 of Chapter 1 of Title 47 of the Code of Federal Regulations is amended, as follows:

1. The authority citation for Part 97 continues to read, as follows:

Authority citation: 48 Stat. 1066, 1082, as amended; 47 U.S.C. 154, 303. Interpret or apply 48 Stat. 1064-1068, 1081-1105, as amended; 47 U.S.C. 151-155, 301-609, unless otherwise noted.

2. Section 97.7(a) is revised, as follows. The line entry for the 10-meter band is revised to read as shown below. Following the kilohertz listing, a megahertz listing for the 1.25 and 0.23-meter bands is added.

§97.7 Frequency privileges.

* * * * *

(a) *Novice class:*

Meter Band	Terrestrial location of the amateur radio station			Limitations see para (g)
	ITU Region 1	ITU Region 2	ITU Region 3	
		kilohertz		
		* * * * *		
10	28100-28500	28100-28500	28100-28500	1
		megahertz		
1.25	----------	222.1-223.91	----------	5
0.23	1270-1295	1270-1295	1270-1295	5, 22
		* * * * *		

3. In Section 97.7(b), the line entry for the 10-meter band is revised to read:

§97.7 Frequency privileges.

* * * * *

(b)***

Meter Band	Terrestrial location of the amateur radio station			Limitations see para (g)
	ITU Region 1	ITU Region 2	ITU Region 3	
		* * * * *		
10	28100-28500	28100-28500	28100-28500	1
		* * * * *		

4. Section 97.7(g)(1) is revised to read, as follows:

§97.7 Frequency privileges.

* * * * *

(g) *Limitations:*

(1) Control operators holding the Novice or Technician class operator license are limited to international Morse code when the station is transmitting emission A1A in the 80, 40, 15 and 10 meter bands.

* * * * *

5. In Section 97.21, paragraphs (c) and (d) are revised to read, as follows:

§97.21 Examination elements and standards.

* * * * *

(c) A written examination shall be such as to prove that a person possesses the operational and technical qualifications required to perform properly the duties of an amateur radio licensee. Each written examination shall be comprised of a question set, as follows:

(1) Element 2: At least 30 questions concerning the privileges of Novice class licensees;

(2) Element 3(A): At least 25 questions concerning the additional privileges of Technician class licensees;

(3) Element (3B): At least 25 questions concerning the additional privileges of General class licensees;

(4) Element 4(A): At least 50 questions concerning the additional privileges of Advanced class licensees;

(5) Element 4(B): At least 40 questions concerning the additional privileges of Amateur Extra class licensees;

(d) The topics and percentage of questions in each question set shall be that listed for the appropriate examination element.

		Elements				
	Topic	2	3(A)	3(B)	4(A)	4(B)
(1)	Federal Communications Commission's Rules for the Amateur Radio service	35%	20%	16%	12%	20%
(2)	Amateur station operating procedures	5%	12%	12%	2%	10%
(3)	Radio wave propagation characteristics of amateur frequency bands	5%	12%	12%	4%	5%
(4)	Amateur Radio Practices	15%	16%	20%	8%	10%
(5)	Electrical principles as applied to amateur station equipment	15%	8%	8%	20%	15%
(6)	Amateur station equipment circuit components	5%	8%	4%	12%	10%
(7)	Practical circuits employed in amateur station equipment	5%	4%	4%	20%	10%
(8)	Signals and emissions transmitted by amateur stations	5%	8%	8%	12%	10%
(9)	Amateur station antennas and feed lines	10%	12%	16%	10%	10%

6. Section 97.23 is revised to read, as follows:

§97.23 Examination requirements.

Applicants for operator licenses will be required to pass the following examination elements;

(a) Amateur Extra: Elements 1(C), 2, 3(A), 3(B), 4(A) and 4(B);
(b) Advanced: Elements 1(B), 2, 3(A), 3(B) and 4(A);
(c) General: Elements 1(B), 2, 3(A) and 3(B);
(d) Technician: Elements 1(A), 2 and 3(A);
(e) Novice: Elements 1(A) and 2.

7. In Section 97.25 paragraph (a) is revised and a new paragraph (e) is added to read, as follows:

§97.25 Examination credit.

(a) An applicant for a higher class of amateur operator license who holds a valid amateur operator license issued by the Federal Communications Commission will be given credit, as follows:

(1) Novice: Elements 1(A) and 2;
(2) Technician: Elements 1(A), 2 and 3(A)
(3) General: Elements 1(B), 2, 3(A) and 3(B);
(4) Advanced: Elements 1(B), 2, 3(A), 3(B) and 4(A).

* * * * *

(e) An applicant holding a Technician operator license issued before (effective date of these rules) will be given credit for Elements 1(A), 2, 3(A) and 3(B).

8. In Section 97.28, paragraphs (a) and (b) are revised to read, as follows:

§97.28 Examination administration.

(a) Unless otherwise prescribed by the Federal Communications Commission, each examination for an amateur radio operator license (except the Novice operator license) shall be administered by three accredited (see §97.515) volunteer examiners. A volunteer examiner administering element 1(A) or element 2 (in conjunction with an examination other than a Novice operator examination), or element 3(A), must hold an Amateur Extra or Advanced radio operator license issued by the Federal Communications Commission. A volunteer examiner administering element 1(B), element 1(C), element 3(B), element 4(A), or element 4(B) must hold an Amateur Extra operator license issued by the Federal Communications Commission.

(b) Unless otherwise prescribed by the Federal Communications Commission, each examination for a Novice operator license shall be administered by two volunteer examiners. The volunteer examiners do not have to be accredited. The volunteer examiners must hold current General, Advanced or Amateur Extra operator licenses issued

by the Federal Communications Commission.

* * * * *

9. Section 97.61 (a) is amended by adding a new line entry before 28000-28300 kHz, by removing limitation 1 from the line entry for 28000-28300 kHz, by adding a new limitation 3 in the line entry for 28300-29500 kHz, and by deleting line entry 28300-29700 kHz and substituting therefor line entry 29500-29700 kHz.

§97.61 Authorized emissions.

(a) *kilohertz:*

Frequency kHz	Emissions	Limitations see para. (d)
	* * * * *	
28000-29700	A1A	
28000-28300	A1A, F1B	
28300-29500	A1A, A3E, F3E, G3E, A3C, F3C, A3F, F3F, H3E, J3E, R3E	3
29500-29700	A1A, A3E, F2A, F3E, G3E, A3C, F3C, A3F, F3F, H3E, J3E, R3E	
	* * * * *	

10. Section 97.61(d) is amended to add a new limitation (3), as follows:

§97.61 Authorized emissions.

* * * * *

(d) * * *

(1) * * *

(2) * * *

(3) A station with a Novice or Technician control operator is authorized to transmit only emissions A1A and J3E in this subband.

11. Section 97.67 is revised by changing subparagraph (6) of paragraph (d) and by adding new paragraphs (j) and (k) as follows:

§97.67 Maximum transmitting power.

* * * * *

(d) * * *

(6) 28100-28500 kHz when the control operator holds a Novice or Technician class operator license.

* * * * *

(j) The transmitter power of each amateur station at which the control operator holds a Novice class operator license shall not exceed 25 watts peak envelope power when transmitting in the 1.25 meter band.

(k) The transmitter power of each amateur station at which the control operator holds a Novice class operator license shall not exceed 5 watts peak envelope power when transmitting in the 0.23 meter band.

12. Section 97.85 is amended by adding a new paragraph (i) as follows:

§97.85 Repeater operation.

* * * * *

(i) No amateur station at which the control operator or station licensee holds a Novice class operator license shall be in repeater operation.

13. Section 97.86 is amended by adding a new paragraph (e), as follows:

§97.86 Auxiliary operation.

* * * * *

(e) No amateur station at which the control operator or station licensee holds a Novice class operator license shall be in auxiliary operation.

14. Section 97.87 is amended by adding a new paragraph (f), as follows:

§97.87 Beacon operation.

* * * * *

(f) No amateur station at which the control operator or station licensee holds a Novice class operator license shall be in beacon operation.

FOOTNOTES

[1]Since each operator license class is authorized all privileges of the next lower class, Technician operators would also benefit from increased HF privileges to Novice operators.

[2]See 47 CFR §97.61(c).

[3]Icom America, Inc., Advanced Computer Controls, Inc., Palomar Engineers and Universal Amateur Radio, Inc. filed comments.

[4]There were 78,986 Novice operator licensees and 85,495 Technician operator licensees as of October 31, 1986.

[5]*See Notice of Proposed Rule Making* in this Docket, paragraph 15.

[6]FCC proceedings concerning standards to deal with the biological effects of human absorption of radio frequency radiation are in progress. See Report and Order, adopted February 26, 1985, in Gen. Docket No. 79-144; FCC 85-90; 50 FR 11151, March 20, 1985. See also Further Notice of Proposed Rule Making in the same docket, adopted February 26, 1985; FCC 85-91; 50 FR 10814, March 18, 1985.

[7]A discussion of this matter was requested. See Notice of Proposed Rule Making in this Docket, paragraph 16.

[8]The Novice operator must pass written Element 3 to upgrade to the next step Technician operator license. Element 3 consists of topics relating both to the Technician operator and the higher General operator licenses.

[9]We have chosen the frequency subband 222.10-223.91 MHz based on the voluntary band plan now under review by the ARRL. For example, we are aware of a similar band plan used by 220 Spectrum Management Association of Southern California with repeater output frequencies beginning at 223.62 MHz. Our reason for selecting this band is to provide Novice operators access to repeater communications by permitting them to operate on repeater input frequencies. Where voluntary band plans identify repeater output frequencies inside the subband 222.10-223.91 MHz, this circumstance is not to be construed as authority for repeater operation (see §97.85) by Novice class licensees.

[10]See 47 CFR §97.21(d).

[11]The FCC may prescribe the qualifications of operators, classify them according to the duties to be performed, and issue licenses to qualified persons. See Section 303(*l*)(1) of the Communications Act of 1934, as amended.

[12]The legislation which permitted reimbursement of expenses was not to have any adverse effect upon the Novice operator system. See Footnote 2, *Notice of Proposed Rule Making*, adopted March 6, 1968, in PR Docket No. 84-265; FCC 84-75; 49 FR 10316, March 20, 1984.

[13]See Report and Order, PR Docket No. 86-63; FCC 86-429; adopted October 6, 1986; 51 FR 42576, November 25, 1986.

FCC DISMISSES ARRL 17-METER PETITION

The FCC has dismissed the ARRL petition, filed last July, to release the 17-meter band, 18.068-18.168 MHz, to US amateurs. This band was authorized to radio amateurs worldwide at the 1979 WARC, and about 65 countries are currently allowing their radio amateurs to operate there. In the US, amateur occupancy of the band is contingent upon the relocation of certain US Government stations.

FCC said that agencies within the US government had informed them that the band will be required for their operations through July 1, 1989. FCC said it would continue to monitor the government usage of the 17-meter band, and it may be possible to provide for amateur sharing of the band with government operations prior to the July 1, 1989 date.

FCC RELEASES CALL SIGN INQUIRY

In February, acting in response to a letter written by ARRL last June, and requests by three other interested parties, FCC asked for comments on a proposal inquiring if call signs could be issued by the private sector! As stated in the FCC Public Notice: "FCC favors the implementation of such a system if it can be accomplished with no additional cost or workload to the FCC. The purpose of this Public Notice is to solicit comments and proposals on this matter . . . so that a determination can be made as to whether to proceed with its implementation."

According to this proposal FCC:

- Would only issue one 2 × 3 call sign for each *new* licensee, regardless of license class.
- This call sign would be from the NA-NZ block.
- FCC would then *discontinue processing requests for any call-sign changes,* and freeze all presently assigned call signs.
- All other call signs would then be available to what FCC calls a "special call sign coordinator (SCSC)," who could assign one or more *supplemental* call signs at the request of the licensee. This supplemental call sign could be used in lieu of the FCC assigned call sign.
- An SCSC would be operated on a not-for-profit basis, but would be allowed to recover administrative costs.
- FCC said, in its preliminary view, that it would prefer having only one SCSC, since it would be more efficient in preventing the same call sign from being assigned to different stations and avoiding inconsistencies of assignment. Further, a single SCSC would minimize the number of points of contact between the SCSC and the FCC, thus holding the administrative burden upon the FCC in check.
- The selection criteria for an SCSC are:

1) The ability to assign call signs in an efficient and objective manner;

2) The ability to provide an accurate on-line access data base of assigned special call signs for Commission monitoring and compliance work;

3) The ability to minimize FCC resources required in the establishment of the special call-sign system and;

(4) The ability to minimize the cost to the licensee for administering the system.

- Written comments on this matter, numbered PRB-3, and proposals to be the SCSC, are due on or before April 23, 1987, with reply comments filed on or before May 22. The Commission requests an original and four copies.

THERNES WINS ANTENNA CASE

John Thernes, WM4T, has finally won his long standing tower suit against the City of Lakeside Park, Kentucky. The City's zoning regulations had, in effect, excluded all antenna towers. Last year Thernes had taken his case to Federal District Court which had ruled against him and upheld the City's ordinance. Thernes then took his case to the Federal Appeals Court, where relying on the FCC's PRB-1 ruling, the Appeals Court vacated the District Court judgment and sent the case back to the District Court for reconsideration. The City continued to refuse to settle to Thernes' satisfaction, and Thernes was prepared to continue his suit in Federal Court.

Finally, on February 12, in a prehearing conference, the City agreed to sign a full consent judgment providing for a 65-foot tower plus an 8-foot mast for a total of 73 feet (what an appropriate number!). Hopefully, the judge will publish the Order, which potentially could provide a good precedent for future cases.

FCC APPROVES F8E EMISSION

The FCC has authorized emission mode F8E on all amateur frequencies 902 MHz and above, effective April 6. Previously, F8E, a mode in which the carrier is frequency modulated by two or more analog voice channels, was limited to the 902-MHz band.

FCC had issued a Notice of Proposed Rule Making, PR 86-207, last June in response to a petition filed by the Southern California Repeater and Remote Base Association (SCRRBA). SCRRBA had requested the F8E emission so that amateurs could experiment with an additional transmission mode. ARRL had filed comments to the NPRM, which said that it had no objection to F8E, provided that it was used in compliance with present and future voluntary band plans as not to interfere with narrowband emissions.

FCC concluded that the addition of the F8E mode would help amateurs develop their knowledge of UHF technology and would have no adverse effect upon existing amateur communications. In authorizing the emission for bands above 902 MHz, FCC stated that it would "encourage all amateur operators to follow the voluntary band plans that are in effect to avoid interference."

The following are the actual changes to Part 97:

Section 97.61 (c) is revised to read as follows:

(c) Above 144.1 MHz: Amateur stations are authorized to transmit the following emissions on amateur frequencies above 144.1 MHz: NØN, A1A, A2A, A2B, A3E, A3C, A3F, F1B, F2B, F2A, F3E, G3E, F3C, F3F, H3E, J3E, and R3E. PØN emission (the emission letters "K, L, M, Q, V, W, and X" may also be used in place of the letter "P" for pulsed radars) may be transmitted on all amateur frequencies above 902 MHz, except in the 1240-1300 MHz and 10.0-10.5 GHz bands. Emission F8E may be transmitted on all amateur frequencies 0.35 meters and above.

The table in Appendix 3 entitled "Classification of Emissions" is amended by adding, before the entry for Pulse modulation, the following entry. Footnote 1, after the symbol PØN in the table, is retained.

****

Type of modulation	Type of transmission	Symbol
	*******	
	Telephony, two or more channels containing analog information.	F8E

FCC DENIES ARRL REQUEST FOR STAY

The FCC has denied the ARRL request for stay of the December 31, 1986 effective date of Docket 85-196. This Docket transferred maintenance of the amateur question pools from FCC to the Volunteer Examiner Coordinators (VECs). The ARRL had filed a petition for reconsideration last fall and, when no response was forthcoming on that petition from the Commission, filed this request to stay (ie, postpone) the effective date in late December.

According to FCC, in order to grant a request for stay, one of the criteria used is that the ARRL must demonstrate a likelihood of success on the merits of its original petition for reconsideration. In its request for stay, ARRL stated that the FCC must continue to maintain the question pools in order to carry out the intent of Congress. FCC said that ARRL had used this same argument when commenting on the original proposal, and it had been rejected by FCC at that time. Thus, according to FCC, the ARRL did not meet the criteria necessary to grant its request for stay.

The FCC further commented that it felt that the ARRL's original concerns had already been satisfied by an agreement among VECs to maintain the existing question pools until January 30, 1988 and that the VEC's are going to cooperate in developing a common pool of examination questions.

Thus, while the ARRL's petition for reconsideration on this matter is pending, the status quo would be maintained.

FCC ISSUES 420-MHz LAND MOBILE ORDER

In September, 1985, segments of the 421-430-MHz amateur band were reallocated for private land mobile use north of what FCC calls "Line A," an imaginary line running roughly 100 miles south of the Canadian border (see 97.3(i) in the amateur rules for the exact boundary). Amateur operation is forbidden north of Line A in the 421-430-MHz band. The major cities north of Line A are Detroit, Buffalo and Cleveland. (Amateurs south of Line A can continue to operate, provided they do not cause interference to land mobile users.)

In this Order, FCC mostly discusses apportioning the spectrum and the use of various frequency coordinators. What concerns the amateur community is the FCC decisions on the allowable area of operations for base and mobile stations in order to avoid interference to amateurs and vice versa.

ARRL had filed comments stating that land mobile operation should be confined to a 50-mile radius around each of the three cities

and suggesting limiting antenna heights on base stations and requiring land mobile stations to resolve any interference caused to amateurs.

FCC commented that it recognized the contribution of amateurs and did not wish to "unduly impede amateur operations." FCC noted that all three cities were north of line A—Buffalo by 63 miles, Detroit by 90 miles, Cleveland by 25 miles—and decided to tailor the rules to vary the allowable locations for base stations in order to minimize interference.

In Buffalo, FCC will require full power base stations to operate within 30 miles of the city center, and permit low-power base stations (2 watts) and control stations (20 watts) to locate anywhere within 50 miles of the city center. In Detroit, FCC will allow base stations to locate anywhere within a 50-mile radius. In Cleveland, FCC will restrict base stations to locations north of Line A and within 30 miles of the city center.

FCC concluded that it hoped these new rules would minimize interference between the land mobile and Amateur Service. It emphasized, however, that amateur operation in this band is on a secondary basis and noted that amateurs cannot claim interference protection from land mobile operations.

ARRL FILES COMMENTS IN ATIS DOCKET

The ARRL has filed comments in response to the Notice of Inquiry portion of General Docket 86-337, which seeks comments on the feasibility of establishing an automatic transmitter identification system (ATIS) for all radio services. ATIS is a unique, unchangeable identifying number assigned to each transmitter at the time of manufacture. This signature is added automatically to each transmission and provides positive identification of each signal. In the notice of inquiry, FCC had sought comments on the benefits and costs of ATIS for various radio services, including Amateur.

ARRL said that ATIS in the Amateur Service is simply not practical for the following reasons:

- Present FCC regulations already require amateurs to identify their stations using their call signs. Amateurs take a great deal of pride in their issued call signs and use them generally more often than is required by the FCC rules.
- Amateur transmitters are built, traded, bought, sold, modified and rebuilt all the time. A data base of current transmitters in use would be almost impossible to establish due to the hundreds of thousands of transmitters. Retrofitting these existing amateur transmitters with ATIS circuitry is simply not feasible or justifiable
- ATIS would be not helpful in identifying intentional rule violators. Present station identification requirements are perfectly adequate in dealing with unintentional interference. The self-regulatory nature of Amateur Radio is sufficient to address all but a very few interference problems.
- ATIS would neither deter nor permit identification of those few who intentionally interfere with amateur communications, because it would be possible to bypass, reprogram, modify or disable an ATIS circuit, or to build a transmitting device without ATIS.

In short, the ARRL's comments concluded that there is simply no need for ATIS in Amateur Radio.

ARRL FOUNDATION SCHOLARSHIP DEADLINE

Each year, the ARRL Foundation sponsors a number of scholarships and the Victor Clark Youth Incentive Program. The deadline for ARRL Foundation Scholarship applications for the 1987-88 academic year is May 1, 1987. The Clark Program provides mini-grants year-round to groups that demonstrate a serious intent to provide support for the development of Amateur Radio among high-school-age youth. For further information about these scholarships, which range from $500 to $5000, and other Foundation programs, contact the ARRL Foundation, c/o ARRL, 225 Main St, Newington, CT 06111.

ROBERT W. GUNDERSON, W2JIO, SK

Robert Gunderson, W2JIO, a well-known *QST* author, 67, died January 11. Gunderson was also known from the "Radio Row" days in New York City, where he worked for the Hudson Radio Company answering customers' questions. He became known as the "question-and-answer man of Radio Row." Gunderson, who was blind since birth, edited and published for 25 years *The Braille Technical Press*, a monthly electronics magazine for the blind. He was known for developing test instruments for blind engineers and technicians. Before retiring in 1974, he taught radio electronics for 37 years at the New York Institute for the Education of the Blind.

ARRL FOUNDATION ANNUAL MEETING

The ARRL Foundation Board of Directors met by telephone conference call on January 31. Paul Grauer, WØFIR, was elected Foundation President; Ed Metzger, W9PRN, Vice President; George Dupont, WA1SVY, Treasurer; and Steve Place, WB1EYI, Secretary.

The Foundation reviewed a proposal from the ARRL for a grant of $15,000 (to be matched by industry) to fund distribution of the upcoming promotional videotape production, *The New World of Amateur Radio.* It approved $500 grants to the Gonzaga High School of Spokane, Washington, and Natick High School of Natick, Massachusetts, under the Victor Clark Youth Incentive Program. It also established a new fund, the "Don Riebhoff, K7ZZ, Memorial Fund" as a repository for memorial contributions.

SECTION MANAGER ELECTION NOTICE

To all ARRL members in the Southern Texas, Colorado, San Francisco, Sacramento Valley, Los Angeles, Georgia, West Virginia and Washington sections: You are hereby solicited for nominating petitions pursuant to an election for Section Manager. Incumbents are listed on page 8 of this issue.

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

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

(Place and date)

Field Services Manager, ARRL
225 Main Street, Newington, CT 06111

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

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

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

Petitions must be received at Headquarters on or before 4 PM Eastern Local Time June 5, 1987.

Whenever more than one member is nominated in a single Section, ballots will be mailed from Headquarters on or before July 1, 1987. Returns will be counted August 18, 1987. SMs elected as a result of the above procedure will take office October 1, 1987.

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

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

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

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

Richard K. Palm, K1CE
Field Services Manager

SECTION MANAGER APPOINTMENT

In the Western Massachusetts Section, William C. Voedisch, W1UD, has been appointed to complete the term (until December 31, 1987) of Don Haney, KA1T (resigned).

In the North Dakota Section, Roger "Bill" Kurtti, NØAFP, has been appointed to complete the term (until March 31, 1987) of Lois Jorgensen, WAØRWM (resigned).

License Renewal Information

1) Attach a photocopy, or the original, of your license to the FCC Form 610 (available from ARRL HQ; SASE, please).

2) Mail to FCC, PO Box 1020, Gettysburg, PA 17326. There is no fee.

3) If you file before the license expiration date, you may continue to operate beyond the expiration date and until the new license arrives. After expiration, there is a five-year grace period under which you may still renew without retesting. However, after two years of the grace period has elapsed, you will lose your call sign, and will be assigned a new one. After this five-year grace period is over, you must be reexamined for a new license.

4) Note that the new 10-year-term licenses, which have been issued to all amateur licensees renewing since January 1984, have only a two-year grace period before both the license and call sign expire.

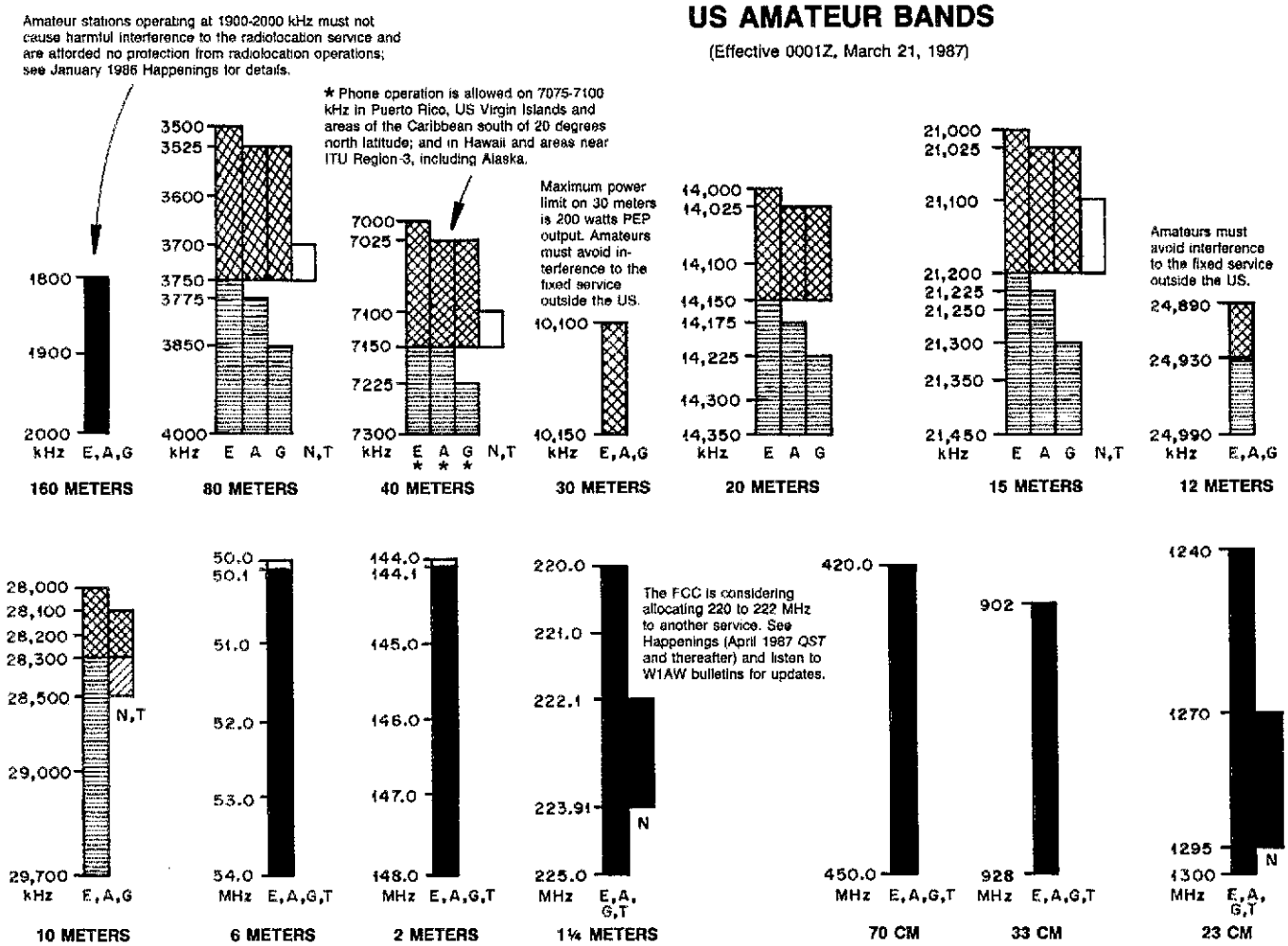
5) You may apply to have your license renewed at any time during the term of the license. FCC suggests the application be made approximately 90 days before expiration.

6) If you are simply modifying your license (change of address, for example), you must fill out a Form 610. Incidentally, your license will also be renewed automatically for 10 years at this time.

7) If you have any questions or problems, drop a note to the Regulatory Information Branch, ARRL HQ.

US AMATEUR BANDS

(Effective 0001Z, March 21, 1987)



Operators with Technician class licenses and above may operate on all amateur bands above 50 MHz. For more detailed information see *The FCC Rule Book*.

5167.5 kHz Alaska emergency use only (SSB only) E, A, G, T, N

KEY

- ☐ = CW ONLY
- ▩ = CW AND RTTY
- ▤ = CW, VOICE, SSTV AND FAX
- ■ = CW, VOICE, SSTV, FAX AND RTTY
- ▨ = CW AND SSB

E = EXTRA
A = ADVANCED
G = GENERAL
T = TECHNICIAN
N = NOVICE

US AMATEUR POWER LIMITS

At all times, transmitter power should be kept down to that necessary to carry out the desired communications. Power is rated in watts PEP output. Unless otherwise stated, the maximum power output is 1500 W. Power for all license classes is limited to 200 W in the 10,100-10,150 kHz band and in all Novice subbands below 28,100 kHz. Novices and Technicians are restricted to 200 W in the 28,100-28,500 kHz subband. In addition, Novices are restricted to 25 W in the 222.1-223.91 MHz subband and 5 W in the 1270-1295 MHz subband.

(Effective 0001Z, March 21, 1987)

Correspondence

Conducted By John Hennessee, KJ4KB
Regulatory Information Assistant, ARRL

A WARM WELCOME TO HAMDOM

☐ During the early part of December 1986, I wrote to the ARRL telling you of my desire to become an Amateur Radio operator. I told you that I was retired and also mentioned the fact that I had taken a home radio course many, many years ago.

On January 6, 1987, I received a reply from the ARRL. Among those that were sent to me was a list of names and telephone numbers of hams. I was hesitant about bothering these people, but the list mentioned that they were willing to help. The one nearest me, and the one that I called, was Joseph Evans, K3KJZ.

He sounded genuinely happy that I had called him, and that alone made my desire to become a ham even stronger. After a short, but encouraging chat, Joe gave me information about an upcoming testing session. The testing session was only two weeks away, so I went to work!

On January 17, 1987 at 10 AM, I was seated in the testing room. I passed the Novice and Technician and missed only two questions on the 13-WPM General code. This letter is my way of saying thanks to the ARRL, to Joe Evans, and to all the other operators who encouraged me to take the examination. —*Matthew R. Colwell, Dundalk, Maryland*

FIGHT "LIDDISM!"

☐ Rereading back copies of *QST* is one way of filling these long Michigan winter evenings. In perusing the How's DX column, I must confess that I miss the reports by Rod Newkirk, W9BRD, which appeared in each May issue on the annual meeting of the DX Hoggery and Poetry Depreciation Society. I've got to believe that this learned group has continued to meet over the years, but their ramblings have not been relayed to the outside DX world.

Perhaps someone like W9BRD could slip into Long Hall during this year's assault on DX "lid" and let us all in on their current lamenting. A limerick or two would please us Old-Timers and also let the newcomers know how it used to be.

By the way, it was rumored on 20 meters last week that Watziz Kaul and Wurzee Lisslin are now members. Oh, well, it takes all kinds!—*D. F. Christensen, W8WOJ, Midland, Michigan*

3Y PANDEMONIUM

☐ In all my 54 years as a licensed amateur, I have never heard a more disgusting exhibition of greed and avarice as that experienced on 14.145 MHz during the Peter I DXpedition. The 3Y stations were listening "up" from 14.145, but this didn't deter a few stations from coming on frequency yelling and acting like a bunch of morons. QRM was such that I can't believe anyone could have even heard the 3Y stations.

Please fellas, ham radio is only a hobby—treat it like one. Working rare DX should be a challenge, not a shouting contest.—*Louis K. Bean, KV4JC, St Croix, US Virgin Islands*

ONE GREAT ANTENNA

☐ A belated thank you to Frank J. Witt, AI1H, for his fine article, "Broadband Dipoles—Some New Insights," which appeared in October 1986 *QST*.

As a fan of the double bazooka antenna, which admittedly offers a "negligibly small bandwidth improvement over the uncompensated dipole...," I'd like to give the following reasons for my preference: (1) The Double Bazooka is at dc ground; the ordinary dipole is not. (2) The Double Bazooka (at least at this QTH) is obviously less noisy as a receive antenna.—*Bob Alderisio, N5IOS, El Prado, New Mexico*

CQ YL

☐ Since proudly receiving my Novice ticket in November 1986, I have put myself in the pleasurable habit of calling "CQ YL, CQ YL..." for four main reasons: (1) I am single and like girls. (2) I certainly can't call "CQ XYL," that wouldn't be very nice! (3) I am trying to encourage more YLs and XYLs to get on the air. (4) One of my goals is WAS/YL.

Now, it's amazing how many of you "gals" answer my call with guys names. Either there's something dreadfully wrong in Brooklyn (no slight intended), or the guys who answer my "CQ YL" simply can not read CW, or will do anything to get anyone to talk to them!

Guys and gals, "CQ YL, CQ YL..." *does not* mean CQ outer space, or CQ Yabozoland, or "I just thought I'd give you a call to see how I was getting out to ya." Honest, that's what a fellow from Ø-land told me!—*John R. Coburn, KB8ANI, Port Huron, Michigan*

HOW NOT TO WIN FRIENDS AND...

☐ If amateurs wonder why our ranks may not be increasing as rapidly as we would like despite the overwhelming interest of many hobbyists, perhaps my story will shed some light on the problems we face. The moral of the story is this: In everyday operating, public relations may not be one of hams' strong points. Friendship and even common courtesy may be missing.

One afternoon in December, I was demonstrating the marvels of Amateur Radio to a nonham. The young man seemed interested. While tuning around on the otherwise quiet 75-meter band, I came across some AM stations chatting away and I enjoyed "reading their mail." On that fateful day, just as I had an impressionable non-ham in my shack, I stumbled upon some very poor operating. This operator did a great deal of on-the-air belching, which seemed to serve no point. My visitor found this to be humorous, but I don't think he will consider joining our ranks. Who can blame him?

Well, those things do happen, I know. In my case, lightning did strike twice. Just a few days ago while on a trip to Maine with my trusty QRP rig, I found myself demonstrating ham radio to a new ham. I was listening on 40 meters. Upon hearing a station in 3-land, I decided to demonstrate just how fun ham radio can be at low cost and low power. The contact was established and a signal report was received. After the opening report from the 3-land station, I added that I was QRP. The response was one for the books, as he stated that QRP operators should just call CQ rather than forcing higher power stations to listen to the weak signals! With that, he signed. My visitor was not impressed.

The lesson is an easy one to take, but a difficult one to put into action. We must all take responsibility for how we conduct ourselves on the air. We must always assume that others *are* listening. They are making judgments about us and our hobby, and we cannot afford to frighten off any aspiring ham. On the other hand, we can not let our "on-the-air" conversations become so self regulated that we talk of nothing but the weather and our rigs. If the operators had merely talked intelligently and forcefully about things of interest to him, our world would be better.—*Joseph T. Malloy, WB2RBA, Clinton, New York*

QSL VIA THE BURO

☐ Having recently volunteered to work at an incoming DX QSL bureau, I'm amazed at the number of stations who work DX and don't have envelopes on file with their bureau. We have boxes full of exotic cards just waiting to be claimed by their owners! It seems the worst offenders are the Advanced and Extra ops with the new calls! Remember that until your new call is in the *Callbook*, we have no way of contacting you.

It is every ham's responsibility to keep envelopes that have your call on them on file with the bureau. Also, don't put $2 worth of postage on one envelope unless you want us to hold your cards until the envelope is filled. It is much better to send a couple of envelopes with 22 or 39 cents postage on them rather than one envelope with $2. Our goal is to efficiently sort them and get the cards to you ASAP, and not to become a storage facility for thousands of cards!—*Vince Yakamavich, AA4MY, Reston, Virginia*

[Some bureaus sell postage credits in addition to envelopes.—Ed.]

Amateur Satellite Communications

Conducted By
Vern "Rip" Riportella, WA2LQQ
PO Box 177, Warwick, NY 10990

Fun, Games and (Hopefully) Education on OSCARs—Part 2

Last month, we discussed how AMSAT performs its receive sensitivity test, the ZRO Test. This month, we'll examine what it takes to do well in the competition.

There's no single piece of equipment or technique that will assure you of being among the top performers in the ZRO Test. Rather, it's a combination of factors that makes the difference. But if there's any common thread that unites the top performers, it's that they all have paid scrupulously careful attention to detail.

When striving for better receiving sensitivity, the primary obstacle is noise. The ability to hear anything is dependent on the power of the signal you're trying to hear compared to the power of the noise in the monitored bandwidth. This is most commonly called the in-band signal-to-noise ratio, or the S/N ratio.

The receiving system consists of two basic components: an antenna, which couples a weak electromagnetic field to your receiver, and a receiver, which converts the RF to AF and couples the resultant audio to your brain. Some important ancillary equipment consists of the preamplifier (actually an extension of your receiver), the transmission line connecting the antenna to the receiver, and the speaker (or earphones), which couples the receiver to your ears.

Here are the basic requirements. Capture as much of the signal as possible at the antenna while rejecting as much extraneous noise as possible. Get the signal to the receiver intact. Convert the signal to audio while limiting the bandwidth to as narrow a slice as possible to allow the desired signal to stand out prominently from the noise, ie, increase the S/N ratio.

A preamp is essential, although where it's placed depends on several factors. In essence, the preamp should be placed ahead (on the antenna side) of any significant losses such as might be incurred in transmission lines. Why?

Picture your transmission line as a noise source (because it is). It's lossy and warm.[1] Any losses incurred between the antenna and the preamp contribute greatly to overall receiver S/N degradation. This is *the single most important thing you can do!* Get the preamp close to the antenna. How close? If there is a 1 dB loss between your antenna and the preamp, you're at the limit of what I consider a reasonable tradeoff. Keep in mind that at 2 m a 1 dB loss is incurred in about 40 feet of RG-8 foam cable (in new condition). At 70 cm, you incur 1 dB loss in about 25 feet of the same coax.

For weak-signal space work, you should have as much gain as possible generated by your antenna array. How much is enough? Start with a single Yagi. Point it to the zenith. Does the needle of your receiver's S meter come off the peg or does it sit there listlessly? If the receiver is in good shape and you have a good, low-noise preamp, the needle might be just off the peg. If not, try to borrow another preamp for a test. Put the second preamp in line. Now, the S meter should be well up-scale and your receiver's speaker should be erupting with the rushing sound of white noise. If the noise is not prominent, you may need a new receiver. If a single preamp gives you noticeable, but slight, needle movement, then chances are you have enough gain in the active components (preamp and receiver). Next you need to concentrate on the passive components, specifically the antenna array. You can add a second Yagi. If you separate it at the proper distance from the first antenna, you will reduce the beamwidth of the resulting array.

The sky is full of noise sources. When you add antenna gain, you are, in effect, increasing the S/N ratio in two ways. First, since the gain of the antenna goes up, it couples more energy to the preamp. Thus, the ratio of the desired satellite signal energy from the antenna increases in proportion to the undesired noise energy unavoidably generated in the preamp. The S/N ratio is improved. Second, and somewhat more subtly, when the antenna gain is increased, the total sky area that is within the beam of the antenna decreases in direct proportion. So all those noise sources in space you don't care to hear are out of the beam. What you *do* want to hear, the satellite, stands out more clearly against the omnipresent noise background.

In general, therefore, once the receiver AGC begins to be "tickled" by the sum of sky noise plus preamp noise plus the noise of everything else ahead of the receiver, as indicated by very slight S-meter movement, it's time to increase antenna gain as far as practical.[2] More antenna gain is added until the target signal exceeds the total noise by an acceptable margin.

What about other noise sources? Noise from distant thunderstorms, the bane of DX HF work, is virtually nonexistent at VHF and above because the ionosphere rarely reflects VHF signals. Thunderstorm noise simply passes out into space for the most part. Automobile ignition noise and noise from urban industrial centers is less of a problem with VHF/UHF space communications because the antennas are generally pointed skyward. You thus turn a "deaf ear" toward the terrestrial noise sources.

But, there are noise sources much closer to home that can degrade your station's performance. Your azimuth and elevation rotators probably contain noise-generating electric motors. Slewing these motors probably increases your local noise. Computers and related digital equipment (such as packet radio TNCs) can generate noise into the GHz range. Turn them off when possible. If not, place them in a thoroughly RFI-proofed box. Turn off all TVs and microwave ovens.

Don't use BNC connectors if you can avoid them, and never use them outdoors. The bayonet connections are notoriously noisy when corroded. Use type "N," TNC or SMA connectors instead. Tighten all antenna hardware. In the most modern designs, the elements are insulated from the boom to avoid the intermittent contact and noise that results from inevitable corrosion of parts exposed to the weather. Make certain all station grounds and bonding straps are clean and tight. A poor ground can doom your otherwise excellent station to virtual deafness.

Is your receiver itself a significant noise source? If it uses a synthesizer as a frequency source, it could be. So-called phase noise can be a problem with some VHF/UHF radios just as this has recently become recognized as a factor in the noise floor of HF radios.[3]

Another way to improve the S/N ratio is to reduce receiver bandwidth. This can mean merely using the narrowest CW filter available commensurate with the signal spectrum of interest. In the ZRO Test, 10-WPM CW is sent so even the 200-Hz filters some top-notch radios offer are practical. Still, more improvement can be obtained by using advanced variable bandwidth audio filters. Some ZRO Test participants, using audio filtering, have successfully copied CW signals others couldn't even begin to detect.[4]

What is in use at the top stations? On 2 m, the top stations are using antennas with gains of 18 or 19 dBi, and a preamp with a noise figure in the 1 dB (or less) range and gain of 18 to 20 dB. A median good station generally runs 12 dB antenna gain and approximately the same preamp as the top station. For 70 cm, the top stations use antennas providing 20 or 22 dBi gain with a preamp in the 0.6 dB noise figure range, while yielding gain in the 18 dB range. A median good station on 70 cm runs about 13 or 14 dBi gain on the antenna and about the same preamp as the top stations. In all cases the preamp is at the antenna.

Especially at 70 cm and up, the sky is generally quiet and even a relatively weak signal from a satellite clearly stands out against the cold sky. For example, it is not uncommon for a first-rate ZRO competitor to be able to hear a milliwatt-level 70-cm downlink signal at a range of 22,000 miles!

At the low end of the capabilities scale, many regular satellite users get by with just 10 dB of antenna gain and 4-5 dB noise figure on both 2 m and 70 cm. They can hardly begin to hear the weak QSOs. The ZRO Test demonstrates how much room for improvement there is at some stations.

When we recognize how easy it is to have a station that hears well, it seems strange

(continued on page 77)

How's DX?

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

Golden Jubilee DXCC Activity

Surely, the first months of calendar 1987 will go down on record as either being at the very bottom of the useful portion of the current solar cycle, or perilously close to that low point! Yet, activity remained at a spirited high level—sparked in no small measure by the advent of the ARRL Golden Jubilee DXCC (all the fun of the chase, and none of the hassles getting cards!). Here's a toast to those who have already qualified, and to the rest of us, too, on rediscovering the thrill of working for the first 100 countries and, at the same time, not missing the late January-early February Peter I *tour de force!* (More on that later.)

The first hundred qualifiers are shown in the accompanying box.

Golden Jubilee DXCC

AA1V	WB2ABD	KA5W	W8RSW
K1EFI	K3SA	KB5GL	W8WOJ
K1IU	K3TC	KS5M	K9LJN
K1JO	K3WW	W5FGO	K9RHY
K1MM	AA4FF	W5ZPA	K9US
K1YDG	AA4S	WB5BIR	KR9P
KB1BE	K4II	AE6H	N9AKE
W1BWS	K4JDJ	K6AAW	N9RD
W1CKA	K4KJZ	K6EID	W9LNQ
W1LQQ	K4KPH	K6GXO	W9WAQ
W1OO	K4MF	K6IR	W9ZM
WA1SMI	K4MQG	NE6I	NØEL
AA2Z	K4XO	W6EL	WØIZ
K2FL	KR4D	W6GO	VE7AHA
K2JLA	N4GNR	W6KTE	VE7DX
K2QIL	N4MM	W6NZX	DK5WS
KA2AJT	N4VZ	W6RFK	EA9IE
NG2X	N4WF	WG6P	G3VXZ
NI2B	W4DOU	NS7J	HB9KU
NJ2C	W4OHZ	K8SQE	I1RBJ
W2FXA	W4UG	K8UNP	JR1FYS
W2GD	W4VQ	W8AH	OE5KE
W2MIG	WC4E	W8BKP	OH3ES
W2PSU	K5LM	W8JBI	VK6RU
WA2IZN	K5OVC	W8JXM	YX5D

K7ZZ/CT4AT

Mid-January brought the sad news that the unique, the inimitable, that superb operator Don Riebhoff joined Silent Keys following a tragic automobile accident in Spain. As K6SSJ reminds us, Don was active from numerous rare spots in the world, as well as participating in the 1S1A Spratly Island operation. Admired by many, K7ZZ would have appreciated a particular Persian proverb: "Death is a camel that lies down at every door."

FOØZA

This call was activated from Tahiti last September 18-25 by OH1ZAA (formerly PAØFIN). No advance information was given, as this was meant to be an expedition "exercise," and operating facilities were not confirmed before arrival in French Polynesia. Regardless, almost 2000 contacts were made CW/SSB 80-10 meters, despite disturbed geomagnetic conditions. Coming expeditions to other locations will be announced, and will include interesting 6- and 2-meter activity on E_s/TEP. QSL information for FOØZA, NNØY, NNØY/WH6 and NNØY/WL7 via OH1ZAA, Jan Hubach, Mantyluodonkatu 1, SF-28880, Pori, Finland.

COLVINS

In early December Iris and Lloyd reported that they had worked 8000 QSOs in 144 countries as FH/W6KG, staying in a small hotel on top of a hill overlooking the Mayotte Islands. December

was a record month for them, as they worked 9000 amateurs in 152 countries as D68QL. The Comoros have just two other licensed amateurs—D68WB (an American doctor) and D68AM. Licensing requires a meeting and approval of the Commander in Chief of the Armed Forces of the Comoros (and $160 US for their licenses!). Even a soft drink costs $3 US! Cards via The Yasme Foundation, Box 2025, Castro Valley, CA 94546. [They're scheduled to appear at the Visalia DX Convention, April 3-5, despite Iris's recuperating from a broken hip she suffered while at the Maldives. After taking a bad fall, she had to be flown to Colombo, Sri Lanka for surgery. At press time, she is reported as resting comfortably and in good spirits. The DX community wishes her a full and speedy recovery.—Ed.]

MICRONESIA

A recent note from KC6MM, following this column's November offering, discusses this interesting part of the world. Mike notes that the Yap State of the Federated States of Micronesia is geographically in the Western Carolines (north of Palau) and that Palau, KC6, is now called Belau. KC6MM has QTHs in both the Eastern and Western Carolines, and as both are in the Federated States of Micronesia, you can see his interest! ZIP code collectors take note that WCI includes Yap 96943 and Palau 96940, while ECI has Truk 96942, Ponape 96941 and Kosrae 96944. At this writing, Mike should just be getting underway for two years in 5W1. He notes that good E-W Carolines information can be had from Cav, KC6JC, Box 39, Pohnpei, E Carolines Islands 96941.

Peter I Update

3Y1EE/3Y2GV left the island Feb 2, following this successful operation, which totaled almost 20,000 contacts in 10 days. Cards were to be printed in early March and distributed soon thereafter. QSL manager for this operation is Erling J. Wiig, LA6VM, Jacob Fayesv 6, N-0287, Oslo 2, Norway. For ease in handling cards, the LA DX group would prefer one QSL per SAE.

As this turned out to be an expensive operation, contributions are welcomed by LA6VM.

THE SOMNILOQUIST

The following is courtesy of W6BDN.

I wake up slowly. I'm not a morning person. If my ablutions are completed with a moderate degree of efficiency, there's 10 or 20 minutes to check for 75-meter DX before leaving for work. Of course, I'm not fully awake, but the autopilot functions reasonably effectively.

That morning VK9ZB was audible through the static. My tally sheet showed that Australia had previously been worked on 75, but still wasn't confirmed. The noise was moderate-to-high, and his signal wasn't very strong. But, I might as well give it a go. After several tries he called me. His signal was 3-6. Realizing that copy was poor on my end, Kim counted out his report: 1, 2, 3, 4, 5 by 1, 2, 3, 4, 5, 6, 7; and he repeated it several times. Usually that would have been very helpful, but Murphy was operating in reverse. At that moment the noise faded, and

Troster's Tips for Easy Listening

Procedures 1

There you are, all alone on your first DXpedition. You called CQ, signed your DX call and now you start getting answers—and fast. Panic time! (What do I do now, coach? Suppose I make a mistake.)

Don't worry. How many terrible mistakes can you make? Answer: really very few, and they're minor. Maybe you copy a call incorrectly. Well, you can be very sure that the operator will send his call many times on the turnover to be sure you have it okay!

But, keep these things in mind as you begin operating (we've discussed some of them before): how often to sign, whether to give "honest" reports or a straight and easy 59(9) to everyone, when to QSY to a different band (in general, stay with a band as long as it is producing a good QSO rate), and how to answer questions (either very rapidly as they occur, or keep going and answer them all at once every 10 minutes or so).

Be aware of what the skip is doing, and what areas of the world should be coming through. Periodically stand by for those "deep skip" areas. If there is an opening, stand by for that area only and work it while you can. Have close-by operators QRX (you can work them almost anytime). These things (and more) will all happen to you. Give some forethought as to how you want to respond and react.

Don't worry about mistakes. You'll learn quickly. Don't forget, you indeed are the DX skipper. The world is calling you. What you say and do is the way things are going to be. So, do the best you can. And, don't forget to say once in a while, "QRX, suffering sixes."—*W6ISQ*

his signal became QS. If there was sideband QSK, I could say "Thank you, I've got it." Instead, I just sat there, squirming in my chair, then logged the contact and scooted off to work.

Driving along, with the fresh air blowing in my face, I was suddenly struck by the realization that VK9ZB wasn't mainland Australia, but one of the elusive islands. But, which one? It had to at least be a new band-country (on 75, they're always very welcome). Or, maybe, even an all-new one!

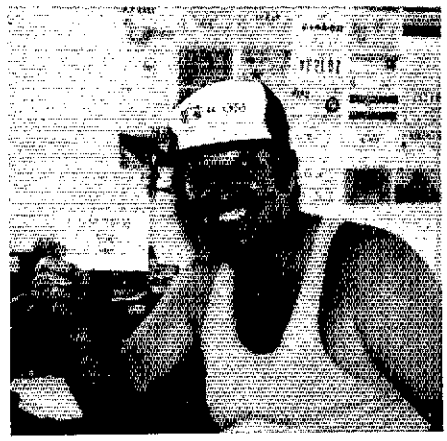
At the first opportunity, I checked with my at-work DX expert, K6MA. Stan confirmed my belief that it was indeed a "goody" island. He itemized several possibilities, but he too wasn't sure exactly which one. I labored extra diligently to make the day pass quickly and rushed home a little early. My curiosity was really aroused!

The latest *QRZ DX* (W5KNE, editor) was on the operating table, where it couldn't possibly have been missed that morning (that is if my eyes had been fully open). Right on the front page was "VK9ZB, Willis Island." It was an all-new one for me. I worked him without even knowing it!

MACAU, XX9CW, ON THE LOW BANDS

Early last spring, DK7PE operated XX9CW from Macau, about 40 miles southwest of Hong Kong. This is a difficult operating site, being directly at the southeastern coast of China, with high mountains to the northwest (EU) and northeast (USA), making DX contacts very difficult. City QRM increased the problem, leading to operating at the only usable spot, about 3 miles south on an island named Taipa.

Good conditions during the first week in April



5H3RB

brought excellent EU and USA top-band signals. The most difficult spot to reach was the East Coast of the US, where almost no nighttime path was available at that time of year. For the US, XX9CW was listening on 1807 kHz and transmitting on 1825 kHz, as was regularly announced.

Antennas included a 160-meter halfwave sloper and a 10-meter long vertical for 40 meters. Both antennas also achieved good results on other bands. Of the total of 1700 two-ways, 715 were made on 80, 846 on 40, and 109 on 160 meters. All incoming cards have been answered. All those still needing this XX9CW confirmation may send their card via Rudolf Klos, Kleine Untergasse 25, D-6051 Nieder-Olm, Fed Rep of Germany.

CIRCUIT

☐ **3A7A:** The March 29 operation by the National Amateur Radio Society of Monaco (ARM) celebrated the National Day of Childhood.

☐ **PA6IARU:** Commemorating the Region 1 IARU Conference in The Netherlands, this station will be active April 9-20.

☐ **KK9A/VP2V:** John operated from Tortola, BVI, March 2-10, 160-10 meters, phone and CW. QSL to his US call.

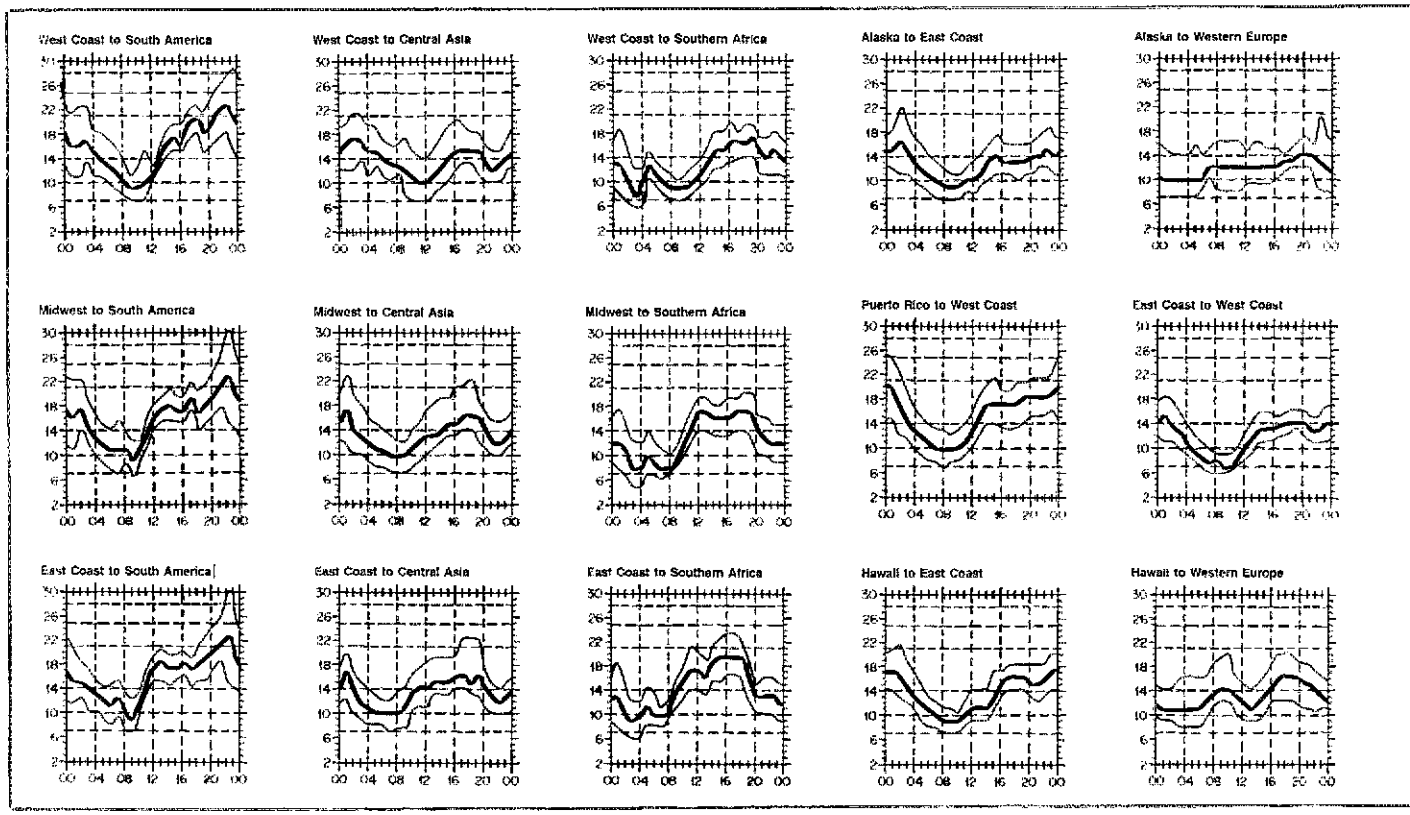
☐ **8R1X/8R1Z/TA2C:** QSL Manager WI4K has moved and wants to be sure that requests go to her at: Carol Shrader, WI4K, Box 5614, Virginia Beach, VA 23455.

☐ **Clubs:** 1987 officers of the National Capitol DX Association include Pres W2GHK (forever), and VP K6IR (catch that great photo of RCA Sarnoff Award Winner Ken upfront in Feb *QST*!). New officers of the Northern Illinois DX Association include Pres W9NUF, VP W9DWQ, Sec'y K9RHY, Treas WA9MAG. The club can be reached via Box 519, Elmhurst, IL 60126. The Southern California DX Club officers are Pres W6AE, VP N6OU, Treas N6JZ, Sec'y W6MFC. The Dixie DXers are now ready for serious activity, say new Pres NQ4I, VP AA4LU and Sec'y KB4IUC.

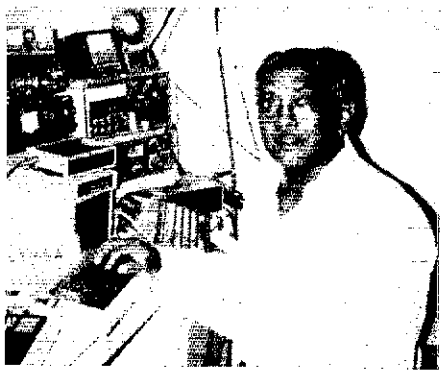
☐ **VK0DA:** N4GNR wants to commend Frank for his Heard Island operation, having made contacts despite poor conditions. In addition, Dan commends VK9NS for handling the cards.

☐ **Super DX Edge:** N2UN has continued to improve his great product, adding an MUF predictor and a Great Circle Bearing calculator. C64 and C128 users are sure to find this a valuable aid to their DXing.

☐ **QSL Managers List:** The Brussels DX Team



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



ST2SA, Sid, a genuine Sudan old-timer. *(tnx DK7PE)*

publishes a fully computerized list of over 11,000 QSL Managers in book form (surface 44 IRCs, air 53 IRCs) via E. Vancraenbroeck, ON7RN, Avenue de Mai 133, 1200 Woluwe-St-Lambert, Belgium.

☐ **KI4IW/C6A:** The March single-transmitter phone DX Test multiop gets confirmed via KI4LW.

☐ **DXCC List:** The new printing is available for $1 ppd from ARRL HQ, and includes DXCC rules (and criteria), Countries List (continent, ITU and CQ zones), room for eight bands of bookkeeping, third-party-traffic countries, deleted countries and prefix cross references. Don't miss it!

☐ **IARU:** 1987 marks special anniversaries for the following IARU societies: Denmark, Portugal (1927); Luxembourg (1937), Panama, Guatemala, Suriname (1947); Cyprus, Liberia, Turkey (1962). (Note, too, that the forerunner of DARC, the Deutsche Amateurradio Sende Dienst, was also founded in 1927.)

☐ **Syria:** In recognition of Syria's 40th Amateur Radio celebration, 6C4Ø will be in use during the last week of the year. YK1AN = 6C4ØM, YK1AO = 6C4ØO, YK1AM = 6C4ØRJ, YK1AA = 6C4ØTIR. LX5ØRL will be operated year long.

☐ **Watts New?:** After listening to the CQWW, W8ZCQ has arrived at the following conclusions for the "new" Ohm's law: For E × I < 1000, P = E × I; for E × I > 1000, P = 1000.

☐ **Noise:** AC5K has power-line and electrical-interference noise well in hand. Check with Wes for further details, via 465 Creekwood Dr, Silsbee, TX 77656.

QSL Corner

Administered By Joanna Hushin, KA1IFO

Here is some information for those of you who would like to QSL a QSL manager or direct to the station location. It is passed along as we receive it and, therefore, may not be accurate. The call sign in parentheses is the QSL manager.

A4XJO	(WB3JRU)
HBØNL	(HB9NL)
HD8G	(KT1N)
J6DX	(W8UMD)
KA2IJ	(W6CNA, 1987 contacts only. Before 1987, KD7P)
KG4DX	(KF4S)
LU1ZA	(LU2CN)
PJ2CC	(WB3JRU)
P41C	(WB3JRU)
S79KG	(YASME Box 2025, Castro Valley, CA 94546)
TA2FM	(WB3JRU)
TG4VT	(W3HNK)
ZF2JX	(KB1HY)
XF4DX	(K9AJ)
ZLØAAC	(KS7P)
3D2SP	(KS7P)
3Y1EE	(LA6VM)
3Y2GV	(LA6VM)
4M4A	(K3UOC)
5T5XX	(DL1VT)
9Q5NW	(AL7EL)

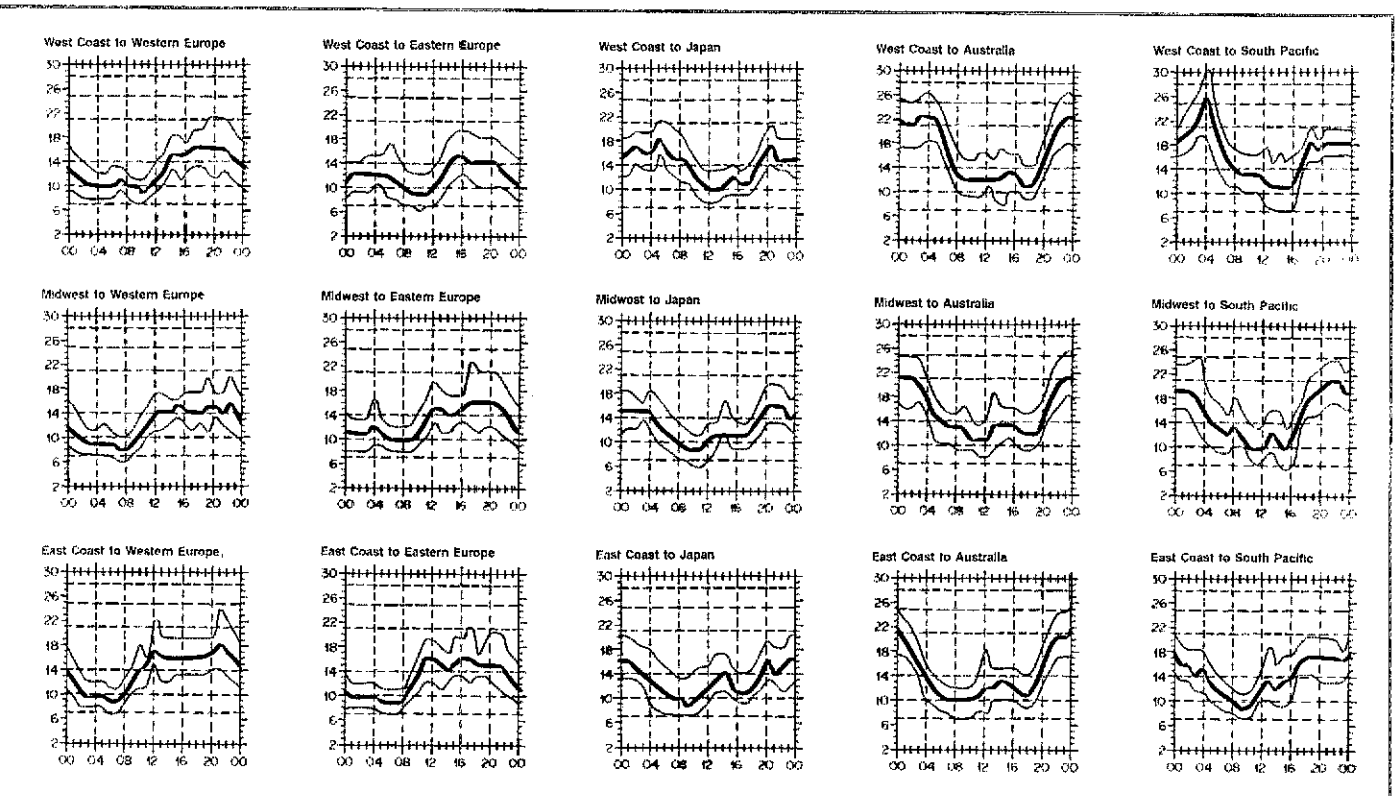
QSL Manager Volunteers

AA4UF, for any KH6 or KL7 prefix.
HC1ATG
KW1K
K7FL
WK5X
NTØW

Special Notes

☐ K1THP is not the manager for ZF2JX.
☐ KU1T is not the manager for J6DX.
☐ WB2CPV is not the manager for KG4DX.
☐ KT1N is not the manager for HC8D.

☐ QSL Corner, December 1986, *QST*, page 57, contains information and addresses for the ARRL Incoming Bureau. March 1987 QSL Corner, page 67, contains information on the operations of the ARRL Outgoing Service. For additional information on bureau operations (Incoming and Outgoing), send a self-addressed, stamped envelope to ARRL QSL Bureau, 225 Main St, Newington, CT 06111.



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 April 16 to May 15, 1987, assume a sunspot number of 12, which corresponds to a 2800-MHz solar flux of 74.

DX Century Club Awards

Administered By Don Search, W3AZD

The ARRL DXCC is awarded to amateurs who submit written confirmations for contacts with 100 or more countries on the official ARRL DXCC list. You may also submit cards to endorse your award in 25-country increments through 250, 10-country increments through 300 and 5-country increments above 300. The totals shown below are exact credits given to DXCC members from January 1 through January 31, 1987. An SASE will bring you the rules and application forms for participation in the DXCC program.

New Members

Mixed

G4JOK/106 JL1OOD/110 NP4TB/107 VU2JXO/186 K2ZA/104 N4FFL/102 W6SPQ/274 WA8YTM/228 KØHBQ/102
HA8RJ/106 JA3JAZ/291 PA3CYX/133 YBØZEA/112 W2VT/156 KG6WP/131 WA6MJM/104 KC9WF/106 NØFCD/100
HL1LW/105 JR3IIR/311 PAØXMO/116 YU2WM/243 WA2MOE/308 N6DYS/185 AG7N/128 W9PC/130 NFØR/100
I1WXY/283 JH6QPD/265 SM6CMR/118 YU3TG/108 AA4QH/110 W6DAO/100 KF8K/110 WB9BZE/101 WØZD/112
IK3ELC/107 JA9BEK/116 SM6GOR/149 KA1WR/123 KI4KX/109 W6PLJ/134 W800C/100 ABØU/115 WDØHNQ/180
JA1NKA/159 JAØRWF/107 SMØMIW/107

Radiotelephone

DL3KCJ/106 JA1NKA/152 LU4DXU/180 VE3HIR/178 K2MFN/132 KU3T/100 W4CVX/111 W6PLJ/113 KC8MN/107
EA2BUF/117 JA3JAZ/187 OZ1FNR/100 YC3BXK/109 N2AVR/100 KZ3B/107 WD5BEV/141 W6RZO/168 W8LNL/119
G4SGV/100 JR3IIR/308 SM7DXQ/206 YU2QU/126 N2ESD/103 WB3JNC/101 WN5IPO/100 WA6MJM/100 KC9WF/105
G4ZZK/100 JH6QPD/262 SM7MPM/108 YU2WM/213 WA2MOE/297 K4JCA/107 AE6H/101 WA6PTC/104 N9ELY/110
GM2BUD/169 JA9BEK/115 SMØMIW/107 KA1GPR/109 WB2BGA/101 KI4KX/101 N6DYS/175 WB6UAN/102 W9DBJ/100
HC1RF/102 NP4TB/106 VE3CUI/131 W1FHP/194 WB2RNH/100 KV4B/147 W6MIT/101 NE7E/110 WDØHNQ/180

CW

DK8NB/107 OK3CEL/102 PY4AST/104 SM6GOR/146 W2KKZ/112 WB2GAI/135 N6OC/270 WD8DXN/101 NØDJJ/109
EA7LQ/106 PA3CWL/109 SM6CMR/110 YU2WM/187 W2VT/151 AE6H/102 AG7N/118 W9NNE/113 WØIJR/235
IK3GER/105 PA3DXO/109 SM6CUK/206 YU3MJ/100 WA2MZX/108 KZ6E/226 W8LRY/100 KAØCDN/236 WØUY/107
JR3IIR/228

RTTY

SV1IW/102 HB9BTQ/101 XE3ABC/102 WA7EGA/102

160 Meters

W6DAO

5BDXCC

DF3CB UZ4FWD W2TE CP1FQ K1KOB JA1SYY YU2WM KBØG VE3DLR
K5QY K6TMB W9YSX KX7E

Endorsements

Mixed

CT4BD/312 JA1SDV/290 KH6IJ/357 YS1SA/235 KY2W/260 WB3DNA/305 NJ5X/271 W7AHX/310 K9JDV/246
DF3UB/153 JA1SJV/304 LA9GV/312 YU1GTU/300 N2CIC/273 AA4D0/176 W5MCH/251 W7HPI/262 KD9BG/271
DL3IE/319 JA1SYY/313 OH2EE/311 YU2QU/217 N2DT/313 K4HHM/297 W5TCX/202 W7IYW/324 KE9A/304
DL6KG/333 JR1BLX/309 OH2VB/335 ZS1FD/200 NA2I/139 KC4OZ/207 WA5YON/154 WA7GVM/300 W9LNQ/336
DL6ON/152 JA2IVK/312 ON8HF/275 ZS6BCR/235 NA2M/292 KE4RX/310 WB5LBJ/DU/301 AG8B/312 W9NNE/315
DL9EM/224 JA5AUC/314 SM6CUK/264 AE1H/182 W2KKZ/252 KF4QD/176 K6GXO/306 K8BXD/150 W9TKV/356
DL9MAB/134 JA5EN/327 SM6EHY/179 K1FI/310 W2NY/305 KV4B/256 K6JGN/177 K8DYZ/342 KØGSV/323
F6GXB/288 JA6VA/328 SM6LPF/212 W1AW/292 W2SEG/224 W4AVY/351 K6MA/343 K8MC/298 KØQQ/311
G3ZRH/202 JA5JGY/279 SM7MPM/126 W1BWS/303 WA2DSC/261 W4WD/335 KT6T/288 K8VFV/307 KAØCDN/270
G4VZQ/149 JA6CNL/323 SM7TV/323 W1PEA/306 WA2SLK/123 WA4TLI/320 KZ6E/286 KX8W/306 KCØMS/246
GW4BLE/308 JA7IL/319 SV1PL/289 W1QV/318 WB2GHI/223 WD4KXM/178 W6EE/363 N8DE/314 KDØJL/229
HA8KVB/130 JH7DNO/311 VE3FRA/322 W1YN/297 K3TUP/331 WD4NBX/308 W6MEL/295 N8MC/309 KEØDV/227
HB9BKP/201 JA8XJF/320 VE6EO/248 WA1UDH/250 KB3OQ/302 WN4G/154 W6NPY/315 W8KMC/252 NAØY/349
I2BVG/320 JA9FPI/304 VE7EIK/199 AF2C/297 W3HER/236 KD5ZM/292 WA6TKT/250 W8RV/294 WØIJR/270
I2ZCE/125 JAØCAK/316 XE1HTT/144 K2JF/292 W3KYN/150 KF5EA/149 WB6DQP/233 W8ZD/347 WØYOY/310
I5UA/352 JRØAMD/126 XE1XF/280 KE2C/302 W3XX/324 N5TC/309 KE7X/239 WA8MLV/127 WØJMZ/319
I8WY/287 KH6BZF/297 XE3ABC/176 KX2A/152 WA3WIP/310 ND5R/303 N7MC/311

Radiotelephone

DL6KG/330 I2EOW/261 JA7IL/319 VE3EFX/249 KC2KU/289 W4CYC/325 WB5LBJ/DU/307 W7DSZ/306 W9LNQ/310
DL6QT/290 I2JQL/303 JH7DNO/309 VE4JK/300 KE2C/298 W4UW/298 K6GXO/301 W7HPI/262 W9NIO/270
DL9MAB/128 I2TZK/273 JA8XJF/319 XE1XF/277 KQ2O/270 WA4TLI/315 K6MA/309 W7JXP/200 W9NNE/297
EA1QF/312 I5UA/352 JA9FPI/292 XE1HTT/142 N2AWI/179 WD4KXM/177 KB6HW/212 WA7ZWG/305 W9TKD/339
EA7AG/300 I7KBI/314 JAØCAK/298 YC2GHE/154 N2CIC/273 WT4Z/149 KG6OU/202 AG8B/191 KØGSV/311
EA7EM/291 I8IGS/275 JRØAMD/126 YS1SA/235 NA2G/228 K5HT/245 KT6T/287 K8DR/338 KØIUC/313
EA7LQ/313 I8KNT/315 KH6BZF/294 ZS6BBP/331 KB3PJ/323 KD5BM/250 W6MND/265 K8DYZ/342 KØJPW/146
F6AFA/140 IC8EGO/314 LA8LF/338 ZS6BCR/188 WB3BGI/306 KD5ZM/292 W6SN/308 K8LZ/320 KØQQ/309
F6GXB/266 IT9YHR/265 LA9GV/312 K8IS/289 AA4MN/175 N5BCL/154 WA6QCO/175 K8VFV/307 KCØMS/245
F9JS/273 IØMBX/316 LU2AH/318 W1AW/234 AK4E/280 ND5N/307 WB6DQP/231 KC8CY/311 KDØFW/151
FØFIJ/201 JA1SDV/284 LX1CW/182 W1BWS/295 K4HHM/282 ND5R/303 WB6VSK/308 N8DE/280 NAØY/343
G4VZQ/149 JA1SJV/257 OD5SM/175 W1PEA/302 KC4OZ/202 NG5X/280 AI7M/199 WD8DXN/201 WØJMZ/314
I1FNX/316 JR1BLX/307 ON8HF/252 AF2C/284 KE4RX/309 NJ5X/270 KB7TW/262 KA9TNZ/175 WØYOY/282
I1HAG/318 JA6CNL/301 SM6LPF/180 K2SGH/305 W4AVY/333 NY5L/302 KB7UG/216 KU9I/315 WBØCIW/308
I1HYW/307 JA6VA/279 SMØCCM/317 KB2MK/250

CW

DF9HE/226 JA1SJV/182 OH2BN/297 SM6CVX/281 AF2C/197 K5YY/296 ND7K/151 KV8Q/155 KE9A/267
DL8AN/312 JA5AUC/252 OH3RF/251 SMØCCM/271 K2JF/250 N5TC/266 NQ7M/126 N8DE/256 W9LNQ/284
G4SSH/125 JA6CNL/251 ON6NW/219 TI4BGA/194 KE2C/212 WD5T/180 N7MC/267 W8KMC/234 W9ZM/311
I8WY/280 JA7IL/245 ON8HF/200 ZS6BCR/199 K4JYS/233 K6GXO/205 K8DYZ/306 WA8MLV/125 KØQQ/200
IT9ZGY/242 JA9FPL/147 OZ1EUO/245 W1BWS/275 K5CON/177 KE7X/239 K8ZH/304 WA8YTM/225 KMØQ/140
JA1SDV/128 KL7UR/127 SM6EHY/163 W1YN/257

RTTY

OE2SNL/149 W1DA/174 WØLYM/176

160 Meters

UT5AB/133 VE1YX/142

IARU News

Conducted By Richard L. Baldwin, W1RU
HC 60, Box 60, Waldoboro, ME 04572

Why the IARU?

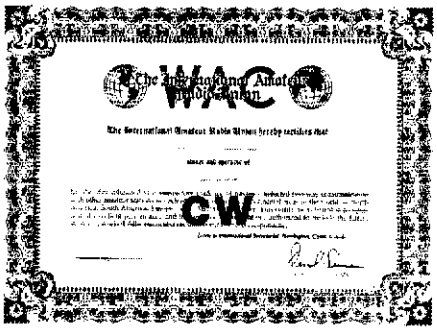
Every now and then we get a letter from a reader who says, "What *is* this IARU that you keep writing about?"

The International Amateur Radio Union (IARU) is a union of national Amateur Radio societies. You've all heard about the American Radio Relay League, the Japan Amateur Radio League, the Radio Society of Great Britain, the Chinese Radio Sports Association, the Wireless Institute of Australia (well, you've heard of them if you've been reading this magazine or this column)—they're all national Amateur Radio societies, representing Amateur Radio in their respective countries. There are some 125 of these national societies banded together, bonded together, in the IARU. Formed in 1925, IARU is now more than 60 years old. Through the years its character, its purpose, has gradually changed, with the change being more rapid in the last decade.

That's *what* IARU is. The *why* is more important.

In the earliest days of radio, when DX was 25 miles or so, what happened far beyond the horizon seemed to be of small importance to individual radio amateurs or to local groups of radio amateurs. This was not only because we couldn't hear each other for any great distance, but also because in those earlier days there was no international regulation of Amateur Radio.

In the early 1920s, radio amateurs discovered the value of the short waves, and all of a sudden Amateur Radio became international. Indeed, all of the radio services became international, and international telecommunications conferences began to regulate the radio services on an international basis. So, what happened on the regulatory front in Europe became important in North America and throughout the world.



The most visible benefit that individual amateurs can receive from the IARU is the Worked All Continents (WAC) certificate, issued through their national Amateur Radio society. Eight types of certificates and seven stickers are available for multi-band/mode operation. For detailed information on this award, US amateurs should send an SASE to ARRL; Canadian amateurs an SASE to CRRL.

Just remember, please, one very important fact: In the field of radio, nothing can be done in isolation. When you tickle the ionosphere in one country, it twitches all over the world. With radio waves, it's one world; to live together harmoniously, we have to work together cooperatively.

Obviously, we think, it is important that radio amateurs have some means for working together cooperatively throughout the world and for promoting the interests of Amateur Radio at international telecommunications conferences, where we come face to face with the other 37 radio services that inhabit the radio-frequency spectrum and who have their own problems to solve, their own axes to grind. So that's *why* we have an International Amateur Radio Union.

The basic strength of the IARU lies in the individual member-societies. They have the responsibility to represent Amateur Radio in their countries, to serve their members, to ensure that their individual administration supports the Amateur Radio Service. To coordinate these activities on a regional basis (Remember: Nothing can be done in isolation), we have the three IARU regional organizations, which meet triennially to discuss regional problems and regional solutions on a cooperative basis, always coordinating these discussions and decisions with the approaches taken in the other regions. Finally, we have the IARU Administrative Council, which attempts to coordinate the work of the IARU on an international basis, looking for ways to best serve Amateur Radio on an international basis.

Thus, while individual Amateur Radio societies obviously work hard to establish their own viewpoints, through the mechanism of the IARU we try to arrive at a common international approach that works to the benefit of all of us. United we stand, divided we fall. That philosophy in the IARU has worked remarkably well.

Amateur Satellite Communications

(continued from page 72)

indeed that some would hog-tie themselves with ineffective or no measures at all to hear all that's on the satellites. The ZRO Test seeks to provide a means of evaluating both objectively (in absolute terms) and relatively (compared to one's peers) how well one's satellite station really hears. In that sense it has been an outstanding success.

Not only will the ZRO Test continue as soon as possible on AO-10 and Phase 3C, but, as mentioned last month, the ZRO Test is destined to foster a whole new breed of on-satellite competitions in the tradition of techno-sport. Next time we'll look forward to the new breed of techno-sport activities planned for the future.

Notes

[1]Any device that is above absolute zero degrees (−273° C) generates noise that is attributable to thermal agitation of its molecules and other lesser effects.

[2]When your receiver is sufficiently sensitive and quiet, such that sky noise comprises the majority of the noise to which it is subject, the receive system is said to be "sky noise limited." This is the point of departure for further improvements obtained through increased antenna gain.

[3]G. F. McCanless, Jr, KA4GSQ, "Using *QST*s to Choose an Old HF Rig," *QST*, Feb 1987, p 20.

[4]Jeff Bishop, W7ID, holds the world record. He is the only one ever to earn a Z8 rating on the Mode B (2-m downlink) session of the ZRO Test. He used special home-brew antennas, but we suspect his real advantage was in the very narrow (about 40 Hz) audio filter and earphones he used.

Information about satellites and AMSAT can be obtained for an SASE to AMSAT NA, PO Box 27, Washington DC 20044.

Club Spectrum

Conducted By Lee Hayford, AH2W
Club Program Manager, ARRL

Let's Get Teenagers Interested in Ham Radio

The following is courtesy of James Priestly, KA1LIK, FARA, Public Relations Officer.

The Falmouth Amateur Radio Assn, Inc, West Falmouth, Massachusetts, took seriously the call to get young people involved in Amateur Radio. When I called League HQ and ordered 25 copies of *Archie's Ham Radio Adventure,* they were delivered quickly. The club put the comic books into local libraries for immediate use. When we presented public and school libraries with copies of *Archie's Ham Radio Adventure,* we discovered a definite need for current League publications. Most collections of League books were limited and badly out of date.

At our Board of Directors meeting, I pushed for three sets of League books gotten by the club at a special discount when the books are donated to a local library. Unfortunately, the Board could fund only one set of books this year at $90. But, an anonymous donor gave a second. The books will be presented at a public ceremony as soon as they arrive. Every club should investigate the card files at their local libraries and see how extensive their ham radio book collection is. Taking inventory of what volumes are needed to encourage young people to get into Amateur Radio would also be helpful.

Libraries, of course, are tax supported and have to limit spending. They often neglect to stock specialized volumes, and that includes Amateur Radio-related books. It then becomes important for radio clubs to fill this void by donating current Amateur Radio publications to their local libraries. This will give teenagers in your community the chance to read about Amateur Radio, and also give your club a chance to increase its membership.

What started out as a small public-relations effort in using the Archie Comic Book has grown into a major effort on the part of the FARA to attract new club members and recruit teenagers into our great hobby. FARA is a Special Service Club that believes in an active training program. We have gone one step farther to enlist new amateurs into the fun of ham radio. We invite all other radio clubs in the country to follow our lead.

CLUB SHOWS APPRECIATION

The following is courtesy of the Tri-Town Radio Amateur Club.

On November 7, 1986, Tri-Town Radio Amateur Club member Rich Bauer, N9DKO, of Park Forest, Illinois, was awarded a Certificate of Merit for outstanding service to the Amateur Radio community. Club President Jerry Bette, N9BMT, nominated Rich for this award, which is sponsored by ARRL HQ.

From left to right are David Lovering, N1CLC, FARA President; Joan Foster, Reference Librarian, Falmouth Public Library; and James J. Priestly, FARA Public Relations Officer. *(photo courtesy WB1DSG)*

Rich Bauer, N9DKO (left), accepts the Certificate of Merit from Tri-Town Radio Amateur Club President Jerry Bette, N9BMT. *(photo courtesy N9DDU)*

Rich, 36, edits the club newsletter, heads the Membership Committee and serves as Co-Chairman of the 1987 Field Day Committee. In addition, Rich serves as the unofficial head of the Publicity Committee and as club photographer. Rich has given his time to participating and organizing activities such as the American Cancer Society Bike-A-Thon, the Country Club Hills Silverfest and the annual Operation Santa Claus.

First licensed in 1982, Rich currently holds a General class ticket. His wife Donna, N9DKN, has held a Technician class license for the past 16 years. Rich enjoys working 2-meter FM and RTTY on 20 and 40 meters. He works as Deputy Director of a suburban Chicago regional public-safety communications center.

NOVICE ENHANCEMENT INFORMATION

By now you've probably heard that the Novice class exam will be expanded to at least 30 questions. The FCC wants to ensure that new Novices understand their upgraded operating privileges. Don't despair! By the time you read this, all ARRL-affiliated clubs and registered instructors should have received a packet of information about Novice Enhancement. Be on the lookout in your mailbox and the *ARRL Letter* for all the information you need to keep abreast of Novice Enhancement. In the meantime, check out this month's Happenings and the article on page 21.

The added incentive to join our hobby is now a reality; it's up to us to provide the materials and resources to the newcomers to keep that incentive alive.

Welcome, SSCs!

The following clubs have demonstrated their zeal for enhancing enjoyment of Amateur Radio and going the extra mile in serving their local communities. These clubs were granted Special Service Club status after demonstrating effective programs in six areas: (1) Public Relations, (2) Emergency Communications, (3) Training, (4) Technical Advancement, (5) Operating Activities and (6) ARRL Membership Recruitment. The number in parentheses is the number of club members.

Welcome aboard!

Hannibal ARC, Inc, Hannibal, MO (42)
Turlock ARC, Modesto, CA (130)
West Haven Amateur Repeater Assn, Inc, West Haven, CT (42)

The following renewing Special Service Clubs have reaffirmed their commitment:

Bartlesville ARC, Bartlesville, OK (82)
Delta ARC, Memphis, TN (206)
Granite State ARA, Bedford, NH (40)
Green Valley ARC, Green Valley, AZ (36)
Northern Ohio ARS, Lorain, OH (520)
San Antonio RC, San Antonio, TX (238)
Tulsa ARC, Tulsa, OK (65)

FM/RPT

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

The "New" 220-MHz Band

Our 220-MHz band has been rocked by a pair of FCC announcements made in the second week of February. On February 10, the FCC released the Report and Order that enhanced the operating privileges of Novice class amateurs. These enhanced privileges include part of the 220-MHz band. Then, on February 12, the FCC released a Notice of Proposed Rule Making (NPRM) that proposed to end the Amateur Radio allocation of the lower 2 MHz of the 220 band.

First, the Good News

As of March 21, 1987, Novices are permitted to transmit up to 25 watts between 222.1 to 223.91 MHz using all authorized emissions. Novices can use 220-MHz repeaters by transmitting on the repeater inputs in this part of the band and listening to the repeater outputs above it. (Nothing prohibits the automatic retransmission of a Novice station in any repeater subband, if the repeater is operated under the auspices of a holder of a Technician or higher class license.)

Novices are specifically prohibited from being the licensees or control operators of stations in repeater, auxiliary or beacon operation. Therefore, Novices are permitted to use 220-MHz repeaters, but they are not permitted to run them.

The 220-MHz privileges make the Novice ticket more attractive and, as a result, we should expect 220-MHz activity to increase at an even greater rate than ever before experienced in the history of the band. The level of activity may even compete with the 2-meter band. In a year or two, 220-MHz operations will be abundant, and no one will dare again try to swipe the 220-MHz repeater band by using the "lack of activity" excuse as the activity level approaches or even surpasses 2 meters.

Novices Want FM Radios

Throughout the amateur history of the 220-MHz band, there has been a dearth of commercial equipment. One reason for this is that in Japan, which is the source of a lot of our amateur equipment, there is no amateur allocation on 220 MHz. There is also no amateur band, and therefore no market, in Europe. Although things have improved lately, the amount of available commercial equipment still pales in comparison to what is available for 2 meters or 430 MHz, for that matter (2 meters and 430 MHz are allocated to Amateur Radio in Japan and Europe).

The influx of Novices on 220 MHz should turn this situation around. The demand for 220-MHz equipment will increase multifold, and you can expect the radio manufacturers to respond to the demand. (Perhaps, there will even be triband hand-held transceivers in our future!)

Now, the Bad News

In its NPRM (General Docket No. 87-14), the FCC proposes to allocate 220 to 222 MHz exclusively to the land mobile service and to allocate 222 to 225 MHz exclusively to Amateur Radio. The proposed exclusive allocation of 222 to 225 MHz is a step in the right direction, as hams currently share this segment of 220 MHz; however, it hardly offsets the deletion of Amateur Radio's 220- to 222-MHz allocation.

The FCC's justification for taking away our 220 to 222 MHz allocation is the "lack of activity" argument. According to the FCC, "...the loading of this band (220-225 MHz) is light in comparison with the 144-148 MHz amateur band, which supports similar operations."

The full text of their Notice of Proposed Rule Making begins on page 16.

The Crunch

Were this proposal to become reality, high-speed packet radio, control links, moonbounce and weak-signal operation would be hard-pressed to find space in the 222-225 MHz portion of the band. The reason is that this is FM voice repeater country. Repeater inputs start just above 222 MHz, and outputs end at 224.98 MHz. Add thousands of Novices exercising their new privileges, and there is no room left at the 220-MHz Inn for anything but repeater operations.

Comments concerning this NPRM must be filed on or before April 6, 1987, so time is running out for a lot of important Amateur Radio activity between 220 and 222 MHz that will have no place to go if the FCC allows the land mobile service to take over. See It Seems to Us, elsewhere in this issue, for information on how to tell the FCC about this activity. We have to convince them that 220 to 222 MHz is critical to our present and future needs to operate in the public interest.

NORTHERN NEVADA FREQUENCY COORDINATION

CARCON (Combined Amateur Relay Council of Nevada) has been reactivated to coordinate repeater, remote base and packet-radio operations in Northern Nevada, ie, all areas in Nevada located north of Tonopah. (R. Scott Fowler, WA7GIV, is the frequency coordinator for Southern Nevada.) CARCON was originally formed in June 1976 and currently has 15 member organizations. If you need information or desire frequency coordination (whether or not you are a member), please contact CARCON at PO Box 7523, Reno, NV 89510-7523.

REPEATER LOG

According to December 1986 reports received, repeaters were involved in the following public-service events: 375 vehicular emergencies, 37 public-safety events, 23 medical emergencies, 12 fire emergencies, 7 drills/alerts, 5 power failures, 4 criminal activities and 2 weather emergencies.

The following repeaters were involved (followed by the number of events): W2VL 43, NK2W 9, WA2ZWP 5, W4BFB 3, WA4BVW 31, WA6BJY 10, WD6DIH 14, KA6EEK 60, W6FNO 262, K8DDG 7, K9LSB 20, WØBLK 1.

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*.

Club Contest Rules	Jan 1987, p 81	Novice Enhancement Report and Order	This issue, p 64
DX Contest Awards Program	Feb 1987, p 82	QSL Bureaus	
Golden Jubilee of DXCC Award	Sep 1986, p 60	Incoming	Dec 1986, p 57
Hamfest Calendar Rules	Sep 1986, p 84	Outgoing	Mar 1987, p 67
Ham Radio-Related Landline BBSs	Nov 1986, p 58	Reciprocal-Operating Agreements	Dec 1986, p 53
License-Renewal Information	Jan 1987, p 62	Terrestrial World DX Records (50 MHz-47 GHz)	Mar 1987, p 78
Major ARRL Operating Events and Conventions—1987	Jan 1987, p 57	Third-Party-Traffic Agreements	Dec 1986, p 53

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

Horn Antennas for 10 GHz

The horn antenna is the easiest antenna for the beginner on 10 GHz to construct. It can be made out of readily available flat sheet brass. Since it is inherently a broadband structure, minor constructional errors can be tolerated. The horn's one drawback is that it becomes inconveniently large at gains over about 25 dB, but for most line-of-sight work such gains are not required anyway. This month I will describe how horn antennas work, and next month I'll give complete details so you can build one yourself.

It is worth taking a little time to understand how small horns work and what their limitations are. Horn antennas are usually fed by waveguide. When operating in its normal frequency range, waveguide propagation is in the TE_{10} mode. This means that the electric (E) field is across the short dimension of the guide and the magnetic (H) field is across the wide dimension. This gives rise to the terminology E-plane and H-plane, as shown in Fig 1.

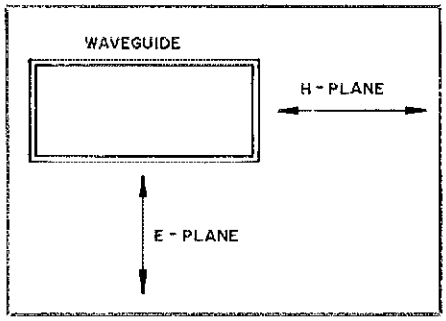


Fig 1—10-GHz antennas are usually fed with waveguide. See text for a discussion of waveguide propagation characteristics.

Horn antennas can be of many types. If the waveguide is flared out only in the H-plane, the horn is called an H-plane sectoral horn. Similarly if the flare is only in the E-plane, an E-plane sectoral horn results. If the flare is in both planes, the antenna is called a pyramidal horn.

For a horn of any given aperture, directivity (gain along the axis) is at a maximum when the field distribution across the aperture is uniform in magnitude and phase. When they are not uniform, side lobes will occur, which will reduce the directivity (gain along the axis) of the antenna. To obtain a uniform distribution, the horn should be as long as possible with minimum flare angle. From a practical point of view, however, the horn should be as short as possible, so an obvious conflict occurs between performance and convenience.

Fig 2 shows the problem. For a given aperture and a given length, there is a path-length difference from the apex of the horn to the center of the aperture (L') and from

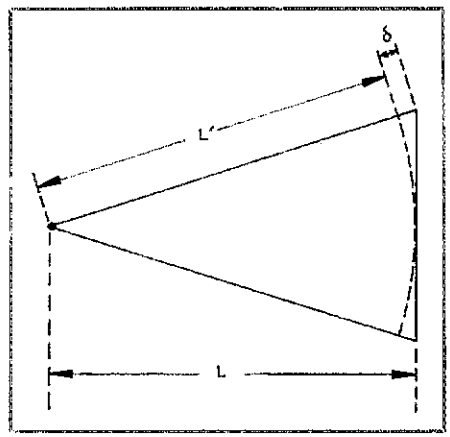


Fig 2—The path-length (phase) difference between the center and edge of a horn antenna is δ.

the apex of the horn to the edge of the aperture (L). This causes a phase difference in the field across the aperture, which in turn gives rise to side lobes and, consequently, lowers the directivity. When L is large, this difference is small, and the field is almost uniform. As L decreases, the phase difference increases and directivity suffers. An optimum (shortest possible) horn is constructed so that this phase difference is the maximum allowable before side lobes become excessive and axial gain decreases.

The magnitude of this permissible phase difference is different for E-plane and H-plane horns. In the E-plane horn, the field intensity is quite constant across the aperture. In the H-plane horn, the field tapers to zero at the edge. Consequently, the phase difference at the edge of the aperture in the E-plane horn is more critical and should be held to less than 90 degrees (0.25 wavelength). In an H-plane horn, the allowable phase difference is 144 degrees (0.4 wavelength). When the aperture of a pyramidal horn exceeds one wavelength in both planes, then the E-plane and H-plane patterns are substantially independent and can be analyzed separately.

Assuming that the waveguide feed is oriented in the usual direction (broad face horizontal—vertical polarization), the H-plane sectoral horn has a narrow horizontal beamwidth and a very wide vertical beamwidth. This is not a very useful beam pattern for most amateur applications. The E-plane sectoral horn has a narrow vertical beamwidth and a wide horizontal beamwidth. Such an antenna pattern could be useful in a beacon system where wide coverage is desired. The most useful form of the horn for general applications is the optimum pyramidal horn. In this configuration the two beamwidths are almost the same. The E-plane (vertical) beamwidth is slightly less than the H-plane (horizontal) and also has greater side lobe intensity.

A 10-GHz pyramidal horn with 18.5-dBi gain is shown in Fig 3. Next month, I'll tell you all you need to know to duplicate this antenna.

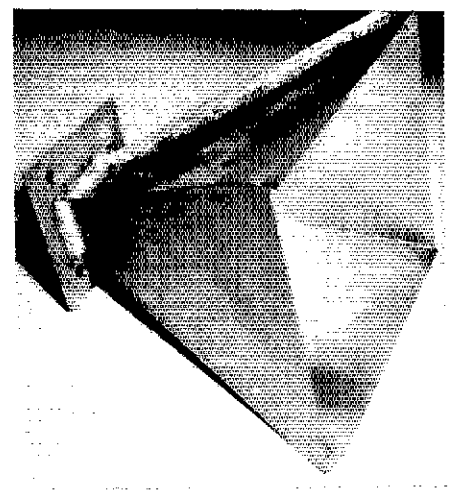


Fig 3—This pyramidal horn has 18.5-dBi gain at 10 GHz. Construction details will be given next month.

10-GHz SSB PRESENTATION

Ernst Willert, N6IDN, has sent along the following information. A presentation on "10 GHz SSB for the Homebrewer" will be given during the 1987 Dayton Hamvention® by Juergen Dahms, DCØDA. Juergen is the conceptual engineer for equipment manufactured by SSB Electronics, a West German firm that sells amateur equipment for VHF, UHF and microwave bands. He will be accompanied by Bernd Bartkowiak, DK1VA, the SSB Electronics manager. Juergen will describe a transverter that eventually led to the commercial design of the SSB Electronics 10-GHz-to-144-MHz transverter modules that offer 200-mW output and a 2.5 dB noise figure at 10 GHz. Ernst says that he will assist Juergen as a moderator/translator. This should be a good one. Ernst points out that he has seen this presentation at a convention in West Germany and that it truly is keyed to the home experimenter and builder. QST

Canadian NewsFronts

Conducted By Harry MacLean, VE3GRO
500 Riverside Dr, London, ON N6H 2R7
Tel 519-473-1668

VE VE Program?

Sweaty palms at the old DOC office four times a year: It may soon be a thing of the past. Early in February, Mitch Powell, VE3OT, an Amateur Radio instructor at Fanshawe College, London, Ontario (Mitch is known to many of you; he served as CRRL President from 1980 to 1983), became the first Canadian amateur to administer DOC Amateur Radio examinations without involvement by DOC. The examination session was part of a DOC pilot project being conducted in Ontario and Quebec, and one of a number of ways that DOC is thinking of conducting Amateur Radio examinations in the future. Options being considered include (1) having a DOC regional or district office set examinations, but having volunteer amateur examiners administer and mark them; (2) having volunteer amateur examiners also set the examinations, drawing 50 multiple-choice theory questions and 25 multiple-choice regulations questions from DOC's recently developed bank of over 800 questions, soon to be placed in the public domain; (3) limiting volunteer amateur examiners to those approved by DOC; (4) limiting volunteer amateur examiners to bona fide Amateur Radio instructors; and (5) still having DOC regional and district offices administer and mark Amateur Radio examinations where volunteer amateur examiners are not available.

What would be the advantages of a new system? Examinations could be conducted in evenings or on weekends, at times convenient for the examination candidates. They could be conducted in places where the candidates could feel at ease and do their best. And DOC would be able to cut its costs, hopefully averting examination fees and future increases in our license fees.

When might a new system begin? According to DOC, as early as June 01 of this year.

Mitch Powell, VE3OT, passes out examination papers at Canada's first Amateur Radio examinations *not* conducted by DOC.

SECTION MANAGER ELECTION NOTICE

To all CRRL members in the British Columbia Section: You are hereby solicited for nominating petitions pursuant to an election for Section Manager. Name of the incumbent appears on page 8 of this *QST*. A petition, to be valid, must carry the signatures of five or more Full members of the League residing in the British Columbia Section. It is advisable to have more than five signatures. Photocopied signatures are not acceptable. Signatures must be on the petition. Petition forms, FSD-129-C are available from the CRRL Headquarters office in London, Ontario, but are not required. The following form is acceptable:

(Place and date)
CRRL Secretary Box 7009, Station E
London, ON N5Y 4J9

We, the undersigned Full members of the League residing in the British Columbia Section, hereby nominate...(name and call sign) as Section Manager for this Section for the next two-year term of office....(signatures and call signs) ...(addresses including postal codes)

A Section Manager must be a resident of his or her Section and a licensed radio amateur holding a Canadian Amateur Certificate or higher, and have been a CRRL Full member for a continuous term of two years at the time of nomination. Petitions will be received at the CRRL Headquarters office until 1600 EDT 1987 June 05. If only one valid petition is received, the person nominated will be declared elected. If more than one valid petition is received, a ballotted election will take place. Ballots will be mailed from CRRL Headquarters on or just before 1987 July 01. Returns will be counted after 1987 August 14. A Section Manager elected as a result of these procedures will serve for a two-year term, to begin on 1987 October 01.

If no valid petition is received, the British Columbia Section will be resolicited in 1987 October and November *QST*. You are urged to take the initiative and file a nominating petition immediately.

Harry MacLean, VE3GRO
CRRL
Secretary

NOTES FROM ALL OVER

☐ Early in February, representatives of CRRL and CARF joined DOC in Ottawa to meet with a delegation from Japan that included representatives of Japan's Ministry of Posts and Telecommunications (MPT), Japan Amateur Radio League, Japan's *CQ* magazine and the Trio-Kenwood Corporation. Purpose of the meeting: to discuss implementation of the new reciprocal-licensing agreement between Canada and Japan, and to discuss Canadian regulations and policies regarding phone patches and, in particular, autopatch. These are not allowed in Japan at this time. Autopatch would be an interesting challenge in Japan, where telephone companies charge by the call rather than on a flat rate, as in North America. CRRL and CARF also used the meeting to ask the Japanese delegation to consider implementing a third-party-traffic agreement with Canada. Time will tell if this is a possibility.

☐ CRRL representatives were able to meet with the Japanese delegation before the "official" meeting with DOC. They were delighted to be presented with a new hand-held transceiver, a gift from the Trio-Kenwood Corporation and the Japan Amateur Radio League. The transceiver is now on monitoring duty at the CRRL Headquarters office in London, Ontario.

☐ Following the meeting with the Japanese delegation, representatives of CRRL and CARF held informal discussions with DOC. What was learned? DOC is trying to get permission to bypass normal procedures so it can effect a regulations change that would give Canadian amateurs access to the 18- and 24-MHz bands by the middle of this year. Nothing will be done on *Restructuring the Amateur Service* for at least a year. Despite submissions by CRRL and others, DOC is considering a proposal that would do away with special call-sign prefixes for special events. Apparently, there is some concern that special prefix call signs may not be legal.

The Japanese delegation in Ottawa. From left to right: JH1ISF, Yoshihiro Nagamori of Japan's MPT, JA1CLN, JA1HQG and JA1CB.

On Line

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

The PX Story

The On Line Program Exchange (PX) was inaugurated in the second installment of this column, in the October 1981 issue of *QST*. From the beginning, the purpose of PX has been to permit Amateur Radio computer hobbyists to exchange their programming ideas with their fellow hams. As stated in the premiere of PX, "A primary purpose of On Line is to exchange ideas. Computer hobbyists often implement their best ideas in the programs that they write. So On Line will regularly conduct a program exchange, or PX, in which readers may obtain listings of Amateur-Radio related programs submitted to PX by other readers."

Five and one-half years later, 149 Amateur Radio programs have been distributed via PX. The programs come in a variety of sizes and functions—a real potpourri of Amateur Radio software that includes programs to generate Morse code practice, calculate antenna bearings, design antennas, keep records, calculate MUF, transmit and receive RTTY, dupe logs, locate VUCC grids, log contests, transmit and receive CW, and generate QSLs. Written for 34 different computers, from the Sinclair mini-microcomputer to the VAX mainframe, the cost of each program is a mere SASE. What a deal! Thousands of hams have taken advantage of the program exchange, so we must be doing something right.

Most of the programs are written in BASIC and, as a result, they can be converted to run on any computer that has a version of BASIC. The only obstacles to such conversions are programs that use computer-specific BASIC statements and commands, such as PEEKs and POKEs to the computer's memory, CALLs to machine language routines, machine-specific I/O and graphic manipulations.

Many program authors have generously made their programs available for distribution via PX. These authors are willing to answer your questions concerning their programs. If you write to a PX program author, please include an SASE to facilitate the author's answer to your question.

Welcoming Your Submissions

PX is looking for a few good programs. Packet-radio programs are much in demand today. If you have written a packet-radio or other ham radio application program for your computer and would like to share it with other hams, PX provides an excellent way of reaching that end.

If you submit a program for PX to ARRL, please print the program listing directly from the computer; do not transcribe it from the computer display (handwritten listings should be used as a last resort). To facilitate photocopying, print the program listing using a fresh printer ribbon. Also, use 8½- × 11-inch white paper with at least ½-inch margins at the top, bottom and sides of each page.

Filling Your Requests

HQ is happy to make computer programs available to readers of On Line; however, in order for your requests to be filled quickly and efficiently, please follow these rules:

1) Send a separate SASE for each program you request. For example, if you request three programs, send three SASEs.

2) Request PX programs by their program number; write the number on the lower-left corner of the SASE. If the program number is not specified, the request will be delayed.

3) Send all requests to ARRL, Dept PX, 225 Main St, Newington, CT 06111 (CRRL members should send their requests to CRRL, PO Box 7009, Stn E, London ON N5Y 4J9). Do not send your requests to Stan Horzepa, WA1LOU. I do not have the means to make copies of the programs for PX distribution. If you'd like to make comments not directly related to PX, however, write to me at the address listed at the top of each installment of the column.

Keep those listings and SASEs coming!

PX: Five for 100

This installment of PX offers five BASIC programs for the versatile Radio Shack TRS-80 Model 100 laptop computer.

Program 145 sets the time and date of a TNC 2-compatible terminal node controller connected to the Model 100. It was written by Jim Gerritz, WA4FMA.

Program 146 calculates antenna lengths and was written by Theodore H. Jenson, KE6WF.

Program 147 logs and dupes the ARRL Sweepstakes contest, and Program 148 dupes the Sweepstakes log. Both programs were written by Jay R. Holcomb, WAØWWW (56 cents postage).

Program 149 is a CW sending program. It was written by Joseph C. Strolin, K1REC.

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

A list of all 149 programs in the PX library is also available by sending a business-size SASE with 22 cents postage to ARRL, Dept PX, 225 Main St, Newington, CT 06111.

NEW SOFTWARE

☐ The WA9GFR RF Engineering Software Disk 1 contains three programs that are useful to the Amateur Radio operator and RF engineer. "Smith Chart" calculates and plots Smith Charts in any imaginable configuration. "HF Propagation" calculates ground-wave propagation from 3 to 50 MHz for various paths and polarizations. "VHF/UHF/L-Band Propagation" calculates air-to-air, air-to-ground and ground-to-ground propagation from 100 MHz to 3 GHz. The three programs are available in two versions: One version runs on the Commodore 64®, and the other is for the IBM® PC and PC-compatibles running MS-DOS® and BASICA. Either version is available for $15 from Lynn A. Gerig, WA9GFR, RR 1, Morgan Rd, Monroeville, IN 46773.

☐ Jack Baldwin, VE7RG, has converted his TRS-80® Model III DXCC award tracking program (PX program number 102) for the IBM PC and PC-compatibles. Jack has also written a new TRS-80 Model III program called MUFSCAN, which provides MUF predictions for all 40 zones or up to 39 specific locations. Any of the three programs may be obtained by sending Jack a blank diskette and an SASE or $5 without a diskette and SASE. Jack's summer address is Box 598, Stn A, Kelowna, BC V1Y 7P2, Canada; his winter address is 2423 W Tucana St, Tucson, AZ 85745.

10-MHz AMTOR

Roy Erismann, HB9BJJ, reports that the following European AMTOR stations are on 10 MHz all of the time and may be called at any time to permit easy verification of 10-MHz transatlantic propagation:

Call Sign	*Mark Frequency, Zero Beat*
G3PLX (GPLX)	10.140 and 10.141 MHz
LA9OK (LAOK)	10.146 MHz
HB9AK (HBAK)	10.146 MHz
HB9BJJ (HBJJ)	10.142 and 10.146 MHz

HELP

☐ Richard Dunklee, WA2ONM (220 Washington Ave, Laurel Springs, NJ 08021), needs help converting the WEFAX program from March 1986 *QST* to run on an Apple® IIc computer with a super serial card and an Epson FX-80 dot-matrix printer. Richard is also looking for a FAX program that allows him to save pictures on disk and to display the pictures prior to printing.

☐ Bob Lombardi, WB4EHS (1874 Palmer Dr, Melbourne, FL 32935), is looking for ham radio applications programs for his Sanyo MBC-550 (MS-DOS) computer.

☐ Mitch Mitchell, WA4OSR (PO Box 8221, Mobile, AL 36689-0221), has recently acquired a Sinclair QL computer and is looking for any ham radio software for the QL. Mitch is also interested in starting an informal ham radio QL newsletter, which would simply consist of copying and redistributing any correspondence received concerning QL ham radio applications. Anyone wishing to participate in the newsletter should include an SASE with their letter to Mitch.

☐ Ed Marriner, W6XM (528 Colima St, LaJolla, CA 92037), wants to correspond with hams who are using the Commodore 64 computer with an MW-350 interface and a Gemini 10X printer.

Silent Keys

Administered by Nancy A. Slipski

It is with deep regret that we record the passing of these amateurs:

W1BIO, George W. Brown, Halifax, MA
KA1GAE, Robert C. Howard, Gloucester, MA
W1GQ, George T. Coombs, Castine, ME
KK1I, Paul E. Champagne, Lowell, MA
W1JWV, Howard H. Cutting, Springfield, MA
W1KTT, Calvin A. Sherman, Rockland, ME
W1LST, Harold R. Frantz, Peabody, MA
W1MJZ, Henry T. Perka, Groton, CT
W1MTS, Victor E. Penney, Alton Bay, NH
W1SCY, Norman E. Smith, Union, ME
WA1THH, John J. Fryer, Lowell, MA
W1TL, Samuel G. Stiness, Pawtucket, RI
N2FQ, James E. French, Ballston Spa, NY
W2GBK, Kay C. Nuttall, Jamestown, NY
K2JOA, Brendan Albert Dooley, Oakdale, NY
WA2LHY, Florence J. Daley, Vero Beach, FL
WA2LRK, Al Schnitzer, Califon, NJ
W2MYN, Robert J. Faling, Tonawanda, NY
WA2NUD, Robert M. Johnson, Vestal, NY
K3AC, Malcolm Williams, Rockville, MD
K3BAK, Lorraine M. (McClain) Stocks, Shallotte, NC
N3BO, Walter G. Young, Seaford, DE
*K3DAP, William F. Bruce, North Wales, PA
N3DHW, Donald L. Schmalz, Somerset, PA
WA3FNS, Glenn E. Mason, Port Vue, PA
WB3HFZ, Frederick R. Goslaw, Victorville, CA
W3IFD, John J. Kimball, Jr, Marathon, FL
WB3KAO, Richard N. Dellinger, Sr, Lebanon, PA
KA3KZC, Richard J. Kownacki, Baden, PA
W3ONX, Ray E. Knestrick, Jr, Washington, PA
K3OQG, Richard B. Hain, Sr, Malvern, PA
W3RKN, Paul L. Leese, Lancaster, PA
W3SHW, Karl F. Oerlein, Annapolis, MD
K3SJO, Vincent Gerald, Luzerne, PA
W3ZU, Donald J. Detwiler, Keymar, MD
W4BEB, Thomas H. Todd, Sr, Tuscaloosa, AL
W4JIR, Woodrow W. Zellers, Floral City, FL
WA4IXX, William F. Bultman, Jr, Sumter, SC
W4JRA, Raymond J. Rieger, Louisville, KY
W4JWO, H. Edwin Mitchell, Marietta, GA
KB4KJV, George M. Welch, Sr, Bonita Springs, FL
W4MCB, Silas F. Tremain, Interlachen, FL
W4OUJ, Melvin "Mickey" R. Cochrane, Ocala, FL
KA4ULZ, La Verne M. Weiss, Boca Raton, FL
K4WR, Dale C. Donner, Venice, FL
KD4XK, William E. Magie, Hill City, SD
KA4YNC, Beverly M. Wall, Mocksville, NC
W4YPZ, Rueben F. James, Concord, NC
WB5BPL, Robert C. King, Kingston, OK
K5DEC, Walter R. Whitcomb, Oklahoma City, OK
KB5DH, Jules F. Robertson, Pineville, LA
W5DZB, Bernice M. Doyle, Roswell, NM
N5EW, Ellsworth A. Weinberg, Dallas, TX
K5KOS, John P. McNutt, Jr, Okumlgee, OK
W5NSS, James H. Fulford, Teague, TX
K5TRZ, Arthur W. Lindstrom, Arcola, IL
W5WJQ, Evert B. Halbach, Thibodaux, LA
WB6AEE, George P. Roberts, Napa, CA
WA6CSP, George C. Jeffus, Mojave, CA
N6DFW, John Sarnataro, Grants Pass, OR
W6DHZ, David Sheffet, Indian Wells, CA
W6DVL, Roy F. McDonald, Sanger, CA
W6EQQ, Edwin C. Heuer, Eureka, CA
WD6ESD, Howard J. Schmidt, Garden Grove, CA
KB6ESM, Kenneth H. Green, Yucca Valley, CA
KG6ET, Jack E. Woodward, Alhambra, CA
W6JMI, Robert J. Hagerty, Hemet, CA
W6JNV, Walter H. Long, San Luis Obispo, CA
WB6KFC, David H. Minton, Rancho Cordova, CA
WA6MFL, Catherine T. Scully, Bishop, CA
W6OOU, Alfred M. Faries, Satellite Beach, FL
KH6TR, Edwin I. De Long, Pahoa, HI
W6TWW, Bruce F. Brown, Campbell, CA
WA6UMU, Robert Harris, Auberry, CA
W6WBT, Frederic C. Jacob, Davis, CA
W6WPY, Robert O. Hartley, Torrance, CA
W6YGT, Paul M. Brewer, Trinity Center, CA
WA6ZJM, Glenn W. Rogers, Palmdale, CA
W7CA, William J. Lozott, Seattle, WA
W7CFK, Arnold N. Morton, Poulsbo, WA
WB7CWT, Augustus A. Henry, Reno, NV
W7NJB, Rex L. Vance, Salt Lake City, UT
KA7PKJ, Russell Winn, Deming, NM
K7SD, Stuart B. Davison, Boise, ID
W7ST, Henry H. Fletcher, Pocatello, ID
N8BOD, Edward L. Henderson, Birmingham, MI
WD8DOX, Bernard Miller, Jr, South Lyon, MI
K8EBO, Charles W. Brown, Quincy, OH
K8HMZ, Elmer W. Soldan, Detroit, MI
W8MDX, Edward G. Enderle, Columbus, OH
W8QFU, James E. Enderle, Columbus, OH
W8RNM, Paul M. Kean, Columbus, OH
KA8TFA, Lester Biederman, Travers City, MI
W9CUV, Lawrence J. Lynch, Monticello, IL
K9CWL, Edward Ford, Godfrey, IL
KA9GVW, Raymond M. Klinkosh, Milwaukee, WI
W9LJY, Jules A. Dysland, McFarland, WI
KA9NBH, Vernon Range, Rochelle, IL
W9NUY, Clarence K. Gittings, Cameron, IL
W9OFL, Lester H. Miller, Waupun, WI
WA9SDL, Maurice L. Lortz, Indianapolis, IN
W9YID, Edward A. Tebow, Grafton, IL
NØAWU, Donald R. Stodden, Wheat Ridge, CO
WØCKH, Adolph L. Sahs, Iowa City, IA
KØDGP, Elmer G. Pettker, St Louis, MO
NMØD, Verne A. Anway, Verndale, MN
WDØDZK, William F. Devine, St Louis, MO
WØNSJ, George W. Saylor, Minnetonka, MN
KAØPTC, Ross F. Babcock, Arvada, CO
WØQQ, Mertin W. Reeves, Branson, MO
DC7AS, Alexander Schoening, Berlin, Fed Rep of Germany
ZL1PN, W. J. Briden, Auckland, New Zealand

*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

April 1937

☐ "In the Public Interest, Convenience and Necessity" titles Clint DeSoto's engrossing account of amateur emergency work in the flooded Ohio River valley the end of January. Called by officials the greatest emergency since World War I, it was also the greatest contribution to public service in amateur radio's history. Stories of heroism abound in the 18 pages of text which summarize our accomplishments, from the first disruption of telephone service in Pittsburgh all along the Ohio to Cairo, Illinois, and beyond.

☐ We had our faults, of course. Hundreds of over-eager amateurs (your scribe included) from outlying areas called into the nets seeking to be of help, but only causing QRM for those on the scene. With League coordination, F.C.C. ordered a ban on all amateur operation below 4 Mc. except actual disaster communication.

☐ Because of our large numbers, and because police and utility radio is still in infancy, we amateurs constitute the logical bulwark for disaster relief communication. The editorial welcomes the Commission's current analysis of the situation with a view to improvement, but warns that any government restrictions or official control could destroy the spirit so essential to our service, and that true improvement should come from ourselves and within our own structure.

☐ It's rather difficult to rotate a rhombic, but W6AUX and W6CNX accomplished a bit of that objective by using guys on pulleys for the side mounts, permitting alteration of the shape of the diamond and resultant change in the vertical pattern.

☐ F.C.C. figures for the last fiscal year show 46,850 amateur stations on the rolls. Some 11,000 applicants took the code and written tests, with 78% passing.

☐ Hundreds of messages were received at Hq. from members who copied the special commemoration tribute by President W8CMP on the first anniversary of the passing of our founder, Hiram Percy Maxim. We note W1JMY, W1JPE (now W1DX) and W1IKE (W1RU) among the Connecticut stations assisting W1AW in handling the volume of hamgrams.

☐ Fearful that power output is becoming more important to us than the basic aim of frequency stability when using crystal control, Technical Editor Jim Lamb has made a survey of pentode and beam power tubes as crystal oscillators for both fundamental and second harmonic output. If you can light a neon bulb from your crystal mount, better read this!

☐ With school graduations proliferating in the next month or so, many of our youngsters in ham radio are faced with the question, "Should you choose radio engineering as a career?" F. D. Merrill, Jr., provides some practical suggestions for determining one's vocational fitness, and a procedure of self-examination to aid in making such an important decision.

25 Years Ago

April 1962

☐ FCC has again proposed license application fees for its various radio services, that for amateurs being set at $5. The Editor takes issue, pointing out that we can—and do—stand a "fair and equitable" share of the cost of regulation through supervising a majority of all exams, self-policing, and assisting investigative responsibility by, e.g., TVI committees. Besides, he argues, processing an application hardly costs $5, and the difference between that figure and the true cost of perhaps $1 is a tax, not a fee.

☐ To obtain a suitable Yagi match, without using the effective but weather-susceptible gamma system, W9YRV and W9RWZ have developed a "hairpin" match which splits and loads the center of the driven element.

☐ A second Echo balloon satellite, soon to be launched, is larger and will provide a better chance for amateurs to bounce v.h.f. signals. K2QBW points out that it will take high power and the best of equipment, but the possibility is there. W1HDQ adds some info on 136-Mc. beacons such satellites carry, and simple means to monitor them.

☐ W1NJM's summary of the 1961 Simulated Emergency Test is upbeat, and shows a resurgence of amateur public service interest and activity after some low points in recent years.

☐ As our ranks grow, each month there are hundreds of newcomers who need help, particularly in how to avoid radiation of spurious signals. W1ICP does the job once again, with tips on tuning and matching, plus a chart of crystal frequencies for Novice use showing the most susceptible ranges.

☐ "Every Member Get a Member" is the slogan for a new campaign to build League membership, and a special application insert provides the tool. Those who add another to our roster will receive a special "ARRL Booster" lapel pin.

☐ Bill Welsh, W1SAD, was chosen winner of the 1961 Edison Award, sponsored by the General Electric Company, for his public service in training some 2800 persons to obtain amateur licenses. In this issue, Bill provides useful tips for others who would conduct similar courses.

☐ Assistant Army MARS Chief K4KNV describes the setup at K4USA-K4AF in the Pentagon as "the most prominently and publicly displayed amateur radio station in the world."—*W1RW*

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.

The "New" Microwave Standings Box

Years ago, the 23 cm (or as most of us know it, the 1296) standings box was published along with the 70 cm, or 432, listing. In fact, the 220-MHz listing was, at one time, carried along with the other two. In the past several years, the 23 cm began appearing by itself. And then, as activity on the next band above it began to rise, the 13-cm standings started to appear along with those for 23 cm. Now we have a new band at 33 cm, and its use should certainly be encouraged. Therefore, even though activity is spotty so far, it is fitting that it be added. In order to encourage activity on the higher bands, they will be carried as well. Thus, it seems appropriate to call this the Microwave Standings and recognize all "worthy" work above 902 MHz.

What level and type of accomplishment is "worthy" of being listed? Certainly, states cannot be the deciding factor. If it's based on grid squares, what should the minimum number be? By carefully positioning oneself and sending out a rover, it's quite possible to work four squares, while working as little as a few feet! Thus, I'm going to get arbitrary, which is sometimes necessary in conducting this column, and establish a distance threshold of 100 miles. You must have made at least one contact of 100 miles or more in order to become listed for the particular band. So, remember to include your best DX in your report, even though the reporting forms no longer call for this data. This is an item often omitted by those submitting reports for the 23-cm and nearby bands. Please also include the number of grids worked as well as the number of call areas. Please note the definition of call areas appearing at the head of each box.

Let's hope that publicizing the accomplishments achieved on the microwave bands will lead to keen competition and still more activity. So, watch the Microwave Standings twice per year for a picture of what is being done on these bands and read KA1GT's The New Frontier column for insights into equipment and techniques for these valuable and exciting frequency assignments.

Microwave Standings

Listings are call, state, US states worked, call areas worked, grids worked and best terrestrial DX worked in miles. Call areas are the 10 US call areas plus KH6 and KL7, plus each VE and XE call area, plus DXCC countries not located within the continental limits of the US, Canada or Mexico. In order to make the standings a true reflection of stations currently active on the bands above 902 MHz, those not reporting activity within the past two years are subject to being dropped. They will be reinstated upon written presentation of continuing activity. It is not necessary to have worked additional states or grids in order to remain in the standings or be reinstated, merely an indication of continued activity and interest. Compiled February 10, 1987. Deadline for next update is August 5, 1987.

33 cm

W1JR	MA	8	3	9	268
W1RIL	MA	7	3	6	—
AF1T	NH	6	3	—	300
W2PGC	NY	1	2	3	478
WS4F	GA	1	1	1	140
VE3LNX	ON	3	—	4	—

23 cm

W2SZ/1	MA	17	8	34	—
K1FO	CT	15	7	21	468
W1RIL	MA	14	6	21	450
W1JR	MA	13	8	31	655
K1PXE	CT	13	5	—	448
AF1T	NH	10	4	—	350
K1LPS	VT	7	5	—	288
WA1OUB	NH	7	4	13	379
W1QXX	MA	6	3	—	260
K2UYH*	NJ	25	32	—	770
WA2LTM*	NJ	17	6	—	770
W2VC	NJ	16	7	26	537
W2PGC	NY	12	8	22	960
K2YCO	NY	11	8	—	570
N2BJ	NY	11	5	17	—
K2EVJ	NY	10	6	—	426
WA2EUS	NY	8	4	9	320
WA2FUZ	NY	5	3	—	125
WA3AXV	PA	16	7	29	698
WA3JUF	PA	14	5	20	300
K3HZO	MD	13	6	25	—
W3IP	MD	11	7	18	369
WA3NZL	MD	11	7	—	780
KB3QM	DE	7	—	7	—
WB4NXY	KY	17	7	29	730
K4QIF*	VA	15	6	—	790
WS4F	GA	8	3	13	625
W3IY/4	VA	7	5	—	481
WA4OFS	FL	7	2	17	1042
K4NTD	FL	4	2	—	847
WB5LUA*	TX	26	24	83	1280
W5HN	TX	14	5	44	1140
W5DFU	OK	13	6	34	1000
KE5EP	TX	12	—	37	—
WB5AFY	TX	11	2	41	685
WA5VJB	TX	9	5	—	1140
KD5RO	TX	9	3	35	650
K5SW	OK	7	4	19	984
WA5TKU	TX	5	3	18	1112
WØRRY/5	OK	5	2	11	265
K5DHU	TX	5	1	12	—
W5NZS	OK	5	—	20	—
W5ASH	TX	4	2	9	1066
W5HPT	TX	4	1	—	571
WB5LBT	LA	3	2	—	—
W5RCI	MS	3	2	—	—
N5BBO	TX	2	2	14	1042
WA5DBY	TX	2	1	—	—
WA5HNK	TX	1	1	5	250
WA5TBE	TX	1	1	—	571
W5GVE	TX	1	1	—	366
N6CA*	CA	8	10	30	2472
K6ZMW	CA	4	3	—	402
W6KGS	CA	3	2	—	362
W6XJ	CA	2	3	—	250
K6QXY	CA	2	2	—	2358
KH6HME	HI	2	2	—	2472
WB6NMT	CA	1	1	—	296
KC6A/6	CA	1	1	—	130
N6TX	CA	1	1	—	112
N6NB/7	UT	4	2	—	295
WB5TCO/7	AZ	2	2	2	403
WA7JUO	NV	2	1	—	—
W8YIO	MI	20	12	45	950
NI8O	OH	18	8	44	1025
K8WW	OH	16	7	32	448
WA8TXT	OH	15	8	20	604
WB8BKC	MI	15	7	33	650
W8IDU	MI	5	4	—	—
WB8PAT	OH	4	3	—	405
W9ZIH	IL	24	9	—	790
WB9SNR	IL	14	8	27	760
WA9FWD	WI	8	3	8	—
W9UD	IL	5	4	—	760
WØUC/9	WI	3	2	4	—
WBØDRL	S	21	6	75	1100
WØRAP	IA	14	5	46	678
WAØTKJ	KS	13	5	40	1100
WØOHU	MN	12	5	18	814
KØTLM	MO	8	3	15	730
KCØQR	NE	8	2	17	430
KØALL	ND	6	2	—	283
KXØO	CO	4	2	4	653
WØYZS	MO	4	2	—	425
WØPW	CO	3	2	3	97
WØZJY	KS	3	1	—	170
NOØY	KS	2	2	4	170
WØRT	KS	2	2	3	—
WØMDL	MN	2	2	—	340
WØVB	MN	2	2	—	290
VE3LNX	ON	9	5	28	—
VE4MA*	MB	8	14	22	800

13 Cm

W2SZ/1	MA	6	3	10	—
W1JR	MA	5	2	4	257
W1RIL	MA	3	2	3	—
WA3AXV	PA	9	6	11	671
WA3JUF	PA	5	3	10	—
W4HHK*	TN	8	5	8	582
WB4NXY	KY	4	4	6	360
WB5LUA	TX	11	5	26	933
W5DFU	OK	4	2	10	—
WA5VJB	TX	3	1	13	185
W5UC	TX	3	1	12	163
WB5AFY	TX	3	1	12	285
W5HN	TX	3	1	10	230
KD5RO	TX	2	1	35	940
W5NZS	OK	1	1	2	—
WA5DBY	TX	1	1	1	65
K5PJR	OK	1	1	1	271
W8YIO	MI	10	8	18	940
WA8TXT	OH	3	3	4	291
W9ZIH	IL	9	4	—	470
WB9SNR	IL	6	4	7	—
WBØDRL	KS	2	1	3	—
VE3LNX	ON	3	—	5	—

9 cm

WB5LUA	TX	3	1	11	165
WB5LUA/5	AR	3	1	6	288
WB5AFY	TX	3	1	5	285

* Some stations worked via EME. —Information not supplied.

ON THE BANDS

6 Meters—It's only a matter of days, or weeks at most, from the time you read this that we can all start looking for Sporadic-E openings. Those in the eastern part of the country, especially, will certainly be particularly on the lookout for signs of signals from across the Atlantic. Amateurs in several European countries are now permitted to operate on 6 meters, and many others will be listening and responding on 28.885 MHz. Of course, the most numerous of the 6-meter operators are those in the UK, where anyone with a Class A license can now get on the band without the need for a special permit. From what I hear and read, literally hundreds have taken advantage of this opportunity. That's the good news. The bad news is that they are restricted in the power they can use, and the limitation is in terms of power radiated by the antenna, not the transmitter output. Despite this limitation, a number of Gs were worked last year and I predict that more will be during the coming season. Other European countries reportedly with some activity on 6 include: Norway, with about 25 permit holders; Ireland, with at least two permit holders; Spain, with apparently some activity; and Portugal, with several stations active. Gibraltar still permits 6-meter operation, and, according to G8VR's column in a recent issue of the RSGB publication *Radio Communication*, the ZB2VHF beacon has now been moved to "the top of the rock" and is generally refurbished. I have no information on how active ZB2BL or any other of Gibraltar's potential 50-MHz operators are, however.

Ireland did have at least three permit holders, but the number was reduced by one with the move by EI9D to an even rarer spot, where he will be active on 6 meters. Jim writes that he has QSYed to the Isle of Man, where his call is GDØGBA. I know that I speak for everyone in wishing him great success at his new QTH and especially lots of luck working North American 50-MHz stations.

In the meantime, the winter season seems to

have produced more than the expected quota of Sporadic E. Note the 2-meter skip reported in that section. On 6 meters, WA5IYX San Antonio says that there were numerous openings during the first two weeks of February. Pat observed that E_s was present virtually every evening between the 9th and the 14th. On the evening of the 14th, the opening extended to the top of the FM broadcast band with stations heard from Utah and Idaho. On 6 meters, the same areas were in evidence plus the NØLL beacon from Kansas, the W5VAS beacon from the New Orleans area and the N4PZ beacon from Florida. Pat notes that this was accompanied by summer-type thunderstorms and tornados over the state of Texas.

2 Meters—E Skip in mid-winter is not a common occurrence on 2 meters, but 1987 can be recorded as one of those years in which it did happen. K5SW Muskogee, OK reports that at 0125Z February 10, the band opened to California, producing a contact with K6PVS DM14 and about 10 minutes later with N6CW DM12. Sam was alerted to the possibility of 2-meter propagation by observing conditions on 6 meters. WA5IYX passes along the word that W5UWB Kingsville in south Texas also experienced a 2-meter E opening at about this same time, so the propagation was quite widespread.

The husband-and-wife team of WA4VCC and KB4CSE Fort Mill, SC EM94 reports good success during the year-end meteor showers. Sharing the station, they managed a 90-percent schedule-completion rate with a total of 30 successful QSOs. A sample of stations worked includes WØSD South Dakota EN13, VE3FGU FNØ4 and W5UWB south Texas EL17. Ted makes a plea for improved operating procedure on the part of many operators. He particularly cites the tendency of some, on hearing complete calls, to go back with reports only. This, he contends, can lead to confusion if the other operator has not yet heard complete calls. His advice: Send calls with the report until the other station has indicated that he has heard calls.

VK3AUU writes from Australia that he has been doing some work with the DL6WU Yagi design for both 2 meters and 70 cm. On 2 meters, David has a 38-foot 19-element model that he says works "really well." It proved its worth when, on October 26, he made an unscheduled contact with W5UN, who was 10 dB above the noise during the moonrise period. The "O" report received is quite an accomplishment with the limited power the Aussies are allowed. David is building an array of four of the antennas and plans eventually to extend the array to eight. He hopes also to get a permit to run higher power and has his sights set on an 8877 amplifier, which will, of course, require a special permit in his country. He also has a 33-element 28-foot 70-cm DL6WU Yagi with which he has heard K2UYH and YU1AW. He adds that his friend VK3UM has an array of 24 16-element KLMs for 70 cm and is already active on EME on that band. He puts in a plea for some of the moonbounce-activity weekends to be scheduled during times when the moon is in southern declination, noting that it is then that perigee occurs and that the moon is often in quieter areas of the sky. On the terrestrial side, David comments that their summer E_s season brought some 2-meter goodies in the form of VKØSJ Macquarie Island and VK6AOM Western Australia as well as several openings to the Brisbane area. He also observes that the VKs have been having good success working stations up to 450 miles on both 2 meters and 70 cm using reflections from high-flying commercial aircraft.

From the February *SWOT Bulletin*, W3UN Frederick, MD says that the regularly scheduled Maryland to Ohio get-togethers continue and are picking up new recruits. The group meets at 0145Z Tuesdays, Fridays and Sundays on 144.170. In the same issue, WØKRX Minneapolis notes that he has worked more DX on 2 meters in the last week of December and first few weeks of January than all of last year. He credits the unusually spring-like temperatures experienced in that usually chilly part of the country. Bob also passes that word the "Minnesota SWOT Net," which he runs, is doing fine. It meets on 144.250 at 2100 local time on Sundays.

WA2FXB northern New Jersey has been trying to stretch the meteor-scatter range a trifle. Up to 1200 miles, it is quite easy to make contacts, but beyond that it gets a lot tougher. In an attempt for slightly greater DX, Sid has been scheduling several stations in Puerto Rico during recent showers. While no two-way contacts have yet been claimed, traces of signals have been heard at each end. Keep trying Sid.

NI4Z Orlando, FL writes that he continues to have a lot of fun with SSB mobile on 2 meters. Condy says that he has no difficulty completing contacts of up to 300 miles from the car. He comments that traveling to nearby grids, which suffer from lack of resident activity, provides him with the same kind of thrill of being rare DX as going to out-of-the-way countries must do for devotee of the HF bands.

1¼ Meters—Activity using weak-signal techniques is still strong and seems to be steadily growing. Our 220- to 225-MHz band is in a unique portion of the radio spectrum, being right on the edge of propagation modes involving the ionosphere. One piece of evidence of this is a report submitted by WS4F near Atlanta. Steve says that after the success he had during the Geminids meteor shower in December, completing 1¼ meter skeds with WA1NOK and W1JR, the latter running only 75 W, he decided to limit his operation during the January Quantradids to that band. This strategy paid off with four out of eight schedules completed successfully for four new grids and a new state. Worked were VE2DFO, K5UGM, WA5TKU and WB5AFY. Steve comments that working meteor scatter on 1¼ meters is not much more difficult than on 2 meters, if you can catch the peak of a favorable shower. He expresses the hope that his experience will convince more of the gang to make the effort during coming showers.

Using this band, the reporting of activity and accomplishments becomes even more important with the FCC's proposal to reallocate 220 to 222 MHz to Land Mobile (see page 9). Such a move, coupled with the increased FM activity in the upper part of the band that will accompany the extension of Novice privileges to 222.1 to 223.91, would make it almost impossible to find space for weak signal work on this important band. If the FCC is to be swayed from its intended course, it's up to us to show that we are using this valuable piece of radio real estate.

The Higher Bands—WA1OUB writes from New Hampshire that he is now active on 23 cm with 140-W output from a pair of 7289s. The antenna is four W3HQT 45-element loop Yagis at 45 feet. A tower-mounted preamp helps in the receive department. Bob says that the system seems to be working well, producing regular contacts out to about 350 miles.

As publicized in the *432 and Above EME Newsletter*, there is a move afoot to come up with stricter definition of stations worked on moonbounce or, as K2UYH calls them, "initials." Until now, the definitions have been rather loose—with many counting each call worked without regard to whether some stations might have been operated under anywhere between two to a dozen different calls. It would appear that the stricter definition provides a much better indication of the real amount of activity and what can actually be accomplished via moonbounce. What do you think? Will the rest of the moonbounce community be convinced to adopt the same definition, or are we headed for another of those differences between bands, such as 2 meters versus the higher bands? Let's hope that it won't.

From the 70-cm state box appearing last month, it is apparent that considerable activity has been put into completing WAS on the band. I wish to extend congratulations to all that have made it and encouragement to all who are still trying.

With activity on our new 33-cm band just getting underway, AF1T is compiling a directory of stations active on the band. Those who are should send him pertinent information, such as name, call sign, address, phone number, grid locator (down to the last 2 characters) and description of station equipment, including power and antenna, etc. A copy of the directory will be sent to anyone providing Dale with a self-addressed, stamped number 10 business-size envelope. Address is Dale Clement, Box 388, Concord, NH 03301.

VHF/UHF Century Club Awards

The ARRL VUCC numbered certificate is given to amateurs who submit written confirmations for contacts with the minimum number of Maidenhead grid-square locators indicated in *italics* for each band listing. Initial qualifiers are shown first, followed by those with endorsements, for December 19, 1986 through February 13, 1987. An SASE will bring you the rules and application forms.

6 m (50 MHz)

100

195 WB4NIX
196 N5HYV
197 WA5S
W1GXT 125
KA2GOJ 125
WA3DMF 275
KI3L 200
NA4I 125
N4MM 325
KS4S 150
N5HVJ 200
K6EID 125
KA9DZM 200
NØLL 325
WBØVZW 125

2 m (144 MHz)

100

146 AB5T
147 KB3QM
148 KB4WM
149 W7IUV
150 W9UB
151 NØBTN
152 WD4EWX
153 K3QM
154 N5HVJ
155 KI4CI
156 KBØZQ
157 W3VWG
158 VE1ALQ
159 NW5E
160 N4MW
161 KB3PD
W4CPZ 125
KB4C6E 125
W4ZD 125
K5WE 150
N8CKH 125
N9AQ 175
N9BD 125
WB9OJR 125
AF9Y 125

1¼ m (220 MHz)

50

15 WA4PCS
16 N2WK
17 KFØM

70 cm (432 MHz)

50

70 K3QM
71 WØFY
72 WA8MIL
73 G4NBS
74 K5WE
75 WB9OJR
76 WBØDGF
77 W5DFU
78 KMØA
79 K9VGE
80 K3HZO
81 N2AHN
82 WØJRP
83 W8YIO
W2VC 70
KE5EP 70
WØRRY/5 150
K5YY 110
NI8O 110
K8TL 70
K8WW 130
WA9JFM 80
KØTLM 90

23 cm (1296 MHz)

25

34 G4NBS
35 K3HZO
36 N8DJB
37 K2TXB
W2VC 30
WB4NXY 30
KE5EP 35
WB5LUA 70
NI8O 40
K8WW 50
W8YIO 45
WØRAP 40

2.3 GHz

5

W8YIO 15

5.7 GHz

5

WA5ICW 15

10 GHz

5

15 WA6QYR
KB7CI 10

24 GHz

5

1 W2SZ
2 WA3RMX
3 WB7UNU

YL News and Views

Conducted By Joan Gibson, KG1F
RR 1, Box 1465, Waterbury, VT 05676

Montage

Maureen McClain, N5FFB, is the 1987 President of The Texas Young Ladies Roundup Net. Election of new officers took place during the annual party and business meeting in September 1986. Other officers include Julie Young K5JFJ, Vice President; Carol Noack, KK5L, Secretary-Treasurer; and Kathy Rogers, K5IHF, Publicity.

Michigan YL of the Year, KA8VOZ. Congratulations to Angie LeVeque, who has been rewarded for her outstanding Amateur Radio participation. The award is sponsored by the Saginaw Valley Radio Club. A committee of three YLs annually queries the all-Michigan radio clubs for their YL nominations. From that list, one is chosen. Angie was cited for her enthusiastic participation in the activities of various nets, including the Michigan Amateur Communications Systems, the 8th Region Daytime Net, Upper Peninsula Net, Great Lakes Emergency and Traffic Net. As manager of the Michigan Novice Net, Angie teaches new participants how to handle and pass traffic on CW. Her students include Novices as well as Extra Class license holders.

This distinguished group of YLs proudly claim a silver anniversary (25-year) membership in Buckeye Belles (see April 1986 *QST*). From left: Marge Farinet, K8ITF; Ruth Silbaugh, W8VWL; Shirley Rex, K8MZT; Louise Long, K8HGD; Elizabeth Isham, K8UKM; Ruth Rickett, W8LGY; Dorothy Higgins, W8RZN.

N2EVZ: 1st Place

WA0UMB: 2nd Place

WB3FUR: 3rd Place

1986 East Meets West SSB Contest Results

1st Place: N2EVZ 19
2nd Place: WA0UMB/3 16
3rd Place: WB3FUR 16

W6QGX 13	WD8ICK 11	J87CD 9
NV5R 11	N7APJ 10	NM7N 9 (check log)
WA2NFY 11		

DX YL TO NORTH AMERICAN YL CONTEST

CW: 1400Z April 8-0200Z April 10, 1987
Phone: 1400 April 15-0200Z April 17, 1987

Eligibility: All licensed women operators throughout the world are invited to participate.

Procedure: DX YLs call "CQ North American YL" and NA YLs call "CQ DX YL."

Operation: All bands may be used. No cross-band operation. Net contact, repeater contacts and contacts with OMs do not count. Stations may be worked and counted once on each band and mode. Participants may work only 24 hours of the 36 hours in each contest. Operating breaks must be indicated in the log.

Exchange: Station worked, QSO number, RS or RST, state/province/country. Entries in log must also show time, band, date and transmitter power.

Scoring: (A) Phone and CW will be scored as separate contests. Submit separate logs for each contest.

B) DX YLs, including Hawaii and Alaska, may contact all the North American continent, which includes the 48 contiguous states and Canadian provinces.

C) Contestants on the North American continent (including the 48 contiguous states and Canadian provinces) may contact DX YL stations, including Hawaii and Alaska.

D) A station may be counted once on each band for credit, and one point is earned for each station worked once on each band.

E) Multiply the number of QSOs by the number of different states/provinces/countries worked. A multiplier is counted only once in the contest. It is not counted on each band.

F) Contestants running 150 watts or less on CW and 300 watts PEP or less on SSB, at all times, may multiply the results of (E) by 1.25 (low-power multiplier).

Logs: All logs must show your state/province/country to qualify for awards. Do not send carbon copies of logs. Please print or type. Logs must be signed by the operator; no logs will be returned. Remember to file separate logs for each contest. Logs must show claimed score and be postmarked by May 4, 1987 and received no later than May 27, 1987, or they will be disqualified. Mail logs to: Mary Lou Brown, NM7N, 504 Channel View Dr, Anacortes, WA 98221, USA.

Duplicates: For each duplicate contact that is removed from the log by the Vice President, a penalty of three additional and equal contacts will be exacted.

Awards: Cup to 1st place DX Phone; Cup to 1st Place NA Phone; Cup to 1st Place DX CW; Cup to 1st Place NA CW. Plaque to highest combined CW and phone DX scores. Plaque to highest combined CW and phone NA scores. The 2nd and 3rd place DX and NA winners in each contest will receive certificates.

Suggested Frequencies: CW: 80 m—3.540-3.570; 40—7.040-7.070; 20 m—14.040-14.070; 15—21.040-21.070; 10—28.180-28.210. SSB: 80 m—3.940-3.970; 40 m—7.240-7.270; 20 m—14.280-14.310; 15 m—21.380-21.410; 10—28.580-28.610 MHz.

Note: Since band allocations in other countries are often different than the USA, North American YLs should look for DX YLs in other parts of the bands, especially on 40 and 80 meters.

Straight Key Night 1986

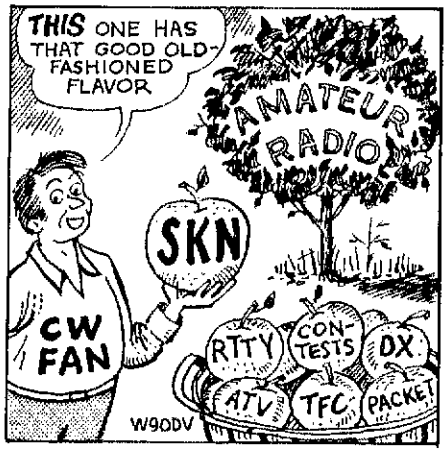
By David Newkirk, AK7M
Assistant Technical Editor, ARRL

Straight Key Narcissism

A perfect fist is hard to find,
So let's begin our task.
"Is there really such a thing?"
Some doubting Novice asks.

Once a year you get a chance
To hear that "human" touch
Amid the packets, paddles and chips
We OTs chide so much.

I heard one, you know, on Straight Key Night
That sounded just like me!
Is there really another that good,
Or was it an LDE?
—*Hunt Turner, KØHT*



LDE—*l*ong *d*elayed *e*cho. Perennial SKN penman Hunt Turner may well have struck gold in that reference to one of radio's most tantalizing enigmas. You've probably heard the stories: Sleepy night owls on a 40-meter sideband net are jarred back to consciousness by a perfect repeat of someone's transmission five seconds after it ended. State police CW ops QSKing a crack 2-MHz interzone net stand by for a mysterious breaker only to discover that someone—something?—in the universe is mimicking every Morse character either station ventures to key. Incredulous check-ins and coworkers are polled for opinion. The moon's too close; Mars, the asteroids, almost anything else—too far. We still don't know the answer.

No, as far as we know, no one who took part in the fun of Straight Key Night 1986 *heard* a long-delayed echo. But KØHT has reminded us that at least 658 of Amateur Radio's finest settled in last New Year's Day to echo the near-hundred-year-long tradition of communicating freely and friendlily with radio's simplest and arguably most efficient means of getting a message through: a transmitter modulated only by the operator's thoughts and the finely honed on-off switch we've come to call the straight key.

The last time we reported SKN's relaxed and neighborly doings, 63 of you good folks reported working a total of 406 call signs in the Night's festivities. This time, 61 SKNists checked in. (We figure that maybe everyone else was so amazed by the upswing in activity in 1986—*252* more stations reported than last year—that they thought it was too good to be true. This year's upsurge in participation was good *and* true, so you bashful types needn't feel strange about dropping us a line about the 1987 shindig, okay?)

SKN's key words (sorry) are fun, celebration and relaxation, but we do have a few low-key (ouch) awards to hand out. (The envelope, please. . .) In SKN-1986, *53* hams were voted "best fist" by their QSO partners, as opposed to 31 last year. Five amateurs shared third-place honors for best fist at two votes apiece: W4YE, W5KL, K8CDE and W9IG. In a three-way tie for second place, W2OPE and WB8CFO each received three votes. Top "best fist" honors went to W1AW (AH2W, opr), with six votes. Great going, all!

What about the most interesting QSO? As we saw in this year's arm-wrestling for "best fist," "most interesting QSO" was significantly up over 1985: *44* nominees as opposed to last year's 31. Just one SKN stalwart cracked the one-vote pileup to come out on top with two votes for "most interesting QSO:" WA4YRN/M, who literally took SKN on the road. FB!

So, Straight Key Narcissism? Maybe so, but in a positive way: This year's better fists, better QSOs and better participation drew praise from just about every reporter. Far from being a long-delayed echo of last year's bash, SKN-1986 turned out to be a renewed celebration of the radio amateur's ability to project personality through the ether just by shorting and unshorting a couple of wires. It's easy to prepare for SKN-1987: Just keep up the good hammin' all year.

KEY KLIX

I heard many more stations this year and heard even better hand key sending (Leland, W5KL). Still using the World War II knee key from the Signal Corps years in the European unpleasantness (Charlie, W2KTF). I finished SKN by working Norm, WA8AEG, author of the cover story in January 1987 *QST* (George, W2SJU). My SKN highlight was being the first station in the brand new West Texas Section to QSO W1AW at HQ (Art, NN7A). I had only three QSOs, but the last one was for about an hour and a half with VE6APE (Lyman, W6IFC). I thoroughly enjoyed SKN, but wish more emphasis could be placed on longer, more interesting QSOs. I'm barely getting warmed up at 60 minutes into a *good* QSO; I enjoy really getting to know the operator! My vote for most interesting QSO goes to W2KTF, whose early experience paralleled mine in home-made keys with screwhead contacts and tin-can metal (John, K8CQA). Keep the SKNs coming! (Frank, WD4DSS). Was surprised to work W1TS; the original holder of the call was on the ARRL staff. Most of my QSOs were with OTs who had more time at hamming than my 40 years (Hank, KA3GXP). I thought the IRS was getting an early shot at me when I chatted with Tax (*really* his name), W7KCZ, in Ferndale, Washington (Chris, WB6RXE). Wish SKN came more often than once a year (Carol, KA5GIS). I hadn't so much as even *looked* at my old straight key for some thirteen years until this SKN. The key may have been rusty—literally—but surprisingly enough, I wasn't!! (Eddy, VE3CUI) I was amazed at the wide distribution of ages participating in SKN; it seems there were as many ops younger than me as older (30-year-old Ed, WB8CFO). SKN is too good a program to be scheduled at a time that conflicts with family events, football games, the Rose Bowl parade, etc. How about moving it to the first weekend in January? (Bob, N8FTT). My most interesting QSO was the one my Dad and I had with NW6O. My Dad was an aircraft radioman during World War II, so he knows the code. He taught me, in fact. He's not a ham, but he does quite a bit of shortwave listening. I got him on the air for the first time in 40 years during that QSO (Ed, KA7YXU). I used my 13-watt portable that I built in 1949. It runs one-half of a 6J6 as VFO, the other half of the 6J6 as doubler and a 2E26 PA; it chirped some! (Frank, K6NL) SKN doesn't come often enough! (John, W3III) CW, sweet music on a straight key when played by a maestro, is still good even when played by lesser artists (Doc, W8CZR). I used a "C" clamp to hold the old J-37 down on the table—really made sending easier! (Mark, K5DP) Long live CW—especially mobile! (Bill, WA4YRN/M) After wimping out in the face of receiver overload at W1AW—only to be replaced and outdone by iron-man AH2W—the only way I could save face was write the SKN lead (AK7M). I even met an OM who admitted that he was a proctologist (Stan, W5VAX). SKN is right up my alley! While my description of myself as a 360-lb, bald-headed Florida female may leave a bit to be desired in the accuracy department, it does make for unusual code practice for the other fella...(Jane, KB4QWG) In literally none of the QSOs I had did the other operators send a list of stations they had already worked. I tried this in my first few QSOs and felt odd about it, probably because it made my SKN seem more like a contest—which it's not supposed to be. Think this suggestion be omitted in the rules of future SKNs (Bob, W2BBX). John, N3BC, told me that his "homebrew key" was a micro-switch: "I hold it between my thumb and fingers and hit it against my leg!" (Bob, K2MT) In *my* most interesting QSO, Don, K7TFW, and I talked about panning gold (John, W5ETK). What does a straight key do? It lets you copy faster than you can send. On a night like this, a Novice can show us how to use a straight key. We need more Straight Key Nights (Bruce, KB4IFS). ☐

Strays

***QST* congratulates. . .**

☐ Dennis Bodson, W4PWF, of Arlington, Virginia, on being nominated as Executive Vice President of the IEEE.

☐ Elizabeth Frost, KA2UCA, of Rochester, New York, on being accepted for the second straight year into the *Who's Who Among American High School Students.*

☐ Tim Raymer, KAØOUV, of Farmington, Missouri, on being a National Merit Scholarship semifinalist.

☐ the following radio amateurs on 50 years as ARRL members:

- Llewelyn "Lew" Williams, W9GSB, of Cary, Illinois
- Stephen Kokinchak, W2IPR, of Yonkers, New York
- Andrew Hammerschmidt, W2VV, of Hilton Head Island, South Carolina
- William Robinson, K6HLR, of San Gabriel, California

Rules, 2nd IARU HF World Championship

The format for the first running of the IARU HF World Championship seemed to please all that participated in it. The shorter hours (24 hours) and the new IARU member-society headquarters station multiplier made the contest exciting and brought a new flavor to it. To run up a big score this year, it is important to strike a balance between large QSO and multiplier totals. Don't forget the IARU HQ station multipliers. They will be the ones with abbreviations instead of ITU zones in the exchange! Don't forget to look on the high bands as well as the low ones—anything could happen this year. Patience and good operating will reward you with some extra multipliers.

For those not familiar with ITU zones around the world, there is a listing of countries and their corresponding ITU zones included in this announcement. Send an SASE or 1 IRC early for the proper forms (including a map) so you will have them in time for the contest. Good luck!

Rules

1) **Eligibility:** All licensed amateurs worldwide.

2) **Object:** To contact as many other amateurs, especially IARU member-society HQ stations, around the world as possible using 1.8 through 30 MHz. (The 10, 18 and 24-MHz bands may not be used for contest QSOs.)

3) **Date:** Second full weekend of July (July 11-12, 1987).

4) **Contest Period:** 1200 UTC Sat until 1200 UTC Sun. Both single-and multioperator stations may operate for the entire 24-hour period.

5) **Categories:**

A) *Single operator*—phone-only, CW-only and mixed-mode. One person performs all operating and logging functions. Use of spotting nets is not permitted. All operators must observe the limits of their operators' licenses at all times. Single-operator stations are allowed only one transmitted signal at any given time.

B) *Multioperator*—single transmitter, mixed-mode only. Must remain on a band for at least 10 minutes at a time. Only one transmitted signal allowed at any given time. (Exception: *Only* IARU member-society HQ stations may operate simultaneously on more than one band, with one transmitter on each band/mode. Only one HQ station call sign per member-society per frequency band is permitted.) All operators must observe the limits of their operators' licenses at all times.

6) **Contest Exchange:** IARU member-society HQ stations send signal report and official IARU member-society abbreviation. All others send signal report and ITU zone. A complete exchange must be logged for each valid QSO.

7) **Valid Contact:**

A) The same station may be worked once per band/mode. Mixed-mode entries may work a station once per mode (but only in the generally accepted portions of that band for that mode. Note: Reworking a station in the phone portion of the band on CW is not permitted). Example: On any band, a station may be worked once on phone and once on CW (in the CW segment) for additional QSO credit. However, this counts as only one multiplier. Crossmode, crossband and repeater QSOs do not count. Where contest-preferred segments are incorporated in regional band plans, participants are requested to observe them.

B) The use of non-Amateur Radio means of communication (eg, telephone) for the purpose of soliciting a contact (or contacts) during the contest period is inconsistent with the spirit and intent of this announcement.

8) **QSO Points:**

A) Contacts within your ITU zone, as well as QSOs with **all** IARU HQ member-society stations, **count one point.**

B) Contacts within your continent (but different ITU zone) count three points.

C) Contacts with a different continent count five points.

9) **Multipliers:** Total number of ITU zones plus IARU member-society HQ stations worked on each frequency band. (Note: HQ stations do not count for zone multipliers.)

10) **Scoring:** Multiplier times total number of QSO points.

11) **Reporting:**

A) All entrants are encouraged to use forms available from ARRL/IARU Secretariat for an SASE or 1 IRC.

B) Logs must indicate times in UTC, bands, modes, calls and complete exchange. Multipliers should be marked clearly in the log. Cross check sheets (dupe sheets) are required if more than 500 total QSOs are made.

C) Entries *must* be postmarked within 30 days after the contest (by Aug 12, 1987). Any entry received after mid-Oct 1987 may not be received in time to be included in the printed results.

12) **Awards:** A certificate will be awarded to the high-scoring CW-only, phone-only, mixed-mode and multioperator entrant in each State, each ITU Zone and each DXCC Country. In addition, achievement-level awards will be issued to those making at least 250 QSOs or having a multiplier total of 50 or more. Additional awards may be made at the discretion of each country's IARU member-society.

13) **Conditions of Entry:**

A) Each entrant agrees to be bound by the provisions of this announcement, by the regulations of his/her licensing authority and by the decisions of the ARRL Awards Committee, acting for the IARU International Secretariat.

B) Disqualifications: An entry may be disqualified if the overall score is reduced by more than 2%. Score reduction does not include correction of arithmetic errors. An entry may be disqualified if more than 2% of duplicates are left in the log. A three-QSO reduction will be assessed for each duplicate QSO found during log checking or for each miscopied call sign. See Jan 1987 *QST*, page 81, for complete details.

Prefix, Continent and ITU Zone

A2	AF	57	H4	OC	51	PJ2,3,4,9			VE,VY	2,3,		ZS	AF	57
A3	OC	62	HA,HG				SA	11		NA	4,9,75	1A0	EU	28
A4	AS	39		EU	28	PJ5,6,7,8			VK	OC	55,58,59	1S	AS	50
A5	AS	41	HB	EU	28		NA	11	VK(LHI)			3A	EU	27
A6	AS	39	HC	SA	12	PY	SA	12,13,15		OC	60	3B8-9	AF	53
A7	AS	39	HH	NA	11	PYØ	SA	13	VK9(W)			3C	AF	47
A9	AS	39	HI	NA	11	PYØ (T)				OC	60	3C0	AF	52
AP	AS	41	HK	SA	12		SA	15	VK9(X)			3D2	OC	56
BV	AS	44	HKØ(M)			PZ	SA	12		OC	54	3D6	AF	57
BY	AS	33,42,		NA	12	S2	AS	41	VK9(C,K)			3V	AF	37
		43,44	HKØ	NA	11	S7	AF	53		OC	54	3W	AS	49
C2	OC	65	HL,HM			S9	AF	47	VK9(M)			3X	AF	46
C3	EU	27		AS	44	SJ-SM				OC	56	3Y	AF	67
C5	AF	46	HP	NA	11		EU	18	VK9(N)			4S	AS	41
C6	NA	11	HR	NA	11	SP	EU	28		OC	60	4U(ITU)		
C9	AF	53	HS	AS	49	ST	AF	48	VK0(H)				EU	28
CE	SA	14,16	HV	EU	28	SU	AF	38		AF	68	4U(UN)		
CE0A	SA	63	HZ,7Z			SV	EU	28	VK0(M)				NA	08
CE0X	SA	14		AS	39	T2	OC	65		OC	60	4W	AS	39
CE0Z	SA	14	I,IS0	EU	28	T30	OC	65	VP2	NA	11	4X	AS	39
CM,CO			J2	AF	48	T31	OC	62	VP5	NA	11	5A	AF	38
	NA	11	J3	NA	11	T32	OC	61,63	VP8(F)			5B	AS	39
CN	AF	37	J5	AF	46	T5	AF	48		SA	16	5H	AF	53
CP	SA	12,14	J6-8	NA	11	T7	EU	28	VP8	SA	73	5N	AF	46
CT	EU	37	JA	AS	45	TA,EU			VP9	NA	11	5R	AF	53
CT3	AF	36	JD,AS				AS	39	VQ9	AF	41	5T	AF	46
CU2	EU	36		OC	45	TF	EU	17	VR6	OC	63	5U	AF	46
CX	SA	14	JT	AS	32,33	TG	NA	11	VS6	AS	44	5V	AF	46
D2,3	AF	52	JW	EU	18	TI	NA	11	VU	AS	41	5W	OC	62
D4	AF	46	JX	EU	18	TJ	AF	47	VU7	AS	41,49	5X	AF	48
D6	AF	53	JY	AS	39	TK	EU	28	XE	NA	10	5Z	AF	48
DA-DP			W,K	NA	6,7,8	TL	AF	47	XE4	NA	10	6W	AF	46
	EU	28	KC6	OC	64,65	TN	AF	52	XT	AF	46	6Y	NA	11
DU	OC	50	KG4	NA	11	TR	AF	52	XU	AS	49	7O	AS	39
EA	EU	37	KH1	OC	61,62	TT	AF	47	XW	AS	49	7P	AF	57
EA6	EU	37	KH2	OC	64	TU	AF	46	XX9,CR9			7Q	AF	53
EA8	AF	36	KH3-7			TY	AF	46		AS	44	7X	AF	37
EA9	AF	37		OC	61	TZ	AF	46	XZ	AS	49	8P	NA	11
EI	EU	27	KH8	OC	62	UA1,3,4,6		19,20,	Y2-9	EU	28	8Q	AS,	41
EL	AF	46	KH9	OC	65		EU	29,30	YA	AS	40		AF	
EP	AS	40	KH0	OC	64	UA1 (FJL)			YB	OC	51,54	8R	SA	12
ET	AF	48	KL7	NA	1,2		EU	75	YI	AS	39	9G	AF	46
F	EU	27	KP1-5			UA-UZ2			YJ	OC	56	9H	EU	28
FT8W				NA	11		EU	29	YK	AS	39	9J	AF	53
	AF	68	KX6	OC	65	UA9-UZ9		20-28	YN,HT			9K	AS	39
FT8X	AF	68	LA	EU	18		AS	30,35,75		NA	11	9L	AF	48
FT8Z	AF	68	LU	SA	14,16	UB	EU	29	YO	EU	28	9M2	AS	54
FG	NA	11	LX	EU	27	UC	EU	29	YS	NA	11	9M6,8		
FG,FS			LZ	EU	28	UD	AS	29	YU	EU	28		OC	54
	NA	11	OA	SA	12	UF	AS	29	YV	SA	12	9N	AS	42
FH	AF	53	OD	AS	39	UG	AS	29	YV0	NA	11	9Q	AF	52
FK	OC	56	OE	EU	28	UH	AS	30	Z2	AF	53	9U	AF	52
FM	NA	11	OF-OH			UI	AS	30	ZA	EU	28	9V	AS	54
FO(Clip)				EU	18	UJ	AS	30	ZB	EU	37	9X	AF	52
	NA	10	OK	EU	28	UL	AS	30	ZC4	AS	39	9Y	SA	11
FO	OC	63	ON	EU	27	UM	AS	31	ZD7-9			J2,A	AS	39
FP	NA	09	OX,XP			UO	EU	29		AF	66			
FR	AF	53		NA	5,75	UP	EU	29	ZF	NA	11			
FW	OC	62	OY	EU	18	UQ	EU	29	ZK1-3					
FY	SA	12	OZ	EU	18	UR	EU	29		OC	62			
G-GW			P2	OC	51	V2-4	NA	11	ZL	OC	60			
	EU	27	PA	EU	27	V8	OC	54	ZP	SA	14			

Results, 17th ARRL 160-Meter Contest

By Billy Lunt, KR1R
Contest Manager, ARRL

and Mary Schetgen, N7IAL
Assistant Contest Manager, ARRL

"What a blowout! I never expected to run out of room to enter DX stations on the dupe sheet!"—WB1GQR.

Old-timers and newcomers alike joined together to foray into the "Gentleman's Band" with the sweet music of CW. Unlike the usual serene walk across the band, at 2200Z Dec 5, 160 exploded with S9 signals. Contacts were plentiful and logged at a rapid rate. The mood was one of excitement! "Conditions were great!" echoed from all directions to mark this year's contest a DX success. Even with the vast amount of statesiders working each other, many DX contacts made it through the QRM wall. Exotic DX makes everybody smile, and many were smiling. Rex, K7QQ, reported West Coast conditions were superb: "I was very surprised to work all three stations from Franz Josef Land and also Europe." Paul, KØPK, reported, "It was a real thrill to have UP, SM, OH, ZL, etc coming back to my CQs!" Bill, WØZV, boasted, "Wow! XX9XX for no. 171 on 160!" These are just a few of the many quotes that expressed the upbeat momentum in this year's annual event.

The 405 entries received this year is up slightly over last year's total. This increase in activity was just enough to shatter 11 Division Records and set new all-time-high scores on each mode! Richard K5NA, from Eastern New York, set the new single-op record at 300,588 points. Fantastic job, Richard! The new multiop record is 269,850 points, set by the two-man Delaware crew, AA1K plus KM3T. Another FB job! Check the Division Leaders box for all the new Division Records (5 single op and 6 multiop). This record-breaking year will be hard to top in the future.

On the single-operator scene, it was K3LR coming in second with 204,767 points from Ohio, being topped only by K5NA. Bill, WØZV from Colorado, the number 10 finisher in '85, climbed up the ladder to number 3 in '86. All three set new Division Records in a 1-2-3 finish! Fourth place was claimed by N4AR from Kentucky, and fifth goes to WØEJ in Iowa, who also set a new Division Record.

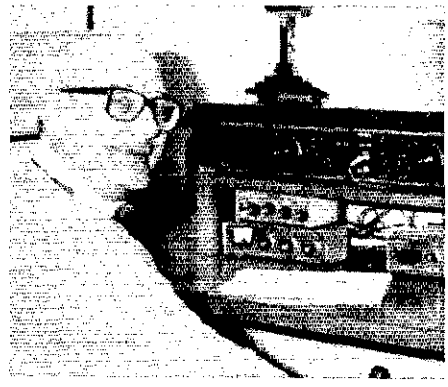
Almost doubling their score from last year, W9AZ in Illinois rounded out second in the lineup for the multiops, with AA1K on top. KS8S moved up in the standings one notch this year for a strong third place finish from Ohio. South Dakota multiop station KØDD grabbed fourth place to complete the top four Division record-breaking leaders. "Another FB job" goes to the ops of WØAIH/9 for moving up from 8th in '85 to a 5th place finish in '86.

Hats off to all who played in this fun contest. We're looking forward to seeing everyone back again for the 18th event, the weekend of Dec 4-6, 1987.

All-time-record-breaking Richard, K5NA, with some of his equipment.

Sixth-place Multiop station, K8ND piling up the Qs.

Macao station XX9XX gave an exotic multiplier to some.



Ev, K4EF, ninth-place Single Op finisher, at the controls in his shack.

VE7CA smiles from his operating position in British Columbia.

Top Ten

Single Operator		*Multioperator*	
Call	*Score*	*Call*	*Score*
K5NA	300,588	AA1K	269,850
K3LR	204,767	W9AZ	223,680
WØZV	183,365	KS8S	220,523
N4AR	182,520	KØDD	175,953
WØEJ	168,344	WØAIH/9	165,483
N5RZ	161,594	K8ND	159,043
N1ACH	152,978	K2WI	145,112
K1IU	152,241	ABØS	142,158
K4EF	150,552	W8FN	133,665
WB1GQR	139,108	WØBXR	124,020

Division Leaders

Single Operator		*Division*	*Multioperator*	
K3UEI	107,261	Atlantic	AA1K*	269,850
VE1ASJ*	127,003	Canada	VE2OJ	30,600
KA9OKH	130,674	Central	W9AZ*	223,680
WØJX	126,854	Dakota	KØDD*	175,953
K4LTA	127,589	Delta	K5MC	1,610
K3LR*	204,767	Great Lakes	KS8S*	220,523
K5NA*	300,588	Hudson	W2GD	108,696
WØEJ	168,344	Midwest	ABØS*	142,158
N1ACH	152,978	New England	AK1L	43,092
KE7X	58,029	Northwestern	K7QQ*	105,057
N6CT	48,906	Pacific	N6IG	66,368
KE9A	128,480	Roanoke	—	—
WØZV*	183,365	Rocky Mountain	—	—
KN4B	82,928	Southeastern	—	—
K7OX*	102,080	Southwestern	N6LL	14,547
N5RZ	161,594	West Gulf	NR5M	117,156
CT4AT	16,512	DX	JA1YWX	1,520

*denotes new Division Record

Antennas Used by the Top Scorers

Single Operator

K5NA	3 sloping dipoles and 4 Beverages
K3LR	Dipole at 300 ft
WØZV	¼-wave GP and 7-600 ft Beverages
N4AR	2 phased verticals ¼ wave
WØEJ	¼-wave sloper and 3 Beverages

Multioperator

AA1K	113-ft shunt feed tower with 200 radials, 4 Beverages and small loop
W9AZ	160-ft series feed tower with 120 radials, 6-1200 ft Beverages and dipole at 120 ft
KS8S	120-ft phased verticals
KØDD	130-ft broadcast vertical and inverted-V at 90 ft
WØAIH/9	vertical and Beverages

SOAPBOX

First 160 contest in years (K1DG). At age 72, these contests are very tiring for old geezers! (W1HRQ). The noise level was so low on Sunday morning that I was sure that the receiver had died. Despite all of the activity, there were still holes where DX could pop through (WB1GQR). Thanks to all who leaned into the headphones a little harder to copy my 4-W signal! (KN1H). I can't believe you guys could hear me with burned finals and no real antenna (N1DMU). My favorite contest. Great to be back on after several years off. Antenna put up day before contest (of course!) with a very minimal ground system (N2KA). I love CW and 160 m (WA2GEZ). Conditions really quite good. Heard lots I couldn't raise. QRM awful (W2GP). Some ops missed many calls because their receiver filters were too sharp (K2STO). Wedding on Saturday kills Q rate! (WB2ULF). Perhaps even casual operators should use dupe sheets. A couple of stations called us more than 10 times (K2WI). A lot of domestic stations in the DX window! (NA2Q). Great contest! It's sort of like a winter "Field Day", with a lot of great operators. Ran 100 watts and a 160 dipole. Had a ball (KI3S). This year I succeeded with a real "Rube Goldberg" antenna system. I live in a row house with no back or front yard to speak of. The antenna was a long wire running 23 ft up the front of the house, then around the house for another 65 ft. The end of the antenna at ground level was fed through 52 ohm coax, through a coil about 18 inches long, wound at random with 14 gauge wire (no idea how many turns). Connections were done with clip leads. Technically, not a good antenna system, but it worked. This is what makes ham radio fun! (W3HMR). Spent 10 minutes trying to work KH6??? only to find out he was portable on the mainland! Truly a great contest; poor propagation during daylight hours means you can also get some sleep and touch base with the family. First 35 minutes spent winding a new coil for linear to get down to the bottom of the band (W3HVQ). Plenty of activity until I quit at 11 AM local time (W3FX). Except for the FOC Marathon, this was my first contest in over 30 years. I felt like a "Rip Van Winkle" but found that little had changed—although some of the "big guns" had grown more aggressive. It was thoroughly enjoyable. Conditions were fairly good, but the West Coast and Europe, with their weak signals, were overwhelmed in the QRM (K4EF). Where were all the Caribbean, South and Central American stations? (K4LTA). Great contest with good conditions sure made for a fun weekend! (AA4H). I had a graduate school paper due and didn't get in nearly enough operating time (KX4V). The number of W6s on was very low or it was the conditions. It is very unusual to work more W1s than W6s here in Texas (W5FIX). Two years ago I said I'd be back with more than 10 watts; now I think I need 3 kW! Sure is humbling to get beaten working Japan by W9s. The "sunrise effect" on 160 always amazes me; you could always tell when the eastern states hit sunrise as they rose 10 to 30 dB out of the noise (WA6PZL). Had fun only playing! Guess not many SB stations on (N6VR). Finally found out where the gentlemen operators hang out. In spite of my ridiculously low score, managed to work 20 out of 26 sections heard. Would sure like to live in the Midwest for this contest (WB6KKN). It happens every year: The company Xmas party chops off the best operating time on Saturday, 6 PM to 12 AM! (W6NA). Some of the "alligator" stations seemed to be in beacon service (KG6AO). Did hear several JAs in the morning on 1912 kHz and next year more power and a better antenna (K6LRN). When I heard all the sigs on 160 m, I ran out and added 60 ft to each end of my 100-ft dipole. What fun! (W6JTI). I was hampered by power line noise (K6XK). Where was all the DX and VE activity? (N6IG). Always a favorite contest to operate because band conditions are so unpredictable. I think we all stick with it all night long in the mighty hope of getting that good, rare band opening (KS7T). What a choice band. I had a ball! (WA7HQD). Propagation was superb until 0700Z Saturday. It seemed as if someone pulled the big switch on the band (W7TJ). Could hear lots of Midwest and South stations who probably didn't come back due to high QRN there (NK7V). Couldn't do any good Friday with lashed up gamma match to tower so Saturday extended 80 m sloper for first-ever 160 operation: 14 states and 3 countries! (W7TSQ). Had a lot of fun with 90 W, but an amp for the next time would really help (KV8S). Thought my new zepp ant would knock 'em dead but it proved to be a better receiving antenna (W9LNQ). Only wish I could stay awake longer at night (ND9X). We were very surprised at how low the noise was. Although we could not hear any W6s or W7s, we thought band conditions were very good (KO2R). It is still very difficult to work Hawaii, Alaska and YU/NWT (NØSM). Thanks for a lot of fun on my second contest ever! (VE7GFA). QRP doesn't seem to work on this band (VE7DW). Conditions were fair; no openings to the West Coast (DJ6RX). Conditions great the night before the contest! (G3ZFC). Not many Cal guys worked the second night (JA1YWX).

FEEDBACK

A few errors crept into last year's results. NØSM, who was listed as Single Op, should have been Multiop and was the Midwest Division Leader. KK5K was listed in the MO Section, and should have been in the MS Section. WØZV was not listed, and should have read WØZV 124,417 - 709 - 83 - 26 and been listed in the CO Section. He was also the Rocky Mountain Division Leader.

Scores

Scores list call sign, final score, total QSOs, total multipliers and hours operated (if given). Example: DJ6RX scored 10,868 points, with 143 QSOs and 38 multipliers in 13 hours of operation.

DX

Portugal
CT4AT 16,512- 192- 43-

Federal Republic of Germany
DJ6RX 10,868- 143- 38-13
DLØFJ (DK4VP,DK8LN,ops) 1,406- 37- 19-

Ireland
EI9J 532- 19- 14- 3

France
F6EPO 240- 15- 8- 1
F9BB 60- 6- 5- 1

England
G3ZFC 4,620- 77- 30-

Galapagos Islands
K1XM/HC8 160- 10- 8- 2

Dominica
J73D 50- 5- 5- 1

Japan
JA7YFH 1,632- 34- 24-
JE1SPY 1,428- 34- 21-20
JA9RPU 616- 22- 14-
JA1YWX (JH7PKU,JI2GUT,JN3PYQ, JO1BMV, ops) 1,520- 38- 20- 7
JA7YAA (JE7HLZ,JG3JRM,JH6ORW, JN1VYN,JR8BMW,ops) 1,118- 31- 18-
JA2YKA (JF2s DQJ,UTL,JG2s MTC, VTD,JK2CZL,JA9s SSY,XXS,ops) 1,008- 28- 18-11
JA7YFB (JE7JWB,JF7s AAD,LEI,TDN, JN1RON,JR7s GYC,JVO,WFH, JQ1NBV,JR9NUZ,ops) 264- 12- 11-

Czechoslovakia
OK1ATP 1,200- 50- 12-
OK1DRO 560- 20- 14- 4

Denmark
OZ2RH 160- 10- 8-
OZ1DKG 18- 6- 3- 1

Australia
VK3BEE 280- 14- 10- 1

Macao
XX9XX 8- 2- 2- 8

Yugoslavia
YU2TW 4,800- 75- 32-
YU3MM 1,836- 34- 27-

Barbados
8P9AG (K8ZM,op) 11,700- 130- 45-

W

1

Connecticut

K1CC (NJ2L,op)	98,250-	616-	75-17
N1CC	52,304-	461-	58-20
W1BIH	51,480-	329-	72- 5
K1DM	34,506-	312-	54-12
W1OD	25,346-	271-	46- 7
W1WEF	23,706-	212-	54- 3
N1JW	21,840-	273-	40- 8
N4XR	18,312-	158-	56- 7
K1KI	8,917-	101-	37- 1
K1NYK	8,192-	64-	32- 1
KH6CP/W1	1,904-	56-	17- 9
W1QV	1,058-	23-	18- 2
AA2Z	60-	6-	5- 1

Eastern Massachusetts

W1PL	73,628-	421-	79-
W1IS	45,936-	295-	72-
KA1DWX	32,193-	233-	63- 6
K2LP	20,115-	221-	45-
W1FJ	10,537-	127-	41- 5
W1HWU	5,508-	81-	34- 7
K5ZD/1	5,495-	77-	35- 2
W1FM	1,806-	43-	21- 1

Maine

N1BUG	100,093-	569-	79-33
W1HRQ	34,100-	304-	55-
WA1IIE	7,452-	102-	36- 6

New Hampshire

N1ACH	152,978-	644-	98-21
K1DG	103,544-	530-	86-
W1FZ	13,340-	142-	46-
W1FJH	8,250-	75-	50- 5
KN1H	5,120-	60-	32-
AC1J	1,680-	42-	20- 3
AK1L (+KA1X)	43,092-	378-	54-22

Rhode Island

K1IU	152,241-	666-	93-23
K5IJ	45,672-	331-	66-17
K2MN	16,380-	182-	45-12
W1OP (K1HGC,KA1KWE,KB1PS, KZ1K,N1s AKO,BBM,W1s EYH,GS, WA1s JHV,TAQ,ops)	39,400-	379-	50-24
N1RI (+N1s BVY,CED,DM,XW, WB1s DEV,DEZ)	23,712-	241-	48-18

Vermont

WB1GQR	139,108-	790-	83-27

Western Massachusetts

KY1H (KB1W,op)	115,344-	674-	81-20
KZ1M	37,850-	377-	50-17
N1DMU	8,060-	101-	30-
W1JP	2,546-	49-	28- 2

2

Eastern New York

K5NA	300,588-	1084-	111-37
N2GUV	87,120-	560-	72-18
NA2M	55,991-	370-	73-23
W2KHQ	21,750-	216-	50-17
W2DW	13,815-	152-	45-
WB2PUH	6,720-	96-	35- 7
WA2JQK (+WA2UKP)	11,610-	135-	43-18

NYC-Long Island

N2KA	20,764-	167-	58- 9
W2KTF	10,027-	134-	37- 6
WA2GEZ	9,864-	137-	36-
W2GP	3,762-	67-	26-
W2GKZ	3,348-	54-	31- 4
WB2DLA	3,120-	65-	24-10

Northern New Jersey

KR2Q	108,264-	651-	78-23
WB2ULI	38,125-	287-	61-10
K2STO	10,620-	118-	45-17
K0DI/2	5,084-	82-	31- 6
WB2FCZ	3,264-	68-	24-
W2GD (+NET)	108,696-	551-	84-16

Southern New Jersey

K8XR	62,908-	418-	71-
N2MM	55,300-	377-	70-
W2PAU	9,800-	121-	40- 5
WA2VYA	6,660-	111-	30- 9
K2WI (+WA2IUO)	145,112-	757-	88-
N2OO (+KA2ZMS,KD2WU,N2s CEQ, FQB,NQ2B,NU2F)	21,414-	249-	43-13

Western New York

KW2J	27,600-	300-	46-10
W2TZ	25,970-	242-	53- 5
KU2A	21,070-	213-	49-21
NA2Q	20,299-	190-	53- 7
KK2B	13,244-	154-	43- 9
W2MIA	5,740-	82-	35- 2

3

Delaware

W3NX	40,250-	281-	70-13
N8NA/3	12,936-	147-	44- 3
AA1K (+KM3T)	269,850-	1129-	105-

Eastern Pennsylvania

K3UEI	107,261-	650-	77-30
W3FV	95,418-	1178-	81-
N3BNA	63,490-	431-	70-19
W3BGN	62,678-	301-	74-
K3WW	36,934-	292-	59- 8
KI3S	34,808-	358-	48-14
W3TS	32,900-	226-	70-15
W3AP	20,790-	183-	55- 3
WB3FAA	17,220-	410-	42-15
W9NXF	11,322-	153-	37-
W3ARK	9,936-	138-	36- 5
N3ARK	9,225-	111-	41-
W3HMR	832-	28-	16- 7

Maryland-DC

N3CXV	68,742-	495-	67-
W3HQV	62,502-	947-	68-17
N3AM	13,860-	165-	42-
W3TFA	12,456-	173-	36-
W3GN	7,992-	111-	36-
W3FX	5,256-	73-	36-
W3PEV	2,800-	50-	28- 6
K3AA (+K3s NNI,ZNV,KA3PMK,KX3U, N3TE,NA3G)	40,579-	341-	119-29

Western Pennsylvania

W3QM	31,200-	312-	50-16
W3IA	18,676-	203-	46-15
K3LVO	7,400-	100-	37- 7
W3HDH	6,720-	80-	42- 2
AF3V	2,970-	55-	27-18
W3KWH (KA3KSD,N3EQF,ops)	21,600-	200-	54-
K3UA (+W3FSB)	8,280-	180-	46- 2

4

Alabama

N4JF	67,160-	454-	73-14
WZ4F	33,360-	275-	60- 5

Georgia

KN4B	82,928-	576-	71-31
N4UZ	26,400-	264-	50-
W1UA	26,376-	231-	56-
K4BAI	23,424-	244-	48- 8
WI4R	13,255-	119-	55- 7
AA4EH	9,460-	103-	44- 9

Kentucky

N4AR	152,520-	951-	90-28
K4EF	150,552-	900-	82-27
K4FU	128,604-	743-	84-30
KJ4NS	50,964-	822-	62-18
KK4Q	34,000-	340-	50- 8
WA4EBN	25,652-	242-	53-30
WB4FDK	16,470-	183-	45-10
N4XM (+KD4U,N4NCN)	101,556-	639-	78-28

North Carolina

K4PQL	126,658-	744-	83-
K4PB	29,890-	305-	49-16
NK4Q	26,448-	225-	58-17

Northern Florida

W4WKQ	11,972-	146-	41-13
W1XQ	9,389-	113-	41- 7
K4XI	8,550-	111-	38-
WC4E	6,800-	100-	34- 8
WD4BXU	5,400-	75-	36- 6

South Carolina

K4CNW	49,764-	371-	86-11
W4UKU	37,230-	385-	51-17
K4II	18,750-	176-	50-

Southern Florida

N4IN	82,820-	475-	82-26
K8UNP	29,559-	243-	59-
N4EJW	8,568-	103-	41-
K4SC	5,760-	72-	40-
N4RP	120-	10-	6-

Tennessee

K4LTA	127,589-	806-	77-22
AA4H	60,522-	451-	66-
WA4ICK	41,956-	301-	68-15
N4TG	23,320-	212-	55- 5
KV4B	20,608-	181-	56-14
K4ON	16,830-	187-	45-

Virginia

KE9A	128,480-	755-	80-35
W4DHZ	68,242-	402-	77-29
W4XD	48,680-	408-	60-15
K4OD	25,872-	225-	58-11
K4FPF	16,544-	176-	47-10
KX4V	14,852-	158-	47-
W4KMS	14,076-	150-	46-
N4XD	7,200-	100-	36- 5
WA4OAE	1,610-	35-	23- 3

5

Arkansas

W5KL	21,008-	213-	48- 4

Louisiana

W5EW	17,100-	190-	45- 8
K5KLA	16,008-	174-	46- 6
N5TV	11,792-	134-	44-
NO5H	4,026-	61-	33-
K5MC (+WC5N)	71,610-	507-	70-23

New Mexico

WS5O	45,158-	337-	67-22
W5DO	36,205-	271-	65-
K7UP	27,246-	239-	57-10
WD5T	19,745-	169-	55-11
W7LHO	13,260-	123-	52- 8
N5EPA	12,936-	132-	49- 8

Northern Texas

N5RZ	161,594-	899-	86-27
KC5DX	127,350-	776-	80-22
KB5UL	73,236-	537-	68-23
K5WXZ	39,138-	295-	66-
W5FIX	34,100-	269-	62-24
N5JB	28,974-	217-	66- 6
N5UA	23,912-	190-	61-11
K7CW (+ops)	28,969-	244-	59-

Oklahoma

KM5H	44,919-	321-	69- 7
W5EHY	7,956-	102-	39- 7

Southern Texas

K5LZO	16,700-	167-	50-
AK5E	6,240-	80-	39- 5
KD5VU	5,016-	76-	33-
KN5H	4,140-	69-	30- 3
W5IRP	2,268-	54-	21-
NR5M (+W5ASP)	117,156-	706-	78-27
W5NTJ (+KC5ZT,WA5IEX,WR5Q)	44,530-	730-	67-
WE5P (+W5PWG)	43,818-	327-	67-
W5XD (+W2IE)	41,920-	326-	64-22
W5MPX (+NQ5B,W0TV,WD8CEN)	14,400-	144-	50-28

6

East Bay

W6FSJ	31,320-	237-	58-12
AE6C	4,352-	68-	32- 9
WA6BOB	864-	27-	16-
K6XV (+K6PJY)	63,816-	427-	71-30

Los Angeles

W6SGJ	10,010-	143-	35-12
W6PFE	5,220-	87-	30-10
AA6DP	2,160-	60-	18-
W8AKS/6	1,702-	37-	23- 4
NE6I	812-	29-	14-
N6LL (N6EU,NN6L,WA6CDR,ops)	14,547-	181-	39-

Orange

N6PE	32,230-	260-	55-30
WA6PZL	23,256-	201-	57-
N4ARO/6	10,116-	136-	36-13
W6SX	108-	9-	6- 4

Santa Barbara

N6VR	41,448-	311-	66-11
WA6FGV	6,756-	151-	29-17
W6JEO	2,640-	60-	22- 6
WB6KKN	2,500-	61-	20-12

Santa Clara Valley

KD6PY	20,280-	195-	52-
W6NA	16,368-	163-	48-14
KG6AO	1,800-	45-	20- 4
W6ISQ	1,050-	25-	21- 6

San Diego

N6ND	65,191-	434-	67-
W6UQF	5,766-	93-	31-
WA6KWM	1,764-	42-	21- 3
AA6EE	140-	10-	7- 1

San Francisco

N6CT	48,906-	363-	66-18
W6BIP	14,625-	161-	45-15
K6LRN	4,620-	110-	41- 6
W6JTI	2,280-	57-	20-
WB6EGE (KA6OPN,N6s MQ,QC, WB6WPO,ops)	31,806-	252-	57-20

San Joaquin Valley

K6MO	25,164-	208-	54-12
K6XK	10,397-	118-	37-13

Sacramento Valley

N6JM	6,897-	103-	33-
N6IG (+AA6GM,WA6YXZ,WB6HEF)	66,368-	422-	68-30

7

Alaska

WL7E	7,308-	87-	21- 7

Arizona

K7OX	102,080-	590-	80-24
KC7V	8,400-	100-	42- 2
W7YS	4,032-	63-	32-

Idaho

KA7T	46,332-	327-	66-19
N7HJM	18,470-	183-	45- 6
W7IWU	11,160-	31-	18-
W7GCL	780-	26-	15-

Montana

KE7X	58,029-	398-	69-21
KS7T	43,485-	333-	65-
W7KZK (+N8ENY)	42,947-	319-	67-26

Nevada

W7TVF	36,084-	271-	102-
W7ABX	3,770-	130-	29- 6

Oregon

N6TR/7	33,705-	227-	63- 5
W7YAQ	8,484-	101-	42- 6
AD7T	4,488-	68-	33-13
KA7FEF	840-	30-	14-12

Utah

N7RU	27,664-	247-	56-10
KC7PA	21,000-	210-	50-
W7MR	13,020-	155-	42- 9
NN7T	8,988-	107-	42-12
WA7HQD	8,920-	100-	40-
K7RJ	7,548-	102-	37-

Washington

W7TJ	32,984-	243-	67-18
K7SS	32,897-	235-	67-
K9JF/7	29,965-	223-	65- 8
KT7G	25,252-	210-	59- 8
W7BYK	8,532-	117-	36-10
K7WA	3,942-	73-	27- 6
NK7V	3,024-	56-	27-
K7UU	2,834-	53-	26- 5
W7TSQ	2,354-	52-	22- 4
W7IEU	360-	18-	10- 2
K7QQ (+W7WA)	105,057-	487-	81-
K7LXC (+KB7TAD)	4,026-	61-	33- 2

Wyoming

NA7R	56,146-	419-	67-14
WB0LJM	32,004-	254-	63-22
K7MM	13,846-	159-	47- 6

8

Michigan

N8EA	61,410-	439-	69-
K8CV	10,584-	126-	42-
W8WVU	7,326-	99-	37- 5
NK8Q	6,840-	95-	36-
W8ROS	1,680-	35-	24- 2
K8AQM (+NI8L,W8WVU)	106,002-	663-	76-35

Ohio

K3LR	204,767-	1015-	97-
KA8HFO	104,380-	593-	85-
KU8E	43,840-	329-	64-
NM8O	34,664-	308-	56- 8
K8KEM	24,576-	256-	48-18
W8IDM	15,222-	177-	43- 8
WD8INF	10,560-	132-	40- 3
K8SVT	9,266-	113-	41-25
WB8ZYD	8,056-	106-	38-
K8MR	4,380-	64-	35-
WA8RCN	4,080-	60-	34- 3
KS8S (+AD8s C,P,N8ET)	220,523-	979-	103-41
K8ND (+K1LT)	159,043-	862-	89-37
W8FN (+WM4T)	133,665-	660-	95-30

West Virginia

K8CQL	60,180-	432-	68-24
KV8S	32,120-	289-	55-15
W8JWX	8,480-	106-	40-

9

Illinois

KF9D	110,889-	668-	81-23
AC9C	102,564-	684-	74-19
K9AB	67,306-	452-	73-18
W9YYG	58,357-	431-	67-12
KK9A	21,900-	216-	50-10
NA9J	19,992-	196-	51-
W9LNQ	12,236-	133-	46-
K9PPW	8,800-	100-	44- 6
ND9X	5,184-	81-	32-
W9CA	2,862-	106-	27-
W9ABA	2,400-	50-	24- 5
W9AZ (AK9F,K9s IFO,NR,KA9PSO, KD9s QK,RN,WB9HAD,ops)	223,680-	1075-	96-
K9AUB (+KD9SI)	38,304-	295-	63-
KO2R (+KA9VUM)	21,216-	221-	48-15

Indiana

KA9OKH	130,674-	721-	87-24
KE9I	114,922-	772-	74-29
W9YSX	97,328-	614-	77-19
KB9AC	31,860-	264-	60-
W9RE	31,598-	250-	61- 4
WA6MBP/9	28,899-	252-	57-21
W9JVF	7,722-	99-	39- 3
W9CG	7,426-	79-	47- 6
AJ9C	5,810-	83-	35-

Wisconsin

WA1UJU	88,665-	641-	68-24
W9WAQ	83,293-	566-	73-22
NI9C	35,380-	305-	58-14
W9MQZ	27,063-	254-	53-
N9KS	20,196-	198-	51- 8
W9HE	18,584-	202-	46- 6
WB9MRO	11,952-	116-	36- 4
W9KHH	8,280-	115-	36- 8
W9YCV	5,650-	75-	37-
W9AIH/9 (+K9s FVF,TG,KM9O, WA9RBW,G3SZA)	165,483-	1002-	81-42
KN9P (+K9LGU)	44,020-	348-	62-

0

Colorado

W0ZV	183,365-	931-	91-33
K4XU	52,160-	438-	70-10
KJ0G	26,880-	221-	60-12
K8FRP	21,400-	214-	50-10
K0UK	21,112-	200-	54-
K0RZ	16,589-	155-	53-10
W0UO	7,600-	95-	40- 4

Iowa

W0EJ	168,344-	919-	88-25
WD0GVY	34,496-	308-	56-23
N0BB	33,852-	273-	62-15
K0SRL	21,828-	214-	51-14
K0RW	17,490-	159-	55- 8
WA0RXR	10,664-	124-	43-11
W0BXR (N2AWE,K9s AYK,WA,N9s EHP, OK,W9TW,KA0CVA,NO0G,WD8AMA, ops)	124,020-	786-	78-33
N0SM (+KBJGH,KE0BX,N0DJY, WB0VYV)	119,658-	801-	74-33

Kansas

WA0TKJ	86,123-	602-	71-17
W0VY	31,744-	256-	62-26
W0RT	29,760-	231-	64- 7
W0AWP	19,706-	167-	59-14
AB0S (+K0WA,WB0DOX)	142,158-	795-	86-30
NI0U (+W7BNK)	73,008-	504-	72-

Minnesota

W0HW	100,200-	668-	75-
K0PK	100,197-	802-	81-20
W0RXL	46,280-	356-	65-23
KN0V	42,840-	312-	68-11
W0IH	8,722-	89-	49-
K0SR (+AB0P,WB0HCH)	91,250-	619-	73-

Missouri

W0HBH	33,440-	304-	55- 5
KM0L	25,901-	218-	59- 6
NS0B	24,850-	226-	55- 6
NJ0X	6,660-	91-	36-

North Dakota

WA3PWL	31,354-	257-	61- 8
NS0Q	10,672-	116-	46-14

Nebraska

KV0I	59,280-	456-	65-18
K0MZV	18,824-	181-	52-
W0OOW	9,020-	110-	41- 8
K0SCM (+WD0EMR)	72,594-	541-	67-26

South Dakota

W0JX	126,854-	754-	82-31
WA0NSY	10,320-	120-	43- 8
K0DD (+K0KX,NS0N)	175,953-	942-	89-42

VE

Maritime-Newfoundland

VE1ASJ	27,003-	1427-	89-
VO1HP	12,220-	112-	47-

Quebec

VE2OJ (VE2s FLD,SD,VE3s NJ,UD,ops)	30,800-	300-	51-16

Ontario

VE3KP	89,886-	615-	71-
VE3IY	88,346-	540-	78-
VE3XN	55,918-	371-	73-11
VE3PN	29,736-	239-	59-
VE3CUI	17,756-	193-	46-10
VE3NBE	12,212-	142-	43- 9
VE3ST	8,740-	115-	38- 4
VE3JKZ	7,720-	95-	40-
VE3JGC	4,774-	77-	31- 9
VE3EZU	3,348-	54-	31-
VE3RFX	1,470-	35-	21- 2

Saskatchewan

VE5XU	7,872-	96-	41-

Alberta

VE6SW	1,408-	32-	22- 4

British Columbia

VE7FPT	10,080-	126-	40-11
VE7CA	6,806-	83-	41-
VE7GFA	5,440-	80-	34-

Checklogs

N2RT, WB2GIN, AI3E, KE6VL, W6MUV, KA7ZAG, WA8MAZ, W0AP, VE7DVV

Public Service

Conducted By Michael R. Riley, KX1B
Public Service Manager, ARRL

The Blue Ribbon Committee: Part 2

Following is the remainder of the Blue Ribbon Committee report approved by the ARRL Board of Directors at their January 1987 meeting. The first installment of the report was published in last month's column.

COMMENTS:

This subcommittee envisions the following scenario within the next five years:

A disaster occurs within this country. ARRL HQ is notified (normally by the wire services). ARRL HQ immediately notifies two emergency communications/equipment teams that they are on "standby" and should be ready to move. The chairman of the Amateur Radio Public Service Communications Committee (see last month's recommendation A.1.a.) is notified. Commercial air carriers, the Federal Government or served agencies are notified that we may request their transportation services. Attempts are made to contact our field organization volunteers within or near the affected area for their appraisal of the situation.

Initial reports of a disaster are verified. Field organization leadership officials within or near the affected area request assistance. ARRL HQ consults with served agencies for assistance/guidance. One team is activated; the other is left on standby.

Transportation schedules are arranged. The activated team is notified of arrangements and given an in-depth appraisal of the situation from HQ. Field organization leadership officials, within or near affected area, are informed of the team's activation and requested to provide assistance once the team arrives.

The activated team arrives on-scene. A briefing is provided by field organization leadership officials involved at the disaster. Served agencies are contacted by the team.

The activated team becomes operational and transmits a message to ARRL HQ via an established gateway [the point of entry into the existing communications structure] or via satellite that communications channels are now open.

After recognition from HQ, the activated team interfaces with and augments on-scene amateur communications, if present. ARRL HQ returns to an informational and advisory role, being updated by an activated gateway.

An international disaster scenario would be similar except that the IARU sister society in the affected country would be immediately contacted and consulted prior to any action on our part. If assistance was desired, the IARU representative or designated individual would request clearance and temporary reciprocal licensing confirmation from appropriate government offices.

Although this scenario is feasible now, commitments by the League should be made to ensure that it does happen as a planned program. Therefore, this subcommittee desires definitive and coordinated input at a national committee level from those who may be involved with the operations of these emergency communications and equipment teams.

We have the technology. We already have several teams organized at the local and statewide levels. We are simply lacking coordination on the national level, training and recruitment structures directed toward our members and our field organization as well as the amateur community as a whole.

C. INVESTIGATE THE CONCEPT OF "GATEWAY STATIONS" AND HOW THEY SHOULD FUNCTION IN THE HANDLING OF TRAFFIC DURING EMERGENCIES.

For the purpose of this paper, a "gateway" will be defined as a highly efficient amateur communications node linking a disaster area with the general amateur and commercial communications communities during emergencies. This subcommittee desires not to use the term "station" as it is singular and therefore limiting.

It is extremely interesting to note that the ARRL Ad Hoc Digital Committee, the Emergency Communications Advisory Committee, members of the NTS Area Staffs and AMSAT have been considering this concept for well over one year independently, with little or no intercommunication. These three separate advisory bodies and many interested members are steadily moving toward the same goal. National coordination and communication at a steering committee level (recommendation A.1.) between these groups is now essential.

1. Since the rapidly advancing technology and growth of high-speed amateur communications simply cannot be equated with the technological advances of a decade ago, it seems premature for this subcommittee to recommend specific procedures on this matter. However, the following guidelines are applicable independently from developments in technology:

a. Gateways should be a cluster of individual stations. Each station would specialize in a particular communications mode or band, and be linked to all other gateway stations within the cluster through a local high-speed communications network. This structure has the advantages of flexible long-term growth and substitution of stations without jeopardizing the whole.

b. Gateways should not be limited to amateur-only communications.

c. Gateways should have the ability to perform as upper-echelon National Traffic System links during emergencies, which would include distributing traffic laterally within activated gateways geographically distributed across the country then dropping the traffic vertically into NTS without overloading any one particular station or geographic location.

d. Realizing that packet radio can provide 24-hour automatic coverage and the usefulness of other modes, gateways should not be dependent upon any one communications mode, system or station.

e. Gateways should be given adequate administrative support and training on a continual basis. Gateways should participate in realistic national drills on a quarterly basis and participate in realistic international drills upon the invitation and coordination of sister organizations.

f. Gateways should have the ability to become completely operational within 1 hour, then stay operational for at least 48 hours when required.

g. Gateways should have defined roles, including a voice within related advisory committees and management positions within our field organization.

h. The communications response of the proposed gateways will require knowledge of agencies being served, such as contact and interface personnel. Therefore, continual national communication between APSCOM and served organizations is essential to achieve an effective and coordinated communications response during emergencies.

i. Gateways should not be considered "ARES/NTS only" clubs. Emergencies demand knowledge in many areas of telecommunications. Recruitment of ARES groups, equipment troubleshooters, Special Service Clubs, affiliated clubs, DXers, computer-hackers and contesters as member-operators of these cluster stations should not be neglected. We must overtly recognize that contesters and DXers also have the type of skills necessary for high-volume message handling under marginal communications conditions. (Recommendation A.1. would go far toward achieving this goal.)

j. Individual gateways should meet minimal staffing, performance and equipment guidelines, to be established by APSCOM.

k. Gateways should be responsible for providing clear channel communications betwen themselves and the emergency communications/equipment teams while encouraging amateurs not directly involved to stand by.

l. During emergencies, activated gateways should be encouraged to utilize flexibility in the routing of messages in order to provide communications in the most efficient manner possible.

m. Once established within our field organization, gateways should have the ability to field questions from local and statewide media during emergencies, and keep ARRL HQ appraised of developments.

n. A separate training and administrative program should be developed for gateways within the present public service structure.

o. Gateways may avail themselves of adequate liability insurance coverage by the League by affiliating as an ARRL club and participating in the League's club insurance program.

2. Therefore this subcommittee RECOMMENDS the following:

a. Gateways be placed on the agenda of the proposed meeting (recommendation A.2.).

b. The Amateur Radio Public Service Communications Committee be tasked by the ARRL Board of Directors with presenting formal recommendations in direct response to the above guidelines.

c. The Amateur Radio Public Service Communications Committee will report its recommendations in response to these guidelines at the ARRL Board of Directors July 1989 meeting.

COMMENTS:

Modern technologies now allow our emer-

gency communications to be flexible, efficient and responsive to the needs of our thousands of dedicated volunteers, the needs of interested organizations and especially the public. Gateways can provide the vehicle for the technology to provide this service as an integral part of our ARRL Field Organization.

Once established, gateways will become a manageable, responsible and highly effective League resource available to the public during emergencies within five years—and beyond.

The League presently has no unified national steering committee responsible and responsive to the needs of our thousands of ARES/NTS public service-oriented volunteers, Amateur Radio as a whole and most importantly, the American public. The Amateur Radio Public Service Communications Committee is necessary to provide long-range planning, guidelines, and procedures to the amateur community which will allow us to serve our fellowman as best we can.

The Amateur Radio Public Service Communications Committee (APSCOM) would provide the ongoing national public service and emergency communications forum the League desperately needs to pursue the organizational advances recommended and technological vistas seen by this committee. The opportunity is ours.

In Summary

The BRC and BRC Subcommittee-1 reports are a direct result of input from hundreds of amateurs involved with public service. If you participated, thank you. BRC members who rose above and beyond the call of duty to make their thoughts known and take a hand in the formation of these reports were: BRC Chairman Tom Comstock, N5TC; Tom Greenhalgh, W1QYY; Pete Jordahl, K5GM; Bill Smith, W7GHT; Joel Kandel, KI4T; Jerry Boyd, KG6LF; Tom Abernethy, WA3TAI; Mike Bruce, KA4BCM; and Richard Whiting, WØTN. The conductor of this column was honored to be a part of the committee as well.

SPOTLIGHTS ON SERVICE

Record-Breaking Flood Hits Oklahoma

Bartlesville, Oklahoma, is recovering from "the worst flood in the city's history." Flood waters on the Caney River in Northeast Oklahoma reached an all-time high in late September 1986. The flood stage on the Caney River is 13 feet in Bartlesville, and the river set a new record of 30 feet, remaining above flood stage for more than a week.

The Bartlesville Amateur Weather Net was activated on September 26 by WB5SZP, Washington County EC, when the National Weather Service warned of possible severe thunderstorms and issued flood warnings for the local area. The net remained ready for the following two days as up to 20 inches of rain pelted the area.

The flood gates at two area dams had to be opened to prevent destruction of the dams. The Washington County Emergency Operations Center activated the emergency plan. An alert was issued to local commercial radio stations via Amateur Radio operators who had been assigned to the stations. Emergency response teams, including ARES/RACES members, made house-to-house notifications.

The flood waters bisected Bartlesville; the Caney River passes directly through the center of town. All emergency response groups and agencies had to divide into two groups with one on each side of the city. The Police Department had to relocate its headquarters operation to the Central Fire Station because the flood forced the department's evacuation.

It became apparent that one of the two Bartlesville 2-meter repeaters was going to go under water. WB5ZHD went to the site and quickly removed the repeater. He set it up at his home and put it back on the air for the duration of the emergency. Both in-town repeaters worked flawlessly, even when they were on emergency power.

Amateur Radio operators furnished communications for rescue operations. Some people had to be rescued from rooftops by helicopter, and some were rescued by boat. Amazingly, no lives were lost during this flood. Radio amateurs also provided invaluable service to relief agencies by coordinating activities for the Red Cross shelters and the Salvation Army distribution centers. Amateurs were also important to the National Guard on their patrols.

Following the emergency, some highlights of Amateur Radio's response were identified:

1) We had an emergency plan, and it worked.

2) Although some radio amateurs were flood victims, they continued to help others.

3) Our exercise drills in the past paid dividends.

4) Amateur Radio operators who are active in the Red Cross, Civil Defense or other disaster relief agencies/organizations contribute much to a smoother-running operation.

Two areas of improvement were discovered: Public information volunteers are needed to deal with the news media, and trained personnel are needed to handle telephone calls from the public.

The flood emergency net logged 85 check-ins, and participating stations were from all parts of Oklahoma and surrounding states. Nearly half of the stations were ARES/RACES members in the vicinity of the major floods.—*John S. Campbell, K5ENA, DEC, Northeast Oklahoma*

Hams on Parade

If you are going to have a nationally televised parade of Hollywood celebrities with 500,000 spectators lining the parade route, there had better be an effective communications system available. The 55th annual Hollywood Christmas Parade, the largest celebrity event of its kind, sure did. Ninety Amateur Radio operators, working with the Los Angeles Police Department (LAPD), took care of communications. This parade, which kicked off the film capital's 100th anniversary, featured colorful floats, antique autos, equestrian units, marching bands and more than 100 entertainment stars, led by Grand Marshals Mickey and Minnie Mouse. The parade included big names such as Stevie Wonder, Jose Feliciano and Pia Zadora.

Net Controller W6VGR operates from the command post during the Hollywood Christmas Parade. *(N6ERG photo)*

Police Officer Frank Pettinato, WB6ELR, coordinated the ham operators. This is the fifth year he has done this. In 1981, Pettinato was assigned to work traffic control during the parade. Like most hams, he had his hand-held transceiver with him in his jacket. Captain Keith Bushey, KF6UJ, who was Commanding Officer of the Hollywood Division at the time (and now runs the LAPD's Communication Department), began discussing ham radio with Pettinato. Captain Bushey had the idea of getting hams involved in police communications. Pettinato agreed and began to recruit hams for police-related communications work. Since then, ham radio has played a very important role in all subsequent parades.

The three net-control operators were John Shaffer, W6GVR, Clay Mayrose, KB6DDV, and Chuck Carpenter, N6CFQ. Ham communicators were in place along the parade route as well as marching in the parade alongside several of the celebrities and floats. In order to broadcast information about the parade to people lining the 3.2-mile route, 14 announcing positions were set up along the route. These broadcasted information about the parade entries to the crowds from prepared scripts as the participants passed their stations. Murphy's law always seems to prevail and, as a result, floats broke down and changes occurred in the parade lineup. Each announcer had two hams stationed with him. Radio amateurs relayed information via net control about these various changes, and each announcer updated the script.

Amateur Television (ATV) was also used in the parade. One camera was atop a local building, one was in a vehicle driven along the parade route, and the third one was in a police vehicle. The ATV system was monitored in the command post, communications vehicle and in the LAPD's Hollywood Division Watch Commander's Office. The Watch Commander was very impressed with ATV's capability. When he needed visual feedback, he was able to dispatch the black-and-white unit with the ATV camera for a closer look.

The parade went fairly smooth. The radio amateurs who were marching with the celebrities and floats were able to control gaps in the parade, keeping the floats about half a block apart. Two tight situations were eased by Amateur Radio during the festivities: One parade participant suffered a heart attack and was transported to a local hospital. Hams were able to keep parade officials posted on the person's status.

An electric-powered float developed problems when its batteries began to die. Quick action by Howard Lange, WA6UTM, enabled net control to have a tow truck dispatched to tow the float through the rest of the parade.—*Robert S. Zamalin, WA6VIP*

IN SERVICE...

☐ North Central Florida—November 8-13, 1986. Amateur Radio was asked to provide communications support for a six-day bicycle safari that covered 400 miles. District Emergency Coordinators NF4O and WD4RJI of Suwannee and West Central Florida Districts, respectively, organized the Amateur Radio effort.

Advanced planning and testing of communication links enabled 95% of the entire 400-mile route to be accessible through 2-meter repeaters. Alternate links on 75 meters were also available. The team of 25 radio amateurs operated from mobile units and campsite stations to handle traffic and to be prepared to report emergencies.—*Cameron Magnon, W4UEA*

Field Organization Reports January 1987

ARRL Section Emergency Coordinator Reports

Twenty nine SEC reports were received, denoting a total ARES membership of 16,401. Sections reporting were: GA, IA, LAX, MDC, MI, MN, MO, NFL, NH, NLI, NM, NV, OH, OK, ONT, OR, PAC, SCV, SD, SDG, SK, SFL, VA, VT, WA, WI, WNY, WPA, WV.

Transcontinental Corps

Area	Successful Functions	% Successful	TCC Function Traffic	Total Traffic
Cycle Two				
TCC Eastern	114	91.90	414	851
TCC Central	87	93.50	325	678
TCC Pacific	119	95.97	370	698
Summary	320	93.79	1109	2227
Cycle Four				
TCC Eastern*	117	94.35	524	1068
TCC Central	86	92.50	305	621
TCC Pacific	116	93.50	517	1034
Summary	319	93.45	1346	2723

*TCC Eastern operates both cycles 3 and 4.

TCC Certificates issued this month: N1BHH K1EIC WA1FCD KA1MKJ KT1Q KW1U WB2EAG N2XJ KK3F WB3GZU KB3UD AA4AT N4EXQ WD4FTK N4GHI WB4PNY W8PMJ W8QHB AF8V KA8WNO WB8YDZ

TCC Roster

N1BHH W1CE W1EFW K1EIC WA1FCD K1GRP KN1K KA1MKJ KT1Q W1QYY KA1T KW1U WB2EAG W2FR W2GKZ NN2H KB2HM W2LWB W2RQ KA2UBD N2XJ K2ZM N3COY K3DPF KK3F WB3GZU W3PQ KQ3T KB3UD AA4AT WA4CCK N4EXQ WD4FTK WB4HML N4GHI WA4JDH W4JL N4KB WB4PNY K4ZK N5AMK N5BB N5BT W5CTZ N5DFO AE5I AJ5K W5KLV KD5KQ W5GHP K5GM W5JOV AJ5K KD5RC WB5SDD KA5SPT ND5T N5TC W5TFB K5TL W5TNT W5VMP NQ5W KB5W KV5X WB5YDD KU6D W6EOT W6INH WF6O K6UYK W6VZT KA7CPT W7EP KB7FE W7GHT NN7H W7LYA KA7MUL KF7R W7TGU W7VSE W8BO W8PMJ W8QHB AF8V N8XX WB8YDZ W9CBE W9EHS W9JUJ KA9RII WB9UYU AD9A KC9D K9DJ KA9EPY K9EZ W9FRC W9GRW KJ9G W9HI N9IA W9KK KA9NLI WA9OYI KS9U VE3AWE VE3FAS VE3GSQ VE6CHK

National Traffic System

Net	Sess	Tfc	Avg	Rate	% Rep	% Rep to Area
Cycle Two						
Area Nets						
EAN	31	754	24.32	.635	94.1	
CAN	31	612	19.74	.504	100.0	
PAN*	60	380	6.33	.374	96.2	
Region Nets						
1RN	62	407	6.56	.388	94.4	100.0
2RN	61	335	5.49	.379	97.1	96.8
3RN	31	143	4.60	.366	96.2	100.0
4RN	62	433	6.98	.308	82.9	100.0
RN5	62	683	11.02	.454	94.0	100.0
RN6	55	173	3.15	.275	100.0	100.0
RN7	60	357	5.95	.331	90.3	100.0
8RN	62	219	3.53	.268	92.4	100.0
9RN	62	256	4.13	.311	92.0	100.0
ECN						67.7
TEN	62	708	11.41	.481	87.5	100.0
TWN	39	119	3.05	.220	71.3	98.3
TCC						
TCC Eastern	114	851				
TCC Central	87	678				
TCC Pacific	119	698				
Cycle Three						
Area Net						
EAN	31	296	9.55	.576	94.9	
Region Nets						
1RN	31	64	2.06	.21	94.0	96.7
2RN	31	118	3.80	.309	91.0	96.7
3RN	24	32	1.33	.168	66.7	83.8
4RN						90.3
8RN						96.7
ECN						100.0
Cycle Four						
Area Nets						
EAN	31	1044	33.68	1.000	95.4	
CAN	31	759	24.48	1.090	100.0	
PAN	29	672	23.17	.758	89.7	
Region Nets						
1RN						96.7
2RN	54	135	2.50	.248	74.2	90.3
3RN	59	188	3.18	.300	95.0	96.7
4RN	62	492	7.93	.450	100.0	100.0
RN5	62	539	8.69	.550	100.0	100.0
RN6	60	447	7.45	.750	97.0	94.8
RN7	62	345	5.56	.474	83.9	98.3
8RN	58	306	5.28	.317	85.0	93.5
9RN	62	370	5.97	.406	95.9	100.0
TEN	60	283	4.71	.325	76.3	100.0
ECN	58	137	2.36	.347	55.0	100.0
TWN	58	258	4.44	.384	89.1	94.8
ARN	31	71	2.29	.081	100.0	90.3
TCC						
TCC Eastern	117	1068				
TCC Central	86	621				
TCC Pacific	116	1034				

*PAN operates both cycles one and two.
TCC functions not counted as net sessions.

ARRL Section Traffic Managers reporting: AL, AR, AZ, DE, EMA, ENY, GA, IA, IL, IN, KS, KY, MDC, ME, MN, MO, NC, ND, NE, NH, NLI, NNJ, NTX, OH, OK, ONT, OR, ORG, RI, SB, SC, SDG, SF, SFL, SJV, SNJ, STX, SV, TN, UT, VA, VT, WA, WIN, WMA, WNY, WPA, WV.

Public Service Honor Roll

This listing is available to amateurs whose public-service performance during the month indicated qualifies for 60 or more total points in the following nine categories (as reported to their SM). Please note maximum points for each category: (1) Checking into CW nets, 1 point each, max 30; (2) Checking into phone/RTTY nets, 1 point each, max 30; (3) NCS CW nets, 3 points each, max 12; (4) NCS phone/RTTY nets, 3 points each, max 12; (5) Performing assigned NTS liaison, 3 points each, max 12; (6) Delivering a formal message to a third party, 1 point each, no max; (7) Handling an emergency message, 5 points each, no max; (8) Serving as Emergency Coordinator or net manager for the entire month, 5 points max; (9) Participating in a public-service event, 5 points, no max. This listing is available to Novices and Technicians who achieve a total of 40 or more points. Stations that qualify for the Public Service Honor Roll 12 consecutive months, or 18 months out of a 24-month period, will be awarded a special PSHR certificate from HQ.

248
KC9CJ
156
WB5SRX
143
KAØEPY
137
N4GHI
128
K5MXQ
127
WA4QXT
WX4H
124
KDØCL
123
VE4AJE
122
KB4WT
121
W9FZW
118
N4EXQ
WB2OWO
119
W8FPA
117
N2EIA
116
K2YQK
KA9FFO
W6OYH
W2MTA
WB2EAG
N2FKA
115
KC4VK
114
KA8TIK
113
W2RRX

111
KW1U
KA2MYJ
110
K4ZK
109
AA4AT
K2VX
KD7ME
108
WF6O
107
K2KBT
W9YCV
N7FXJ
WB1GXZ
WB1HIH
106
AG9G
WØIKT
NQ2H
105
W6INH
N3EMD
W7VSE
104
NC9T
WA4JDH
103
N6MCY
WB2VUK
WB7WOW
102
N5AMK
WA1FCD
101
K4JST
W3FA
KT1Q
W9CBE
WD5GKH
NE2W
KA2UBD

N2XJ
WB8JGW
100
N3DPF
WA2FJJ
99
W4ANK
AA4MP
KA1GWE
98
N3EGF
K6UYK
K4NLK
97
KI4YV
NG1A
WB1CBP
NØHMX
96
W4PIM
N9BDL
WB2RBA
WB8KWC
95
VE3ORN
WA2SPL
AC5Z
N7BHL
WD4KBW
NN2H
KA1JXH
W9EHS
94
KF4FG
W3YVQ
KV5X
NW7K
WA4PFK
WB2IDS
KBØZ
W4CKS
93
WB4HRR

KD2UV
K2ZM
92
VE4LB
NOØA
W9DM
K2ZVI
K9CNP
91
KØGP
WA4EIC
KB1AF
WB8SIW
90
WA2ERT
WA1JVV
89
WA6ZUD
VE4RO
KA4ZTB
VE3DPO
W7GHT
WB4WII
N4JRE
W9HBI
88
N4KSO
WD4COL
WA2VJL
W5CTZ
WA4RUE
87
NØFOO
K2MT
N5DFO
86
N6ANQ
WØFRC
AA4HT
W7LBK
NG2T
85
K4VWK

K3RXK
K3JL
KA8WNO
KA4MTX
84
WDØGUF
KT9I
KAØSBY
KA1MDM
WD8QXT
KJ9L
KA8CPS
83
AE1T
KØSI
N8EFB
WB8SYA
KAØNLI
82
W5VMP
81
WA4LLE
WA4ZHC
WB5EPA
AA4TE
W2FR
N1EDD
K8UQY
80
KN7U
WØKK
NDØN
WB5YDD
KD8WI
WA9VLC
79
N1AKS
N2EQM
NF8B
KA8TNT
VE7EJW
78
KL7CB
K4JHF
ND2S
77
KA4TLC
WA1TBY
K2YAI
N7BGW
WD9DZU
N8AHA
76
VE3WV
WAØTFC
N7GGJ

75
KI4BR
KØERM
74
KA5SPT
WD4MIS
K3NNI
W1TN
VE2EDO
NTØB
NØCLS
KJ9J
AJ5K
W1RWG
KA7AID
73
KAØBCB
72
VE4IX
WA4CCK
WA3YLO
KAØARP
KA9RII
NJ9S
K9ZBM
KAØKPY
KA9KHS
N8AEH
W9NXG
71
NT4S
W4HON
KA2ZYX
KA4GUS
WA6QCA
W2PKY
70
W4JLS
W2LWB
N2AKZ
KB4LB
W4FMZ
KA1MKJ
NJ4L
KA8ZRH
WA4RNP
69
KB5UL
KDØNH
KN1K
NR8C
68
WA6WJZ
K4MTX
N2GPA
N4KRA/T
N2CER

67
N6CVF
WBØGPM
KC3Y
N1DHT
W5KLV
WA3UNX
W4SME
WD8KQC
66
WB5SDD
KDØYL
N4PL
KU2N
WB2QMP
65
VE3CYR
VE3GSQ
NØGCC
KB9LT
K4ZN
KA1KML
N8FXH
N8EVC
WD8KBW
64
N5JHI
AA4GL
KJ3E
N1CPX
KA6ODQ
KA9RNY
KA4YEA
KA1KTH
N2DXP
N8FWA
K8JDI
63
NØBKE
KB4BZA
N2ABA
KA1EXJ
KF7R
VE7EJU
62
NN4I
NB1A
K4AJV
K4IWW
WB6QBZ
KD8KU
61
KA5YIW
WD4ALY
KB4JPN
KA4HHE
K4BAI

KØPCK
AIØO
WB5FQU
KØZBJ
WB4TZR
KA4YHS
WA9VND
KA4FZI
KA7EEE
60
K5UPN
VE3GT
KA1LMR
WBØWNJ
KAØYQX
W4TYU
WØOUD
WF4Y
WD8LDY
K8ND
WA8DHB
WD8RHU
59
KA5QYV/T
58
KA1HPO/T
57
KA2ZKM/T
KA6TND/T
55
KB2BKE/N
KA2ZNZ/T
KB2ATJ/T
53
WB2NLU/T
52
VE3POJ
51
KA2TWY/T
NØHDR/T
47
WA8DYS/T
45
N6FWG/T
N2EVG/T
43
N2GQS/T
KA2JMA/T
N4MMM/T
KA9CTW/T
42
KA2TVX/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	878	1094	1235	131	3338
NØBQP	32	1055	36	654	1777
WAØHJZ	0	1000	31	637	1668
WBØYPY	0	809	77	439	1325
W3VR	439	261	401	35	1136
WA4JDH	0	458	496	3	957
KC9CJ	14	472	147	219	852
KW1U	0	382	298	10	688
N4GHI	48	294	256	31	627
KØJAN	0	371	31	175	575
KØRXK	0	260	31	270	561
KA9RII	4	286	259	8	557
N4EXQ	25	271	206	54	556
WX4H	0	283	259	13	555
KØDKM	193	83	252	23	551
WØFRC	81	183	254	27	545
WF6O	2	268	237	7	514
K4DOR	30	225	239	16	510
W7VSE	0	267	233	4	504

Independent Nets

Net Name	Sess	Tfc	Check-Ins
Amateur Radio Telegraph Society	52	201	360
Early Bird Net	31	765	—
Empire Slow Speed Net	31	79	418
Golden Bear Amateur Radio Net	31	56	1888
IMRA	27	1071	1964
Mission Trail Net	31	97	959
New England Novice Net	27	27	103
NYSPTEN	31	56	663
Southwest Traffic Net	31	261	1893
West Coast Slow Speed Net	31	463	463
20ISSBN	26	657	354
75 Meter Interstate SB Net	31	255	1670
7290 Traffic Net	49	414	3159

Coming Conventions

April 3-5
California State, Visalia*
April 4-5
Delta Division, N Little Rock, AR
April 10-12
Missouri State, Kansas City
May 2-3
Louisiana State, Baton Rouge*
May 16-17
Atlantic Division, Rochester, NY
May 29-31
Oregon State, Seaside

ARRL NATIONAL CONVENTIONS

July 10-12, 1987—Atlanta, Georgia
Sept 9-11, 1988—Portland, Oregon
***pending Executive Committee approval**

Date Change
The 1988 National Convention, to be held in Portland, Oregon, has been changed to September 9-11.

MISSOURI STATE CONVENTION

April 10-12, Kansas City

The PHD ARA will sponsor the 1987 PHD Kansas City and Missouri State ARRL Convention at the Heart of America Trade Center, 8601 E 40 Hwy. There will be a complete program of forums: ARRL, FCC, DX, Computers, Packet Radio, Amateur TV, and many more. Seven hundred tables available. Manufacturer and dealer exhibits. Free parking; RVs welcome, no hookups available. Hours: 8:30 AM-6 PM Saturday and Sunday. Exams and setups 6 PM-9 PM Friday; fee is $1. Walk-ins only if space is available. Talk-in on 146.34/94. All registrations will be honored, if received by Tuesday, April 7. Saturday night Royals baseball game with NY Yankees replaces the annual banquet; reserved seat, lower level $6. Guests include Paul Grauer, WØFIR, Midwest ARRL Director; Charles Hutchinson, K8CH, Technical Editor, *QST*; Bernice Dunn, KA1KXQ, ARRL Convention Manager; Bill Pasternak, WA6ITF, Producer *Westlink Radio* news. Registration $5 (good for all three days). Swap tables $11 each, includes one registration with each table. Order swap tables and baseball tickets in advance. For registration and information, send SASE to PHD ARA, PO Box 11, Liberty, MO 64068-0011, tel 816-781-7313.

LOUISIANA STATE CONVENTION

May 2-3, Baton Rouge

The Baton Rouge ARC is sponsoring their "50th Anniversary" convention at the LSU Gym Armory. Doors open 8 AM-3 PM Saturday and 8 AM-2 PM Sunday. Free admission and a Saturday night seafood dinner with live Cajun entertainment. Over 100 swap tables, with major dealers included. Talk-in on 146.79, 145.45. On-site lodging and nearby motel accomodations. For information and reservations, SASE to Rick Pourciau, NV5A, 879 Castle Kirk Dr, Baton Rouge, LA 70808, tel 504-766-9387.

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.

Arkansas (Rogers)—May 2: The Northwest Arkansas ARC will hold its 7th Annual Hamfest in the Rogers Youth Center, 315 W Oliver St, 8 AM-4 PM. Tables available at no charge to commercial exhibitors, or $2 each for others—first come, first served. Doors open 6 AM for exhibitors only. General admission and parking on premises free. Snack bar available. Talk-in on 16/76 or 03/63. Recreational areas and parking also available for RVs and campers on beautiful Beaver Reservoir, 6 miles east on Hwy 12. For more info, write to Roy Milliren, AF5W, 2014 S 16th St, Rogers, AR 72756, tel 501-636-6750.

†**Georgia (Marietta)—Apr 18:** The Kennehoochee ARC is sponsoring their Hamfest at the Cobb County Civic Center (exit 112 off I-75). Vendors at 8 AM-4 PM. Public 9 AM-3 PM. Volunteer exams at 10 AM by CAVEC. In case of rain, flea-market space available inside. Talk-in on 28/88. For more info, write to Dean Harris, Kennehoochee ARC, PO Box 1245, Marietta, GA 30061-1245.

Illinois (Sandwich)—May 3: The Kishwaukee ARC is sponsoring the DeKalb Hamfest at the Sandwich Fairgrounds on Suydam Rd, just north of Rte 34. Admission $2 in advance, $3 at the gate. Free parking. Inside tables $5 each; outside selling space free. Talk-in on 52, 444.45 and 13/73. For tickets, write to KARC Box 264, Sycamore, IL 60178.

Illinois (Sullivan)—May 3: The Moultrie ARK hamfest will be held at the Moultrie County 4-H Fairgrounds, Cadwell Rd, 5 miles east of Sullivan, 8 AM-3 PM. Limited indoor and outdoor flea market. No charge to vendors. Space on a first-come, first-served basis. Lunch available. Vendors setup on Saturday. No overnight hookups. Talk-in on 055/655 and 52. Tests given for amateur licenses. For more information, write to MARK, PO Box 79, Sullivan, IL 61951, or call Vernon E. Jack, K9SWY, tel 217-728-7596.

Indiana (Columbus)—Apr 4: The Fourth Annual Columbus ARC Swapfest will be open 8 AM-5 PM EST at the Bartholomew County Fairgrounds. Talk-in on 146.790 and 444.950. Admission $3. Advance setup on Friday with overnight security. Parking free. VE testing will be conducted off site at the Knights Inn, located at the intersection of SR46 and Interstate 65. For more info, contact Dave Mann, KA9UUP, 458N Country Club Rd, Columbus, IN 47201, tel 812-342-6302.

†**Louisiana (Alexandria)—Apr 11-12:** Please note the date change from last month's listing.

Massachusetts (Braintree)—Apr 12: The South Shore ARC will hold its annual indoor flea market at the Viking Club, 410 Quincy Ave, 11 AM-4 PM. Eight-ft tables available for $10 each (includes one free admission per table), and must be paid for in advance before April 9 by sending the appropriate amount to Ed Doherty, W1MPT, 236 Wildwood Ave, Braintree, MA 02184. Tables will cost $12 the day of the sale. (No guarantee of table space unless paid for in advance.) Make checks payable to the South Shore ARC. Confirmation of check receipt will be sent. No cancellation refund after April 9. The club will open to vendors 9 AM. Doors open to the public 11 AM, with an entrance fee of $1. Plenty of free parking, rain or shine. For more info, call Ed, W1MPT, 617-343-4431 (evenings).

Massachusetts (Fitchburg)—Apr 25: The Montachusett ARA will hold a flea market at the Knights of Columbus Hall on Electric Ave. Doors open 8 AM for sellers and 9:30 AM-3 PM for buyers. Talk-in on 144.85/145.45 and 52. Refreshments available. Admission $1, tables $8. For reservations, send check payable to MARA, c/o James Beauregard, 7 Mountain Ave, Fitchburg, MA 01420.

Minnesota (Bemidji)—May 2: The Bemidji ARC will hold its annual hamfest at the Bemidji Middle School. Doors open 8 AM, with a pancake feed. Exams given. Dealers will be present. Talk-in on 13/73. For more information, write to Bemidji ARC, PO Box 524, Bemidji, MN 56601, 218-751-7920.

†**Minnesota (Rochester)—Apr 4:** The Rochester Area Hamfest will open their doors at 8:30 AM at the John Adams Junior High School, 1525 NW 31st St. Large, indoor flea market with plenty of programs, refreshments and free parking. Talk-in on 22/82. For more info, contact RARC, c/o WBØYEE, 2253 Nordic Ct NW, Rochester, MN 55901.

Nebraska (Omaha)—Apr 5: The Ak-Sar-Ben ARC will present their annual auction at the Radial Social Hall, 1516 NW Radial Hwy. Food available, with free admission. Check-in 8 AM, auction 9:15. Talk-in on 34/94. For rules or info, write to Ak-Sar-Ben ARC, PO Box 291, Omaha, NE 68101, Attn: Auction Chairman.

†**New Jersey (Flemington)—May 9:** The Cherryville Repeater Assn is sponsoring their Flemington Hamfest on State Rte 31 at the Hunterdon Central High School Field House. Admission $4. Doors open 8 AM-4 PM. Talk-in on 52, 975/375, 615/015, 222.52/224.12 and 449.850/444.850. Breakfast and lunches available; indoor facilities and VE testing included. For reservations, contact William Inkrote, K2NJ, RD 10 Box 294, Quakertown-Croton Rd, Flemington, NJ 08822, tel 201-788-4080. For information, contact Donald L. Mazak, NR2H, 2 Meadowrun Way, Flemington, NJ 08822, tel 201-234-4802 (days) or 201-782-1114 (evenings).

New Jersey (Paramus)—May 17: The Bergen County ARA is sponsoring its Spring Hamfest at Bergen Community College, 400 Paramus Rd. Rain or shine, doors open 8 AM-4 PM. Buyers free, sellers $5 per space, tailgate only. Featuring amateur testing, Novice through Extra, from 9 AM. Talk-in on 19/79 and 52. For further info, contact Jim, KK2U, 444 Berkshire Rd, Ridgewood, NJ 07450, tel 201-445-2855.

New Jersey (Stirling)—May 3: The Tri-County Radio Assn is sponsoring their annual indoor ham-

†ARRL Hamfest

fest/flea market 9 AM-3 PM in the Passaic Township Community Center. Donation $3 at the door $8 for tables, $10 with power. Limited, reserved tailgating. Refreshments, restrooms. Talk-in on 855/255, 52 and 444.975/449.975. For more information, contact Dick Franklin, W2EUF, PO Box 182, Westfield, NJ 07090, tel 201-232-5955.

†**New Jersey (Trenton)—Apr 11-12:** The 12th Trenton Computer Festival will be held at Trenton State College 9 AM-5 PM. A packet-radio forum and sessions on Amateur Radio-related software will be featured, plus electronics, technical and exhibits. Admission $7 both days, or $5 Sunday. Students/senior citizens $3. Flea-market space sold in advance. For further info, write to TCF-87, Trenton State College, Hillwood Lakes, CN4700 Trenton, NJ 08650-4700, tel 609-771-2487.

†**New York (Melville)—May 3:** The Suffolk County Radio Club Indoor/Outdoor Electronic Flea Market will be held 8 AM-2 PM at Republic Lodge No. 1987, 585 Broadhollow Rd (Rte 110). Refreshments on premises, free parking. General admission $3. (Wives and children under 12 free). Indoor tables $10 each, outdoor space $7; each includes one free admission. Talk-in on 144.61/145.21 and 52. For info, contact Bill Sullivan, N2ETG, at 516-689-9871 (evenings).

†**North Carolina (Raleigh)—Apr 12:** The Raleigh ARS Hamfest will be held at the Jim Graham Building, NCS Fairgrounds 8 AM-4 PM. Admission $4 in advance, $5 at the door. Many activities featured. VE tests given by preregistration. Talk-in on 146.64, 146.88. For more info, contact Rollin Ransom, NF4P 2447 Fairway Dr, Raleigh, NC 27603, tel 919-779-5021.

Ohio (Dayton)—April 24: The Dayton-Cincinnati Chapter of the Quarter Century Wireless Association will hold its 1987 Annual Banquet at the Neil's Heritage House on Friday night. COD bar is at 6:30, dinner at 7:30. Tickets are $13 each. For tickets or information, contact Bob Dingle, KA4LAU, 657 Dell Ridge Dr, Dayton, OH 45429

Ohio (Dayton)—Apr 24: The 18th Annual BASH, sponsored by the Miami Valley FM Assn, will be held at the Conference Center (Madison Room) of the HARA Arena and Conference Center (same location as HamVention®) starting 7 PM. Free admission and entertainment. Food available. For more info, contact Miami Valley FM Assn, PO Box 263, Dayton, OH 45401.

Ohio (Dayton)—Apr 24-26: The Dayton HamVention® will be held at the HARA Arena and Exhibition Center. Giant 3-day flea market, starting noon Friday and continuing all day Saturday and Sunday. Technical forums, ARRL and FCC forums, new products and exhibits, special group meetings, and much more. Admission: $8 advance, $10 at door. Banquet: $15 advance, $17 at door. Flea-market space $23 in advance (valid for all 3 days). Checks for advance registration to Dayton HamVention, Box 2205, Dayton, OH 45401.

Oklahoma (Mooreland)—Apr 5: The Great Plains ARC is sponsoring their 6th Annual Northwest Oklahoma Eyeball and Swapmeet. Doors open 9 AM. Admission $2. Dinner at noon. Local airport. Dealer and swap tables at no charge. Talk-in on 72/12, 13/73 and 52. VE tests given on Saturday. Campsites available. Directions: north on Main or Elm St, across the tracks and west. For further info, contact Gerald Bowman, WG5Z, Box 356, Mooreland, OK 73852.

Pennsylvania (Drexel Hill)—May 3: The Delaware County ARA is sponsoring their 8th Annual Hamfest at the Hill Middle School, State Rd and Penn Ave (five miles SW of Philadelphia). Doors open 8 AM, setup 7 AM. Admission $3. Indoor tables with electricity by reservation at $3 per space. Outdoor tailgating on a first-come, first-served basis at no extra charge. ARRL/VEC license exams (Novice-Extra), starting 10 AM. Food available. Talk-in on 96/36, 224.5 MHz and 52. For advanced registration and info, write to HAMFEST, DCARA, PO Box 236, Springfield, PA 19064, or call Barbara, N3DLG, 215-535-1616.

Pennsylvania (Lancaster)—Apr 4: The 14th Lancaster Hamfest sponsored by SERCOM will be held at the Overlook Roller Rink 8 AM-2 PM. Vendors setup 7 AM. Admission $4, space for tailgating $5, tables $10, perimeter or with electricity $12. Directions: Rte 501, just one mile north of Rte 30/501 intersection, two miles north of Lancaster. XYLs free. Talk-in on 01/61 or 015/615. For info, SASE to Hamfest Committee, PO Box 6082, Lancaster, PA 17603.

†**Pennsylvania (Wrightstown)—May 17:** The Warminster ARC is sponsoring their 13th annual Hamfest at the Middletown Grange Fairgrounds located on Penns Park Rd. Gates open 7 AM (6 AM for vendors). Donation $3 (XYLs and children free). Indoor spaces with 8-ft tables and power available at $5 each (preregistration only). Unlimited outdoor 8-ft spaces available at $5 each (no preregistration). Talk-in on 147.69/.09 and 52. For info and preregistration, contact Frank Charlton, KA3FBP, 1479 Kingsley Dr, Warminster, PA 18974, tel 215-675-2549.

†**South Carolina (Greenville)—May 2-3:** The Blue Ridge ARS proudly sponsors the 48th Annual Greenville Hamfest and Electronic Flea Market at the American Legion Fairgrounds. Amateur Radio license exams (walk-in), indoor displays, indoor/outdoor electronic and computer flea market, food, free parking and camping. Early dealer/flea-market setups with advance registration. Hours: for Saturday 8 AM-5 PM, Sunday 8 AM-3 PM. Admission $3.50 in advance, $5 at the gate. For advance tickets or information, send SASE to Blue Ridge ARS, PO Box 6751, Greenville, SC 29606.

Tennessee (Clarksville)—Apr 5: The Clarksville ARS is sponsoring their annual Swapfest at the National Guard Armory on Hwy 41A (Ft Campbell Blvd). The Armory is off 124, three miles south of gate 1 to Ft Campbell. Tables $5 each. Admission free. Talk-in on 52 or 205/805 or packet 145.03. To reserve tables or to get more information, call WD4DBJ (Larry), 615-232-6141.

Texas (Austin)—Apr 18: The Austin ARC is sponsoring their spring swapfest, starting 7 AM. Free admission and parking; tables $2 each. Food available. Location is the Manchaca Fire Station on FM 1626 (south of Austin). Talk-in on 18/78. For more info, contact Dave Harper, WD5N, No. 109 W 38 St, Austin, TX 78705, tel 512-454-9205 evenings.

Texas (Bellville)—Apr 24: The annual 7290 Traffic Net Picnic will be held at the Coushatte Recreation Ranch. Seminars, entertainment and catered barbecue. Talk-in on 52. For additional info, contact Jo Ann Keith, KA5AZK, Rte 5, Box 627, Gilmer, TX 75644.

Virginia (Brookville)—May 3: The Lynchburg ARC will hold its annual Swapfest at 9 AM at the Brookville High School, just outside of Lynchburg on Rte 460 West. Admission $1; tailgaters pay general admission plus $2. VE tests 1 PM with limited walk-ins (first-come, first-served). Please preregister by sending in a completed 610 Form, license copy and check payable to ARRL/VEC for $4.35 to LARC Volunteer Exams, PO Box 201, Lynchburg, VA 24502. More info, write to Lynchburg ARC, PO Box 4242, Lynchburg, VA 24502.

†**Washington (Spokane)—Apr 25:** The Inland Empire amateur Hamfest will be held at West 708 Boone St (Spokane Red Cross Bingo Hall). Admission $2; tables $8 in advance, $10 at door. Doors open 9 AM-5 PM. Talk-in on 146.88, 146.94 and 146.52. Features include food, seminars on packet, amateur satellite, DX electrical safety and CPR, plus many more. VE tests (Novice-Extra). For info, contact Inland Empire Amateur Hamfest Committee, W 3022 Francis, Spokane, WA 99205-7259, tel 509 328-8627.

Wisconsin (Cedarburg)—May 2: The Ozaukee Radio Club will sponsor its 8th annual Cedarburg Swapfest 8 AM-1 PM at Circle B Recreation Center, Hwy 60 and County I (located 20 miles north of Milwaukee). Admission $2 in advance, $3 at the door. Four-ft tables $3. Food available. Seller's setup 7 AM. For admission tickets, table reservations, maps or information, send a business-size SASE to 1986 ORC Swapfest, 101 E Clay St, Saukville, WI 53080, tel 414-284-3271.

Wisconsin (Madison)—Apr 5: The Madison Area Repeater Assn is pleased to announce its 15th annual Madison Swapfest, held at the Dane County Exposition Center Forum Building. Doors open 7:30 AM for flea-market sellers, 8 AM for the general public. Arrangements for early setup available for exibitors and purchasers of 6 or more flea-market tables. Plenty of parking, with hotel accommodations available. An all-you-can-eat pancake breakfast and luncheon also available. Talk-in on 16/76. Admission: $2.50 in advance, $3 at the door; under 12 free. Tables: $5 each in advance, $6 at the door plus admission. Reserve early for tables. For tickets and table reservations, write to MARA, PO Box 3403, Madison, WI 53704, tel 608-274-5153.

Is Your Event Accessible?

Amateur Radio has always had a strong tradition of brotherhood and sisterhood, regardless of physical ability. In keeping with this tradition, it would be greatly appreciated if all clubs, when advertising classes, exams, meetings, flea markets, hamfests and conventions, let it be known whether the event is wheelchair accessible.

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

Strays

QST CONGRATULATES THE 1986 WINNERS OF THE ARRL COVER PLAQUE AWARD

- Clarke Greene, K1JX, January
- Robert C. Sommer, N4UU, February
- Keith Sueker, W3VF, March
- Rich Arndt, WB4TLM and Joe Fikes, KB4KVE, April
- Wes Hayward, W7ZOI, May
- Michael R. Owen, W9IP/2, June
- Mark Mandelkern, KN5S, July
- John J. Uhl, KV5E, August
- Jerry Pittenger, K8RA, September
- Frank J. Witt, A11H, October
- George T. Isleib, W3CPR, November
- Michael J. Masterson, KA2HZA, December

TOP OF THE MORNING TO YOU, OM/YL

☐ A group of EI amateurs, including executive committee members of the Irish Radio Transmitters Society (IRTS), will be in the United States April 14-26. They will visit New York, travel around Florida and then attend the Dayton HamVention®. If you hear them on 2 meters, please don't hesitate to say hello to them. They will be looking forward to making many QSOs with local amateurs.—*Nao Akiyama, N1CIX*

I would like to get in touch with...

☐ hams who are members of The Better World Society and are interested in starting a net. William Taylor, WB5FXI, 1204 Kings Ct, Gautier, MS 39553.

☐ anyone in the east Tennessee area interested in forming a QRP activities group. Larry Maso, NU4B, 9003 B Creekside La, Knoxville, TN 37923.

Contest Corral

Conducted By Mary Schetgen, N7IAL
Assistant Contest Manager, ARRL

Mar 31

West Coast Qualifying Run, 10-35 WPM, at 0500Z Apr 1 (9 PM PST Mar 31). W6OWP prime, W6ZRJ alternate. Frequency is approximately 3.590. Underline one minute of the highest speed you copied, certify that your copy was made without aid and send it 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.

APRIL

4

Holiday in Dixie QSO Party, sponsored by WA5ARJ, on Sat, Apr 4, from 1800Z until 2300Z. Suggested frequencies and modes: SSB on 7.235 14.245. CW on 7.115 and Novice at 21.115. Exchange name, QTH, RST and Holiday-In-Dixie ops names. Send SASE and QSL for certificate to WA5ARJ, Box 4842, Shreveport, LA 71134.

4-5

North American QSO Party, CW, Mar *QST*, p 91.

GARTG SSTV Contest, Part 1, Mar *QST*, p 91.

Connecticut QSO Party, Mar *QST*, p 91.

CRRL QSO Party, CW, Mar *QST*, p 92.

The SP-DX Contest, phone, sponsored by the Polski Zwiazek Krotkofalowcow, from 1500Z Apr 4 until 2400Z Apr 5. Suggested frequencies are 160-10 meters. Non-Polish stations transmit a 5-digit number consisting of RS plus QSO number. Polish stations send a signal report plus 2 letters denoting the province. Count 3 points for each SP-station QSO. Each different province counts as a multiplier (49 max). Categories: single op, multiband; single op, single band; multiop, single transmitter (all bands); SWL. Include complete logs, summary sheet and multiplier check list. Certificates. Mail entries by Apr 30 to Polski Zwiazek Krotkofalowcow, SP-DX Contest Committee, PO Box 320, 00-950 Warsaw, Poland.

10

W1AW Qualifying Run, 10-35 WPM at 0300Z Apr 11 (10 PM EST Apr 10). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 147.555 MHz. See Mar 31 listing for more details.

11-12

North American QSO Party, SSB. See Mar *QST*, p 91.

CRRL QSO Party, phone, see Mar *QST* p 92.

GARTG RTTY Contest, Part 2, Mar *QST*, p 91.

Montana QSO Party, sponsored by the Yellowstone RC, from 0000Z Sat, Apr 11, until 1800Z Sun, Apr 12. Single ops only. Stations may be worked each band/each mode. Mobiles, more than once if county change. Exchange: QSO number/QTH/county for Montana stations; state/province/country all others. Scoring: SSB—1 point per QSO; CW—2 points. Montana mobiles: All contacts to Montana mobiles: SSB—5 points; CW—10 points. Multipliers: Montana stations use states/provinces/countries. Non-Montanan use Montana counties (max 56). Suggested frequencies: CW—3.565 7.065 14.065 21.065 28.065; phone—3.940 7.260 14.280 21.370 28.600; Novice—3.710 7.110 21.110 28.110. Certificates to top scorers in each state/province/country, and top-10 Montana stations. Logs must be received by May 15. Send logs to Gina Williams, N7IBG, 11 Gatewood Dr, Billings, MT 59102.

13

ARRL VHF/UHF Spring Sprints, 144 MHz, from 7 PM until 11 PM local time Apr 13. (Note: Other Spring Sprint dates are: 220 MHz on Tues, Apr 21; 432 MHz on Wed, Apr 29; 902 MHz on Fri, May 8; 1296 MHz on Thur, May 14 **[see 1296 MHz listing for special rules]**; and 50 MHz on Sat-Sun, **2300Z May 23 until 0300Z May 24.**) Single-operator only. Exchange grid-square locators (see Jan 1983 *QST*, page 49). Signal reports are optional. Count one point per valid QSO. Multiply QSO points by number of different grid squares worked for final score. Contests are separate; there is no accumulation of scores. Usual VHF/UHF rules apply. Entries for each contest must be postmarked by June 20. Mail contest entries in separate envelopes. Submit separate log and summary sheets for each contest entered. Logs must indicate time, call sign and complete exchange for each valid QSO. Multipliers must be clearly marked in the log. Official entry forms, available from ARRL HQ for an SASE, are recommended.

QRP ARCI Spring CW Contest, sponsored by the QRP ARC International, from 1200Z Apr 18 until 2400Z Apr 19. CW only. Operate a maximum of 24 hours. Exchange for members is RST, state/province/country and QRP ARCI membership number. Nonmembers exchange RST, state/province/country and power output. Work each station once per band for QSO points. Each member-contact counts 5 points, each nonmember US or Canadian contact, 2 pts. Count 4 points for nonmember contacts on a different continent. QSO points (total all bands) times total number of states/provinces/countries (an s/p/c may be worked on more than one band) times power-multiplier times bonus-multiplier equals claimed score. Multipliers are 4-5 W output × 2, 3-4 W output × 4, 2-3 W output × 6, 1-2 W output × 8, less than 1 W output × 10. Over 5-W output counts as checklog. Bonus multipliers: If 100% natural power, × 2; if battery power, × 1.5. Suggested frequencies: 1.810 3.560 7.040 14.060 21.060 28.060 50.360 MHz; Novices and Technicians—10 kHz from the bottom of each band. No 10-MHz or 24-MHz operation. Use separate logs per band. Certificates. Logs must be received by May 22. Send to QRP ARCI Contest Chairman Eugene C. Smith, KA5NLY, Pentagon PO Box 46599, Washington, DC 20050-6599.

21

ARRL Spring Sprints, 220 MHz. See Apr 13 listing.

25-26

Helvetia Contest, sponsored by the USKA (Switzerland), from 1300Z Apr 26 until 1300Z Apr 27. CW and phone (mixed mode only). Categories: single op, multiop, SWL. CW—160-10 meters; phone—80-10 meters; no WARC band operation. Work stations once per band, regardless of mode. Exchange RS(T) and 3-digit serial number. Swiss stations will also send one of the following abbreviations to indicate their canton: AG AI AR BE BL BS FR GE GL GR JU LU NE NW OW SG SH SO SZ TG TI UR VD VS ZG ZH. Count 3 points per QSO with Swiss (HB) stations. HB stations also work each other. Multiply by number of Swiss cantons worked (max 26 per band). Awards. Separate logs per band. Mail entry by May 31 to Walter Schmutz, Gantrischweg 1, CH-3114 Oberwichtrach, Switzerland.

North Carolina QSO Party, sponsored by the Alamance ARC, K4EG, from 1200Z Apr 25, to 0400Z Apr 26. Work stations once per band/mode. May work mobiles more than once if county change. Exchange: RST/QTH/county for NC stations; state/province/country all others. Suggested frequencies: CW—3.540 3.740 7.040 7.140 14.040 21.140 28.040 28.140; SSB—3.860 7.260 14.260 21.360 28.360. 1 point for SSB; 2 points for CW; 5 points for Novice contacts. NC stations multiply points × total NC counties, states, provinces, countries. Others multiply score by number of NC counties worked (max 100). Mail logs by June 30 to NC QSO Party, c/o K4EG, Box 3064, Burlington NC 27215. Include SASE for results and certificate.

26

W1AW Qualifying Run, 10-35 WPM, at 2300Z Apr 26 (7 PM EDT). See Mar 31 and Apr 10 listings for more details.

29

ARRL Spring Sprints, 432 MHz. See Apr 13 listing.

MAY

2

Utah QSO Party, sponsored by the Utah ARC and the Utah DX Assn, from 0000Z May 2 to 2400Z. Suggested frequencies: CW—1.810 and up 60 kHz from the bottom of each band; SSB—1.860 3.980 7.280 14.280 21.380 28.680; Novice—3.710 7.110 21.110 28.110. Exchange: Utah—RST/county; Non-Utah—RST/state/province/country. Novice and Technician station sign N or T. Points: Utah stations receive points for all contacts, 5 points for Novice or Technician, 3 points for all other class licensees. Non-Utah stations, 5 points for Utah Novice or Technician worked, 3 points for all other Utah licensees. Multipliers—Utah stations: Number of states/provinces/countries. Non-Utah stations, number of Utah counties per band (max 29). Awards for top scorers. Send logs and SASE for results to Curt Wilbur, K7CU, 907 East 250 S, Bountiful, UT 84010.

2-3

County Hunters SSB Contest, sponsored by MARAC, from 0001Z May 2 until 2400Z May 3 (0800Z-1200Z each day is a mandatory rest period). Work mobile and portable stations each time they change band or county. Fixed stations may work other fixed stations only once, regardless of band change. No contacts on net frequencies. Exchange signal report and QTH (county for US; country for DX). Suggested frequencies: 3.870-3.890 7.225-7.250 14.250-14.285 21.360-21.380 28.570-28.600 MHz. There will be a mobile window at 3.870-3.880 7.235-7.245 14.265-14.275 where low power mobiles will operate. Fixed stations are asked to work the mobiles and move out of the window. Point value of contacts: mobile—15; mobile team—30; portable—5; DX (incl KH6/KL7)—5; fixed US station—1. Final score equals the total of US counties plus Canadian stations times the total number of QSO points. Awards and certificates. Send your logs by June 4 (or an SASE for more information) to Barry Brewer, WA5DTK, 1013 North Blvd, Universal City, TX 78148.

6

West Coast Qualifying Run, 10-35 WPM, at 0400Z May 7 (9 PM PDT May 6). See Mar 31 listing for more details.

8

ARRL Spring Sprint, 902 MHz. See Apr 13 listing for details.

9

W1AW Qualifying Run, 10-35 WPM, at 0200Z May 10 (10 PM EDT May 9). See above listings for more details.

Nevada QSO Party, sponsored by the Frontier ARS, for May 9, 0000Z to 2400Z. 160-6 meters, CW/SSB/Packet/RTTY/SSTV. No crossmode or repeaters. five points each Nevada station per band; 1 point all others worked. Multipliers: State/province/country plus number of Nevada counties worked. Certificates awarded. Mail logs by June 5 to Frontier ARS, c/o Bob Herrill, WB5PTO, 1813 Silver Birch La, Las Vegas, NV 89104.

CQ-M Contest (Peace to the World), sponsored by the Krenkel Central Radio Club of the USSR, from 2100Z May 9 until 2100Z May 10. CW and phone, 3.5 through 28 MHz. Amateur satellites count as a separate band if a 144- to 28-MHz mode is used. Work stations once per band, regardless of mode. No crossmode QSOs. Categories: single op, single band; single op, all band; multioperator, single transmitter (all bands); SWL. Exchange signal

report and serial number. Avoid lower 5 kHz of 80/40 meters and lower 10 kHz of 20/15 meters. Count one point per QSO within your continent, 3 points for other continents. QSOs with your own country count for multiplier credit, but have no point value. Multiply total QSO points by the sum of different countries (R-150-S country list) worked per band. The R-150 list is basically the same as the ARRL countries list except for USSR countries. Serious competitors should review the R-150 list. Awards. Mail logs by July 1 to CQ-M Contest Committee, PO Box 88, Moscow, USSR.

9-10

A. Volta RTTY DX Contest, sponsored by the SSB and RTTY Club of Como and the Associazione Radio-amatori Italiani, from 1200Z May 9 until 1200Z May 10. 80-10 meters. Entry classes: single op; multi op, single transmitter; SWL. Work stations once per band. Exchange signal report, serial number and zone number. Multipliers are DXCC countries and call areas in W/K, VE and VK. QSOs within the same country do not count (W2 cannot work W2, but can work W1, W3, W4, etc). Points for other QSOs are determined from exchange table available from sponsor. QSOs with different continents on 3.5 and 28 MHz are worth double. Multiply QSO points by sum of DXCC countries and W/VE/VK call areas worked per band. Count one additional multiplier for working the same "country" on at least four bands. Mail logs to be received by July 16 to Francesco Di Michele, I2DMI, PO Box 55, 22063 Cantu, Italy.

14

ARRL Spring Sprints, 1296 MHz, from 7 PM until 11 PM local time on May 14. **Exchange six-character Maidenhead Locator** (write to Special Requests, ARRL, for a reprint or see Dec 1986 *QST*, p 30). QSO points equals the distance in km for each successfully completed QSO. In making the distance calculations, a string (or ruler) and a map may be used. However, calculations by computer program are preferred. Several such programs are available in the commercial market, including The ARRL World Grid Locator Atlas ($4). For purposes of making calculations, stations are defined as being located in the center of the 6-character locator subsquare (most computer programs make this assumption). Final score equals sum of QSO points (distance in km). Other usual VHF/UHF rules apply. Send logs to ARRL before Jun 20.

16

Armed Forces Day

16-17

Southern California 6 Meter Club QSO Party, sponsored by the Southern California 6 Meter Club, from 1200Z May 16 until 1200Z May 17. All modes. Work station once per mode. Scoring count 1 point per QSO times grid squares worked equals total score. Send logs to Southern CA 6 Meter Club, PO Box 448, Cypress, CA 90630.

ARI Italian International Contest

World Telecommunications Day Contest

16-18

Michigan QSO Party

23-24

ARRL Spring Sprints, 50 MHz. See Apr 13 listing.

25

W1AW Qualifying Run

30

QRP ARCI Hootowl Sprint

30-31

CQ WW WPX Contest, CW, see Mar *QST*, p 91.

Six Meter Invitational Net Activity Day Contest (SIN)

Special Events

Conducted By Mary Schetgen, N7IAL
Assistant Contest Manager, ARRL

Selmer, Tennessee: The McNairy County ARS will operate WA4TPA **Apr 4 and 5,** 1500Z to 2400Z, from Shiloh Military Park, to commemorate the 125th anniversary of the Battle of Shiloh. Suggested frequencies: phone—80, 40 and 20-meter bands; CW—80, 40 and Novice bands. For a commemorative certificate, send a large SASE (39 cents) to William J. Gray, KB4SID, Box 552, Selmer, TN 38375.

Arcade, New York: The Pioneer Radio Operators Society (PROS) will operate KC2JY **Apr 4-5,** 1400Z to 2200Z, for the 4th Annual Arcade Trade Fair. Operation will be SSB with suggested frequencies: 3.890 7.240 14.250. For QSL send QSL and SASE to PROS, KC2JY, Box 296, Arcade, NY 14009.

Benton, Kentucky: The Marshall County ARA will be operating a special-event station on **Apr 5** for the 14th Annual Tater Day. Suggested frequencies: phone—3.925 14.280; Novice—7.130. To receive a certificate, send QSL card to Roger Gough, KB4MLW, Rte 2, Box 269, Hickory, KY 42051.

Springer Mt, Georgia: The Lanierland ARC will operate W4IKR from 1400Z **Apr 10** until 0200Z **Apr 11,** and from 1400Z **Apr 11** until 0200Z **Apr 12** at Amicalola Falls State Park to honor the 50th anniversary of the completion of the Appalachian Trail, a hiking trail from Springer Mt, Georgia to Mt Katahdin, Maine. Suggested frequencies: phone—3.870 7.270 14.270; CW—3.740 7.140. Listen for CQ-ATC on all bands. For commemorative certificate, send QSL and 9- × 12- in SASE (39 cents) to Lanierland ARC, Box 2182, Gainesville, GA 30503.

St Charles, Missouri: The St Charles ARC will operate WBØHSI on Sat **Apr 11,** from 1400Z to 2200Z, to celebrate its 15th anniversary. Suggested frequencies: 7.250 14.325 21.350 28.510 and 146.67. For certificates, send a no. 10 SASE to the St Charles ARC, Box 1429, St Charles, MO 63302-1429.

Philadelphia, Pennsylvania: The Olympia RAC will celebrate the anniversary of the United States Submarine Service by operating from the *USS Becuna* and the *USS Olympia*. Suggested frequencies and times: 1300Z **Apr 11** until 2000Z **Apr 12** on 3.590 7.050 14.050 21.090 28.150 CW, and 3.890 7.240 21.360 28.600 phone (all freqs within 10 kHz). 2-m and Novice operation is planned. The ORAC call is WA3BAT. For certificate, send no. 10 SASE or 1 IRC, if foreign, to ORAC, Box 928, Philadelphia, PA 19105.

Stoystown, Pennsylvania: The Somerset County Pennsylvania ARC will operate KA3IUS, **Apr 11** from 1700Z to 2200Z, on 40 m and starting 2200Z on 75 m. On **April 12** from 1700Z to 2200Z on 40 m. All operations in lower 25 kHz of bands. Send SASE for certificate to William D. Valentine, Somerset Count ARC, RD 2, Box 237, Stoystown, PA 15563.

Edgewater, Florida: The Coronado Wireless Assn will operate a special-event station on **Apr 19** during daylight hours. Suggested frequencies: General portion of 10 m and 20 m with the call WO4K. QSL WO4K, Box 1, Edgewater, FL 32032.

Rocky Point, New York: The Rocky Point Schools ARC will operate N2FCZ from Marconi's shack to commemorate the birthday of Marconi on **Apr 25,** 1400Z to 2100Z; use MGM for RST. Suggested frequencies: 3.705 21.105 CW. Pse QRS for new Novices. For commemorative QSL, send your QSL and SASE to RPS ARC, Rocky Point Jr/Sr High School, 82 Rocky Point Rd, Rocky Point, NY 11778.

Nebraska City, Nebraska: In celebration of Arbor Day, stations will be operating from 2400Z **Apr 20** to 0600Z **Apr 26.** Frequencies: General phone and CW—80-10 meters. Certificates issued for ham/SWL. Send SASE and QSL to Nebraska City ARC, Box 278, Nebraska City, NE 68410.

Camdenton, Missouri: The Lake of the Ozarks ARC will operate NIØV 1400Z to 2200Z **Apr 25** during the 37th Annual Dogwood Festival. Suggested frequencies: CW—7.125; phone—14.255-14.285 and 20-m packet. For certificate, send no. 10 SASE to LOARC, Rte 2, Box 399, Sunrise Beach, MO 65079.

Dubuque, Iowa: The Great River ARC of Dubuque, Iowa will operate N9GBY from 1600Z until 2300Z, **Apr 25,** at the site of the annual Boy Scouts of America Grant Pilgimage in Galena, IL. Frequencies will be on the lower 20 kHz of the General bands. For QSL, send SASE to N9GBY, Box 141, Galena, IL 61036. Station KA9KLZ will operate simultaneously in the lower 25 kHz of the 80-and 40-m Novice bands. For QSL send SASE to KA9KLZ, 213 Jefferson, Cuba City, WI 53807.

Gulfport, Mississippi: The Confederate Signal Assn of South Mississippi has scheduled the Confederate Memorial Day special event for **Apr 25-26,** beginning 1800Z Sat to 1900Z Sun. Suggested frequencies: 21.150 21.350 28.150 28.350. QSL via W. R. Jeffrey, KA4CRT, Box 923, Gulfport, MS 39502-0923.

Strays

***QST* congratulates...**

☐ New Year's Eve means Straight Key Night for many hams, but for Mark, KA7MEI, and Pam, KA7NFA, Keller it was an event of another kind. They became the proud parents of Daniel Austin Keller, the first baby born in 1987 in Orofino, Idaho.

I would like to get in touch with...

☐ hams who raise homing pigeons as a hobby. Bill Copeland, WB6RVE, PO Box 163, Perris, CA 92370.

☐ anyone involved or interested in the animal rights movement. Hawk Kaufman, KA9SXJ, 205 Eaton St, Bartonville, IL 61607.

☐ any hams who were in the 104th Infantry (Timberwolf) Div, Co A, 414th Inf Regt, during WW II. Malcolm Ivey, KA4ROP, 7185 Lower Thomaston Rd, Macon, GA 31210.

☐ anyone with a control head and microphone for an Azden PCS 2000. John Anderson, N7GGO, PO Box 1145, Shelton, WA 98584.

Section News

Administered by Steven Ewald, WA4CMS

CANADA

ALBERTA: SM, Bill Gillespie, VE6ABC—A/SM: VE6AMM, SEC: VE6AFO, OO: VE6TY, STM/DEC/SM: VE6ABC. After many years of active service in various aspects of amateur radio, Roy Ellis, VE6XC, retires from active service. Roy plans to spend his time raising horses and continue with community league and volunteer work. Thanks, Roy, for your many years of devoted service. To fill the gap Ken Oelke, VE6AFO of Calgary, will attempt to fill Roy's shoes. Good Luck - Ken. Poor band conditions slow traffic reporting and general 80 meter activities. Traffic: APSN QNI 640, QTC 7. Informal 28. ATN QNI 278, QTC 30. Personal totals: VE6GUS 46, VE6MI 2. VE6EJ 2, VE6ADX 1, VE6AKY 1.

BRITISH COLUMBIA: SM, H. Ernie Savage, VE7FB—British Columbia Public Service Net, 3729 KHz at 0130 Z NM Ford V37DDF-reports High 207 Low 163 Total 5065. British Columbia Emergency Net 3650 KHz at 0200Z NM Ferdi VE7EJU reports QNI's consistently in the 30s. Low 29, high 40. Total QNI's 1100. Unfortunately the number of QTC's down from last December. Everybody is urged to contribute QTCs. Only by handling traffic can we become efficient traffic handlers. January wasn't the best month for band conditions but in all things were not that bad. Those that missed the Burnaby ARC's auction sure missed a good day and good bargains. Thanks to all of you for your support in our AREC program. Traffic: VE7BNI 304, VE7EJW 96, VE7EJU 91, VE7ANG 85, VE7FB 55, VE7XA 40, VE7CTJ 37, VE7FME 19, VE7CCJ 10, VE7EGM 9, VE7BNH 7, VE7BZI 4.

MANITOBA: SM, Jack Adams, VE4AJE—Effective February 1, 1987, the CRRL Manitoba evening phone net changed frequency to 3750 KHZ. This net meets daily at 7 PM local time or 0100Z during the winter and 0000Z during day light saving time season. VE4CR Bill Fenn resigned as secretary for the CRRL traffic net. Bill has dedicated many years to this service, ensuring that those who were sick or in the hospital received a get well card from the Manitoba group. On behalf of CRRL/ARRL, I would like to take this opportunity to thank Bill. I'm sure these feelings are mutual thoughout the Manitoba traffic net group. Mac, VE4TE, who was one of the first to start this net and who is net manager for the Manitoba Morning WX net will take over as secretary-Many Thanks Mac. Net traffic reports: MTN (CW) net-31 sessions 247 QNI, 75 QTC. MMWN-31 sessions 826 QNI, 32 QTC-Winnipeg repreater society informational net-9 sessions, 1 QTC, 407 QNI. CRRL evening phone net-30 sessions, 851 QNI, 29 QTC. Individual traffic: VE4AJE 94, VE4RO 63, VE4TE 32, VE4IX 60, NE4NE 33, VE4BI 27.

MARITIME-NEWFOUNDLAND: SM, Leigh Hawkes, VE1GA—ORS: VE1VX. OES: VE1BZC. SEC: Pending. Rem, all appointments made by SM are valid only during his term of office and are subject to regular reporting and periodic renewal. Contact me if u would like to renew or join the team. VO1BD has been appointed A/D by VE1SH. Rptr VE1NZ has joined the link now providing NS-NB-PEI coverage. Congrats VE1BTN, new harmonic. Rem, HARC/DARC fleamkt on May 23 weekend. 40 M Sun Morn VO Net now on 7097 kHz at 1400 Z, VO1OO NCS. Vacs: VE1YS to Cuba, VE1RB to 8P6, VE1LZ to W4. New calls VE1VAU, VE1VAY. HOSP: VE1FA, VE1RO, VE1YJ, XYL - VE1QM. SK: VE1LR, EX - VE1MA. Traffic: VE1BKM 66, VE1BPM 10, VE1BX 2. (Dec.) VE1BKM 180, VE1BPM 34, VE1VX 11.

ONTARIO: SM, Larry Thivierge, VE3GT—SEC: VE3GV. STM: VE3CYR. TC: VE3EGO. As I have been re-elected for another two year term commencing this month, I would like to take this opportunity to sincerely thank all those amateurs who have supported me over the past two years and to solicit your help for another two years. Whether your forte is DX, traffic, packet radio, ARES, rag chewing or what ever, lets all work to-gether towards a common goal of a strong and vibrant amateur radio organization within the Section and across the country. Interest is high in the Golden Jubilee DXCC Award - out of the first four applications received at Newington, two applications indicated 100 countries in the first 3 days of the new year. Don't forget the Durham Region flea market on the 11th. Recently retired DOC Kitchener District Office Manager VE3GA is the 31st member and second DOC retired Manager of the KWARC Coffee Club. VE3LVH has an amateur BBS up and running in the St. Catharines area. ECs VE3DBB VE3LDU VE3LXA have stepped down and hopefully replacements will be named shortly. The Swap Net, held on repeater VE3RPT has returned again on Wednesdays at 1900. Late BPL for December was VE3KK with 1,028 - this is Marshall's 24th. While attending a course at Transport Canada's Training Institute in Cornwall I had the opportunity to visit their fine station, VE3MTA, which is used mainly on the higher frequencies. DOC, through its Onatrio Director, advises that it considers the use of anything but an amateur call sign for a tnc is illegal. This would include the use of geographical names for a digipeater, as well as the use of just your suffix to identify your station. This was specifically in reference to a Toronto digipeater that was using a geographical locator rather than its assigned call sign. How's your FD planning coming along-is this going to be your groups' year. Traffic: VE3GSQ 304, VE3FAS 221, VE3GNW 157, VE3DCX 147, VE3ORN 128, VE3GT 95, VE3DPO 91, VE3OCF 83, VE3WV 76, VE3CYR 73, VE3KXB 73, VE3BUO 60, VE3EAM 26, VE3BAJ 23, VE3AJN 23, VE3KCZ 16, VE3GOL 11, VE3POJ 9. (Dec.) VE3KK 1028, VE3EFX 35, VE3FGU 19.

QUEBEC: SM, Harold Moreau, VE2BP—STM: VE2EDO. BM: VE2ALE. TC: VE2ED. NM: VE2EDO. Speedy recovery to Joe, VE2ALE, our BM, who is back home after a heart transplant. VE2DDT operate a BBS(RTTY) on 80 meter. Congrats to VE2ED and VE2FT our Assistant Directors. Felicitations a VE2UMS pour leur classement lors du French DX contest 1986. Avec regret j'ai a vous annoncer le deces de VE2WV. Traffic: VE2EDO 170, VE2BP 48, VE2JN 34, VE2EC 25.

ATLANTIC DIVISION

DELAWARE: SM, Harold K. Low, WA3WIY—New Castle Co. Emergency Net now in operation on 146.985 Saturdays 5:30 PM. New officers Nanticoke ARC Pres WA3RBP VP W3XU T/S KV3D. KC3TI called a meeting of all Field Organization personnel 1/10/87 also EOC staff from all counties. SMC's for Army, Navy and Air Mars were also present. Dignitaries present KX1B W3ABC and from EPA KC3LM and WA3PZO. SARA will sponsor the Delmarva Hamfest again, AUG 16 at Del Tech in Georgetown. AWARE and FSARC will hold exams every month this year. Contact either club for details. New EC in NCC N3FOL. DTN stations 297 trfc 25 in 5 sessions. SEC stations 57 in 4 sessions. Traffic: W3QQ 92, WA3WIY 33, WB3DUG 30, K3JL 27, KA3IXV 16, W3PVO 9, KC3JM 7, PSHR K3JL.

EASTERN PENNSYLVANIA: SM, Kay Craigie, KC3LM—ASM: WA3PZO, KA3A, KO3B, K3ZFD. SEC: WA3PZO. SGL: WA3IAO. STM: KB3UD. PIO: W3AMQ. TC: W3FAF. This month we applaud all ARES volunteers in EPA. You're prepared to help under circumstances ranging from inconvenient to hair-raising. ARES training turns hazy good intentions into real skills. K3SMB SM/WPA offered fine hospitality during the Atlantic Division Cabinet meeting last month. SEC WA3PZO now chairs ARRL's Emergency Communications Advisory Committee. He and KC3LM attended Delaware Section's Amateur emergency comm. conference. Section staff and DEC's met last month to strengthen EPA's Field Organization leadership. KA3A has changed chairs from Affiliated Club Coordinator to Assistant SM for the northeastern region of EPA. A new era for Novices begins! Let's convert this FCC decision into a true enhancement by meeting the challenge and offering the friendship that will put life into frequency and mode allocations. Offer a welcome and find a friend. In the technical corner, W3CPR's article in the November '86 QST won the prestigious cover plaque award. STM KB3UD has been beta-testing new packet BBS software. Public Information Assistants WB3AIG and KA3KNA have been using PBBS's to good advantage. Add W3DZI to our list of Official Observers. Good luck to all Spring Sprint competitors on VHF/UHF. Turning to the clubs, KC3LM enjoyed recent visits to Delmont RC and Carbon ARC. Penna. Emergency Comm. Council ARC and Keystone AR Group have joined our list of Affiliated Clubs. Is Delaware Co. ARA's May 3 hamfest on your calendar? Pocono ARK and Perkiomen Valley ARC sponsored winter Novice classes. Warminster ARC and York ARC ran Novice and upgrade classes, too. Noahs ARC did comm for the Pitfiley County pig-bothering festival. Harrisburg RAC's officers are KA3BZX, KA3PDQ (love that suffix!), and K3BSV. Reading RC's are KC3QB, WA3TIU, W3UQC, WB3AAK, W3WJC, WB3FPL, NE3F, and W3UQH. PARA's are K3HLN, K3ITH, WD4DSV, WB3HXM, and W3SOU. Please send your club paper to our Director W3ABC. He actually reads them! DEC2 WB2OOB reports the ordinance finally enacted in Manheim Twp., Lancaster Co., affects only TVRO, not ham antennas. This is the result of PRB-1 applied well by local clubs and ARES leaders. NET REPORTS, December (QNI/QTC/sessions): EPA 446/154/62, EPAEPTN 544/324/31, PTTN 229/76/29, D3ARES 124/15/4, D5ESN 41/2/3, D6ARES 74/27/7, D8ARES 63/0/4, MARCTN 169/161/14, MARC ARES 65/48/49, STAR 74/27/7. Traffic (December): N3AZW 1096, N3COY 467, WB3JOE 418, N3AIW 228, WA3EHD 217, W3IPX 179, KA3IME 179, KA3DLY 178, W3AQN 125, KB3UD 114, WB8KPE 106, N3CD 104, N3DRM 92, W3KAG 90, KU3R 88, AA3B 76, KA3JOI 68, K3WPI 66, W3JKX 63, K3TX 49, N3EFW 48, W3TWV 25, W3AQN 24, WA3WQP 22, W3ADE 19, W3CL 16, WA3CKA 13, W3VA 12, KO3M 11, K3EBZ 10, W3DP 4, W4UQ 3.

MARYLAND-DC: SM, John A. Barolet, KJ3E— ARRL members should receive a ballot from headquarters soon after April 1 for election of a new Section Manager. VOTE! Novice Enhancement is with us. The voice and digital priviledges should increase the amateur radio population and help fill some of our highly prized but relatively unused bands. Let's recruit and train the newcomers for service to the public and to the amateur radio comunity. On the subject of the many flagrant rules violations, particularly by rude operators who individually or in a group deliberately "stamp on" a QSO or net. Please, DO NOT CALL THE FCC! The proper corrective action is to alert the MDC Official Observer Coordinator, KC3EK, and ask for Official Observer/Amateur Auxiliary monitoring of the rules violation. The ARRL/FCC Amateur Auxiliary plan is today's solution. You never heard of it? Ask KC3EK or KJ3E for detailed information. WB3EFG say the Baltimore clubs are now coordinating their public service activities, providing a common amateur radio front to the public. A word on my favorite topic...message handling. Let's not invent a custom message format for each communications emergency. The ARRL radiogram format is time- tested and fully adequate for record emergency communications, even for packet. LEARN IT AND USE IT! Some MDC folks got the idea that the K3RXK/KJ3E proposal for a Section Public Service Coordinator and local assistants would deprive them of participating independently in public service communications. Not so! The PSC and assistants would field requests for non-emergency public-service communications to relieve the frequently-overloaded emergency coordinators. The Foundation for Amateur Radio plans to award 26 scholarships for the academic year 1987-88: obtain additional information from W3ABC, but act NOW if interested. KA3T is running a full-service packet bulletin board in Mount Airy and Carroll County ARC is operating a packet mailbox at the county EOC. K3LDE, guest of honor at a surprise party, was presented a plaque with a mint 807 on the face. What's an 807??? APPOINTMENTS: N3DRB BM and OBS, N3RO EC/Frederick County, KJ3E EC/St. Mary's County, WA3SWS EC/Harford County (Thanks to retiring EC N3CNJ and WA5UNR for their service), KC3ZJ ORS, W3OIO, K3EF, W3ERB, WA2WDT, and KA3HDH as OES. WITH THE NETS: Net/Mgr QND/QTC/QNI: MDD/W3FA 61/209/537 (MDD Brass: W3FA/100 K3NNI/91 W3QQ/74 KJ3E/65), MEPN/N3EGF 34/206/1120, MSN/KC3Y 31/46/475. WRPON/WB3BFK 23/23/325, FREDCARES/K3RXK 4/11/63. MDCPON/W3OYY 5/3/79, HOCOARES/K3NNI 2/2/24. PSHR: W3FA 101, N3EGF 98, W3YVQ 94, K3RXK 85, K3NNI 74, WA3YLO 72, KC3Y 67, KJ3E 64. Traffic: KJ3E 157, W3FA 149, NC3Z 128, K3RXK 120, K3NNI 117, KC3Y 98, N3DE 84, NA3Q 98, N3EGF 60, KT3T 45, WA3UZI 38, WA3YLO 33, W3LDD 32, N3RO 31, K2EB 30, KK3F 28, KX3U 25, WB3BFK 25, W3FZV 20, W3DQI 18, W3YVQ 17, WA3GYW 9, KC3DW 8, KA3T 7, K3OMN 6, WA2WDT 4, W3ZNW 4.

SOUTHERN NEW JERSEY: SM, Richard Baier, WA2HEB—SEC: K2QU. STM: WB2UVB. ACC: K2IXE. TC: KA2RAF. PIO: VACANT. SGL: KA2KMU. BM: WB2UVB. OOC: WA2HEB. ATC'S N2BQT, K2JF, KA2RJA and WB2MNF. Many times I'm asked as to where the testing opportunities are in our section. Here is some of the information I have received in the past couple of weeks. The DVRA will be conducting VE tests at the Hopewell branch of the Mercer County Library in Pennington at 12:30 PM on Saturday, May 9, July 18, Sept. 12 and Nov. 14. To pre-register, or for further info, contact Don Wright, AA2F at (609) 737-1723. The Cape May County ARC will be conducting VE tests at the Library Bldg. Basement, Mechanic St. (just off Rt.9), Cape May Court House, NJ. The time of these tests is 10 AM SHARP and will be held on Apr. 25, July 25 and Oct. 24. No pre- registration is required. For further info. contact Mary Petruzzi, AE2Y, 16 Rose Lane. Villas, NJ 08251. Since both of these VE teams are with ARRL VEC, I assume the fee is $4.35. Are there more VE tests? Please let me know. I'll include them in this column, in a timely manner. Until next month, 73. Traffic: N2FKA 119, N2CER 77, W2IML 65, NG2T 43, WA2HEB 6.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA—ACC: N2EH. BM: W2GLH. OOC: W2AET. PIO: WA2PUU. SEC: NN2H. STM: W2ZOJ. SGL: WB3CUF. TC: K2QR. Appointments: (EC) N2FSP-Seneca County, WA2PUU-Onondaga County. MNI TNX to N2BED past EC in Seneca. Club Officers: Champlain Valley ARC-WA2JPM, WD2AKF, KA2TCQ, KA2MIQ, WB4LGG; Binghamton ARA-N2BLX, NE2W, WN2CVP, WB2SGS; Fulton ARC- W2TQF, WB2LBE, WB2CWJ, N2AWS, WB2WMB; Odgensburg ARC-KA2JXI, KA2CEO, N2FSX; Salt City DXA-KO2K, NM2L, WB2WBU, KB2G; Tompkins County ARC-KD2IM, N2BU, N2GFX, N2GFW; Stars-N2GAO, K2QNQ, WA2VER; Black River Valley ARC-NO2W, K2MQX, N2FIJ, WA2OEP; Utica ARC- NA2A, WA2AZA, NA2Q, WA2FSU. Hamfests: Owego (STARC) May 2, Rochester (New York State and Atlantic Division Convention) May 15-16-17, Skaneateles May 30, Rome Ham Family Day (Westmoreland) June 7; Cortland June 20; Batavia (Alexander) July 12; Trumansburg (Aug.?), HAM-O-RAMA (Sept.5?), Elmira (Horseheads) Sept. 26; Syracuse (RAGS) Oct. 17. Wow! More every year! Also had Feb. and March events, but got word too late for timely entry in here. (Chemung, Drumlins) Hey, W2PHQ our senior OES hit 84 on January 17. CLUB NEWS: Congrats to W2FEY, GRAM Amateur of the year; BARA and RAGS are "fighting the good fight" re Antenna Ordinances; LARC Ham of the Year to W2CM—I cannot compliment all of the clubs enough on their excellent newsletters! Public Service Honor Roll: N2ABA N3DPF N2EIA N2EVG WA2FJJ W2FR NN2H WB2IDS W2MTA KU2N WB2NLU WB2OWD WB2RBA ND2S KA2TWY KA2TVX KA2UBD KD2UV NE2W K2YAI KA3ZKM KA2ZNZ. January BPL to KA2UBD.

NYSEMO	3993.5	0900 Sn	N2AGO	080-005-04	
NYSR	3530	0930 Sm	W2MTA	023-007-04	
NYS/M*	3677	1000 Dy	WB2EAG	418-251-31	
WDN/M*	04/64	1100 Dy	WB2OWO	401-120-31	
Mike Farad	3925	1300 Dy	VE2FMQ	242-052-30	
NYPON*	3913	1700 Dy	KA2UBD	744-292-31	
*Empire SS	3590	1800 Dy	W2WSS	418-079-31	
*NYSPTEN	3925	1800 Dy	WB2HKU	663-056-31	
OCTEN/E*	34/94	1830 Dy	WB2HLY	663-078-31	
Q Net	31/91	1830 Dy	N2AGK	421-000-31	
STAR*	13/73	1830 Dy	NE3B	304-057-31	
WDN/E*	57/17	1830 Dy	WB2OWO	591-221-31	
Blueline	93/33	1900 Dy	WA2SEF	198-034-25	
NYS/E*	3677	1900 Dy	KU2N	441-251-31	
JCRAC Net	10/70	2000 Dy	KA2OTS	382-010-30	
Black River	6.655	2100 Dy	WB2OFU	393-008-31	
CNYTN*	90/30	2115 Dy	WA2PUU	262-073-30	
OCTN/L*	28/88	2130 Dy	WB2HLY	267-067-31	
WDN/L*	04/64	2130 Dy	WB2OWO	303-122-31	
NYS/L*	3677	2200 Dy	KU2N	336-188-31	

*NTS Net. Other Nets: MVTN 010-045-31; LCARES 049-000-04; VHF THIN 051-000-04. Traffic: KA2UBD 567, W2MTA 376, N3DPF 358, WB2OWO 326, N2EIA 267, WB2IDS 265, WA2FJJ 218, N2ABA 203, WB2QIX 177, NE2W 176, WB2RBA 160, W2FR 143, ND2S 132, KU2N 119, NN2H 110, KD2UV 96, K2YAI 94, N2EVG 92, KA2ZKN 86, K2GXT 75, KA2DBD 69, W2UYE 59, WB2NLU 57, WA2JPB 49, KA2ZNZ 47, AF2K 45, W2ZOJ 35, KA2TWY 33, N2DYT 28, NE3B 22, KA2TVX 20, K2QR 9, WA2OEP 8, WB3CUF 6, K2IUT 6, K2VR 4. (Dec.) K2VR 2.

WESTERN PENNSYLVANIA: SM, Otto L. Schuler, K3SMB—STM: WN3VAW. SEC WA3UFN. BM: KC3ET. TC: N3EFN. OOC: K3SMB. PIO: KC3TO. ACC: AK3J. SGL: W3DTW.

NET	QNI	QTC	SESS	KHZ	T/D	MAN
WPACW	290	134	31	3585	7:00P	WA3UNX
WPAPTN	446	88	31	3983	8:00P	WA3HLN
KFN	259	62	26	3983	1:00P	N3EMD
PFN	186	108	31	3958	5:00P	WA3THT
KSSN	67	9	20	3730	6:30P	KA3NQA
WPA2MTN	365	63	31	146.28/88	8:00P	KA3BGC
NWPA2MTN	410	31	29	144.53/45.731	9:00P	KC3NY

I regret to announce three Silent Keys. They are: W3UED, WA3FNS and N3CH(60 years plus). Our sympathy to their families and friends. New officers for 1987: BVARA Pres. KA3MRG, 1st V.P. KG3L, 2nd V.P. KA3PIU, Sec. KA3BNG, Treas. WB3HWB, Trustee WA3ZEW. GPVHFS Pres. WA3QKX, VP WA3IKG, Treas. K3JZD, Sec. KA3ORL, Trustees K3LIE & K3WOD. Foothills ARC: Pres. N3AEP, V.P. WA3VJP, Sec. N3ERN, Treas. N3CNU. Steel City ARC: Pres. KA3ITM, V.P. KC3HJ Treas. AK3J, Rec. N3EQF, Corr. Sec. W3UUH. Packet Radio is coming into it's own and is very active in the WPA section. A meeting was scheduled for Jan. 28 but due to wx conditions where not conducive to travel. I hope we can make it in better weather. The WPA repeater concil officers are Pres. K3JDU, V.P. K3KEM & Sec/Treas. KR3P. K3PS is still rep. Coordinator. All coorespondence to WPA Rep. Council, P.O. Box 352, DuBois, PA 15801. We need more operators for the traffic nets, I wonder why the number of stations participating have disappeared from the nets. I would appreciate any suggestions to better the attendance and all comments will be kept anonymous, help. Jan. Traffic: W3OKN 163, N3EMD 161, WA3UNX 93, N3AES 82, W3NGO 68, N3FM 57, WN3VAW 56, N3CZW 56, K3SMB 52, KD3AC 37, W3KUN 21, WA3QNT 17, N3EKJ 11, KC3JQ 9, W3AHH 7, K3LTV 6, KA3EGE 4. (Dec.) KA3COX 28, KB3NV 2.

CENTRAL DIVISION

ILLINOIS: SM, David E. Lattan, WD9EBQ—SEC: W9OBH. STM: K9CNP. OOC: W9TT. BM: K9EUI. SGL: W9KPT. PIO: N9EWA. ACC: WB9SFT. TC: N9RF. ASM: AA9D.

NET	FREQ	TIMES	(Z WIN)	QNI	QTC	SES
ILN	3690	0030/0400	Dy	461	125	60
ITN	3705	0100 Dy	102	22	23	
ILPN	3915	2230	M-F 1430 SN	343	45	26
NCPN	3915	1300	Dy (X Sn)	427	89	27
NCPN	7270	1815	Dy (X Sn)	311	34	21
IEN	3940	1500	Sn	91	3	4
IARES	3915	2230	1+3 Sn	60	2	
ISN	3905	0000	Dy	674	117	31
CTN	147.69/09	0300	Dy	493	126	31

Illinois was represented 97% to 9RN by stations KA9BBV K9CNP W9EHS KA9FEZ W9HBI W9INZ KJ9L WA7MAD W9NXG and NC9T. D9RN was represented 100% to CAND.

Illinois stations were W9EHS KA9FEZ W9HOT NN9M and NC9T. This month we welcome two new faces to the section staff. Jim, K9CNP, familiar to us as EC for Sangamon Co. and a regular on the NTS nets has agreed to undertake the STM slot which has been open since the resignation of KB9X. Bill, N9EWA PIA of note from Schaumburg is taking over the PIO reigns from K9IDQ. Also in the welcome aboard department, Don, KF5NX, recently moved to New Douglas, Il from Louisiana where had served as SEC DEC EC ORS and OES. Don will be a welcome addition to the field organization here in Illinois. OBS K9GXU reported that the ARRL bulletin copy on 80 meters was pretty good this month...hope it continues! Have an appointment that is inactive? Contact the appropriate section official listed above or if in doubt WD9EBQ for endorsement. Are you a reader of this section of QST that is puzzled by all the cryptic references to folks as ECs ORSs PIAs ATCs and all those other funny initials? Ever wonder about this 'field organization' that gets mentioned from time to time? If so, and you think that you might enjoy volunteering a little of your ham radio time in support of the public and the Amateur Radio Service, call 1-800/451-2775, leave your name and address and mention that you are interested in more information on the field organization and I'll send you a booklet that tells all! (well..most anyway) It was sure good seeing so many appointees at the ARRL forum at the Wheaton hamfest! All of the NMs were there as well as a good number of net members and ECs. Lets keep the ball rolling and remember that progress sometimes looks pretty minimal from month to month, but darn good from year to year. In a section of about 10,000 hams of whom roughly half are ARRL members it is at times discouraging that we have only about 150 volunteer appointees trying to keep the programs of the field organization going. A point which is often overlooked or unknown by those not associated with the field organization is that every hour spent monitoring for inirations, copying bulletins, attending NWS training, teaching classes, administering exams, handling traffic.... ad infinatum is an hour NOT spent ragchewing, working dx, building a project or catching a nap in the hamshack. I want all of you who do any more than use your appointment certificate to paper the wall to know that what you do is important, needed and appreciated. From me to you...THANKS FEW! Traffic: KA9FEZ 280, NC9T 260, W9EHS 183, W9HLX 140, W9HBI 108, K9CNP 106, WA9VLC 100, W9NXG 95, KJ9L 88, W9HOT 75, W9KR 62, N9CIB 49, N9DIX 26, W9LWH 26, W9LNQ 25, WA7MAD 25, NN9M 24, W9OBU 24, W9RTD 21, KA9BBV 20, WD9DZU 16, K9WMP 14, WB9TVD 13, KA9CTW/T 11, K9QEW 10, KF5NX 6, W9VEY/M 6, WA9RUM 5, W9IL 4, WD9HQW 4.

INDIANA: SM, Ron Koczor, K9TUS—ASM: W9UMH. SEC: WB9ZQE. STM: W9JUJ. ACC: K9TUS. TC: K9PS. SGL: WA9VQO. BM: KC9TA. PIO: KA9LQM OOC: KJ9G. SHC: 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	3540	414	2313	89
QIN	3656	1430/	0000/	0300	554	233	1318	62
ICN	3705		2315		94	32	530	22
IWN	3910		1310		1562	327	31	
IWN	VHF	Bloom./Kokomo			2004		545	62
Hoosier VHF Nets:					5107	325	5647	194

APPT: N9FOF. EC Clark County: N9ETL. OO/AA. Silent Keys: W9VJX, Winchester; WA9SBK, Columbus: W9JTU, Evansville. Special Service Club of the month is the Madison County ARC. Contact is Frank, WA9JWL; club has about 100 members and operates one two meter repeater and an HF club station. In addition to common activities like FD, SET, C&T classes and supporting VE testing, the club takes part in the Lions Club Home Show and Anderson Summer Festival each year. Club encourages its members to take part in the Novice Roundup, various DX contests and has operated the Boy Scouts Hamboree from the club station. MCARC works closely with Anderson city CD officials, Madison County EMA and the local police. In fact Anderson Police Chief, N9FQA, is a MCARC member! Keep up the good work guys! Hope to see you all at their April 6 meeting. Columbus Swapfest is April 4. Club officers note: IRCC meeting is in Indy is April 5. Congratulations to Steuben County ARC, Indiana's newest affiliated club. Welcome to the family. Do you hold an ARRL appointment? If not, there's one waiting for you. No matter what your interest, there's a place for you. ARRL appointees remember that you that you can get a very distinctive name badge available to appointees only. Badge color depends on your appointment. Contact me for more details. Over 120 volunteer exam test sessions are scheduled for Indiana in 1997. Congratulations to all who are willing to take the time to make the VE system work! Novice Enhancement is here! Clubs have a chance to really grow by making use of this new and enthusiastic pool of hams. Making it work depends on us, doesn't it? Station reports for January: W9JUJ 642, W9JZV 170, KJ9J 169, KA9FFO 112, K9WWJ 107, NJ9S 75, K9TKE 65, WD9HII 56, WA9QCF 55, WB9IHR 53, KB9HH 45, W9PMT 36, KW9D 33, W9ZGC 33, KD9ER 33, KA9RNY 21, K9KTB 20, KA9QMI 18, K9ZBM 13, WD9DWD 10, W9BTZ 10.

WISCONSIN: SM, Richard R. Regent, K9GDF—K9VGE received Half Century Award for confirming 50 grid squares on 432 MHz. KD9ZF working on trunking system for digipeaters. MANCORAD qualified as a Special Service Club. New officers Riverland Amateur Radio Club: Pres. NI9V; V. Pres. KA9UUK; Sec./Treas. K9UYB. New officers Rock River RC: Pres. WB9ADB V. Pres. W9BCV; Sec. KA9BAC; Treas. KA9FNE. New officers Taylor County Area ARC: Pres. W9LEE; Treas. WD9FWP; Sec. N9FZD. Congratulations to new Official Observers K9RGV and N9ADQ. If you are interested in becoming an OO, let NC9G know. Licensed over 25 years ago? Check with me for information about the Wisconsin Chapter of the Quarter Century Wireless Association. Plaque for fifty years with ARRL to W9OVO and W9YCV. April 4th, exams begin 9 AM at Wauwatosa East High School, 74th and Milwaukee Avenue, with W9SNK. April 5th, Madison Swapfest and exams, Dane County Expo Center Forum Building, 8 AM, sponsored by Madison Area Repeater Association. April 18th, walk- in exams begin 9 AM at WCTI, 800 Main Street, Pewaukee, with WD9JKZ. Good Citizen Award for Colby High School goes to National Honor Society senior KA9WDD. Marshfield Area ARS will rebroadcast Westlink on 147.78 Thursdays at 9 PM. Regret to report Silent Keys K9MPY, KA9BAH and W9YYW. By coincidence, K9GCF and K9GDF attend the same church.

BWN	3984	6 AM	WD9IID	1053-1223-27
BEN	3985	NOON	KA9RII	776-264-31
WSBN	3985	5:30 PM	WB9ESM	728-197-31
WNN	3723	6 PM	N9DGL	
WSSN	3645	6:30 PM	N9BDL	165-32-31
WIN-E	3662	7 PM	WB9ICH	288-108-31
WIN-L	3662	10 PM	KC9CJ	117-35-31
NWTN	34/94	6:30 PM	W9ZZM	327-52-31

Traffic: WB9YPY 1325, KC9CJ 852, KA9RII 557, W9CBE 195, W9YCV 178, K9GDF 175, WB9RGO 157, WA9WYS 103, N9BDL 99, WB9ICH 95, W9DND 92, KA9BHL 80, W9UCL 78, KA9KLZ 75, N9BCX 73, K9AKG 70, AG9G 64, N9AUG 40,

Dayton HAMVENTION

April 24, 25, 26, 1987

Early Reservation Information

• General Chairman, Jim Simpson, WB8QZZ

• Asst. General Chairman, Bill McNabb, WD8SAY

Grand banquet tickets are limited, please place your reservations early.

- **Giant 3 day flea market • Exhibits**
- **Awards • License exams**
- **CW proficiency test**

Flea Market Tickets

We increased Flea Market area by nearly 400 spaces this year and all were sold out by January 10.

Special Awards

Nominations are requested for "Radio Amateur of the Year", "Special Achievement" and "Technical Achievement" awards. Contact; Awards chairman, Box 44, Dayton, OH 45401.

License Exam

Novice thru extra exams scheduled Saturday & Sunday by appointment only. Send current FCC form 610, copy of present license and check for $4.35 (payable to ARRL/VEC) to: Exam Registration, 8830 Windbluff Point, Dayton Oh 45459.

Slide Show

35 mm slide/tape presentation about the HAMVENTION is available for loan. Contact Dick Miller 2853 La Cresta, Beavercreek, OH 45324

Parking

Free parking is available at Hara Arena. In addition, there will be free shuttle bus service from all major motels and designated parking lots. Parking and road information will be available on DARA's 146.34/.94 repeater.

Free Bus Service

Free Bus Service will be provided between many Motels and Hara Arena. See the schedules at the motel registration desks. Avoid parking problems at the Arena by taking the HAMVENTION buses.

Campers & Trailers

Campers and Trailers may be parked at Montgomery County Joint Vocational School. A HAMVENTION bus will provide transportation between the camper parking area and the Arena. No campers or travel trailers will be permitted to park in the Arena lot or Flea Market area.

Wheelchairs

Wheelchairs will be available. Send S.A.S.E. for details to "Wheelchair" P.O. Box 44, Dayton, OH 45401.

Alternate Activities

HAMVENTION is for everyone. We have planned activities for the YL or your non-ham family members.

Deadlines

Award Nominations: April 4
Lodging: April 4
License Exams: March 28
Advance Registration and banquet: USA - April 11
Canada - April 4

Information

General Information: (513) 433-7720
or DARA Box 44 Dayton, OH 45401
Flea Market Information: (513) 223-0923
Lodging Information: (513) 223-2612
(No Reservations By Phone)

This is the year for you to attend the internationally famous Dayton HAMVENTION. Come with your friends to hear enlightening forums, see the latest equipment, and visit a flea market that has everything! No matter what you are looking for, you can find it in Dayton!

HAMVENTION is sponsored by the Dayton Amateur Radio Association Inc.

K9UTQ 34, W9ODV 32, K9FHI 28, K9JPS 26, W9NGP 24, WD9DNQ 22, W9UW 20, W9PVD 6. (Dec.) KC9CJ 817, W9CXY 181, NB9H 18, KY9P 12, KA9RZL 8, N9BYS 6.

DAKOTA DIVISION

MINNESOTA: SM, George Fredrickson, Jr., KCØT—Sec: KAØARP. STM KDØCI. Hello; This New Year has started out great, traffic count is up. The Public Service Honor role (PSHR) for January 1987 totaled 15, the highest in over 4 years. Thanks goes out to all of you. I'm sure that you all have heard that we are thinking of moving the Phone Net to another frequency somewhere between 3850 and 3890 KHz, due to the QRM and harmonics from a Broadcast Station. Congratulations go to KAØODQ, Jeff, from Arden Hills, for Amateur of the Month for January. Also to KAØTNV, Luella, who upgraded to General. NØFJP, Marv, from Owatonna, received (WAS) on 160 meter SSB, his certificate number is 366. Good Job and Happy Birthday to you! I'm sorry to report the following Silent Keys: WØAGN Larry Whight of Eveleth, MN and WBØBJK Annette Wynnemer of Waseca, MN. There is a new repeater in Warroad that is on 147.690/090, give it a try when you're driving thru. NØFOO Mel should receive an award of some sort for helping two gentlemen near Brainerd, MN, who where involved in a car fire. His quick reaction in calling the Fire Dept. helped save most of their belongings. He also brought them home so they could call their families. Thanks Mel for setting a good example. I hear that the Rochester group has been busy graduating 15 new Novices from its fall class. They also have a Tech/General class which has encouraged 22 members to work on their upgrades. The VE examinations are being held on May 16 at North Memorial Medical Center, Robbinsdale ARC. June 6 at the Minnesota State Fair Grounds, St. Paul RC. I would like to thank the following clubs for their News Letters: Brainerd ARC, St. Paul Ground Wave, Mankato ARC and MSN Letter. Happy Easter! 73s KAØBFP.

NET	FREQ	TIME	QNI/QTC/SESS	MGR
MSN/RTTY	3620	6:30P	96/0/13	WAØLUT
MSN/1	3685	6:30P	398/116/31	KAØEPY
MSN/2	3685	10:00P	318/41/31	NCØE
MSSN	3710	6:00P	315/52/31	KAØODQ
MSPN/N	3929	12:00P	665/225/31	WBØWNJ
MSPN/E	3929	5:30P	1104/151/31	KAØBFP
MNAMWXTN	3929	6:15P	290/149/24	KØOGI
PICONET	3925	9:00A	5323/490/150	WDØBAC

MN EMERGENCY FREQ: 3929 BULLENTINS: 3685 & 3929 MN/MSO: 3620. Traffic: WBØWNJ 451, WAØTEC 417, KAØEPY 296, KDØCL 243, WDØBAC 240, NØFOO 178, KAØSBY 156, KT9I 142, KDØCI 105, KØOGI 81, KAØARP 66, KAØYOX 62, KAØBFP 54, NØCLS 54, KAØODQ 52, W9DM 44, WØGRW 43, WAØONE 43, KDØNH 37, NTØB 26, WDØGUF 26, KAØYZE 24, KCØT 23, WAØLUT 16, NØCRO 14, NØEWA 13, KAØPDM 10, KAØPQW 10, KAØAJF 9, KADCDC 9, WØKYG 4, NØFKU 3.

NORTH DAKOTA: SM, Bill Kurtti, NØAFP—Thanks to everyone for their support. I will need continued support to be able to do a descent job. The Peace Garden Hamfest will be July 10-12. There will be tests, camping, meetings, dance, Sunday breakfast, transmitter hunts, flea market, dealers, and a good time for all. Grand Forks 147.03 repeater auto patch automatically calls police when 911 is called. Use only in emergency. Minot changed frequency at Berthold. It's now 147.36/96. Test sessions in Bismarck, Grand Forks, and Minot were successes. Special congrats to KAØHHH to extra and WØEUQ, KØTIN, and WDØHPW to advanced. 146.16/76 at Minot AFB has a new controller including mailbox.

NET	FREQ	MGR	SESS	QNI	QTC
GOOSE RIVER	1990	WØCDO	4	134	11
ND WX NET	3883	WØGFE	84	902	100
DATA	3883	KAØFSM	27	348	26

Traffic: WØCDO 128, KAØFSM 62.

SOUTH DAKOTA: SM, R.L. Cory, WØYMB—SEC: KAØKPY. asst. SM: NØABE and WØFPR. STM duties have been transferred to Myron, KDØYL, and NØABE is now the Official Bulletin station for S. Dak. Also NØABE has been given the outstanding Amateur of the Year Award from the Minnehaha County Civil Defense—Our congratulations to him and thanks for the good job he has done as STM. Belated Christmas parties were held in Jan. by the Medicine Butte Repeater Group and the Mobridge Area Amateur Radio Club. Congratulations to the South Dak. School of Mines and Tech ARC on their affiliation with the ARRL-Packet radio on S.D. has increased to 80 stations with a link accross the state southern half. Now we need to get the Northern half into it. Contact NØABE for State Packet Info. Traffic: NØDPF 194, KØZBJ 129, KAØAIE 105, KØERM 105, WØHOJ 74, KAØKPY 62, WAØVRE 59, WDØBMS 40, WBØOMF 34, WDØBMR 26, WØYMB 14, NØABE 11, KDØYL 8.

DELTA DIVISION

ARKANSAS: SM, Joel M, Harrison, WB5IGF— ASM: K5UR. SEC: N5BPU. STM: W9OK. ACC: NI5D. SGL: W5LCI. TC: W5FD. Repeater Coordinator: WB5FDP. The 1987 ARRL Delta Division Convention April 4 & 5 in Little Rock. If you need information, contact WA5LUY, Wayne Mahnker at 501-758-4545. DON'T MISS THIS CONVENTION. Arkansas Net frequencies and times:

Phone Net	3885 KHz	6:00 AM CST	M-Sat
Mockingbird	3928 KHz	4:30 PM CST	M-F
Razorback	3987.5 KHz	6:30 PM CST	Daily
Ark. CW (OZK)	3591 KHz	7:00 PM CST	Daily
Ark. EC Net	3987.5 KHz	5:30 PM CST	Sunday

It is with deep sorry that I report the passing of our very dear friend Jimmy Beavers, W5HMZ. It's too bad you missed what has been happening on OZK. Check in on 3591 KHz at 7 PM and see what's going on. Traffic: W5QFU 82, W5UAU 46, W9OK 46, W5RIT 27, W5KL 10.

LOUISIANA: SM, John "Wondy" Wondergem, K5KR—SEC: N5ADF. ACC: K5DPG. SGL: KD5SL. OOC: KE5QK. TC: N5JM. PACKET: NE5S. Congrats to the new officers of the Greater New Orleans ARC. Pres: Keith, KE5GA, VP: Greg, KA5WZV. SEC: Hank, N5ITX. Treas: Susan, KA5WWV. Hamfest Calendar: Apr 11-12 Alexandria. May 2-3 Baton Rouge. June 20-21 New Orleans. The 1987 ARRL Net Directory (yellow cover) contains a list of all reported state and wide-area coverage nets plus several articles on net operating procedures. The nets are listed by name, frequency, UTC date/time, purpose and area served. Under the Louisiana listing only 3 VHF nets and 7 MHF nets are reported whereas we have dozens of nets meeting on a regular daily or weekly basis. Your nets will be listed in the 1988 Directory if your net manager or club officer completes the ARRL Net Directory Registration Form FSD-85 available from ARRL Headquarters. Meanwhile ask to see my copy at the forthcoming Louisiana hamfests and be surprised on how much useful information is contained in the ARRL Net Directory. Thibodaux ARC elections of officers: Pres: Buddy, KA5GZB. VP: Fred, W5QMB. Sec: Jim, W5NDB. Treas: Johnny, K5CRF. Thibodaux ARC net 2nd, 4th & 5th Mondays, 7 PM on 147.30 MHz.

MISSISSIPPI: SM, Paul Kemp, KW5T—ASM: K5QNE. SEC: K4HKD. SGL: AL7GQ. ACC: KC5VD. PIO: KA5VBE. OOC:

W5VMC. VHF Coord: N5DWU. BM; AJ@X. TC: WB5SXK. Congratulations to Mississippi Sideband Net on an alltime high in activity; check-ins now avaraging 80-plus per night. Recent planning session in Brandon drew more than two dozen packet enthusiasts from Mississippi and Louisiana. WA5WRE continues to recover from 60-foot tall from tower following lengthy hospitalization at Hattiesburg, Vicksburg and Hattiesburg ARC's have been formally recognized as Special Services Clubs following year's probationary period. SEC K4HKD looking for emergency coordinators in a number of counties; if your area has none, why not contact Ross and take on the task! ATTENTION LEAGUE APPOINTEES: Filing your monthly reports? Remember that these reports keep your appointment current; it only takes a second! Field Day is only a couple of months away; it's past time to start getting your plans, equipment and people together for this challenging and FUN weekend. MSBN(WJ5P) Sessions 31 QNI 2530 QTC 45. (MTN(KB5W) Sessions 31 QNI 217 QTC 67. MMN(WJ5L) Sessions 31 QNI 714 QTC 8. MSN(W5YRX) Sessions 22 QNI 87 QTC 24. MLEN(WD50) Sessions 4 QNI 117 QTC 3. HAEN(N5GRW) Sessions 4 QNI 56 QTC 0. CAND(W5KLV) Sessions 31 QTC 612 (Mississippi represented 100% by N5AMK). DRN5(WD5YDD) sessions 62 QTC 623 (Mississippi represented 100% by N5AMK, KT5Z, KB5W, W5HKW and KE5EC). Traffic: N5AMK 416, KB5W 406, KT5Z 67, W5WZ 56.

TENNESSEE: SM, John C. Brown, NO4Q—ASM: WA4GLS. ACC: WA4GLS. OO/AA: W9FZW. SEC: WA4GZQ. SGL: WA4GZZ. STM: NG4J & STC: W4HHK. The 1987 hamfest season seems to be getting off to a good start. I still don't have a complete listing of them all yet. I need them as soon as at all possible so that I might get them off to HQ, for them to get it on publications to be shipped when appropriate. The hamfest approval list need to be approved by the Delta Division Director for ARRL sanction and also need to get the announcement to the QST staff to be included in the QST "Hamfest" calendar. The airwaves are sure live with packet signals these days. Copy of the signals can be copied almost anytime of the day, but especially at the late evening and night time periods. Much blocking of signals are noted and that is hoped to be changed as time goes along and organized procedures and education of the recommended operation practices are developed. It is suggested that you stay alert for these procedures as they come along. Everyone will be able to get through and make better connections. Your section manager has already moved some formal traffic by this means and it sure gets it through in some kinda hurry. That is enough on that subject for now. It has been noted that the DX activity is begining to increase and am also getting some bad reports about tempers getting out of control and bad comments flying back and forth. I sure hope none of you out there are involved in that action. Just stay in there and you can make the much needed contact. Want to congratulate N4OSZ, N4OZB, W4LVP, WA4CNW and NG4J on making the CW Honor Roll this period. Keep up the good work. The traffic for this period on the nets are as follows: LF - Sessions-81, QNI- 4313, QTC-254; VHF-Sessions-22, QNI-462, QTC 562; CW-Sessions-40, QNI-341, QSC-90. The individual station activity reports are as follows: W9FZW 212 and a BPL, WA4FMR 124, W4TYV 28, W4TYU 18, NN4S 17, W4PFP 16, KE4LS 14, WA4HKU 13, W4PSN 7, KA5KDB 7, W4EWR 5, KB4UQ 4, W3HET 4 and WB4DYJ 2. Good work and don't some of the fellows and gals want to have their reports included? Just give a report on or before the 5th or so of the month. CUL.

GREAT LAKES DIVISION

KENTUCKY: SM, Dale Bennett, WA4JTE—Spring is here and we know that there will be a lot of antenna work going on. Just a reminder to keep a look out for power lines and other hazards. Hate to have any accidents to report the next few months. DX is picking up, know all the DX Hounds are looking forward to a lot of good DXing. Sounds like several KY stations very active in the recent 160 m contest. Good luck to all. Two hamfests coming up. Looking forward to Glasgow and E-town. Hope to see a lot of familiar faces. Be sure to send your SAR ARES and local net reports to Glen, KA4MTX. Traffic: K4VHF 94, WD4RWU 50, K4AVX 41, KI4QH 37, KA4BCM 34, KA4MTX 32, KA4SAA 31, KJ4HP 21, K4HOE 21, W4WQV 16, WA4AVV 8, WD4CQF 8, W4PKX 6. (Dec.) W4WQV 35. PSHR: KA4MTX 85.

MICHIGAN: SM, James R. Seeley, WB8MTD—Silent Keys, with deep W9IWY, K8QJX. SEC WB8BGY announces two new EC appointments: WA1ELA, Don Boulanger, for Midland Co.; and KA8SFQ, Don Storck, for Saginaw Co. Sincere thanks to WB8PLO and WB8WNF for their contributions over the years in these posts. Congrats to K8KMQ for his recent 20-year service award from the American Red Cross. The Midland ARC is one group that is actively trying to do something about the "Novice Dropout" (my term) problem. Here are some quotes from their latest newsletter, President N8ERF writing: "For years MARC has introduced many new novices into the world of Amateur Radio and will continue to do so. Now we are beginning to take the next step. We have established an equipment loan program for novices so they can get on the air right away...WD9GUF is putting together the knowledge necessary to help new novices locate good used equipment...W8TCY (holds) a construction "net" (at his home) on a regular basis." Etc. Highly commendable. Efforts like these are vital in the preservation of our service. January net activity (Net QNI Tfc Sessions): QMN 945 250 92;MITN 527 108 30; SEMTN 302 88 29; UPN 1617 58 35; WSSBN 666 38 31; GLETN 605 32 30; MNN 192 24 28; MACS 657 13 31; VHF activity 1110 8 86. Traffic: KA8CPS 345, W8QHB 210, WB8SIW 114, N8AHA 107, WD8KQC 80, K8GXV 76, W8RNQ 74, WD8RHU 57, WA8DHB 48, K8UPE 43, K8KMQ 42, W8SCW W88SYA 41, W8IHX 40, N8CNY NJ8X 38, W8EOI 36, W8HIN 33, W8YIQ 29, N8DSW 28, KD8QK 26, K8HAP WD8MJB 25, K8OCP 23, NT8G 22, N8HHH 18, N8HWL W8YZ 17, N8EXS 15, WA8MVH 13, KI8Q 12, W8BEZ W8VIZ 9, KA8LAR W8URM 8, K8ZJU 7, W8CUP 5, NJ8R 4.

OHIO: SM, Jeffrey A. Maass, K8ND—ASM: N8AUH. SEC: WD8MPV. STM: KF8J. BM: W8ZM. ACC: KJ3O. TC: KB8MU. OOC: AD8I.

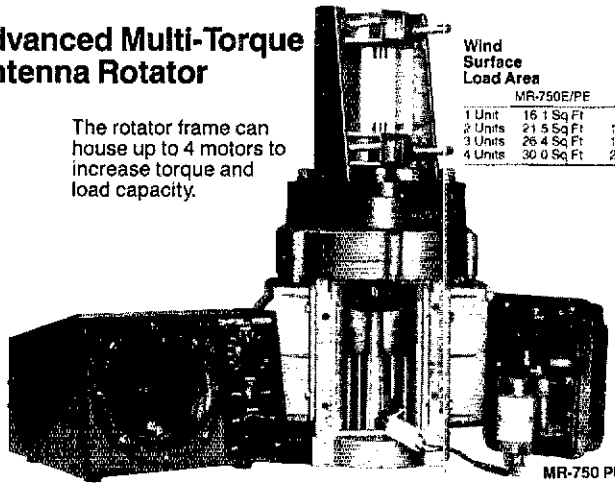
NET	QNI	QTC	Sess.	Time(Local)	Freq.	MGR
BN(E)	305	125	31	1845	3.577	N8EVC
BN(L)	188	77	31	2200	3.577	K8TVG
BNR	259	104	31	1800	3.605	W8EK
BSSN				0945,1900	3.873	K8OZ
ONN	180	32	29	1825	3.708	WD8KBW
OSN	334	67	31	1810	3.577	N8AEH
OSSBN	2227	615	93	1030,1615, & 1830	3.9725	WB8JGW
OSSN				0645 M-F	3.577	KA8GJV
				0800 S-SN	3.577	KA8GJV
O6MN				2100	50.16	WD8CTX
Ohio Section ARES Net				1500 Sun.	3.875	WD8MPV

Hamfests in April: Dayton Hamvention, April 24-26. See you there! VE exam sessions: April 4-Portsmouth; April 11-Columbus, Maumee, and North Olmstead; April 25 and 26-Dayton; April 26-Akron. The Dayton ARA is offering scholarships to Amateurs graduating from high school in 1987. The

Superior Communications Accessories

Advanced Multi-Torque Antenna Rotator

The rotator frame can house up to 4 motors to increase torque and load capacity.



MR-750 PE

Wind Surface Load Area

	MR-750E/PE	MR-300E
1 Unit	16.1 Sq.Ft	5.92 Sq.Ft
2 Units	21.5 Sq.Ft	11.84 Sq.Ft
3 Units	26.4 Sq.Ft	17.75 Sq.Ft
4 Units	30.0 Sq.Ft	23.67 Sq.Ft

Each motor is equipped with a Super Wedge and Clutch brake system (Slip clutch type) that works independently from the main frame gear train and protects the rotator mechanism from excessive torque.

Low voltage (24VAC) motors...low-cost 6-wire control cable...can be installed on the same base as a TEXEX unit.

Specifications

■ Rotator Unit

		MR-750E/PE	MR-300E
Rotation time	60 Hz	58 seconds (60 Hz input)	33 seconds (60 Hz input)
	50 Hz	70 seconds (50 Hz input)	39 seconds (50 Hz input)
Output torque Brake power	1 motor	610 inch/lbs 5,200 inch/lbs	220 inch/lbs 1,700 inch/lbs
	2 motor	1,200 inch/lbs 9,600 inch/lbs	440 inch/lbs 3,500 inch/lbs
	3 motor	1,800 inch/lbs 13,900 inch/lbs	650 inch/lbs 5,200 inch/lbs
	4 motor	2,400 inch/lbs 18,300 inch/lbs	870 inch/lbs 7,000 inch/lbs
Rotation angle		375 degrees	
Permissible mast size		1½ ~ 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

COAXIAL SWITCHES

SAT No. 59300803

CS-201

CS-401

	CS-201	CS-201G	CS-401	CS-401G	CS-4
	2position	2position	4position	4position	4position
Frequency:	800 MHz	1.3 GHz	800 MHz	1.3GHz	1.3 GHz
Connectors:	SO-239	N type	SO-239	N type	BNC type
VSWR:	Below 1.1.2				

Insertion Loss: Less than 0.2 dB

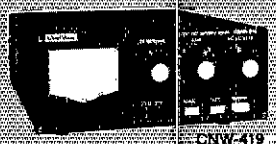
POWER SUPPLIES

Model	Max/Cont.	Variable Output VDC
PS-51XM	5.5A/5A	9–15
PS-120M	12A/10A	9–15
PS-30XM	31A/24A	1–15
PS-60MD*	65A/44A	13–8
PS-60W	65A/44A (Low)	3–15 Variable
	48A/22A (High V)	6–30 Variable

*Sub DC Outlets, 10.6A (1–15 VDC

PS-51XM

ANTENNA TUNERS



CNW-419

Frequency Range:	CNW-419	CNW-919	CL-680 (no metering)
	1.8-30 MHz (17 bands)	140–150 MHz	1.8-30 MHz (17 bands)
Power Rating:	200 W CW (3.5-30 MHz) 100W CW (1.8-3.4 MHz)	200W CW	200W CW (3.5-30 MHz) 100W CW (1.8-3.4 MHz)
Output Impedance:	10-250 ohm	10–250ohm	10–250 ohm

POWER AMPLIFIERS

LA-2155W

Band:	LA-2035R 144-148 MHz	LA-2065R 144-148 MHz	LA-4040R 430-450 MHz	LA-2155W 144-148 MHz
Input Power:	0.5-3 W	0.5-5 W	10 W	10-35 W
Max. Output Power:	90 W plus	60 W plus	35 W	90-150 W

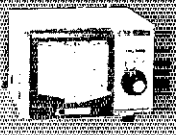
Pre-Amp (Gain) 15 dB

DK-210

ELECTRONIC KEYER

Sharpen your "fist" with Daiwa precision!

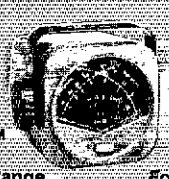
Cross Needle SWR/Power Meters for All Bands



CN-720B

Model	Freq. Range Int. Sensor	Forward Power	Connectors
CN-720B	1.8–150 MHz	20/200 W/2 kW	SO-239
NS-660PA	1.8–150 MHz	30/300 W/3 kW	SO-239
NS-663PA/N	140-525 MHz	3/30/300 W	SO-239/N Type
NS-668	900 MHz–1.3 GHz	1.5/15/60 W	N Type

MOBILE/BASE CROSS NEEDLE SWR/POWER METERS



CN-410M

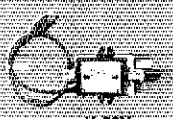
NS-448

Model	Freq. Range Int. Sensor	Forward Power	Connectors
CN-410M*	3.5–150 MHz	15/150 W	SO-239
NS-448**	900 MHz–1.3 GHz	5/20 W	SO-239
CN-460M*	140–450 MHz	15/150 W	SO-239
CN-465*	140–450 MHz	15/75 W	SO-239
CN-520	1.8–60 MHz	200 W/2 kW	SO-239
CN-550	144–250 MHz	20/200 W	SO-239

*Back lit with mobile bracket **Separate sensor type

REMOTE EXTERNAL SENSORS (For indoor/outdoor use)

Permit operation over range of 1.8 MHz through 1.3 GHz. Optional for use with NS-660 series meters.
U-66H, 1.8–150 MHz, Max 3 kW, SO-239 Connectors
U-66V, 140–525 MHz, Max 300W, SO-239 Connectors
U-66VN, 140–525 MHz, Max 300W, N Type Connectors
U-66S1, 900 MHz–1.3 GHz, Max 60W, N Type Connectors
SC-20, 60 ft. Cable with connectors for use with remote sensors



U-66V

AF-606K AUDIO FILTERS

Four stages of filtering...variable bandwidth over broad range...razor sharp CW reception...built-in speaker...PLL Tone Decoder circuitry.

AF-606K

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scholarships will be based on financial need and academic accomplishment, with consideration given for service to Amateur Radio and community involvement. There are no restrictions on the course of study to be followed. For information, contact DARA Scholarship Committee, 317 Ernst Ave., Dayton OH 45404 or (513) 277-2172. Applications must be postmarked by May 15. Novice classes begin April 21 in Columbus at theCenter of Science and Industry. Fee is $47 for tuition, books, and tapes. Contact COSI for information. Members of the Farout ARC (Dayton/Kettering) contributed $176 to the JHS 22 ARC of New York (WB2JKJ) in support of efforts to teach English through the use of Amateur Radio. New Officers for Farout: Pres NK8B; VP WB8KWC; Sec N8HBI; Treas WD8ATN. January is the month for selecting new leadership in clubs around the Section, as the following information shows! New Officers, Northern Ohio ARS (NOARS): Pres N8ARA; VP KD8SC; Sec W8YFB; Treas NB8W. New Officers, Champaign-Logan ARC: Pres WD8CDB; VP KA8YUM; Sec-Treas N8FFJ. New Officers, Queen City Emergency Net (Cincy): Pres WB8SCI; VP KA8HXF; Sec KC7TN; Treas N8HRE; Comm Mgr WA8DFD. New Officers, Madison City ARC: Pres WB8IUH; VP WB8JGW; Sec-Treas KA8YYC; Activities Mgr N8CWU. New Officers, Mt. Vernon ARC: Pres KC8UZ; VP N8CIY; Sec-Treas W8WWU. The North Coast ARC now has 200 members, and a new list of officers: Pres NR8T; VP K8TTZ; Sec KA8ARG; Treas N8GJR. The Twenty-Over-Nine ARC (Youngstown) is now an ARRL Affiliated Club, with over 100 members: welcome! Their officers: Pres N8GUB; VP N8GZJ; Sec KA8TZX; Treas WD8NAC. Whew! Congratulations all, and Affiliated Club Coordinator KJ3O and I look forward to working with you! Sad news, another long list of Silent Keys this month: K8EBO, W8FDM, W8FQT, W8GVG, K8MKU, WD8OWB, and K8RTT. With the announcement of Novice Enhancement by the FCC in late January, we have an opportunity to involve our Novices in the mainstream of Amateur operations. I am particulary excited about the prospect of adding Novices to the list of stations active in the Amateur Radio Emergency Service (ARES) and the local traffic nets on 220 MHz and 10 meter SSB. Has your club considered the value in introducing Novices to your programs while they are fresh and very excited about our hobby? The stations listed below have reported handling radiogram traffic during the month of DECEMBER 1986. K8OZ 314, W8PMJ 287, KV8Q 276, N8XX 260, WB8JGW 229, K8TVG 210, KA8KHS 191, WD8KFN 180, K8ND 174, W8FPA 153, W8ZOL 151, W8BO 150, KA8GJV 148, WB8MEK 138, K8JDI 136, WA8EYQ 132, N8EFB 124, W8QZK 116, W8SKP 108, KD8KU 107, KD8FW 106, N8EVC 105, W8EK 96, K8DHD 93, WD8QXT 86, N8AKS 82, N8FWA 82, AD8I 80, WD8RAO 78, WD8RIB 72, WB8BWY 62, N8AEH 59, WB8DMF 58, WA8SSI 56, KC8TW 56, WB8KWC 54, NT8N 54, WA8DYS 53, K8CMR 50, KA8CGF 48, KD8WI 45, N8FBE 44, KC8UZ 44, KD9XL 40, N8GEC 37, WD8MPV 37, WD8QZM 36, KJ3O 31, K8EF 28, W8MVE 28, KA8OOF 28, KA8TNT 26, NF8B 25, N8FPH 22, N8GZE 22, W8JLW 20, KC8YV 20, NR8C 19, W8RG 19, KA8RIX 19, W8WEG 19, WD8JVE 18, K8LQM 18, KC8D 17, WA8HGH 17, WD8IKC 17, N2NS 17, WD8OYK 17, KA8UYM 17, NØCB 16, WA8HED 16, WD8CTX 15, KJ3T 15, KE8CV 14, N8HWF 14, KC8JV 14, WB8KWD 14, N8CJS 13, WB8HHZ 13, KA8LAY 13, WB8RSM 13, K8VOY 13, KA8DRR 12, WA8ERQ 12, KA8RQS 12, W9SWM 12, KA8WMD 12, KA8YIT 12, K8CKY 11, N8GIY 11, NK8B 10, KD8IC 10, K8IOW 10, WD8MIO 10, WD8DKO 9, NU8I 9, WB8YYS 9, KC8WH 8, NU8H 7, WD8JAW 7, KZ8P 7, N8AJU 6, W8BHL 6, KB8BV 6, WB8YFD 6, N8CW 5, N8HEA 5. KA8SOM 5, WA3EZN 4, N8GOB 4, KD8HB 4, AE8L 4, K1LT 4, WD8PWG 4, KA8SON 4, KA8VYT 4, N8FFC 3, N8HIL 3, W8LT 3, NQ8K 3, WB8MRL 3, W8ZM 3, WD8CKK 2, WB8GDM 2, N8GIO 2, N8HWA 2, WB8AWM 1, N8BKH 1, WD8CSP 1, N8EEN 1, N8HBF 1, W8KN 1, WD8MSJ 1, WB8SMC 1, KA8THO 1. (Dec.) K8OZ 612, W8PMJ 519. (Nov.) K8OZ 210.

HUDSON DIVISION:

EASTERN NEW YORK: SM, Paul S. Vydareny, WB2VUK—ASM & STM: K2ZM. BM: WB2EAG. SGL: KB2HQ. SEC: WA2ZYM. TC & OO/RFI: KC2ZO. ATC: WA2VGM. Net listings (QNI/QSP): AESN 66/1 CDN 607/41 Col/Gm 39/0 ESS 418/79 HVN 257/44 NYPON 744/292 NYS/E 441/251 NYS/L 336/185 NYS/M 418/319 SDN 363/118. CLUB NEWS: Albany ARA-W2OOJ has retired as newsletter editor after many years. KN2Q has assumed editor position. They have new members KA2SJH and WA2CJT and report WA2JWM as Silent Key. Catskill Mountain ARA has become an ARRL affiliated club. Communications Club of New Rochelle had a Potpourri of Antennas for its Feb. program. Overlook Mtn ARC has set up a list of elmers including KD2LF K2UR KD2HU KD2NN K2HA and N2FS. Saratoga County RACES heard Hudson Division Director WA2DHF talk about the latest happenings in Amateur Radio at its February meeting. Westchester ARA had a presentation from member Julian Hirsch, W2KFB, about the latest in compact disk players and a remarkable new loudspeaker system. Westchester ECA discussed plans at its February meeting for WECAFEST 87. ATTENTION all clubs. The Hudson Division is setting up a speakers bureau. If you have a speaker at one of your meetings who would be willing to speak at other clubs, let WB2VUK know with name and address. Don't forget New York State Convention in Rochester in May. Jan. PSHR: WB2EAG KA2MYJ NQ2H WB2VUK K2ZM K2ZVI N2EQM W2PKY KB2ATJ/T. Jan Traffic: WB2EAG 299, K2ZM 159, WB2VUK 111, NQ2H 90, W2PKY 90, KA2MYJ 87, K2ZVI 71, KC2ZO 62, N2EQM 36, KB2ATJ 29, K2HNW 27, KA2TQW 18, N2FSJ 9, KA2NGJ.

NEW YORK CITY-LONG ISLAND: SM, John H. Smale, K2IZ—ASM/VE: W2NL, ACC: KA2RGI. SEC: KA2LAD OCC: NB2T. TC/RFI: WA2YNM. STC: K2MT. SGL: WA2NYS. PIO: KA2WIJ. The following are traffic nets in and around the section:

NCVHF	146.745/R	1930	M-F	K2MPG/MGR
BAVMF	146.6670/R	2000	M-F	K2YQK/MGR
SCVHF	145.370/R	2000	M-F, Sun.	KA2JMA MGR
NYS/M	3677 KHz	1000	DAILY	WB2EAG MGR
NYS/E	3677 KHz	1900	DAILY	KU2N MGR
NYS/L	3677 KHz	2200	DAILY	NU2N MGR
NYPON	3913 KHz	1700	DAILY	KA2UBD MGR
ESS	3590 KHz	1800	DAILY	W2WSS MGR
BBS	145.010 Packet Node Station			AI2Q

All times are local, please note that AI2Q is the packet node station and that all incoming NTS traffic should be routed through him. 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 caculator for the math questions, for further info please contact Joe Kolb, W2NL. By the time this column comes out you should have received ballots for the election of a Section Manager. It is hard to tell who can do the job but you will have to seperate the grain from the chaff. Ask around, find out who the people are who are running for this office, are they serious about the job or are they running just so there will be an election, the pay isn't the greatest, the hours are very long but hopefully this section

will elect another to the long line of excellent SMs that NLI has had, W2MD, K2DGI, K2IZ, WB2IAP are a few that come to mind, please vote, don't waste it. W2TCR Sec/Treas. of the Manhattan Avenue of The Americas Radio club marks his 30th year in Amateur Radio this year. The following members of Hall of Science ARC visited the kids in the Flushing Hosp. Pediatric Ward on Dec 21st: KA2NGS, WA2QCZ (SANTA), WB2JQD, KA2AMJ, WB2OLB, WB2YXB, KA2FSN, WB2KDG, WA2JUJ, WB2KVY, N2GIU, N2GOT. Officers for Suffolk County RC are: KA2JMA Pres., KA2LAD VP, N2ETG Treas., W2GZD Cor. Sec., N2FMW Rec. Sec. Officers for Kings county RC are: N2FOW Pres., K2AAZ VP., KA2KDQ Sec., K2OWH, Treas. Traffic (Jan.): K2YGK 166, N2AKZ 121, N2GPA 75, K2MT 73, NF2N 62, W2LWB 56, KB2AKY 54, KA2ZYX 45, N2GQS 37, KB2BKE 35, K2HPG 26, KA2JMA 10.

NORTHERN NEW JERSEY: SM, Robert R. Anderson, K2BJG—ASM (VE liaison): N2XJ. ASM (FO Info): N2BFG. SEC: N2BMN. STM: KA2HNQ. OO/AAC: KA2BZS. ACC: KY2S. PIO: WB2NQV. SGL: W2KB. TC: K2BLA. and BM: N2CXX. It is with deep regret that I must report the resignation due to ill health of SEC Fred Janicke, N2FOZ. I am pleased to announce the appointment of Ralph Francavilla, N2BMN, as his replacement effective 2/2/87. Contact Ralph at 154 Redneck Ave Little Ferry NJ 07643, Phone 641-9494. WB2GAI replaces N2BMN as DEC (Bergen). Other new appointments are: NM: KA2F and K2SC. ORS: KA2F, K2SC, and W2QNL. OO/AA: KA2OGI. Several NNJ section members have received Hudson Division level appointments from Director Mendelsohn: contest advisory committee K2NJ, DX advisory committee W2OM, and Assistant director KY2S, WB2NQV, and N2BFG. The inaugural Hudson Division Cabinet meeting was held in conjunction with the annual meeting of the Hudson Amateur Council on 1/24/87. In an effort intended to solve problems within the division six division level committees were established: Long range planning, Traffic improvment, Public service steering, Antenna ordinance watch, Education task force, and Public information. To ensure appropriate section representation on these committeesvolunteers from the NNJ section are needed. For details please contact Director Mendelsohn, The Bergen ARES Net has moved to 146.79/R at 1930 Hr. The Chestnut Ridge Radio club has applied for ARRL affiliation. The Tri-county RA flea market will be held on May 3rd. Congratulations to the following who were newly licensed or upgraded during January sessions conducted by: NNJ VE Board, and Bergen ARA. Novice: E Diamond. Technician: KB2ANE, KB2BXA, and KB2API. General: KB2CBD, KA2ZJH, and KA2ZJO. Advanced: KB2BUR, N2FOZ, KB2AXU, KB2BWQ, KA2MMO, and KA2YPD. Extra: K2QAR. W2QNL received the 1986 W2WE award for outstanding achievement as NJ traffic handler. net Manager changes effective 1/87 are: KA2F replacing AG2R (NJN), WB2ZJF of the SNJ section replacing W2RRX (NJM), and K2SC replacing WB2QMP (OBTTN). KA2HNQ and KC2YG are now providing VHF Packet Liaison for NJVN/L. January Data: /P indicates VHF Packet Liaison.

NET	MGR.	FREQ	TIME	SESS	SES	OSP	QNI
NJM	WB2ZJF	3695	1000	DV	31	131	241
NJPN	W2CC	3950	1600	DV	31	77	399
NJN/E	KA2F	3695	1900	DV	31	129	215
NJN/L	KA2F	3695	2200	DV	31	52	115
OBTTN	K2SC	147.12	2000	DV	31	157	379
TCETN	KA2SPH	146.685	1930	DV	NOT	REC.	
NJVN/E	WB2FTX	146.895	1930	DV/P	31	29	239
NJVN/L	WB2ANK	146.49	2230	DV/P	31	36	226
NJSN	WB2PKG	2735	1830	DV	31	32	186
NNJ/PL	(OPEN)	145.01	24HR				

via WA2ANA-1 PBBS

NNJ Amateur Radio Public Info Line: 201-735-8550 SAR/PHSR: N2XJ 260/101, N2DXP 86/64, W2CC 20/, WB2QMP 86/66, W2RRX 132/113, W2XD 17/.

MIDWEST DIVISION

IOWA: SM, Rollin J. Sievers, WBØAVW—SEC: KDØBG. STM: KCØXL. OOC: WØVX. ACC: WBØQAM. BM: KØIR. TC: KØDAS. SGL: AKØQ. 110 Amateurs from the Des Moines Area participated in Operation Santa Claus helping 700 less fortunate people. Ft. Dodge ARC received a TH6DX antenna as a gift from John, WØNY. Also every member of the Ft. Dodge DX Club had worked the new Peter 1 Island. Students third thru eighth grade were treated by a demonstration of Ham radio by Jake WDØGXJ and Lloyd, WØCON at Hartley. Jim, NAØR of D. Moines is winner of WIN MAGER award. Appreciation certificates should all delivered, if you have been missed, contact your officer of your appointment.

NET	QNI	QTC	FREQ	TIME	DAY	MGR
Ia75M Noon sess	1238	138	3970	1630	Dy	WBØJFF
Ia75M Eve sess	888	49	3970	2330	Dy	NØAEF
ICN 11 sessions	15	1	3705	0100	M-W-F	NOØJ
ITEN 4 sessions	101	7	3970	2330	Sun	KDØBG
W. Cen. ARES	291	2	147.69	8:30	M-F	KØCNM

TLCN QNI 259, QTC 105 in 62 sess., WØYLS Mgr. DTEN NØGCC, Mgr. 708 messages handled in 62 sess. at rate of .481%. IA represented 98% by KØIPT-50, WØHTP-42, KCØXL-43. Siouxland Repeater Association planning a state of the art repeater near Le Mars if funds can be raised. No major changes in the Ia 75 M. net operations after lengthly Board of Directors meeting. Traffic: WØSS 111, KCØXL 107, KØGP 84, KAØADF 77, KØBRE 59, W4JL 54, WBØAVW 44, NØCKD 38, WØBW 22, KAØGSA 17, WØHTP 14, WØFQ 8, WØPDT 6, KAØVBA 4.

KANSAS: SM, Robert M. Summers, KØBXF—SEC: NØBLD. STM: WØOYH. ACC: KØBXF. TC: WBØNQM. BM: KØJDD. SGL: NØBLD. Net Mgrs: CW: WBØZEN. Phone: WØFBC. RTTY: KAØCUF. Slow Speed CW: WØMYM. WX Net: WAØHOZ. Pkt R: NKØB. DECs WØOAG, WØEB and WBØYJT. It is with deep regret, I list three SILENT KEYS this month. WØFRK, Lee; WØMMA, Len and KAØWOL, Jack. I am sure I can speak for all as I send our deepest sympathy to each of their families. Most all clubs are in the midst of the first novice class and or up-grade class of the new year. Don't forget there are a lot of interested parties out there though, that will not be available and just might be waiting for the fall class later this year. I am sure every club can use all the newcomers available, especially when it comes to operating activities. HOW about a nomination from out there for the HIRAM PERCY MAXIM MEMORIAL AWARD. Does your club have a youngster under 21 whose accomplishments and contributions are within the framework for nomination? I must receive said nomination by June 1, 1987. The storm season will be upon us by the time you read this. I hope each of you have sought out your EC, volunteered your services, taken part in training now ready and able to represent HAM RADIO. Traffic: WØFRC 545, NØGCC 431, WØFIR 210, KSØU 181, WØHI 165, WØOYH 150, KØBXF 89, WAØHOZ 70, WØFDJ 68, NBØZ 46, WØQMT 44, NKØB 30, NØGZT 21, WØPB 14, WØMYM 14, WØCHJ 4, NØEYE 4.

MISSOURI: SM, Ben Smith, KØPCK—Elected to hold office for 1987 in the following amateur radio clubs were: Northland ARC of Kansas City, Pres. WAØWPJ, VP. WØGL, Sec Tres. KAØQMK and Activities KAØSYG. CMRA of Columbia, Pres. KA9HJP, VP NØCBZ, Rec- Sec, NØHKN, Rec-Sec. KAØOKS, Tres. NØFPI and elected to the Executive Board, KT5Y,

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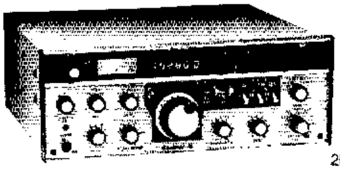

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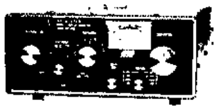

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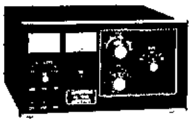

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Eastern Ozarks Amteur Radio Club, Pres. W6RP, VP AFØJ, Sec. WØFWY, Tres. KDØID, Activities Mgr. KAØVKF, Directors, WØZKY, KAØCUU, AIØH and KAØWGQ, Rolla Regional Amateur Radio Society, Pres. KAØCEU, VP. KBØWD, Sec, WØDLG and Tres. KAØCOD and newly elected board of directors were: KAØRDQ and KØRFS. Silent Key report, WBØYBC. January has been a good month for Field Appointments. KBØUD, OBS: WDØFVM, OO and the following OES: WDØFVM, NUØT, KDØUD and WAØAVG. We are happy to announce the Section Leadership Position of State Government Liaison Officer to Ernest De Camp, KDØUD. Em's address is 605 E. Woodland Street, Springfield, MO 65807. Telephone (417) 883-1020. We want to thank all of the amateurs for their willingness to serve in these positions.

NET	Sess	QNI	QTC	Day	Time	Freq	Mgr
MEOW	31	576	147	Dly	5:30 PM	3.963	KØDSQ
MON	62	347	125	Dly	7:00/9:45	3.585	KØSI
MOSSB	31	786	63	Dly	6:00	3.963	KØORB
HBN	22	380	25	Mon-Fri	12:05	3.880	KØDSQ
MTTN	19	64	20	Mon-Sat	6:30	3.370	NØBKE
PHD	5	171	9	Mon	9:00	146.43	WAØKUH
ZAEN	4	68	9	Tue	8:00	147.84/.24	NØDE
RRABN	30	480	3	Dly	9:00	146.19/.79	KAØLLN
CMEN	4	36	3	Wed	9:00	146.16/.76	KØPCK
ARES	5	74	2	Thu	9:00	147.855/.255	NØFQW
SLAN	4	26	2	Mon	8:00	146.31/.91	KØWEX
LOZBC	27	459	0	Mon-Sat	6:00 AM	146.13/.73	WØRTL
LOZFM	5	109	0	Fri	9:00	146.13/.73	WØRTL
NEMOE	13	92	0	TTSat	7:30	144.53/5.13	KAØFTS
TCN	5	63	0	Thu	9:00	147.09/.69	KAØLO
MCARES	4	46	0	Thu	8:30	146.205/.805	WBØELJ
MOFON	5	24	0	Wed	8:15	222.42/4.02	AIØO
SARN	4	34	0	Tue	9:00	148.437/.03	WØENW

Traffic: NQØG 260, KØSI 183, NDØN130, WØBMA 128, AIØO 90, WAØYJX 85, KØORB 66, KGØL 59, KØPCK 51, WØOUD 46, NØBKE 36, KØDSQ 36, KT5Y 30, WØOTF 30, WAØHTN 26, WDØELL 23, NIØR 17, WBØCJB 15, NØSS 14.

NEBRASKA: SM, Vern Witka, WBØQGM—STM: Jerry Kohn, WDØEGK. SEC: Michael Ruhrdanz, NØFER. The Nebraska Section CW Net now meets on 3537 kHz at 1900 Local Sunday through Friday. The Late Night Nebraska Section CW Net also meets on 3537 at 2215 local on Monday and Tuesday. The NCW group hopes this new frequency, for both sessions, will solve some of the QRM problems the net has been experiencing the Lincoln Amateur Radio Club Packet Radio Group meets on the first Friday night of the month at the local Lincoln Red Cross. The packet meeting starts at 1930 local time. The AK-SAR-BEN Radio Club of Omaha has recognized Bob Lockwood, WAØDHU, for his years of dedicated service to amateur radio by presenting Bob with a certificate making WAØDHU an admiral in the "Great Navy of Nebraska." WAØDHU has served in many club positions, including AK-SAR-BEN Club president and for years was chairman of the club education committee. Your section officials are available to assist you in many different areas. So don't hesitate to ask if we can be of help. Nebraska section officials include: Affiliated Club Coordinator, Larry Lehman, KCØDA. Public Information Officer, Mike Lennen, KDØEV. State Government Liason, Bob Mitchell, WBØFJJ. Technical Coordinator, Charles Conner, KØNG. The STM and SEC are listed at the beginning of this month's report. Traffic: KØDKM 551, WØKK 84, KAØKPT 52, WBØTED 47. WAØBOK 36, KAØBCB 24, NOØA 14, WØKBS 8, WBØGPM 5, WBØGQM 4, WDØCRD 2.

NEW ENGLAND DIVISION

CONNECTICUT: SM, John Ronan, K3ZJJ—STM: K1EIC. SEC: KA1ECL. ACC: KG1M. OOC: NA1I. TC: W1HAD. BM: K3ZJJ. PIO: KX1B. SGL: W1AH.

NET	SESS	QNI	TFC	MGR
CN	56	194	144	K1EIR
CPN	31	322	70	KA1BHT
WESCON	31	444	178	WB1GXZ
NUTMEG	31		132	K1EC
CSN	15	148	68	WB1GXZ

The Jan. 22 Snow Emergency proved the effectiveness of our NTS and ARES nets. SEC KA1ECL and STM K1EC activated the following nets at 5 PM which remained in operation until 9:30 when the storm subsided: CPN on 3.965 the State Wide Emergency Net—KA1BHT/NM KA1MDM KY1F K1EIC NCSs. WCN—WB1GXZ/NM, W2MXX KB1ZC WA3DZD KA1ECL WA1SHM K1EIC N1EDD NCSs. ARES Dist 1 KV1Q DEC. ARES Dist 3 KB1H KB1UV DEC. Dist 7 ARES GNARC W1GLQ/NCS. Dist 8 ARES N1DCS DEC. On alert—ARES Dist 5 NA1S/DEC. ECARA provided radio- equipped 4-wheel transportation for Day Kimbel Hospital staff. As SEC KA1ECL said, "We did a good job during the snow storm, and we should be proud of that." As a result, GNARC and KA1MDM will be organizing a formal ARES program. FARA and N1AMC are also planning a formal ARES progarm. Welcome to the Cricket Wireless Asso.! Cricket Wireless received its charter on Feb. 25 as an ARRL affiliated club. The Cricket WA meets 9 PM every Sunday on 28.4 MHz USB. Their newsletter, The Cricket Telegraph is newsy and fun to read. Requests continue to come in for video tape copies of FARA's PBS television broadcast on amateur radio including OZ9DC who is organizing an ARES type group in Denmark. Julius, HA6NY, has become the first Hungarian to receive a US Extra Class Amateur license. On Jan 10, Julius went from Novice to Extra in one sitting at FARA's VE Exam. Julius has already earned DXCC using Novice Call KA1PFT and expects to earn DXCC again using his Extra call before returning to Hungary. WA2WAI and a group from Channel 61 in Farmington are working with TSARC for the coordination of a wide-area ATV repeater. Congratulations to Ken, WB2SGI, who has been appointed Dist 2 DEC. A Packet Radio system is being established in Connecticut which could be of great value to emergency communication. Key participants are KB1H, KA1ECL, KE3Z, KX1B, WB1ASH. In February, SARA toured the facilities of the Stamford Advocate which used Hi Tech electronics in newspaper production. Traffic: KA1MDM 290, WB1GXZ 203, W1EFW 163, KA1MKJ 144, N1EDD 132, KA1GWE 77, N1DMV 65, W1YOL 52, K1CE 50, KA1KTH 37, W1WP 37, KA1BHT 29, KY1F 24, K1AQE 21, KA1OCZ 20, WA1NLD 18, W1BDN 12, WB8FIV 9, W1CUH 5.

EASTERN MASSACHUSETTS: SM, Luck Hurder, KY1T—ASM: K9HI. SGL: K3HI. OO/AA: KA1KF. SEC: KB1PA. PIO: K1HLZ. BM: KB1AF. STM: KW1U. TC: KA1IU. ACC: KA1KCU. EMASS Hot Line - 437-0111. Westlink 449-2226.

NET	MGR	FREQ	TIME(LOC)/DY	QTC	QNI
EMRI	N1AJJ	3658	1900/2200 DY	178	231
EMRIPN	WA1FCD	3880	1730 DY	81	148
EM2MN	KA1AMR	145.23	2000 DY	188	385
NEEPN	K1BZD	3945	0830 SN	5	48
HHTN	NG1A	04/64	2230 DY	140	415
EMRISS	N1CVE	3715	1600/2030 DY	41	134
CITN	KB1AF	745/045	1930 DY	134	248

Congratulations to Scott, WA1FCD, for taking on the duties of Net Manager for EMRIPN, and warm thanks to Jack, N1BGW for his extremely capable assistance through thick and thin. Bulletin Mgr KB1AF reports that the OBS people are still in there with their large numbers of important re- transmis-

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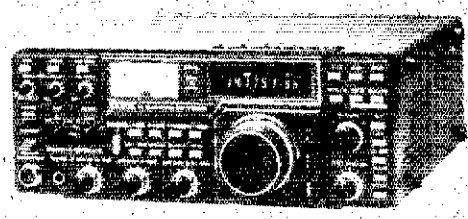

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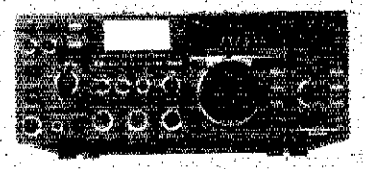

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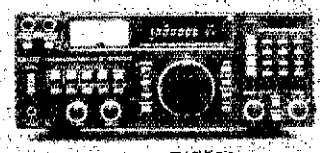

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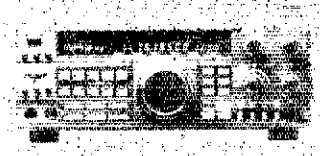

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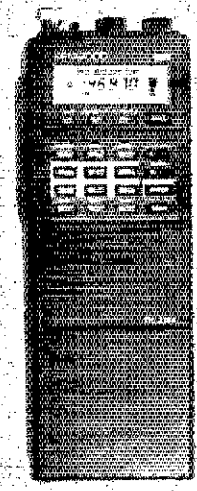

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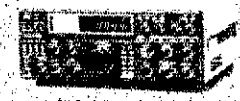

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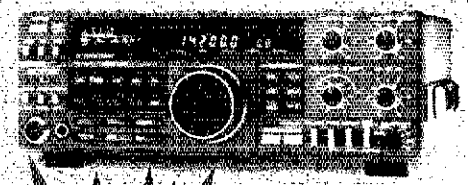

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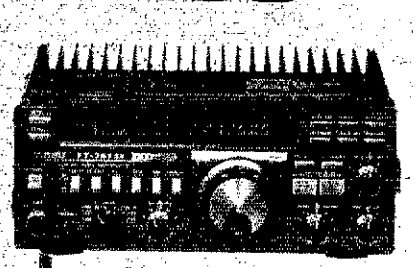

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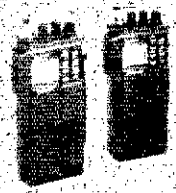

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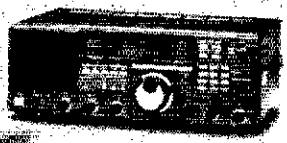

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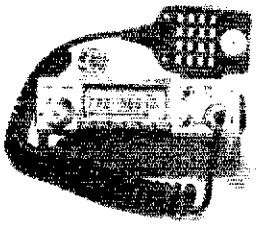

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sions of bulletins. Wellesley ARS has an excellent turnout of 23 Novices in their new class, while Cape Cod Amateurs KZ1V, KQ1K, WA1OVN, W2CAP, KA1KF and KA1EUI are hard at work, making plans for Novice stations in their local elementary and middle schools. With Novice enhancements just becoming available, we can all look forward to much more interest from school administrations and students. Matter of fact, Eastham Elementary has 31 brand new Novices who are just itching to join in on the fun! Contact me for info on how to promote interest locally - it's easy! Section Traffic Manager KW1U says that WA1FCD, NG1A, KB1AF, KN1K, WA1TBY and KW1U all made the Public Svc Honor Roll this month. Section Emergency Coordinator KB1PA reports a growing number of EMASS Amateurs who are applying for appointments as Emergency Coordinators, and Official Emergency Stations. Be sure to contact Barry or myself to get further info on this important aspect of the Amateur Radio Service. Traffic: KW1U 688, KN1K 340, KB1AF 266, WA1FCD 242, NG1A 193, N1BHH 160, W1CE 144, W1ZHC 116, K1ABO 82, WA1TBY 77, KY1T 74, N1AJJ 70, WA1KLG 59, KA1EID 56, KA1ON 51, KA1LIH 48, KA1AMR 43, K1SEC 36, KA1BBU 23, WA1FNM 15, K1BZD 12, WB1GIA 10, KA1KCU 9, KY1B 7, KA1EDY 7, K1LCQ 7, N1DVZ 4, WA1SNH 2, AE1X 1. Have you expressed your opinions to your Section Manager and Division Director recently?

MAINE: SM, Cliff Laverty, W1RWG—ASM: Bill Mann, W1KX. SEC: KA8UVQ. STM: AK1W. BM: W1JTH. ACC: KA1FKS. OOC: W1KX. PIO: KY1E. SGL: K1NIT. TC: K1PV. Traffic: WB1CBP 109, W1ISO 91, ND1A 82, KA1JOJ 66, WA2ERT 54, W1JTH 44, W1RWG 34, AK1W 28, KA1ODT 18, W1KX 14, W1GCB 14, KA1ENM 10, W1VEH 10, W1BMX 7, WA1YNZ 4, NB2K 3. (Dec.) KA1ODT 18. PSHR: WB1CBP 97, WA2ERT 90, W1RWG 74. Pse send reports by 5th.

NET	SESS	CHECKINS	TRAFFIC	MANAGER
Sea Gull	27	980	94	K1GUP
Pine Tree	31	316	63	ND1A
N1AHH-1 BBS		1100	426	N1AHH
Aroostook E	4	72	1	WA1YNZ
RACES	4	71	20	W1RWG

Me Pub Svc no report

W1JTH, BM, reports 52 total bulletin trasmissions including five on packet by six OBSs; 9 ARRL 3 ME. Pen Bay Amateur Radio Club held VE exams at CEP in Rockland Feb. 14. Androscoggin ARC held exams on Feb. 28 at Poland. Hamfests: Deerfield (NH) May 9, Bangor June 6-7, St. Albans Aug. 7-8-9, Windsor Sept. 12. Please share your club and your individual ham activities with the rest of the membership. K1PV, TC, reports that WA1KAH has been appointed by the New England Spectrum Management Council as the new Maine director, and K1MON continues as two-meter coordinator. Keep your contacts clean!

NEW HAMPSHIRE: SM, Bill Burden, WB1BRE—SEC: W1NH. BM: K1OSM. In spite of the succession of blizzards here in NH, activity in Jan was heavy! KB1MK introduced a bill on tower height regulation to the state legislature. The bill has been before committee and is in the amendment process. The Amateur Radio display at the Montshire Museum of Science in Hanover was opened this month by the Twin State club. I visited the site and spoke with club pres WB1GRR. The operating display includes HF, VHF, and packet with SSTV to be installed and the live demos are attracting many young people. Congrats to new hams KA1PHN and KA1PIL, the first two grads of Bob's (W1HJT) novice class for the GBARA. Speaking of Novice classes, W1GUA and KA1LDS report that their classes are well attended with enthusiastic future Hams!! And we are very pleased to announce the official formation of a new club in the Greenville-Brookline are. They selected the club name-Souhegan Valley ARC-at the Jan meeting. Congrats to new pres W1FJH who reports that there are 25 members and they will publish a monthly newsletter and are already holding weekly nets on 147.48 (simplex). The Packet Racket continues in the CNHARC-N1DYL has a new ant for his station and N1AYT is on 2M packet. More NTS tfc being handled via packet in that area now. I got a note from Chris KA1LMR. Chris has been licensed for a little over a year and has just made his first two Moon bounce contacts! The young man did it with a 20 el collinear and 130 Wts and got W5UN and KB8RQ-super achievment, Chris! WA1OMM won the "Best Equipped Shack" contest in POPCOM mag and the pix of shack will be in the March issue-(hope I get some hints from it!). Congrats to the GSARA on being renewed as an SSC. They have initiated operation of their new emergency station at the Manchester Red Cross and are sponsoring regular Vol exams. From the Xmas tfc in SWNH area- over 1400 pcs of tfc generated by handlers and WA1FHB BBS! Formation of a regional council of clubs for that area reported by WB1GXM, who has started a DEC newsletter. I'm receiving an increasing amount of section tfc via packet-abt 25 pcs in Jan- working out very well! My mail stop is WA1DSW-1. And our section had 100% rep on FRN in Jan. That result and the health of NTS depends on continuous support of these efforts by all of us. We need more new tfc handlers-the recruiting and training takes time and if we want the system to continue to be effective, we have to seek out those people now! I'm sure that many of the new hams as well as some of the veterans can be recruited to help spread the work around. Work on it and contact N1NH for support. IDEAS—From Twin State Club: loaner H/Ts for hospitalized hams. With Novice Enhance approved: seek out the inactive Novices in your area for a "refresher course" to get them on the air. Start planning for spring Walkathons, Bikathons, etc public service events now. If 220 is active in your area, you will be able to get Novices into the action now! Traffic: GSFM 145, GSPN 84, NHN 80, MSOVTP 42, W1PEX 326, N1CPX 252, WA1FHB 178, N1AKS 134, N1NH 106, W1FYR 93, KK1E 91, W1TN 83, K6UXO 63, WA1YZN 50, WB1GXM 49, W1ALE 47, NE1J 36, K1PQV 32, K1TQY 28, KA1HPO 18, KA1LMR 13, N1CMD 10, KI1M 10, KC1AF 7, N1DQA 6, KV1S 6.

RHODE ISLAND: SM, John Bob Vota, WB1FDY—E.B.A.W.A. is now 11 years old, congrats and hope you have many more years. O.S.A.R.G held a retirement Party for W1XJ, Dick. I and all the Amateurs of R.I. hope you enjoy your retirement. N.P.A.R.C. novice classes a great sucess with 22 students, keep up the good work. I did not receive any other club news so short column agn. Traffic: KA1JXH 262, PSHR 95, KA1KML 168, PSHR 65, W1EOF 160, WA1CRY 73. New Net Manager E.M.R.I. P.N. WA1FCD.

VERMONT: SM, Frank I. Suitor, W1CTM—A Meeting of N.E. Section Mgr's was held in Boxborough, Mass, during January. It was an opportunity for me to meet with & learn from other more experienced SM's. In addition all SM's had a chance to comment & make suggestions on items to be discussed at the next Division Mgr's meeting. Reps from ARRL were also available to provide info on League Hq activities. Main area of concern was if a visitor center/museum should be constructed. K1KI survey is running 4 to 3 in favor. Other areas discussed included: Novice improvement, publications, ant restrictions, ARRL call sign insurance, VE Question pools, & DXCC restructuring. SEC (W1KRV) reports ARES public service support to Red Cross during Burlington power failure of 1/17 (11 hams) and support of state OEM/NWS on snow storm of 1/22-23 (60 hams). VTN/ARES coord has resulted in

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MRF453,/A	Q	60W	15.00	35.00
MRF454,/A	Q	80W	15.00	34.00
MRF455,/A	Q	60W	12.00	28.00
MRF458		80W	20.00	46.00
MRF475		12W	3.00	9.00
MRF476		3W	2.75	8.00
MRF477		40W	11.00	25.00
MRF479		15W	10.00	23.00
MRF485*		15W	6.00	15.00
MRF492	Q	90W	16.75	37.50
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SRF3662	Q	110W	25.00	54.00
SRF3775	Q	75W	14.00	32.00
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MRF240,/A	40W	136-174	18.00	41.00
MRF245	80W	136-174	28.00	65.00
MRF247	75W	136-174	27.00	63.00
MRF607	1.75W	136-174	3.00	—
MRF641	15W	407-512	22.00	49.00
MRF644	25W	407-512	24.00	54.00
MRF646	40W	407-512	26.50	59.00
MRF648	60W	407-512	33.00	69.00
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SD1447	100W	136-174	32.50	78.00
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2N6080	4W	136-174	7.75	—
2N6081	15W	136-174	9.00	—
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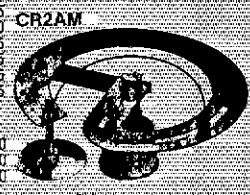

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significantly improving our public service capability. Tnx to all participants for serving UR community & state. New DEC's: N1ARI, W1ICW, KB1UE and new EC's: N1CQE, WB1AJG plus OES: KT1Q, AE1T, W1AIM & KA1LHC are helping ARES become even better. Total ARES membership now at 124. If UR not a member, won't U join us? Contact Joe (W1KRV) for more info. VT emergency net now @ 6 PM Sundays on 3976 KHZ. Looks like BARC novice/tech classes are doing something right—latest class is the largest ever @ 24. The teaching reputation of Mitch/Chris/Greg is starting to spread! Welcome to new novices: KA1'S—GBH, GQX, MQH, PDX, PEA, PEB, PEZ, PHT, PHU, PHV, PHW, PIE, PIF & PIR. Upgrades to Tech included: KA1'S—NOM, NON, NVZ, PHU & PHW. Next exams are 5/2 (BARC-WB2JSJ) & 5/16 (CVARC-K1HKI). WA1LIR is a new call & face on ATV. Tune into W1KOD/R-ATV on 8 PM Sundays—Audio can be heard on 144.51 MHz. BARC SEN (34/94) RAN 2 1/2 hours on 1/11—that NCS sure can talk! K1VT/R had its 1st maintenance in 8 yrs swhen a connector had to be replaced—how's that for reliability! Sadly, I report that WA1MHP (Wayne) has joined the Silent Key Ranks. January net report: VTN 31/275/241, CVTN 4/81/8, TSEN 4/48/5, BARC SEN 4/88/3, HHN 12/55/3, GMN 27/463/30, VFN 4/81/9, CAR 27/734/58. January Traffic report: KT1Q 474, WA2SPL 224, WA1JVV 144, AE1T 119, N1DHT 100, K2KBT 96, NB1A 48, W1OAK 7. Happy Easter to all.

WESTERN MASSACHUSETTS: SM,Bill Voedisch, W1UD—STM: W1UD. TC: KA1JJM. PIO/ACC: K1BE. SEC/SGL: WB1HIH. Multi-modes and bands sure do pay off when the progagation is poor and you want to get a message through. One recent session of 1RN saw traffic from southeastern Mass destined to EAN, by way of the rep in NH. And 80 was the pits. So 2 meter voice to Boston area, and then packet to NH via Harvard got the traffic there in very short order. Expect to see many more active Novices now that Enhancement has been approved and should be effective soon. As you can see from the masthead, W1UD has accepted the Section Manager position for WMA to fill out the current term. Although my plans are still to be active in traffic and other on-air activities, I can't squeeze out enough time to give the myriad other Section and Field Organization activities the attention they deserve and which the hams in West Mass should expect from their SM. I have enjoyed working with you over the past three years and am sure you will all give Bill your full cooperation and assistance. 73 for now. Don, KA1T. Traffic: KA1T 137, W1UD 133, W1KK 94, KA1EXJ 53, WB1HIH 48, KA1OFC 35, KA1IFC 28, KA1EKQ 28, N1FJ 17, W1ZPB 12, WA1OPN 11.

NORTHWESTERN DIVISION

ALASKA: SM, Jim Moody, Jr., NL7C—SEC: KL7JIM. STM: KL7T. TC: AL7L. NMs: KL7GID, KL7AF, KL7JKW. DECs: KL7WM, KL7JFT. KL7GG, the Alaska Frequency Coordinator, has sent out packages to each of the repeater owners with general guidelines for amateur radio repeater stations operating within Alaska and a repeater coordinator form. The coordination form MUST be filled out annually and returned to KL7GG. He has put in a lot of work contacting amateurs all over the section to ensure the Alaska repeater directory contains all of the repeaters, and this is the list that contains all of the COORDINATED repeaters. This is the list that will be published in the next ARRL Repeater Directory. At present the Alaska Repeater Directory contains 58 repeaters and four Digi-peaters. If you have a repeater operating and haven't been contacted by KL7GG, please contact him as soon as possible so that your repeater may be coordinated.

IDAHO: SM, Don Clower, KA7T—SEC: N7BI. STM: W7GHT. OOC: WB7CYO: WB7PFQ. I would like to welcome Dan Marter, K7REX, as the new DEC for S.W. Ida. Dan brings a lot of experience and enthusiasm to his new job. On 1/27, the Ada County ARES group had a meeting with K7REX, K7CXG, KD7HZ, N7ALB, N7GIV, N7HQT, W7JMH, W7IWU to discuss upcoming ARES functions. Jack Blake, Ada County Civil Def. Coord., was the guest speaker. Much was discussed and many plans were made. It was an outstanding meeting. The Twin Falls ARC had 44 hams and spouses at their X-mas party.

NET	FREQ	TIME	SESS	QNI	QTC
FARM	3937	8 PM DA	31	2009	38
ID CD	3990	8:10 AM M-F	22	790	36
IMN	3635	9 PM DA	31	281	71
NWTN	146.38/98	7:30 PM DA	31	1041	48

General: ARES net 2359z Sun. If you would like to join ARES, pse contact N7BI, K7REX or KA7T. 73s Don. TRAFFIC: N7BHL 144, W7GHT 242, W7JMH 22, NW7K 55. PSHR: N7BHL 95, W7GHT 89, NW7K 94.

MONTANA: SM, Les Belyea, N7AIK— SEC: W7LR. STM: KF7R. ASM & TC: KØPP. PIO: N7HAZ. SGL: W7JMX. ACC: KA7MAH. BM: K7KCR. Sorry to report that W7RLL is a SK. 1987 officers for the Lower Yellowstone ARS are Pres, N7HJG, VP, WB7QZU, Sec'y, WA7GVT, Tres, N7DYE. Gallatin ARC Pres, N7GDM, VP, NV7Y, Sec'y Tres, NV7W. Area hamfest's, Spokane April 25, Seaside, May 29-31. N7DKY of Great Falls reports the following up-grades, To extra-N7CTS, to adv. - K7RVF. to tech, - KA7YDH. April 25th will be a state-wide function called "Operation Good Turn" that will envolve Boy Scouts and Amateur Radio. The SM, ASM and the PIO met with the governor in Helena getting this started. DX note, KE7X got his 5band DXCC, congrats. PSHR - KF7R

NET	SESS	QNI	QTC	MGR
IMN	31	286	71	WA7GQO
MTN	31	2134	174	KF7R
MSN	4	84	1	KØPP

OREGON: SM, Randy Stimson, KZ7T— STM: W7VSE. SEC: N7CPA. PIO: KC7YN. SGL: KA7KSK. ACC: WB7TWD. RFI: AK7T. OO: N7SG. STC: N7ENI. First I would like to congratulate Rush Drake, W7RM, as the new Northwest Division Director and Bill Shrader, W7QMU, as the new Northwest Division Vice Director. The 1988 National Convention has been approved for September 10, 11, 12 at The Red Lion Inn at Jantzen Beach, Portland, Oregon. Also the 1987 Sea-Pac Convention will be held in Seaside, Oregon on May 30, 31, 1987. There is an Oregon Emergency Services Net on 3993.5 kHz at 8:30 AM daily, and in order to keep it going and for something to talk about they started to report the weather. The U.S. Weather Bureau heard about it and contacted Lyman Rinker, W7AZD, to see if he could compile this information and get it to the Bureau which they do every day by a special computer program. This has developed into a state wide net with over 50 checkins and almost every county is represented. The net control is Ray Stoltenberg, W7HKE.Traffic:(p) is Packet W7VSE 504, N7BGW 278, N7FXJ 126, W7ZB 105, WB7VSN 27, W7HLF 29, KM7R 26(p), W7FBP 20, N7CPA 16(p), KA7AID 15, WB7SZM 14(p), KA7EEE 8. (Dec.) W7ODG 118.

WASHINGTON: SM, Brad Wells, KR7L—STM: KD7ME. SEC: KA7INX. ASM/ACC: KC7PH. TC: W7BUN. OOC: N7DVR. SGL: KD7AC. BM: N7CAK. ASM: KD7G. The 1987 Northwestern Division convention will be the Tacoma Hamfair August 22-23. The Inland Empire Hamfest is April 25 at West 708 Boone, Spokane. 13500 sq. ft. of carpeted display and flea market. Hours from 9 AM-5 PM. DX, satellite, packet

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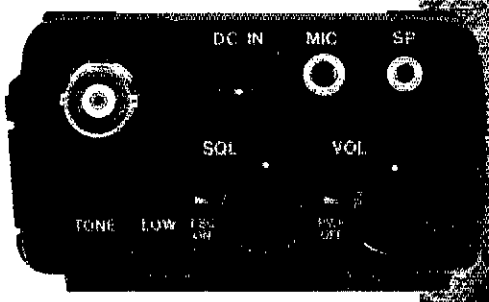
NEW!

This HT Has it All!

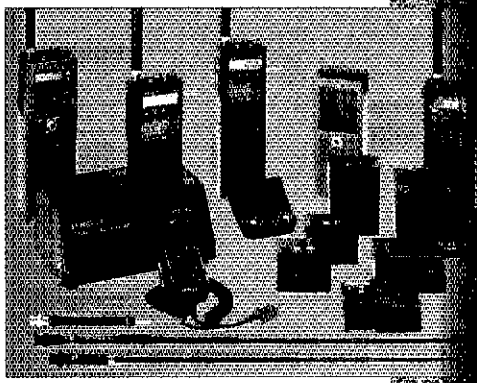
TH-215A/415A

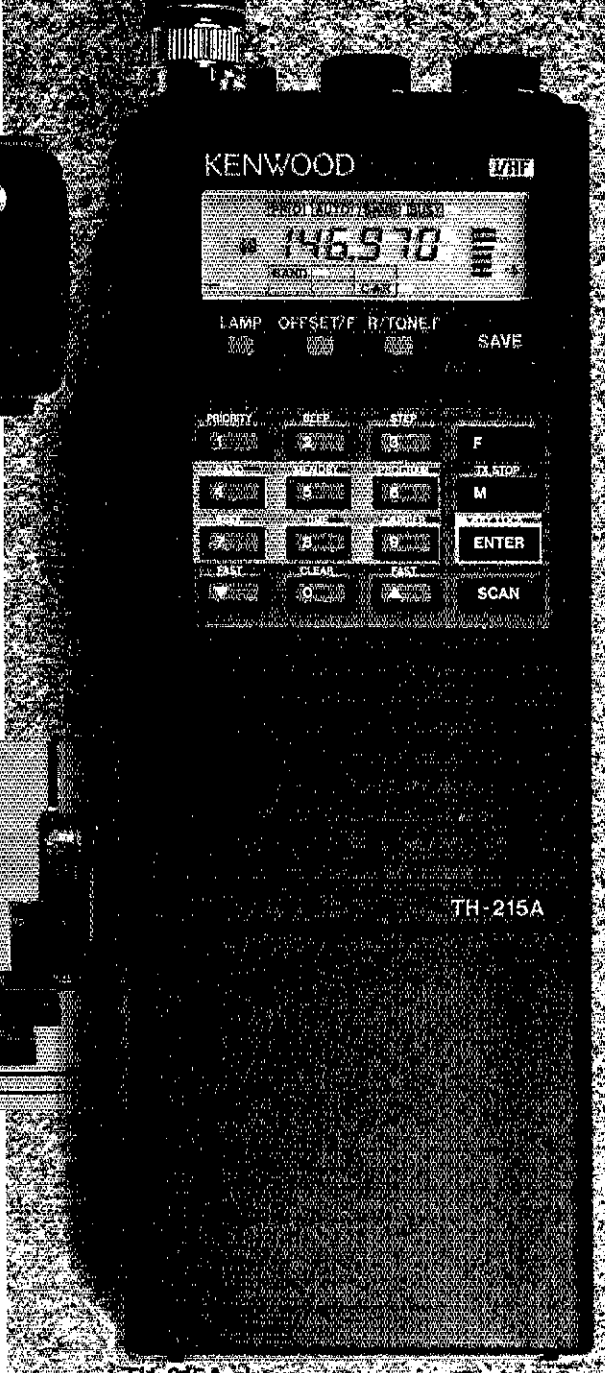
Full-featured Hand-held Transceivers

Kenwood brings you the greatest hand-held transceiver ever! More than just "big rig performance," the new TH-215A for 2 m and TH-415A for 70 cm pack the most features and the best performance in a handy size. And our full line of accessories will let you go from ham-shack 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).
- **TH-415A covers 440-449.995 MHz.**
- **5, 2.5, or 1.5 W output, depending on the power source.** Supplied battery pack (PB-2) provides 2.5 W output. Optional NiCd packs for extended operation or higher RF output available.
- **CTCSS encoder built-in.** TSU-4 CTCSS **decoder** optional.
- **10 memory channels store any offset, in 100-kHz steps.** Each memory channel can store frequency, frequency step, offset, **reverse switch position,** and CTCSS frequency.
- **Nine types of scanning!** Including new **"seek scan"** and **priority alert.**
- **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 key-pad 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.





TH-215A shown.

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 Compact battery charger • SMC-30 speaker microphone • SC-12, 13 soft cases • RA-3, 5 telescoping antennas • RA-8B 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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seminars. VEC testing.Info (509) 328-8627. KE7EQ conducting novice classes every Monday, Radio Club of Tocoma clubhouse. W7JXP runs language net (emphasis on Russian phrases) on WWDXC repeater (146.40-147.00 MHz), 10 AM every Monday. VEC exams— Hogue Bldg., Central Washington University, Ellensberg, April 4 at 1 PM—contact NC7C for additional info. The Spokane ARES has adopted 145.695 MHz as emergency monitoring frequency. Tune to this frequency instead of turning your rig off. A big thank-you to KA7VEE for demonstrating amateur radio to 4th and 5th grade classes at Brier Elementary School. Ham Centennial license plates—request Form TD420014 (R-2-85) from Dept. of Licensing, Amateur Radio Desk, Box 9909, Olympia, 98504. ARRL membership in NW Division grew 2.67% last year. Many thanks to all who turned out for the Senate Committee hearing on SB5055. This bill result of legislative contact by N7GHE. KD7AC kept the amateur community informed of its progress. Novice enhancement is now a reality— let's use it as a recruiting tool and involve new hams in ARES and public service. WB7UEU and Olympia ARS are coordinating communications for 1989 marathon run, along Lewis & Clark Trail to celebrate Washington's 100th birthday. The trail runs from Clarkston to the Pacific Ocean along the Columbia River—a test run takes place this month. Annual Diabetes Bike-a-thon April 26—contact W7JIE to help with communications. ARES groups should contact W6MTI/7 for an interesting presentation on earthquakes. New emergency districts formulated by KA7INX become effective this month for one-year trial period. The number of DECs will be increased to provide better coordination and support for the various county ECs. ARES groups involved in the October 1987 Simulated Emergency Test will be encouraged to participate in multi-county exercises...start planning now. Clubs: Inland Empire VHF Radio Amateurs meet 2nd Thursday, 7 PM at Tidyman's, South Pines Road at 12th, Spokane. Contact WB7NNF for info. News items for this column should reach me a minimum of 60 days before publication. Traffic: WB7WOW 198, KR7F 130, K7GXZ 98, WA7CBN 86, W7ICG 78, W7GB 75, N7GGJ 66, K7SUX 43, W7LBK 25, W7APS 24, N6EQZ 23, KA7MPD 17, K7CLL 10, N7GDW 9, KA7VEE 9, WA7YEN 8, W7IEU 5, KB7AEC 3, N7FXM 3, NN7M 2, KA7UBP 1. Category 2/3 KD7G, KR7L, KD7ME.

PACIFIC DIVISION

NEVADA: SM, Joe Lambert, W8IXD—K7HRW started his novice classes Tues. & Thurs., with 25 enrolled. Instructors are K7HRW, K7VY, W7AZF, N7GXT. K7HRW was recently appointed the State Races officer. KE7EH reports that the SAREX film was a big hit with about 30 Cub Scouts and their parents in Sparks. Field Day activities for So. Nev. are getting organized by NK7N and N7CXD. It will be held at the cool elevation of 6,000 ft. at Cold Creek. All interested contact NK7N and N7CXD. LVRAC had a "Show'n Tell" at their Feb. mtg. featuring home made, home brewed projects. LVRAC has agreed to provide communications for the Child Abduction Search Team—a group organized by Viet Nam veterans to find lost children. The SM Joe, W8IXD, and Div. Dir. Rod will be in Reno for a No. Nev. Section Meeting on April 12. All are invited to attend. Contact K7HRW for info.

PACIFIC: SM, Army Curtis, AH6P—Aloha and hafa adai to all of the Pacific. Congratulations to EARC and HWARS on becoming affiliated ARRL clubs. Is your club affiliated? Ask me to explain why it should be. EARC 2 meter net reports 24 sessions, QNI 309, QTC 12 for December. The success of this net is due to net control stations KH6JCA, N5HRN, WX4J, KH6OV, WH6BBH, KJ9U, KH6JAT, and N4ESX. KH6FOO now active on 2 meter EME from Hilo, 432 to follow. MARC reports new officers for 87 with AH6GR pres, AH6GJ vp, AH6GQ sec, WH6BFT tres and K6GSS director. Maui's first UHF stand-alone repeater is WH6BFT/R in Kula on 443.150. KH6WY and AH6GJ working on HF packet gateways. Traffic may once again flow freely to and from the islands. Right on!! Traffic: KH6S 41, KH6H 14, N4ESX 12, WX4J 9.

SACRAMENTO VALLEY: SM, Bob Watson, W6IEW—ASM: N6JTJ. STM: WA6WJZ. SGL: N6IG. ACC & TC: W6RFF. SEC: NR6A. DEC North: KF6KJ. DEC Sac Metro: W6CFQ. SECTION NET: First Sunday each Month, 8 PM, on 146.985, Input up. Yuba/Sutter repeater WD6AXM/R. Net Control - W6IEW or W6RFF. Please note some changes in the Section officials listed above. We are fortunate to have two of the men who worked so hard in the floods of last year and in the organization of the Sacramento Amateur Radio Emergency council accept appointments. Deane Coats, NR6A replaces Ron Wenstrom, KJ6R as Section Emergency Coordinator. Bob Cloud, W6CFQ is the District Emergency Coordinator for the four counties designated as the Metropolitan Sacramento area. Vern Wheeler, KA6GHI, who has served as District Emergency Coordinator for the Sierra Foothill area is recovering slowly from a serious heart attack and will have a few less worries without the DEC job. Thanks very much, Vern, for your fine job and get well soon. Finally the Section has a female appointee. Marj, N6JTJ, has the job of attracting more qualified women to fill Section positions and has been named Asst. SM for that purpose. The Amador ARC had the pleasure of having Director Stafford, KB6ZV, and Vice Director Knochenhauer, N6ITL at their Fifth Annual dinner. Traffic: N6LUY 170, K6SRF 150, N6CVF 132, WA6ZUD 68, WA6WJZ 52, WD6BZQ 34, KI6GW 28, W6RFF 16, N6LAM 15, WB6SRQ 10.

SAN FRANCISCO: SM, Bob Smith, NA6T— Novice enhancment is a reality and Packet radio is on the move. Now is the time to start recuiting the younger computer people into amateur radio. Rod, KB6ZV, and myself enjoyed meeting with LCARS, FWRA-HARC, and UARC during the first week of Feb. Glad to see all three clubs are very active this year. Congrats to Ken, WB6DQS, the new Pres. of DNARC—our smallest, but most active club in the section. The computer nite at SFRC has Bloomed into a FULL BLOWN BOOTH at the SF Commodore Computer Show with demos of PACKET RADIO. What a way to enlist the "computer buff" into amateur radio, tnx to WB6UHA es WA6DDM. Good thinking Dave es Jim!! Congratulations to Steve, WA6LLY, on his appt. to HF es VHF Awards Manager for SCRA,Inc.Need your WAS, es VUCC applications validated, he's the oneto see. SCRA, Inc. is now meeting at the Public Health Building in Santa Rosa, same time, bigger room, for a club on the move. N6IJB-1 has been moved about 1/3 the way DOWN the hill making the access from the south to AMT-7 a little shakey, but look for a new DIGI on Cahto Peak near Laytonville, es at Ridgewood Summit in the near future. Need a club program, contact me for information. See you all at Visalia in April for the International DX Convention. Traffic: N6FWG 25.

SAN JOAQUIN VALLEY: SM, Charles McConnell, W6DPD—SEC: WC6U. SMT: N6AWHG, TC: WA6EXV. ACC: W6DPD. Asst. SMs: W6TRP and K6YK. Congrats to the Turlock ARC on being named a Special Service Club. 1987 officers of the Southern Sierra ARS are Pres N6MTK, 1st VP KD6XG, 2nd VP WU6V, Sec K6DDF, Treas W6KQI. 1987 officers of the Sonora Pass ARK are Pres N6EUC, VP N6HUH, Sec KB6NCG, Treas KB6CEH. The club meets the 3rd Wed in Twain Harte. 1987 officers of the Stanislaus ARA are Pres WG6P, VP N6OCV, Sec KB6ECF, Treas N6OCS. The club

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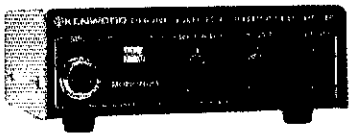
Accessories

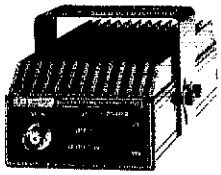
TL-922A 160-15 m 2 KW PEP/1 KW DC Input Linear Amplifier. Pair of EIMAC 3-500Z tubes and excellent IMD characteristics. Perfect safety protection with blower turn-off delay circuit.



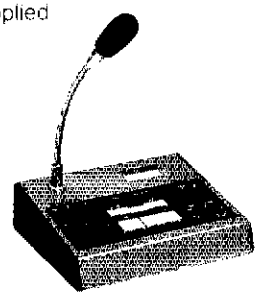
PC-1A Phone Patch (FCC Part 68 registered).

MA-5 80/40/20/15/10 meter mobile antenna. All resonators supplied. 200 W PEP max., VSWR 1.5:1 or less. Easily adjustable for center frequencies.

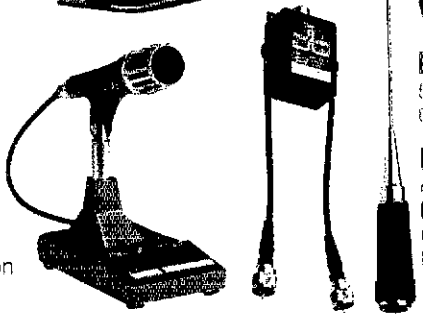
VP-1 Bumper mount for above.



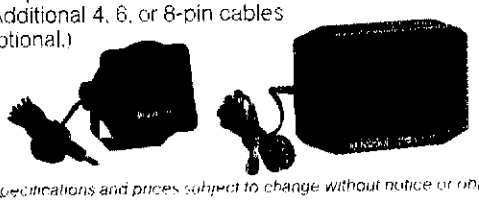
VB-2530 25 W RF Power Amplifier (for TR-2600A). BNC-BNC cable, and mounting bracket supplied.



MC-85 (8-pin) Multi-function desk-top microphone (8-pin) 700 Ω unidirectional electret condenser mic. Built-in audio level compensation with output and tone control, meter, and UP/DOWN switch. Selector switch for up to three transceivers. (Additional 4, 6, or 8-pin cables optional.)



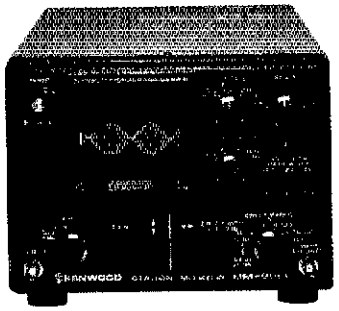
MC-60A (8-pin) Deluxe desk-top microphone. Pre-amp built-in, PTT, LOCK and UP/DOWN switches. Hi/Lo Z selector switch.



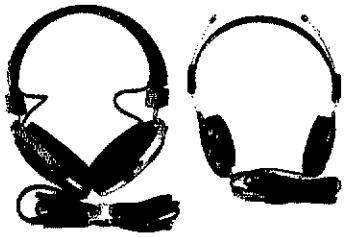
SP-40 Compact mobile speaker.

SP-50B Mobile speaker.

Specifications and prices subject to change without notice or obligation



SM-220 Station monitor/10 MHz oscilloscope Pan display capability with optional BS-8 (for TS-940S, TS-830S). Monitor transmitted waveforms and/or received signal waveforms. Built-in 2-tone generator.



HS-5 Deluxe headphones.

HS-6 Lightweight headphones.

LF-30A Low pass filter, 1 kW, 50 Ω. Insertion loss: less than 0.5dB at 30 MHz.

MA-4000 2 m/70 cm dual band mobile gain antenna. Duplexer supplied. Ideal for use with the TW-4000A "Dual Bander" and TM-211A/TM-411A. (Mount not supplied.)

MJ-Series Microphone adapters

Not Shown:

MC-50 Desk-top microphone. Hi/Lo Z. 4-pin connector.

MC-80 Desk-top microphone. 700 Ω unidirectional electret element with flexible boom. Built-in mic. pre-amp and UP/DOWN switch, with lock. (8-pin).

MC-48B Hand microphone with 16-key DTMF pad and UP/DOWN switches. (8-pin).

MC-46 As above, but with 6-pin connector.

MC-43S Hand microphone with UP/DOWN switches. (8-pin).

MC-35S Noise cancelling hand microphone, 50 k Ω (4-pin).

MC-30S As above, but 500 Ω.

PG-4A Microphone cable for MC-60A. Converts MC-60A to 4-pin connector.

PG-4B As above, but 6-pin.

PG-4C As above, but 8-pin, as supplied with MC-60A.

PG-4D Extra 4-pin cable for MC-85.

PG-4E As above, but 6-pin.

PG-4F As above, but 8-pin.

HS-7 Micro-headphones.

KPS-7A 13.8 V DC, 7.5 A intermittent DC power supply.

RA-3 2 m, ⅜ λ telescoping antenna with BNC connector.

RA-5 2 m ½ λ 70 cm ⅝ λ telescoping antenna with BNC connector.

RA-8B 2 m StubbyDuk® with BNC connector.

RA-9B As above, for 220 MHz.

RA-10B As above, for 440 MHz.

RD-20 Dummy load, 50 Ω DC-500 MHz 20 W continuous, 50 W intermittent.

PG-3B DC line filter for mobile use.

Service manuals are available for all Kenwood transceivers and most accessories.

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meets the 3rd Tuesday in Modesto. 1987 officers of the Calaveras ARS are Pres K6LHR, VP N6HWX, S/T KE6OZ. K6UVL and K6RPH are SILENT KEYS. KI6AA is Extra. N6KKV and N6QMM are Advanced. KB6NCG is General. KB6NMF, KA6VFO, KB6CEG, KA6UQN, KB6CEH, N6OQQ, and N6OQR are Tech. W6YEP has an IC2KL. W6YO has a FT 980. N6JQT has a TR 2530. KA6SRN has a TH 31AT. The 1987 Fresno Hamfest is May 1-3, 1987, at Airport Holiday Inn. Write Fresno Hamfest, P.O. Box 783, Fresno, CA 93712. Traffic: N6MCY 69, N6AWH 36, W6DPD 12, WA6YAB 10, W6VMB 8, K6RAU 5, W6SX 1.

SANTA CLARA VALLEY: SM, Glenn Thomas, WB6W—SEC: WA6OCV. TC: WA6PWW. STM: N6JLJ. PIO: WB6NLA. ASM: N6JQJ & NS6S. ACC: W6MKM. BM: (vacant) OOC: (vacant) Congratulations to N6BIS on FINALLY getting her card for one of the RAREST of all stations to work on CW!...special thanks to the FINDER committie for their efforts in putting the FINDER system together. They have had a number of alpha test runs that have been very helpful in "ringing out the system." The EMARC group was addressed by Lou Beaudet K6TMB, president of the Northern California DX Club...speaking of DX, tnx to the NCDXF for their part of the Peter I, DXpedition. Nothin' like a new country to get the juces flowin! The annual FARS/EMARC banquet was a great success. Special thanks to the firms who donated door prizes...the ONLY Special Service Club in the section, the Gabilan ARC had their meeting as a social hour only. A very important aspect of many Amateur Radio events is social; few things promote any group as well as an "eyeball QSO"!...the San Mateo ARC heard from Charles Kreling on Electronics in General Aviation... the world famous Foothill Flea Markets are off and running! These are held the second Saturday of the month, March thru September. Cost is $7 per seller (2 spaces) and buyers are FREE! The sponsors and schedule are:

March 14	SPECS
April 11	Amateur's Donation to Palo Alto Red Cross
May 9	EMARC
June 13	SPECS Users Group
July 11	Perham Foundation
August 8	PAARA
September 12	FARS

The San Jose State U. club is meeting every other week, usually in the student union. Contact WA6PGP for more details if you're interested...In the next few months we will be changing the report date for section appointees (EC, ORS, OBS etc.) from the end of the month to the middle of the month to allow a bit more time for them to be digested. I'll have more on this subject in this column next month. PSHR: W6NJR. OO reports: (none) Traffic: W6YBV 206, W6KZJ 73, N6JLJ 26, KA6SXW 15, WA6HAD 8, W6PRI 3, KB6IWG 2.

ROANOKE DIVISION

NORTH CAROLINA: SM, Rae Everhart, K4SWN—SEC: AB4W. STM: K4NLK. BM: K4IWW. ACC: WC4T. PIO: WA4OBR. TC: K4ITL. SGL: KE4ML. Raleigh Hamfest Apr.12. Field Day only 2 months away. Make your final plans NOW. Congrats to new upgrades: KB4TTY, KB4VDJ, N4GVF, KB4SCC, KB4LWD, KB4OKB, N4ILM now KK4EV. WB4TSB now KK4FE. Welcome to K4LFV and W4KX as new residents of Section. New officers Rowan ARS Pres. KA4MPP. VP. KB4MUV. Sect/Tres. N4UH. TARA High Point Pres. N4NIS. VP KK4AT. Sect. N4LAW. Treas. KA4PKJ. HSMtn VHF Soc. Pres. KI4KM. VP KJ4AX. Sect/Tres. N4HHG. Alamance ARC Pres. N4MIO. VP KB4TDF. Sect/Tres. N4ARY. Engr. WA4FFW. Support the club in your community. It benefits everyone. Novice classes being taught by AI4J, AA4CO, KB4IVV, KJ4VD, NC QSO Party April 26 from 8 AM-12 Midnight sponsored by K4EG. Big snowstorm just passed and N4MBI EC Forsyth Co activated ARES to provide communications in 4-wheel drive vehicles for doctors/nurses to strategic locations. WB4HRR-DEC activated Skywarn/ARES in mountain counties through WA4BVW/R. Section would like to RECOGNIZE and SALUTE the OFFICIAL RELAY STATIONS—ORS this month: W4WXZ N4CJJ AA4MP K4MC K4VHT NJ4L W4EHF WB4WII KA4EYF AB4V KB4IVV KA4KJI N4BJX N4NLK N4LUO WD4RMQ KU4W N4UE N4NOY N4AET WA4SRD K4FTB AK1E N4JEO K4JHF WB4HRR WB4MXC W4EAT AB4S WB4N W4ACY. STM K4NLK reported excellent traffic training sessions on PCTN with 5 hams doing different aspects of traffic handling. Believe packet radio will play big part in future of NTS. Quarterly traffic report: Oct-Dec 86.

NET	QNI	QTC	TFC	QND	SESS	NM
NCMN	1233	638	622	1780	92	WB4HRR
NCEN	1269	896	743	2442	92	WB4WII
CN	2175	1191	1113	5054	184	NJ4L
CSN	940	243	241	2515	92	AA4MP
CNCTN	2462	537	413	1604	92	WA4MNR
PCTN	1496	634	497	1531	92	NE4J
RARS	691	80	80	1141	92	K4ABJ
M2MEN	1676	116	115	1245	90	KF4MZ
CFARS	1390	75	74	1599	92	W4EHF
PETN	541	209	172	1004	85	WB4HRR
THEN	1076	151	83	941	91	N4LUO
Totals	14,949	4,772	4,073	20,856	1,095	

This SM would appreciate any SARs from Novices/Techs. Traffic: K4NLK 249, WB4HRR 209, NJ4L 188, KA4EYF 119, WD4HTE 111, AA4MP 103, AK1E 96, KI4YV 76, K4IWW 68, N4MQU 68, K4SWN 59, WB4WII 58, KA4TLC 52, WB4N 48, K4JHF 42, AA4TE 39, WA4MNR 34, NE4J 33, W4EHF 32, N4JRE 28, N4LST 25, N4MMM 25, K4GI 24, K4DDY 18, N4CJJ 17, WD4MRD 15, WB4CYN 14, NT4K 12, N4LUO 10, N4UE 8, WD4EQK 6, WD4RMQ 5, W2JDB 3, KB4NWX 3, W4KX 1. (Dec.) W4EHF 30, N4JEO 24, KA4YMY 17. Totals: SARs 38, Tic 1,967. Get ready for summer mobiling. It's spring cleaning time. NOVICE ROUNDUP was a lot of fun and a great experience. Lots of good fists.

SOUTH CAROLINA: SM, Jimmy Walker, WD4HLZ— To you, EMMIE PATIENCE, KA4LRM, the SC Section owes a debt of gratitude for the almost five years of dedication and devotion you have given the SCSSB Net as Net Manager. Your planned retirement, 7 April 1987, marks the end of a tour of duty, far greater than most amateurs are willing to donate, during which you gave freely of an enormous amount of personal time and resources, tending to the myriad of details over which a Net Manager must agonize. CONGRATS for a SUPERB JOB as Net Manager! As a personal tribute to you, it is my fondest hope that EACH AMATEUR reading this WILL FIND A WAY to become more active in local nets and on one or more of our section Nets

CN - 3573 Khz at 1900 EST Daily
CN - 3573 Khz at 2200 EST Daily
CSN - 3715 Khz at 1800 EST Daily
SCNT - 3905 Khz at 1200 EST Monday thru Saturday
SCNT - 3905 Khz at 1230 EST Sunday
SCSSB - 3915 Khz at 1900 EST Daily

Traffic: K4ZN 159, W4ANK 89, KB4BZA 89, WØIKT 67, KA4LRM 66, W4FMZ 62, WB4UDK 34, KA4YEA 18.

VIRGINIA: SM, Claude Feigley, W3ATQ—STM: KB4WT. SEC: N4EXQ. ACC: NT4S. OOC: W4HU. BM: AB4U. TC: WB4MAE.

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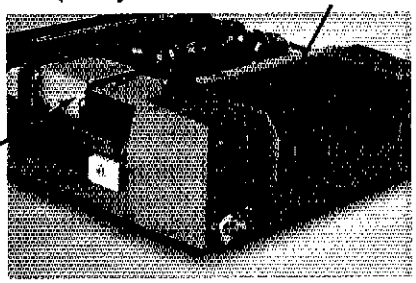
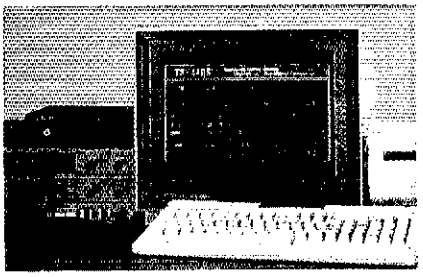
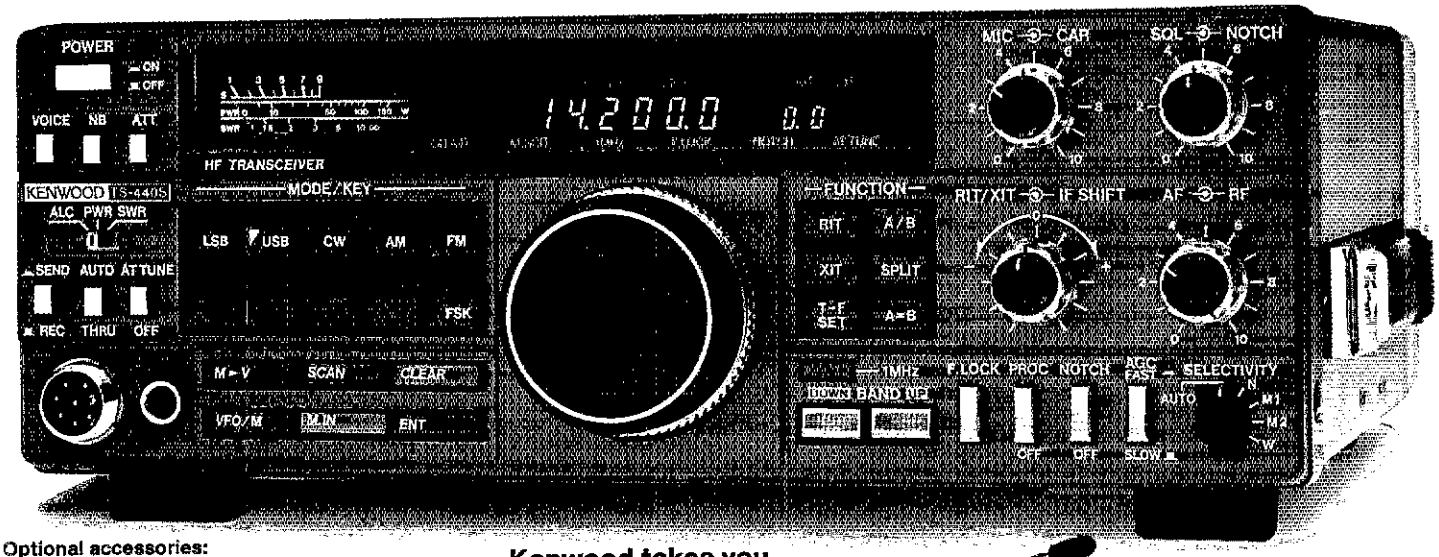
Kenwood's advanced digital know-how brings Amateurs world-wide "big-rig" performance in a compact package. We call it "Digital DX-citement"—that special feeling you get every time you turn the power on!

- **Covers All Amateur bands**
  General coverage receiver tunes from 100 kHz—30 MHz. Easily modified for HF MARS operation.
- **Direct keyboard entry of frequency**
- **All modes built-in**
  USB, LSB, CW, AM, FM, and AFSK. Mode selection is verified in Morse Code.
- **Built-in automatic antenna tuner (optional)**
  Covers 80-10 meters.
- **VS-1 voice synthesizer (optional)**
- **Superior receiver dynamic range**
  Kenwood DynaMix™ high sensitivity direct mixing system ensures true 102 dB receiver dynamic range. (500 Hz bandwidth on 20 m)
- **100% duty cycle transmitter**
  Super efficient cooling permits continuous key-down for periods exceeding one hour. RF input power is rated at 200 W PEP on SSB, 200 W DC on CW, AFSK, FM, and 110 W DC AM. (The PS-50 power supply is needed for continuous duty.)
- **Adjustable dial torque**
- **100 memory channels**
  Frequency and mode may be stored in 10 groups of 10 channels each. Split frequencies may be stored in 10 channels for repeater operation.
- **TU-8 CTCSS unit (optional)**
  Subtone is memorized when TU-8 is installed.
- **Superb interference reduction**
  IF shift, tuneable notch filter, noise blanker, all-mode squelch, RF attenuator, RIT/XIT, and optional filters fight QRM.
- **MC-43S UP/DOWN mic. included**
- **Computer interface port**
- **5 IF filter functions**
- **Dual SSB IF filtering**
  A built-in SSB filter is standard. When an optional SSB filter (YK-88S or YK-88SN) is installed, **dual** filtering is provided.
- **VOX, full or semi break-in CW**
- **AMTOR compatible**







Optional accessories:
- AT-440 internal auto. antenna tuner (80 m—10 m)
- AT-250 external auto. tuner (160 m—10 m)
- AT-130 compact mobile antenna tuner (160 m—10 m)
- IF-232C/IC-10 level translator and modem IC kit
- PS-50 heavy duty power supply
- PS-430/PS-30 DC power supply
- SP-430 external speaker
- MB-430 mobile mounting bracket
- YK-88C/88CN 500 Hz/270 Hz CW filters
- YK-88S/88SN 2.4 kHz/1.8 kHz SSB filters
- MC-60A/80/85 desk microphones
- MC-55 (8P) mobile microphone
- HS-5/6/7 headphones
- SP-40/50B mobile speakers
- MA-5/VP-1 HF 5 band mobile helical antenna and bumper mount
- TL-922A 2 kw PEP linear amplifier
- SM-220 station monitor
- VS-1 voice synthesizer
- SW-100A/200A/2000 SWR/power meters
- TU-8 CTCSS tone unit
- PG-2S extra DC cable.

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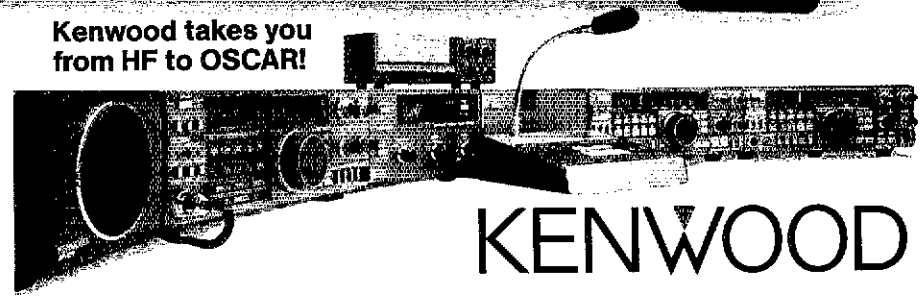

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Follows a listing of the Section "NTS" nets. If you desire to have your net qualified as an "NTS" net, contact the STM, KB4WT, for details.

VTN	1 PM	3907	KB4NGO
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

Please note that KB4NGO has taken over the reins of the VTN replacing AA4AT who asked to be relieved of that post. Tnx to ART for an outstanding job as VTN net manager. Reminder to all—the Roanoke Division League Planning Meeting will be held in Roanoke, May 16-17. This is a chance for all to learn about ARRL activities and present their views and questions concerning the League's operation. Contact NN4I or the SM for further details. Steve Place, WB1EYI, Mgr. of the Volunteer Resources Group at ARRL HDQ is scheduled to be present at this meeting. Has your club sent in its 1987 Annual Report? A Gold Star to the Rappahannock Amateur Radio Assoc. for being the first to file a 1987 report. W4HU reports his corp of OOs were very busy with KE4EQ, W4HU, W8IRT, KB4WT, AA4EL and K4JDJ submitting reports. K4JDJ issued 23 notices of operating discrepancies. WA4RTS reports the Lynchburg ARES group has installed VHF gear in the Lynchburg Emergency Communications Center and working on UHF installation. Congrats to W4OLD for being named the Ham of the Year for Roanoke Valley by the RVARC. K4JST and NW4O report lots of funon HF Packet with their PK-232 units. VE exam schedule: Apr. 4, Williamsburg contact WJ4X; May 2, Hampton contact N4IIC; May 23, Richmond contact WU4G, May 23, Woodbridge contact Don Ross; June 6, Portsmouth contact WB4BAB. Traffic remained steady for the month with 43 stations reporting a count of 4706. N4GHI, N4EXQ and K4DOR made BPL. We welcome KB4TRI to the tfc gang. It was a pleasure meeting many of you at the Frostfest and will be looking for you at the Roanoke hamfest May 31 and at Manassas June 6th. New appointees: N4GHI, WD4FTK as OES and WB4VWR as DEC for the Virginia Capitol District. The next issue of the Virginia Ham is scheduled for April. Send your info to NN4I before April 10. Your SM is looking for your comments on the "HAM" along with your opinions regarding Section activities. I am interested in knowing about stations interested in knowing about stations interested in handling traffic via Packet both on HF and VHF snd me your callsign via Packet check the WA4ONG, WD4BAV and WA4OHV PBBS regularly. Traffic: N4GHI 627, N4EXQ 556, K4DOR 510, AA4AT 258, WA4CCK 237, W3ATQ 235, WD4OCW 193, K4MTX 173, KB4WT 172, AA4GL 166, WD4FTK 137, K4JST 130, WD4ALY 125, WD4MIS 121, WB4KSG 110, KI4BR 93, W4JLS 81, WB4ZNB 76, NN4I 67, KJ4MF 58, WB4EDB 52, NT4S 48, W4TZC 47, N4KSO 46, K4JM 41, WB4UHC 39, K4VWK 38, K4BGZ 34, N8ANQ 33, KA4ZTB 32, NW4O 29, K4GR 19, K4AXF 18, K4MLC 17, WB4KIT 16, KB4PW 15, N4FNT 12, WB3ANC 11, KB4TRI 11, K1GGS 10, W4YE 7, WA4TVS 4, KM4X 2.

WEST VIRGINIA: SM, Karl S. Thompson, K8KT—SEC: K8QEW. STM: KD8G. ACC: WA8CTO. SGL: K8BS. TC: K8CG. Charleston Area H. F. and Computer Show will be April 5 at Civic Center. Next State Radio Council Mtg will be Mar 28, at Jax. Mill. Please attend this very important meeting. Bluefield H. F. will be May 17, at city park.

Net	Freq	Time	QNI	QTC	Sess	NM
WVFN	3855	6:00	1145	144	31	W8YP
WVMD	7235	11:45	920	50	31	W8FZP
WVN	3567	7:00	304	78	31	KZ8Q
WVRN	3640	6:30	356	36	31	K8LG
WVNN	3730	5:15	143	28	30	KA8TIK
Hillbilly	14290	Noon su	116	16	4	W8YP

Traffic: KA8WNO 256, W8FZP 131, W8YP 94, K8TPF 91, KA8TIK 86, KE8FI 79, K8QEW 57, K8UQY 51, WD8DHC 37, WD8LDY 36, N8FXH 31, K8KT 30, KA8OGF 21, KD8G 17, W8JWX 13, NC8G 12, KD8VT 7.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Bill Sheffield, KØIJ—ASM: KAØMQA. SEC: WBØFQB. STM: NØDZA. ACC: WBØDUV. OOC: KCØUD. BM: KAØCZW. PIO: NØFOE. TC: NCØF. SGL: WDØGQL. The annual statewide channel 9 Health Fair is scheduled for April 4th-12th. This year the Area Coordinator is KAØEFM. I have worked the Health Fair as a NCS and have helped coordinate this activity in years past, and from experience I can say that it is a very large undertaking. I would like to commend Bob Fedde, KAØEFM, for his coordination of this large public service event...it is certainly a first in the section and perhaps the nation that a blind amateur has volunteered to coordinate such an event. He will need several ham operators and site coordinators throughout the state...if you can help out in your area please let him know. The Colorado Weather Net (CWXN) has been operating daily for over 30 years on 80 meters and 2 meters. WAØHJZ the NM is looking for some Net Control Stations on both frequencies, if you can help one or more mornings a week get in touch with WAØHJZ for further details on how you can help the CWXN. NETS: COL: QNI 1120, QTC 25-inf 130, QNF 955, 31 sess. CWN QNI 69, QTC 69, QNF 362 29 sess. CWXN: QNI 2685, QTC 2426, QNF 2790, 31 sess. HNN: QNI 2184, QTC 101-inf 415, QNF 1375, 31 sess. NCTN: QNI 271, QTC 112, QNF 375, 30 sess. SCTN: QNI 280 QTC 115, QNF 304, 30 sess. Traffic: NØBQP 1777, WAØHJZ 1688, KØJAN 575, KØRXK 561, NØHMX 163, KBOZ 136, NØHDR 135, KAØNLI 110, WDØBSZ 102, NØDZA 73, WØNFW 73, AIØW 14 (Dec.) KBØZ 100.

NEW MEXICO: SM, Joe T. Knight, W5PDY—ASM: K5BIS. SEC: K8YEJ. DEC: WD5HCB. STM: ND5T. NMs: WA5UNO K6LL W5QNR. TC: W8GY. ACC: KA5BEM. Southwest Net (SWN) meets daily on 3583/7083 at 0230 UTC and handled 151 msgs with 244 checkins. New Mexico Roadrunner Net meets daily on 3939 at 0100 UTC and handled 38 msgs with 1392 checkins. New Mexico Breakfast Club meets daily on 3939 and handled 126 msgs with 1112 checkins. Yucca 2-mtr Net 78/18 handled 19 msgs with 506 checkins. Caravan Club 2-mtr Net 66/06 handled 0 msgs with 151 checkins. SCAT Net 66/06 handled 5 msgs with 426 checkins. Info Net 13/73 with 142 checkins. W5UR & KA5BEM both making a good recovery after surgery. W5KWP doing better after a hospital stay. 70 MPH winds destroyed lots of antennas in Jan. Whitey's 23rd annual BEAN FEED, Las Cruces, Apr 25-26th. KD5AO is SK in auto accident. Traffic: W5DAD 178, KN5D BBS, 1114 connects.

UTAH: SM, Jim Brown, NA7G—SEC: Rich Fisher, NS7K. STM: John Sampson, W7OCX. Novice Enhancement is becoming a reality—I know some hams have reservations, but I hope the incentives will encourage new, younger people to join our ranks. With sadness I report Herb, KA7GYW as a Silent Key. VHF Society elections: WØKP, Pres, NV7V, VP: KE7BG, Sec'y: K7JL, Freq. Coord. TCARS having Spring Hamfest as VE Exams 3rd weekend in May at Lookout Pass; contact Ed, WB7UAO for info. 73 de NA7G. Traffic: WA7KHE 104, WA7MEL 101, K7MG 34, N7ASY 33, NA7G 17, W7OCX 9.

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- Automatic mode selection, plus LSB

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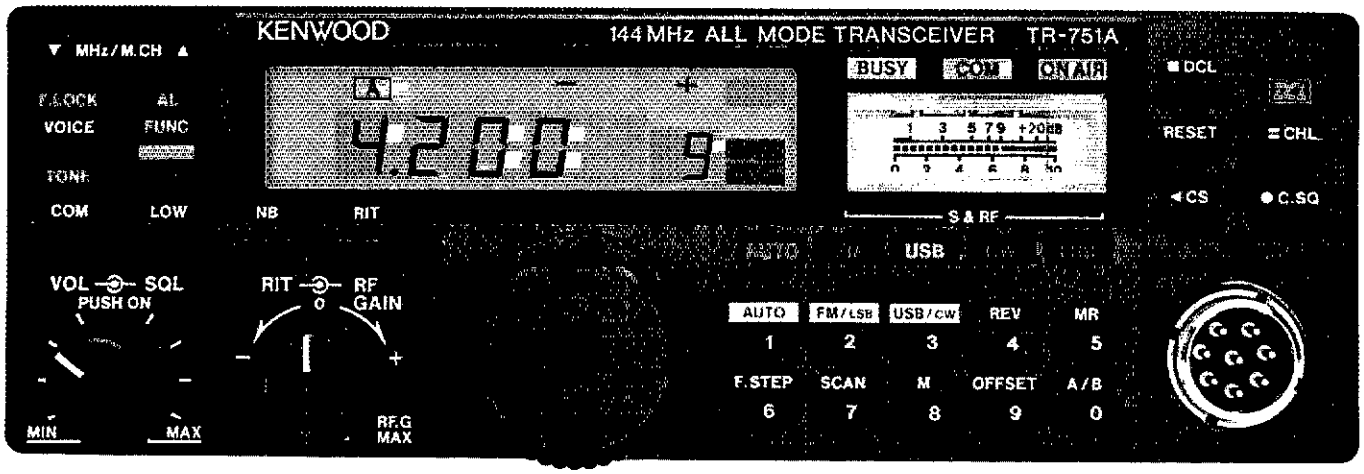
CW	USB	FM	USB	FM

- Optional front panel-selectable 38-tone CTCSS encoder
- Frequency range 142-149 MHz (modifiable to cover 141-151 MHz)
- High performance receiver with GaAs FET front end
- VS-1 voice synthesizer option
- 25 watts high/5 watts adjustable low
- Programmable scanning—memory, band, or mode scan with "COM" channel and priority alert
- 10 memory channels for frequency, mode, CTCSS tone, offset. Two channels for odd splits.
- All mode squelch, noise blanker, and RIT
- Easy-to-read analog S & RF meter

- Dual digital VFOs
- Semi break-in CW with side tone
- MC-48 16-key DTMF hand microphone and microphone hook included
- Frequency lock, offset, reverse switches
- Digital Channel Link (DCL) option

Optional accessories:

- **CD-10** call sign display
- **PS-430, PS-30** DC power supplies
- **SW-100A/B** SWR/power meter
- **SW-200A/B** SWR/power meter
- **SWT-1** 2 m antenna tuner
- **SWT-2** 70 cm antenna tuner
- **TU-7** 38-tone CTCSS encoder
- **MU-1** modem unit for DCL system
- **VS-1** voice synthesizer
- **MB-10** extra mobile mount
- **SP-40, SP-50B** mobile speakers
- **PG-2N** extra DC cable
- **PG-3B** DC line noise filter
- **MC-60A, MC-80, MC-85** deluxe base station mics.
- **MC-43S** UP/DOWN mic.
- **MC-55** (8-pin) mobile mic.
- **MA-4000** dual band antenna with duplexer



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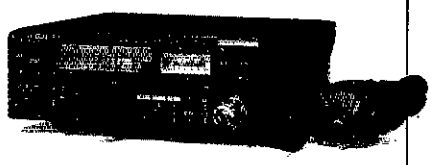

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WYOMING: SM, Dick Wunder, WA7WFC—Asst. Section Mgr.—Steve Cochrane, KA7AWS Section Emergency Coord.—Jim Anderson, W7TVK The Sheridan Amateur Radio League will sponsor the WYOMING HAMFEST July 10-12 at the Wyo. State Fairgrounds in Douglas, Wyo. Miley Radio has indicated that he will be back again this year. Camping should be available again this year at the fairgrounds. W7NE reports that Cheyenne held Amateur Exams with 3 Extras, 1 ADV, & 1 GEN as successful. W7TVK reports that Casper also held Amateur Exams during January. KC7AR reports the Wyoming Cowboy Net held 22 sessions with 942 QNI and 5 QTC. KA7FDL reports the Albany County RACES Net had 30 QNI. No traffic listing as I had to file this report early this month.

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. Novice Enhancement is in place so now it's up to the rest of us to show them how to reach for the stars. The 1987 officers of the West ALA ARS Are: President WD4DAT, Kelly Bruce; Vice President W4WYP, Herbert McDaniel; and Sec/Treas N4OFU, Pat Mills. The new officers of the Mobile Club are: President N6CMY, Mike Harpin; Vice President N4MFQ, Steve Kelly; Secretary N4NRI, Bobbi Ferguson; and treasurer KA4PGO. Doris Pucket. I have two Silent Key reports this month: K4SKX, Earle S. Younce of Mobile and W4YNM, Harry G. Parker formerly of Lake City, Florida. Traffic: CAND reports 612 messages in 31 sessions with DRN5 Rep 100% by WA4JDH, W4CKS, and NW4X. DRN5 reports 683 messages in 62 sessions with Alabama rep 94% by WA4JDH. W4CKS, NW4X, and W4WJF. Aend reports 46 messages passed in 31 sessions with other nets represented by WA4JDH, WD4NYL, and N4DCS. AENB reports 65 messages passed in 31 sessions with RN5 represented by WA4JDH, W4CKS, W4QAT, NW4X, and, WA4ZPZ. AENM reports 54 messages passed in 35 sessions. Brass Pounders League: WA4JDH. PSHR: WA4JDH. W4CKS, and WA4RNP. Totals: WA4JDH 957, W4CKS 78, NW4X 72, WA4RNP 34, K4AOZ 52, W4WJF 14, W4DGH 8, KC4AF 8, and, WB4TVY 2. Very Seven Three, Joe.

GEORGIA: SM, Eddy Kosobucki, K4JNL—ASM & BM: K4VHC. SEC: NC4E. STM: WB4WOL. ACC: WA4ABY. OCC: NA4I. PIO: WB4DEB. SGL: W4BTZ. TC: WD4PAH. For the 2nd yr in a row the GA Tech ARC has won the small club category Club Challenge for the 80's. Congrats. CARS in Savannah elected N4LLX as Pres, VP: KD4WF, Sec: KB4RMN & Treas: AB4B. Packeteers join the group in the Savannah on Thurs at 7 PM on 145.01 via K4NLX-2. Alford Memorial ARC installed WB4DEB as Pres, VP: N4JPD, Sec: N4OCJ, Treas: NM4T & Trustee: WA3JBQ. Albany ARC, Pres: WA4DDA, VP: N4PBA, Sec: W4EVG & Treas: K4XA. Chehaw ARS elected Pres: KA4WBC, VP: KE4KN, Sec: WB4TFW & Treas: N4PAF. Coastal RC: Pres: N4EKZ, VP: WA4TZW & Sec/Treas: W4PVW. K4DDM of Albany became a Silent Key on Feb 8th. Our sympathy to his family. Tnx to W4BTZ & WB4UBW and all the Atlanta area hams who went before the Legistative committee on the Ga state tags. We will keep u posted on the outcome. Our hats off to all the instructor's & VE's throughout the section for the PB work ur doing in helping get new blood into the hobby. Also to the people who devote their time in writing the best newsletter in the country. This is devotion to our club. Augusta ARC elected N4MWR as Pres, VP: KJ4LA, Sec/Treas: WB4AIU. Also informed me that the Augusta Hamfest is scheduled for Sept 20th. I want to congratutate all the new officers in the section clubs on their election & to the past officers for a job well done. It takes good leadership for any organization to function but without the support of the members it can't. HAPPY EASTER. Traffic: W4PIM 194, WB4DVZ 123, W4WXA 92, KF4FG 83, WA4ZHC 68, WB4WQL 67, WD4COL 55, WA4LLE 53, W4HON 48, KB4LA 43, AA4JV 42, N4UZ 36, K4BAI 35, KA4HHE 32, K4EV 14, KI4IG12.

NORTHERN FLORDIA: SM, Roy Mackey, N4ADI—SEC: Rudy, WA4PUP. STM: Ron, WB4GHU. SGL: John, KC4N. ACC: Giff, WD4RIO. BM: Wimpy, KB4LB. OO/RFI: Jim, K4JJE. PIO: Petey, WA4PUO. Have had special communication from CLARC in Brooksville and they report 1987 officers: Pres Mike, KB4KFH; VP Norm, VE3HVQ and Fred, WD4FOB; Sec. Angie, WB4JJH; Treas George, WD4FNX; and Trustee, Regis, W4ILE. NOFARS from Jacksonville reports Billy, N4UF as Pres.; Pete, W4PTT, VP: Larry, AA4JI Sec.; Glenn KI4TP as Tres. We heartly congratulate these volunteers and hope they will have the complete support of their club members in carrying out their activities for the year. By the time this is in print, all clubs will have received their renewal forms to update their records for HQ. Please complete them carefully and forward to ARRL. Further our SSCs will also be asked to update their activities so they may be continued to be recognized as SSCs. This is an annual excercise that needs to be done to keep our programs focused on what makes each club function. WD4RIQ is continuing to contact clubs that are not currently affiliated to help them join our ranks. Once a club has become affiliated then it has the opportunity to reach for the SSC status which requires each club to organize itself to do many things that might not have been done without taking the time to define and execute some new endeavor which will help the club or community. After all we exist becuase we perform Public Services for our local areas. 73, N4ADI. Traffic: WX4H 555, WA4QXT 459, WD4IIO 312, KB9LT 304, N4PL 287, AA4HT 276, KC4VK 199, WC4D 136, KB4LB 129, WA4EYU 120, WF4Y 112, N4GMU 110, K4AJV 102, KB4FIY 90, W3QQ 92, N4ADI 74, NS4C 60, KI4CQ 54, W4MGO 49, N4JAQ 48, W4KIX 44, NF4O 43, W7YWF 37, W4DTV 36, KA4KAH 30, N4JHI 29, W4GUJ 28, W4EQB 27, WD4FJY 23, WD4RIQ 18, NQ4P 17, N2AOX 16, N4DY 14, W8IM 13, WA4SXW 12, WB4TZR 11, KF4GY 10, WA4PUP 9, KJ4HS 8, WB4AWG 5.

SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFK—SEC: W4SS, STM: K4ZK. TC: KI4T. BM: WD4KBW. PIO: W4WYR. SGL: KC4N. OOC: W4TAH. ACC: WA4NBE. WD4KBW reports 51 bulletins received and 122 sent by AA4BN 15, W4DL 48, WA4EIC 59, WT4F 8, KA4GUS 19, WD4KBW 14 and AA4MI 10. I would like to share with you this note received from WB4AID dated Jan 10. "I thought you would like to know what I have been doing for the past two and a half years. Before I decided to terminate my tour as FMTN manager in 1985, I had already been enrolled in a school for still photography. Years ago my forte had been that of amatuer cinematographer. I decided to change and needed to be taught. Two years of intensive training have succeeded in equipping me for a new art form. My efforts have been rewarded by winning a picture contest and having that picture published on a postcard. Another publication was a picture taken in Denver for the National Flute Convention and which subsequently appeared in their magazine. Now the training has turned to that of photojournalism which is done mostly at home except to one class per week. This enables me to function on FMTN again as NCS and D4RN rep." Note - WB4AID has recently been elected as manager of FMTN effective February 1. Congrats. All Enjoyed the Sarasota Hamfest and the ARRL Forum. Also look forward to meeting W4RH for breakfast there each year - guess this is tour or five years in a row now. Talked to W4TAH at the hamfest and he gave me info on the Sarasota ARA Scholarship - The purpose of this scholarship is to assist any young person regardless of sex, race, color or creed who has passed any grade of FCC Amateur Radio Operator License to pursue further study in any academic field. If you would like further information send a self addressed stamped envelope to Sarasota ARA, PO Box 3182, Sarasota, Florida 33578. Note - PARTIAL eligibility requirements include: 1. Must be between the ages of 17 and 26 whose main residence lies in Sarasota County north of a line extending due east from Osprey to the DeSoto County line. 2. Must be a graduate from a Sarasota County High School or similarly accredited school. Remember to listen and/or QNI the ARRL Information Net on 3940 KHz every Saturday morning at eight am. 73 de WA4PFK. Traffic: W3CUL 3338, W3VR 1136, WA4PFK 364, WA4NFK 296 K4SCL 268, K4ZK 266, WA4RUE 248, KF4JA 189, K4EUK 182, AA4BN 176, K4IA 169, WB4WYG 153, KA4FZI 141, WA4EIC 128, KA4GUS 124, KA4NXF 120, KI4ZW 114, KA4YHS 112, WA9VND 101, W4DL 99, W4SME 80, W1NJM 76, KA4SIH 64, KF4RL 58, KB4MON 58, KJ4WJ 52, N1EGN 44, KY4U 43, N4ET 42, KB4KXV 41, K5IHH 40, WB4GCK 37, WD4KBW 33, K4FQU 33, W4TAH 30, N4MML 29, WD4CHO 23, W4VQE 23, WD4NXK 21, K9EHP 20, WA4HDH 19, WA4NBE 18, K9AKY 17, KY8Y 17, K4OVC 15, WD9AEP 15, K9ALX 15, KB4LPL 15, WA1BWV 13, K4JI 12, WT4F 12, W9FPO 12, W3IJR 10, KD4GR 10, W4MPV 9, N8ABC 9, KB4KAW 8, N4HAS 8, WA4VWJ 8, N4ORZ 7, W4MFD 7, AA4CH 6, KA4GDU 6, WB4AID 6, WK4F 5, N4ILN 4, NX5Q 4, WD4MCC 4, N4NZI 3, KA2KNZ 3, W8OM 3, N4ORN 1, KB4EWO 1, WN4SY 1.

SOUTHWESTERN DIVISION

ARIZONA: SM, Jim Swafford, W7FF—STM: W7EP. NM's: K6LL, KA7HEV, WB7CAG. Have just been notified that I was re-elected, by default, for another two-year term as your SM. Thanks for all of your support, and I'll do my best to promote Amateur Radio in the Arizona Section. I hope that all current appointees will wish to continue their activities in the field organization. I really need your support. KD7WM reports european signals coming thru on Oscar Ten satellite on Mode B. Seems there's life in the ol bird yet! Bill, K7KI, gave a very nice technical talk to the SADX Club on computer aided DX'ing and antenna matching using a new computer program he has developed in conjunction with ON4UN. FB. Your SM attended regular meeting of Cochese ARA at Sierra Vista in February. This is a very FB club and is very active in So. Az. They are building a new clubhouse, and will have their annual swapmeet on May 1 thru 3, at the club property, "Green Acres", in Sierra Vista. Bruce, N7CEE, has moved to Cochese Co. to attend flight school leaving the EC job in Flagstaff vacant. N7FVK has volunteered to fill this important slot. Welcome! KH6PP who recently QSY'd to Hawaii sent the SM a message from there on HF packet radio. It came in on a Tucson BBS and was relayed by N7HOR. Thanks, Tom. This packet stuff really works! W7YS advises that the next VE exams will be in Flagstaff on May 23. New Officers of the NADXA are: W7YS, Pres., and KD7XO Sec-Treas. N7GLT was recently re-elected Pres. of Coconino ARC, with KA7TVM as V.P.; AI7Z, Sec-Treas. W7YR is encouraging members of Sun City ARC to get "in the swing" for the DXCC Golden Jubilee award. Hope all of you DX'ers got Peter is. in January. Heard W7SA and W9YOY among others working them. N7FU and K6FM are forming a novice class in Flagstaff. What with new novice enhancement privileges, there should be a flood of new candidates. OPRC club station W7GV has found a new home at Pima College, downtown campus. That's it for now. Keep those cards and letters coming in. See you on same street corner next time. 73. Jim.

Net	QNI	QTC	MGR
SWN	244	151	K6LL
ACN(HF)	689	80	WB7CAG
ACN(VHF)	429	77	WB7CAG
ATEN	1097	124	KA7HEV

Traffic: KA7MUL 479, W7EP 172, K6LL 139, NS7C 103, KN7U 100, W7AMM 94, WB7CAG 76, KB7FE 58, W7KCM 48, N7ETP 46, KE7EO 22, W7LNB 22, K7JKM 11, K7POF 10, K7QV 8, W7KXE 6.

LOS ANGELES: SM, Bob Poole, AJ6F—ASM:K6IYK. SEC:AK6Y. STM:W6INH. SGL:K6KSY. OOC:K6BMG. TC:WB6QPO. Welcome to Novices now using the new privileges on 28-1200 MHz! It's up to all of us to set a good example of solid ham-radio operations for our newest operators. The SCDXC Convention is scheduled to feature some of the heavyweights in DX; N6TJ, KC7UU and (!) ZL1AMO are featured in various presentations. See you there! My congratulations to the Palos Verdes Amateur Radio Club for their hard work and many contributions to making the W6AM Museum one step closer to fruition; special thanks to K5KT, WA8HXM and K6KSY for keeping me informed of the progress. A very special thanks to W6EJJ and the ARRL for their support. The radio ranch house and a parcel of 30,000 square feet have been saved toward the memory of some of the best radio days in California and Don's overwhelming popularity. W6FNO/R and the crew are after public service as usual: 289 Vehicular, 8 fire and 7 medical emergencies were passed through the repeater to the benefit of hundreds of citizens (KA6ZDL, N6AHT, KB6DDV, WA6HOB, K6IDU, KB6LTL, WA6UUV and N6CUS all made significant contributions). KA5BTR and KA6ZDL acted as net control operators for the City of Baldwin Park's Anniversary Days Parade while using the facilities of W6FNO/R. WB5EKU (President) and AA6TN (Vice-president) of the Southern California Digital Communications Council met with the membership Jan 31 to discuss area band planning for packet radio; this very successful meeting set the stage for a rational approach to band planning for digital radio techniques. The SFVARC announced the San Fernando Valley Ham-o-Rama the 3rd Saturday of each month; contact SFVARC Box 3151, Van Nuys, CA 91407. The SGVARC will feature Director Heyn at the April 7 meeting at Arcadia Park; Fried will be showing the interview tape with the late W6AM. The "T" hunters again had their annual WA6TEY memorial hunt on Jan 24; T-hunting is lotsa fun so contact N6JSX or WB6ADC for all the latest info. The AJ6F-1 BBS operates on 145.07 from Torrance 24 hrs per day. The Pasadena ARC made a wise choice in selecting KC7O as their president; Allen is sure to provide a great deal of professionalism to the club. The TRW swapmeet on Jan 31 was perhaps the largest to date; congrats to WA6RAY and company for doing a great job there month after month. Here we are again confronted with noise and skip conditions and slow traffic. Things will pick up soon they tell me. By the time you receive this, Valentine traffic will be over and we can look towards summer for vacations and need of substitute fills for the net spots, also keep your eyes on RN-6 sked. We will need help to fill spots for regular and vacation spots. Traffic: K6UYK 409, W6INH 225, N6LHE 162, WB6VPY 64, W6NKE 32.

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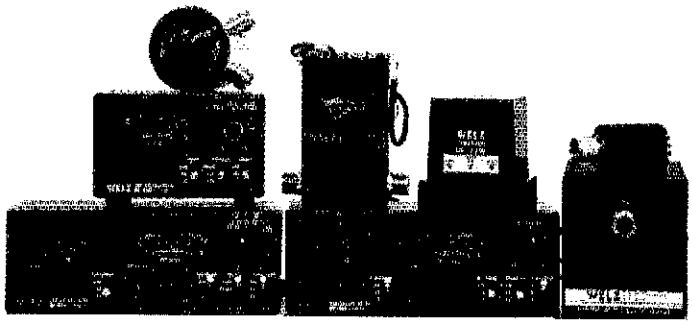

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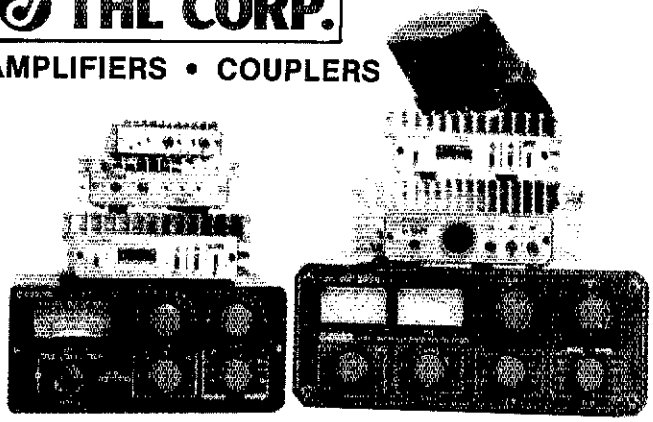

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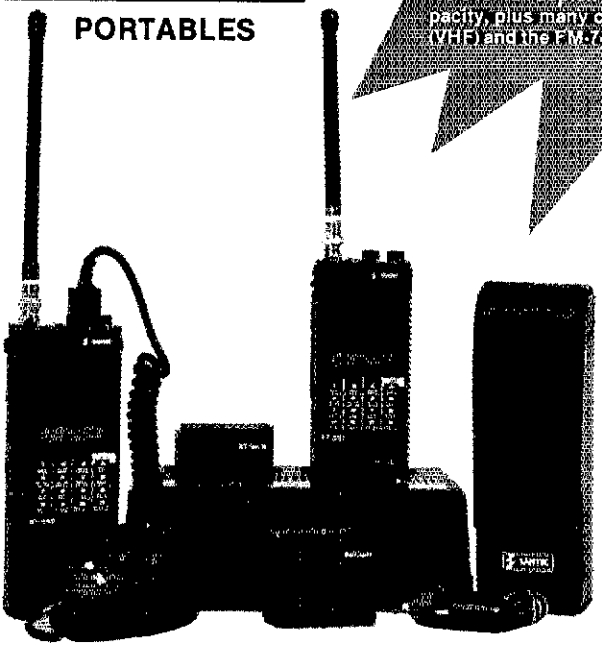

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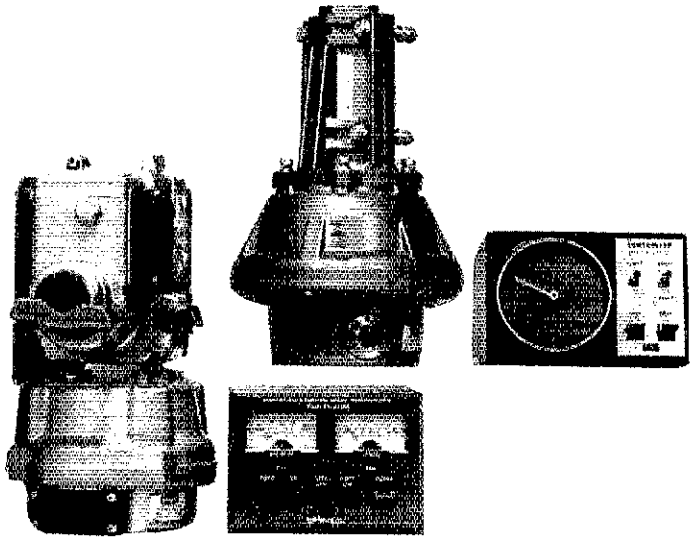

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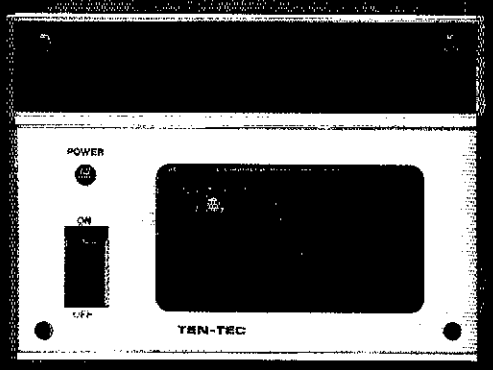

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MODEL 561 CORSAIR II

CORSAIR II HF TRANSCEIVER, Model 561 . . . $1345
Receiver performance that only a permeability tuned oscillator can deliver . . . superb signal to noise ratio, outstanding adjacent signal rejection. Three, frequency tuning rates using dual range offset tuning. QSK with a changeover time of 30 ms or less for superior CW or AMTOR operation. Twelve position band switch for operation on all nine HF bands, from 1.8 to 30 Mhz, plus 40 Khz overshoot on band edges.

RECEIVER
Sensitivity: 0.25 µV for 10 dB S/N ratio.
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.
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PLUS: Built-in antenna pre-amp, spot button, selectable AGC fast, slow and off and much more.

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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.
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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".

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Uses the same PTO design as the CORSAIR. Adds complete TX/RX

ARGOSY II, SSB/CW HF TRANSCEIVER, MODEL 525D . . . $695
A unique combination of small size, simplicity and low cost. Great for mobile, portable and base station use. Operates 80, 40, 30, 20, 15 and 10 meters, in 500 kHz segments, plus 40 kHz overshoot at band edges. 100 watts input with solid state, no tune, final. 12 to 14 VDC at 500 mA, RX, 9A TX. Optional RX filters, 250 Hz, 500 Hz or 1.8 kHz. RX sensitivity .3uV for 10dB S + N/N typical. Offset tuning range, 6 kHz. Variable notch filter, greater than 50 dB rejection, 200 Hz to 3.5 kHz. Optional noise blanker. Famous Ten-Tec QSK CW, of course.

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Model 225 115/230 VAC 9A power supply $129.00
Model 222 Mobile Mount, w/quick release $27.50
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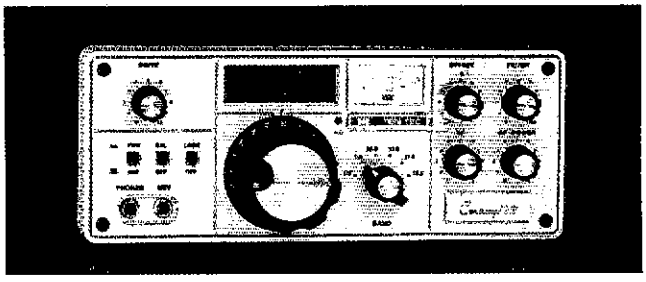

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POWER SUPPLY for Century/22. Model 979 115VAC . . . $98,
979E 230VAC . . . $110

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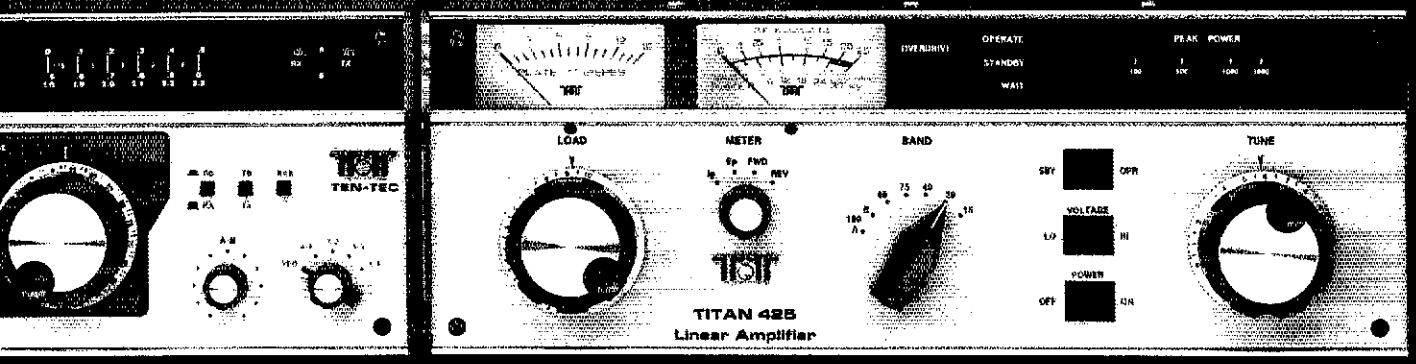

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frequency control. Front panel switch selects, CORSAIR transceive, 263 transceive, CORSAIR TX/263 RX, 263 TX/CORSAIR RX. You can also listen to both frequencies simultaneously. A balance control is provided for priority adjustment. Also makes provision for Xtal control. Connects to CORSAIR with cables provided. Size is HWD 5.25″ x 7.5″ x 12″.

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Vernier drive, tune and load controls.
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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.
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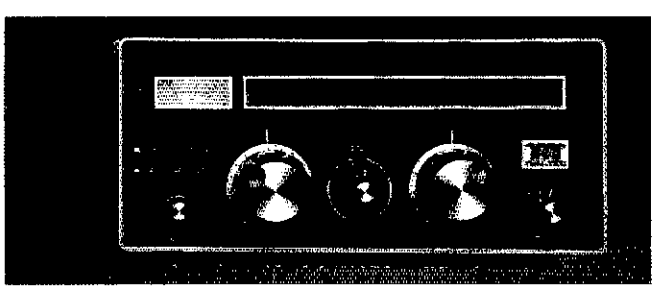

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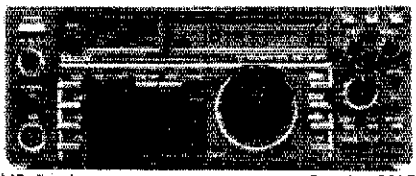

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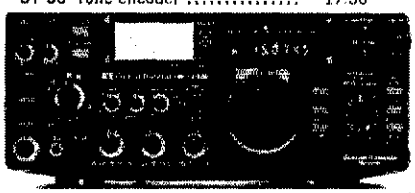
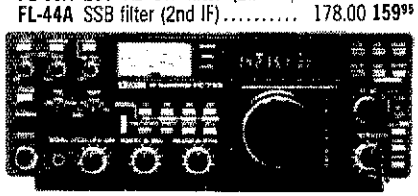
EX-243 Electronic keyer unit	56.00	
UT-30 Tone encoder	17.50	



IC-745 9-band xcvr w/.1-30 MHz rcvr	1049.00	899.95
PS-35 Internal power supply	199.00	179.95
EX-241 Marker unit	22.50	
EX-242 FM unit	44.00	
EX-243 Electronic keyer unit	56.00	
FL-45 500 Hz CW filter (1st IF)	66.50	
FL-54 270 Hz CW filter (1st IF)	53.00	
FL-52A 500 Hz CW filter (2nd IF)	108.00	99.95
FL-53A 250 Hz CW filter (2nd IF)	108.00	99.95
FL-44A SSB filter (2nd IF)	178.00	159.95



IC-751A 9-band xcvr/.1-30 MHz rcvr	1649.00	1399
PS-35 Internal power supply	199.00	179.95
FL-32 500 Hz CW filter (1st IF)	66.50	
FL-63 250 Hz CW filter (1st IF)	54.50	
FL-52A 500 Hz CW filter (2nd IF)	108.00	99.95
FL-53A 250 Hz CW filter (2nd IF)	108.00	99.95
FL-33 AM filter	35.25	
FL-70 2.8 kHz wide SSB filter	52.00	
RC-10 External frequency controller	39.25	

Other Accessories:	Regular	SALE
IC-2KL 160-15m solid state amp w/ps	1999.00	1699
PS-15 20A external power supply	169.00	154.95
PS-30 Systems p/s w/cord, 6-pin plug	299.00	269.95
OPC Opt. cord, specify 2, 4 or 6-pin	10.00	
MB Mobile mount, 735/745/751A	24.50	
SP-3 External speaker	61.00	
SP-7 Small external speaker	49.00	
CR-64 High stab. ref. xtal (745/751)	63.00	
PP-1 Speaker/patch	159.25	149.95
SM-6 Desk microphone	44.95	
SM-8 Desk mic - two cables, Scan	78.50	
SM-10 Compressor/graph EQ, 8 pin mic	136.25	124.95
AT-100 100W 8-band auto. antenna tuner	445.00	389.95
AT-500 500W 9-band auto. antenna tuner	559.00	489.95
AH-2 8-band tuner w/mount & whip	625.00	549.95
AH-2A Antenna tuner system, only	495.00	429.95

ICOM

Other Accessories - continued:	Regular	SALE
GC-5 World clock	91.95	89.95

6-meter VHF Portable	Regular	SALE
IC-505 3/10W 6m SSB/CW portable	549.00	489.95
EX-248 FM unit	55.50	
LC-10 Leather case	39.50	

VHF/UHF base multi-modes	Regular	SALE
IC-551D 80W 6-meter SSB/CW	799.00	719.95
EX-106 FM option	140.00	126.95
BC-10A Memory back-up	9.50	
IC-271A* 25W 2 meters ... CLOSEOUT	859.00	699.95
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-275A 25W 2m FM/SSB/CW w/ps	1199.00	1049
IC-471A* 25W 430-450.... CLOSEOUT	979.00	769.95
AG-1* Mast mounted preamplifier	99.50	
IC-471H* 75W 430-450 ... CLOSEOUT	1399.00	999.95
AG-35* Mast mounted preamplifier	95.00	

***Preamp $9.95 with 271A/471A/471H Purchase**

Accessories common to 271A/H and 471A/H	Regular	SALE
PS-25 Internal power supply for (A)	115.00	104.95
PS-35 Internal power supply for (H)	199.00	179.95
SM-6 Desk microphone	44.95	
EX-310 Voice synthesizer	46.00	
TS-32 CommSpec encode/decoder	59.95	
UT-15 Encoder/decoder interface	14.00	
UT-15S UT-15S w/TS-32 installed	92.00	

VHF/UHF mobile multi-modes	Regular	SALE
IC-290H 25W 2m SSB/FM, TTP mic	639.00	569.95
IC-490A 10W 430-440 SSB/FM/CW	699.00	599.95

VHF/UHF/1.2 GHz FM	Regular	SALE
IC-27A Compact 25W 2m FM w/TTP mic	429.00	369.95
IC-27H Compact 45W 2m FM w/TTP mic	459.00	399.95
IC-37A Compact 25W 220 FM, TTP mic	499.00	439.95
IC-47A Compact 25W 440 FM, TTP mic	549.00	479.95
PS-45 Compact 8A power supply	139.00	129.95
UT-16/EX-388 Voice synthesizer	34.99	
SP-10 Slim-line external speaker	35.99	
IC-28A 25W 2m FM, UP/DN mic	429.00	369.95
IC-28H 45W 2m FM, UP/DN mic	459.00	399.95
IC-38A 25W 220 FM	459.00	399.95
IC-48A 25W 440-450 FM	459.00	399.95
HM-14 TTP microphone	55.50	
UT-28 Digital code squelch	37.50	
UT-29 Tone squelch decoder	43.00	
HM-16 Speaker/microphone	34.00	
IC-3200A 25W 2m/440 FM w/TTP	599.00	499.95
UT-23 Voice synthesizer	34.99	
AH-32 2m/440 Dual Band antenna	37.00	
AHB-32 Trunk-lip mount	34.00	
Larsen PO-K Roof mount	20.00	
Larsen PO-TLM Trunk-lip mount	20.18	
Larsen PO-MM Magnetic mount	19.63	
RP-3010 440 MHz, 10W FM, xtal cont.	1229.00	1089
IC-120 1W 1.2 GHz FM Mobile	579.00	499.95
ML-12 1.2 GHz 10W amplifier	379.00	339.95
IC-1271A 10W 1.2 GHz SSB/CW Base	1229.00	1069
AG-1200 Mast mounted preamplifier	105.00	
PS-25 Internal power supply	115.00	104.95
EX-310 Voice synthesizer	46.00	
TV-1200 ATV interface unit	129.00	119.95
UT-15S CTCSS encoder/decoder	92.00	
RP-1210 1.2 GHz, 10W FM, 99 ch. synth	1479.00	1289

MasterCard VISA

Hand-helds	Regular	SALE
IC-2A 2-meters	279.00	249.95
IC-2AT with TTP	299.00	259.95
IC-3AT 220 MHz, TTP	339.00	299.95
IC-4AT 440 MHz, TTP	339.00	299.95
IC-02AT 2-meters	369.00	299.95
IC-02AT/High Power	399.00	339.95
IC-03AT for 220 MHz	449.00	399.95
IC-04AT for 440 MHz	449.00	389.95
IC-u2A 2-meters	299.00	269.95
IC-u2AT with TTP	329.00	289.95

Accessories for IC-u2A/T (CALL)

IC-12AT 1W 1.2GHz FM HT/batt/cgr/TTP	459.00	399.95
A-2 5W PEP synth. aircraft HT	599.00	499.95

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

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

Receivers	Regular	SALE
R-71A 100 kHz-30 MHz, 117V AC	$949.00	799.95
RC-11 Infrared remote controller	67.25	
FL-32 500 Hz CW filter	66.50	
FL-63 250 Hz CW filter (1st IF)	54.50	
FL-44A SSB filter (2nd IF)	178.00	159.95
EX-257 FM unit	42.50	
EX-310 Voice synthesizer	46.00	
CR-64 High stability oscillator xtal	63.00	
SP-3 External speaker	61.00	
CK-70 (EX-299) 12V DC option	12.25	
MB-12 Mobile mount	24.50	
R-7000 25 MHz-2 GHz scanning rcvr	1099.00	969.95
RC-12 Infrared remote controller	67.25	
EX-310 Voice synthesizer	46.00	
TV-R7000 ATV unit	131.95	119.95
AH-7000 Radiating antenna	89.95	(15)

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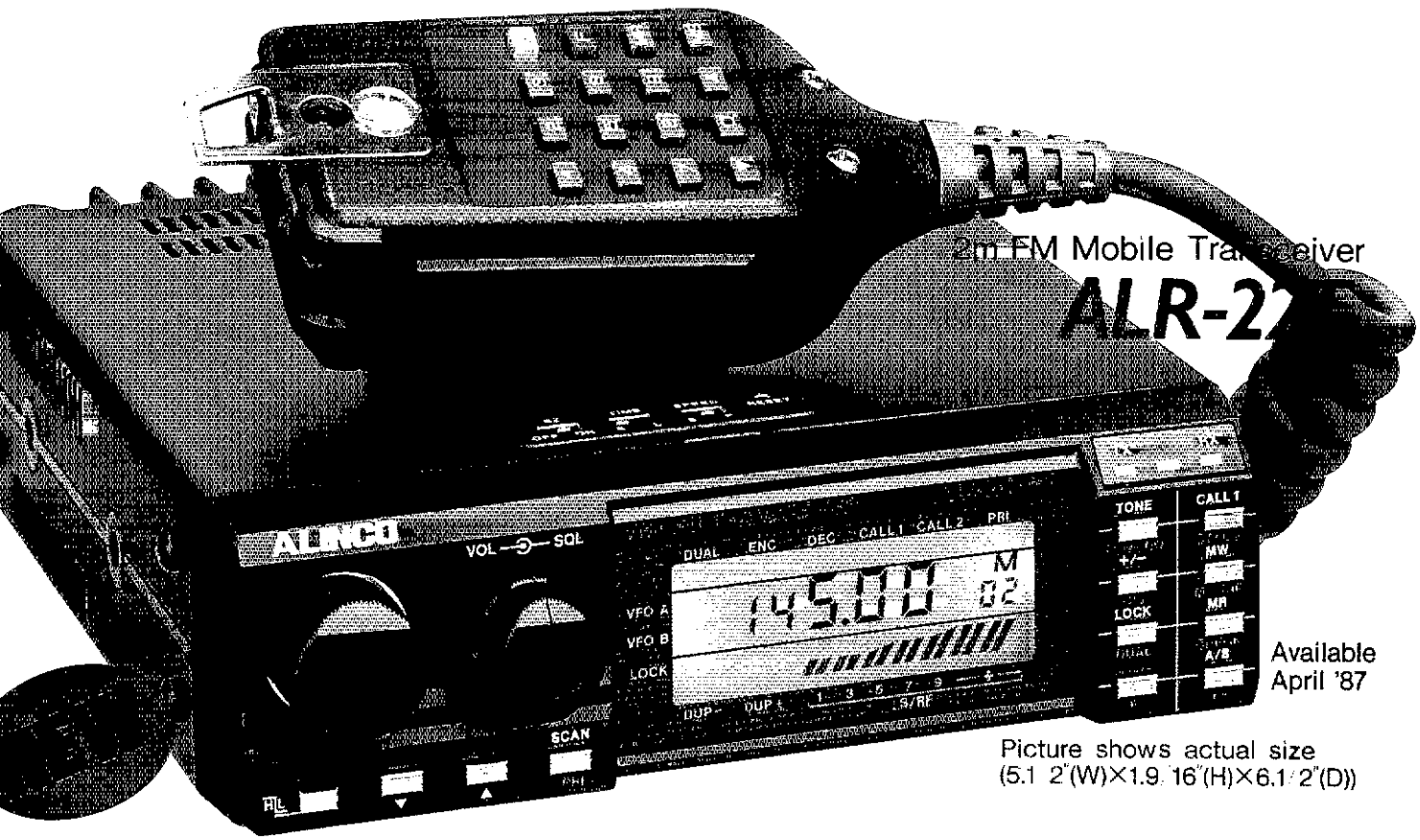

Available April '87

Picture shows actual size (5.1 2"(W)×1.9 16"(H)×6.1 2"(D))

With ALINCO's advanced engineering and condensed technology, the ALR-22T 2-m FM Mobile Transceiver has been designed to be the ultimate in compact size with an impressive array of features, allowing maximum flexibility in mobile installation and ease of operation.

- 144-147.999 MHz
- Modifiable for CAP and MARS
- 25 Watt High - 5 Watt Low Power
- 21 Memory Channels
- 16-Key Autopatch Microphone with Up/Down Buttons
- 32 CTCSS Encoder Standard
- Programmable Band Scan
- Programmable Non-Standard Repeater Offset
- Ultra Compact & Light Weight
- Simple to Operate
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- Large LCD Display
- Many Features, See Your Dealer

SOON TO BE AVAILABLE: 45 WATT 2-m, 25 WATT 450 MHz AND 25 WATT DUAL BAND VERSIONS

ALR-206T

ALONE IN ITS CLASS

m FM Mobile Transceiver

- 140-149.995 MHz Covers MARS and CAP
- Programmable Band Scan
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- Unique Control Knob
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- 25 Watt High - 5 Watt Low
- Built in Lithium Back Up Battery
- Up/Down Control On Microphone
- 10 Channel Memory
- Built in Sub Audible Control

Linear Amplifiers

List Prices From $82.00 to $177.00

MODEL	Frequency Rage	Input/Output
ELH-230D	140-150 MHz	1W-3W & 5W/30W
ELH-230G	"	1W-3W & 5W/30W
ELH-260D	"	1W-3W/50W
ELH-730D	430-450 MHz	1W-3W/30W

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List Prices From $72.00 to $193.00

MODEL	CONT./MAX.	N/W (About)
EP-660	5.5A/6.5A D.C.MAX	6.38 lbs
EP-1101M	10A/11A D.C.MAX	12.10 "
EP-1510	15A/20A D.C.MAX	13.64 "
EP-2010	15A/20A D.C.MAX	13.64 "
EP-3030	25A/30A D.C.MAX	18.70 "

ALM-203T

SPECIAL

See Your Dealer

For Limited Time
Price Includes extra Ni-Cd Battery and Speaker Microphone

2m FM Handheld Transceiver

- 2Band HT
  - Band A 140-150MHz
  - Band B 150-160MHz (Receive Only)
- 10 Channel Memory
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Performance, Reliability, and Customer Support: The Winning Team

While attractive front panels and impressive magazine advertisements may initially glamorize any amateur radio item, they can also reflect the classic proverb of beauty being only skin deep. The favorable returns from any unit and the success of its manufacturer, however, are directly influenced by **after-purchase reliability and factory-backed service.** Knowledge of such performance records and readily available customer support encourage the peace of mind to use and enjoy a new unit to its maximum potential.

ICOM considers the aspect of service from two interrelated standpoints: daily in-field use and possible "down the line" repairs if, and when, needed. This concept is pursued by first building **professional communications quality and reliability into every unit,** confidently backing it with a full warranty, then substantiating that dependability with **uncompromised factory authorized service and customer support.** All ICOM HF transceivers and shortwave receivers reflect that philosophy with their **full one-year warranties**...and service centers that are not bottlenecked with backlogs (stout performers simply give less trouble). ICOM isn't playing down customer support, but building a positive long-term reputation on it!

Today's era of advanced technology and seemingly endless consumers tends to replace old-time "concerned treatment" with attitudes of "being one of a vast number in line." Returning a unit for adjustment or repair and later attempting to check its status sometimes proves to be a frustrating experience. While no one is infallible, ICOM honestly strives to avoid an attitude of "too many customers to provide congenial service." ICOM's customer service **hotline** at (206) 454-7619, for example, will put you directly in touch with the main service department. The only prerequisite is **mutual understanding** in sharing this resource so everyone can have queries answered and radios repaired. If a problem can't be alleviated via telephone, ICOM strives for a service center "turnaround time" of three to five days.

Continuing that customer support, **ICOM is the only amateur radio company with four factory-owned service centers in North America.** The centers are located in Atlanta, Georgia; Dallas, Texas; Bellevue, Washington; and Vancouver, British Columbia. Most ICOM service centers are also situated near major airports to further minimize transportation problems.

The amateur radio industry is ICOM's major interest; it's not a sideline or spin-off of other pursuits. ICOM doesn't manufacture stereos, VCRs, or televisions. ICOM is communications industry oriented with secondary involvement in top quality marine, land mobile, and avionics equipment.

The stouthearted reliability of ICOM equipment is continuously praised in testimonial letters from proud owners. A few samples from those "believe it or not" files include stories of transceivers literally drowned in salt water two or three hours, yet continuing to operate flawlessly...of no failures to date in the IC-735 and IC-751 power amplifiers...of handheld transceivers dropped from towers, and one was even run over by a truck(!), yet continued to operate after outer case repairs (fortunately, ICOM handhelds include a separate metal frame to protect PC boards and a high impact plastic "outer case").

The next time you switch on a deluxe HF transceiver, compact VHF mobile rig or handheld FM unit, pause a couple of seconds and think about its less apparent aspect of customer support and service. Who would you call if a problem arose, what would be their attitude, and approximately how long might you anticipate being off the air? If you're a proud ICOM owner, those answers are reassuring rather than aggravating.

Again, ICOM's dedication to top performance, exceptional reliability and unsurpassed customer support may not be visible on a front panel or in a colorful ad, but they're **included in every ICOM item.** ICOM equipment is simple to use and the best in quality. It's "Simply the Best" and an increasing number of amateurs are proving that statement in their setups every day. Isn't it time you, too, joined the ICOM winning team?

ICOM America, Inc., 2380-116th Ave. NE, Bellevue, WA, 98004 **Customer Service Hotline (206) 454-7619**
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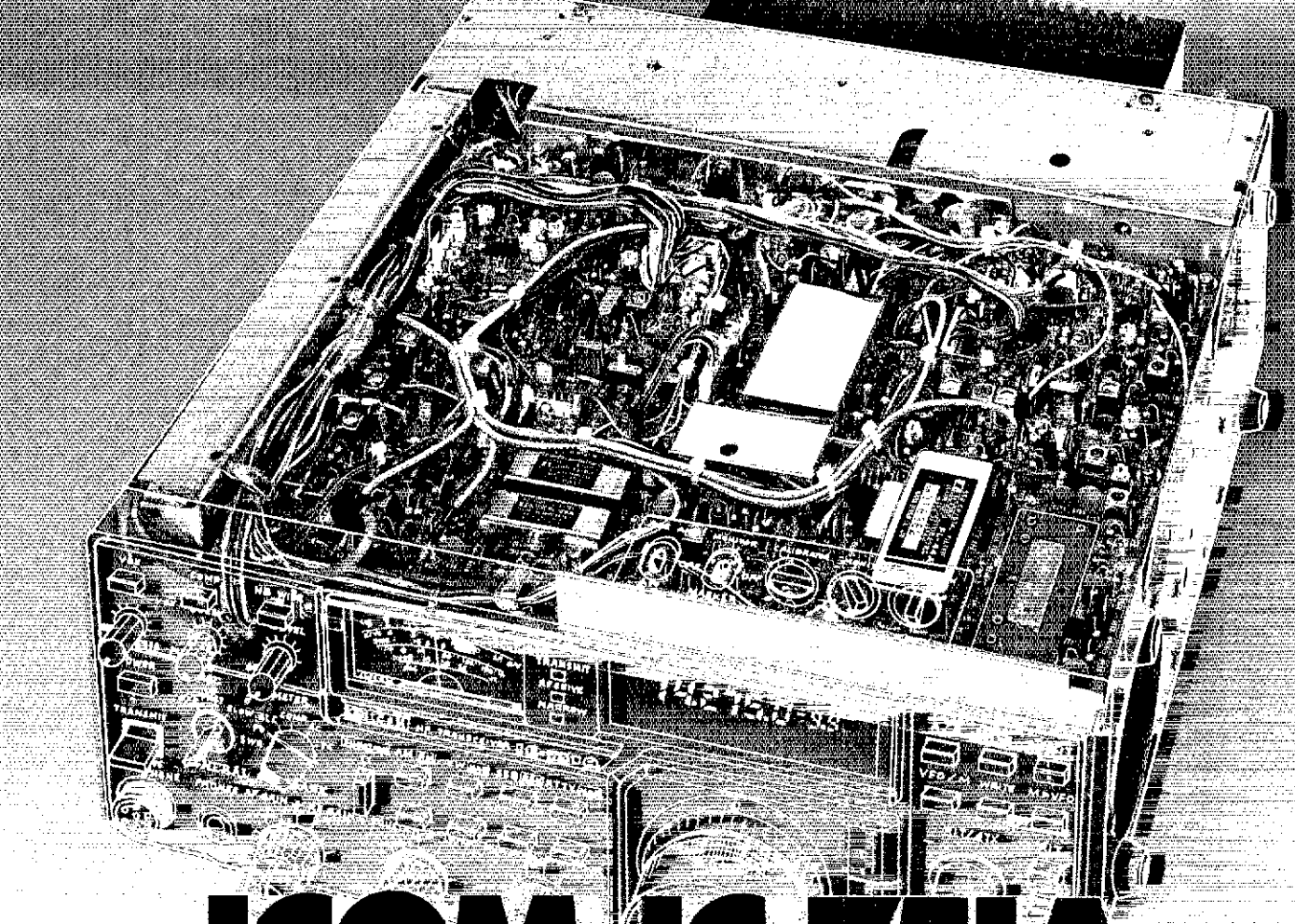


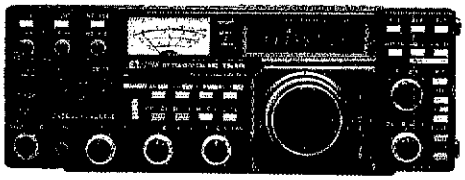
ICOM IC-751A

"IT'S WHAT'S INSIDE THAT COUNTS!"

- **All HF Band Transceiver / General Coverage Receiver**
- **Advanced Circuit Designs**
- **All Modes Built-in USB, LSB, FM, AM, CW, RTTY**
- **Superb Frequency Stability**
- **Continuous Duty Operation**
- **Crystal Clear Signal Quality**

Midsize Masterpiece! The deluxe IC-751A includes more high performance features and professional circuitry per cubic inch than any other HF transceiver. Its smooth-as-silk operation and long-term reliability produce the ideal contesting, DX'ing, mobiling and portable rig. Owning an IC-751A truly means "Going First Class!"

Unsurpassed Quality and Reliability. Quality and Reliability is important to you and it's important to ICOM. ICOM now covers you and your investment with its exclusive



one year warranty. There's more! The IC-751A's receiver boasts 105dB dynamic range for superb listening. The 100% duty cycle transmitter defies abuse and delivers 100 watts of exceptionally stable and clean RF output. Reliability. Quality. One year warranty. That's ICOM.

All Bands, All Modes Included. Operates 160 through 10 meters, it's easily modified for MARS operation, plus it includes general coverage reception from 100kHz to 30MHz. No compromise, no comparison!

32 Tunable Memories. Store both frequency and mode information. Use them to quick-access your favorite spots or as 32 preferred frequency-remembering VFOs.

A Modern Amateur's Delight! Special attractions include an electronic keyer, semi or full break-in rated to 40 WPM, panel selectable 500Hz/FL-32A CW filter, and volume control-tracking sidetone. SSB transmissions are enhanced with an RF speech processor and tone control to produce sparkling clear audio. PLUS there's a new rubberized tuning knob for velvet-smooth tuning and a full line of accessories and filters.

RF Power Control. Varies output independent of mic gain, ALC and speech processor action. Enjoy maximum "talk power" at any drive level!

To see the IC-751A, contact your local ICOM dealer.

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First in Communications

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ICOM CANADA, A Division of ICOM America, Inc., 3071 - #5 Road, Unit 9, Richmond, B.C. V6X 2T4 Canada

All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. 751A187

ORANGE: SM, Joe H. Brown, W6UBQ—ASM: RIV. COO. BOB W6LKN (714-686-3823). ASM: ORG CO RALPH WB6JBI (714-776-9272) ASM: SB CO, TONY WB6QHB (714-981-1836). ACC: MARK KB6GNZ sez its my job to be accessible to your club needs and to assist you, the club officer, in maintaining an active and stimulating club program, using the ARRL Resources, so that your club will thrive and flourish over the years. (714-736-0267). Victorvalley ARC Officers. Pres. Shirley N6LFA, VP Jack KA6LCO, Secy. Jim N5COT, Treas. Joyce KB6BLO. N6LFA has been apt PIA. Good Luck Shirley. The Lee DeForest ARC has many Activities for the coming year, such as D/F ant, portable ant design, ant measuring tests plus RACES/ARES activity. It may turn out that several types of committees will be formed so that the fun derived from the game will be spread around the membership. Fun, educational and of benefit to practical ham as well as the scientific. Tall order? Sure. But the challenge is worth the effort. CONGRATULATIONS? The West Coast ARC topped the list for large clubs for 1986 Club Challenge for the 80s. Since the club recruited most members in the competition, it will be given first choice of one of three HF xcvers donated by major equip manufactures. The Buena Park ARC Officers. Pres Bob WA6SVD. VP, Randy WB6ESQ. Treas. Chester KB6EHX. Secy. Lois N6NAS. From the Tri-County ARA. If you didn't know... The requirements for a Novice license are simple: you must be able to send/receive morse code at 5 WPM (same as Boy Scouts), and answer correctly at least 15 out of 20 questions on very basic radio theory, operation, and FCC regulations. Now is that really hard? not even scary. PASS THE WORK. SEC: KEN WA6ZEF (714-983-1272) Rlv Co EC Norco/Corona, Jerry N6MEJ. Org Co Asst DEC David WA6PMX. EC, Gene KB6CMO. MARK KD6KQ. Blaine KB6HSW, Tom KB6CTT. Wish you the best in your new positions. OOC: ALEX W6HE. One new OO appointed this month. Total 21. VOLMON moving on in the Org Section. TC: JOHN KD7XG. In ATC activities John WA6BFH handled correspondence requesting assistance locating Gunn diodes for 10 GHZ. Will, AA6DD, gave program the SC 6 Meter club concerning sun spot cycles, propagation studies, and E-layer propagation. Have contacted John, KD6SQ, and Lee, WB6KAJ, regarding the League's SKIPNET project. John wants to propose to the SCARC Club a soft-ware project that relates to SKIPNET. Am excited about SKIPNET and prospects for advancing packet radio towards its full potential. STM: ERNIE, WA6QCA, PSHR,WF6O, WA6QCA, WB6QBZ, KA6TAB/T, BPL WF60. Good show Dan. NTS info? (714-983-1272).

NET	FREQ	SEC	QNI	TFC	TIME	NM
SCN/1	3598	31	284	289	18303	WF60
SCN/2	3598	31	172	52	2015	WF60
SCN/V	146.645	31	412	225	2100	WA6QCA

From the Org SM. I would like to commend the DX type users, trustee and owners of the 145.48 MHz machine. Most enjoyable listening during the 3Y2GV, 3Y2EE DX expedition. The spark of DXing was kindled. The QSTs, the info and the helpful advice to the new DXer. (FANTASTIC) The cooperative spirit of Amateur Radio is alive and well. Traffic: WF6O 512, KA6HJK 102, WA6QCA 101, N6GOT 98, WB6QBZ 80, K6VCE 70, AD0A 50, KA6TND 20, W6CPB 17, W6SX, W6NTN 5.

SAN DIEGO: SM, Arthur R. Smith, W6INI—STM: N6GW. SEC: W6INI. PIO: KG6LF. TC: N6NR. 220 MHz oprs are invited to take part in ARES 220 net each Sat at 1900 on 220 Club rptr (WD6HFR). 224.9 (-) MHz. ARC of El Cajon has RTTY net (170 shift) each Wed at 2000 on 28.08 MHz. KB6WB is NCS. Got a packet problem? Try the packet voice net at 2100 Tue on the Palomar ARC rptr, 146.73 (-). KB5MU is MC. Licensing tests under SANDARC-VEC are now computerized for the C-64. Computer selects the appropriate number of questions in each category. Testee selects answer A,B,C, or D. When finished the computer grades the test. Prints results, indicates passed or failed, and which questions were answered correctly or incorrectly. For info write SANDARC-VEC POB 5023, La Mesa, CA 92041. As one solution for getting youths into Amateur Radio, clubs are urged to join the "Adopt-A-School" program - form a school club, run licensing classes. S D Packet Radio Assn has been accepted as an ARRL-affiliated club. Congratulations. N6GW has been elected to the Pacific Area Staff. NCTN held 30 sessions, handled 45 msgs. Traffic: (Dec.) KU6D 294, N6GW 121. (Jan.) N4KRA 91, KU6D 62, N6GW 34.

WEST GULF DIVISION

NORTHERN TEXAS: SM, Phil Clements, K5PC—Asst. SM: K5MXQ. SEC: W5GPO. ACC: NI5V. BM: W5QXK. TC: W5LNL. PIO: K5HGL. OOC: WB5JBP. Our Section reorganization has been completed, and I would like to present our District Emergency Coordinators for our 10 ARES Districts: Dist. 1 is Charles Byers, W5GPO, in Wichita Falls (also your Section EC) Dist. 2 is Bob Oliver, NF5T. in Graham. dist. 3 is Mike Siebert, KA5BNO, in Eastland. Dist. 4 is Claude Whitley, WB6FLQ, in Ft. Worth. (also Dist. 13 State RACES Officer) Dist. 5 is Bill Swan, K5MWC, in Plano. Dist. 6 is Larry Summers, WB5CIC, in Dallas. dist. 7 is Harvey Henning, N0AJP, in Waco. Dist.8 is Jerry Keisler, WA5KZA, in parts. dist. 9 is Jim Johanson, K2SCU, in Greenville. Dist. 10 is Joe Brown, K5UPN, in Longview. We need Emergency Coordinators in the following counties to make us 100% in our coverage: Throckmorton, Stephens, Brown, Mills, Hamilton, Bosque, Navarro, Limestone, Kaufman, Cherokee, Harrison, Gregg, Collin, Wood, Bowie, Marion, and Franklin. Any interested parties, please contact W5GPO or me. Tornado season is again upon us; I hope everyone involved in Skywarn activities has had a chance to attend a refresher course by your local weather service. Response teams, please register your capabilities and tel. numbers with W5GPO and me, and have your gear in readiness. Sunspot activity is still nil, and HF circuits will be marginal in some areas, requiring relays. I hope we can involve packet in our next health and welfare operation, as it is error free and also frees up the HF circuits for higher priority traffic. Remember, our Section Emergency freqs. are 7290/day 3873/night and 3697/CW. In times of communications emergency, please monitor these freqs. for possible emergency traffic from mobiles in a disaster situation. In our Section, the local EC is always in charge of all ARES operations at the disaster site. The first arriving ARES member should contact him and set up a command post and assembly area outside the disaster site, assemble responding units, and organize resourses. Since time is our enemy in this kind of situation, it is better to over-react in response than to have too little-too late. We must always be a ready asset to the local EC; not an additional burden. In areas where there is no organized ARES unit, or EC, the DEC in that area of his designee will be in charge. There is a state-wide ARES net on Sunday night on 3873 following the Texas TFc. Net. More details later. Let's keep our eyes skyward, and be ready! The D/FW Metroplex Tfc. Net met every night in 1986; QNI/6, 507 QTC/1, 998. Join them on 146.88 in Dallas @ 1830L. The TSN (Texas Slow-Speed Net) for Jan. QNI/138 WTC/26 in 24 ssns. This net meets nightly on 3745 kHz @2000Z. The 7290 Tfc Net for Jan. QNI/3, 159 QTC/414 in 49 ssns. PSHR for Jan. KA5QYV KB5UL K5MXQ WB5SDD K5UPN KL7CB W5VMP N5JHI KA5YIW and KA5SPT. Traffic: W5TNT 228, KA5SPT 198, WB5SDD 190, W9OYL 174, K5MXQ 160, W5VMP 138, KD5RC 114, WB4HML 101, WG5S 83, KB5UL 82, KA5AZK 72, KL7CB 65, K5UPN 50, N5IUI 35, KM5L 28, KA5YIW 19, KA5QYV 19, KC5NG 12, N5JHI 10, WD5EEH 10.

OKLAHOMA: SM, Bill Goswick, K5WG—ASM/ACC: NB5N. BM: W5AS. OOC: K5WG. PIO: WB5SYT. SEC: W5ZTN. SGL: W5NZS. STM: KV5X. TC: W5QMJ. Hearty congratulations to the Edmond Amateur Radio society on winning the League's 1986 Club Challenge of the 80s! EARS topped the nation in the medium club category by recruiting 50 new League members during 1986. A new HF rig will have been presented to EARS by the time you read this. The Club Challenge continues during 1987 so all affiliated clubs should put forth a real effort to win one of those rigs. Congrats to the Tulsa Amateur Radio Club and the Bartlesville Amateur Radio club on completing their first recertifications as Special Service Clubs. The 1987 Green Country Hamfest, sponsored by the Broken Arrow and Tulsa ARCs, will be held at the Vo-Tech Southeast Campus in Broken Arrow May 15-17. Exams for all license classes will be available. This is a well-attended event with an excellent fleamarket. Be there. Traffic: WB5SRX 385, NX5E 210, NQ5W 173, KV5X 167, W5RB 160, W5AS 99, WA5OUV 78, N5IKN 52, WD5IFB 43, K5GBN 32, WA5ZOO 31, KA5WGS 30, W5VLW 28, W5VOR 27, WA5QGC 27, K5WG 21, NB5N 16, K5CAY 14, KD5IS 10, N5JVA 4, N5QY 4, N5DWN 3, NI8W 2. (Dec.) N5JVA 6, NQ5Y 5, KD5IS 5, N5DWN 4.

SOUTHERN TEXAS: SM, Arthur R. Ross, W5KR—ASM: N5TC. STM: K5QEW. SEC: K5DG. SGL: K5KJN. ACC: WB5YDD. OOC: WA2VJL. BM: K5CVD. PIO: WA5UZB. TC: NZ5U. ORS KA6JDT rprts Houston ECHO 5 Society in Nov had 11 ops and a truck-mounted portable station to assist the 150 mile bike marathon between Conroe and Huntsville for American Lung Assn. NM WD5GKH rprts in 1986 Texas Traffic Net held 728 sessions, had 8356 check-ins, passed 4677 msgs. Bryan ARC and Texas A&M's Memorial Student Cntr Amateur Radio Committee provided communication for Bryan-College Station CofC Holiday Parade in Dec; 21 ops helped. PIA WB5NOL rprts busy period in San Antonio with club move to new Red Cross bldg and setting up new club station; new packet committee working hard; club supporting action by local Amateur cited by city for his tower. EC N5KAQ rprts good check-ins on the 146.307.90 McCulloch County Emgcy Net. ORS NZ5J rprts Seguin's 146.16/.76 machine is now ID-ing as WR5X/R SEG; has improved coverage, thanks to W5FFG; N5IVU upgraded to Advanced, now awaits word on U S Navy pilot training. 7290 Traffic NM WD5CZX rprts 49 sessions in Jan with 414 msgs and 3155 check-ins. DRN5 NM WB5YDD rprts 683 msgs in 62 sessions in Jan; STX stns represented 100% by W5CTZ, NX5V, KD5KQ, N5DFO, W5KLV, KE5ZV, WB6EPA, WB5FQU, WA5ZJY, WB5AZQ, N5BHQ, K5QEW, WB5YDD. OBS W5KLV Jan rprt 10 ARRL bulletins, 31 satellite bulletins, 4 propagation forecasts, 4 DX bulletins, 2 CRRL bulletins given 176 readings on 9 nets. PIA K5PFE rprts KA5ESE and WD5BTU operating packet and working on a digipeater. PIA N5IKW rprts Sam Houston ARK (SHARK) officers for 1987: KB5NX, Pres; N5IF, vp; N5IKW, secy; KB5YC, treas. PIO WA5UZB rprts N5IKW and WD5H are new PIAs; KA6JDT received Public Service Awards from 3 Houston area Amateur Radio Clubs and special commendation from ARRL; Northwest ARS (NARS) awaiting designation as Special Service Club. PIA N5FIX rprts NARS celebrated its second annual awards banquet; in addition, KA6JDT recieved Achievement Award from D-CAT (Disaster and Communications Action Team), KA5AKG received NARS Outstanding Service Award; KB5AEF is coordinator for the ARES group. AD W5OVH rprts El Paso ARC has a TS-530S transceiver, donated by KE5YU, and a KLM tri-band beam donated by KA5DQY SEC K5DG has begun an ARES net on 3873kHz; it is held every Sunday evening immediately following the Texas Traffic Net (7:00PM CST or 7:30PM CDT) and all who are interested in ARES activity are invited to check in. OOC WA2VJL is loudly calling for more OO volunteers. Traffic: WB5YDD 373, W5KLV 270, WD5GKH 167, W5TFB 148, AJ5K 145, W5CTZ 118, N5DPO 95, WB5EPA 90, WB5FQU 69, AC5Z 52, W5BGE 42, WA2VJL 40, WB5J 40, NZ5J 4.

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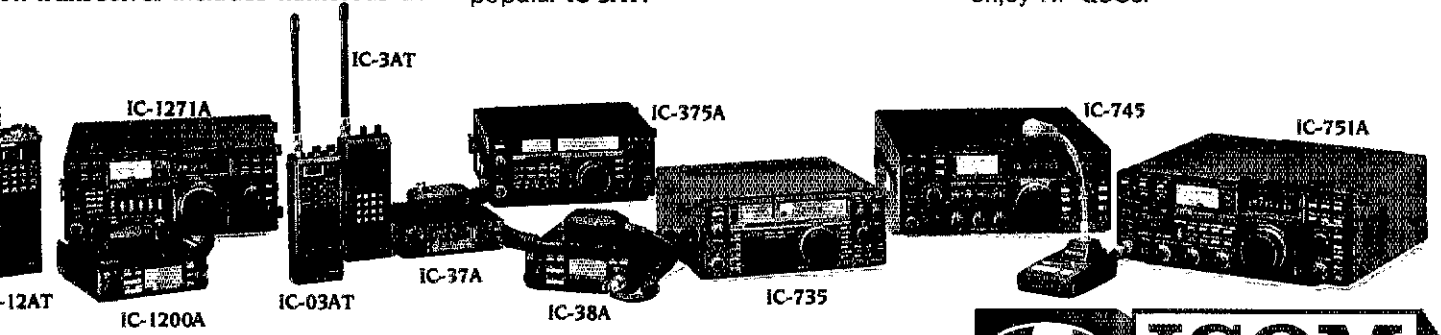

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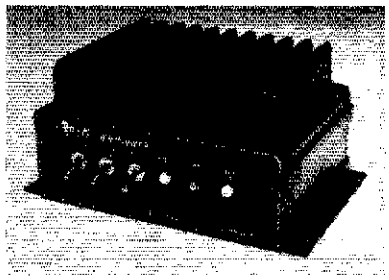

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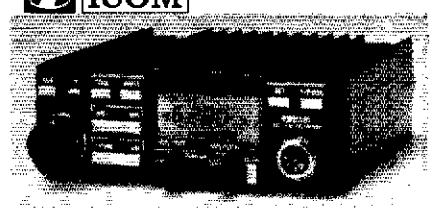

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100 watts	100H	100A	100B	100C	100D	100E
250 watts	250H	250A	250B	250C	250D	250E
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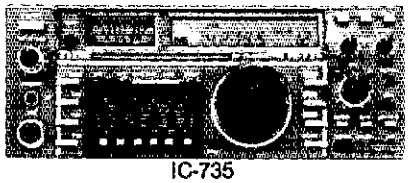

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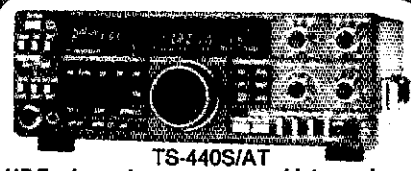

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TR-751A All Mode Mobile 25w	599.95	Call $
TM-201B FM Mobile 45w	369.95	Call $
TM-211A FM Mobile 25w	399.95	Call $
TM-2530A FM Mobile 25w	429.95	Call $
TM-2550A FM Mobile 45w	469.95	Call $
TM-2570A FM Mobile 70w	559.95	Call $
TH21-BT FM, HT	259.95	Call $
TH-205 AT, NEW 2m HT	259.95	Call $
TH-215A, 2m HT Has It All	349.95	Call $
TR-2600A FM, HT	359.95	Call $
UHF		
TS-811A All Mode Base 25w	1049.95	Call $
TM-401B FM Mobile 25w	399.95	Call $
TM-411A FM Mobile 25w	449.95	Call $
TH-41BT FM, HT	269.95	Call $
TR-3600 FM HT	369.95	Call $
220 MHZ		
TM-3530A FM 220 MHz 25w	449.95	Call $
TH-31BT FM, 220 MHz HT	269.95	Call $
TL-922A HF Amp	1499.95	Call $

FT 757GX

HF Equipment	List	Juns
FT-ONE Gen. Cvg Xcvr	$2859.00	Call $
FT-757 GX 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-290R All Mode Portable	579.95	Call $
FT-23 R/TT Mini HT	299.95	Call $
FT-209RH FM Handheld 5w	359.95	Call $
UHF		
FT-770RH FM Mobile 25w	479.95	Call $
FT-73 R/TT Mini HT	314.95	Call $
FT-709RH FM HT 4w	359.95	Call $
VHF/UHF Full Duplex		
FT-726R All Mode Xcvr	1095.95	Call $
HF/726 Module for 10, 12, 15M	289.95	Call $
430/726 430-440 MHz	329.95	Call $
440/726 440-450 MHz	329.95	Call $
SU-726 Sate Duplex	129.95	Call $
FT-690R 6m, All Mode, port.	569.95	Call $
Dual Bander		
FT-2700RH FM 2m/70 cm 25w	599.95	Call $
FT-727R 2m/70 cm HT	479.95	Call $
220 MHZ		
FT-109 RH New HT	TBA	Call $
Repeaters		
FTR-2410 2m Repeaters	1249.95	Call $
FTR-5410 70cm Repeaters	1289.95	Call $

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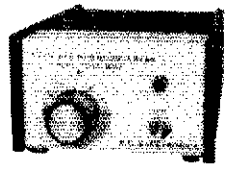

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ICOM IC-28A/H
THE ONE FOR THE ROAD

- **Compact Size**
- **Simple to Operate**
- **Large LCD Readout**
- **25 Watt IC-28A**
- **45 Watt IC-28H**
- **Packet Compatible**
- **21 Memory Channels**

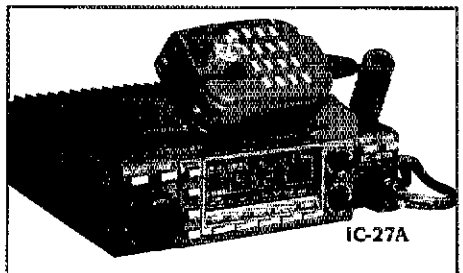
The IC-28H has all the features you need for carefree 2-meter mobile operation. The only thing it doesn't have is a big price.

45 Watts. The IC-28H provides a full 45 watts of powerful output. The **IC-28A** 25-watt version is also available. Both units have a selectable low power.

Large LCD readout. A wide-view LCD readout can be easily read even in bright sunlight. An automatic dimmer circuit reduces the brightness for evening operation.

Wideband Coverage. The IC-28H performs from 138~174MHz (specifications guaranteed from 144.00~148MHz) and includes weather channels. Ideal for MARS and CAP operation.

Compact Size. The IC-28H measures only 2 inches high by 5½ inches wide by 7¼ inches deep (IC-28A is 5¼ inches deep). Great for mobile installations where space is limited.



The IC-27H 45 watt and IC-27A 25 watt ultra compact 2-meter mobiles continue to be available.

21 Memory Channels. Store 21 frequencies into memory, or lock out certain memory channels. All memories are backed up with a lithium battery.

Scanning. Scan the entire band or the memory channels from the provided HM-12 mic.

Easy to Operate. With only 11 front panel controls, the IC-28H is simple to operate.

Available Options. IC-HM14 DTMF mic, PS-45 13.8V 8A power supply, UT-29 tone squelch unit, SP-10 external speaker, IC-HM16 speaker mic and HS-15/HS-15SB flexible boom mic and PTT switchbox.

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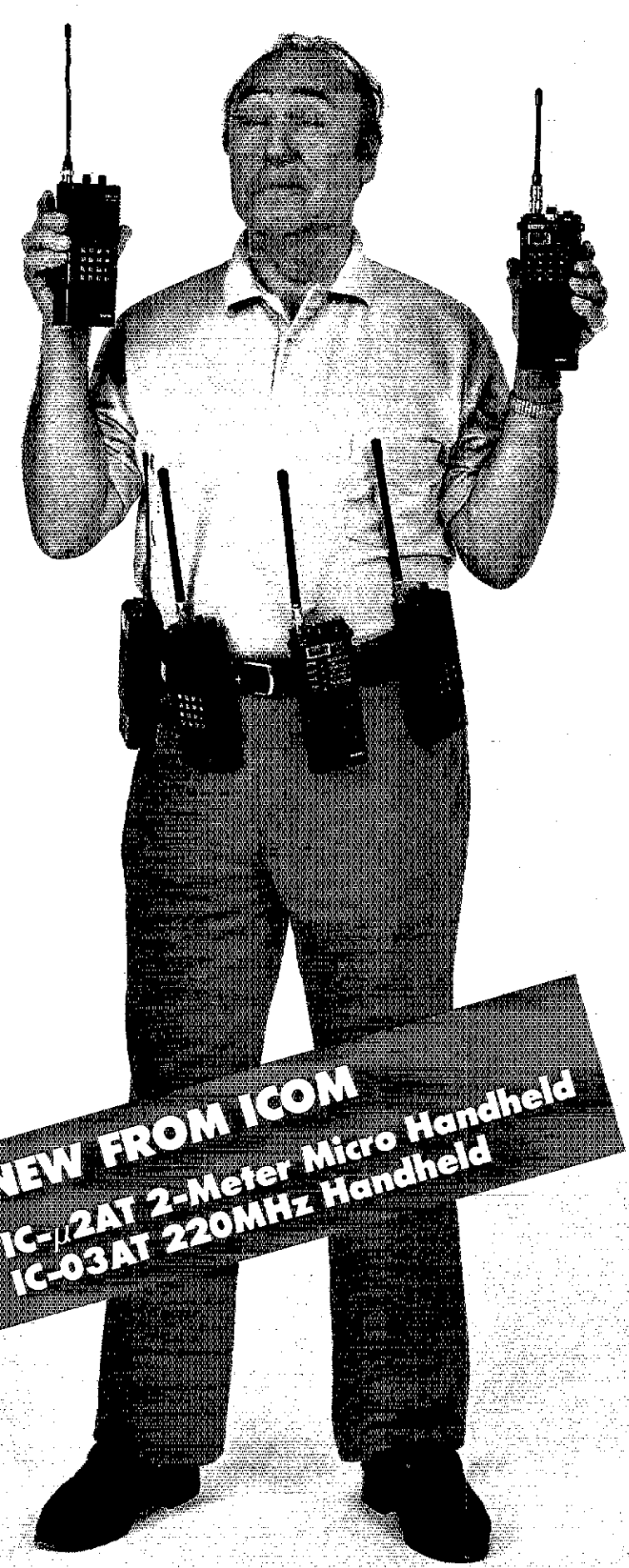

ICOM HANDHELDS

SURROUND YOURSELF WITH THE BEST!

Reliable. ICOM's extensive line of reliable, field-proven handhelds and interchangeable accessories give you the most options for handheld communications. 2-meter, 220MHz, 440MHz or 1.2GHz...ICOM has your frequency covered.

2-Meters. For 2-meter coverage, ICOM offers the IC-02AT and IC-2AT handhelds. The versatile IC-02AT covers 140.000–151.995MHz, the IC-2AT 141.500–149.995MHz...both include frequencies for MARS and CAP operation. The IC-02AT features an LCD readout, 32 PL tones standard, DTMF, direct keyboard entry, three watts output, (optional 5 watts output with IC-BP7 battery pack), 10 memories and three scanning functions. The IC-2AT, the most rugged handheld on the market, has a DTMF pad, 1.5 watts output and thumbwheel frequency selection. The IC-2A is also available and has the same features as the IC-2AT except DTMF.

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.

440MHz. For 440MHz operation, ICOM has two handhelds available, the versatile IC-04AT and the IC-4AT. The IC-04AT and IC-4AT offer full coverage from 440.000–449.995MHz. The IC-04AT includes an LCD readout, 32 PL tones standard, DTMF direct keyboard entry, three watts output, (optional 5 watts output with IC-BP7 battery pack), 10 memories and three scanning systems. The IC-4AT has a DTMF pad, thumbwheel selection and 1.5 watts output.

1.2GHz. ICOM announces the IC-12AT 1260.000–1299.990MHz handheld, the first 1.2GHz handheld available. The IC-12AT features 10 memories, an LCD readout, DTMF direct keyboard entry, two scanning systems and one watt output.

Accessories. A variety of interchangeable accessories are available, including the IC-BP8 800mAH long-life battery pack, HS-10 boom headset, CP1 cigarette lighter plug and cord, HM9 speaker mic (for IC-02AT, IC-04AT and IC-12AT), leather cases, and an assortment of battery pack chargers.

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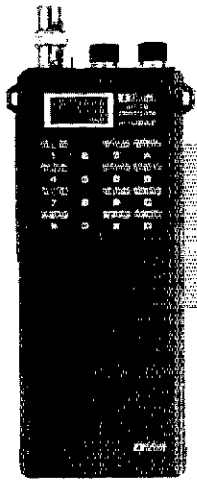

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Grand Prize

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FXAL2	1/2" Aluminum Black Jacket		.89
FLC12	1/2" Corr. Copper	Blk. Jkt.	1.59
FLC78	7/8" Corr. Copper		3.92
NM12AL	N Conn., 1/2" Alum. (Male or Female)		22.00
NM12CC	N Conn., 1/2" Copper (Male or Female)		22.00
NM78CC	N Conn., 7/8" Copper (Male or Female)		54.00

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Nemal No.	Description	100 Ft.	Per Ft.
1100	RG 8 95% Shielded Mil. Spec.	28.00	.32
1102	RG8 95% Shielded Foam	30.00	.32
1110	RG8X 95% Shield (mini 8)	15.00	.17
1130	RG213/U Mil. Spec. 96% Shield	34.00	.36
1140	RG214/U Mil. Spec. - Dbl. Silver	155.00	1.65
1180	Belden 9913 Low Loss	46.00	.50
1705	RG142B/U Teflon/Silver	140.00	1.50
1310	RG217/U 5/8" 50 ohm Dbl. Shield	80.00	.85
1470	RG223/U Mil. Spec. Dbl. Silver	80.00	.85
1450	RG174 95% Shielded Mil. Spec.	12.00	.14

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Nemal No.	Description	100 Ft.	Per Ft.
8C18Z2	2-18 Ga., 6-22 Ga.	19.00	.21
8C1620	2-16 Ga., 6-20 Ga. Heavy Duty	34.00	.36

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NE720	Type N for Belden 9913		4.25
NE723	N Female Belden 9913		4.75
PL258AM	Amphenol Barrel		1.45
PL259	Standard Plug for RG8, 213	10/5.90 or	.65
PL259AM	Amphenol PL259	10/7.90 or	.89
PL259TS	PL259 Teflon/Silver		1.59
UG21D	Type N for RG6, 213, 214		3.00
UG83B	N Female to PL259		6.50
UG88C	BNC RG58		1.25
UG146	SO239 to Male N		6.50
UG175/6	Adapter for RG58/59 (specify)	10/2.00 or	.22
UG255	SO239 to BNC Amphenol		3.75
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Nemal No.	Description	Per Ft.
GS38	3/8" Tinned Copper	.30
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GS316	3/16" Tinned Copper	.15
GS316S	3/16" Silver Plated	.35

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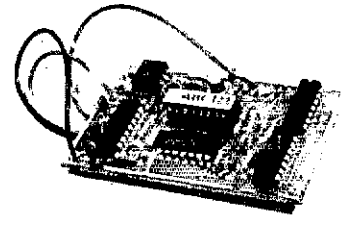

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Perfect means of RTTY code ID

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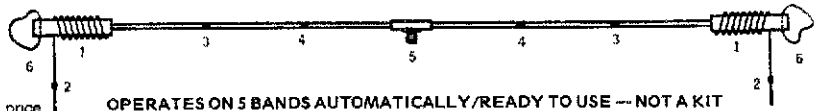

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ICOM IC-275
THE VHF SUPERSTAR!

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

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

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

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

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

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

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

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

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

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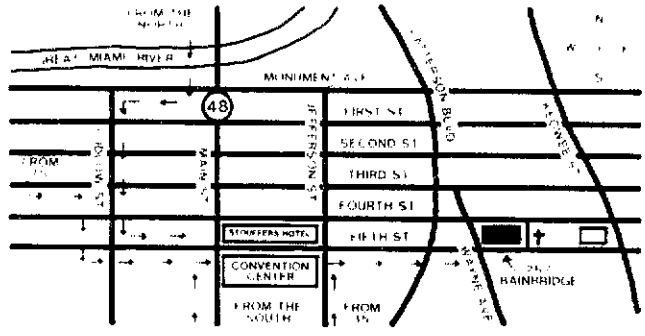

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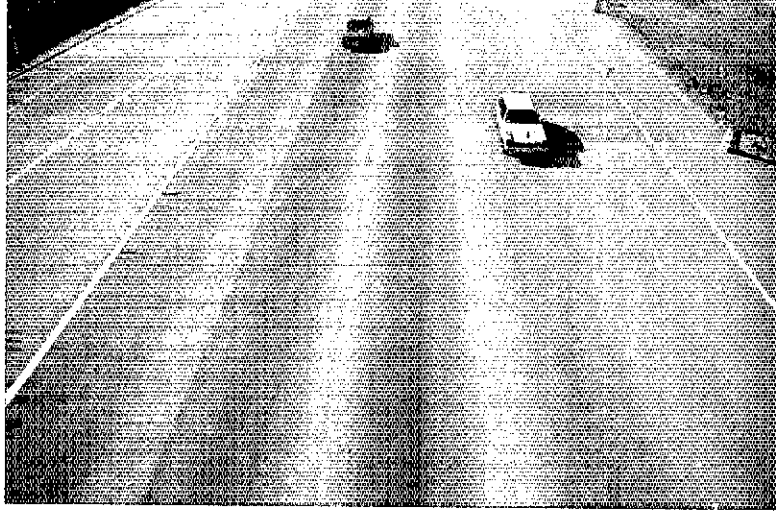


Tired of all the traffic on your band?

Discover the wide open spaces on 220MHz.

ICOM has a commitment to 220MHz.

ICOM has the most complete line of 220MHz gear to take you away from the traffic on other bands.

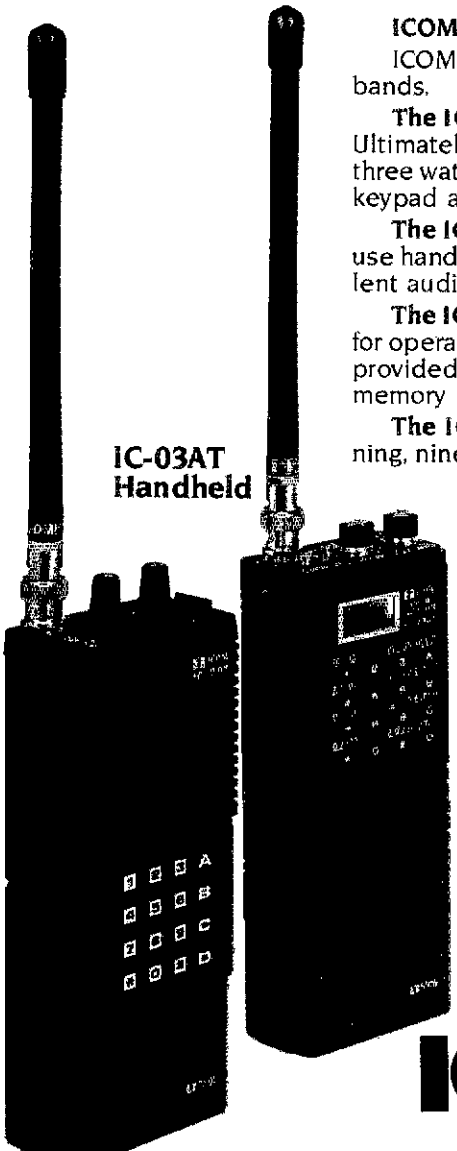
The IC-03AT Handheld reflects uncompromised top-of-the line quality and performance. Ultimately deluxe, with 10 full function memories, scanning, 32 built-in subaudible tones, three watts output (five watts optional) and an LCD readout. Direct frequency entry via DTMF keypad and adjustable offsets for non-standard repeaters.

The IC-3AT Handheld is ICOM's 220MHz version of the world's most popular and easy-to-use handheld. Provides superb transmit and receive performance, 1.5 watts output and excellent audio.

The IC-38A Mobile...ICOM's new compact and easy to operate mobile especially designed for operator convenience. It sports a large LCD readout and band/memory stepping from the provided IC-HM12 mic. Plus 21 memories, receive coverage from 215–230MHz, scanning and memory lock-out.

The IC-37A Mobile...ICOM's slim-line 220MHz mobile. There's band or memory scanning, nine memories, 32 built-in subaudible tones and an LED readout. Plus a reverse switch for offset checks and an internal speaker. Comes with the IC-HM23 DTMF touchtone mic with up/down frequency and memory scan.

Discover the wide open spaces on 220MHz. ICOM will help take you to the excitement.



IC-03AT Handheld

IC-3AT Handheld

IC-37A Mobile

IC-38A Mobile

ICOM 220MHz

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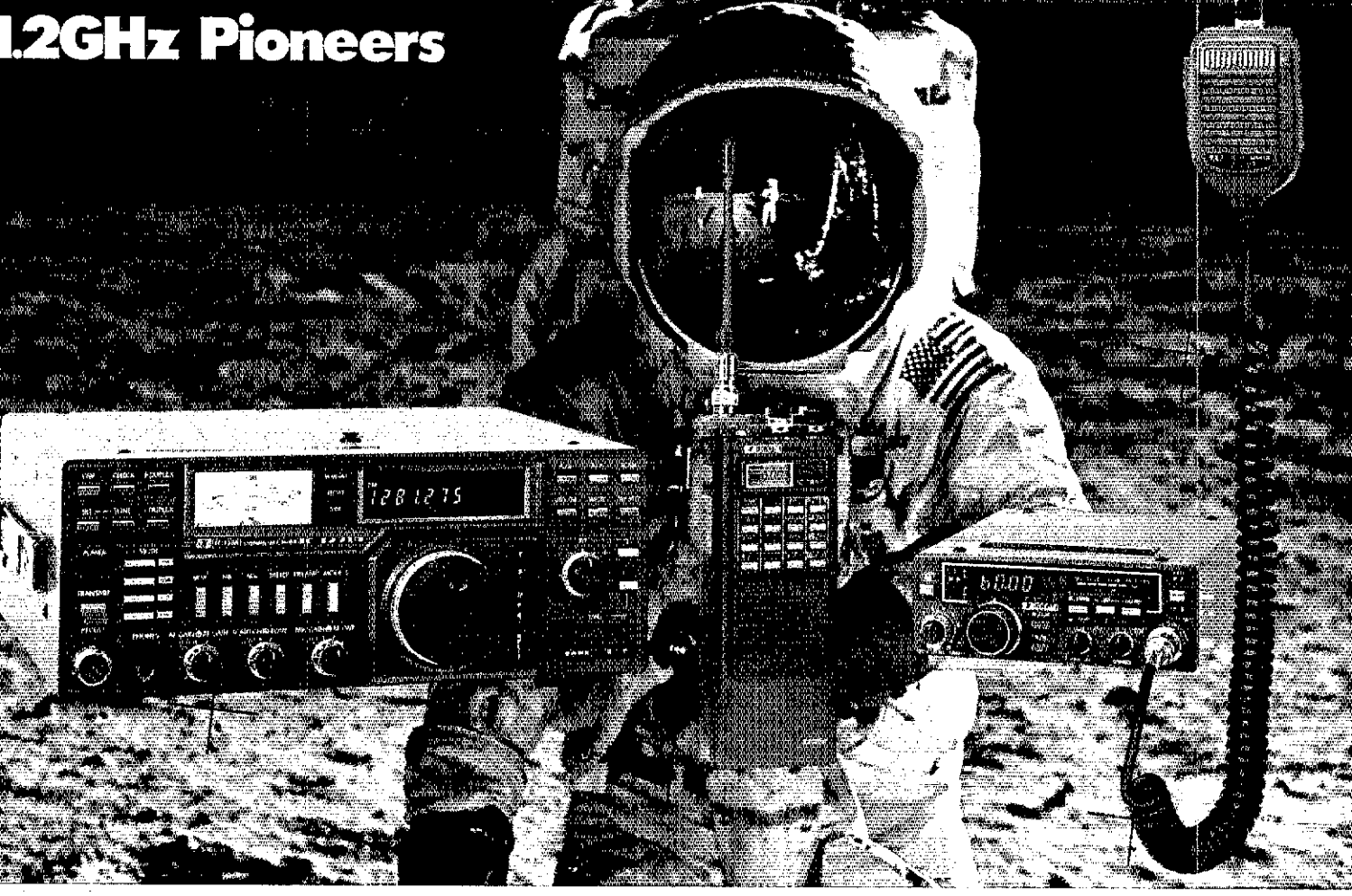


ICOM 1.2GHz

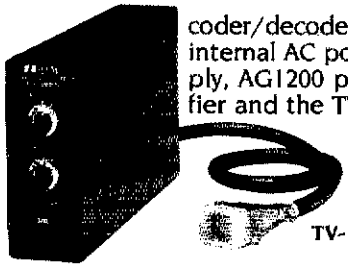
THE ONLY 1.2GHz SYSTEM... ANYWHERE

- **IC-1271A Base Station**
- **IC-12AT Handheld**
- **IC-120 Mobile**
- **IC-RP1210 Repeater**

Explore 1.2GHz with ICOM. Only COM offers the most complete line of am gear for 1.2GHz...the IC-1271A ull-featured base station transceiver, he new IC-12AT handheld, the IC-120 nobile and the IC-RP1210 repeater. So, et away from the crowd and be a ioneer on 1.2GHz.

The IC-1271A 1240–1300MHz ase station transceiver features 10 vatts of RF output power, 32 memo-ies, scanning and multi-mode opera-ion including ATV (amateur TV).

A variety of options are available or the IC-1271A including the IC-EX310 oice synthesizer, UT15S CTCSS en-coder/decoder, IC-PS25 internal AC power supply, AG1200 preamplifier and the TV1200 TV interface unit.

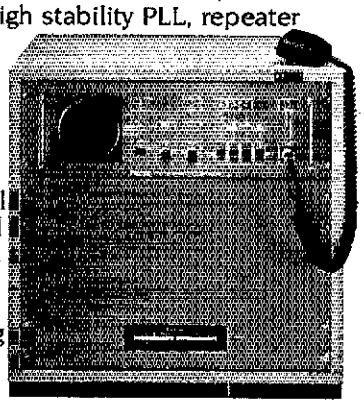


TV-1200

The new IC-12AT covers from 1260–1299.990MHz, has ten memory channels, memory scan, program scan and programmable offset. It also features an LCD readout, RIT and VXO, 32 built-in tones and a DTMF pad.

The IC-120 1.2GHz mobile transceiver has six memory channels, scanning, an HM-14 up/down scanning mic, RIT, LED readout and three tuning rates. Accessories include the ML12 10 watt amplifier and the PS45 slimline external power supply.

The IC-RP1210 completes your 1.2GHz system. It features a field programmable 1198 channel, DIP switch), high stability PLL, repeater access to CTCSS, three-digit DTMF decoder for control of special functions, 10 watts, selectable hang time and ID'er.



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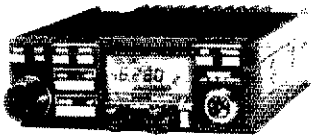

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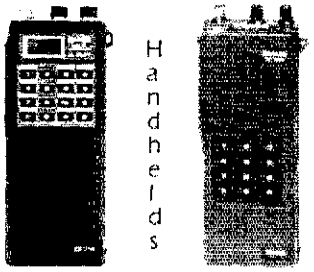

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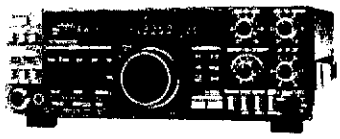

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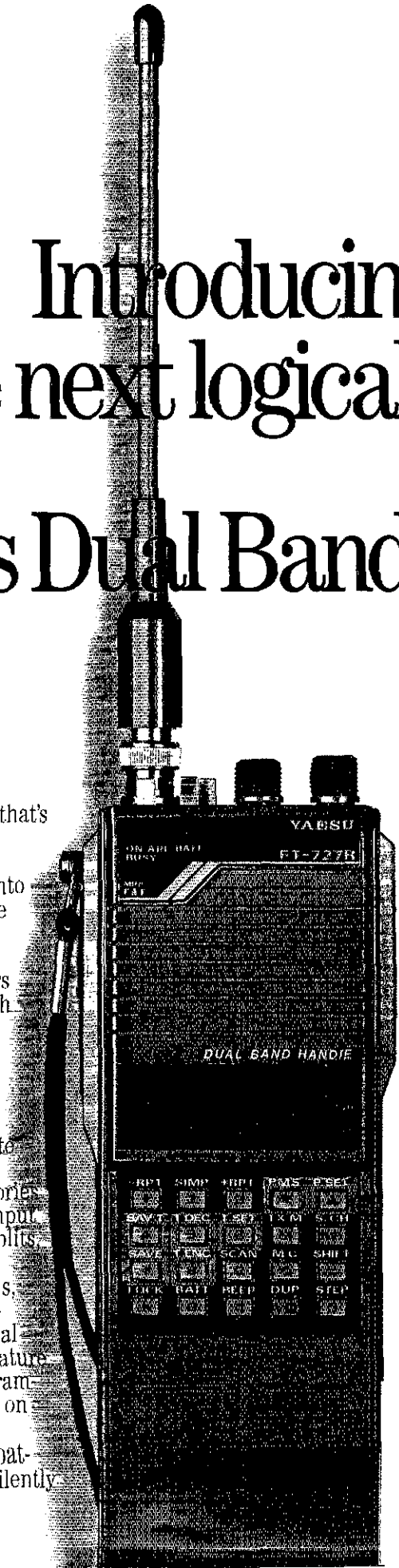

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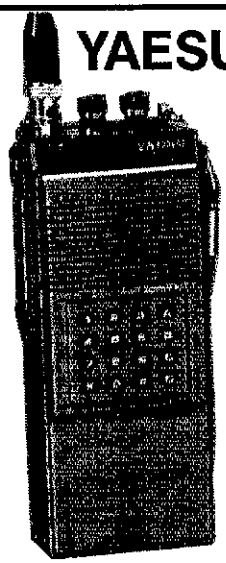
YAESU FT-703R/TTP UHF Handheld CLOSEOUT



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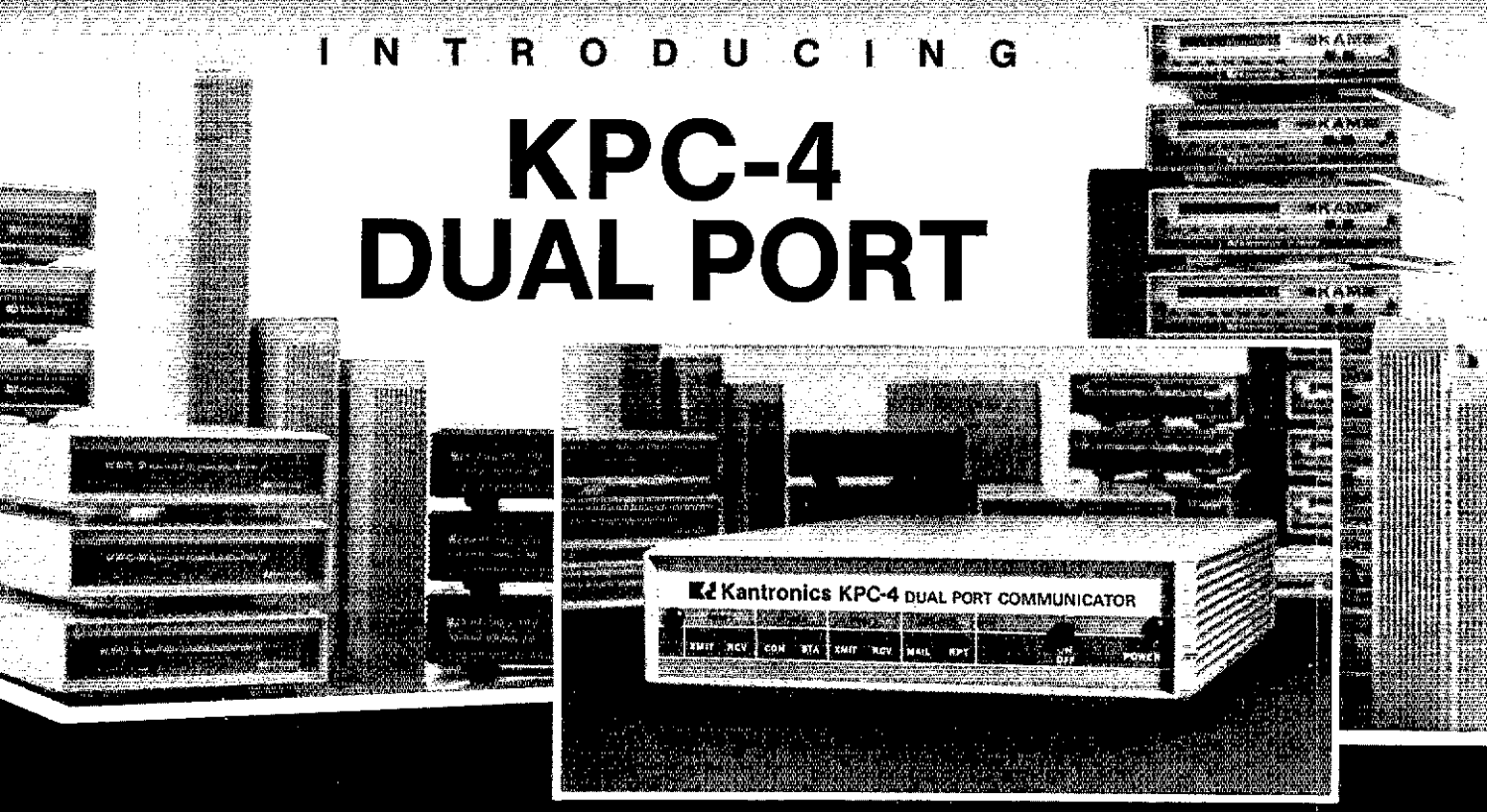

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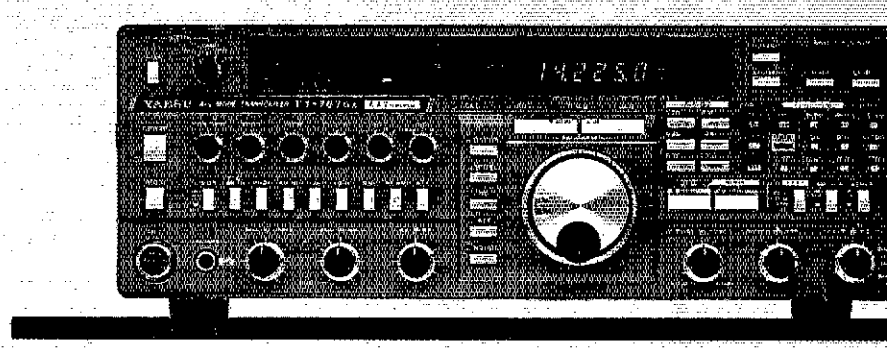

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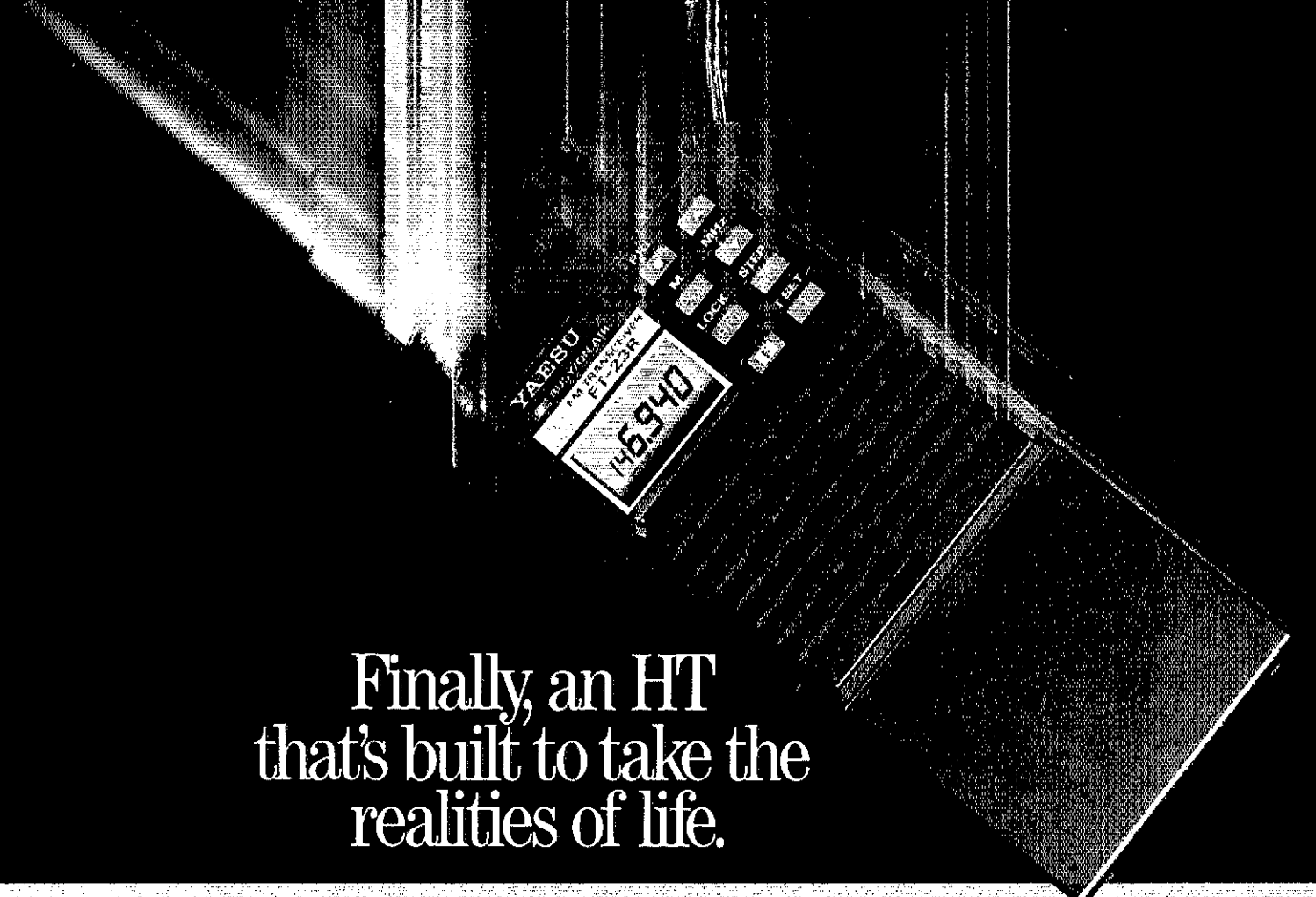

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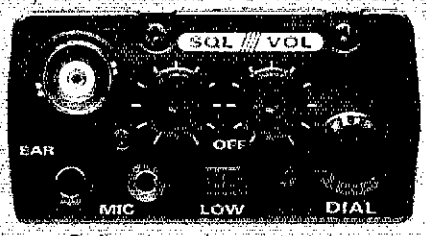
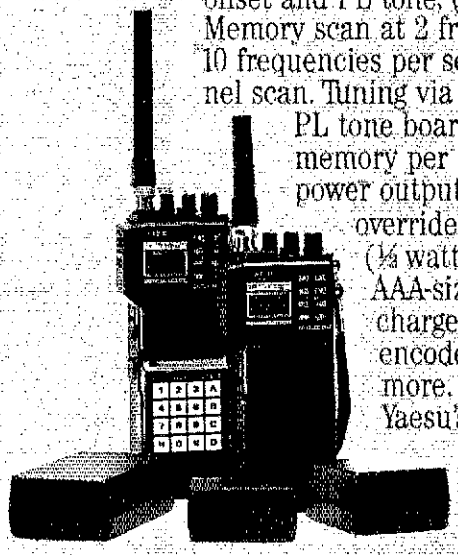


Radios above shown actual size.



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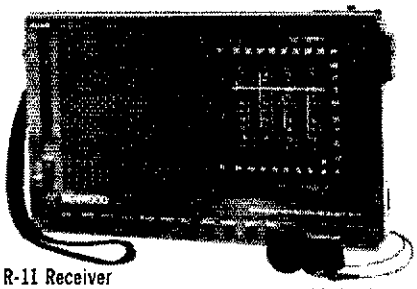

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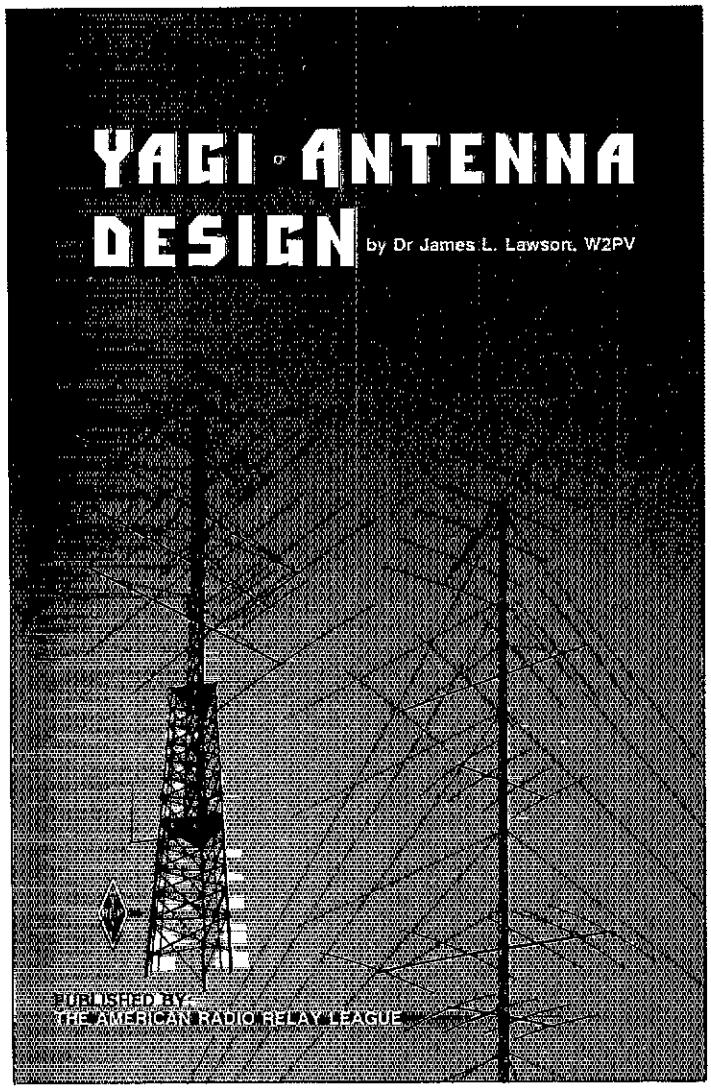

Yagi Antenna Design is based on the series in **Ham Radio Magazine** by the late Dr. James L. Lawson, W2PV. Jim was a highly competitive person and this carried through to his Amateur Radio hobby and work with antennas. Although this book is primarily the work of the author, credit should be given to its editors: Bill Myers, K1GQ; Clarke Greene, K1JX; and Mark Wilson, AA2Z. This ARRL publication stands to be a "classic" that should be added to every radio amateur's technical library. The book is available only in hard cover, and is printed on high quality textbook paper. There are over 210 pages of detailed information on Yagi design. For more detail, refer to the column at right. The retail price is $15.00. Please add $2.50 ($3.50 for UPS) for postage and handling. Also available at your favorite ARRL dealer.

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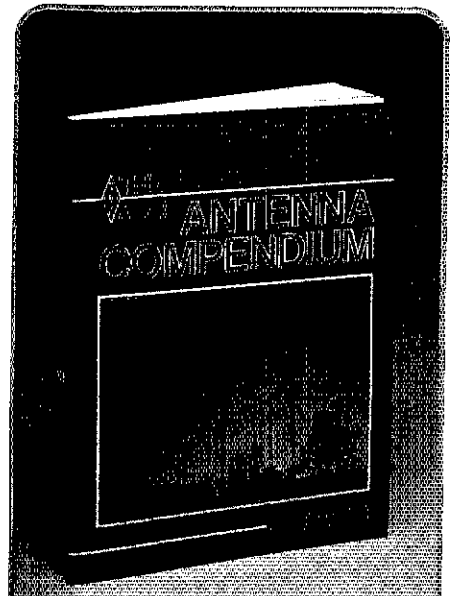

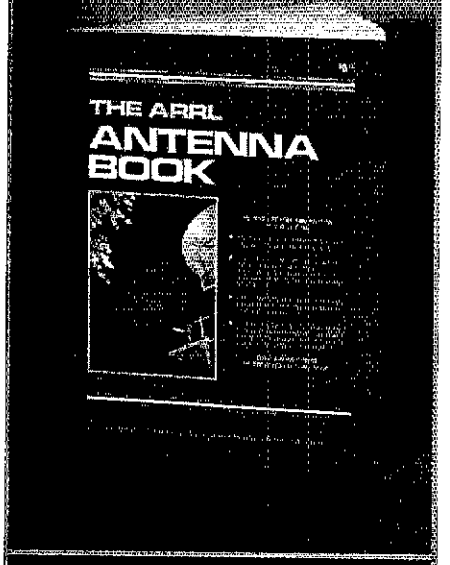

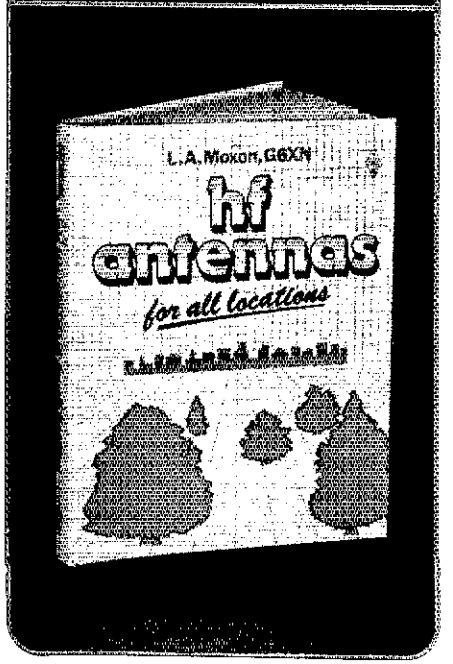

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HF ANTENNAS FOR ALL LOCATIONS by L.A. Moxon, G6XN. An RSGB publication. Contains 264 pages of practical antenna information. This book is concerned primarily with small wire arrays, although construction information is also given on a small number 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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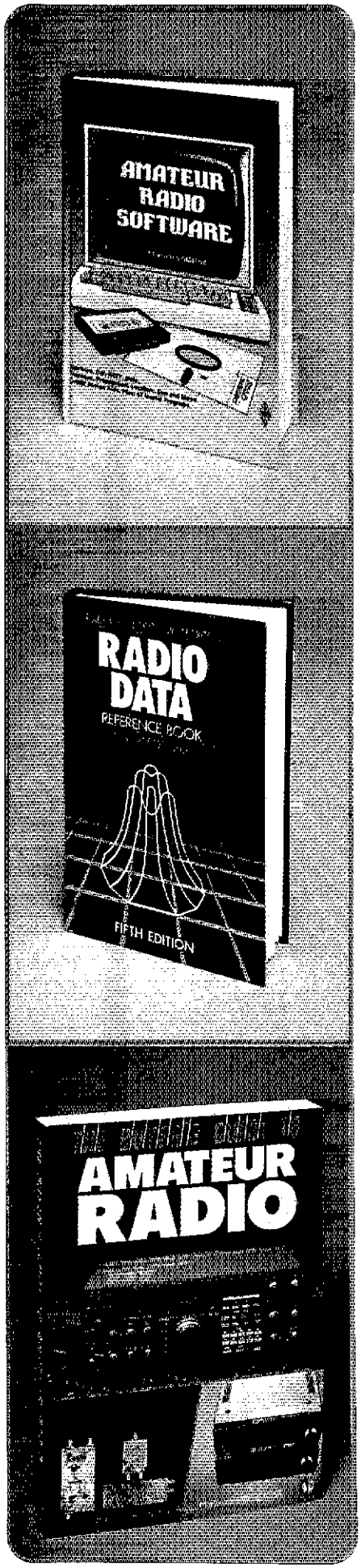

RSGB BOOKS

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 meterological 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.

NEW!

THE BUYER'S GUIDE TO AMATEUR RADIO by Angus McKenzie, G3OSS. Have you ever seen a used equipment ad and wondered what the specifications were for the piece of gear advertised? Is the rig that your friend is selling all he claims it to be? *The Buyer's Guide to Amateur Radio* may have the answers! This book contains over 100 full reviews of equipment and close to that number of product descriptions. Modern gear is covered as well as some venerable "boat anchors." Some of the descriptions apply only to the British versions of equipment designed for operation under European band plans. The opinions expressed in this book are those of the author and not necessarily those of ARRL. Copyright 1986, 480 pages, $12.00 softbound.

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(1) Advertising must pertain to products and services which are related to Amateur Radio.
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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.
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IMRA-International Mission Radio Association Helps missionaries by supplying equipment and running a net for them daily except Sunday, 14.280 MHz, 1900-2000 GMT. Br. Bernard Frey, 1 Pryer Manor Rd., Larchmont, NY 10538.

THE Veteran Wireless Operators Association, a non-profit organization of communications people founded in 1925, invites your inquiries and application for membership. Write VWOA, Ed F. Pleuler, Jr., Secretary, 46 Murdock Street, Fords, NJ 08863.

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.

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THANK YOU for attending Warren, Ohio Hamfest. See you August 16, 1987. W.A.R.A.

HAMFEST TICKETS. Printed Quickly, Cheaply! Samples SASE. Howelab, Box 73, Folly Beach, SC 29439.

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., 20933 Brant Avenue, Long Beach, CA 90810.

HAMFEST SUNDAY MAY 17, 1987. LIMARC sponsors ARRL Long Island Hamfair at the New York Institute of Technology Route 25A/Northern Blvd., Old Westbury, NY. Outdoor tailgateing, no reservations needed, sellers car space $5, general admission $3. Wives, children and sweethearts free, all Hams must buy a ticket! Exit 39 North on Glen Cove Road 2 miles to 25A, turn right 1 mile to site. Talkin 146.85. Food, refreshments available and many awards to attendees. Open 7:30 AM for sellers, 9:00 AM for buyers. If further info needed call Hank Wener, WB2ALW at night 516-484-4322.

ROCHESTER HAMFEST Saturday, Sunday, May 16-17. Outdoor flea market starts Friday, May 15. All other activities, commercial exhibits, indoor flea market, programs, banquet, etc., start on Saturday. Registration $6 advance, $7 gate. Outdoor flea market $5 per parking space. Indoor flea market, advance only, $16 per 8' table. Commercial exhibitors, write or call for details. Rochester Hamfest, 300 White Spruce Blvd., Rochester, NY 14623. Phone business hours 716-424-7184.

LARGEST INDOOR COMPUTER and Ham Fest in Central NJ. OBRA Annual Festival, Sunday 17 May, Old Bridge Civic Arena, Cottrel Road and Highway 516, Old Bridge, NJ. Open Sellers 6 AM, Buyers 8 AM. Sellers indoor $12, tailgate $8, Buyers $5, save $1 purchase in advance. Table admits one. XYL, kids under 12 free. Send advanced table sales, reservations with check payable to OBRA, Chris Mohr, N2DHN, 50 Harrison Place, Parlin NJ 08859. 201-727-1769. Food & refreshments. FCC Exams, pre-register, preferred. Walk-in registration 9 AM, testing 10 AM. Talkin 7.12/7.72. Easy access Rt. 9 to Highway 516E, 3/4 mile to Civic Center. *N2DHN for additional information.*

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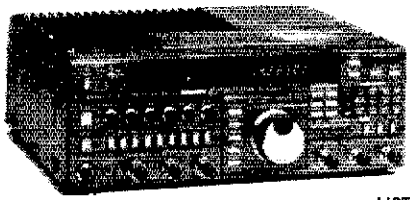
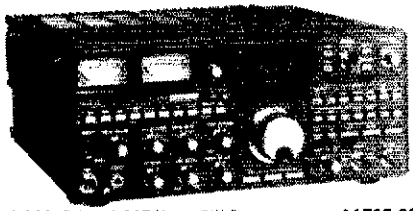
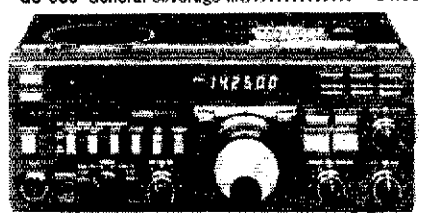


HF Equipment	LIST
FT-767GX 160-10m xcvr/.1-29.99 MHz Rcvr	$1895.00
6M/767 6m module	179.95
2M/767 2m module	179.95
SPECIAL! • 2M/767 $1 with FT-767GX Purchase	
430/767 430-440 module	219.95
440/767 440-450 module	219.95
FT-ONE Xcvr/Rcvr/4 filters/RAM/FM	2859.00
KY-ONE Keyer unit	50.00
DC-ONE DC cable	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	119.95
FIF-232C for VIC-20/TI/most RS-232	79.95
FRB-1 External relay box	20.00
GC-980 General coverage kit	14.95



FT-757GX 9-band Xcvr/SW Rcvr/mic	$995.00
FP-757HD Heavy duty supply with fan	249.00
FP-757GX Compact power supply	235.00
FP-700 Power supply	209.95
FRB-757 External relay box	10.00
FC-757AT Automatic ant. tuner w/memory	359.00
FAS-1-4R Remote antenna selector	79.95
MMB-20 Mobile mount	25.95
FIF-65A Interface; Apple IIe	59.95
FIF-232C for VIC-20/TI/most RS-232	79.95
GX Turbo/F01 Software; Apple II	59.95
GX Turbo/C01 Software; C64/128	89.95
GX Turbo/V01 Software; VIC-20	89.95

FT-757GX accessories - cont.	LIST
FTV-700 Transverter w/no module	175.00
2M/FTV 2m module only	189.00
6M/FTV 6m module only	139.00
70 cm/FTV 430 module only	255.00
Misc. accessories	LIST
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SP-102P Speaker/patch	99.95
MD-1B8 Desk microphone	89.95
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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6M/726 6m unit	269.95
430/726 430-440 MHz unit (OSCAR)	329.95
440/726 440-450 MHz unit (FM band)	329.95
SU-726 Satellite duplex module	129.95
XF-455MC 600 Hz CW filter	69.95
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
FBA-8 Holder for C-cell Nicads	26.95
NC-26B Wall Charger for FBA-8	16.95
CSC-19 Soft case	10.00
MH-10F Speaker/Microphone	27.95
MH-10E Hand Microphone	21.95
FTS-7 Encoder/decoder	49.95
FT-270RH 45w 2m FM Xcvr w/TTP mic	439.95
FT-2700RH 25w 2m/440 FM w/TTP mic	599.95
FTS-8 Encoder/decoder	49.95
FVS-1 Voice synthesizer	31.95
AD-2 50w 2m/440 duplexer	34.95
FT-770RH 25w 440 FM xcvr w/TTP mic	479.95

FTS-8 Encoder/decoder • **FREE** with the purchase of a **FT-270RH** or **FT-770RH**

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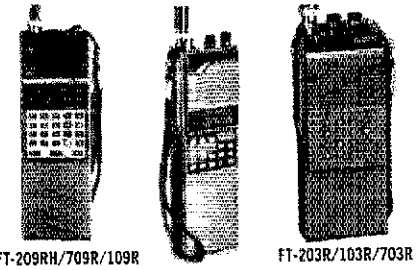

FT-209RH/709R/109R FT-727R FT-203R/103R/703R

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FT-209RH 5w 2m FM HT/TTP/batt/cgr	$359.95
FT-109RH 220 FM HT/TTP/batt/cgr	379.95
FT-709R 4w 440 FM HT/TTP/batt/cgr	359.95
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FT-23R 2.5w 2m compact HT	269.95
FT-23R/TTP 2.5w 2m compact HT w/TTP	299.95
FT-73R 2w 440 compact HT	279.95
FT-73R/TTP 2w 440 compact HT w/TTP	314.95

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FT-703R/TTP 440 w/batt/cgr/TTP ... 169.95

Acc. for 09-series/03-series/FT-727R	LIST
FBA-5 Alkaline battery holder	14.95
FNB-3 425ma 10.8v batt (comes w/03 series)	49.95
FNB-4 500ma 12v batt (comes w/09-series)	59.95
FTS-6 Encoder/decoder; 09-series	49.95
FTS-7 Encoder/decoder; 03-series	*29.95
*When purchased with FT-703R or 203R, otherwise	$49.95
LCC-6 Leather case w/top cover, 09-series	39.95
MH-12A2B Speaker/microphone	39.95
NC-9B Wall charger for FNB-3	9.95
NC-15 Desk quick charger/AC ps	89.95
NC-18B Wall charger for FNB-4	9.95
MMB-21 Mobile bracket	14.95
PA-3 Mobile adapter and charger	39.95
TA-2 2m 19" telescoping whip ant	11.95
YH-2 VOX headset	26.95

FRG-9600 FRG-8800

Receivers	LIST
FRG-8800 150 KHz-29.999 MHz Shortwave	$599.95
FRA-7700 Indoor active receive antenna	59.95
FRT-7700 Antenna tuner	64.95
FRV-8800 118-174 MHz VHF converter	129.95
FIF-232C Interface; VIC-20/TI/RS-232	79.95
FF-5 500 KHz low-pass filter for VLF	20.00
DC-8800 DC kit	3.50
FM-W/8800 FM-wide kit	20.00
FRG-9600 60 to 905 MHz receiver	679.95
VU-9600 NTSC video unit	25.00
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THE 18TH ANNUAL B*A*S*H will be held on Friday Night of the Hamvention, April 24, 1987 at the Conference Center (Madison Room) of the HARA Arena and Conference Center, (the same location as the Hamvention), starting at 7:00 PM. There is no admission charge, and free continuous entertainment. Hot dinner, sandwiches, snacks and beverages are available. Two exciting top awards, and many others. Stay right at HARA when the Hamvention closes on Friday evening and meet your friends and join us for an evening of fun and entertainment. Sponsored by the Miami Valley FM Association, P.O. Box 263, Dayton, OH 45401.

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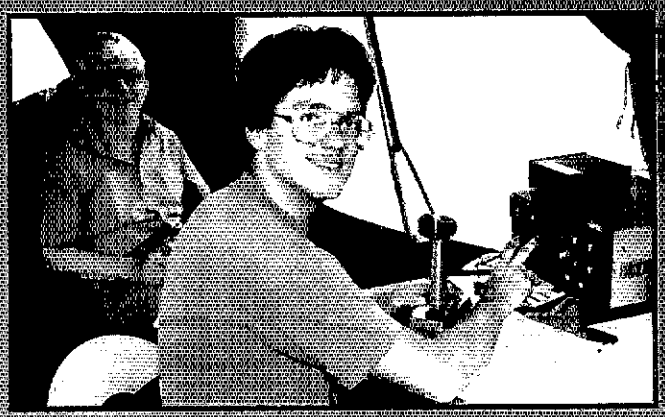
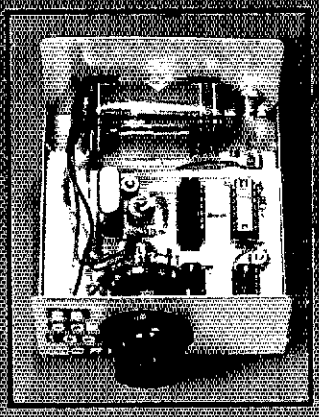
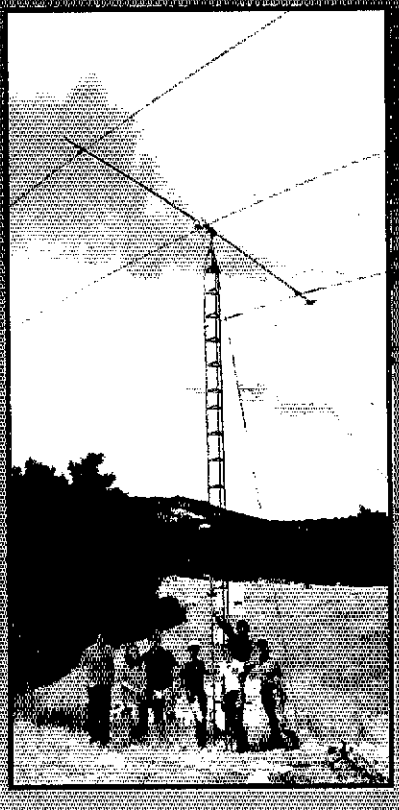
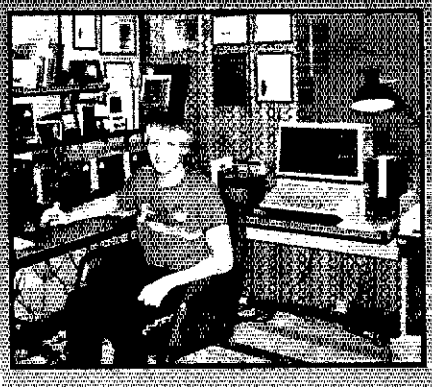
THE 1987 ARRL HANDBOOK

FOR THE RADIO AMATEUR









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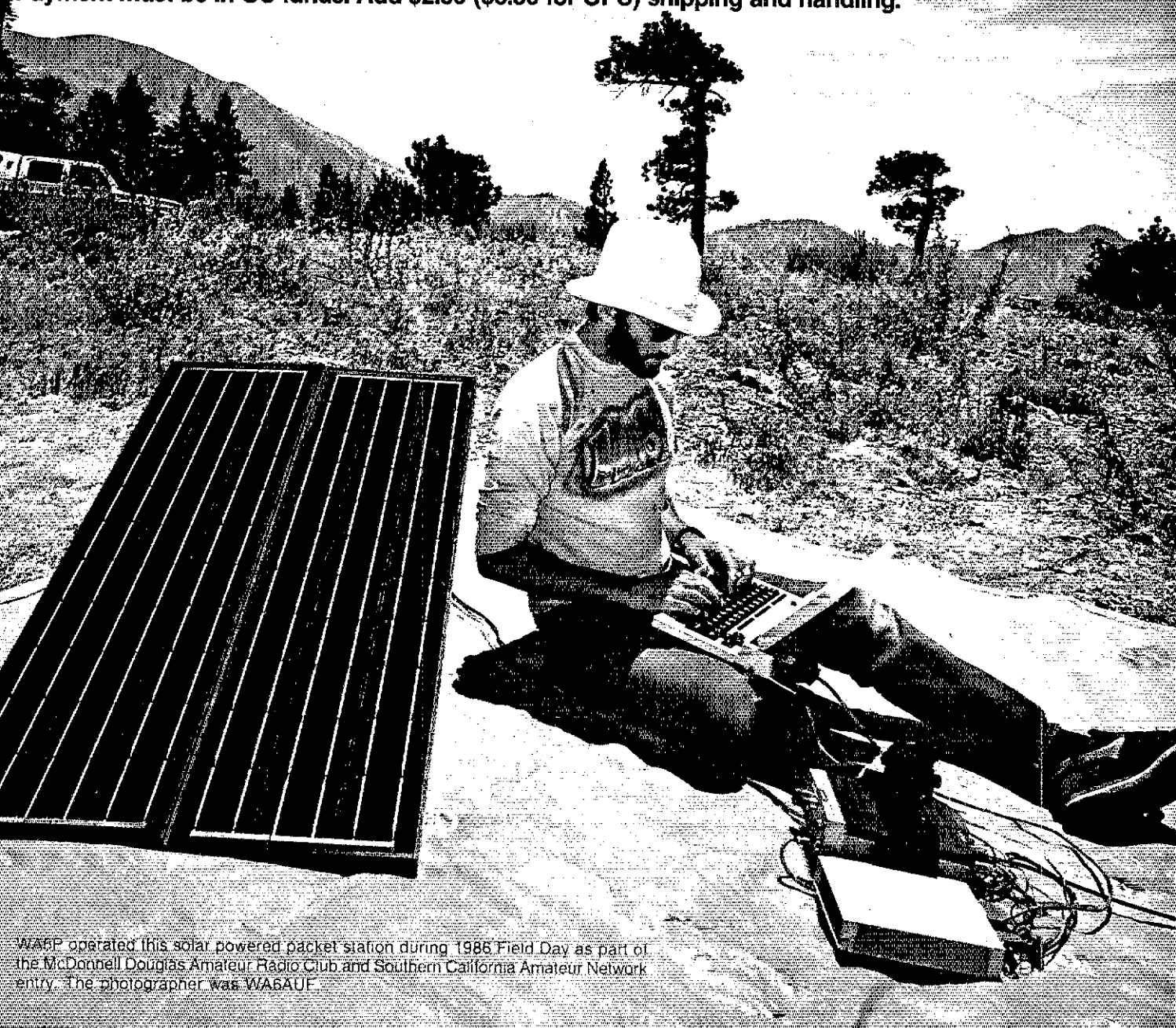

WA6P operated this solar powered packet station during 1986 Field Day as part of the McDonnell Douglas Amateur Radio Club and Southern California Amateur Network entry. The photographer was WA6AUF.

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Novices will find the 220 and 1270 MHz listings a must. For those interested in packet radio and other modes there are almost 1,000 digipeaters and specialized repeaters listed. You'll find much other useful information including a CTCSS (PL) Tone Frequency Chart, addresses of members of both the ARRL VHF-UHF and Repeater Advisory committees, band plans, information on how to operate through repeaters, compilations of frequency coordinators and ARRL Special Service Clubs. Available in the handy pocket-size (3¼ x 5¼ in.) that was introduced last year. 16th Edition, copyright 1987, $4.00. Shipping and handling $2.50 ($3.50 for UPS). Off the press in late April. Purchase at your dealer or directly from:

The American Radio Relay League, Inc.
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WANTED: old microphones for my mic. museum. Also mic-related items. Write Bob Paquette, 107 E. National Ave., Milw. WI 53204

MANUALS FOR MOST Hamgear made 1937/1972 plus Kenwood. No quotes. Our current catalog "F" at $1 required to order. Over 2,000 models listed. HI-MANUALS, P.O. Box G802, Council Bluffs, IA 51502-0802

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WANTED: Radio, magazines, horn speakers, pre 1930. W6THU, 1545 Raymond, Glendale, CA 91201, 818-242-8961.

MICROPHONES AND related memorabilia used in radio/TV broadcasting prior to 1960 wanted. Cash paid: trade terms available. Write: James Steele, 160 West 77th Street, New York, NY 10024-6942.

WANTED: *QST* VOLUME 1. W6ISQ, 82 Belbrook Way, Atherton, CA 94025.

SCHEMATICS: Radio receivers 1920's/60's. Send Brand-name, Model No., SASE Scaramella, Box 1, Woonsocket, R.I. 02895-0001.

TELEGRAPH BUGS, KEYS and old instruments wanted. Collector seeks most models and variations including military, spark and wireless. Donations of parts, partial or damaged keys appreciated. Write: John Hensley, WJ5J, 5054 Holloway Avenue, Baton Route, LA 70808.

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

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ANTIQUE RADIO CLASSIFIED. Monthly magazine for buyers and sellers of old radios and related items. sample copy free. 6-month subscription plus sample $9. ARC, P.O. Box 2-B1, Carlisle, MA 01741

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SELL HALLICRAFTER SX-117 rcvr/spkr $100. Heath SB-303, SB-401, HDP-21 Mic all three $200. All recently aligned, with manuals excellent condition. K2BWK 716-924-3380.

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WANTED: SCHEMATIC, Ameco TX 6 & 2 VFO Model. 621 Xerox ok. C. Barber, 39638 Durand Drive, Sterling Hts., MI 48310.

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WANTED: BC-375 WWII Aircraft Transmitter also Tuning Units, 211 Tubes and PE-73C Dynamotor. Pete Hammersma, WB2JWV, 87 Philip Avenue, Elmwood Park, NJ 07407.

NEEDED: Power Supply P-2000AC for Hallicrafters Hurricane xcvr SR-2000. Good condition or repairable. Don Smith, WB2ZJF, 609- 935-2178.

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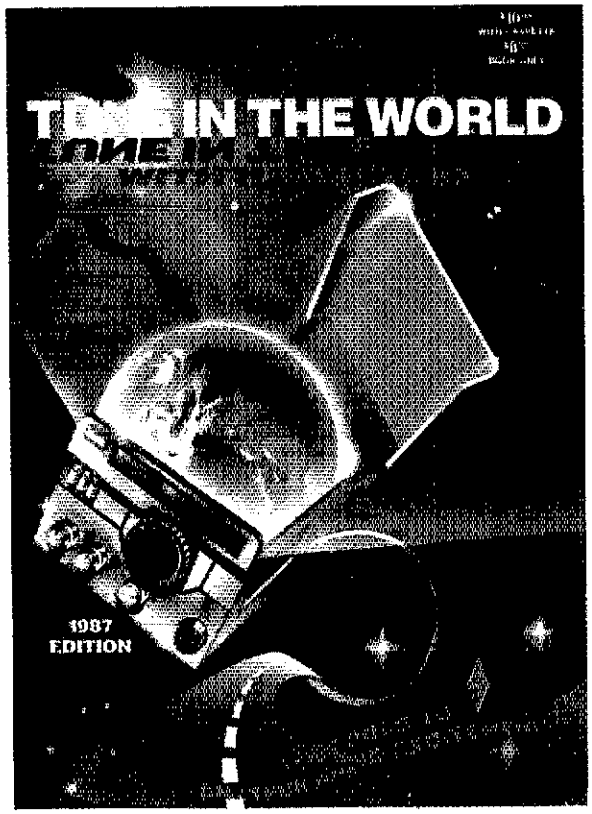

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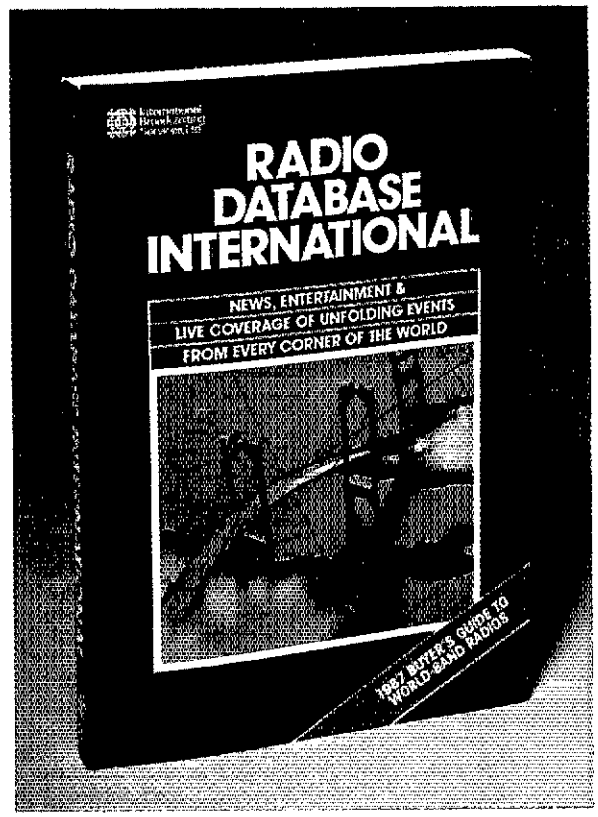

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ANTIQUE RADIOS, schematics, tubes & literature, send SASE to VRS(QS), 376 Cilley Road, Manchester, NH 03103 for large list.

FTDX560 $175; Galaxy III $150; HA460 $60; AF68PMR8 $60; B&Wssb $50; Marauder $50; WA2RUG, 609-779-8833, bef 11 PM et.

MILITARY RADIO eqipment pre-1955 wanted by enthusiast - especially WW2 German, Japanese, Italian, any condx. and all accessories. Any U.S. Gov't publication on 'enemy radio equipment'. Some U.S. sets too - favoring protable/mobile or self-contained units, examples TBX, TBY, TRC-10, PRC-1 thru 5, BC348 thru letter C. Also interested in simple 1-2-3 tube or transitor radios, especially shortwave, examples Knight 2-transistor DXer, Philmore, Revell. Heathkit HX-1681 xmtr, non-ancient, for sale best offer. Hugh Miller, KA7LXY, 11206-1 NE, Seattle, WA 98125. 206-365-3684, (1800-2100-UTC).

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WANTED: 8873 TUBE. G2DRT.

WANTED: AEA CK-2 keyer for HS0A. Hiro Shiozawa, 1464 Osato, Kofu 400 JAPAN.

GAAS FETs at low cost. Contact JA&JCJ.

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HAM RADIO REPAIR, tube through solid state. Robert Hall Electronics, P.O. Box 8383, San Francisco, CA 94128; 408-729-8200.

FREE RECORDINGS of Mexico City, Columbia and San Salvador emergency nets. Send three C-90 cassettes and return postage to: International Amateur Radio Network, Belgrade Lakes, ME 04918. IARN 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 in beautiful Belgrade Lakes during second weekend of July. Glenn Baxter, K1MAN, Network Manager. Tel. 207-495-2215.

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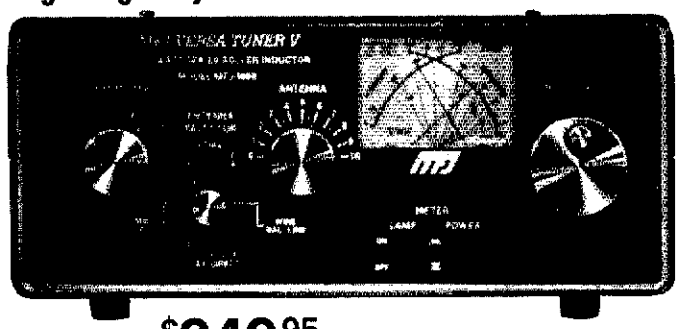
MFJ TUNERS

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.

MFJ989B **$349.95**

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

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

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

MFJ's Fastest Selling TUNER

MFJ-941D **$99.95**

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

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

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

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

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

MFJ's 1.5 KW VERSA TUNER III

MFJ-962B **$229.95**

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

Lighted Cross-needle Meter reads SWR, forward and reflected power in one glance. Has 300 and 3,000 watt ranges. 6 position antenna switch handles 2 coax lines, wire and balanced lines. 4:1 balun. 250 pf, 6 kv variable capacitors. 12 position ceramic inductor switch. New smaller size matches new rigs: 10¾ × 4½ × 14⅞ inches. Flip stand for easy viewing. Requires 12V for light.

MFJ's Best VERSA TUNER

MFJ-949C **$149.95**

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

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

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

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

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

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

Order your convenience package now and enjoy.

2 KW COAX SWITCHES

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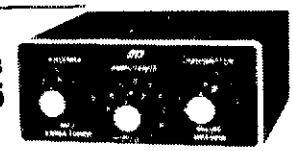
$29.95 MFJ-1701

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

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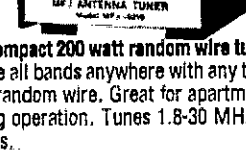

MFJ's ultra compact 200 watt random wire tuner lets you operate all bands anywhere with any transceiver using a random wire. Great for apartment, motel, camping operation. Tunes 1.8-30 MHz. 2 x 3 x 4 inches.

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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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New MFJ-1274 lets you work VHF and HF packet with built-in tuning indicator for $169.95 . . .

. . . you get MFJ's latest clone of TAPR's TNC-2, TAPR's VHF/HF modem and built-in tuning indicator that features 20 LEDs for easy precise tuning

MFJ-1274
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MFJ-1270
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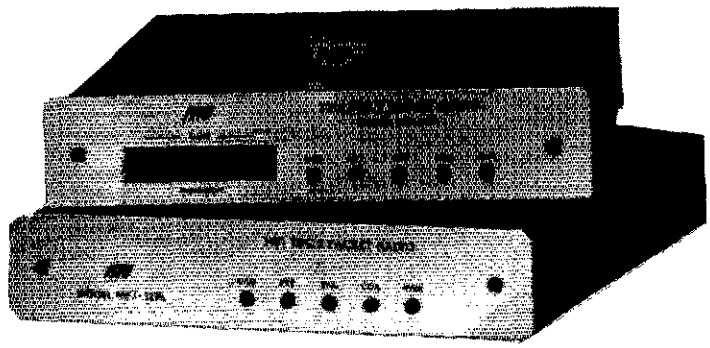

Now you can join the exciting world of packet radio on both VHF and HF bands with a precision tuning indicator . . . for an incredible $169.95!

You get MFJ's top quality clone of the highly acclaimed industry standard TAPR TNC-2. We've made TAPR's modem selectable for both VHF and HF operation, added their precision 20 segment LED tuning indicator, a TTL serial port, an easily replaceable lithium battery for memory back-up and put it all in a new cabinet.

If you don't need the tuning indicator or the convenience of a switchable VHF/HF modem, choose the affordable MFJ-1270 for $139.95.

All you need to operate packet radio is a MFJ-1274 or MFJ-1270, your rig, and any home computer with a RS-232 serial port and 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. The Starter Pack includes interfacing cable, terminal software on disk or tape and complete instructions . . .everything you need to get on packet radio. Order MFJ-1282 (disk) or MFJ-1283 (tape), $19.95.

Unlike machine specific TNCs you never have to worry about your MFJ-1274 or 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 with an apropriate 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 widespread use.

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Both feature AX.25 Level 2 Version 2 software, hardware HDLC for full duplex, true Data Carrier Detect for HF, multiple connects, 256K EPROM, 16K RAM (expandable to 32K with optional EPROM), simple operation, socketed ICs plus much more.

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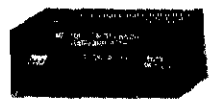
Help make history! Join the packet radio revolution now and help spread this exciting network throughout the world. Order the top quality and affordable MFJ-1274 or MFJ-1270 today.



MFJ-1273, $49.95

Now you can tune in HF, OSCAR and other non-FM packet stations fast! This MFJ clone of the TAPR tuning indicator makes tuning natural and easy - - it shows you which direction to tune. All you have to do is to center a single LED and you're precisely tuned in to within 10 Hz. 20 LEDs give high resolution and wide frequency coverage.

The MFJ-1273 tuning indicator plugs into the MFJ-1270 and all TNC-1s, TNC-2s and clones that have the TAPR tuning indicator connector.

Order any product from MFJ and try it -- no obligation. If not satisfied return within 30 days for prompt refund (less shipping).
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A3

10, 15, 20,*40 meters

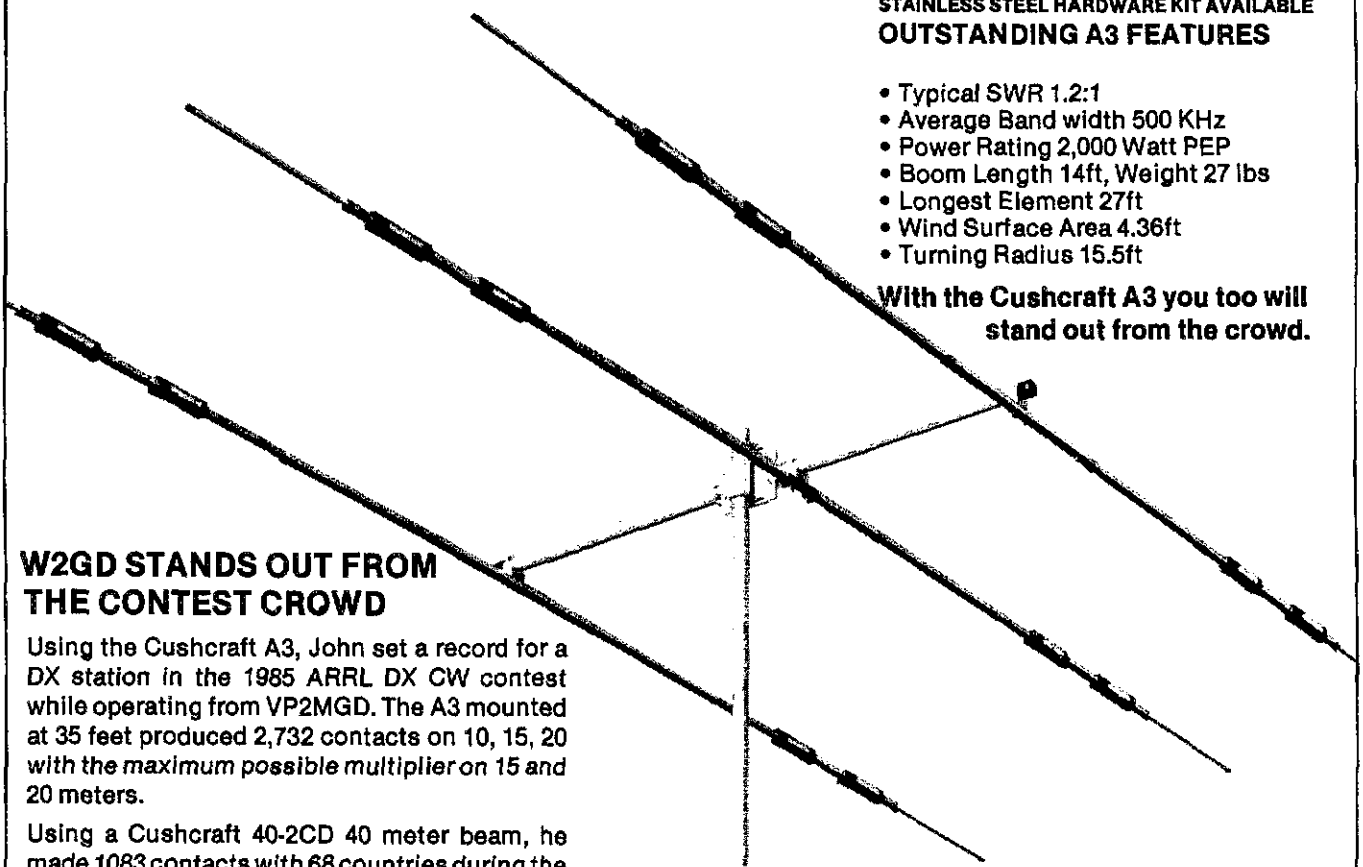
Whether busting pileups, rag chewing or hunting rare DX, the A3 stands out from the crowd with the perfect combination of easy assembly, the right size, rugged durability and great performance.

***40 METERS WITH THE A743 ADD ON KIT, STAINLESS STEEL HARDWARE KIT AVAILABLE**

OUTSTANDING A3 FEATURES

- Typical SWR 1.2:1
- Average Band width 500 KHz
- Power Rating 2,000 Watt PEP
- Boom Length 14ft, Weight 27 lbs
- Longest Element 27ft
- Wind Surface Area 4.36ft
- Turning Radius 15.5ft

With the Cushcraft A3 you too will stand out from the crowd.



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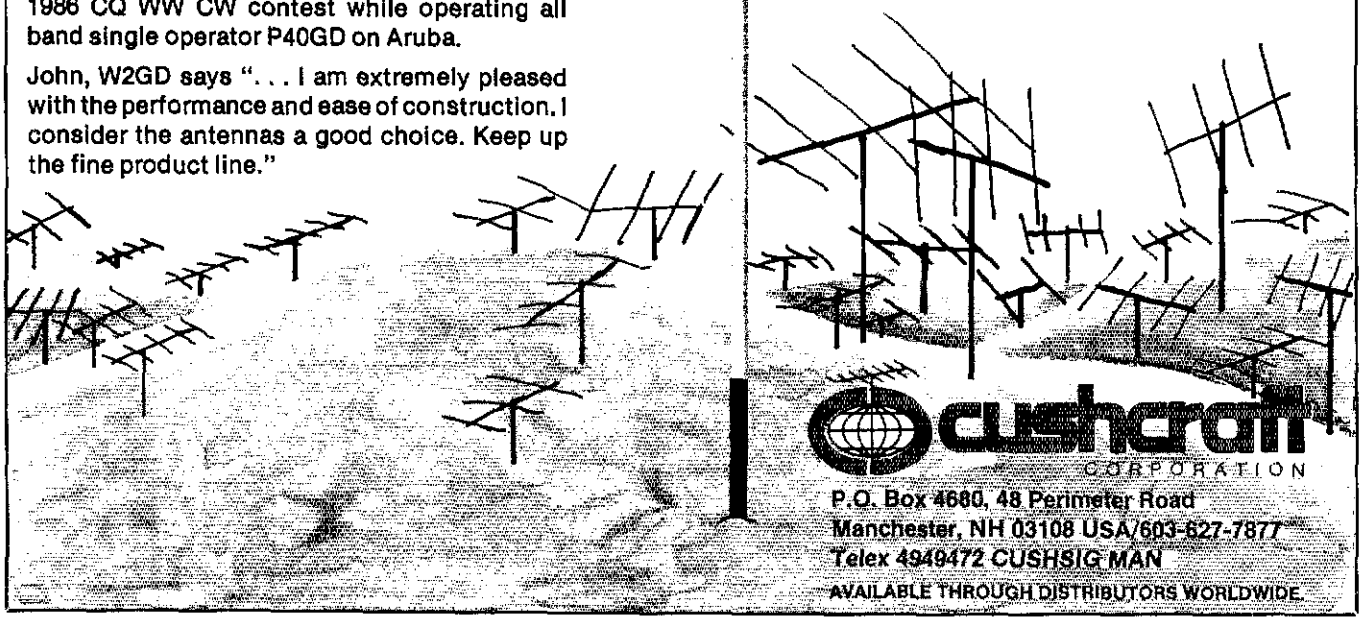

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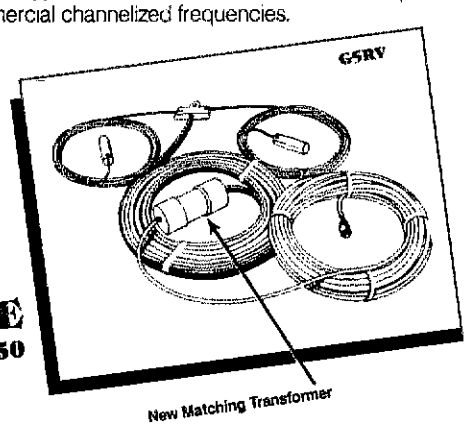

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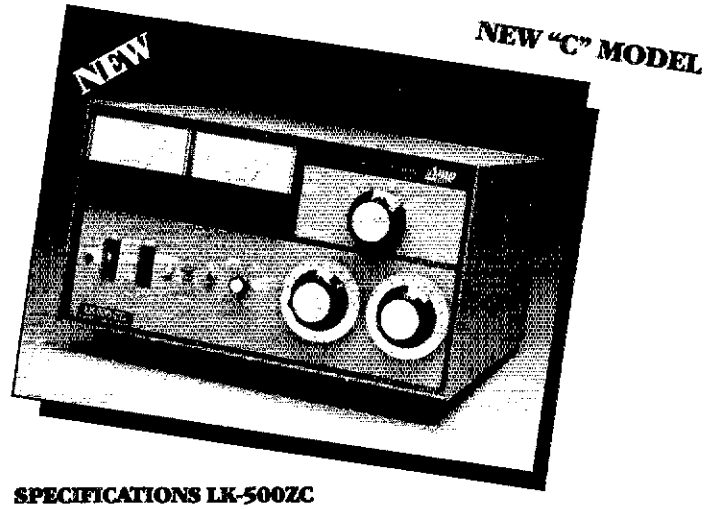

SPECIFICATIONS LK-500ZC

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).
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WANTED: MINT Collins S/Line, (round). W6OWD, 415-728-7136.

HEATH 2KW PEP $650. KJ4QB, 2378 Lourdes Drive, W. Jacksonville, FL 32210.

FOR SALE: Kenwood TS-820S, $450. Kenwood R-820 Receiver, $300. Both units mint with manuals. Robert White, K9LWA, 2501 Birch Drive, Richmond, IN 47374, 317-935-3966.

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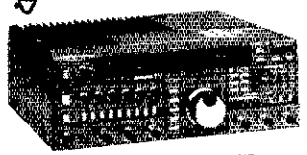

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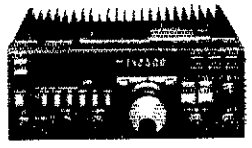

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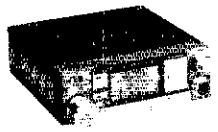

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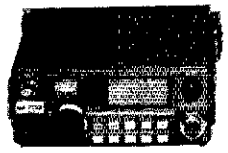

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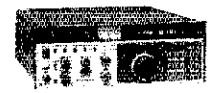

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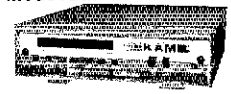

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IBM-PC RTTY/CW. New CompRtty II is the complete RTTY/CW program for IBM-PC's and compatibles. Now with larger buffers, better support for packet units, pictures, much more. Virtually any speed ASCII. BAUDOT, CW, Text entry via built-in screen editor! Adjustable split screen display. Instant mode/speed change. Hardcopy, diskcopy, break-in buffer, select calling, text file transfer, customizable full screen logging, 24 programmable 1000 character messages. Ideal for MARS and traffic handling. Requires 256K PC or AT compatible, serial port, RS-232C TU. $65. Send call letters (including MARS) with order. David A. Rice, KC2HO, 25 Village View Bluff, Ballston Lake, NY 12019.

TR-9130 all mode two meters $375. Mirage two meter amplifier B3016 $150. KLM 432MHz 110W output amplifier $275. All units above have less than 1 hr air-time. Brand new GBC Video Camera with Power Supply $100. 4-400A surplus $65. A pair 4-400A used but good $50. Charles Borg, N4JQH, 458 Borraclough Avenue NW, Palm Bay, FL 32907, 305-725-0011.

HR2B 2 meter very clean, ideal for packet $75, MFJ 1270 Packet TNC $90, DX-150 Receiver $50. After 7:00 p.m. KD4AJ, 404-396- 6760.

WANTED: D.C. p/s for KWM-2; SB-101; HW-101. 220 & 440 xtal mobile or HT. WA8VJL, P.O. Box 1382, San Bonito, TX 78586.

WANTED COLLINS—KWM-2A, 75S3A, 516F-2 and 30L-1. State condition and prices. KW6F, Mac, 2539 Washington Street, Long Beach, CA 90810, 213-835-2070 after 5PM pst.

5¼' DSDD DISK SALE. 67 cents each—while supply lasts. 100% error-free, sleeves, write-protect tabs. Add $3 S&H. Make check payable to Robert Mauro. Mail to: Computype, 257 Center Lane, Levittown, NY 11756.

SCREW IDENTIFIER, Metric or inch. $3.50 each or $6 for both. Elwick, Dept. 623, 230 Woods Lane Somerdale, NJ 08083.

WANTED: EARLY commercial Iconoscope Television Camera or information, schematics, etc. Brewster, 412-833-4287, 454 Diablo Drive, Pittsburgh, PA 15241.

FT101-EE for sale mint condition completely refurbished at Yaesu $375. Tempo-1 with power supply needs work $150. 101-EE phone patch mint $90. N2MB, 1-718-327-4952, 347 Beach 43rd Street, Far Rockaway, NYC 11691.

FOR SALE: Clean TS120V w CW Filter, PS-20, MC-35, AT130, boxes, manuals, $450 or trade for Argosy II; AEA CP-1 with C-64 software cartridge, $175; KA1DTU, 203-678-8585 after 6 PM.

KENWOOD TR-7950 FM Mobile, excellent condition 50W, 21 Memories, scan, original carton, manuals, will ship. $275. Also, ICOM 260A all-mode 2M mobile, 10W, never used mobile, original carton, manuals, will ship $240. T. Jones, 37 Orenda Spgs. Saratoga, NY 12866.

ROSS'$$$$ USED April Specials: Kenwood VFO-700A $79.90, TS-700A $329.90, VFO-520S $129.90, TS-180S/DFC with CW & SSB Filter $459.90, Yaesu FC-901 $159.90, FP-301 $95.90, Drake TR-4 $179.90, RV-V4C $79.90, WH-7 $89.90, Tempo 2020 $189.90. Phone or send SASE for used items list. Over 7,500 new ham items in stock. Mention ad. Prices cash, FOB Preston. We close at 2:00 Saturdays & Mondays. Ross Distributing Company, 78 South State, Preston, ID 83263, 208-852-0830, P.O. Box 234.

FOB SELL: 1983 Signal One Milspec 1030, options, $4650; 100 foot HD trailer-mount antenna mast, accessories, $2000; Knight T-60, $35; Palomar Loop Amp, BCB, 160/80 Loops, $110; NC101, $65; Meissner Receiver, $35; Heil Speaker, $25; GSB100, GSB201, kW 80- 10, $450; Tr4CW, RIT, NB, RV4C, AC4, nearmint, $475; National HRO-5RA-1, Rack, Spkr, Coils, $175; Want: Telrex 10, 15, 20, 40 meter beams; Telrex Rotors, masts, Alpha 77 SX factory-built; Henry 4K, 6K, 8K; RV-6; Raytrack 6 meter Linear; RG17; Rohn 25, 45, 55; Dill towers. Clean Johnson SSB sell $135; K8CCV, 216-427- 2303, 6-9 PM weeknights.

WANTED: SWAN 510X Oscillator. Need for Swan 500CX Transceiver to permit MARS use. Ike Hamilton, 68 Mohawk Drive, Searcy, AR 72143, 501-268-6298 (evenings).

WANTED: E.H. Scott Communications Receiver Ollie, K2BBK, 716-461- 4246.

DIGITAL AUTOMATIC DISPLAYS for FT-101's, TS-520's, Collins, Drake, Swan, Heath and all others. Six 1/2' digits. 5' wide by 1 1/4' metal cabinet. Send $2 for information. Receive a $30 discount. Includes comparison of the simple 'BCD' readouts found in new radios and our very accurate "Calculating Frequency Counter" readouts. Please be specific. Grand Systems, POB 3377, Blaine, WA 98230.

KENWOOD 830S Transceiver, CW 500Hz, 2X-$640 digital VFO230-$180, Both very nice condition, original cartons, manuals, will ship. T. Jones, 37 Orenda Spgs., Saratoga, NY 12866.

COMBINE SUMMER VACTION and Amateur Radio. Home for rent near beaches in Rhode Island. By week or month with Tower, Low Band Beam, VHF Beam and Dipoles. TS930S and IC290H available. Call 203-747-3335, K1RM.

LAB EXPERIMENTOR Multi-Voltage Regulated Power Supply printed circuit board only. Can hold 3 Fixed-1 variable positive and 3 Fixed-1 variable negative 1 Amp Regulators with heat sinks, Bridge Rectifier, Filter Capacitors, Regulator I/O capacitors, Resistors. 22 pin Edge Connector Contacts gold flashed. Requires external Transformer. Size 4 ½' × 6 ½'. Model PS4ECC $21.95. Pepperkit, Division of Electronic Construction Company, 527-10th Street, Sparks, NV 89431-0811. Include call letters with order.

LIKE NEW SELDOM Used: Kenwood R-2000 $360 Autek QF-1A $50 Heathkit keyer HD1410 $38 New: MFJ 941-D Tuner $70 UPS Prepaid W7JUA Oregon 503-981-7034.

TEST EQUIPMENT: HP8551B/851B spectrum analyzer and display section freq range 10.1 MHz to 12 GHz, Type N coaxial input, with extra waveguide mixers range can go to 40 GHz, ten calibrated spectrum widths 100 kHz to 2 GHz, sensitivity up to -100 DBm $1,650, Marconi TF1066B signal generator, 10 MHz thru 470MHz, both AM/FM, plus deviation, crystal calibrated rf output, ideal for AM/FM, UHF/VHF, stereo tv repairs $550, HP606A signal generator 50 kHz thru 65 MHz $375, HP608C signal generator 10 MHz thru 480 MHz $345, all lab calibrated, satisfaction guaranteed. Visa, M/C or check, add shipping, phone Bill Slep, 704-524-7519, Slep Electronics Company, Highway 441, Otto, NC 28763.

ROSS'$$$$ NEW Specials (April only): Kenwood TS-440S $849.90, TH- 205AT $224.90, TR-2600A $239.90, TR-3500 $237.90, TS-780 $759.90, ICOM IC-745 $869.90, Yaesu FT-720RVH $249.90. All L.T.O. Phone or send SASE for over 7500 ham-related items in stock for immediate shipment. Mention ad. Prices cash, FOB Preston. We close at 2:00 Saturdays & Mondays. Ross Distributing Company, 78 South State, Preston, ID 83263, 208-852-0830, P.O. Box 234.

PIEZO CODE Oscillator Module. All you need is key and 6-12V battery, good tone and volume, great for practice or MCW. $1.75 postpaid. Send LSASE for odds-n-ends list. Arthur Schur, 4321 Avenue, J Brooklyn, NY 11210.

IC-730, PBT, HM-7, $425. SM-6, $25. Kenwood VB-2530, MS-1, $65. New Zenith ZT-1 terminal, $85. New Cushcraft CS-450M, $30. Want: IC-735. F.O.B. K1LEC, 802-886-8121.

AMPLIFIERS: HENRY 2KD5 desktop legal-limit amplifier for 80-10 meters, pair 3-500Z's; in perfect condition, works brilliantly, will demo. $895 (local deal). Also, Amp Supply monoband amp for 160 meters, self-contained, uses 4 x 6MJ6's for 500 W CW or PEP output. Brand new conditon, will demo. $225, can ship. Steve, WB2WIK, 153 Rodman Ct., Eatontown, NJ 07724, 201-376-2004 weekdays.

FOR SALE: FT101B, FV101B, external digital display $450. Kenwood TS700SP $350. Heath HW8 $70. Kantronics Exterface Ham Text with AMTOR for Apple $200. Heath ET3400A trainer $200. WA2YZL, P.O. Box 357, South Freeport, ME 04078, 207-865-6858.

FULL STATION: Collins 75A4 #1925. .8 & 31 Filters, KWS-1 #697, new spare 4X250B tinals, matching speaker, D-104, $750; 100' Rohn 25G tower, 3 extra top sections, Ham II rotor, Cushcraft ATB-34 tribander, 200' 7/8' hardline, you take down, $850; B&W 5100-B, 51SB-B xmtr, $75; SB-144 2m xcvr, $100; (2) GE Custom MVP 450MHz 30W mobiles, $300 each, duplexer & repeater mod for MVP, $250. KB1IO, Plaistow, NH, 603-382-5172.

SINGER-GERTSCH FM-7 Service Monitor w/DM-3 deviation meter. AM/FM 20-1000 MHz, just rebuilt, $795 or trade for ICOM 745. Kenwood R- 1000 & Autek OF-1 $250. Bearcat 220 like new, $195. Robert Trimble, P.O. Box 763, Wilsonville, OR 97070, 503-245-7678.

ICOM-25H. GOOD conditon. Original carton and operator manual. $145. 02AT. Mint. Includes (together only): BC-35, (2)BP-3, BP-7, CP-1, HM-9. Original cartons and manuals. $417. Firm! Harry, NE8Y, 813-294-1144 after 8:00 PM EST.

JOHNSON WANTED: Invader, Invader 2000, Valiant, Valiant II transmitters, matching SSB adaptor, Courier Linear Amplifier, 200 - 1000W Matchbox. Contact: G. Hawrysko, K2AWA, P.O. Box 568, Boro Hall, Jamaica, NY 11424.

PC/MS-DOS Ham Software. $5.50 for sample disk and new catalog. Rockford Systems, 7474 Hessler, Rockford, MI 49341.

WANTED- TA-33 antenna - rotor - 50 ft. plus tiltover tower or possibly self-standing. Tom Withem, 1744 Lilly Lane, New Albany, IN 47150, 1-812-945-4810.

FOR SALE: FT-101, SB200, Dentron Super Tuner, Heath HO-10 Monitor Scope. $550. W9KV, 706 N. Elmhurst, Mt. Prospect, IL 60056.

KENWOOD-940S/AT. Mint. Original cartons and operator manual. YK88C-1 installed. MC-85 included. $1575. Firm! Tr-7850 with KPS- 12. Mint. (Together only.) Original cartons and manuals. $300. Firm! Bird 43. Mint. Include 250-H and 100-C. Manual. $160. Firm! Harry, NE8Y, 813-294-1144 after 8:00 PM EST.

HELP! I NEED room for my new equipment. All equipment in excellent condition. Kenwood TS-520 ($325); Kenwood TS-700S ($325); Robot 400 ($295); Panasonic RF-4900 SW Receiver ($300); AEA Computer Patch CP-1; Standard 2M Handheld SRC-146A; other items. Also Radio Shack Model 1 Computer ($125). LSASE for list. WB2IMH, Box 305, Gladwyne, PA 19035.

WILSON WR-500 Rotator Wanted. Need rotator and control box. Contact N4GKX, POB 8515, Dothan, AL 36304.

WANTED: TWO 7094 RF amplifier tubes. Roger Dzwonczyk, WB2EIG, 283 East Longview Avenue, Columbus, OH 43202, 614-262-4447.

LEARN MORSE CODE the easy way on your MacIntosh Computer. MacMorse V20. Select the characters you want randomly sent. All English ham characters available. Vary speed from 5 to 22 WPM. Make the next license painless with MacMorse. Send $19.95. Kall #314, 700 Marine Parkway, New Port Richey, FL 33552.

BLEEDER RESISTORS: 200,000 Ohm, 50 Watt. 2/$11, 3/$15, Free Shipping. Gary Paladino, 906 Hester, Harrison, AR 72601.

MINI-QUAD MODIFICATION Kits, Mini-Quads, low Butternut prices, Free shipping, stamp for flyer, Hart Eastern Communications, 1444 Darlington, Derby, NY 14047.

YAESU FT-ONE, new, never used, "G" model, also rec. and xmit on General Coverage Frequs. (MARS etc.), must sell for financial resons, first $1495 - will take. WA0YOB, 303-688-1068.

DISCOVER "THE RADIO WORKS". See what we are doing with high performance HF and VHF antennas, parts, and accessories. Unusual 48 page discount catalog. 22 cents SASE The Radio Works, APROST, Box 6159, Portsmouth, VA 23703, 804-484-0140.

SELL: ICOM 551D 6 meter, mint and original cartons $600. Also 15 meter NCG 10 watt mobile $235. WA3IWW, phone 215-385-3343.

WANTED: ICOM IC-50L or IC-20L for conversion to 50 MHz. Clarke Greene, K1JX, 92B-2 Cynthia Lane, Middletown, CT 06457.

THE HAM SHOPPER: classified ads publication. Personal ads for ham and computer gear free for subscribers. (Free for non-scribers until April 17) Published twice monthly. Ads quickly circulate. One year subscription: $8.75. P.O. Box 522, Lincoln, IL 62656.

JOBS FOR HAMS

CAMP COUNSELOR/radio instructor, nine summer weeks in New Hampshire. Top facilities for DX, AM and Ham with long established activity. New rigs, triplebeam tower. Write/call Alan Stolz, WA1LGI, 5 Lockwood Circle, Westport, CT 06880, 203-226- 4389.

WANTED FOR summer of 1987: Instructors in Electronics, Ham Radio and computers. Small boys' science camp in Pennsylvania. Apply: Donald Wacker, P.O. Box 356, Paupack, PA 18451.

COUNSELOR: Operator with General License to teach Ham Radio at Pennsylvania coed camp. Have completely equipped Ham Station. Write Trail's End Camp, 215 Adams Street, Brooklyn, NY 11201.

JOB WANTED BOSTON AREA. Returning from 13 years in Europe (speak French, German). Background – PC software houses: manuals, product testing, user training; book publishing: management, advertising and sales, writing, editing, translating; service technician in broadcasting, communications. Ph. D. in Philosophy, 1st class phone. Seek position electronics/computer industry. Dr. G.E. Tucker, WA5NVI, c/o W5VU, 6906 Kingsbury Drive, Dallas, TX 75231.

RADIO TECHNICIAN Qualified experienced Technician with 3-5 years work on the bench and holder of a current technican's license. Growing RCC in business 27 years with great potential for right man. Excellent salary, benefits and working conditions. Tel-Air Communications, Inc., 156 Woodport Road, Sparta, NJ 07871, 201-729-7900.

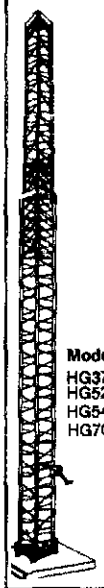
ADVERTISING DEPARTMENT STAFF

Lee Aurick, W1SE, Advertising Manager
Sandy Gerli, AC1Y, Deputy Adv. Mgr.
Angela Beebe, Advertising Assistant

203-667-2494 is a direct line, and will be answered only by Advertising Department personnel

Index of Advertisers

ANTENNA/TOWER SALE!



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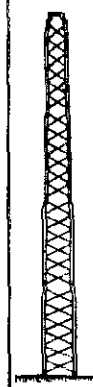
CRANKUP SALE!
All Models Shipped Factory Direct—Freight Paid*!
Check these features:
- All steel construction
- Hot dip galvanized after fabrication
- Complete with base and rotor plate
- Totally self-supporting—no guys needed

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.!

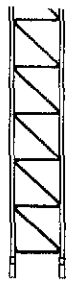


ROHN
Self Supporting Towers On SALE!
FREIGHT PREPAID
- All Steel Construction—Rugged
- Galvanized Finish—Long Life
- Totally Free Standing—No Guy Wires
- America's Best Tower Buy—Compare Save $
- Complete With Base and Rotor Plate
- In Stock Now—Fast Delivery

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

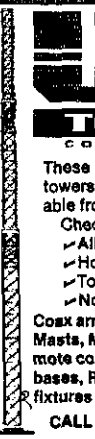


- World Famous Rohn Quality and Dependability
- Rugged high wind survival-provides safe installation
- Multi purpose towers satisfy a wide range of needs
- Complete packages include: guy hardware, turnbuckles, guy assemblies, w/torq bars, concrete base, rotor plate and top section per manufacturers specs.

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
MA550 mast	22'	60'	10 sq ft	869
TX436	22'	36'	18 sq ft	829
TX456	22'	56'	18 sq ft	1249
TX472	23'	72'	18 sq ft	2059
HDX556	22'	56'	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.
Heliax® is a Registered Trademark of the Andrew Corp.

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
⅞" Heliax®	$25	$25	$25	$25
⅞" Heliax®	$49	$49	$49	$49

COAX CONNECTORS
Amphenol Silver PL259.....$1.25
UG21B N Male.....$2.95
9086/9913 N Male Connector.....$4.95

ANTENNA WIRE & ACCESSORIES
Stranded Copper 14ga.....$.10/ft.
¼ mile 18ga copper-clad steel wire.....$30
Dog bone end insulator.....$.79 ea.

Van Gorden
1:1 Balun.....$11 Center Insulator.....$6
Dipole Kits.....D80 $31.95/D40 $28.95
Short Dipole Kits.....SD80 $35.95/SD40 $33.95
All-band Dipole w/ladder line.....$29.95
G5RV all band antenna.....$49.95

ALPHA DELTA
DX-A 160-80-40 Sloper.....$49

CUSHCRAFT
A3 3-el Tribander.....$229
A4 4-el Tribander Beam.....$299
A743 & A744, 30/40 mtr KIT for the A3 & A4 ea$79
R3 20, 15, 10mtr Vertical.....$275
AV5 80-10mtr Vertical.....$109
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

hy-gain
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
- 648S 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
- Highest 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.....$39
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

MIRAGE/KLM
KT34A 4-el Broad Band Triband Beam.....$399.95
KT34XA 6-el Broad Band Triband Beam.....$589.95

CREATE ANTENNAS
CALL FOR DISCOUNT PRICING!

ROTORS
Daiwa MR 750 PE (16.1 sq ft rating).....$289
Additional Motor Units.....$89
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 × 9EF (1/2" × 9" Eye to Eye Turnbuckle)	$9.95
1/2 × 9EJ (1/2 × 9" Eye & Jaw Turnbuckle)	$10.95
1/2 × 12EE (1/2" 12" Eye & Eye Turnbuckle)	$12.95
1/2 × 12EJ (1/2" × 12" Eye & Jaw Turnbuckle)	$13.95
5/8 × 12EJ (5/8" × 12" Eye & Jaw Turnbuckle)	$16.95
3/16" Preformed Guy Grip	$2.49
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500 D Guy Insulator (5/32" or 3/16" Cable)	$1.69
502 Guy Insulator (1/4" Cable)	$2.99
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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
Socketfast Potting Compound (does 6-8 ends)	$14.95

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Heavy Duty Steel Masts 2 in OD - Galvanized Finish

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25 in Wall	$69	$129	$189	$249

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(Prices & Availability Subject To Change Without Notice) *(Antenna/tower product prices do not include shipping unless noted otherwise)*

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- *100 memories*
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- Optional Built-in AT

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- FM Standard
- 32 Memories
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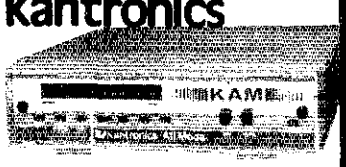

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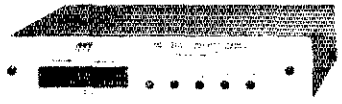

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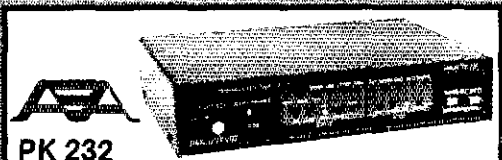

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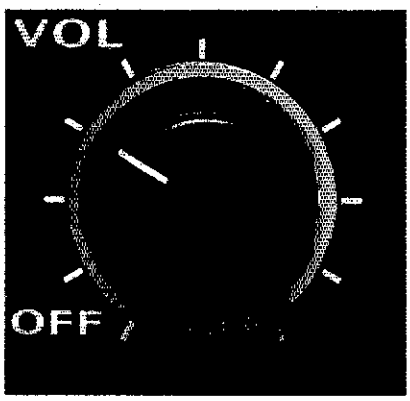

You don't have to sacrifice performance to gain simplicity in your mobile operation.

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Plus you get: 45 watts output (35 watts on 440 MHz). LCD readout. 10 memories that store frequency, offset and PL tone. (7 memories can store odd splits.) Scan all memories or selected memories 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. PL tone board (optional). PL display.

Independent PL memory per channel. PL encode *and* decode. LCD power output and "S"-meter display. Eight-key control pad. Keypad lock. High/low power switch (low power: 5 watts VHF, 3 watts UHF).

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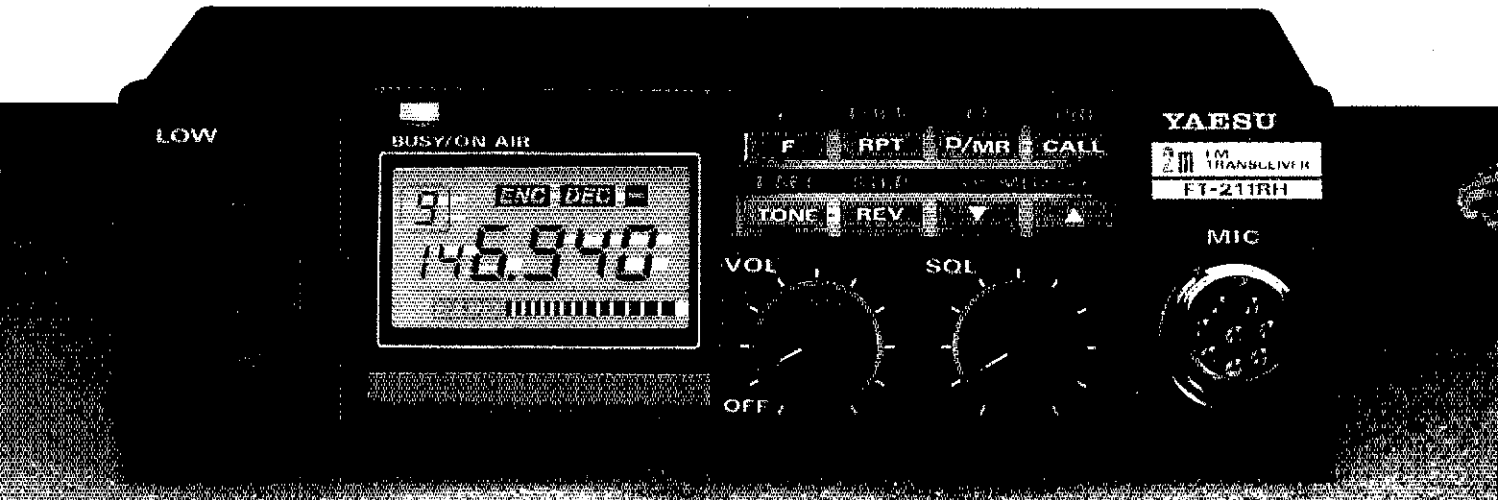
Discover the 2-meter FT-211RH and 440-MHz FT-711RH at your nearest Yaesu dealer today. If you can turn a knob and push a button, you'll have high-performance mobile operation mastered.

YAESU



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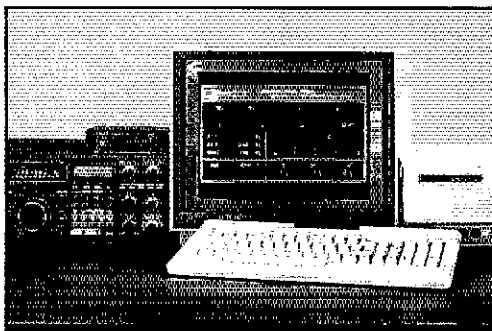
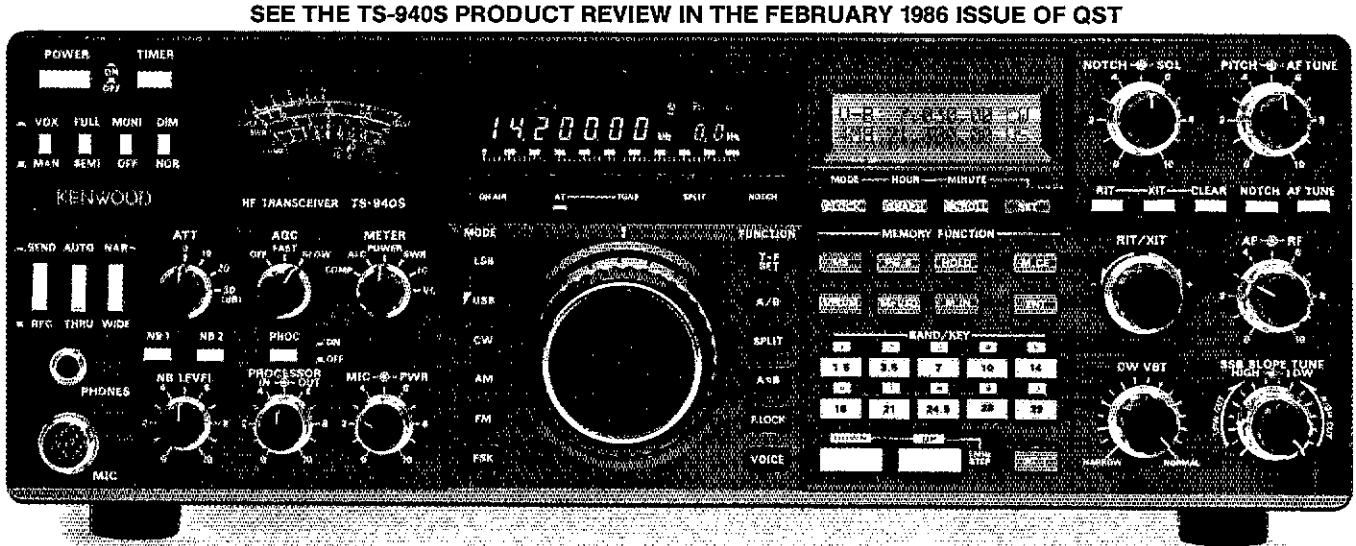
The new TS-940S is a serious radio for the serious operator. Superb interference reduction circuits and high dynamic range receiver combine with superior transmitter design to give you no-nonsense, no compromise performance that gets your signals through! The exclusive multi-function LCD sub display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

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

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



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



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

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

KENWOOD

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